

**DECISION SUPPORT TOOLS FOR PRIORITIZING
THE HYDRAULIC VULNERABILITY OF
EXISTING NEW YORK STATE COASTAL BRIDGES DUE TO
THE IMPACT OF CLIMATE CHANGE PROJECTIONS**

VOLUME I

By
Gerarda M. Shields

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dissertation requirement for the degree of Doctor of Philosophy.

Date

Prof. Reza Khanbilvardi
Chair of Examining Committee

Date

Dean Mumtaz K. Kassir
Executive Officer

Supervisory Committee

Prof. Ghassem Asrar, Co-Chair

Prof. Stuart Gaffin

Prof. Shayesteh Mahani

Prof. Nir Krakauer

THE CITY UNIVERSITY OF NEW YORK

Abstract

DECISION SUPPORT TOOLS FOR PRIORITIZING THE HYDRAULIC VULNERABILITY OF EXISTING NEW YORK STATE COASTAL BRIDGES DUE TO THE IMPACT OF CLIMATE CHANGE PROJECTIONS

By

Gerarda M. Shields

Adviser: Professor Reza Khanbilvardi

With the reality of climate change now broadly accepted by scientific organizations and governments, bridge owners are considering how climate change projections may affect the safety of their bridges. Existing bridges were designed based on historic, or observed, climate conditions and not future climate change projections. The average age of U.S. bridges is 43 years, and it is possible that many of these bridges will still be in service in the latter half of the century. Projected increases in sea level may have strong implications for coastal bridge design, inspection, maintenance and risk assessment activities.

The first objective of this study was to develop a set of criteria to readily prioritize the hydraulic vulnerability of U.S. coastal bridges, in light of climate change projections, to serve as a decision support tool for bridge owners. The National Bridge Inventory database was the source from which the prioritization criteria were developed. This tool can assist owners in determining which bridges are likely to be the most vulnerable to climate change projections. These bridges can then be given the highest priority towards a more thorough risk assessment.

The second objective was to determine whether sea level rise projections would negatively impact a bridge's hydraulic vulnerability. Using the criteria developed, a negative impact was

defined as an increase in priority from the historic to the projected climate condition. The New York State coastal area was chosen as the case study because of the region's sensitivity to changes in sea level. Nine (9) case study bridges were selected, and a projected sea level rise of 55 inches (1.4 m) was used for the hydraulic and scour analysis. It was determined that sea level rise projections would have a negative impact on the hydraulic vulnerability of New York State coastal bridges since four of the nine case studies increased in priority from the historic to the projected climate condition. Based on the research findings, revisions to national and state standards were recommended to incorporate sea level rise projections with regard to hydraulic studies, design and risk assessment.

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1 INTRODUCTION

1.1 Need and Justification

With the reality of climate change now broadly accepted by scientific organizations and governments, bridge owners are beginning to consider how climate change may affect the safety of their bridges and the public. Existing bridges are designed and reconstructed based on historic, or observed, climate conditions and not future climate change projections. With an average life span of 75 years, many bridges are “living” well beyond this average. It is likely that many of the bridges in service today will still be in existence towards the end of the century. Projected changes in sea level by 2080 are likely to have strong implications for coastal bridge design, inspection and maintenance. This sentiment was recently echoed by the United States Transportation Research Board’s (TRB) 2008 Report:

“The past several decades of historical regional climate patterns commonly used by transportation planners to guide their operations and investments may no longer be a reliable guide for future plans. In particular, future climate will include new classes (in terms of magnitude and frequency) of weather and climate extremes such as record rainfall . . . not experienced in modern times as human-induced changes are superimposed on the climate’s natural variability. The impacts will vary by mode of transportation and region of the country, but they will be widespread and costly in both human and economic terms and will require significant changes in the planning, design, construction, operation, and maintenance of transportation systems.”

In response to this finding, the TRB recommends that state and local governments should incorporate climate change projections into their long-term capital improvement plans,

facility designs, maintenance practices, operations, and emergency response plans. Taking measures now to evaluate and protect the most vulnerable infrastructure should pay off by diminishing near-term maintenance expenditures and reducing the risk of catastrophic failure, with its toll on human life and economic activity.

Additionally, it has been determined that transportation professionals often lack sufficiently detailed information about expected climate changes and their timing in order to take appropriate action. TRB recommends research that provides climate data and decision support tools that meet the needs of transportation decision makers. One example cited was the development of a geographic information systems platform that can be used to map the locations of infrastructure, such as bridges, overlaid with information on climate change effects (e.g., sea level rise). Such a tool for would enable bridge owners to manage their current inventory more effectively.

The New York State coastal region was selected as the case study due to the large number of coastal bridges, extremely dense population, large infrastructure investment and low elevation. This region is comprised of an extensive network of highways, with a significant number of bridges along the coastlines of New York City and Long Island. According to the National Bridge Inventory, there are over 300 bridges within coastal region. New York State currently spends about \$15 billion annually in public funds and direct user charges to operate, maintain and improve transportation (NYSDOT, 2011).

With over 12 million people, and as many as 39,000 persons per square mile, this region is one of the most densely populated in the United States (NOAA, 2004). Additionally, the largest population increases in Northeast are expected in Kings, Queens and Suffolk counties, all of which are part of the New York State coastal region. Geographically, a

majority of the land in the New York State coastal region is at an elevation less than 10ft above the current mean sea level (Gornitz et al, 2002). All of these factors make the New York State coastal area very susceptible to climate change projections, especially sea level rise which is the focus of this study.

1.2 Purpose and Hypothesis

The purpose of this study is to develop a set of standardized criteria to prioritize the hydraulic vulnerability of U.S. coastal bridges in light of climate change projections to be used as a decision making tool for bridge owners. It is expected that this research will enable bridge owners to more efficiently select the most vulnerable bridges so that a complete, thorough risk assessment can be performed to determine the governing failure mode. The hydraulic vulnerability of coastal bridges to climate change impacts is of particular concern in the United States. In a study of bridge failure causes in the United States from 1966-2005, over 60% of the recorded bridge failures were due to hydraulic factors (Figure 1).

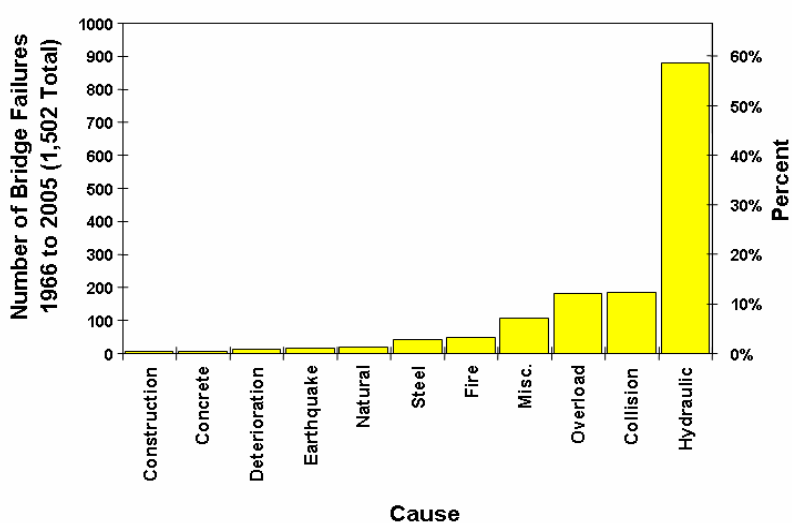


Figure 1: Causes of bridge failures in the United States from 1966-2005 (NYSDOT, 2006)

For this research, the New York State coastal region was used as a case study to determine the impact of climate change projections, specifically sea level rise, on existing bridges. Using the criteria developed, nine (9) case study bridges were selected based on their prioritization for the historic climate condition. Three bridges each were selected from the high, medium and low prioritization categories. Then, a preliminary analysis based on the failure mode of undermining of the foundations by scour was performed for the projected climate condition for each case study bridge. Again, using the criteria developed, the bridges were re-prioritized - based on the results of the preliminary analysis - for the projected climate condition. The changes in prioritization from the historic to projected climate condition were compared for each bridge to determine the impact of sea level rise.

The hypothesis is that sea level rise will have a negative impact on the hydraulic vulnerability of coastal bridges. This hypothesis will be tested by comparing the prioritization of each case study bridge for the historic and projected climate conditions for sea level. A negative impact is defined as an increase in priority from the historic to the projected climate change condition due to a 55 inch rise in sea level.

It is assumed that the case study bridges are representative of the entire coastal bridge population. The definitions of critical, high, medium and low prioritization and the associated criteria are discussed in detail in Section 3.3.

1.3 Thesis Objectives for New Work

In an effort to make a positive and unique contribution to the field of civil engineering and test the aforementioned hypothesis, the following objectives have been identified:

1. Develop criteria to prioritize the hydraulic vulnerability of US coastal bridges, using New York as a case study, to be used as part of the risk assessment process by bridge owners.
2. Determine if sea level rise projections will negatively impact the hydraulic vulnerability of coastal bridges.
3. Revise regional and national standards for the design, inspection and prioritization practices with regards to climate change projections.

1.4 Study Area

For the purposes of this study, the coastal region of New York State consists of the following counties: Bronx, Kings, Nassau, New York, Queens, Richmond, and Suffolk (Figure 2). In this region a large portion of the coastline, especially the peninsulas and barrier islands, are at elevations of less than 10ft above sea level.



Figure 2: New York State coastal region study area

1.5 Stakeholders

Numerous state, county and local agencies own and operate the bridges within the study area. The New York State Department of Transportation (NYSDOT) directly owns the largest number of bridges and oversees the operation of all other bridges within the state. NYSDOT is divided into geographic regions. Region 1 is located in the capital of Albany and houses the NYSDOT Main Office. Region 11 (New York City) and Region 10 (Nassau and Suffolk Counties) are the two regions within the case study area. Support and permission to use design drawings and inspection reports for this research has been given by these three regions.

The Port Authority of New York & New Jersey (PANY&NJ) is a federally appointed agency that manages a number of bridges, tunnels, airports and transit in New York City and Northern New Jersey. PANY&NJ has also granted permission to use the Bayonne Bridge over the Kill Van Kull as a case study.

2 LITERATURE REVIEW

2.1 Climate Change

2.1.1 Observations of Climate Change

Scientific consensus on climate change has grown rapidly in recent years as advances in analysis have been achieved. As evidenced by the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC), the reality of climate change is now broadly accepted by both national and internationally recognized scientific organizations and governments alike. The IPCC is the leading body for the assessment of climate change, established by the United Nations Environment Programme and the World Meteorological Organization. The organization is charged with providing “a clear scientific view on the current state of climate change and its potential environmental and socio-economic consequences” (IPCC, 2010). The AR4 states that the average global surface temperature has increased over the past century. The 100-year average trend of global surface temperatures, from 1906 to 2005, indicates an increase of 1.33 °F (0.74 °C). The temperature increase is widespread over the globe and is greater at higher northern latitudes such as the Northeastern United States.

Additionally, trends from 1900 to 2005 have been observed in precipitation amount and intensity. A significant increase in precipitation has been observed in the eastern parts of North and South America, and the intensity of tropical cyclone activity in the North Atlantic has increased since about 1970 (IPCC, 2008).

Increases in sea level have also been observed with a global average sea level rise rate of 0.071 inches/year (1.7 mm/year) over the period from 1961 to 2003. The two major causes

of global sea-level rise are thermal expansion caused by the warming of the oceans and the loss of land-based ice (such as glaciers and polar ice caps) due to increased melting (NOAA, 2012). The linear trend in relative mean sea level (MSL) is a combination of the absolute global rate of sea level rise and the rate of any local vertical land motion. The variation in vertical land motion, ranging from rapid subsidence in the southern United States to rapid uplift in Alaska, is primarily responsible for the regional differences in MSL trends and for the differing rates within regions (NOAA, 2009). Vertical land motion is created by a variety of mechanisms such as: glacial isostatic adjustment, tectonic movement, sedimentary basin subsidence, soil compaction, and fluid withdrawal.

The National Oceanic and Atmospheric Administration (NOAA) has maintained tidal gages in the United States through the Center for Operational Oceanographic Products and Services. Most of the east coast stations in the United States have been in operation for many decades, making it possible to detect statistically significant differences in trends among the stations with regard to sea level rise rates. All of the trends are above the global 20th century average. There are higher trends in the mid-Atlantic coastal region from New Jersey to Virginia than other east coast regions. The higher trend in sea level rise in this region has been attributed to “the ongoing collapse of the peripheral bulge that was formed as a result of visco-elastic lithospheric compensation during the previous ice age,” as a result of the weight of the ice sheet (NOAA, 2009).

In the New York State coastal region, tidal gages have been recording data for over 150 years in some locations. On the western boundary of the study area, the tidal gage located at the Battery in New York City has observed a mean sea level trend of 0.109 inches/year (2.77 mm/year) based on monthly mean sea level data from 1856 to 2006. This is equivalent to a

change of 0.91 feet (0.28 m) in 100 years. Relative sea level rise trends at various tidal gages within the New York State coastal region are shown below (Table 1). In general, the observed rate of sea level rise is approximately 1.5 times that of the global average.

Table 1: Sea Level Rise Trends in the NYS Coastal Region

Station Name	Data Collected Since (year)	Relative Sea Level Rise	
		(inches/year)	(mm/year)
Montauk	1947	0.109	2.78
The Battery	1856	0.109	2.77
Port Jefferson	1957	0.096	2.44
Kings Point	1931	0.093	2.35

2.1.2 Projections of Climate Change

Climate change responses and effects depend on both natural and anthropogenic drivers. One such anthropogenic driver is greenhouse gas (GHG) emissions. Global GHG emissions due to human activities have been growing since pre-industrial times, with an increase of 70% between 1970 and 2004 (IPCC, 2007). The largest growth in GHG emissions during this period was due to increases in energy supply, transport and industry. Other sectors such as residential and commercial buildings, forestry and agriculture grew at a slower rate. Even with current climate change mitigation policies and sustainable development practices, global GHG emissions will continue to grow over the next few decades. Since climate change projections are dependent on global GHG emissions rates, various scenarios were developed to “project” future GHG emissions. In 2000, the IPCC issued the Special Report on Emissions Scenarios (SRES) which described the scenarios. Four scenario categories, named A1, A2, B1 and B2, were considered (Table 2).

Table 2: Emissions Scenarios

Scenario	Description
A1	A1 supposes a world of very rapid economic growth, a global population that peaks in mid-century and rapid introduction of new and more efficient technologies. A1 is divided into three groups that describe alternative directions of technological change: 1. fossil intensive (A1FI) 2. non-fossil energy resources (A1T) 3. balance across all sources (A1B).
A2	A2 assumes a very heterogeneous world with high population growth, slow economic development and slow technological change.
B1	B1 considers a convergent world, with the same global population as A1, but with more rapid changes in economic structures toward a service and information economy.
B2	B2 describes a world with intermediate population and economic growth, emphasizing local solutions to economic, social, and environmental sustainability.

These scenarios take into account a wide range of demographic, economic and technological driving forces and resulting GHG emissions and are based on current climate policies. No likelihood has been attached to any of the scenarios as it is difficult to project future climate change policies and practices. At time the of this literature review, sixteen (16) global climate models (GCMs) developed by various institutions around the world (Appendix A.1). The emissions scenarios, in addition to other scenarios published since the SRES, were used to develop climate projections by the GCMs.

Climate change projections produced by GCMs are often of a spatial scale that is much more coarse (ex: 100km resolution) than what is needed for a regional scale (ex: 10 km resolution or finer). A few methods for downscaling global climate model projections to a regional level are available. The most straightforward means of obtaining high resolution scenarios is to apply coarse scale climate change projections to a high resolution observed climate baseline. This is known as the change factor method (IPCC, 2004). This method is used

when regional climate models output is not available, for sensitivity studies or when rapid assessment of multiple climate change scenarios are needed. Higher resolution climate change information can also be obtained through more sophisticated downscaling methods such as statistical and dynamical downscaling. These downscaling methods would be recommended for a more detailed analysis, such as with bridges, when performing a thorough risk assessment.

Beginning August 2008, the New York City Panel on Climate Change (NPCC) began looking at GCM projections from a regional perspective. For the purpose of rapid assessment, the NPCC used the change factor method to determine regional climate change projections for air temperature, precipitation, and sea level rise. The emissions scenarios selected were A2 (“worst case”), A1B (“business as usual”) and B1 (“best case”) because most of the GCMs contained these scenarios in their simulations. The combination of 16 GCMs and three emissions scenarios produced a matrix of outputs for temperature and precipitation. For each scenario which included specific time periods and variables, the results constituted a “model-based” probability function (NPCC, 2009). The results for the future time periods were compared to the model results for the 1971-2000 baseline period. Average temperature change projections were calculated as the difference between each model’s future simulation and the same model’s baseline simulation, whereas mean precipitation was based on the ratio of a given model’s future precipitation to the same model’s baseline precipitation. The same method was employed for sea level rise projections, but these projections were based on seven GCMs that included sea level rise as part of their analysis.

Extreme events, such as hurricanes and nor'easters, tend to occur on daily, rather than monthly, time scales. Since monthly output from climate models is considered more reliable than daily output, the NPCC employed a “hybrid projection technique.” This technique utilized the monthly precipitation output in the same manner as the annual output. The monthly projections were applied to the observed precipitation values of the Central Park rain gage data collected from baseline period. While this is a simplified approach to the projection, this method does help decision makers to prepare for extreme events. Projections of increases in precipitation, sea level rise rates and extreme events specific to the New York City Area are summarized below (Table 3) and discussed further on.

Table 3: Baseline Climate and Mean Annual Changes¹
Source: Columbia Center for Climate Systems Research

	Baseline 1971-2000	2020s	2050s	2080s
Air temperature Central range ²	55 °F	+ 1.5 to 3 °F	+ 3 to 5 °F	+ 4 to 7.5 °F
Precipitation Central range ²	46.5 in	+ 0 to 5 %	+ 0 to 10 %	+ 5 to 10 %
Sea level rise³ Central range ²	NA	+ 2 to 5 in	+ 7 to 12 in	+ 12 to 23 in
Rapid Ice-Melt Sea Level Rise⁴	NA	~ 5 to 10 in	~ 19 to 29 in	~ 41 to 55 in

1. Based on 16 GCMs (7 GCMs for Sea Level Rise) and 3 emissions scenarios. Baseline is 1971-2000 for temperature and precipitation and 2000-2004 for sea level rise. Data from National Weather Service (NWS) and National Oceanic and Atmospheric Administration (NOAA). Temperature data are from Central Park; precipitation data are the mean of the Central Park and La Guardia Airport values; and sea level data is from the Battery at the southern tip of Manhattan (the only location in NYC for which comprehensive historic sea level rise data are available).

2. Central range = middle 67% of values from model-based probabilities; temperatures ranges are rounded to the nearest half-degree, precipitation to the nearest 5%, and sea level rise to the nearest inch.

3. The model-based sea level rise projections may represent the range of possible outcomes less completely than the temperature and precipitation projections. See page 18 for more information.

4. "Rapid ice-melt scenario" is based on acceleration of recent rates of ice melt in the Greenland and West Antarctic ice sheets and paleoclimate studies. See Appendix C for further description.

2.1.3 Precipitation Change

Based on the three scenarios selected, regional precipitation may increase by approximately 0 to 5% by the 2020s, 0 to 10% by the 2050s and 5 to 10% by the 2080s. It is interesting to

note that many of the climate models tend to distribute most of the additional precipitation during the winter months while precipitation appears to decrease slightly during the autumn months of September and October.

2.1.4 Sea Level Rise

The IPCC-based methods used to project sea level rise for the New York City region include both global and local components relative to the region. Global components include: global thermal expansion and meltwater from glaciers, ice caps and ice sheets while the regional component is local land subsidence. There has been extensive discussion within the scientific community since the IPCC published the sea level rise projections. The concern is that the IPCC approach to sea level rise may significantly underestimate the range of possible increases. For example, the atmosphere has little ability to hold heat, and therefore most of the additional heat produced by human emissions is likely to be absorbed by the oceans. This additional heat could result in thermal expansion of the oceans and increase the melting rate of the Greenland and Antarctic ice sheets. In response, the “rapid ice-melt” sea level rise scenarios were developed by the NPCC for the New York City region. These take into account the potential for a substantial increase in melting rate based on recent observations of accelerated icemelt, icemelt dynamics and paleoclimate studies.

As a result, sea level is projected to rise 2 – 10 inches (5 – 25 cm) by 2020, 7 – 29 inches (18 - 74 cm) by 2050 and 12 – 55 inches (30 – 140 cm) by 2080 with the IPCC-based approach projecting the lower bound and the Rapid Ice-Melt method projecting the upper bound values.

2.1.5 Extreme Events

Models developed by the US Army Corps of Engineers were used to investigate future coastal flood heights and storm return intervals for the New York City region. Flood height projections are for mean high water elevations but do not include wave height. The NYC regional 100-yr flood levels could rise from 10 – 12 ft (3.0–3.5 m) in the 2020s, 10 – 13 ft (3.1–3.8 m) in the 2050s, and 11 – 14 ft (3.2 - 4.2 m) by the 2080s (Gornitz et al., 2002). The 100-yr flood return period is a storm that floods to a specific elevation and is likely to occur with a 1% probability each year. However, research also suggests that the flood return period is likely to decrease in the future. Research by Gornitz et al (2002) included case studies of five areas within the NYC region: New York City, Coney Island, Rockaway Beach, Long Island, and Westhampton. In the most extreme cases, the likelihood of a 100-yr flood could become as frequent as once in 43 years (2.3% probability) by the 2020s, once in 19 years (5.3%) by the 2050s, and once in 4 years (25%) by the 2080s. The current 100-yr flood height in New York City region is 10ft (2.96 m) using the National Geodetic Vertical Datum (NGVD).

2.2 Response to Climate Change Projections

This research attempts to address the impact of climate change projections because there has been an expressed need for the research both nationally as well as at the state level, such as in New York. Current research and legislation seeking to mitigate the impact of climate change projections are discussed.

2.2.1 United States

The Executive Committee of the Transportation Research Board (TRB) initiated a national study of the potential impacts of climate change on U.S. transportation systems. The research was funded by a broad range of organizations within the country, and the report was published in 2008. The report focused on: climate changes of greatest relevance for U.S. transportation; vulnerability of transportation systems to climate change; adaptation strategies; data and support tools needed for decision makers; and actions and research needed in order to prepare the country for climate change. The five climate changes of greatest relevance to U.S. transportation are: increases in very hot days and heat waves, increases in Arctic temperatures, rising sea levels, increases in intense precipitation events, and increases in extreme events, such as hurricane activity. The study found that transportation professionals often lack sufficiently detailed information about expected climate changes and the time frames with which these changes are anticipated to occur. The study recommends “ongoing and planned research at federal and state agencies and universities that provide climate data and decision support tools should include the needs of transportation decision makers” (TRB, 2008). Examples of needed tools suggested were geographic information systems (GIS) that can be used to map the locations of critical infrastructure. The GIS could be overlaid with information on climate change effects (e.g., sea level rise) specific to the locations of the critical infrastructure. This recommendation was incorporated into this research and will be discussed in further detail in the methodology.

2.2.2 New York

In August 2009, Governor David A. Paterson signed Executive Order No. 24. One goal of the Executive Order was to identify and assess short-term and long-term actions to adapt to climate change across all economic sectors, including transportation. The Executive Order also created the New York Climate Action Council which prepared an Interim Climate Action Plan in November 2010. The Climate Action Plan addresses how economic sectors can reduce greenhouse gas emissions and adapt to climate change. The Plan incorporated developments and findings by ongoing projects researching climate mitigation options and adaptation strategies. Extensions of this initiative include: the ClimAID adaptation project, the New York State Sea Level Rise Task Force, and PlaNYC.

The ClimAID adaptation project is funded by the New York State Energy Research and Development Authority (NYSERDA) and is a collaboration between institutions such as the Center for Climate Systems Research at the Earth Institute of Columbia University, the Institute of Sustainable Cities at the City University of New York and Cornell University. The focus of the project is to provide decision makers with information on the State's vulnerability to the effects of climate change, including rising sea levels, increasing temperatures, and changing weather patterns. The project incorporates the knowledge and feedback from various stakeholders in eight key sectors, one of which is transportation. Researchers performed a statewide vulnerability assessment and economic analysis. Based on the assessment of vulnerabilities and adaptation requirements, the project produced a comprehensive climate change analysis for New York State, addressing both current and projected impacts and identifying adaptation strategies, including economic analyses, for

each sector. From this analysis, a generalized set of guidelines were developed to assist decision makers from each sector to prioritize and adapt to climate change.

The New York State Sea Level Rise Task Force (SLRTF) was created in 2007 by the New York State Legislature. The purpose of the New York state sea level rise task force is to “evaluate ways of protecting New York's remaining coastal ecosystems and natural habitats, and increasing coastal community resilience in the face of sea level rise, applying the best available science as to sea level rise and its anticipated impacts” (Sweeney, 2007). The SLRTF report includes the following: (a) a qualitative assessment of the anticipated impacts related to sea level rise; (b) recommendations to provide more protective standards and the implementation and enforcement of such standards for coastal development, wetlands protection, shoreline armoring, and post-storm recovery; (c) recommendations regarding adaptive measures to respond to sea level rise; and (d) recommendations on state and local regulatory alterations to respond to the impacts of sea level rise. The SLRTF steering committee was divided into four workgroups: Ecosystems and Natural Habitats, Infrastructure and Community Resilience, Legal, and Public Outreach. The Infrastructure and Community Resilience workgroup includes the transportation sector. The SLRTF report was originally scheduled to be published in December 2009, but the deadline was extended until November 2010 so that the Task Force could incorporate the findings from the ClimAID project. The ClimAID report was released in November 2011 (NYSERDA, 2011). Neither did the report nor the workgroup specifically address an assessment of bridges or recommend revisions to bridge standards for design, maintenance or inspection.

To address the short-term and long-term actions to adapt to climate change posed in Executive Order No. 24, New York City created the PlaNYC initiative. The main objectives

of PlaNYC are “improving the environment, building the economy, and enhancing the quality of life for all New Yorkers” (PlaNYC, 2010). These objectives are also an effort to cope with a future population projection of an additional one million people by 2030. For the last 50 years, New York City has underinvested in maintaining and developing its transportation network. In PlaNYC, it was noted that transportation was the greatest single barrier to achieving the region’s growth potential. As a result, PlaNYC calls for agencies to achieve “a state of good repair” on their road and transit systems. To accomplish this, efforts are being made to reach a state of good repair on the city’s roads and bridges and establish a new regional transit financing authority responsible for budgeting maintenance, repair, replacement and new construction activities.

Part of the PlaNYC initiative is to protect critical infrastructure from the effects of climate change. To this end, Mayor Michael Bloomberg established the New York City Panel on Climate Change (NPCC) in August 2008. The NPCC is funded, in part, by the Rockefeller Foundation. The NPCC which was charged with advising the Mayor and the New York City Climate Change Adaptation Task Force on issues related to climate change and adaptation strategies as it relates to infrastructure. The NPCC published a series of three workbooks. The first workbook, “Climate Risk Information,” discusses observed and projected climate changes in the New York City region. These findings were presented in Section 2.1.2.

The second workbook, “Adaptation Assessment Guidebook,” outlines a general, eight-step process to help stakeholders inventory their vulnerable infrastructure and develop adaptation strategies to address these risks. The eight adaptation assessment steps are:

1. Identify current and future climate hazards
2. Conduct inventory of infrastructure and assets

3. Characterize risk of climate change on infrastructure
4. Develop initial adaptation strategies
5. Identify opportunities for coordination
6. Link strategies to capital and rehabilitation cycles
7. Prepare and implement adaptation plans
8. Monitor and reassess

In addition, a series of Infrastructure Questionnaires were developed for each sector of infrastructure to give more specific guidance. For the transportation sector, key areas of assessment were identified as: a) the importance of the structure, b) elevation of structure relative to precipitation, sea level rise and extreme event projections, c) current condition and useful life of structure, and d) vulnerability of structure to current climate conditions. The adaptation assessment steps as well as key areas of assessment were the main drivers for the development of standardized prioritization criteria which are discussed in detail in the methodology.

The final workbook, “Climate Protection Levels,” discussed the need to develop design standards that incorporate climate change projections so that existing and future infrastructure can operate safely. The workbook specifically highlights the need to update design standards and regulations governing bridges, particularly in regards to scour. Scour is the “erosion of the streambed or bank material due to flowing water” (HEC-18 2001). In this research, the undermining of a bridge structure due to scour was the main focus to. This is discussed in detail in Sections 2.5 and 3.4.

2.3 Population and Land Use Trends in the New York City Region

An estimated 153 million people lived in coastal counties in 2003 in the United States. Twenty-three of the 25 most densely populated U.S. counties lie along the coast according to NOAA's *Population Trends Along the Coastal United States: 1980-2008*. New York State (NYS) coastal population is approximately 12 million. The most densely populated counties in the nation are Manhattan, Brooklyn, Bronx, and Queens with an average 39,000 persons per square mile. The next most populated city is San Francisco with a distant 16,000 persons per square mile. By comparison, the national *coastal* average is 300 persons per square mile while the national average for the entire United States is only 98 persons per square mile (NOAA, 2004).

Urban areas are expanding at a rapid rate within the United States, particularly in the eastern portion of the country. The United States Department of Agriculture's National Resources Conservation Service (NRCS) reported that over 25 million acres of land were newly developed into urban areas or rural transportation land between 1987 and 1997 (NRCS 2005). The New York City Region saw an average increase of 10-20% in developed land within this same period (Figure 3).

Urban land use tends to be characterized by low permeability to impervious land cover due to structures, sidewalks, asphalt roadways and parking lots. Residential area lots, one half acre or less, are 25% to 65% impervious by area. Larger residential lots (2 acres or more) can have impervious areas as low as 12%. On the opposite end of the spectrum, commercial lots can be up to 85% impervious while parking lots are completely impervious (TR-55, 1986). The lower the permeability of the land cover, the longer it takes for water to be

absorbed into the ground. During precipitation events, drainage becomes a challenge and flooding is more likely to occur, especially during extreme events.

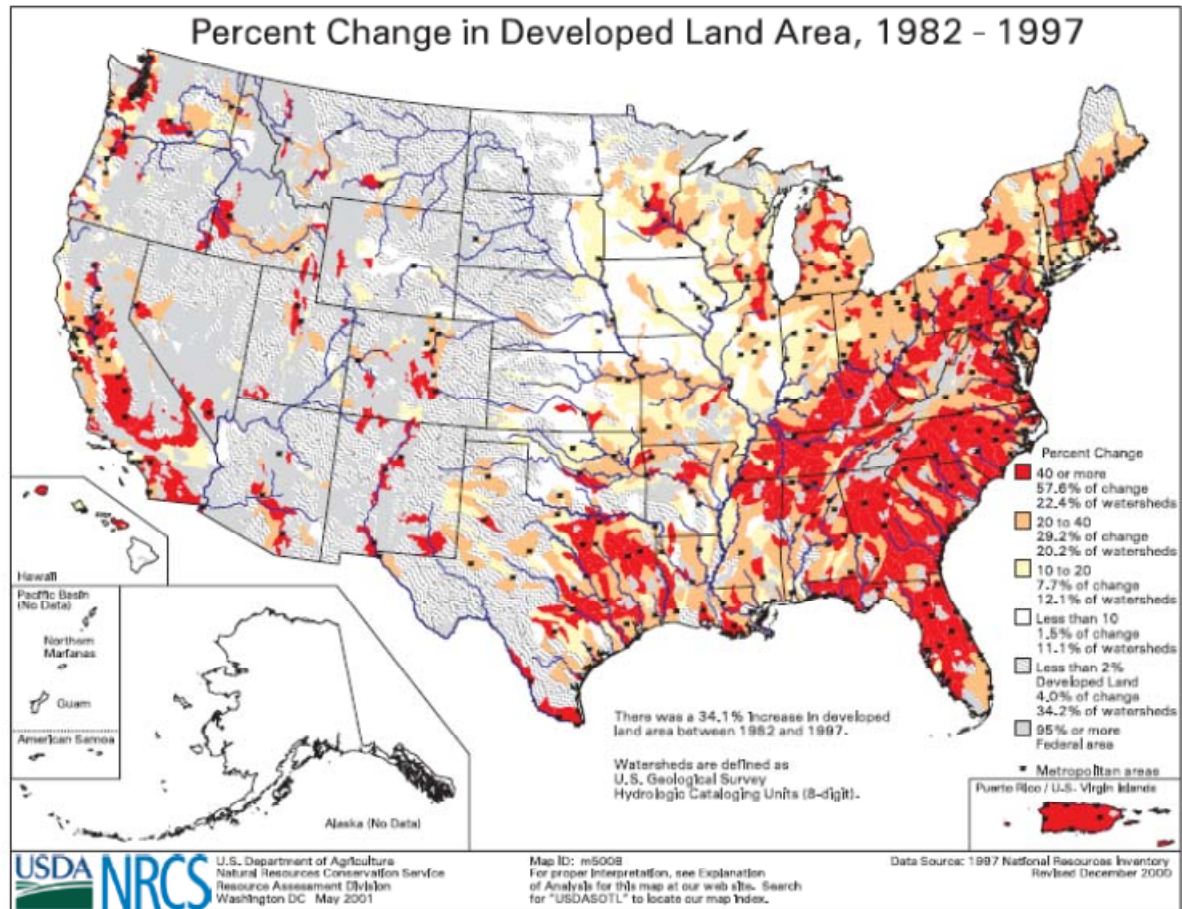


Figure 3: Percent change in developed land area in the US (1982-1997)

2.3.1 New York City

The five boroughs (Manhattan, Bronx, Brooklyn, Queens and Staten Island) that make up New York City total approximately 195,000 acres of land (790 km²). According to the New York City Department of City Planning, approximately 66% of the land use in New York City is either residential, commercial, industrial/manufacturing, transportation/utility, or parking facilities (NYCDCP, 2008). Residential lots make up a majority of this land use

totaling 42%. The densest residential areas with multi-family homes are found in throughout Manhattan, the south Bronx, northern Brooklyn and western Queens.

Approximately one-quarter of New York City's lot area is occupied by public parks, playgrounds and nature preserves, cemeteries, amusement areas, beaches, stadiums and golf courses. The percentage of open space and recreational area is not likely to change significantly as much of this land is protected and owned by the City. However, there is still 8% of the city's land classified as vacant. Staten Island has the most vacant land with more than 5,400 acres. These lots have the potential to be developed into urban land. Land use maps by type can be found in Appendix A.2.

2.3.2 Nassau County

Nassau County is comprised of approximately 182,000 acres (737 km²). The land use in this area has changed dramatically over the past century. The most significant surge of population and development occurred after World War II as veterans returned home seeking safe and affordable communities in which to raise their families. By the 1950, Nassau County held the distinction of being the largest population and the fastest-growing suburban county in the nation (URS, 2007). Due to this surge, extensive housing developments, shopping centers, industrial complexes and business districts now dominate where vast acreages of potatoes and other crops were once grown for markets in New York City.

The rapid urbanization also created an increased demand for public services, water disposal facilities and recreation areas. The majority of open areas remain in the south. These open areas are typically golf courses, municipal parks, greenbelts bordering parkways, wildlife

preserves, tidal marshes and barrier beaches. Some areas in the northern part of the county are still open and undisturbed. These areas consist of a few scattered vegetable and horse farms, large estates, preserve properties and partially wooded areas. Since the late 1950s, building activity has slowed considerably. Many of the north shore communities continue to maintain strict zoning and land use regulations which limit land use densities. These areas also continue to lack centralized sewer systems thus discouraging more intensive development. The central and southern portions have an established roadway and infrastructure system which continue to support a greater intensification of land uses (URS, 2007).

In 1997, fifty-five percent of the total land area in the Nassau was classified as residential. Single-family homes represent the most dominant housing type and are likely to remain as such. Land use trends indicate that vacant or underutilized parcels are becoming developed into new housing or mixed use structures, and Nassau's development is exhibiting trends similar to New York City.

2.3.3 Suffolk County

Suffolk is comprised of approximately 741,000 acres (3,000 km²). Suffolk County saw an increase in urban land development since the 1950's as developers began to move eastward from Nassau County. At that time, nearly 300,000 acres (1,210 km²) in Suffolk County were either undeveloped or farmland. Farmland acreage continues to rapidly decline even to the present day. The Suffolk County Planning Department (SCPD) reported that farmland acreage has decreased from 123,000 acres (498 km²) in 1950 to 31,000 acres (125 km²) in 1996. It is estimated that only 10,000 acres will remain by 2012. Most of the remaining farmland is located on the eastern portion of the county in the towns of Southold,

Southampton, East Hampton and Riverhead. Most of the lots in the county are sized from 1 to 5 acres. Farmland is ideal for developers for both the acreage size and ideal building conditions. The SCPD began conservation efforts in earnest in the 1990's with an Agricultural Protection Plan. The SCPD's goal is to preserve 20,000 acres of farmland from being lost.

2.4 Commuting Trends in the New York City Region

Land-use decisions play an important role in determining the demand for automobile travel. Existing land-use patterns in many areas make automobile or transit travel a necessity for most trips. In the 2006 National Cooperative Highway Research Program's *Commuting in America III* report, solo drivers make up the largest, growing transportation group. While most states had between 70% to 80% solo drivers, New York State was the exception with 56% percent of its commuters being solo drivers. This is largely due to the extensive transit system (subway and railroad) that accommodates 24% of the commuting population. Nationally, New Yorkers experience the greatest commuting times with an average commute of 30 minutes. Approximately 11% of commuters experience a commute of 60 minutes or more. These trends indicate that bridges, roads and rail lines are heavily relied on by many to reach their destination. The New York State Department of Transportation spends \$15 billion annually to operate, maintain and improve transportation and maintains over 300 bridges in the coastal region.

2.5 Bridge Design and Inspection Standards in the United States

All bridges within the New York City region are subject to the design and inspection standards set forth by the federal government. The Code of Federal Regulations (CFR) is the

codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government. The design, construction and inspection of bridges is governed by Title 23, Part 650 of the CFR: “Bridges, Structures and Hydraulics.” Key design and inspection legislation concerning bridge hydrology and hydraulics will be discussed in the following sections.

2.5.1 Design of New Bridges

In 1921, the American Association of State Highway Transportation Officials (AASHTO) adopted standard design specifications for highway bridges. AASHTO posts revisions according to advances in technology and best practices.

Article 1.3.2 states, “hydraulic studies of bridge sites are a necessary part of the preliminary design of a bridge and reports of such studies” should include the following data in all hydrologic and hydraulic studies, if applicable, as shown in Table 4. It should be noted that all the required hydrologic and hydraulic data is based on historic or observed events and no language currently exists to incorporate future projections due climate change.

The primary design and performance standard for coastal flooding and storm surge in the United States is the Federal Emergency Management Agency (FEMA) defined 100-year flood. The 100-year flood is defined as a flood that has a 1% chance of being equaled or exceeded in any given year (TRB, 2008). The 100-year FEMA flood zone has been considered a high risk flooding area and subject to special design codes as well as insurance and environmental regulations. FEMA is responsible for creating and maintaining Flood Insurance Rate Maps (FIRMs) that delineate the 100-year floodplain for all communities that participate in the National Flood Insurance Program. The New York City region is part of this program.

Table 4: AASHTO hydrological and hydraulic analyses guidelines (Articles 1.2.3.2-3)

Hydrologic Analysis	Hydraulic Analysis
• <i>Flood data applicable to estimating floods at site, including both historical floods and maximum floods of record.</i> • Flood-frequency curve for the site. • Distribution of flow and velocities at site for flood discharges to be considered in the design of structure. • Stage-discharge curve for the site.	• Backwater and mean velocities at bridge opening for various trial bridge lengths. • <i>Estimates of scour depth at piers and abutments.</i> • Effects of natural geomorphic stream pattern changes.

In 2009, FEMA began Risk Mapping, Assessment, and Planning (Risk MAP) with funding from the National Flood Insurance Fund and Congressional appropriations for flood hazard mapping. The major objective of this plan is to ensure 80% of the United States' flood hazards are "current whether the flood hazard data are new, have been updated, or deemed still valid" (FEMA, 2009). At this time, the FIRMs are not being updated for climate change projections, only observed storm events (Springett, 2010).

For bridges over waterways, the 100-year storm and 500-year (or superflood) storm serve as the key design criteria to design and protect bridges against scour. Scour is the "erosion of the streambed or bank material due to flowing water" (Figure 4) (HEC-18, 2001). Estimating scour depths at piers and abutments is performed using the guidance assembled by the Federal Highway Administration's (FHWA) design publication *Hydraulic Engineering Circular (HEC) 18, Evaluating Scour at Bridges*. Bridge foundations should be

designed to withstand the effects of scour without failing under the worst conditions resulting from floods equal to or less than the 100-year flood with a safety factor greater than one. Bridge foundations should be *checked* to ensure that they will not fail due to scour resulting from a superflood (safety factor equal to one, at minimum).

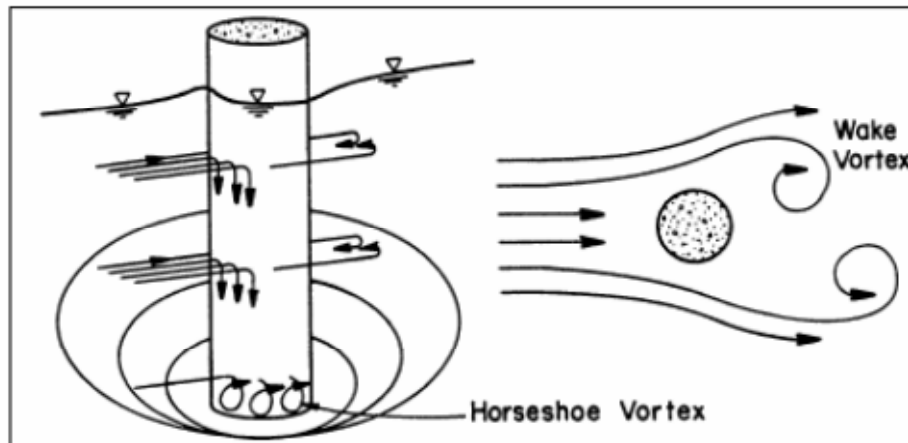


Figure 4: Schematic Representation of Scour at a Cylindrical Bridge Pier (HEC 18)

The amount of scour that can occur around bridge piers and abutments is effected by certain factors such as: number of piers in the waterway, pier and abutment geometry, erodability of the streambed soil, overall bridge skew and cross-sectional area under the bridge. These factors are to be considered when designing a new bridge and inspection of existing bridges.

2.5.2 Evaluation and Inspection of Existing Bridges

According to the FHWA Technical Advisory T5140.23, released in 1991 for evaluating scour at existing bridges, an initial screening process was called for to identify bridges susceptible to scour and establish a priority list. Bridge scour evaluations should be conducted for each bridge to determine whether it is scour critical. Scour critical bridges have at least one pier or abutment which is rated unstable due to observed scour or potential

scour as determined by a scour analysis. If a bridge is determined to be scour critical, a plan of action (POA) should be developed to address inspection frequency, monitoring schedule, bridge closure protocol and scour countermeasure design alternatives including cost estimates and anticipated construction timelines. It will be necessary for bridge owners to revise their priority lists if climate change projections must be considered.

The Code of Federal Regulations, Part 650, Subpart C contains the National Bridge Inspection Standards (NBIS) which set the standards for the proper safety inspection of all highway bridges in the United States. The NBIS requires that all routine inspections occur at intervals not to exceed twenty-four (24) months. Each state or federal agency must prepare and maintain an inventory of all bridges subject to the NBIS. Certain Structure Inventory and Appraisal (SI&A) data must be collected and retained by the agency and is stored by the FHWA. Data is collected using FHWA established procedures as outlined in the “Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges.” Data items typically used in bridge hydrologic and hydraulic analyses are shown in Table 5. The reader is referred to Appendix A.3 for a complete list of all NBIS Items.

Table 5: Sample NBIS data items

NBIS Item	Description	NBIS Item	Description
19	Detour Length	48	Length of Maximum Span
27	Year Built	51	Bridge Roadway Width
34	Bridge Skew	61	Channel Protection
39	Navigation Vertical Clearance	62	Culverts
44	Structure Type	71	Waterway Adequacy
45	Number of Spans	113	Scour Critical Rating

In April 1987, the New York State Thruway Authority's Schoharie Creek Bridge collapsed during a heavy flood. In response to this failure, New York State Department of Transportation (NYSDOT) created the Bridge Safety Assurance Program. The Program's Hydraulic Vulnerability Manual contains of a multi-step process for identifying potential causes of bridge failure (failure modes) and for the rating of bridges as to the extent of the vulnerability to these failure modes. The procedure outlines NYSDOT's hydraulic vulnerability assessment for new bridges, existing bridges and bridges programmed for rehabilitation.

The bridges are classified into a high, medium or low prioritization category using a flow diagram (Figure 5) and specific classification criteria. After classification, each bridge undergoes a detailed analysis and further rating to determine the critical failure mode. This research seeks to make the initial prioritization more efficient and to include a more interdisciplinary approach to criteria selection.

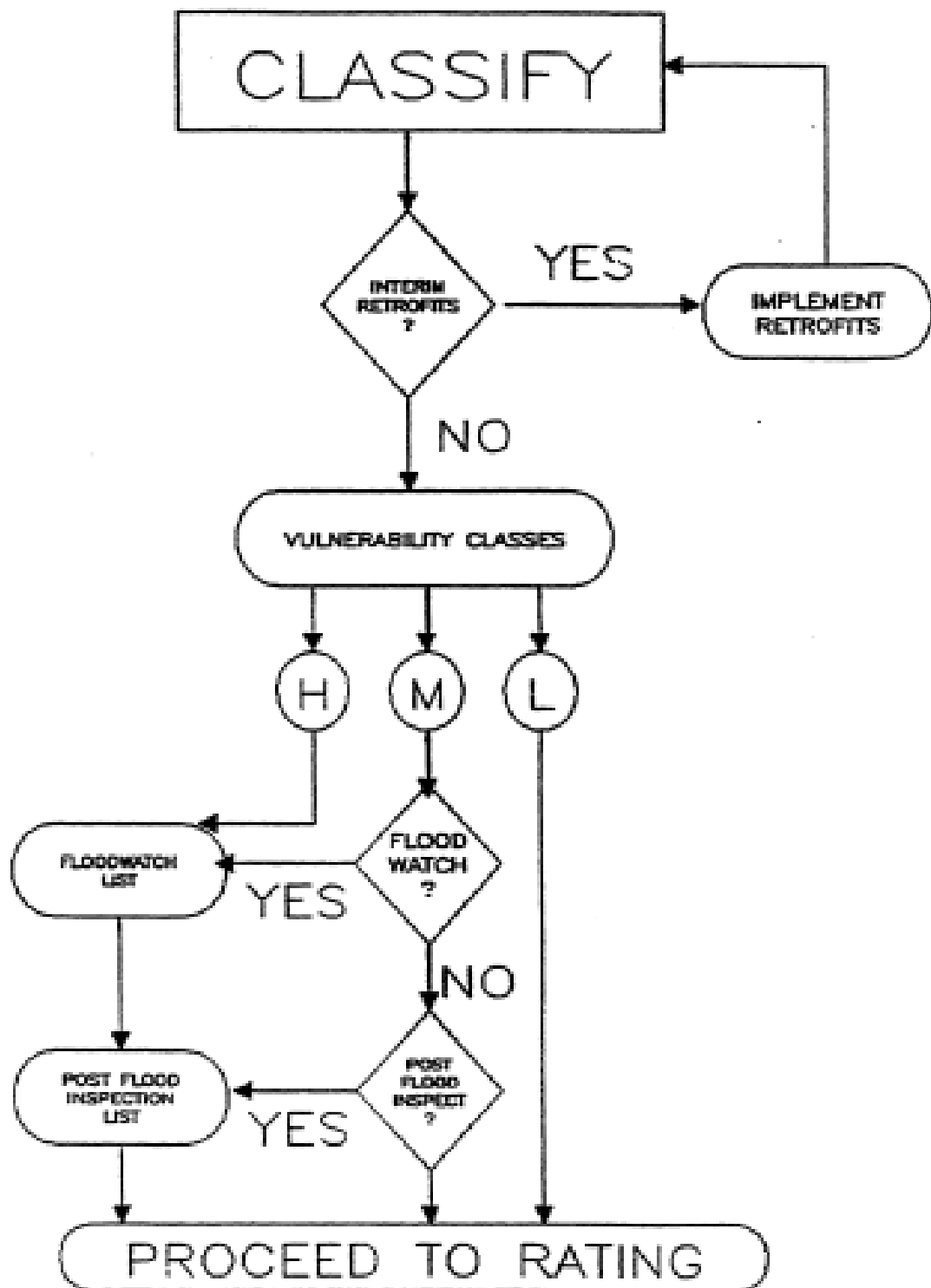


Figure 5: NYS HVAM hydraulic vulnerability classification flow diagram

3 METHODOLOGY

3.1 Objectives

As mentioned from Section 1.3, the following objectives have been defined:

1. Develop standardized criteria to prioritize the hydraulic vulnerability of US coastal bridges, using NYS as a case study.
2. Determine if climate change projections, sea level rise in particular, will negatively impact the hydraulic vulnerability of existing bridges.
3. Recommend revisions to regional and national standards for inspection, maintenance and reconstruction of existing bridges with regards to sea level rise.

In order to accomplish the objectives, the following scope of work (Figure 6) has been outlined and will be discussed in detail in subsequent sections.

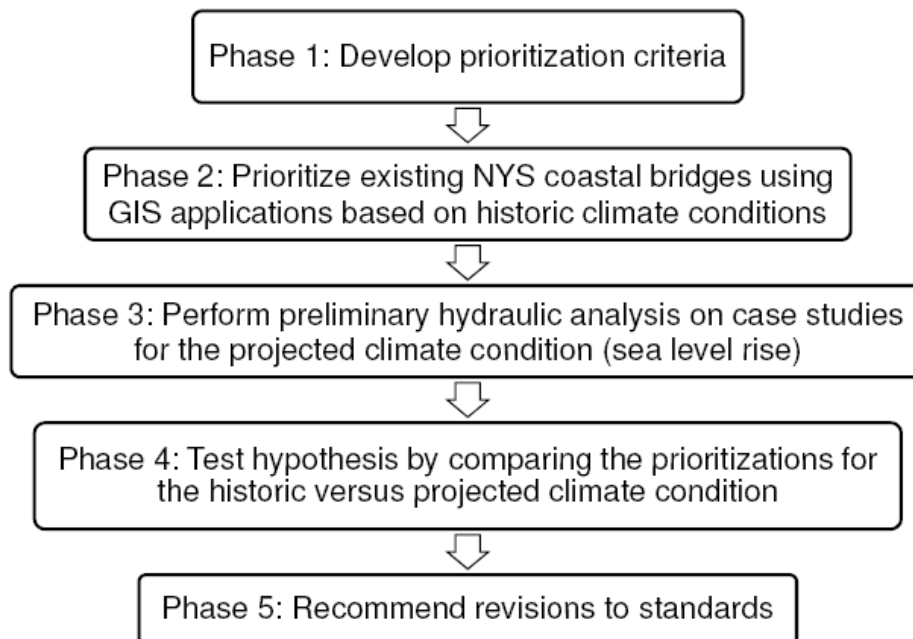


Figure 6: Study phases

3.2 Task1: Development of GIS Database and Prioritization Criteria

A Geographic Information Systems (GIS) Database using ArcView software was used to manage data and automate the prioritization of bridge vulnerability using criteria developed as part of this research. The National Bridge Inspection Standards' (NBIS) data inventory was selected to be used as the data for which the prioritization criteria would be based. The NBIS is current, must be maintained by bridge owners according to federal law, and has a uniform rating procedure that all states must follow. This will allow for the prioritization criteria to be standardized and used throughout the United States. In addition, each bridge in the NBIS system is geographically referenced which lends this data well to GIS applications. The major benefit of the NBIS data is that nearly all the data is numerical. Most of the data is in the form of a rating system with lower numbers indicating poor quality and higher numbers indicating good condition or health. This numerical format can be easily queried for specific criteria within GIS software. The combination of coding for geographical location and comprehensive numerical rating data are a natural fit for the application of GIS software, such as ArcGIS, to be used as an efficient tool for prioritization. Results queried from a GIS, as opposed to tabular results, allow the additional benefit of viewing the prioritized bridges geographically. If there are clusters of high priority bridges close to one another, bridge owners may consider a different strategy for protecting the structures as compared to an isolated high priority bridge. Additional layers can be overlain in the GIS to view the relationship between high vulnerability bridges and other elements, such as floodplains or evacuation routes. This will enable bridge owners to make better decisions by being able to see multiple elements at once.

The NBIS data was divided into three main categories which directly, indirectly or otherwise affect the hydraulic vulnerability of a bridge. The three main categories to which the criteria fall are: a) hydrologic & hydraulic, b) structural & geotechnical and c) social importance (Figure 7). Each of the proposed factors will be discussed within their respective categories. The hydrologic and hydraulic factors most directly affect the hydraulic vulnerability of a bridge because these factors have a direct influence on the amount of flooding or scour potential. Structural and geotechnical factors indirectly affect the hydraulic vulnerability because a deficiency in the structure may make it more susceptible to failure by hydraulic forces. Social importance factors are characteristics that stakeholders (bridge owners, tax payers, commuters, residents, business owners, etc.) may feel that a bridge should receive special attention to ensure that it remains in service but do not directly or indirectly affect a bridge's vulnerability. The social importance factors should be viewed as indicators of other considerations which decision makers often need to take into account.

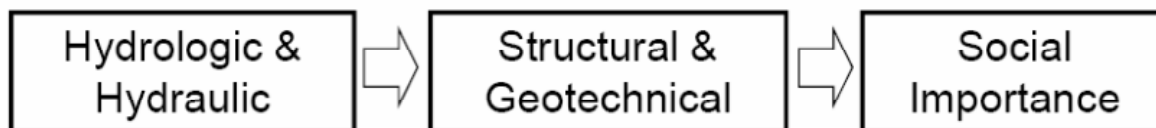


Figure 7: Main categories of prioritization criteria

3.2.1 Hydrologic Factors

Hydrologic characteristics are those that deal with the movement and quantity of water on Earth. A significant portion of New York City region lies less than 10 feet (3 m) above mean sea level, and the infrastructure, including bridges, is vulnerable to sea level rise and coastal flooding during major storm events. While the NYSDOT HVAM does consider historic maximum flooding events, it currently does not incorporate projected sea level rise

due to climate change projections. The bridge sites most vulnerable to sea level rise are situated at the lowest elevations, typically closest to the shoreline. The rapid ice melt scenario projections are used because the projections are more conservative than other scenarios (NPCC, 2009). The bridge sites that would be affected most by these projections would be the sites within the current 100-year flood zone which are at the lowest elevations. The current 100-year flood can produce approximately an 8.6-foot (2.6 m) surge for much of New York City. These sites would only further be inundated by 2080 with the projected increase of 55 inches (140 cm) in sea level (Figure 8). These sites would be identified as having the highest priority followed by the bridge sites within 2020, 2050 and then 2080 projected flood zone areas. For the analysis of the projected climate condition, a projected sea level rise of 55 inches will be used.

The two types of storms with the largest influence in the New York City region are hurricanes and nor'easters. Hurricanes make landfall in New York very infrequently, typically July through October. This type of storm can produce large storm surges. Nor'easters are generally associated with smaller surges than hurricanes but their effects can be significant. Due to a nor'easters' typically long duration, high tide will often occur within the duration resulting in extended periods of high water causing flooding. Overall, occurrences of North Atlantic hurricanes do not show a statistically significant long-term trend over the twentieth century (Easterling, 2000). The National Oceanic and Atmospheric Association (NOAA) recorded the tropical storm or "cyclone" paths in the Northeastern United States from 1851 until the present time. A tropical cyclone that has winds exceeding 74 mph (34 m/s) is considered to be a hurricane. A hurricane's destructive winds and rains cover a wide swath. Hurricane-force winds can extend outward to about 25 miles (40 km)

from the storm center of a small hurricane and to more than 150 miles (241 km) for a large one (NOAA 1999).

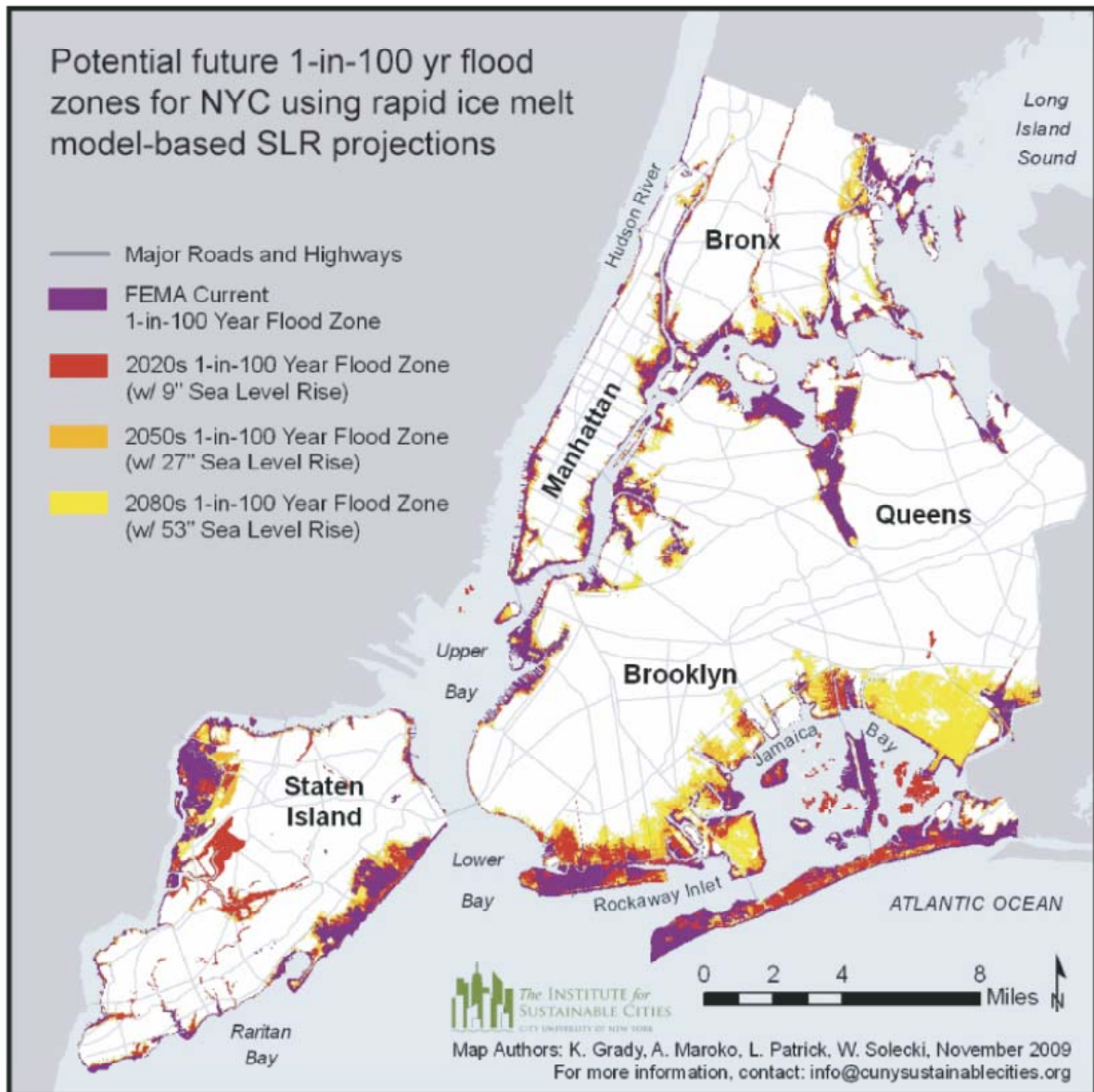


Figure 8: Areas of potentially at-risk to the 100-year flood in NYC due to rapid ice melt sea level rise projections derived from global climate models (NPCC 2009).

3.2.2 Hydraulic Factors

Hydraulic characteristics are those that deal with the mechanical properties of water such as pressure, flow and velocity. The hydraulic factors considered in this research are channel and bridge geometries that effect water pressure, flow and velocity.

The number of spans is a good indicator of whether a bridge constricts the flow of the waterway in the immediate area. Multiple, short spans indicate that there are multiple piers in the water. This reduces the cross sectional flow area under the bridge. A reduced cross sectional area increases the flow velocity which, in turn, increases erosion potential (scouring) of the streambed. During a flood event such as the 100-year storm, scouring may occur rapidly and the bridge may be compromised within a short period of time. The NBIS Item 45 records the number of spans for each bridge.

The reduced area also makes the bridge more prone to flooding and overtopping of the roadway. If the roadway is flooded, motorists will not be able to use the bridge. Bridges are currently rated by the NBIS Item 71 for their ability to pass the 100-year storm (or less) under the bridge. Bridges rated 0-2 experience frequent overtopping while bridges rated with a 9 seldom experience flooding. However, this is based on historic or observed flood events, not projected flooding events due to climate change.

Waterway embankment with evidence of slumping, erosion, or local failures are an indication that the channel is vulnerable to failure, particularly during a flood event. Embankments with well established vegetation or man-made protection such as steel sheeting or riprap are less vulnerable. NBIS Item 61 rates channel condition and protection measured from a poor condition (0-2) to a satisfactory condition (8-9).

Many of the waterways that bridges cross are under navigation control by the United States Coast Guard. These waterways are important because ships, boats, ferries and barges utilize the waterway to transport goods and passengers. If the waterway is blocked or the vertical clearance under the bridge reduced, marine traffic would be affected. The vertical clearance is the minimum distance between the lowest part of a bridge's substructure and the free water surface. The NBIS Item 39 records the vertical clearance in meters. It is expected that vertical clearance will be reduced throughout the study region as sea levels are projected to continue to rise. Bridges with already minimal vertical clearance (ex: < 3m) would be affected most.

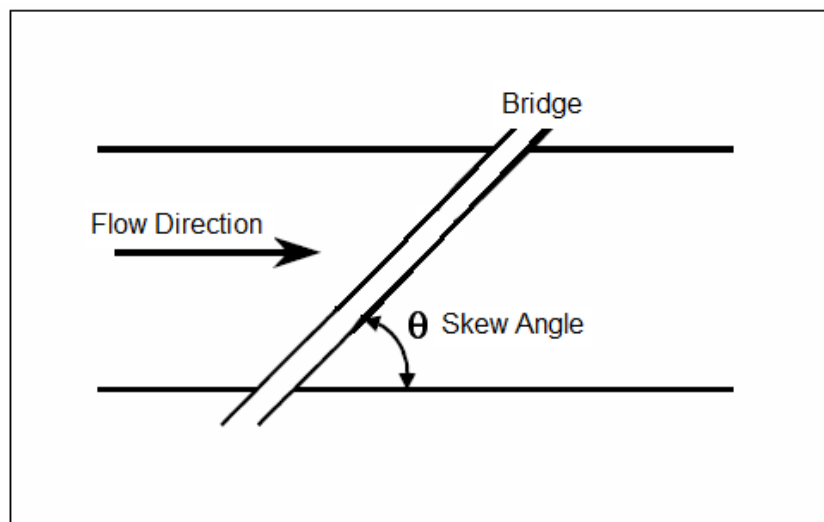


Figure 9: Diagram of bridge skew angle

Ideally, the length of a bridge pier should run parallel to the flow of water under the bridge so that turbulence of flow is at a minimum. If a bridge pier is not parallel to the flow, this is known as a skew. The skew angle is the angle between the centerline of a pier and a line perpendicular to the roadway (Figure 9). NBIS Item 34 indicates then angle, in degrees, from the perpendicular.

Bridges that have observed or calculated scour conditions are considered to be scour critical. These have the highest vulnerability because scour has occurred or is expected to occur in the future due to a storm event or long-term degradation of the channel. NBIS Item 113 uses the rating system shown in Table 6.

Table 6: NBIS Item 113 Rating System

Rating	Description
U	Bridge with "unknown" foundation that has not been evaluated for scour. Since risk cannot be determined, flag for monitoring during flood events and, if appropriate, closure.
T	Bridge over "tidal" waters that have not been evaluated for scour, but considered low risk. Bridge will be monitored with regular inspection cycle and with appropriate underwater inspections.
9	Bridge foundations on dry land well above flood water elevations.
8	Bridge foundations determined to be stable for assessed or calculated scour conditions; calculated scour is above top of footing.
7	Countermeasures have been installed to correct a previously existing problem with scour. Bridge is no longer scour critical.
6	Scour calculation/evaluation has not been made.
5	Bridge foundations determined to be stable for calculated scour conditions; scour within limits of footing or piles.
4	Bridge foundations determined to be stable for calculated scour conditions; field review indicates action is required to protect exposed foundations from effects of additional erosion and corrosion.
3	Bridge is scour critical; bridge foundations determined to be unstable for calculated scour conditions: a) Scour within limits of footing or piles or b) Scour below spread-footing base or pile tips.
2	Bridge is scour critical; field review indicates that extensive scour has occurred at bridge foundations. Immediate action is required to provide scour countermeasures.
1	Bridge is scour critical; field review indicates that failure of piers/abutments is imminent. Bridge is closed to traffic.

3.2.3 Structural & Geotechnical Factors

The type of structure is an important factor. If the main structure of the bridge is continuous, this is more structurally redundant than a simply supported bridge. A redundant structure has alternate paths for the loads to travel which can allow for more time to remove motorists from the bridge. The NBIS Item 43 gives a general classification to the main superstructure

of the bridge. Simply supported concrete slabs or steel floor systems are classified from 1 through 7. Truss, arch, suspension, and moveable bridges are classified from 8 through 19.

The year the bridge was built is an indicator of its vulnerability. Bridges built prior to 1940, (NBIS Item 27) particularly along the south shore of the study region tend to be characterized by simply supported spans, short span lengths and piers comprised of multiple, short timber piles. Short span lengths may mean that multiple piers are in the waterway which increases obstruction to flow. The use of timber piles in the early 20th century was common, but the timber piles are often not embedded enough to resist scour or the depth of embedment is unknown. All of these factors make a bridge more vulnerable to failure. In addition, many bridges in the New York City coastal region were built in the early 1900's. Many bridges are likely to be at the end of their service lives and will require extensive reconstruction or complete replacement. The impact of climate change projections should be incorporated into the design.

NBIS Item 67, indicates the overall rating of the superstructure, (deck, roadway, truss members, etc.) and substructure (piers, piles and abutments) of the bridge. Bridges in excellent condition will be expected to perform as designed while bridges in poor condition are more likely to be vulnerable to flooding and scour.

3.2.4 Social Importance Factors

The purpose of the social importance criteria - for the purpose of prioritization - is to give an *indication* of the impact a bridge would have on the population if it were to fail, be taken out of service completely or have a reduced level of service (ex: less travel lanes available due to repair work). This criteria is not intended to quantify the impact on stakeholders, commerce or the local economy.

Not all bridges are created equal, so to speak. Roads are categorized as highways (interstate, state and county), streets and roads (NBIS Item 5). Interstate highways are typically hundreds of miles long with multiple lanes while roads can be just a single lane and less than a mile long. As a result, bridges carrying interstate highway traffic are typically of higher importance than a local road.

Another means of identifying the importance of a bridge is the average daily traffic (ADT). The ADT is a record of the average number of vehicles that traverse the bridge each day (NBIS Item 29). Bridges that serve a large number of motorists are likely of greater importance than bridges serving a small number of motorists.

The social importance of a bridge is also reflected in the bypass or detour length a motorist would have to travel should the bridge become out of service. Detour length (NBIS Item 19) is defined as the amount of additional miles (or kilometers) that a motorist would have to travel in order to reach his or her destination. The greater the detour length, the greater the travel time and economic cost (ex: gasoline) the motorist will experience. Since the average commuter in the New York City Region experiences a commute of 30 minutes, a detour of 20 miles (30 km) would essentially double the commute time.

The preservation of a bridge with historical significance (NBIS Item 37) is often important to a community. The historical significance of a bridge may involve a variety of characteristics. The bridge may be a unique example of the history of engineering, architecture or art. The crossing itself might be significant because it is associated with a significant event or circumstance. Within the United States, bridges may be designated as historic by the National Register of Historic Places.

3.2.5 Sensitivity of Factors Considered for Prioritization Criteria

In order to determine which factors should be included in the prioritization criteria, the sensitivity of the factors were explored. The sensitivity is a measure of the number of bridges that have the same NBIS rating or range of ratings. Since the purpose of the criteria is to delineate between high, medium and low priority, then the criteria must be distinctive enough to sort the bridge inventory.

For example, assuming an average storm surge of 5ft for the 100-year storm plus a projected sea level rise of 4.5ft, a bridge would need a navigational vertical clearance (Item 39) of 10ft or 3m to pass the projected 100-year storm at minimum. Less than 1% of the bridges had a clearance less than 3m while more than 50% of the bridges in the New York coastal area had a vertical clearance less than 6m.

The angle of bridge skew to flow, NBIS Item 34, was removed from the selection criteria because there was no distinct delineation between the number of bridges and specific skew angle or range of angles.

For NBIS Item 29, average daily traffic, approximately 12% of the coastal bridges carry an ADT of 100,000 vehicles per day or greater while more than 50% have an ADT of greater than 10,000 vehicles per day.

NBIS Item 5, Route Type, was removed from the selection criteria because more than one third of the bridges in the New York coastal area carry highways which are given higher importance than state or local roads. ADT was able to more clearly define high traffic bridges than route type.

3.3 Task 2: Prioritization

Once the sensitivity of the factors was determined, the prioritization criteria were able to be identified. Bridges within the New York coastal area were initially categorized into high, medium and low priority for the historic climate condition. After a hydraulic and scour analysis was performed, the bridges were re-prioritized for the projected climate condition. The NBIS Items selected for the prioritization process are discussed in the following sections.

3.3.1 Critical

For this purpose of this study, another group was added called the “critical” category. This prioritization is used for bridges that, after a hydraulic and scour analysis, were found to be undermined or compromised for the projected climate condition of sea level rise. ***It is recommended that bridges with this prioritization receive a full risk assessment and corrective action be included as part of the bridge owner’s short term fiscal planning (ex: 5-10 year plan).***

A critical bridge is a structure whose safety or serviceability may be compromised due to an observed or calculated condition. Bridges classified as critical for the historic climate condition are either closed to vehicular traffic or are receiving corrective action, such as reconstruction or countermeasures. Bridges currently closed to traffic have not been included in this study since the future of the structure is unknown.

3.3.2 High Prioritization

The rationale for the selection of high prioritization criteria was to identify factors that are the most direct indicators of hydraulic vulnerability. For the New York City coastal region,

a bridge is considered to be of high vulnerability if any of the following conditions exist. If Item 113, Scour Critical Bridges, is rated either a 2 or 3, the bridge has an observed or calculated scour condition. This means that scour has occurred in the area of the bridge and has been documented in inspection reports or an engineering analysis indicates that the bridge foundation would be unstable for calculated scour conditions.

Bridges with an Item 61, Channel and Channel Protection, rating of 3 or less have experienced streambed degradation, movement or failure of bank protection. Bridges with these ratings indicate a high vulnerability to scour and stability problems.

For Waterway Adequacy, NBIS Item 71, bridges with a rating of 3 or less experience occasional to frequent overtopping of the bridge decking during flooding events. Item 39, Navigation Vertical Clearance, records the minimum vertical clearance, in meters, under the bridge. Bridges with a vertical clearance of less than 3m (10ft) may not be able to pass the storm surge with the projected sea level rise of 1.4m (4.6 ft) by 2080. Both items indicate a vulnerability to flooding of the roadway and increased pressure flow on the structure. ***It is recommended that bridges with this prioritization receive a full risk assessment and corrective action be included as part of the bridge owner's mid-term fiscal planning (ex: 10-20 year plan).***

3.3.3 Medium Prioritization

Medium prioritization criteria focused on indirect indicators of hydraulic vulnerability or other factors that are of importance to bridge owners and stakeholders. If Item 67, Structural Evaluation, is rated less 3 or less, the bridge structure is basically intolerable and requires high priority for corrective action. Again, the average commuter in the New York City Region experiences a commute of 30 minutes, a detour of 20 miles (30 km) would

essentially double the commute time. Thus, bridges with a detour length (NBIS Item 19) rating of 30km or more are considered of medium priority. Bridges with an ADT of 100,000 vehicles per day or more as per Item 29 were selected due to the impact they would have should they go out of service. A significant number of bridges were built prior to 1940 in the region. For this reason, all bridges built prior to 1910 as per NBIS Item 27 were placed in this group since they are now over 100 years of age and many have design characteristics that are not favorable hydraulically or are not structurally redundant. Lastly, bridges designated as historic or soon to be historic with an NBIS Item 37 rating of 2 or less are considered in this category due to their significance to the community.

It is recommended that bridges with medium prioritization receive a full risk assessment and corrective action be included as part of the bridge owner's long-term fiscal planning (ex: 25+ year plan).

3.3.4 Low Prioritization

Low prioritization bridges are those bridges that do not meet any of the critical, high or medium vulnerability criteria. ***It is recommended that bridges with low prioritization do not require a full-risk assessment unless engineering judgment warrants it.***

Table 7 summarizes the draft vulnerability prioritization criteria for New York State coastal bridges. Figure 10 shows the results of the prioritization criteria as processed by the GIS software. Each bridge is prioritized and given a color code on the map: red for high, orange for medium and green for low vulnerabilities.

Table 7: Draft vulnerability prioritization criteria (Shields, 2011)

NBIS Item No.	Description	Criteria
High Vulnerability		
113	Scour Critical	≤ 3
61	Channel and Channel Protection	≤ 3
71	Waterway Adequacy	≤ 3
39	Navigation Control	$\leq 3\text{m}$
Medium Vulnerability		
67	Structural Evaluation	≤ 3
19	Detour Length	$\geq 30\text{ km}$
29	Average Daily Traffic (ADT)	$\geq 100,000$
27	Year Built	≤ 1910
37	Historic Significance	≤ 2
Low Vulnerability		
None of the above criteria are met.		

Prioritization Legend

- High
- Medium
- Low



Figure 10: Initial prioritization of NYS coastal bridges using GIS
(Shields, 2011)

3.4 Task 3: Preliminary Analysis of Case Study Bridges

The following is a discussion of the methodology used to perform a preliminary hydraulic and scour analysis on each of the case study bridges for the projected climate condition. A hydraulic and scour analysis has already been performed by others for the historic climate condition in order to complete the NBIS Item 113 Scour Critical rating.

3.4.1 Data Acquisition

Bathymetry and Topography. Data was acquired for both the modeling of the selected case study bridges as well as for the preliminary analysis. Digital Elevation Model (DEM), USGS elevation data and soundings from bridge inspections were used.

Bridge Drawings. Bridge location, orientation and geometry were obtained from design and construction drawings. Drawings were supplied from various sources with permission from the bridge owners. Bridge footprints, such as piers and abutments, were included in the model.

Typical Tide and Sea Level Rise. Tide data from stations are available from the National Oceanic and Atmospheric Administration (NOAA). The storm tide is the combination of the astronomical tide and the storm surge. Due to the complexity of many tidal hydrodynamic models, multiple simulations may require excessive effort, especially since multiple bridges are being investigated. If only one simulation is run, it is recommended by FHWA to time the surge peak with the mid-rising tide. This method is called the Single Design Hydrograph approach (Zevenbergen et al., 2004).

HEC-25 states, “For most engineering studies it is important to recognize the potential for an increase in the rate of sea level rise and plan accordingly. Such changes, if and when they occur, will of course have potentially significant impacts on tidal hydrodynamics and structure performance due to the net change in water depth.” For this reason, sea level rise projections were superimposed on top of the storm tide synthetic storm surge hydrograph. The sea level rise projections including rapid ice-melt will be considered as the “worst case” scenario in order to determine the maximum impact on the case study bridges. The rapid ice-melt scenario is based on acceleration of recent rate of ice melt in the Greenland and West Antarctic ice sheets and paleoclimate studies (NPCC, 2009). The IPCC approach is based largely on temperature and precipitation. As discussed in the IPCC Fourth Assessment Report (IPCC, 2007), these estimates may be low because they do not include any ice dynamics. For the NYC coastal region, the NPCC projects sea level to rise a maximum of

10 inches (25 cm) by 2020, 29 inches (74 cm) by 2050 and 55 inches (140 cm) by 2080. Since bridges typically have a life span of 75-100 years (in NYC a significant number of bridges are over 100 years old), the furthest projection for 2080 of 55 inches was used.

Design Storms. For bridges within the Battery to Long Island Shore boundary, design storms were developed using ADCIRC hurricane data summarized in the Pooled Fund Study (Zevenbergen, 2002) that was coordinated by the South Carolina Department of Transportation. From this study, peak storm surge values were obtained for the 100- and 500-year events respectively for each bridge site. The values were derived from the ADCIRC station (No. 368) located in Long Island Sound. The shape of the synthetic storm surge hydrograph was developed from the normalization of ADCIRC hurricane data as presented in the Pool Funded Study. The alternative synthetic storm surge hydrograph method presented in HEC-25 was utilized because it better represents the falling limb. The recommended half storm duration of 2 hours was used. The half storm duration is defined as the radius of maximum wind speed over the forward speed of the storm as was calculated to be approximately 40 nautical miles. Figure 11 shows the storm surge hydrographs used for the observed tide at Long Island Sound, synthetic tide and storm tide combination for the 100-year and 500-year storms prior to the superposition of 55 inches (1.4 m) of sea level rise.

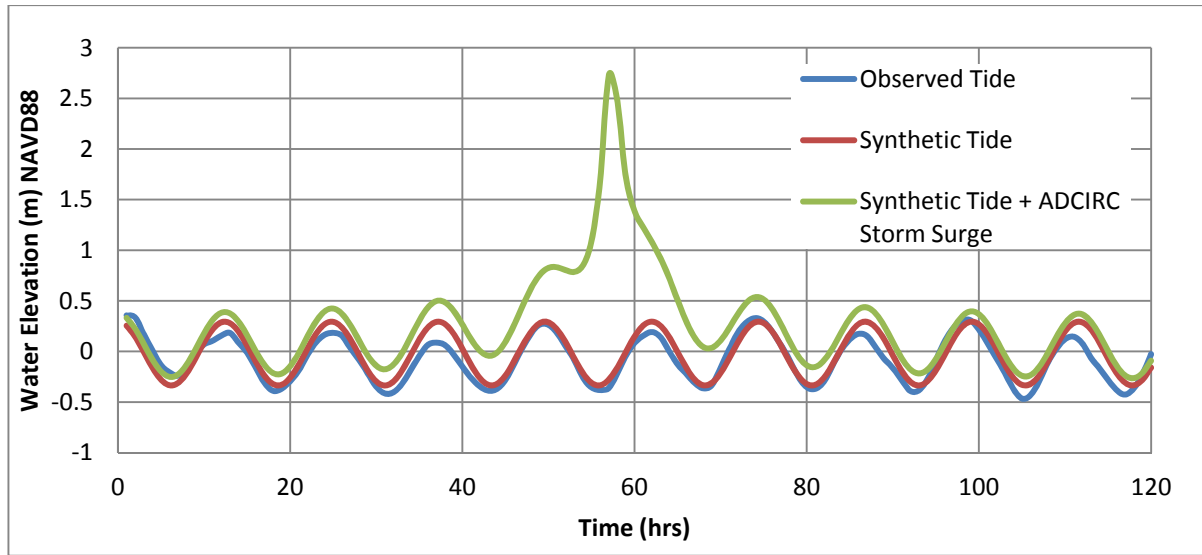


Figure 11a: 100-yr Alternative Method Synthetic Storm Surge Hydrograph
(Shields et al, 2011)

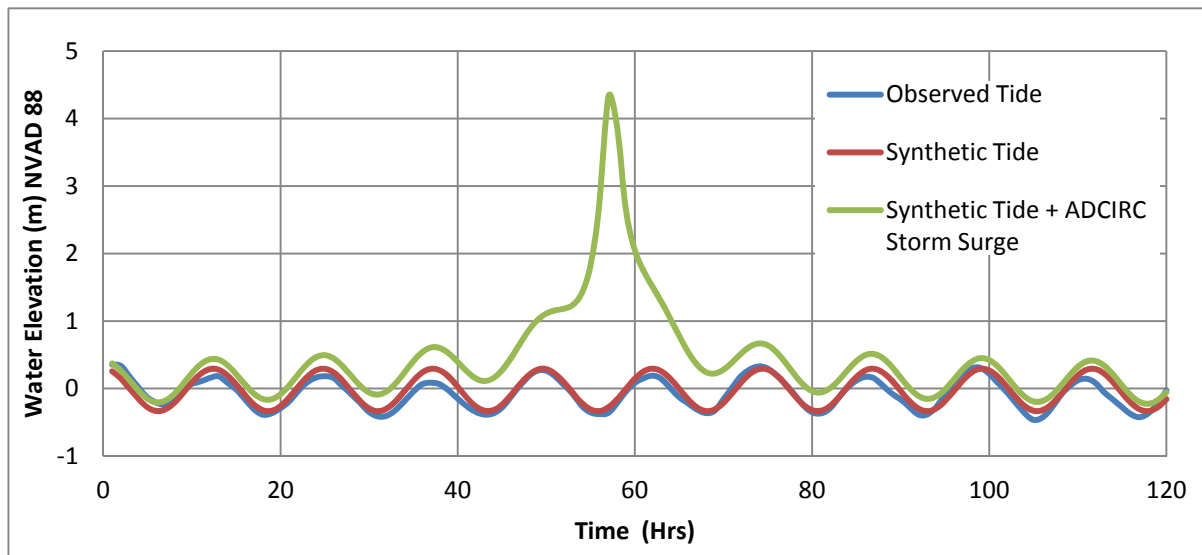


Figure 11b: 500-yr Alternative Method Synthetic Storm Surge Hydrograph
(Shields et al, 2011)

3.4.2 Hydrodynamic Modeling

The case study bridges were grouped into two areas: a) Sandy Hook to the North Shore and b) the South Shore. This was done because data was readily available from an existing study

of the South Shore and a model was being developed from the Battery to the North Shore during the time of this study (Figure 12).

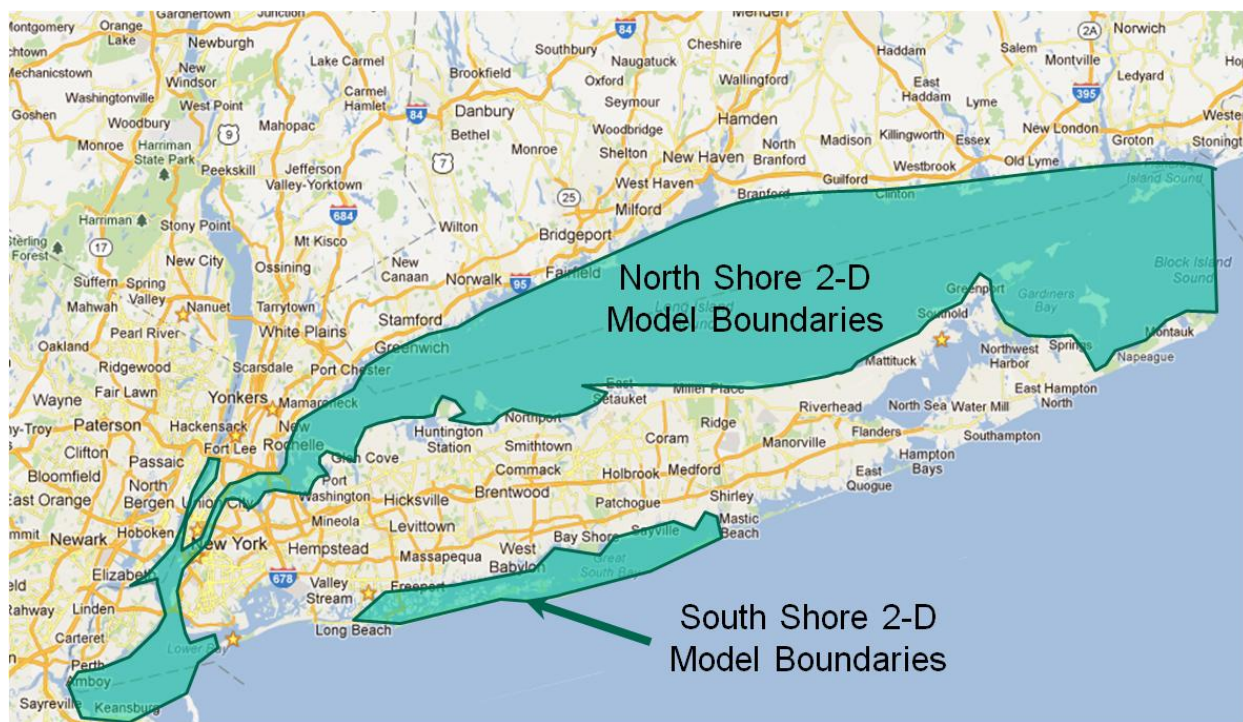


Figure 12: North and South shore model boundaries for hydrodynamic models

Sandy Hook to the North Shore. A Finite-Volume Coastal Ocean Model (FVCOM) was employed to determine the boundary conditions for each bridge site within the study area, particularly the water stage and velocities. This is a two-dimensional hydrodynamic model. A Manning's coefficient value of 0.02 was used. The extent of this model was the North Shore at New London and Montauk to Sandy Hook just south of the Battery.

The verification and calibration of the coupled FVCOM modeling system was performed with a two- stage approach: 1) calibration based on typical conditions from observed and modeled data (Figure 13) and 2) validation of storm conditions especially those observed and modeled for hurricanes. Typical conditions have been documented or modeled by

organizations such as NOAA, United States Geological Survey (USGS), the Federal Emergency Management Agency's Flood Insurance Studies (FEMA) and the New York Harbor Observing and Projection System (NYHOPS).

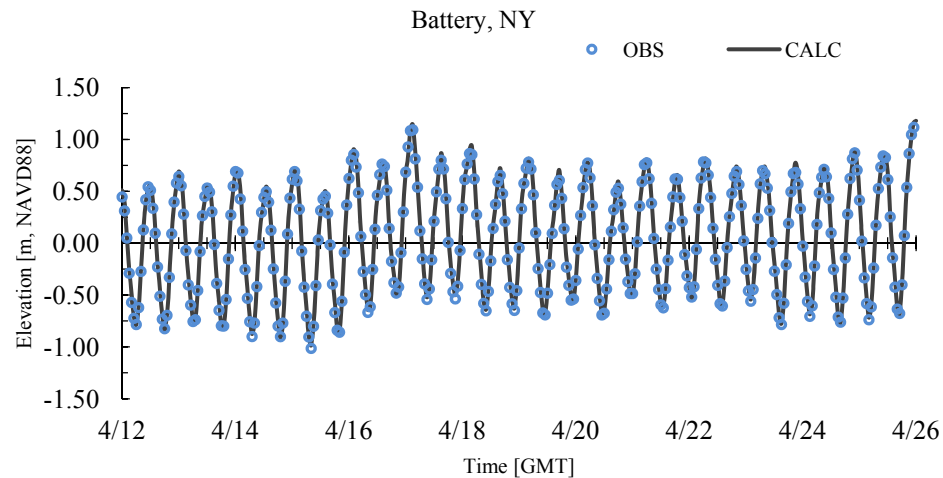


Figure 13a: FVCOM calculated versus observed tidal elevations at the Battery station (Shields et al, 2011)

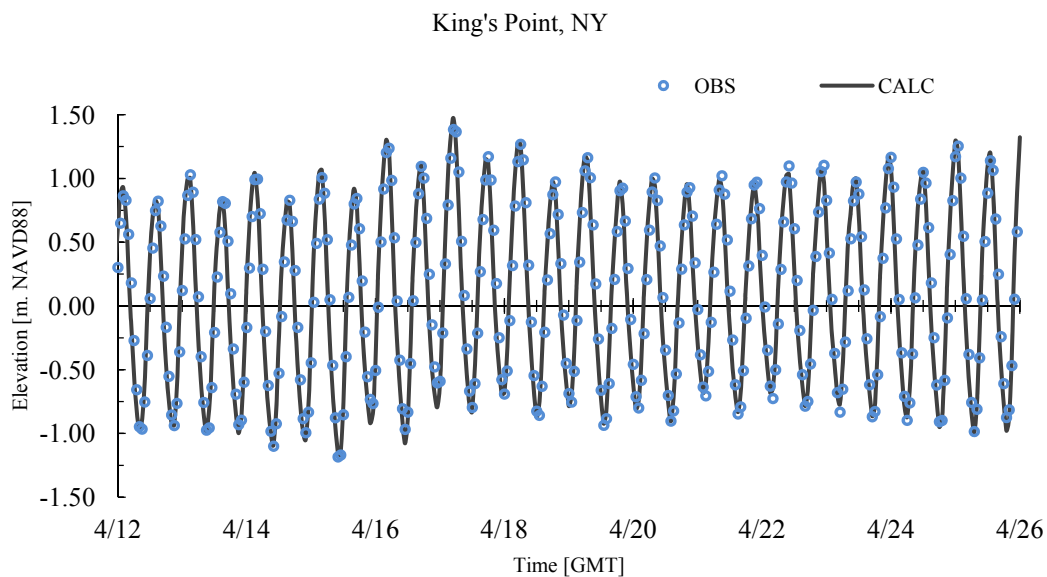


Figure 13b: FVCOM calculated versus observed tidal elevations at King's Point Station (Shields et al, 2011)

The Surface-Water Modeling System (SMS) was used to pre-and post process the data from the FVCOM model to develop boundary conditions and display the results graphically and in tabular format.

South Shore. In 2009 and 2010, tide gages were installed at Jones Inlet and Merrick Bay, respectively, by Stony Brook University. The tidal elevation data was used to develop synthetic storm surge hydrographs to be used for analysis of the projected climate condition for the bridges within the South Shore study area since the tide gages were in close proximity to the bridges.

In 2001, a Hydraulic and Scour Analysis was performed on nineteen (19) bridges along the South Shore of Long Island by Ayres Associates (Ayres, 2001). This study was performed so that the bridges could be coded for the NBIS Item 113 – Scour Critical Bridges for the historic climate condition. The boundaries for the model extend from East Rockaway Inlet to Mastic Beach. The River Modeling Analysis or RMA-2 was used which is a two dimensional depth-averaged finite element hydrodynamic numerical model. It computes water surface elevations and horizontal velocity components for subcritical, free-surface flow in two dimensional flow fields. This program was developed by the United States Army Corps of Engineers Waterways Experiment Station (WES).

The simulation of typical tides by Ayres was used for comparison with the synthetic storm surge hydrographs developed from Jones Inlet and Merrick Bay. In addition, the results of the analysis for the historic climate condition from the Ayres Study were also used to validate the results for the projected climate condition found in this study.

Case Study Bridge Sites. The nearest synthetic storm surge hydrographs to each bridge site were needed in order to run a one-dimensional hydraulic model to determine the impact of

sea level rise coupled with storm conditions for the 100- and 500-year storms. For the North Shore bridges, the hydrographs were retrieved from the FVCOM model and a projected sea level rise of 55 inches was superimposed onto them (Figure 14). For the South Shore bridges, the hydrographs were developed directly from the observed tidal data and the sea level rise added. The software used was the Army Corps of Engineers Hydraulic Engineering Center's River Analysis System (HEC-RAS). This software allowed for more detailed bridge geometry to be inputted than the FVCOM and RMA-2 models.

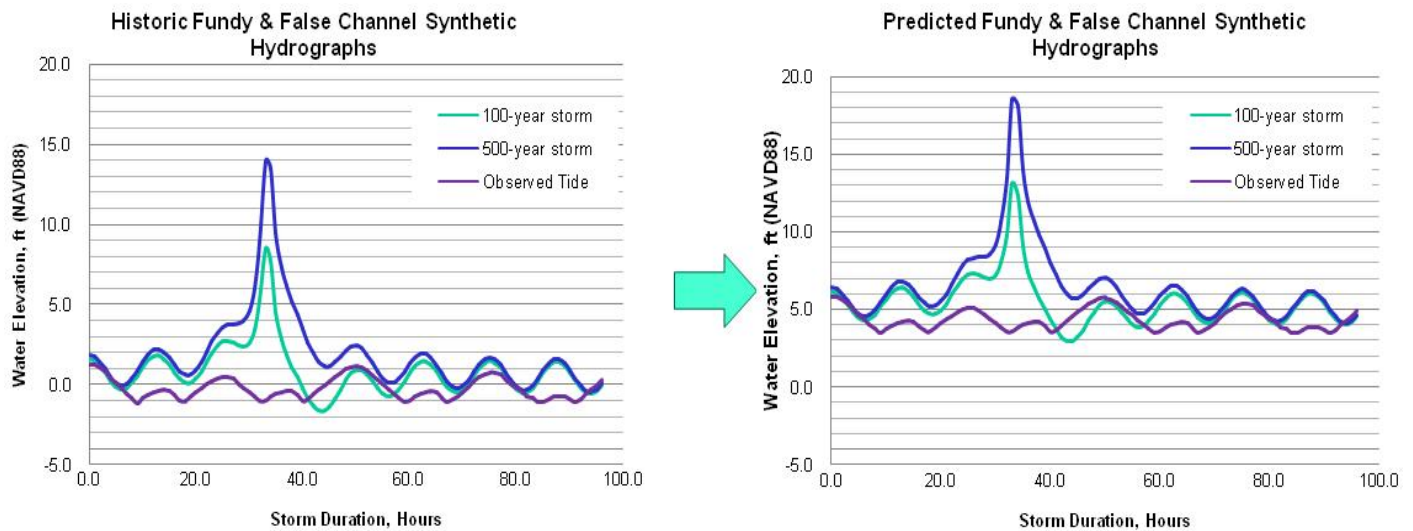


Figure 14: Superposition of projected sea level rise onto storm tide hydrograph

3.4.3 Hydraulic and Scour Analysis

For bridges over waterways, the 100-year and 500-year (or superflood) storms serve as the key design criteria to design and protect bridges against scour. Estimating scour depths at piers and abutments is performed using the guidance assembled by the FHWA design publication HEC 18, *Evaluating Scour at Bridges* (Richardson et al., 2001). Bridge foundations should be designed with significant safety factor to withstand the effects of

scour without failing for the worst conditions resulting from floods equal to or less than the 100-year flood. Bridge foundations should be checked (safety factor of one, at minimum) to ensure that they will not fail due to scour resulting from a superflood. The extent of flooding can be seen by reviewing the model results. Using the flow, velocity and flood elevation data from the models developed in conjunction with soil data, bridge scour can be estimated. In riverine and coastal flows, scour calculations are performed in multiple parts: a) contraction scour, b) pier scour, c) abutment scour and d) long-term degradation.

Contraction scour equations are based on the principle of conservation of sediment transport. For example, in live-bed scour the fully developed scour in the bridge cross section reaches equilibrium when sediment transported into the contracted section equals sediment transported out. As scour develops at the bridge's cross-section, the shear stress in the contracted section decreases as a result of a larger flow area and decreasing average velocity. The Laursen equation was used to estimate scour in the contracted section of the streambed (HEC 18, Equation 5.2).

Local scour at piers is a function of bed material characteristics, bed configuration, flow characteristics, fluid properties, and the geometry of the pier and footing. Flow characteristics of interest for local pier scour are the velocity and depth just upstream of the pier, the angle the velocity vector makes to the pier (angle of attack), and free surface or pressure flow. Pier geometry characteristics such as type, dimensions, and shape are also required. Local scour at piers has been studied extensively in the laboratory, but there is limited field data. The Colorado State University equation was used for pier scour estimates (HEC-18, Equation 6.3).

Abutment scour occurs when the abutment obstructs the flow. The flow obstructed by the abutment forms a horizontal vortex starting at the upstream end of the abutment and running along the toe of the abutment, and a vertical wake vortex at the downstream end of the abutment (Figure 13). Froehlich analyzed 170 live-bed scour measurements in laboratory flumes by regression analysis to obtain the following equation (HEC-18, Equation 7.1).

Long-term bed elevation changes may be the natural trend of the stream or may be the result of some modification to the stream or watershed. The streambed may be aggrading, degrading, or in relative equilibrium in the vicinity of the bridge crossing. The long-term trend may change over the life of the bridge. These long-term changes are the result of changes to the stream or watershed. Such changes may be the result of natural processes or human activities. Due to the tidal nature of the case study bridges and no evidence that the streambeds were going to be significantly modified in the near future, the long term degradation was considered negligible.

4 RESULTS

The selected case study bridges are shown below and are maintained by various owners (Table 8). Figure 15 shows the location of each of the bridge sites. The results of the analysis for each bridge will be discussed in detail in the following sections. Complete calculations and additional data for each bridge can be found in Appendix B.

Table 8: Selected case study bridges

No. on Map	Vulnerability	Name	Owner
8	High	Loop Pkway over Long Creek	NYSDOT - Region 10
7	High	Meadowbrook Pkway over Sloop Channel	NYSDOT - Region 10
2	High	Mill Dam Road over Centerport Harbor	County - Suffolk
1	Medium	Southland Drive over Dosoris Pond	Town - Glen Cove
3	Medium	West Shore Road over Mill Neck Creek	County - Nassau
4	Medium	Sunken Meadow Parkway	NYSDOT - Region 10
5	Low	Meadowbrook Pkway over False Channel	NYSDOT - Region 10
6	Low	Meadowbrook Pkway over Fundy Channel	NYSDOT - Region 10
9	Low	Bayonne Bridge over Kill Van Kull	Port Authority



Figure 15: Case study bridges

4.1 Southland Drive over Dosoris Pond (BIN 2261550)

Background: Southland Drive over Dosoris Pond is located in the town of Glen Cove, Nassau County. The three-span granite stone arch bridge is approximately 104 ft long and 22.5 ft wide. Built in 1929, the depth of the timber pile foundations is unknown, which is not uncommon for bridges built during this time period. The bridge was initially classified as having a **medium vulnerability** because the detour length (NBIS Item 19) was indicated as greater than 30 km. Dosoris Pond is not navigable at the bridge as the vertical clearance is less than 5ft during mean high water. Multiple large sand shoals appear to have developed due to deposition of soil from the ebb tide (Figure 16).

Dosoris Pond is flood controlled by treated timber tide gates in order to keep the water surface above a minimum elevation in the pond. Dosoris Pond empties directly into Long Island Sound, and the bridge is less than a mile from the outlet. Aerial images show significant turbulence in the area of the bridge during both the ebb and flood tides. The bridge was rehabilitated in 2005 which included additional scour protection in the form of riprap and steel sheeting. The 2007 fathometric survey (McLaren, 2007) indicated that the scour hole between the west abutment and Pier 1 has increased an additional 2ft since the 2002 survey. Deeper depths exist upstream and downstream of the bridge and are likely scour holes.

Analysis: The hydrograph results from the FVCOM model indicate projected flood elevations (NAVD 88) of approximately 18ft for the 100-year storm and 25ft for the 500-year storm (Figure 17). The bridge and waterway were modeled in HEC-RAS. The extents of the HEC-RAS model were approximately 300ft upstream and 600ft downstream of the bridge.



Figure 16: Aerial image of Southland Drive over Dosoris Pond

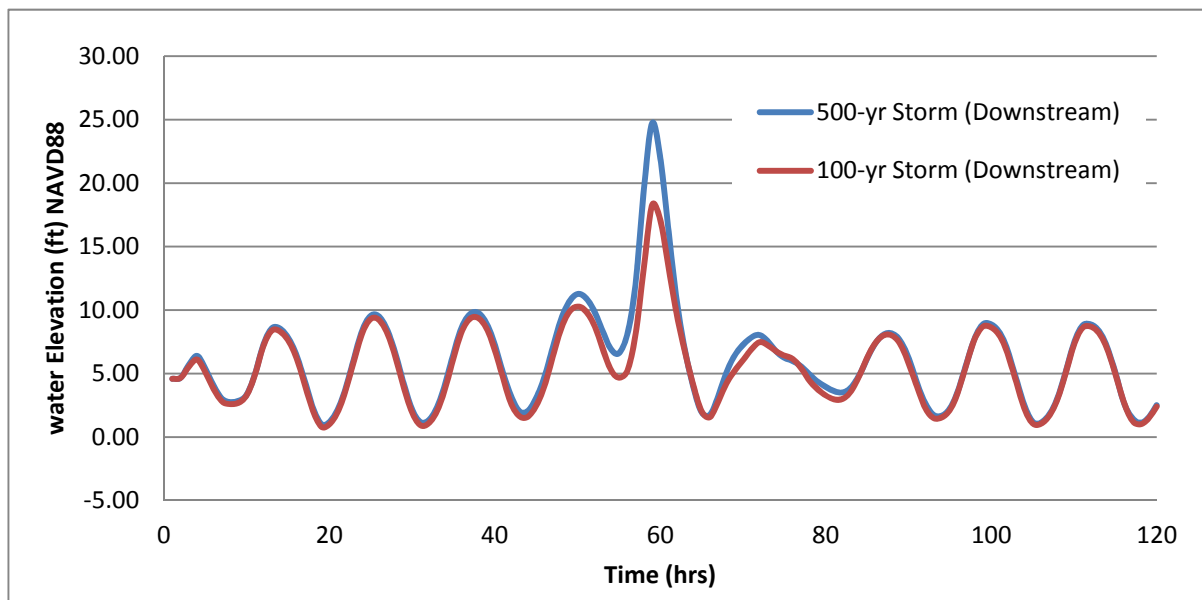


Figure 17: Dosoris Pond synthetic hydrographs

The east side of the bridge has a wide floodplain (< 10ft) while the west side has a steeper slope (elevations of 20ft +). This results in overtopping of the eastern approach roadway and bridge deck during normal tidal conditions as well as the 100-year and 500-year storm (Figures 18 and 19).

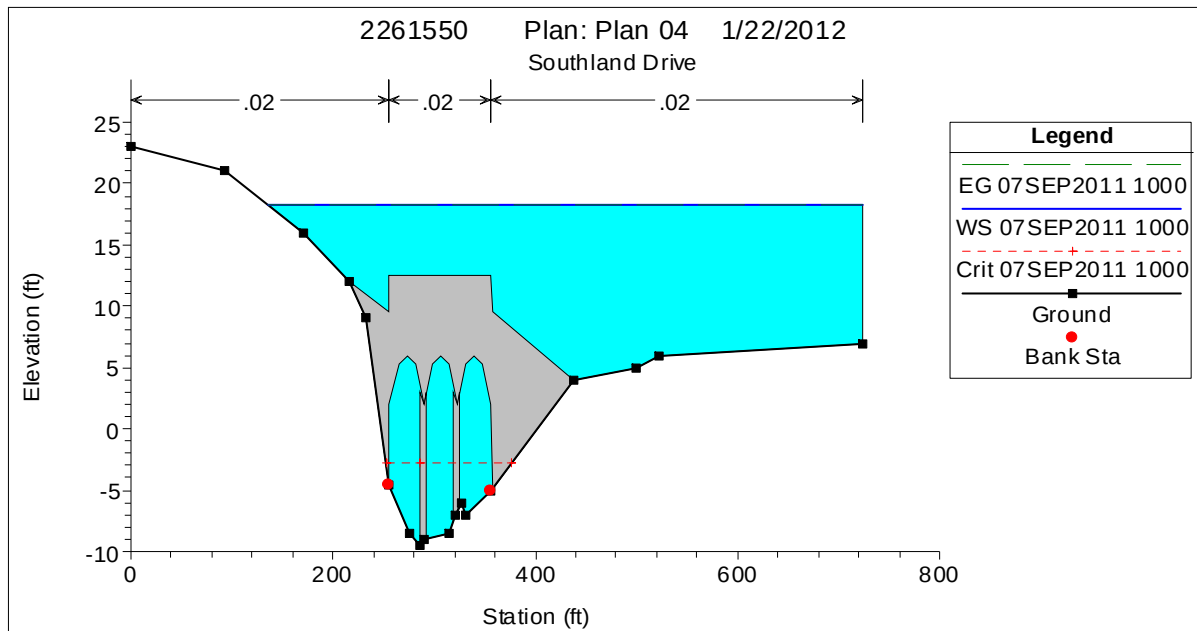


Figure 18: Southland Drive over Dosoris Pond HEC-RAS results for the 100-year storm

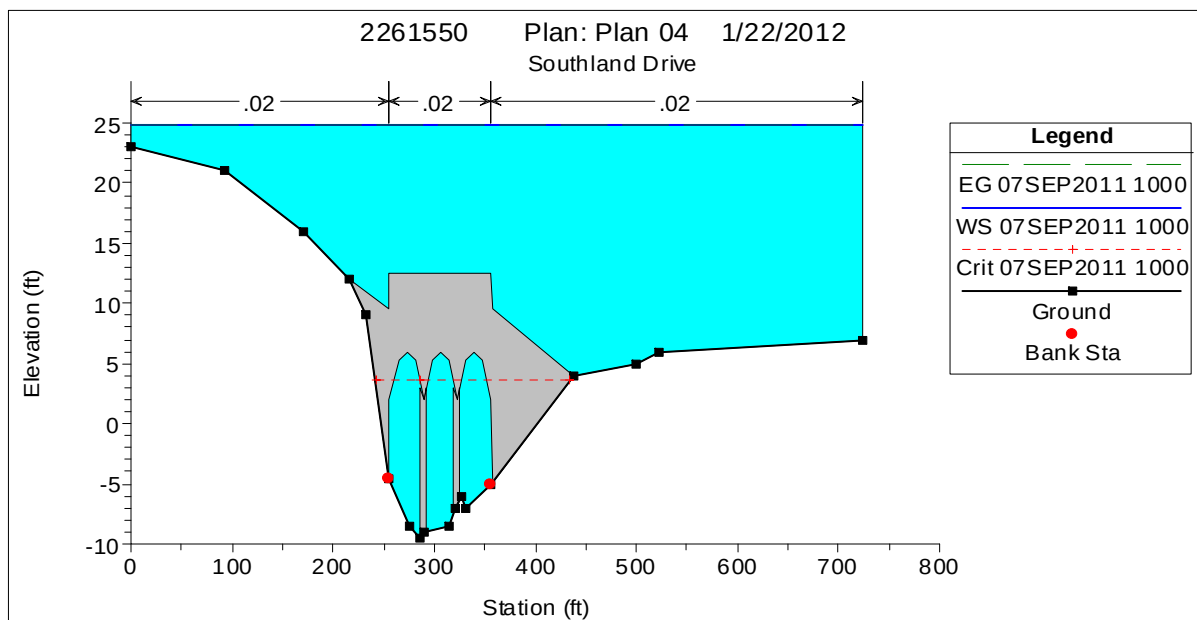


Figure 19: Southland Drive over Dosoris Pond HEC-RAS results for the 500-year storm

The HEC-RAS model indicated velocities of approximately 9 and 11 ft/s at the maximum flood elevation for the 100- and 500-yr storms, respectively. The Laursen equation to estimate scour in the contracted section (HEC 18, Equation 5.2) indicated that minimal contraction scour is likely to occur. Local abutment scour and pier scour was calculated and the results are summarized below (Table 9).

Table 9: TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
Southland Drive over Dosoris Pond

100-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Bottom of Pile Cap Elevation² (ft)	Depth of Pile Exposure (ft)
West Abutment	-4.5	0	5	5	-9	-15	Not Exposed
Piers	-10	0	13	13	-23	-15	-8
East Abutment	-5	0	13	13	-18	-15	-3

500-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Bottom of Pile Cap Elevation² (ft)	Depth of Pile Exposure (ft)
West Abutment	-4.5	0	7	7	-12	-15	Not Exposed
Piers	-10	0	15	15	-25	-15	-10
East Abutment	-5	0	20	20	-25	-15	-10

1. All elevations are with reference to NAVD 88.

2. Estimate of Pile Cap Bottom based on design drawings. Timber piles are of unknown size and depth.

Conclusions: The possibility of flooding of the approach roadways during typical tides is a major concern. In addition, the HEC-RAS model indicated that the bridge and surrounding areas will experience extensive flooding during the 100 and 500-year events. Scour calculations project a considerable amount of erosion at the piers. However, the depth and

diameter of the piles are unknown according to 2002 reconstruction plans making it difficult to determine if undermining of the structure will occur. Assuming that the piles are a minimum of 30ft long, which is typical, the structure would not be undermined, and a reasonable amount of embedment would remain. As a result, the bridge should remain in the **high category** until more information can be obtained about the foundation.

It is recommended that the depths of the piles be determined using non-destructive testing methods. *Since this bridge has a high prioritization, it is also recommended that it receive a full risk assessment and corrective action be included as part of the bridge owner's short term fiscal planning (ex: 5-10 year plan).*

4.2 West Shore Road over Mill Neck Creek (BIN 3300010)

Background: West Shore Road over Mill Neck Creek connects the towns of Bayville and Mill Neck in Nassau County. The Bayville Bridge is a reinforced concrete beam, single leaf bascule with multiple piers in the waterway (Figure 20). The bridge was built in 1938 and the latest reconstruction was in 1993 as indicated by the NBIS data. Bridge plans indicate that the bascule span is approximately 104 ft long and 43 ft wide. The bridge was initially classified as having a **medium vulnerability** because it is eligible for the National Register of Historic Places. The bridge is located in a constriction of Mill Neck Creek, multiple piers are in the waterway and the abutments create additional constriction.

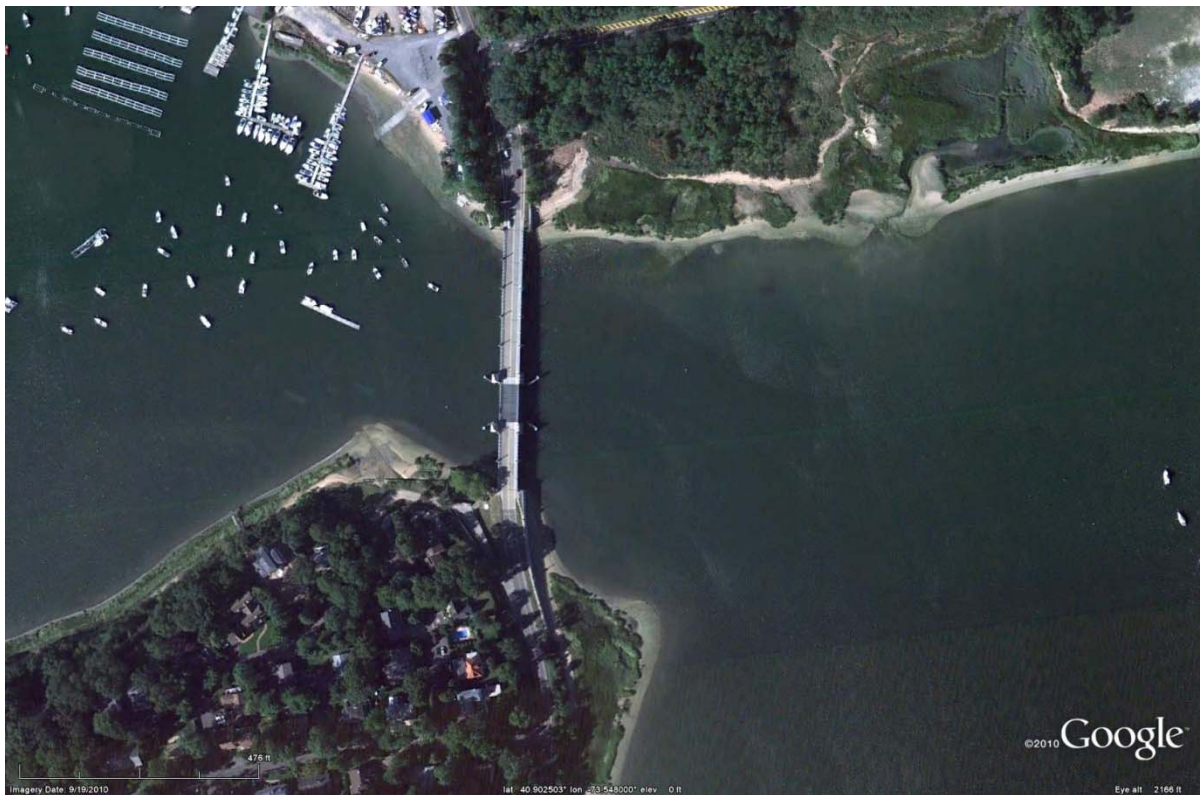


Figure 20: Aerial image of West Shore Road over Mill Neck Creek (Google 2010)

The 2010 fathometric survey (Boswell, 2010) indicated that the foundation is supported by piles of unknown length. Interestingly, most of the piers have experienced aggradation since the 2005 survey with the exception of Pier 2, the south abutment and Pier 7.

Analysis: The hydrograph results from the FVCOM model indicate projected flood elevations (NAVD 88) of approximately 17ft for the 100-year storm and 24ft for the 500-year storm (Figure 21). The bridge and waterway were modeled in HEC-RAS. The extents of the HEC-RAS model were approximately 1700ft upstream and 1000ft downstream of the bridge.

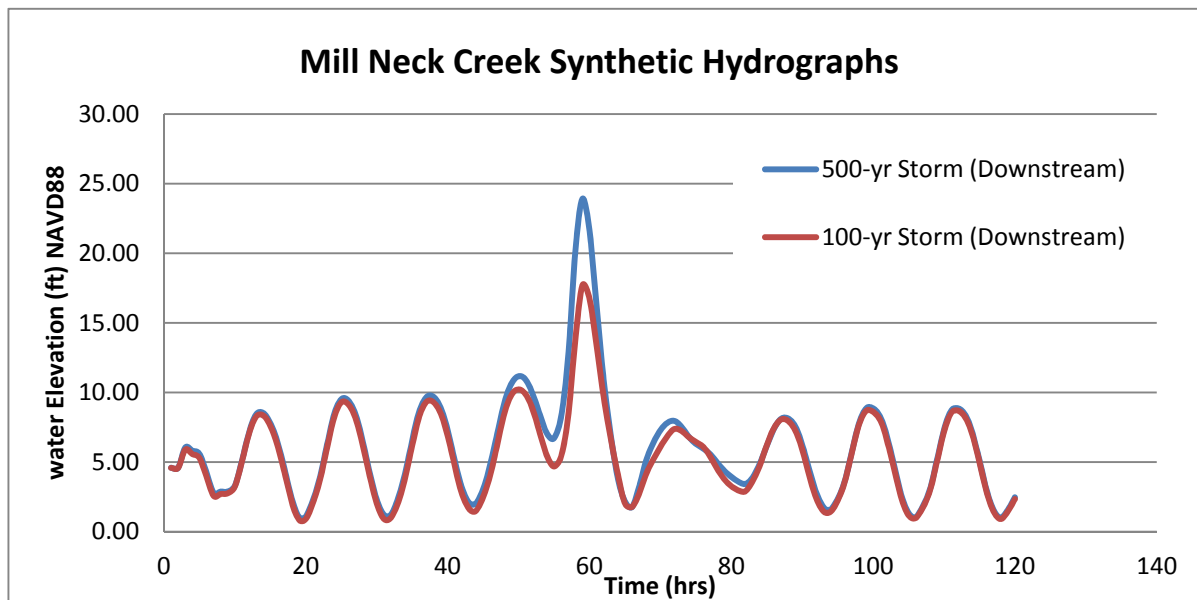


Figure 21: Mill Neck Creek synthetic hydrographs

The north side of the bridge has a wide floodplain (< 10ft) while the south side has a much steeper slope (elevations of 100ft +). This results in overtopping of the northern approach roadway during the 100-year storm. During the 500-year storm, the bridge deck is overtopped as well as the north approach roadway.

Since the bridge crosses Mill Neck Creek at a point that is approximately 6 miles away from the mouth of Oyster Bay into Long Island Sound, flooding appears to be more of a concern

than high velocities. The HEC-RAS model indicated velocities of approximately 3 ft/s for the 100-year and 10 ft/s for the 500-year at the maximum flood elevations (Figures 22 and 23) . The Laursen equation to project scour in the contracted section (HEC 18, Equation 5.2) indicated that minimal contraction scour is likely to occur. Local abutment scour and pier scour was calculated and the results are summarized below (Table 10).

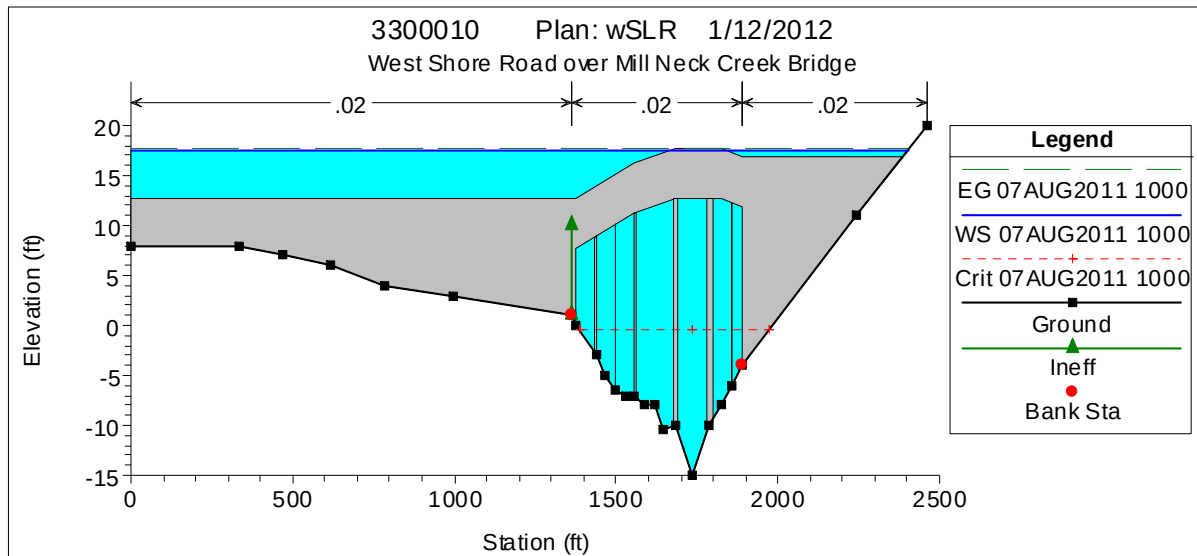


Figure 22: Mill Neck Creek HEC-RAS results for the 100-year storm

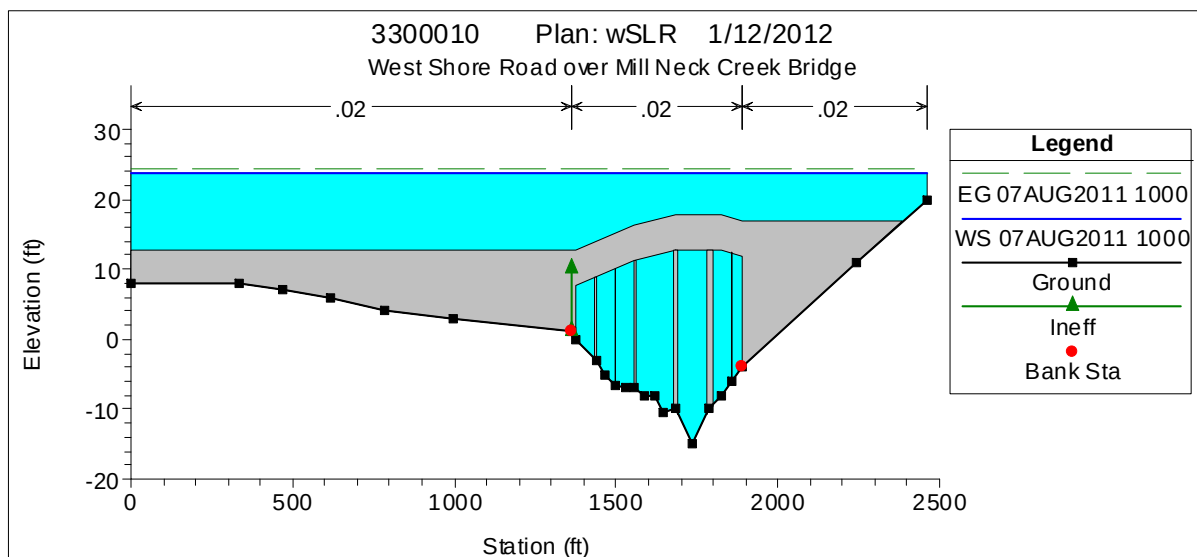


Figure 23: Mill Neck Creek HEC-RAS results for the 500-year storm

Table 10: TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
West Shore Road Over Mill Neck Creek
100-YEAR STORM SCOUR SUMMARY

Substructure	Groundline	Contraction	Local	Total	Scour	Pile Tip	Remaining
Unit	Elevation ¹ (ft)	Scour (ft)	Scour (ft)	Scour (ft)	Elevation (ft)	Elevation ² (ft)	Pile Embedment (ft)
North Abutment	0	0	14	14	-14	-45	31
Center Pier	-25	0	6	6	-31	-65	34
South Abutment	0	0	13	13	-13	-45	32

500-YEAR STORM SCOUR SUMMARY

Substructure	Groundline	Contraction	Local	Total	Scour	Pile Tip	Remaining
Unit	Elevation (ft)	Scour (ft)	Scour (ft)	Scour (ft)	Elevation (ft)	Elevation ² (ft)	Pile Embedment (ft)
North Abutment	0	0	11	11	-11	-45	34
Center Pier	-25	0	5	5	-30	-65	35
South Abutment	0	0	15	15	-15	-45	30

1. All elevations are with reference to NAVD 88 and are taken from the 2009 Fathometric Survey by Boswell Engineering.

2. Estimate of pile tip elevation was taken from the Ayers Study (2001).

Conclusions: While the flooding indicates that the bridge should be considered a **high vulnerability**, the scour calculations do not indicate that the bridge would be undermined (NBIS Items 113 and 71 not to change). As a result, the bridge should not be placed in the critical category.

It is recommended that bridges with a high prioritization receive a full risk assessment and corrective action be included as part of the bridge owner's short term fiscal planning (ex: 5-10 year plan).

4.3 Mill Dam Road over Centerport Harbor (BIN 3300640)

Background: The Mill Dam Road Bridge spans from Greenlawn to the Centerport peninsula (Figure 24). It is a fixed, concrete and granite two-span bridge. The center span is approximately 60ft long and 40ft wide. The entire bridge is approximately 650 ft long. Upstream of the bridge is Mill Pond while downstream is Centerport Harbor. The bridge was built in 1935 and rehabilitated in 2003 which included a raised profile. Mill Pond is flood controlled by treated timber tide gates which open when the water surface reaches the top of the gates and close during outgoing tides in order to keep the water surface above a minimum elevation (Figure 25). The waterway is not navigable under the bridge. The bridge was initially classified as having a **high vulnerability** because the freeboard is less than 3ft (Item 39 Navigational Control).



Figure 24: Aerial image of Mill Dam Road over Centerport Harbor (Google 2010)

The abutments are located in the waterway and founded on battered piles. The channel bottom consists of mainly sand. The shorelines adjacent to the bridge are comprised of steel sheet pile bulkheads (the depth of the sheet piles were not indicated) (Boswell, 2010). A scour hole approximately 10ft deep exists on the downstream (north) side of the bridge (Figure 26).



Figure 25: South fascia elevation of Mill Dam Road over Centerport Harbor (Boswell, 2010)

Analysis: The hydrograph results from the FVCOM model indicate projected flood elevations (NAVD 88) of approximately 12ft for the 100-year storm and 18ft for the 500-year storm (Figure 27). The bridge and waterway were modeled in HEC-RAS. The extents of the HEC-RAS model were approximately 1500ft upstream and downstream of the bridge. The HEC-RAS maximum water elevation at the bridge was projected to be 12ft for the 100-year storm and 18ft (Figure 28) for the 500-year storm (Figure 29).

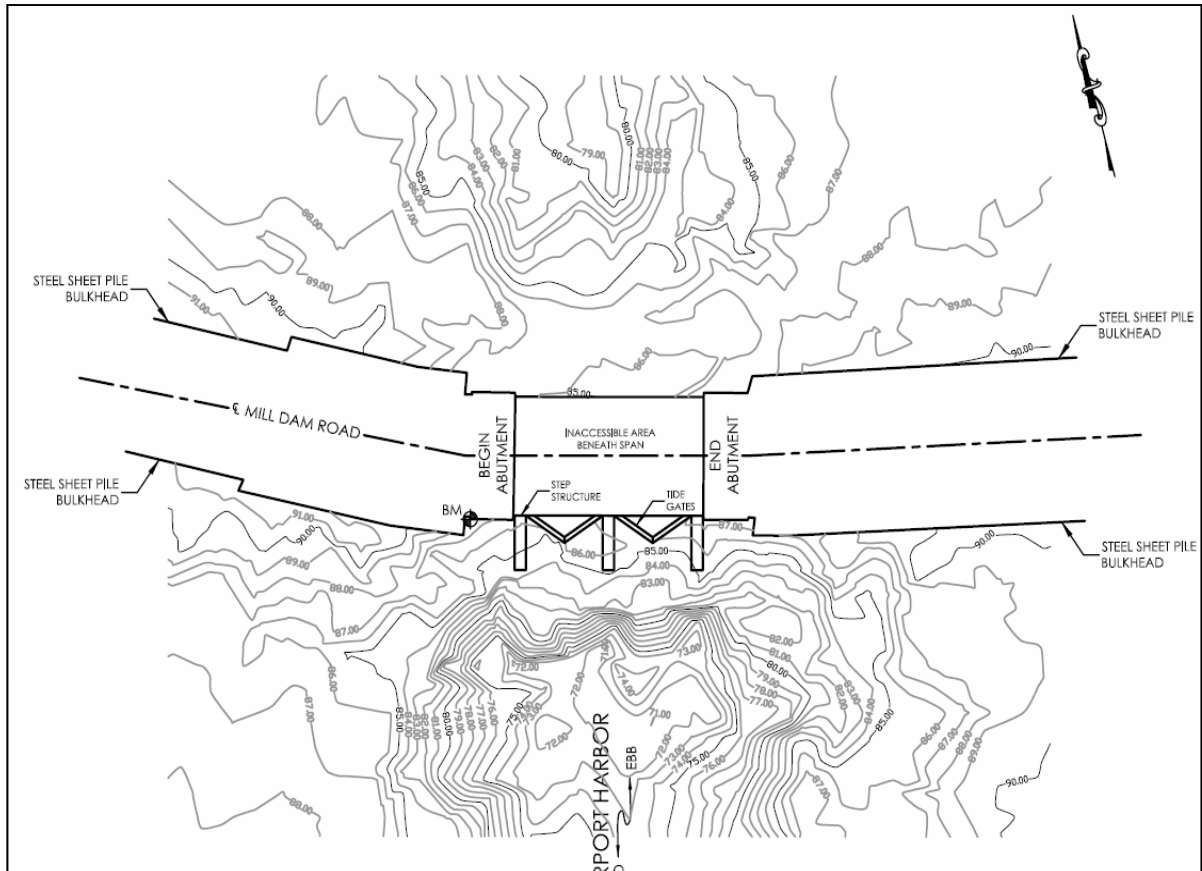


Figure 26: Bathymetric survey of Mill Dam Road Bridge (Boswell, 2010)

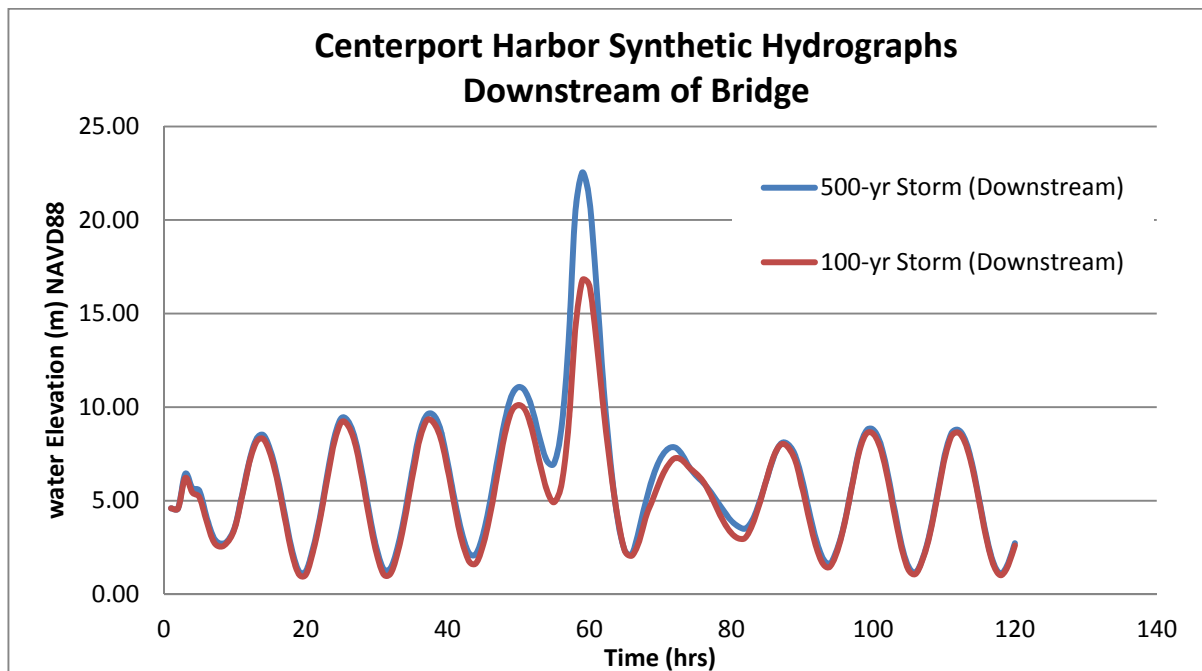


Figure 27: Centerport Harbor synthetic hydrographs

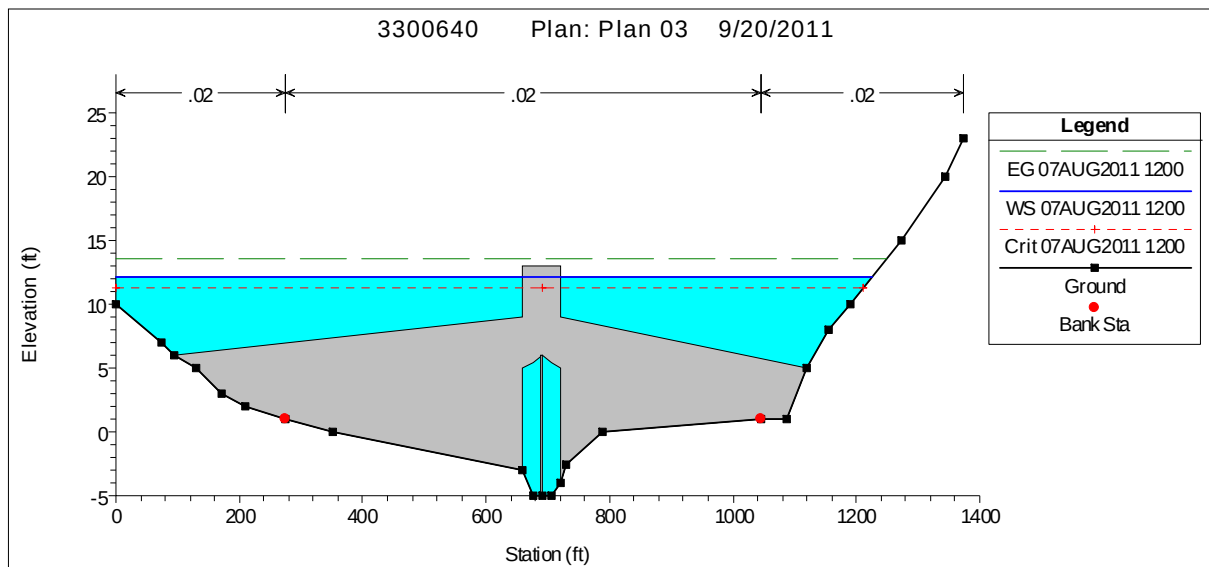


Figure 28: Centerport Harbor HEC-RAS results for the 100-year storm

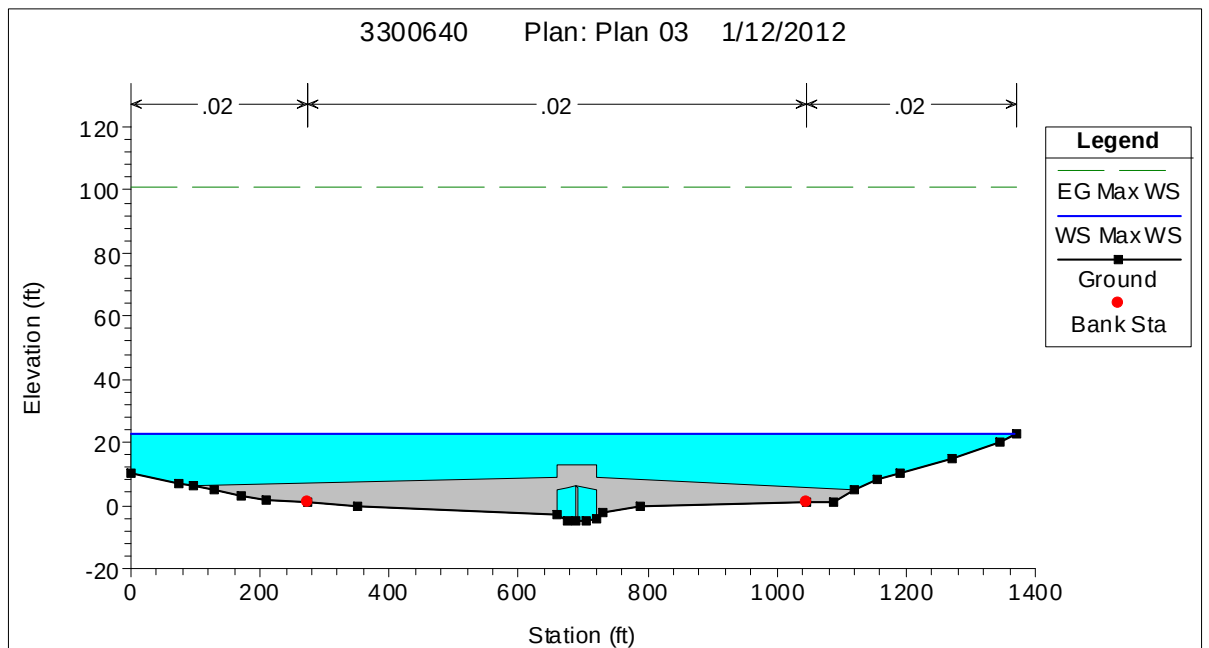


Figure 29: Centerport Harbor HEC-RAS results for the 500-year storm

The west side of the bridge has a wide floodplain while the east side has a much steeper slope. This results in more widespread flooding of the bridge and to the west for the 100-yr and 500-year storms. The normal tide may be a source of daily flooding at high tide at the approach spans.

Maximum velocities range from 6 to 10 ft/s during the flood tide for the 100-year and 500-year storms, respectively. The Laursen equation to project scour in the contracted section (HEC 18, Equation 5.2) indicated that minimal live-bed contraction scour is likely to occur. A summary of the scour calculations is shown in Table 11.

Table 11: TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
Mill Dam Road over Centerport Harbor

100-YEAR STORM SCOUR SUMMARY							
Substructure Unit	Groundline Elevation¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation² (ft)	Remaining Pile Embedment (ft)
East Abutment	0	0	1	1	-1	-45	44
Center Pier	-25	0	3	3	-28	-65	37
West Abutment	0	0	5	5	-5	-45	40

500-YEAR STORM SCOUR SUMMARY							
Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation² (ft)	Remaining Pile Embedment (ft)
East Abutment	0	7.8	12	20	-20	-45	25
Center Pier	-25	7.8	7	15	-40	-65	25
West Abutment	0	7.8	18	25	-25	-45	20

1. All elevations are with reference to NAVD 88 and are taken from the 2009 Fathometric Survey by Boswell Engineering.

2. Estimate of pile tip elevation was taken from the Ayers Study (2001).

Conclusions: While the flooding still indicates that the bridge should be considered a **high vulnerability**, the scour calculations do not indicate that the bridge would be undermined.

It is assumed that the tide gates will be operated to reduce flooding of the structure. As a result, the bridge should not be placed in the critical category.

It is recommended that bridges with a high prioritization receive a full risk assessment and corrective action be included as part of the bridge owner's short term fiscal planning (ex: 5-10 year plan).

4.4 Sunken Meadow Parkway (BIN 5059070)

Background: The Sunken Meadow Parkway bridge was built in 1955 and crosses a small marsh creek within the Sunken Meadow State Park in Suffolk County. It is a fixed, concrete arch which spans approximately 140ft and is 40ft wide. The creek does not directly connect to the Long Island Sound due to an earth dam with access road on top of the dam (Figure 30). There is evidence of a possible small culvert through the dam to allow some flow into the creek. The waterway is navigable under the bridge for small watercraft such as a canoe. The bridge was initially classified as having a **medium vulnerability** because the waterway adequacy (NBIS Item 71) indicates the bridge experiences occasional flooding. Further inspection of the site did reveal that there were two other access points. These access road are not for public access and do not appear to have standard widths for two-way traffic.

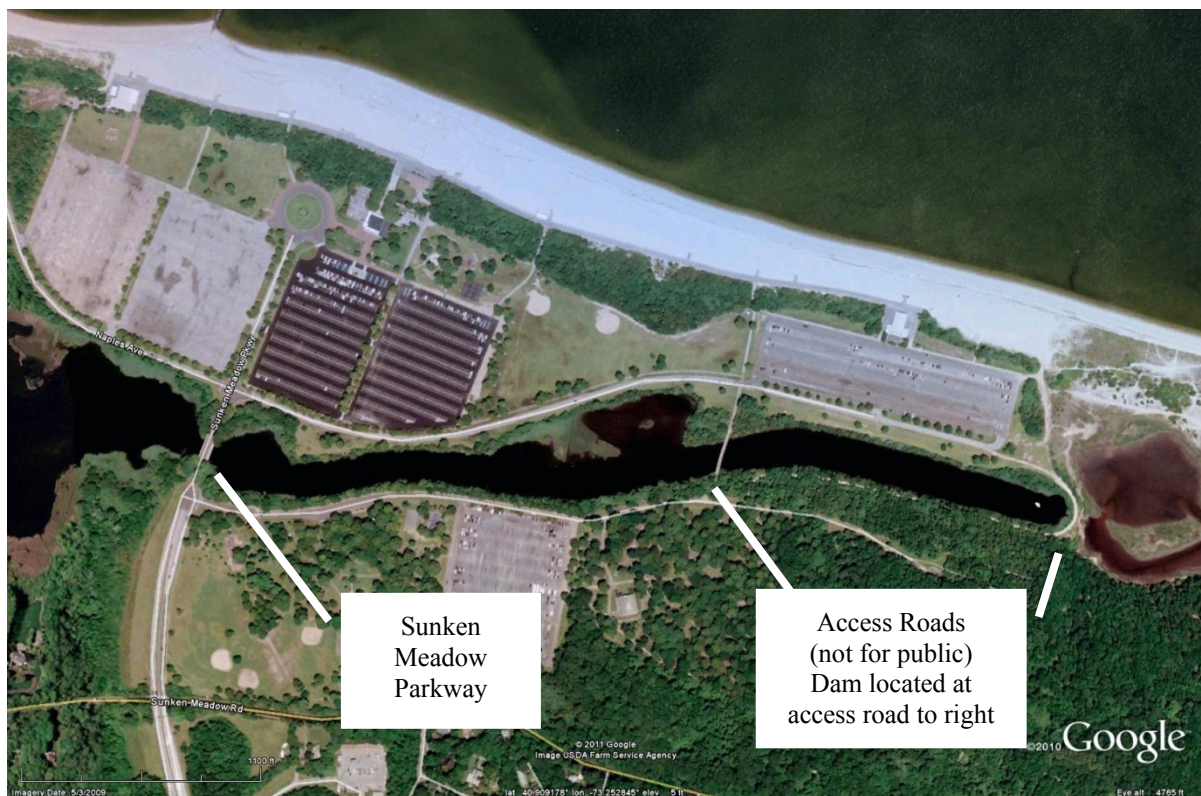


Figure 30: Aerial image of Sunken Meadow Parkway (Google 2010)

The abutments are located in the waterway and are likely founded on piles. The channel bottom consists of mainly silty sand. Due to the dam approximately 0.75 miles to the east of the bridge, flow velocities are minimal during normal tides.

Analysis: Since the waterway is not directly connected to the open ocean due to the earth dam, a 1-D hydraulic model was not run. The flood modeling from the FVCOM model indicate projected flood elevations (NAVD 88) of approximately 12ft for the 100-year storm and 18ft for the 500-year storm. Flooding will likely come from overland flooding of the large northern floodplain which is less than 10ft above sea level. Minimal flow velocities are not likely to create significant scour in the area of the bridge.

Conclusions: The potential for coastal flooding is significant when sea level rise projections are included. However, the bridge does not appear to serve any residential communities, only the park and golf course. For this reason, it is recommended that the bridge be set with a **low priority** rating.

It should be clearly understood that the purpose of prioritization is with regard to a bridge owner's available resources (planning, finances, etc.). A low prioritization does not necessarily indicate less risk of failure. The assumption is that the bridge owner could close the Sunken Meadow Parkway Bridge, if deemed unsafe for motorists, with less impact to the travelling public than, say, a medium priority bridge.

4.5 Loop Parkway over Long Creek (BIN 1056769)

Background: The Loop Parkway Bridge was built in 1933 and crosses over Long Creek in Nassau County. It is a single leaf bascule span with sixteen (16) approach piers and two bascule piers (Figures 31 and 32). The overall dimensions of the bridge are approximately 700ft long and 60ft wide. The abutments are not in the water with the current tide. The bridge was initially classified as having a **high priority** because a pier stability analysis conducted for NYSDOT indicated that the bridge would become unstable due to a calculated scour condition. This calculation is based on historic storm events, and does not include sea level rise projections.



Figure 31: Aerial image of Loop Parkway over Long Creek (Google 2010)



Figure 32: North fascia of Loop Parkway over Long Creek (Boswell 2009)

Loop parkway over Long Creek is one of three bridges and serves as the part of the hurricane evacuation route for the island containing the populated Atlantic Beach, Long Beach, Lido Beach and Point Lookout communities in Nassau County (Hurricane Evacuation Routes, 2011). The bridge immediately connects Meadow Island on the east side to Alder Island in the west. Both islands are wetland areas and are uninhabited. The 2009 fathometric survey conducted by Boswell Engineering indicated scour holes with maximum depths of 30ft on the north sides (upstream) of Piers 7 and 13. This is likely due to the higher velocities during ebb tide and the confluence of three small waterways just north of the bridge. Deeper depths of 25- 29ft were also recorded immediately upstream of the bascule piers. This is likely due to the size and constriction created by the piers.

NYSDOT conducted non-destructive testing (NDT) to better determine the pile lengths of the piers. The design plans from 1933 indicated that piles were to be 75ft long on the east side and 90ft on the west side of the main bascule spans. The NDT tests indicate pile depths of 50ft to 54ft on the east side and 65ft to 69ft on the west side of the bridge.

Analysis: The synthetic hydrograph was developed directly from the observed tidal readings at Jones Inlet and sea level rise was surperimposed onto the readings for the projected climate condition (Figure 33). The maximum water elevations at the bridge from the HEC-RAS model indicate projected flood elevations (NAVD 88) of approximately 15ft for the 100-year storm (Figure 34) and 22ft for the 500-year storm (Figure 35). The extents of the HEC-RAS model were approximately 1000ft upstream and 1500ft downstream of the bridge.

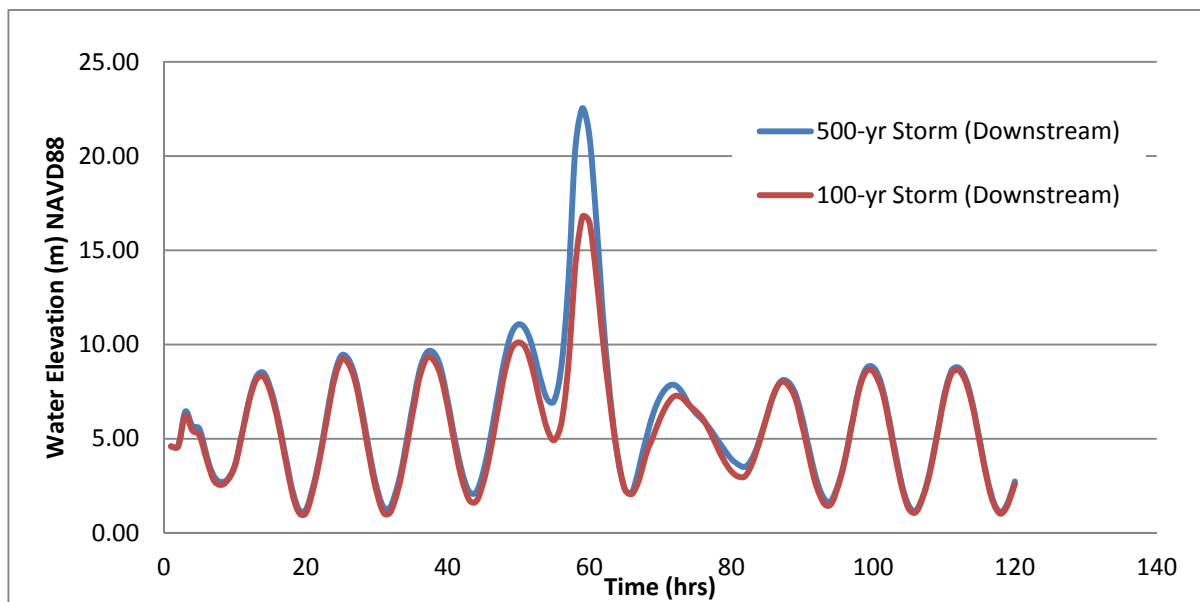


Figure 33: Loop Parkway over Long Creek synthetic hydrographs

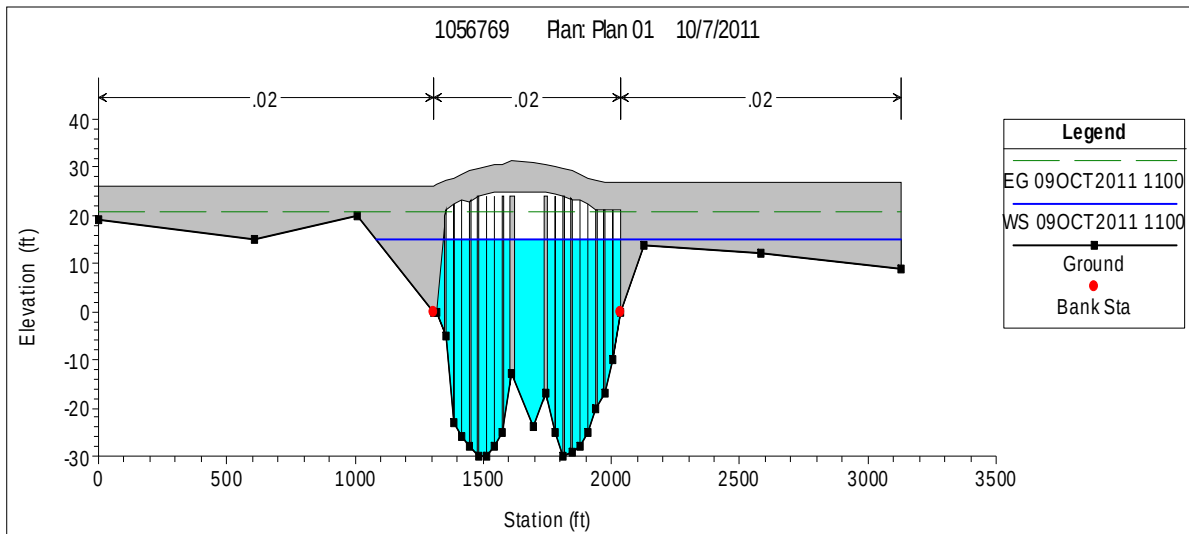


Figure 34: Loop Parkway over Long Creek HEC-RAS results for the 100-year storm

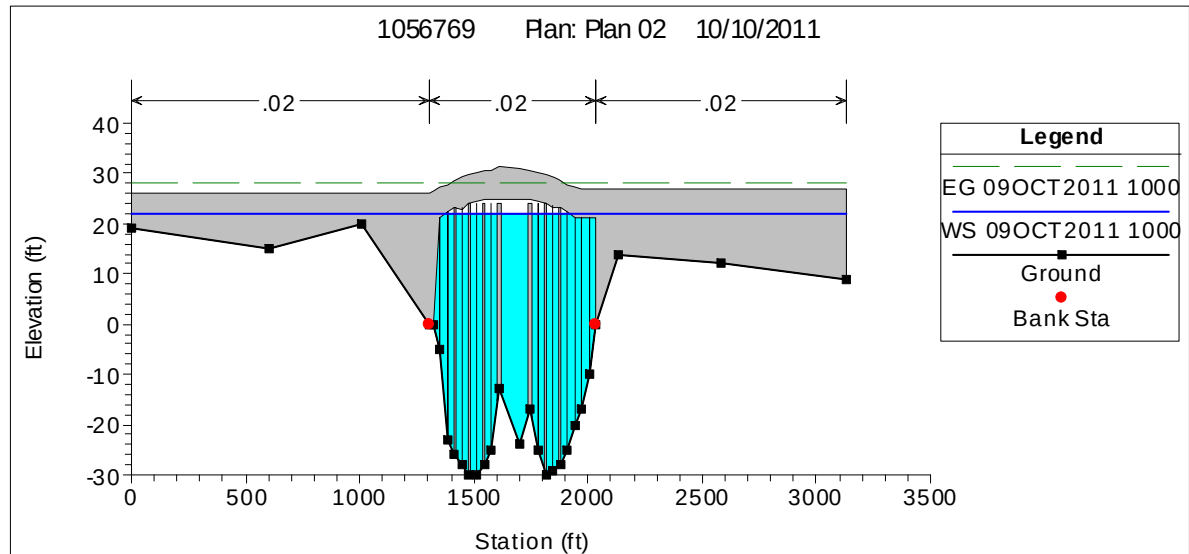


Figure 35: Loop Parkway over Long Creek HEC-RAS results for the 500-year storm

The approach roadway and bridge are at an elevation of +26ft to +31ft (NAVD 88). As a result, the approach roadway and bridge do not flood during the 100-year storm. Normal tide, with seal level rise projections, does not appear to be flood concern. During the 100-yr storm, Meadow Island on the east side to Alder Island in the west experience significant flooding. Meadow Island does not appear to be completely inundated while Alder Island

does appear to be so. Further investigation would need to be done in order to determine if the roadways are entirely passable.

The velocities under the bridge are high (16 ft/s or more) which are likely to cause significant scour at the bascule piers. Contraction scour, local abutment scour and pier scour was calculated and the results are summarized below (Table 12).

Table 12: TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
Loop Parkway over Long Creek

100-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation ¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Approximate Bottom of Pile Cap Elevation ² (ft)	Depth of Exposed Piles (ft)
West Abutment	-10	5	7	12	-22	0	-22
West Bascule Pier	-17	5	36	41	-58	Unknown	Unknown
Pier 13	-31	5	13	17	-48	0	-48
East Abutment	-10	5	11	16	-26	0	-26

500-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Footing/Bottom of Pile Cap Elevation ² (ft)	Depth of Exposed Piles (ft)
West Abutment	-4.5	10.2	14.8	25.1	-29.6	0	-29.6
West Bascule Pier	-17	10.2	35.5	45.8	-62.8	Unknown	Unknown
Pier 13	-31	10.2	12.5	22.7	-53.7	0	-53.7
East Abutment	-5	10.2	9.5	19.7	-24.7	0	-24.7

1. All elevations are with reference to NAVD 88 and are taken from the 2009 Fathometric Survey by Boswell Engineering.

2. Estimate of Pile Cap Bottom based on design drawings from 1933. Bascule piers are at an unknown depth

Conclusions: While the flooding still indicates that the bridge should be considered a high vulnerability, the scour calculations do project a considerable amount of erosion, especially at the piers. The previous pier stability analysis conducted by NYSDOT already indicates that the piers would be unstable based on historic flooding conditions. In addition, the depth of the bascules piers are unknown and scour has been observed at several piers. As a result, the bridge should be placed in the **critical category**.

Since this bridge has a critical prioritization, it is recommended that the bridge receive a full risk assessment and corrective action be included as part of the bridge owner's short term fiscal planning (ex: 5 year plan or less).

4.6 Meadowbrook Parkway over Sloop Channel (BIN 1059129)

Background: Along with the Loop Parkway, the Meadowbrook Parkway was built in 1933 in Nassau County and a portion crosses Sloop Channel. It is also single leaf bascule span with forty-one (41) approach piers and two bascule piers (Figures 36 and 37). The overall dimensions of the bridge are approximately 1500ft long and 75ft wide. The abutments are not in the water with the current tide. The bridge was initially classified as having a **high priority** because a pier stability analysis conducted for NYSDOT indicated that the bridge would become unstable due to a calculated scour condition based on historic climate conditions. This calculation is based on historic storm events, and does not include sea level rise projections.

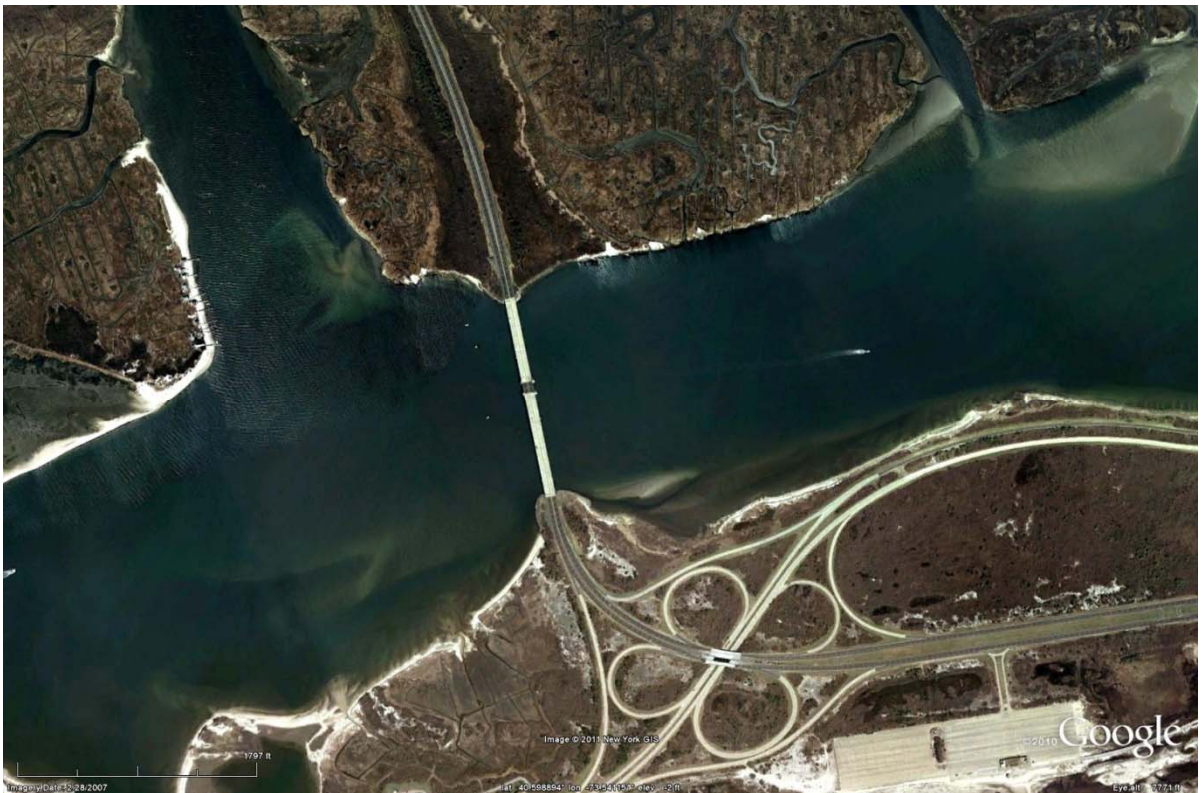


Figure 36: Aerial image of Meadowbrook Parkway over Sloop Channel (Google 2007)



Figure 37: West fascia of Meadowbrook Parkway over Sloop Channel (Boswell 2009)

Meadowbrook Parkway and Wantagh Parkway are the two main roadways that serve as egress roadways for those visitors to the beach, stadium and other recreational activities. Robert Moses Causeway is the third egress roadway, but it is located approximately 13 miles to the west from the most visited areas of Jones Beach. The 2009 fathometric survey conducted by Boswell Engineering indicated a scour holes with maximum depths of 35ft between Piers 37 to 40 as well as immediately upstream and downstream of Piers 33 and 34. In general, the channel depths in the area of the northern piers (Piers 26 through 42) are between 27 – 35ft deep while channel depths through the southern piers (Piers 1 through 25) range between 8ft – 27 ft.

Analysis: The synthetic hydrograph was developed directly from the observed tidal readings at Jones Inlet and sea level rise was surperimposed onto the readings for the projected

climate condition (Figure 38). The hydrograph results from the HEC-RAS model indicate projected flood elevations (NAVD 88) of approximately 17ft for the 100-year storm (Figure 39) and 23ft for the 500-year storm (Figure 40). The extents of the HEC-RAS model were approximately 3200ft upstream and 1100ft downstream of the bridge.

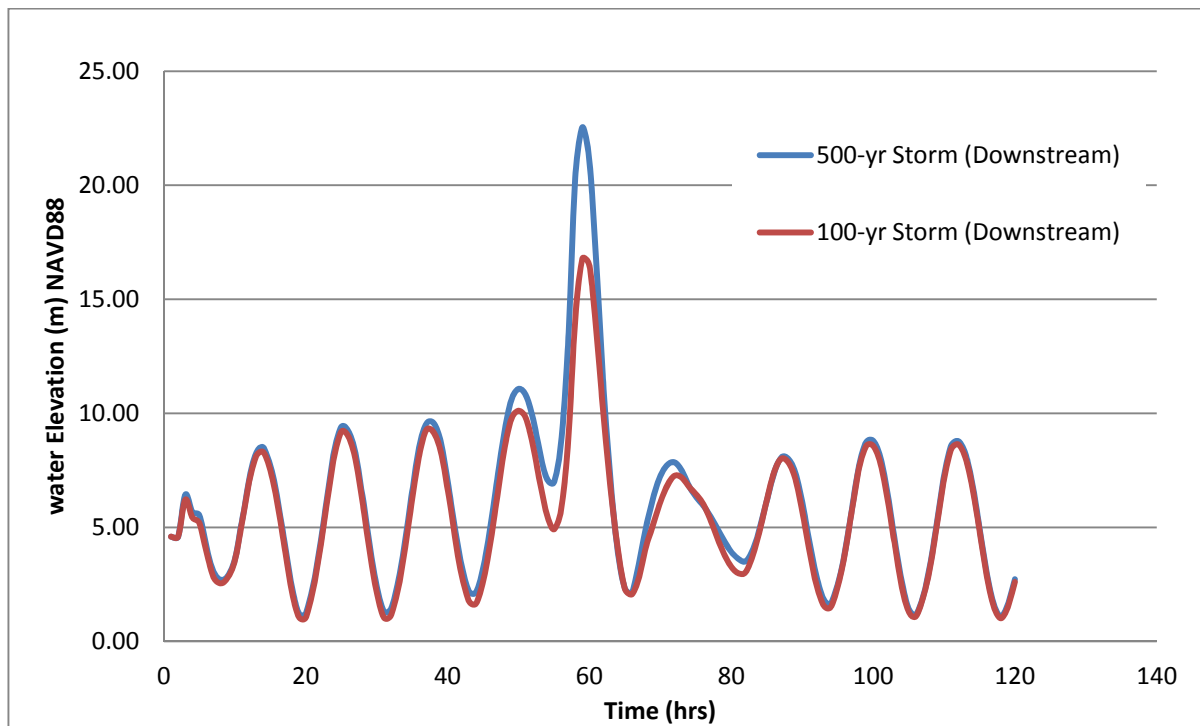


Figure 38: Sloop Channel synthetic hydrographs

Normal tide, with sea level rise projections, does not appear to be flood concern. Jones Island and Jones Beach both have elevations of 10ft or less. During the 100-yr storm and 500-yr storms, both areas experience significant flooding. While the 100-yr storm does not overtop the bridge, the approach roadways are overtopped by flooding.

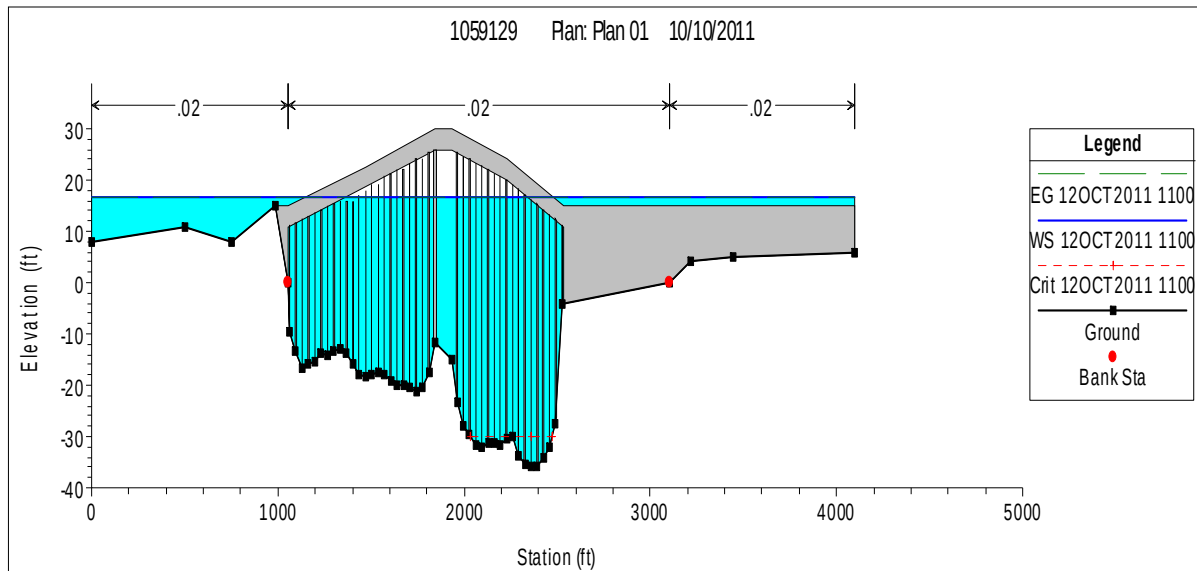


Figure 39: Sloop Channel HEC-RAS results for the 100-year storm

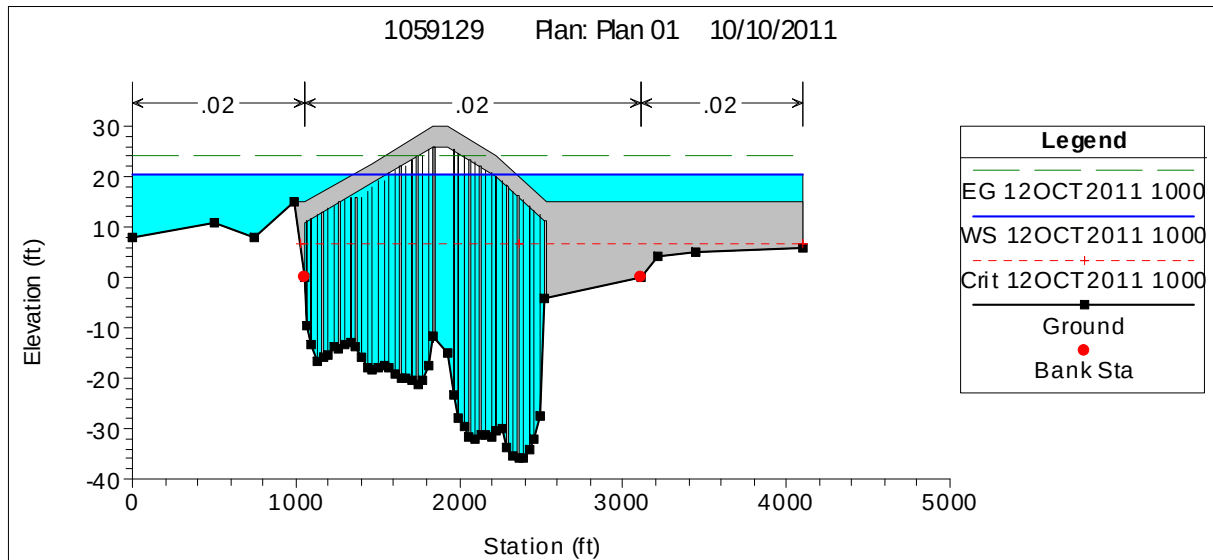


Figure 40: Sloop Channel HEC-RAS results for the 500-year storm

The velocities under the bridge are high (approximately 17 ft/s) during the incoming 100-yr and 500-yr floods and are likely to cause significant scour at the bascule piers and the northern piers. Contraction scour, local abutment scour and pier scour was calculated and the results are summarized below (Table 13).

Conclusions: While the flooding still indicates that the bridge should be considered high vulnerability, the scour calculations do predict extensive erosion due to contraction scour.

The calculated scour conditions for the 100 and 500-year storms both indicate that the bascule piers and highly susceptible piers, like Pier 29, will likely be undermined. The previous pier stability analysis conducted by NYSDOT already indicates that the piers would be unstable based on historic flooding conditions. In addition, scour has been observed at several piers on the north side of the bridge. As a result, the bridge should be placed in the **critical category**.

Since this bridge has a critical prioritization, it is recommended that the bridge receive a full risk assessment and corrective action be included as part of the bridge owner's short term fiscal planning (ex: 5 year plan or less).

**Table 13: TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
Meadowbrook Parkway over Sloop Channel**

100-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation ¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Footing/Bottom of Pile Cap Elevation ² (ft)	Remaining Pile Embedment (ft)
North Abutment	-4.5	0	13	13	-18	-79	61
Bascule Piers	-17	0	36	36	-53	-70	17
Pier 39	-38	0	13	13	-51	-68	17
South Abutment	-5	0	8	8	-13	-71	58

500-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Footing/Bottom of Pile Cap Elevation ² (ft)	Remaining Pile Embedment (ft)
North Abutment	-4.5	0	18	18	-23	-79	56
Bascule Piers	-17	0	36	36	-53	-70	17
Pier 39	-38	0	13	13	-51	-68	17
South Abutment	-5	0	13	13	-18	-71	53

1. All elevations are with reference to NAVD 88 and are taken from the 2009 Fathometric Survey by Boswell Engineering.
2. Estimate of Pile depths are based on NYSDOT records. Bascule piers are at an unknown depth, and assume based on other piers.

4.7 Meadowbrook Parkway over False Channel (BIN 1059159)

Background: Along with the Loop Parkway, the Meadowbrook Parkway was built in 1933 in Nassau County and a portion crosses False Channel. The overall dimensions of the bridge are approximately 190ft long and 75ft wide (Figure 41). The bridge is a fixed span with three (3) approach piers. The abutments are not in the water with the current tide. The bridge was initially classified as having a **low priority** because a pier stability analysis conducted for NYSDOT indicated that the bridge would not become unstable due to a calculated scour condition. This calculation is based on historic storm events, and does not include sea level rise projections.



Figure 41: Aerial image of Meadowbrook Parkway over False Channel (Google 2010)

The 2009 fathometric survey conducted by Boswell Engineering indicated scour holes upstream and downstream of the bridge. Approximately 50ft upstream (east) of the bridge, a

scour hole with a maximum depth of 37ft exists along the main channel. Approximately 75ft downstream (west) of the bridge, a scour hole with a maximum depth of 35ft exists along the main channel. In general, the streambed appears to be stable in the area of the bridge with main channel depths of approximately 22ft. Soil boring logs indicate that the first 0 – 30ft is composed of silty sand and 30 - 70ft below grade is composed of a gravelly sand. The north and south shorelines have significant quantities of riprap placed.

Analysis: The tidal data was obtained from the Merrick tide gage maintained by Stony Brook University (www.lishore.org). The hydrographs were developed using ADCIRC data and the alternate synthetic hydrograph method (Figure 42). The bridge and waterway were modeled in HEC-RAS. The extents of the HEC-RAS model were approximately 400ft upstream and downstream of the bridge.

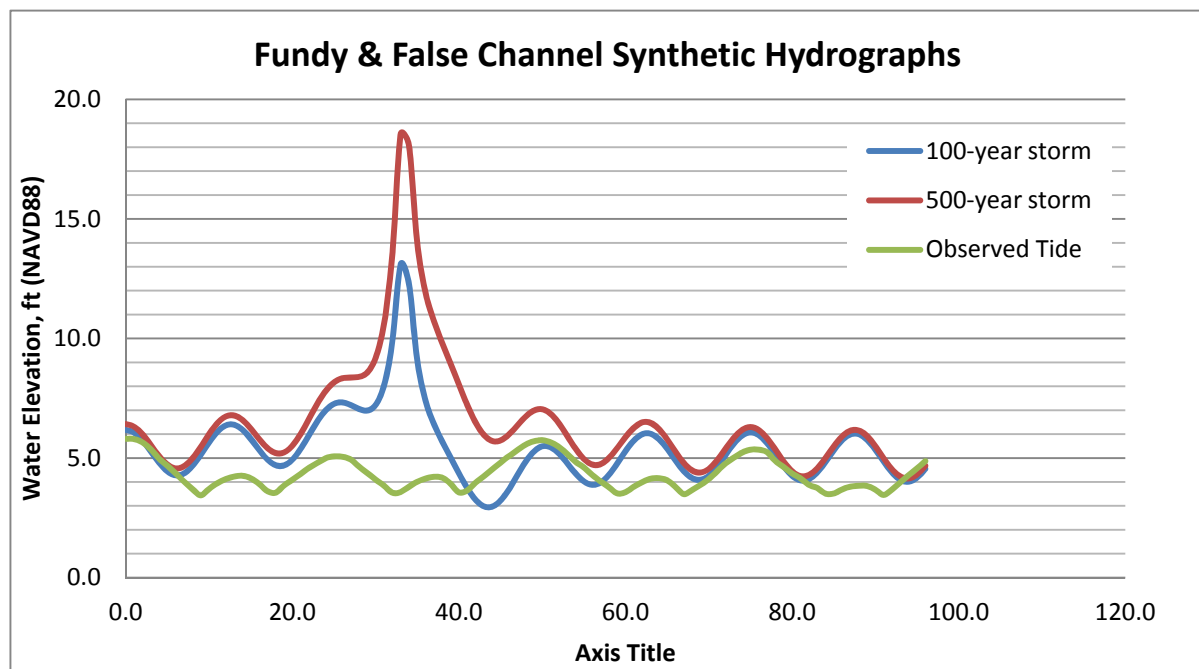


Figure 42: False and Fundy channel synthetic hydrographs

The HEC-RAS model indicates flood projected elevations (NAVD 88) of approximately 13ft for the 100-year storm and 18ft for the 500-year storm at the bridge (Figures 43 and 44).

Overtopping of the structure does not occur for the 100-year storm. However, approach roadways may become flooded. Significant overtopping of the bridge deck and approach roadways are projected to occur for the 500-year storm.

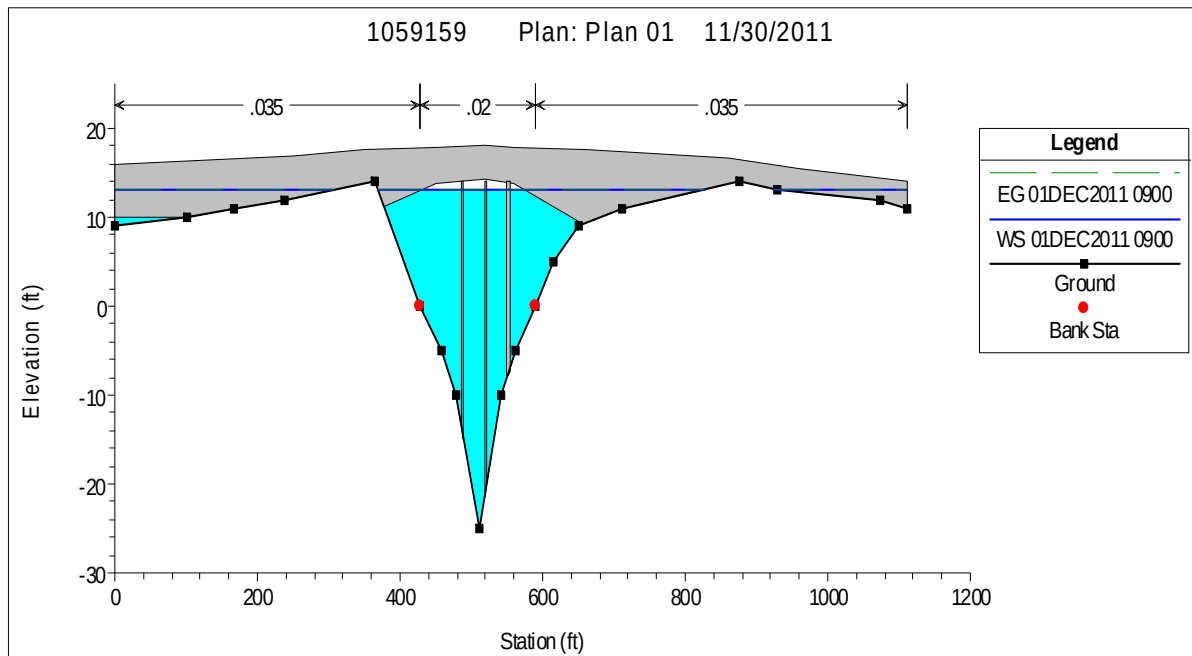


Figure 43: False Channel HEC-RAS results for the 100-year storm

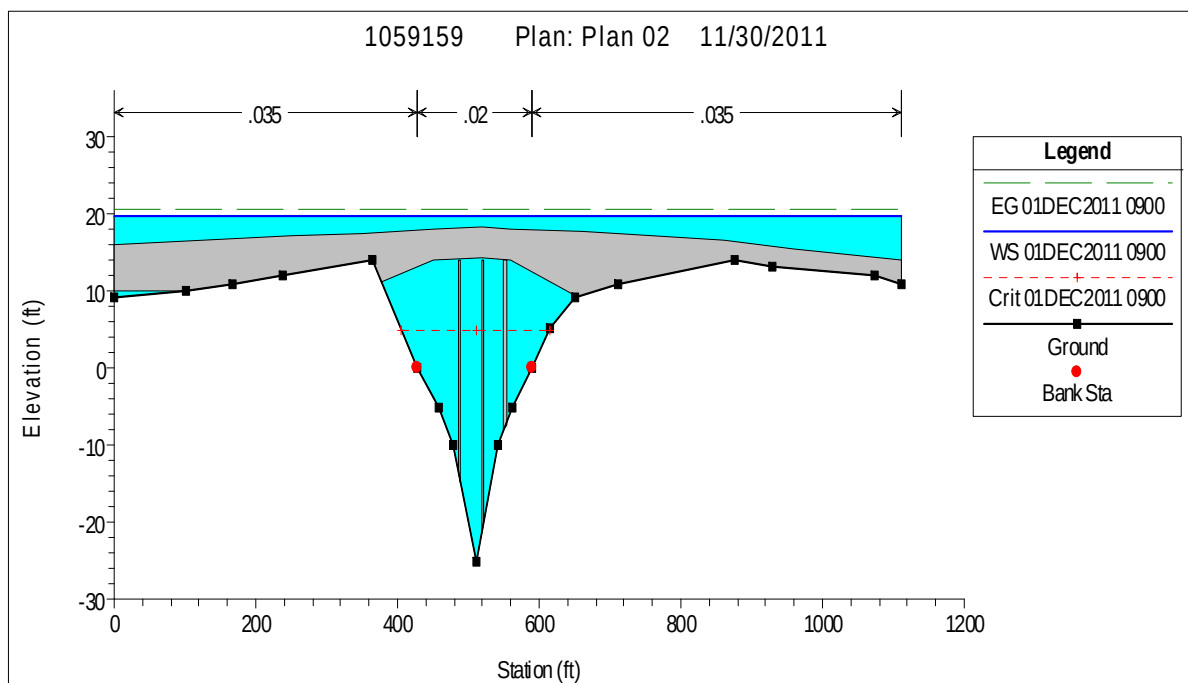


Figure 44: False Channel HEC-RAS results for the 500-year storm

For the 500 year storm, the bridge is overtopped. Maximum velocity for the 100-year storm is approximately 3ft/s while the 500-year storm is approximately 8ft/s. Scour calculations also indicate low scour potential, and no evidence of undermining of the piers and abutments (Table 14).

Table 14: TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
Meadowbrook Parkway over False Channel
100-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation² (ft)	Remaining Pile Embedment (ft)
North Abutment	0	0	3	3	-3	-45	42
Center Pier (Pier 2)	-25	0	2	2	-27	-65	38
South Abutment	0	0	3	3	-3	-45	42

500-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation² (ft)	Remaining Pile Embedment (ft)
North Abutment	0	4.2	7	11	-11	-45	34
Center Pier (Pier 2)	-25	4.2	9	13	-38	-65	27
South Abutment	0	4.2	6	11	-11	-45	34

1. All elevations are with reference to NAVD 88 and are taken from the 2009 Fathometric Survey by Boswell Engineering.

2. Estimate of pile tip elevation was taken from the Ayers Study (2001).

Conclusions: While the flooding potential is significant for the 500-year storm, velocities for both design storms are very low and scour appears to be minimal. For these reasons, it is recommended that the bridge maintain a **low priority**.

4.8 Meadowbrook Parkway over Fundy Channel (BIN 1059149)

Background: Along with the Loop Parkway, the Meadowbrook Parkway was built in 1933 in Nassau County and a portion crosses Fundy Channel. The overall dimensions of the bridge are approximately 512ft long and 79ft wide. The bridge is a fixed span with fifteen (15) approach piers (Figures 45). The abutments are not in the water with the current tide. The bridge was initially classified as having a **low priority** because a pier stability analysis conducted for NYSDOT indicated that the bridge would not become unstable due to a calculated scour condition. This calculation is based on historic storm events, and does not include sea level rise projections.



Figure 45: Aerial image of Meadowbrook Parkway over Fundy Channel (Google 2010)

The 2009 fathometric survey conducted by Boswell Engineering indicated scour holes upstream and downstream of the bridge. Approximately 50ft upstream (east) of the bridge, a

scour hole with a maximum depth of 37ft exists along the main channel. Approximately 75ft downstream (west) of the bridge, a scour hole with a maximum depth of 35ft exists along the main channel. In general, the streambed appears to be stable in the area of the bridge with main channel depths of approximately 22ft. Soil boring logs indicate that the first 0 – 30ft is composed of silty sand and 30 - 70ft below grade is composed of a gravelly sand. The north and south shorelines have significant quantities of riprap placed.

Analysis: The tidal data was obtained from the Merrick tide gage maintained by Stony Brook University (www.lishore.org). The hydrographs were developed using ADCIRC data and the alternate synthetic hydrograph method (Figure 42). The bridge and waterway were modeled in HEC-RAS. The extents of the HEC-RAS model were approximately 800ft upstream and downstream of the bridge.

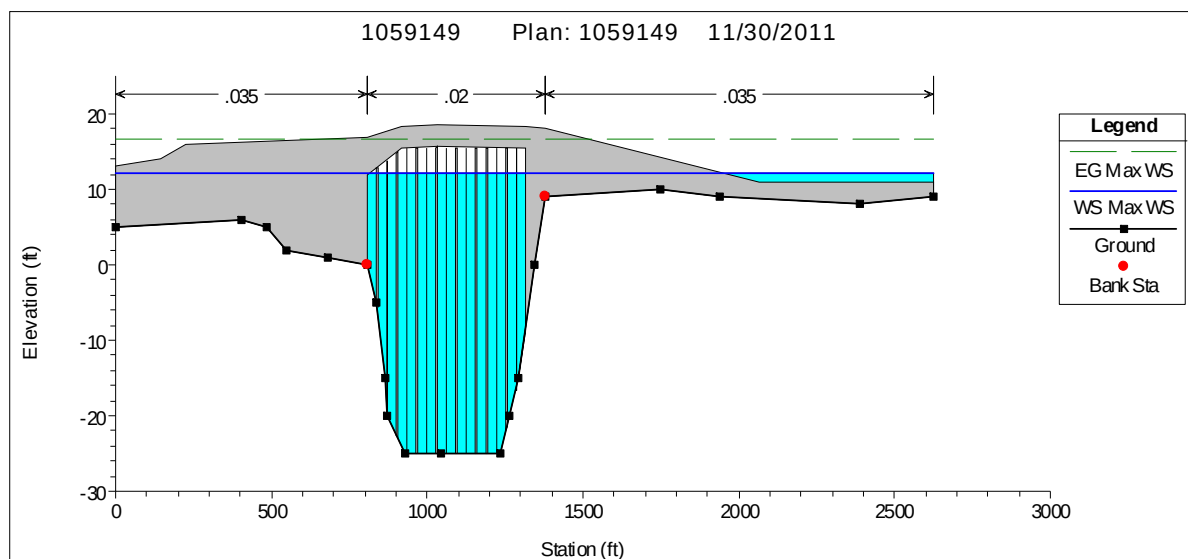


Figure 46: Fundy Channel HEC-RAS results for the 100-year storm

The HEC-RAS model indicates projected flood elevations (NAVD 88) of approximately 13ft for the 100-year storm (Figure 46) and 18ft for the 500-year storm (Figure 47). Overtopping

of the structure does not occur for the 100-year storm. However, approach roadways on the north side do show some flooding.

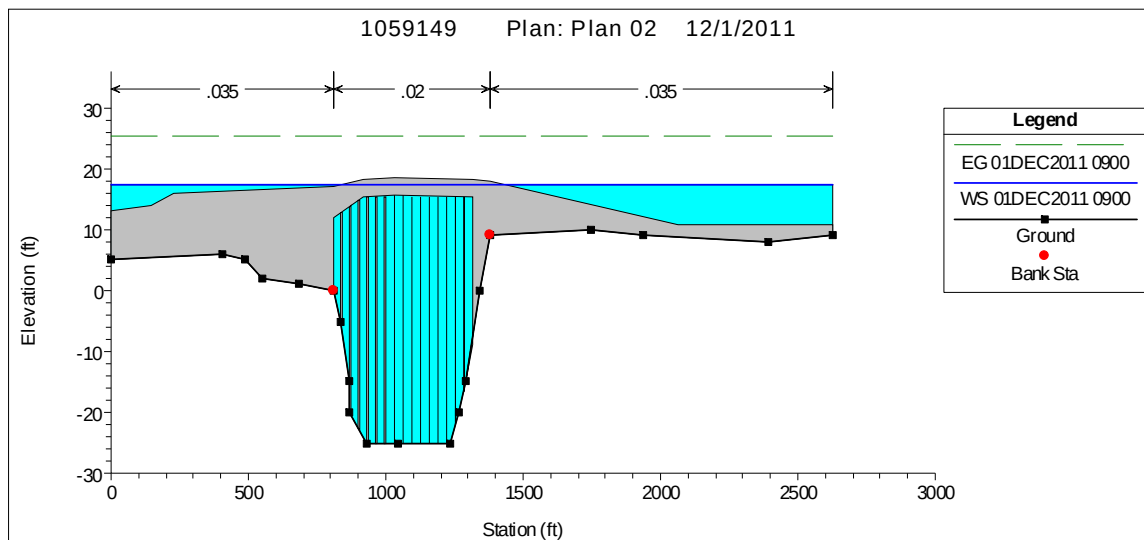


Figure 47: Fundy Channel HEC-RAS results for the 500-year storm

For the 500 year storm, the bridge is overtopped. Maximum velocities for both storms are high, approximately 3ft/s. However, scour calculations indicate low scour potential, and no evidence of undermining of the piers and abutments was found (Table 15).

Conclusions: While the flooding potential is significant for the 500-year storm, scour appears to be minimal. For these reasons, it is recommended that the bridge maintain a **low priority**.

Table 15: TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
Meadowbrook Parkway over Fundy Channel

100-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation ¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation ² (ft)	Remaining Pile Embedment (ft)
North Abutment	0	0	5	5	-5	-45	40
Center Pier (Pier 9)	-25	0	5	5	-30	-65	35
South Abutment	0	0	10	10	-10	-45	35

500-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation² (ft)	Remaining Pile Embedment (ft)
North Abutment	0	0	11	11	-11	-45	34
Center Pier (Pier 9)	-25	0	5	5	-30	-65	35
South Abutment	0	0	15	15	-15	-45	30

1. All elevations are with reference to NAVD 88 and are taken from the 2009 Fathometric Survey by Boswell Engineering.

2. Estimate of pile tip elevation was taken from the Ayers Study (2001).

4.9 Bayonne Bridge over Kill Van Kull (BIN 5523040)

Background: The Port Authority began construction of the Bayonne Bridge in September of 1928 and opened to traffic in November of 1931, linking Bayonne, NJ with Port Richmond, Staten Island, NY. At the time of completion, the Bayonne Bridge was the longest steel arch bridge in the world, and today remains the fourth longest. Viaducts support each side of the arch, spanning this major shipping channel. The approach roads, to the Bayonne Bridge's span, are carried by a series of reinforced concrete piers, ranging from 20 to 110 feet tall. The approximate dimensions of the bridge are 5,780 feet in length and 85 feet wide. (Figures 48 and 49). The south abutment is not in the water with the current tide, but the north abutment is within the channel.

On December 29, 2010, the Port Authority announced their "Raise the Roadway" alternative to provide the most effective solution to the Bayonne Bridge clearance issue. It was proposed to raise the bridge's roadway to approximately 215 feet, allowing 64 feet of additional air draft. Major benefits of raising the roadway include: increased deployment of larger, operationally efficient and environmentally beneficial vessels, via the Suez and an expanded Panama Canal, to reach the port's main terminals. The \$1 billion bridge proposal includes planning, construction, and contingency. It does not include additional engineering to refine ramp, roadway, future transit improvements, and evaluate construction-staging options. The results of the Bayonne Bridge "Raise the Roadway" project includes roadway modernization of lane width increases to 12 feet, addition of shoulders and a median divider, while retaining the "character and historic design of the 80-year-old facility" (PANYNJ, 2011).

The bridge was initially classified as having a low priority because none of the high or medium prioritization criteria were met. The piers are founded on bedrock which has a very low scour potential. It is assumed that the foundations were designed for bearing capacity, not skin friction, thus not relying on the soil above bedrock to provide capacity. In addition, the high deck elevation makes flooding of the deck highly unlikely.



Figure 48: Aerial image of Bayonne Bridge over Kill Van Kull (Google, 2010)



Figure 49: Bayonne Bridge looking East over the Kill Van Kull (PANYNJ, 2011)

Analysis: The bridge and waterway were modeled in HEC-RAS. The extents of the HECRAS model were approximately 2000ft upstream and 4500ft downstream of the bridge. The maximum water elevation at the bridge was projected to be 13ft for the 100-year storm and 17ft for the 500-year storm (Figures 50 and 51).

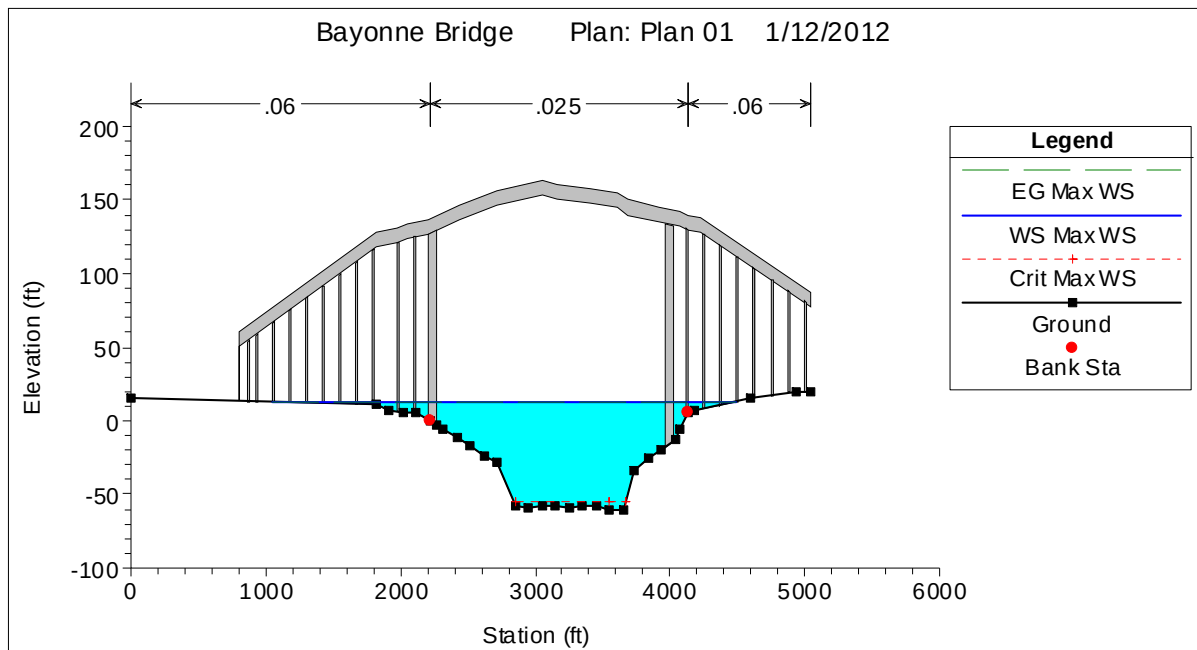


Figure 50: Bayonne Bridge HEC-RAS results for the 100-year storm

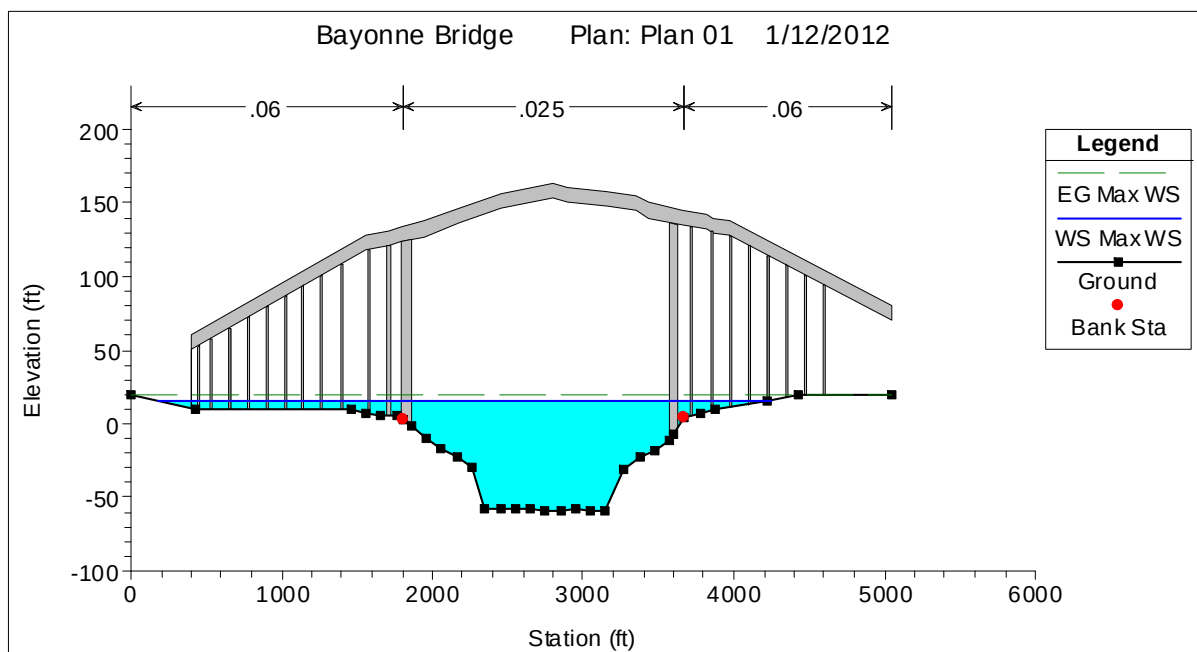


Figure 51: Bayonne Bridge HEC-RAS results for the 500-year storm

The HEC-RAS model indicates flood elevations (NAVD 88) of approximately 13ft for the 100-year storm and 17ft for the 500-year storm (Figure X). Overtopping of the structure does not occur for either the 100- or 500-yr storms. Flow velocities for both storms range between 3-5 ft/s due to the large, dredged cross sectional area resulting in low scour potential for both the 100- and 500-yr storm events (Table 16).

Table 16: TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
Bayonne Bridge over Kill Van Kull

100-YEAR STORM SCOUR SUMMARY							
Substructure Unit	Groundline Elevation¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation² (ft)	Remaining Pile Embedment (ft)
South Abutment	6	0	2	2	4	-45	49
North Abutment	0	0	4	4	-4	-45	41
500-YEAR STORM SCOUR SUMMARY							
Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation² (ft)	Remaining Pile Embedment (ft)
South Abutment	6	0	6	6	0	-45	45
North Abutment	0	0	14	14	-14	-45	31

1. All elevations are with reference to NAVD 88.
2. Estimate of pile tip elevation taken from Port Authority documents.

Conclusions: Scour and flooding potential are minimal for the projected conditions. For these reasons, it is recommended that the bridge maintain a **low priority** since the projected climate condition would not meet any of the high or medium prioritization criteria.

5 CONCLUSIONS

5.1 Summary of Results and Assessment of Hypothesis

A comparison of the prioritizations for the historic versus the projected climate condition is shown in Table 17.

Table 17: Summary of Prioritization for Historic vs. Projected Climate Condition

Bridge Name	Prioritization for Historic Condition	Prioritization for Projected Condition
Loop Pkway over Long Creek	High	Critical
Meadowbrook Pkway over Sloop Channel	High	Critical
Mill Dam Road over Centerport Harbor	High	High
Southland Drive over Dosoris Pond	Medium	High
West Shore Road over Mill Neck Creek	Medium	High
Sunken Meadow Parkway	Medium	Low
Meadowbrook Pkway over False Channel	Low	Low
Meadowbrook Pkway over Fundy Channel	Low	Low
Bayonne Bridge over Kill Van Kull	Low	Low

An assessment of the hypothesis shows that increase in sea level of 55 inches would, indeed, have a negative impact on the hydraulic vulnerability of coastal bridges. As can be seen from Table 17, four of the nine case studies increased in prioritization due to the projected climate condition. It is interesting to note that none of the low priority bridges increased in priority.

An interesting anomaly was Sunken Meadow Parkway. After a preliminary analysis, the priority was downgraded to low due to the fact the bridge connects a park to the mainland, not a community. If this bridge is closed, it will likely have minimal impact on the County. This bridge crossing is unique, and a situation like this would be difficult to identify using

the criteria alone. This is why the results of the prioritization criteria will need to be reviewed by engineers and decision makers to adjust certain selections. Even the NYSDOT HVAM included verbiage to this effect regarding its rating criteria, “flexibility exists which allows the evaluating engineer to use judgment to account for factors which. . .are not covered in the detailed procedures” (NYSDOT, 2003).

5.2 Prioritization Criteria Revisions

After reviewing the case studies, the criteria were adjusted to better identify high vulnerability bridges. NBIS Item 39, navigational vertical clearance, was adjusted to not include bridges listed with a vertical clearance of zero meters. This zero data entry appears to indicate that the waterway is not navigable and not necessarily a direct indicator of vertical clearance below the bridge.

In addition, bridges with multiple piers in the waterway as well as abutments projecting (thus constricting flow) appeared to be important factors when determining hydraulic vulnerability. NBIS items 48 and 49, length of maximum span and overall structure length, respectively, were considered. A new criterion was considered in which bridges with a maximum span to overall structure length ratio of 0.25 (25%). NBIS Item 39 was adjusted to remove the value of zero and the new criterion with Items 48 and 49 was added to the GIS query. The revised prioritization criteria were able to identify all of the original high priority bridges as well as West Shore Road over Mill Neck Creek (BIN 3300010). However, this criterion alone would result in over 70 bridges in the high priority category or approximately 23% of the entire coastal bridge inventory. This result would not enable bridge owners to make decisions about their inventory efficiently, and further refinement was needed.

NBIS Item 46, number of approach spans, was used to further refine the prioritization criteria. Bridges with more with 10 or more piers in the waterway was finally selected because this refinement was also able to identify all the original high priority bridges and West Shore Road. The revised prioritization criteria are shown in Table 18.

The revised prioritization criteria resulted in a total of 31 high priority bridges or approximately 10% of the total bridge inventory (Figure 52). Clusters of high priority bridges were found along the South Shore of Long Island, Harlem River, East River, Newtown Creek and Flushing Bay.

Interestingly, at the time of this writing many of these high priority bridges are in the process of or will be reconstructed in the near future. It is expected that their susceptibility to scour and flooding would improve, especially if climate change projections are incorporated. This is especially true of the bridges along the South Shore of Long Island.

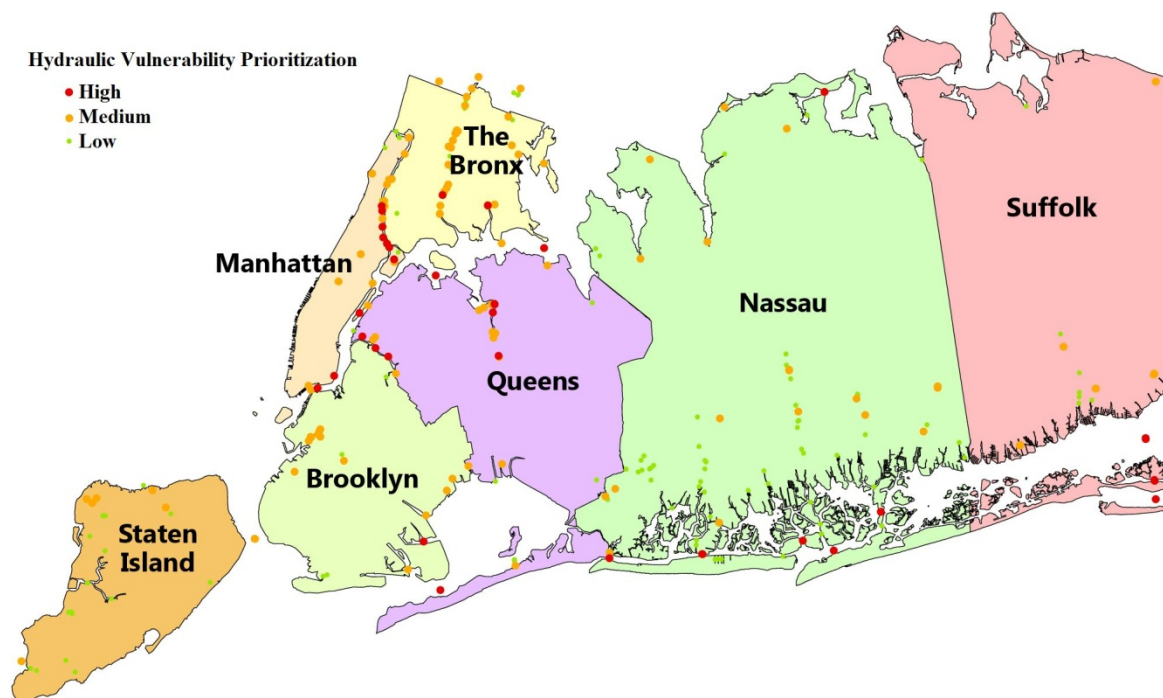


Figure 52: Revised prioritization of NYS coastal bridges

Table 18: Finalized Vulnerability Prioritization Criteria for NYS Coastal Bridges

NBIS Item No.	Description	Criteria
Critical		
Bridges analyzed for the projected climate condition meet the High Vulnerability Criteria and analysis results in undermining of the structure.		
High Vulnerability		
113	Scour Critical, or	≤ 3
61	Channel and Channel Protection, or	≤ 3
71	Waterway Adequacy, or	≤ 3
39	Navigation Control, or	$0 < x \leq 3\text{m}$
48 and 49	Maximum Span/Overall Length, and	≤ 0.25
46	Number of Piers	≥ 10
Medium Vulnerability		
67	Structural Evaluation	≤ 3
19	Detour Length	$\geq 30 \text{ km}$
29	Average Daily Traffic (ADT)	$\geq 100,000$
27	Year Built	≤ 1910
37	Historic Significance	≤ 2
Low Vulnerability		
None of the above criteria are met.		

5.3 Recommended Revisions to Standards

Revisions to national and regional standards are recommended based on the findings of this research for the design, inspection and prioritization practices with regards to climate change

projections. For hydraulic studies, it is recommended that AASHTO revise Article 1.3.2 to include the following revision, “Flood data applicable to estimating floods at site, including both historic and projected climate flood conditions.”

FHWA HEC 18 should consider revising guidance in HEC-18 to, “Bridge foundations should to be designed for . . . the worst conditions resulting from historic and projected climate flood conditions equal to or less than the 100-year flood.”

Prioritization should be revised at both the national and state level. It is recommended that FHWA issue Technical Advisory, similar to Technical Advisory T5140.23, for bridges to be prioritized for climate change impacts and bridge scour evaluations be performed to determine whether a bridge is scour critical. At the state level, the NYSDOT should incorporate the prioritization criteria developed in this research in the Hydraulic Vulnerability Assessment Manual to be used as part of their assessment process.

5.4 Evaluation of Research Objectives for New Work

Objectives were identified at the beginning of this research to determine what new work would be contributed to the scientific and engineering communities. Were these objectives accomplished? Yes, the three research objectives were successfully accomplished and are briefly discussed here.

The first objective was to develop criteria to prioritize the hydraulic vulnerability of United States coastal bridges. After various revisions to the criteria, the finalized Vulnerability Prioritization Criteria was presented in Figure 18. While New York was as a case study, it is believed that the criteria can be used, and modified as needed, for any coastal bridge inventory as part of the risk assessment process by bridge owners.

The second objective was to determine if sea level rise projections will negatively impact the hydraulic vulnerability of coastal bridges. The hypothesis stated that sea level rise will have a negative impact on the hydraulic vulnerability of coastal bridges and was tested by comparing the prioritization of each case study bridge for the historic and projected climate conditions for sea level. A negative impact was defined as an increase in priority from the historic to the projected climate change condition due to a 55 inch rise in sea level. It was determined that four (4) of the nine (9) case studies resulted in an increase in priority. The hypothesis is true.

Based on the findings of the previous objectives, the final goal was to revise regional and national standards for the design, inspection and prioritization practices with regards to climate change projections. These recommendations were outlined in the previous section (Section 5.3).

5.5 Future Work

When any software or set of criteria is used, there will always be a need for judgment by engineers and decision makers since they know their bridge inventory best. There will always be cases of unique bridge structures and site hydraulics that will not be identified by set criteria.

In order to improve the criteria, the following future work should be considered:

- Further testing and refinement of the criteria using additional case study bridges would be beneficial and improve the robustness of the criteria, particularly for high and medium priority bridges.

- Testing the criteria in other coastal regions to determine if the criteria are specific to a region or could act as general criteria for any location in the United States.
- Consider various time scales such as near term (ex: 2020) for sea level rise impacts.
- Meet with NYSDOT and other bridge owners to present results and determine if there are additional concerns to be considered or applications for this research.

Also, ideas stemming from this research could also be explored as future work. For example, a more comprehensive risk assessment on the case study bridges could be performed for multiple failure modes. This would enable the author to experience the entire assessment process that bridge owners perform on their inventory. In addition, an appropriate case study bridge could be analyzed to assess the cumulative effect of multiple factors acting on a bridge at the same time such as wind forces, fluid forces, and undermining of the foundation due to scour. This is not a typical practice of engineers, but is more representative of what a bridge experiences during an extreme event.

One observation that was seen was that while a bridge may be able to pass the 100-year or 500-year storm, some of the approach roadways flooded. The impact of flooding on roads, especially evacuation routes, could be explored. This would be of value to emergency management planners.

An application of this research could be used for estimating the financial losses to commuters and/or commerce should a bridge be taken out of service.

Scientists are currently developing models to determine projections for projected precipitation changes due to climate change at the regional scale. When the data becomes available, the research could be expanded to riverine regions to test the prioritization criteria.

A.1 IPCC AR4 global climate models

FIGURE 7.

IPCC AR4 Global Climate Models

GCMs used for NPCC climate risk information, host center, grid box resolution, and equilibrium climate sensitivity of atmospheric component to a doubling of carbon dioxide.

Institution	GCM name	Resolution	Equilibrium climate sensitivity °F (°C) for doubling of CO₂
Bjerknes Centre for Climate Research, Norway	bccr_bcm2_0	2.8x2.8	Not Available
Canadian Centre for Climate Modeling and Analysis, Canada	cccma_cgcm3_1_t63	3.75x3.75	3.4
CERFACS, National Weather Research Center, METEO-FRANCE, France	cnrm_cm3	2.8x2.8	Not Available
CSIRO Atmospheric Research, Australia	csiro_mk3_0	1.88x1.88	3.1
Geophysical Fluid Dynamics Laboratory, USA	gfdl_cm2_0	2x2.5	2.9
Geophysical Fluid Dynamics Laboratory, USA	gfdl_cm2_1	2x2.5	3.4
NASA Goddard Institute for Space Studies, USA	giss_model_e_r	4x5	2.7
Institute for Numerical Mathematics, Russia	inmcm3_0	4x5	2.1
Pierre Simon Laplace Institute, France	ipsl_cm4	2.5x3.75	4.4
Center for Climate Systems Research; National Institute for Environmental Studies; Frontier Research Center for Global Change, Japan	miroc3_2_medres	2.8x2.8	4.0
Meteorological Institute of the University of Bonn, Germany	miub_echo_g	3.75x3.75	3.2
Meteorological Research Institute, Japan	mri_cgcm2_3_2a	2.8x2.8	3.4
Max Planck Institute for Meteorology, Germany	mpi_echam5	1.878x1.88	
National Center for Atmospheric Research, USA	ncar_pcm1	2.8x2.8	2.1
National Center for Atmospheric Research, USA	ncar_ccsm3_0	1.4x1.4	2.7
Hadley Centre for Climate Prediction, Met Office, UK	ukmo_hadcm3	2.5x3.75	3.3

A.2 Select listing of NBIS items

A.3 HEC-18 scour computation equations

HEC- 18 Scour Computation Equations:

Contraction scour, using the Laursen equation, to project scour in the contracted section of the streambed is as follows (HEC 18, Equation 5.2):

$$\frac{y_2}{y_1} = \left(\frac{Q_2}{Q_1} \right)^{6/7} \left(\frac{W_1}{W_2} \right)^{k_1}$$

$$y_s = y_2 - y_o = \text{average contraction scour depth}$$

Where:

y_1 = Average depth in the upstream main channel

y_2 = Average depth in the contracted section

y_o = Existing depth in the contracted section before scour

Q_1 = Flow in upstream channel transporting sediment

Q_2 = Flow in contracted channel

W_1 = Bottom width of the upstream main channel

W_2 = Bottom width of the main channel in contracted section less pier widths

The Colorado State University equation was used for pier scour projection and is shown below (HEC-18, Equation 6.3).

$$\frac{y_s}{a} = 2.0 K_1 K_2 K_3 K_4 \left(\frac{y_2}{a} \right)^{0.35} Fr_1^{0.43}$$

Where:

y_s = Scour depth

y_2 = Flow depth directly upstream of pier

K_1 = Correction factor for pier nose shape

K_2 = Correction factor for angle of attack

K_3 = Correction factor for bed condition

K_4 = Correction factor for armoring for bed material size

a = Pier width

L = Pier length

Fr_1 = Froude number

V_1 = Mean velocity of flow at upstream fascia of bridge

For abutment scour, the Froehlich equation (HEC-18, Equation 7.1) was used:

$$\frac{y_s}{y_a} = 2.27 K_1 K_2 \left(\frac{L'}{y_a} \right)^{0.43} Fr_1^{0.61} + 1$$

Where:

y_s = Scour depth

y_a = Average depth of flow on floodplain

K_1 = Coefficient factor for abutment shape

K_2 = Coefficient factor for angle of embankment to flow

L' = Length of active flow obstructed by embankment

Fr_1 = Froude number of approach flow upstream of abutment

B.1 Loop Parkway over Long Creek

OBJECTID	7	Historical	5	SpecInspe	N
Shape	Point	NavControl	1	FractCritD	308
StateCode	362	NavVertCle	57	UndWaterDa	907
BIN	1056769	NavHorizCl	228	SpecInspec	
Record	1	OpenPostCl	A	BridgImprC	1696
Type	3	ServiceOnB	1	RoadImprCo	866
LOS	1	ServiceUnd	5	TotalCost	2562
RteNo	0	StructMate	3	YearEst	2008
HighwayDis	1	TypeDesign	16	BordBridge	0
CountyCode	59	ApprMater	6	BPercenRes	0
PlaceCode	34000	ApprDesign	2	BordBIN	0
FeaturesIn	LONG CREEK	NoSpansMai	1	STRAHNET	0
CritFacili		NoSpansApp	18	ParallelSt	N
Route	RTE 908C	RouteHoriz	76	DirectTraf	2
Location	NEAR EAST	MainSpanLe	246	TempStruct	
BAY IN NASSAU		StructLeng	2072	HighwaySys	1
MinVertCle	9999	SdeWlkLeft	0	FedLandsHi	0
KiloPoint	163056	SdeWlkRtWi	0	YearRecon	1992
BaseHwyNet	0	BrdgCb2Cb	153	DeckType	N
LRSRoute	0	BrdgOut2Ou	176	DeckWearTy	1
SubrouteNo		MinVertOve	9999	TypeMembr	0
LatDD	40	RefFeature	N	DeckProtec	N
LatMM	36	MinVertUn	0	ADTTruck	4
LatSS	15780	RefFeat	N	NatNetwk	0
LonDD	73	MinLatUn	999	PierAbutPr	2
LongMM	34	MinLatUnLf	0	NBISBrdgeL	Y
LongSS	977	Deck	7	ScourCrit	3
Latitude	40.604383	SupStruct	6	FutADT	33521
Longitude	-73.569381	SubStruct	6	YearFutADT	2022
DetourLeng	25	ChannelPro	6	MinNavVert	
Toll	3	Culverts	N	FedAgeninc	NN
MainRespon	1	MethOpRate	1	WashHead	
Owner	1	OperRating	581	NoName	590
FunctClass	12	MethOpRa_1	0	Status	0
YearBuilt	1934	InventRat	327	NoName_1	0
LanesOn	4	TructEval	6		
LanesUnder	0	DeckGeo	2		
ADT	24175	UnclearVer	N		
YearADT	2002	BridgePost	5		
DesignLoad	5	WaterwayAd	5		
ApprWidth	152	ApprAlign	8		
Median	2	TypeWorkPr	34		
Skew	0	WorkBy	1		
StructFlar	1	LenImprov	2072		
BridgeRail	1	InspDate	308		
Transition	0	InspFreq	24		
ApprGuardR	0	FractCrit	Y24		
ApprGuar_1	1	UndWaterIn	Y60		

1056769.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X      X
XXXXXXXX XXXX      X      XXX XXXX      XXXXXX      XXXX
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X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      X

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PROJECT DATA

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Project in English units

PLAN DATA

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Long Creek - NYSDOT\1056769.p02

Geometry Title: 1056769
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1056769
Loop Parkway over Long Creek - NYSDOT\1056769.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of:	Cross Sections =	6	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

GEOMETRY DATA

1056769.rep

Geometry Title: 1056769

Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1056769 Loop Parkway
over Long Creek - NYSDOT\1056769.g01

CROSS SECTION

RIVER: Long Creek
REACH: Long Creek RS: 5.0

INPUT

Description: Upstream 2 Bridge Lengths

Station	Elevation	Data	num=	6	Sta	Elev	Sta	Elev	Sta	Elev
0	5	1108	0	1376	-23	1644	-28	1912	-28	
2180	3									

Manning's n	Values	num=	3	Sta	n Val	Sta	n Val
0	.02	1108	.02	1912	.02		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1108	1912		360	450		.1	.3

CROSS SECTION OUTPUT Profile #09OCT2011 1000

E.G. Elev (ft)	18.08	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.28	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	16.80	Reach Len. (ft)	360.00	450.00
770.00				
Crit w.s. (ft)		Flow Area (sq ft)	15844.40	30927.20
7852.40				
E.G. slope (ft/ft)	0.000140	Area (sq ft)	15844.40	30927.20
7852.40				
Q Total (cfs)	-454608.00	Flow (cfs)	-81553.91	
-309818.50 -63235.59				
Top width (ft)	2180.00	Top width (ft)	1108.00	804.00
268.00				
Vel Total (ft/s)	-8.32	Avg. vel. (ft/s)	-5.15	-10.02
-8.05				
Max Chl Dpth (ft)	44.80	Hydr. Depth (ft)	14.30	38.47
29.30				
Conv. Total (cfs)	38387270.0	Conv. (cfs)	6886443.0	
26161190.0 5339637.0				
Length wtd. (ft)	465.76	wetted Per. (ft)	1119.81	805.03
283.59				
Min Ch El (ft)	-28.00	Shear (lb/sq ft)	0.12	0.34
0.24				
Alpha	1.19	Stream Power (lb/ft s)	2180.00	0.00
0.00				
Frctn Loss (ft)	0.09	Cum volume (acre-ft)	638.17	1928.36
821.39				
C & E Loss (ft)		Cum SA (acres)	77.67	54.92
74.25				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Long Creek

REACH: Long Creek

RS: 4

INPUT

Description: One Bridge Length Upstream

Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	363	9	691	6	1100	1	1440	-23
1563	-28	1686	-28	2026	0	2056	7	2390	12
2896	10								

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1100	.02	2026	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1100	2026		440	430		.1	.3

CROSS SECTION OUTPUT Profile #09OCT2011 1000

E.G. Elev (ft)	18.48	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.93	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	16.55	Reach Len. (ft)	440.00	430.00
420.00				
Crit W.S. (ft)		Flow Area (sq ft)	11407.33	30403.98
5552.79				
E.G. Slope (ft/ft)	0.000255	Area (sq ft)	11407.33	30403.98
5552.79				
Q Total (cfs)	-455554.00	Flow (cfs)	-63948.25	
-369079.60 -22526.15				
Top Width (ft)	2896.00	Top Width (ft)	1100.00	926.00
870.00				
Vel Total (ft/s)	-9.62	Avg. Vel. (ft/s)	-5.61	-12.14
-4.06				
Max Chl Dpth (ft)	44.55	Hydr. Depth (ft)	10.37	32.83
6.38				
Conv. Total (cfs)	28545630.0	Conv. (cfs)	4007083.0	
23127020.0 1411519.0				
Length wtd. (ft)	430.39	Wetted Per. (ft)	1109.60	928.10
877.40				
Min Ch El (ft)	-28.00	Shear (lb/sq ft)	0.16	0.52
0.10				
Alpha	1.35	Stream Power (lb/ft s)	2896.00	0.00
0.00				
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	525.56	1611.57
702.91				
C & E Loss (ft)		Cum SA (acres)	68.55	45.99
64.19				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may

indicate the need for additional cross sections.

CROSS SECTION

RIVER: Long Creek

REACH: Long Creek

RS: 3.2

INPUT

Description: North Bridge Fascia
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	19	606	15	1007	20	1305	0	1320	0
1352	-5	1384	-23	1416	-26	1448	-28	1480	-30
1512	-30	1544	-28	1576	-25	1613	-13	1697	-24
1744	-17	1781	-25	1813	-30	1845	-29	1877	-28
1909	-25	1941	-20	1973	-17	2005	-10	2037	0
2129	14	2584	12	3131	9				

Manning's n Values

num=

3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1305	.02	2037	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1305	2037		60	60		.1	.3

CROSS SECTION OUTPUT Profile #09OCT2011 1000

E.G. Elev (ft)	19.08	Element	Left OB	Channel
Right OB				
Vel Head (ft)	3.90	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	15.18	Reach Len. (ft)	4.00	4.00
4.00				
Crit W.S. (ft)		Flow Area (sq ft)	1720.94	26438.53
4306.31				
E.G. Slope (ft/ft)	0.000411	Area (sq ft)	1720.94	26438.53
4306.31				
Q Total (cfs)	-456287.00	Flow (cfs)	-9978.89	
-430203.90 -16104.24				
Top width (ft)	2094.32	Top width (ft)	268.31	732.00
1094.00				
Vel Total (ft/s)	-14.05	Avg. Vel. (ft/s)	-5.80	-16.27
-3.74				
Max Chl Dpth (ft)	45.18	Hydr. Depth (ft)	6.41	36.12
3.94				
Conv. Total (cfs)	22499910.0	Conv. (cfs)	492067.8	
21213730.0 794114.1				
Length wtd. (ft)	4.00	Wetted Per. (ft)	268.83	744.93
1101.25				
Min Ch El (ft)	-30.00	Shear (lb/sq ft)	0.16	0.91
0.10				
Alpha	1.27	Stream Power (lb/ft s)	3131.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	459.25	1331.01
655.38				
C & E Loss (ft)		Cum SA (acres)	61.63	37.80
54.72				

BRIDGE

RIVER: Long Creek
 REACH: Long Creek RS: 3.1

INPUT

Description:

Distance from Upstream XS = 4

Deck/Roadway width = 50

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 29

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0	26	0	606	26	0	1007	26	0	1305	27.2	21.1	1320	27.2	21.1
1305	26	0	1320	26.4	0	1352	27.2	21.1	1384	27.9	22.4	1416	28.4	23.1
1384	27.9	22.4	1416	28.4	23.1	1448	29.3	24.8	1480	29.8	24.1	1512	30.3	24.4
1480	29.8	24.1	1512	30.3	24.4	1544	30.7	24.8	1576	30.7	24.8	1613	31.25	24.8
1576	30.7	24.8	1613	31.25	24.8	1697	30.9	24.8	1744	30.6	24.7	1781	30.2	24.4
1744	30.6	24.7	1781	30.2	24.4	1813	29.8	24.8	1845	29.3	23.4	1877	28.5	23.1
1845	29.3	23.4	1877	28.5	23.1	1909	27.9	22.4	1941	27.2	21.1	1973	27	21
1941	27.2	21.1	1973	27	21	2005	27	21	2036	27	21	2037	27	0
2036	27	21	2037	27	0	2129	27	0	2584	27	0	3131	27	0
2584	27	0	3131	27	0									

Upstream Bridge Cross Section Data

Station Elevation Data

num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	19	606	15	1007	20	1305	0	1320	0
1352	-5	1384	-23	1416	-26	1448	-28	1480	-30
1512	-30	1544	-28	1576	-25	1613	-13	1697	-24
1744	-17	1781	-25	1813	-30	1845	-29	1877	-28
1909	-25	1941	-20	1973	-17	2005	-10	2037	0
2129	14	2584	12	3131	9				

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1305	.02	2037	.02

Bank Sta: Left Right Coeff Contr. Expan.
 1305 2037 .1 .3

Downstream Deck/Roadway Coordinates

num= 29

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0	26	0	606	26	0	1007	26	0	1305	27.2	21.1	1320	27.2	21.1
1305	26	0	1320	26.4	0	1352	27.2	21.1	1384	27.9	22.4	1416	28.4	23.1
1384	27.9	22.4	1416	28.4	23.1	1448	29.3	24.8	1480	29.8	24.1	1512	30.3	24.4
1480	29.8	24.1	1512	30.3	24.4	1544	30.7	24.8	1576	30.7	24.8	1613	31.25	24.8
1576	30.7	24.8	1613	31.25	24.8	1697	30.9	24.8	1744	30.6	24.7	1781	30.2	24.4
1744	30.6	24.7	1781	30.2	24.4	1813	29.8	24.8	1845	29.3	23.4	1877	28.5	23.1
1845	29.3	23.4	1877	28.5	23.1	1909	27.9	22.4	1941	27.2	21.1	1973	27	21
1941	27.2	21.1	1973	27	21	2005	27	21	2036	27	21	2037	27	0
2036	27	21	2037	27	0	2129	27	0	2584	27	0	3131	27	0
2584	27	0	3131	27	0									

Downstream Bridge Cross Section Data

Station Elevation Data

num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	19	606	15	1007	20	1305	0	1320	0
1352	-5	1384	-20	1416	-25	1448	-28	1480	-29
1512	-30	1544	-28	1576	-25	1613	-15	1697	-24
1744	-15	1781	-23	1813	-26	1845	-26	1877	-25
1909	-22	1941	-20	1973	-16	2005	-10	2037	0

1056769.rep
 2129 14 2584 12 3131 9
 Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .02 1305 .02 2037 .02
 Bank Sta: Left Right Coeff Contr. Expan.
 1305 2037 .1 .3
 Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Piers = 18

Pier Data
 Pier Station Upstream= 1352 Downstream= 1352

Upstream num= 2
 width Elev width Elev
 3 -50 3 24
 Downstream num= 2
 width Elev width Elev
 3 -50 3 24

Pier Data
 Pier Station Upstream= 1384 Downstream= 1384

Upstream num= 2
 width Elev width Elev
 3 -50 3 24
 Downstream num= 2
 width Elev width Elev
 3 -50 3 24

Pier Data
 Pier Station Upstream= 1416 Downstream= 1416

Upstream num= 2
 width Elev width Elev
 3 -50 3 24
 Downstream num= 2
 width Elev width Elev
 3 -50 3 24

Pier Data
 Pier Station Upstream= 1448 Downstream= 1448

Upstream num= 2
 width Elev width Elev
 3 -50 3 24
 Downstream num= 2
 width Elev width Elev
 3 -50 3 24

Pier Data
 Pier Station Upstream= 1480 Downstream= 1480

Upstream num= 2
 width Elev width Elev
 3 -50 3 24
 Downstream num= 2
 width Elev width Elev
 3 -50 3 24

Pier Data				
Pier Station		Upstream=	1512	Downstream= 1512
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data				
Pier Station		Upstream=	1544	Downstream= 1544
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data				
Pier Station		Upstream=	1576	Downstream= 1576
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data				
Pier Station		Upstream=	1613	Downstream= 1613
Upstream	num=	2		
width	Elev	width	Elev	
15	-50	15	24	
Downstream	num=	2		
width	Elev	width	Elev	
15	-50	15	24	

Pier Data				
Pier Station		Upstream=	1744	Downstream= 1744
Upstream	num=	2		
width	Elev	width	Elev	
15	-50	15	24	
Downstream	num=	2		
width	Elev	width	Elev	
15	-50	15	24	

Pier Data				
Pier Station		Upstream=	1781	Downstream= 1781
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data				
Pier Station		Upstream=	1813	Downstream= 1813
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data				
Pier Station		Upstream=	1845	Downstream= 1845
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data				
Pier Station		Upstream=	1877	Downstream= 1877
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data				
Pier Station		Upstream=	1909	Downstream= 1909
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data				
Pier Station		Upstream=	1941	Downstream= 1941
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data				
Pier Station		Upstream=	1973	Downstream= 1973
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data				
Pier Station		Upstream=	2005	Downstream= 2005
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth

inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #09OCT2011 1000

E.G. US. (ft)	19.08	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	15.18	E.G. Elev (ft)	21.17
20.22			
Q Total (cfs)	-456287.00	W.S. Elev (ft)	15.18
13.17			
Q Bridge (cfs)		Crit W.S. (ft)	
Q Weir (cfs)		Max Chl Dpth (ft)	45.18
43.13			
Weir Sta Lft (ft)		Vel Total (ft/s)	-19.64
-21.30			
Weir Sta Rgt (ft)		Flow Area (sq ft)	23237.40
21422.55			
Weir Submerg		Froude # Chl	-0.51
-0.57			
Weir Max Depth (ft)		Specif Force (cu ft)	725706.80
681854.80			
Min El Weir Flow (ft)	26.01	Hydr Depth (ft)	37.77
34.64			
Min El Prs (ft)	24.80	W.P. Total (ft)	2062.32
1940.22			
Delta EG (ft)		Conv. Total (cfs)	8677076.0
7891923.0			
Delta WS (ft)	2.01	Top Width (ft)	615.25
618.39			
BR Open Area (sq ft)		Frctn Loss (ft)	
BR Open Vel (ft/s)		C & E Loss (ft)	
Coef of Q		Shear Total (lb/sq ft)	1.95
2.30			
Br Sel Method	Energy/Weir	Power Total (lb/ft s)	0.00
0.00			

Note: The post processor is unable to handle negative flow through a bridge at this time. The water surfaces inside the bridge are based on projecting the outside water surface.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

CROSS SECTION

RIVER: Long Creek

REACH: Long Creek

RS: 3

INPUT

Description: South Bridge Fascia

Station Elevation Data

num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	19	606	15	1007	20	1305	0	1320	0
1352	-5	1384	-20	1416	-25	1448	-28	1480	-29
1512	-30	1544	-28	1576	-25	1613	-15	1697	-24
1744	-15	1781	-23	1813	-26	1845	-26	1877	-25
1909	-22	1941	-20	1973	-16	2005	-10	2037	0
2129	14	2584	12	3131	9				

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1305	.02	2037	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1305	2037		840	525	732	.1
							.3

CROSS SECTION OUTPUT Profile #09OCT2011 1000

E.G. Elev (ft)	18.09	Element	Left OB	Channel
Right OB				
Vel Head (ft)	4.92	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	13.17	Reach Len. (ft)	840.00	525.00
732.00				
Crit W.S. (ft)		Flow Area (sq ft)	1292.86	24328.43
2189.18				
E.G. Slope (ft/ft)	0.000566	Area (sq ft)	1292.86	24328.43
2189.18				
Q Total (cfs)	-456287.00	Flow (cfs)	-8017.89	
-440244.00 -8025.11				
Top width (ft)	1828.80	Top width (ft)	196.28	732.00
900.52				
Vel Total (ft/s)	-16.41	Avg. Vel. (ft/s)	-6.20	-18.10
-3.67				
Max Chl Dpth (ft)	43.17	Hydr. Depth (ft)	6.59	33.24
2.43				
Conv. Total (cfs)	19178920.0	Conv. (cfs)	337012.6	
18504590.0 337316.1				
Length Wtd. (ft)	560.68	Wetted Per. (ft)	196.73	742.70
905.70				
Min Ch El (ft)	-30.00	Shear (lb/sq ft)	0.23	1.16
0.09				
Alpha	1.18	Stream Power (lb/ft s)	3131.00	0.00
0.00				
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	459.17	1328.73
655.19				
C & E Loss (ft)		Cum SA (acres)	61.62	37.74
54.67				

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)

is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Long Creek

REACH: Long Creek

RS: 2

INPUT

Description: One Bride Length Downstream

Station Elevation Data

num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6	764	10	1355	15	1721	11	1928	0
2162	-23	2398	-28	2657	-25	2917	0	3162	6
3792	4	4180	5	4362	0				

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1928	.02	2917	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1928	2917		964 1050	1100	.1	.3

CROSS SECTION OUTPUT Profile #09OCT2011 1000

E.G. Elev (ft)	17.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.19	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	16.21	Reach Len. (ft)	964.00	1050.00
1100.00				
Crit w.s. (ft)		Flow Area (sq ft)	11860.47	34856.03
17340.14				
E.G. Slope (ft/ft)	0.000152	Area (sq ft)	11860.47	34856.03
17340.14				
Q Total (cfs)	-462022.00	Flow (cfs)	-36373.08	
-342947.50 -82701.37				
Top width (ft)	4362.00	Top width (ft)	1928.00	989.00
1445.00				
Vel Total (ft/s)	-7.21	Avg. Vel. (ft/s)	-3.07	-9.84
-4.77				
Max Chl Dpth (ft)	44.21	Hydr. Depth (ft)	6.15	35.24
12.00				
Conv. Total (cfs)	37442510.0	Conv. (cfs)	2947694.0	
27792650.0 6702163.0				
Length wtd. (ft)	1050.79	Wetted Per. (ft)	1938.56	991.40
1461.36				
Min Ch El (ft)	-28.00	Shear (lb/sq ft)	0.06	0.33
0.11				
Alpha	1.47	Stream Power (lb/ft s)	4362.00	0.00
0.00				
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	332.35	972.07
491.10				
C & E Loss (ft)		Cum SA (acres)	41.14	27.37
34.96				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may

indicate the need for additional cross sections.

CROSS SECTION

RIVER: Long Creek

REACH: Long Creek

RS: 1

INPUT

Description: Two Bridge Lengths Downstream

Station Elevation Data

num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1	222	5	773	10	1677	5	1790	0
2146	-23	2503	-28	2787	-25	3072	0	4396	1

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1790	.02	3072	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1790	3072		0	0	.1	.3

CROSS SECTION OUTPUT Profile #09OCT2011 1000

E.G. Elev (ft)	17.38	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.60	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	16.78	Reach Len. (ft)		
Crit w.s. (ft)	-3.51	Flow Area (sq ft)	18175.20	45797.96
21554.72				
E.G. Slope (ft/ft)	0.000076	Area (sq ft)	18175.20	45797.96
21554.72				
Q Total (cfs)	-465219.00	Flow (cfs)	-54866.10	
-321393.30 -88959.60				
Top width (ft)	4396.00	Top width (ft)	1790.00	1282.00
1324.00				
Vel Total (ft/s)	-5.44	Avg. vel. (ft/s)	-3.02	-7.02
-4.13				
Max Chl Dpth (ft)	44.78	Hydr. Depth (ft)	10.15	35.72
16.28				
Conv. Total (cfs)	53371740.0	Conv. (cfs)	6294454.0	
36871500.0 10205790.0				
Length Wtd. (ft)		Wetted Per. (ft)	1805.96	1283.89
1339.78				
Min Ch El (ft)	-28.00	Shear (lb/sq ft)	0.05	0.17
0.08				
Alpha	1.30	Stream Power (lb/ft s)	4396.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River: Long Creek

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Reach	River Sta.	n1	n2	n3
Long Creek	5.0	.02	.02	.02
Long Creek	4	.02	.02	.02
Long Creek	3.2	.02	.02	.02
Long Creek	3.1	Bridge		
Long Creek	3	.02	.02	.02
Long Creek	2	.02	.02	.02
Long Creek	1	.02	.02	.02

SUMMARY OF REACH LENGTHS

River: Long Creek

Reach	River Sta.	Left	Channel	Right
Long Creek	5.0	360	450	770
Long Creek	4	440	430	420
Long Creek	3.2	60	60	60
Long Creek	3.1	Bridge		
Long Creek	3	840	525	732
Long Creek	2	964	1050	1100
Long Creek	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Long Creek

Reach	River Sta.	Contr.	Expan.
Long Creek	5.0	.1	.3
Long Creek	4	.1	.3
Long Creek	3.2	.1	.3
Long Creek	3.1	Bridge	
Long Creek	3	.1	.3
Long Creek	2	.1	.3
Long Creek	1	.1	.3

Profile Output Table - Six XS Bridge

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Crit W.S.
Frctn Loss	C & E Loss	Top Width	Q Left	Q Channel	Q Right
(ft)	(ft)	(ft)	(cfs)	(ft) (cfs)	(ft) (cfs)
Long Creek	4	09OCT2011 1000	18.48	16.55	
0.14		2896.00 -63948.25	-369079.60	-22526.15	-12.14
Long Creek	3.2	09OCT2011 1000	19.08	15.18	
		2094.32 -9978.89	-430203.90	-16104.24	-16.27
Long Creek	3.1	BR U 09OCT2011 1000	21.17	15.18	
		615.25	-456287.00		-19.64
Long Creek	3.1	BR D 09OCT2011 1000	20.22	13.17	

			1056769.rep			
		618.39		-456287.00		-21.30
Long Creek	3	09OCT2011 1000		18.09	13.17	
0.15		1828.80	-8017.89	-440244.00	-8025.11	-18.10
Long Creek	2	09OCT2011 1000		17.40	16.21	
0.11		4362.00	-36373.08	-342947.50	-82701.37	-9.84

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HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X      X
XXXXXXXX XXXX      X      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      X

```

PROJECT DATA

Project Title: 1056769
Project File : 1056769.prj
Run Date and Time: 1/12/2012 7:54:04 AM

Project in English units

PLAN DATA

Plan Title: Plan 02
Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\1056769 Loop Parkway over
Long Creek - NYSDOT\1056769.p02

Geometry Title: 1056769
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1056769
Loop Parkway over Long Creek - NYSDOT\1056769.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of:	Cross Sections =	6	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

GEOMETRY DATA

1056769.rep

Geometry Title: 1056769

Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1056769 Loop Parkway
over Long Creek - NYSDOT\1056769.g01

CROSS SECTION

RIVER: Long Creek

REACH: Long Creek RS: 5.0

INPUT

Description: Upstream 2 Bridge Lengths

Station	Elevation	Data	num=	6	Sta	Elev	Sta	Elev	Sta	Elev
0	5	1108	0	1376	-23	1644	-28	1912	-28	
2180	3									

Manning's n values

Sta	n Val	Sta	num=	3	Sta	n Val
0	.02	1108	.02	1912	.02	

Bank	Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
	1108	1912	360	450	770		.1	.3

CROSS SECTION OUTPUT Profile #09OCT2011 1000

E.G. Elev (ft)	23.66	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.17	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.49	Reach Len. (ft)	360.00	450.00
770.00				
Crit w.s. (ft)		Flow Area (sq ft)	22148.92	35501.96
9377.32				
E.G. slope (ft/ft)	0.000109	Area (sq ft)	22148.92	35501.96
9377.32				
Q Total (cfs)	-544085.00	Flow (cfs)	-125498.70	
-344477.30 -74108.98				
Top width (ft)	2180.00	Top width (ft)	1108.00	804.00
268.00				
Vel Total (ft/s)	-8.12	Avg. vel. (ft/s)	-5.67	-9.70
-7.90				
Max Chl Dpth (ft)	50.49	Hydr. Depth (ft)	19.99	44.16
34.99				
Conv. Total (cfs)	52001560.0	Conv. (cfs)	11994680.0	
32923830.0 7083053.0				
Length wtd. (ft)	468.17	wetted Per. (ft)	1125.50	805.03
289.28				
Min Ch El (ft)	-28.00	Shear (lb/sq ft)	0.13	0.30
0.22				
Alpha	1.15	Stream Power (lb/ft s)	2180.00	0.00
0.00				
Frctn Loss (ft)	0.06	Cum volume (acre-ft)	1159.09	2260.31
1285.26				
C & E Loss (ft)		Cum SA (acres)	93.64	54.92
75.87				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Long Creek
 REACH: Long Creek RS: 4

INPUT

Description: One Bridge Length Upstream

Station Elevation Data		num= 11		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	363	9	691	6	1100	1	1440	-23		
1563	-28	1686	-28	2026	0	2056	7	2390	12		
2896	10										

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1100	.02	2026	.02		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1100	2026		440 430	420	.1	.3

CROSS SECTION OUTPUT Profile #09OCT2011 1000

E.G. Elev (ft)	23.93	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.40	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.53	Reach Len. (ft)	440.00	430.00
420.00				
Crit w.s. (ft)		Flow Area (sq ft)	17984.55	35940.80
10754.77				
E.G. Slope (ft/ft)	0.000158	Area (sq ft)	17984.55	35940.80
10754.77				
Q Total (cfs)	-544832.00	Flow (cfs)	-107243.70	
-384404.80 -53183.55				
Top width (ft)	2896.00	Top width (ft)	1100.00	926.00
870.00				
Vel Total (ft/s)	-8.42	Avg. Vel. (ft/s)	-5.96	-10.70
-4.95				
Max Chl Dpth (ft)	50.53	Hydr. Depth (ft)	16.35	38.81
12.36				
Conv. Total (cfs)	43320060.0	Conv. (cfs)	8527038.0	
30564360.0 4228670.0				
Length Wtd. (ft)	430.20	Wetted Per. (ft)	1115.58	928.10
883.37				
Min Ch El (ft)	-28.00	Shear (lb/sq ft)	0.16	0.38
0.12				
Alpha	1.27	Stream Power (lb/ft s)	2896.00	0.00
0.00				
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	993.25	1891.28
1107.32				
C & E Loss (ft)		Cum SA (acres)	84.52	45.98
65.81				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Long Creek
 REACH: Long Creek RS: 3.2

INPUT

Description: North Bridge Fascia

Station	Elevation	Data	num=	28	Station	Elevation	Station	Elevation	Station	Elevation
0	19	606	15	1007	20	1305	0	1320	0	
1352	-5	1384	-23	1416	-26	1448	-28	1480	-30	
1512	-30	1544	-28	1576	-25	1613	-13	1697	-24	
1744	-17	1781	-25	1813	-30	1845	-29	1877	-28	
1909	-25	1941	-20	1973	-17	2005	-10	2037	0	
2129	14	2584	12	3131	9					

Manning's n	Values	num=	3	Station	n val
0	.02	1305	.02	2037	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1305	2037		60	60		.1	.3

CROSS SECTION OUTPUT Profile #09OCT2011 1000

E.G. Elev (ft)	24.56	Element	Left OB	Channel
Right OB				
Vel Head (ft)	2.65	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	21.91	Reach Len. (ft)	4.00	4.00
4.00				
Crit W.S. (ft)		Flow Area (sq ft)	8291.73	31362.88
11665.94				
E.G. Slope (ft/ft)	0.000251	Area (sq ft)	8291.73	31362.88
11665.94				
Q Total (cfs)	-545666.00	Flow (cfs)	-33389.63	
-446370.50 -65905.84				
Top Width (ft)	3131.00	Top Width (ft)	1305.00	732.00
1094.00				
Vel Total (ft/s)	-10.63	Avg. Vel. (ft/s)	-4.03	-14.23
-5.65				
Max Chl Dpth (ft)	51.91	Hydr. Depth (ft)	6.35	42.85
10.66				
Conv. Total (cfs)	34473020.0	Conv. (cfs)	2109425.0	
28199930.0 4163671.0				
Length Wtd. (ft)	4.00	Wetted Per. (ft)	1308.62	744.93
1107.98				
Min Ch El (ft)	-30.00	Shear (lb/sq ft)	0.10	0.66
0.16				
Alpha	1.51	Stream Power (lb/ft s)	3131.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	860.55	1559.09
999.23				
C & E Loss (ft)		Cum SA (acres)	72.37	37.80
56.35				

BRIDGE

RIVER: Long Creek
 REACH: Long Creek

RS: 3.1

INPUT

Description:

Distance from Upstream XS = 4
 Deck/Roadway width = 50
 Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 29														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		26		0	606		26		0	1007		26		0
1305		26		0	1320		26.4		0	1352		27.2		21.1
1384		27.9		22.4	1416		28.4		23.1	1448		29.3		23
1480		29.8		24.1	1512		30.3		24.4	1544		30.7		24.8
1576		30.7		24.8	1613		31.25		24.8	1697		30.9		24.8
1744		30.6		24.7	1781		30.2		24.4	1813		29.8		24
1845		29.3		23.4	1877		28.5		23.1	1909		27.9		22.4
1941		27.2		21.1	1973		27		21	2005		27		21
2036		27		21	2037		27		0	2129		27		0
2584		27		0	3131		27		0					

Upstream Bridge Cross Section Data

Station Elevation Data num= 28														
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	19	606	15	1007	20	1305	0	1320	0					
1352	-5	1384	-23	1416	-26	1448	-28	1480	-30					
1512	-30	1544	-28	1576	-25	1613	-13	1697	-24					
1744	-17	1781	-25	1813	-30	1845	-29	1877	-28					
1909	-25	1941	-20	1973	-17	2005	-10	2037	0					
2129	14	2584	12	3131	9									

Manning's n Values

num= 3									
Sta	n val	Sta	n val	Sta	n val	Sta	n val	Sta	n val
0	.02	1305	.02	2037	.02				

Bank Sta: Left Right Coeff Contr. Expan.
 1305 2037 .1 .3

Downstream Deck/Roadway Coordinates

num= 29														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		26		0	606		26		0	1007		26		0
1305		26		0	1320		26.4		0	1352		27.2		21.1
1384		27.9		22.4	1416		28.4		23.1	1448		29.3		23
1480		29.8		24.1	1512		30.3		24.4	1544		30.7		24.8
1576		30.7		24.8	1613		31.25		24.8	1697		30.9		24.8
1744		30.6		24.7	1781		30.2		24.4	1813		29.8		24
1845		29.3		23.4	1877		28.5		23.1	1909		27.9		22.4
1941		27.2		21.1	1973		27		21	2005		27		21
2036		27		21	2037		27		0	2129		27		0
2584		27		0	3131		27		0					

Downstream Bridge Cross Section Data

Station Elevation Data num= 28														
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	19	606	15	1007	20	1305	0	1320	0					
1352	-5	1384	-20	1416	-25	1448	-28	1480	-29					
1512	-30	1544	-28	1576	-25	1613	-15	1697	-24					
1744	-15	1781	-23	1813	-26	1845	-26	1877	-25					
1909	-22	1941	-20	1973	-16	2005	-10	2037	0					
2129	14	2584	12	3131	9									

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Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .02 1305 .02 2037 .02

Bank Sta: Left Right Coeff Contr. Expan.
1305 2037 .1 .3

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
weir crest shape = Broad Crested

Number of Piers = 18

Pier Data
Pier Station Upstream= 1352 Downstream= 1352
Upstream num= 2
width Elev width Elev
3 -50 3 24
Downstream num= 2
width Elev width Elev
3 -50 3 24

Pier Data
Pier Station Upstream= 1384 Downstream= 1384
Upstream num= 2
width Elev width Elev
3 -50 3 24
Downstream num= 2
width Elev width Elev
3 -50 3 24

Pier Data
Pier Station Upstream= 1416 Downstream= 1416
Upstream num= 2
width Elev width Elev
3 -50 3 24
Downstream num= 2
width Elev width Elev
3 -50 3 24

Pier Data
Pier Station Upstream= 1448 Downstream= 1448
Upstream num= 2
width Elev width Elev
3 -50 3 24
Downstream num= 2
width Elev width Elev
3 -50 3 24

Pier Data
Pier Station Upstream= 1480 Downstream= 1480
Upstream num= 2
width Elev width Elev
3 -50 3 24
Downstream num= 2
width Elev width Elev
3 -50 3 24

Pier Data

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Pier Station	Upstream=	1512	Downstream=	1512
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data				
Pier Station	Upstream=	1544	Downstream=	1544
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data				
Pier Station	Upstream=	1576	Downstream=	1576
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data				
Pier Station	Upstream=	1613	Downstream=	1613
Upstream	num=	2		
width	Elev	width	Elev	
15	-50	15	24	
Downstream	num=	2		
width	Elev	width	Elev	
15	-50	15	24	

Pier Data				
Pier Station	Upstream=	1744	Downstream=	1744
Upstream	num=	2		
width	Elev	width	Elev	
15	-50	15	24	
Downstream	num=	2		
width	Elev	width	Elev	
15	-50	15	24	

Pier Data				
Pier Station	Upstream=	1781	Downstream=	1781
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data				
Pier Station	Upstream=	1813	Downstream=	1813
Upstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-50	3	24	

Pier Data

				1056769.rep	
Pier Station	Upstream=	1845	Downstream=	1845	
Upstream	num= 2				
width	Elev	width	Elev		
3	-50	3	24		
Downstream	num= 2				
width	Elev	width	Elev		
3	-50	3	24		
Pier Data					
Pier Station	Upstream=	1877	Downstream=	1877	
Upstream	num= 2				
width	Elev	width	Elev		
3	-50	3	24		
Downstream	num= 2				
width	Elev	width	Elev		
3	-50	3	24		
Pier Data					
Pier Station	Upstream=	1909	Downstream=	1909	
Upstream	num= 2				
width	Elev	width	Elev		
3	-50	3	24		
Downstream	num= 2				
width	Elev	width	Elev		
3	-50	3	24		
Pier Data					
Pier Station	Upstream=	1941	Downstream=	1941	
Upstream	num= 2				
width	Elev	width	Elev		
3	-50	3	24		
Downstream	num= 2				
width	Elev	width	Elev		
3	-50	3	24		
Pier Data					
Pier Station	Upstream=	1973	Downstream=	1973	
Upstream	num= 2				
width	Elev	width	Elev		
3	-50	3	24		
Downstream	num= 2				
width	Elev	width	Elev		
3	-50	3	24		
Pier Data					
Pier Station	Upstream=	2005	Downstream=	2005	
Upstream	num= 2				
width	Elev	width	Elev		
3	-50	3	24		
Downstream	num= 2				
width	Elev	width	Elev		
3	-50	3	24		

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

1056769.rep

Add Friction component to Momentum
 Do not add Weight component to Momentum
 Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end
 Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #09OCT2011 1000

E.G. US. (ft)	24.56	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	21.91	E.G. Elev (ft)	28.13
27.30			
Q Total (cfs)	-545666.00	W.S. Elev (ft)	21.91
20.38			
Q Bridge (cfs)		Crit W.S. (ft)	
Q Weir (cfs)		Max Chl Dpth (ft)	51.91
50.33			
Weir Sta Lft (ft)		Vel Total (ft/s)	-20.02
-21.12			
Weir Sta Rgt (ft)		Flow Area (sq ft)	27251.58
25836.83			
Weir Submerg		Froude # Chl	-0.49
-0.52			
Weir Max Depth (ft)		Specif Force (cu ft)	956905.60
908204.50			
Min El Weir Flow (ft)	26.01	Hydr Depth (ft)	56.40
42.53			
Min El Prs (ft)	24.80	W.P. Total (ft)	2435.90
2219.11			
Delta EG (ft)		Conv. Total (cfs)	10127710.0
9860784.0			
Delta WS (ft)	1.53	Top width (ft)	483.17
607.53			
BR Open Area (sq ft)		Frctn Loss (ft)	
BR Open Vel (ft/s)		C & E Loss (ft)	
Coef of Q		Shear Total (lb/sq ft)	2.03
2.23			
Br Sel Method	Energy/Weir	Power Total (lb/ft s)	0.00
0.00			

Note: The post processor is unable to handle negative flow through a bridge at this time. The water surfaces inside the bridge are based on projecting the outside water surface.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

CROSS SECTION

RIVER: Long Creek
 REACH: Long Creek

RS: 3

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INPUT

Description: South Bridge Fascia

Station Elevation Data		num= 28							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	19	606	15	1007	20	1305	0	1320	0
1352	-5	1384	-20	1416	-25	1448	-28	1480	-29
1512	-30	1544	-28	1576	-25	1613	-15	1697	-24
1744	-15	1781	-23	1813	-26	1845	-26	1877	-25
1909	-22	1941	-20	1973	-16	2005	-10	2037	0
2129	14	2584	12	3131	9				

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1305	.02	2037	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1305	2037		840 525	732	.1	.3

CROSS SECTION OUTPUT Profile #09OCT2011 1000

E.G. Elev (ft)	23.68	Element	Left OB	Channel
Right OB				
Vel Head (ft)	3.30	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	20.38	Reach Len. (ft)	840.00	525.00
732.00				
Crit w.s. (ft)		Flow Area (sq ft)	6292.81	29601.65
9990.21				
E.G. slope (ft/ft)	0.000326	Area (sq ft)	6292.81	29601.65
9990.21				
Q Total (cfs)	-545666.00	Flow (cfs)	-24075.21	
-463464.90 -58125.92				
Top width (ft)	3131.00	Top width (ft)	1305.00	732.00
1094.00				
Vel Total (ft/s)	-11.89	Avg. vel. (ft/s)	-3.83	-15.66
-5.82				
Max Chl Dpth (ft)	50.38	Hydr. Depth (ft)	4.82	40.44
9.13				
Conv. Total (cfs)	30212910.0	Conv. (cfs)	1333017.0	
25661530.0 3218366.0				
Length Wtd. (ft)	590.93	Wetted Per. (ft)	1307.09	742.70
1106.45				
Min Ch El (ft)	-30.00	Shear (lb/sq ft)	0.10	0.81
0.18				
Alpha	1.50	Stream Power (lb/ft s)	3131.00	0.00
0.00				
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	860.16	1556.40
998.70				
C & E Loss (ft)		Cum SA (acres)	72.31	37.74
56.30				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Long Creek
 REACH: Long Creek

RS: 2

INPUT

Description: One Bride Length Downstream

Station Elevation Data		num= 13									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6	764	10	1355	15	1721	11	1928	0		
2162	-23	2398	-28	2657	-25	2917	0	3162	6		
3792	4	4180	5	4362	0						

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1928	.02	2917	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1928	2917		964 1050	1100	.1	.3

CROSS SECTION OUTPUT Profile #09OCT2011 1000

E.G. Elev (ft)	22.96	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.77	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.19	Reach Len. (ft)	964.00	1050.00
1100.00				
Crit W.S. (ft)		Flow Area (sq ft)	23387.72	40769.13
25979.60				
E.G. Slope (ft/ft)	0.000088	Area (sq ft)	23387.72	40769.13
25979.60				
Q Total (cfs)	-547431.00	Flow (cfs)	-85620.02	
-338734.90 -123076.10				
Top width (ft)	4362.00	Top width (ft)	1928.00	989.00
1445.00				
Vel Total (ft/s)	-6.07	Avg. Vel. (ft/s)	-3.66	-8.31
-4.74				
Max Chl Dpth (ft)	50.19	Hydr. Depth (ft)	12.13	41.22
17.98				
Conv. Total (cfs)	58320580.0	Conv. (cfs)	9121531.0	
36087140.0 13111910.0				
Length wtd. (ft)	1046.96	Wetted Per. (ft)	1944.54	991.40
1467.34				
Min Ch El (ft)	-28.00	Shear (lb/sq ft)	0.07	0.23
0.10				
Alpha	1.35	Stream Power (lb/ft s)	4362.00	0.00
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	573.99	1132.33
696.47				
C & E Loss (ft)		Cum SA (acres)	41.14	27.37
34.96				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Long Creek
 REACH: Long Creek

RS: 1

INPUT

Description: Two Bridge Lengths Downstream

Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1	222	5	773	10	1677	5	1790	0
2146	-23	2503	-28	2787	-25	3072	0	4396	1

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1790	.02	3072	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1790	3072		0	0	.1	.3

CROSS SECTION OUTPUT Profile #09OCT2011 1000

E.G. Elev (ft)	23.00	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.46	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.54	Reach Len. (ft)		
Crit W.S. (ft)	-1.41	Flow Area (sq ft)	28485.60	53182.28
29180.96				
E.G. Slope (ft/ft)	0.000050	Area (sq ft)	28485.60	53182.28
29180.96				
Q Total (cfs)	-550139.00	Flow (cfs)	-94352.15	
-336019.40 -119767.50				
Top width (ft)	4396.00	Top width (ft)	1790.00	1282.00
1324.00				
Vel Total (ft/s)	-4.96	Avg. Vel. (ft/s)	-3.31	-6.32
-4.10				
Max Chl Dpth (ft)	50.54	Hydr. Depth (ft)	15.91	41.48
22.04				
Conv. Total (cfs)	77446220.0	Conv. (cfs)	13282490.0	
47303380.0 16860350.0				
Length wtd. (ft)		wetted Per. (ft)	1811.72	1283.89
1345.54				
Min Ch El (ft)	-28.00	Shear (lb/sq ft)	0.05	0.13
0.07				
Alpha	1.22	Stream Power (lb/ft s)	4396.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River: Long Creek

Reach	River Sta.	n1	n2	n3
Long Creek	5.0	.02	.02	.02
Long Creek	4	.02	.02	.02

		1056769.rep		
Long Creek	3.2	.02	.02	.02
Long Creek	3.1	Bridge		
Long Creek	3	.02	.02	.02
Long Creek	2	.02	.02	.02
Long Creek	1	.02	.02	.02

SUMMARY OF REACH LENGTHS

River: Long Creek

Reach	River Sta.	Left	Channel	Right
Long Creek	5.0	360	450	770
Long Creek	4	440	430	420
Long Creek	3.2	60	60	60
Long Creek	3.1	Bridge		
Long Creek	3	840	525	732
Long Creek	2	964	1050	1100
Long Creek	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

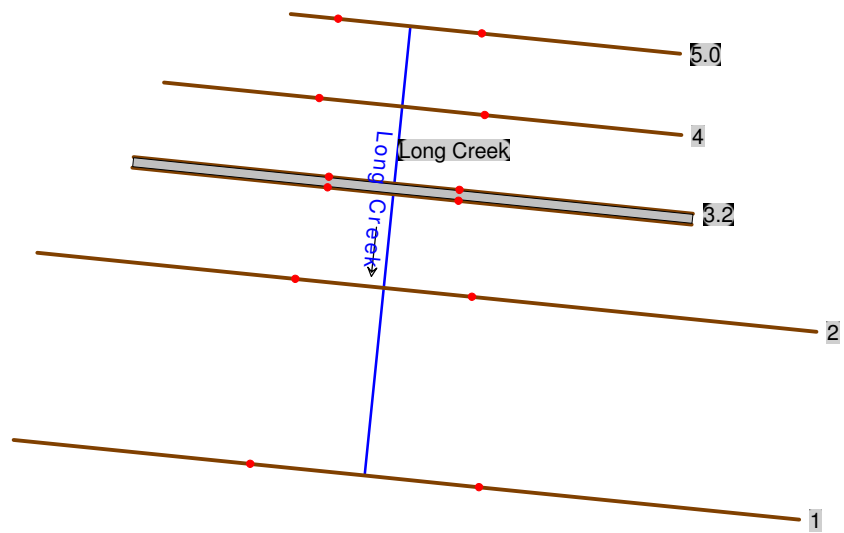
River: Long Creek

Reach	River Sta.	Contr.	Expan.
Long Creek	5.0	.1	.3
Long Creek	4	.1	.3
Long Creek	3.2	.1	.3
Long Creek	3.1	Bridge	
Long Creek	3	.1	.3
Long Creek	2	.1	.3
Long Creek	1	.1	.3

Profile Output Table - Six XS Bridge

Reach Frctn Loss Chnl	River Sta C & E Loss	Profile Top Width	E.G. Elev Q Left	W.S. Elev Q Channel	Crit W.S. Q Right	W.S. Vel
(ft)	(ft)	(ft)	(cfs)	(ft) (cfs)	(ft) (cfs)	(ft) (ft/s)
Long Creek 0.08	4	09OCT2011 1000 2896.00	-107243.70	23.93 -384404.80	22.53 -53183.55	-10.70
Long Creek	3.2	09OCT2011 1000 3131.00	-33389.63	24.56 -446370.50	21.91 -65905.84	-14.23
Long Creek	3.1	BR U 09OCT2011 1000 483.17		28.13 -545666.00	21.91	-20.02

Long Creek	3.1	BR D	1056769.rep 09OCT2011 1000 607.53	27.30 -545666.00	20.38	-21.12
Long Creek 0.09	3		09OCT2011 1000 3131.00 -24075.21	23.68 -463464.90	20.38 -58125.92	-15.66
Long Creek 0.07	2		09OCT2011 1000 4362.00 -85620.02	22.96 -338734.90	22.19 -123076.10	-8.31



Some schematic data outside default extents (see View/Set Schematic Plot Extents...)
 None of the XS's are Geo-Referenced (Geo-Ref user entered XS, Geo-Ref interpolated XS, Non Geo-Ref user entered XS, Non Geo-Ref interpolated XS)

TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
Loop Parkway over Long Creek

100-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation ¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Approximate Bottom of Pile Cap Elevation ² (ft)	Depth of Exposed Piles (ft)
West Abutment	-10	5	7	12	-22	0	-22
West Bascule Pier	-17	5	36	41	-58	Unknown	Unknown
Pier 13	-31	5	13	17	-48	0	-48
East Abutment	-10	5	11	16	-26	0	-26

500-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Footing/Bottom of Pile Cap Elevation ² (ft)	Depth of Exposed Piles (ft)
West Abutment	-4.5	10.2	14.8	25.1	-29.6	0	-29.6
West Bascule Pier	-17	10.2	35.5	45.8	-62.8	Unknown	Unknown
Pier 13	-31	10.2	12.5	22.7	-53.7	0	-53.7
East Abutment	-5	10.2	9.5	19.7	-24.7	0	-24.7

1. All elevations are with reference to NAVD 88 and are taken from the 2009 Fathometric Survey by Boswell Engineering.

2. Estimate of Pile Cap Bottom based on design drawings from 1933. Bascule piers are at an unknown depth

SCOUR MODE COMPUTATIONS - FLOOD TIDE
Loop Parkway over Long Creek

The following computations are made using Laursen's Equation (Equation 5.1 in HEC-18):

$$V_c = K_u \times Y_1^{1/6} \times D_{50}^{1/3}$$

100-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	26,225
APPROACH SECTION MAIN CHANNEL WIDTH (ft)	W ₁ =	732
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	35.8
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ^{1/3}	V _c =	3.82
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	420,175
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	16.00
MAIN CHANNEL SCOUR MODE		LIVE-BED

500-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	31,363
APPROACH SECTION MAIN CHANNEL WIDTH (ft)	W ₁ =	732
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	43.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ^{1/3}	V _c =	3.94
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	446,370
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	14.23
MAIN CHANNEL SCOUR MODE		LIVE-BED

**100-YEAR FLOOD
CONTRACTION SCOUR COMPUTATIONS - FLOOD TIDE
Loop Parkway over Long Creek
LIVE BED CONTRACTION SCOUR COMPUTATIONS**

The following computations are made using the HEC-18 equations for Live Bed Contraction Scour:
(Equations 5.2 and 5.3)

$$Y_s = Y_2 - Y_0$$

$$Y_2 = [(Q_2/Q_1)^{6/7} \times (W_1/W_2)^{k_1}] \times Y_1$$

ENERGY SLOPE	S ₁ =	0.000403
FALL VELOCITY (Use Figure 5.8 in HEC-18, <i>For English: multiply by 3.28</i>)	w=	0.656
AVERAGE UPSTREAM CHANNEL DEPTH (ft), Y ₁ = A ₁ /W ₁	y ₁ =	35.80
SHEAR VELOCITY IN UPSTREAM SECTION, V* = gy ₁ S ₁ ^{1/2}	V.=	0.68158806
V*/w	V*/w=	1.04
k ₁	k ₁ =	0.64
DISCHARGE IN UPSTREAM CHANNEL (cfs)	Q ₁ =	420,175.0
DISCHARGE IN CONTRACTED SECTION (cfs)	Q ₂ =	443,575.0
WIDTH OF UPSTREAM CHANNEL SECTION (ft)	W ₁ =	732.0
WIDTH OF MAIN CHANNEL CONTRACTED SECTION (ft)	W ₂ =	615.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	Y ₂ =	41.92
AVERAGE WATER DEPTH AT BRIDGE (ft)	Y ₀ =	37.0
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	Y _s =	4.9

500-YEAR FLOOD

ENERGY SLOPE	S ₁ =	0.000251
FALL VELOCITY (Use Figure 5.8 in HEC-18, <i>For English: multiply by 3.28</i>)	w=	0.656
AVERAGE UPSTREAM CHANNEL DEPTH (ft), Y ₁ = A ₁ /W ₁	y ₁ =	43.00
SHEAR VELOCITY IN UPSTREAM SECTION, V* = gy ₁ S ₁ ^{1/2}	V.=	0.58952065
V*/w	V*/w=	0.90
k ₁	k ₁ =	0.64
DISCHARGE IN UPSTREAM CHANNEL (cfs)	Q ₁ =	446,370.0
DISCHARGE IN CONTRACTED SECTION (cfs)	Q ₂ =	545,666.0
WIDTH OF UPSTREAM CHANNEL SECTION (ft)	W ₁ =	732.0
WIDTH OF MAIN CHANNEL CONTRACTED SECTION (ft)	W ₂ =	483.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	Y ₂ =	66.65
AVERAGE WATER DEPTH AT BRIDGE (ft)	Y ₀ =	56.4

AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	$Y_s =$	10.2

LOCAL ABUTMENT SCOUR COMPUTATIONS

Loop Parkway over Long Creek

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	100
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	1,651
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	9379.0
V _e = Q _e /A _e , (ft/s)	V _e =	5.681
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	222
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	7.4
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.011861
SCOUR DEPTH, Y _s (ft)	Y _s =	11.2

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	100
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	8,292
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	33,390
V _e = Q _e /A _e , (ft/s)	V _e =	4.027
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	1,305
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	6.4
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.009841
SCOUR DEPTH, Y _s (ft)	Y _s =	9.5

LOCAL ABUTMENT SCOUR COMPUTATIONS
Loop Parkway over Long Creek

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	130
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	3,987
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	14023.0
V _e = Q _e /A _e , (ft/s)	V _e =	3.517
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	1,094
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	3.6
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.014986
SCOUR DEPTH, Y _s (ft)	Y _s =	6.9

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	130
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	11,666
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	65,906
V _e = Q _e /A _e , (ft/s)	V _e =	5.649
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	1,094
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	10.7
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.008227
SCOUR DEPTH, Y _s (ft)	Y _s =	14.8

LOCAL PIER SCOUR COMPUTATIONS - FLOOD TIDE
Loop Parkway over Long Creek

The following computations are made using the HEC-18 CSU Equation (Eqn. 6.1):

$$y_s = (2.0K_1K_2K_3K_4(a/y_1)^{0.65}Fr^{0.43} \times y_1$$

100-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE	K ₄ =	1.00
(SEE EQNS. 6.5 - 6.8)		
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	3.0
LENGTH OF PIER	L=	60.0
L/a (Maximum L/a value is 12)	L/a=	20.0
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	16.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	36.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	12.5

500-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE	K ₄ =	1.00
(SEE EQNS. 6.5 - 6.8)		
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	3.0
LENGTH OF PIER	L=	60.0
L/a (Maximum L/a value is 12)	L/a=	20.0
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	15.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	43.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	12.5

LOCAL PIER SCOUR COMPUTATIONS - FLOOD TIDE
Loop Parkway over Long Creek

The following computations are made using the HEC-18 CSU Equation (Eqn. 6.1):

$$y_s = (2.0K_1K_2K_3K_4(a/y_1)^{0.65}Fr^{0.43} \times y_1$$

100-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE	K ₄ =	1.00
(SEE EQNS. 6.5 - 6.8)		
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	15.0
LENGTH OF PIER	L=	60.0
L/a (Maximum L/a value is 12)	L/a=	4.0
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	16.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	36.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	35.6

500-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE	K ₄ =	1.00
(SEE EQNS. 6.5 - 6.8)		
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	15.0
LENGTH OF PIER	L=	60.0
L/a (Maximum L/a value is 12)	L/a=	4.0
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	15.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	43.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	35.5

1056769 - Loop Parkway over Long Creek

500 - year storm

Time	R.S. = 1 Node = s5n6					R.S. = 6 Node = s6n4				
(hrs)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)
1	0.00	0.00	0.00	4.59	0.00	0.00	0.00	0.00	4.59	0.00
2	0.00	0.00	151.21	4.60	0.00	0.00	0.00	173.36	4.59	0.00
3	0.56	0.01	186.00	6.43	0.04	0.56	0.00	155.29	6.44	0.01
4	0.33	0.01	135.59	5.67	0.02	0.33	0.00	155.61	5.67	0.01
5	0.28	0.01	331.66	5.52	0.04	0.28	0.00	12.15	5.52	0.01
6	-0.14	0.10	329.26	4.14	0.31	-0.13	0.01	353.74	4.16	0.04
7	-0.48	0.02	321.02	3.03	0.08	-0.48	0.00	343.46	3.01	0.01
8	-0.58	0.01	187.94	2.71	0.03	-0.59	0.00	181.15	2.66	0.01
9	-0.53	0.04	160.59	2.87	0.13	-0.53	0.01	173.76	2.85	0.03
10	-0.30	0.05	156.82	3.61	0.18	-0.30	0.01	173.72	3.61	0.03
11	0.21	0.09	155.71	5.28	0.31	0.20	0.02	170.09	5.25	0.05
12	0.75	0.06	153.51	7.06	0.21	0.75	0.01	166.37	7.04	0.04
13	1.12	0.04	151.51	8.28	0.12	1.13	0.01	176.37	8.30	0.03
14	1.19	0.01	335.34	8.51	0.04	1.20	0.00	344.70	8.51	0.00
15	0.95	0.06	333.14	7.70	0.18	0.95	0.01	347.08	7.71	0.04
16	0.51	0.07	330.14	6.26	0.24	0.51	0.01	356.95	6.26	0.05
17	-0.07	0.08	329.15	4.35	0.26	-0.07	0.00	6.42	4.35	0.01
18	-0.65	0.08	328.06	2.45	0.25	-0.65	0.02	353.16	2.45	0.05
19	-1.02	0.05	324.05	1.25	0.15	-1.01	0.01	347.47	1.28	0.04
20	-1.03	0.03	162.72	1.23	0.09	-1.03	0.00	246.03	1.22	0.00
21	-0.66	0.06	158.22	2.42	0.20	-0.67	0.01	178.35	2.41	0.03
22	-0.14	0.09	155.94	4.14	0.29	-0.14	0.01	171.98	4.14	0.04
23	0.53	0.09	153.96	6.32	0.29	0.53	0.01	166.73	6.33	0.04
24	1.14	0.06	150.25	8.34	0.19	1.14	0.01	170.96	8.33	0.04
25	1.47	0.01	19.42	9.40	0.02	1.47	0.00	161.83	9.43	0.01
26	1.42	0.02	335.67	9.24	0.08	1.41	0.01	345.25	9.23	0.02
27	1.11	0.03	333.34	8.24	0.10	1.11	0.00	0.83	8.23	0.01
28	0.55	0.08	327.84	6.40	0.28	0.56	0.01	0.37	6.41	0.04
29	-0.11	0.08	327.71	4.23	0.26	-0.11	0.02	352.14	4.23	0.06
30	-0.66	0.07	328.26	2.42	0.22	-0.65	0.02	351.24	2.45	0.05
31	-1.00	0.02	318.60	1.33	0.06	-1.00	0.01	344.21	1.33	0.02
32	-0.97	0.02	165.86	1.43	0.07	-0.97	0.00	190.70	1.43	0.01
33	-0.61	0.07	157.65	2.59	0.22	-0.62	0.01	172.82	2.57	0.03
34	-0.07	0.08	155.73	4.38	0.27	-0.06	0.01	170.87	4.39	0.04
35	0.61	0.07	153.37	6.58	0.24	0.61	0.01	164.13	6.58	0.03
36	1.20	0.04	148.24	8.54	0.12	1.21	0.01	170.28	8.55	0.02
37	1.51	0.01	123.38	9.55	0.03	1.51	0.00	158.23	9.54	0.01
38	1.52	0.01	341.29	9.58	0.03	1.52	0.00	170.65	9.59	0.01
39	1.28	0.06	334.08	8.79	0.18	1.28	0.01	337.84	8.80	0.02
40	0.75	0.08	329.78	7.04	0.26	0.74	0.02	355.90	7.03	0.06
41	0.13	0.09	329.70	5.02	0.29	0.13	0.01	15.15	5.02	0.02
42	-0.40	0.07	327.48	3.29	0.23	-0.40	0.01	350.96	3.30	0.04
43	-0.73	0.02	319.64	2.21	0.08	-0.73	0.01	341.21	2.19	0.02
44	-0.74	0.03	160.94	2.16	0.10	-0.74	0.01	176.23	2.18	0.04
45	-0.43	0.08	156.26	3.20	0.27	-0.42	0.01	171.98	3.21	0.04
46	0.11	0.08	156.15	4.97	0.27	0.11	0.01	169.63	4.96	0.03
47	0.77	0.08	153.51	7.11	0.27	0.77	0.02	173.62	7.11	0.05
48	1.39	0.07	150.30	9.16	0.24	1.40	0.01	167.10	9.17	0.04

49	1.83	0.02	138.31	10.60	0.06	1.84	0.01	161.16	10.62	0.02
50	1.98	0.02	345.83	11.07	0.08	1.97	0.01	3.58	11.06	0.02
51	1.90	0.02	155.40	10.81	0.06	1.89	0.01	157.38	10.79	0.02
52	1.60	0.07	333.79	9.82	0.23	1.60	0.01	352.99	9.84	0.04
53	1.13	0.06	328.58	8.30	0.18	1.14	0.01	2.25	8.32	0.04
54	0.77	0.02	316.00	7.12	0.06	0.76	0.00	140.21	7.08	0.01
55	0.73	0.04	158.41	6.98	0.13	0.73	0.01	155.74	6.99	0.04
56	1.25	0.09	156.40	8.71	0.28	1.26	0.02	160.55	8.72	0.05
57	2.61	0.13	157.18	13.14	0.44	2.60	0.04	160.76	13.12	0.11
58	4.80	0.12	151.55	20.35	0.40	4.82	0.03	164.04	20.41	0.09
59	5.47	0.14	334.08	22.54	0.44	5.46	0.03	345.86	22.49	0.09
60	5.02	0.13	333.29	21.06	0.41	5.04	0.02	342.67	21.12	0.07
61	3.61	0.09	330.70	16.42	0.30	3.62	0.02	1.82	16.47	0.07
62	1.97	0.15	330.47	11.07	0.48	1.97	0.04	348.31	11.06	0.13
63	0.72	0.13	328.23	6.96	0.42	0.73	0.03	343.08	6.98	0.10
64	-0.20	0.05	323.77	3.94	0.17	-0.21	0.01	239.59	3.90	0.02
65	-0.69	0.02	323.87	2.33	0.07	-0.69	0.01	296.64	2.33	0.02
66	-0.74	0.03	164.26	2.15	0.11	-0.74	0.01	210.89	2.15	0.02
67	-0.35	0.07	158.08	3.46	0.24	-0.34	0.01	183.42	3.49	0.02
68	0.14	0.06	156.97	5.04	0.21	0.14	0.01	167.88	5.05	0.02
69	0.53	0.06	155.50	6.31	0.19	0.52	0.01	171.94	6.30	0.03
70	0.81	0.02	153.98	7.26	0.05	0.81	0.00	72.05	7.24	0.01
71	0.96	0.01	148.63	7.74	0.04	0.96	0.00	32.85	7.74	0.01
72	0.99	0.00	359.14	7.85	0.01	0.99	0.00	61.17	7.84	0.01
73	0.89	0.02	332.80	7.50	0.05	0.89	0.00	20.70	7.51	0.01
74	0.69	0.03	328.66	6.84	0.09	0.69	0.01	9.74	6.85	0.02
75	0.54	0.03	330.39	6.35	0.09	0.54	0.01	358.28	6.36	0.03
76	0.42	0.03	330.33	5.98	0.09	0.42	0.01	354.21	5.97	0.02
77	0.28	0.02	328.33	5.52	0.05	0.28	0.00	129.65	5.51	0.01
78	0.12	0.02	329.36	4.97	0.06	0.12	0.00	150.28	4.98	0.00
79	-0.05	0.02	328.83	4.42	0.06	-0.05	0.00	291.77	4.43	0.00
80	-0.21	0.02	328.50	3.92	0.07	-0.19	0.00	106.30	3.97	0.00
81	-0.30	0.01	314.25	3.62	0.02	-0.30	0.00	350.19	3.61	0.00
82	-0.33	0.01	158.44	3.51	0.05	-0.33	0.00	186.79	3.50	0.00
83	-0.19	0.04	156.16	3.98	0.12	-0.19	0.01	171.72	3.96	0.02
84	0.11	0.05	156.26	4.95	0.15	0.11	0.01	170.20	4.95	0.03
85	0.48	0.05	154.25	6.15	0.17	0.48	0.01	162.35	6.17	0.03
86	0.84	0.05	153.05	7.34	0.16	0.84	0.01	163.27	7.34	0.03
87	1.06	0.02	150.79	8.05	0.06	1.05	0.00	140.27	8.05	0.01
88	1.04	0.02	335.38	8.02	0.06	1.05	0.01	2.85	8.03	0.02
89	0.87	0.03	330.59	7.43	0.09	0.86	0.01	2.35	7.43	0.02
90	0.47	0.07	331.95	6.13	0.21	0.47	0.01	358.39	6.13	0.04
91	-0.06	0.11	330.17	4.40	0.35	-0.06	0.02	352.08	4.40	0.05
92	-0.52	0.07	327.65	2.87	0.22	-0.52	0.01	341.44	2.88	0.04
93	-0.83	0.04	326.67	1.86	0.13	-0.83	0.00	338.82	1.87	0.01
94	-0.89	0.00	216.44	1.66	0.01	-0.89	0.00	234.94	1.67	0.00
95	-0.64	0.05	157.86	2.49	0.17	-0.63	0.01	178.70	2.51	0.04
96	-0.22	0.07	155.88	3.86	0.24	-0.22	0.01	169.12	3.86	0.03
97	0.36	0.09	155.11	5.78	0.30	0.36	0.02	170.43	5.78	0.05
98	0.94	0.05	150.82	7.67	0.16	0.94	0.01	171.35	7.68	0.04
99	1.26	0.02	142.48	8.72	0.07	1.25	0.00	156.43	8.71	0.01
100	1.28	0.01	352.28	8.80	0.02	1.29	0.00	11.23	8.81	0.01
101	1.07	0.04	334.18	8.10	0.13	1.07	0.01	357.49	8.11	0.02
102	0.60	0.07	329.29	6.57	0.23	0.60	0.01	359.87	6.56	0.04
103	-0.02	0.10	330.47	4.54	0.31	-0.01	0.01	1.37	4.57	0.04
104	-0.58	0.07	328.68	2.70	0.24	-0.58	0.02	353.27	2.69	0.06
105	-0.96	0.05	326.94	1.45	0.16	-0.96	0.02	355.20	1.46	0.06

106	-1.04	0.02	163.68	1.17	0.05	-1.04	0.00	278.10	1.19	0.00
107	-0.82	0.08	156.42	1.92	0.26	-0.81	0.02	176.78	1.94	0.06
108	-0.40	0.09	155.48	3.28	0.29	-0.40	0.01	170.07	3.29	0.05
109	0.19	0.09	156.09	5.22	0.28	0.19	0.01	168.70	5.21	0.04
110	0.81	0.07	152.70	7.24	0.22	0.81	0.01	166.31	7.24	0.04
111	1.22	0.03	146.62	8.58	0.09	1.23	0.01	165.21	8.61	0.03
112	1.28	0.02	340.54	8.78	0.08	1.28	0.00	5.42	8.79	0.01
113	1.11	0.03	335.67	8.25	0.08	1.11	0.00	5.08	8.24	0.01
114	0.71	0.05	330.93	6.91	0.16	0.71	0.01	357.49	6.92	0.03
115	0.12	0.09	330.72	5.00	0.31	0.14	0.01	6.62	5.04	0.05
116	-0.47	0.09	329.68	3.06	0.29	-0.47	0.02	348.94	3.06	0.08
117	-0.90	0.07	327.99	1.65	0.22	-0.90	0.01	346.17	1.64	0.04
118	-1.06	0.02	314.26	1.10	0.05	-1.06	0.00	273.50	1.11	0.00
119	-0.91	0.05	159.48	1.62	0.15	-0.91	0.00	175.43	1.60	0.01
120	-0.57	0.07	156.67	2.73	0.22	-0.57	0.01	170.58	2.73	0.04

100-year storm

Time R.S. = 1 Node = s5n6

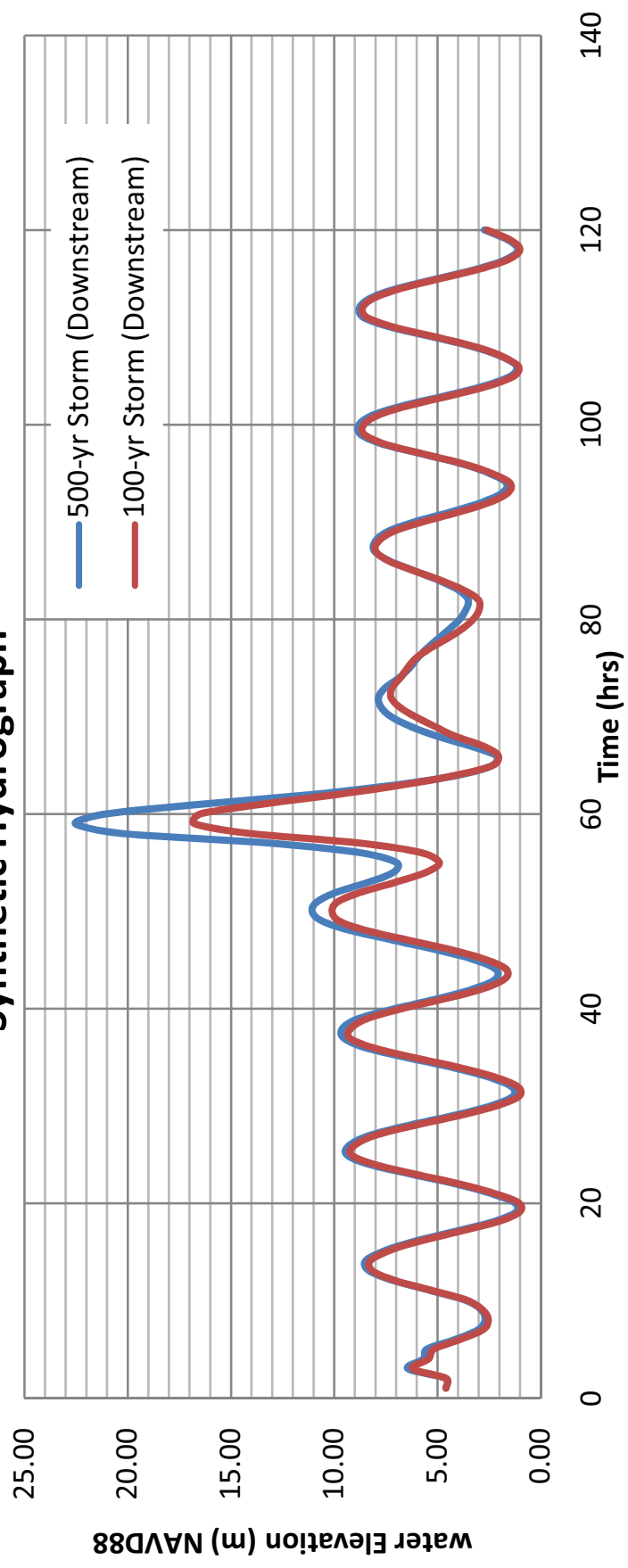
R.S. = 6 Node = s6n4

(hrs)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)
1	0.00	0.00	0.00	4.59	0.00	0.00	0.00	0.00	4.59	0.00
2	0.00	0.00	151.21	4.60	0.00	0.00	0.00	173.36	4.59	0.00
3	0.49	0.01	185.70	6.21	0.03	0.50	0.01	358.77	6.25	0.03
4	0.26	0.00	350.62	5.43	0.01	0.26	0.00	156.76	5.45	0.01
5	0.18	0.02	329.10	5.18	0.05	0.18	0.00	137.54	5.19	0.00
6	-0.21	0.10	330.39	3.91	0.34	-0.20	0.02	350.84	3.92	0.06
7	-0.55	0.01	314.46	2.80	0.05	-0.54	0.00	227.79	2.82	0.01
8	-0.63	0.01	223.29	2.54	0.02	-0.63	0.00	332.48	2.51	0.01
9	-0.55	0.02	165.47	2.80	0.06	-0.55	0.00	176.78	2.79	0.01
10	-0.32	0.05	157.51	3.54	0.16	-0.32	0.01	175.20	3.55	0.03
11	0.19	0.09	155.50	5.21	0.28	0.18	0.01	166.64	5.19	0.04
12	0.73	0.05	154.30	6.97	0.15	0.72	0.01	171.24	6.96	0.02
13	1.08	0.03	152.05	8.12	0.11	1.07	0.01	171.34	8.11	0.02
14	1.13	0.01	341.57	8.30	0.03	1.14	0.00	342.59	8.32	0.01
15	0.89	0.05	332.28	7.50	0.16	0.88	0.01	351.58	7.49	0.04
16	0.44	0.09	329.47	6.04	0.28	0.45	0.01	356.70	6.05	0.04
17	-0.14	0.11	330.32	4.14	0.37	-0.14	0.03	353.26	4.13	0.08
18	-0.72	0.10	328.12	2.24	0.32	-0.72	0.02	352.43	2.23	0.06
19	-1.07	0.03	321.76	1.08	0.11	-1.07	0.02	355.10	1.08	0.06
20	-1.08	0.02	164.33	1.04	0.05	-1.08	0.00	326.42	1.06	0.00
21	-0.72	0.08	156.56	2.24	0.25	-0.71	0.01	174.72	2.26	0.04
22	-0.19	0.09	156.02	3.98	0.30	-0.19	0.01	172.69	3.97	0.04
23	0.47	0.09	154.73	6.13	0.28	0.47	0.01	170.61	6.12	0.04
24	1.07	0.05	150.13	8.09	0.15	1.07	0.01	166.40	8.10	0.03
25	1.40	0.01	136.80	9.19	0.04	1.41	0.00	187.94	9.20	0.01
26	1.34	0.03	334.17	8.99	0.09	1.34	0.00	338.51	9.00	0.01
27	1.04	0.06	334.14	7.99	0.21	1.03	0.02	350.12	7.98	0.05
28	0.46	0.07	328.38	6.11	0.23	0.46	0.01	4.86	6.10	0.04
29	-0.20	0.10	329.00	3.95	0.33	-0.20	0.02	352.61	3.93	0.06
30	-0.74	0.07	327.31	2.16	0.24	-0.75	0.03	351.41	2.13	0.08
31	-1.08	0.04	323.79	1.05	0.14	-1.08	0.02	358.60	1.05	0.06
32	-1.06	0.03	159.77	1.13	0.11	-1.05	0.00	182.65	1.14	0.00
33	-0.70	0.07	157.12	2.29	0.23	-0.70	0.01	183.92	2.29	0.02
34	-0.16	0.09	155.60	4.06	0.29	-0.16	0.01	172.96	4.06	0.04
35	0.50	0.09	153.87	6.24	0.29	0.51	0.02	170.49	6.25	0.06
36	1.09	0.06	149.96	8.17	0.18	1.09	0.01	170.91	8.16	0.03
37	1.43	0.01	116.82	9.27	0.02	1.43	0.01	165.48	9.27	0.02
38	1.40	0.02	338.31	9.18	0.07	1.40	0.00	4.42	9.18	0.01
39	1.15	0.04	334.93	8.36	0.12	1.14	0.01	353.80	8.34	0.02
40	0.64	0.07	328.72	6.70	0.21	0.65	0.01	2.65	6.71	0.04
41	0.02	0.08	328.68	4.65	0.26	0.02	0.01	357.95	4.66	0.04
42	-0.53	0.07	328.83	2.87	0.23	-0.53	0.02	346.23	2.87	0.05
43	-0.86	0.03	322.08	1.77	0.10	-0.85	0.01	351.62	1.81	0.02
44	-0.90	0.04	156.83	1.66	0.13	-0.88	0.00	200.61	1.69	0.01
45	-0.60	0.08	156.58	2.62	0.28	-0.60	0.02	176.32	2.63	0.06
46	-0.10	0.07	155.77	4.26	0.23	-0.10	0.01	172.00	4.27	0.04
47	0.54	0.08	154.76	6.35	0.26	0.54	0.01	162.96	6.37	0.03
48	1.17	0.05	149.71	8.42	0.17	1.17	0.02	169.78	8.44	0.05

49	1.58	0.01	115.75	9.77	0.02	1.58	0.00	159.21	9.78	0.01
50	1.68	0.01	8.17	10.11	0.03	1.68	0.00	353.11	10.10	0.01
51	1.59	0.01	332.68	9.81	0.04	1.59	0.00	332.11	9.81	0.00
52	1.24	0.05	332.92	8.65	0.16	1.24	0.00	336.34	8.66	0.01
53	0.73	0.07	330.72	7.00	0.23	0.73	0.01	357.27	7.00	0.04
54	0.29	0.05	325.40	5.56	0.16	0.30	0.01	15.66	5.56	0.02
55	0.10	0.01	296.48	4.91	0.04	0.10	0.01	355.83	4.93	0.04
56	0.35	0.07	157.43	5.75	0.24	0.35	0.01	170.50	5.75	0.02
57	1.28	0.13	155.09	8.77	0.41	1.28	0.03	171.81	8.80	0.10
58	2.91	0.11	154.32	14.13	0.37	2.91	0.02	161.96	14.12	0.07
59	3.72	0.06	149.78	16.78	0.18	3.72	0.02	171.07	16.80	0.05
60	3.63	0.03	327.12	16.49	0.08	3.62	0.00	353.29	16.47	0.01
61	2.72	0.08	331.32	13.50	0.26	2.73	0.02	356.76	13.53	0.06
62	1.60	0.12	330.02	9.85	0.38	1.60	0.02	356.14	9.82	0.07
63	0.62	0.08	326.32	6.64	0.28	0.62	0.01	336.66	6.62	0.04
64	-0.17	0.07	328.51	4.05	0.23	-0.17	0.01	326.15	4.03	0.03
65	-0.70	0.04	325.51	2.30	0.12	-0.69	0.00	256.19	2.34	0.01
66	-0.77	0.03	162.70	2.06	0.09	-0.77	0.00	239.05	2.08	0.01
67	-0.54	0.05	158.59	2.82	0.16	-0.54	0.00	228.69	2.82	0.01
68	-0.13	0.06	158.29	4.18	0.18	-0.12	0.00	186.54	4.19	0.01
69	0.17	0.04	156.47	5.15	0.14	0.18	0.00	167.52	5.18	0.01
70	0.46	0.05	155.88	6.09	0.15	0.46	0.00	165.92	6.09	0.01
71	0.69	0.03	156.52	6.86	0.09	0.69	0.00	140.11	6.87	0.01
72	0.81	0.01	154.55	7.26	0.02	0.82	0.00	34.45	7.28	0.01
73	0.79	0.02	333.39	7.19	0.07	0.79	0.01	3.88	7.18	0.02
74	0.67	0.01	324.14	6.80	0.04	0.67	0.01	5.64	6.79	0.02
75	0.57	0.01	326.01	6.46	0.04	0.57	0.01	345.68	6.46	0.03
76	0.45	0.02	331.14	6.05	0.07	0.44	0.01	350.34	6.04	0.03
77	0.24	0.04	332.39	5.37	0.13	0.24	0.00	109.08	5.38	0.01
78	-0.01	0.04	331.14	4.56	0.14	-0.01	0.01	10.63	4.57	0.02
79	-0.23	0.04	329.25	3.82	0.13	-0.23	0.01	348.09	3.84	0.04
80	-0.41	0.02	323.99	3.26	0.06	-0.40	0.00	344.22	3.28	0.01
81	-0.49	0.01	298.75	2.99	0.02	-0.50	0.00	5.44	2.97	0.01
82	-0.48	0.01	174.15	3.02	0.02	-0.48	0.00	342.98	3.01	0.01
83	-0.26	0.04	157.37	3.74	0.14	-0.26	0.00	160.67	3.75	0.01
84	0.08	0.05	155.10	4.84	0.17	0.08	0.01	170.35	4.84	0.03
85	0.48	0.05	155.16	6.18	0.15	0.49	0.01	167.23	6.19	0.02
86	0.85	0.05	153.77	7.38	0.15	0.85	0.01	167.47	7.38	0.03
87	1.04	0.01	146.94	8.00	0.03	1.04	0.00	134.05	7.99	0.00
88	1.00	0.02	334.05	7.87	0.07	1.00	0.01	351.24	7.87	0.02
89	0.78	0.03	329.49	7.16	0.10	0.79	0.01	357.93	7.18	0.03
90	0.35	0.06	330.24	5.73	0.20	0.35	0.01	354.40	5.75	0.04
91	-0.18	0.08	329.58	3.99	0.27	-0.18	0.02	356.39	4.00	0.06
92	-0.64	0.06	327.51	2.49	0.18	-0.64	0.01	345.23	2.48	0.05
93	-0.92	0.03	322.79	1.59	0.09	-0.92	0.01	355.29	1.58	0.03
94	-0.94	0.03	157.47	1.50	0.09	-0.94	0.00	337.07	1.52	0.01
95	-0.67	0.06	156.77	2.39	0.19	-0.67	0.01	173.10	2.38	0.03
96	-0.24	0.08	155.85	3.80	0.27	-0.25	0.01	171.73	3.79	0.04
97	0.35	0.09	155.11	5.72	0.28	0.34	0.02	171.46	5.72	0.05
98	0.91	0.06	151.10	7.56	0.19	0.91	0.01	163.59	7.58	0.03
99	1.21	0.01	138.76	8.56	0.05	1.21	0.00	162.70	8.55	0.01
100	1.22	0.01	347.16	8.58	0.03	1.21	0.00	58.79	8.57	0.00
101	0.99	0.03	332.30	7.85	0.09	0.99	0.01	356.78	7.85	0.02
102	0.53	0.08	330.30	6.31	0.25	0.53	0.01	0.00	6.32	0.04
103	-0.08	0.08	328.45	4.32	0.26	-0.07	0.01	344.54	4.35	0.03
104	-0.64	0.08	329.57	2.50	0.27	-0.63	0.02	353.55	2.52	0.07
105	-1.01	0.04	327.37	1.30	0.14	-1.00	0.01	352.72	1.30	0.04

106	-1.07	0.01	198.15	1.09	0.02	-1.07	0.00	204.96	1.09	0.01
107	-0.83	0.05	158.85	1.87	0.17	-0.84	0.01	178.91	1.83	0.02
108	-0.43	0.09	155.34	3.18	0.29	-0.44	0.01	174.56	3.16	0.04
109	0.16	0.09	155.55	5.10	0.29	0.16	0.01	169.31	5.10	0.05
110	0.76	0.06	152.56	7.09	0.19	0.77	0.01	167.69	7.11	0.03
111	1.17	0.04	148.04	8.42	0.13	1.16	0.01	168.18	8.41	0.03
112	1.23	0.02	342.57	8.64	0.06	1.24	0.00	343.40	8.65	0.01
113	1.06	0.03	334.47	8.08	0.09	1.06	0.01	357.18	8.08	0.02
114	0.66	0.05	329.40	6.75	0.17	0.66	0.01	355.40	6.75	0.03
115	0.09	0.09	329.99	4.88	0.30	0.08	0.01	0.90	4.85	0.05
116	-0.51	0.08	328.19	2.94	0.26	-0.51	0.01	348.21	2.93	0.03
117	-0.93	0.04	325.36	1.54	0.14	-0.94	0.01	346.49	1.52	0.04
118	-1.09	0.01	191.76	1.01	0.03	-1.10	0.01	206.02	0.99	0.02
119	-0.94	0.05	157.52	1.50	0.17	-0.94	0.00	193.80	1.51	0.01
120	-0.61	0.06	156.22	2.60	0.20	-0.60	0.01	178.20	2.63	0.02

Loop Parkway over Long Creek Synthetic Hydrograph



B.2 Meadowbrook Parkway over Sloop Channel

OBJECTID	5	ApprGuar_1	0	UndWaterIn	Y60
Shape	Point	Historical	5	SpecInspe	N
StateCode	362	NavControl	1	FractCritD	208
BIN	1059129	NavVertCle	64	UndWaterDa	908
Record	1	NavHorizCl	228	SpecInspec	
Type	8	OpenPostCl	A	BridgImprC	4999
LOS	1	ServiceOnB	1	RoadImprCo	2490
RteNo	0	ServiceUnd	5	TotalCost	7489
HighwayDis	1	StructMate	3	YearEst	2008
CountyCode	59	TypeDesign	16	BordBridge	0
PlaceCode	34000	ApprMater	6	BPercenRes	0
FeaturesIn	SLOOP	ApprDesign	2	BordBIN	0
CHANNEL		NoSpansMai	1	STRAHNET	0
CritFacili		NoSpansApp	43	ParallelSt	N
Route	RTE 908E	RouteHoriz	108	DirectTraf	2
Location	NEAR EAST	MainSpanLe	283	TempStruct	
BAY IN NASSAU		StructLeng	4514	HighwaySys	1
MinVertCle	9999	SdeWlkLeft	0	FedLandsHi	0
KiloPoint	1352	SdeWlkRtWi	0	YearRecon	1993
BaseHwyNet	1	BrdgCb2Cb	213	DeckType	1
LRSRoute	0	BrdgOut2Ou	239	DeckWearTy	1
SubrouteNo		MinVertOve	9999	TypeMembr	0
LatDD	40	RefFeature	N	DeckProtec	1
LatMM	35	MinVertUn	0	ADTTruck	4
LatSS	51770	RefFeat	N	NatNetwk	0
LonDD	73	MinLatUn	999	PierAbutPr	2
LongMM	32	MinLatUnLf	0	NBISBrdgeL	Y
LongSS	3309	Deck	7	ScourCrit	3
Latitude	40.597714	SupStruct	7	FutADT	17277
Longitude	-73.542525	SubStruct	6	YearFutADT	2028
DetourLeng	16	ChannelPro	6	MinNavVert	
Toll	3	Culverts	N	FedAgeninc	NN
MainRespon	1	MethOpRate	1	WashHead	
Owner	1	OperRating	581	NoName	609
FunctClass	12	MethOpRa_1	0	Status	0
YearBuilt	1934	InventRat	327	NoName_1	0
LanesOn	6	TructEval	6		
LanesUnder	0	DeckGeo	2		
ADT	12341	UnclearVer	N		
YearADT	2008	BridgePost	5		
DesignLoad	5	WaterwayAd	5		
ApprWidth	216	ApprAlign	8		
Median	2	TypeWorkPr	34		
Skew	0	WorkBy	1		
StructFlar	1	LenImprov	4514		
BridgeRail	1	InspDate	208		
Transition	0	InspFreq	24		
ApprGuardR	0	FractCrit	Y24		

1059129.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X      X
XXXXXXXX XXXX      X      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      X

```

PROJECT DATA

Project Title: 1059129
Project File : 1059129.prj
Run Date and Time: 1/12/2012 7:47:22 AM

Project in English units

PLAN DATA

Plan Title: Plan 01
Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059129 Meadowbrook
Parkway over Sloop Channel - NYSDOT\1059129.p01

Geometry Title: 1059129
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059129
Meadowbrook Parkway over Sloop Channel - NYSDOT\1059129.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of:	Cross Sections =	25	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

GEOMETRY DATA

1059129.rep

Geometry Title: 1059129

Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059129 Meadowbrook Parkway over Sloop Channel - NYSDOT\1059129.g01

CROSS SECTION

RIVER: Sloop
REACH: Sloop

RS: 4

INPUT

Description: Two Bridge Lengths Upstream

Station	Elevation	Data	num=	14	Station	Elevation	Station	Elevation	Station	Elevation
0	9	302	8	491	7	730	6	781	5	
925	4	1112	3	1314	2	1449	1	1623	0	
2000	-5	2552	-25	4000	-25	4308	0			

Manning's n	Values	num=	3	Station	n Val
0	.035	1623	.02	4308	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1623	4308		166.67	198.67	202.22	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.81	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.035	0.020
W.S. Elev (ft)	16.80	Reach Len. (ft)	166.67	198.67
202.22				
Crit W.S. (ft)		Flow Area (sq ft)	19350.90	94380.49
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	19350.90	94380.49
Q Total (cfs)	-90166.90	Flow (cfs)	-4866.94	-85299.96
Top width (ft)	4308.00	Top width (ft)	1623.00	2685.00
Vel Total (ft/s)	-0.79	Avg. Vel. (ft/s)	-0.25	-0.90
Max Chl Dpth (ft)	41.80	Hydr. Depth (ft)	11.92	35.15
Conv. Total (cfs)	79179770.0	Conv. (cfs)	4273887.0	
74905880.0				
Length Wtd. (ft)	196.97	Wetted Per. (ft)	1630.83	2703.21
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
Alpha	1.23	Stream Power (lb/ft s)	4308.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1593.33	8432.06
1701.98				
C & E Loss (ft)		Cum SA (acres)	167.37	249.79
122.08				

Warning: The cross-section end points had to be extended vertically for the computed
Page 2

water surface.

CROSS SECTION

RIVER: Sloop

REACH: Sloop

RS: 3.88888*

INPUT

Description:

Station Elevation Data			num= 19								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	294.25	8.01	339.58	7.78	478.39	7.07	711.26	6.12		
760.95	5.22	762.79	5.21	901.25	4.25	1083.45	3.25	1280.27	2.24		
1316.51	1.98	1411.8	1.25	1581.33	.22	1966.31	-5.55	1969.03	-5.64		
2530	-25	3888.89	-25	4195.44	0	4312	.11				

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1581.33	.02	4195.44	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1581.33	4195.44	166.67	198.67	202.22	.1		.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.82	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.80	Reach Len. (ft)	166.67	198.67
202.22				
Crit w.s. (ft)		Flow Area (sq ft)	18618.67	91363.01
1952.09				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	18618.67	91363.01
1952.09				
Q Total (cfs)	-90782.00	Flow (cfs)	-4800.59	-85397.23
-584.17				
Top Width (ft)	4312.00	Top Width (ft)	1581.33	2614.11
116.56				
Vel Total (ft/s)	-0.81	Avg. Vel. (ft/s)	-0.26	-0.93
-0.30				
Max Chl Dpth (ft)	41.80	Hydr. Depth (ft)	11.77	34.95
16.75				
Conv. Total (cfs)	77108310.0	Conv. (cfs)	4077521.0	
72534610.0 496185.1				
Length wtd. (ft)	197.03	Wetted Per. (ft)	1589.16	2615.51
133.25				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.26	Stream Power (lb/ft s)	4312.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1520.69	8008.48
1697.45				
C & E Loss (ft)		Cum SA (acres)	161.24	237.71
121.81				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop

RS: 3.77777*

INPUT

Description:

Station Elevation Data			num= 19								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	286.49	8.03	330.63	7.81	465.79	7.15	692.52	6.25		
740.9	5.45	742.69	5.43	877.51	4.5	1054.9	3.5	1246.53	2.49		
1281.82	2.23	1374.6	1.51	1539.67	.44	1932.63	-6.09	1935.41	-6.19		
2508	-25	3777.78	-25	4082.89	0	4316	.22				

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1539.67	.02	4082.89	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1539.67	4082.89		166.67 198.67	202.22	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.82	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.81	Reach Len. (ft)	166.67	198.67
202.22				
Crit w.s. (ft)		Flow Area (sq ft)	17891.76	88354.08
3891.79				
E.G. slope (ft/ft)	0.000001	Area (sq ft)	17891.76	88354.08
3891.79				
Q Total (cfs)	-91397.80	Flow (cfs)	-4746.90	-85390.86
-1260.04				
Top width (ft)	4316.00	Top width (ft)	1539.67	2543.22
233.11				
Vel Total (ft/s)	-0.83	Avg. vel. (ft/s)	-0.27	-0.97
-0.32				
Max Chl Dpth (ft)	41.81	Hydr. Depth (ft)	11.62	34.74
16.70				
Conv. Total (cfs)	74780220.0	Conv. (cfs)	3883840.0	
69865430.0 1030946.0				
Length Wtd. (ft)	197.09	wetted Per. (ft)	1547.50	2544.61
249.70				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.27	Stream Power (lb/ft s)	4316.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1450.85	7598.65
1683.89				
C & E Loss (ft)		Cum SA (acres)	155.27	225.95
121.00				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop

RS: 3.66666*

INPUT

Description:

Station Elevation Data				num= 19							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	278.74	8.04	321.69	7.84	453.18	7.22	673.78	6.37		
720.85	5.67	722.59	5.66	853.76	4.75	1026.36	3.75	1212.8	2.73		
1247.13	2.48	1337.4	1.76	1498	.67	1898.94	-6.64	1901.78	-6.73		
2486	-25	3666.67	-25	3970.33	0	4320	.33				

Manning's n Values				num= 3			
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1498	.02	3970.33	.035		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1498	3970.33		166.67	198.67	202.22	.1
							.3

CROSS SECTION OUTPUT Profile #Max WS

		Element	Left OB	Channel
E.G. Elev (ft)	16.82			
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.81	Reach Len. (ft)	166.67	198.67
202.22				
Crit W.S. (ft)		Flow Area (sq ft)	17183.32	85350.91
5819.42				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	17183.32	85350.91
5819.42				
Q Total (cfs)	-92014.30	Flow (cfs)	-4695.06	-85336.14
-1983.09				
Top width (ft)	4320.00	Top width (ft)	1498.00	2472.33
349.67				
Vel Total (ft/s)	-0.85	Avg. Vel. (ft/s)	-0.27	-1.00
-0.34				
Max Chl Dpth (ft)	41.81	Hydr. Depth (ft)	11.47	34.52
16.64				
Conv. Total (cfs)	72466140.0	Conv. (cfs)	3697609.0	
67206740.0				
Length wtd. (ft)	197.14	Wetted Per. (ft)	1505.83	2473.71
366.15				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.29	Stream Power (lb/ft s)	4320.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1383.74	7202.53
1661.35				
C & E Loss (ft)		Cum SA (acres)	149.46	214.51
119.65				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop

REACH: Sloop RS: 3.55555* 1059129.rep

INPUT

Description:

Station Elevation Data			num= 19								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	270.99	8.06	312.74	7.86	440.58	7.3	655.04	6.5		
700.8	5.89	702.49	5.88	830.01	5	997.81	4.01	1179.06	2.98		
1212.44	2.74	1300.2	2.01	1456.33	.89	1865.26	-7.18	1868.15	-7.28		
2464	-25	3555.56	-25	3857.78	0	4324	.44				

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1456.33	.02	3857.78	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1456.33	3857.78		166.67	198.67	202.22	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.83	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.81	Reach Len. (ft)	166.67	198.67
202.22				
Crit w.s. (ft)		Flow Area (sq ft)	16481.65	82359.53
7734.67				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	16481.65	82359.53
7734.67				
Q Total (cfs)	-92631.40	Flow (cfs)	-4639.65	-85236.08
-2755.67				
Top width (ft)	4324.00	Top width (ft)	1456.33	2401.45
466.22				
Vel Total (ft/s)	-0.87	Avg. Vel. (ft/s)	-0.28	-1.03
-0.36				
Max Chl Dpth (ft)	41.81	Hydr. Depth (ft)	11.32	34.30
16.59				
Conv. Total (cfs)	70168370.0	Conv. (cfs)	3514536.0	
64566410.0				
2087425.0				
Length wtd. (ft)	197.20	Wetted Per. (ft)	1464.17	2402.83
482.59				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.31	Stream Power (lb/ft s)	4324.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1319.34	6820.08
1629.89				
C & E Loss (ft)		Cum SA (acres)	143.81	203.40
117.75				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
REACH: Sloop RS: 3.44444*

INPUT

Description:

Station Elevation Data			num= 19								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	263.23	8.07	303.79	7.89	427.97	7.37	636.29	6.62		
680.75	6.11	682.4	6.11	806.26	5.25	969.26	4.26	1145.33	3.22		
1177.76	2.99	1263	2.27	1414.67	1.11	1831.57	-7.73	1834.52	-7.82		
2442	-25	3444.44	-25	3745.22	0	4328	.56				

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1414.67	.02	3745.22	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1414.67	3745.22		166.67 198.67	202.22	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.83	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.81	Reach Len. (ft)	166.67	198.67
202.22				
Crit w.s. (ft)		Flow Area (sq ft)	15798.06	79375.26
9634.94				
E.G. slope (ft/ft)	0.000002	Area (sq ft)	15798.06	79375.26
9634.94				
Q Total (cfs)	-93249.30	Flow (cfs)	-4586.08	-85082.91
-3580.30				
Top width (ft)	4328.00	Top width (ft)	1414.67	2330.55
582.78				
Vel Total (ft/s)	-0.89	Avg. vel. (ft/s)	-0.29	-1.07
-0.37				
Max Chl Dpth (ft)	41.81	Hydr. Depth (ft)	11.17	34.06
16.53				
Conv. Total (cfs)	67883980.0	Conv. (cfs)	3338595.0	
61938980.0 2606403.0				
Length Wtd. (ft)	197.26	Wetted Per. (ft)	1422.51	2331.93
599.03				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.34	Stream Power (lb/ft s)	4328.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1257.58	6451.26
1589.57				
C & E Loss (ft)		Cum SA (acres)	138.31	192.61
115.32				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 3.33333*

INPUT
 Description:

1059129.rep
 num= 19
 Station Elevation Data

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	255.48	8.09	294.84	7.92	415.37	7.45	617.55	6.75
660.7	6.34	662.3	6.33	782.52	5.5	940.71	4.51	1111.6	3.46
1143.07	3.24	1225.8	2.52	1373	1.33	1797.89	-8.28	1800.89	-8.37
2420	-25	3333.33	-25	3632.67	0	4332	.67		

Manning's n Values
 num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1373	.02	3632.67	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 1373 3632.67 166.67 198.67 202.22 .1 .3

CROSS SECTION OUTPUT Profile #Max WS

Element	Left OB	Channel
E.G. Elev (ft)	16.83	
Right OB		
Vel Head (ft)	0.02	
0.035		
W.S. Elev (ft)	16.82	
202.22		
Crit W.S. (ft)		
11525.16		
E.G. Slope (ft/ft)	0.000002	
11525.16		
Q Total (cfs)	-93867.80	
-4464.44		
Top width (ft)	4332.00	
699.33		
Vel Total (ft/s)	-0.91	
-0.39		
Max Chl Dpth (ft)	41.82	
16.48		
Conv. Total (cfs)	65618260.0	
59330660.0 3120868.0		
Length wtd. (ft)	197.33	
715.48		
Min Ch El (ft)	-25.00	
0.00		
Alpha	1.36	
0.00		
Frctn Loss (ft)	0.00	
1540.45		
C & E Loss (ft)		
112.34		

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 3.22222*

INPUT

Description:

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	255.48	8.09	294.84	7.92	415.37	7.45	617.55	6.75
660.7	6.34	662.3	6.33	782.52	5.5	940.71	4.51	1111.6	3.46
1143.07	3.24	1225.8	2.52	1373	1.33	1797.89	-8.28	1800.89	-8.37
2420	-25	3333.33	-25	3632.67	0	4332	.67		

1059129.rep

0	9	247.73	8.1	285.9	7.95	402.76	7.52	598.81	6.87
640.65	6.56	642.2	6.55	758.77	5.75	912.16	4.76	1077.86	3.71
1108.38	3.49	1188.6	2.77	1331.33	1.56	1764.2	-8.82	1767.26	-8.91
2398	-25	3222.22	-25	3520.11	0	4336	.78		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1331.33	.02	3520.11	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1331.33	3520.11		166.67	198.67		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.84	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.82	Reach Len. (ft)	166.67	198.67
202.22				
Crit w.s. (ft)		Flow Area (sq ft)	14465.38	73432.30
13403.30				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	14465.38	73432.30
13403.30				
Q Total (cfs)	-94487.10	Flow (cfs)	-4475.30	-84598.53
-5413.26				
Top Width (ft)	4336.00	Top width (ft)	1331.33	2188.78
815.89				
Vel Total (ft/s)	-0.93	Avg. Vel. (ft/s)	-0.31	-1.15
-0.40				
Max Chl Dpth (ft)	41.82	Hydr. Depth (ft)	10.87	33.55
16.43				
Conv. Total (cfs)	63358240.0	Conv. (cfs)	3000911.0	
56727470.0				
3629857.0				
Length wtd. (ft)	197.39	Wetted Per. (ft)	1339.17	2190.16
831.93				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.38	Stream Power (lb/ft s)	4336.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1141.82	5754.33
1482.59				
C & E Loss (ft)		Cum SA (acres)	127.81	171.99
108.83				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 3.11111*

INPUT

Description:

Station	Elevation	Data	num=	19
Sta	Elev	Sta	Elev	Sta
0	9	239.97	8.12	276.95
620.6	6.78	622.1	6.78	735.02
				7.97
				390.16
				6
				883.62
				7.6
				580.07
				7
				3.95

1059129.rep
 1073.69 3.75 1151.4 3.03 1289.67 1.78 1730.51 -9.37 1733.63 -9.46
 2376 -25 3111.11 -25 3407.56 0 4340 .89
 Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .035 1289.67 .02 3407.56 .035
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 1289.67 3407.56 166.67 198.67 202.22 .1 .3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.84	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.82	Reach Len. (ft)	166.67	198.67
202.22				
Crit w.s. (ft)		Flow Area (sq ft)	13815.52	70477.49
15269.06				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	13815.52	70477.49
15269.06				
Q Total (cfs)	-95107.10	Flow (cfs)	-4417.25	-84258.29
-6431.57				
Top width (ft)	4340.00	Top width (ft)	1289.67	2117.89
932.44				
Vel Total (ft/s)	-0.96	Avg. vel. (ft/s)	-0.32	-1.20
-0.42				
Max Chl Dpth (ft)	41.82	Hydr. Depth (ft)	10.71	33.28
16.38				
Conv. Total (cfs)	61121180.0	Conv. (cfs)	2838776.0	
54149120.0 4133286.0				
Length Wtd. (ft)	197.46	wetted Per. (ft)	1297.51	2119.27
948.37				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.41	Stream Power (lb/ft s)	4340.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	1087.71	5426.16
1416.04				
C & E Loss (ft)		Cum SA (acres)	122.79	162.17
104.77				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 3

INPUT

Description: One Bridge Length Upstream

Station	Elevation	Data	num=	10					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	268	8	602	7	1039	4	1248	2
1700	-10	2354	-25	3000	-25	3295	0	4344	1

Manning's n Values num= 3

				1059129.rep			
Sta	n Val	Sta	n Val	Sta	n Val		
0	.035	1248	.02	3295	.035		
Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1248	3295		281.25 179.38	196.25	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.84	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.82	Reach Len. (ft)	281.25	179.38
196.25				
Crit w.s. (ft)		Flow Area (sq ft)	13181.53	67527.05
17122.77				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	13181.53	67527.05
17122.77				
Q Total (cfs)	-95727.90	Flow (cfs)	-4360.56	-83839.65
-7527.69				
Top width (ft)	4344.00	Top width (ft)	1248.00	2047.00
1049.00				
Vel Total (ft/s)	-0.98	Avg. Vel. (ft/s)	-0.33	-1.24
-0.44				
Max Chl Dpth (ft)	41.82	Hydr. Depth (ft)	10.56	32.99
16.32				
Conv. Total (cfs)	58894620.0	Conv. (cfs)	2682744.0	
51580620.0 4631254.0				
Length wtd. (ft)	185.08	Wetted Per. (ft)	1255.85	2048.39
1064.82				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.43	Stream Power (lb/ft s)	4344.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1036.07	5111.45
1340.85				
C & E Loss (ft)		Cum SA (acres)	117.94	152.67
100.17				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 2.875*

INPUT

Description:

Station Elevation Data		num=	57								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.88	262.74	8.17	581.51	7.52	590.18	7.49	873.43	5.39		
1018.6	4.97	1145.58	4.29	1223.5	1.75	1232.15	.35	1261.57	-.8		
1290.98	-1.87	1320.4	-2.45	1349.81	-3.02	1379.23	-3.51	1408.64	-4.22		
1438.06	-4.8	1467.47	-5.43	1496.89	-6.17	1526.3	-7.09	1555.72	-8.02		
1585.13	-8.76	1614.55	-9.36	1643.96	-9.98	1673.38	-10.72	1685.79	-11.07		
1702.79	-11.5	1732.21	-12.16	1761.63	-12.75	1791.04	-13.34	1820.46	-14.03		
1849.87	-14.52	1879.29	-14.74	1905.24	-14.51	1985.27	-16.52	2011.22	-18.04		
2040.64	-19.19	2069.19	-19.95	2097.74	-20.78	2126.29	-21.41	2154.84	-21.87		

1059129.rep

2183.39	-22.4	2211.94	-23.03	2240.49	-23.46	2269.04	-23.95	2297.59	-24.96
2326.14	-25.73	2354.69	-26.38	2919.94	-26.38	2935.47	-25.4	2951.01	-24.23
2966.54	-22.96	2982.08	-21.42	2997.62	-17.58	3271.38	0	3387.96	.6
3623.22	.92	4313.25	1.62						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1223.5	.02	3271.38	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1223.5	3271.38		281.25	179.38	196.25	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.85	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.83	Reach Len. (ft)	281.25	179.38
196.25				
Crit w.s. (ft)		Flow Area (sq ft)	12382.86	68385.16
16441.48				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	12382.86	68385.16
16441.48				
Q Total (cfs)	-96412.50	Flow (cfs)	-3971.44	-85388.20
-7052.87				
Top Width (ft)	4313.25	Top width (ft)	1223.50	2047.88
1041.87				
Vel Total (ft/s)	-0.99	Avg. Vel. (ft/s)	-0.32	-1.25
-0.43				
Max Chl Dpth (ft)	43.21	Hydr. Depth (ft)	10.12	33.39
15.78				
Conv. Total (cfs)	59455400.0	Conv. (cfs)	2449095.0	
52656960.0	4349343.0			
Length wtd. (ft)	184.57	Wetted Per. (ft)	1231.50	2049.60
1057.08				
Min Ch El (ft)	-26.38	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.42	Stream Power (lb/ft s)	4313.25	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	953.54	4831.61
1265.24				
C & E Loss (ft)		Cum SA (acres)	109.96	144.24
95.46				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 2.75*

INPUT

Description:

Station	Elevation Data	num=	57						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.75	257.48	8.34	569.87	8.02	578.36	7.98	855.94	5.76
998.21	5.93	1122.64	5.82	1199	1.5	1207.84	-1.07	1237.91	-2.61

1059129.rep

1267.98	-3.99	1298.05	-4.39	1328.12	-4.76	1358.2	-4.98	1388.27	-5.63
1418.34	-6.03	1448.41	-6.53	1478.48	-7.25	1508.55	-8.32	1538.62	-9.42
1568.69	-10.14	1598.76	-10.57	1628.83	-11.04	1658.9	-11.76	1671.59	-12.14
1688.97	-12.61	1719.04	-13.28	1749.11	-13.8	1779.18	-14.32	1809.25	-15.04
1839.32	-15.36	1869.39	-15.13	1895.92	-14.09	1977.73	-16.31	2004.26	-18.78
2034.33	-20.42	2063.52	-21.3	2092.7	-22.33	2121.89	-22.94	2151.07	-23.22
2180.26	-23.65	2209.45	-24.25	2238.63	-24.48	2267.82	-24.81	2297	-26.19
2326.19	-27.1	2355.38	-27.75	2839.88	-27.75	2857.91	-26.9	2875.94	-25.67
2893.97	-24.24	2912	-22.26	2930.03	-15.68	3247.75	0	3363.53	1.08
3597.19	1.5	4282.5	2.25						

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .035 1199 .02 3247.75 .035		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
1199 3247.75	281.25 179.38 196.25	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.85	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.83	Reach Len. (ft)	281.25	179.38
196.25				
Crit w.s. (ft)		Flow Area (sq ft)	11607.26	69006.91
15766.44				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	11607.26	69006.91
15766.44				
Q Total (cfs)	-97095.40	Flow (cfs)	-3622.12	-86847.84
-6625.44				
Top width (ft)	4282.50	Top width (ft)	1199.00	2048.75
1034.75				
Vel Total (ft/s)	-1.01	Avg. Vel. (ft/s)	-0.31	-1.26
-0.42				
Max Chl Dpth (ft)	44.58	Hydr. Depth (ft)	9.68	33.68
15.24				
Conv. Total (cfs)	59729760.0	Conv. (cfs)	2228201.0	
53425810.0 4075743.0				
Length wtd. (ft)	184.11	Wetted Per. (ft)	1207.21	2051.41
1049.34				
Min Ch El (ft)	-27.75	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.41	Stream Power (lb/ft s)	4282.50	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	876.09	4548.72
1192.69				
C & E Loss (ft)		Cum SA (acres)	102.14	135.81
90.78				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 2.625*

INPUT

Description:

Station Elevation Data num= 57									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.62	252.22	8.51	558.22	8.52	566.55	8.47	838.45	6.14
977.81	6.9	1099.7	7.35	1174.5	1.25	1183.54	-2.49	1214.26	-4.43
1244.99	-6.11	1275.71	-6.33	1306.44	-6.5	1337.16	-6.46	1367.89	-7.04
1398.61	-7.26	1429.34	-7.62	1460.06	-8.33	1490.79	-9.55	1521.51	-10.82
1552.24	-11.52	1582.96	-11.77	1613.69	-12.1	1644.41	-12.8	1657.38	-13.21
1675.14	-13.73	1705.86	-14.4	1736.59	-14.85	1767.31	-15.3	1798.04	-16.05
1828.76	-16.2	1859.49	-15.53	1886.6	-13.68	1970.19	-16.11	1997.3	-19.51
2028.03	-21.65	2057.85	-22.65	2087.67	-23.88	2117.49	-24.47	2147.31	-24.57
2177.13	-24.89	2206.96	-25.48	2236.78	-25.5	2266.6	-25.68	2296.42	-27.43
2326.24	-28.47	2356.06	-29.13	2759.81	-29.13	2780.34	-28.4	2800.86	-27.11
2821.39	-25.52	2841.91	-23.1	2862.44	-13.79	3224.12	0	3339.11	1.57
3571.16	2.09	4251.75	2.88						

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1174.5	.02	3224.12	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1174.5	3224.12		281.25	179.38	196.25	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.86	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.83	Reach Len. (ft)	281.25	179.38
196.25				
Crit w.s. (ft)		Flow Area (sq ft)	10849.75	69411.27
15092.76				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	10849.75	69411.27
15092.76				
Q Total (cfs)	-97773.30	Flow (cfs)	-3303.40	-88236.48
-6233.42				
Top Width (ft)	4251.75	Top Width (ft)	1174.50	2049.62
1027.63				
Vel Total (ft/s)	-1.03	Avg. Vel. (ft/s)	-0.30	-1.27
-0.41				
Max Chl Dpth (ft)	45.96	Hydr. Depth (ft)	9.24	33.87
14.69				
Conv. Total (cfs)	59735960.0	Conv. (cfs)	2018257.0	
53909310.0 3808398.0				
Length wtd. (ft)	183.70	Wetted Per. (ft)	1182.98	2053.65
1041.60				
Min Ch El (ft)	-29.13	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.40	Stream Power (lb/ft s)	4251.75	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	803.59	4263.71
1123.17				
C & E Loss (ft)		Cum SA (acres)	94.48	127.37
86.13				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop

RS: 2.5*

INPUT

Description:

Station Elevation Data				num=	57				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.5	246.96	8.68	546.58	9.01	554.73	8.96	820.96	6.51
957.41	7.87	1076.76	8.88	1150	1	1159.23	-3.92	1190.61	-6.24
1221.99	-8.23	1253.37	-8.26	1284.75	-8.24	1316.13	-7.93	1347.51	-8.46
1378.89	-8.49	1410.27	-8.72	1441.65	-9.4	1473.03	-10.79	1504.41	-12.22
1535.79	-12.9	1567.17	-12.98	1598.55	-13.16	1629.93	-13.84	1643.17	-14.28
1661.31	-14.85	1692.69	-15.53	1724.07	-15.91	1755.45	-16.29	1786.83	-17.06
1818.21	-17.04	1849.59	-15.92	1877.28	-13.27	1962.65	-15.91	1990.34	-20.25
2021.72	-22.88	2052.18	-24	2082.64	-25.42	2113.09	-25.99	2143.55	-25.91
2174.01	-26.13	2204.46	-26.7	2234.92	-26.52	2265.38	-26.54	2295.84	-28.66
2326.29	-29.83	2356.75	-30.5	2679.75	-30.5	2702.77	-29.9	2725.79	-28.55
2748.81	-26.8	2771.83	-23.94	2794.85	-11.89	3200.5	0	3314.69	2.06
3545.12	2.67	4221	3.5						

Manning's n Values				num=	3		
Sta	n Val	Sta	n Val	Sta	n Val		
0	.035	1150	.02	3200.5	.035		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1150	3200.5		281.25	179.38	196.25	.1 .3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.86	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.84	Reach Len. (ft)	281.25	179.38
196.25				
Crit W.S. (ft)		Flow Area (sq ft)	10116.17	69582.83
14434.58				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	10116.17	69582.83
14434.58				
Q Total (cfs)	-98446.50	Flow (cfs)	-3014.81	-89548.68
-5883.02				
Top width (ft)	4221.00	Top width (ft)	1150.00	2050.50
1020.50				
Vel Total (ft/s)	-1.05	Avg. Vel. (ft/s)	-0.30	-1.29
-0.41				
Max Chl Dpth (ft)	47.34	Hydr. Depth (ft)	8.80	33.93
14.14				
Conv. Total (cfs)	59460280.0	Conv. (cfs)	1820901.0	
54086120.0 3553260.0				
Length wtd. (ft)	183.33	Wetted Per. (ft)	1158.78	2056.24
1033.86				
Min Ch El (ft)	-30.50	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.39	Stream Power (lb/ft s)	4221.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	735.91	3977.52
1056.66				
C & E Loss (ft)		Cum SA (acres)	86.97	118.93
81.52				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
REACH: Sloop

RS: 2.375*

INPUT

Description:

Station Elevation Data			num= 57						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.38	241.69	8.85	534.93	9.51	542.91	9.44	803.47	6.88
937.01	8.83	1053.82	10.41	1125.5	.75	1134.92	-5.34	1166.96	-8.05
1198.99	-10.35	1231.03	-10.2	1263.06	-9.99	1295.1	-9.4	1327.13	-9.87
1359.17	-9.72	1391.2	-9.82	1423.24	-10.48	1455.27	-12.02	1487.31	-13.62
1519.34	-14.28	1551.38	-14.19	1583.41	-14.22	1615.45	-14.89	1628.97	-15.35
1647.48	-15.96	1679.52	-16.65	1711.55	-16.96	1743.59	-17.27	1775.62	-18.08
1807.66	-17.89	1839.69	-16.32	1867.96	-12.85	1955.11	-15.71	1983.38	-20.99
2015.42	-24.12	2046.51	-25.36	2077.6	-26.97	2108.69	-27.52	2139.79	-27.26
2170.88	-27.38	2201.97	-27.93	2233.07	-27.55	2264.16	-27.41	2295.25	-29.9
2326.34	-31.2	2357.44	-31.88	2599.69	-31.88	2625.2	-31.4	2650.72	-29.99
2676.23	-28.08	2701.75	-24.79	2727.26	-10	3176.88	0	3290.27	2.54
3519.09	3.25	4190.25	4.12						

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1125.5	.02	3176.88	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1125.5	3176.88		281.25	179.38	196.25	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.86	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.84	Reach Len. (ft)	281.25	179.38
196.25				
Crit w.s. (ft)		Flow Area (sq ft)	9405.20	69537.28
13785.76				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	9405.20	69537.28
13785.76				
Q Total (cfs)	-99114.80	Flow (cfs)	-2751.10	-90799.71
-5563.99				
Top width (ft)	4190.25	Top width (ft)	1125.50	2051.38
1013.37				
Vel Total (ft/s)	-1.07	Avg. Vel. (ft/s)	-0.29	-1.31
-0.40				
Max Chl Dpth (ft)	48.72	Hydr. Depth (ft)	8.36	33.90
13.60				
Conv. Total (cfs)	58920340.0	Conv. (cfs)	1635434.0	
53977310.0				
Length Wtd. (ft)	182.99	Wetted Per. (ft)	1134.65	2059.09
1026.12				
Min Ch El (ft)	-31.88	Shear (lb/sq ft)	0.00	0.01
0.00				

Alpha	1.38	1059129.rep	Stream Power (lb/ft s)	4190.25	0.00
0.00					
Frctn Loss (ft)	0.00		Cum Volume (acre-ft)	672.89	3691.08
993.09					
C & E Loss (ft)			Cum SA (acres)	79.63	110.48
76.94					

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 2.25*

INPUT

Description:

Station Elevation Data num= 57									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.25	236.43	9.02	523.29	10.01	531.09	9.93	785.98	7.25
916.62	9.8	1030.88	11.94	1101	.5	1110.61	-6.76	1143.3	-9.86
1175.99	-12.47	1208.68	-12.14	1241.38	-11.73	1274.06	-10.87	1306.76	-11.28
1339.45	-10.95	1372.14	-10.92	1404.83	-11.56	1437.52	-13.25	1470.21	-15.01
1502.9	-15.65	1535.59	-15.4	1568.28	-15.29	1600.97	-15.93	1614.76	-16.42
1633.66	-17.08	1666.35	-17.77	1699.04	-18.01	1731.73	-18.25	1764.42	-19.09
1797.11	-18.73	1829.8	-16.72	1858.64	-12.44	1947.58	-15.51	1976.42	-21.73
2009.11	-25.35	2040.84	-26.71	2072.57	-28.52	2104.3	-29.05	2136.02	-28.61
2167.75	-28.62	2199.48	-29.16	2231.21	-28.57	2262.94	-28.28	2294.67	-31.14
2326.4	-32.57	2358.12	-33.26	2519.62	-33.26	2547.64	-32.91	2575.65	-31.43
2603.66	-29.35	2631.67	-25.63	2659.68	-8.1	3153.25	0	3265.84	3.03
3493.06	3.83	4159.5	4.75						

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1101	.02	3153.25	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1101	3153.25		281.25	179.38	196.25	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.87	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.84	Reach Len. (ft)	281.25	179.38
196.25				
Crit w.s. (ft)		Flow Area (sq ft)	8714.34	69260.42
13139.64				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	8714.34	69260.42
13139.64				
Q Total (cfs)	-99778.20	Flow (cfs)	-2509.02	-91998.77
-5270.41				
Top width (ft)	4159.50	Top width (ft)	1101.00	2052.25
1006.25				
Vel Total (ft/s)	-1.10	Avg. vel. (ft/s)	-0.29	-1.33
-0.40				
Max Chl Dpth (ft)	50.10	Hydr. Depth (ft)	7.91	33.75
13.06				

Conv. Total (cfs)	58096440.0	1059129.rep	Conv. (cfs)	1460890.0
53566830.0	3068726.0			
Length wtd. (ft)	182.69	Wetted Per. (ft)	1110.58	2062.13
1018.39				
Min Ch El (ft)	-33.26	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.37	Stream Power (lb/ft s)	4159.50	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	614.39	3405.29
932.43				
C & E Loss (ft)		Cum SA (acres)	72.44	102.03
72.39				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 2.125*

INPUT

Description:

Station Elevation Data				num=	57
Sta	Elev	Sta	Elev	Sta	Elev
0	8.12	231.17	9.19	511.64	10.5
896.22	10.77	1007.94	13.47	1076.5	.25
1153	-14.59	1186.34	-14.07	1219.69	-13.47
1319.72	-12.18	1353.07	-12.01	1386.41	-12.63
1486.45	-17.03	1519.79	-16.6	1553.14	-16.35
1619.83	-18.19	1653.17	-18.89	1686.52	-19.06
1786.55	-19.57	1819.9	-17.11	1849.32	-12.02
2002.81	-26.58	2035.17	-28.06	2067.53	-30.06
2164.63	-29.87	2196.99	-30.38	2229.36	-29.59
2326.45	-33.94	2358.81	-34.63	2439.56	-34.63
2531.08	-30.63	2561.58	-26.47	2592.09	-6.21
3467.03	4.42	4128.75	5.38		

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1076.5	.02	3129.62	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1076.5	3129.62	281.25	179.38	196.25	.1	.3	

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.87	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.85	Reach Len. (ft)	281.25	179.38
196.25				
Crit w.s. (ft)		Flow Area (sq ft)	8044.54	68755.77
12498.47				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	8044.54	68755.77
12498.47				
Q Total (cfs)	-100436.00	Flow (cfs)	-2286.05	-93149.78
-5000.17				

Top width (ft)	4128.75	1059129.rep	Top Width (ft)	1076.50	2053.12
999.13					
Vel Total (ft/s)	-1.12	Avg. Vel. (ft/s)	-0.28	-1.35	
-0.40					
Max Chl Dpth (ft)	51.48	Hydr. Depth (ft)	7.47	33.49	
12.51					
Conv. Total (cfs)	56997890.0	Conv. (cfs)	1297342.0		
52862930.0 2837616.0					
Length wtd. (ft)	182.40	Wetted Per. (ft)	1086.58	2065.35	
1010.65					
Min Ch El (ft)	-34.63	Shear (lb/sq ft)	0.00	0.01	
0.00					
Alpha	1.35	Stream Power (lb/ft s)	4128.75	0.00	
0.00					
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	560.29	3121.12	
874.68					
C & E Loss (ft)		Cum SA (acres)	65.41	93.58	
67.87					

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 2

INPUT

Description: Upstream Bridge

Station	Elevation	Data	num=	52					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8	500	11	751	8	985	15	1052	0
1062	-9.61	1096	-13.49	1130	-16.71	1164	-16.01	1198	-15.21
1232	-13.81	1266	-14.11	1300	-13.41	1334	-13.11	1368	-13.71
1402	-15.71	1436	-17.81	1470	-18.41	1504	-17.81	1538	-17.41
1572	-18.01	1606	-19.31	1640	-20.01	1674	-20.11	1708	-20.21
1742	-21.11	1776	-20.41	1810	-17.51	1840	-11.61	1932.5	-15.11
1962.5	-23.21	1996.5	-27.81	2029.5	-29.41	2062.5	-31.61	2095.5	-32.11
2128.5	-31.31	2161.5	-31.11	2194.5	-31.61	2227.5	-30.61	2260.5	-30.01
2293.5	-33.61	2326.5	-35.31	2359.5	-36.01	2392.5	-35.91	2425.5	-34.31
2458.5	-31.91	2491.5	-27.31	2524.5	-4.31	3106	0	3217	4
3441	5	4098	6						

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .035	1052 .02	3106 .035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1052	3106	70	70	70	.1	.3	

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.88	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.85	Reach Len. (ft)	5.00	5.00
5.00				
Crit w.s. (ft)		Flow Area (sq ft)	7397.30	68026.29
		Page 19		

1059129.rep

11870.85				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	7397.30	68026.29
11870.85				
Q Total (cfs)	-101090.00	Flow (cfs)	-2080.33	-94253.84
-4755.83				
Top width (ft)	4098.00	Top width (ft)	1052.00	2054.00
992.00				
Vel Total (ft/s)	-1.16	Avg. Vel. (ft/s)	-0.28	-1.39
-0.40				
Max Chl Dpth (ft)	52.86	Hydr. Depth (ft)	7.03	33.12
11.97				
Conv. Total (cfs)	55637400.0	Conv. (cfs)	1144963.0	
51874950.0 2617488.0				
Length Wtd. (ft)	5.00	Wetted Per. (ft)	1062.64	2068.73
1002.92				
Min Ch El (ft)	-36.01	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.34	Stream Power (lb/ft s)	4098.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	510.44	2839.48
819.79				
C & E Loss (ft)		Cum SA (acres)	58.54	85.12
63.39				

BRIDGE

RIVER: Sloop
 REACH: Sloop RS: 1.9

INPUT

Description:

Distance from Upstream XS = 5
 Deck/Roadway Width = 60
 Weir Coefficient = 2.6
 Upstream Deck/Roadway Coordinates

num=	11													
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
985	15		15		1052	15		0		1052.1	15		11	
1470	22.6		18.6		1840	30		26		1932.5	30		26	
2227.5	24.1		20.1		2534	15		11		2535	15		-5	
3601	15		0		4098	15		0						

Upstream Bridge Cross Section Data

Station	Elevation	Data	num=	52										
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	8	500	11	751	8	985	15	1052						
1062	-9.61	1096	-13.49	1130	-16.71	1164	-16.01	1198	-15.21					
1232	-13.81	1266	-14.11	1300	-13.41	1334	-13.11	1368	-13.71					
1402	-15.71	1436	-17.81	1470	-18.41	1504	-17.81	1538	-17.41					
1572	-18.01	1606	-19.31	1640	-20.01	1674	-20.11	1708	-20.21					
1742	-21.11	1776	-20.41	1810	-17.51	1840	-11.61	1932.5	-15.11					
1962.5	-23.21	1996.5	-27.81	2029.5	-29.41	2062.5	-31.61	2095.5	-32.11					
2128.5	-31.31	2161.5	-31.11	2194.5	-31.61	2227.5	-30.61	2260.5	-30.01					
2293.5	-33.61	2326.5	-35.31	2359.5	-36.01	2392.5	-35.91	2425.5	-34.31					
2458.5	-31.91	2491.5	-27.31	2524.5	-4.31	3106	0	3217	4					
3441	5	4098	6											

Manning's n	Values	num=	3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1052	.02	3106	.035

Bank Sta: Left Right Coeff Contr. Expan.
1052 3106 .1 .3

Downstream Deck/Roadway Coordinates

num=	11													
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
985	15	15			1052	15	0			1052.1	15	11		
1470	22.6	18.6			1840	30	26			1932.5	30	26		
2227.5	24.1	20.1			2534	15	11			2535	15	-5		
3601	15	0			4098	15	0							

Downstream Bridge Cross Section Data

Station	Elevation	Data	num=	53										
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	8	500	11	751	8	985	15	1051	.224					
1052	0	1062	-9.61	1096	-13.49	1130	-16.71	1164	-16.01					
1198	-15.21	1232	-13.81	1266	-14.11	1300	-13.41	1334	-13.11					
1368	-13.71	1402	-15.71	1436	-17.81	1470	-18.41	1504	-17.81					
1538	-17.41	1572	-18.01	1606	-19.31	1640	-20.01	1674	-20.11					
1708	-20.21	1742	-21.11	1776	-20.41	1810	-17.51	1840	-11.61					
1932.5	-15.11	1962.5	-23.21	1996.5	-27.81	2029.5	-29.41	2062.5	-31.61					
2095.5	-32.11	2128.5	-31.31	2161.5	-31.11	2194.5	-31.61	2227.5	-30.61					
2260.5	-30.01	2293.5	-33.61	2326.5	-35.31	2359.5	-36.01	2392.5	-35.91					
2425.5	-34.31	2458.5	-31.91	2491.5	-27.31	2524.5	-4.31	3106	0					
3217	4	3441	5	4098	6									

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1052	.02	3106	.035

Bank Sta: Left Right Coeff Contr. Expan.
1052 3106 .1 .3

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 weir crest shape = Broad Crested

Number of Piers = 43

Pier Data

Pier Station	Upstream=	1062	Downstream=	1062
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	24	

Pier Data

Pier Station	Upstream=	1096	Downstream=	1096
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	24	

Pier Data

1059129.rep

Pier Station	Upstream=	1130	Downstream=	1130
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	15	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	15	

Pier Data				
Pier Station	Upstream=	1164	Downstream=	1164
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	15	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	15	

Pier Data				
Pier Station	Upstream=	1198	Downstream=	1198
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	15	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	15	

Pier Data				
Pier Station	Upstream=	1232	Downstream=	1232
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	16	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	16	

Pier Data				
Pier Station	Upstream=	1266	Downstream=	1266
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	16	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	16	

Pier Data				
Pier Station	Upstream=	1300	Downstream=	1300
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	16	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	16	

Pier Data				
Pier Station	Upstream=	1334	Downstream=	1334
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	16	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	16	

Pier Data

				1059129.rep	
Pier Station	Upstream=	1368	Downstream=	1368	
Upstream	num= 2				
width	Elev	width	Elev		
3	-65	3	16		
Downstream	num= 2				
width	Elev	width	Elev		
3	-65	3	16		
Pier Data					
Pier Station	Upstream=	1402	Downstream=	1402	
Upstream	num= 2				
width	Elev	width	Elev		
3	-65	3	16		
Downstream	num= 2				
width	Elev	width	Elev		
3	-65	3	16		
Pier Data					
Pier Station	Upstream=	1436	Downstream=	1436	
Upstream	num= 2				
width	Elev	width	Elev		
3	-65	3	17		
Downstream	num= 2				
width	Elev	width	Elev		
3	-65	3	17		
Pier Data					
Pier Station	Upstream=	1470	Downstream=	1470	
Upstream	num= 2				
width	Elev	width	Elev		
3	-65	3	18		
Downstream	num= 2				
width	Elev	width	Elev		
3	-65	3	18		
Pier Data					
Pier Station	Upstream=	1504	Downstream=	1504	
Upstream	num= 2				
width	Elev	width	Elev		
3	-65	3	19		
Downstream	num= 2				
width	Elev	width	Elev		
3	-65	3	19		
Pier Data					
Pier Station	Upstream=	1538	Downstream=	1538	
Upstream	num= 2				
width	Elev	width	Elev		
3	-65	3	19		
Downstream	num= 2				
width	Elev	width	Elev		
3	-65	3	19		
Pier Data					
Pier Station	Upstream=	1572	Downstream=	1572	
Upstream	num= 2				
width	Elev	width	Elev		
3	-65	3	22		
Downstream	num= 2				
width	Elev	width	Elev		
3	-65	3	22		

Pier Data

				1059129.rep	
Pier Station	Upstream=	1606	Downstream=	1606	
Upstream	num= 2				
width	Elev	width	Elev		
3	-65	3	22		
Downstream	num= 2				
width	Elev	width	Elev		
3	-65	3	22		
Pier Data					
Pier Station	Upstream=	1640	Downstream=	1640	
Upstream	num= 2				
width	Elev	width	Elev		
3	-65	3	22		
Downstream	num= 2				
width	Elev	width	Elev		
3	-65	3	22		
Pier Data					
Pier Station	Upstream=	1674	Downstream=	1674	
Upstream	num= 2				
width	Elev	width	Elev		
3	-65	3	22		
Downstream	num= 2				
width	Elev	width	Elev		
3	-65	3	22		
Pier Data					
Pier Station	Upstream=	1708	Downstream=	1708	
Upstream	num= 2				
width	Elev	width	Elev		
3	-65	3	24		
Downstream	num= 2				
width	Elev	width	Elev		
3	-65	3	24		
Pier Data					
Pier Station	Upstream=	1742	Downstream=	1742	
Upstream	num= 2				
width	Elev	width	Elev		
3	-65	3	24		
Downstream	num= 2				
width	Elev	width	Elev		
3	-65	3	24		
Pier Data					
Pier Station	Upstream=	1776	Downstream=	1776	
Upstream	num= 2				
width	Elev	width	Elev		
3	-65	3	24		
Downstream	num= 2				
width	Elev	width	Elev		
3	-65	3	24		
Pier Data					
Pier Station	Upstream=	1810	Downstream=	1810	
Upstream	num= 2				
width	Elev	width	Elev		
3	-65	3	27		
Downstream	num= 2				
width	Elev	width	Elev		
3	-65	3	27		

Pier Data

1059129.rep

Pier Station	Upstream=	1840	Downstream=	1840
Upstream	num=	2		
width	Elev	width	Elev	
15	-65	15	27	
Downstream	num=	2		
width	Elev	width	Elev	
15	-65	15	27	

Pier Data				
Pier Station	Upstream=	1840	Downstream=	1840
Upstream	num=	2		
width	Elev	width	Elev	
15	-65	15	27	
Downstream	num=	2		
width	Elev	width	Elev	
15	-65	15	27	

Pier Data				
Pier Station	Upstream=	1962.5	Downstream=	1962.5
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	

Pier Data				
Pier Station	Upstream=	1996.5	Downstream=	1996.5
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	

Pier Data				
Pier Station	Upstream=	2029.5	Downstream=	2029.5
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	

Pier Data				
Pier Station	Upstream=	2062.5	Downstream=	2062.5
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	

Pier Data				
Pier Station	Upstream=	2095.5	Downstream=	2095.5
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	

Pier Data

1059129.rep
Pier Station Upstream= 2128.5 Downstream= 2128.5
Upstream num= 2
width Elev width Elev
3 -65 3 27
Downstream num= 2
width Elev width Elev
3 -65 3 27

Pier Data
Pier Station Upstream= 2161.5 Downstream= 2161.5
Upstream num= 2
width Elev width Elev
3 -65 3 26
Downstream num= 2
width Elev width Elev
3 -65 3 26

Pier Data
Pier Station Upstream= 2194.5 Downstream= 2194.5
Upstream num= 2
width Elev width Elev
3 -65 3 26
Downstream num= 2
width Elev width Elev
3 -65 3 26

Pier Data
Pier Station Upstream= 2227.5 Downstream= 2227.5
Upstream num= 2
width Elev width Elev
3 -65 3 25
Downstream num= 2
width Elev width Elev
3 -65 3 25

Pier Data
Pier Station Upstream= 2260.5 Downstream= 2260.5
Upstream num= 2
width Elev width Elev
3 -65 3 24
Downstream num= 2
width Elev width Elev
3 -65 3 24

Pier Data
Pier Station Upstream= 2293.5 Downstream= 2293.5
Upstream num= 2
width Elev width Elev
3 -65 3 23
Downstream num= 2
width Elev width Elev
3 -65 3 23

Pier Data
Pier Station Upstream= 2326.5 Downstream= 2326.5
Upstream num= 2
width Elev width Elev
3 -65 3 23
Downstream num= 2
width Elev width Elev
3 -65 3 23

Pier Data

1059129.rep
Pier Station Upstream= 2359.5 Downstream= 2359.5
Upstream num= 2
width Elev width Elev
3 -65 3 23
Downstream num= 2
width Elev width Elev
3 -65 3 23

Pier Data
Pier Station Upstream= 2392.5 Downstream= 2392.5
Upstream num= 2
width Elev width Elev
3 -65 3 20
Downstream num= 2
width Elev width Elev
3 -65 3 20

Pier Data
Pier Station Upstream= 2425.5 Downstream= 2425.5
Upstream num= 2
width Elev width Elev
3 -65 3 18
Downstream num= 2
width Elev width Elev
3 -65 3 18

Pier Data
Pier Station Upstream= 2458.5 Downstream= 2458.5
Upstream num= 2
width Elev width Elev
3 -65 3 18
Downstream num= 2
width Elev width Elev
3 -65 3 18

Pier Data
Pier Station Upstream= 2491.5 Downstream= 2491.5
Upstream num= 2
width Elev width Elev
3 -65 3 17
Downstream num= 2
width Elev width Elev
3 -65 3 17

Pier Data
Pier Station Upstream= 2525 Downstream= 2525
Upstream num= 2
width Elev width Elev
3 -65 3 17
Downstream num= 2
width Elev width Elev
3 -65 3 17

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

1059129.rep

Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #Max WS

E.G. US. (ft)	16.88	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	16.85	E.G. Elev (ft)	16.91
16.81			
Q Total (cfs)	-101090.00	W.S. Elev (ft)	16.85
16.74			
Q Bridge (cfs)		Crit W.S. (ft)	
Q Weir (cfs)		Max Chl Dpth (ft)	52.85
52.75			
Weir Sta Lft (ft)		Vel Total (ft/s)	-2.00
-2.00			
Weir Sta Rgt (ft)		Flow Area (sq ft)	50547.93
50454.58			
Weir Submerg		Froude # Chl	-0.05
-0.05			
Weir Max Depth (ft)		Specif Force (cu ft)	1050032.00
1044693.00			
Min El Weir Flow (ft)	8.01	Hydr Depth (ft)	57.69
56.97			
Min El Prs (ft)	26.00	W.P. Total (ft)	5050.32
5035.63			
Delta EG (ft)		Conv. Total (cfs)	17441810.0
17421970.0			
Delta WS (ft)	0.11	Top width (ft)	876.27
885.66			
BR Open Area (sq ft)		Frctn Loss (ft)	
BR Open Vel (ft/s)		C & E Loss (ft)	
Coef of Q		Shear Total (lb/sq ft)	0.02
0.02			
Br Sel Method	Energy/Weir	Power Total (lb/ft s)	0.00
0.00			

Note: The post processor is unable to handle negative flow through a bridge at this time. The water surfaces inside the bridge are based on projecting the outside water surface.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

CROSS SECTION

RIVER: Sloop
REACH: Sloop

RS: 1.8

INPUT

Description: Downstream Bridge

Station Elevation Data		num= 53	
Sta	Elev	Sta	Elev
0	8	500	11
1052	0	1062	-9.61
1198	-15.21	1232	-13.81
1368	-13.71	1402	-15.71
1538	-17.41	1572	-18.01
1708	-20.21	1742	-21.11
1932.5	-15.11	1962.5	-23.21
2095.5	-32.11	2128.5	-31.31
2260.5	-30.01	2293.5	-33.61
2425.5	-34.31	2458.5	-31.91
3217	4	3441	5

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.035	1052	.02
		3106	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1052	3106		352.17	178	441.67	.1
							.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.77	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.74	Reach Len. (ft)	352.17	178.00
441.67				
Crit w.s. (ft)		Flow Area (sq ft)	7285.83	67808.67
11765.75				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	7285.83	67808.67
11765.75				
Q Total (cfs)	-101090.00	Flow (cfs)	-2041.08	-94333.66
-4715.27				
Top Width (ft)	4098.00	Top Width (ft)	1052.00	2054.00
992.00				
Vel Total (ft/s)	-1.16	Avg. Vel. (ft/s)	-0.28	-1.39
-0.40				
Max Chl Dpth (ft)	52.75	Hydr. Depth (ft)	6.93	33.01
11.86				
Conv. Total (cfs)	55294260.0	Conv. (cfs)	1116428.0	
51598670.0				
Length wtd. (ft)	192.88	Wetted Per. (ft)	1062.53	2068.73
1002.82				
Min Ch El (ft)	-36.01	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.34	Stream Power (lb/ft s)	4098.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	510.01	2832.68
819.10				
C & E Loss (ft)		Cum SA (acres)	58.48	84.95
63.33				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop

RS: 1.66666*

INPUT

Description:

Station Elevation Data			num= 61						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.33	243.52	9.33	380.71	9.82	524.32	10.28	600.69	9.44
787.53	7.55	871.82	9.5	1032.91	12.75	1102.12	.19	1103.17	0
1116.14	-8.04	1160.25	-11.4	1204.37	-14.2	1248.48	-13.73	1292.59	-13.19
1336.71	-12.14	1380.82	-12.51	1412.54	-12.17	1424.93	-12.1	1469.05	-12.18
1513.16	-13.01	1557.27	-15.01	1601.39	-17.09	1634.78	-17.72	1645.5	-17.89
1689.61	-17.6	1733.73	-17.48	1777.84	-18.18	1821.95	-19.48	1866.07	-20.27
1910.18	-20.56	1952.54	-20.84	1954.29	-20.84	1998.41	-21.6	2042.52	-21.03
2086.63	-18.62	2125.56	-13.71	2245.57	-16.65	2284.5	-23.41	2328.61	-27.25
2371.42	-28.59	2414.24	-30.43	2457.06	-30.86	2499.87	-30.2	2542.69	-30.04
2585.5	-30.47	2628.32	-29.64	2671.14	-29.15	2713.95	-32.16	2756.77	-33.58
2799.58	-34.17	2836.18	-33.91	2872.78	-32.39	2909.38	-30.21	2945.98	-26.19
2982.58	-6.84	3627.5	0	3740.33	3.42	3968.02	4.42	4303.73	5.09
4635.83	6.33								

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1103.17	.02	3627.5	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1103.17	3627.5		352.17	178	441.67	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.77	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.76	Reach Len. (ft)	352.17	178.00
441.67				
Crit w.s. (ft)		Flow Area (sq ft)	8278.14	84174.19
12316.94				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	8278.14	84174.19
12316.94				
Q Total (cfs)	-101993.00	Flow (cfs)	-1987.56	-95917.64
-4087.80				
Top width (ft)	4635.83	Top width (ft)	1103.17	2524.33
1008.33				
Vel Total (ft/s)	-0.97	Avg. vel. (ft/s)	-0.24	-1.14
-0.33				
Max Chl Dpth (ft)	50.93	Hydr. Depth (ft)	7.50	33.35
12.22				
Conv. Total (cfs)	68725300.0	Conv. (cfs)	1339264.0	
64631580.0 2754454.0				
Length wtd. (ft)	191.40	Wetted Per. (ft)	1112.82	2533.54
1018.81				
Min Ch El (ft)	-34.17	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.29	Stream Power (lb/ft s)	4635.83	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	447.10	2522.15
697.01				
C & E Loss (ft)		Cum SA (acres)	49.76	75.60

53.19

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
REACH: Sloop

RS: 1.53333*

INPUT

Description:

Station Elevation Data				num=	61				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.67	254.82	9.26	398.37	9.45	548.64	9.56	628.56	8.75
824.05	7.1	912.25	8.6	1080.82	10.51	1153.24	.16	1154.33	0
1170.28	-6.48	1224.51	-9.3	1278.74	-11.69	1332.96	-11.46	1387.19	-11.16
1441.42	-10.46	1495.64	-10.9	1534.63	-10.74	1549.87	-10.79	1604.1	-11.25
1658.32	-12.32	1712.55	-14.31	1766.78	-16.37	1807.83	-17.18	1821	-17.37
1875.23	-17.39	1929.46	-17.54	1983.68	-18.36	2037.91	-19.64	2092.14	-20.52
2146.36	-21.01	2198.43	-21.47	2200.59	-21.47	2254.82	-22.09	2309.04	-21.64
2363.27	-19.73	2411.12	-15.81	2558.64	-18.19	2606.49	-23.6	2660.72	-26.69
2713.35	-27.77	2765.98	-29.26	2818.61	-29.61	2871.24	-29.09	2923.88	-28.97
2976.51	-29.32	3029.14	-28.67	3081.77	-28.29	3134.4	-30.71	3187.03	-31.86
3239.67	-32.34	3279.86	-31.9	3320.06	-30.47	3360.26	-28.5	3400.46	-25.07
3440.66	-9.36	4149	0	4263.66	2.83	4495.03	3.84	4836.18	4.67
5173.67	6.67								

Manning's n Values			num=	3		
Sta	n Val	Sta	n Val	Sta	n Val	
0	.035	1154.33	.02	4149	.035	

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1154.33	4149		352.17	178		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.78	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.76	Reach Len. (ft)	352.17	178.00
441.67				
Crit W.S. (ft)		Flow Area (sq ft)	9324.41	100236.10
12877.96				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	9324.41	100236.10
12877.96				
Q Total (cfs)	-102979.00	Flow (cfs)	-1996.77	-97284.78
-3697.45				
Top width (ft)	5173.67	Top width (ft)	1154.33	2994.67
1024.67				
Vel Total (ft/s)	-0.84	Avg. Vel. (ft/s)	-0.21	-0.97
-0.29				
Max Chl Dpth (ft)	49.10	Hydr. Depth (ft)	8.08	33.47
12.57				
Conv. Total (cfs)	81773360.0	Conv. (cfs)	1585593.0	
77251700.0				
Length wtd. (ft)	190.49	Wetted Per. (ft)	1163.21	3000.17
1034.81				

Min Ch El (ft)	-32.34	1059129.rep		
0.00		Shear (lb/sq ft)	0.00	0.00
Alpha	1.26	Stream Power (lb/ft s)	5173.67	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	375.94	2145.37
569.28				
C & E Loss (ft)		Cum SA (acres)	40.64	64.32
42.88				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 1.4*

INPUT

Description:

Station Elevation Data	num=	61							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
0 9 266.11 9.2 416.03 9.09 572.96 8.85 656.42 8.06									
860.58 6.66 952.69 7.7 1128.72 8.26 1204.35 .12 1205.5 0									
1224.42 -4.91 1288.76 -7.21 1353.1 -9.17 1417.44 -9.18 1481.78 -9.14									
1546.12 -8.79 1610.46 -9.3 1656.72 -9.3 1674.8 -9.48 1739.14 -10.33									
1803.48 -11.62 1867.82 -13.61 1932.16 -15.65 1980.87 -16.63 1996.5 -16.86									
2060.84 -17.18 2125.18 -17.61 2189.52 -18.53 2253.86 -19.81 2318.2 -20.78									
2382.54 -21.46 2444.32 -22.1 2446.88 -22.11 2511.22 -22.58 2575.56 -22.26									
2639.9 -20.83 2696.67 -17.91 2871.72 -19.73 2928.49 -23.8 2992.83 -26.13									
3055.27 -26.95 3117.72 -28.08 3180.17 -28.35 3242.62 -27.98 3305.06 -27.9									
3367.51 -28.18 3429.96 -27.7 3492.41 -27.43 3554.85 -29.25 3617.3 -30.13									
3679.75 -30.5 3723.55 -29.9 3767.34 -28.55 3811.14 -26.8 3854.94 -23.94									
3898.74 -11.89 4670.5 0 4786.98 2.25 5022.05 3.26 5368.64 4.25									
5711.5 7									

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .035 1205.5 .02 4670.5 .035		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
1205.5 4670.5	352.17 178 441.67	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.78	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.77	Reach Len. (ft)	352.17	178.00
441.67				
Crit W.S. (ft)		Flow Area (sq ft)	10423.67	116004.50
13448.03				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	10423.67	116004.50
13448.03				
Q Total (cfs)	-104047.00	Flow (cfs)	-2044.35	-98561.66
-3441.00				
Top width (ft)	5711.50	Top width (ft)	1205.50	3465.00
1041.00				
Vel Total (ft/s)	-0.74	Avg. vel. (ft/s)	-0.20	-0.85

1059129.rep

-0.26				
Max Chl Dpth (ft)	47.27	Hydr. Depth (ft)	8.65	33.48
12.92				
Conv. Total (cfs)	94454220.0	Conv. (cfs)	1855868.0	
89474600.0 3123752.0				
Length wtd. (ft)	189.92	Wetted Per. (ft)	1213.73	3468.05
1050.81				
Min Ch El (ft)	-30.50	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.24	Stream Power (lb/ft s)	5711.50	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	296.11	1703.56
435.82				
C & E Loss (ft)		Cum SA (acres)	31.10	51.13
32.41				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop

RS: 1.26666*

INPUT

Description:

Station Elevation Data			num=	61					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9.33	277.41	9.13	433.68	8.73	597.28	8.13	684.28	7.38
897.11	6.21	993.13	6.8	1176.63	6.01	1255.47	.09	1256.67	0
1278.56	-3.34	1353.02	-5.11	1427.47	-6.66	1501.92	-6.9	1576.38	-7.11
1650.83	-7.12	1725.28	-7.69	1778.82	-7.87	1799.74	-8.18	1874.19	-9.4
1948.64	-10.92	2023.1	-12.91	2097.55	-14.93	2153.91	-16.09	2172	-16.34
2246.46	-16.97	2320.91	-17.67	2395.36	-18.7	2469.82	-19.97	2544.27	-21.04
2618.72	-21.9	2690.22	-22.74	2693.18	-22.74	2767.63	-23.07	2842.08	-22.87
2916.54	-21.94	2982.23	-20.01	3184.79	-21.27	3250.48	-24	3324.94	-25.57
3397.2	-26.13	3469.46	-26.9	3541.73	-27.1	3613.99	-26.87	3686.25	-26.83
3758.52	-27.03	3830.78	-26.74	3903.04	-26.57	3975.31	-27.8	4047.57	-28.4
4119.83	-28.67	4167.23	-27.9	4214.63	-26.63	4262.02	-25.09	4309.42	-22.82
4356.82	-14.42	5192	0	5310.31	1.67	5549.06	2.67	5901.09	3.83
6249.33	7.33								

Manning's n Values			num=	3
Sta	n Val	Sta	n Val	Sta
0	.035	1256.67	.02	5192
				.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1256.67	5192		352.17	178 441.67	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.78	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.77	Reach Len. (ft)	352.17	178.00
441.67				
Crit w.s. (ft)		Flow Area (sq ft)	11582.43	131474.40
14031.07				

E.G. Slope (ft/ft)	0.000001	1059129.rep Area (sq ft)	11582.43	131474.40
14031.07 Q Total (cfs)	-105196.00	Flow (cfs)	-2121.12	-99804.70
-3270.18 Top width (ft)	6249.33	Top width (ft)	1256.67	3935.33
1057.33 Vel Total (ft/s)	-0.67	Avg. Vel. (ft/s)	-0.18	-0.76
-0.23 Max Chl Dpth (ft)	45.44	Hydr. Depth (ft)	9.22	33.41
13.27 Conv. Total (cfs)	106769900.0	Conv. (cfs)	2152855.0	
101297900.0 3319106.0 Length wtd. (ft)	189.58	Wetted Per. (ft)	1264.35	3936.86
1066.81 Min Ch El (ft)	-28.67	Shear (lb/sq ft)	0.00	0.00
0.00 Alpha	1.22	Stream Power (lb/ft s)	6249.33	0.00
0.00 Frctn Loss (ft)	0.00	Cum volume (acre-ft)	207.16	1197.92
296.51 C & E Loss (ft)		Cum SA (acres)	21.15	36.01
21.77				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
REACH: Sloop RS: 1.13333*

INPUT

Description:

Station Elevation Data			num=	61						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	9.67	288.7	9.07	451.34	8.36	621.59	7.41	712.14	6.69	
933.63	5.76	1033.56	5.9	1224.54	3.77	1306.59	.06	1307.83	0	
1332.71	-1.78	1417.27	-3.02	1501.84	-4.15	1586.41	-4.63	1670.97	-5.09	
1755.54	-5.45	1840.11	-6.09	1900.91	-6.43	1924.67	-6.87	2009.24	-8.47	
2093.81	-10.22	2178.37	-12.21	2262.94	-14.22	2326.96	-15.54	2347.51	-15.82	
2432.07	-16.76	2516.64	-17.74	2601.2	-18.88	2685.77	-20.14	2770.34	-21.29	
2854.9	-22.35	2936.11	-23.37	2939.47	-23.37	3024.04	-23.56	3108.6	-23.49	
3193.17	-23.05	3267.79	-22.11	3497.86	-22.81	3572.48	-24.19	3657.04	-25	
3739.12	-25.31	3821.2	-25.72	3903.28	-25.85	3985.36	-25.76	4067.44	-25.77	
4149.52	-25.89	4231.6	-25.77	4313.68	-25.71	4395.76	-26.35	4477.84	-26.68	
4559.92	-26.83	4610.91	-25.9	4661.91	-24.71	4712.9	-23.39	4763.9	-21.7	
4814.9	-16.95	5713.5	0	5833.64	1.08	6076.08	2.09	6433.55	3.42	
6787.17	7.67									

Manning's n Values			num=	3
Sta	n Val	Sta	n Val	Sta
0	.035	1307.83	.02	5713.5
				.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1307.83	5713.5	352.17	178	441.67	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.78	Element	Left OB	Channel
		Page 34		

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Right OB				
Vel Head (ft)	0.01	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	16.78	Reach Len. (ft)	352.17	178.00
441.67				
Crit w.s. (ft)		Flow Area (sq ft)	12796.38	146653.20
14618.29				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	12796.38	146653.20
14618.29				
Q Total (cfs)	-106428.00	Flow (cfs)	-2219.58	
-101054.30 -3154.12				
Top width (ft)	6787.17	Top width (ft)	1307.83	4405.67
1073.67				
Vel Total (ft/s)	-0.61	Avg. Vel. (ft/s)	-0.17	-0.69
-0.22				
Max Chl Dpth (ft)	43.61	Hydr. Depth (ft)	9.78	33.29
13.62				
Conv. Total (cfs)	118731000.0	Conv. (cfs)	2476160.0	
112736100.0 3518733.0				
Length wtd. (ft)	189.38	Wetted Per. (ft)	1315.04	4406.38
1082.81				
Min Ch El (ft)	-26.83	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.21	Stream Power (lb/ft s)	6787.17	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	108.61	629.66
151.27				
C & E Loss (ft)		Cum SA (acres)	10.78	18.96
10.97				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
REACH: Sloop

RS: 1

INPUT

Description:

Station	Elevation	Data	num=	13						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	10	300	9	469	8	740	6	1074	5	
1359	0	2023	-5	2500	-15	3182	-24	5000	-25	
6235	0	6966	3	7325	8					

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1359	.02	6235	.035

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	1359	6235		0	0	0		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	16.79	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-val.	0.035	0.020
0.035				

W.S. Elev (ft)	16.78	1059129.rep Reach Len. (ft)		
Crit W.S. (ft)	-19.98	Flow Area (sq ft)	14071.02	161526.80
15219.20		Area (sq ft)	14071.02	161526.80
E.G. Slope (ft/ft)	0.000001	Flow (cfs)	-2337.25	
15219.20		Top Width (ft)	1359.00	4876.00
Q Total (cfs)	-107700.00	Avg. Vel. (ft/s)	-0.17	-0.63
-102283.40 -3079.38		Hydr. Depth (ft)	10.35	33.13
Top width (ft)	7325.00	Conv. (cfs)	2828376.0	
1090.00		Wetted Per. (ft)	1365.84	4876.44
Vel Total (ft/s)	-0.56	Shear (lb/sq ft)	0.00	0.00
-0.20		Stream Power (lb/ft s)	7325.00	0.00
Max Chl Dpth (ft)	41.78	Cum Volume (acre-ft)		
13.96		Cum SA (acres)		
Conv. Total (cfs)	130331200.0			
123776400.0 3726453.0				
Length wtd. (ft)				
1098.82				
Min Ch El (ft)	-25.00			
0.00				
Alpha	1.20			
0.00				
Frctn Loss (ft)				
C & E Loss (ft)				

SUMMARY OF MANNING'S N VALUES

River:Sloop

Reach	River Sta.	n1	n2	n3
Sloop	4	.035	.02	.035
Sloop	3.88888*	.035	.02	.035
Sloop	3.77777*	.035	.02	.035
Sloop	3.66666*	.035	.02	.035
Sloop	3.55555*	.035	.02	.035
Sloop	3.44444*	.035	.02	.035
Sloop	3.33333*	.035	.02	.035
Sloop	3.22222*	.035	.02	.035
Sloop	3.11111*	.035	.02	.035
Sloop	3	.035	.02	.035
Sloop	2.875*	.035	.02	.035
Sloop	2.75*	.035	.02	.035
Sloop	2.625*	.035	.02	.035
Sloop	2.5*	.035	.02	.035
Sloop	2.375*	.035	.02	.035
Sloop	2.25*	.035	.02	.035
Sloop	2.125*	.035	.02	.035
Sloop	2	.035	.02	.035
Sloop	1.9	Bridge		
Sloop	1.8	.035	.02	.035
Sloop	1.66666*	.035	.02	.035
Sloop	1.53333*	.035	.02	.035
Sloop	1.4*	.035	.02	.035
Sloop	1.26666*	.035	.02	.035
Sloop	1.13333*	.035	.02	.035
Sloop	1	.035	.02	.035

SUMMARY OF REACH LENGTHS

River: Sloop

Reach	River Sta.	Left	Channel	Right
Sloop	4	166.67	198.67	202.22
Sloop	3.88888*	166.67	198.67	202.22
Sloop	3.77777*	166.67	198.67	202.22
Sloop	3.66666*	166.67	198.67	202.22
Sloop	3.55555*	166.67	198.67	202.22
Sloop	3.44444*	166.67	198.67	202.22
Sloop	3.33333*	166.67	198.67	202.22
Sloop	3.22222*	166.67	198.67	202.22
Sloop	3.11111*	166.67	198.67	202.22
Sloop	3	281.25	179.38	196.25
Sloop	2.875*	281.25	179.38	196.25
Sloop	2.75*	281.25	179.38	196.25
Sloop	2.625*	281.25	179.38	196.25
Sloop	2.5*	281.25	179.38	196.25
Sloop	2.375*	281.25	179.38	196.25
Sloop	2.25*	281.25	179.38	196.25
Sloop	2.125*	281.25	179.38	196.25
Sloop	2	70	70	70
Sloop	1.9	Bridge		
Sloop	1.8	352.17	178	441.67
Sloop	1.66666*	352.17	178	441.67
Sloop	1.53333*	352.17	178	441.67
Sloop	1.4*	352.17	178	441.67
Sloop	1.26666*	352.17	178	441.67
Sloop	1.13333*	352.17	178	441.67
Sloop	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Sloop

Reach	River Sta.	Contr.	Expan.
Sloop	4	.1	.3
Sloop	3.88888*	.1	.3
Sloop	3.77777*	.1	.3
Sloop	3.66666*	.1	.3
Sloop	3.55555*	.1	.3
Sloop	3.44444*	.1	.3
Sloop	3.33333*	.1	.3
Sloop	3.22222*	.1	.3
Sloop	3.11111*	.1	.3
Sloop	3	.1	.3
Sloop	2.875*	.1	.3
Sloop	2.75*	.1	.3
Sloop	2.625*	.1	.3
Sloop	2.5*	.1	.3
Sloop	2.375*	.1	.3
Sloop	2.25*	.1	.3
Sloop	2.125*	.1	.3

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Sloop	2	.1	.3
Sloop	1.9	Bridge	
Sloop	1.8	.1	.3
Sloop	1.66666*	.1	.3
Sloop	1.53333*	.1	.3
Sloop	1.4*	.1	.3
Sloop	1.26666*	.1	.3
Sloop	1.13333*	.1	.3
Sloop	1	.1	.3

Profile Output Table - Culvert Only

Reach	River Sta	Profile	E.G. US.	W.S. US.	E.G. IC	E.G. OC
Min El Weir Flow	Q Culv Group	Q Weir	Delta WS	Culv Vel US	Culv Vel US	Culv Vel DS
(ft)	(cfs)	(cfs)	(ft)	(ft/s)	(ft)	(ft/s)

Profile Output Table - Six XS Bridge

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Crit W.S.	Frctn
Loss C & E Loss	Top Width	Q Left	Q Channel	Q Right	Vel Chnl	
(ft)	(ft)	(cfs)	(ft)	(cfs)	(ft/s)	
Sloop	2.125*	Max WS	16.87	16.85		
0.00	4128.75	-2286.05	-93149.78	-5000.17	-1.35	
Sloop	2	Max WS	16.88	16.85		
	4098.00	-2080.33	-94253.84	-4755.83	-1.39	
Sloop	1.9 BR U	Max WS	16.91	16.85		
	876.27		-101090.00		-2.00	
Sloop	1.9 BR D	Max WS	16.81	16.74		
	885.66		-101090.00		-2.00	
Sloop	1.8	Max WS	16.77	16.74		
0.00	4098.00	-2041.08	-94333.66	-4715.27	-1.39	
Sloop	1.66666*	Max WS	16.77	16.76		
0.00	4635.83	-1987.56	-95917.64	-4087.80	-1.14	

1059129.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X      X
XXXXXXXX XXXX      X      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      X

```

PROJECT DATA

Project Title: 1059129
Project File : 1059129.prj
Run Date and Time: 1/12/2012 7:49:58 AM

Project in English units

PLAN DATA

Plan Title: Plan 01
Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059129 Meadowbrook
Parkway over Sloop Channel - NYSDOT\1059129.p01

Geometry Title: 1059129
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059129
Meadowbrook Parkway over Sloop Channel - NYSDOT\1059129.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of:	Cross Sections =	25	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary	
Conveyance Calculation Method:	At breaks in n values only
Friction Slope Method:	Average Conveyance
Computational Flow Regime:	Subcritical Flow

GEOMETRY DATA

1059129.rep

Geometry Title: 1059129

Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059129 Meadowbrook Parkway over Sloop Channel - NYSDOT\1059129.g01

CROSS SECTION

RIVER: Sloop
REACH: Sloop

RS: 4

INPUT

Description: Two Bridge Lengths Upstream

Station	Elevation	Data	num=	14	Station	Elevation	Station	Elevation	Station	Elevation
0	9	302	8	491	7	730	6	781	5	
925	4	1112	3	1314	2	1449	1	1623	0	
2000	-5	2552	-25	4000	-25	4308	0			

Manning's n	Values	num=	3	Station	n Val	Station	n Val
0	.035	1623	.02	4308	.035		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1623	4308		166.67	198.67	202.22	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.49	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
W.S. Elev (ft)	22.49	Reach Len. (ft)	166.67	198.67
202.22				
Crit W.S. (ft)		Flow Area (sq ft)	28585.77	109658.10
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	28585.77	109658.10
Q Total (cfs)	-27303.00	Flow (cfs)	-2140.33	-25162.67
Top width (ft)	4308.00	Top width (ft)	1623.00	2685.00
Vel Total (ft/s)	-0.20	Avg. Vel. (ft/s)	-0.07	-0.23
Max Chl Dpth (ft)	47.49	Hydr. Depth (ft)	17.61	40.84
Conv. Total (cfs)	104221800.0	Conv. (cfs)	8170134.0	
96051660.0				
Length Wtd. (ft)	196.20	Wetted Per. (ft)	1636.52	2708.90
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
Alpha	1.26	Stream Power (lb/ft s)	4308.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2549.68	9859.12
2401.27				
C & E Loss (ft)		Cum SA (acres)	167.37	249.77
122.08				

Warning: The cross-section end points had to be extended vertically for the computed
Page 2

water surface.

CROSS SECTION

RIVER: Sloop

REACH: Sloop

RS: 3.88888*

INPUT

Description:

Station Elevation Data			num= 19								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	294.25	8.01	339.58	7.78	478.39	7.07	711.26	6.12		
760.95	5.22	762.79	5.21	901.25	4.25	1083.45	3.25	1280.27	2.24		
1316.51	1.98	1411.8	1.25	1581.33	.22	1966.31	-5.55	1969.03	-5.64		
2530	-25	3888.89	-25	4195.44	0	4312	.11				

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1581.33	.02	4195.44	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1581.33	4195.44		166.67	198.67		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

	E.G. Elev (ft)		Left OB	Channel
Right OB	22.49	Element		
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.49	Reach Len. (ft)	166.67	198.67
202.22				
Crit W.S. (ft)		Flow Area (sq ft)	27615.74	106236.10
2615.27				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	27615.74	106236.10
2615.27				
Q Total (cfs)	-27780.30	Flow (cfs)	-2139.36	-25426.75
-214.19				
Top Width (ft)	4312.00	Top Width (ft)	1581.33	2614.11
116.56				
Vel Total (ft/s)	-0.20	Avg. Vel. (ft/s)	-0.08	-0.24
-0.08				
Max Chl Dpth (ft)	47.49	Hydr. Depth (ft)	17.46	40.64
22.44				
Conv. Total (cfs)	101897000.0	Conv. (cfs)	7847081.0	
93264230.0				
Length Wtd. (ft)	196.27	Wetted Per. (ft)	1594.85	2615.51
138.94				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.28	Stream Power (lb/ft s)	4312.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2442.16	9366.79
2395.20				
C & E Loss (ft)		Cum SA (acres)	161.24	237.68
121.81				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop

RS: 3.77777*

INPUT

Description:

Station Elevation Data			num= 19								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	286.49	8.03	330.63	7.81	465.79	7.15	692.52	6.25		
740.9	5.45	742.69	5.43	877.51	4.5	1054.9	3.5	1246.53	2.49		
1281.82	2.23	1374.6	1.51	1539.67	.44	1932.63	-6.09	1935.41	-6.19		
2508	-25	3777.78	-25	4082.89	0	4316	.22				

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1539.67	.02	4082.89	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1539.67	4082.89		166.67 198.67	202.22	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

	E.G. Elev (ft)	22.50	Element	Left OB	Channel
Right OB					
Vel Head (ft)	0.00		wt. n-val.	0.035	0.020
0.035					
W.S. Elev (ft)	22.49		Reach Len. (ft)	166.67	198.67
202.22					
Crit w.s. (ft)			Flow Area (sq ft)	26651.10	102822.70
5217.98					
E.G. Slope (ft/ft)	0.000000		Area (sq ft)	26651.10	102822.70
5217.98					
Q Total (cfs)	-28259.30		Flow (cfs)	-2145.61	-25641.76
-471.94					
Top width (ft)	4316.00		Top width (ft)	1539.67	2543.22
233.11					
Vel Total (ft/s)	-0.21		Avg. vel. (ft/s)	-0.08	-0.25
-0.09					
Max Chl Dpth (ft)	47.49		Hydr. Depth (ft)	17.31	40.43
22.38					
Conv. Total (cfs)	99139500.0		Conv. (cfs)	7527236.0	
89956620.0 1655647.0					
Length Wtd. (ft)	196.33		wetted Per. (ft)	1553.19	2544.61
255.38					
Min Ch El (ft)	-25.00		Shear (lb/sq ft)	0.00	0.00
0.00					
Alpha	1.30		Stream Power (lb/ft s)	4316.00	0.00
0.00					
Frctn Loss (ft)	0.00		Cum Volume (acre-ft)	2338.34	8890.05
2377.02					
C & E Loss (ft)			Cum SA (acres)	155.27	225.92
121.00					

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop

RS: 3.66666*

INPUT

Description:

Station Elevation Data				num= 19							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	278.74	8.04	321.69	7.84	453.18	7.22	673.78	6.37		
720.85	5.67	722.59	5.66	853.76	4.75	1026.36	3.75	1212.8	2.73		
1247.13	2.48	1337.4	1.76	1498	.67	1898.94	-6.64	1901.78	-6.73		
2486	-25	3666.67	-25	3970.33	0	4320	.33				

Manning's n Values				num= 3			
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1498	.02	3970.33	.035		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1498	3970.33		166.67	198.67	202.22	.1
							.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.50	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.50	Reach Len. (ft)	166.67	198.67
202.22				
Crit W.S. (ft)		Flow Area (sq ft)	25704.94	99415.18
7808.58				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	25704.94	99415.18
7808.58				
Q Total (cfs)	-28737.50	Flow (cfs)	-2151.37	-25833.90
-752.23				
Top width (ft)	4320.00	Top width (ft)	1498.00	2472.33
349.67				
Vel Total (ft/s)	-0.22	Avg. Vel. (ft/s)	-0.08	-0.26
-0.10				
Max Chl Dpth (ft)	47.50	Hydr. Depth (ft)	17.16	40.21
22.33				
Conv. Total (cfs)	96400510.0	Conv. (cfs)	7216805.0	
86660340.0				
Length wtd. (ft)	196.40	Wetted Per. (ft)	1511.52	2473.71
371.84				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.32	Stream Power (lb/ft s)	4320.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2238.18	8428.86
2346.78				
C & E Loss (ft)		Cum SA (acres)	149.46	214.48
119.65				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop

REACH: Sloop

RS: 3.55555*

INPUT

Description:

Station Elevation Data			num= 19			Elev Sta			Elev Sta			Elev Sta		
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	9	270.99	8.06	312.74	7.86	440.58	7.3	655.04	6.5					
700.8	5.89	702.49	5.88	830.01	5	997.81	4.01	1179.06	2.98					
1212.44	2.74	1300.2	2.01	1456.33	.89	1865.26	-7.18	1868.15	-7.28					
2464	-25	3555.56	-25	3857.78	0	4324	.44							

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1456.33	.02	3857.78	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1456.33	3857.78		166.67	198.67	202.22	.1
							.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.50	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.50	Reach Len. (ft)	166.67	198.67
202.22				
Crit w.s. (ft)		Flow Area (sq ft)	24765.59	96019.53
10386.63				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	24765.59	96019.53
10386.63				
Q Total (cfs)	-29216.50	Flow (cfs)	-2155.14	-26005.54
-1055.82				
Top width (ft)	4324.00	Top width (ft)	1456.33	2401.45
466.22				
Vel Total (ft/s)	-0.22	Avg. Vel. (ft/s)	-0.09	-0.27
-0.10				
Max Chl Dpth (ft)	47.50	Hydr. Depth (ft)	17.01	39.98
22.28				
Conv. Total (cfs)	93679620.0	Conv. (cfs)	6910222.0	
83384020.0				
Length wtd. (ft)	196.47	Wetted Per. (ft)	1469.85	2402.83
488.28				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.33	Stream Power (lb/ft s)	4324.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2141.62	7983.19
2304.55				
C & E Loss (ft)		Cum SA (acres)	143.81	203.37
117.75				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop

REACH: Sloop

RS: 3.44444*

1059129.rep

INPUT

Description:

Station Elevation Data			num= 19								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	263.23	8.07	303.79	7.89	427.97	7.37	636.29	6.62		
680.75	6.11	682.4	6.11	806.26	5.25	969.26	4.26	1145.33	3.22		
1177.76	2.99	1263	2.27	1414.67	1.11	1831.57	-7.73	1834.52	-7.82		
2442	-25	3444.44	-25	3745.22	0	4328	.56				

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1414.67	.02	3745.22	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1414.67	3745.22		166.67	198.67	202.22	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.50	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.50	Reach Len. (ft)	166.67	198.67
202.22				
Crit w.s. (ft)		Flow Area (sq ft)	23844.45	92631.01
12949.69				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	23844.45	92631.01
12949.69				
Q Total (cfs)	-29695.60	Flow (cfs)	-2158.52	-26153.20
-1383.88				
Top width (ft)	4328.00	Top width (ft)	1414.67	2330.55
582.78				
Vel Total (ft/s)	-0.23	Avg. vel. (ft/s)	-0.09	-0.28
-0.11				
Max Chl Dpth (ft)	47.50	Hydr. Depth (ft)	16.86	39.75
22.22				
Conv. Total (cfs)	90973880.0	Conv. (cfs)	6612733.0	
80121570.0				
4239578.0				
Length Wtd. (ft)	196.55	Wetted Per. (ft)	1428.20	2331.93
604.72				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.36	Stream Power (lb/ft s)	4328.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2048.63	7552.99
2250.38				
C & E Loss (ft)		Cum SA (acres)	138.31	192.58
115.32				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 3.33333*

INPUT
Description:

1059129.rep
 num= 19
 Station Elevation Data

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	255.48	8.09	294.84	7.92	415.37	7.45	617.55	6.75
660.7	6.34	662.3	6.33	782.52	5.5	940.71	4.51	1111.6	3.46
1143.07	3.24	1225.8	2.52	1373	1.33	1797.89	-8.28	1800.89	-8.37
2420	-25	3333.33	-25	3632.67	0	4332	.67		

Manning's n Values
 num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1373	.02	3632.67	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 1373 3632.67 166.67 198.67 202.22 .1 .3

CROSS SECTION OUTPUT Profile #Max WS

Left OB	Channel
E.G. Elev (ft)	22.50
Right OB	
Vel Head (ft)	0.00
0.035	0.020
W.S. Elev (ft)	22.50
202.22	166.67
Crit W.S. (ft)	198.67
15502.54	22932.87
E.G. Slope (ft/ft)	89254.99
15502.54	22932.87
Q Total (cfs)	89254.99
-1739.10	-2160.17
Top width (ft)	-26276.13
699.33	4332.00
Vel Total (ft/s)	1373.00
-0.11	2259.67
Max Chl Dpth (ft)	-0.24
22.17	16.70
Conv. Total (cfs)	39.50
76879970.0	88288630.0
5088342.0	6320317.0
Length wtd. (ft)	196.62
721.16	1386.53
Min Ch El (ft)	2261.05
0.00	0.00
Alpha	0.00
0.00	1.38
Frctn Loss (ft)	0.00
2184.34	1959.14
C & E Loss (ft)	7138.21
112.34	132.98
	182.11

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 3.22222*

INPUT

Description:

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	255.48	8.09	294.84	7.92	415.37	7.45	617.55	6.75
660.7	6.34	662.3	6.33	782.52	5.5	940.71	4.51	1111.6	3.46
1143.07	3.24	1225.8	2.52	1373	1.33	1797.89	-8.28	1800.89	-8.37
2420	-25	3333.33	-25	3632.67	0	4332	.67		

1059129.rep

0	9	247.73	8.1	285.9	7.95	402.76	7.52	598.81	6.87
640.65	6.56	642.2	6.55	758.77	5.75	912.16	4.76	1077.86	3.71
1108.38	3.49	1188.6	2.77	1331.33	1.56	1764.2	-8.82	1767.26	-8.91
2398	-25	3222.22	-25	3520.11	0	4336	.78		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1331.33	.02	3520.11	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1331.33	3520.11		166.67	198.67		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.50	Reach Len. (ft)	166.67	198.67
202.22				
Crit w.s. (ft)		Flow Area (sq ft)	22036.71	85879.98
18043.30				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	22036.71	85879.98
18043.30				
Q Total (cfs)	-30655.70	Flow (cfs)	-2161.27	-26370.80
-2123.63				
Top width (ft)	4336.00	Top width (ft)	1331.33	2188.78
815.89				
Vel Total (ft/s)	-0.24	Avg. Vel. (ft/s)	-0.10	-0.31
-0.12				
Max Chl Dpth (ft)	47.50	Hydr. Depth (ft)	16.55	39.24
22.11				
Conv. Total (cfs)	85609650.0	Conv. (cfs)	6035605.0	
73643550.0 5930491.0				
Length wtd. (ft)	196.70	Wetted Per. (ft)	1344.86	2190.16
837.62				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.40	Stream Power (lb/ft s)	4336.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1873.10	6738.83
2106.47				
C & E Loss (ft)		Cum SA (acres)	127.81	171.97
108.83				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 3.11111*

INPUT

Description:

Station	Elevation	Data	num=	19
Sta	Elev	Sta	Elev	Sta
0	9	239.97	8.12	276.95
620.6	6.78	622.1	6.78	735.02
				6
				883.62
				5.01
				1044.13
				3.95

1059129.rep
 1073.69 3.75 1151.4 3.03 1289.67 1.78 1730.51 -9.37 1733.63 -9.46
 2376 -25 3111.11 -25 3407.56 0 4340 .89
 Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .035 1289.67 .02 3407.56 .035
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 1289.67 3407.56 166.67 198.67 202.22 .1 .3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.51	Reach Len. (ft)	166.67	198.67
202.22				
Crit W.S. (ft)		Flow Area (sq ft)	21149.46	82521.25
20571.54				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	21149.46	82521.25
20571.54				
Q Total (cfs)	-31136.40	Flow (cfs)	-2160.27	-26436.65
-2539.48				
Top width (ft)	4340.00	Top width (ft)	1289.67	2117.89
932.44				
Vel Total (ft/s)	-0.25	Avg. vel. (ft/s)	-0.10	-0.32
-0.12				
Max Chl Dpth (ft)	47.51	Hydr. Depth (ft)	16.40	38.96
22.06				
Conv. Total (cfs)	82955580.0	Conv. (cfs)	5755528.0	
70434210.0 6765849.0				
Length Wtd. (ft)	196.78	wetted Per. (ft)	1303.20	2119.27
954.06				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.42	Stream Power (lb/ft s)	4340.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1790.48	6354.80
2016.84				
C & E Loss (ft)		Cum SA (acres)	122.79	162.14
104.77				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 3

INPUT

Description: One Bridge Length Upstream

Station	Elevation	Data	num=	10						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	9	268	8	602	7	1039	4	1248	2	
1700	-10	2354	-25	3000	-25	3295	0	4344	1	

Manning's n Values num= 3

1059129.rep
 2183.39 -22.4 2211.94 -23.03 2240.49 -23.46 2269.04 -23.95 2297.59 -24.96
 2326.14 -25.73 2354.69 -26.38 2919.94 -26.38 2935.47 -25.4 2951.01 -24.23
 2966.54 -22.96 2982.08 -21.42 2997.62 -17.58 3271.38 0 3387.96 .6
 3623.22 .92 4313.25 1.62

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .035 1223.5 .02 3271.38 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 1223.5 3271.38 281.25 179.38 196.25 .1 .3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.51	Reach Len. (ft)	281.25	179.38
196.25				
Crit w.s. (ft)		Flow Area (sq ft)	19337.76	80026.18
22363.92				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	19337.76	80026.18
22363.92				
Q Total (cfs)	-32147.80	Flow (cfs)	-2042.04	-27226.38
-2879.38				
Top width (ft)	4313.25	Top width (ft)	1223.50	2047.88
1041.87				
Vel Total (ft/s)	-0.26	Avg. Vel. (ft/s)	-0.11	-0.34
-0.13				
Max Chl Dpth (ft)	48.89	Hydr. Depth (ft)	15.81	39.08
21.47				
Conv. Total (cfs)	80798060.0	Conv. (cfs)	5132328.0	
68428890.0 7236842.0				
Length wtd. (ft)	187.10	Wetted Per. (ft)	1237.19	2049.60
1062.76				
Min Ch El (ft)	-26.38	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.44	Stream Power (lb/ft s)	4313.25	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1583.34	5658.31
1813.12				
C & E Loss (ft)		Cum SA (acres)	109.96	144.22
95.46				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 2.75*

INPUT

Description:

Station Elevation Data				num=	57				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.75	257.48	8.34	569.87	8.02	578.36	7.98	855.94	5.76
998.21	5.93	1122.64	5.82	1199	1.5	1207.84	-1.07	1237.91	-2.61

1059129.rep

1267.98	-3.99	1298.05	-4.39	1328.12	-4.76	1358.2	-4.98	1388.27	-5.63
1418.34	-6.03	1448.41	-6.53	1478.48	-7.25	1508.55	-8.32	1538.62	-9.42
1568.69	-10.14	1598.76	-10.57	1628.83	-11.04	1658.9	-11.76	1671.59	-12.14
1688.97	-12.61	1719.04	-13.28	1749.11	-13.8	1779.18	-14.32	1809.25	-15.04
1839.32	-15.36	1869.39	-15.13	1895.92	-14.09	1977.73	-16.31	2004.26	-18.78
2034.33	-20.42	2063.52	-21.3	2092.7	-22.33	2121.89	-22.94	2151.07	-23.22
2180.26	-23.65	2209.45	-24.25	2238.63	-24.48	2267.82	-24.81	2297	-26.19
2326.19	-27.1	2355.38	-27.75	2839.88	-27.75	2857.91	-26.9	2875.94	-25.67
2893.97	-24.24	2912	-22.26	2930.03	-15.68	3247.75	0	3363.53	1.08
3597.19	1.5	4282.5	2.25						

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.035	1199	.02
		3247.75	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1199	3247.75		281.25	179.38		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.52	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.51	Reach Len. (ft)	281.25	179.38
196.25				
Crit w.s. (ft)		Flow Area (sq ft)	18421.37	80650.27
21647.09				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	18421.37	80650.27
21647.09				
Q Total (cfs)	-32676.50	Flow (cfs)	-1935.79	-27960.81
-2779.90				
Top width (ft)	4282.50	Top width (ft)	1199.00	2048.75
1034.75				
Vel Total (ft/s)	-0.27	Avg. Vel. (ft/s)	-0.11	-0.35
-0.13				
Max Chl Dpth (ft)	50.26	Hydr. Depth (ft)	15.36	39.37
20.92				
Conv. Total (cfs)	80964070.0	Conv. (cfs)	4796394.0	
69279790.0				
Length wtd. (ft)	186.61	Wetted Per. (ft)	1212.90	2051.41
1055.02				
Min Ch El (ft)	-27.75	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.43	Stream Power (lb/ft s)	4282.50	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1461.44	5327.48
1713.98				
C & E Loss (ft)		Cum SA (acres)	102.14	135.78
90.78				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop	
REACH: Sloop	RS: 2.625*

INPUT

Description:

Station Elevation Data			num= 57								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.62	252.22	8.51	558.22	8.52	566.55	8.47	838.45	6.14		
977.81	6.9	1099.7	7.35	1174.5	1.25	1183.54	-2.49	1214.26	-4.43		
1244.99	-6.11	1275.71	-6.33	1306.44	-6.5	1337.16	-6.46	1367.89	-7.04		
1398.61	-7.26	1429.34	-7.62	1460.06	-8.33	1490.79	-9.55	1521.51	-10.82		
1552.24	-11.52	1582.96	-11.77	1613.69	-12.1	1644.41	-12.8	1657.38	-13.21		
1675.14	-13.73	1705.86	-14.4	1736.59	-14.85	1767.31	-15.3	1798.04	-16.05		
1828.76	-16.2	1859.49	-15.53	1886.6	-13.68	1970.19	-16.11	1997.3	-19.51		
2028.03	-21.65	2057.85	-22.65	2087.67	-23.88	2117.49	-24.47	2147.31	-24.57		
2177.13	-24.89	2206.96	-25.48	2236.78	-25.5	2266.6	-25.68	2296.42	-27.43		
2326.24	-28.47	2356.06	-29.13	2759.81	-29.13	2780.34	-28.4	2800.86	-27.11		
2821.39	-25.52	2841.91	-23.1	2862.44	-13.79	3224.12	0	3339.11	1.57		
3571.16	2.09	4251.75	2.88								

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1174.5	.02	3224.12	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1174.5	3224.12		281.25	179.38	196.25	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.52	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.52	Reach Len. (ft)	281.25	179.38
196.25				
Crit w.s. (ft)		Flow Area (sq ft)	17523.23	81057.14
20931.72				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	17523.23	81057.14
20931.72				
Q Total (cfs)	-33201.30	Flow (cfs)	-1837.22	-28675.78
-2688.30				
Top width (ft)	4251.75	Top width (ft)	1174.50	2049.62
1027.63				
Vel Total (ft/s)	-0.28	Avg. Vel. (ft/s)	-0.10	-0.35
-0.13				
Max Chl Dpth (ft)	51.65	Hydr. Depth (ft)	14.92	39.55
20.37				
Conv. Total (cfs)	80829980.0	Conv. (cfs)	4472801.0	
69812420.0 6544769.0				
Length wtd. (ft)	186.17	Wetted Per. (ft)	1188.66	2053.65
1047.28				
Min Ch El (ft)	-29.13	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.43	Stream Power (lb/ft s)	4251.75	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1345.40	4994.52
1618.06				
C & E Loss (ft)		Cum SA (acres)	94.48	127.34
86.13				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop

RS: 2.5*

INPUT

Description:

Station Elevation Data				num=	57				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.5	246.96	8.68	546.58	9.01	554.73	8.96	820.96	6.51
957.41	7.87	1076.76	8.88	1150	1	1159.23	-3.92	1190.61	-6.24
1221.99	-8.23	1253.37	-8.26	1284.75	-8.24	1316.13	-7.93	1347.51	-8.46
1378.89	-8.49	1410.27	-8.72	1441.65	-9.4	1473.03	-10.79	1504.41	-12.22
1535.79	-12.9	1567.17	-12.98	1598.55	-13.16	1629.93	-13.84	1643.17	-14.28
1661.31	-14.85	1692.69	-15.53	1724.07	-15.91	1755.45	-16.29	1786.83	-17.06
1818.21	-17.04	1849.59	-15.92	1877.28	-13.27	1962.65	-15.91	1990.34	-20.25
2021.72	-22.88	2052.18	-24	2082.64	-25.42	2113.09	-25.99	2143.55	-25.91
2174.01	-26.13	2204.46	-26.7	2234.92	-26.52	2265.38	-26.54	2295.84	-28.66
2326.29	-29.83	2356.75	-30.5	2679.75	-30.5	2702.77	-29.9	2725.79	-28.55
2748.81	-26.8	2771.83	-23.94	2794.85	-11.89	3200.5	0	3314.69	2.06
3545.12	2.67	4221	3.5						

Manning's n Values				num=	3		
Sta	n Val	Sta	n Val	Sta	n Val		
0	.035	1150	.02	3200.5	.035		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1150	3200.5		281.25	179.38	196.25	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.52	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.52	Reach Len. (ft)	281.25	179.38
196.25				
Crit W.S. (ft)		Flow Area (sq ft)	16649.16	81231.43
20231.89				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	16649.16	81231.43
20231.89				
Q Total (cfs)	-33722.10	Flow (cfs)	-1746.83	-29368.04
-2607.24				
Top width (ft)	4221.00	Top width (ft)	1150.00	2050.50
1020.50				
Vel Total (ft/s)	-0.29	Avg. Vel. (ft/s)	-0.10	-0.36
-0.13				
Max Chl Dpth (ft)	53.02	Hydr. Depth (ft)	14.48	39.62
19.83				
Conv. Total (cfs)	80382640.0	Conv. (cfs)	4163871.0	
70003960.0 6214810.0				
Length wtd. (ft)	185.77	Wetted Per. (ft)	1164.46	2056.24
1039.54				
Min Ch El (ft)	-30.50	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.42	Stream Power (lb/ft s)	4221.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1235.08	4660.37
1525.33				
C & E Loss (ft)		Cum SA (acres)	86.97	118.90
81.52				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop

RS: 2.375*

INPUT

Description:

Station Elevation Data			num= 57								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.38	241.69	8.85	534.93	9.51	542.91	9.44	803.47	6.88		
937.01	8.83	1053.82	10.41	1125.5	.75	1134.92	-5.34	1166.96	-8.05		
1198.99	-10.35	1231.03	-10.2	1263.06	-9.99	1295.1	-9.4	1327.13	-9.87		
1359.17	-9.72	1391.2	-9.82	1423.24	-10.48	1455.27	-12.02	1487.31	-13.62		
1519.34	-14.28	1551.38	-14.19	1583.41	-14.22	1615.45	-14.89	1628.97	-15.35		
1647.48	-15.96	1679.52	-16.65	1711.55	-16.96	1743.59	-17.27	1775.62	-18.08		
1807.66	-17.89	1839.69	-16.32	1867.96	-12.85	1955.11	-15.71	1983.38	-20.99		
2015.42	-24.12	2046.51	-25.36	2077.6	-26.97	2108.69	-27.52	2139.79	-27.26		
2170.88	-27.38	2201.97	-27.93	2233.07	-27.55	2264.16	-27.41	2295.25	-29.9		
2326.34	-31.2	2357.44	-31.88	2599.69	-31.88	2625.2	-31.4	2650.72	-29.99		
2676.23	-28.08	2701.75	-24.79	2727.26	-10	3176.88	0	3290.27	2.54		
3519.09	3.25	4190.25	4.12								

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1125.5	.02	3176.88	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1125.5	3176.88		281.25	179.38	196.25	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.52	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.52	Reach Len. (ft)	281.25	179.38
196.25				
Crit w.s. (ft)		Flow Area (sq ft)	15797.85	81188.77
19541.53				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	15797.85	81188.77
19541.53				
Q Total (cfs)	-34238.90	Flow (cfs)	-1663.22	-30041.48
-2534.20				
Top width (ft)	4190.25	Top width (ft)	1125.50	2051.38
1013.37				
Vel Total (ft/s)	-0.29	Avg. Vel. (ft/s)	-0.11	-0.37
-0.13				
Max Chl Dpth (ft)	54.40	Hydr. Depth (ft)	14.04	39.58
19.28				
Conv. Total (cfs)	79641640.0	Conv. (cfs)	3868751.0	
69878200.0				
5894692.0				
Length Wtd. (ft)	185.40	wetted Per. (ft)	1140.33	2059.09
1031.80				
Min Ch El (ft)	-31.88	shear (lb/sq ft)	0.00	0.00
0.00				

Alpha	1.41	1059129.rep	Stream Power (lb/ft s)	4190.25	0.00
0.00					
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1130.33	4325.94	
1435.74					
C & E Loss (ft)		Cum SA (acres)	79.63	110.45	
76.94					

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 2.25*

INPUT

Description:

Station Elevation Data num= 57									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.25	236.43	9.02	523.29	10.01	531.09	9.93	785.98	7.25
916.62	9.8	1030.88	11.94	1101	.5	1110.61	-6.76	1143.3	-9.86
1175.99	-12.47	1208.68	-12.14	1241.38	-11.73	1274.06	-10.87	1306.76	-11.28
1339.45	-10.95	1372.14	-10.92	1404.83	-11.56	1437.52	-13.25	1470.21	-15.01
1502.9	-15.65	1535.59	-15.4	1568.28	-15.29	1600.97	-15.93	1614.76	-16.42
1633.66	-17.08	1666.35	-17.77	1699.04	-18.01	1731.73	-18.25	1764.42	-19.09
1797.11	-18.73	1829.8	-16.72	1858.64	-12.44	1947.58	-15.51	1976.42	-21.73
2009.11	-25.35	2040.84	-26.71	2072.57	-28.52	2104.3	-29.05	2136.02	-28.61
2167.75	-28.62	2199.48	-29.16	2231.21	-28.57	2262.94	-28.28	2294.67	-31.14
2326.4	-32.57	2358.12	-33.26	2519.62	-33.26	2547.64	-32.91	2575.65	-31.43
2603.66	-29.35	2631.67	-25.63	2659.68	-8.1	3153.25	0	3265.84	3.03
3493.06	3.83	4159.5	4.75						

Manning's n Values num= 3					
Sta	n val	Sta	n val	Sta	n val
0	.035	1101	.02	3153.25	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1101	3153.25		281.25	179.38	196.25	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.52	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.52	Reach Len. (ft)	281.25	179.38
196.25				
Crit W.S. (ft)		Flow Area (sq ft)	14966.83	80914.98
18854.06				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	14966.83	80914.98
18854.06				
Q Total (cfs)	-34751.70	Flow (cfs)	-1585.88	-30697.76
-2468.05				
Top width (ft)	4159.50	Top width (ft)	1101.00	2052.25
1006.25				
Vel Total (ft/s)	-0.30	Avg. vel. (ft/s)	-0.11	-0.38
-0.13				
Max Chl Dpth (ft)	55.78	Hydr. Depth (ft)	13.59	39.43
18.74				

Conv. Total (cfs)	78584740.0	1059129.rep	Conv. (cfs)	3586187.0
69417490.0 5581062.0				
Length wtd. (ft)	185.07	Wetted Per. (ft)	1116.26	2062.13
1024.07				
Min Ch El (ft)	-33.26	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.40	Stream Power (lb/ft s)	4159.50	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1031.01	3992.17
1349.25				
C & E Loss (ft)		Cum SA (acres)	72.44	102.00
72.39				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 2.125*

INPUT

Description:

Station Elevation Data				num=	57
Sta	Elev	Sta	Elev	Sta	Elev
0	8.12	231.17	9.19	511.64	10.5
896.22	10.77	1007.94	13.47	1076.5	.25
1153	-14.59	1186.34	-14.07	1219.69	-13.47
1319.72	-12.18	1353.07	-12.01	1386.41	-12.63
1486.45	-17.03	1519.79	-16.6	1553.14	-16.35
1619.83	-18.19	1653.17	-18.89	1686.52	-19.06
1786.55	-19.57	1819.9	-17.11	1849.32	-12.02
2002.81	-26.58	2035.17	-28.06	2067.53	-30.06
2164.63	-29.87	2196.99	-30.38	2229.36	-29.59
2326.45	-33.94	2358.81	-34.63	2439.56	-34.63
2531.08	-30.63	2561.58	-26.47	2592.09	-6.21
3467.03	4.42	4128.75	5.38		

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1076.5	.02	3129.62	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1076.5	3129.62	281.25	179.38	196.25	.1	.3	

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.53	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.52	Reach Len. (ft)	281.25	179.38
196.25				
Crit w.s. (ft)		Flow Area (sq ft)	14157.04	80413.63
18171.65				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	14157.04	80413.63
18171.65				
Q Total (cfs)	-35260.70	Flow (cfs)	-1514.30	-31337.73
-2408.66				

Top width (ft)	4128.75	1059129.rep Top Width (ft)	1076.50	2053.12
999.13 Vel Total (ft/s)	-0.31	Avg. Vel. (ft/s)	-0.11	-0.39
-0.13 Max Chl Dpth (ft)	57.15	Hydr. Depth (ft)	13.15	39.17
18.19 Conv. Total (cfs)	77222180.0	Conv. (cfs)	3316377.0	
68630750.0 5275059.0 Length wtd. (ft)	184.76	Wetted Per. (ft)	1092.26	2065.35
1016.33 Min Ch El (ft)	-34.63	Shear (lb/sq ft)	0.00	0.00
0.00 Alpha	1.40	Stream Power (lb/ft s)	4128.75	0.00
0.00 Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	936.99	3660.00
1265.84 C & E Loss (ft)		Cum SA (acres)	65.41	93.55
67.87				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
REACH: Sloop RS: 2

INPUT

Description: Upstream Bridge

Station Elevation Data		num=	52
Sta	Elev	Sta	Elev
0	8	500	11
1062	-9.61	1096	-13.49
1232	-13.81	1266	-14.11
1402	-15.71	1436	-17.81
1572	-18.01	1606	-19.31
1742	-21.11	1776	-20.41
1962.5	-23.21	1996.5	-27.81
2128.5	-31.31	2161.5	-31.11
2293.5	-33.61	2326.5	-35.31
2458.5	-31.91	2491.5	-27.31
3441	5	4098	6

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
0	.035	1052	.02
		3106	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1052	3106	70	70	70	.1		.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.53	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.53	Reach Len. (ft)	5.00	5.00
5.00				
Crit w.s. (ft)		Flow Area (sq ft)	13370.00	79687.83
		Page 19		

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17502.91				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	13370.00	79687.83
17502.91				
Q Total (cfs)	-35765.50	Flow (cfs)	-1448.12	-31960.04
-2357.34				
Top width (ft)	4098.00	Top width (ft)	1052.00	2054.00
992.00				
Vel Total (ft/s)	-0.32	Avg. Vel. (ft/s)	-0.11	-0.40
-0.13				
Max Chl Dpth (ft)	58.54	Hydr. Depth (ft)	12.71	38.80
17.64				
Conv. Total (cfs)	75568350.0	Conv. (cfs)	3059706.0	
67527860.0 4980785.0				
Length Wtd. (ft)	5.00	Wetted Per. (ft)	1068.32	2068.73
1008.60				
Min Ch El (ft)	-36.01	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.39	Stream Power (lb/ft s)	4098.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	848.13	3330.35
1185.48				
C & E Loss (ft)		Cum SA (acres)	58.54	85.10
63.39				

BRIDGE

RIVER: Sloop
 REACH: Sloop RS: 1.9

INPUT

Description:

Distance from Upstream XS = 5
 Deck/Roadway Width = 60
 Weir Coefficient = 2.6
 Upstream Deck/Roadway Coordinates

num=	11														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	
985	15		15		1052	15		0		1052.1	15		11		
1470	22.6		18.6		1840	30		26		1932.5	30		26		
2227.5	24.1		20.1		2534	15		11		2535	15		-5		
3601	15		0		4098	15		0							

Upstream Bridge Cross Section Data

Station	Elevation	Data	num=	52											
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8	500	11	751	8	985	15	1052							
1062	-9.61	1096	-13.49	1130	-16.71	1164	-16.01	1198	-15.21						
1232	-13.81	1266	-14.11	1300	-13.41	1334	-13.11	1368	-13.71						
1402	-15.71	1436	-17.81	1470	-18.41	1504	-17.81	1538	-17.41						
1572	-18.01	1606	-19.31	1640	-20.01	1674	-20.11	1708	-20.21						
1742	-21.11	1776	-20.41	1810	-17.51	1840	-11.61	1932.5	-15.11						
1962.5	-23.21	1996.5	-27.81	2029.5	-29.41	2062.5	-31.61	2095.5	-32.11						
2128.5	-31.31	2161.5	-31.11	2194.5	-31.61	2227.5	-30.61	2260.5	-30.01						
2293.5	-33.61	2326.5	-35.31	2359.5	-36.01	2392.5	-35.91	2425.5	-34.31						
2458.5	-31.91	2491.5	-27.31	2524.5	-4.31	3106	0	3217	4						
3441	5	4098	6												

Manning's n	Values	num=	3						
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1052	.02	3106	.035				

Bank Sta: Left Right Coeff Contr. Expan.
1052 3106 .1 .3

Downstream Deck/Roadway Coordinates

num=	11													
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
985	15	15			1052	15	0			1052.1	15	11		
1470	22.6	18.6			1840	30	26			1932.5	30	26		
2227.5	24.1	20.1			2534	15	11			2535	15	-5		
3601	15	0			4098	15	0							

Downstream Bridge Cross Section Data

Station	Elevation	Data	num=	53										
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	8	500	11	751	8	985	15	1051	.224					
1052	0	1062	-9.61	1096	-13.49	1130	-16.71	1164	-16.01					
1198	-15.21	1232	-13.81	1266	-14.11	1300	-13.41	1334	-13.11					
1368	-13.71	1402	-15.71	1436	-17.81	1470	-18.41	1504	-17.81					
1538	-17.41	1572	-18.01	1606	-19.31	1640	-20.01	1674	-20.11					
1708	-20.21	1742	-21.11	1776	-20.41	1810	-17.51	1840	-11.61					
1932.5	-15.11	1962.5	-23.21	1996.5	-27.81	2029.5	-29.41	2062.5	-31.61					
2095.5	-32.11	2128.5	-31.31	2161.5	-31.11	2194.5	-31.61	2227.5	-30.61					
2260.5	-30.01	2293.5	-33.61	2326.5	-35.31	2359.5	-36.01	2392.5	-35.91					
2425.5	-34.31	2458.5	-31.91	2491.5	-27.31	2524.5	-4.31	3106	0					
3217	4	3441	5	4098	6									

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1052	.02	3106	.035

Bank Sta: Left Right Coeff Contr. Expan.
1052 3106 .1 .3

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 weir crest shape = Broad Crested

Number of Piers = 43

Pier Data

Pier Station	Upstream=	1062	Downstream=	1062
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	24	

Pier Data

Pier Station	Upstream=	1096	Downstream=	1096
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	24	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	24	

Pier Data

				1059129.rep	
Pier Station	Upstream=	1130	Downstream=	1130	
Upstream	num=	2			
width	Elev	width	Elev		
3	-65	3	15		
Downstream	num=	2			
width	Elev	width	Elev		
3	-65	3	15		
Pier Data					
Pier Station	Upstream=	1164	Downstream=	1164	
Upstream	num=	2			
width	Elev	width	Elev		
3	-65	3	15		
Downstream	num=	2			
width	Elev	width	Elev		
3	-65	3	15		
Pier Data					
Pier Station	Upstream=	1198	Downstream=	1198	
Upstream	num=	2			
width	Elev	width	Elev		
3	-65	3	15		
Downstream	num=	2			
width	Elev	width	Elev		
3	-65	3	15		
Pier Data					
Pier Station	Upstream=	1232	Downstream=	1232	
Upstream	num=	2			
width	Elev	width	Elev		
3	-65	3	16		
Downstream	num=	2			
width	Elev	width	Elev		
3	-65	3	16		
Pier Data					
Pier Station	Upstream=	1266	Downstream=	1266	
Upstream	num=	2			
width	Elev	width	Elev		
3	-65	3	16		
Downstream	num=	2			
width	Elev	width	Elev		
3	-65	3	16		
Pier Data					
Pier Station	Upstream=	1300	Downstream=	1300	
Upstream	num=	2			
width	Elev	width	Elev		
3	-65	3	16		
Downstream	num=	2			
width	Elev	width	Elev		
3	-65	3	16		
Pier Data					
Pier Station	Upstream=	1334	Downstream=	1334	
Upstream	num=	2			
width	Elev	width	Elev		
3	-65	3	16		
Downstream	num=	2			
width	Elev	width	Elev		
3	-65	3	16		

Pier Data

				1059129.rep	
Pier Station	Upstream=	1368	Downstream=	1368	
Upstream	num= 2				
width 3	Elev -65	width 3	Elev 16		
Downstream	num= 2				
width 3	Elev -65	width 3	Elev 16		
Pier Data					
Pier Station	Upstream=	1402	Downstream=	1402	
Upstream	num= 2				
width 3	Elev -65	width 3	Elev 16		
Downstream	num= 2				
width 3	Elev -65	width 3	Elev 16		
Pier Data					
Pier Station	Upstream=	1436	Downstream=	1436	
Upstream	num= 2				
width 3	Elev -65	width 3	Elev 17		
Downstream	num= 2				
width 3	Elev -65	width 3	Elev 17		
Pier Data					
Pier Station	Upstream=	1470	Downstream=	1470	
Upstream	num= 2				
width 3	Elev -65	width 3	Elev 18		
Downstream	num= 2				
width 3	Elev -65	width 3	Elev 18		
Pier Data					
Pier Station	Upstream=	1504	Downstream=	1504	
Upstream	num= 2				
width 3	Elev -65	width 3	Elev 19		
Downstream	num= 2				
width 3	Elev -65	width 3	Elev 19		
Pier Data					
Pier Station	Upstream=	1538	Downstream=	1538	
Upstream	num= 2				
width 3	Elev -65	width 3	Elev 19		
Downstream	num= 2				
width 3	Elev -65	width 3	Elev 19		
Pier Data					
Pier Station	Upstream=	1572	Downstream=	1572	
Upstream	num= 2				
width 3	Elev -65	width 3	Elev 22		
Downstream	num= 2				
width 3	Elev -65	width 3	Elev 22		

Pier Data

				1059129.rep	
Pier Station	Upstream=	1606	Downstream=	1606	
Upstream	num= 2				
width 3	Elev -65	width 3	Elev 22		
Downstream	num= 2				
width 3	Elev -65	width 3	Elev 22		
Pier Data					
Pier Station	Upstream=	1640	Downstream=	1640	
Upstream	num= 2				
width 3	Elev -65	width 3	Elev 22		
Downstream	num= 2				
width 3	Elev -65	width 3	Elev 22		
Pier Data					
Pier Station	Upstream=	1674	Downstream=	1674	
Upstream	num= 2				
width 3	Elev -65	width 3	Elev 22		
Downstream	num= 2				
width 3	Elev -65	width 3	Elev 22		
Pier Data					
Pier Station	Upstream=	1708	Downstream=	1708	
Upstream	num= 2				
width 3	Elev -65	width 3	Elev 24		
Downstream	num= 2				
width 3	Elev -65	width 3	Elev 24		
Pier Data					
Pier Station	Upstream=	1742	Downstream=	1742	
Upstream	num= 2				
width 3	Elev -65	width 3	Elev 24		
Downstream	num= 2				
width 3	Elev -65	width 3	Elev 24		
Pier Data					
Pier Station	Upstream=	1776	Downstream=	1776	
Upstream	num= 2				
width 3	Elev -65	width 3	Elev 24		
Downstream	num= 2				
width 3	Elev -65	width 3	Elev 24		
Pier Data					
Pier Station	Upstream=	1810	Downstream=	1810	
Upstream	num= 2				
width 3	Elev -65	width 3	Elev 27		
Downstream	num= 2				
width 3	Elev -65	width 3	Elev 27		

Pier Data

1059129.rep

Pier Station	Upstream=	1840	Downstream=	1840
Upstream	num=	2		
width	Elev	width	Elev	
15	-65	15	27	
Downstream	num=	2		
width	Elev	width	Elev	
15	-65	15	27	

Pier Data				
Pier Station	Upstream=	1840	Downstream=	1840
Upstream	num=	2		
width	Elev	width	Elev	
15	-65	15	27	
Downstream	num=	2		
width	Elev	width	Elev	
15	-65	15	27	

Pier Data				
Pier Station	Upstream=	1962.5	Downstream=	1962.5
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	

Pier Data				
Pier Station	Upstream=	1996.5	Downstream=	1996.5
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	

Pier Data				
Pier Station	Upstream=	2029.5	Downstream=	2029.5
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	

Pier Data				
Pier Station	Upstream=	2062.5	Downstream=	2062.5
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	

Pier Data				
Pier Station	Upstream=	2095.5	Downstream=	2095.5
Upstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	
Downstream	num=	2		
width	Elev	width	Elev	
3	-65	3	27	

Pier Data

1059129.rep
Pier Station Upstream= 2128.5 Downstream= 2128.5
Upstream num= 2
width Elev width Elev
3 -65 3 27
Downstream num= 2
width Elev width Elev
3 -65 3 27

Pier Data
Pier Station Upstream= 2161.5 Downstream= 2161.5
Upstream num= 2
width Elev width Elev
3 -65 3 26
Downstream num= 2
width Elev width Elev
3 -65 3 26

Pier Data
Pier Station Upstream= 2194.5 Downstream= 2194.5
Upstream num= 2
width Elev width Elev
3 -65 3 26
Downstream num= 2
width Elev width Elev
3 -65 3 26

Pier Data
Pier Station Upstream= 2227.5 Downstream= 2227.5
Upstream num= 2
width Elev width Elev
3 -65 3 25
Downstream num= 2
width Elev width Elev
3 -65 3 25

Pier Data
Pier Station Upstream= 2260.5 Downstream= 2260.5
Upstream num= 2
width Elev width Elev
3 -65 3 24
Downstream num= 2
width Elev width Elev
3 -65 3 24

Pier Data
Pier Station Upstream= 2293.5 Downstream= 2293.5
Upstream num= 2
width Elev width Elev
3 -65 3 23
Downstream num= 2
width Elev width Elev
3 -65 3 23

Pier Data
Pier Station Upstream= 2326.5 Downstream= 2326.5
Upstream num= 2
width Elev width Elev
3 -65 3 23
Downstream num= 2
width Elev width Elev
3 -65 3 23

Pier Data

1059129.rep
Pier Station Upstream= 2359.5 Downstream= 2359.5
Upstream num= 2
width Elev width Elev
3 -65 3 23
Downstream num= 2
width Elev width Elev
3 -65 3 23

Pier Data
Pier Station Upstream= 2392.5 Downstream= 2392.5
Upstream num= 2
width Elev width Elev
3 -65 3 20
Downstream num= 2
width Elev width Elev
3 -65 3 20

Pier Data
Pier Station Upstream= 2425.5 Downstream= 2425.5
Upstream num= 2
width Elev width Elev
3 -65 3 18
Downstream num= 2
width Elev width Elev
3 -65 3 18

Pier Data
Pier Station Upstream= 2458.5 Downstream= 2458.5
Upstream num= 2
width Elev width Elev
3 -65 3 18
Downstream num= 2
width Elev width Elev
3 -65 3 18

Pier Data
Pier Station Upstream= 2491.5 Downstream= 2491.5
Upstream num= 2
width Elev width Elev
3 -65 3 17
Downstream num= 2
width Elev width Elev
3 -65 3 17

Pier Data
Pier Station Upstream= 2525 Downstream= 2525
Upstream num= 2
width Elev width Elev
3 -65 3 17
Downstream num= 2
width Elev width Elev
3 -65 3 17

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

1059129.rep

Add Friction component to Momentum
 Do not add Weight component to Momentum
 Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end
 Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #Max WS

E.G. US. (ft)	22.53	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	22.53	E.G. Elev (ft)	22.53
22.54			
Q Total (cfs)	-35765.50	W.S. Elev (ft)	22.53
22.53			
Q Bridge (cfs)		Crit W.S. (ft)	
Q Weir (cfs)		Max Chl Dpth (ft)	58.53
58.54			
Weir Sta Lft (ft)		Vel Total (ft/s)	-0.66
-0.66			
Weir Sta Rgt (ft)		Flow Area (sq ft)	54204.77
54206.53			
Weir Submerg		Froude # Chl	-0.02
-0.02			
Weir Max Depth (ft)		Specif Force (cu ft)	1343128.00
1343368.00			
Min El Weir Flow (ft)	8.01	Hydr Depth (ft)	136.25
136.40			
Min El Prs (ft)	26.00	W.P. Total (ft)	5765.38
5765.92			
Delta EG (ft)		Conv. Total (cfs)	17939440.0
17939310.0			
Delta WS (ft)	0.00	Top width (ft)	397.84
397.40			
BR Open Area (sq ft)		Frctn Loss (ft)	
BR Open Vel (ft/s)		C & E Loss (ft)	
Coef of Q		Shear Total (lb/sq ft)	0.00
0.00			
Br Sel Method	Energy/Weir	Power Total (lb/ft s)	0.00
0.00			

Note: The post processor is unable to handle negative flow through a bridge at this time. The water surfaces inside the bridge are based on projecting the outside water surface.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop

RS: 1.8

INPUT

Description: Downstream Bridge

Station Elevation Data		num= 53	
Sta	Elev	Sta	Elev
0	8	500	11
1052	0	1062	-9.61
1198	-15.21	1232	-13.81
1368	-13.71	1402	-15.71
1538	-17.41	1572	-18.01
1708	-20.21	1742	-21.11
1932.5	-15.11	1962.5	-23.21
2095.5	-32.11	2128.5	-31.31
2260.5	-30.01	2293.5	-33.61
2425.5	-34.31	2458.5	-31.91
3217	4	3441	5

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.035	1052	.02
		3106	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1052	3106		352.17	178	441.67	.1
							.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.53	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.53	Reach Len. (ft)	352.17	178.00
441.67				
Crit w.s. (ft)		Flow Area (sq ft)	13374.66	79696.93
17507.30				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	13374.66	79696.93
17507.30				
Q Total (cfs)	-35765.50	Flow (cfs)	-1448.64	-31959.07
-2357.80				
Top Width (ft)	4098.00	Top Width (ft)	1052.00	2054.00
992.00				
Vel Total (ft/s)	-0.32	Avg. Vel. (ft/s)	-0.11	-0.40
-0.13				
Max Chl Dpth (ft)	58.54	Hydr. Depth (ft)	12.71	38.80
17.65				
Conv. Total (cfs)	75585060.0	Conv. (cfs)	3061473.0	
67540730.0				
Length Wtd. (ft)	200.85	Wetted Per. (ft)	1068.32	2068.73
1008.61				
Min Ch El (ft)	-36.01	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.39	Stream Power (lb/ft s)	4098.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	847.36	3322.67
1184.48				
C & E Loss (ft)		Cum SA (acres)	58.48	84.95
63.33				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop

RS: 1.66666*

INPUT

Description:

Station Elevation Data			num= 61						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.33	243.52	9.33	380.71	9.82	524.32	10.28	600.69	9.44
787.53	7.55	871.82	9.5	1032.91	12.75	1102.12	.19	1103.17	0
1116.14	-8.04	1160.25	-11.4	1204.37	-14.2	1248.48	-13.73	1292.59	-13.19
1336.71	-12.14	1380.82	-12.51	1412.54	-12.17	1424.93	-12.1	1469.05	-12.18
1513.16	-13.01	1557.27	-15.01	1601.39	-17.09	1634.78	-17.72	1645.5	-17.89
1689.61	-17.6	1733.73	-17.48	1777.84	-18.18	1821.95	-19.48	1866.07	-20.27
1910.18	-20.56	1952.54	-20.84	1954.29	-20.84	1998.41	-21.6	2042.52	-21.03
2086.63	-18.62	2125.56	-13.71	2245.57	-16.65	2284.5	-23.41	2328.61	-27.25
2371.42	-28.59	2414.24	-30.43	2457.06	-30.86	2499.87	-30.2	2542.69	-30.04
2585.5	-30.47	2628.32	-29.64	2671.14	-29.15	2713.95	-32.16	2756.77	-33.58
2799.58	-34.17	2836.18	-33.91	2872.78	-32.39	2909.38	-30.21	2945.98	-26.19
2982.58	-6.84	3627.5	0	3740.33	3.42	3968.02	4.42	4303.73	5.09
4635.83	6.33								

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1103.17	.02	3627.5	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1103.17	3627.5		352.17	178	441.67	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.53	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.53	Reach Len. (ft)	352.17	178.00
441.67				
Crit w.s. (ft)		Flow Area (sq ft)	14652.05	98759.30
18142.88				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	14652.05	98759.30
18142.88				
Q Total (cfs)	-36516.70	Flow (cfs)	-1356.58	-33106.41
-2053.71				
Top width (ft)	4635.83	Top width (ft)	1103.17	2524.33
1008.33				
Vel Total (ft/s)	-0.28	Avg. vel. (ft/s)	-0.09	-0.34
-0.11				
Max Chl Dpth (ft)	56.70	Hydr. Depth (ft)	13.28	39.12
17.99				
Conv. Total (cfs)	93044220.0	Conv. (cfs)	3456549.0	
84354820.0				
Length wtd. (ft)	198.29	Wetted Per. (ft)	1118.59	2533.54
1024.59				
Min Ch El (ft)	-34.17	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.34	Stream Power (lb/ft s)	4635.83	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	734.06	2958.05
1003.74				
C & E Loss (ft)		Cum SA (acres)	49.76	75.60

53.19

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
REACH: Sloop

RS: 1.53333*

INPUT

Description:

Station Elevation Data		num= 61	
Sta	Elev	Sta	Elev
0	8.67	254.82	9.26
824.05	7.1	912.25	8.6
1170.28	-6.48	1224.51	-9.3
1441.42	-10.46	1495.64	-10.9
1658.32	-12.32	1712.55	-14.31
1875.23	-17.39	1929.46	-17.54
2146.36	-21.01	2198.43	-21.47
2363.27	-19.73	2411.12	-15.81
2713.35	-27.77	2765.98	-29.26
2976.51	-29.32	3029.14	-28.67
3239.67	-32.34	3279.86	-31.9
3440.66	-9.36	4149	0
5173.67	6.67		

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.035	1154.33	.02
		4149	.035

Bank Sta: Left	Right	Lengths: Left	Channel Right	Coeff Contr.	Expan.
1154.33	4149	352.17	178 441.67	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.54	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.54	Reach Len. (ft)	352.17	178.00
441.67				
Crit W.S. (ft)		Flow Area (sq ft)	15986.76	117520.20
18791.96				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	15986.76	117520.20
18791.96				
Q Total (cfs)	-37334.60	Flow (cfs)	-1316.43	-34155.64
-1862.54				
Top width (ft)	5173.67	Top width (ft)	1154.33	2994.67
1024.67				
Vel Total (ft/s)	-0.25	Avg. Vel. (ft/s)	-0.08	-0.29
-0.10				
Max Chl Dpth (ft)	54.88	Hydr. Depth (ft)	13.85	39.24
18.34				
Conv. Total (cfs)	110079000.0	Conv. (cfs)	3881419.0	
100706000.0				
Length wtd. (ft)	196.61	Wetted Per. (ft)	1168.98	3000.17
1040.58				

Min Ch El (ft)	-32.34	1059129.rep		
0.00		Shear (lb/sq ft)	0.00	0.00
Alpha	1.30	Stream Power (lb/ft s)	5173.67	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	610.21	2516.16
816.49				
C & E Loss (ft)		Cum SA (acres)	40.64	64.32
42.88				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 1.4*

INPUT

Description:

Station Elevation Data	num=	61							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
0 9 266.11 9.2 416.03 9.09 572.96 8.85 656.42 8.06									
860.58 6.66 952.69 7.7 1128.72 8.26 1204.35 .12 1205.5 0									
1224.42 -4.91 1288.76 -7.21 1353.1 -9.17 1417.44 -9.18 1481.78 -9.14									
1546.12 -8.79 1610.46 -9.3 1656.72 -9.3 1674.8 -9.48 1739.14 -10.33									
1803.48 -11.62 1867.82 -13.61 1932.16 -15.65 1980.87 -16.63 1996.5 -16.86									
2060.84 -17.18 2125.18 -17.61 2189.52 -18.53 2253.86 -19.81 2318.2 -20.78									
2382.54 -21.46 2444.32 -22.1 2446.88 -22.11 2511.22 -22.58 2575.56 -22.26									
2639.9 -20.83 2696.67 -17.91 2871.72 -19.73 2928.49 -23.8 2992.83 -26.13									
3055.27 -26.95 3117.72 -28.08 3180.17 -28.35 3242.62 -27.98 3305.06 -27.9									
3367.51 -28.18 3429.96 -27.7 3492.41 -27.43 3554.85 -29.25 3617.3 -30.13									
3679.75 -30.5 3723.55 -29.9 3767.34 -28.55 3811.14 -26.8 3854.94 -23.94									
3898.74 -11.89 4670.5 0 4786.98 2.25 5022.05 3.26 5368.64 4.25									
5711.5 7									

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .035 1205.5 .02 4670.5 .035		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
1205.5 4670.5	352.17 178 441.67	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.54	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.54	Reach Len. (ft)	352.17	178.00
441.67				
Crit w.s. (ft)		Flow Area (sq ft)	17376.24	135988.50
19451.87				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	17376.24	135988.50
19451.87				
Q Total (cfs)	-38219.20	Flow (cfs)	-1307.83	-35174.58
-1736.79				
Top width (ft)	5711.50	Top width (ft)	1205.50	3465.00
1041.00				
Vel Total (ft/s)	-0.22	Avg. vel. (ft/s)	-0.08	-0.26

1059129.rep

-0.09				
Max Chl Dpth (ft)	53.04	Hydr. Depth (ft)	14.41	39.25
18.69				
Conv. Total (cfs)	126706200.0	Conv. (cfs)	4335775.0	
116612500.0 5757885.0				
Length wtd. (ft)	195.47	Wetted Per. (ft)	1219.50	3468.05
1056.57				
Min Ch El (ft)	-30.50	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.27	Stream Power (lb/ft s)	5711.50	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	475.35	1998.20
622.61				
C & E Loss (ft)		Cum SA (acres)	31.10	51.13
32.41				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop

RS: 1.26666*

INPUT

Description:

Station Elevation Data			num=	61					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9.33	277.41	9.13	433.68	8.73	597.28	8.13	684.28	7.38
897.11	6.21	993.13	6.8	1176.63	6.01	1255.47	.09	1256.67	0
1278.56	-3.34	1353.02	-5.11	1427.47	-6.66	1501.92	-6.9	1576.38	-7.11
1650.83	-7.12	1725.28	-7.69	1778.82	-7.87	1799.74	-8.18	1874.19	-9.4
1948.64	-10.92	2023.1	-12.91	2097.55	-14.93	2153.91	-16.09	2172	-16.34
2246.46	-16.97	2320.91	-17.67	2395.36	-18.7	2469.82	-19.97	2544.27	-21.04
2618.72	-21.9	2690.22	-22.74	2693.18	-22.74	2767.63	-23.07	2842.08	-22.87
2916.54	-21.94	2982.23	-20.01	3184.79	-21.27	3250.48	-24	3324.94	-25.57
3397.2	-26.13	3469.46	-26.9	3541.73	-27.1	3613.99	-26.87	3686.25	-26.83
3758.52	-27.03	3830.78	-26.74	3903.04	-26.57	3975.31	-27.8	4047.57	-28.4
4119.83	-28.67	4167.23	-27.9	4214.63	-26.63	4262.02	-25.09	4309.42	-22.82
4356.82	-14.42	5192	0	5310.31	1.67	5549.06	2.67	5901.09	3.83
6249.33	7.33								

Manning's n Values			num=	3
Sta	n Val	Sta	n Val	Sta
0	.035	1256.67	.02	5192
				.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1256.67	5192		352.17	178 441.67	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.54	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.54	Reach Len. (ft)	352.17	178.00
441.67				
Crit w.s. (ft)		Flow Area (sq ft)	18826.21	154158.70
20125.80				

E.G. Slope (ft/ft)	0.000000	1059129.rep Area (sq ft)	18826.21	154158.70
20125.80 Q Total (cfs)	-39170.70	Flow (cfs)	-1321.74	-36195.45
-1653.51 Top width (ft)	6249.33	Top width (ft)	1256.67	3935.33
1057.33 Vel Total (ft/s)	-0.20	Avg. Vel. (ft/s)	-0.07	-0.23
-0.08 Max Chl Dpth (ft)	51.21	Hydr. Depth (ft)	14.98	39.17
19.03 Conv. Total (cfs)	142928600.0	Conv. (cfs)	4822845.0	
132072300.0 6033442.0 Length wtd. (ft)	194.67	Wetted Per. (ft)	1270.12	3936.86
1072.57 Min Ch El (ft)	-28.67	Shear (lb/sq ft)	0.00	0.00
0.00 Alpha	1.25	Stream Power (lb/ft s)	6249.33	0.00
0.00 Frctn Loss (ft)	0.00	Cum volume (acre-ft)	329.00	1405.38
421.96 C & E Loss (ft)		Cum SA (acres)	21.15	36.01
21.77				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 1.13333*

INPUT

Description:

Station Elevation Data			num= 61							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	9.67	288.7	9.07	451.34	8.36	621.59	7.41	712.14	6.69	
933.63	5.76	1033.56	5.9	1224.54	3.77	1306.59	.06	1307.83	0	
1332.71	-1.78	1417.27	-3.02	1501.84	-4.15	1586.41	-4.63	1670.97	-5.09	
1755.54	-5.45	1840.11	-6.09	1900.91	-6.43	1924.67	-6.87	2009.24	-8.47	
2093.81	-10.22	2178.37	-12.21	2262.94	-14.22	2326.96	-15.54	2347.51	-15.82	
2432.07	-16.76	2516.64	-17.74	2601.2	-18.88	2685.77	-20.14	2770.34	-21.29	
2854.9	-22.35	2936.11	-23.37	2939.47	-23.37	3024.04	-23.56	3108.6	-23.49	
3193.17	-23.05	3267.79	-22.11	3497.86	-22.81	3572.48	-24.19	3657.04	-25	
3739.12	-25.31	3821.2	-25.72	3903.28	-25.85	3985.36	-25.76	4067.44	-25.77	
4149.52	-25.89	4231.6	-25.77	4313.68	-25.71	4395.76	-26.35	4477.84	-26.68	
4559.92	-26.83	4610.91	-25.9	4661.91	-24.71	4712.9	-23.39	4763.9	-21.7	
4814.9	-16.95	5713.5	0	5833.64	1.08	6076.08	2.09	6433.55	3.42	
6787.17	7.67									

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1307.83	.02	5713.5	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1307.83	5713.5	352.17	178	441.67	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.54	Element	Left OB	Channel
		Page 34		

1059129.rep

Right OB				
Vel Head (ft)	0.00	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	22.54	Reach Len. (ft)	352.17	178.00
441.67				
Crit w.s. (ft)		Flow Area (sq ft)	20331.92	172038.10
20804.64				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	20331.92	172038.10
20804.64				
Q Total (cfs)	-40189.20	Flow (cfs)	-1352.20	-37238.68
-1598.33				
Top width (ft)	6787.17	Top width (ft)	1307.83	4405.67
1073.67				
Vel Total (ft/s)	-0.19	Avg. Vel. (ft/s)	-0.07	-0.22
-0.08				
Max Chl Dpth (ft)	49.37	Hydr. Depth (ft)	15.55	39.05
19.38				
Conv. Total (cfs)	158757100.0	Conv. (cfs)	5341525.0	
147101800.0 6313771.0				
Length wtd. (ft)	194.12	Wetted Per. (ft)	1320.81	4406.38
1088.57				
Min Ch El (ft)	-26.83	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.23	Stream Power (lb/ft s)	6787.17	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	170.71	738.91
214.46				
C & E Loss (ft)		Cum SA (acres)	10.78	18.96
10.97				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Sloop
 REACH: Sloop RS: 1

INPUT

Description:

Station	Elevation	Data	num=	13						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	10	300	9	469	8	740	6	1074	5	
1359	0	2023	-5	2500	-15	3182	-24	5000	-25	
6235	0	6966	3	7325	8					

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .035	1359 .02	6235 .035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1359	6235	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	22.54	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-val.	0.035	0.020
0.035				

W.S. Elev (ft)	22.54	1059129.rep Reach Len. (ft)		
Crit W.S. (ft)	-22.06	Flow Area (sq ft)	21898.86	189612.50
21497.60		Area (sq ft)	21898.86	189612.50
E.G. Slope (ft/ft)	0.000000	Flow (cfs)	-1395.70	-38281.52
21497.60		Top Width (ft)	1359.00	4876.00
Q Total (cfs)	-41240.70	Avg. Vel. (ft/s)	-0.06	-0.20
-1563.48		Hydr. Depth (ft)	16.11	38.89
Top width (ft)	7325.00	Conv. (cfs)	5894930.0	
1090.00		Wetted Per. (ft)	1371.60	4876.44
Vel Total (ft/s)	-0.18	Shear (lb/sq ft)	0.00	0.00
-0.07		Stream Power (lb/ft s)	7325.00	0.00
Max Chl Dpth (ft)	47.54	Cum Volume (acre-ft)		
19.72		Cum SA (acres)		
Conv. Total (cfs)	174185600.0			
161687100.0 6603570.0				
Length wtd. (ft)				
1104.58				
Min Ch El (ft)	-25.00			
0.00				
Alpha	1.22			
0.00				
Frctn Loss (ft)				
C & E Loss (ft)				

SUMMARY OF MANNING'S N VALUES

River:Sloop

Reach	River Sta.	n1	n2	n3
Sloop	4	.035	.02	.035
Sloop	3.88888*	.035	.02	.035
Sloop	3.77777*	.035	.02	.035
Sloop	3.66666*	.035	.02	.035
Sloop	3.55555*	.035	.02	.035
Sloop	3.44444*	.035	.02	.035
Sloop	3.33333*	.035	.02	.035
Sloop	3.22222*	.035	.02	.035
Sloop	3.11111*	.035	.02	.035
Sloop	3	.035	.02	.035
Sloop	2.875*	.035	.02	.035
Sloop	2.75*	.035	.02	.035
Sloop	2.625*	.035	.02	.035
Sloop	2.5*	.035	.02	.035
Sloop	2.375*	.035	.02	.035
Sloop	2.25*	.035	.02	.035
Sloop	2.125*	.035	.02	.035
Sloop	2	.035	.02	.035
Sloop	1.9	Bridge		
Sloop	1.8	.035	.02	.035
Sloop	1.66666*	.035	.02	.035
Sloop	1.53333*	.035	.02	.035
Sloop	1.4*	.035	.02	.035
Sloop	1.26666*	.035	.02	.035
Sloop	1.13333*	.035	.02	.035
Sloop	1	.035	.02	.035

SUMMARY OF REACH LENGTHS

River: Sloop

Reach	River Sta.	Left	Channel	Right
Sloop	4	166.67	198.67	202.22
Sloop	3.88888*	166.67	198.67	202.22
Sloop	3.77777*	166.67	198.67	202.22
Sloop	3.66666*	166.67	198.67	202.22
Sloop	3.55555*	166.67	198.67	202.22
Sloop	3.44444*	166.67	198.67	202.22
Sloop	3.33333*	166.67	198.67	202.22
Sloop	3.22222*	166.67	198.67	202.22
Sloop	3.11111*	166.67	198.67	202.22
Sloop	3	281.25	179.38	196.25
Sloop	2.875*	281.25	179.38	196.25
Sloop	2.75*	281.25	179.38	196.25
Sloop	2.625*	281.25	179.38	196.25
Sloop	2.5*	281.25	179.38	196.25
Sloop	2.375*	281.25	179.38	196.25
Sloop	2.25*	281.25	179.38	196.25
Sloop	2.125*	281.25	179.38	196.25
Sloop	2	70	70	70
Sloop	1.9	Bridge		
Sloop	1.8	352.17	178	441.67
Sloop	1.66666*	352.17	178	441.67
Sloop	1.53333*	352.17	178	441.67
Sloop	1.4*	352.17	178	441.67
Sloop	1.26666*	352.17	178	441.67
Sloop	1.13333*	352.17	178	441.67
Sloop	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

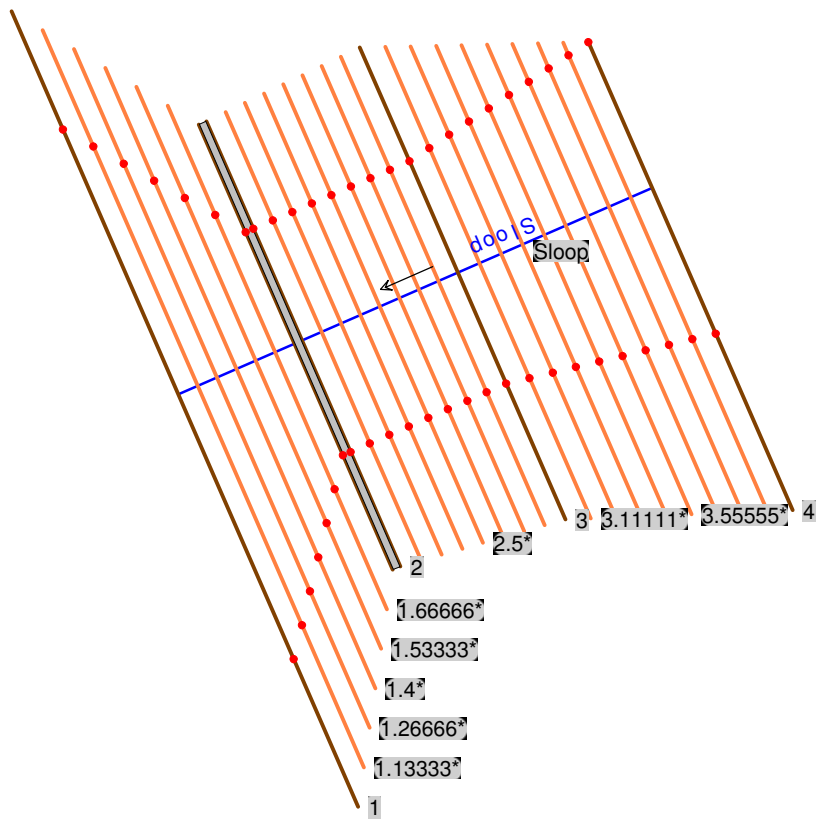
River: Sloop

Reach	River Sta.	Contr.	Expan.
Sloop	4	.1	.3
Sloop	3.88888*	.1	.3
Sloop	3.77777*	.1	.3
Sloop	3.66666*	.1	.3
Sloop	3.55555*	.1	.3
Sloop	3.44444*	.1	.3
Sloop	3.33333*	.1	.3
Sloop	3.22222*	.1	.3
Sloop	3.11111*	.1	.3
Sloop	3	.1	.3
Sloop	2.875*	.1	.3
Sloop	2.75*	.1	.3
Sloop	2.625*	.1	.3
Sloop	2.5*	.1	.3
Sloop	2.375*	.1	.3
Sloop	2.25*	.1	.3
Sloop	2.125*	.1	.3

		1059129.rep	
Sloop	2	.1	.3
Sloop	1.9	Bridge	
Sloop	1.8	.1	.3
Sloop	1.66666*	.1	.3
Sloop	1.53333*	.1	.3
Sloop	1.4*	.1	.3
Sloop	1.26666*	.1	.3
Sloop	1.13333*	.1	.3
Sloop	1	.1	.3

Profile Output Table - Six XS Bridge

Reach Loss	C & E Loss	River Sta Top Width	Profile Q Left	E.G. Elev Q Channel (ft)	W.S. Elev Q Right (ft)	Crit W.S. Vel Chnl (ft/s)	Frctn
(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft/s)	
Sloop	2.125*	4128.75	Max WS	22.53	22.52		
0.00			-1514.30	-31337.73	-2408.66	-0.39	
Sloop	2	4098.00	Max WS	22.53	22.53		
			-1448.12	-31960.04	-2357.34	-0.40	
Sloop	1.9	BR U	Max WS	22.53	22.53		
		397.84		-35765.50		-0.66	
Sloop	1.9	BR D	Max WS	22.54	22.53		
		397.40		-35765.50		-0.66	
Sloop	1.8	4098.00	Max WS	22.53	22.53		
0.00			-1448.64	-31959.07	-2357.80	-0.40	
Sloop	1.66666*	4635.83	Max WS	22.53	22.53		
0.00			-1356.58	-33106.41	-2053.71	-0.34	



None of the XS's are Geo-Referenced [Geo-Ref user entered XS] [Geo-Ref interpolated XS] [Non Geo-Ref user entered XS] [Non Geo-Ref interpolated XS]

TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
Meadowbrook Parkway over Sloop Channel

100-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation ¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Elevation ² (ft)	Exposed Pile Depth (ft)
North Abutment	-4.5	0	13	13	-18	-79	61
Bascule Piers	-17	0	36	36	-53	-70	17
Pier 39	-38	0	13	13	-51	-68	17
South Abutment	-5	0	8	8	-13	-71	58

500-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Footing/Bottom of Pile Cap Elevation ² (ft)	Exposed Pile Depth (ft)
North Abutment	-4.5	0	18	18	-23	-79	56
Bascule Piers	-17	0	36	36	-53	-70	17
Pier 39	-38	0	13	13	-51	-68	17
South Abutment	-5	0	13	13	-18	-71	53

1. All elevations are with reference to NAVD 88 and are taken from the 2009 Fathometric Survey by Boswell Engineering.

2. Estimate of Pile depths are based on NYSDOT records. Bascule piers are at an unknown depth, and assume based on other piers.

SCOUR MODE COMPUTATIONS - FLOOD TIDE
Meadowbrook Parkway over Sloop Channel

The following computations are made using Laursen's Equation (Equation 5.1 in HEC-18):

$$V_c = K_u \times Y_1^{1/6} \times D_{50}^{1/3}$$

100-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	68,026
APPROACH SECTION MAIN CHANNEL WIDTH (ft)	W ₁ =	2,054
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	33.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ^{1/3}	V _c =	3.77
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	94,253
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	16.00
MAIN CHANNEL SCOUR MODE		LIVE-BED

500-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	79,687
APPROACH SECTION MAIN CHANNEL WIDTH (ft)	W ₁ =	2,054
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	39.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ^{1/3}	V _c =	3.87
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	31,960
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	17.00
MAIN CHANNEL SCOUR MODE		LIVE-BED

LIVE BED CONTRACTION SCOUR COMPUTATIONS
Meadowbrook Parkway over Sloop Channel

The following computations are made using the HEC-18 equations for Live Bed Contraction Scour:
(Equations 5.2 and 5.3)

$$Y_s = Y_2 - Y_0$$

$$Y_2 = [(Q_2/Q_1)^{6/7} \times (W_1/W_2)^{k_1}] \times Y_1$$

100-YEAR FLOOD

ENERGY SLOPE	$S_1 =$	0.000003
FALL VELOCITY (Use Figure 5.8 in HEC-18, <i>For English: multiply by 3.28</i>)	$w =$	0.656
AVERAGE UPSTREAM CHANNEL DEPTH (ft), $Y_1 = A_1/W_1$	$y_1 =$	33.00
SHEAR VELOCITY IN UPSTREAM SECTION, $V^* = gy_1 S_1^{1/2}$	$V =$	0.05646061
V^*/w	$V^*/w =$	0.09
k_1	$k_1 =$	0.59
DISCHARGE IN UPSTREAM CHANNEL (cfs)	$Q_1 =$	94,253.0
DISCHARGE IN CONTRACTED SECTION (cfs)	$Q_2 =$	50,547.0
WIDTH OF UPSTREAM CHANNEL SECTION (ft)	$W_1 =$	2,054.0
WIDTH OF MAIN CHANNEL CONTRACTED SECTION (ft)	$W_2 =$	876.0
MEDIAN GRAIN SIZE (ft)	$D_{50} =$	0.00667
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	$Y_2 =$	31.98
AVERAGE WATER DEPTH AT BRIDGE (ft)	$Y_0 =$	57.0
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	$Y_s =$	0.0

500-YEAR FLOOD

ENERGY SLOPE	$S_1 =$	0.000004
FALL VELOCITY (Use Figure 5.8 in HEC-18, <i>For English: multiply by 3.28</i>)	$w =$	0.656
AVERAGE UPSTREAM CHANNEL DEPTH (ft), $Y_1 = A_1/W_1$	$y_1 =$	39.00
SHEAR VELOCITY IN UPSTREAM SECTION, $V^* = gy_1 S_1^{1/2}$	$V =$	0.07087454
V^*/w	$V^*/w =$	0.11
k_1	$k_1 =$	0.59
DISCHARGE IN UPSTREAM CHANNEL (cfs)	$Q_1 =$	31,960.0
DISCHARGE IN CONTRACTED SECTION (cfs)	$Q_2 =$	35,866.0
WIDTH OF UPSTREAM CHANNEL SECTION (ft)	$W_1 =$	2,054.0
WIDTH OF MAIN CHANNEL CONTRACTED SECTION (ft)	$W_2 =$	397.0
MEDIAN GRAIN SIZE (ft)	$D_{50} =$	0.00667
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	$Y_2 =$	113.54
AVERAGE WATER DEPTH AT BRIDGE (ft)	$Y_0 =$	136.25
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	$Y_s =$	0.0

LOCAL ABUTMENT SCOUR COMPUTATIONS - SOUTH
Meadowbrook Parkway over Sloop Channel

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD (Left)

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	100
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	7,397
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	2080.0
V _e = Q _e /A _e , (ft/s)	V _e =	0.281
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	1,052
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	7.0
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000621
SCOUR DEPTH, Y _s (ft)	Y _s =	7.6

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	100
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	13,370
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	1,448
V _e = Q _e /A _e , (ft/s)	V _e =	0.108
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	1,052
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	12.7
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000132
SCOUR DEPTH, Y _s (ft)	Y _s =	13.0

LOCAL ABUTMENT SCOUR COMPUTATIONS - NORTH
Meadowbrook Parkway over Sloop Channel

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD (Left)

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	220
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	11,870
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	4755.0
V _e = Q _e /A _e , (ft/s)	V _e =	0.401
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	992
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	12.0
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000520
SCOUR DEPTH, Y _s (ft)	Y _s =	13.0

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	130
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	17,503
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	2,357
V _e = Q _e /A _e , (ft/s)	V _e =	0.135
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	992
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	17.6
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000119
SCOUR DEPTH, Y _s (ft)	Y _s =	18.1

LOCAL PIER SCOUR COMPUTATIONS - FLOOD TIDE
Meadowbrook Parkway over Sloop Channel

The following computations are made using the HEC-18 CSU Equation (Eqn. 6.1):

$$y_s = (2.0K_1K_2K_3K_4(a/y_1)^{0.65}Fr^{0.43} \times y_1$$

100-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE	K ₄ =	1.00
(SEE EQNS. 6.5 - 6.8)		
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	3.0
LENGTH OF PIER	L=	75.0
L/a (Maximum L/a value is 12)	L/a=	25.0
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	16.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	36.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	12.5

500-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE	K ₄ =	1.00
(SEE EQNS. 6.5 - 6.8)		
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	3.0
LENGTH OF PIER	L=	75.0
L/a (Maximum L/a value is 12)	L/a=	25.0
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	17.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	35.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	12.8

LOCAL PIER SCOUR COMPUTATIONS - FLOOD TIDE
Meadowbrook Parkway over Sloop Channel

The following computations are made using the HEC-18 CSU Equation (Eqn. 6.1):

$$y_s = (2.0K_1K_2K_3K_4(a/y_1)^{0.65}Fr^{0.43} \times y_1$$

100-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE	K ₄ =	1.00
(SEE EQNS. 6.5 - 6.8)		
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	15.0
LENGTH OF PIER	L=	75.0
L/a (Maximum L/a value is 12)	L/a=	5.0
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	16.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	36.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	35.6

500-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE	K ₄ =	1.00
(SEE EQNS. 6.5 - 6.8)		
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	15.0
LENGTH OF PIER	L=	75.0
L/a (Maximum L/a value is 12)	L/a=	5.0
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	17.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	35.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	36.4

Stage Hydrograph for 500 and 100 Year storms

Initial Flow at RS6 = (Area x 1ft/s) =

20000

SLR = 4.592 ft

1059129 - Meadowbrook Parkway over Sloop Channel

500 - year storm

Time	R.S. = 1 Node = s5n6					R.S. = 6 Node = s6n4				
(hrs)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)
1	0.00	0.00	0.00	4.59	0.00	0.00	0.00	0.00	4.59	0.00
2	0.00	0.00	151.21	4.60	0.00	0.00	0.00	173.36	4.59	0.00
3	0.56	0.01	186.00	6.43	0.04	0.56	0.00	155.29	6.44	0.01
4	0.33	0.01	135.59	5.67	0.02	0.33	0.00	155.61	5.67	0.01
5	0.28	0.01	331.66	5.52	0.04	0.28	0.00	12.15	5.52	0.01
6	-0.14	0.10	329.26	4.14	0.31	-0.13	0.01	353.74	4.16	0.04
7	-0.48	0.02	321.02	3.03	0.08	-0.48	0.00	343.46	3.01	0.01
8	-0.58	0.01	187.94	2.71	0.03	-0.59	0.00	181.15	2.66	0.01
9	-0.53	0.04	160.59	2.87	0.13	-0.53	0.01	173.76	2.85	0.03
10	-0.30	0.05	156.82	3.61	0.18	-0.30	0.01	173.72	3.61	0.03
11	0.21	0.09	155.71	5.28	0.31	0.20	0.02	170.09	5.25	0.05
12	0.75	0.06	153.51	7.06	0.21	0.75	0.01	166.37	7.04	0.04
13	1.12	0.04	151.51	8.28	0.12	1.13	0.01	176.37	8.30	0.03
14	1.19	0.01	335.34	8.51	0.04	1.20	0.00	344.70	8.51	0.00
15	0.95	0.06	333.14	7.70	0.18	0.95	0.01	347.08	7.71	0.04
16	0.51	0.07	330.14	6.26	0.24	0.51	0.01	356.95	6.26	0.05
17	-0.07	0.08	329.15	4.35	0.26	-0.07	0.00	6.42	4.35	0.01
18	-0.65	0.08	328.06	2.45	0.25	-0.65	0.02	353.16	2.45	0.05
19	-1.02	0.05	324.05	1.25	0.15	-1.01	0.01	347.47	1.28	0.04
20	-1.03	0.03	162.72	1.23	0.09	-1.03	0.00	246.03	1.22	0.00
21	-0.66	0.06	158.22	2.42	0.20	-0.67	0.01	178.35	2.41	0.03
22	-0.14	0.09	155.94	4.14	0.29	-0.14	0.01	171.98	4.14	0.04
23	0.53	0.09	153.96	6.32	0.29	0.53	0.01	166.73	6.33	0.04
24	1.14	0.06	150.25	8.34	0.19	1.14	0.01	170.96	8.33	0.04
25	1.47	0.01	19.42	9.40	0.02	1.47	0.00	161.83	9.43	0.01
26	1.42	0.02	335.67	9.24	0.08	1.41	0.01	345.25	9.23	0.02
27	1.11	0.03	333.34	8.24	0.10	1.11	0.00	0.83	8.23	0.01
28	0.55	0.08	327.84	6.40	0.28	0.56	0.01	0.37	6.41	0.04
29	-0.11	0.08	327.71	4.23	0.26	-0.11	0.02	352.14	4.23	0.06
30	-0.66	0.07	328.26	2.42	0.22	-0.65	0.02	351.24	2.45	0.05
31	-1.00	0.02	318.60	1.33	0.06	-1.00	0.01	344.21	1.33	0.02
32	-0.97	0.02	165.86	1.43	0.07	-0.97	0.00	190.70	1.43	0.01
33	-0.61	0.07	157.65	2.59	0.22	-0.62	0.01	172.82	2.57	0.03
34	-0.07	0.08	155.73	4.38	0.27	-0.06	0.01	170.87	4.39	0.04
35	0.61	0.07	153.37	6.58	0.24	0.61	0.01	164.13	6.58	0.03
36	1.20	0.04	148.24	8.54	0.12	1.21	0.01	170.28	8.55	0.02
37	1.51	0.01	123.38	9.55	0.03	1.51	0.00	158.23	9.54	0.01
38	1.52	0.01	341.29	9.58	0.03	1.52	0.00	170.65	9.59	0.01
39	1.28	0.06	334.08	8.79	0.18	1.28	0.01	337.84	8.80	0.02
40	0.75	0.08	329.78	7.04	0.26	0.74	0.02	355.90	7.03	0.06
41	0.13	0.09	329.70	5.02	0.29	0.13	0.01	15.15	5.02	0.02
42	-0.40	0.07	327.48	3.29	0.23	-0.40	0.01	350.96	3.30	0.04
43	-0.73	0.02	319.64	2.21	0.08	-0.73	0.01	341.21	2.19	0.02
44	-0.74	0.03	160.94	2.16	0.10	-0.74	0.01	176.23	2.18	0.04
45	-0.43	0.08	156.26	3.20	0.27	-0.42	0.01	171.98	3.21	0.04
46	0.11	0.08	156.15	4.97	0.27	0.11	0.01	169.63	4.96	0.03
47	0.77	0.08	153.51	7.11	0.27	0.77	0.02	173.62	7.11	0.05
48	1.39	0.07	150.30	9.16	0.24	1.40	0.01	167.10	9.17	0.04

49	1.83	0.02	138.31	10.60	0.06	1.84	0.01	161.16	10.62	0.02
50	1.98	0.02	345.83	11.07	0.08	1.97	0.01	3.58	11.06	0.02
51	1.90	0.02	155.40	10.81	0.06	1.89	0.01	157.38	10.79	0.02
52	1.60	0.07	333.79	9.82	0.23	1.60	0.01	352.99	9.84	0.04
53	1.13	0.06	328.58	8.30	0.18	1.14	0.01	2.25	8.32	0.04
54	0.77	0.02	316.00	7.12	0.06	0.76	0.00	140.21	7.08	0.01
55	0.73	0.04	158.41	6.98	0.13	0.73	0.01	155.74	6.99	0.04
56	1.25	0.09	156.40	8.71	0.28	1.26	0.02	160.55	8.72	0.05
57	2.61	0.13	157.18	13.14	0.44	2.60	0.04	160.76	13.12	0.11
58	4.80	0.12	151.55	20.35	0.40	4.82	0.03	164.04	20.41	0.09
59	5.47	0.14	334.08	22.54	0.44	5.46	0.03	345.86	22.49	0.09
60	5.02	0.13	333.29	21.06	0.41	5.04	0.02	342.67	21.12	0.07
61	3.61	0.09	330.70	16.42	0.30	3.62	0.02	1.82	16.47	0.07
62	1.97	0.15	330.47	11.07	0.48	1.97	0.04	348.31	11.06	0.13
63	0.72	0.13	328.23	6.96	0.42	0.73	0.03	343.08	6.98	0.10
64	-0.20	0.05	323.77	3.94	0.17	-0.21	0.01	239.59	3.90	0.02
65	-0.69	0.02	323.87	2.33	0.07	-0.69	0.01	296.64	2.33	0.02
66	-0.74	0.03	164.26	2.15	0.11	-0.74	0.01	210.89	2.15	0.02
67	-0.35	0.07	158.08	3.46	0.24	-0.34	0.01	183.42	3.49	0.02
68	0.14	0.06	156.97	5.04	0.21	0.14	0.01	167.88	5.05	0.02
69	0.53	0.06	155.50	6.31	0.19	0.52	0.01	171.94	6.30	0.03
70	0.81	0.02	153.98	7.26	0.05	0.81	0.00	72.05	7.24	0.01
71	0.96	0.01	148.63	7.74	0.04	0.96	0.00	32.85	7.74	0.01
72	0.99	0.00	359.14	7.85	0.01	0.99	0.00	61.17	7.84	0.01
73	0.89	0.02	332.80	7.50	0.05	0.89	0.00	20.70	7.51	0.01
74	0.69	0.03	328.66	6.84	0.09	0.69	0.01	9.74	6.85	0.02
75	0.54	0.03	330.39	6.35	0.09	0.54	0.01	358.28	6.36	0.03
76	0.42	0.03	330.33	5.98	0.09	0.42	0.01	354.21	5.97	0.02
77	0.28	0.02	328.33	5.52	0.05	0.28	0.00	129.65	5.51	0.01
78	0.12	0.02	329.36	4.97	0.06	0.12	0.00	150.28	4.98	0.00
79	-0.05	0.02	328.83	4.42	0.06	-0.05	0.00	291.77	4.43	0.00
80	-0.21	0.02	328.50	3.92	0.07	-0.19	0.00	106.30	3.97	0.00
81	-0.30	0.01	314.25	3.62	0.02	-0.30	0.00	350.19	3.61	0.00
82	-0.33	0.01	158.44	3.51	0.05	-0.33	0.00	186.79	3.50	0.00
83	-0.19	0.04	156.16	3.98	0.12	-0.19	0.01	171.72	3.96	0.02
84	0.11	0.05	156.26	4.95	0.15	0.11	0.01	170.20	4.95	0.03
85	0.48	0.05	154.25	6.15	0.17	0.48	0.01	162.35	6.17	0.03
86	0.84	0.05	153.05	7.34	0.16	0.84	0.01	163.27	7.34	0.03
87	1.06	0.02	150.79	8.05	0.06	1.05	0.00	140.27	8.05	0.01
88	1.04	0.02	335.38	8.02	0.06	1.05	0.01	2.85	8.03	0.02
89	0.87	0.03	330.59	7.43	0.09	0.86	0.01	2.35	7.43	0.02
90	0.47	0.07	331.95	6.13	0.21	0.47	0.01	358.39	6.13	0.04
91	-0.06	0.11	330.17	4.40	0.35	-0.06	0.02	352.08	4.40	0.05
92	-0.52	0.07	327.65	2.87	0.22	-0.52	0.01	341.44	2.88	0.04
93	-0.83	0.04	326.67	1.86	0.13	-0.83	0.00	338.82	1.87	0.01
94	-0.89	0.00	216.44	1.66	0.01	-0.89	0.00	234.94	1.67	0.00
95	-0.64	0.05	157.86	2.49	0.17	-0.63	0.01	178.70	2.51	0.04
96	-0.22	0.07	155.88	3.86	0.24	-0.22	0.01	169.12	3.86	0.03
97	0.36	0.09	155.11	5.78	0.30	0.36	0.02	170.43	5.78	0.05
98	0.94	0.05	150.82	7.67	0.16	0.94	0.01	171.35	7.68	0.04
99	1.26	0.02	142.48	8.72	0.07	1.25	0.00	156.43	8.71	0.01
100	1.28	0.01	352.28	8.80	0.02	1.29	0.00	11.23	8.81	0.01
101	1.07	0.04	334.18	8.10	0.13	1.07	0.01	357.49	8.11	0.02
102	0.60	0.07	329.29	6.57	0.23	0.60	0.01	359.87	6.56	0.04
103	-0.02	0.10	330.47	4.54	0.31	-0.01	0.01	1.37	4.57	0.04
104	-0.58	0.07	328.68	2.70	0.24	-0.58	0.02	353.27	2.69	0.06
105	-0.96	0.05	326.94	1.45	0.16	-0.96	0.02	355.20	1.46	0.06

106	-1.04	0.02	163.68	1.17	0.05	-1.04	0.00	278.10	1.19	0.00
107	-0.82	0.08	156.42	1.92	0.26	-0.81	0.02	176.78	1.94	0.06
108	-0.40	0.09	155.48	3.28	0.29	-0.40	0.01	170.07	3.29	0.05
109	0.19	0.09	156.09	5.22	0.28	0.19	0.01	168.70	5.21	0.04
110	0.81	0.07	152.70	7.24	0.22	0.81	0.01	166.31	7.24	0.04
111	1.22	0.03	146.62	8.58	0.09	1.23	0.01	165.21	8.61	0.03
112	1.28	0.02	340.54	8.78	0.08	1.28	0.00	5.42	8.79	0.01
113	1.11	0.03	335.67	8.25	0.08	1.11	0.00	5.08	8.24	0.01
114	0.71	0.05	330.93	6.91	0.16	0.71	0.01	357.49	6.92	0.03
115	0.12	0.09	330.72	5.00	0.31	0.14	0.01	6.62	5.04	0.05
116	-0.47	0.09	329.68	3.06	0.29	-0.47	0.02	348.94	3.06	0.08
117	-0.90	0.07	327.99	1.65	0.22	-0.90	0.01	346.17	1.64	0.04
118	-1.06	0.02	314.26	1.10	0.05	-1.06	0.00	273.50	1.11	0.00
119	-0.91	0.05	159.48	1.62	0.15	-0.91	0.00	175.43	1.60	0.01
120	-0.57	0.07	156.67	2.73	0.22	-0.57	0.01	170.58	2.73	0.04

100-year storm

Time | R.S. = 1 Node = s5n6

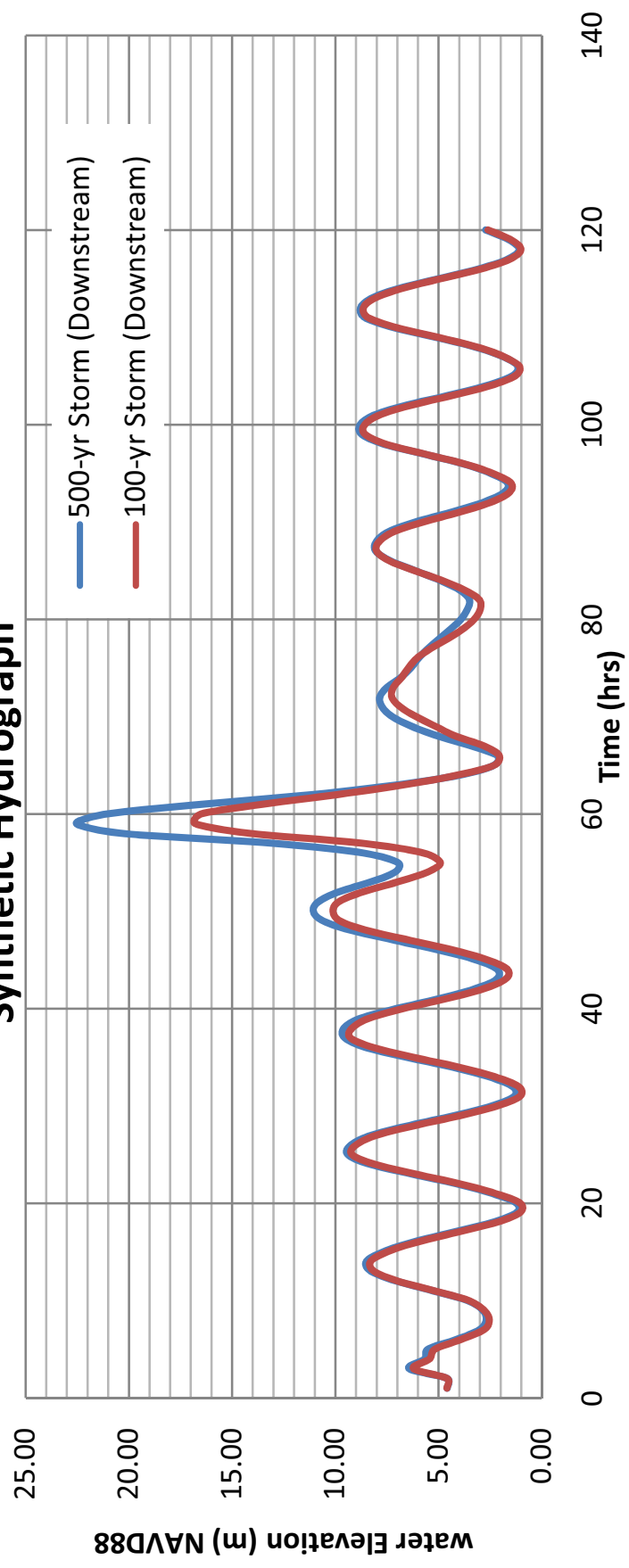
R.S. = 6 Node = s6n4

(hrs)	Elevation			Elevation			Elevation			Elevation		
	(m) NAVD	Velocity	Velocity	(ft) NAVD	Velocity		(m) NAVD	Velocity	Velocity	(ft) NAVD	Velocity	
	88	(m/s)	Direction	88 + SLR	(ft/s)		88	(m/s)	Direction	88 + SLR	(ft/s)	
1	0.00	0.00	0.00	4.59	0.00		0.00	0.00	0.00	4.59	0.00	
2	0.00	0.00	151.21	4.60	0.00		0.00	0.00	173.36	4.59	0.00	
3	0.49	0.01	185.70	6.21	0.03		0.50	0.01	358.77	6.25	0.03	
4	0.26	0.00	350.62	5.43	0.01		0.26	0.00	156.76	5.45	0.01	
5	0.18	0.02	329.10	5.18	0.05		0.18	0.00	137.54	5.19	0.00	
6	-0.21	0.10	330.39	3.91	0.34		-0.20	0.02	350.84	3.92	0.06	
7	-0.55	0.01	314.46	2.80	0.05		-0.54	0.00	227.79	2.82	0.01	
8	-0.63	0.01	223.29	2.54	0.02		-0.63	0.00	332.48	2.51	0.01	
9	-0.55	0.02	165.47	2.80	0.06		-0.55	0.00	176.78	2.79	0.01	
10	-0.32	0.05	157.51	3.54	0.16		-0.32	0.01	175.20	3.55	0.03	
11	0.19	0.09	155.50	5.21	0.28		0.18	0.01	166.64	5.19	0.04	
12	0.73	0.05	154.30	6.97	0.15		0.72	0.01	171.24	6.96	0.02	
13	1.08	0.03	152.05	8.12	0.11		1.07	0.01	171.34	8.11	0.02	
14	1.13	0.01	341.57	8.30	0.03		1.14	0.00	342.59	8.32	0.01	
15	0.89	0.05	332.28	7.50	0.16		0.88	0.01	351.58	7.49	0.04	
16	0.44	0.09	329.47	6.04	0.28		0.45	0.01	356.70	6.05	0.04	
17	-0.14	0.11	330.32	4.14	0.37		-0.14	0.03	353.26	4.13	0.08	
18	-0.72	0.10	328.12	2.24	0.32		-0.72	0.02	352.43	2.23	0.06	
19	-1.07	0.03	321.76	1.08	0.11		-1.07	0.02	355.10	1.08	0.06	
20	-1.08	0.02	164.33	1.04	0.05		-1.08	0.00	326.42	1.06	0.00	
21	-0.72	0.08	156.56	2.24	0.25		-0.71	0.01	174.72	2.26	0.04	
22	-0.19	0.09	156.02	3.98	0.30		-0.19	0.01	172.69	3.97	0.04	
23	0.47	0.09	154.73	6.13	0.28		0.47	0.01	170.61	6.12	0.04	
24	1.07	0.05	150.13	8.09	0.15		1.07	0.01	166.40	8.10	0.03	
25	1.40	0.01	136.80	9.19	0.04		1.41	0.00	187.94	9.20	0.01	
26	1.34	0.03	334.17	8.99	0.09		1.34	0.00	338.51	9.00	0.01	
27	1.04	0.06	334.14	7.99	0.21		1.03	0.02	350.12	7.98	0.05	
28	0.46	0.07	328.38	6.11	0.23		0.46	0.01	4.86	6.10	0.04	
29	-0.20	0.10	329.00	3.95	0.33		-0.20	0.02	352.61	3.93	0.06	
30	-0.74	0.07	327.31	2.16	0.24		-0.75	0.03	351.41	2.13	0.08	
31	-1.08	0.04	323.79	1.05	0.14		-1.08	0.02	358.60	1.05	0.06	
32	-1.06	0.03	159.77	1.13	0.11		-1.05	0.00	182.65	1.14	0.00	
33	-0.70	0.07	157.12	2.29	0.23		-0.70	0.01	183.92	2.29	0.02	
34	-0.16	0.09	155.60	4.06	0.29		-0.16	0.01	172.96	4.06	0.04	
35	0.50	0.09	153.87	6.24	0.29		0.51	0.02	170.49	6.25	0.06	
36	1.09	0.06	149.96	8.17	0.18		1.09	0.01	170.91	8.16	0.03	
37	1.43	0.01	116.82	9.27	0.02		1.43	0.01	165.48	9.27	0.02	
38	1.40	0.02	338.31	9.18	0.07		1.40	0.00	4.42	9.18	0.01	
39	1.15	0.04	334.93	8.36	0.12		1.14	0.01	353.80	8.34	0.02	
40	0.64	0.07	328.72	6.70	0.21		0.65	0.01	2.65	6.71	0.04	
41	0.02	0.08	328.68	4.65	0.26		0.02	0.01	357.95	4.66	0.04	
42	-0.53	0.07	328.83	2.87	0.23		-0.53	0.02	346.23	2.87	0.05	
43	-0.86	0.03	322.08	1.77	0.10		-0.85	0.01	351.62	1.81	0.02	
44	-0.90	0.04	156.83	1.66	0.13		-0.88	0.00	200.61	1.69	0.01	
45	-0.60	0.08	156.58	2.62	0.28		-0.60	0.02	176.32	2.63	0.06	
46	-0.10	0.07	155.77	4.26	0.23		-0.10	0.01	172.00	4.27	0.04	
47	0.54	0.08	154.76	6.35	0.26		0.54	0.01	162.96	6.37	0.03	
48	1.17	0.05	149.71	8.42	0.17		1.17	0.02	169.78	8.44	0.05	

49	1.58	0.01	115.75	9.77	0.02	1.58	0.00	159.21	9.78	0.01
50	1.68	0.01	8.17	10.11	0.03	1.68	0.00	353.11	10.10	0.01
51	1.59	0.01	332.68	9.81	0.04	1.59	0.00	332.11	9.81	0.00
52	1.24	0.05	332.92	8.65	0.16	1.24	0.00	336.34	8.66	0.01
53	0.73	0.07	330.72	7.00	0.23	0.73	0.01	357.27	7.00	0.04
54	0.29	0.05	325.40	5.56	0.16	0.30	0.01	15.66	5.56	0.02
55	0.10	0.01	296.48	4.91	0.04	0.10	0.01	355.83	4.93	0.04
56	0.35	0.07	157.43	5.75	0.24	0.35	0.01	170.50	5.75	0.02
57	1.28	0.13	155.09	8.77	0.41	1.28	0.03	171.81	8.80	0.10
58	2.91	0.11	154.32	14.13	0.37	2.91	0.02	161.96	14.12	0.07
59	3.72	0.06	149.78	16.78	0.18	3.72	0.02	171.07	16.80	0.05
60	3.63	0.03	327.12	16.49	0.08	3.62	0.00	353.29	16.47	0.01
61	2.72	0.08	331.32	13.50	0.26	2.73	0.02	356.76	13.53	0.06
62	1.60	0.12	330.02	9.85	0.38	1.60	0.02	356.14	9.82	0.07
63	0.62	0.08	326.32	6.64	0.28	0.62	0.01	336.66	6.62	0.04
64	-0.17	0.07	328.51	4.05	0.23	-0.17	0.01	326.15	4.03	0.03
65	-0.70	0.04	325.51	2.30	0.12	-0.69	0.00	256.19	2.34	0.01
66	-0.77	0.03	162.70	2.06	0.09	-0.77	0.00	239.05	2.08	0.01
67	-0.54	0.05	158.59	2.82	0.16	-0.54	0.00	228.69	2.82	0.01
68	-0.13	0.06	158.29	4.18	0.18	-0.12	0.00	186.54	4.19	0.01
69	0.17	0.04	156.47	5.15	0.14	0.18	0.00	167.52	5.18	0.01
70	0.46	0.05	155.88	6.09	0.15	0.46	0.00	165.92	6.09	0.01
71	0.69	0.03	156.52	6.86	0.09	0.69	0.00	140.11	6.87	0.01
72	0.81	0.01	154.55	7.26	0.02	0.82	0.00	34.45	7.28	0.01
73	0.79	0.02	333.39	7.19	0.07	0.79	0.01	3.88	7.18	0.02
74	0.67	0.01	324.14	6.80	0.04	0.67	0.01	5.64	6.79	0.02
75	0.57	0.01	326.01	6.46	0.04	0.57	0.01	345.68	6.46	0.03
76	0.45	0.02	331.14	6.05	0.07	0.44	0.01	350.34	6.04	0.03
77	0.24	0.04	332.39	5.37	0.13	0.24	0.00	109.08	5.38	0.01
78	-0.01	0.04	331.14	4.56	0.14	-0.01	0.01	10.63	4.57	0.02
79	-0.23	0.04	329.25	3.82	0.13	-0.23	0.01	348.09	3.84	0.04
80	-0.41	0.02	323.99	3.26	0.06	-0.40	0.00	344.22	3.28	0.01
81	-0.49	0.01	298.75	2.99	0.02	-0.50	0.00	5.44	2.97	0.01
82	-0.48	0.01	174.15	3.02	0.02	-0.48	0.00	342.98	3.01	0.01
83	-0.26	0.04	157.37	3.74	0.14	-0.26	0.00	160.67	3.75	0.01
84	0.08	0.05	155.10	4.84	0.17	0.08	0.01	170.35	4.84	0.03
85	0.48	0.05	155.16	6.18	0.15	0.49	0.01	167.23	6.19	0.02
86	0.85	0.05	153.77	7.38	0.15	0.85	0.01	167.47	7.38	0.03
87	1.04	0.01	146.94	8.00	0.03	1.04	0.00	134.05	7.99	0.00
88	1.00	0.02	334.05	7.87	0.07	1.00	0.01	351.24	7.87	0.02
89	0.78	0.03	329.49	7.16	0.10	0.79	0.01	357.93	7.18	0.03
90	0.35	0.06	330.24	5.73	0.20	0.35	0.01	354.40	5.75	0.04
91	-0.18	0.08	329.58	3.99	0.27	-0.18	0.02	356.39	4.00	0.06
92	-0.64	0.06	327.51	2.49	0.18	-0.64	0.01	345.23	2.48	0.05
93	-0.92	0.03	322.79	1.59	0.09	-0.92	0.01	355.29	1.58	0.03
94	-0.94	0.03	157.47	1.50	0.09	-0.94	0.00	337.07	1.52	0.01
95	-0.67	0.06	156.77	2.39	0.19	-0.67	0.01	173.10	2.38	0.03
96	-0.24	0.08	155.85	3.80	0.27	-0.25	0.01	171.73	3.79	0.04
97	0.35	0.09	155.11	5.72	0.28	0.34	0.02	171.46	5.72	0.05
98	0.91	0.06	151.10	7.56	0.19	0.91	0.01	163.59	7.58	0.03
99	1.21	0.01	138.76	8.56	0.05	1.21	0.00	162.70	8.55	0.01
100	1.22	0.01	347.16	8.58	0.03	1.21	0.00	58.79	8.57	0.00
101	0.99	0.03	332.30	7.85	0.09	0.99	0.01	356.78	7.85	0.02
102	0.53	0.08	330.30	6.31	0.25	0.53	0.01	0.00	6.32	0.04
103	-0.08	0.08	328.45	4.32	0.26	-0.07	0.01	344.54	4.35	0.03
104	-0.64	0.08	329.57	2.50	0.27	-0.63	0.02	353.55	2.52	0.07
105	-1.01	0.04	327.37	1.30	0.14	-1.00	0.01	352.72	1.30	0.04

106	-1.07	0.01	198.15	1.09	0.02	-1.07	0.00	204.96	1.09	0.01
107	-0.83	0.05	158.85	1.87	0.17	-0.84	0.01	178.91	1.83	0.02
108	-0.43	0.09	155.34	3.18	0.29	-0.44	0.01	174.56	3.16	0.04
109	0.16	0.09	155.55	5.10	0.29	0.16	0.01	169.31	5.10	0.05
110	0.76	0.06	152.56	7.09	0.19	0.77	0.01	167.69	7.11	0.03
111	1.17	0.04	148.04	8.42	0.13	1.16	0.01	168.18	8.41	0.03
112	1.23	0.02	342.57	8.64	0.06	1.24	0.00	343.40	8.65	0.01
113	1.06	0.03	334.47	8.08	0.09	1.06	0.01	357.18	8.08	0.02
114	0.66	0.05	329.40	6.75	0.17	0.66	0.01	355.40	6.75	0.03
115	0.09	0.09	329.99	4.88	0.30	0.08	0.01	0.90	4.85	0.05
116	-0.51	0.08	328.19	2.94	0.26	-0.51	0.01	348.21	2.93	0.03
117	-0.93	0.04	325.36	1.54	0.14	-0.94	0.01	346.49	1.52	0.04
118	-1.09	0.01	191.76	1.01	0.03	-1.10	0.01	206.02	0.99	0.02
119	-0.94	0.05	157.52	1.50	0.17	-0.94	0.00	193.80	1.51	0.01
120	-0.61	0.06	156.22	2.60	0.20	-0.60	0.01	178.20	2.63	0.02

Meadowbrook Parkway over Sloop Channel Synthetic Hydrograph



B.3 Meadowbrook Parkway over Fundy Channel

OBJECTID	49	ApprGuar_1	1	UndWaterIn	Y60
Shape	Point	Historical	4	SpecInspe	N
StateCode	362	NavControl	1	FractCritD	0
BIN	1059149	NavVertCle	42	UndWaterDa	907
Record	1	NavHorizCl	88	SpecInspec	
Type	8	OpenPostCl	A	BridgImprC	4999
LOS	1	ServiceOnB	1	RoadImprCo	2490
RteNo	0	ServiceUnd	5	TotalCost	7489
HighwayDis	1	StructMate	6	YearEst	2008
CountyCode	59	TypeDesign	1	BordBridge	0
PlaceCode	34000	ApprMater	0	BPercenRes	0
FeaturesIn	FUNDY	ApprDesign	0	BordBIN	0
CHANNEL		NoSpansMai	16	STRAHNET	0
CritFacili		NoSpansApp	0	ParallelSt	N
Route	RTE 908E	RouteHoriz	231	DirectTraf	2
Location	NEAR EAST	MainSpanLe	97	TempStruct	
BAY IN NASSAU		StructLeng	1563	HighwaySys	1
MinVertCle	9999	SdeWlkLeft	0	FedLandsHi	0
KiloPoint	6841	SdeWlkRtWi	0	YearRecon	1988
BaseHwyNet	1	BrdgCb2Cb	231	DeckType	N
LRSRoute	0	BrdgOut2Ou	239	DeckWearTy	1
SubrouteNo		MinVertOve	9999	TypeMembr	0
LatDD	40	RefFeature	N	DeckProtec	N
LatMM	36	MinVertUn	0	ADTTruck	4
LatSS	55830	RefFeat	N	NatNetwk	0
LonDD	73	MinLatUn	999	PierAbutPr	2
LongMM	33	MinLatUnLf	0	NBISBrdgeL	Y
LongSS	1486	Deck	7	ScourCrit	6
Latitude	40.615508	SupStruct	8	FutADT	43639
Longitude	-73.554128	SubStruct	6	YearFutADT	2022
DetourLeng	16	ChannelPro	7	MinNavVert	
Toll	3	Culverts	N	FedAgeninc	NN
MainRespon	1	MethOpRate	1	WashHead	
Owner	1	OperRating	572	NoName	820
FunctClass	12	MethOpRa_1	0	Status	0
YearBuilt	1934	InventRat	417	NoName_1	0
LanesOn	6	TructEval	6		
LanesUnder	0	DeckGeo	4		
ADT	31171	UnclearVer	N		
YearADT	2002	BridgePost	5		
DesignLoad	5	WaterwayAd	6		
ApprWidth	231	ApprAlign	8		
Median	2	TypeWorkPr	34		
Skew	0	WorkBy	1		
StructFlar	0	LenImprov	1563		
BridgeRail	1	InspDate	208		
Transition	0	InspFreq	24		
ApprGuardR	0	FractCrit	N		

1059149.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X      X
XXXXXXXX XXXX      X      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      X

```

PROJECT DATA

Project Title: 1059149
Project File : 1059149.prj
Run Date and Time: 1/12/2012 8:08:56 AM

Project in English units

PLAN DATA

Plan Title: Plan 02
Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059149 Meadbrook Parkway
over Fundy Channel - NYSDOT\1059149.p02

Geometry Title: 1059149
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059149
Meadbrook Parkway over Fundy Channel - NYSDOT\1059149.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of:	Cross Sections =	4	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

GEOMETRY DATA

Geometry Title: 1059149

Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059149 Meadbrook
Parkway over Fundy Channel - NYSDOT\1059149.g01

CROSS SECTION

RIVER: Fundy
REACH: Fundy

RS: 4

INPUT

Description: 1.5 Bridge Lengths Upstream

Station	Elevation	Data	num=	12	Sta	Elev	Sta	Elev	Sta	Elev
0	2	166	2	387	1	500	0	700	-20	
906	-25	1265	-20	1401	0	1471	4	1775	5	
1978	6	2259	7							

Manning's n Values

num=

3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	500	.02	1401	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	500	1401		696	577		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	13.12	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	13.10	Reach Len. (ft)	696.00	577.00
215.00				
Crit W.S. (ft)		Flow Area (sq ft)	5830.00	27875.60
6788.80				
E.G. slope (ft/ft)	0.000003	Area (sq ft)	5830.00	27875.60
6788.80				
Q Total (cfs)	41386.88	Flow (cfs)	2280.12	37036.19
2070.57				
Top width (ft)	2259.00	Top width (ft)	500.00	901.00
858.00				
Vel Total (ft/s)	1.02	Avg. Vel. (ft/s)	0.39	1.33
0.30				
Max Chl Dpth (ft)	38.10	Hydr. Depth (ft)	11.66	30.94
7.91				
Conv. Total (cfs)	22765230.0	Conv. (cfs)	1254201.0	
20372090.0				
Length wtd. (ft)	569.89	Wetted Per. (ft)	511.11	903.56
864.22				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.52	Stream Power (lb/ft s)	2259.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	175.89	705.04
200.05				
C & E Loss (ft)		Cum SA (acres)	18.44	23.87
39.38				

Warning: The cross-section end points had to be extended vertically for the computed
Page 2

water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Fundy

REACH: Fundy

RS: 3

INPUT

Description: Upstream Bridge

Station Elevation Data		num= 20		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5	403	6	485	5	550	2	683	1		
808	0	838	-5	868	-15	870	-20	930	-25		
1044	-25	1234	-25	1264	-20	1294	-15	1342	0		
1381	9	1747	10	1937	9	2390	8	2624	9		

Manning's n Values

num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	808	.02	1381	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	808	1381		295 280	237	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	13.12	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	13.07	Reach Len. (ft)	105.00	105.00
105.00				
Crit W.S. (ft)	-17.51	Flow Area (sq ft)	7405.47	18234.96
5127.44				
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	7405.47	18234.96
5127.44				
Q Total (cfs)	40414.01	Flow (cfs)	3594.19	35351.68
1468.14				
Top width (ft)	2624.00	Top width (ft)	808.00	573.00
1243.00				
Vel Total (ft/s)	1.31	Avg. Vel. (ft/s)	0.49	1.94
0.29				
Max Chl Dpth (ft)	38.07	Hydr. Depth (ft)	9.17	31.82
4.13				
Conv. Total (cfs)	15379060.0	Conv. (cfs)	1367725.0	
13452650.0 558683.4				
Length Wtd. (ft)	105.00	Wetted Per. (ft)	816.16	582.77
1247.08				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.92	Stream Power (lb/ft s)	2624.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	70.15	399.64
170.64				
C & E Loss (ft)	0.00	Cum SA (acres)	7.99	14.11
34.19				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

BRIDGE

RIVER: Fundy

REACH: Fundy

RS: 2.5

INPUT

Description:

Distance from Upstream XS = 105

Deck/Roadway Width = 75

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 12														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		13		0	144		14		0	225		16		0
807.9		17		0	808		17		12	920		18.4		15.4
1032		18.6		15.6	1314		18.4		15.4	1314		18.4		-10
1381		18		0	2064		11		0	3000		11		0

Upstream Bridge Cross Section Data

Station Elevation Data num= 20														
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	5	403	6	485	5	550	2	683	1					
808	0	838	-5	868	-15	870	-20	930	-25					
1044	-25	1234	-25	1264	-20	1294	-15	1342	0					
1381	9	1747	10	1937	9	2390	8	2624	9					

Manning's n Values

num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	808	.02	1381	.035

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	808	1381	.1		.3

Downstream Deck/Roadway Coordinates

num= 12														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		13		0	144		14		0	225		16		0
807.9		17		0	808		17		12	920		18.4		15.4
1032		18.6		15.6	1314		18.4		15.4	1314		18.4		-10
1381		18		0	2064		11		0	3000		11		0

Downstream Bridge Cross Section Data

Station Elevation Data num= 24														
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	5	144	4	225	6	394	7	456	5					
478	3	520	1	796	0	810	-5	840	-15					
870	-20	930	-25	1044	-25	1234	-25	1264	-20					
1294	-15	1314	0	1353	8	1477	8	1608	9					
1953	9	2062	10	2356	9	2566	8							

Manning's n Values

num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	394	.02	1353	.035

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	394	1353	.1		.3

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Piers = 15

Pier Data
 Pier Station Upstream= 838 Downstream= 838
 Upstream num= 2
 width Elev width Elev
 3 -30 3 17
 Downstream num= 2
 width Elev width Elev
 3 -30 3 17

Pier Data
 Pier Station Upstream= 870 Downstream= 870
 Upstream num= 2
 width Elev width Elev
 3 -30 3 17
 Downstream num= 2
 width Elev width Elev
 3 -30 3 17

Pier Data
 Pier Station Upstream= 902 Downstream= 902
 Upstream num= 2
 width Elev width Elev
 3 -30 3 17
 Downstream num= 2
 width Elev width Elev
 3 -30 3 17

Pier Data
 Pier Station Upstream= 934 Downstream= 934
 Upstream num= 2
 width Elev width Elev
 3 -30 3 17
 Downstream num= 2
 width Elev width Elev
 3 -30 3 17

Pier Data
 Pier Station Upstream= 966 Downstream= 966
 Upstream num= 2
 width Elev width Elev
 3 -30 3 17
 Downstream num= 2
 width Elev width Elev
 3 -30 3 17

Pier Data
 Pier Station Upstream= 998 Downstream= 998
 Upstream num= 2
 width Elev width Elev
 3 -30 3 17
 Downstream num= 2
 width Elev width Elev

3 -30 3 17

Pier Data

Pier Station Upstream= 1030 Downstream= 1030

Upstream num= 2

width Elev width Elev

3 -30 3 17

Downstream num= 2

width Elev width Elev

3 -30 3 17

Pier Data

Pier Station Upstream= 1062 Downstream= 1062

Upstream num= 2

width Elev width Elev

3 -30 3 17

Downstream num= 2

width Elev width Elev

3 -30 3 17

Pier Data

Pier Station Upstream= 1094 Downstream= 1094

Upstream num= 2

width Elev width Elev

3 -30 3 17

Downstream num= 2

width Elev width Elev

3 -30 3 17

Pier Data

Pier Station Upstream= 1126 Downstream= 1126

Upstream num= 2

width Elev width Elev

3 -30 3 17

Downstream num= 2

width Elev width Elev

3 -30 3 17

Pier Data

Pier Station Upstream= 1158 Downstream= 1158

Upstream num= 2

width Elev width Elev

3 -30 3 17

Downstream num= 2

width Elev width Elev

3 -30 3 17

Pier Data

Pier Station Upstream= 1190 Downstream= 1190

Upstream num= 2

width Elev width Elev

3 -30 3 17

Downstream num= 2

width Elev width Elev

3 -30 3 17

Pier Data

Pier Station Upstream= 1222 Downstream= 1222

Upstream num= 2

width Elev width Elev

3 -30 3 17

Downstream num= 2

width Elev width Elev

3 -30 3 17

Pier Data

Pier Station Upstream= 1254 Downstream= 1254

Upstream num= 2
width Elev width Elev
3 -30 3 17

Downstream num= 2
width Elev width Elev
3 -30 3 17

Pier Data

Pier Station Upstream= 1286 Downstream= 1286

Upstream num= 2
width Elev width Elev
3 -30 3 17

Downstream num= 2
width Elev width Elev
3 -30 3 17

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add weight component to Momentum

Class B flow critical depth computations use critical depth

inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #Max WS

E.G. US. (ft)	13.12	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	13.07	E.G. Elev (ft)	13.14
13.14			
Q Total (cfs)	40414.01	W.S. Elev (ft)	13.05
13.04			
Q Bridge (cfs)	39806.63	Crit W.S. (ft)	-17.03
-16.98			
Q Weir (cfs)		Max Chl Dpth (ft)	38.05
38.04			
Weir Sta Lft (ft)		Vel Total (ft/s)	2.36
2.33			
Weir Sta Rgt (ft)		Flow Area (sq ft)	17139.55
17351.36			
Weir Submerg		Froude # Chl	0.07
0.07			
Weir Max Depth (ft)		Specif Force (cu ft)	285578.00
292946.70			
Min El Weir Flow (ft)	11.01	Hydr Depth (ft)	14.33
15.26			
Min El Prs (ft)	15.60	W.P. Total (ft)	2336.46
2327.73			
Delta EG (ft)	0.03	Conv. Total (cfs)	5581834.0
5622079.0			

1059149.rep

Delta WS (ft)	0.02	Top Width (ft)	1195.66
BR Open Area (sq ft)	16751.98	Frctn Loss (ft)	0.00
BR Open Vel (ft/s)	2.52	C & E Loss (ft)	0.00
Coef of Q		Shear Total (lb/sq ft)	0.02
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Fundy
REACH: Fundy RS: 2

INPUT

Description: Downstream Bridge

Station	Elevation	Data	num=	24	Sta	Elev	Sta	Elev	Sta	Elev
0	5	144	4	225	6	394	7	456	5	
478	3	520	1	796	0	810	-5	840	-15	
870	-20	930	-25	1044	-25	1234	-25	1264	-20	
1294	-15	1314	0	1353	8	1477	8	1608	9	
1953	9	2062	10	2356	9	2566	8			

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.035	394	.02
		1353	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	394	1353		300	400	1298	.1
							.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	13.12	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	13.08	Reach Len. (ft)	300.00	400.00
1298.00				
Crit w.s. (ft)		Flow Area (sq ft)	3002.21	22866.19
5042.63				
E.G. slope (ft/ft)	0.000007	Area (sq ft)	3002.21	22866.19
5042.63				
Q Total (cfs)	40414.00	Flow (cfs)	1310.39	37618.11
1485.49				
Top width (ft)	2566.00	Top width (ft)	394.00	959.00
1213.00				
Vel Total (ft/s)	1.31	Avg. Vel. (ft/s)	0.44	1.65
0.29				
Max Chl Dpth (ft)	38.08	Hydr. Depth (ft)	7.62	23.84
4.16				
Conv. Total (cfs)	15016320.0	Conv. (cfs)	486891.2	
13977480.0	551953.7			

Length wtd. (ft)	423.22	1059149.rep Wetted Per. (ft)	402.11	968.92
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.01
Alpha	1.48	Stream Power (lb/ft s)	2566.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	57.77	286.41
C & E Loss (ft)		Cum SA (acres)	6.54	10.56

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Fundy
REACH: Fundy

RS: 1

INPUT

Description: 1.5 Bridge Lengths Downstream

Station Elevation Data		num= 19							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	20	50	16	118	14	163	10	272	8
441	7	656	5	822	3	1162	2	1632	0
1780	-15	1927	-10	2333	-25	2681	-25	2943	0
2974	6	3238	6	3347	5	3662	5		

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1632	.02	2974	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1632	2974	0	0	0	.1	.3	

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	13.11	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	13.10	Reach Len. (ft)		
Crit w.s. (ft)	-18.56	Flow Area (sq ft)	13775.46	39514.70
5254.30				
E.G. slope (ft/ft)	0.000002	Area (sq ft)	13775.46	39514.70
5254.30				
Q Total (cfs)	38811.44	Flow (cfs)	3167.20	34582.34
1061.90				
Top width (ft)	3533.88	Top width (ft)	1503.88	1342.00
688.00				
Vel Total (ft/s)	0.66	Avg. Vel. (ft/s)	0.23	0.88
0.20				
Max Chl Dpth (ft)	38.10	Hydr. Depth (ft)	9.16	29.44
7.64				
Conv. Total (cfs)	31372190.0	Conv. (cfs)	2560119.0	

27953710.0 858359.0 1059149.rep

Length wtd. (ft)		Wetted Per. (ft)	1504.06	1344.89
696.10				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.57	Stream Power (lb/ft s)	3662.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River: Fundy

Reach	River Sta.	n1	n2	n3
Fundy	4	.035	.02	.035
Fundy	3	.035	.02	.035
Fundy	2.5	Bridge		
Fundy	2	.035	.02	.035
Fundy	1	.035	.02	.035

SUMMARY OF REACH LENGTHS

River: Fundy

Reach	River Sta.	Left	Channel	Right
Fundy	4	696	577	215
Fundy	3	295	280	237
Fundy	2.5	Bridge		
Fundy	2	300	400	1298
Fundy	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Fundy

Reach	River Sta.	Contr.	Expan.
Fundy	4	.1	.3
Fundy	3	.1	.3
Fundy	2.5	Bridge	
Fundy	2	.1	.3
Fundy	1	.1	.3

Profile Output Table - Six XS Bridge

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Crit W.S.	Frctn

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Loss	C & E Loss	Top width	Q Left	Q Channel	Q Right	vel chnl
(ft)	(ft)	(ft)	(cfs)	(ft) (cfs)	(ft) (cfs)	(ft) (ft/s)
Fundy	4		Max WS	13.12	13.10	
0.00		2259.00	2280.12	37036.19	2070.57	1.33
Fundy	3		Max WS	13.12	13.07	-17.51
0.00	0.00	2624.00	3594.19	35351.68	1468.14	1.94
Fundy	2.5	BR U	Max WS	13.14	13.05	-17.03
0.00	0.00	1195.66	0.03	39806.60	607.38	2.52
Fundy	2.5	BR D	Max WS	13.14	13.04	-16.98
0.00	0.02	1137.36	0.00	39869.33	544.68	2.47
Fundy	2		Max WS	13.12	13.08	
0.00		2566.00	1310.39	37618.11	1485.49	1.65
Fundy	1		Max WS	13.11	13.10	-18.56
		3533.88	3167.20	34582.34	1061.90	0.88

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U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X      X
XXXXXXXX XXXX      X      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      X

```

PROJECT DATA

Project Title: 1059149
Project File : 1059149.prj
Run Date and Time: 1/12/2012 8:11:20 AM

Project in English units

PLAN DATA

Plan Title: Plan 02
Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059149 Meadbrook Parkway
over Fundy Channel - NYSDOT\1059149.p02

Geometry Title: 1059149
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059149
Meadbrook Parkway over Fundy Channel - NYSDOT\1059149.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of:	Cross Sections =	4	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

GEOMETRY DATA

Geometry Title: 1059149

Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059149 Meadbrook
Parkway over Fundy Channel - NYSDOT\1059149.g01

CROSS SECTION

RIVER: Fundy
REACH: Fundy

RS: 4

INPUT

Description: 1.5 Bridge Lengths Upstream

Station Elevation Data		num= 12									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2	166	2	387	1	500	0	700	-20		
906	-25	1265	-20	1401	0	1471	4	1775	5		
1978	6	2259	7								

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	500	.02	1401	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	500	1401		696	577		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	18.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	18.50	Reach Len. (ft)	696.00	577.00
215.00				
Crit W.S. (ft)		Flow Area (sq ft)	8530.00	32741.00
11422.00				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	8530.00	32741.00
11422.00				
Q Total (cfs)	36971.97	Flow (cfs)	2740.40	31081.65
3149.92				
Top Width (ft)	2259.00	Top width (ft)	500.00	901.00
858.00				
Vel Total (ft/s)	0.70	Avg. Vel. (ft/s)	0.32	0.95
0.28				
Max Chl Dpth (ft)	43.50	Hydr. Depth (ft)	17.06	36.34
13.31				
Conv. Total (cfs)	31684750.0	Conv. (cfs)	2348505.0	
26636780.0 2699465.0				
Length wtd. (ft)	555.74	Wetted Per. (ft)	516.51	903.56
869.62				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.57	Stream Power (lb/ft s)	2259.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	283.80	830.45
418.79				
C & E Loss (ft)		Cum SA (acres)	21.25	24.21
41.40				

Warning: The cross-section end points had to be extended vertically for the computed
Page 2

water surface.

CROSS SECTION

RIVER: Fundy
REACH: Fundy

RS: 3

INPUT

Description: Upstream Bridge

Station Elevation Data		num= 20		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5	403	6	485	5	550	2	683	1		
808	0	838	-5	868	-15	870	-20	930	-25		
1044	-25	1234	-25	1264	-20	1294	-15	1342	0		
1381	9	1747	10	1937	9	2390	8	2624	9		

Manning's n Values		num= 3		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	808	.02	1381	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	808	1381		295	280		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	18.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	18.49	Reach Len. (ft)	105.00	105.00
105.00				
Crit w.s. (ft)	-18.08	Flow Area (sq ft)	11782.71	21339.12
11861.25				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	11782.71	21339.12
11861.25				
Q Total (cfs)	35493.73	Flow (cfs)	4619.29	27348.32
3526.12				
Top Width (ft)	2624.00	Top Width (ft)	808.00	573.00
1243.00				
Vel Total (ft/s)	0.79	Avg. Vel. (ft/s)	0.39	1.28
0.30				
Max Chl Dpth (ft)	43.49	Hydr. Depth (ft)	14.58	37.24
9.54				
Conv. Total (cfs)	22688970.0	Conv. (cfs)	2952827.0	
17482110.0 2254032.0				
Length wtd. (ft)	105.00	Wetted Per. (ft)	821.57	582.77
1252.50				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	2.08	Stream Power (lb/ft s)	2624.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	121.53	472.28
361.33				
C & E Loss (ft)	0.00	Cum SA (acres)	10.80	14.45
36.22				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)

is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

BRIDGE

RIVER: Fundy

REACH: Fundy

RS: 2.5

INPUT

Description:

Distance from Upstream XS = 105

Deck/Roadway Width = 75

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 12														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		13		0	144		14		0	225		16		0
807.9		17		0	808		17		12	920		18.4		15.4
1032		18.6		15.6	1314		18.4		15.4	1314		18.4		-10
1381		18		0	2064		11		0	3000		11		0

Upstream Bridge Cross Section Data

Station Elevation Data num= 20														
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	5	403	6	485	5	550	2	683	1					
808	0	838	-5	868	-15	870	-20	930	-25					
1044	-25	1234	-25	1264	-20	1294	-15	1342	0					
1381	9	1747	10	1937	9	2390	8	2624	9					

Manning's n Values

num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	808	.02	1381	.035

Bank	Sta: Left	Right	Coeff	Contr.	Expan.
	808	1381	.1		.3

Downstream Deck/Roadway Coordinates

num= 12														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		13		0	144		14		0	225		16		0
807.9		17		0	808		17		12	920		18.4		15.4
1032		18.6		15.6	1314		18.4		15.4	1314		18.4		-10
1381		18		0	2064		11		0	3000		11		0

Downstream Bridge Cross Section Data

Station Elevation Data num= 24														
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	5	144	4	225	6	394	7	456	5					
478	3	520	1	796	0	810	-5	840	-15					
870	-20	930	-25	1044	-25	1234	-25	1264	-20					
1294	-15	1314	0	1353	8	1477	8	1608	9					
1953	9	2062	10	2356	9	2566	8							

Manning's n Values

num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	394	.02	1353	.035

Bank	Sta: Left	Right	Coeff	Contr.	Expan.
	394	1353	.1		.3

Upstream Embankment side slope

= 0 horiz. to 1.0 vertical

Downstream Embankment side slope

= 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Piers = 15

Pier Data
 Pier Station Upstream= 838 Downstream= 838
 Upstream num= 2
 width Elev width Elev
 3 -30 3 17
 Downstream num= 2
 width Elev width Elev
 3 -30 3 17

Pier Data
 Pier Station Upstream= 870 Downstream= 870
 Upstream num= 2
 width Elev width Elev
 3 -30 3 17
 Downstream num= 2
 width Elev width Elev
 3 -30 3 17

Pier Data
 Pier Station Upstream= 902 Downstream= 902
 Upstream num= 2
 width Elev width Elev
 3 -30 3 17
 Downstream num= 2
 width Elev width Elev
 3 -30 3 17

Pier Data
 Pier Station Upstream= 934 Downstream= 934
 Upstream num= 2
 width Elev width Elev
 3 -30 3 17
 Downstream num= 2
 width Elev width Elev
 3 -30 3 17

Pier Data
 Pier Station Upstream= 966 Downstream= 966
 Upstream num= 2
 width Elev width Elev
 3 -30 3 17
 Downstream num= 2
 width Elev width Elev
 3 -30 3 17

Pier Data
 Pier Station Upstream= 998 Downstream= 998
 Upstream num= 2
 width Elev width Elev
 3 -30 3 17
 Downstream num= 2
 width Elev width Elev
 3 -30 3 17

Pier Data

				1059149.rep	
Pier Station	Upstream=	1030	Downstream=	1030	
Upstream	num= 2				
width	Elev	width	Elev		
3	-30	3	17		
Downstream	num= 2				
width	Elev	width	Elev		
3	-30	3	17		
Pier Data					
Pier Station	Upstream=	1062	Downstream=	1062	
Upstream	num= 2				
width	Elev	width	Elev		
3	-30	3	17		
Downstream	num= 2				
width	Elev	width	Elev		
3	-30	3	17		
Pier Data					
Pier Station	Upstream=	1094	Downstream=	1094	
Upstream	num= 2				
width	Elev	width	Elev		
3	-30	3	17		
Downstream	num= 2				
width	Elev	width	Elev		
3	-30	3	17		
Pier Data					
Pier Station	Upstream=	1126	Downstream=	1126	
Upstream	num= 2				
width	Elev	width	Elev		
3	-30	3	17		
Downstream	num= 2				
width	Elev	width	Elev		
3	-30	3	17		
Pier Data					
Pier Station	Upstream=	1158	Downstream=	1158	
Upstream	num= 2				
width	Elev	width	Elev		
3	-30	3	17		
Downstream	num= 2				
width	Elev	width	Elev		
3	-30	3	17		
Pier Data					
Pier Station	Upstream=	1190	Downstream=	1190	
Upstream	num= 2				
width	Elev	width	Elev		
3	-30	3	17		
Downstream	num= 2				
width	Elev	width	Elev		
3	-30	3	17		
Pier Data					
Pier Station	Upstream=	1222	Downstream=	1222	
Upstream	num= 2				
width	Elev	width	Elev		
3	-30	3	17		
Downstream	num= 2				
width	Elev	width	Elev		
3	-30	3	17		

Pier Data

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Pier Station	Upstream=	1254	Downstream=	1254
Upstream	num=	2		
width	Elev	width	Elev	
3	-30	3	17	
Downstream	num=	2		
width	Elev	width	Elev	
3	-30	3	17	

Pier Data				
Pier Station	Upstream=	1286	Downstream=	1286
Upstream	num=	2		
width	Elev	width	Elev	
3	-30	3	17	
Downstream	num=	2		
width	Elev	width	Elev	
3	-30	3	17	

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters

Add Friction component to Momentum
Do not add weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #Max WS

E.G. US. (ft)	18.51	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	18.49	E.G. Elev (ft)	18.51
18.51			
Q Total (cfs)	35493.73	w.S. Elev (ft)	18.47
18.47			
Q Bridge (cfs)	29137.11	Crit w.S. (ft)	-17.64
-17.60			
Q Weir (cfs)		Max Chl Dpth (ft)	43.47
43.47			
Weir Sta Lft (ft)		Vel Total (ft/s)	1.37
1.38			
Weir Sta Rgt (ft)		Flow Area (sq ft)	25910.72
25806.23			
Weir Submerg		Froude # Chl	0.04
0.04			
Weir Max Depth (ft)		Specif Force (cu ft)	398545.30
406220.70			
Min El Weir Flow (ft)	11.01	Hydr Depth (ft)	10.91
11.15			
Min El Prs (ft)	15.60	W.P. Total (ft)	4475.25
4455.60			
Delta EG (ft)	0.01	Conv. Total (cfs)	5685542.0
5531265.0			
Delta WS (ft)	0.01	Top width (ft)	2375.93
2315.33			
BR Open Area (sq ft)	16751.98	Frctn Loss (ft)	0.00

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0.00			
BR Open Vel (ft/s)	1.74	C & E Loss (ft)	0.00
0.01			
Coef of Q		Shear Total (lb/sq ft)	0.01
0.01			
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00
0.00			

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Fundy
REACH: Fundy RS: 2

INPUT

Description: Downstream Bridge

Station Elevation Data		num=	24
Sta	Elev	Sta	Elev
0	5	144	4
478	3	520	1
870	-20	930	-25
1294	-15	1314	0
1953	9	2062	10

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
0	.035	394	.02
		1353	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
394	1353	300	400	1298	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	18.50	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	18.49	Reach Len. (ft)	300.00	400.00
1298.00				
Crit w.s. (ft)		Flow Area (sq ft)	5132.06	28050.27
11599.76				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	5132.06	28050.27
11599.76				
Q Total (cfs)	35493.50	Flow (cfs)	1817.30	30276.94
3399.26				
Top width (ft)	2566.00	Top width (ft)	394.00	959.00
1213.00				
Vel Total (ft/s)	0.79	Avg. Vel. (ft/s)	0.35	1.08
0.29				
Max Chl Dpth (ft)	43.49	Hydr. Depth (ft)	13.03	29.25
9.56				
Conv. Total (cfs)	23034080.0	Conv. (cfs)	1179369.0	
19648710.0	2206005.0			
Length Wtd. (ft)	456.28	Wetted Per. (ft)	407.52	968.92
1223.50				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00

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0.00				
Alpha	1.61	Stream Power (lb/ft s)	2566.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	94.20	343.49
306.46				
C & E Loss (ft)		Cum SA (acres)	6.91	10.56
28.32				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Fundy

REACH: Fundy

RS: 1

INPUT

Description: 1.5 Bridge Lengths Downstream

Station Elevation Data		num=	19						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	20	50	16	118	14	163	10	272	8
441	7	656	5	822	3	1162	2	1632	0
1780	-15	1927	-10	2333	-25	2681	-25	2943	0
2974	6	3238	6	3347	5	3662	5		

Manning's n Values		num=	3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1632	.02	2974	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1632	2974	0	0	0	.1	.3	

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	18.50	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	18.50	Reach Len. (ft)		
Crit w.s. (ft)	-19.17	Flow Area (sq ft)	22223.56	46761.50
8969.50				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	22223.56	46761.50
8969.50				
Q Total (cfs)	33012.96	Flow (cfs)	4020.48	27448.25
1544.23				
Top width (ft)	3643.25	Top width (ft)	1613.25	1342.00
688.00				
Vel Total (ft/s)	0.42	Avg. Vel. (ft/s)	0.18	0.59
0.17				
Max Chl Dpth (ft)	43.50	Hydr. Depth (ft)	13.78	34.84
13.04				
Conv. Total (cfs)	44513540.0	Conv. (cfs)	5421071.0	
37010280.0	2082191.0			
Length wtd. (ft)		Wetted Per. (ft)	1613.61	1344.89
701.50				

Min Ch El (ft)	-25.00	1059149.rep		
0.00		Shear (lb/sq ft)	0.00	0.00
Alpha	1.63	Stream Power (lb/ft s)	3662.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River: Fundy

Reach	River Sta.	n1	n2	n3
Fundy	4	.035	.02	.035
Fundy	3	.035	.02	.035
Fundy	2.5	Bridge		
Fundy	2	.035	.02	.035
Fundy	1	.035	.02	.035

SUMMARY OF REACH LENGTHS

River: Fundy

Reach	River Sta.	Left	Channel	Right
Fundy	4	696	577	215
Fundy	3	295	280	237
Fundy	2.5	Bridge		
Fundy	2	300	400	1298
Fundy	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Fundy

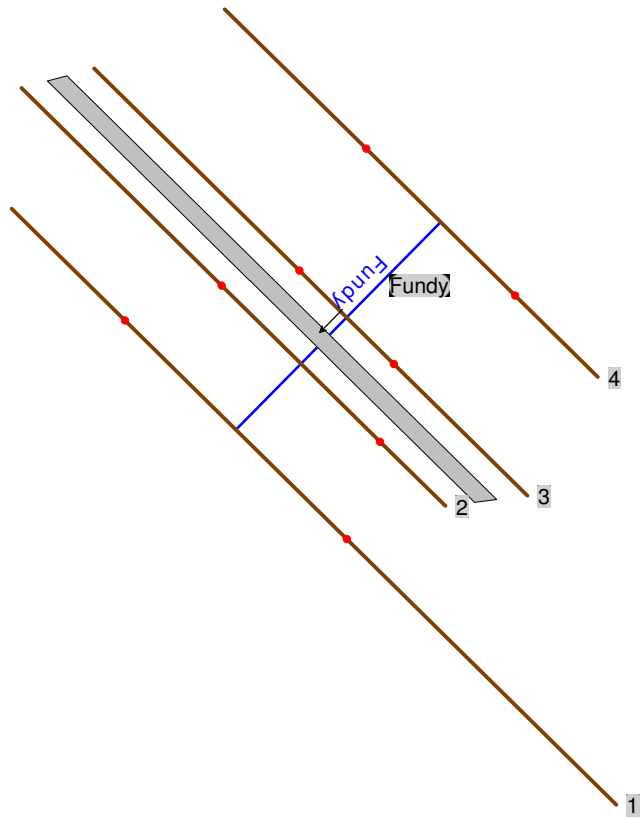
Reach	River Sta.	Contr.	Expan.
Fundy	4	.1	.3
Fundy	3	.1	.3
Fundy	2.5	Bridge	
Fundy	2	.1	.3
Fundy	1	.1	.3

Profile Output Table - Six XS Bridge

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Crit W.S.	Frctn
Loss	C & E Loss	Q Left	Q Channel	Q Right	vel Chnl	
(ft)	(ft)	(cfs)	(ft)	(ft)	(ft/s)	
			(cfs)	(cfs)		

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Fundy	4		Max WS	18.51	18.50	
0.00		2259.00	2740.40	31081.65	3149.92	0.95
Fundy	3		Max WS	18.51	18.49	-18.08
0.00	0.00	2624.00	4619.29	27348.32	3526.12	1.28
Fundy	2.5	BR U	Max WS	18.51	18.47	-17.64
0.00	0.00	2375.93	1087.99	28695.68	5710.06	1.70
Fundy	2.5	BR D	Max WS	18.51	18.47	-17.60
0.00	0.01	2315.33	870.29	29256.88	5366.55	1.63
Fundy	2		Max WS	18.50	18.49	
0.00		2566.00	1817.30	30276.94	3399.26	1.08
Fundy	1		Max WS	18.50	18.50	-19.17
		3643.25	4020.48	27448.25	1544.23	0.59



None of the XS's are Geo-Referenced [Geo-Ref user entered XS] [Geo-Ref interpolated XS] [Non Geo-Ref user entered XS] [Non Geo-Ref interpolated XS]

TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
Meadowbrook Parkway over Fundy Channel

100-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation ¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation ² (ft)	Remaining Pile Embedment (ft)
North Abutment	0	0	5	5	-5	-45	40
Center Pier (Pier 9)	-25	0	5	5	-30	-65	35
South Abutment	0	0	10	10	-10	-45	35

1. All elevations are with reference to NAVD 88 and are taken from the 2009 Fathometric Survey by Boswell Engineering.
2. Estimate of pile tip elevation was taken from the Ayers Study (2001).

500-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation ² (ft)	Remaining Pile Embedment (ft)
North Abutment	0	0	11	11	-11	-45	34
Center Pier (Pier 9)	-25	0	5	5	-30	-65	35
South Abutment	0	0	15	15	-15	-45	30

1. All elevations are with reference to NAVD 88 and are taken from the 2009 Fathometric Survey by Boswell Engineering.
2. Estimate of pile tip elevation was taken from the Ayers Study (2001).

SCOUR MODE COMPUTATIONS - FLOOD TIDE
Meadowbrook Parkway over Fundy Channel

The following computations are made using Laursen's Equation (Equation 5.1 in HEC-18):

$$V_c = K_u \times Y_1^{1/6} \times D_{50}^{1/3}$$

100-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	18,235
APPROACH SECTION MAIN CHANNEL WIDTH (ft)	W ₁ =	573
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	32.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ^{1/3}	V _c =	3.75
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	40,414
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	2.00
MAIN CHANNEL SCOUR MODE		CLEAR WATER

500-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	21,339
APPROACH SECTION MAIN CHANNEL WIDTH (ft)	W ₁ =	573
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	37.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ^{1/3}	V _c =	3.84
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	27,338
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	2.00
MAIN CHANNEL SCOUR MODE		CLEAR WATER

CONTRACTION SCOUR COMPUTATIONS
Meadowbrook Parkway over Fundy Channel
CLEAR WATER CONTRACTION SCOUR COMPUTATIONS

The following computations are made using the HEC-18 equation for Live Bed Contraction Scour:
(Equations 5.4 and 5.5)

$$Y_s = Y_2 - Y_0$$

$$Y_2 = [K_u Q^2 / D_m^{2/3} W^{2-3/7}]$$

100-YEAR FLOOD

K ₁ =0.0077 (English Units)	K _u = 0.0077
DISCHARGE THROUGH BRIDGE OR ON THE SET BACK OVBANK (cfs)	Q= 39,806.0
DIAM. OF THE SMALLEST NONTRANSPORTABLE PARTICLE (1.25D ₅₀)	D _m = 0.0
BOTTOM WIDTH OF CONTRACTED SECTION LESS PIER WIDTHS (ft)	W= 573.0
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	Y ₂ = 18.49
AVERAGE WATER DEPTH AT BRIDGE (ft)	Y ₀ = 36.0
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	Y _s = -17.5

500-YEAR FLOOD

K ₁ =0.0077 (English Units)	K _u = 0.0077
DISCHARGE THROUGH BRIDGE OR ON THE SET BACK OVBANK (cfs)	Q= 28,686.0
DIAM. OF THE SMALLEST NONTRANSPORTABLE PARTICLE (1.25D ₅₀)	D _m = 0.0
BOTTOM WIDTH OF CONTRACTED SECTION LESS PIER WIDTHS (ft)	W= 573.0
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	Y ₂ = 13.96
AVERAGE WATER DEPTH AT BRIDGE (ft)	Y ₀ = 51.0
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	Y _s = -37.0

LOCAL ABUTMENT SCOUR COMPUTATIONS
Meadowbrook Parkway over Fundy Channel

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD (Left)

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	150
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	7,405
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	3594.0
V _e = Q _e /A _e , (ft/s)	V _e =	0.485
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	808
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	9.2
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000822
SCOUR DEPTH, Y _s (ft)	Y _s =	10.2

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	150
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	11,782
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	4,619
V _e = Q _e /A _e , (ft/s)	V _e =	0.392
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	808
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	14.6
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000417
SCOUR DEPTH, Y _s (ft)	Y _s =	15.4

LOCAL ABUTMENT SCOUR COMPUTATIONS
Meadowbrook Parkway over Fundy Channel

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD (Left)

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	450
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	5,127
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	1468.0
V _e = Q _e /A _e , (ft/s)	V _e =	0.286
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	1,243
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	4.1
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.001078
SCOUR DEPTH, Y _s (ft)	Y _s =	5.3

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	450
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	11,861
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	3,526
V _e = Q _e /A _e , (ft/s)	V _e =	0.297
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	1,243
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	9.5
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000484
SCOUR DEPTH, Y _s (ft)	Y _s =	10.7

LOCAL PIER SCOUR COMPUTATIONS - FLOOD TIDE
Meadowbrook Parkway over Fundy Channel

The following computations are made using the HEC-18 CSU Equation (Eqn. 6.1):

$$y_s = (2.0K_1K_2K_3K_4(a/y_1)^{0.65}Fr^{0.43} \times y_1$$

100-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE (SEE EQNS. 6.5 - 6.8)	K ₄ =	1.00
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	3.0
LENGTH OF PIER	L=	75.0
L/a (Maximum L/a value is 12)	L/a=	25.0
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	1.9
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	32.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	5.0

500-YEAR FLOOD

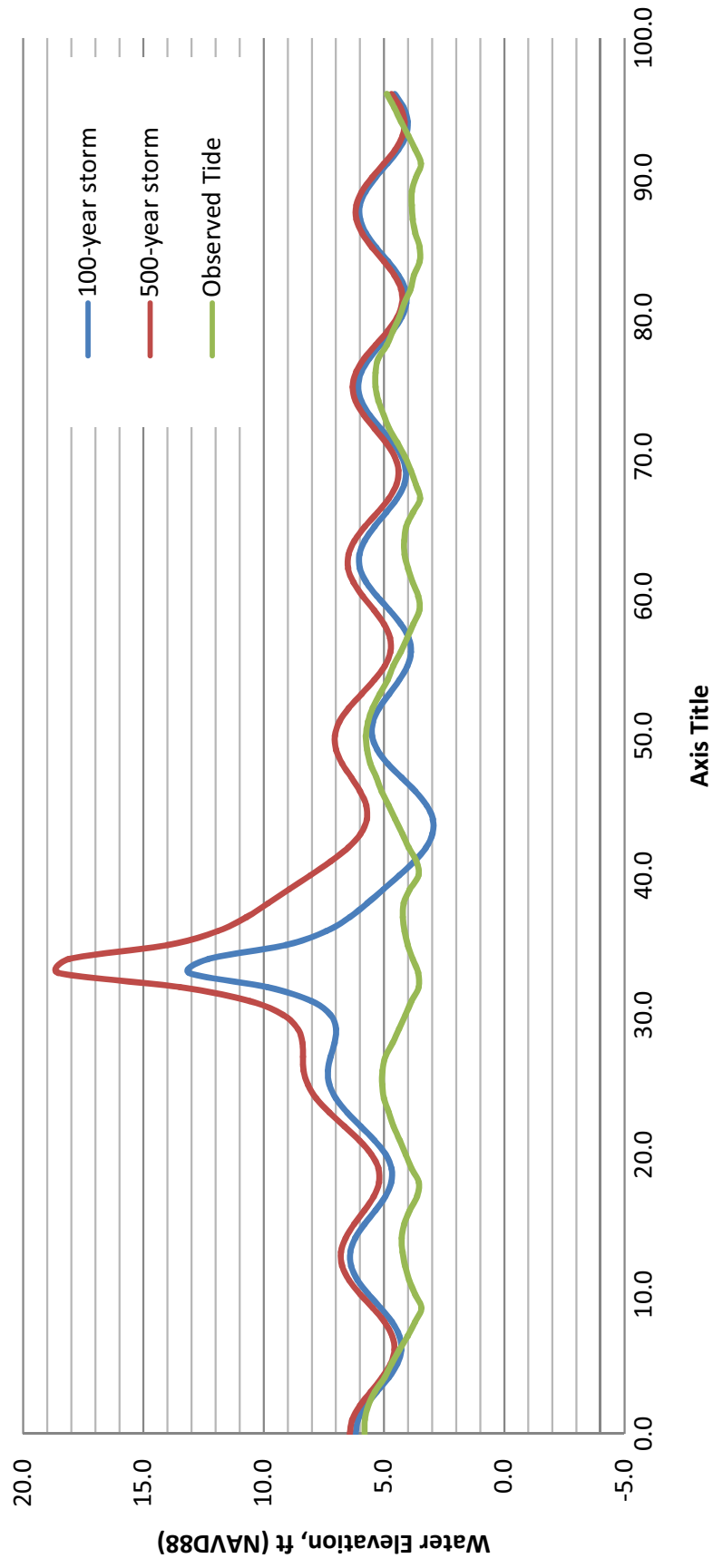
Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE (SEE EQNS. 6.5 - 6.8)	K ₄ =	1.00
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	3.0
LENGTH OF PIER	L=	75.0
L/a (Maximum L/a value is 12)	L/a=	25.0
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	2.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	37.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	5.1

$$S_t(t) = S_p \left(1 - e^{-\frac{D}{(t-t_0)}} \right) \quad H_t(t) = a \cos\left(\frac{360t}{T}\right) + Z$$

Input Variables:					Notes:				
Peak Storm Tide Elevations:									
1 Appendix E ADCRIC 100-year =	2.9 m	MSL = 9.5	ft						
2 Appendix E ADCRIC 500-year, Y500 =	4.73 m	MSL = 15.5	ft						
3 Mean High Water, MHW =	0.649 m	MSL			Taken from NOAA Tidal Benchmark at Jon				
4 Mean Low Water, MLW =	0.04 m	MSL			Taken from NOAA Tidal Benchmark at Jon				
5 Mean Sea Level, MSL =	0.344 m	MSL			Taken from NOAA Tidal Benchmark at Jon				
6 Mean Tidal Range = MHW -MLW =	0.609 m	MSL			(Taken from StonyBrook Data at lishore.or				
7 Mean Tidal Amplitude, a = (MTR/2) =	0.3045 m	MSL							
8 Conversion between MSL to NAVD88 =	-0.686 m								
9 Vertical Datum offset, Z = MSL - NGVD88 -1m =	-1.342 m				Extra meter removed because False chann				
10 ADCRIC 100-year, Y100 + Z =	1.558 m	NAVD 88							
11 ADCRIC 500-year = Y500 + Z =	3.388 m	NAVD 88							
12 Half Tidal Day =	12.5 hrs								
13 Time of Mid-rising tide =	8.4 hrs								
14 Mid-rising tide offset = t ₀ + t + 2 x 12.5hrs =	33.4 hrs								
15 Peak surge elevation for 100-year storm, Sp =	2.8 m				From Trial Calculations below				
16 Peak surge elevation for 500-year storm., Sp =	4.5 m				From Trial Calculations below				
Appendix C, 50% Levels									
17 Radius of Maximum Wind, R =	37 nmi								
18 Forward Speed, f =	25 knots								
19 Half duration, D = R/f =	1.48 hours								
FEMA FIS (Should be consistent with values above)									
20 Stillwater elevation for 100-year storm=	10.2 ft (NAVD88)								
21 Stillwater elevation for 100-year storm=	12.5 ft (NAVD 88)								
22 Average Radius of Maximum Wind, Ravg =	0.26 nmi								
Additional Information									
23 Sea Level Rise NPCC Prediction , m	1.4 m	=	4.592 ft		(NPCC 2080 maximum projection)				
24 NGVD29 to NAVD88	-1.15128 ft				NOAA Tidal Benchmark Conversion for Sta				
Trial Calculations									
S(tot) = St + Ht =	1.59 m								
Time of maximum surge (assumed), t =	33.2 hrs								
Time (hrs)	Obs Tide (m)	Obs Tide (ft) NGVD29	Obs Tide (ft) NAVD88	100-year storm			500-year storm		
				Storm + Tide (m)	Storm + Tide + SLR		Storm + Tide (m)	Storm + Tide + SLR	
					NAVD88 (m)	NAVD88 (ft)		NAVD88 (m)	NAVD88 (ft)
0.0	0.721	7.0	5.8	-0.92	0.48	6.2	-0.84	0.56	6.4
1.0	0.719	7.0	5.8	-0.95	0.45	6.1	-0.87	0.53	6.3
2.0	0.675	6.8	5.7	-1.05	0.35	5.7	-0.97	0.43	6.0
3.0	0.59	6.5	5.4	-1.19	0.21	5.3	-1.11	0.29	5.5
4.0	0.468	6.1	5.0	-1.33	0.07	4.8	-1.25	0.15	5.1
5.0	0.379	5.8	4.7	-1.45	-0.05	4.4	-1.36	0.04	4.7
6.0	0.28	5.5	4.4	-1.50	-0.10	4.3	-1.41	-0.01	4.6
7.0	0.175	5.2	4.0	-1.47	-0.07	4.4	-1.38	0.02	4.7
8.0	0.083	4.9	3.7	-1.38	0.02	4.7	-1.28	0.12	5.0
9.0	0.001	4.6	3.4	-1.23	0.17	5.1	-1.13	0.27	5.5
10.0	0.083	4.9	3.7	-1.08	0.32	5.7	-0.97	0.43	6.0
11.0	0.155	5.1	3.9	-0.94	0.46	6.1	-0.83	0.57	6.5
12.0	0.208	5.3	4.1	-0.86	0.54	6.4	-0.75	0.65	6.7
13.0	0.239	5.4	4.2	-0.85	0.55	6.4	-0.73	0.67	6.8
14.0	0.25	5.4	4.3	-0.91	0.49	6.2	-0.79	0.61	6.6
15.0	0.219	5.3	4.2	-1.03	0.37	5.8	-0.90	0.50	6.2
16.0	0.148	5.1	3.9	-1.17	0.23	5.3	-1.03	0.37	5.8
17.0	0.055	4.8	3.6	-1.29	0.11	4.9	-1.15	0.25	5.4
18.0	0.035	4.7	3.6	-1.37	0.03	4.7	-1.21	0.19	5.2
19.0	0.126	5.0	3.9	-1.37	0.03	4.7	-1.20	0.20	5.2
20.0	0.199	5.2	4.1	-1.30	0.10	4.9	-1.12	0.28	5.5
21.0	0.274	5.5	4.3	-1.16	0.24	5.4	-0.97	0.43	6.0
22.0	0.352	5.7	4.6	-0.98	0.42	6.0	-0.78	0.62	6.6
23.0	0.411	5.9	4.8	-0.81	0.59	6.5	-0.58	0.82	7.3
24.0	0.474	6.1	5.0	-0.67	0.73	7.0	-0.42	0.98	7.8
25.0	0.497	6.2	5.1	-0.59	0.81	7.3	-0.31	1.09	8.2
26.0	0.492	6.2	5.1	-0.57	0.83	7.3	-0.26	1.14	8.3
27.0	0.458	6.1	4.9	-0.60	0.80	7.2	-0.25	1.15	8.4
28.0	0.366	5.8	4.6	-0.65	0.75	7.1	-0.24	1.16	8.4
29.0	0.285	5.5	4.4	-0.67	0.73	7.0	-0.18	1.22	8.6
30.0	0.201	5.3	4.1	-0.60	0.80	7.2	0.00	1.40	9.2
31.0	0.124	5.0	3.8	-0.36	1.04	8.0	0.43	1.83	10.6
32.0	0.035	4.7	3.6	0.20	1.60	9.8	1.31	2.71	13.5
33.0	0.041	4.7	3.6	1.19	2.59	13.1	2.85	4.25	18.5
34.0	0.112	5.0	3.8	0.95	2.35	12.3	2.72	4.12	18.1
35.0	0.172	5.2	4.0	-0.03	1.37	9.1	1.47	2.87	14.0
36.0	0.214	5.3	4.1	-0.54	0.86	7.4	0.83	2.23	11.9
37.0	0.237	5.4	4.2	-0.84	0.56	6.4	0.47	1.87	10.7
38.0	0.225	5.3	4.2	-1.06	0.34	5.7	0.19	1.59	9.8
39.0	0.148	5.1	3.9	-1.27	0.13	5.0	-0.07	1.33	8.9
40.0	0.038	4.7	3.6	-1.47	-0.07	4.4	-0.34	1.06	8.1
41.0	0.064	4.8	3.7	-1.66	-0.26	3.7	-0.60	0.80	7.2
42.0	0.162	5.1	4.0	-1.81	-0.41	3.3	-0.82	0.58	6.5
43.0	0.244	5.4	4.2	-1.89	-0.49	3.0	-0.98	0.42	6.0
44.0	0.332	5.7	4.5	-1.90	-0.50	3.0	-1.06	0.34	5.7
45.0	0.417	6.0	4.8	-1.82	-0.42	3.2	-1.05	0.35	5.7
46.0	0.503	6.2	5.1	-1.68	-0.28	3.7	-0.98	0.42	6.0
47.0	0.572	6.5	5.3	-1.50	-0.10	4.3	-0.86	0.54	6.4
48.0	0.649	6.7	5.6	-1.33	0.07	4.8	-0.75	0.65	6.7

49.0	0.687	6.8	5.7	-1.19	0.21	5.3	-0.67	0.73	7.0
50.0	0.704	6.9	5.7	-1.13	0.27	5.5	-0.65	0.75	7.0
51.0	0.676	6.8	5.7	-1.14	0.26	5.5	-0.71	0.69	6.9
52.0	0.618	6.6	5.5	-1.22	0.18	5.2	-0.83	0.57	6.5
53.0	0.528	6.3	5.2	-1.34	0.06	4.8	-0.99	0.41	5.9
54.0	0.428	6.0	4.8	-1.47	-0.07	4.4	-1.16	0.24	5.4
55.0	0.356	5.8	4.6	-1.57	-0.17	4.0	-1.29	0.11	5.0
56.0	0.261	5.4	4.3	-1.62	-0.22	3.9	-1.36	0.04	4.7
57.0	0.179	5.2	4.0	-1.59	-0.19	4.0	-1.35	0.05	4.7
58.0	0.105	4.9	3.8	-1.49	-0.09	4.3	-1.28	0.12	5.0
59.0	0.026	4.7	3.5	-1.35	0.05	4.8	-1.15	0.25	5.4
60.0	0.041	4.7	3.6	-1.19	0.21	5.3	-1.01	0.39	5.9
61.0	0.11	5.0	3.8	-1.05	0.35	5.7	-0.89	0.51	6.3
62.0	0.169	5.1	4.0	-0.97	0.43	6.0	-0.82	0.58	6.5
63.0	0.212	5.3	4.1	-0.97	0.43	6.0	-0.83	0.57	6.5
64.0	0.219	5.3	4.2	-1.03	0.37	5.8	-0.90	0.50	6.2
65.0	0.192	5.2	4.1	-1.16	0.24	5.4	-1.04	0.36	5.8
66.0	0.108	4.9	3.8	-1.31	0.09	4.9	-1.19	0.21	5.3
67.0	0.016	4.6	3.5	-1.44	-0.04	4.5	-1.34	0.06	4.8
68.0	0.07	4.8	3.7	-1.53	-0.13	4.2	-1.43	-0.03	4.5
69.0	0.132	5.0	3.9	-1.55	-0.15	4.1	-1.46	-0.06	4.4
70.0	0.209	5.3	4.1	-1.50	-0.10	4.3	-1.41	-0.01	4.5
71.0	0.306	5.6	4.4	-1.39	0.01	4.6	-1.30	0.10	4.9
72.0	0.408	5.9	4.8	-1.24	0.16	5.1	-1.16	0.24	5.4
73.0	0.479	6.2	5.0	-1.09	0.31	5.6	-1.02	0.38	5.8
74.0	0.546	6.4	5.2	-0.99	0.41	5.9	-0.92	0.48	6.2
75.0	0.582	6.5	5.3	-0.95	0.45	6.1	-0.88	0.52	6.3
76.0	0.582	6.5	5.3	-0.98	0.42	6.0	-0.92	0.48	6.2
77.0	0.55	6.4	5.2	-1.09	0.31	5.6	-1.02	0.38	5.8
78.0	0.437	6.0	4.9	-1.23	0.17	5.1	-1.17	0.23	5.3
79.0	0.36	5.8	4.6	-1.38	0.02	4.7	-1.32	0.08	4.8
80.0	0.28	5.5	4.4	-1.50	-0.10	4.3	-1.44	-0.04	4.4
81.0	0.218	5.3	4.2	-1.56	-0.16	4.1	-1.51	-0.11	4.2
82.0	0.135	5.0	3.9	-1.55	-0.15	4.1	-1.49	-0.09	4.3
83.0	0.095	4.9	3.8	-1.46	-0.06	4.4	-1.41	-0.01	4.6
84.0	0.023	4.7	3.5	-1.33	0.07	4.8	-1.28	0.12	5.0
85.0	0.024	4.7	3.5	-1.18	0.22	5.3	-1.13	0.27	5.5
86.0	0.076	4.8	3.7	-1.05	0.35	5.7	-1.00	0.40	5.9
87.0	0.112	5.0	3.8	-0.97	0.43	6.0	-0.93	0.47	6.1
88.0	0.122	5.0	3.8	-0.97	0.43	6.0	-0.93	0.47	6.1
89.0	0.12	5.0	3.8	-1.04	0.36	5.8	-1.00	0.40	5.9
90.0	0.072	4.8	3.7	-1.17	0.23	5.3	-1.13	0.27	5.5
91.0	0.006	4.6	3.5	-1.32	0.08	4.8	-1.28	0.12	5.0
92.0	0.076	4.8	3.7	-1.46	-0.06	4.4	-1.42	-0.02	4.5
93.0	0.166	5.1	4.0	-1.55	-0.15	4.1	-1.51	-0.11	4.2
94.0	0.259	5.4	4.3	-1.58	-0.18	4.0	-1.54	-0.14	4.1
95.0	0.344	5.7	4.6	-1.53	-0.13	4.2	-1.49	-0.09	4.3
96.0	0.437	6.0	4.9	-1.41	-0.01	4.5	-1.37	0.03	4.7

Predicted Fundy & False Channel Synthetic Hydrographs



B.4 Meadowbrook Parkway over False Channel

OBJECTID	62	ApprGuar_1	1	UndWaterIn	Y60
Shape	Point	Historical	4	SpecInspe	N
StateCode	362	NavControl	1	FractCritD	0
BIN	1059159	NavVertCle	36	UndWaterDa	907
Record	1	NavHorizCl	85	SpecInspec	
Type	8	OpenPostCl	A	BridgImprC	4999
LOS	1	ServiceOnB	1	RoadImprCo	2490
RteNo	0	ServiceUnd	5	TotalCost	7489
HighwayDis	1	StructMate	6	YearEst	2008
CountyCode	59	TypeDesign	1	BordBridge	0
PlaceCode	34000	ApprMater	1	BPercenRes	0
FeaturesIn	FALSE	ApprDesign	1	BordBIN	0
CHANNEL		NoSpansMai	4	STRAHNET	0
CritFacili		NoSpansApp	2	ParallelSt	N
Route	RTE 908E	RouteHoriz	112	DirectTraf	2
Location	AT	MainSpanLe	98	TempStruct	
FREEPORT-S OF SSP		StructLeng	445	HighwaySys	1
MinVertCle	9999	SdeWlkLeft	0	FedLandsHi	0
KiloPoint	6903	SdeWlkRtWi	0	YearRecon	1988
BaseHwyNet	1	BrdgCb2Cb	224	DeckType	1
LRSRoute	0	BrdgOut2Ou	239	DeckWearTy	2
SubrouteNo		MinVertOve	9999	TypeMembr	0
LatDD	40	RefFeature	N	DeckProtec	1
LatMM	37	MinVertUn	0	ADTTruck	4
LatSS	48540	RefFeat	N	NatNetwk	0
LonDD	73	MinLatUn	999	PierAbutPr	2
LongMM	33	MinLatUnLf	0	NBISBrdgeL	Y
LongSS	4471	Deck	7	ScourCrit	6
Latitude	40.63015	SupStruct	7	FutADT	43639
Longitude	-73.562419	SubStruct	6	YearFutADT	2022
DetourLeng	16	ChannelPro	7	MinNavVert	
Toll	3	Culverts	N	FedAgeninc	NN
MainRespon	1	MethOpRate	1	WashHead	
Owner	1	OperRating	544	NoName	790
FunctClass	12	MethOpRa_1	0	Status	0
YearBuilt	1934	InventRat	327	NoName_1	0
LanesOn	6	TructEval	6		
LanesUnder	0	DeckGeo	2		
ADT	31171	UnclearVer	N		
YearADT	2002	BridgePost	5		
DesignLoad	5	WaterwayAd	5		
ApprWidth	226	ApprAlign	8		
Median	2	TypeWorkPr	34		
Skew	0	WorkBy	1		
StructFlar	0	LenImprov	445		
BridgeRail	1	InspDate	1008		
Transition	0	InspFreq	24		
ApprGuardR	0	FractCrit	N		

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HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X      X
XXXXXXXX XXXX      X      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      X

```

PROJECT DATA

Project Title: 1059159
Project File : 1059159.prj
Run Date and Time: 1/19/2012 2:34:26 PM

Project in English units

PLAN DATA

Plan Title: Plan 04
Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059159 Meadowbrook
Parkway over False Cannel - NYSDOT\1059159.p04

Geometry Title: 1059159
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059159
Meadowbrook Parkway over False Cannel - NYSDOT\1059159.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of:	Cross Sections =	6	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

GEOMETRY DATA

1059159.rep

Geometry Title: 1059159

Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059159 Meadowbrook Parkway over False Cannel - NYSDOT\1059159.g01

CROSS SECTION

RIVER: False

REACH: False

RS: 6

INPUT

Description: Two bridge lengths upstream

Station	Elevation	Data	num=	10	Station	Elevation	Station	Elevation	Station	Elevation
0	4	50	3	194	2	263	0	484	-30	
667	0	793	3	883	4	982	5	1112	5	

Manning's n values

Station	n Val	Station	n Val	Station	n Val
0	.035	263	.02	667	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	263	667		188	185		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	13.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	13.10	Reach Len. (ft)	188.00	185.00
182.00				
Crit w.s. (ft)		Flow Area (sq ft)	2841.30	11352.40
4230.00				
E.G. slope (ft/ft)	0.000000	Area (sq ft)	2841.30	11352.40
4230.00				
Q Total (cfs)	-233.24	Flow (cfs)	-14.75	-198.10
-20.38				
Top width (ft)	1112.00	Top width (ft)	263.00	404.00
445.00				
Vel Total (ft/s)	-0.01	Avg. vel. (ft/s)	-0.01	-0.02
0.00				
Max Chl Dpth (ft)	43.10	Hydr. Depth (ft)	10.80	28.10
9.51				
Conv. Total (cfs)	9111148.0	Conv. (cfs)	576224.1	7738761.0
796163.2				
Length wtd. (ft)	184.95	wetted Per. (ft)	272.14	408.47
453.15				
Min Ch El (ft)	-30.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.64	Stream Power (lb/ft s)	1112.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	36.08	125.15
39.08				
C & E Loss (ft)		Cum SA (acres)	5.63	4.68
5.62				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: False
 REACH: False

RS: 5

INPUT

Description: One bridge length upstream

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6	217	6	309	6	332	0	518	-35
685	0	705	2	762	3	810	3	853	6
891	7	969	8	1108	8				

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	332	.02	685	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	332	685		121 120	118	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	13.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	13.10	Reach Len. (ft)	121.00	120.00
118.00				
Crit w.s. (ft)		Flow Area (sq ft)	2426.20	10801.80
3097.30				
E.G. slope (ft/ft)	0.000000	Area (sq ft)	2426.20	10801.80
3097.30				
Q Total (cfs)	-383.65	Flow (cfs)	-16.99	-344.79
-21.87				
Top width (ft)	1108.00	Top width (ft)	332.00	353.00
423.00				
Vel Total (ft/s)	-0.02	Avg. vel. (ft/s)	-0.01	-0.03
-0.01				
Max Chl Dpth (ft)	48.10	Hydr. Depth (ft)	7.31	30.60
7.32				
Conv. Total (cfs)	8624335.0	Conv. (cfs)	381881.7	7750742.0
491712.1				
Length wtd. (ft)	119.95	Wetted Per. (ft)	339.87	359.89
428.33				
Min Ch El (ft)	-35.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.67	Stream Power (lb/ft s)	1108.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	24.72	78.10
23.78				
C & E Loss (ft)		Cum SA (acres)	4.35	3.07
3.80				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: False
 REACH: False RS: 4

INPUT

Description: Upstream bridge

Station Elevation Data		num= 19		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	100	10	166	11	237	12	365	14		
428	0	459	-5	479	-10	511	-25	543	-10		
563	-5	589	0	616	5	650	9	712	11		
877	14	928	13	1073	12	1111	11				

Manning's n Values		num= 3		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	428	.02	589	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	428	589		138 132	128	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	13.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	13.10	Reach Len. (ft)	20.00	20.00
20.00				
Crit W.S. (ft)		Flow Area (sq ft)	1069.54	3671.38
954.55				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	1069.54	3671.38
954.55				
Q Total (cfs)	-483.45	Flow (cfs)	-22.12	-444.06
-17.27				
Top Width (ft)	953.71	Top Width (ft)	366.26	161.00
426.45				
Vel Total (ft/s)	-0.08	Avg. Vel. (ft/s)	-0.02	-0.12
-0.02				
Max Chl Dpth (ft)	38.10	Hydr. Depth (ft)	2.92	22.80
2.24				
Conv. Total (cfs)	2304886.0	Conv. (cfs)	105461.6	2117085.0
82339.3				
Length Wtd. (ft)	20.00	Wetted Per. (ft)	371.82	169.79
429.32				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.87	Stream Power (lb/ft s)	1111.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	19.86	58.17
18.29				
C & E Loss (ft)		Cum SA (acres)	3.38	2.37
2.65				

BRIDGE

RIVER: False

REACH: False

RS: 3.5

INPUT

Description:

Distance from Upstream XS = 20

Deck/Roadway width = 80

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 11

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		16		10	250		17		10	350	17.51			10
450	17.86		13.86		520	18.18		14.2		560	17.9		13.9	
660	17.6		9		760	17.2		11		860	16.7		11	
960	15.55		11		1111	14		11						

Upstream Bridge Cross Section Data

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	100	10	166	11	237	12	365	14
428	0	459	-5	479	-10	511	-25	543	-10
563	-5	589	0	616	5	650	9	712	11
877	14	928	13	1073	12	1111	11		

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	428	.02	589	.035

Bank	Sta	Left	Right	Coeff	Contr.	Expan.
	428		589	.1		.3

Downstream Deck/Roadway Coordinates

num= 11

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		16		10	250		17		10	350	17.51			10
450	17.86		13.86		520	18.18		14.2		560	17.9		13.9	
660	17.6		9		760	17.2		11		860	16.7		11	
960	15.55		11		1111	14		11						

Downstream Bridge Cross Section Data

Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	128	10	263	12	288	13	319	14
429	15	460	5	485	0	495	-10	527	-20
559	-10	577	0	636	8	704	11	750	12
826	13	938	14	1097	12				

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	485	.02	577	.035

Bank	Sta	Left	Right	Coeff	Contr.	Expan.
	485		577	.1		.3

Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins =

Energy head used in spillway design =

Spillway height used in design =

Weir crest shape = Broad Crested

Number of Piers = 3

Pier Data
 Pier Station Upstream= 488 Downstream= 488
 Upstream num= 2
 width Elev width Elev
 3 -35 3 14
 Downstream num= 2
 width Elev width Elev
 3 -35 3 14

Pier Data
 Pier Station Upstream= 520 Downstream= 520
 Upstream num= 2
 width Elev width Elev
 3 -35 3 14
 Downstream num= 2
 width Elev width Elev
 3 -35 3 14

Pier Data
 Pier Station Upstream= 552 Downstream= 552
 Upstream num= 2
 width Elev width Elev
 3 -35 3 14
 Downstream num= 2
 width Elev width Elev
 3 -35 3 14

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add weight component to Momentum

Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #Max WS

E.G. US. (ft)	13.10	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	13.10	E.G. Elev (ft)	13.10
13.10			
Q Total (cfs)	-483.45	W.S. Elev (ft)	13.10
13.10			
Q Bridge (cfs)		Crit W.S. (ft)	
Q Weir (cfs)		Max Chl Dpth (ft)	38.10
33.10			
Weir Sta Lft (ft)		Vel Total (ft/s)	-0.12
-0.17			
Weir Sta Rgt (ft)		Flow Area (sq ft)	4161.77
2929.65			
Weir Submerg		Froude # Chl	0.00
-0.01			
Weir Max Depth (ft)		Specif Force (cu ft)	46451.90

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31770.83			
Min El Weir Flow (ft)	14.15	Hydr Depth (ft)	30.36
22.11			
Min El Prs (ft)	14.20	W.P. Total (ft)	775.97
453.71			
Delta EG (ft)		Conv. Total (cfs)	1247885.0
760840.6			
Delta WS (ft)	0.00	Top Width (ft)	137.08
132.49			
BR Open Area (sq ft)		Frctn Loss (ft)	
BR Open Vel (ft/s)		C & E Loss (ft)	
Coef of Q		Shear Total (lb/sq ft)	0.00
0.00			
Br Sel Method	Energy/Weir	Power Total (lb/ft s)	0.00
0.00			

Note: The post processor is unable to handle negative flow through a bridge at this time. The water surfaces inside the bridge are based on projecting the outside water surface.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

CROSS SECTION

RIVER: False

REACH: False

RS: 3

INPUT

Description: Downstream bridge

Station Elevation Data				num=	18				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	128	10	263	12	288	13	319	14
429	15	460	5	485	0	495	-10	527	-20
559	-10	577	0	636	8	704	11	750	12
826	13	938	14	1097	12				

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	485	.02	577	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	485	577		163	163	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	13.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	13.10	Reach Len. (ft)	163.00	163.00
163.00				

		1059159.rep		
Crit W.S. (ft)		Flow Area (sq ft)	1061.06	2304.91
948.44				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	1061.06	2304.91
948.44				
Q Total (cfs)	-483.45	Flow (cfs)	-33.77	-422.33
-27.36				
Top Width (ft)	780.14	Top Width (ft)	341.10	92.00
347.04				
Vel Total (ft/s)	-0.11	Avg. Vel. (ft/s)	-0.03	-0.18
-0.03				
Max Chl Dpth (ft)	33.10	Hydr. Depth (ft)	3.11	25.05
2.73				
Conv. Total (cfs)	1569027.0	Conv. (cfs)	109588.0	1370658.0
88780.4				
Length wtd. (ft)	163.00	Wetted Per. (ft)	346.00	101.79
348.76				
Min Ch El (ft)	-20.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	2.35	Stream Power (lb/ft s)	1097.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	19.53	56.54
17.99				
C & E Loss (ft)		Cum SA (acres)	3.30	2.30
2.55				

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: False
REACH: False RS: 2

INPUT

Description: Onebridge length downstream

Station Elevation Data		num=	15						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8	188	8	302	7	429	6	441	0
535	-20	555	-30	587	-35	619	-25	639	-20
757	0	819	5	862	5	994	6	1110	7

Manning's n values		num=	3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	441	.02	757	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
441	757	180	180	180	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	13.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	13.10	Reach Len. (ft)	180.00	180.00
		Page 8		

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180.00				
Crit W.S. (ft)		Flow Area (sq ft)	2556.62	9209.61
2774.31				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	2556.62	9209.61
2774.31				
Q Total (cfs)	-599.51	Flow (cfs)	-29.00	-532.04
-38.47				
Top width (ft)	1110.00	Top width (ft)	441.00	316.00
353.00				
Vel Total (ft/s)	-0.04	Avg. Vel. (ft/s)	-0.01	-0.06
-0.01				
Max Chl Dpth (ft)	48.10	Hydr. Depth (ft)	5.80	29.14
7.86				
Conv. Total (cfs)	7171022.0	Conv. (cfs)	346863.6	6364036.0
460123.2				
Length wtd. (ft)	180.00	Wetted Per. (ft)	447.52	324.68
359.31				
Min Ch El (ft)	-35.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.75	Stream Power (lb/ft s)	1110.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	12.76	35.00
11.02				
C & E Loss (ft)		Cum SA (acres)	1.83	1.54
1.24				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: False

REACH: False

RS: 1

INPUT

Description: Two bridge lengths downstream

Station Elevation Data				num=	12				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6	190	6	300	5	360	4	382	3
427	2	446	0	612	-10	873	0	908	2
990	3	1122	4						

Manning's n values

num=

3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	446	.02	873	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
446	873	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	13.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	13.10	Reach Len. (ft)		
		Page 9		

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Crit w.s. (ft)	-7.65	Flow Area (sq ft)	3619.10	7728.70
2559.90				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	3619.10	7728.70
2559.90				
Q Total (cfs)	-731.44	Flow (cfs)	-88.54	-570.54
-72.35				
Top width (ft)	1122.00	Top width (ft)	446.00	427.00
249.00				
Vel Total (ft/s)	-0.05	Avg. Vel. (ft/s)	-0.02	-0.07
-0.03				
Max Chl Dpth (ft)	23.10	Hydr. Depth (ft)	8.11	18.10
10.28				
Conv. Total (cfs)	5070820.0	Conv. (cfs)	613811.7	3955399.0
501608.6				
Length wtd. (ft)		Wetted Per. (ft)	453.25	427.49
258.17				
Min Ch El (ft)	-10.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.59	Stream Power (lb/ft s)	1122.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River:False

Reach	River Sta.	n1	n2	n3
False	6	.035	.02	.035
False	5	.035	.02	.035
False	4	.035	.02	.035
False	3.5	Bridge		
False	3	.035	.02	.035
False	2	.035	.02	.035
False	1	.035	.02	.035

SUMMARY OF REACH LENGTHS

River: False

Reach	River Sta.	Left	Channel	Right
False	6	188	185	182
False	5	121	120	118
False	4	138	132	128
False	3.5	Bridge		
False	3	163	163	163
False	2	180	180	180
False	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: False

Reach	River Sta.	Contr.	Expan.
False	6	.1	.3
False	5	.1	.3
False	4	.1	.3
False	3.5	Bridge	
False	3	.1	.3
False	2	.1	.3
False	1	.1	.3

Profile Output Table - Six XS Bridge

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Crit W.S.	Frctn
Loss	C & E Loss	Top Width	Q Left	Q Channel	Q Right	Vel Chnl
(ft)	(ft)	(ft)	(cfs)	(ft)	(ft)	(ft/s)
False	5	Max WS	13.10	13.10		
0.00		1108.00	-16.99	-344.79	-21.87	-0.03
False	4	Max WS	13.10	13.10		
		953.71	-22.12	-444.06	-17.27	-0.12
False	3.5	BR U	Max WS	13.10	13.10	
		137.08	-11.95	-459.79	-11.72	-0.13
False	3.5	BR D	Max WS	13.10	13.10	
		132.49	-36.41	-421.14	-25.90	-0.20
False	3	Max WS	13.10	13.10		
0.00		780.14	-33.77	-422.33	-27.36	-0.18
False	2	Max WS	13.10	13.10		
0.00		1110.00	-29.00	-532.04	-38.47	-0.06

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U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X      X
XXXXXXXX XXXX      X      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      X

```

PROJECT DATA

Project Title: 1059159
Project File : 1059159.prj
Run Date and Time: 1/19/2012 2:38:56 PM

Project in English units

PLAN DATA

Plan Title: Plan 04
Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059159 Meadowbrook
Parkway over False Cannel - NYSDOT\1059159.p04

Geometry Title: 1059159
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059159
Meadowbrook Parkway over False Cannel - NYSDOT\1059159.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of:	Cross Sections =	6	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

GEOMETRY DATA

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Geometry Title: 1059159

Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\1059159 Meadowbrook Parkway over False Cannel - NYSDOT\1059159.g01

CROSS SECTION

RIVER: False

REACH: False

RS: 6

INPUT

Description: Two bridge lengths upstream

Station	Elevation	Data	num=	10	Station	Elevation	Station	Elevation	Station	Elevation
0	4	50	3	194	2	263	0	484	-30	
667	0	793	3	883	4	982	5	1112	5	

Manning's n values

num=

3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	263	.02	667	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	263	667		188	185		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	18.60	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.10	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	18.50	Reach Len. (ft)	188.00	185.00
182.00				
Crit w.s. (ft)		Flow Area (sq ft)	4261.50	13534.00
6633.00				
E.G. slope (ft/ft)	0.000014	Area (sq ft)	4261.50	13534.00
6633.00				
Q Total (cfs)	48673.46	Flow (cfs)	4133.02	38358.22
6182.22				
Top width (ft)	1112.00	Top width (ft)	263.00	404.00
445.00				
Vel Total (ft/s)	1.99	Avg. vel. (ft/s)	0.97	2.83
0.93				
Max Chl Dpth (ft)	48.50	Hydr. Depth (ft)	16.20	33.50
14.91				
Conv. Total (cfs)	13162430.0	Conv. (cfs)	1117665.0	
10372950.0 1671815.0				
Length wtd. (ft)	184.90	wetted Per. (ft)	277.54	408.47
458.55				
Min Ch El (ft)	-30.00	Shear (lb/sq ft)	0.01	0.03
0.01				
Alpha	1.64	Stream Power (lb/ft s)	1112.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	70.76	157.45
75.14				
C & E Loss (ft)		Cum SA (acres)	6.67	4.87
7.01				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: False
 REACH: False

RS: 5

INPUT

Description: One bridge length upstream

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6	217	6	309	6	332	0	518	-35
685	0	705	2	762	3	810	3	853	6
891	7	969	8	1108	8				

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	332	.02	685	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	332	685		121 120	118	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	18.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.13	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	18.48	Reach Len. (ft)	121.00	120.00
118.00				
Crit w.s. (ft)		Flow Area (sq ft)	4211.54	12700.07
5372.00				
E.G. slope (ft/ft)	0.000015	Area (sq ft)	4211.54	12700.07
5372.00				
Q Total (cfs)	48446.08	Flow (cfs)	3725.88	39919.09
4801.10				
Top width (ft)	1108.00	Top width (ft)	332.00	353.00
423.00				
Vel Total (ft/s)	2.17	Avg. vel. (ft/s)	0.88	3.14
0.89				
Max Chl Dpth (ft)	53.48	Hydr. Depth (ft)	12.69	35.98
12.70				
Conv. Total (cfs)	12319830.0	Conv. (cfs)	947491.3	
10151420.0 1220919.0				
Length Wtd. (ft)	119.87	Wetted Per. (ft)	345.25	359.89
433.71				
Min Ch El (ft)	-35.00	Shear (lb/sq ft)	0.01	0.03
0.01				
Alpha	1.75	Stream Power (lb/ft s)	1108.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	52.47	101.74
50.06				
C & E Loss (ft)		Cum SA (acres)	5.39	3.26
5.20				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)

is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: False

REACH: False

RS: 4

INPUT

Description: Upstream bridge

Station	Elevation	Data	num=	19						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	9	100	10	166	11	237	12	365	14	
428	0	459	-5	479	-10	511	-25	543	-10	
563	-5	589	0	616	5	650	9	712	11	
877	14	928	13	1073	12	1111	11			

Manning's n	Values	num=	3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	428	.02	589	.035

Bank	Sta: Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	428	589		138 132	128		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	18.78	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.76	wt. n-val.	0.035	0.020
0.035				
W.S. Elev (ft)	18.02	Reach Len. (ft)	20.00	20.00
20.00				
Crit w.s. (ft)	4.57	Flow Area (sq ft)	3149.14	4464.13
3481.76				
E.G. slope (ft/ft)	0.000150	Area (sq ft)	3149.14	4464.13
3481.76				
Q Total (cfs)	48302.42	Flow (cfs)	6086.62	35871.95
6343.85				
Top width (ft)	1111.00	Top width (ft)	428.00	161.00
522.00				
Vel Total (ft/s)	4.35	Avg. vel. (ft/s)	1.93	8.04
1.82				
Max Chl Dpth (ft)	43.02	Hydr. Depth (ft)	7.36	27.73
6.67				
Conv. Total (cfs)	3948792.0	Conv. (cfs)	497589.5	2932583.0
518619.1				
Length wtd. (ft)	20.00	wetted Per. (ft)	438.59	169.79
529.80				
Min Ch El (ft)	-25.00	Shear (lb/sq ft)	0.07	0.25
0.06				
Alpha	2.58	Stream Power (lb/ft s)	1111.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	42.25	78.09
38.06				
C & E Loss (ft)	0.05	Cum SA (acres)	4.33	2.55
3.92				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

BRIDGE

RIVER: False

REACH: False

RS: 3.5

INPUT

Description:

Distance from Upstream XS = 20

Deck/Roadway width = 80

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num=

11

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0	16	10			250	17	10			350	17.51	10		
450	17.86	13.86			520	18.18	14.2			560	17.9	13.9		
660	17.6	9			760	17.2	11			860	16.7	11		
960	15.55	11			1111	14	11							

Upstream Bridge Cross Section Data

Station Elevation Data

num=

19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	100	10	166	11	237	12	365	14
428	0	459	-5	479	-10	511	-25	543	-10
563	-5	589	0	616	5	650	9	712	11
877	14	928	13	1073	12	1111	11		

Manning's n Values

num=

3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	428	.02	589	.035

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	428	589	.1		.3

Downstream Deck/Roadway Coordinates

num=

11

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0	16	10			250	17	10			350	17.51	10		
450	17.86	13.86			520	18.18	14.2			560	17.9	13.9		
660	17.6	9			760	17.2	11			860	16.7	11		
960	15.55	11			1111	14	11							

Downstream Bridge Cross Section Data

Station Elevation Data

num=

18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	128	10	263	12	288	13	319	14
429	15	460	5	485	0	495	-10	527	-20
559	-10	577	0	636	8	704	11	750	12
826	13	938	14	1097	12				

Manning's n Values

num=

3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	485	.02	577	.035

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	485	577	.1		.3

Upstream Embankment side slope

=

0 horiz. to 1.0 vertical

Downstream Embankment side slope

=

0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Piers = 3

Pier Data
 Pier Station Upstream= 488 Downstream= 488
 Upstream num= 2
 width Elev width Elev
 3 -35 3 14
 Downstream num= 2
 width Elev width Elev
 3 -35 3 14

Pier Data
 Pier Station Upstream= 520 Downstream= 520
 Upstream num= 2
 width Elev width Elev
 3 -35 3 14
 Downstream num= 2
 width Elev width Elev
 3 -35 3 14

Pier Data
 Pier Station Upstream= 552 Downstream= 552
 Upstream num= 2
 width Elev width Elev
 3 -35 3 14
 Downstream num= 2
 width Elev width Elev
 3 -35 3 14

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy
 Selected Low Flow Methods = Highest Energy Answer

High Flow Method
 Energy Only

Additional Bridge Parameters

Add Friction component to Momentum
 Do not add weight component to Momentum
 Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end
 Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #Max WS

E.G. US. (ft)	18.78	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	18.02	E.G. Elev (ft)	21.00
20.38			
Q Total (cfs)	48302.42	w.S. Elev (ft)	20.04
15.21			
Q Bridge (cfs)	35934.21	Crit w.S. (ft)	5.60
10.05			
Q Weir (cfs)		Max Chl Dpth (ft)	45.04

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35.21			
Weir Sta Lft (ft)		Vel Total (ft/s)	6.13
15.61			
Weir Sta Rgt (ft)		Flow Area (sq ft)	7878.78
3094.43			
Weir Submerg		Froude # Ch1	0.21
0.54			
Weir Max Depth (ft)		Specif Force (cu ft)	93640.63
64789.30			
Min El Weir Flow (ft)	14.15	Hydr Depth (ft)	7.09
29.74			
Min El Prs (ft)	14.20	W.P. Total (ft)	2051.51
709.74			
Delta EG (ft)	1.82	Conv. Total (cfs)	1300894.0
639619.4			
Delta WS (ft)	2.77	Top width (ft)	1111.00
104.06			
BR Open Area (sq ft)	3038.85	Frctn Loss (ft)	0.20
0.03			
BR Open Vel (ft/s)	11.82	C & E Loss (ft)	0.42
1.13			
Coef of Q		Shear Total (lb/sq ft)	0.33
1.55			
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00
0.00			

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: False
REACH: False

RS: 3

INPUT

Description: Downstream bridge

Station Elevation Data		num=		18							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	128	10	263	12	288	13	319	14		
429	15	460	5	485	0	495	-10	527	-20		
559	-10	577	0	636	8	704	11	750	12		
826	13	938	14	1097	12						

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	485	.02	577	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
485	577	163	163	163	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	19.23	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.41	wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	17.81	Reach Len. (ft)	163.00	163.00
163.00				
Crit W.S. (ft)		Flow Area (sq ft)	3176.51	2738.93
3323.52				
E.G. Slope (ft/ft)	0.000303	Area (sq ft)	3176.51	2738.93
3323.52				
Q Total (cfs)	48302.42	Flow (cfs)	8106.80	31806.39
8389.23				
Top width (ft)	1097.00	Top width (ft)	485.00	92.00
520.00				
Vel Total (ft/s)	5.23	Avg. vel. (ft/s)	2.55	11.61
2.52				
Max Chl Dpth (ft)	37.81	Hydr. Depth (ft)	6.55	29.77
6.39				
Conv. Total (cfs)	2775005.0	Conv. (cfs)	465741.0	1827297.0
481966.4				
Length wtd. (ft)	163.00	wetted Per. (ft)	494.94	101.79
526.46				
Min Ch El (ft)	-20.00	Shear (lb/sq ft)	0.12	0.51
0.12				
Alpha	3.33	Stream Power (lb/ft s)	1097.00	0.00
0.00				
Frctn Loss (ft)	0.01	Cum volume (acre-ft)	37.86	68.85
32.73				
C & E Loss (ft)		Cum SA (acres)	3.57	2.30
2.88				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: False

REACH: False

RS: 2

INPUT

Description: Onebridge length downstream

Station Elevation Data				num= 15					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8	188	8	302	7	429	6	441	0
535	-20	555	-30	587	-35	619	-25	639	-20
757	0	819	5	862	5	994	6	1110	7

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	441	.02	757	.035

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 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 441 757 180 180 180 .1 .3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	18.67	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.16	Wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	18.51	Reach Len. (ft)	180.00	180.00
180.00				
Crit W.S. (ft)		Flow Area (sq ft)	4944.14	10920.40
4685.42				
E.G. Slope (ft/ft)	0.000021	Area (sq ft)	4944.14	10920.40
4685.42				
Q Total (cfs)	48117.70	Flow (cfs)	4698.46	38455.98
4963.27				
Top width (ft)	1110.00	Top width (ft)	441.00	316.00
353.00				
Vel Total (ft/s)	2.34	Avg. Vel. (ft/s)	0.95	3.52
1.06				
Max Chl Dpth (ft)	53.51	Hydr. Depth (ft)	11.21	34.56
13.27				
Conv. Total (cfs)	10577970.0	Conv. (cfs)	1032886.0	
8453982.0 1091102.0				
Length wtd. (ft)	180.00	Wetted Per. (ft)	452.94	324.68
364.72				
Min Ch El (ft)	-35.00	Shear (lb/sq ft)	0.01	0.04
0.02				
Alpha	1.84	Stream Power (lb/ft s)	1110.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	22.67	43.30
17.75				
C & E Loss (ft)		Cum SA (acres)	1.83	1.54
1.24				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: False
 REACH: False RS: 1

INPUT

Description: Two bridge lengths downstream
 Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6	190	6	300	5	360	4	382	3
427	2	446	0	612	-10	873	0	908	2
990	3	1122	4						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	446	.02	873	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 446 873 0 0 0 .1 .3

CROSS SECTION OUTPUT Profile #Max WS

		Element	Left OB	Channel
E.G. Elev (ft)	18.64			
Right OB				
Vel Head (ft)	0.14	Wt. n-Val.	0.035	0.020
0.035				
W.S. Elev (ft)	18.50	Reach Len. (ft)		
Crit W.S. (ft)	2.35	Flow Area (sq ft)	6027.50	10034.50
3904.50				
E.G. Slope (ft/ft)	0.000032	Area (sq ft)	6027.50	10034.50
3904.50				
Q Total (cfs)	47917.54	Flow (cfs)	7998.98	34306.24
5612.33				
Top Width (ft)	1122.00	Top Width (ft)	446.00	427.00
249.00				
Vel Total (ft/s)	2.40	Avg. Vel. (ft/s)	1.33	3.42
1.44				
Max Chl Dpth (ft)	28.50	Hydr. Depth (ft)	13.51	23.50
15.68				
Conv. Total (cfs)	8536776.0	Conv. (cfs)	1425062.0	6111847.0
999866.9				
Length Wtd. (ft)		Wetted Per. (ft)	458.65	427.49
263.57				
Min Ch El (ft)	-10.00	Shear (lb/sq ft)	0.03	0.05
0.03				
Alpha	1.55	Stream Power (lb/ft s)	1122.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River:False

Reach	River Sta.	n1	n2	n3
False	6	.035	.02	.035
False	5	.035	.02	.035
False	4	.035	.02	.035
False	3.5	Bridge		
False	3	.035	.02	.035
False	2	.035	.02	.035
False	1	.035	.02	.035

SUMMARY OF REACH LENGTHS

River: False

Reach	River Sta.	Left	Channel	Right
False	6	188	185	182
False	5	121	120	118

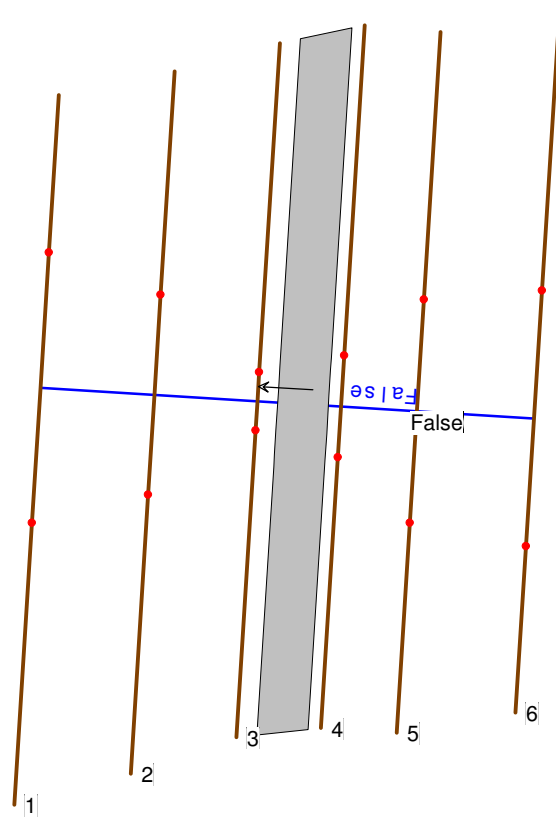
		1059159.rep		
False	4	138	132	128
False	3.5	Bridge		
False	3	163	163	163
False	2	180	180	180
False	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: False

Reach	River Sta.	Contr.	Expan.
False	6	.1	.3
False	5	.1	.3
False	4	.1	.3
False	3.5	Bridge	
False	3	.1	.3
False	2	.1	.3
False	1	.1	.3

Profile Output Table - Six XS Bridge

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Crit W.S.	Frctn
Loss	C & E Loss	Top Width	Q Left	Q Channel	Q Right	Vel Chnl
(ft)	(ft)	(ft)	(cfs)	(ft)	(ft)	(ft/s)
False	5	Max WS	18.61	18.48		
0.00		1108.00	3725.88	39919.09	4801.10	3.14
False	4	Max WS	18.78	18.02		4.57
0.00	0.05	1111.00	6086.62	35871.95	6343.85	8.04
False	3.5	BR U	21.00	20.04		5.60
0.20	0.42	1111.00	5104.17	34815.59	8382.67	9.01
False	3.5	BR D	20.38	15.21		10.05
0.03	1.13	104.06	3213.26	41894.78	3194.39	19.39
False	3	Max WS	19.23	17.81		
0.01		1097.00	8106.80	31806.39	8389.23	11.61
False	2	Max WS	18.67	18.51		
0.00		1110.00	4698.46	38455.98	4963.27	3.52



None of the XS's are Geo-Referenced [Geo-Ref user entered XS] [Geo-Ref interpolated XS] [Non Geo-Ref user entered XS] [Non Geo-Ref interpolated XS]

TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
Meadowbrook Parkway over False Channel

100-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation ¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation ² (ft)	Remaining Pile Embedment (ft)
North Abutment	0	0	3	3	-3	-45	42
Center Pier (Pier 2)	-25	0	2	2	-27	-65	38
South Abutment	0	0	3	3	-3	-45	42

500-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation ² (ft)	Remaining Pile Embedment (ft)
North Abutment	0	4.2	7	11	-11	-45	34
Center Pier (Pier 2)	-25	4.2	9	13	-38	-65	27
South Abutment	0	4.2	6	11	-11	-45	34

1. All elevations are with reference to NAVD 88 and are taken from the 2009 Fathometric Survey by Boswell Engineering.

2. Estimate of pile tip elevation was taken from the Ayers Study (2001).

SCOUR MODE COMPUTATIONS - FLOOD TIDE
Meadowbrook Parkway over False Channel

The following computations are made using Laursen's Equation (Equation 5.1 in HEC-18):

$$V_c = K_u \times Y_1^{1/6} \times D_{50}^{1/3}$$

100-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	3,671
APPROACH SECTION MAIN CHANNEL WIDTH (ft)	W ₁ =	161
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	22.8
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ^{1/3}	V _c =	3.54
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	1,489
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	0.40
MAIN CHANNEL SCOUR MODE		CLEAR WATER

500-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	4,475
APPROACH SECTION MAIN CHANNEL WIDTH (ft)	W ₁ =	161
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	27.8
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ^{1/3}	V _c =	3.66
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	33,259
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	7.43
MAIN CHANNEL SCOUR MODE		LIVE-BED

CONTRACTION SCOUR COMPUTATIONS
Meadowbrook Parkway over False Channel
CLEAR WATER CONTRACTION SCOUR COMPUTATIONS

The following computations are made using the HEC-18 equation for Live Bed Contraction Scour:
(Equations 5.4 and 5.5)

$$Y_s = Y_2 - Y_0$$

$$Y_2 = [K_u Q^2 / D_m^{2/3} W^{2-3/7}]$$

100-YEAR FLOOD

K ₁ =0.0077 (English Units)	K _u =	0.0077
DISCHARGE THROUGH BRIDGE OR ON THE SET BACK OVBANK (cfs)	Q=	1,489.0
DIAM. OF THE SMALLEST NONTRANSPORTABLE PARTICLE (1.25D ₅₀)	D _m =	0.0
BOTTOM WIDTH OF CONTRACTED SECTION LESS PIER WIDTHS (ft)	W=	161.0
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	Y ₂ =	3.28
AVERAGE WATER DEPTH AT BRIDGE (ft)	Y ₀ =	22.8
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	Y _s =	-19.5

CONTRACTION SCOUR COMPUTATIONS - FLOOD TIDE
Meadowbrook Parkway over False Channel
LIVE BED CONTRACTION SCOUR COMPUTATIONS

The following computations are made using the HEC-18 equations for Live Bed Contraction Scour:
(Equations 5.2 and 5.3)

$$Y_s = Y_2 - Y_0$$

$$Y_2 = [(Q_2/Q_1)^{6/7} \times (W_1/W_2)^{k_1}] \times Y_1$$

500-YEAR FLOOD

ENERGY SLOPE	$S_1 =$	0.000128
FALL VELOCITY (Use Figure 5.8 in HEC-18, <i>For English: multiply by 3.28</i>)	$w =$	0.656
AVERAGE UPSTREAM CHANNEL DEPTH (ft), $Y_1 = A_1/W_1$	$y_1 =$	27.80
SHEAR VELOCITY IN UPSTREAM SECTION, $V^* = gy_1 S_1^{1/2}$	$V_* =$	0.33849739
V^*/w	$V^*/w =$	0.52
k_1	$k_1 =$	0.64
DISCHARGE IN UPSTREAM CHANNEL (cfs)	$Q_1 =$	33,259.0
DISCHARGE IN CONTRACTED SECTION (cfs)	$Q_2 =$	33,410.0
WIDTH OF UPSTREAM CHANNEL SECTION (ft)	$W_1 =$	161.0
WIDTH OF MAIN CHANNEL CONTRACTED SECTION (ft)	$W_2 =$	161.0
MEDIAN GRAIN SIZE (ft)	$D_{50} =$	0.00667
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	$Y_2 =$	27.91
AVERAGE WATER DEPTH AT BRIDGE (ft)	$Y_0 =$	23.66
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	$Y_s =$	4.2

LOCAL ABUTMENT SCOUR COMPUTATIONS
Meadowbrook Parkway over False Channel

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD (South Abutment)

COEFFICIENT FOR ABUTMENT SHAPE	$K_1 =$	1.1
ANGLE OF ATTACK (radians)	$q(\text{rads}) =$	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	$K_2 =$	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	$L' =$	120
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	$A_e =$	1,069
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	$Q_e =$	75.0
$V_e = Q_e/A_e$, (ft/s)	$V_e =$	0.070
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	$L =$	428
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, $y_a = A_e/L$ (ft)	$y_a =$	2.5
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	$Fr =$	0.000436
SCOUR DEPTH, Y_s (ft)	$Y_s =$	2.8

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	$K_1 =$	1.1
ANGLE OF ATTACK (radians)	$q(\text{rads}) =$	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	$K_2 =$	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	$L' =$	120
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	$A_e =$	1,579
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	$Q_e =$	4,328
$V_e = Q_e/A_e$, (ft/s)	$V_e =$	2.741
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	$L =$	428
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, $y_a = A_e/L$ (ft)	$y_a =$	3.7
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	$Fr =$	0.011537
SCOUR DEPTH, Y_s (ft)	$Y_s =$	6.4

LOCAL ABUTMENT SCOUR COMPUTATIONS
Meadowbrook Parkway over False Channel

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD (Left)

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	120
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	953
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	57.9
V _e = Q _e /A _e , (ft/s)	V _e =	0.061
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	426
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	2.2
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000422
SCOUR DEPTH, Y _s (ft)	Y _s =	2.5

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	120
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	2,113
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	7,185
V _e = Q _e /A _e , (ft/s)	V _e =	3.400
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	522
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	4.0
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.013044
SCOUR DEPTH, Y _s (ft)	Y _s =	7.1

LOCAL PIER SCOUR COMPUTATIONS - FLOOD TIDE
Meadowbrook Parkway over False Channel

The following computations are made using the HEC-18 CSU Equation (Eqn. 6.1):

$$y_s = (2.0K_1K_2K_3K_4(a/y_1)^{0.65}Fr^{0.43} \times y_1$$

100-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE (SEE EQNS. 6.5 - 6.8)	K ₄ =	1.00
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	3.0
LENGTH OF PIER	L=	80.0
L/a (Maximum L/a value is 12)	L/a=	26.7
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	0.4
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	22.8
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	2.4

500-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE (SEE EQNS. 6.5 - 6.8)	K ₄ =	1.00
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	3.0
LENGTH OF PIER	L=	80.0
L/a (Maximum L/a value is 12)	L/a=	26.7
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	8.8
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	23.7
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	9.1

B.5 Southland Drive over Dosoris Pond

OBJECTID	183	LongMM	38	NavVertCle	0
Shape	Point	LongSS	886	NavHorizCl	0
StateCode	362	Latitude	40.893486	OpenPostCl	A
BIN	2261550	Longitude	-73.635794	ServiceOnB	1
Record	1	DetourLeng	199	ServiceUnd	5
Type	5	Toll	3	StructMate	5
LOS	0	MainRespon	4	TypeDesign	5
RteNo	0	Owner	4	ApprMater	0
HighwayDis	1	FunctClass	19	ApprDesign	0
CountyCode	59	YearBuilt	1929	NoSpansMai	3
PlaceCode	29113	LanesOn	2	NoSpansApp	0
FeaturesIn	DOSORIS	LanesUnder	0	RouteHoriz	55
POND		ADT	1051	MainSpanLe	94
CritFacili		YearADT	2006	StructLeng	359
Route	SOUTHLAND DRIVE	DesignLoad	9	SdeWlkLeft	0
Location	SOUTH OF	ApprWidth	91	SdeWlkRtWi	0
	MATINICOCK PT	Median	0	BrdgCb2Cb	55
MinVertCle	9999	Skew	0	BrdgOut2Ou	68
KiloPoint	0	StructFlar	0	MinVertOve	9999
BaseHwyNet	0	BridgeRail	0	RefFeature	N
LRSRoute	0	Transition	0	MinVertUn	0
SubrouteNo		ApprGuardR	0	RefFeat	N
LatDD	40	ApprGuar_1	1	MinLatUn	999
LatMM	53	Historical	5	MinLatUnLf	0
LatSS	36550	NavControl	0	Deck	9
LonDD	73				

SupStruct	9	BridgImprC	30	MinNavVert	
SubStruct	7	RoadImprCo	15	FedAgeninc	NN
ChannelPro	7	TotalCost	45	WashHead	
Culverts	N	YearEst 2008		NoName	566
MethOpRate	1	BordBridge	0	Status	0
OperRating	898	BPercenRes	0	NoName_1	0
MethOpRa_1	0	BordBIN	0		
InventRat	572	STRAHNET	0		
TructEval	7	ParallelSt	N		
DeckGeo	2	DirectTraf	2		
UnclearVer	N	TempStruct			
BridgePost	5	HighwaySys	0		
WaterwayAd	4	FedLandsHi	0		
ApprAlign	4	YearRecon	2004		
TypeWorkPr	34	DeckType	N		
WorkBy1		DeckWearTy	2		
LenImprov	359	TypeMembr	0		
InspDate	708	DeckProtec	N		
InspFreq	24	ADTTruck	5		
FractCrit	N	NatNetwk	0		
UndWaterIn	Y60	PierAbutPr			
SpecInspe	N	NBISBrdgeL	Y		
FractCritD	0	ScourCrit	0		
UndWaterDa	807	FutADT 1471			
SpecInspec		YearFutADT	2026		

2261550.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X      X
XXXXXXXX XXXX      X      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      X

```

PROJECT DATA

Project Title: 2261550
Project File : 2261550.prj
Run Date and Time: 1/22/2012 9:13:44 AM

Project in English units

PLAN DATA

Plan Title: Plan 04
Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\2261550 Southland Drive
over Dosoris Pond - Glen Cove\2261550.p04

Geometry Title: 2261550
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\2261550
Southland Drive over Dosoris Pond - Glen Cove\2261550.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of:	Cross Sections =	7	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

GEOMETRY DATA

2261550.rep

Geometry Title: 2261550
 Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\2261550 Southland
 Drive over Dosoris Pond - Glen Cove\2261550.g01

CROSS SECTION

RIVER: dosoris pond
 REACH: dosoris outlet RS: 6

INPUT

Description: Dosoris Pond Inlet
 Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	51	5	113	1	166	-10	197	-5
427	-5	447	-10	467	-5	600	-5	684	-10
1118	1	1223	2	1275	3	1334	7	1426	7

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	51	.02	1223	.02

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 51 1223 196 176 632 .1 .3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	18.26	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	18.26	Reach Len. (ft)	196.00	176.00
632.00				
Crit W.S. (ft)		Flow Area (sq ft)	625.26	26226.22
2637.78				
E.G. slope (ft/ft)	0.000000	Area (sq ft)	625.26	26226.22
2637.78				
Q Total (cfs)	5267.67	Flow (cfs)	68.16	4870.18
329.33				
Top width (ft)	1426.00	Top width (ft)	51.00	1172.00
203.00				
Vel Total (ft/s)	0.18	Avg. Vel. (ft/s)	0.11	0.19
0.12				
Max Chl Dpth (ft)	28.26	Hydr. Depth (ft)	12.26	22.38
12.99				
Conv. Total (cfs)	16705550.0	Conv. (cfs)	216144.7	
15444990.0 1044414.0				
Length wtd. (ft)	243.41	Wetted Per. (ft)	62.30	1175.18
214.41				
Min Ch El (ft)	-10.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.03	Stream Power (lb/ft s)	1426.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	44.66	182.51
97.59				
C & E Loss (ft)		Cum SA (acres)	3.82	6.51
6.44				

Warning: The cross-section end points had to be extended vertically for the computed
 Page 2

water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: dosoris pond
REACH: dosoris outlet RS: 5

INPUT

Description: One Bridge Length Upstream

Station Elevation Data		num= 15									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	19	38	17	76	14	161	12	210	8		
261	-1	280	-5	320	-10	339	-15	460	1		
469	2	508	4	544	5	695	6	760	7		

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	210	.02	508	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	210	508		196	96		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	18.26	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	18.26	Reach Len. (ft)	196.00	96.00
5.00				
Crit W.S. (ft)		Flow Area (sq ft)	971.36	6573.31
3185.96				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	971.36	6573.31
3185.96				
Q Total (cfs)	4924.36	Flow (cfs)	195.86	3562.73
1165.77				
Top width (ft)	745.90	Top width (ft)	195.90	298.00
252.00				
Vel Total (ft/s)	0.46	Avg. Vel. (ft/s)	0.20	0.54
0.37				
Max Chl Dpth (ft)	33.26	Hydr. Depth (ft)	4.96	22.06
12.64				
Conv. Total (cfs)	5270098.0	Conv. (cfs)	209612.2	3812863.0
1247622.0				
Length wtd. (ft)	65.23	Wetted Per. (ft)	196.24	301.32
263.28				
Min Ch El (ft)	-15.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.17	Stream Power (lb/ft s)	760.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	41.06	116.25
55.34				
C & E Loss (ft)		Cum SA (acres)	3.26	3.54
3.14				

Warning: The cross-section end points had to be extended vertically for the computed
Page 3

water surface.

CROSS SECTION

RIVER: dosoris pond
 REACH: dosoris outlet RS: 4

INPUT

Description: Upstream Bridge XS

Station Elevation Data		num= 18									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23	93	21	170	16	216	12	233	9		
256	-4.5	276	-8.5	286	-9.5	291	-9	314	-8.5		
321	-7	326	-6	331	-7	356	-5	438	4		
500	5	523	6	724	7						

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	256	.02	356	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	256	356		168	115		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

	E.G. Elev (ft)		Left OB	Channel
Right OB	18.26	Element		
Vel Head (ft)	0.01	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	18.26	Reach Len. (ft)	1.00	1.00
1.00				
Crit W.S. (ft)	-3.14	Flow Area (sq ft)	734.94	2562.33
5047.15				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	734.94	2562.33
5047.15				
Q Total (cfs)	4829.34	Flow (cfs)	218.87	2022.79
2587.68				
Top Width (ft)	588.74	Top Width (ft)	120.74	100.00
368.00				
Vel Total (ft/s)	0.58	Avg. Vel. (ft/s)	0.30	0.79
0.51				
Max Chl Dpth (ft)	27.76	Hydr. Depth (ft)	6.09	25.62
13.72				
Conv. Total (cfs)	3926419.0	Conv. (cfs)	177949.0	1644596.0
2103874.0				
Length Wtd. (ft)	1.00	Wetted Per. (ft)	124.92	100.91
379.78				
Min Ch El (ft)	-9.50	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.21	Stream Power (lb/ft s)	724.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	37.23	106.18
54.87				
C & E Loss (ft)	0.00	Cum SA (acres)	2.55	3.10
3.11				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)

is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

BRIDGE

RIVER: dosoris pond

REACH: dosoris outlet RS: 3.9

INPUT

Description: Southland Drive

Distance from Upstream XS = 1

Deck/Roadway Width = 22.5

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 17														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
216	12		12		255	9.5	-4.5			256	12.57		2	
264.3	12.57		5.2		272.5	12.57		6		280.8	12.57		5.2	
289	12.57		2		297.5	12.57		5.2		305.5	12.57		6	
313.8	12.57		5.2		322	12.57		2		330.3	12.57		5.2	
338.5	12.57		6		346.8	12.57		5.2		356	12.57		2	
357	9.5		-5		438			4						

Upstream Bridge Cross Section Data

Station Elevation Data num= 18											
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23	93	21	170	16	216	12	233	9		
256	-4.5	276	-8.5	286	-9.5	291	-9	314	-8.5		
321	-7	326	-6	331	-7	356	-5	438	4		
500	5	523	6	724	7						

Manning's n Values

num= 3			
Sta	n Val	Sta	n Val
0	.02	256	.02
		356	.02

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	256	356		.1	.3

Downstream Deck/Roadway Coordinates

num= 17														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
216	12		12		255	9.5	-4.5			256	12.57		2	
264.3	12.57		5.2		272.5	12.57		6		280.8	12.57		5.2	
289	12.57		2		297.5	12.57		5.2		305.5	12.57		6	
313.8	12.57		5.2		322	12.57		2		330.3	12.57		5.2	
338.5	12.57		6		346.8	12.57		5.2		356	12.57		2	
357	9.5		-5		438			4						

Downstream Bridge Cross Section Data

Station Elevation Data num= 18											
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23	93	21	170	16	216	12	233	9		
256	-4.5	276	-7.5	286	-8	291	-8	314	-8		
321	-6.5	326	-6	331	-6.5	356	-2	438	4		
500	5	523	6	724	7						

Manning's n Values

num= 3			
Sta	n Val	Sta	n Val
0	.02	256	.02
		356	.02

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	256	356		.1	.3

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Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Piers = 2

Pier Data
 Pier Station Upstream= 289 Downstream= 289
 Upstream num= 2
 width Elev width Elev
 5 -15 5 12.57
 Downstream num= 2
 width Elev width Elev
 5 -15 5 12.57

Pier Data
 Pier Station Upstream= 322 Downstream= 322
 Upstream num= 2
 width Elev width Elev
 5 -15 5 12.57
 Downstream num= 2
 width Elev width Elev
 5 -15 5 12.57

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
 Energy
 Selected Low Flow Methods = Highest Energy Answer

High Flow Method
 Energy Only

Additional Bridge Parameters
 Add Friction component to Momentum
 Do not add weight component to Momentum
 Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end
 Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #Max WS

E.G. US. (ft)	18.26	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	18.26	E.G. Elev (ft)	18.27
18.27			
Q Total (cfs)	4829.34	W.S. Elev (ft)	18.26
18.26			
Q Bridge (cfs)	512.50	Crit W.S. (ft)	-2.83
-1.85			
Q Weir (cfs)		Max Chl Dpth (ft)	27.76
26.26			
Weir Sta Lft (ft)		Vel Total (ft/s)	0.73
0.74			
Weir Sta Rgt (ft)		Flow Area (sq ft)	6652.60
6562.16			
Weir Submerg		Froude # chl	0.03

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0.03			
Weir Max Depth (ft)		Specif Force (cu ft)	51947.57
49733.97			
Min El Weir Flow (ft)	4.01	Hydr Depth (ft)	11.30
11.14			
Min El Prs (ft)	6.00	W.P. Total (ft)	847.89
841.42			
Delta EG (ft)	0.00	Conv. Total (cfs)	2175841.0
2143941.0			
Delta WS (ft)	0.00	Top width (ft)	588.84
588.83			
BR Open Area (sq ft)	1006.76	Frctn Loss (ft)	0.00
0.00			
BR Open Vel (ft/s)	0.51	C & E Loss (ft)	0.00
0.00			
Coef of Q		Shear Total (lb/sq ft)	0.00
0.00			
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00
0.00			

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: dosoris pond
REACH: dosoris outlet RS: 3.5

INPUT

Description: Downstream Bridge XS

Station Elevation Data				num=	18				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23	93	21	170	16	216	12	233	9
256	-4.5	276	-7.5	286	-8	291	-8	314	-8
321	-6.5	326	-6	331	-6.5	356	-2	438	4
500	5	523	6	724	7				

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	256	.02	356	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	256	356		168 115	89	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	18.27	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	18.26	Reach Len. (ft)	168.00	115.00
89.00				
Crit W.S. (ft)		Flow Area (sq ft)	735.91	2467.39
4927.12				
E.G. slope (ft/ft)	0.000002	Area (sq ft)	735.91	2467.39
4927.12				
Q Total (cfs)	4829.34	Flow (cfs)	229.81	1992.15
2607.37				

Top width (ft)	588.86	2261550.rep Top width (ft)	120.86	100.00
368.00 Vel Total (ft/s)	0.59	Avg. Vel. (ft/s)	0.31	0.81
0.53 Max Chl Dpth (ft)	26.26	Hydr. Depth (ft)	6.09	24.67
13.39 Conv. Total (cfs)	3745287.0	Conv. (cfs)	178224.5	1544971.0
2022091.0 Length wtd. (ft)	110.92	Wetted Per. (ft)	125.04	100.85
379.52 Min Ch El (ft)	-8.00	Shear (lb/sq ft)	0.00	0.00
0.00 Alpha	1.20	Stream Power (lb/ft s)	724.00	0.00
0.00 Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	35.59	101.05
42.61 C & E Loss (ft)		Cum SA (acres)	2.23	2.83
2.14				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: dosoris pond
 REACH: dosoris outlet RS: 3

INPUT

Description: One Bridge Length Downstream

Station Elevation Data				num=	19				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	21	30	17	56	15	66	14	77	13
88	12	94	11	106	-4	135	-6	172	-7.5
237	-5	272	0	300	3	312	6	323	8
360	10	478	11	547	10	587	9		

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
0	.02	106	.02
		323	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
106	323	287	229	117	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	28.49	Element	Left OB	Channel
Right OB				
Vel Head (ft)	3.19	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	25.31	Reach Len. (ft)	287.00	229.00
117.00				

		2261550.rep		
Crit w.s. (ft)		Flow Area (sq ft)	1154.55	6207.14
4004.58				
E.G. slope (ft/ft)	0.000542	Area (sq ft)	1154.55	6207.14
4004.58				
Q Total (cfs)	149920.30	Flow (cfs)	9129.40	100024.80
40766.10				
Top width (ft)	587.00	Top width (ft)	106.00	217.00
264.00				
Vel Total (ft/s)	13.19	Avg. Vel. (ft/s)	7.91	16.11
10.18				
Max Chl Dpth (ft)	32.81	Hydr. Depth (ft)	10.89	28.60
15.17				
Conv. Total (cfs)	6440965.0	Conv. (cfs)	392222.5	4297326.0
1751417.0				
Length wtd. (ft)	201.24	Wetted Per. (ft)	118.08	218.21
280.39				
Min Ch El (ft)	-7.50	Shear (lb/sq ft)	0.33	0.96
0.48				
Alpha	1.18	Stream Power (lb/ft s)	587.00	0.00
0.00				
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	31.95	89.60
33.48				
C & E Loss (ft)		Cum SA (acres)	1.79	2.41
1.49				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: dosoris pond
REACH: dosoris outlet RS: 2

INPUT

Description: Two Bridge Lengths Downstream

Station Elevation Data		num=		21					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	16	27	14	51	13	78	11	101	-2
120	-10	148	-2	198	-2	220	-10	237	1
252	2	259	3	264	4	267	5	273	6
280	7	286	8	302	10	314	11	419	12
478	11								

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	78	.02	286	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
78	286	408	273	168	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

2261550.rep

Element	Left OB	Channel
E.G. Elev (ft)	50.98	
Right OB		
Vel Head (ft)	0.39	
0.020		
W.S. Elev (ft)	50.59	
168.00		
Crit w.s. (ft)		
7557.23		
E.G. Slope (ft/ft)	0.000031	
7557.23		
Q Total (cfs)	102933.40	
32053.86		
Top width (ft)	478.00	
192.00		
Vel Total (ft/s)	4.84	
4.24		
Max Chl Dpth (ft)	60.59	
39.36		
Conv. Total (cfs)	18402420.0	
10802110.0 5730586.0		
Length Wtd. (ft)	254.60	
231.77		
Min Ch El (ft)	-10.00	
0.06		
Alpha	1.08	
0.00		
Frctn Loss (ft)	0.01	
17.96		
C & E Loss (ft)		
0.88		

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: dosoris pond
REACH: dosoris outlet RS: 1

INPUT

Description: Outlet to LI Sound
Station Elevation Data num=

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	15	35	13	118	12	130	11	175	9
211	7	223	5	238	4	250	3	272	-2
315	-10	327	-2	351	1	351	2	356	3
381	6	392	7	416	10	437	11	470	12
531	13	644	12						

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	175	.02	381	.02

2261550.rep
 Bank Sta: Left 175 Right 381 Lengths: Left 0 Channel 0 Right 0 Coeff Contr. .1 Expan. .3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	18.28	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	18.27	Reach Len. (ft)		
Crit w.s. (ft)	0.12	Flow Area (sq ft)	1081.75	3500.12
1754.51				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	1081.75	3500.12
1754.51				
Q Total (cfs)	4393.20	Flow (cfs)	487.03	3077.97
828.20				
Top Width (ft)	644.00	Top width (ft)	175.00	206.00
263.00				
Vel Total (ft/s)	0.69	Avg. Vel. (ft/s)	0.45	0.88
0.47				
Max Chl Dpth (ft)	28.27	Hydr. Depth (ft)	6.18	16.99
6.67				
Conv. Total (cfs)	2410489.0	Conv. (cfs)	267228.3	1688836.0
454424.2				
Length wtd. (ft)		Wetted Per. (ft)	178.42	211.48
269.55				
Min Ch El (ft)	-10.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.26	Stream Power (lb/ft s)	644.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River: dosoris pond

Reach	River Sta.	n1	n2	n3
dosoris outlet	6	.02	.02	.02
dosoris outlet	5	.02	.02	.02
dosoris outlet	4	.02	.02	.02
dosoris outlet	3.9	Bridge		
dosoris outlet	3.5	.02	.02	.02
dosoris outlet	3	.02	.02	.02
dosoris outlet	2	.02	.02	.02
dosoris outlet	1	.02	.02	.02

SUMMARY OF REACH LENGTHS

River: dosoris pond

Reach	River Sta.	2261550.rep Left	Channel	Right
dosoris outlet	6	196	176	632
dosoris outlet	5	196	96	5
dosoris outlet	4	168	115	89
dosoris outlet	3.9	Bridge		
dosoris outlet	3.5		115	89
dosoris outlet	3	287	229	117
dosoris outlet	2	408	273	168
dosoris outlet	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: dosoris pond

Reach	River Sta.	Contr.	Expan.
dosoris outlet	6	.1	.3
dosoris outlet	5	.1	.3
dosoris outlet	4	.1	.3
dosoris outlet	3.9	Bridge	
dosoris outlet	3.5		.3
dosoris outlet	3	.1	.3
dosoris outlet	2	.1	.3
dosoris outlet	1	.1	.3

Profile Output Table - Six XS Bridge

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Crit W.S.
Frctn Loss	C & E Loss	Top width	Q Left	Q Channel	Q Right
(ft)	(ft)	(ft)	(cfs)	(ft)	(ft)
				(cfs)	(ft/s)
dosoris outlet	5	Max WS	18.26	18.26	
0.00		745.90	195.86	3562.73	1165.77
dosoris outlet	4	Max WS	18.26	18.26	0.54
0.00	0.00	588.74	218.87	2022.79	2587.68
dosoris outlet	3.9	BR U	Max WS	18.27	18.26
0.00	0.00	588.84	235.60	807.12	3786.62
dosoris outlet	3.9	BR D	Max WS	18.27	18.26
0.00	0.00	588.83	239.07	752.84	3837.42
dosoris outlet	3.5	Max WS	18.27	18.26	-1.85
0.03		588.86	229.81	1992.15	2607.37
dosoris outlet	3	Max WS	28.49	25.31	0.81
0.02		587.00	9129.40	100024.80	40766.10
					16.11

2261550.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X      X
XXXXXXXX XXXX      X      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      X

```

PROJECT DATA

Project Title: 2261550
Project File : 2261550.prj
Run Date and Time: 1/22/2012 9:41:44 AM

Project in English units

PLAN DATA

Plan Title: Plan 04
Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\2261550 Southland Drive
over Dosoris Pond - Glen Cove\2261550.p04

Geometry Title: 2261550
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\2261550
Southland Drive over Dosoris Pond - Glen Cove\2261550.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of:	Cross Sections =	7	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

GEOMETRY DATA

2261550.rep

Geometry Title: 2261550
 Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\2261550 Southland
 Drive over Dosoris Pond - Glen Cove\2261550.g01

CROSS SECTION

RIVER: dosoris pond
 REACH: dosoris outlet RS: 6

INPUT

Description: Dosoris Pond Inlet
 Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	51	5	113	1	166	-10	197	-5
427	-5	447	-10	467	-5	600	-5	684	-10
1118	1	1223	2	1275	3	1334	7	1426	7

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	51	.02	1223	.02

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 51 1223 196 176 632 .1 .3

CROSS SECTION OUTPUT Profile #07SEP2011 1000

E.G. Elev (ft)	24.71	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	24.71	Reach Len. (ft)	196.00	176.00
632.00				
Crit W.S. (ft)		Flow Area (sq ft)	954.21	33785.62
3947.13				
E.G. slope (ft/ft)	0.000001	Area (sq ft)	954.21	33785.62
3947.13				
Q Total (cfs)	20638.82	Flow (cfs)	325.38	18720.39
1593.05				
Top width (ft)	1426.00	Top width (ft)	51.00	1172.00
203.00				
Vel Total (ft/s)	0.53	Avg. Vel. (ft/s)	0.34	0.55
0.40				
Max Chl Dpth (ft)	34.71	Hydr. Depth (ft)	18.71	28.83
19.44				
Conv. Total (cfs)	25970770.0	Conv. (cfs)	409442.9	
23556720.0 2004608.0				
Length wtd. (ft)	255.23	Wetted Per. (ft)	68.75	1175.18
220.86				
Min Ch El (ft)	-10.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.03	Stream Power (lb/ft s)	1426.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	48.86	179.72
114.50				
C & E Loss (ft)		Cum SA (acres)	4.80	6.51
6.44				

Warning: The cross-section end points had to be extended vertically for the computed
 Page 2

water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: dosoris pond
REACH: dosoris outlet RS: 5

INPUT

Description: One Bridge Length Upstream

Station Elevation Data		num= 15									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	19	38	17	76	14	161	12	210	8		
261	-1	280	-5	320	-10	339	-15	460	1		
469	2	508	4	544	5	695	6	760	7		

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	210	.02	508	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	210	508		196	96		.1	.3

CROSS SECTION OUTPUT Profile #07SEP2011 1000

E.G. Elev (ft)	24.72	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	24.69	Reach Len. (ft)	196.00	96.00
5.00				
Crit W.S. (ft)		Flow Area (sq ft)	2316.71	8489.84
4806.65				
E.G. Slope (ft/ft)	0.000005	Area (sq ft)	2316.71	8489.84
4806.65				
Q Total (cfs)	20271.12	Flow (cfs)	1861.62	12990.24
5419.26				
Top Width (ft)	760.00	Top width (ft)	210.00	298.00
252.00				
Vel Total (ft/s)	1.30	Avg. Vel. (ft/s)	0.80	1.53
1.13				
Max Chl Dpth (ft)	39.69	Hydr. Depth (ft)	11.03	28.49
19.07				
Conv. Total (cfs)	9113898.0	Conv. (cfs)	836985.9	5840412.0
2436500.0				
Length wtd. (ft)	66.51	Wetted Per. (ft)	216.05	301.32
269.71				
Min Ch El (ft)	-15.00	Shear (lb/sq ft)	0.00	0.01
0.01				
Alpha	1.13	Stream Power (lb/ft s)	760.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	41.50	94.31
51.00				
C & E Loss (ft)		Cum SA (acres)	4.21	3.54
3.14				

Warning: The cross-section end points had to be extended vertically for the computed
Page 3

water surface.

CROSS SECTION

RIVER: dosoris pond
 REACH: dosoris outlet RS: 4

INPUT

Description: Upstream Bridge XS

Station Elevation Data		num= 18		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23	93	21	170	16	216	12	233	9		
256	-4.5	276	-8.5	286	-9.5	291	-9	314	-8.5		
321	-7	326	-6	331	-7	356	-5	438	4		
500	5	523	6	724	7						

Manning's n Values		num= 3		Sta		n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	256	.02	356	.02		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	256	356		168	115		.1	.3

CROSS SECTION OUTPUT Profile #07SEP2011 1000

E.G. Elev (ft)	24.72	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	24.67	Reach Len. (ft)	1.00	1.00
1.00				
Crit W.S. (ft)	3.03	Flow Area (sq ft)	1971.55	3204.05
7408.68				
E.G. Slope (ft/ft)	0.000009	Area (sq ft)	1971.55	3204.05
7408.68				
Q Total (cfs)	20165.07	Flow (cfs)	1645.44	6981.76
11537.86				
Top Width (ft)	724.00	Top Width (ft)	256.00	100.00
368.00				
Vel Total (ft/s)	1.60	Avg. Vel. (ft/s)	0.83	2.18
1.56				
Max Chl Dpth (ft)	34.17	Hydr. Depth (ft)	7.70	32.04
20.13				
Conv. Total (cfs)	6893939.0	Conv. (cfs)	562536.7	2386893.0
3944510.0				
Length Wtd. (ft)	1.00	Wetted Per. (ft)	261.96	100.91
386.20				
Min Ch El (ft)	-9.50	Shear (lb/sq ft)	0.00	0.02
0.01				
Alpha	1.20	Stream Power (lb/ft s)	724.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	31.85	81.43
50.29				
C & E Loss (ft)		Cum SA (acres)	3.16	3.10
3.11				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)

is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

BRIDGE

RIVER: dosoris pond

REACH: dosoris outlet RS: 3.9

INPUT

Description: Southland Drive

Distance from Upstream XS = 1

Deck/Roadway Width = 22.5

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 17														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
216	12		12		255	9.5	-4.5			256	12.57		2	
264.3	12.57		5.2		272.5	12.57		6		280.8	12.57		5.2	
289	12.57		2		297.5	12.57		5.2		305.5	12.57		6	
313.8	12.57		5.2		322	12.57		2		330.3	12.57		5.2	
338.5	12.57		6		346.8	12.57		5.2		356	12.57		2	
357	9.5		-5		438			4						

Upstream Bridge Cross Section Data

Station Elevation Data num= 18											
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23	93	21	170	16	216	12	233	9		
256	-4.5	276	-8.5	286	-9.5	291	-9	314	-8.5		
321	-7	326	-6	331	-7	356	-5	438	4		
500	5	523	6	724	7						

Manning's n Values

num= 3			
Sta	n Val	Sta	n Val
0	.02	256	.02
		356	.02

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	256	356		.1	.3

Downstream Deck/Roadway Coordinates

num= 17														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
216	12		12		255	9.5	-4.5			256	12.57		2	
264.3	12.57		5.2		272.5	12.57		6		280.8	12.57		5.2	
289	12.57		2		297.5	12.57		5.2		305.5	12.57		6	
313.8	12.57		5.2		322	12.57		2		330.3	12.57		5.2	
338.5	12.57		6		346.8	12.57		5.2		356	12.57		2	
357	9.5		-5		438			4						

Downstream Bridge Cross Section Data

Station Elevation Data num= 18											
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23	93	21	170	16	216	12	233	9		
256	-4.5	276	-7.5	286	-8	291	-8	314	-8		
321	-6.5	326	-6	331	-6.5	356	-2	438	4		
500	5	523	6	724	7						

Manning's n Values

num= 3			
Sta	n Val	Sta	n Val
0	.02	256	.02
		356	.02

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	256	356		.1	.3

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Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Piers = 2

Pier Data
Pier Station Upstream= 289 Downstream= 289
Upstream num= 2
width Elev width Elev
5 -15 5 12.57
Downstream num= 2
width Elev width Elev
5 -15 5 12.57

Pier Data
Pier Station Upstream= 322 Downstream= 322
Upstream num= 2
width Elev width Elev
5 -15 5 12.57
Downstream num= 2
width Elev width Elev
5 -15 5 12.57

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add weight component to Momentum

Class B flow critical depth computations use critical depth
inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #07SEP2011 1000

E.G. US. (ft)	24.72	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	24.67	E.G. Elev (ft)	24.82
24.82		W.S. Elev (ft)	24.76
Q Total (cfs)	20165.07	Crit w.s. (ft)	3.66
24.75		Max Chl Dpth (ft)	34.26
Q Bridge (cfs)	1002.94	Vel Total (ft/s)	1.84
8.44		Flow Area (sq ft)	10948.74
Q Weir (cfs)		Froude # chl	0.06
32.75			
Weir Sta Lft (ft)			
1.86			
Weir Sta Rgt (ft)			
10857.26			
Weir Submerg			

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0.06	Weir Max Depth (ft)		Specif Force (cu ft)	109621.30
106815.60	Min El Weir Flow (ft)	4.01	Hydr Depth (ft)	15.12
15.00	Min El Prs (ft)	6.00	W.P. Total (ft)	991.41
984.94	Delta EG (ft)	0.01	Conv. Total (cfs)	4562708.0
4522308.0	Delta WS (ft)	0.01	Top Width (ft)	724.00
724.00	BR Open Area (sq ft)	1006.76	Frctn Loss (ft)	
	BR Open Vel (ft/s)	1.00	C & E Loss (ft)	
	Coef of Q		Shear Total (lb/sq ft)	0.01
0.01	Br Sel Method	Energy only	Power Total (lb/ft s)	0.00
0.00				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: dosoris pond
REACH: dosoris outlet RS: 3.5

INPUT

Description: Downstream Bridge XS

Station Elevation Data				num=	18						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23	93	21	170	16	216	12	233	9		
256	-4.5	276	-7.5	286	-8	291	-8	314	-8		
321	-6.5	326	-6	331	-6.5	356	-2	438	4		
500	5	523	6	724	7						

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	256	.02	356	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
256	356	168	115	89	.1	.3

CROSS SECTION OUTPUT Profile #07SEP2011 1000

E.G. Elev (ft)	24.81	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	24.76	Reach Len. (ft)	168.00	115.00
89.00				
Crit w.s. (ft)		Flow Area (sq ft)	1994.92	3117.44
7319.28				

E.G. Slope (ft/ft)	0.000009	2261550.rep Area (sq ft)	1994.92	3117.44
7319.28 Q Total (cfs)	20165.07	Flow (cfs)	1720.72	6844.05
11600.31 Top width (ft)	724.00	Top width (ft)	256.00	100.00
368.00 Vel Total (ft/s)	1.62	Avg. Vel. (ft/s)	0.86	2.20
1.58 Max Chl Dpth (ft)	32.76	Hydr. Depth (ft)	7.79	31.17
19.89 Conv. Total (cfs)	6721602.0	Conv. (cfs)	573564.6	2281320.0
3866718.0 Length Wtd. (ft)	107.85	Wetted Per. (ft)	262.05	100.85
386.02 Min Ch El (ft)	-8.00	Shear (lb/sq ft)	0.00	0.02
0.01 Alpha	1.20	Stream Power (lb/ft s)	724.00	0.00
0.00 Frctn Loss (ft)	0.00	Cum volume (acre-ft)	26.90	74.59
31.72 C & E Loss (ft)		Cum SA (acres)	2.49	2.83
2.14				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: dosoris pond
REACH: dosoris outlet RS: 3

INPUT

Description: One Bridge Length Downstream

Station Elevation Data				num=	19				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	21	30	17	56	15	66	14	77	13
88	12	94	11	106	-4	135	-6	172	-7.5
237	-5	272	0	300	3	312	6	323	8
360	10	478	11	547	10	587	9		

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	106	.02	323	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
106	323	287	229	117	.1	.3

CROSS SECTION OUTPUT Profile #07SEP2011 1000

E.G. Elev (ft)	24.81	Element	Left OB	Channel
Right OB Vel Head (ft)	0.06	Wt. n-Val.	0.020	0.020
0.020 W.S. Elev (ft)	24.75	Reach Len. (ft)	287.00	229.00
117.00 Crit w.s. (ft)		Flow Area (sq ft)	1095.58	6086.42
3857.70 E.G. slope (ft/ft)	0.000011	Area (sq ft)	1095.58	6086.42
3857.70				

Q Total (cfs)	20051.97	2261550.rep Flow (cfs)	1172.23	13522.04
5357.70 Top width (ft)	587.00	Top width (ft)	106.00	217.00
264.00 Vel Total (ft/s)	1.82	Avg. Vel. (ft/s)	1.07	2.22
1.39 Max Chl Dpth (ft)	32.25	Hydr. Depth (ft)	10.34	28.05
14.61 Conv. Total (cfs)	6167314.0	Conv. (cfs)	360537.3	4158927.0
1647850.0 Length wtd. (ft)	205.36	wetted Per. (ft)	117.53	218.21
279.83 Min Ch El (ft)	-7.50	Shear (lb/sq ft)	0.01	0.02
0.01 Alpha	1.19	Stream Power (lb/ft s)	587.00	0.00
0.00 Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	20.94	62.44
20.31 C & E Loss (ft)		Cum SA (acres)	1.79	2.41
1.49				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: dosoris pond
REACH: dosoris outlet RS: 2

INPUT

Description: Two Bridge Lengths Downstream

Station Elevation Data		num= 21									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	16	27	14	51	13	78	11	101	-2		
120	-10	148	-2	198	-2	220	-10	237	1		
252	2	259	3	264	4	267	5	273	6		
280	7	286	8	302	10	314	11	419	12		
478	11										

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	78	.02	286	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
78	286	408	273	168	.1	.3

CROSS SECTION OUTPUT Profile #07SEP2011 1000

E.G. Elev (ft)	24.80	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.09	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	24.72	Reach Len. (ft)	408.00	273.00
168.00				
Crit w.s. (ft)		Flow Area (sq ft)	874.82	5433.34
2589.39				
E.G. slope (ft/ft)	0.000017	Area (sq ft)	874.82	5433.34
2589.39				
Q Total (cfs)	19887.33	Flow (cfs)	1262.76	14289.60
		Page 9		

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4334.97				
Top width (ft)	478.00	Top width (ft)	78.00	208.00
192.00				
Vel Total (ft/s)	2.24	Avg. Vel. (ft/s)	1.44	2.63
1.67				
Max Chl Dpth (ft)	34.72	Hydr. Depth (ft)	11.22	26.12
13.49				
Conv. Total (cfs)	4772962.0	Conv. (cfs)	303061.9	3429507.0
1040393.0				
Length Wtd. (ft)	262.98	Wetted Per. (ft)	86.88	219.42
205.89				
Min Ch El (ft)	-10.00	Shear (lb/sq ft)	0.01	0.03
0.01				
Alpha	1.14	Stream Power (lb/ft s)	478.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	14.45	32.16
11.65				
C & E Loss (ft)		Cum SA (acres)	1.18	1.30
0.88				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: dosoris pond
 REACH: dosoris outlet RS: 1

INPUT

Description: Outlet to LI Sound

Station Elevation Data		num= 22									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	15	35	13	118	12	130	11	175	9		
211	7	223	5	238	4	250	3	272	-2		
315	-10	327	-2	351	1	351	2	356	3		
381	6	392	7	416	10	437	11	470	12		
531	13	644	12								

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	175	.02	381	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
175	381	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #07SEP2011 1000

E.G. Elev (ft)	24.78	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	24.72	Reach Len. (ft)		
Crit w.s. (ft)	7.47	Flow Area (sq ft)	2210.50	4828.82
3450.86				
E.G. slope (ft/ft)	0.000015	Area (sq ft)	2210.50	4828.82
3450.86				
Q Total (cfs)	19658.96	Flow (cfs)	3292.61	11070.93
5295.42				

Top width (ft)	644.00	2261550.rep	Top width (ft)	175.00	206.00
Vel Total (ft/s)	1.87	Avg. Vel. (ft/s)		1.49	2.29
Max Chl Dpth (ft)	34.72	Hydr. Depth (ft)		12.63	23.44
Conv. Total (cfs)	5127363.0	Conv. (cfs)		858762.6	2887472.0
Length wtd. (ft)		Wetted Per. (ft)		184.87	211.48
Min Ch El (ft)	-10.00	Shear (lb/sq ft)		0.01	0.02
Alpha	1.13	Stream Power (lb/ft s)		644.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River: dosoris pond

Reach	River Sta.	n1	n2	n3
dosoris outlet	6	.02	.02	.02
dosoris outlet	5	.02	.02	.02
dosoris outlet	4	.02	.02	.02
dosoris outlet	3.9	Bridge		
dosoris outlet	3.5	.02	.02	.02
dosoris outlet	3	.02	.02	.02
dosoris outlet	2	.02	.02	.02
dosoris outlet	1	.02	.02	.02

SUMMARY OF REACH LENGTHS

River: dosoris pond

Reach	River Sta.	Left	Channel	Right
dosoris outlet	6	196	176	632
dosoris outlet	5	196	96	5
dosoris outlet	4	168	115	89
dosoris outlet	3.9	Bridge		
dosoris outlet	3.5	168	115	89
dosoris outlet	3	287	229	117
dosoris outlet	2	408	273	168
dosoris outlet	1	0	0	0

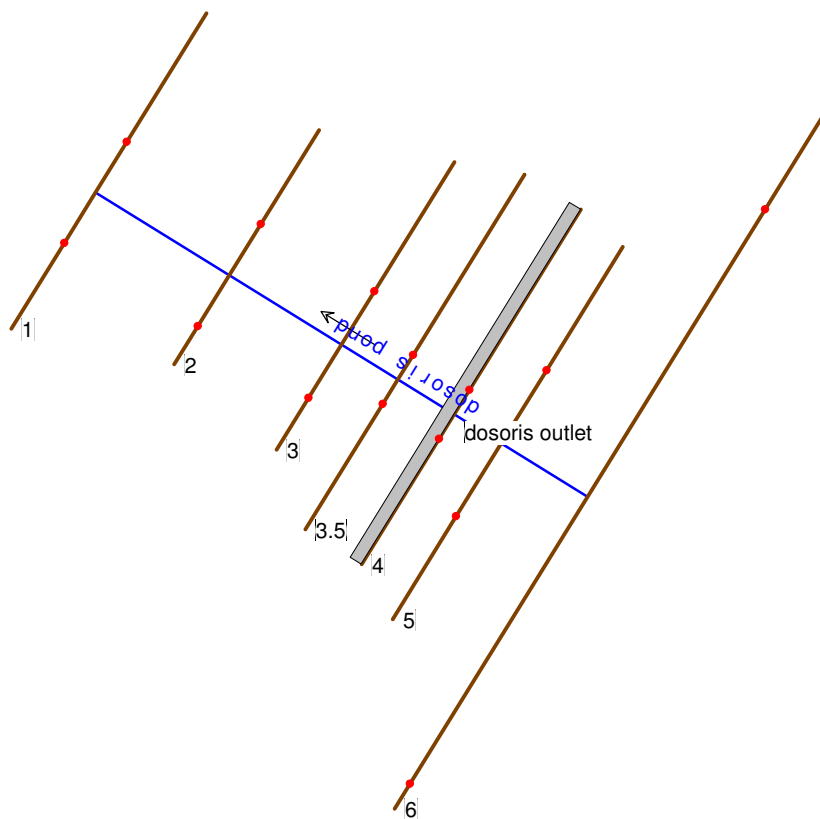
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: dosoris pond

Reach	River Sta.	2261550.rep Contr.	Expan.
dosoris outlet	6	.1	.3
dosoris outlet	5	.1	.3
dosoris outlet	4	.1	.3
dosoris outlet	3.9	Bridge	
dosoris outlet	3.5	.1	.3
dosoris outlet	3	.1	.3
dosoris outlet	2	.1	.3
dosoris outlet	1	.1	.3

Profile Output Table - Six XS Bridge

Reach Frctn	Loss	C & E	River Sta Loss	Top	Profile Width	Q Left	E.G. Elev Q Channel (ft) (cfs)	W.S. Elev Q Right (ft) (cfs)	Crit W.S. Vel Chnl (ft/s)
(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(cfs)	(ft/s)
dosoris outlet	5			07SEP2011	1000		24.72	24.69	
0.00				760.00	1861.62	12990.24	5419.26	1.53	
dosoris outlet	4			07SEP2011	1000		24.72	24.67	3.03
				724.00	1645.44	6981.76	11537.86	2.18	
dosoris outlet	3.9	BR U		07SEP2011	1000		24.82	24.76	3.66
				724.00	2128.48	2786.54	15250.05	1.21	
dosoris outlet	3.9	BR D		07SEP2011	1000		24.82	24.75	8.44
				724.00	2146.58	2651.72	15366.78	1.19	
dosoris outlet	3.5			07SEP2011	1000		24.81	24.76	
0.00				724.00	1720.72	6844.05	11600.31	2.20	
dosoris outlet	3			07SEP2011	1000		24.81	24.75	
0.00				587.00	1172.23	13522.04	5357.70	2.22	



None of the XS's are Geo-Referenced [Geo-Ref user entered XS] [Geo-Ref interpolated XS] [Non Geo-Ref user entered XS] [Non Geo-Ref interpolated XS]

TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
Southland Drive over Dosoris Pond

100-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation ¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Bottom of Pile Cap Elevation ² (ft)	Depth of Pile Exposure (ft)
West Abutment	-4.5	0	5	5	-9	-15	No Exposed
Piers	-10	0	13	13	-23	-15	-8
East Abutment	-5	0	13	13	-18	-15	-3

500-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Bottom of Pile Cap Elevation ² (ft)	Depth of Pile Exposure (ft)
West Abutment	-4.5	0	7	7	-12	-15	Not Exposed
Piers	-10	0	15	15	-25	-15	-10
East Abutment	-5	0	20	20	-25	-15	-10

1. All elevations are with reference to NAVD 88.

2. Estimate of Pile Cap Bottom based on design drawings. Timber piles are of unknown size and depth.

SCOUR MODE COMPUTATIONS - FLOOD TIDE
Southland Drive over Dosoris Pond

The following computations are made using Laursen's Equation (Equation 5.1 in HEC-18):

$$V_c = K_u \times Y_1^{1/6} \times D_{50}^{1/3}$$

100-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	2,562
APPROACH SECTION MAIN CHANNEL WIDTH (sq ft)	W ₁ =	100
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	25.6
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ^{1/3}	V _c =	3.61
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	2,022
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	9.00
MAIN CHANNEL SCOUR MODE		LIVE-BED

500-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	3,204
APPROACH SECTION MAIN CHANNEL WIDTH (sq ft)	W ₁ =	100
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	32.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ^{1/3}	V _c =	3.75
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	6,981
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	11.00
MAIN CHANNEL SCOUR MODE		LIVE-BED

CONTRACTION SCOUR COMPUTATIONS - FLOOD TIDE
Southland Drive over Dosoris Pond
LIVE BED CONTRACTION SCOUR COMPUTATIONS

The following computations are made using the HEC-18 equations for Live Bed Contraction Scour:
(Equations 5.2 and 5.3)

$$Y_s = Y_2 - Y_0$$

$$Y_2 = [(Q_2/Q_1)^{6/7} \times (W_1/W_2)^{k_1}] \times Y_1$$

100-YEAR FLOOD

ENERGY SLOPE	S ₁ =	0.000002
FALL VELOCITY (Use Figure 5.8 in HEC-18, <i>For English: multiply by 3.28</i>)	w=	0.656
AVERAGE UPSTREAM CHANNEL DEPTH (ft), Y ₁ = A ₁ /W ₁	y ₁ =	25.62
SHEAR VELOCITY IN UPSTREAM SECTION, V* = gy ₁ S ₁ ^{1/2}	V=	0.04061931
V*/w	V*/w=	0.06
k ₁	k ₁ =	0.59
DISCHARGE IN UPSTREAM CHANNEL (cfs)	Q ₁ =	2,022.0
DISCHARGE IN CONTRACTED SECTION (cfs)	Q ₂ =	807.0
WIDTH OF UPSTREAM CHANNEL SECTION (ft)	W ₁ =	100.0
WIDTH OF MAIN CHANNEL CONTRACTED SECTION (ft)	W ₂ =	100.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	Y ₂ =	11.66
AVERAGE WATER DEPTH AT BRIDGE (ft)	Y ₀ =	16.0
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	Y _s =	0.0

500-YEAR FLOOD

ENERGY SLOPE	S ₁ =	0.000009
FALL VELOCITY (Use Figure 5.8 in HEC-18, <i>For English: multiply by 3.28</i>)	w=	0.656
AVERAGE UPSTREAM CHANNEL DEPTH (ft), Y ₁ = A ₁ /W ₁	y ₁ =	32.00
SHEAR VELOCITY IN UPSTREAM SECTION, V* = gy ₁ S ₁ ^{1/2}	V=	0.09629953
V*/w	V*/w=	0.15
k ₁	k ₁ =	0.59
DISCHARGE IN UPSTREAM CHANNEL (cfs)	Q ₁ =	6,981.0
DISCHARGE IN CONTRACTED SECTION (cfs)	Q ₂ =	2,786.0
WIDTH OF UPSTREAM CHANNEL SECTION (ft)	W ₁ =	100.0
WIDTH OF MAIN CHANNEL CONTRACTED SECTION (ft)	W ₂ =	100.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	Y ₂ =	14.56
AVERAGE WATER DEPTH AT BRIDGE (ft)	Y ₀ =	23
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	Y _s =	0.0

LOCAL ABUTMENT SCOUR COMPUTATIONS - East Abutment
Southland Drive over Dosoris Pond

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	80
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	4,454
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	3786.0
V _e = Q _e /A _e , (ft/s)	V _e =	0.850
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	368
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	12.1
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.001091
SCOUR DEPTH, Y _s (ft)	Y _s =	13.2

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	80
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	6,843
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	15,250
V _e = Q _e /A _e , (ft/s)	V _e =	2.229
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	368
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	18.6
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.001861
SCOUR DEPTH, Y _s (ft)	Y _s =	20.5

LOCAL ABUTMENT SCOUR COMPUTATIONS - West Abutment
Southland Drive over Dosoris Pond

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	30
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	539
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	235.0
V _e = Q _e /A _e , (ft/s)	V _e =	0.436
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	120
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	4.5
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.001507
SCOUR DEPTH, Y _s (ft)	Y _s =	5.0

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	256
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	1,795
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	2,128
V _e = Q _e /A _e , (ft/s)	V _e =	1.186
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	368
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	4.9
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.003774
SCOUR DEPTH, Y _s (ft)	Y _s =	7.1

LOCAL PIER SCOUR COMPUTATIONS - FLOOD TIDE
Southland Drive over Dosoris Pond

The following computations are made using the HEC-18 CSU Equation (Eqn. 6.1):

$$y_s = (2.0K_1K_2K_3K_4(a/y_1)^{0.65}Fr^{0.43} \times y_1$$

100-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE (SEE EQNS. 6.5 - 6.8)	K ₄ =	1.00
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	5.0
LENGTH OF PIER	L=	22.5
L/a (Maximum L/a value is 12)	L/a=	4.5
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	9.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	25.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	13.0

500-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE (SEE EQNS. 6.5 - 6.8)	K ₄ =	1.00
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	5.0
LENGTH OF PIER	L=	22.5
L/a (Maximum L/a value is 12)	L/a=	4.5
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	11.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	32.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	14.6

Stage Hydrograph for 500 and 100 Year storms

Initial Flow at RS6 = (Area x 1ft/s) =

5000

Sea Level Rise (SLR) = 4.592 ft

2261550 - Southland Drive over Dosoris Pond

500 - year storm

Time	R.S. = 1 Node = s2n5					R.S. = 6 Node = s1n7				
(hrs)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)
1	0	0	0	4.59	0.00	0	0	0	4.59	0.00
2	0.023	0.016	90.184	4.67	0.05	0.023	0.042	132.352	4.67	0.14
3	0.335	0.031	109.628	5.69	0.10	0.333	0.114	139.813	5.68	0.37
4	0.549	0.112	76.509	6.39	0.37	0.547	0.167	127.005	6.39	0.55
5	0.236	0.013	131.737	5.37	0.04	0.236	0.103	318.049	5.37	0.34
6	-0.17	0.075	277.499	4.03	0.25	-0.175	0.237	319.724	4.02	0.78
7	-0.479	0.021	266.255	3.02	0.07	-0.479	0.091	319.185	3.02	0.30
8	-0.558	0.01	252.682	2.76	0.03	-0.556	0.033	300.209	2.77	0.11
9	-0.529	0.01	109.563	2.86	0.03	-0.529	0.02	162.01	2.86	0.07
10	-0.378	0.054	91.491	3.35	0.18	-0.376	0.111	145.249	3.36	0.36
11	0.118	0.151	95.89	4.98	0.50	0.12	0.23	134.26	4.99	0.75
12	0.812	0.076	148.895	7.26	0.25	0.813	0.127	125.7	7.26	0.42
13	1.207	0.182	100.22	8.55	0.60	1.207	0.226	130.806	8.55	0.74
14	1.207	0.126	95.911	8.55	0.41	1.206	0.109	130.29	8.55	0.36
15	0.984	0.055	75.343	7.82	0.18	0.984	0.027	113.766	7.82	0.09
16	0.571	0.023	10.634	6.46	0.08	0.572	0.092	325.412	6.47	0.30
17	-0.047	0.058	286.094	4.44	0.19	-0.076	0.271	326.215	4.34	0.89
18	-0.699	0.078	272.728	2.30	0.26	-0.716	0.266	326.507	2.24	0.87
19	-1.086	0.043	277.626	1.03	0.14	-1.086	0.146	321.75	1.03	0.48
20	-1.036	0.05	85.348	1.19	0.16	-1.046	0.078	146.678	1.16	0.26
21	-0.734	0.114	93.507	2.18	0.37	-0.737	0.173	143.951	2.17	0.57
22	-0.197	0.185	97.915	3.95	0.61	-0.19	0.263	134.788	3.97	0.86
23	0.521	0.092	127.157	6.30	0.30	0.521	0.212	133.507	6.30	0.70
24	1.184	0.052	114.431	8.48	0.17	1.183	0.079	125.192	8.47	0.26
25	1.516	0.073	116.219	9.56	0.24	1.517	0.025	60.11	9.57	0.08
26	1.493	0.106	60.539	9.49	0.35	1.493	0.027	161.558	9.49	0.09
27	1.162	0.076	88.255	8.40	0.25	1.164	0.05	134.489	8.41	0.16
28	0.583	0.039	2.743	6.50	0.13	0.582	0.136	320.328	6.50	0.45
29	-0.138	0.082	273.376	4.14	0.27	-0.132	0.262	329.281	4.16	0.86
30	-0.744	0.074	271.067	2.15	0.24	-0.746	0.233	325.465	2.15	0.76
31	-1.041	0.026	287.107	1.18	0.09	-1.039	0.102	314.862	1.18	0.33
32	-0.995	0.049	81.534	1.33	0.16	-1.001	0.075	144.548	1.31	0.25
33	-0.682	0.107	89.938	2.36	0.35	-0.681	0.169	143.753	2.36	0.55
34	-0.113	0.186	101.855	4.22	0.61	-0.11	0.3	134.985	4.23	0.98
35	0.617	0.085	128.344	6.62	0.28	0.619	0.162	137.082	6.62	0.53
36	1.245	0.061	110.115	8.68	0.20	1.245	0.024	130.501	8.68	0.08
37	1.555	0.068	112.332	9.69	0.22	1.556	0.063	345.038	9.70	0.21
38	1.58	0.09	69.069	9.77	0.30	1.579	0.047	169.68	9.77	0.15
39	1.324	0.084	82.29	8.93	0.28	1.322	0.058	135.635	8.93	0.19
40	0.808	0.03	16.388	7.24	0.10	0.804	0.085	317.415	7.23	0.28
41	0.127	0.047	273.226	5.01	0.15	0.123	0.204	328.182	5.00	0.67
42	-0.439	0.085	287.728	3.15	0.28	-0.463	0.337	324.448	3.07	1.11
43	-0.786	0.048	266.95	2.01	0.16	-0.773	0.138	316.777	2.06	0.45
44	-0.769	0.026	99.675	2.07	0.09	-0.769	0.083	140.407	2.07	0.27
45	-0.453	0.109	83.186	3.11	0.36	-0.452	0.16	143.372	3.11	0.52
46	0.051	0.147	103.998	4.76	0.48	0.052	0.247	134.421	4.76	0.81
47	0.758	0.071	143.112	7.08	0.23	0.758	0.175	130.262	7.08	0.57
48	1.43	0.035	143.406	9.28	0.11	1.428	0.048	127.046	9.28	0.16

49	1.857	0.018	135.865	10.68	0.06	1.857	0.062	305.862	10.68	0.20
50	2.036	0.094	71.772	11.27	0.31	2.035	0.022	6.328	11.27	0.07
51	1.939	0.129	54.316	10.95	0.42	1.941	0.036	197.997	10.96	0.12
52	1.63	0.087	71.567	9.94	0.29	1.631	0.047	138.436	9.94	0.15
53	1.156	0.033	66.308	8.38	0.11	1.152	0.009	162.584	8.37	0.03
54	0.719	0.034	311.548	6.95	0.11	0.717	0.088	306.745	6.94	0.29
55	0.615	0.055	245.951	6.61	0.18	0.614	0.163	309.173	6.61	0.53
56	1.063	0.091	242.894	8.08	0.30	1.065	0.05	326.97	8.09	0.16
57	2.277	0.525	255.977	12.06	1.72	2.267	0.623	325.133	12.03	2.04
58	4.528	1.097	244.573	19.44	3.60	4.501	1.16	311.359	19.36	3.80
59	6.136	0.317	225.22	24.72	1.04	6.133	0.303	354.732	24.71	0.99
60	5.286	0.678	60.296	21.93	2.22	5.292	0.19	97.382	21.95	0.62
61	3.535	0.393	62.408	16.19	1.29	3.53	0.143	114.29	16.17	0.47
62	1.836	0.055	52.599	10.61	0.18	1.84	0.158	310.147	10.63	0.52
63	0.666	0.062	310.199	6.78	0.20	0.663	0.249	319.172	6.77	0.82
64	-0.218	0.085	279.782	3.88	0.28	-0.227	0.358	328.307	3.85	1.17
65	-0.81	0.072	256.074	1.94	0.24	-0.786	0.129	320.854	2.01	0.42
66	-0.861	0.012	115.727	1.77	0.04	-0.865	0.068	139.398	1.75	0.22
67	-0.421	0.195	93.126	3.21	0.64	-0.431	0.301	141.956	3.18	0.99
68	0.159	0.103	111.091	5.11	0.34	0.164	0.171	140.762	5.13	0.56
69	0.568	0.057	115.765	6.46	0.19	0.568	0.039	185.718	6.46	0.13
70	0.811	0.039	180.491	7.25	0.13	0.811	0.045	261.15	7.25	0.15
71	0.995	0.01	125.688	7.86	0.03	0.995	0.021	10.122	7.86	0.07
72	1.05	0.072	93.216	8.04	0.24	1.05	0.078	128.814	8.04	0.26
73	0.895	0.048	37.034	7.53	0.16	0.895	0.017	168.576	7.53	0.06
74	0.656	0.034	12.214	6.74	0.11	0.657	0.032	332.741	6.75	0.10
75	0.502	0.03	261.815	6.24	0.10	0.506	0.122	320.931	6.25	0.40
76	0.427	0.02	242.523	5.99	0.07	0.419	0.068	321.966	5.97	0.22
77	0.3	0.005	34.676	5.58	0.02	0.296	0.056	318.005	5.56	0.18
78	0.111	0.021	262.494	4.96	0.07	0.109	0.074	320.458	4.95	0.24
79	-0.07	0.018	286.878	4.36	0.06	-0.071	0.087	317.988	4.36	0.29
80	-0.194	0.014	289.659	3.96	0.05	-0.195	0.063	313.02	3.95	0.21
81	-0.298	0.011	265.927	3.61	0.04	-0.298	0.041	310.898	3.61	0.13
82	-0.33	0.007	112.095	3.51	0.02	-0.33	0.004	174.764	3.51	0.01
83	-0.22	0.033	94.683	3.87	0.11	-0.218	0.075	136.878	3.88	0.25
84	0.075	0.078	90.85	4.84	0.26	0.076	0.123	136.78	4.84	0.40
85	0.487	0.08	108.483	6.19	0.26	0.487	0.138	134.035	6.19	0.45
86	0.853	0.055	136.84	7.39	0.18	0.851	0.084	141.224	7.38	0.28
87	1.064	0.036	124.875	8.08	0.12	1.065	0.037	140.434	8.09	0.12
88	1.086	0.029	103.321	8.15	0.10	1.089	0.045	135.491	8.16	0.15
89	0.916	0.061	93.334	7.60	0.20	0.917	0.033	121.805	7.60	0.11
90	0.502	0.012	311.497	6.24	0.04	0.501	0.078	325.188	6.24	0.26
91	-0.083	0.071	272.571	4.32	0.23	-0.091	0.24	327.16	4.29	0.79
92	-0.581	0.1	266.436	2.69	0.33	-0.583	0.195	327.572	2.68	0.64
93	-0.865	0.026	304.668	1.75	0.09	-0.875	0.13	322.25	1.72	0.43
94	-0.887	0.009	113.192	1.68	0.03	-0.882	0.001	339.63	1.70	0.00
95	-0.714	0.061	102.575	2.25	0.20	-0.711	0.121	145.782	2.26	0.40
96	-0.278	0.161	93.63	3.68	0.53	-0.28	0.246	135.508	3.67	0.81
97	0.364	0.114	112.221	5.79	0.37	0.363	0.232	133.825	5.78	0.76
98	0.973	0.066	128.697	7.78	0.22	0.971	0.132	129.948	7.78	0.43
99	1.31	0.166	112.115	8.89	0.54	1.311	0.108	120.44	8.89	0.35
100	1.302	0.103	91.791	8.86	0.34	1.303	0.082	126.588	8.87	0.27
101	1.116	0.063	71.777	8.25	0.21	1.115	0.058	126.714	8.25	0.19
102	0.667	0.04	28.235	6.78	0.13	0.665	0.07	322.654	6.77	0.23
103	0.012	0.075	270.037	4.63	0.25	0.005	0.246	327.185	4.61	0.81
104	-0.633	0.108	271.633	2.52	0.35	-0.65	0.286	325.115	2.46	0.94
105	-1.029	0.046	272.487	1.22	0.15	-1.026	0.135	320.016	1.23	0.44

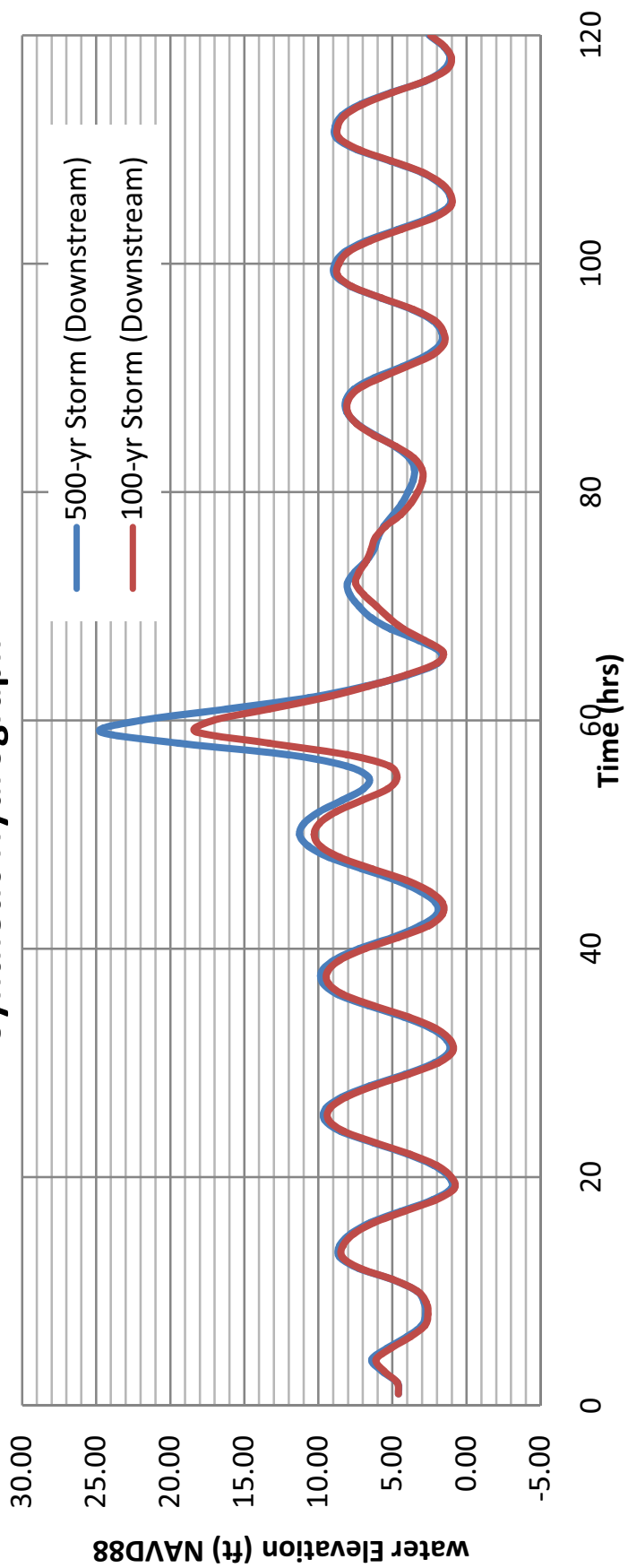
106	-1.057	0.011	81.849	1.13	0.04	-1.05	0.017	156.824	1.15	0.06
107	-0.861	0.054	101.42	1.77	0.18	-0.859	0.106	147.133	1.77	0.35
108	-0.47	0.15	91.315	3.05	0.49	-0.468	0.222	143.334	3.06	0.73
109	0.167	0.156	102.938	5.14	0.51	0.17	0.25	133.79	5.15	0.82
110	0.856	0.068	140.849	7.40	0.22	0.857	0.148	131.788	7.40	0.49
111	1.271	0.183	113.686	8.76	0.60	1.268	0.112	125.831	8.75	0.37
112	1.304	0.113	95.268	8.87	0.37	1.304	0.042	119.03	8.87	0.14
113	1.157	0.065	72.981	8.39	0.21	1.157	0.049	124.79	8.39	0.16
114	0.765	0.042	38.824	7.10	0.14	0.765	0.046	322.944	7.10	0.15
115	0.153	0.045	287.097	5.09	0.15	0.146	0.204	326.926	5.07	0.67
116	-0.556	0.101	268.391	2.77	0.33	-0.541	0.256	327.789	2.82	0.84
117	-0.93	0.048	259.457	1.54	0.16	-0.937	0.119	322.421	1.52	0.39
118	-1.058	0.016	81.756	1.12	0.05	-1.051	0.014	206.512	1.14	0.05
119	-0.936	0.041	88.493	1.52	0.13	-0.939	0.069	147.074	1.51	0.23
120	-0.634	0.118	91.286	2.51	0.39	-0.63	0.204	143.711	2.53	0.67

100-year storm

Time	R.S. = 1 Node = s2n5					R.S. = 6 Node = s1n7				
(hrs)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)
1	0	0	0	4.59	0.00	0	0	0	4.59	0.00
2	0.023	0.016	90.184	4.67	0.05	0.023	0.042	132.352	4.67	0.14
3	0.293	0.026	112.908	5.55	0.09	0.291	0.097	141.938	5.55	0.32
4	0.462	0.105	73.865	6.11	0.34	0.461	0.154	126.206	6.10	0.51
5	0.153	0.009	240.682	5.09	0.03	0.15	0.103	315.514	5.08	0.34
6	-0.247	0.074	273.77	3.78	0.24	-0.251	0.246	320.463	3.77	0.81
7	-0.543	0.019	259.514	2.81	0.06	-0.542	0.078	319.644	2.81	0.26
8	-0.607	0.002	148.45	2.60	0.01	-0.606	0.025	294.953	2.60	0.08
9	-0.574	0.012	105.797	2.71	0.04	-0.573	0.018	156.172	2.71	0.06
10	-0.391	0.066	91.458	3.31	0.22	-0.389	0.132	144.278	3.32	0.43
11	0.109	0.153	97.415	4.95	0.50	0.111	0.232	134.265	4.96	0.76
12	0.785	0.074	149.273	7.17	0.24	0.785	0.13	124.035	7.17	0.43
13	1.154	0.174	100.785	8.38	0.57	1.159	0.204	129.799	8.39	0.67
14	1.141	0.116	99.412	8.33	0.38	1.139	0.092	128.29	8.33	0.30
15	0.924	0.052	81.337	7.62	0.17	0.922	0.026	114.865	7.62	0.09
16	0.5	0.027	359.489	6.23	0.09	0.497	0.092	325.249	6.22	0.30
17	-0.118	0.048	287.647	4.20	0.16	-0.149	0.287	326.618	4.10	0.94
18	-0.769	0.088	278.723	2.07	0.29	-0.767	0.303	326.837	2.08	0.99
19	-1.149	0.056	265.765	0.82	0.18	-1.151	0.122	320.856	0.82	0.40
20	-1.087	0.03	96.488	1.03	0.10	-1.084	0.071	145.983	1.04	0.23
21	-0.791	0.114	92.837	2.00	0.37	-0.793	0.178	144.189	1.99	0.58
22	-0.243	0.187	96.94	3.79	0.61	-0.243	0.265	134.783	3.79	0.87
23	0.466	0.102	126.508	6.12	0.33	0.466	0.23	134.264	6.12	0.75
24	1.119	0.062	115.302	8.26	0.20	1.12	0.097	127.059	8.27	0.32
25	1.44	0.111	115.763	9.32	0.36	1.441	0.04	357.378	9.32	0.13
26	1.413	0.118	71.272	9.23	0.39	1.413	0.071	142.083	9.23	0.23
27	1.081	0.06	78.216	8.14	0.20	1.081	0.011	116.951	8.14	0.04
28	0.504	0.04	354.479	6.25	0.13	0.505	0.141	323.652	6.25	0.46
29	-0.209	0.094	279.484	3.91	0.31	-0.249	0.355	327.584	3.78	1.16
30	-0.818	0.068	280.295	1.91	0.22	-0.812	0.222	326.32	1.93	0.73
31	-1.116	0.037	266.006	0.93	0.12	-1.118	0.102	315.95	0.92	0.33
32	-1.065	0.042	88.842	1.10	0.14	-1.072	0.093	143.597	1.08	0.31
33	-0.774	0.118	91.179	2.05	0.39	-0.778	0.191	143.907	2.04	0.63
34	-0.219	0.188	96.827	3.87	0.62	-0.216	0.264	134.33	3.88	0.87
35	0.507	0.102	122.826	6.25	0.33	0.508	0.207	138.318	6.26	0.68
36	1.141	0.076	110.722	8.33	0.25	1.139	0.064	134.609	8.33	0.21
37	1.446	0.135	116.622	9.33	0.44	1.448	0.02	16.419	9.34	0.07
38	1.457	0.102	76.902	9.37	0.33	1.457	0.029	161.577	9.37	0.10
39	1.205	0.082	73.326	8.54	0.27	1.206	0.049	132.265	8.55	0.16
40	0.686	0.037	17.233	6.84	0.12	0.685	0.123	316.571	6.84	0.40
41	0.001	0.059	270.466	4.60	0.19	0.006	0.22	328.992	4.61	0.72
42	-0.616	0.066	262.251	2.57	0.22	-0.59	0.152	328.781	2.66	0.50
43	-0.903	0.018	297.978	1.63	0.06	-0.91	0.114	316.514	1.61	0.37
44	-0.908	0.031	91.189	1.61	0.10	-0.917	0.063	142.625	1.58	0.21
45	-0.64	0.084	88.911	2.49	0.28	-0.636	0.144	143.679	2.51	0.47
46	-0.166	0.173	98.626	4.05	0.57	-0.163	0.269	135.182	4.06	0.88
47	0.536	0.09	131.785	6.35	0.30	0.534	0.205	132.319	6.34	0.67
48	1.206	0.048	118.52	8.55	0.16	1.206	0.08	124.75	8.55	0.26

49	1.61	0.05	122.445	9.87	0.16	1.61	0.054	346.723	9.87	0.18
50	1.735	0.083	108.135	10.28	0.27	1.737	0.01	101.636	10.29	0.03
51	1.624	0.108	57.966	9.92	0.35	1.624	0.048	133.346	9.92	0.16
52	1.286	0.07	79.114	8.81	0.23	1.285	0.061	132.27	8.81	0.20
53	0.747	0.031	15.66	7.04	0.10	0.746	0.078	317.115	7.04	0.26
54	0.217	0.052	265.752	5.30	0.17	0.216	0.198	323.315	5.30	0.65
55	0.028	0.033	77.913	4.68	0.11	0.01	0.116	307.969	4.62	0.38
56	0.186	0.015	138.157	5.20	0.05	0.22	0.116	128.741	5.31	0.38
57	1.065	0.056	268.726	8.09	0.18	1.06	0.07	117.505	8.07	0.23
58	2.662	0.655	260.653	13.32	2.15	2.635	0.769	324.368	13.23	2.52
59	4.17	0.387	270.163	18.27	1.27	4.167	0.482	315.589	18.26	1.58
60	3.808	0.496	62.987	17.08	1.63	3.813	0.069	105.732	17.10	0.23
61	2.666	0.235	67.158	13.34	0.77	2.66	0.092	130.734	13.32	0.30
62	1.527	0.043	52.091	9.60	0.14	1.526	0.108	287.429	9.60	0.35
63	0.622	0.068	335.845	6.63	0.22	0.62	0.196	324.589	6.63	0.64
64	-0.171	0.094	270.183	4.03	0.31	-0.185	0.299	329.163	3.99	0.98
65	-0.79	0.021	308.132	2.00	0.07	-0.825	0.183	328.151	1.89	0.60
66	-0.919	0.044	83.264	1.58	0.14	-0.914	0.045	161.043	1.59	0.15
67	-0.542	0.126	87.345	2.81	0.41	-0.549	0.178	141.466	2.79	0.58
68	-0.105	0.106	104.911	4.25	0.35	-0.102	0.121	148.264	4.26	0.40
69	0.199	0.071	115.586	5.24	0.23	0.203	0.06	161.79	5.26	0.20
70	0.449	0.03	142.651	6.06	0.10	0.448	0.011	244.94	6.06	0.04
71	0.707	0.034	178.208	6.91	0.11	0.709	0.025	232.659	6.92	0.08
72	0.88	0.07	77.667	7.48	0.23	0.88	0.039	133.903	7.48	0.13
73	0.806	0.041	96.969	7.24	0.13	0.804	0.02	286.514	7.23	0.07
74	0.656	0.017	95.414	6.74	0.06	0.653	0.06	314.94	6.73	0.20
75	0.559	0.006	129.908	6.43	0.02	0.565	0.085	320.908	6.45	0.28
76	0.476	0.008	254.666	6.15	0.03	0.47	0.053	326.511	6.13	0.17
77	0.264	0.01	314.353	5.46	0.03	0.261	0.103	324.537	5.45	0.34
78	-0.038	0.043	266.628	4.47	0.14	-0.04	0.111	326.191	4.46	0.36
79	-0.253	0.027	274.363	3.76	0.09	-0.256	0.091	322.912	3.75	0.30
80	-0.396	0.02	262.64	3.29	0.07	-0.399	0.074	316.502	3.28	0.24
81	-0.493	0.012	272.568	2.97	0.04	-0.492	0.057	318.476	2.98	0.19
82	-0.486	0.014	95.511	3.00	0.05	-0.487	0.016	147.042	2.99	0.05
83	-0.311	0.057	96.127	3.57	0.19	-0.311	0.11	137.355	3.57	0.36
84	0.053	0.112	92.078	4.77	0.37	0.053	0.161	135.096	4.77	0.53
85	0.507	0.088	113.861	6.25	0.29	0.507	0.163	132.307	6.25	0.53
86	0.861	0.085	122.643	7.42	0.28	0.861	0.11	140.434	7.42	0.36
87	1.046	0.072	110.334	8.02	0.24	1.049	0.048	138.776	8.03	0.16
88	1.037	0.076	104.973	7.99	0.25	1.038	0.061	136.816	8.00	0.20
89	0.837	0.058	94.08	7.34	0.19	0.837	0.019	105.638	7.34	0.06
90	0.378	0.022	293.294	5.83	0.07	0.381	0.13	326.26	5.84	0.43
91	-0.173	0.042	293.928	4.02	0.14	-0.196	0.259	327.993	3.95	0.85
92	-0.693	0.062	285.535	2.32	0.20	-0.692	0.224	324.457	2.32	0.73
93	-0.939	0.022	262.526	1.51	0.07	-0.937	0.064	318.521	1.52	0.21
94	-0.926	0.021	90.109	1.55	0.07	-0.928	0.022	137.752	1.55	0.07
95	-0.752	0.068	96.361	2.13	0.22	-0.756	0.108	146.819	2.11	0.35
96	-0.304	0.169	90.786	3.59	0.55	-0.302	0.223	134.724	3.60	0.73
97	0.348	0.123	107.551	5.73	0.40	0.351	0.237	133.707	5.74	0.78
98	0.956	0.087	119.039	7.73	0.29	0.957	0.14	129.209	7.73	0.46
99	1.255	0.17	108.522	8.71	0.56	1.256	0.132	125.383	8.71	0.43
100	1.23	0.106	96.393	8.63	0.35	1.23	0.073	124.235	8.63	0.24
101	1.043	0.065	62.656	8.01	0.21	1.042	0.034	119.276	8.01	0.11
102	0.587	0.034	17.287	6.52	0.11	0.586	0.083	326.113	6.51	0.27
103	-0.059	0.083	269.315	4.40	0.27	-0.074	0.245	327.749	4.35	0.80
104	-0.711	0.121	270.581	2.26	0.40	-0.711	0.277	325.369	2.26	0.91
105	-1.07	0.04	274.555	1.08	0.13	-1.069	0.144	318.849	1.09	0.47

Southland Drive over Dosoris Pond Synthetic Hydrograph



**DECISION SUPPORT TOOLS FOR PRIORITIZING
THE HYDRAULIC VULNERABILITY OF
EXISTING NEW YORK STATE COASTAL BRIDGES DUE TO
THE IMPACT OF CLIMATE CHANGE PROJECTIONS**

VOLUME II

By
Gerarda M. Shields

A dissertation submitted to the Graduate Faculty in Engineering in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

2012

B.6 West Shore Road over Mill Neck Creek

OBJECTID	19	ApprGuar_1	0	UndWaterIn	Y60
Shape	Point	Historical	2	SpecInspe	N
StateCode	362	NavControl	1	FractCritD	808
BIN	3300010	NavVertCle	36	UndWaterDa	804
Record	1	NavHorizCl	234	SpecInspec	
Type	4	OpenPostCl	A	BridgImprC	984
LOS	0	ServiceOnB	5	RoadImprCo	503
RteNo	0	ServiceUnd	5	TotalCost	1487
HighwayDis	1	StructMate	3	YearEst	2008
CountyCode	59	TypeDesign	16	BordBridge	0
PlaceCode	56000	ApprMater	3	BPercenRes	0
FeaturesIn	MILL NECK	ApprDesign	2	BordBIN	0
CREEK		NoSpansMai	1	STRAHNET	0
CritFacili		NoSpansApp	12	ParallelSt	N
Route	WEST SHORE	RouteHoriz	91	DirectTraf	2
ROAD		MainSpanLe	274	TempStruct	
Location	AT BAYVILLE	StructLeng	1648	HighwaySys	0
MinVertCle	9999	SdeWlkLeft	12	FedLandsHi	0
KiloPoint	0	SdeWlkRtWi	12	YearRecon	1993
BaseHwyNet	0	BrdgCb2Cb	91	DeckType	1
LRSRoute	0	BrdgOut2Ou	128	DeckWearTy	2
SubrouteNo		MinVertOve	9999	TypeMembr	0
LatDD	40	RefFeature	N	DeckProtec	1
LatMM	54	MinVertUn	0	ADTTruck	5
LatSS	11210	RefFeat	N	NatNetwk	0
LonDD	73	MinLatUn	999	PierAbutPr	2
LongMM	32	MinLatUnLf	0	NBISBrdgeL	Y
LongSS	5489	Deck	5	ScourCrit	0
Latitude	40.903114	SupStruct	6	FutADT	12530
Longitude	-73.548581	SubStruct	7	YearFutADT	2005
DetourLeng	9	ChannelPro	7	MinNavVert	
Toll	3	Culverts	N	FedAgeninc	NN
MainRespon	2	MethOpRate	5	WashHead	
Owner	2	OperRating	560	NoName	638
FunctClass	16	MethOpRa_1	0	Status	0
YearBuilt	1938	InventRat	255	NoName_1	0
LanesOn	2	TructEval	6		
LanesUnder	0	DeckGeo	4		
ADT	8950	UnclearVer	N		
YearADT	1985	BridgePost	5		
DesignLoad	4	WaterwayAd	5		
ApprWidth	91	ApprAlign	8		
Median	0	TypeWorkPr	34		
Skew	0	WorkBy	1		
StructFlar	0	LenImprov	1648		
BridgeRail	1	InspDate	808		
Transition	0	InspFreq	24		
ApprGuardR	0	FractCrit	Y24		

3300010.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X
XXXXXXXX XXXX      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      XXXXX

```

PROJECT DATA

Project Title: 3300010

Project File : 3300010.prj

Run Date and Time: 1/12/2012 7:28:38 AM

Project in English units

Project Description:

August

PLAN DATA

Plan Title: WSLR

Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\3300010 West Shore Road
over Mill Neck Creek - Nassau\3300010.p04

Geometry Title: 3300010

Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\3300010
West Shore Road over Mill Neck Creek - Nassau\3300010.g01

Flow Title :

Flow File :

Plan Summary Information:

Number of: Cross Sections	=	30	Multiple Openings	=	0
Culverts	=	0	Inline Structures	=	0
Bridges	=	1	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary	
Conveyance Calculation Method:	At breaks in n values only
Friction Slope Method:	Average Conveyance
Computational Flow Regime:	Subcritical Flow

3300010.rep

GEOMETRY DATA

Geometry Title: 3300010

Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\3300010 west Shore Road over Mill Neck Creek - Nassau\3300010.g01

CROSS SECTION

RIVER: Mill Neck Creek

REACH: Mill Neck Creek RS: 7

INPUT

Description: Two bridge lengths upstream

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	11	70	10	151	9	238	8	325	6
413	4	477	2	539	1	791	-4	1525	-7
2460	-12	2610	-4	2669	1	2756	20		

Manning's n Values

num=

3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	539	.02	2669	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	539	2669	135.71	100	110		.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	539	10	T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.63	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.61	Reach Len. (ft)	135.71	100.00
110.00				
Crit W.S. (ft)		Flow Area (sq ft)	4066.79	52095.30
631.65				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	5913.79	52095.30
631.65				
Q Total (cfs)	54573.71	Flow (cfs)	1853.09	52416.01
304.61				
Top width (ft)	2745.06	Top width (ft)	539.00	2130.00
76.06				
Vel Total (ft/s)	0.96	Avg. Vel. (ft/s)	0.46	1.01
0.48				
Max Chl Dpth (ft)	29.61	Hydr. Depth (ft)	7.55	24.46
8.30				
Conv. Total (cfs)	33949140.0	Conv. (cfs)	1152767.0	
32606880.0 189490.8				
Length wtd. (ft)	101.17	Wetted Per. (ft)	545.71	2130.49
77.85				
Min Ch El (ft)	-12.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.06	Stream Power (lb/ft s)	2756.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1759.08	2107.24

Page 2

718.52
C & E Loss (ft)
57.55

Cum SA (acres)

135.05

90.81

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek

REACH: Mill Neck Creek RS: 6.85714*

INPUT

Description:

Station Elevation Data			num= 23								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	14.7	69.4	13.3	149.7	11.7	235.9	10.1	322.2	7.7		
409.4	5.2	472.8	3	534.3	1.6	774.2	-3.2	805.2	-3.4		
836.7	-3.5	1047.4	-4.7	1473	-6.5	1576.3	-7.1	1878.7	-8.5		
2363.1	-12.1	2445.1	-7.7	2538.5	-4	2554.9	-3	2574.8	-1.5		
2607.4	2.1	2675.7	19.5	2718.9	26.1						

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	534.3	.02	2607.4	.02

Bank Sta: Left Right		Lengths: Left Channel Right		Coeff Contr. Expan.	
534.3	2607.4	135.71	100	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	534.3	10	T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.62	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.61	Reach Len. (ft)	135.71	100.00
110.00				
Crit W.S. (ft)		Flow Area (sq ft)	3508.45	49652.80
471.97				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	4760.73	49652.80
471.97				
Q Total (cfs)	54268.55	Flow (cfs)	1559.23	52478.98
230.35				
Top Width (ft)	2668.27	Top width (ft)	534.30	2073.10
60.87				
Vel Total (ft/s)	1.01	Avg. Vel. (ft/s)	0.44	1.06
0.49				
Max Chl Dpth (ft)	29.71	Hydr. Depth (ft)	6.57	23.95
7.75				
Conv. Total (cfs)	31691580.0	Conv. (cfs)	910552.9	
30646510.0 134516.9				
Length wtd. (ft)	100.93	Wetted Per. (ft)	537.38	2073.65
62.81				
Min Ch El (ft)	-12.10	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.06	Stream Power (lb/ft s)	2718.90	0.00

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0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1742.45	1990.45
717.13				
C & E Loss (ft)		Cum SA (acres)	133.38	85.99
57.37				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 6.71428*

INPUT

Description:

Station	Elevation	Data	num=	23						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	18.4	68.8	16.5	148.4	14.4	233.8	12.2	319.3	9.3	
405.8	6.4	468.7	3.9	529.6	2.1	757.4	-2.4	786.8	-2.7	
816.8	-2.8	1016.8	-4.3	1421	-6	1519.1	-6.6	1806.2	-7.8	
2266.3	-12.3	2360.1	-7	2466.9	-4	2485.8	-3.1	2508.5	-1.5	
2545.9	3.3	2629.1	26.5	2681.7	32.3					

Manning's n values	num=	3
Sta	n Val	Sta
0	.02	529.6
		2545.9
		.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
529.6	2545.9	135.71	100	110	.1	.3
Ineffective Flow	num=	1				
Sta L	Sta R	Elev	Permanent			
0	529.6	10	T			

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.62	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.60	Reach Len. (ft)	135.71	100.00
110.00				
Crit w.s. (ft)		Flow Area (sq ft)	2739.09	47365.95
366.89				
E.G. slope (ft/ft)	0.000003	Area (sq ft)	3663.66	47365.95
366.89				
Q Total (cfs)	53973.63	Flow (cfs)	1152.00	52641.60
180.02				
Top width (ft)	2568.38	Top width (ft)	500.78	2016.30
51.30				
Vel Total (ft/s)	1.07	Avg. vel. (ft/s)	0.42	1.11
0.49				
Max Chl Dpth (ft)	29.90	Hydr. Depth (ft)	5.47	23.49
7.15				
Conv. Total (cfs)	29588990.0	Conv. (cfs)	631540.7	
28858760.0				
Length wtd. (ft)	100.73	wetted Per. (ft)	501.03	2016.96
53.25				
Min Ch El (ft)	-12.30	Shear (lb/sq ft)	0.00	0.00
		Page 4		

3300010.rep

0.00				
Alpha	1.06	Stream Power (lb/ft s)	2681.70	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1729.33	1879.09
716.07				
C & E Loss (ft)		Cum SA (acres)	131.77	81.30
57.23				

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 6.57142*

INPUT

Description:

Station Elevation Data				num=	23				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	22.1	68.2	19.8	147	17.2	231.8	14.4	316.5	11
402.2	7.6	464.5	4.9	524.9	2.7	740.6	-1.7	768.4	-1.9
796.8	-2	986.3	-3.8	1369	-5.5	1461.9	-6	1733.8	-7
2169.4	-12.4	2275.1	-6.4	2395.4	-4	2416.6	-3.3	2442.2	-1.6
2484.3	4.4	2582.4	33.4	2644.6	38.4				

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	524.9	.02	2484.3	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
524.9	2484.3	135.71	100	110	.1	.3	
Ineffective Flow		num=	1				
Sta L	Sta R	Elev	Permanent				
0	524.9	10	T				

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.62	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.60	Reach Len. (ft)	135.71	100.00
110.00				
Crit w.s. (ft)		Flow Area (sq ft)	2141.67	45040.97
294.74				
E.G. Slope (ft/ft)	0.000004	Area (sq ft)	2822.37	45040.97
294.74				
Q Total (cfs)	53695.62	Flow (cfs)	962.42	52587.51
145.69				
Top width (ft)	2394.11	Top width (ft)	390.05	1959.40
44.66				
Vel Total (ft/s)	1.13	Avg. Vel. (ft/s)	0.45	1.17
0.49				
Max Chl Dpth (ft)	30.00	Hydr. Depth (ft)	5.49	22.99
6.60				
Conv. Total (cfs)	27616590.0	Conv. (cfs)	494986.9	
27046670.0				
Length Wtd. (ft)	100.63	wetted Per. (ft)	390.34	1960.18
46.57				
Min Ch El (ft)	-12.40	Shear (lb/sq ft)	0.00	0.01
0.00				

Alpha	1.05	3300010.rep	Stream Power (lb/ft s)	2644.60	0.00
0.00					
Frctn Loss (ft)	0.00		Cum Volume (acre-ft)	1719.23	1773.02
715.23					
C & E Loss (ft)			Cum SA (acres)	130.38	76.73
57.11					

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 6.42857*

INPUT

Description:

Station Elevation Data	num=	23							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
0 25.9 67.6 23.1 145.7 19.9 229.7 16.5 313.6 12.7									
398.6 8.8 460.3 5.8 520.1 3.3 723.8 -.9 750.1 -1.2									
776.9 -1.3 955.7 -3.4 1317 -5.1 1404.6 -5.5 1661.3 -6.3									
2072.6 -12.6 2190.1 -5.8 2323.9 -4 2347.5 -3.5 2375.9 -1.7									
2422.7 5.6 2535.8 40.3 2607.4 44.6									

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .02 520.1 .02 2422.7 .02		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
520.1 2422.7	135.71 100 110	.1	.3
Ineffective Flow	num= 1		
Sta L Sta R Elev Permanent			
0 520.1 10 T			

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.62	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.60	Reach Len. (ft)	135.71	100.00
110.00				
Crit W.S. (ft)		Flow Area (sq ft)	1755.79	42926.52
234.57				
E.G. Slope (ft/ft)	0.000004	Area (sq ft)	2263.98	42926.52
234.57				
Q Total (cfs)	53437.32	Flow (cfs)	840.41	52481.79
115.12				
Top Width (ft)	2259.22	Top width (ft)	317.51	1902.60
39.10				
Vel Total (ft/s)	1.19	Avg. Vel. (ft/s)	0.48	1.22
0.49				
Max Chl Dpth (ft)	30.20	Hydr. Depth (ft)	5.53	22.56
6.00				
Conv. Total (cfs)	25919980.0	Conv. (cfs)	407645.4	
25456500.0 55837.6				
Length wtd. (ft)	100.66	Wetted Per. (ft)	317.84	1903.55
40.90				
Min Ch El (ft)	-12.60	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.04	Stream Power (lb/ft s)	2607.40	0.00

3300010.rep

0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1711.30	1672.05
714.57				
C & E Loss (ft)		Cum SA (acres)	129.28	72.30
57.01				

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 6.28571*

INPUT

Description:

Station Elevation Data	num=	23							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
0 29.6 66.9 26.3 144.4 22.6 227.6 18.6 310.8 14.4									
394.9 10.1 456.1 6.8 515.4 3.9 707 -1.1 731.7 -1.5									
756.9 -1.5 925.1 -2.9 1265 -4.6 1347.4 -5 1588.9 -5.5									
1975.7 -12.7 2105 -5.2 2252.3 -4 2278.3 -3.7 2309.6 -1.8									
2361.1 6.7 2489.2 47.2 2570.3 50.7									

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .02 515.4 .02 2361.1 .02		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
515.4 2361.1	135.71 100 110	.1	.3
Ineffective Flow	num= 1		
Sta L Sta R Elev Permanent			
0 515.4 10 F			

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.62	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.59	Reach Len. (ft)	135.71	100.00
110.00				
Crit w.s. (ft)		Flow Area (sq ft)	1836.15	40767.81
187.69				
E.G. slope (ft/ft)	0.000005	Area (sq ft)	1836.15	40767.81
187.69				
Q Total (cfs)	53194.39	Flow (cfs)	1073.63	52029.47
91.29				
Top width (ft)	2148.03	Top width (ft)	267.87	1845.70
34.46				
Vel Total (ft/s)	1.24	Avg. Vel. (ft/s)	0.58	1.28
0.49				
Max Chl Dpth (ft)	30.29	Hydr. Depth (ft)	6.85	22.09
5.45				
Conv. Total (cfs)	24368490.0	Conv. (cfs)	491831.5	
23834840.0 41819.5				
Length wtd. (ft)	100.60	wetted Per. (ft)	268.22	1846.81
36.14				
Min Ch El (ft)	-12.70	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.04	Stream Power (lb/ft s)	2570.30	0.00
0.00				

Frctn Loss (ft)	0.00	3300010.rep		
714.03		Cum Volume (acre-ft)	1704.92	1575.98
C & E Loss (ft)		Cum SA (acres)	128.36	68.00
56.91				

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 6.14285*

INPUT

Description:

Station Elevation Data	num=	23							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
0 33.3 66.3 29.6 143.1 25.3 225.5 20.7 307.9 16									
391.3 11.3 452 7.7 510.7 4.4 690.2 .7 713.4 .3									
737 .2 894.6 -2.5 1212.9 -4.1 1290.2 -4.5 1516.4 -4.8									
1878.9 -12.9 2020 -4.6 2180.8 -4 2209.2 -3.8 2243.3 -1.9									
2299.6 7.9 2442.6 54.1 2533.1 56.9									

Manning's n Values	num=	3		
Sta n Val Sta n Val Sta n Val				
0 .02 510.7 .02 2299.6 .02				

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
510.7 2299.6	135.71 100 110	.1	.3
Ineffective Flow	num= 1		
Sta L Sta R Elev Permanent			
0 510.7 10 T			

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.62	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.59	Reach Len. (ft)	135.71	100.00
110.00				
Crit W.S. (ft)		Flow Area (sq ft)	1242.60	38779.41
145.30				
E.G. Slope (ft/ft)	0.000005	Area (sq ft)	1519.06	38779.41
145.30				
Q Total (cfs)	52964.27	Flow (cfs)	661.16	52233.35
69.76				
Top width (ft)	2049.56	Top width (ft)	230.66	1788.90
29.99				
Vel Total (ft/s)	1.32	Avg. Vel. (ft/s)	0.53	1.35
0.48				
Max Chl Dpth (ft)	30.49	Hydr. Depth (ft)	5.39	21.68
4.84				
Conv. Total (cfs)	22702150.0	Conv. (cfs)	283395.0	
22388860.0 29901.1				
Length wtd. (ft)	100.43	Wetted Per. (ft)	231.04	1790.21
31.52				
Min Ch El (ft)	-12.90	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.03	Stream Power (lb/ft s)	2533.10	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1699.69	1484.67

713.61
C & E Loss (ft)
56.83

Cum SA (acres)

127.59

63.82

CROSS SECTION

RIVER: Mill Neck Creek
REACH: Mill Neck Creek RS: 6

INPUT

Description: One Bridge Length Upstream

Station	Elevation	Data	num=	14	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	37	506	5	695	1	717	1	864	-2			
1233	-4	1444	-4	1782	-13	1935	-4	2140	-4			
2177	-2	2238	9	2396	61	2496	63					

Manning's n	Values	num=	3	Sta	n Val	Sta	n Val
0	.02	506	.02	2238	.02		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
506	2238	127.2	99	46.8	.1	.3		

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
0 506 10 T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.62	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.58	Reach Len. (ft)	127.20	99.00
46.80				
Crit W.S. (ft)		Flow Area (sq ft)	1054.47	36783.02
111.96				
E.G. Slope (ft/ft)	0.000006	Area (sq ft)	1252.13	36783.02
111.96				
Q Total (cfs)	52744.55	Flow (cfs)	591.51	52100.23
52.81				
Top width (ft)	1957.08	Top width (ft)	198.99	1732.00
26.08				
Vel Total (ft/s)	1.39	Avg. Vel. (ft/s)	0.56	1.42
0.47				
Max Chl Dpth (ft)	30.58	Hydr. Depth (ft)	5.30	21.24
4.29				
Conv. Total (cfs)	21204730.0	Conv. (cfs)	237804.6	
20945700.0				
Length wtd. (ft)	99.33	Wetted Per. (ft)	199.39	1733.50
27.46				
Min Ch El (ft)	-13.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.03	Stream Power (lb/ft s)	2496.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	1695.37	1397.94
713.29				
C & E Loss (ft)		Cum SA (acres)	126.92	59.78
56.76				

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 5.8*

INPUT

Description:

Station Elevation Data			num= 25			Elev Sta			Elev Sta		
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	31.4	107	26.6	303.7	17.8	338.4	16.1	387.3	13.8		
434.3	11.6	487.5	9.1	559.8	5.8	598.2	4.2	768.1	.1		
787.2	0	787.9	0	920	-2.6	1251.7	-4.9	1441.4	-5.2		
1745.2	-13	1886.7	-5.1	2076.2	-4.1	2105.9	-2.6	2110.4	-2.3		
2166.8	7.4	2301.4	42.9	2343.7	53.9	2380.6	55.3	2455.6	58.4		

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	598.2	.02	2166.8	.02

Bank Sta: Left Right		Lengths: Left Channel Right		Coeff Contr. Expan.	
598.2	2166.8	127.2	99	.1	.3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 0 598.2 10 T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.58	Reach Len. (ft)	127.20	99.00
46.80				
Crit W.S. (ft)		Flow Area (sq ft)	1595.35	34466.37
196.45				
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	1980.33	34466.37
196.45				
Q Total (cfs)	52543.70	Flow (cfs)	946.56	51488.84
108.30				
Top Width (ft)	1897.20	Top Width (ft)	290.00	1568.60
38.60				
Vel Total (ft/s)	1.45	Avg. Vel. (ft/s)	0.59	1.49
0.55				
Max Chl Dpth (ft)	30.58	Hydr. Depth (ft)	5.50	21.97
5.09				
Conv. Total (cfs)	20488990.0	Conv. (cfs)	369104.0	
20077660.0 42229.8				
Length wtd. (ft)	99.49	Wetted Per. (ft)	290.31	1569.88
39.92				
Min Ch El (ft)	-13.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.04	Stream Power (lb/ft s)	2455.60	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1690.65	1316.97
713.12				
C & E Loss (ft)		Cum SA (acres)	126.20	56.03
56.73				

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 5.6*

INPUT

Description:

Station Elevation Data				num=	25				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	25.8	123.5	22	350.6	14.9	390.5	13.3	446.9	11.4
501.2	9.5	562.6	7.4	646.1	4.6	690.4	3.4	841.2	-.8
858.2	-1	858.7	-1	976	-3.3	1270.4	-5.7	1438.7	-6.5
1708.4	-13	1838.3	-6.2	2012.4	-4.3	2039.7	-3	2043.8	-2.7
2095.6	5.8	2244.5	37.1	2291.3	46.7	2332.2	49	2415.2	53.8

Manning's n Values				num=	3		
Sta	n Val	Sta	n Val	Sta	n Val		
0	.02	690.4	.02	2095.6	.02		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	690.4	2095.6		127.2	99		.1	.3

Ineffective Flow				num=	1		
Sta L	Sta R	Elev	Permanent	T			
0	690.4	10					

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.57	Reach Len. (ft)	127.20	99.00
46.80				
Crit w.s. (ft)		Flow Area (sq ft)	2363.88	31940.12
329.74				
E.G. slope (ft/ft)	0.000007	Area (sq ft)	3062.43	31940.12
329.74				
Q Total (cfs)	52348.04	Flow (cfs)	1466.63	50671.79
209.62				
Top width (ft)	1886.54	Top width (ft)	425.33	1405.20
56.01				
Vel Total (ft/s)	1.51	Avg. vel. (ft/s)	0.62	1.59
0.64				
Max Chl Dpth (ft)	30.57	Hydr. Depth (ft)	5.56	22.73
5.89				
Conv. Total (cfs)	19661170.0	Conv. (cfs)	550843.1	
19031600.0 78730.3				
Length wtd. (ft)	99.73	wetted Per. (ft)	425.57	1406.30
57.24				
Min Ch El (ft)	-13.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.07	Stream Power (lb/ft s)	2415.20	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1683.29	1241.51
712.84				
C & E Loss (ft)		Cum SA (acres)	125.16	52.65
56.68				

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 5.4*

INPUT

Description:

Station Elevation Data				num= 25					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	20.2	140	17.3	397.4	11.9	442.7	10.6	506.6	8.9
568.1	7.3	637.7	5.6	732.4	3.4	782.6	2.6	914.3	-1.7
929.1	-2	929.6	-2	1032	-3.9	1289.1	-6.6	1436.1	-7.7
1671.6	-13	1790	-7.3	1948.6	-4.4	1973.5	-3.3	1977.2	-3
2024.4	4.2	2187.7	31.4	2239	39.6	2283.8	42.7	2374.8	49.2

Manning's n Values				num= 3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	782.6	.02	2024.4	.02

Bank Sta: Left		Right	Lengths: Left Channel		Right	Coeff	Contr.	Expan.
782.6	2024.4		127.2	99	46.8		.1	.3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent T
 0 782.6 10

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.57	Reach Len. (ft)	127.20	99.00
46.80				
Crit W.S. (ft)		Flow Area (sq ft)	3617.42	29134.01
536.43				
E.G. Slope (ft/ft)	0.000008	Area (sq ft)	4876.34	29134.01
536.43				
Q Total (cfs)	52150.38	Flow (cfs)	2338.93	49420.86
390.60				
Top width (ft)	1977.59	Top width (ft)	655.53	1241.80
80.26				
Vel Total (ft/s)	1.57	Avg. Vel. (ft/s)	0.65	1.70
0.73				
Max Chl Dpth (ft)	30.57	Hydr. Depth (ft)	5.52	23.46
6.68				
Conv. Total (cfs)	18709630.0	Conv. (cfs)	839120.0	
17730380.0 140132.0				
Length wtd. (ft)	100.26	wetted Per. (ft)	655.71	1242.72
81.36				
Min Ch El (ft)	-13.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.12	Stream Power (lb/ft s)	2374.80	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1671.70	1172.11
712.37				
C & E Loss (ft)		Cum SA (acres)	123.58	49.65
56.60				

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 5.2*

INPUT

Description:

Station Elevation Data				num=	25				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	14.6	156.5	12.7	444.2	9	494.8	7.8	566.3	6.5
635.1	5.2	712.9	3.8	818.7	2.2	874.8	1.8	987.4	-2.6
1000.1	-3	1000.5	-3	1088	-4.6	1307.8	-7.5	1433.5	-8.9
1634.8	-13	1741.6	-8.4	1884.8	-4.6	1907.2	-3.7	1910.6	-3.3
1953.2	2.6	2130.8	25.7	2186.6	32.5	2235.4	36.3	2334.4	44.6

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	874.8	.02	1953.2	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	874.8	1953.2		127.2	99	46.8	.1
Ineffective Flow			num=	1			
Sta L	Sta R	Elev	Permanent				
0	874.8	10	T				

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.56	Reach Len. (ft)	127.20	99.00
46.80				
Crit W.S. (ft)		Flow Area (sq ft)	5761.69	26112.61
860.70				
E.G. Slope (ft/ft)	0.000008	Area (sq ft)	7988.13	26112.61
860.70				
Q Total (cfs)	51947.16	Flow (cfs)	4336.92	46907.21
703.03				
Top Width (ft)	2068.24	Top width (ft)	874.80	1078.40
115.04				
Vel Total (ft/s)	1.59	Avg. Vel. (ft/s)	0.75	1.80
0.82				
Max Chl Dpth (ft)	30.56	Hydr. Depth (ft)	6.59	24.21
7.48				
Conv. Total (cfs)	17973960.0	Conv. (cfs)	1500596.0	
16230120.0 243250.9				
Length wtd. (ft)	100.90	Wetted Per. (ft)	877.86	1079.17
116.01				
Min Ch El (ft)	-13.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.18	Stream Power (lb/ft s)	2334.40	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1652.92	1109.33
711.62				
C & E Loss (ft)		Cum SA (acres)	121.35	47.01
56.50				

Warning: The cross-section end points had to be extended vertically for the computed
 Page 13

water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 5

INPUT

Description: Half Bridge Length Upstream

Station Elevation Data		num= 16		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	173	8	491	6	547	5	626	4		
702	3	788	2	905	1	967	1	1071	-4		
1598	-13	1841	-4	1882	1	2074	20	2187	30		
2294	40										

Manning's n Values		num= 3		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	967	.02	1882	.02

Bank Sta: Left		Right		Lengths: Left Channel		Right		Coeff Contr.		Expan.	
967	1882	97.2	83.4	106		.1		.3			

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent T
 0 967 10

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.56	Reach Len. (ft)	97.20	83.40
106.00				
Crit W.S. (ft)		Flow Area (sq ft)	7307.68	22827.21
1385.11				
E.G. Slope (ft/ft)	0.000009	Area (sq ft)	11899.18	22827.21
1385.11				
Q Total (cfs)	51743.75	Flow (cfs)	6337.11	44126.82
1279.82				
Top width (ft)	2049.31	Top width (ft)	967.00	915.00
167.31				
Vel Total (ft/s)	1.64	Avg. Vel. (ft/s)	0.87	1.93
0.92				
Max Chl Dpth (ft)	30.56	Hydr. Depth (ft)	7.56	24.95
8.28				
Conv. Total (cfs)	16971360.0	Conv. (cfs)	2078500.0	
14473100.0 419766.1				
Length wtd. (ft)	85.89	wetted Per. (ft)	975.60	915.67
168.13				
Min Ch El (ft)	-13.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.22	Stream Power (lb/ft s)	2294.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1623.88	1053.72
710.42				
C & E Loss (ft)		Cum SA (acres)	118.66	44.74
56.35				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 4.8*

INPUT

Description:

Station Elevation Data		num= 35									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.8	187.1	8	254.5	7.7	359.8	7	476.7	6.3		
530.9	5.8	591.5	4.8	603.5	4.7	676.9	3.9	759.1	3		
765.7	2.9	852.1	2.1	978.6	1.1	1045.6	1	1071.8	-.3		
1141.2	-3.7	1164.1	-4.1	1210.3	-5.2	1256.4	-6.2	1302.6	-7		
1348.8	-7.7	1395	-8.6	1441.1	-9.3	1487.3	-10.4	1544.2	-11.2		
1625.8	-13.4	1715	-9.5	1780.1	-7	1831.6	-4.9	1845.9	-4.3		
1883	0	2090	17.5	2157.4	22.6	2211.8	26.8	2327.2	36		

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1045.6	.02	1883	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1045.6	1883		97.2	83.4	106	.1

Ineffective Flow		num= 1	
Sta L	Sta R	Elev	Permanent
0	1045.6	10	T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.55	Reach Len. (ft)	97.20	83.40
106.00				
Crit w.s. (ft)		Flow Area (sq ft)	7896.33	20911.82
1822.02				
E.G. slope (ft/ft)	0.000010	Area (sq ft)	12886.74	20911.82
1822.02				
Q Total (cfs)	51537.13	Flow (cfs)	7194.25	42502.55
1840.34				
Top width (ft)	2090.69	Top width (ft)	1045.60	837.40
207.69				
Vel Total (ft/s)	1.68	Avg. vel. (ft/s)	0.91	2.03
1.01				
Max Chl Dpth (ft)	30.95	Hydr. Depth (ft)	7.55	24.97
8.77				
Conv. Total (cfs)	16087010.0	Conv. (cfs)	2245642.0	
13266920.0				
Length Wtd. (ft)	86.44	Wetted Per. (ft)	1054.39	838.05
208.43				
Min Ch El (ft)	-13.40	Shear (lb/sq ft)	0.00	0.02
0.01				
Alpha	1.26	Stream Power (lb/ft s)	2327.20	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1596.23	1011.84
706.51				
C & E Loss (ft)		Cum SA (acres)	116.41	43.07

55.89

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 4.6*

INPUT

Description:

Station Elevation Data		num= 35		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.6	201.1	8	273.6	7.8	386.9	7	512.5	6.2		
570.8	5.7	635.9	4.7	648.9	4.5	727.8	3.8	816.1	3		
823.3	3	916.1	2.2	1052.1	1.2	1124.2	1	1148.1	-.2		
1211.5	-3.3	1232.3	-3.9	1274.5	-5.2	1316.6	-6.3	1358.7	-7		
1400.8	-7.5	1443	-8.4	1485.1	-8.9	1527.2	-10.5	1579.2	-10.9		
1653.6	-13.8	1733.5	-9.6	1791.8	-7.2	1837.9	-5.2	1850.7	-4.6		
1884	-1	2106	14.9	2178.3	19.7	2236.7	23.6	2360.4	32		

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1124.2	.02	1884	.02		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1124.2	1884		97.2	83.4		.1	.3
Ineffective Flow			num= 1					
Sta L	Sta R	Elev	Permanent					
0	1124.2	10	T					

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.55	Reach Len. (ft)	97.20	83.40
106.00				
Crit W.S. (ft)		Flow Area (sq ft)	8484.26	18977.30
2405.28				
E.G. Slope (ft/ft)	0.000011	Area (sq ft)	13870.75	18977.30
2405.28				
Q Total (cfs)	51324.47	Flow (cfs)	8127.08	40561.42
2635.97				
Top width (ft)	2145.87	Top width (ft)	1124.20	759.80
261.87				
Vel Total (ft/s)	1.72	Avg. Vel. (ft/s)	0.96	2.14
1.10				
Max Chl Dpth (ft)	31.35	Hydr. Depth (ft)	7.55	24.98
9.19				
Conv. Total (cfs)	15235120.0	Conv. (cfs)	2412438.0	
12040220.0				
782458.4				
Length wtd. (ft)	87.13	Wetted Per. (ft)	1133.18	760.47
262.53				
Min Ch El (ft)	-13.80	Shear (lb/sq ft)	0.01	0.02
0.01				
Alpha	1.29	Stream Power (lb/ft s)	2360.40	0.00

3300010.rep

0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1566.37	973.66
701.37				
C & E Loss (ft)		Cum SA (acres)	113.99	41.54
55.32				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 4.4*

INPUT

Description:

Station	Elevation	Data	num=	35						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	8.4	215.2	8	292.7	7.8	413.9	7	548.3	6.1	
610.7	5.5	680.4	4.5	694.3	4.3	778.6	3.7	873.2	3	
880.9	3	980.2	2.2	1125.7	1.3	1202.8	1	1224.4	-.1	
1281.7	-3	1300.6	-3.6	1338.6	-5.1	1376.7	-6.4	1414.8	-7	
1452.9	-7.3	1491	-8.3	1529.1	-8.6	1567.1	-10.5	1614.1	-10.6	
1681.4	-14.2	1752	-9.7	1803.6	-7.5	1844.3	-5.4	1855.6	-4.9	
1885	-2	2122	12.4	2199.2	16.8	2261.5	20.3	2393.6	28	

Manning's n Values	num=	3
Sta n Val	Sta	n Val
0 .02 1202.8	.02	1885 .02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1202.8	1885	97.2	83.4	106	.1	.3	
Ineffective Flow	num=	1					
Sta L Sta R	Elev	Permanent					
0 1202.8	10	T					

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.54	Reach Len. (ft)	97.20	83.40
106.00				
Crit W.S. (ft)		Flow Area (sq ft)	9072.01	17042.92
3157.21				
E.G. Slope (ft/ft)	0.000013	Area (sq ft)	14895.66	17042.92
3157.21				
Q Total (cfs)	51103.70	Flow (cfs)	9118.96	38231.90
3752.84				
Top width (ft)	2212.42	Top width (ft)	1202.80	682.20
327.41				
Vel Total (ft/s)	1.75	Avg. Vel. (ft/s)	1.01	2.24
1.19				
Max Chl Dpth (ft)	31.74	Hydr. Depth (ft)	7.54	24.98
9.64				
Conv. Total (cfs)	14453840.0	Conv. (cfs)	2579147.0	
10813260.0 1061428.0				
Length Wtd. (ft)	88.02	Wetted Per. (ft)	1211.97	682.92

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328.00				
Min Ch El (ft)	-14.20	Shear (lb/sq ft)	0.01	0.02
0.01				
Alpha	1.33	Stream Power (lb/ft s)	2393.60	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1534.28	939.18
694.60				
C & E Loss (ft)		Cum SA (acres)	111.40	40.16
54.60				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 4.2*

INPUT

Description:

Station Elevation Data		num=	35						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.2	229.2	8	311.9	7.9	441	7	584.2	6.1
650.6	5.3	724.8	4.4	739.6	4.2	829.5	3.6	930.2	3
938.4	3	1044.2	2.3	1199.2	1.4	1281.4	1	1300.7	-.1
1351.9	-2.6	1368.8	-3.3	1402.8	-5.1	1436.9	-6.4	1470.9	-7
1504.9	-7.2	1539	-8.1	1573	-8.3	1607.1	-10.5	1649.1	-10.3
1709.2	-14.6	1770.5	-9.9	1815.3	-7.7	1850.6	-5.7	1860.5	-5.2
1886	-3	2138	9.9	2220.1	13.9	2286.3	17.1	2426.8	24

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
0	.02	1281.4	.02
		1886	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1281.4	1886	97.2	83.4	106	.1	.3	
Ineffective Flow	num=	1					
Sta L	Sta R	Elev	Permanent				
0	1281.4	10	T				

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.60	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.54	Reach Len. (ft)	97.20	83.40
106.00				
Crit W.S. (ft)		Flow Area (sq ft)	9660.41	15107.84
4150.31				
E.G. Slope (ft/ft)	0.000014	Area (sq ft)	15885.40	15107.84
4150.31				
Q Total (cfs)	50873.33	Flow (cfs)	10142.17	35399.97
5331.18				
Top width (ft)	2295.24	Top width (ft)	1281.40	604.60
409.24				
Vel Total (ft/s)	1.76	Avg. Vel. (ft/s)	1.05	2.34
1.28				
Max Chl Dpth (ft)	32.14	Hydr. Depth (ft)	7.54	24.99

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10.14				
Conv. Total (cfs)	13774800.0	Conv. (cfs)	2746161.0	
9585129.0 1443506.0				
Length wtd. (ft)	89.17	Wetted Per. (ft)	1290.77	605.42
409.75				
Min Ch El (ft)	-14.60	Shear (lb/sq ft)	0.01	0.02
0.01				
Alpha	1.36	Stream Power (lb/ft s)	2426.80	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1499.94	908.40
685.71				
C & E Loss (ft)		Cum SA (acres)	108.62	38.92
53.70				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 4

INPUT

Description: Upstream Bridge Fascia

Station Elevation Data		num= 24									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8	331	8	468	7	620	6	785	4		
996	3	1360	1	1377	0	1437	-3	1467	-5		
1497	-6.5	1527	-7	1557	-7	1587	-8	1617	-8		
1647	-10.5	1684	-10	1737	-15	1789	-10	1827	-8		
1857	-6	1887	-4	2241	11	2460	20				

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1360	.02	1887	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1360	1887	45	45	45	.1	.3
Ineffective Flow	num= 1					
Sta L	Sta R	Elev	Permanent			
0	1360	10	T			

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.60	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.54	Reach Len. (ft)	2.50	2.50
2.50				
Crit W.S. (ft)	-0.99	Flow Area (sq ft)	10250.67	13164.89
5489.14				
E.G. Slope (ft/ft)	0.000015	Area (sq ft)	16895.67	13164.89
5489.14				
Q Total (cfs)	50631.01	Flow (cfs)	11142.95	31920.89
7567.18				
Top width (ft)	2400.07	Top width (ft)	1360.00	527.00
513.07				
Vel Total (ft/s)	1.75	Avg. Vel. (ft/s)	1.09	2.42

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1.38				
Max Chl Dpth (ft)	32.54	Hydr. Depth (ft)	7.54	24.98
10.70				
Conv. Total (cfs)	13240790.0	Conv. (cfs)	2914054.0	
8347807.0 1978935.0				
Length wtd. (ft)	2.50	Wetted Per. (ft)	1369.56	528.00
513.53				
Min Ch El (ft)	-15.00	Shear (lb/sq ft)	0.01	0.02
0.01				
Alpha	1.39	Stream Power (lb/ft s)	2460.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	1463.36	881.33
673.98				
C & E Loss (ft)		Cum SA (acres)	105.68	37.84
52.58				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

BRIDGE

RIVER: Mill Neck Creek

REACH: Mill Neck Creek RS: 3.9

INPUT

Description: West Shore Road over Mill Neck Creek Bridge

West Shore Road over

Mill Neck Creek Bridge

Distance from Upstream XS = 2.5

Deck/Roadway Width = 40

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num=

9

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0	12.7	-20	1376.9	12.7	-20	1377	12.7	7.7						
1557	16.3	11.3	1684	17.8	12.8	1827	17.8	12.8						
1887	16.8	11.8	1887.1	16.8	-20	2500	16.8	-20						

Upstream Bridge Cross Section Data

Station Elevation Data

num=

24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8	331	8	468	7	620	6	785	4
996	3	1360	1	1377	0	1437	-3	1467	-5
1497	-6.5	1527	-7	1557	-7	1587	-8	1617	-8
1647	-10.5	1684	-10	1737	-15	1789	-10	1827	-8
1857	-6	1887	-4	2241	11	2460	20		

Manning's n Values

num=

3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1360	.02	1887	.02

Bank Sta: Left Right Coeff Contr. Expan.
1360 1887 .1 .3

Ineffective Flow

num=

1

Sta L	Sta R	Elev	Permanent
0	1360	10	T

Downstream Deck/Roadway Coordinates

num= 9									
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		12.7		-20	1376.9		12.7		-20
1557		16.3		11.3	1684		17.8		12.8
1887		16.8		11.8	1887.1		16.8		-20
					2500		16.8		-20

Downstream Bridge Cross Section Data

Station Elevation Data num= 24									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8	331	8	468	7	620	6	785	4
996	3	1360	1	1377	0	1437	-3	1467	-4.5
1497	-6	1527	-6.5	1557	-7	1587	-8	1617	-7
1647	-9.5	1684	-17	1737	-14	1789	-10	1827	-8
1857	-6	1887	-2	2241	11	2460	20		

Manning's n Values

num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1360	.02	1887	.02

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	1360	1887		.1	.3

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Piers = 7

Pier Data

Pier Station	Upstream=	1437	Downstream=	1437
Upstream	num= 2			
width	Elev	width	Elev	
5	-20	5	12.7	
Downstream	num= 2			
width	Elev	width	Elev	
5	-20	5	12.7	

Pier Data

Pier Station	Upstream=	1497	Downstream=	1497
Upstream	num= 2			
width	Elev	width	Elev	
5	-20	5	12.7	
Downstream	num= 2			
width	Elev	width	Elev	
5	-20	5	12.7	

Pier Data

Pier Station	Upstream=	1557	Downstream=	1557
Upstream	num= 2			
width	Elev	width	Elev	
5	-20	5	12.7	
Downstream	num= 2			
width	Elev	width	Elev	
5	-20	5	12.7	

Pier Data

Pier Station	Upstream=	1684	Downstream=	1684
Upstream	num= 2			

width	Elev	width	Elev
5	-20	5	12.7
Downstream	num=	2	
width	Elev	width	Elev
5	-20	5	12.7

Pier Data					
Pier Station	Upstream=	1684	Downstream=	1684	
Upstream	num=	2			
width	Elev	width	Elev		
15	-20	15	12.7		
Downstream	num=	2			
width	Elev	width	Elev		
15	-20	15	12.7		

Pier Data					
Pier Station	Upstream=	1789	Downstream=	1789	
Upstream	num=	2			
width	Elev	width	Elev		
15	-20	15	12.7		
Downstream	num=	2			
width	Elev	width	Elev		
15	-20	15	12.7		

Pier Data					
Pier Station	Upstream=	1857	Downstream=	1857	
Upstream	num=	2			
width	Elev	width	Elev		
5	-20	5	12.7		
Downstream	num=	2			
width	Elev	width	Elev		
5	-20	5	12.7		

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add weight component to Momentum

Class B flow critical depth computations use critical depth
inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #07AUG2011 1000

E.G. US. (ft)	17.60	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	17.54	E.G. Elev (ft)	17.76
17.75			
Q Total (cfs)	50631.01	W.S. Elev (ft)	17.60
17.60			
Q Bridge (cfs)	30940.68	Crit W.S. (ft)	-0.48
-0.55			
Q Weir (cfs)		Max Chl Dpth (ft)	32.60
34.17			
Weir Sta Lft (ft)		vel Total (ft/s)	3.06

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3.06			5500010.1rep	
Weir Sta Rgt (ft)			Flow Area (sq ft)	16536.40
16553.15				
Weir Submerg			Froude # chl	0.10
0.09				
Weir Max Depth (ft)			Specif Force (cu ft)	162530.10
164220.50				
Min El Weir Flow (ft)	12.71		Hydr Depth (ft)	7.41
7.43				
Min El Prs (ft)	12.80		w.P. Total (ft)	3461.79
3469.00				
Delta EG (ft)	0.05		Conv. Total (cfs)	3783981.0
3783238.0				
Delta WS (ft)	0.02		Top width (ft)	2230.18
2228.98				
BR Open Area (sq ft)	8729.72		Frctn Loss (ft)	
BR Open Vel (ft/s)	3.54		C & E Loss (ft)	
Coef of Q			Shear Total (lb/sq ft)	0.05
0.05				
Br Sel Method	Energy only		Power Total (lb/ft s)	0.00
0.00				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Neck Creek
REACH: Mill Neck Creek RS: 3.8

INPUT

Description: Downstream Bridge Fascia

Downstream		Bridge		Upstream		Downstream		Bridge		Upstream	
Station	Elevation	Data	num=	24							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8	331	8	468	7	620	6	785	4		
996	3	1360	1	1377	0	1437	-3	1467	-4.5		
1497	-6	1527	-6.5	1557	-7	1587	-8	1617	-7		
1647	-9.5	1684	-17	1737	-14	1789	-10	1827	-8		
1857	-6	1887	-2	2241	11	2460	20				

Manning's	n	Values		num=	3
Sta	n	Val	Sta	n	Val
0	.02		1360	.02	
					1887 .02

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	1360	1887		475	55	45		.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.71	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.68	Reach Len. (ft)	475.00	55.00
45.00				
Crit W.S. (ft)		Flow Area (sq ft)	17083.87	13361.81
		Page 23		

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5206.37	E.G. slope (ft/ft)	0.000009	Area (sq ft)	17083.87	13361.81
5206.37	Q Total (cfs)	50631.00	Flow (cfs)	20117.96	25195.72
5317.32	Top width (ft)	2403.44	Top width (ft)	1360.00	527.00
516.44	Vel Total (ft/s)	1.42	Avg. Vel. (ft/s)	1.18	1.89
1.02	Max Chl Dpth (ft)	34.68	Hydr. Depth (ft)	12.56	25.35
10.08	Conv. Total (cfs)	17180030.0	Conv. (cfs)	6826396.0	
8549374.0	Length Wtd. (ft)	169.17	Wetted Per. (ft)	1369.70	528.70
516.82	Min Ch El (ft)	-17.00	Shear (lb/sq ft)	0.01	0.01
0.01	Alpha	1.20	Stream Power (lb/ft s)	2460.00	0.00
0.00	Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1455.89	871.32
673.28	C & E Loss (ft)		Cum SA (acres)	104.27	37.46
52.05					

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 3

INPUT

Description: Half Bridge Length Downstream

Station	Elevation	Data	num=	14	Sta	Elev	Sta	Elev	Sta	Elev
0	8	504	7	626	6	772	5	876	4	
975	3	1160	1	1309	-4	1457	-13	1813	-4	
2153	0	2250	5	2358	10	2530	20			

Manning's n	Values	num=	3	Sta	n Val	Sta	n Val
0	.02	1160	.02	2153	.02		

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	1160	2153		235	83.33	473.33		.1	.3
Ineffective Flow			num=	1					
Sta L	Sta R	Elev	Permanent	T					
0	1160	10							

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.71	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.67	Reach Len. (ft)	235.00	83.33
473.33				
Crit w.s. (ft)		Flow Area (sq ft)	8897.52	22734.08
		Page 24		

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3075.87				
E.G. slope (ft/ft)	0.000009	Area (sq ft)	13937.01	22734.08
3075.87				
Q Total (cfs)	50104.57	Flow (cfs)	7461.98	39732.04
2910.55				
Top width (ft)	2489.93	Top width (ft)	1160.00	993.00
336.93				
Vel Total (ft/s)	1.44	Avg. Vel. (ft/s)	0.84	1.75
0.95				
Max Chl Dpth (ft)	30.67	Hydr. Depth (ft)	7.67	22.89
9.13				
Conv. Total (cfs)	17168020.0	Conv. (cfs)	2556801.0	
13613940.0 997283.3				
Length Wtd. (ft)	147.91	Wetted Per. (ft)	1169.70	993.49
337.40				
Min Ch El (ft)	-13.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.24	Stream Power (lb/ft s)	2530.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1286.75	848.54
669.00				
C & E Loss (ft)		Cum SA (acres)	90.53	36.51
51.61				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 2.66666*

INPUT

Description:

Station Elevation Data			num=	24						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	7.7	400.3	6.9	574.1	6	662.3	5.2	713.1	4.9	
848.7	4.1	879.4	4	997.8	3.1	1110.6	2.3	1117.2	2.3	
1321.3	.7	1351.4	-1.2	1496.3	-4.9	1670	-12	1992.9	-4.7	
2184.4	-2.3	2301.3	.3	2460.8	2.8	2512.7	3.7	2747.9	7.2	
2945	10.8	3039.6	12.9	3070.8	14.1	3122.7	20			

Manning's n Values			num=	3		
Sta	n Val	Sta	n Val	Sta	n Val	
0	.02	1321.3	.02	2301.3	.02	

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	1321.3	2301.3		235	83.33	473.33		.1	.3

Ineffective Flow			num=	1
Sta L	Sta R	Elev	Permanent	T
0	1321.3	10		

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.71	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.68	Reach Len. (ft)	235.00	83.33

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473.33				
Crit W.S. (ft)		Flow Area (sq ft)	10146.18	22725.96
8646.43				
E.G. Slope (ft/ft)	0.000006	Area (sq ft)	16784.78	22725.96
8646.43				
Q Total (cfs)	49312.23	Flow (cfs)	7276.89	34216.34
7818.99				
Top width (ft)	3102.28	Top width (ft)	1321.30	980.00
800.98				
Vel Total (ft/s)	1.19	Avg. Vel. (ft/s)	0.72	1.51
0.90				
Max Chl Dpth (ft)	29.68	Hydr. Depth (ft)	7.68	23.19
10.79				
Conv. Total (cfs)	19783080.0	Conv. (cfs)	2919345.0	
13726920.0 3136823.0				
Length Wtd. (ft)	190.74	Wetted Per. (ft)	1331.30	980.38
801.32				
Min Ch El (ft)	-12.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.26	Stream Power (lb/ft s)	3122.70	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	1203.88	805.05
605.32				
C & E Loss (ft)		Cum SA (acres)	83.84	34.62
45.43				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 2.33333*

INPUT

Description:

Station Elevation Data			num= 24								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.3	449.1	6.4	644.2	5	743.1	4.1	800.1	3.8		
952.4	3.1	986.7	2.9	1119.7	2.3	1246.2	1.7	1253.6	1.6		
1482.7	.3	1517.2	-2.6	1683.5	-5.8	1883	-11	2172.8	-5.5		
2344.7	-3.2	2449.7	.7	2695.4	1.9	2775.3	2.4	3137.9	4.4		
3441.5	6.4	3587.3	7.9	3635.4	9.5	3715.3	20				

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1482.7	.02	2449.7	.02

Bank Sta: Left Right		Lengths: Left Channel Right		Coeff Contr.		Expan.	
1482.7	2449.7	235	83.33	473.33	.1	.3	

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	1482.7	10	T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.70	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-val.	0.020	0.020

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0.020				
W.S. Elev (ft)	17.69	Reach Len. (ft)	235.00	83.33
473.33				
Crit W.S. (ft)		Flow Area (sq ft)	11395.38	22785.74
16400.29				
E.G. Slope (ft/ft)	0.000004	Area (sq ft)	19901.84	22785.74
16400.29				
Q Total (cfs)	48280.30	Flow (cfs)	6608.73	28011.93
13659.64				
Top Width (ft)	3697.69	Top Width (ft)	1482.70	967.00
1247.99				
Vel Total (ft/s)	0.95	Avg. Vel. (ft/s)	0.58	1.23
0.83				
Max Chl Dpth (ft)	28.69	Hydr. Depth (ft)	7.69	23.56
13.14				
Conv. Total (cfs)	23975720.0	Conv. (cfs)	3281856.0	
13910570.0 6783302.0				
Length wtd. (ft)	237.17	Wetted Per. (ft)	1493.11	967.36
1248.58				
Min Ch El (ft)	-11.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.23	Stream Power (lb/ft s)	3715.30	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1104.92	761.52
469.23				
C & E Loss (ft)		Cum SA (acres)	76.28	32.76
34.30				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 2

INPUT

Description: One Bridge Length Upstream

Station	Elevation	Data	num=	15						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	7	498	6	824	3	1056	2	1390	1	
1644	0	1683	-4	2096	-10	2505	-4	2598	1	
2930	1	3938	2	4135	3	4200	5	4308	20	

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .02	1644 .02	2598 .02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1644	2598	237.71	87	120.29	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	1644	10	T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.70	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-val.	0.020	0.020

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0.020				
W.S. Elev (ft)	17.69	Reach Len. (ft)	237.71	87.00
120.29				
Crit W.S. (ft)		Flow Area (sq ft)	12641.31	22847.15
26321.53				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	23169.31	22847.15
26321.53				
Q Total (cfs)	47011.73	Flow (cfs)	5724.61	22154.69
19132.43				
Top Width (ft)	4291.36	Top Width (ft)	1644.00	954.00
1693.36				
Vel Total (ft/s)	0.76	Avg. Vel. (ft/s)	0.45	0.97
0.73				
Max Chl Dpth (ft)	27.69	Hydr. Depth (ft)	7.69	23.95
15.54				
Conv. Total (cfs)	29917880.0	Conv. (cfs)	3643096.0	
14099060.0 12175720.0				
Length wtd. (ft)	116.52	Wetted Per. (ft)	1654.71	954.43
1694.27				
Min Ch El (ft)	-10.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.18	Stream Power (lb/ft s)	4308.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	988.74	717.88
237.12				
C & E Loss (ft)		Cum SA (acres)	67.84	30.92
18.31				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 1.85714*

INPUT

Description:

Station Elevation Data			num= 20								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6.6	509.4	5.6	815.3	3.2	842.9	3	1080.2	2.1		
1310.6	1.4	1421.9	1.1	1681.7	0	1727.7	-3.7	1784	-4.6		
2214.1	-9.6	2850.3	-4.1	2942.8	-1.3	2995	1.1	3285.7	1.5		
3798	2.6	4168.2	3.8	4340.7	5.1	4397.6	6.9	4492.1	20		

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1681.7	.02	2995	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1681.7	2995	237.71	87	120.29	.1	.3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 0 1681.7 10 T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.70	Element	Left OB	Channel
Right OB				

Vel Head (ft)	0.01	3300010.rep		
0.020		wt. n-Val.	0.020	0.020
W.S. Elev (ft)	17.69	Reach Len. (ft)	237.71	87.00
120.29		Flow Area (sq ft)	12931.25	31216.87
Crit W.S. (ft)		Area (sq ft)	23919.06	31216.87
21509.23	0.000002	Flow (cfs)	5319.56	27366.44
E.G. Slope (ft/ft)		Top width (ft)	1681.70	1313.30
21509.23	46264.20	Avg. Vel. (ft/s)	0.41	0.88
Q Total (cfs)		Hydr. Depth (ft)	7.69	23.77
13578.21	32408890.0	Conv. (cfs)	3726443.0	
Top width (ft)		Wetted Per. (ft)	1692.81	1313.61
1480.43	112.17	Shear (lb/sq ft)	0.00	0.00
Vel Total (ft/s)	0.70	Stream Power (lb/ft s)	4492.10	0.00
0.63		Cum volume (acre-ft)	860.26	663.89
Max Chl Dpth (ft)	27.29	Cum SA (acres)	58.77	28.65
14.53				
Conv. Total (cfs)				
19170670.0 9511774.0				
Length Wtd. (ft)				
1481.21				
Min Ch El (ft)	-9.60			
0.00				
Alpha	1.19			
0.00				
Frctn Loss (ft)	0.00			
171.08				
C & E Loss (ft)				
13.93				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 1.71428*

INPUT

Description:

Station Elevation Data			num=	20						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	6.1	520.8	5.3	833.6	3.2	861.8	3	1104.5	2.1	
1340	1.5	1453.8	1.1	1719.4	0	1772.3	-3.4	1837.2	-4.5	
2332.3	-9.1	3195.7	-4.1	3321.2	-1.7	3392	1.3	3641.3	2	
4080.8	3.7	4398.4	5.7	4546.4	7.2	4595.2	8.9	4676.3	20	

Manning's n Values			num=	3
Sta	n Val	Sta	n Val	Sta
0	.02	1719.4	.02	3392

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1719.4	3392	237.71	87	120.29	.1	.3
Ineffective Flow	num=	1				
Sta L	Sta R	Elev	Permanent			
0	1719.4	10	T			

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.70	Element	Left OB	Channel
		Page 29		

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Right OB				
Vel Head (ft)	0.01	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.69	Reach Len. (ft)	237.71	87.00
120.29				
Crit W.S. (ft)		Flow Area (sq ft)	13221.28	39376.92
17062.12				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	24693.09	39376.92
17062.12				
Q Total (cfs)	45516.67	Flow (cfs)	4953.04	31240.22
9323.41				
Top width (ft)	4659.42	Top width (ft)	1719.40	1672.60
1267.42				
Vel Total (ft/s)	0.65	Avg. Vel. (ft/s)	0.37	0.79
0.55				
Max Chl Dpth (ft)	26.79	Hydr. Depth (ft)	7.69	23.54
13.46				
Conv. Total (cfs)	35009670.0	Conv. (cfs)	3809683.0	
24028780.0 7171208.0				
Length wtd. (ft)	108.62	wetted Per. (ft)	1731.00	1672.84
1268.07				
Min Ch El (ft)	-9.10	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.19	Stream Power (lb/ft s)	4676.30	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	727.62	593.39
117.83				
C & E Loss (ft)		Cum SA (acres)	49.49	25.67
10.14				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 1.57142*

INPUT

Description:

Station	Elevation	Data	num=	20						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	5.7	532.3	4.9	851.9	3.1	880.7	3	1128.7	2.2	
1369.4	1.6	1485.7	1.2	1757.1	0	1817	-3.1	1890.3	-4.4	
2450.4	-8.7	3541	-4.2	3699.5	-2.2	3789	1.4	3997	2.5	
4363.7	4.8	4628.6	7.5	4752	9.3	4792.8	10.8	4860.4	20	

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .02	1757.1 .02	3789 .02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1757.1	3789	237.71	87	120.29	.1	.3
Ineffective Flow	num=	1				
Sta L Sta R	Elev	Permanent				
0 1757.1	10	T				

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.70	3300010.rep Element	Left OB	Channel
Right OB Vel Head (ft)	0.01	Wt. n-Val.	0.020	0.020
0.020 W.S. Elev (ft)	17.69	Reach Len. (ft)	237.71	87.00
120.29 Crit W.S. (ft)		Flow Area (sq ft)	13511.43	47557.28
13111.44 E.G. Slope (ft/ft)	0.000001	Area (sq ft)	25467.21	47557.28
13111.44 Q Total (cfs)	44769.18	Flow (cfs)	4583.19	34032.87
6153.12 Top Width (ft)	4843.42	Top width (ft)	1757.10	2031.90
1054.42 Vel Total (ft/s)	0.60	Avg. Vel. (ft/s)	0.34	0.72
0.47 Max Chl Dpth (ft)	26.39	Hydr. Depth (ft)	7.69	23.41
12.43 Conv. Total (cfs)	38028600.0	Conv. (cfs)	3893130.0	
28908780.0 5226686.0 Length wtd. (ft)	105.75	Wetted Per. (ft)	1769.10	2032.10
1054.96 Min Ch El (ft)	-8.70	Shear (lb/sq ft)	0.00	0.00
0.00 Alpha	1.18	Stream Power (lb/ft s)	4860.40	0.00
0.00 Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	590.76	506.57
76.16 C & E Loss (ft)		Cum SA (acres)	40.00	21.97
6.93				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 1.42857*

INPUT

Description:

Station Elevation Data			num=	20					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5.3	543.7	4.5	870.1	3.1	899.6	3	1152.9	2.3
1398.8	1.7	1517.5	1.2	1794.9	0	1861.6	-2.7	1943.5	-4.3
2568.6	-8.3	3886.4	-4.2	4077.9	-2.6	4186	1.6	4352.7	3
4646.5	5.8	4858.8	9.4	4957.7	11.3	4990.3	12.7	5044.6	20

Manning's n values			num=	3
Sta	n Val	Sta	n Val	Sta
0	.02	1794.9	.02	4186

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1794.9	4186	237.71	87	120.29	.1	.3
Ineffective Flow	num=	1				
Sta L	Sta R	Elev	Permanent			
0	1794.9	10	T			

CROSS SECTION OUTPUT Profile #07AUG2011 1000

3300010.rep

E.G. Elev (ft)	17.70	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.69	Reach Len. (ft)	237.71	87.00
120.29				
Crit W.S. (ft)		Flow Area (sq ft)	13802.37	55554.23
9616.06				
E.G. slope (ft/ft)	0.000001	Area (sq ft)	26255.34	55554.23
9616.06				
Q Total (cfs)	44021.81	Flow (cfs)	4248.60	35901.98
3871.23				
Top width (ft)	5027.42	Top width (ft)	1794.90	2391.10
841.42				
Vel Total (ft/s)	0.56	Avg. Vel. (ft/s)	0.31	0.65
0.40				
Max Chl Dpth (ft)	25.99	Hydr. Depth (ft)	7.69	23.23
11.43				
Conv. Total (cfs)	41205640.0	Conv. (cfs)	3976807.0	
33605250.0 3623580.0				
Length Wtd. (ft)	103.46	wetted Per. (ft)	1807.30	2391.28
841.85				
Min Ch El (ft)	-8.30	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.17	Stream Power (lb/ft s)	5044.60	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	449.63	403.61
44.78				
C & E Loss (ft)		Cum SA (acres)	30.31	17.56
4.31				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 1.28571*

INPUT

Description:

Station	Elevation	Data	num=	20
Sta	Elev	Sta	Elev	Sta
0	4.9	555.1	4.1	888.4
1428.2	1.8	1549.4	1.3	1832.6
2686.7	-7.9	4231.7	-4.3	4456.3
4929.3	6.9	5089	11.2	5163.4

Manning's n Values	num=	3
Sta	n Val	Sta
0	.02	1832.6
		4583
		.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1832.6	4583	237.71	87	120.29	.1	.3	
Ineffective Flow	num=	1					
Sta L	Sta R	Elev	Permanent				
0	1832.6	10	T				

CROSS SECTION OUTPUT Profile #07AUG2011 1000
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E.G. Elev (ft)	17.69	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.69	Reach Len. (ft)	237.71	87.00
120.29				
Crit W.S. (ft)		Flow Area (sq ft)	14092.49	63559.74
6558.56				
E.G. slope (ft/ft)	0.000001	Area (sq ft)	27056.87	63559.74
6558.56				
Q Total (cfs)	43273.88	Flow (cfs)	3930.91	37090.46
2252.51				
Top width (ft)	5211.25	Top width (ft)	1832.60	2750.40
628.25				
Vel Total (ft/s)	0.51	Avg. Vel. (ft/s)	0.28	0.58
0.34				
Max Chl Dpth (ft)	25.59	Hydr. Depth (ft)	7.69	23.11
10.44				
Conv. Total (cfs)	44697620.0	Conv. (cfs)	4060238.0	
38310760.0 2326620.0				
Length wtd. (ft)	101.66	wetted Per. (ft)	1845.40	2750.57
628.61				
Min Ch El (ft)	-7.90	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.16	Stream Power (lb/ft s)	5228.70	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	304.16	284.66
22.45				
C & E Loss (ft)		Cum SA (acres)	20.41	12.42
2.29				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 1.14285*

INPUT

Description:

Station	Elevation	Data	num=	20						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	4.4	566.5	3.8	906.7	3	937.4	3	1201.4	2.4	
1457.6	1.9	1581.3	1.3	1870.3	0	1950.9	-2.1	2049.8	-4.1	
2804.9	-7.4	4577	-4.3	4834.6	-3.5	4980	1.9	5064	4	
5212.2	7.9	5319.2	13	5369.1	15.5	5385.5	16.6	5412.9	20	

Manning's n Values	num=	3
Sta	n Val	Sta
0	.02	1870.3
		4980
		.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1870.3	4980	237.71	87	120.29	.1	.3
Ineffective Flow	num=	1				
Sta L	Sta R	Elev	Permanent			
0	1870.3	10	T			

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	17.69	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.69	Reach Len. (ft)	237.71	87.00
120.29				
Crit W.S. (ft)		Flow Area (sq ft)	14382.53	71231.26
3956.03				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	27864.71	71231.26
3956.03				
Q Total (cfs)	42526.16	Flow (cfs)	3659.63	37698.79
1167.75				
Top Width (ft)	5394.28	Top Width (ft)	1870.30	3109.70
414.28				
Vel Total (ft/s)	0.47	Avg. Vel. (ft/s)	0.25	0.53
0.30				
Max Chl Dpth (ft)	25.09	Hydr. Depth (ft)	7.69	22.91
9.55				
Conv. Total (cfs)	48148710.0	Conv. (cfs)	4143483.0	
42683080.0				
1322140.0				
Length wtd. (ft)	100.26	Wetted Per. (ft)	1883.60	3109.86
414.65				
Min Ch El (ft)	-7.40	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.14	Stream Power (lb/ft s)	5412.90	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	154.31	150.05
7.93				
C & E Loss (ft)		Cum SA (acres)	10.31	6.57
0.85				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 1

INPUT

Description: Two Bridge Lengths Downstream

Station		Elevation Data		num=	10					
Sta	Elev	Sta	Elev		Sta	Elev	Sta	Elev	Sta	Elev
0	4	925	3		1487	2	1908	0	2103	-4
2923	-7	5213	-4		5377	2	5495	9	5597	20

Manning's n Values		num=	3	
Sta	n Val	Sta	n Val	Sta
0	.02	1908	.02	5377
				.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1908	5377	0	0	0	.1	.3	
Ineffective Flow	num=	1					
Sta L	Sta R	Elev	Permanent				
0	1908	10	T				

CROSS SECTION OUTPUT Profile #07AUG2011 1000

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E.G. Elev (ft)	17.69	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	17.69	Reach Len. (ft)		
Crit W.S. (ft)	-3.72	Flow Area (sq ft)	14672.52	79025.61
1788.54				
E.G. slope (ft/ft)	0.000001	Area (sq ft)	28689.02	79025.61
1788.54				
Q Total (cfs)	41778.89	Flow (cfs)	3397.25	37920.36
461.28				
Top width (ft)	5575.58	Top width (ft)	1908.00	3469.00
198.58				
Vel Total (ft/s)	0.44	Avg. Vel. (ft/s)	0.23	0.48
0.26				
Max Chl Dpth (ft)	24.69	Hydr. Depth (ft)	7.69	22.78
9.01				
Conv. Total (cfs)	51981240.0	Conv. (cfs)	4226848.0	
47180460.0 573927.8				
Length wtd. (ft)		wetted Per. (ft)	1921.70	3469.16
199.25				
Min Ch El (ft)	-7.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.12	Stream Power (lb/ft s)	5597.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River: Mill Neck Creek

Reach	River Sta.	n1	n2	n3
Mill Neck Creek	7	.02	.02	.02
Mill Neck Creek	6.85714*	.02	.02	.02
Mill Neck Creek	6.71428*	.02	.02	.02
Mill Neck Creek	6.57142*	.02	.02	.02
Mill Neck Creek	6.42857*	.02	.02	.02
Mill Neck Creek	6.28571*	.02	.02	.02
Mill Neck Creek	6.14285*	.02	.02	.02
Mill Neck Creek	6	.02	.02	.02
Mill Neck Creek	5.8*	.02	.02	.02
Mill Neck Creek	5.6*	.02	.02	.02
Mill Neck Creek	5.4*	.02	.02	.02
Mill Neck Creek	5.2*	.02	.02	.02
Mill Neck Creek	5	.02	.02	.02
Mill Neck Creek	4.8*	.02	.02	.02
Mill Neck Creek	4.6*	.02	.02	.02
Mill Neck Creek	4.4*	.02	.02	.02
Mill Neck Creek	4.2*	.02	.02	.02
Mill Neck Creek	4	.02	.02	.02
Mill Neck Creek	3.9	Bridge		
Mill Neck Creek	3.8	.02	.02	.02

3300010.rep

Mill Neck Creek	3	.02	.02	.02
Mill Neck Creek	2.66666*	.02	.02	.02
Mill Neck Creek	2.33333*	.02	.02	.02
Mill Neck Creek	2	.02	.02	.02
Mill Neck Creek	1.85714*	.02	.02	.02
Mill Neck Creek	1.71428*	.02	.02	.02
Mill Neck Creek	1.57142*	.02	.02	.02
Mill Neck Creek	1.42857*	.02	.02	.02
Mill Neck Creek	1.28571*	.02	.02	.02
Mill Neck Creek	1.14285*	.02	.02	.02
Mill Neck Creek	1	.02	.02	.02

SUMMARY OF REACH LENGTHS

River: Mill Neck Creek

Reach	River Sta.	Left	Channel	Right
Mill Neck Creek	7	135.71	100	110
Mill Neck Creek	6.85714*	135.71	100	110
Mill Neck Creek	6.71428*	135.71	100	110
Mill Neck Creek	6.57142*	135.71	100	110
Mill Neck Creek	6.42857*	135.71	100	110
Mill Neck Creek	6.28571*	135.71	100	110
Mill Neck Creek	6.14285*	135.71	100	110
Mill Neck Creek	6	127.2	99	46.8
Mill Neck Creek	5.8*	127.2	99	46.8
Mill Neck Creek	5.6*	127.2	99	46.8
Mill Neck Creek	5.4*	127.2	99	46.8
Mill Neck Creek	5.2*	127.2	99	46.8
Mill Neck Creek	5	97.2	83.4	106
Mill Neck Creek	4.8*	97.2	83.4	106
Mill Neck Creek	4.6*	97.2	83.4	106
Mill Neck Creek	4.4*	97.2	83.4	106
Mill Neck Creek	4.2*	97.2	83.4	106
Mill Neck Creek	4	45	45	45
Mill Neck Creek	3.9	Bridge		
Mill Neck Creek	3.8	475	55	45
Mill Neck Creek	3	235	83.33	473.33
Mill Neck Creek	2.66666*	235	83.33	473.33
Mill Neck Creek	2.33333*	235	83.33	473.33
Mill Neck Creek	2	237.71	87	120.29
Mill Neck Creek	1.85714*	237.71	87	120.29
Mill Neck Creek	1.71428*	237.71	87	120.29
Mill Neck Creek	1.57142*	237.71	87	120.29
Mill Neck Creek	1.42857*	237.71	87	120.29
Mill Neck Creek	1.28571*	237.71	87	120.29
Mill Neck Creek	1.14285*	237.71	87	120.29
Mill Neck Creek	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Mill Neck Creek

Reach	River Sta.	Contr.	Expan.
Mill Neck Creek	7	.1	.3

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Mill Neck Creek	6.85714*	.1	.3
Mill Neck Creek	6.71428*	.1	.3
Mill Neck Creek	6.57142*	.1	.3
Mill Neck Creek	6.42857*	.1	.3
Mill Neck Creek	6.28571*	.1	.3
Mill Neck Creek	6.14285*	.1	.3
Mill Neck Creek	6	.1	.3
Mill Neck Creek	5.8*	.1	.3
Mill Neck Creek	5.6*	.1	.3
Mill Neck Creek	5.4*	.1	.3
Mill Neck Creek	5.2*	.1	.3
Mill Neck Creek	5	.1	.3
Mill Neck Creek	4.8*	.1	.3
Mill Neck Creek	4.6*	.1	.3
Mill Neck Creek	4.4*	.1	.3
Mill Neck Creek	4.2*	.1	.3
Mill Neck Creek	4	.1	.3
Mill Neck Creek	3.9	Bridge	
Mill Neck Creek	3.8	.1	.3
Mill Neck Creek	3	.1	.3
Mill Neck Creek	2.66666*	.1	.3
Mill Neck Creek	2.33333*	.1	.3
Mill Neck Creek	2	.1	.3
Mill Neck Creek	1.85714*	.1	.3
Mill Neck Creek	1.71428*	.1	.3
Mill Neck Creek	1.57142*	.1	.3
Mill Neck Creek	1.42857*	.1	.3
Mill Neck Creek	1.28571*	.1	.3
Mill Neck Creek	1.14285*	.1	.3
Mill Neck Creek	1	.1	.3

Profile Output Table - Six XS Bridge

Reach W.S. Chnl	Frctn Loss	River Sta C & E Loss	Profile Top Width	E.G. Elev Q Left	W.S. Elev Q Channel	Crit Q Right	Vel
(ft)	(ft)	(ft)	(ft)	(cfs)	(ft) (cfs)	(ft) (cfs)	
(ft/s)							
Mill Neck Creek	4.2*		07AUG2011 1000	17.60	17.54		
0.00			2295.24 10142.17	35399.97	5331.18		2.34
Mill Neck Creek	4		07AUG2011 1000	17.60	17.54		
-0.99			2400.07 11142.95	31920.89	7567.18		
2.42							
Mill Neck Creek	3.9	BR U	07AUG2011 1000	17.76	17.60		
-0.48			2230.18 19085.50	31201.72	343.80		
3.30							
Mill Neck Creek	3.9	BR D	07AUG2011 1000	17.75	17.60		
-0.55			2228.98 19043.25	31248.97	338.79		
3.29							
Mill Neck Creek	3.8		07AUG2011 1000	17.71	17.68		
0.00			2403.44 20117.96	25195.72	5317.32		1.89
Mill Neck Creek	3		07AUG2011 1000	17.71	17.67		
0.00			2489.93 7461.98	39732.04	2910.55		1.75

3300010.rep

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U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X
XXXXXXXX XXXX      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      XXXXX

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PROJECT DATA

Project Title: 3300010
Project File : 3300010.prj
Run Date and Time: 1/12/2012 7:23:52 AM

Project in English units

Project Description:
August

PLAN DATA

Plan Title: WSLR
Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\3300010 West Shore Road
over Mill Neck Creek - Nassau\3300010.p04

Geometry Title: 3300010
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\3300010
West Shore Road over Mill Neck Creek - Nassau\3300010.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of: Cross Sections	=	30	Multiple Openings	=	0
Culverts	=	0	Inline Structures	=	0
Bridges	=	1	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

3300010.rep

GEOMETRY DATA

Geometry Title: 3300010

Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\3300010 west Shore Road over Mill Neck Creek - Nassau\3300010.g01

CROSS SECTION

RIVER: Mill Neck Creek

REACH: Mill Neck Creek RS: 7

INPUT

Description: Two bridge lengths upstream

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	11	70	10	151	9	238	8	325	6
413	4	477	2	539	1	791	-4	1525	-7
2460	-12	2610	-4	2669	1	2756	20		

Manning's n Values

num=

3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	539	.02	2669	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	539	2669		135.71	100		.1	.3

Ineffective Flow	num=	1
Sta L	Sta R	Elev
0	539	10

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.90	Reach Len. (ft)	135.71	100.00
110.00				
Crit W.S. (ft)		Flow Area (sq ft)	7457.10	65493.00
1165.80				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	9304.10	65493.00
1165.80				
Q Total (cfs)	-46548.40	Flow (cfs)	-2848.19	-43276.45
-423.76				
Top width (ft)	2756.00	Top width (ft)	539.00	2130.00
87.00				
Vel Total (ft/s)	-0.63	Avg. Vel. (ft/s)	-0.38	-0.66
-0.36				
Max Chl Dpth (ft)	35.90	Hydr. Depth (ft)	13.84	30.75
13.40				
Conv. Total (cfs)	51359750.0	Conv. (cfs)	3142585.0	
47749610.0 467559.9				
Length wtd. (ft)	102.19	wetted Per. (ft)	552.00	2130.49
92.95				
Min Ch El (ft)	-12.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.05	Stream Power (lb/ft s)	2756.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2458.36	2654.19

Page 2

1079.54
C & E Loss (ft)
59.61

Cum SA (acres)

129.69

90.12

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek

REACH: Mill Neck Creek RS: 6.85714*

INPUT

Description:

Station Elevation Data			num= 23								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	14.7	69.4	13.3	149.7	11.7	235.9	10.1	322.2	7.7		
409.4	5.2	472.8	3	534.3	1.6	774.2	-3.2	805.2	-3.4		
836.7	-3.5	1047.4	-4.7	1473	-6.5	1576.3	-7.1	1878.7	-8.5		
2363.1	-12.1	2445.1	-7.7	2538.5	-4	2554.9	-3	2574.8	-1.5		
2607.4	2.1	2675.7	19.5	2718.9	26.1						

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	534.3	.02	2607.4	.02

Bank Sta: Left Right		Lengths: Left Channel Right		Coeff Contr. Expan.	
534.3	2607.4	135.71	100	.1	.3

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
0 534.3 10 T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.90	Reach Len. (ft)	135.71	100.00
110.00				
Crit W.S. (ft)		Flow Area (sq ft)	6870.20	62696.49
958.01				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	8122.48	62696.49
958.01				
Q Total (cfs)	-46852.50	Flow (cfs)	-2686.30	-43853.95
-312.25				
Top Width (ft)	2704.49	Top width (ft)	534.30	2073.10
97.09				
Vel Total (ft/s)	-0.66	Avg. Vel. (ft/s)	-0.39	-0.70
-0.33				
Max Chl Dpth (ft)	36.00	Hydr. Depth (ft)	12.86	30.24
9.87				
Conv. Total (cfs)	48298940.0	Conv. (cfs)	2769228.0	
45207820.0 321892.3				
Length wtd. (ft)	101.98	Wetted Per. (ft)	543.67	2073.65
99.61				
Min Ch El (ft)	-12.10	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.06	Stream Power (lb/ft s)	2718.90	0.00

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0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2431.21	2507.04
1076.86				
C & E Loss (ft)		Cum SA (acres)	128.02	85.30
59.38				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 6.71428*

INPUT

Description:

Station	Elevation	Data	num=	23						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	18.4	68.8	16.5	148.4	14.4	233.8	12.2	319.3	9.3	
405.8	6.4	468.7	3.9	529.6	2.1	757.4	-2.4	786.8	-2.7	
816.8	-2.8	1016.8	-4.3	1421	-6	1519.1	-6.6	1806.2	-7.8	
2266.3	-12.3	2360.1	-7	2466.9	-4	2485.8	-3.1	2508.5	-1.5	
2545.9	3.3	2629.1	26.5	2681.7	32.3					

Manning's n Values	num=	3
Sta	n Val	Sta
0	.02	529.6
		2545.9
		.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
529.6	2545.9	135.71	100	110	.1	.3
Ineffective Flow	num=	1				
Sta L	Sta R	Elev	Permanent			
0	529.6	10	T			

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.90	Reach Len. (ft)	135.71	100.00
110.00				
Crit w.s. (ft)		Flow Area (sq ft)	6060.87	60056.32
760.78				
E.G. slope (ft/ft)	0.000001	Area (sq ft)	6985.43	60056.32
760.78				
Q Total (cfs)	-47149.80	Flow (cfs)	-2358.08	-44520.67
-271.05				
Top width (ft)	2619.77	Top width (ft)	529.60	2016.30
73.87				
Vel Total (ft/s)	-0.71	Avg. vel. (ft/s)	-0.39	-0.74
-0.36				
Max Chl Dpth (ft)	36.20	Hydr. Depth (ft)	11.44	29.79
10.30				
Conv. Total (cfs)	45395900.0	Conv. (cfs)	2270366.0	
42864570.0	260964.9			
Length wtd. (ft)	101.68	wetted Per. (ft)	535.35	2016.96
76.69				
Min Ch El (ft)	-12.30	Shear (lb/sq ft)	0.00	0.00
		Page 4		

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0.00				
Alpha	1.06	Stream Power (lb/ft s)	2681.70	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2407.68	2366.14
1074.69				
C & E Loss (ft)		Cum SA (acres)	126.36	80.60
59.16				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 6.57142*

INPUT

Description:

Station Elevation Data		num= 23							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	22.1	68.2	19.8	147	17.2	231.8	14.4	316.5	11
402.2	7.6	464.5	4.9	524.9	2.7	740.6	-1.7	768.4	-1.9
796.8	-2	986.3	-3.8	1369	-5.5	1461.9	-6	1733.8	-7
2169.4	-12.4	2275.1	-6.4	2395.4	-4	2416.6	-3.3	2442.2	-1.6
2484.3	4.4	2582.4	33.4	2644.6	38.4				

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	524.9	.02	2484.3	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
524.9	2484.3	135.71	100	110		.1	.3
Ineffective Flow	num= 1						
Sta L	Sta R	Elev	Permanent				
0	524.9	10	T				

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.90	Reach Len. (ft)	135.71	100.00
110.00				
Crit W.S. (ft)		Flow Area (sq ft)	5144.70	57377.19
642.93				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	5825.40	57377.19
642.93				
Q Total (cfs)	-47437.60	Flow (cfs)	-1951.08	-45249.62
-236.90				
Top width (ft)	2550.25	Top width (ft)	524.90	1959.40
65.95				
Vel Total (ft/s)	-0.75	Avg. Vel. (ft/s)	-0.38	-0.79
-0.37				
Max Chl Dpth (ft)	36.30	Hydr. Depth (ft)	9.80	29.28
9.75				
Conv. Total (cfs)	42446390.0	Conv. (cfs)	1745793.0	
40488620.0 211978.5				
Length Wtd. (ft)	101.39	Wetted Per. (ft)	527.06	1960.18

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68.77				
Min Ch El (ft)	-12.40	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.06	Stream Power (lb/ft s)	2644.60	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2387.72	2231.35
1072.92				
C & E Loss (ft)		Cum SA (acres)	124.72	76.04
58.98				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 6.42857*

INPUT

Description:

Station Elevation Data			num=	23					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	25.9	67.6	23.1	145.7	19.9	229.7	16.5	313.6	12.7
398.6	8.8	460.3	5.8	520.1	3.3	723.8	-.9	750.1	-1.2
776.9	-1.3	955.7	-3.4	1317	-5.1	1404.6	-5.5	1661.3	-6.3
2072.6	-12.6	2190.1	-5.8	2323.9	-4	2347.5	-3.5	2375.9	-1.7
2422.7	5.6	2535.8	40.3	2607.4	44.6				

Manning's n Values			num=	3
Sta	n Val	Sta	n Val	Sta
0	.02	520.1	.02	2422.7
				.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
520.1	2422.7	135.71	100	110	.1	.3	
Ineffective Flow		num=	1				
Sta L	Sta R	Elev	Permanent				
0	520.1	10	T				

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.90	Reach Len. (ft)	135.71	100.00
110.00				
Crit w.s. (ft)		Flow Area (sq ft)	4242.98	54909.09
545.49				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	4751.17	54909.09
545.49				
Q Total (cfs)	-47714.00	Flow (cfs)	-1629.22	-45879.08
-205.69				
Top width (ft)	2433.94	Top width (ft)	471.70	1902.60
59.63				
Vel Total (ft/s)	-0.80	Avg. Vel. (ft/s)	-0.38	-0.84
-0.38				
Max Chl Dpth (ft)	36.50	Hydr. Depth (ft)	9.00	28.86
9.15				
Conv. Total (cfs)	39905000.0	Conv. (cfs)	1362574.0	
		Page 6		

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38370390.0	172030.0			
Length Wtd. (ft)	101.29	Wetted Per. (ft)	472.15	1903.55
62.38				
Min Ch El (ft)	-12.60	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.06	Stream Power (lb/ft s)	2607.40	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2371.24	2102.46
1071.42				
C & E Loss (ft)		Cum SA (acres)	123.16	71.61
58.83				

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 6.28571*

INPUT

Description:

Station Elevation Data	num=	23							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
0 29.6 66.9 26.3 144.4 22.6 227.6 18.6 310.8 14.4									
394.9 10.1 456.1 6.8 515.4 3.9 707 -.1 731.7 -.5									
756.9 -.5 925.1 -2.9 1265 -4.6 1347.4 -5 1588.9 -5.5									
1975.7 -12.7 2105 -5.2 2252.3 -4 2278.3 -3.7 2309.6 -1.8									
2361.1 6.7 2489.2 47.2 2570.3 50.7									

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .02 515.4 .02 2361.1 .02		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
515.4 2361.1	135.71 100 110	.1	.3
Ineffective Flow	num= 1		
Sta L Sta R Elev Permanent			
0 515.4 10 F			

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.89	Reach Len. (ft)	135.71	100.00
110.00				
Crit W.S. (ft)		Flow Area (sq ft)	3930.92	52395.98
467.54				
E.G. slope (ft/ft)	0.000002	Area (sq ft)	3930.92	52395.98
467.54				
Q Total (cfs)	-47976.20	Flow (cfs)	-1709.32	-46087.14
-179.73				
Top width (ft)	2298.19	Top width (ft)	398.11	1845.70
54.38				
Vel Total (ft/s)	-0.84	Avg. Vel. (ft/s)	-0.43	-0.88
-0.38				
Max Chl Dpth (ft)	36.59	Hydr. Depth (ft)	9.87	28.39
8.60				
Conv. Total (cfs)	37695760.0	Conv. (cfs)	1343043.0	
36211500.0 141220.0				

Length wtd. (ft)	101.16	3300010.rep		
57.04		Wetted Per. (ft)	398.61	1846.81
Min Ch El (ft)	-12.70	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.05	Stream Power (lb/ft s)	2570.30	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2357.72	1979.29
1070.14				
C & E Loss (ft)		Cum SA (acres)	121.81	67.30
58.68				

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 6.14285*

INPUT

Description:

Station Elevation Data		num=	23						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	33.3	66.3	29.6	143.1	25.3	225.5	20.7	307.9	16
391.3	11.3	452	7.7	510.7	4.4	690.2	.7	713.4	.3
737	.2	894.6	-2.5	1212.9	-4.1	1290.2	-4.5	1516.4	-4.8
1878.9	-12.9	2020	-4.6	2180.8	-4	2209.2	-3.8	2243.3	-1.9
2299.6	7.9	2442.6	54.1	2533.1	56.9				

Manning's n Values		num=	3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	510.7	.02	2299.6	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
510.7	2299.6	135.71	100	110	.1	.3	
Ineffective Flow		num=	1				
Sta L	Sta R	Elev	Permanent				
0	510.7	10	T				

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.89	Reach Len. (ft)	135.71	100.00
110.00				
Crit W.S. (ft)		Flow Area (sq ft)	3046.66	50054.81
395.81				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	3323.13	50054.81
395.81				
Q Total (cfs)	-48224.30	Flow (cfs)	-1324.80	-46744.28
-155.22				
Top width (ft)	2180.78	Top width (ft)	342.38	1788.90
49.50				
Vel Total (ft/s)	-0.90	Avg. Vel. (ft/s)	-0.43	-0.93
-0.39				
Max Chl Dpth (ft)	36.79	Hydr. Depth (ft)	8.90	27.98
8.00				
Conv. Total (cfs)	35343570.0	Conv. (cfs)	970945.9	
34258860.0				
Length wtd. (ft)	100.97	Wetted Per. (ft)	342.94	1790.21
		Page 8		

3300010.rep

52.02				
Min Ch El (ft)	-12.90	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.05	Stream Power (lb/ft s)	2533.10	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2346.42	1861.69
1069.05				
C & E Loss (ft)		Cum SA (acres)	120.66	63.13
58.55				

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 6

INPUT

Description: One Bridge Length Upstream

Station Elevation Data		num= 14							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	37	506	5	695	1	717	1	864	-2
1233	-4	1444	-4	1782	-13	1935	-4	2140	-4
2177	-2	2238	9	2396	61	2496	63		

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	506	.02	2238	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
506	2238	127.2	99	46.8	.1	.3
Ineffective Flow num= 1						
Sta L	Sta R	Elev	Permanent			
0	506	10	T			

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.89	Reach Len. (ft)	127.20	99.00
46.80				
Crit W.S. (ft)		Flow Area (sq ft)	2623.69	47704.81
336.85				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	2821.35	47704.81
336.85				
Q Total (cfs)	-48459.00	Flow (cfs)	-1208.63	-47115.89
-134.48				
Top width (ft)	2075.95	Top width (ft)	298.71	1732.00
45.24				
Vel Total (ft/s)	-0.96	Avg. Vel. (ft/s)	-0.46	-0.99
-0.40				
Max Chl Dpth (ft)	36.89	Hydr. Depth (ft)	8.78	27.54
7.45				
Conv. Total (cfs)	33227160.0	Conv. (cfs)	828729.5	
32306220.0				
Length Wtd. (ft)	99.70	wetted Per. (ft)	299.30	1733.50
47.63				
Min Ch El (ft)	-13.00	Shear (lb/sq ft)	0.00	0.00
0.00				

Alpha	1.04	3300010.rep	Stream Power (lb/ft s)	2496.00	0.00
0.00					
Frctn Loss (ft)	0.00		Cum Volume (acre-ft)	2336.85	1749.48
1068.12					
C & E Loss (ft)			Cum SA (acres)	119.66	59.09
58.43					

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 5.8*

INPUT

Description:

Station Elevation Data	num=	25							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
0 31.4 107 26.6 303.7 17.8 338.4 16.1 387.3 13.8									
434.3 11.6 487.5 9.1 559.8 5.8 598.2 4.2 768.1 .1									
787.2 0 787.9 0 920 -2.6 1251.7 -4.9 1441.4 -5.2									
1745.2 -13 1886.7 -5.1 2076.2 -4.1 2105.9 -2.6 2110.4 -2.3									
2166.8 7.4 2301.4 42.9 2343.7 53.9 2380.6 55.3 2455.6 58.4									

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .02 598.2 .02 2166.8 .02		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
598.2 2166.8	127.2 99 46.8	.1	.3
Ineffective Flow	num= 1		
Sta L Sta R Elev Permanent			
0 598.2 10 T			

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.89	Reach Len. (ft)	127.20	99.00
46.80				
Crit W.S. (ft)		Flow Area (sq ft)	3867.17	44362.65
515.41				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	4252.15	44362.65
515.41				
Q Total (cfs)	-48670.80	Flow (cfs)	-1888.45	-46549.72
-232.63				
Top width (ft)	2061.71	Top width (ft)	430.60	1568.60
62.52				
Vel Total (ft/s)	-1.00	Avg. Vel. (ft/s)	-0.49	-1.05
-0.45				
Max Chl Dpth (ft)	36.89	Hydr. Depth (ft)	8.98	28.28
8.24				
Conv. Total (cfs)	31971830.0	Conv. (cfs)	1240522.0	
30578500.0 152811.5				
Length wtd. (ft)	100.05	Wetted Per. (ft)	431.05	1569.88
64.66				
Min Ch El (ft)	-13.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.07	Stream Power (lb/ft s)	2455.60	0.00

3300010.rep

0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2326.52	1644.86
1067.66				
C & E Loss (ft)		Cum SA (acres)	118.59	55.34
58.37				

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 5.6*

INPUT

Description:

Station Elevation Data	num=	25							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
0 25.8 123.5 22 350.6 14.9 390.5 13.3 446.9 11.4									
501.2 9.5 562.6 7.4 646.1 4.6 690.4 3.4 841.2 -.8									
858.2 -1 858.7 -1 976 -3.3 1270.4 -5.7 1438.7 -6.5									
1708.4 -13 1838.3 -6.2 2012.4 -4.3 2039.7 -3 2043.8 -2.7									
2095.6 5.8 2244.5 37.1 2291.3 46.7 2332.2 49 2415.2 53.8									

Manning's n Values	num=	3		
Sta n Val Sta n Val Sta n Val				
0 .02 690.4 .02 2095.6 .02				

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
690.4 2095.6	127.2 99 46.8	.1	.3
Ineffective Flow	num= 1		
Sta L Sta R Elev Permanent	T		
0 690.4 10			

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.89	Reach Len. (ft)	127.20	99.00
46.80				
Crit W.S. (ft)		Flow Area (sq ft)	5687.13	40810.77
778.11				
E.G. slope (ft/ft)	0.000003	Area (sq ft)	6385.68	40810.77
778.11				
Q Total (cfs)	-48882.70	Flow (cfs)	-2919.83	-45569.23
-393.64				
Top width (ft)	2119.46	Top width (ft)	628.22	1405.20
86.04				
Vel Total (ft/s)	-1.03	Avg. Vel. (ft/s)	-0.51	-1.12
-0.51				
Max Chl Dpth (ft)	36.89	Hydr. Depth (ft)	9.05	29.04
9.04				
Conv. Total (cfs)	30715370.0	Conv. (cfs)	1834669.0	
28633350.0 247344.5				
Length wtd. (ft)	100.72	wetted Per. (ft)	628.56	1406.30
87.92				
Min Ch El (ft)	-13.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.10	Stream Power (lb/ft s)	2415.20	0.00
0.00				

Frctn Loss (ft)	0.00	3300010.rep		
1066.97		Cum Volume (acre-ft)	2310.99	1548.07
C & E Loss (ft)		Cum SA (acres)	117.05	51.96
58.29				

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 5.4*

INPUT

Description:

Station	Elevation	Data	num=	25						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	20.2	140	17.3	397.4	11.9	442.7	10.6	506.6	8.9	
568.1	7.3	637.7	5.6	732.4	3.4	782.6	2.6	914.3	-1.7	
929.1	-2	929.6	-2	1032	-3.9	1289.1	-6.6	1436.1	-7.7	
1671.6	-13	1790	-7.3	1948.6	-4.4	1973.5	-3.3	1977.2	-3	
2024.4	4.2	2187.7	31.4	2239	39.6	2283.8	42.7	2374.8	49.2	

Manning's n	Values	num=	3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	782.6	.02	2024.4	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	782.6	2024.4		127.2	99	46.8	.1	.3
Ineffective Flow	num=	1						
Sta L	Sta R	Elev	Permanent					
0	782.6	10	T					

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.89	Reach Len. (ft)	127.20	99.00
46.80				
Crit W.S. (ft)		Flow Area (sq ft)	8394.39	36979.28
1163.27				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	9653.31	36979.28
1163.27				
Q Total (cfs)	-49096.20	Flow (cfs)	-4981.16	-43466.98
-648.05				
Top width (ft)	2142.59	Top width (ft)	782.60	1241.80
118.19				
Vel Total (ft/s)	-1.05	Avg. Vel. (ft/s)	-0.59	-1.18
-0.56				
Max Chl Dpth (ft)	36.89	Hydr. Depth (ft)	10.73	29.78
9.84				
Conv. Total (cfs)	29799110.0	Conv. (cfs)	3023335.0	
26382440.0				
Length wtd. (ft)	101.75	Wetted Per. (ft)	786.49	1242.72
119.81				
Min Ch El (ft)	-13.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.13	Stream Power (lb/ft s)	2374.80	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2287.57	1459.67
		Page 12		

1065.93
C & E Loss (ft)
58.18

Cum SA (acres)

114.99

48.95

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek

REACH: Mill Neck Creek RS: 5.2*

INPUT

Description:

Station Elevation Data			num= 25								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	14.6	156.5	12.7	444.2	9	494.8	7.8	566.3	6.5		
635.1	5.2	712.9	3.8	818.7	2.2	874.8	1.8	987.4	-2.6		
1000.1	-3	1000.5	-3	1088	-4.6	1307.8	-7.5	1433.5	-8.9		
1634.8	-13	1741.6	-8.4	1884.8	-4.6	1907.2	-3.7	1910.6	-3.3		
1953.2	2.6	2130.8	25.7	2186.6	32.5	2235.4	36.3	2334.4	44.6		

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	874.8	.02	1953.2	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	874.8	1953.2		127.2	99	46.8	.1	.3

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
0 874.8 10 T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.88	Reach Len. (ft)	127.20	99.00
46.80				
Crit W.S. (ft)		Flow Area (sq ft)	11291.71	32929.68
1741.56				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	13518.14	32929.68
1741.56				
Q Total (cfs)	-49307.40	Flow (cfs)	-7767.46	-40484.96
-1054.98				
Top width (ft)	2116.84	Top width (ft)	874.80	1078.40
163.64				
Vel Total (ft/s)	-1.07	Avg. Vel. (ft/s)	-0.69	-1.23
-0.61				
Max Chl Dpth (ft)	36.88	Hydr. Depth (ft)	12.91	30.54
10.64				
Conv. Total (cfs)	29096140.0	Conv. (cfs)	4583556.0	
23890040.0 622537.9				
Length wtd. (ft)	102.63	Wetted Per. (ft)	884.18	1079.17
165.02				
Min Ch El (ft)	-13.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.15	Stream Power (lb/ft s)	2334.40	0.00

0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2253.74	1380.23
1064.37				
C & E Loss (ft)		Cum SA (acres)	112.57	46.32
58.03				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 5

INPUT

Description: Half Bridge Length Upstream

Station	Elevation	Data	num=	16							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9	173	8	491	6	547	5	626	4		
702	3	788	2	905	1	967	1	1071	-4		
1598	-13	1841	-4	1882	1	2074	20	2187	30		
2294	40										

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.02	967	.02
		1882	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	967	1882		97.2	83.4	106	.1
Ineffective Flow			num=	1			.3
Sta L	Sta R	Elev	Permanent				
0	967	10	T				

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.88	Reach Len. (ft)	97.20	83.40
106.00				
Crit w.s. (ft)		Flow Area (sq ft)	13424.80	28615.39
2654.71				
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	18016.30	28615.39
2654.71				
Q Total (cfs)	-49515.60	Flow (cfs)	-10163.67	-37592.12
-1759.82				
Top width (ft)	2117.88	Top width (ft)	967.00	915.00
235.88				
Vel Total (ft/s)	-1.11	Avg. Vel. (ft/s)	-0.76	-1.31
-0.66				
Max Chl Dpth (ft)	36.88	Hydr. Depth (ft)	13.88	31.27
11.25				
Conv. Total (cfs)	27783360.0	Conv. (cfs)	5702865.0	
21093060.0				
Length Wtd. (ft)	87.35	Wetted Per. (ft)	981.92	915.67
236.99				
Min Ch El (ft)	-13.00	Shear (lb/sq ft)	0.00	0.01
0.00				

Alpha	1.18	3300010.rep	Stream Power (lb/ft s)	2294.00	0.00
0.00					
Frctn Loss (ft)	0.00		Cum Volume (acre-ft)	2207.70	1310.29
1062.00					
C & E Loss (ft)			Cum SA (acres)	109.88	44.05
57.82					

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 4.8*

INPUT

Description:

Station Elevation Data			num=	35							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.8	187.1	8	254.5	7.7	359.8	7	476.7	6.3		
530.9	5.8	591.5	4.8	603.5	4.7	676.9	3.9	759.1	3		
765.7	2.9	852.1	2.1	978.6	1.1	1045.6	1	1071.8	-.3		
1141.2	-3.7	1164.1	-4.1	1210.3	-5.2	1256.4	-6.2	1302.6	-7		
1348.8	-7.7	1395	-8.6	1441.1	-9.3	1487.3	-10.4	1544.2	-11.2		
1625.8	-13.4	1715	-9.5	1780.1	-7	1831.6	-4.9	1845.9	-4.3		
1883	0	2090	17.5	2157.4	22.6	2211.8	26.8	2327.2	36		

Manning's n Values			num=	3							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1045.6	.02	1883	.02						

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1045.6	1883		97.2	83.4	106	.1	.3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 0 1045.6 10 T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.88	Reach Len. (ft)	97.20	83.40
106.00				
Crit W.S. (ft)		Flow Area (sq ft)	14514.89	26212.50
3401.21				
E.G. slope (ft/ft)	0.000003	Area (sq ft)	19505.30	26212.50
3401.21				
Q Total (cfs)	-49729.90	Flow (cfs)	-11447.78	-35872.68
-2409.43				
Top width (ft)	2174.00	Top width (ft)	1045.60	837.40
291.00				
Vel Total (ft/s)	-1.13	Avg. Vel. (ft/s)	-0.79	-1.37
-0.71				
Max Chl Dpth (ft)	37.28	Hydr. Depth (ft)	13.88	31.30
11.69				
Conv. Total (cfs)	26801020.0	Conv. (cfs)	6169574.0	
19332930.0 1298519.0				

Length wtd. (ft)	88.05	3300010.rep		
291.98		Wetted Per. (ft)	1060.72	838.05
Min Ch El (ft)	-13.40	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.20	Stream Power (lb/ft s)	2327.20	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2165.83	1257.81
1054.64				
C & E Loss (ft)		Cum SA (acres)	107.63	42.37
57.18				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 4.6*

INPUT

Description:

Station Elevation Data		num=	35						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.6	201.1	8	273.6	7.8	386.9	7	512.5	6.2
570.8	5.7	635.9	4.7	648.9	4.5	727.8	3.8	816.1	3
823.3	3	916.1	2.2	1052.1	1.2	1124.2	1	1148.1	-.2
1211.5	-3.3	1232.3	-3.9	1274.5	-5.2	1316.6	-6.3	1358.7	-7
1400.8	-7.5	1443	-8.4	1485.1	-8.9	1527.2	-10.5	1579.2	-10.9
1653.6	-13.8	1733.5	-9.6	1791.8	-7.2	1837.9	-5.2	1850.7	-4.6
1884	-1	2106	14.9	2178.3	19.7	2236.7	23.6	2360.4	32

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
0	.02	1124.2	.02
		1884	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1124.2	1884	97.2	83.4	106		.1	.3
Ineffective Flow	num=	1					
Sta L	Sta R	Elev	Permanent				
0	1124.2	10	T				

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.88	Reach Len. (ft)	97.20	83.40
106.00				
Crit w.s. (ft)		Flow Area (sq ft)	15605.08	23789.96
4365.38				
E.G. slope (ft/ft)	0.000004	Area (sq ft)	20991.56	23789.96
4365.38				
Q Total (cfs)	-49952.50	Flow (cfs)	-12797.45	-33839.83
-3315.22				
Top width (ft)	2240.84	Top width (ft)	1124.20	759.80
356.84				
Vel Total (ft/s)	-1.14	Avg. Vel. (ft/s)	-0.82	-1.42
-0.76				

Max Chl Dpth (ft)	37.68	3300010.rep	Hydr. Depth (ft)	13.88	31.31
12.23					
Conv. Total (cfs)	25903740.0	Conv. (cfs)	6636342.0		
17548230.0 1719164.0					
Length Wtd. (ft)	88.89	Wetted Per. (ft)	1139.51	760.47	
357.71					
Min Ch El (ft)	-13.80	Shear (lb/sq ft)	0.00	0.01	
0.00					
Alpha	1.21	Stream Power (lb/ft s)	2360.40	0.00	
0.00					
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2120.65	1209.94	
1045.19					
C & E Loss (ft)		Cum SA (acres)	105.21	40.84	
56.39					

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 4.4*

INPUT

Description:

Station Elevation Data	num=	35							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
0 8.4 215.2 8 292.7 7.8 413.9 7 548.3 6.1									
610.7 5.5 680.4 4.5 694.3 4.3 778.6 3.7 873.2 3									
880.9 3 980.2 2.2 1125.7 1.3 1202.8 1 1224.4 -.1									
1281.7 -3 1300.6 -3.6 1338.6 -5.1 1376.7 -6.4 1414.8 -7									
1452.9 -7.3 1491 -8.3 1529.1 -8.6 1567.1 -10.5 1614.1 -10.6									
1681.4 -14.2 1752 -9.7 1803.6 -7.5 1844.3 -5.4 1855.6 -4.9									
1885 -2 2122 12.4 2199.2 16.8 2261.5 20.3 2393.6 28									

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .02 1202.8 .02 1885 .02		

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1202.8	1885	97.2	83.4	106	.1	.3	
Ineffective Flow	num=	1					
Sta L Sta R Elev Permanent							
0 1202.8 10 T							

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.88	Reach Len. (ft)	97.20	83.40
106.00				
Crit w.s. (ft)		Flow Area (sq ft)	16695.55	21366.81
5585.82				
E.G. slope (ft/ft)	0.000004	Area (sq ft)	22519.20	21366.81
5585.82				
Q Total (cfs)	-50185.00	Flow (cfs)	-14186.33	-31479.29
-4519.38				

Top width (ft)	2322.93	3300010.rep	Top width (ft)	1202.80	682.20
437.93					
Vel Total (ft/s)	-1.15	Avg. Vel. (ft/s)	-0.85	-1.47	
-0.81					
Max Chl Dpth (ft)	38.08	Hydr. Depth (ft)	13.88	31.32	
12.76					
Conv. Total (cfs)	25128420.0	Conv. (cfs)	7103317.0		
15762180.0 2262925.0					
Length wtd. (ft)	89.87	Wetted Per. (ft)	1218.31	682.92	
438.69					
Min Ch El (ft)	-14.20	Shear (lb/sq ft)	0.00	0.01	
0.00					
Alpha	1.23	Stream Power (lb/ft s)	2393.60	0.00	
0.00					
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2072.11	1166.71	
1033.08					
C & E Loss (ft)		Cum SA (acres)	102.62	39.46	
55.42					

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 4.2*

INPUT

Description:

Station Elevation Data			num=	35					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.2	229.2	8	311.9	7.9	441	7	584.2	6.1
650.6	5.3	724.8	4.4	739.6	4.2	829.5	3.6	930.2	3
938.4	3	1044.2	2.3	1199.2	1.4	1281.4	1	1300.7	-.1
1351.9	-2.6	1368.8	-3.3	1402.8	-5.1	1436.9	-6.4	1470.9	-7
1504.9	-7.2	1539	-8.1	1573	-8.3	1607.1	-10.5	1649.1	-10.3
1709.2	-14.6	1770.5	-9.9	1815.3	-7.7	1850.6	-5.7	1860.5	-5.2
1886	-3	2138	9.9	2220.1	13.9	2286.3	17.1	2426.8	24

Manning's n values			num=	3
Sta	n Val	Sta	n Val	Sta
0	.02	1281.4	.02	1886
				n Val
				.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1281.4	1886	97.2	83.4	106	.1	.3
Ineffective Flow		num=	1			
Sta L	Sta R	Elev	Permanent			
0	1281.4	10	T			

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.88	Reach Len. (ft)	97.20	83.40
106.00				
Crit W.S. (ft)		Flow Area (sq ft)	17786.59	18942.00
7155.01				

E.G. Slope (ft/ft)	0.000004	3300010.rep Area (sq ft)	24011.58	18942.00
7155.01 Q Total (cfs)	-50428.10	Flow (cfs)	-15567.26	-28732.95
-6127.89 Top width (ft)	2424.37	Top width (ft)	1281.40	604.60
538.37 Vel Total (ft/s)	-1.15	Avg. Vel. (ft/s)	-0.88	-1.52
-0.86 Max Chl Dpth (ft)	38.48	Hydr. Depth (ft)	13.88	31.33
13.29 Conv. Total (cfs)	24524270.0	Conv. (cfs)	7570692.0	
13973450.0 2980126.0 Length Wtd. (ft)	91.12	Wetted Per. (ft)	1297.11	605.42
539.04 Min Ch El (ft)	-14.60	Shear (lb/sq ft)	0.00	0.01
0.00 Alpha	1.24	Stream Power (lb/ft s)	2426.80	0.00
0.00 Frctn Loss (ft)	0.00	Cum volume (acre-ft)	2020.19	1128.12
1017.58 C & E Loss (ft)		Cum SA (acres)	99.84	38.23
54.23				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 4

INPUT

Description: Upstream Bridge Fascia

Station		Elevation Data		num=	24	Sta		Elev	Sta	Elev	Sta	Elev
Sta	Elev	Sta	Elev			Sta	Elev		Sta	Elev	Sta	Elev
0	8	331	8			468	7		620	6	785	4
996	3	1360	1			1377	0		1437	-3	1467	-5
1497	-6.5	1527	-7			1557	-7		1587	-8	1617	-8
1647	-10.5	1684	-10			1737	-15		1789	-10	1827	-8
1857	-6	1887	-4			2241	11		2460	20		

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
0	.02	1360	.02
		1887	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1360	1887		45	45	.1	.3
Ineffective Flow			num=	1			
Sta L	Sta R	Elev	Permanent	T			
0	1360	10					

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.90	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.88	Reach Len. (ft)	2.50	2.50
2.50				

		3300010.rep		
Crit w.s. (ft)		Flow Area (sq ft)	18877.29	16507.70
9049.95				
E.G. slope (ft/ft)	0.000004	Area (sq ft)	25522.29	16507.70
9049.95				
Q Total (cfs)	-50678.90	Flow (cfs)	-16680.40	-25259.38
-8739.11				
Top width (ft)	2460.00	Top width (ft)	1360.00	527.00
573.00				
Vel Total (ft/s)	-1.14	Avg. Vel. (ft/s)	-0.88	-1.53
-0.97				
Max Chl Dpth (ft)	38.88	Hydr. Depth (ft)	13.88	31.32
15.79				
Conv. Total (cfs)	24420760.0	Conv. (cfs)	8037823.0	
12171800.0 4211136.0				
Length wtd. (ft)	2.50	Wetted Per. (ft)	1375.91	528.00
577.38				
Min Ch El (ft)	-15.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.22	Stream Power (lb/ft s)	2460.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	1964.93	1094.19
997.86				
C & E Loss (ft)		Cum SA (acres)	96.90	37.15
52.88				

BRIDGE

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 3.9

INPUT

Description: West Shore Road over Mill Neck Creek Bridge
 West Shore Road over

Mill Neck Creek Bridge

Distance from Upstream XS = 2.5

Deck/Roadway width = 40

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num=	9													
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0	12.7	-20			1376.9	12.7	-20			1377	12.7	-20		
1557	16.3	11.3			1684	17.8	12.8			1827	17.8	12.8		
1887	16.8	11.8			1887.1	16.8	-20			2500	16.8	-20		

Upstream Bridge Cross Section Data

Station	Elevation	Data	num=	24						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	8	331	8	468	7	620	6	785	4	
996	3	1360	1	1377	0	1437	-3	1467	-5	
1497	-6.5	1527	-7	1557	-7	1587	-8	1617	-8	
1647	-10.5	1684	-10	1737	-15	1789	-10	1827	-8	
1857	-6	1887	-4	2241	11	2460	20			

Manning's n Values

num=	3			
Sta	n Val	Sta	n Val	Sta
0	.02	1360	.02	1887
				.02

Bank Sta: Left Right Coeff Contr. Expan.
 1360 1887 .1 .3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	1360	10	T

Downstream Deck/Roadway Coordinates

num=	9												
Sta Hi	Cord	Lo	Cord	Sta Hi	Cord	Lo	Cord	Sta Hi	Cord	Lo	Cord		
0	12.7		-20	1376.9	12.7		-20	1377	12.7		7.7		
1557	16.3		11.3	1684	17.8		12.8	1827	17.8		12.8		
1887	16.8		11.8	1887.1	16.8		-20	2500	16.8		-20		

Downstream Bridge Cross Section Data

Station	Elevation	Data	num=	24						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	8	331	8	468	7	620	6	785	4	
996	3	1360	1	1377	0	1437	-3	1467	-4.5	
1497	-6	1527	-6.5	1557	-7	1587	-8	1617	-7	
1647	-9.5	1684	-17	1737	-14	1789	-10	1827	-8	
1857	-6	1887	-2	2241	11	2460	20			

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1360	.02	1887	.02

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	1360	1887	.1		.3

Upstream Embankment side slope	=	0 horiz. to 1.0 vertical
Downstream Embankment side slope	=	0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow	=	.98
Elevation at which weir flow begins	=	
Energy head used in spillway design	=	
Spillway height used in design	=	
Weir crest shape	=	Broad Crested

Number of Piers = 7

Pier Data

Pier Station	Upstream=	1437	Downstream=	1437

Upstream	num=	2		
width	Elev	width	Elev	
5	-20	5	12.7	
Downstream	num=	2		
width	Elev	width	Elev	
5	-20	5	12.7	

Pier Data

Pier Station	Upstream=	1497	Downstream=	1497

Upstream	num=	2		
width	Elev	width	Elev	
5	-20	5	12.7	
Downstream	num=	2		
width	Elev	width	Elev	
5	-20	5	12.7	

Pier Data

Pier Station	Upstream=	1557	Downstream=	1557

Upstream	num=	2		
width	Elev	width	Elev	
5	-20	5	12.7	
Downstream	num=	2		
width	Elev	width	Elev	
5	-20	5	12.7	

Pier Data
 Pier Station Upstream= 1684 Downstream= 1684
 Upstream num= 2
 width Elev width Elev
 5 -20 5 12.7
 Downstream num= 2
 width Elev width Elev
 5 -20 5 12.7

Pier Data
 Pier Station Upstream= 1684 Downstream= 1684
 Upstream num= 2
 width Elev width Elev
 15 -20 15 12.7
 Downstream num= 2
 width Elev width Elev
 15 -20 15 12.7

Pier Data
 Pier Station Upstream= 1789 Downstream= 1789
 Upstream num= 2
 width Elev width Elev
 15 -20 15 12.7
 Downstream num= 2
 width Elev width Elev
 15 -20 15 12.7

Pier Data
 Pier Station Upstream= 1857 Downstream= 1857
 Upstream num= 2
 width Elev width Elev
 5 -20 5 12.7
 Downstream num= 2
 width Elev width Elev
 5 -20 5 12.7

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add weight component to Momentum

Class B flow critical depth computations use critical depth

inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #07AUG2011 1000

E.G. US. (ft)	23.90	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	23.88	E.G. Elev (ft)	24.40
Q Total (cfs)	-50678.90	W.S. Elev (ft)	23.88
Q Bridge (cfs)		Crit W.S. (ft)	

3300010.rep

Q Weir (cfs)		Max Chl Dpth (ft)	38.88
Weir Sta Lft (ft)		Vel Total (ft/s)	-5.81
Weir Sta Rgt (ft)		Flow Area (sq ft)	8729.72
Weir Submerg		Froude # Chl	-0.16
0.00 Weir Max Depth (ft)		Specif Force (cu ft)	203852.80
Min El Weir Flow (ft)	12.71	Hydr Depth (ft)	
Min El Prs (ft)	12.80	W.P. Total (ft)	1226.65
Delta EG (ft)		Conv. Total (cfs)	2420390.0
Delta WS (ft)	40.85	Top width (ft)	
BR Open Area (sq ft)		Frctn Loss (ft)	
BR Open Vel (ft/s)		C & E Loss (ft)	
Coef of Q		Shear Total (lb/sq ft)	0.19
Br Sel Method	Energy/weir	Power Total (lb/ft s)	0.00
0.00			

Note: The post processor is unable to handle negative flow through a bridge at this time. The water surfaces inside the bridge are based on projecting the outside water surface.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

Warning: There is no flow in the channel. Check that the channel stations are correctly coded. To force flow into the channel, a

levee or ineffective flow may have to be added or the Manning's n of the overbank could be increased.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

CROSS SECTION

RIVER: Mill Neck Creek

REACH: Mill Neck Creek RS: 3.8

INPUT

Description: Downstream Bridge Fascia

Station	Elevation	Data	num=	24						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	8	331	8	468	7	620	6	785	4	
996	3	1360	1	1377	0	1437	-3	1467	-4.5	
1497	-6	1527	-6.5	1557	-7	1587	-8	1617	-7	
1647	-9.5	1684	-17	1737	-14	1789	-10	1827	-8	
1857	-6	1887	-2	2241	11	2460	20			

Manning's n Values		num=	3
Sta	n Val	Sta	n Val

3300010.rep
 0 .02 1360 .02 1887 .02
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 1360 1887 475 55 45 .1 .3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	305436700000.00	Element		Left OB
Channel Right OB				
Vel Head (ft)	305436700000.00	Wt. n-Val.		
0.020				
W.S. Elev (ft)	-16.97	Reach Len. (ft)	475.00	55.00
45.00				
Crit W.S. (ft)	-1.40	Flow Area (sq ft)		0.01
E.G. Slope (ft/ft)	897986700000.000000	Area (sq ft)		
0.01				
Q Total (cfs)	-50678.90	Flow (cfs)		-50678.90
Top width (ft)	0.72	Top width (ft)		0.72
Vel Total (ft/s)	-4435102.00	Avg. Vel. (ft/s)		
-4435102.00				
Max Chl Dpth (ft)	0.03	Hydr. Depth (ft)		0.02
Conv. Total (cfs)	0.1	Conv. (cfs)		0.1
Length wtd. (ft)	103.49	wetted Per. (ft)		0.72
Min Ch El (ft)	-17.00	Shear (lb/sq ft)		
886377100000.00				
Alpha	1.00	Stream Power (lb/ft s)	2460.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1964.20	1093.46
997.60				
C & E Loss (ft)		Cum SA (acres)	96.86	37.13
52.87				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 3

INPUT

Description: Half Bridge Length Downstream

Station	Elevation	Data	num=	14
Sta	Elev	Sta	Elev	Sta
0	8	504	7	626
975	3	1160	1	1309
2153	0	2250	5	2358
				6
				772
				1457
				2530
				5
				876
				1813
				4
				-4
				-13
				20

3300010.rep

Manning's n values
 Sta n Val Sta num= 3
 0 .02 1160 .02 2153 .02

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 1160 2153 235 83.33 473.33 .1 .3
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 0 1160 10 T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.90	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.88	Reach Len. (ft)	235.00	83.33
473.33				
Crit W.S. (ft)		Flow Area (sq ft)	16105.18	28904.09
5371.69				
E.G. slope (ft/ft)	0.000003	Area (sq ft)	21144.68	28904.09
5371.69				
Q Total (cfs)	-50914.40	Flow (cfs)	-11825.39	-35070.73
-4018.27				
Top width (ft)	2530.00	Top width (ft)	1160.00	993.00
377.00				
Vel Total (ft/s)	-1.01	Avg. Vel. (ft/s)	-0.73	-1.21
-0.75				
Max Chl Dpth (ft)	36.88	Hydr. Depth (ft)	13.88	29.11
14.25				
Conv. Total (cfs)	29490550.0	Conv. (cfs)	6849485.0	
20313610.0 2327456.0				
Length wtd. (ft)	170.67	wetted Per. (ft)	1175.91	993.49
381.42				
Min Ch El (ft)	-13.00	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.16	Stream Power (lb/ft s)	2530.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1848.91	1075.22
994.82				
C & E Loss (ft)		Cum SA (acres)	90.53	36.51
52.67				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 2.66666*

INPUT

Description:

Station	Elevation	Data	num=	24	Sta	Elev	Sta	Elev	Sta	Elev
0	7.7	400.3	6.9	574.1	6	662.3	5.2	713.1	4.9	
848.7	4.1	879.4	4	997.8	3.1	1110.6	2.3	1117.2	2.3	
1321.3	.7	1351.4	-1.2	1496.3	-4.9	1670	-12	1992.9	-4.7	

3300010.rep
 2184.4 -2.3 2301.3 .3 2460.8 2.8 2512.7 3.7 2747.9 7.2
 2945 10.8 3039.6 12.9 3070.8 14.1 3122.7 20
 Manning's n values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .02 1321.3 .02 2301.3 .02
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 1321.3 2301.3 235 83.33 473.33 .1 .3
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 0 1321.3 10 T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.90	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.89	Reach Len. (ft)	235.00	83.33
473.33				
Crit w.s. (ft)		Flow Area (sq ft)	18353.16	28813.02
13724.69				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	24991.76	28813.02
13724.69				
Q Total (cfs)	-51694.40	Flow (cfs)	-11595.13	-30246.49
-9852.78				
Top width (ft)	3122.70	Top width (ft)	1321.30	980.00
821.40				
Vel Total (ft/s)	-0.85	Avg. vel. (ft/s)	-0.63	-1.05
-0.72				
Max Chl Dpth (ft)	35.89	Hydr. Depth (ft)	13.89	29.40
16.71				
Conv. Total (cfs)	34843290.0	Conv. (cfs)	7815403.0	
20386880.0 6641015.0				
Length Wtd. (ft)	212.94	Wetted Per. (ft)	1337.51	980.38
825.76				
Min Ch El (ft)	-12.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.16	Stream Power (lb/ft s)	3122.70	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	1724.46	1020.01
891.07				
C & E Loss (ft)		Cum SA (acres)	83.84	34.62
46.16				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 2.33333*

INPUT

Description:

Station	Elevation	Data	num=	24						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	7.3	449.1	6.4	644.2	5	743.1	4.1	800.1	3.8	

3300010.rep

952.4	3.1	986.7	2.9	1119.7	2.3	1246.2	1.7	1253.6	1.6
1482.7	.3	1517.2	-2.6	1683.5	-5.8	1883	-11	2172.8	-5.5
2344.7	-3.2	2449.7	.7	2695.4	1.9	2775.3	2.4	3137.9	4.4
3441.5	6.4	3587.3	7.9	3635.4	9.5	3715.3	20		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1482.7	.02	2449.7	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1482.7	2449.7		235 83.33	473.33		.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	1482.7	10	T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.90	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.89	Reach Len. (ft)	235.00	83.33
473.33				
Crit W.S. (ft)		Flow Area (sq ft)	20601.40	28789.80
24237.96				
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	29107.86	28789.80
24237.96				
Q Total (cfs)	-52703.80	Flow (cfs)	-10971.16	-25666.02
-16066.62				
Top width (ft)	3715.30	Top width (ft)	1482.70	967.00
1265.60				
Vel Total (ft/s)	-0.72	Avg. Vel. (ft/s)	-0.53	-0.89
-0.66				
Max Chl Dpth (ft)	34.89	Hydr. Depth (ft)	13.89	29.77
19.15				
Conv. Total (cfs)	42181380.0	Conv. (cfs)	8780745.0	
20541750.0 12858880.0				
Length wtd. (ft)	253.18	Wetted Per. (ft)	1499.32	967.36
1270.23				
Min Ch El (ft)	-11.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.13	Stream Power (lb/ft s)	3715.30	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1578.53	964.91
684.82				
C & E Loss (ft)		Cum SA (acres)	76.28	32.76
34.82				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 2

INPUT

Description: One Bridge Length Upstream
 Station Elevation Data num= 15

3300010.rep

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	498	6	824	3	1056	2	1390	1
1644	0	1683	-4	2096	-10	2505	-4	2598	1
2930	1	3938	2	4135	3	4200	5	4308	20

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1644	.02	2598	.02

Bank Sta: Left Right Lengths: Left Channel Right

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
1644	2598	237.71	87	120.29	.1	.3	

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	1644	10	T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.90	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.90	Reach Len. (ft)	237.71	87.00
120.29				
Crit W.S. (ft)		Flow Area (sq ft)	22847.47	28769.71
36918.21				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	33375.47	28769.71
36918.21				
Q Total (cfs)	-53940.60	Flow (cfs)	-10172.83	-21610.97
-22156.80				
Top width (ft)	4308.00	Top width (ft)	1644.00	954.00
1710.00				
Vel Total (ft/s)	-0.61	Avg. Vel. (ft/s)	-0.45	-0.75
-0.60				
Max Chl Dpth (ft)	33.90	Hydr. Depth (ft)	13.90	30.16
21.59				
Conv. Total (cfs)	51673850.0	Conv. (cfs)	9745335.0	
20702810.0 21225710.0				
Length wtd. (ft)	126.77	Wetted Per. (ft)	1660.92	954.43
1714.97				
Min Ch El (ft)	-10.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.11	Stream Power (lb/ft s)	4308.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1409.99	909.86
352.55				
C & E Loss (ft)		Cum SA (acres)	67.84	30.92
18.65				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 1.85714*

INPUT

Description:
 Station Elevation Data num= 20

3300010.rep

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6.6	509.4	5.6	815.3	3.2	842.9	3	1080.2	2.1
1310.6	1.4	1421.9	1.1	1681.7	0	1727.7	-3.7	1784	-4.6
2214.1	-9.6	2850.3	-4.1	2942.8	-1.3	2995	1.1	3285.7	1.5
3798	2.6	4168.2	3.8	4340.7	5.1	4397.6	6.9	4492.1	20

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1681.7	.02	2995	.02

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
1681.7	2995	237.71	87	120.29	.1	.3	

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	1681.7	10	T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.90	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.90	Reach Len. (ft)	237.71	87.00
120.29				
Crit w.s. (ft)		Flow Area (sq ft)	23372.05	39370.47
30784.69				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	34359.86	39370.47
30784.69				
Q Total (cfs)	-54669.10	Flow (cfs)	-9851.52	-27889.94
-16927.64				
Top width (ft)	4492.10	Top width (ft)	1681.70	1313.30
1497.10				
Vel Total (ft/s)	-0.58	Avg. vel. (ft/s)	-0.42	-0.71
-0.55				
Max Chl Dpth (ft)	33.50	Hydr. Depth (ft)	13.90	29.98
20.56				
Conv. Total (cfs)	55322330.0	Conv. (cfs)	9969233.0	
28223190.0 17129910.0				
Length Wtd. (ft)	122.49	Wetted Per. (ft)	1699.01	1313.61
1501.94				
Min Ch El (ft)	-9.60	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.12	Stream Power (lb/ft s)	4492.10	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1225.17	841.81
259.07				
C & E Loss (ft)		Cum SA (acres)	58.77	28.65
14.23				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 1.71428*

INPUT
 Description:

3300010.rep
 Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6.1	520.8	5.3	833.6	3.2	861.8	3	1104.5	2.1
1340	1.5	1453.8	1.1	1719.4	0	1772.3	-3.4	1837.2	-4.5
2332.3	-9.1	3195.7	-4.1	3321.2	-1.7	3392	1.3	3641.3	2
4080.8	3.7	4398.4	5.7	4546.4	7.2	4595.2	8.9	4676.3	20

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1719.4	.02	3392	.02

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 1719.4 3392 237.71 87 120.29 .1 .3
 Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	1719.4	10	T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.90	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.90	Reach Len. (ft)	237.71	87.00
120.29				
Crit W.S. (ft)		Flow Area (sq ft)	23896.70	49761.78
25016.58				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	35368.52	49761.78
25016.58				
Q Total (cfs)	-55397.40	Flow (cfs)	-9552.66	-33264.93
-12579.81				
Top width (ft)	4676.30	Top width (ft)	1719.40	1672.60
1284.30				
Vel Total (ft/s)	-0.56	Avg. Vel. (ft/s)	-0.40	-0.67
-0.50				
Max Chl Dpth (ft)	33.00	Hydr. Depth (ft)	13.90	29.75
19.48				
Conv. Total (cfs)	59109610.0	Conv. (cfs)	10192790.0	
35494030.0 13422790.0				
Length wtd. (ft)	118.82	wetted Per. (ft)	1737.21	1672.84
1289.00				
Min Ch El (ft)	-9.10	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.12	Stream Power (lb/ft s)	4676.30	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1034.91	752.80
182.02				
C & E Loss (ft)		Cum SA (acres)	49.49	25.67
10.39				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 1.57142*

INPUT

3300010.rep

Description:

Station Elevation Data			num= 20								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5.7	532.3	4.9	851.9	3.1	880.7	3	1128.7	2.2		
1369.4	1.6	1485.7	1.2	1757.1	0	1817	-3.1	1890.3	-4.4		
2450.4	-8.7	3541	-4.2	3699.5	-2.2	3789	1.4	3997	2.5		
4363.7	4.8	4628.6	7.5	4752	9.3	4792.8	10.8	4860.4	20		

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1757.1	.02	3789	.02

Bank Sta: Left		Right	Lengths: Left Channel		Right	Coeff	Contr.	Expan.
1757.1	3789	237.71	87	120.29	.1	.3		
Ineffective Flow num= 1								
Sta L	Sta R	Elev	Permanent T					
0	1757.1	10						

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.90	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.90	Reach Len. (ft)	237.71	87.00
120.29				
Crit w.s. (ft)		Flow Area (sq ft)	24421.32	60173.41
19744.18				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	36377.10	60173.41
19744.18				
Q Total (cfs)	-56125.60	Flow (cfs)	-9219.77	-37873.18
-9032.65				
Top width (ft)	4860.40	Top width (ft)	1757.10	2031.90
1071.40				
Vel Total (ft/s)	-0.54	Avg. Vel. (ft/s)	-0.38	-0.63
-0.46				
Max Chl Dpth (ft)	32.60	Hydr. Depth (ft)	13.90	29.61
18.43				
Conv. Total (cfs)	63412040.0	Conv. (cfs)	10416720.0	
42790020.0 10205300.0				
Length wtd. (ft)	115.67	Wetted Per. (ft)	1775.31	2032.10
1075.99				
Min Ch El (ft)	-8.70	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.12	Stream Power (lb/ft s)	4860.40	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	839.15	643.02
120.22				
C & E Loss (ft)		Cum SA (acres)	40.00	21.97
7.13				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 1.42857*

3300010.rep

INPUT

Description:

Station Elevation Data			num= 20								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5.3	543.7	4.5	870.1	3.1	899.6	3	1152.9	2.3		
1398.8	1.7	1517.5	1.2	1794.9	0	1861.6	-2.7	1943.5	-4.3		
2568.6	-8.3	3886.4	-4.2	4077.9	-2.6	4186	1.6	4352.7	3		
4646.5	5.8	4858.8	9.4	4957.7	11.3	4990.3	12.7	5044.6	20		

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1794.9	.02	4186	.02

Bank Sta: Left		Right	Lengths: Left Channel		Right	Coeff	Contr.	Expan.
1794.9	4186	237.71	87	120.29	.1	.3		
Ineffective Flow		num= 1						
Sta L	Sta R	Elev	Permanent					
0	1794.9	10	T					

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.90	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.90	Reach Len. (ft)	237.71	87.00
120.29				
Crit w.s. (ft)		Flow Area (sq ft)	24947.37	70401.20
14927.48				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	37400.35	70401.20
14927.48				
Q Total (cfs)	-56853.60	Flow (cfs)	-8906.26	-41739.48
-6207.86				
Top width (ft)	5044.60	Top width (ft)	1794.90	2391.10
858.60				
Vel Total (ft/s)	-0.52	Avg. vel. (ft/s)	-0.36	-0.59
-0.42				
Max Chl Dpth (ft)	32.20	Hydr. Depth (ft)	13.90	29.44
17.39				
Conv. Total (cfs)	67929140.0	Conv. (cfs)	10641270.0	
49870680.0 7417200.0				
Length Wtd. (ft)	113.00	Wetted Per. (ft)	1813.51	2391.28
863.09				
Min Ch El (ft)	-8.30	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.12	Stream Power (lb/ft s)	5044.60	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	637.85	512.62
72.35				
C & E Loss (ft)		Cum SA (acres)	30.31	17.56
4.47				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 1.28571*

INPUT

Description:

Station Elevation Data				num=	20				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4.9	555.1	4.1	888.4	3.1	918.5	3	1177.1	2.3
1428.2	1.8	1549.4	1.3	1832.6	0	1906.3	-2.4	1996.7	-4.2
2686.7	-7.9	4231.7	-4.3	4456.3	-3.1	4583	1.7	4708.4	3.5
4929.3	6.9	5089	11.2	5163.4	13.4	5187.9	14.6	5228.7	20

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1832.6	.02	4583	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1832.6	4583	237.71	87	120.29	.1	.3	
Ineffective Flow		num=	1				
Sta L	Sta R	Elev	Permanent				
0	1832.6	10	T				

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.90	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.90	Reach Len. (ft)	237.71	87.00
120.29				
Crit W.S. (ft)		Flow Area (sq ft)	25471.99	80638.30
10547.86				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	38436.37	80638.30
10547.86				
Q Total (cfs)	-57581.30	Flow (cfs)	-8587.98	-45023.55
-3969.78				
Top width (ft)	5228.70	Top width (ft)	1832.60	2750.40
645.70				
Vel Total (ft/s)	-0.49	Avg. Vel. (ft/s)	-0.34	-0.56
-0.38				
Max Chl Dpth (ft)	31.80	Hydr. Depth (ft)	13.90	29.32
16.34				
Conv. Total (cfs)	72849730.0	Conv. (cfs)	10865190.0	
56962120.0 5022415.0				
Length wtd. (ft)	110.77	Wetted Per. (ft)	1851.61	2750.57
650.11				
Min Ch El (ft)	-7.90	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.11	Stream Power (lb/ft s)	5228.70	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	430.92	361.79
37.17				
C & E Loss (ft)		Cum SA (acres)	20.41	12.42
2.39				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek

REACH: Mill Neck Creek RS: 1.14285* 3300010.rep

INPUT

Description:

Station	Elevation	Data	num=	20							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4.4	566.5	3.8	906.7	3	937.4	3	1201.4	2.4		
1457.6	1.9	1581.3	1.3	1870.3	0	1950.9	-2.1	2049.8	-4.1		
2804.9	-7.4	4577	-4.3	4834.6	-3.5	4980	1.9	5064	4		
5212.2	7.9	5319.2	13	5369.1	15.5	5385.5	16.6	5412.9	20		

Manning's n	Values	num=	3								
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1870.3	.02	4980	.02						

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1870.3	4980		237.71	87	120.29	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	1870.3	10	T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.90	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.90	Reach Len. (ft)	237.71	87.00
120.29				
Crit W.S. (ft)		Flow Area (sq ft)	25996.63	90541.72
6622.73				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	39478.80	90541.72
6622.73				
Q Total (cfs)	-58308.80	Flow (cfs)	-8314.59	-47735.85
-2258.36				
Top width (ft)	5412.90	Top width (ft)	1870.30	3109.70
432.90				
Vel Total (ft/s)	-0.47	Avg. Vel. (ft/s)	-0.32	-0.53
-0.34				
Max Chl Dpth (ft)	31.30	Hydr. Depth (ft)	13.90	29.12
15.30				
Conv. Total (cfs)	77763430.0	Conv. (cfs)	11088740.0	
63662830.0	3011863.0			
Length Wtd. (ft)	108.90	Wetted Per. (ft)	1889.81	3109.86
437.31				
Min Ch El (ft)	-7.40	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.10	Stream Power (lb/ft s)	5412.90	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	218.33	190.85
13.47				
C & E Loss (ft)		Cum SA (acres)	10.31	6.57
0.90				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Neck Creek
 REACH: Mill Neck Creek RS: 1

INPUT

Description: Two Bridge Lengths Downstream

Station		Elevation Data		num= 10		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4	925	3	1487	2	1908	0	2103	-4		
2923	-7	5213	-4	5377	2	5495	9	5597	20		

Manning's n Values		num= 3		n Val	
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	1908	.02	5377	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1908	5377		0	0	.1	.3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 0 1908 10 T

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	23.90	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	23.90	Reach Len. (ft)		
Crit w.s. (ft)	-3.26	Flow Area (sq ft)	26521.20	100568.10
3130.00				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	40537.70	100568.10
3130.00				
Q Total (cfs)	-59035.90	Flow (cfs)	-8030.07	-50050.18
-955.64				
Top width (ft)	5597.00	Top width (ft)	1908.00	3469.00
220.00				
Vel Total (ft/s)	-0.45	Avg. Vel. (ft/s)	-0.30	-0.50
-0.31				
Max Chl Dpth (ft)	30.90	Hydr. Depth (ft)	13.90	28.99
14.23				
Conv. Total (cfs)	83168720.0	Conv. (cfs)	11312620.0	
70509810.0 1346290.0				
Length wtd. (ft)		Wetted Per. (ft)	1927.91	3469.16
224.70				
Min Ch El (ft)	-7.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.09	Stream Power (lb/ft s)	5597.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River: Mill Neck Creek

Reach	River Sta.	n1	n2	n3

3300010.rep

Mill Neck Creek	7	.02	.02	.02
Mill Neck Creek	6.85714*	.02	.02	.02
Mill Neck Creek	6.71428*	.02	.02	.02
Mill Neck Creek	6.57142*	.02	.02	.02
Mill Neck Creek	6.42857*	.02	.02	.02
Mill Neck Creek	6.28571*	.02	.02	.02
Mill Neck Creek	6.14285*	.02	.02	.02
Mill Neck Creek	6	.02	.02	.02
Mill Neck Creek	5.8*	.02	.02	.02
Mill Neck Creek	5.6*	.02	.02	.02
Mill Neck Creek	5.4*	.02	.02	.02
Mill Neck Creek	5.2*	.02	.02	.02
Mill Neck Creek	5	.02	.02	.02
Mill Neck Creek	4.8*	.02	.02	.02
Mill Neck Creek	4.6*	.02	.02	.02
Mill Neck Creek	4.4*	.02	.02	.02
Mill Neck Creek	4.2*	.02	.02	.02
Mill Neck Creek	4	.02	.02	.02
Mill Neck Creek	3.9	Bridge		
Mill Neck Creek	3.8	.02	.02	.02
Mill Neck Creek	3	.02	.02	.02
Mill Neck Creek	2.66666*	.02	.02	.02
Mill Neck Creek	2.33333*	.02	.02	.02
Mill Neck Creek	2	.02	.02	.02
Mill Neck Creek	1.85714*	.02	.02	.02
Mill Neck Creek	1.71428*	.02	.02	.02
Mill Neck Creek	1.57142*	.02	.02	.02
Mill Neck Creek	1.42857*	.02	.02	.02
Mill Neck Creek	1.28571*	.02	.02	.02
Mill Neck Creek	1.14285*	.02	.02	.02
Mill Neck Creek	1	.02	.02	.02

SUMMARY OF REACH LENGTHS

River: Mill Neck Creek

Reach	River Sta.	Left	Channel	Right
Mill Neck Creek	7	135.71	100	110
Mill Neck Creek	6.85714*	135.71	100	110
Mill Neck Creek	6.71428*	135.71	100	110
Mill Neck Creek	6.57142*	135.71	100	110
Mill Neck Creek	6.42857*	135.71	100	110
Mill Neck Creek	6.28571*	135.71	100	110
Mill Neck Creek	6.14285*	135.71	100	110
Mill Neck Creek	6	127.2	99	46.8
Mill Neck Creek	5.8*	127.2	99	46.8
Mill Neck Creek	5.6*	127.2	99	46.8
Mill Neck Creek	5.4*	127.2	99	46.8
Mill Neck Creek	5.2*	127.2	99	46.8
Mill Neck Creek	5	97.2	83.4	106
Mill Neck Creek	4.8*	97.2	83.4	106
Mill Neck Creek	4.6*	97.2	83.4	106
Mill Neck Creek	4.4*	97.2	83.4	106
Mill Neck Creek	4.2*	97.2	83.4	106
Mill Neck Creek	4	45	45	45
Mill Neck Creek	3.9	Bridge		
Mill Neck Creek	3.8	475	55	45
Mill Neck Creek	3	235	83.33	473.33

			3300010.rep		
Mill Neck Creek	2.66666*	235	83.33	473.33	
Mill Neck Creek	2.33333*	235	83.33	473.33	
Mill Neck Creek	2	237.71	87	120.29	
Mill Neck Creek	1.85714*	237.71	87	120.29	
Mill Neck Creek	1.71428*	237.71	87	120.29	
Mill Neck Creek	1.57142*	237.71	87	120.29	
Mill Neck Creek	1.42857*	237.71	87	120.29	
Mill Neck Creek	1.28571*	237.71	87	120.29	
Mill Neck Creek	1.14285*	237.71	87	120.29	
Mill Neck Creek	1	0	0	0	

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Mill Neck Creek

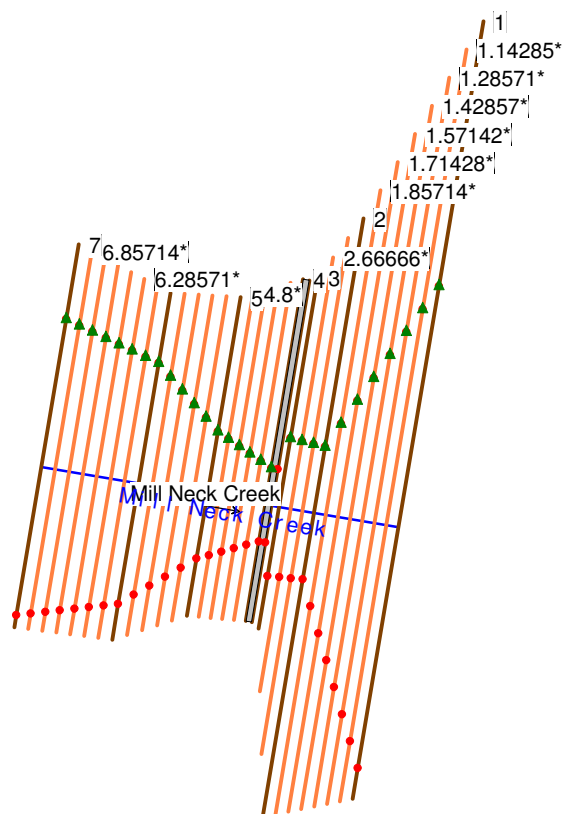
Reach	River Sta.	Contr.	Expan.
Mill Neck Creek	7	.1	.3
Mill Neck Creek	6.85714*	.1	.3
Mill Neck Creek	6.71428*	.1	.3
Mill Neck Creek	6.57142*	.1	.3
Mill Neck Creek	6.42857*	.1	.3
Mill Neck Creek	6.28571*	.1	.3
Mill Neck Creek	6.14285*	.1	.3
Mill Neck Creek	6	.1	.3
Mill Neck Creek	5.8*	.1	.3
Mill Neck Creek	5.6*	.1	.3
Mill Neck Creek	5.4*	.1	.3
Mill Neck Creek	5.2*	.1	.3
Mill Neck Creek	5	.1	.3
Mill Neck Creek	4.8*	.1	.3
Mill Neck Creek	4.6*	.1	.3
Mill Neck Creek	4.4*	.1	.3
Mill Neck Creek	4.2*	.1	.3
Mill Neck Creek	4	.1	.3
Mill Neck Creek	3.9	Bridge	
Mill Neck Creek	3.8	.1	.3
Mill Neck Creek	3	.1	.3
Mill Neck Creek	2.66666*	.1	.3
Mill Neck Creek	2.33333*	.1	.3
Mill Neck Creek	2	.1	.3
Mill Neck Creek	1.85714*	.1	.3
Mill Neck Creek	1.71428*	.1	.3
Mill Neck Creek	1.57142*	.1	.3
Mill Neck Creek	1.42857*	.1	.3
Mill Neck Creek	1.28571*	.1	.3
Mill Neck Creek	1.14285*	.1	.3
Mill Neck Creek	1	.1	.3

Profile Output Table - Six XS Bridge

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	
Crit W.S. vel Chnl	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right
(ft) (ft/s)	(ft)	(ft)	(ft) (cfs)	(ft) (cfs)	(ft) (cfs)

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Mill Neck Creek	4.2*		07AUG2011	1000		23.91	23.88
	0.00			2424.37	-15567.26	-28732.95	-6127.89
-1.52							
Mill Neck Creek	4		07AUG2011	1000		23.90	23.88
				2460.00	-16680.40	-25259.38	-8739.11
-1.53							
Mill Neck Creek	3.9	BR U	07AUG2011	1000		24.40	23.88
						-50678.85	-0.05
-5.81							
Mill Neck Creek	3.9	BR D	07AUG2011	1000			
Mill Neck Creek	3.8		07AUG2011	1000	305436700000.00		-16.97
-1.40	0.00			0.72		-50678.90	
-4435102.00							
Mill Neck Creek	3		07AUG2011	1000		23.90	23.88
	0.00			2530.00	-11825.39	-35070.73	-4018.27
-1.21							



None of the XS's are Geo-Referenced [Geo-Ref user entered XS] [Geo-Ref interpolated XS] [Non Geo-Ref user entered XS] [Non Geo-Ref interpolated XS]

TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
West Shore Road Over Mill Neck Creek

100-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation² (ft)	Remaining Pile Embedment (ft)
North Abutment	0	0	14	14	-14	-45	31
Center Pier	-25	0	6	6	-31	-65	34
South Abutment	0	0	13	13	-13	-45	32

1. All elevations are with reference to NAVD 88 and are taken from the 2009 Fathometric Survey by Boswell Engineering.
2. Estimate of pile tip elevation was taken from the Ayers Study (2001).

500-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation² (ft)	Remaining Pile Embedment (ft)
North Abutment	0	0	11	11	-11	-45	34
Center Pier	-25	0	5	5	-30	-65	35
South Abutment	0	0	15	15	-15	-45	30

1. All elevations are with reference to NAVD 88 and are taken from the 2009 Fathometric Survey by Boswell Engineering.
2. Estimate of pile tip elevation was taken from the Ayers Study (2001).

SCOUR MODE COMPUTATIONS - FLOOD TIDE
West Shore Road over Mill Neck Creek

The following computations are made using Laursen's Equation (Equation 5.1 in HEC-18):

$$V_c = K_u \times Y_1^{1/6} \times D_{50}^{1/3}$$

100-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	13,165
APPROACH SECTION MAIN CHANNEL WIDTH (ft)	W ₁ =	527
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	25.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ^{1/3}	V _c =	3.60
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	31,921
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	3.00
MAIN CHANNEL SCOUR MODE		CLEAR WATER

500-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	16,507
APPROACH SECTION MAIN CHANNEL WIDTH (ft)	W ₁ =	527
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	31.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ^{1/3}	V _c =	3.73
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	25,000
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	2.00
MAIN CHANNEL SCOUR MODE		CLEAR WATER

CONTRACTION SCOUR COMPUTATIONS
West Shore Road over Mill Neck Creek
CLEAR WATER CONTRACTION SCOUR COMPUTATIONS

The following computations are made using the HEC-18 equation for Live Bed Contraction Scour:
(Equations 5.4 and 5.5)

$$Y_s = Y_2 - Y_0$$

$$Y_2 = [K_u Q^2 / D_m^{2/3} W^{2/3}]^{3/7}$$

50-YEAR FLOOD

K ₁ =0.0077 (English Units)	K _u =	0.0077
DISCHARGE THROUGH BRIDGE OR ON THE SET BACK OVERBANK (cfs)	Q=	
DIAM. OF THE SMALLEST NONTRANSPORTABLE PARTICLE (1.25D ₅₀)	D _m =	0.008338
BOTTOM WIDTH OF CONTRACTED SECTION LESS PIER WIDTHS (ft)	W=	670.0
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	Y ₂ =	0.00
AVERAGE WATER DEPTH AT BRIDGE (ft)	Y ₀ =	
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	Y _s =	0.0

100-YEAR FLOOD

K ₁ =0.0077 (English Units)	K _u =	0.0077
DISCHARGE THROUGH BRIDGE OR ON THE SET BACK OVERBANK (cfs)	Q=	31,201.0
DIAM. OF THE SMALLEST NONTRANSPORTABLE PARTICLE (1.25D ₅₀)	D _m =	0.0
BOTTOM WIDTH OF CONTRACTED SECTION LESS PIER WIDTHS (ft)	W=	527.0
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	Y ₂ =	16.12
AVERAGE WATER DEPTH AT BRIDGE (ft)	Y ₀ =	27.0
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	Y _s =	-10.9

500-YEAR FLOOD

K ₁ =0.0077 (English Units)	K _u =	0.0077
DISCHARGE THROUGH BRIDGE OR ON THE SET BACK OVERBANK (cfs)	Q=	50,000.0
DIAM. OF THE SMALLEST NONTRANSPORTABLE PARTICLE (1.25D ₅₀)	D _m =	0.0
BOTTOM WIDTH OF CONTRACTED SECTION LESS PIER WIDTHS (ft)	W=	527.0
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	Y ₂ =	24.15
AVERAGE WATER DEPTH AT BRIDGE (ft)	Y ₀ =	51.0
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	Y _s =	-26.9

LOCAL ABUTMENT SCOUR COMPUTATIONS
West Shore Road over Mill Neck Creek

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD (North Abutment)

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	200
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	16,985
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	11142.0
V _e = Q _e /A _e , (ft/s)	V _e =	0.656
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	1,360
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	12.5
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000816
SCOUR DEPTH, Y _s (ft)	Y _s =	13.8

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	450
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	11,861
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	3,526
V _e = Q _e /A _e , (ft/s)	V _e =	0.297
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	1,243
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	9.5
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000484
SCOUR DEPTH, Y _s (ft)	Y _s =	10.7

LOCAL ABUTMENT SCOUR COMPUTATIONS
West Shore Road over Mill Neck Creek

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD (South Abutment)

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	150
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	5,489
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	7567.0
V _e = Q _e /A _e , (ft/s)	V _e =	1.379
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	513
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	10.7
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.002001
SCOUR DEPTH, Y _s (ft)	Y _s =	12.6

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	150
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	11,782
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	4,619
V _e = Q _e /A _e , (ft/s)	V _e =	0.392
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	808
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	14.6
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000417
SCOUR DEPTH, Y _s (ft)	Y _s =	15.4

LOCAL PIER SCOUR COMPUTATIONS - FLOOD TIDE
West Shore Road over Mill Neck Creek

The following computations are made using the HEC-18 CSU Equation (Eqn. 6.1):

$$y_s = (2.0K_1K_2K_3K_4(a/y_1)^{0.65}Fr^{0.43} \times y_1$$

100-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE	K ₄ =	1.00
(SEE EQNS. 6.5 - 6.8)		
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	3.0
LENGTH OF PIER	L=	43.0
L/a (Maximum L/a value is 12)	L/a=	14.3
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	3.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	25.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	5.8

500-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE	K ₄ =	1.00
(SEE EQNS. 6.5 - 6.8)		
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	3.0
LENGTH OF PIER	L=	43.0
L/a (Maximum L/a value is 12)	L/a=	14.3
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	2.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	37.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	5.1

Stage Hydrograph for 500 and 100 Year storms

Initial Flow at RS6 = (Area x 1ft/s) =

SLR = 4.592 ft

3300010 - West Shore Road over Mill Neck Creek

500 - year storm

Time	R.S. = 1 Node = s3n5					R.S. = 7 Node = s4n14				
(hrs)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)
1	0	0	0	4.59	0.00	0	0	0	4.59	0.00
2	0	0	272.165	4.59	0.00	0	0	262.306	4.59	0.00
3	0.443	0.39	272.907	6.05	1.28	0.473	0.189	289.939	6.14	0.62
4	0.375	0.132	96.684	5.82	0.43	0.367	0.194	96.054	5.80	0.64
5	0.306	0.079	264.272	5.60	0.26	0.301	0.054	111.997	5.58	0.18
6	-0.11	0.173	91.506	4.23	0.57	-0.127	0.171	88.917	4.18	0.56
7	-0.552	0.033	55.576	2.78	0.11	-0.535	0.123	87.023	2.84	0.40
8	-0.522	0.117	90.477	2.88	0.38	-0.54	0.143	91.369	2.82	0.47
9	-0.52	0.121	279.431	2.89	0.40	-0.508	0.027	333.137	2.93	0.09
10	-0.392	0.031	359.764	3.31	0.10	-0.386	0.055	79.276	3.33	0.18
11	0.155	0.337	266.474	5.10	1.11	0.172	0.113	305.711	5.16	0.37
12	0.776	0.268	262.481	7.14	0.88	0.78	0.087	306.359	7.15	0.29
13	1.172	0.158	266.08	8.44	0.52	1.173	0.038	318.252	8.44	0.12
14	1.201	0.031	280.573	8.53	0.10	1.201	0.059	56.939	8.53	0.19
15	0.976	0.045	68.582	7.79	0.15	0.974	0.075	94.186	7.79	0.25
16	0.569	0.116	92.186	6.46	0.38	0.564	0.111	94.944	6.44	0.36
17	-0.032	0.189	81.478	4.49	0.62	-0.049	0.118	109.727	4.43	0.39
18	-0.663	0.162	79.54	2.42	0.53	-0.68	0.136	104.759	2.36	0.45
19	-1.07	0.084	63.254	1.08	0.28	-1.076	0.134	96.423	1.06	0.44
20	-1.066	0.037	335.149	1.10	0.12	-1.068	0.063	77.745	1.09	0.21
21	-0.713	0.161	294.998	2.25	0.53	-0.702	0.038	348.541	2.29	0.12
22	-0.212	0.245	258.56	3.90	0.80	-0.186	0.098	307.41	3.98	0.32
23	0.505	0.339	260.142	6.25	1.11	0.524	0.136	291.34	6.31	0.45
24	1.172	0.298	265.326	8.44	0.98	1.174	0.098	295.722	8.44	0.32
25	1.501	0.165	273.665	9.52	0.54	1.497	0.059	330.493	9.50	0.19
26	1.472	0.059	322.607	9.42	0.19	1.468	0.05	11.776	9.41	0.16
27	1.175	0.069	67.73	8.45	0.23	1.169	0.077	64.881	8.43	0.25
28	0.601	0.154	86.193	6.56	0.51	0.589	0.116	96.717	6.52	0.38
29	-0.099	0.191	76.363	4.27	0.63	-0.117	0.105	106.901	4.21	0.34
30	-0.697	0.141	73.111	2.31	0.46	-0.71	0.117	107.025	2.26	0.38
31	-1.027	0.083	62.193	1.22	0.27	-1.029	0.105	94.161	1.22	0.34
32	-1.026	0.045	326.897	1.23	0.15	-1.015	0.053	75.003	1.26	0.17
33	-0.674	0.147	289.41	2.38	0.48	-0.659	0.037	349.426	2.43	0.12
34	-0.123	0.271	260.022	4.19	0.89	-0.099	0.098	305.882	4.27	0.32
35	0.6	0.355	264.21	6.56	1.16	0.616	0.141	289.611	6.61	0.46
36	1.235	0.274	262.806	8.64	0.90	1.238	0.087	290.952	8.65	0.29
37	1.546	0.14	275.009	9.66	0.46	1.547	0.057	328.32	9.67	0.19
38	1.556	0.055	310.496	9.70	0.18	1.555	0.05	3.113	9.69	0.16
39	1.32	0.067	50.114	8.92	0.22	1.315	0.07	52.083	8.91	0.23
40	0.829	0.137	96.955	7.31	0.45	0.818	0.114	96.438	7.28	0.37
41	0.158	0.18	77.486	5.11	0.59	0.139	0.09	116.032	5.05	0.30
42	-0.43	0.139	71.873	3.18	0.46	-0.445	0.09	108.38	3.13	0.30
43	-0.761	0.079	60.309	2.10	0.26	-0.759	0.062	101.07	2.10	0.20
44	-0.777	0.043	323.272	2.04	0.14	-0.773	0.026	62.708	2.06	0.09
45	-0.474	0.173	281.874	3.04	0.57	-0.46	0.04	336.984	3.08	0.13
46	0.057	0.25	259.963	4.78	0.82	0.069	0.059	318.725	4.82	0.19
47	0.747	0.371	266.994	7.04	1.22	0.763	0.129	285.2	7.09	0.42
48	1.42	0.263	263.08	9.25	0.86	1.422	0.083	284.041	9.26	0.27

49	1.846	0.144	269.533	10.65	0.47	1.843	0.053	309.906	10.64	0.17
50	2.004	0.104	274.968	11.17	0.34	2.007	0.049	336.686	11.17	0.16
51	1.931	0.054	338.995	10.93	0.18	1.934	0.07	356.935	10.94	0.23
52	1.615	0.07	61.45	9.89	0.23	1.612	0.079	30.146	9.88	0.26
53	1.164	0.084	85.171	8.41	0.28	1.159	0.087	71.957	8.39	0.29
54	0.751	0.103	71.216	7.06	0.34	0.747	0.072	95.213	7.04	0.24
55	0.647	0.029	15.374	6.71	0.10	0.65	0.018	284.405	6.72	0.06
56	1.11	0.23	267.699	8.23	0.75	1.126	0.148	273.698	8.29	0.49
57	2.432	0.284	248.793	12.57	0.93	2.441	0.135	229.404	12.60	0.44
58	4.717	0.322	221.15	20.06	1.06	4.724	0.245	182.362	20.09	0.80
59	5.888	0.126	115.151	23.90	0.41	5.886	0.231	139.544	23.90	0.76
60	5.208	0.342	63.759	21.67	1.12	5.209	0.196	108.649	21.68	0.64
61	3.553	0.437	38.109	16.25	1.43	3.555	0.13	108.686	16.25	0.43
62	1.933	0.388	53.961	10.93	1.27	1.936	0.233	39.575	10.94	0.76
63	0.722	0.277	68.256	6.96	0.91	0.717	0.355	85.94	6.94	1.16
64	-0.229	0.228	77.793	3.84	0.75	-0.252	0.24	103.146	3.77	0.79
65	-0.737	0.133	67.726	2.17	0.44	-0.742	0.121	101.166	2.16	0.40
66	-0.861	0.062	349.57	1.77	0.20	-0.85	0.054	77.534	1.80	0.18
67	-0.421	0.243	274.854	3.21	0.80	-0.398	0.087	310.036	3.29	0.29
68	0.159	0.221	252.879	5.11	0.72	0.167	0.074	323.554	5.14	0.24
69	0.543	0.177	255.682	6.37	0.58	0.547	0.057	317.889	6.39	0.19
70	0.819	0.126	256.182	7.28	0.41	0.822	0.035	338.946	7.29	0.11
71	0.986	0.094	256.122	7.83	0.31	0.985	0.026	346.392	7.82	0.09
72	1.026	0.049	250.238	7.96	0.16	1.028	0.018	41.94	7.96	0.06
73	0.893	0.025	118.874	7.52	0.08	0.894	0.049	86.911	7.52	0.16
74	0.683	0.022	83.646	6.83	0.07	0.681	0.048	88.097	6.83	0.16
75	0.525	0.017	304.38	6.31	0.06	0.522	0.024	58.504	6.30	0.08
76	0.427	0.008	17.626	5.99	0.03	0.43	0.02	41.771	6.00	0.07
77	0.302	0.028	84.698	5.58	0.09	0.302	0.019	84.506	5.58	0.06
78	0.118	0.036	83.082	4.98	0.12	0.113	0.024	122.046	4.96	0.08
79	-0.063	0.038	67.379	4.39	0.12	-0.065	0.025	100.414	4.38	0.08
80	-0.196	0.035	64.678	3.95	0.11	-0.198	0.013	95.595	3.94	0.04
81	-0.305	0.022	65.449	3.59	0.07	-0.304	0.006	107.032	3.59	0.02
82	-0.353	0.014	43.724	3.43	0.05	-0.348	0.002	275.342	3.45	0.01
83	-0.214	0.061	282.602	3.89	0.20	-0.21	0.031	289.968	3.90	0.10
84	0.083	0.131	274.63	4.86	0.43	0.086	0.027	300.22	4.87	0.09
85	0.477	0.216	265.228	6.16	0.71	0.482	0.061	289.702	6.17	0.20
86	0.849	0.197	264.533	7.38	0.65	0.852	0.041	292.885	7.39	0.13
87	1.071	0.126	269.659	8.10	0.41	1.072	0.022	333.335	8.11	0.07
88	1.08	0.058	274.071	8.13	0.19	1.08	0.025	46.35	8.13	0.08
89	0.916	0.004	66.84	7.60	0.01	0.912	0.049	91.244	7.58	0.16
90	0.509	0.088	94.403	6.26	0.29	0.504	0.093	94.016	6.25	0.31
91	-0.049	0.15	80.591	4.43	0.49	-0.06	0.097	99.272	4.40	0.32
92	-0.548	0.122	73.34	2.79	0.40	-0.554	0.088	101.874	2.77	0.29
93	-0.864	0.08	62.124	1.76	0.26	-0.863	0.084	96.034	1.76	0.28
94	-0.914	0.036	350.081	1.59	0.12	-0.91	0.051	81.765	1.61	0.17
95	-0.683	0.117	294.305	2.35	0.38	-0.675	0.03	347.631	2.38	0.10
96	-0.298	0.196	261.381	3.61	0.64	-0.279	0.061	322.998	3.68	0.20
97	0.346	0.29	257.042	5.73	0.95	0.361	0.094	301.647	5.78	0.31
98	0.967	0.297	265.963	7.76	0.97	0.969	0.089	292.409	7.77	0.29
99	1.298	0.172	266.278	8.85	0.56	1.296	0.049	322.177	8.84	0.16
100	1.3	0.07	291.146	8.86	0.23	1.298	0.043	22.199	8.85	0.14
101	1.119	0.033	7.119	8.26	0.11	1.114	0.05	64.584	8.25	0.16
102	0.665	0.11	99.563	6.77	0.36	0.659	0.101	94.636	6.75	0.33
103	0.03	0.18	78.983	4.69	0.59	0.013	0.106	108.587	4.63	0.35
104	-0.609	0.149	74.764	2.59	0.49	-0.629	0.123	105.233	2.53	0.40
105	-0.989	0.088	64.335	1.35	0.29	-0.995	0.117	94.815	1.33	0.38

106	-1.082	0.038	0.946	1.04	0.12	-1.072	0.076	86.767	1.08	0.25
107	-0.844	0.095	298.503	1.82	0.31	-0.837	0.03	6.393	1.85	0.10
108	-0.485	0.171	263.442	3.00	0.56	-0.465	0.056	327.636	3.07	0.18
109	0.168	0.292	257.967	5.14	0.96	0.18	0.109	298.735	5.18	0.36
110	0.83	0.325	264.829	7.31	1.07	0.835	0.121	289.868	7.33	0.40
111	1.25	0.203	262.289	8.69	0.67	1.251	0.051	309.668	8.70	0.17
112	1.299	0.079	283.108	8.85	0.26	1.298	0.045	29.109	8.85	0.15
113	1.161	0.034	353.294	8.40	0.11	1.158	0.046	53.689	8.39	0.15
114	0.767	0.083	104.66	7.11	0.27	0.761	0.091	95.792	7.09	0.30
115	0.169	0.17	82.271	5.15	0.56	0.155	0.101	99.359	5.10	0.33
116	-0.486	0.159	76.282	3.00	0.52	-0.502	0.123	100.817	2.95	0.40
117	-0.926	0.102	68.308	1.55	0.33	-0.931	0.126	96.078	1.54	0.41
118	-1.091	0.045	33.045	1.01	0.15	-1.09	0.085	90.982	1.02	0.28
119	-0.923	0.063	288.74	1.56	0.21	-0.915	0.03	33.941	1.59	0.10
120	-0.646	0.12	274.397	2.47	0.39	-0.632	0.038	358.73	2.52	0.12

100-year storm

Time R.S. = 1 Node = s3n5

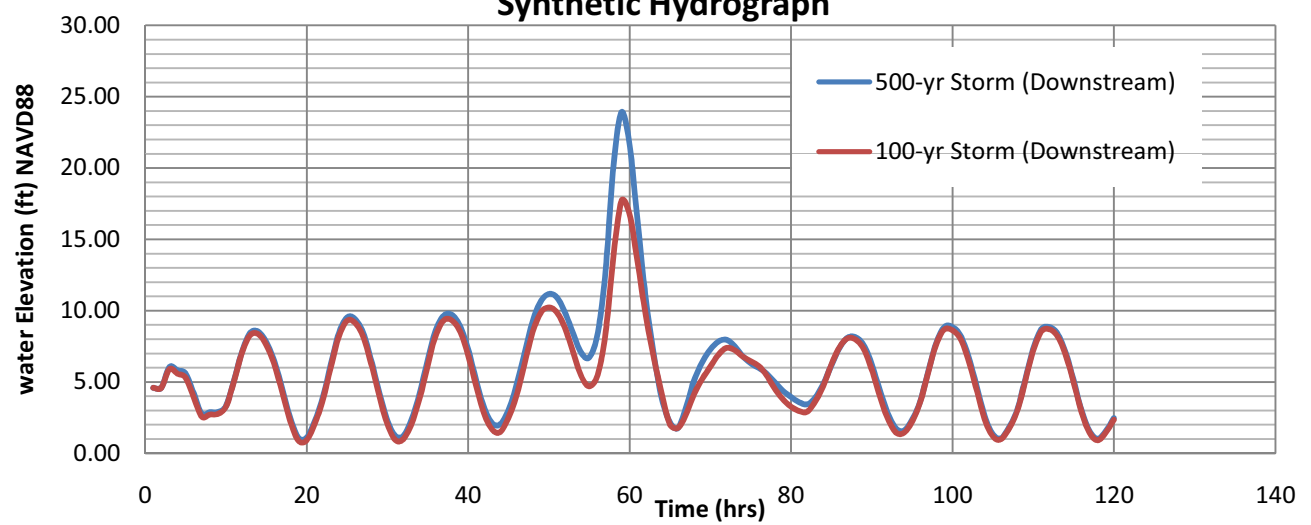
R.S. = 7 Node = s4n14

(hrs)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)
1	0	0	0	4.59	0.00	0	0	0	4.59	0.00
2	0	0	272.165	4.59	0.00	0	0	262.306	4.59	0.00
3	0.398	0.336	273.598	5.90	1.10	0.424	0.17	289.33	5.98	0.56
4	0.301	0.142	94.138	5.58	0.47	0.295	0.189	96.661	5.56	0.62
5	0.217	0.068	267.328	5.30	0.22	0.211	0.081	103.081	5.28	0.27
6	-0.194	0.169	91.63	3.96	0.55	-0.207	0.175	89.995	3.91	0.57
7	-0.614	0.036	68.512	2.58	0.12	-0.6	0.133	87.402	2.62	0.44
8	-0.573	0.108	89.012	2.71	0.35	-0.596	0.138	91.531	2.64	0.45
9	-0.557	0.116	279.524	2.77	0.38	-0.545	0.039	331.78	2.80	0.13
10	-0.409	0.038	331.963	3.25	0.12	-0.402	0.041	67.167	3.27	0.13
11	0.141	0.321	266.624	5.05	1.05	0.159	0.112	305.96	5.11	0.37
12	0.754	0.268	262.887	7.07	0.88	0.756	0.084	306.117	7.07	0.28
13	1.123	0.159	265.33	8.28	0.52	1.124	0.035	333.186	8.28	0.11
14	1.147	0.029	275.407	8.35	0.10	1.141	0.06	63.348	8.33	0.20
15	0.92	0.044	73.329	7.61	0.14	0.915	0.078	96.154	7.59	0.26
16	0.495	0.118	90.861	6.22	0.39	0.49	0.112	94.167	6.20	0.37
17	-0.104	0.18	80.93	4.25	0.59	-0.124	0.122	103.208	4.19	0.40
18	-0.729	0.158	79.442	2.20	0.52	-0.746	0.145	102.697	2.15	0.48
19	-1.132	0.074	61.978	0.88	0.24	-1.135	0.148	96.932	0.87	0.49
20	-1.119	0.032	359.022	0.92	0.10	-1.115	0.073	80.739	0.93	0.24
21	-0.769	0.149	299.822	2.07	0.49	-0.756	0.038	353.658	2.11	0.12
22	-0.266	0.245	259.677	3.72	0.80	-0.241	0.101	306.971	3.80	0.33
23	0.443	0.321	259.341	6.05	1.05	0.46	0.127	292.11	6.10	0.42
24	1.106	0.299	265.913	8.22	0.98	1.11	0.098	293.343	8.23	0.32
25	1.433	0.166	271.38	9.29	0.54	1.432	0.056	333.304	9.29	0.18
26	1.389	0.061	307.262	9.15	0.20	1.389	0.042	11.022	9.15	0.14
27	1.092	0.052	72.691	8.17	0.17	1.089	0.069	76.456	8.16	0.23
28	0.516	0.155	85.49	6.28	0.51	0.507	0.117	95.229	6.25	0.38
29	-0.171	0.189	75.975	4.03	0.62	-0.19	0.108	106.906	3.97	0.35
30	-0.775	0.139	74.37	2.05	0.46	-0.789	0.135	100.743	2.00	0.44
31	-1.116	0.077	63.55	0.93	0.25	-1.117	0.123	96.902	0.93	0.40
32	-1.093	0.034	341.221	1.01	0.11	-1.086	0.064	79.668	1.03	0.21
33	-0.767	0.14	298.087	2.08	0.46	-0.754	0.035	353.09	2.12	0.11
34	-0.226	0.257	258.56	3.85	0.84	-0.201	0.1	305.741	3.93	0.33
35	0.485	0.337	260.664	6.18	1.11	0.502	0.134	292.012	6.24	0.44
36	1.125	0.289	264.864	8.28	0.95	1.129	0.088	294.123	8.30	0.29
37	1.443	0.144	271.401	9.33	0.47	1.443	0.053	331.101	9.33	0.17
38	1.439	0.065	297.031	9.31	0.21	1.436	0.047	5.794	9.30	0.15
39	1.204	0.054	48.761	8.54	0.18	1.2	0.066	61.027	8.53	0.22
40	0.705	0.133	94.508	6.90	0.44	0.694	0.106	97.749	6.87	0.35
41	0.043	0.182	77.43	4.73	0.60	0.024	0.097	116.855	4.67	0.32
42	-0.56	0.141	72.699	2.76	0.46	-0.572	0.099	103.073	2.72	0.32
43	-0.894	0.083	61.91	1.66	0.27	-0.893	0.089	93.008	1.66	0.29
44	-0.943	0.04	339.467	1.50	0.13	-0.936	0.047	75.64	1.52	0.15
45	-0.635	0.16	291.714	2.51	0.52	-0.622	0.039	339.943	2.55	0.13
46	-0.171	0.211	254.29	4.03	0.69	-0.155	0.065	319.139	4.08	0.21
47	0.516	0.353	262.981	6.28	1.16	0.536	0.129	293	6.35	0.42
48	1.187	0.305	264.283	8.49	1.00	1.194	0.095	287.081	8.51	0.31

49	1.603	0.157	271.067	9.85	0.51	1.603	0.062	315.055	9.85	0.20
50	1.717	0.087	287.965	10.22	0.29	1.715	0.049	342.057	10.22	0.16
51	1.613	0.062	7.572	9.88	0.20	1.611	0.058	13.148	9.88	0.19
52	1.282	0.079	84.699	8.80	0.26	1.278	0.078	57.554	8.78	0.26
53	0.765	0.136	85.377	7.10	0.45	0.757	0.11	96.262	7.07	0.36
54	0.263	0.124	69.619	5.45	0.41	0.259	0.046	106.605	5.44	0.15
55	0.03	0.051	28.2	4.69	0.17	0.029	0.03	241.307	4.69	0.10
56	0.243	0.123	273.673	5.39	0.40	0.251	0.057	289.227	5.42	0.19
57	1.125	0.517	266.509	8.28	1.70	1.158	0.209	276.564	8.39	0.69
58	2.786	0.286	242.905	13.73	0.94	2.793	0.134	230.951	13.75	0.44
59	3.994	0.071	196.686	17.69	0.23	3.969	0.075	134.028	17.61	0.25
60	3.712	0.124	52.821	16.77	0.41	3.72	0.094	75.853	16.79	0.31
61	2.683	0.288	45.251	13.39	0.94	2.685	0.125	84.732	13.40	0.41
62	1.561	0.289	57.253	9.71	0.95	1.559	0.135	74.449	9.71	0.44
63	0.644	0.234	72.944	6.70	0.77	0.63	0.27	92.002	6.66	0.89
64	-0.137	0.199	72.073	4.14	0.65	-0.16	0.178	102.959	4.07	0.58
65	-0.78	0.144	76.606	2.03	0.47	-0.793	0.155	99.335	1.99	0.51
66	-0.856	0.037	7.141	1.78	0.12	-0.849	0.075	72.554	1.81	0.25
67	-0.567	0.165	285.586	2.73	0.54	-0.552	0.049	326.494	2.78	0.16
68	-0.133	0.182	252.248	4.16	0.60	-0.117	0.061	331.114	4.21	0.20
69	0.189	0.073	234.984	5.21	0.24	0.189	0.039	27.972	5.21	0.13
70	0.449	0.128	258.724	6.06	0.42	0.453	0.047	331.7	6.08	0.15
71	0.703	0.097	255.473	6.90	0.32	0.706	0.036	11.149	6.91	0.12
72	0.852	0.075	245.157	7.39	0.25	0.852	0.026	26.255	7.39	0.09
73	0.807	0.034	120.967	7.24	0.11	0.805	0.055	83.181	7.23	0.18
74	0.672	0.021	118.899	6.80	0.07	0.672	0.033	77.576	6.80	0.11
75	0.568	0.004	15.43	6.46	0.01	0.564	0.025	72.071	6.44	0.08
76	0.466	0.022	58.108	6.12	0.07	0.468	0.031	81.16	6.13	0.10
77	0.263	0.048	82.088	5.45	0.16	0.258	0.046	87.791	5.44	0.15
78	-0.024	0.06	85.851	4.51	0.20	-0.027	0.047	99.01	4.50	0.15
79	-0.243	0.047	82.999	3.79	0.15	-0.246	0.025	105.627	3.79	0.08
80	-0.404	0.04	82.348	3.27	0.13	-0.405	0.018	128.251	3.26	0.06
81	-0.494	0.023	75.976	2.97	0.08	-0.495	0.006	117.926	2.97	0.02
82	-0.512	0.005	294.208	2.91	0.02	-0.511	0.017	295.213	2.92	0.06
83	-0.292	0.105	281.763	3.63	0.34	-0.287	0.041	299.126	3.65	0.13
84	0.04	0.166	267.112	4.72	0.54	0.048	0.043	304.353	4.75	0.14
85	0.496	0.238	264.662	6.22	0.78	0.502	0.068	296.627	6.24	0.22
86	0.865	0.199	262.494	7.43	0.65	0.866	0.04	303.812	7.43	0.13
87	1.056	0.112	268.732	8.06	0.37	1.056	0.023	356.308	8.06	0.08
88	1.03	0.052	273.191	7.97	0.17	1.028	0.022	54.213	7.96	0.07
89	0.836	0.012	88.347	7.33	0.04	0.831	0.052	92.881	7.32	0.17
90	0.396	0.107	92.718	5.89	0.35	0.389	0.107	91.66	5.87	0.35
91	-0.18	0.152	80.235	4.00	0.50	-0.194	0.1	101.068	3.96	0.33
92	-0.662	0.118	72.465	2.42	0.39	-0.67	0.099	104.302	2.39	0.32
93	-0.953	0.07	58.644	1.47	0.23	-0.955	0.092	93.174	1.46	0.30
94	-0.961	0.033	342.236	1.44	0.11	-0.957	0.049	77.602	1.45	0.16
95	-0.718	0.117	297.483	2.24	0.38	-0.71	0.03	352.85	2.26	0.10
96	-0.312	0.208	262.505	3.57	0.68	-0.293	0.071	317.696	3.63	0.23
97	0.33	0.28	256.93	5.67	0.92	0.343	0.098	299.904	5.72	0.32
98	0.939	0.285	265.204	7.67	0.93	0.942	0.085	295.568	7.68	0.28
99	1.246	0.163	262.793	8.68	0.53	1.245	0.045	324.873	8.68	0.15
100	1.227	0.063	280.1	8.62	0.21	1.226	0.042	33.7	8.61	0.14
101	1.046	0.02	6.79	8.02	0.07	1.043	0.046	77.21	8.01	0.15
102	0.584	0.107	95.934	6.51	0.35	0.578	0.099	94.298	6.49	0.32
103	-0.046	0.181	78.75	4.44	0.59	-0.064	0.111	105.554	4.38	0.36
104	-0.67	0.145	74.723	2.39	0.48	-0.69	0.132	106.018	2.33	0.43
105	-1.038	0.081	62.177	1.19	0.27	-1.041	0.116	95.052	1.18	0.38

106	-1.1	0.034	357.458	0.98	0.11	-1.095	0.073	85.828	1.00	0.24
107	-0.872	0.09	295.343	1.73	0.30	-0.867	0.03	10.382	1.75	0.10
108	-0.513	0.167	263.323	2.91	0.55	-0.493	0.057	326.443	2.97	0.19
109	0.131	0.284	258.793	5.02	0.93	0.145	0.111	297.918	5.07	0.36
110	0.789	0.32	264.893	7.18	1.05	0.796	0.119	289.282	7.20	0.39
111	1.202	0.202	262.265	8.53	0.66	1.203	0.047	316.791	8.54	0.15
112	1.252	0.075	279.098	8.70	0.25	1.249	0.044	30.013	8.69	0.14
113	1.108	0.029	334.288	8.23	0.10	1.105	0.042	63.458	8.22	0.14
114	0.72	0.082	100.859	6.95	0.27	0.713	0.097	97.164	6.93	0.32
115	0.13	0.169	82.555	5.02	0.55	0.117	0.102	104.001	4.98	0.33
116	-0.52	0.16	77.13	2.89	0.52	-0.539	0.121	101.062	2.82	0.40
117	-0.962	0.101	68.885	1.44	0.33	-0.973	0.135	95.226	1.40	0.44
118	-1.121	0.045	34.437	0.92	0.15	-1.115	0.095	90.583	0.93	0.31
119	-0.954	0.055	289.943	1.46	0.18	-0.95	0.03	35.031	1.48	0.10
120	-0.682	0.123	281.981	2.36	0.40	-0.666	0.038	350.352	2.41	0.12

West Shore Road over Mill Neck Creek Synthetic Hydrograph



B.7 Mill Dam Road over Centerport Harbor

OBJECTID	367	ApprGuardR	0	FractCrit	N
Shape	Point	ApprGuar_1	0	UndWaterIn	Y60
StateCode	362	Historical	5	SpecInspe	N
BIN	3300640	NavControl	1	FractCritD	0
Record	1	NavVertCle	3	UndWaterDa	906
Type	8	NavHorizCl	182	SpecInspec	
LOS	0	OpenPostCl	A	BridgImprC	152
RteNo	0	ServiceOnB	5	RoadImprCo	63
HighwayDis	2	ServiceUnd	5	TotalCost	215
CountyCode	103	StructMate	5	YearEst	2008
PlaceCode	37000	TypeDesign	5	BordBridge	0
FeaturesIn	CENTERPORT	ApprMater	0	BPercenRes	0
HARBOR		ApprDesign	0	BordBIN	0
CritFacili		NoSpansMai	1	STRAHNET	0
Route	MILL DAM	NoSpansApp	0	ParallelSt	N
ROAD		RouteHoriz	73	DirectTraf	2
Location	0.5 MI N OF	MainSpanLe	192	TempStruct	
CENTERPORT		StructLeng	207	HighwaySys	0
MinVertCle	9999	SdeWlkLeft	15	FedLandsHi	0
KiloPoint	0	SdeWlkRtWi	15	YearRecon	2004
BaseHwyNet	0	BrdgCb2Cb	73	DeckType	N
LRSRoute	0	BrdgOut2Ou	113	DeckWearTy	1
SubrouteNo		MinVertOve	9999	TypeMembr	0
LatDD	40	RefFeature	N	DeckProtec	N
LatMM	53	MinVertUn	0	ADTTtruck	5
LatSS	34360	RefFeat	N	NatNetwk	0
LonDD	73	MinLatUn	999	PierAbutPr	1
LongMM	22	MinLatUnLf	0	NBISBrdgeL	Y
LongSS	2139	Deck	0	ScourCrit	6
Latitude	40.892878	SupStruct	9	FutADT	4386
Longitude	-73.372608	SubStruct	9	YearFutADT	2018
DetourLeng	1	ChannelPro	8	MinNavVert	
Toll	3	Culverts	N	FedAgeninc	NN
MainRespon	2	MethOpRate	1	WashHead	
Owner	2	OperRating	999	NoName	778
FunctClass	19	MethOpRa_1	0	Status	0
YearBuilt	1936	InventRat	499	NoName_1	0
LanesOn	2	TructEval	9		
LanesUnder	0	DeckGeo	2		
ADT	3358	UnclearVer	N		
YearADT	1998	BridgePost	5		
DesignLoad	9	WaterwayAd	5		
ApprWidth	73	ApprAlign	8		
Median	0	TypeWorkPr	34		
Skew	0	WorkBy	1		
StructFlar	0	LenImprov	207		
BridgeRail	1	InspDate	1108		
Transition	0	InspFreq	24		

3300640.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X      X
XXXXXXXX XXXX      X      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      X

```

PROJECT DATA

Project Title: 3300640
Project File : 3300640.prj
Run Date and Time: 1/11/2012 9:33:16 AM

Project in English units

PLAN DATA

Plan Title: Plan 03
Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\3300640 Mill Dam Road -
Suffolk County\3300640.p03

Geometry Title: 3300640
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\3300640
Mill Dam Road - Suffolk County\3300640.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of:	Cross Sections	=	32	Multiple Openings	=	0
	Culverts	=	0	Inline Structures	=	0
	Bridges	=	1	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

GEOMETRY DATA

3300640.rep

Geometry Title: 3300640

Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\3300640 Mill Dam Road
- Suffolk County\3300640.g01

CROSS SECTION

RIVER: Mill Pond

REACH: Mill Pond

RS: 6

INPUT

Description: Two Bridge Lengths Upstream

Station	Elevation	Data	num=	18	Sta	Elev	Sta	Elev	Sta	Elev
0	11	10	10	88	5	119	4	138	2	
163	1	549	-2	602	-4	620	-2	789	1	
835	2	871	3	916	4	975	5	1050	6	
1125	10	1169	12	1220	14					

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	163	.02	789	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	163	789		84.8	91		.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	8.76	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.48	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	7.28	Reach Len. (ft)	84.80	91.00
97.20				
Crit W.S. (ft)		Flow Area (sq ft)	352.55	5047.78
920.94				
E.G. Slope (ft/ft)	0.001168	Area (sq ft)	352.55	5047.78
920.94				
Q Total (cfs)	58577.77	Flow (cfs)	1936.80	51530.77
5110.20				
Top width (ft)	1021.57	Top width (ft)	110.57	626.00
285.00				
Vel Total (ft/s)	9.27	Avg. Vel. (ft/s)	5.49	10.21
5.55				
Max Chl Dpth (ft)	11.28	Hydr. Depth (ft)	3.19	8.06
3.23				
Conv. Total (cfs)	1713942.0	Conv. (cfs)	56669.4	1507752.0
149520.6				
Length wtd. (ft)	91.17	Wetted Per. (ft)	110.78	626.19
285.09				
Min Ch El (ft)	-4.00	Shear (lb/sq ft)	0.23	0.59
0.24				
Alpha	1.11	Stream Power (lb/ft s)	1220.00	0.00
0.00				
Frctn Loss (ft)	0.43	Cum Volume (acre-ft)	2.84	24.49
2.17				
C & E Loss (ft)		Cum SA (acres)	0.59	8.16
0.60				

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Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond

RS: 5.8*

INPUT

Description:

Station	Elevation	Data	num=	29	Sta	Elev	Sta	Elev	Sta	Elev
0	10.8	10.66	9.87	32.04	87.3	5.31	93.83	4.95		
111.33	4.38	126.88	3.86	132.95	3.32	147.14	2.05	151.37	1.87	
164.99	1.46	173.8	1	353.1	-.91	503.17	-2.15	548.4	-3.8	
577.93	-2.1	607.73	-1.74	798.99	.51	855.2	1.2	894.07	2.18	
924.49	3.12	962.52	4.09	986.61	4.59	1012.37	5.18	1075.75	6.41	
1133.04	9.69	1139.12	10.03	1176.3	11.8	1219.4	13.6			

Manning's n	Values	num=	3	Sta	n Val
0	.02	173.8	.02	855.2	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	173.8	855.2		84.8	91	97.2	.1
							.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	453567000000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	453567000000.00	Wt. n-Val.	
0.020			
W.S. Elev (ft)	-3.78	Reach Len. (ft)	84.80
97.20			
Crit W.S. (ft)	5.28	Flow Area (sq ft)	0.01
E.G. Slope (ft/ft)	2166109000000.000000	Area (sq ft)	
0.01			
Q Total (cfs)	58572.55	Flow (cfs)	58572.55
Top width (ft)	0.99	Top width (ft)	0.99
Vel Total (ft/s)	5404601.00	Avg. Vel. (ft/s)	
5404601.00			
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.0	Conv. (cfs)	0.0
Length wtd. (ft)	91.00	Wetted Per. (ft)	0.99
Min Ch El (ft)	-3.80	Shear (lb/sq ft)	
1485974000000.00			
Alpha	1.00	Stream Power (lb/ft s)	1219.40
0.00			
Frctn Loss (ft)	83.92	Cum Volume (acre-ft)	2.50
		Page 3	19.22

1.14
C & E Loss (ft)
0.29

Cum SA (acres)

0.48

7.51

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond

RS: 5.6*

INPUT

Description:

Station Elevation Data			num= 29								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10.6	11.33	9.73	34.03	8.43	92.73	5.24	99.66	4.89		
118.25	4.28	134.77	3.71	141.21	3.24	156.29	2.09	160.78	1.9		
175.24	1.6	184.6	1	333.07	-1.18	457.35	-2.31	494.8	-3.6		
535.86	-2.2	577.3	-1.81	843.24	.64	921.4	1.4	953.14	2.35		
977.98	3.23	1009.03	4.18	1028.71	4.69	1049.74	5.35	1101.5	6.82		
1148.28	9.77	1153.25	10.06	1183.61	11.6	1218.8	13.2				

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	184.6	.02	921.4	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	184.6	921.4		84.8	91	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	42.97	Element	Left OB	Channel
Right OB				
Vel Head (ft)	42.34	Wt. n-Val.		0.020
W.S. Elev (ft)	0.64	Reach Len. (ft)	84.80	91.00
97.20				
Crit W.S. (ft)	5.01	Flow Area (sq ft)		1121.72
E.G. Slope (ft/ft)	0.230533	Area (sq ft)		1121.72
Q Total (cfs)	58571.41	Flow (cfs)		58571.41
Top width (ft)	633.33	Top width (ft)		633.33
Vel Total (ft/s)	52.22	Avg. Vel. (ft/s)		52.22
Max Chl Dpth (ft)	4.24	Hydr. Depth (ft)		1.77
Conv. Total (cfs)	121988.6	Conv. (cfs)		121988.6
Length wtd. (ft)	91.00	Wetted Per. (ft)		633.40

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Min Ch El (ft)	-3.60	Shear (lb/sq ft)	25.49
Alpha	1.00	Stream Power (lb/ft s)	1218.80
0.00			0.00
Frctn Loss (ft)	83.91	Cum Volume (acre-ft)	2.50
1.14			18.04
C & E Loss (ft)		Cum SA (acres)	0.48
0.29			6.85

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond

RS: 5.4*

INPUT

Description:

Station Elevation Data			num=	29						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	10.4	11.99	9.6	36.02	8.29	98.15	5.16	105.49	4.84	
125.16	4.19	142.65	3.57	149.48	3.16	165.43	2.14	170.19	1.94	
185.49	1.73	195.4	1	313.05	-1.45	411.52	-2.46	441.2	-3.4	
493.79	-2.3	546.87	-1.87	887.5	.76	987.6	1.6	1012.21	2.53	
1031.47	3.35	1055.55	4.27	1070.81	4.79	1087.12	5.53	1127.24	7.23	
1163.52	9.85	1167.37	10.08	1190.91	11.4	1218.2	12.8			

Manning's n Values			num=	3		
Sta	n Val	Sta	n Val	Sta	n Val	
0	.02	195.4	.02	987.6	.02	

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	195.4	987.6		84.8	91	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	144335400000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	144335300000.00	wt. n-Val.	
0.020			
W.S. Elev (ft)	-3.38	Reach Len. (ft)	84.80
97.20			91.00
Crit W.S. (ft)	4.77	Flow Area (sq ft)	0.02
E.G. Slope (ft/ft)	688637700000.000000	Area (sq ft)	
0.02			
Q Total (cfs)	58570.28	Flow (cfs)	58570.28
Top width (ft)	1.75	Top width (ft)	1.75
Vel Total (ft/s)	3048803.00	Avg. Vel. (ft/s)	

3300640.rep

3048803.00				
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)		0.01
Conv. Total (cfs)	0.1	Conv. (cfs)		0.1
Length Wtd. (ft)	91.00	Wetted Per. (ft)		1.75
Min Ch El (ft)	-3.40	Shear (lb/sq ft)		
472756300000.00				
Alpha	1.00	Stream Power (lb/ft s)	1218.20	0.00
0.00				
Frctn Loss (ft)	68.34	Cum Volume (acre-ft)	2.50	16.87
1.14				
C & E Loss (ft)		Cum SA (acres)	0.48	6.18
0.29				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 5.2*

INPUT

Description:

Station Elevation Data			num=	29					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10.2	12.65	9.47	38.01	8.14	103.58	5.08	111.32	4.78
132.08	4.09	150.54	3.42	157.74	3.08	174.57	2.18	179.59	1.97
195.75	1.87	206.2	1	293.02	-1.73	365.7	-2.61	387.6	-3.2
451.73	-2.4	516.43	-1.94	931.75	.88	1053.8	1.8	1071.28	2.71
1084.96	3.47	1102.07	4.36	1112.9	4.9	1124.49	5.7	1152.99	7.63
1178.76	9.92	1181.5	10.11	1198.22	11.2	1217.6	12.4		

Manning's n Values			num=	3
Sta	n Val	Sta	n Val	Sta
0	.02	206.2	.02	1053.8
				.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
206.2	1053.8	84.8	91	97.2	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	36.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	35.93	Wt. n-Val.		0.020
W.S. Elev (ft)	0.57	Reach Len. (ft)	84.80	91.00
97.20				
Crit W.S. (ft)	4.58	Flow Area (sq ft)		1217.51
E.G. slope (ft/ft)	0.187744	Area (sq ft)		1217.51

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Q Total (cfs)	58569.04	Flow (cfs)	58569.04
Top width (ft)	666.44	Top width (ft)	666.44
Vel Total (ft/s)	48.11	Avg. Vel. (ft/s)	48.11
Max Chl Dpth (ft)	3.77	Hydr. Depth (ft)	1.83
Conv. Total (cfs)	135171.4	Conv. (cfs)	135171.4
Length wtd. (ft)	91.00	Wetted Per. (ft)	666.51
Min Ch El (ft)	-3.20	Shear (lb/sq ft)	21.41
Alpha	1.00	Stream Power (lb/ft s)	1217.60
0.00			0.00
Frctn Loss (ft)	68.34	Cum Volume (acre-ft)	2.50
1.14			15.60
C & E Loss (ft)		Cum SA (acres)	0.48
0.29			5.48

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond

RS: 5

INPUT

Description:

Station Elevation Data				num=	16				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	40	8	109	5	139	4	166	3
189	2	206	2	217	1	273	-2	334	-3
486	-2	976	1	1120	2	1155	5	1194	10
1217	12								

Manning's n Values				num=	3		
Sta	n Val	Sta	n Val	Sta	n Val		
0	.02	217	.02	1120	.02		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	217	1120		84.8	91	97.2	.1
							.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	20046230000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	20046230000.00	wt. n-Val.	
0.020			
W.S. Elev (ft)	-2.98	Reach Len. (ft)	84.80
		Page 7	91.00

3300640.rep

97.20				
Crit W.S. (ft)	4.44	Flow Area (sq ft)		0.05
E.G. Slope (ft/ft)	95607960000.000000	Area (sq ft)		
0.05				
Q Total (cfs)	58567.81	Flow (cfs)		58567.80
Top Width (ft)	4.69	Top Width (ft)		4.69
Vel Total (ft/s)	1136212.00	Avg. Vel. (ft/s)		
1136212.00				
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)		0.01
Conv. Total (cfs)	0.2	Conv. (cfs)		0.2
Length wtd. (ft)	91.00	Wetted Per. (ft)		4.69
Min Ch El (ft)	-3.00	Shear (lb/sq ft)		
65653540000.00				
Alpha	1.00	Stream Power (lb/ft s)	1217.00	0.00
0.00				
Frctn Loss (ft)	289.29	Cum Volume (acre-ft)	2.50	14.33
1.14				
C & E Loss (ft)		Cum SA (acres)	0.48	4.78
0.29				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 4.8*

INPUT

Description:

Station Elevation Data			num= 36								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	44.5	7.88	51.27	7.59	94.71	5.83	121.26	4.72		
132.45	4.33	154.63	3.62	156.66	3.55	177.31	2.8	184.67	2.6		
210.25	1.8	222.17	1.8	229.16	1.73	241.4	.8	288.72	-1.69		
295.87	-2.06	355.2	-3.4	369.2	-3	384.4	-3.4	519.3	-2.05		
530.41	-1.94	925.85	.64	954.2	.8	1082	1.6	1100.55	2.57		
1116.02	3.61	1133.02	4.51	1140.02	4.87	1153.51	5.83	1175.54	7		
1179.79	7.46	1185.98	8.04	1193.32	8.7	1204.67	9.75	1213.04	10.35		
1242.8	12										

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	241.4	.02	1082	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	241.4	1082		84.8	91	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	110.80	Element	Left OB	Channel
Right OB				
Vel Head (ft)	111.33	Wt. n-Val.		0.020
W.S. Elev (ft)	-0.54	Reach Len. (ft)	84.80	91.00
97.20				
Crit W.S. (ft)	4.44	Flow Area (sq ft)		691.67
E.G. Slope (ft/ft)	0.794745	Area (sq ft)		691.67
Q Total (cfs)	58567.01	Flow (cfs)		58567.01
Top width (ft)	478.42	Top width (ft)		478.42
Vel Total (ft/s)	84.68	Avg. Vel. (ft/s)		84.68
Max Chl Dpth (ft)	2.86	Hydr. Depth (ft)		1.45
Conv. Total (cfs)	65696.0	Conv. (cfs)		65696.0
Length wtd. (ft)	91.00	Wetted Per. (ft)		478.50
Min Ch El (ft)	-3.40	Shear (lb/sq ft)		71.72
Alpha	1.00	Stream Power (lb/ft s)	1242.80	0.00
0.00				
Frctn Loss (ft)	289.28	Cum Volume (acre-ft)	2.50	13.61
1.14				
C & E Loss (ft)		Cum SA (acres)	0.48	4.28
0.29				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond

REACH: Mill Pond

RS: 4.6*

INPUT

Description:

Station Elevation Data			num=	36						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	10	49	7.76	56.45	7.44	104.28	5.62	133.51	4.44	
145.84	4	170.26	3.23	172.5	3.16	195.23	2.35	203.33	2.2	
231.5	1.6	244.63	1.6	252.33	1.45	265.8	.6	311.79	-1.76	
318.74	-2.13	376.4	-3.8	404.4	-3	434.8	-3.8	552.61	-2.09	
562.31	-1.95	907.64	.48	932.39	.6	1044	1.2	1069.92	2.18	
1091.51	3.46	1115.27	4.38	1125.04	4.74	1143.88	5.63	1174.66	6.25	
1180.6	6.85	1189.23	7.53	1199.49	8.27	1215.34	9.49	1227.03	10.26	
1268.6	12									

3300640.rep

Manning's n values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .02 265.8 .02 1044 .02

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 265.8 1044 84.8 91 97.2 .1 .3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	29220320000.00	Element	Left OB	
Channel Right OB				
Vel Head (ft)	29220320000.00	wt. n-Val.		
0.020				
W.S. Elev (ft)	-3.78	Reach Len. (ft)	84.80	91.00
97.20				
Crit w.s. (ft)	4.44	Flow Area (sq ft)	0.04	
E.G. Slope (ft/ft)	139406400000.000000	Area (sq ft)		
0.04				
Q Total (cfs)	58566.22	Flow (cfs)	58566.22	
Top width (ft)	3.88	Top width (ft)	3.88	
Vel Total (ft/s)	1371783.00	Avg. Vel. (ft/s)		
1371783.00				
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01	
Conv. Total (cfs)	0.2	Conv. (cfs)	0.2	
Length wtd. (ft)	91.00	wetted Per. (ft)	3.88	
Min Ch El (ft)	-3.80	Shear (lb/sq ft)		
95707180000.00				
Alpha	1.00	Stream Power (lb/ft s)	1268.60	0.00
0.00				
Frctn Loss (ft)	470.28	Cum Volume (acre-ft)	2.50	12.88
1.14				
C & E Loss (ft)		Cum SA (acres)	0.48	3.77
0.29				

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 4.4*

INPUT

Description:

Station Elevation Data num= 36

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3300640.rep									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	53.49	7.64	61.64	7.29	113.85	5.42	145.77	4.16
159.22	3.67	185.89	2.85	188.33	2.77	213.16	1.9	222	1.8
252.75	1.4	267.09	1.4	275.49	1.18	290.2	.4	334.86	-1.84
341.61	-2.19	397.6	-4.2	439.6	-3	485.2	-4.2	585.91	-2.14
594.2	-1.97	889.43	.32	910.59	.4	1006	.8	1039.28	1.78
1067.01	3.3	1097.51	4.26	1110.06	4.6	1134.25	5.42	1173.77	5.5
1181.4	6.23	1192.49	7.02	1205.66	7.85	1226.02	9.24	1241.02	10.18
1294.4	12								

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .02 290.2 .02 1006 .02

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 290.2 1006 84.8 91 97.2 .1 .3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	188.97	Element	Left OB	Channel
Right OB				
Vel Head (ft)	190.29	wt. n-Val.		0.020
W.S. Elev (ft)	-1.33	Reach Len. (ft)	84.80	91.00
97.20				
Crit W.S. (ft)	4.43	Flow Area (sq ft)		529.04
E.G. Slope (ft/ft)	1.291968	Area (sq ft)		529.04
Q Total (cfs)	58565.53	Flow (cfs)		58565.53
Top width (ft)	352.37	Top width (ft)		352.37
Vel Total (ft/s)	110.70	Avg. Vel. (ft/s)		110.70
Max Chl Dpth (ft)	2.87	Hydr. Depth (ft)		1.50
Conv. Total (cfs)	51524.8	Conv. (cfs)		51524.8
Length wtd. (ft)	91.00	wetted Per. (ft)		352.48
Min Ch El (ft)	-4.20	Shear (lb/sq ft)		121.06
Alpha	1.00	Stream Power (lb/ft s)	1294.40	0.00
0.00				
Frctn Loss (ft)	470.27	Cum Volume (acre-ft)	2.50	12.33
1.14				
C & E Loss (ft)		Cum SA (acres)	0.48	3.40
0.29				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

3300640.rep

RIVER: Mill Pond
 REACH: Mill Pond

RS: 4.2*

INPUT

Description:

Station Elevation Data			num= 36								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	57.99	7.52	66.82	7.15	123.43	5.21	158.02	3.87		
172.61	3.33	201.52	2.47	204.17	2.39	231.08	1.45	240.66	1.4		
274.01	1.2	289.54	1.2	298.65	.91	314.6	.2	357.93	-1.92		
364.47	-2.26	418.8	-4.6	474.8	-3	535.6	-4.6	619.22	-2.18		
626.1	-1.98	871.21	.16	888.78	.2	968	.4	1008.64	1.39		
1042.5	3.15	1079.76	4.13	1095.08	4.47	1124.63	5.21	1172.89	4.75		
1182.2	5.62	1195.74	6.51	1211.83	7.42	1236.69	8.98	1255.01	10.09		
1320.2	12										

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	314.6	.02	968	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	314.6	968		84.8	91		.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	53178910000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	53178910000.00	wt. n-val.	
0.020			
W.S. Elev (ft)	-4.58	Reach Len. (ft)	84.80 91.00
97.20			
Crit w.s. (ft)	4.44	Flow Area (sq ft)	0.03
E.G. slope (ft/ft)	253781500000.000000	Area (sq ft)	
0.03			
Q Total (cfs)	58564.84	Flow (cfs)	58564.84
Top width (ft)	2.88	Top width (ft)	2.88
Vel Total (ft/s)	1850600.00	Avg. Vel. (ft/s)	
1850600.00			
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.1	Conv. (cfs)	0.1
Length wtd. (ft)	91.00	wetted Per. (ft)	2.88
Min Ch El (ft)	-4.60	Shear (lb/sq ft)	
174192600000.00			
Alpha	1.00	Stream Power (lb/ft s)	1320.20 0.00
0.00			
Frctn Loss (ft)	280.77	Cum volume (acre-ft)	2.50 11.78
1.14			
C & E Loss (ft)		Cum SA (acres)	0.48 3.03
0.29			

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may

3300640.rep

indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond

REACH: Mill Pond

RS: 4

INPUT

Description: One Bridge Length Upstream

Station Elevation Data		num= 25		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
0	10	72	7	133	5	186	3	220	2		
249	1	312	1	339	0	381	-2	440	-5		
510	-3	586	-5	658	-2	853	0	930	0		
978	1	1018	3	1062	4	1115	5	1172	4		
1183	5	1199	6	1218	7	1269	10	1346	12		

Manning's n Values		num= 3		Sta n Val	
0	.02	339	.02	930	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	339	930		105 97.6	90	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	149.64	Element	Left OB	Channel
Right OB				
Vel Head (ft)	151.28	wt. n-val.		0.020
W.S. Elev (ft)	-1.65	Reach Len. (ft)	105.00	97.60
90.00				
Crit w.s. (ft)	4.43	Flow Area (sq ft)		593.33
E.G. slope (ft/ft)	0.771340	Area (sq ft)		593.33
Q Total (cfs)	58564.32	Flow (cfs)		58564.32
Top width (ft)	318.70	Top width (ft)		318.70
Vel Total (ft/s)	98.71	Avg. vel. (ft/s)		98.71
Max Chl Dpth (ft)	3.35	Hydr. Depth (ft)		1.86
Conv. Total (cfs)	66682.3	Conv. (cfs)		66682.3
Length wtd. (ft)	97.60	wetted Per. (ft)		318.91
Min Ch El (ft)	-5.00	Shear (lb/sq ft)		89.59
Alpha	1.00	Stream Power (lb/ft s)	1346.00	0.00
0.00				
Frctn Loss (ft)	301.13	Cum Volume (acre-ft)	2.50	11.16
1.14				
C & E Loss (ft)		Cum SA (acres)	0.48	2.70

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0.29

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond

REACH: Mill Pond

RS: 3.8*

INPUT

Description:

Station Elevation Data				num=	42
Sta	Elev	Sta	Elev	Sta	Elev
0	10	69.28	7.12	86.59	6.53
153.02	4.21	178.98	3.19	201.65	2.45
249.1	1.2	300.22	1.07	326.2	.2
480.78	-4.44	487.2	-5	545.98	-3.4
624.94	-4.29	635.04	-3.66	681.63	-1.72
953	.2	998.95	1	1005.36	1.27
1079.35	4.68	1088.17	4.94	1130.08	5.99
1195.17	6.65	1210.49	7.61	1228.68	8.59
1318.32	12.89	1351.2	14.2		

Manning's n values

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	326.2	.02	953	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	326.2	953		105	97.6	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	75973320000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	75973320000.00	Wt. n-Val.	
0.020			
W.S. Elev (ft)	-4.98	Reach Len. (ft)	105.00
90.00			
Crit W.S. (ft)	4.35	Flow Area (sq ft)	0.03
E.G. Slope (ft/ft)	362736900000.000000	Area (sq ft)	
0.03			
Q Total (cfs)	58563.77	Flow (cfs)	58563.77
Top width (ft)	2.41	Top width (ft)	2.41
Vel Total (ft/s)	2211941.00	Avg. Vel. (ft/s)	
2211941.00			
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.1	Conv. (cfs)	0.1

Length wtd. (ft)	97.60	3300640.rep Wetted Per. (ft)	2.41
Min Ch El (ft)	-5.00	Shear (lb/sq ft)	
248887900000.00			
Alpha	1.00	Stream Power (lb/ft s)	1351.20
0.00			0.00
Frctn Loss (ft)	2008.77	Cum Volume (acre-ft)	2.50
1.14			10.49
C & E Loss (ft)		Cum SA (acres)	0.48
0.29			2.34

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond RS: 3.6*

INPUT

Description:

Station Elevation Data			num= 42								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	66.56	7.24	83.19	6.65	108.27	5.71	122.96	5.25		
147.01	4.41	171.95	3.37	193.74	2.58	203.39	2.32	230.2	1.48		
239.32	1.4	288.44	1.13	313.4	.4	354.73	-.54	405.3	-1.56		
525.58	-4.08	534.4	-5	581.96	-3.8	582.29	-3.81	633.6	-5		
648.71	-4.22	658.78	-3.37	705.27	-1.43	719.2	-1.11	899.36	.28		
976	.4	1019.89	1	1026.02	1.2	1056.47	3.51	1063.25	3.9		
1096.7	5.36	1105.13	5.7	1145.17	6.99	1145.84	6.99	1197.29	7.49		
1207.35	8.31	1221.98	9.22	1239.35	10.18	1240.07	10.23	1285.99	13.08		
1324.99	14.66	1356.4	16.4								

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	313.4	.02	976	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
313.4	976	105	97.6	90	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	633.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	636.22	Wt. n-Val.		0.020
W.S. Elev (ft)	-2.64	Reach Len. (ft)	105.00	97.60
90.00				
Crit W.S. (ft)	4.35	Flow Area (sq ft)		289.32
E.G. slope (ft/ft)	5.145420	Area (sq ft)		289.32

Q Total (cfs)	58563.34	3300640.rep Flow (cfs)		58563.34
Top width (ft)	219.63	Top width (ft)		219.63
Vel Total (ft/s)	202.42	Avg. Vel. (ft/s)		202.42
Max Chl Dpth (ft)	2.36	Hydr. Depth (ft)		1.32
Conv. Total (cfs)	25817.6	Conv. (cfs)		25817.6
Length wtd. (ft)	97.60	wetted Per. (ft)		219.80
Min Ch El (ft)	-5.00	Shear (lb/sq ft)		422.83
Alpha 0.00	1.00	Stream Power (lb/ft s)	1356.40	0.00
Frctn Loss (ft)	2008.74	Cum Volume (acre-ft)	2.50	10.17
1.14				
C & E Loss (ft)		Cum SA (acres)	0.48	2.09
0.29				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 3.4*

INPUT

Description:

Station Elevation Data			num=	42					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	63.84	7.36	79.8	6.76	103.84	5.81	117.93	5.37
141.01	4.61	164.93	3.56	185.83	2.72	195.08	2.47	220.79	1.72
229.55	1.6	276.66	1.2	300.6	.6	353.16	-.36	417.45	-1.33
570.39	-3.72	581.6	-5	617.94	-4.2	618.19	-4.21	657.4	-5
672.47	-4.15	682.52	-3.08	728.9	-1.15	742.8	-.74	922.54	.42
999	.6	1040.84	1	1046.68	1.13	1075.7	3.76	1082.17	4.27
1114.06	6.04	1122.08	6.47	1160.25	7.98	1160.89	7.99	1209.94	9.24
1219.52	9.96	1233.47	10.82	1250.03	11.78	1250.71	11.82	1294.48	14.62
1331.66	16.44	1361.6	18.6						

Manning's n Values			num=	3		
Sta	n Val	Sta	n Val	Sta	n Val	
0	.02	300.6	.02	999	.02	

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	300.6	999		105	97.6	90		.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	61554370000.00	Element	Left OB
		Page 16	

3300640.rep

Channel Right OB				
Vel Head (ft)	61554370000.00	wt. n-Val.		
0.020				
W.S. Elev (ft)	-4.98	Reach Len. (ft)	105.00	97.60
90.00				
Crit W.S. (ft)	4.40	Flow Area (sq ft)		0.03
E.G. Slope (ft/ft)	293894000000.000000	Area (sq ft)		
0.03				
Q Total (cfs)	58562.93	Flow (cfs)		58562.93
Top width (ft)	2.67	Top width (ft)		2.67
Vel Total (ft/s)	1991005.00	Avg. Vel. (ft/s)		
1991005.00				
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)		0.01
Conv. Total (cfs)	0.1	Conv. (cfs)		0.1
Length wtd. (ft)	97.60	Wetted Per. (ft)		2.68
Min Ch El (ft)	-5.00	Shear (lb/sq ft)		
201651700000.00				
Alpha	1.00	Stream Power (lb/ft s)	1361.60	0.00
0.00				
Frctn Loss (ft)	3940.94	Cum Volume (acre-ft)	2.50	9.85
1.14				
C & E Loss (ft)		Cum SA (acres)	0.48	1.84
0.29				

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond RS: 3.2*

INPUT

Description:

Station	Elevation	Data	num=	42					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	61.13	7.48	76.4	6.88	99.42	5.9	112.91	5.5
135	4.8	157.91	3.75	177.91	2.86	186.77	2.63	211.39	1.96
219.77	1.8	264.88	1.27	287.8	.8	351.58	-.18	429.6	-1.11
615.19	-3.36	628.8	-5	653.92	-4.6	654.1	-4.6	681.2	-5
696.24	-4.07	706.26	-2.79	752.53	-.86	766.4	-.37	945.72	.56
1022	.8	1061.78	1	1067.34	1.07	1094.94	4.02	1101.08	4.63
1131.41	6.72	1139.04	7.23	1175.34	8.97	1175.95	9	1222.58	10.98
1231.7	11.61	1244.96	12.43	1260.71	13.37	1261.36	13.41	1302.98	16.16
1338.33	18.22	1366.8	20.8						

Manning's n values num= 3

3300640.rep

Sta	n Val	Sta	n Val	Sta	n Val				
0	.02	287.8	.02	1022	.02				

Bank Sta: Left 287.8 Right 1022 Lengths: Left Channel 105 97.6 Right 90 Coeff Contr. .1 Expan. .3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	1182.76	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1185.28	Wt. n-Val.		0.020
W.S. Elev (ft)	-2.52	Reach Len. (ft)	105.00	97.60
90.00				
Crit W.S. (ft)	4.50	Flow Area (sq ft)		211.97
E.G. Slope (ft/ft)	10.094640	Area (sq ft)		211.97
Q Total (cfs)	58562.43	Flow (cfs)		58562.43
Top width (ft)	167.17	Top width (ft)		167.17
Vel Total (ft/s)	276.28	Avg. Vel. (ft/s)		276.28
Max Chl Dpth (ft)	2.48	Hydr. Depth (ft)		1.27
Conv. Total (cfs)	18432.1	Conv. (cfs)		18432.1
Length wtd. (ft)	97.60	Wetted Per. (ft)		167.40
Min Ch El (ft)	-5.00	Shear (lb/sq ft)		797.99
Alpha	1.00	Stream Power (lb/ft s)	1366.80	0.00
0.00				
Frctn Loss (ft)	3939.32	Cum Volume (acre-ft)	2.50	9.61
1.14				
C & E Loss (ft)		Cum SA (acres)	0.48	1.65
0.29				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond RS: 3

INPUT

Description:

Station	Elevation	Data	num=	23					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	73	7	95	6	129	5	170	3
210	2	275	1	350	0	660	-3	676	-5

690	-5	705	-5	3300640.rep	720	-4	730	-2.5	790	0
1045	1	1088	1	1120	5	1156	8	1191	10	
1272	15	1345	20	1372	23					

Manning's n values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .02	275 .02	1045 .02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
275	1045	45	45	45	.1	.3	

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	128577500.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	128577500.00	wt. n-Val.	
0.020			
W.S. Elev (ft)	-4.98	Reach Len. (ft)	2.50 2.50
2.50			
Crit w.s. (ft)	4.61	Flow Area (sq ft)	0.64
E.G. Slope (ft/ft)	246182100.000000	Area (sq ft)	
0.64			
Q Total (cfs)	58561.94	Flow (cfs)	58561.94
Top width (ft)	29.51	Top width (ft)	29.51
Vel Total (ft/s)	90996.66	Avg. Vel. (ft/s)	90996.66
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.02
Conv. Total (cfs)	3.7	Conv. (cfs)	3.7
Length wtd. (ft)	2.50	wetted Per. (ft)	29.51
Min Ch El (ft)	-5.00	Shear (lb/sq ft)	
335195400.00			
Alpha	1.00	Stream Power (lb/ft s)	1372.00 0.00
0.00			
Frctn Loss (ft)		Cum Volume (acre-ft)	2.50 9.37
1.14			
C & E Loss (ft)		Cum SA (acres)	0.48 1.43
0.29			

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

BRIDGE

RIVER: Mill Pond
 REACH: Mill Pond RS: 2.9

INPUT
 Description:

Distance from Upstream XS = 2.5
 Deck/Roadway width = 40
 Weir Coefficient = 2.6
 Upstream Deck/Roadway Coordinates

num= 9														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
95		6		-5	659.9		9		-5	660		13		5
676		13		5.5	690		13		6	705		13		5.5
720		13		5	720.1		9		-5	1120		5		-5

Upstream Bridge Cross Section Data

Station Elevation Data num= 23									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	73	7	95	6	129	5	170	3
210	2	275	1	350	0	660	-3	676	-5
690	-5	705	-5	720	-4	730	-2.5	790	0
1045	1	1088	1	1120	5	1156	8	1191	10
1272	15	1345	20	1372	23				

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	275	.02	1045	.02

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	275	1045		.1	.3

Downstream Deck/Roadway Coordinates

num= 9														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
95		6		-5	659.9		9		-5	660		13		5
676		13		5.5	690		13		6	705		13		5.5
720		13		5	720.1		9		-5	1120		5		-5

Downstream Bridge Cross Section Data

Station Elevation Data num= 23									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	73	7	95	6	129	5	170	3
210	2	275	1	350	0	660	-4	676	-5
690	-4	705	-5	720	-3	730	-3	790	0
1045	1	1088	1	1120	5	1156	8	1191	10
1272	15	1345	20	1372	23				

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	275	.02	1045	.02

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	275	1045		.1	.3

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Piers = 1

Pier Data			
Pier Station	Upstream=	Downstream=	
	690	690	
Upstream	num= 2		
width	Elev	width	Elev

3	-5	3	6
Downstream	num=	2	
width	Elev	width	Elev
3	-5	3	6

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters

Add Friction component to Momentum
Do not add weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #07AUG2011 2300

E.G. US. (ft)	128577500.00	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	-4.98	E.G. Elev (ft)	13.63
13.44		W.S. Elev (ft)	12.14
Q Total (cfs)	58561.94	Crit w.s. (ft)	11.28
11.29		Max Chl Dpth (ft)	17.14
Q Bridge (cfs)	4939.39	Vel Total (ft/s)	9.78
11.29		Flow Area (sq ft)	5985.68
Q Weir (cfs)		Froude # Chl	0.42
16.29		Specif Force (cu ft)	38028.44
Weir Sta Lft (ft)		Hydr Depth (ft)	5.14
11.72		W.P. Total (ft)	1327.41
Weir Sta Rgt (ft)		Conv. Total (cfs)	1217398.0
4995.46		Top width (ft)	1165.56
Weir Submerg		Frctn Loss (ft)	
0.51		C & E Loss (ft)	
Weir Max Depth (ft)		Shear Total (lb/sq ft)	0.65
36754.61		Power Total (lb/ft s)	0.00
Min El Weir Flow (ft)	5.01		
4.34			
Min El Prs (ft)	6.00		
1309.45			
Delta EG (ft)	-167306000000.00		
909492.2			
Delta WS (ft)	18.47		
1151.83			
BR Open Area (sq ft)	562.65		
BR Open Vel (ft/s)	8.78		
Coef of Q			
0.99			
Br Sel Method	Energy only		
0.00			

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

3300640.rep

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m) between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond

REACH: Mill Pond RS: 2.8

INPUT

Description:

Station Elevation Data				num=	23
Sta	Elev	Sta	Elev	Sta	Elev
0	10	73	7	95	6
210	2	275	1	350	0
690	-4	705	-5	720	-3
1045	1	1088	1	1120	5
1272	15	1345	20	1372	23

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	275	.02	1045	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	275	1045		114 95.56	77.14	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	167306000000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	167306000000.00	Wt. n-Val.	
0.020			
W.S. Elev (ft)	-4.97	Reach Len. (ft)	114.00 95.56
77.14			
Crit W.S. (ft)	4.45	Flow Area (sq ft)	0.02
E.G. Slope (ft/ft)	638954400000.000000	Area (sq ft)	
0.02			
Q Total (cfs)	58561.93	Flow (cfs)	58561.93
Top width (ft)	1.37	Top width (ft)	1.37
Vel Total (ft/s)	3282455.00	Avg. Vel. (ft/s)	
3282454.00			
Max Chl Dpth (ft)	0.03	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.1	Conv. (cfs)	0.1
Length wtd. (ft)	95.56	wetted Per. (ft)	1.37
Min Ch El (ft)	-5.00	Shear (lb/sq ft)	
518335800000.00			

3300640.rep
Alpha 1.00 Stream Power (lb/ft s) 1372.00 0.00
0.00
Frctn Loss (ft) 6715132000000.00 Cum Volume (acre-ft) 1.24
6.04 0.38
C & E Loss (ft) Cum SA (acres) 0.21 0.73
0.12

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond RS: 2.68571*

INPUT

Description:

Station Elevation Data				num=	34				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	11	66.93	7.82	87.1	6.78	109.63	5.95	118.28	5.65
155.87	3.68	192.55	2.56	252.14	1.29	309.45	.45	322.57	.26
394.59	-.71	613.69	-4.76	628.71	-5.71	641.81	-4.71	656.78	-4.8
667.06	-4.63	708.14	-5.71	722.09	-3.94	731.39	-3.89	787.18	-1.07
1024.29	.86	1066.42	.91	1097.78	4.37	1133.06	6.98	1148.58	7.78
1167.35	8.94	1195.33	10.8	1212.44	12.43	1235.24	14.38	1246.72	15.28
1264.89	16.8	1292.26	19.16	1318.26	21.21	1344.71	24.29		

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	252.14	.02	1024.29	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	252.14	1024.29		114	95.56		.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	162398800000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	162398800000.00	wt. n-Val.	
0.020			
W.S. Elev (ft)	-5.69	Reach Len. (ft)	114.00 95.56
77.14			
Crit w.s. (ft)	3.94	Flow Area (sq ft)	0.02
E.G. Slope (ft/ft)	776515600000.000000	Area (sq ft)	
0.02			
Q Total (cfs)	58561.95	Flow (cfs)	58561.95
Top width (ft)	1.65	Top width (ft)	1.65
Vel Total (ft/s)	3233958.00	Avg. Vel. (ft/s)	
3233958.00			
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.1	Conv. (cfs)	0.1

3300640.rep

Length Wtd. (ft)	95.56	Wetted Per. (ft)	1.65
Min Ch El (ft)	-5.71	Shear (lb/sq ft)	
532212000000.00			
Alpha	1.00	Stream Power (lb/ft s)	1344.71
0.00			0.00
Frctn Loss (ft)	31167840000000.00	Cum Volume (acre-ft)	1.24
6.04 0.38			
C & E Loss (ft)		Cum SA (acres)	0.21
0.12			0.73

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond RS: 2.57142*

INPUT

Description:

Station Elevation Data		num=	34
Sta	Elev	Sta	Elev
0	12	60.86	8.64
141.74	4.35	175.09	3.12
362.49	-.42	567.38	-5.51
644.12	-5.26	711.29	-6.43
1003.57	.71	1044.84	.81
1143.7	7.89	1171.11	9.83
1239.24	17.34	1266.05	20.13

Manning's n values		num=	3
Sta	n Val	Sta	n Val
0	.02	229.29	.02
		1003.57	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
229.29	1003.57	114	95.56	77.14	.1	.3	

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	48177050000.00	Element	Left OB
Channel Right OB			
vel Head (ft)	48177050000.00	wt. n-val.	
0.020			
W.S. Elev (ft)	-6.40	Reach Len. (ft)	114.00
77.14			95.56
Crit W.S. (ft)	3.36	Flow Area (sq ft)	0.03
E.G. slope (ft/ft)	178459500000.000000	Area (sq ft)	
0.03			
Q Total (cfs)	58561.98	Flow (cfs)	58561.98

3300640.rep

Top width (ft)	2.50	Top width (ft)	2.50
Vel Total (ft/s)	1761421.00	Avg. Vel. (ft/s)	
1761421.00			
Max Chl Dpth (ft)	0.03	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.1	Conv. (cfs)	0.1
Length wtd. (ft)	95.56	Wetted Per. (ft)	2.50
Min Ch El (ft)	-6.43	Shear (lb/sq ft)	
148123900000.00			
Alpha	1.00	Stream Power (lb/ft s)	1317.43
0.00			0.00
Frctn Loss (ft)	23247470000000.00	Cum volume (acre-ft)	1.24
6.04 0.38			
C & E Loss (ft)		Cum SA (acres)	0.21
0.12			0.73

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond

REACH: Mill Pond

RS: 2.45714*

INPUT

Description:

Station Elevation Data			num=	34						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	13	54.8	9.45	71.31	8.33	89.75	7.3	96.83	6.96	
127.61	5.03	157.64	3.68	206.43	1.86	256.3	.96	267.72	.79	
330.39	-.14	521.07	-6.27	534.14	-7.14	563.88	-4.8	597.86	-5.87	
621.18	-5.89	714.43	-7.14	726.27	-5.81	734.17	-5.68	781.54	-3.21	
982.86	.57	1023.26	.72	1053.34	3.11	1087.17	4.95	1102.05	5.52	
1120.06	6.83	1146.89	8.86	1163.29	11.62	1185.16	14.59	1196.17	15.83	
1213.59	17.87	1239.84	21.1	1264.77	23.63	1290.14	26.86			

Manning's n values			num=	3		
Sta	n Val	Sta	n Val	Sta	n Val	
0	.02	206.43	.02	982.86	.02	

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	206.43	982.86		114 95.56	77.14	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	73494110000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	73494100000.00	wt. n-Val.	

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0.020
W.S. Elev (ft) -7.12 Reach Len. (ft) 114.00 95.56
77.14
Crit W.S. (ft) 2.68 Flow Area (sq ft) 0.03
E.G. Slope (ft/ft) 351071400000.000000 Area (sq ft)
0.03
Q Total (cfs) 58562.00 Flow (cfs) 58562.00
Top width (ft) 2.45 Top width (ft) 2.45
Vel Total (ft/s) 2175551.00 Avg. Vel. (ft/s)
2175551.00
Max Chl Dpth (ft) 0.02 Hydr. Depth (ft) 0.01
Conv. Total (cfs) 0.1 Conv. (cfs) 0.1
Length wtd. (ft) 95.56 Wetted Per. (ft) 2.45
Min Ch El (ft) -7.14 Shear (lb/sq ft)
240795500000.00
Alpha 1.00 Stream Power (lb/ft s) 1290.14 0.00
0.00
Frctn Loss (ft) 29662570000000.00 Cum Volume (acre-ft) 1.24
6.04 0.38
C & E Loss (ft) Cum SA (acres) 0.21 0.72
0.12

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond

RS: 2.34285*

INPUT

Description:

Station Elevation Data				num= 34					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	14	48.73	10.27	63.42	9.11	79.81	7.98	86.11	7.61
113.48	5.7	140.18	4.24	183.57	2.14	229.72	1.22	240.3	1.05
298.29	.15	474.76	-7.03	486.86	-7.86	524.91	-4.85	568.39	-6.4
598.24	-6.51	717.57	-7.86	728.36	-6.75	735.55	-6.58	778.71	-4.29
962.14	.43	1001.69	.62	1031.11	2.48	1064.22	3.93	1078.79	4.39
1096.41	5.77	1122.67	7.9	1138.72	11.22	1160.12	14.69	1170.9	16.11
1187.95	18.4	1213.63	22.08	1238.03	24.84	1262.86	28.14		

Manning's n Values				num= 3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	183.57	.02	962.14	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	183.57	962.14		114 95.56	77.14	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

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3300640.rep

E.G. Elev (ft)	57883030000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	57883030000.00	wt. n-Val.	
0.020			
W.S. Elev (ft)	-7.84	Reach Len. (ft)	114.00 95.56
77.14			
Crit W.S. (ft)	1.99	Flow Area (sq ft)	0.03
E.G. Slope (ft/ft)	276420700000.000000	Area (sq ft)	
0.03			
Q Total (cfs)	58562.04	Flow (cfs)	58562.04
Top width (ft)	2.76	Top width (ft)	2.76
Vel Total (ft/s)	1930717.00	Avg. Vel. (ft/s)	
1930717.00			
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.1	Conv. (cfs)	0.1
Length wtd. (ft)	95.56	wetted Per. (ft)	2.76
Min Ch El (ft)	-7.86	Shear (lb/sq ft)	
189634000000.00			
Alpha	1.00	Stream Power (lb/ft s)	1262.86 0.00
0.00			
Frctn Loss (ft)	23659570000000.00	Cum Volume (acre-ft)	1.24
6.04 0.38			
C & E Loss (ft)		Cum SA (acres)	0.21 0.72
0.12			

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 2.22857*

INPUT

Description:

Station Elevation Data	num=	34
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev		
0 15 42.66 11.09 55.52 9.88 69.88 8.65 75.39 8.27		
99.35 6.38 122.73 4.81 160.71 2.43 203.15 1.48 212.87 1.32		
266.2 .43 428.44 -7.78 439.57 -8.57 485.94 -4.9 538.93 -6.93		
575.3 -7.14 720.71 -8.57 730.45 -7.68 736.94 -7.47 775.89 -5.36		
941.43 .29 980.11 .53 1008.89 1.85 1041.28 2.91 1055.53 3.26		
1072.76 4.72 1098.44 6.93 1114.15 10.81 1135.08 14.79 1145.62 16.38		
1162.3 18.93 1187.42 23.05 1211.28 26.05 1235.57 29.43		

Manning's n Values	num=	3
Sta n Val Sta n Val		
0 .02 160.71 .02 941.43 .02		

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Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 160.71 941.43 114 95.56 77.14 .1 .3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	46741550000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	46741550000.00	wt. n-Val.	
0.020			
W.S. Elev (ft)	-8.55	Reach Len. (ft)	114.00 95.56
77.14			
Crit W.S. (ft)	1.12	Flow Area (sq ft)	0.03
E.G. slope (ft/ft)	223043200000.000000	Area (sq ft)	
0.03			
Q Total (cfs)	58562.12	Flow (cfs)	58562.12
Top width (ft)	3.07	Top width (ft)	3.07
Vel Total (ft/s)	1734980.00	Avg. vel. (ft/s)	
1734980.00			
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.1	Conv. (cfs)	0.1
Length wtd. (ft)	95.56	wetted Per. (ft)	3.07
Min Ch El (ft)	-8.57	Shear (lb/sq ft)	
153103300000.00			
Alpha	1.00	Stream Power (lb/ft s)	1235.57 0.00
0.00			
Frctn Loss (ft)	19022710000000.00	Cum volume (acre-ft)	1.24
6.04 0.38			
C & E Loss (ft)		Cum SA (acres)	0.21 0.71
0.12			

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 2.11428*

INPUT

Description:

Station	Elevation	Data	num=	34
Sta	Elev	Sta	Elev	Sta
0	16	36.59	11.91	47.62
85.22	7.05	105.27	5.37	137.86
234.1	.72	382.13	-8.54	392.29
552.35	-7.77	723.86	-9.29	732.54
920.71	.14	958.53	.43	986.67
1049.11	3.66	1074.22	5.97	1089.57
			10.41	1110.04
			14.9	1120.34
				16.66

3300640.rep
 1136.65 19.47 1161.21 24.03 1184.54 27.26 1208.29 30.71
 Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .02 137.86 .02 920.71 .02
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 137.86 920.71 114 95.56 77.14 .1 .3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	37921310000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	37921310000.00	Wt. n-Val.	
0.020			
W.S. Elev (ft)	-9.27	Reach Len. (ft)	114.00 95.56
77.14			
Crit W.S. (ft)	0.09	Flow Area (sq ft)	0.04
E.G. Slope (ft/ft)	178756600000.000000	Area (sq ft)	
0.04			
Q Total (cfs)	58562.50	Flow (cfs)	58562.50
Top width (ft)	3.37	Top width (ft)	3.37
Vel Total (ft/s)	1562732.00	Avg. Vel. (ft/s)	
1562732.00			
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.1	Conv. (cfs)	0.1
Length wtd. (ft)	95.56	Wetted Per. (ft)	3.38
Min Ch El (ft)	-9.29	Shear (lb/sq ft)	
123833500000.00			
Alpha	1.00	Stream Power (lb/ft s)	1208.29 0.00
0.00			
Frctn Loss (ft)	15978720000000.00	Cum Volume (acre-ft)	1.24
6.04 0.38			
C & E Loss (ft)		Cum SA (acres)	0.21 0.70
0.12			

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 2

INPUT

Description: One Bridge Length Downstream

Station	Elevation	Data	num=	17					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	17	50	10	115	3	150	2	202	1

345	-10	408	-5	3300640.rep	480	-8	727	-10	900	0
1009	1	1050	5	1065	10	1085	15	1111	20	
1135	25	1181	32							

Manning's n values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .02	115 .02	900 .02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
115	900	99.5	91.5	83.38	.1	.3	

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	32839480000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	32839480000.00	wt. n-Val.	
0.020			
W.S. Elev (ft)	-9.98	Reach Len. (ft)	99.50 91.50
83.38			
Crit w.s. (ft)	-0.82	Flow Area (sq ft)	0.04
E.G. Slope (ft/ft)	156749700000.000000	Area (sq ft)	
0.04			
Q Total (cfs)	58562.86	Flow (cfs)	58562.86
Top width (ft)	3.66	Top width (ft)	3.66
Vel Total (ft/s)	1454257.00	Avg. Vel. (ft/s)	
1454257.00			
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.1	Conv. (cfs)	0.1
Length wtd. (ft)	91.50	wetted Per. (ft)	3.66
Min Ch El (ft)	-10.00	Shear (lb/sq ft)	
107574400000.00			
Alpha	1.00	Stream Power (lb/ft s)	1181.00 0.00
0.00			
Frctn Loss (ft)	8984921000000.00	Cum Volume (acre-ft)	1.24
6.04 0.38			
C & E Loss (ft)		Cum SA (acres)	0.21 0.69
0.12			

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond RS: 1.875*

3300640.rep

INPUT

Description:

Station Elevation Data			num= 26								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	18.88	25.6	13.79	51.2	9.58	57.88	8.88	133.12	2.75		
167.31	1.76	218.09	.72	357.75	-9.38	416.73	-5	484.14	-7.62		
715.38	-9.38	890	.12	906.47	.37	931.17	.92	988.81	1.95		
1013.5	2.31	1059.95	6.17	1071.14	9.13	1076.95	10.69	1099.61	15.32		
1126.04	19.55	1129.06	20.07	1153.48	24.55	1156.26	25.06	1180.93	28.52		
1208.38	32.5										

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	133.12	.02	890	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	133.12	890		99.5	91.5		.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	16874680000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	16874680000.00	wt. n-Val.	
0.020			
W.S. Elev (ft)	-9.35	Reach Len. (ft)	99.50 91.50
83.38			
Crit w.s. (ft)	-0.19	Flow Area (sq ft)	0.06
E.G. Slope (ft/ft)	67234270000.000000	Area (sq ft)	
0.06			
Q Total (cfs)	58563.16	Flow (cfs)	58563.16
Top width (ft)	4.46	Top width (ft)	4.46
Vel Total (ft/s)	1042463.00	Avg. Vel. (ft/s)	
1042463.00			
Max Chl Dpth (ft)	0.03	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.2	Conv. (cfs)	0.2
Length wtd. (ft)	91.50	Wetted Per. (ft)	4.46
Min Ch El (ft)	-9.38	Shear (lb/sq ft)	
52836560000.00			
Alpha	1.00	Stream Power (lb/ft s)	1208.38 0.00
0.00			
Frctn Loss (ft)	7956157000000.00	Cum Volume (acre-ft)	1.24
6.04 0.38			
C & E Loss (ft)		Cum SA (acres)	0.21 0.69
0.12			

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond

RS: 1.75*

INPUT

Description:

Station Elevation Data			num= 26								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	20.75	29.09	13.68	58.17	8.36	65.76	7.75	151.25	2.5		
184.61	1.52	234.18	.43	370.5	-8.75	425.46	-5	488.27	-7.25		
703.75	-8.75	880	.25	898.4	.6	926	1.5	990.41	3.1		
1018	3.62	1069.9	7.33	1082.41	9.97	1088.89	11.38	1114.21	15.65		
1143.75	19.61	1147.13	20.14	1174.41	24.62	1177.51	25.13	1205.08	28.74		
1235.75	33										

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	151.25	.02	880	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	151.25	880		99.5 91.5	83.38	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	24477430000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	24477440000.00	wt. n-val.	
0.020			
W.S. Elev (ft)	-8.73	Reach Len. (ft)	99.50 91.50
83.38			
Crit w.s. (ft)	0.44	Flow Area (sq ft)	0.05
E.G. slope (ft/ft)	116811300000.000000	Area (sq ft)	
0.05			
Q Total (cfs)	58563.48	Flow (cfs)	58563.48
Top width (ft)	4.24	Top width (ft)	4.24
Vel Total (ft/s)	1255527.00	Avg. Vel. (ft/s)	
1255527.00			
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.2	Conv. (cfs)	0.2
Length wtd. (ft)	91.50	Wetted Per. (ft)	4.24
Min Ch El (ft)	-8.75	Shear (lb/sq ft)	
80178090000.00			
Alpha	1.00	Stream Power (lb/ft s)	1235.75 0.00
0.00			
Frctn Loss (ft)	9581189000000.00	Cum Volume (acre-ft)	1.24
6.04 0.38			
C & E Loss (ft)		Cum SA (acres)	0.21 0.68
0.12			

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

3300640.rep

need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 1.625*

INPUT

Description:

Station Elevation Data		num= 26	
Sta	Elev	Sta	Elev
0	22.62	32.57	13.56
201.92	1.28	250.28	.15
692.12	-8.12	870	.38
1022.49	4.94	1079.85	8.5
1161.45	19.68	1165.19	20.21
1263.12	33.5		

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.02	169.38	.02
		870	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
169.38	870	99.5	91.5	83.38	.1	.3	

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	19783960000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	19783960000.00	wt. n-Val.	
0.020			
W.S. Elev (ft)	-8.10	Reach Len. (ft)	99.50 91.50
83.38			
Crit W.S. (ft)	1.17	Flow Area (sq ft)	0.05
E.G. Slope (ft/ft)	94400470000.000000	Area (sq ft)	
0.05			
Q Total (cfs)	58563.61	Flow (cfs)	58563.61
Top width (ft)	4.72	Top width (ft)	4.72
Vel Total (ft/s)	1128755.00	Avg. Vel. (ft/s)	
1128755.00			
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.2	Conv. (cfs)	0.2
Length wtd. (ft)	91.50	Wetted Per. (ft)	4.72
Min Ch El (ft)	-8.12	Shear (lb/sq ft)	
64802040000.00			
Alpha	1.00	Stream Power (lb/ft s)	1263.12 0.00
0.00			
Frctn Loss (ft)	7598914000000.00	Cum Volume (acre-ft)	1.24
6.04 0.38			
C & E Loss (ft)		Cum SA (acres)	0.21 0.67
0.12			

Warning: Divided flow computed for this cross-section.

3300640.rep

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond RS: 1.5*

INPUT

Description:

Station	Elevation	Data	num=	26						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	24.5	36.06	13.45	72.12	5.9	81.52	5.5	187.5	2	
219.23	1.04	266.37	-.13	396	-7.5	442.92	-5	496.54	-6.5	
680.5	-7.5	860	.5	882.27	1.07	915.67	2.67	993.6	5.4	
1026.99	6.25	1089.8	9.66	1104.94	11.65	1112.78	12.76	1143.43	16.3	
1179.16	19.74	1183.26	20.28	1216.28	24.74	1220.03	25.25	1253.39	29.16	
1290.5	34									

Manning's n	Values	num=	3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	187.5	.02	860	.02

Bank	Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
	187.5	860	99.5	91.5	83.38		.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	15431680000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	15431680000.00	wt. n-Val.	
0.020			
W.S. Elev (ft)	-7.48	Reach Len. (ft)	99.50 91.50
83.38			
Crit W.S. (ft)	1.79	Flow Area (sq ft)	0.06
E.G. Slope (ft/ft)	73627160000.000000	Area (sq ft)	
0.06			
Q Total (cfs)	58563.76	Flow (cfs)	58563.76
Top width (ft)	5.34	Top width (ft)	5.34
Vel Total (ft/s)	996895.30	Avg. Vel. (ft/s)	996895.30
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.2	Conv. (cfs)	0.2
Length wtd. (ft)	91.50	Wetted Per. (ft)	5.34
Min Ch El (ft)	-7.50	Shear (lb/sq ft)	
50545150000.00			
Alpha	1.00	Stream Power (lb/ft s)	1290.50 0.00
0.00			
Frctn Loss (ft)	5640142000000.00	cum volume (acre-ft)	1.24
6.04 0.38			
C & E Loss (ft)		Cum SA (acres)	0.21 0.66
0.12			

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond

RS: 1.375*

INPUT

Description:

Station Elevation Data			num= 26								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	26.38	39.54	13.34	79.09	4.68	89.4	4.38	205.62	1.75		
236.54	.8	282.46	-.42	408.75	-6.88	451.65	-5	500.68	-6.12		
668.88	-6.88	850	.62	874.2	1.3	910.5	3.25	995.2	6.55		
1031.49	7.56	1099.76	10.83	1116.2	12.48	1124.73	13.46	1158.03	16.62		
1196.87	19.81	1201.32	20.34	1237.21	24.81	1241.28	25.32	1277.54	29.37		
1317.88	34.5										

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	205.62	.02	850	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	205.62	850		99.5 91.5	83.38	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	10975780000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	10975780000.00	wt. n-Val.	
0.020			
W.S. Elev (ft)	-6.86	Reach Len. (ft)	99.50 91.50
83.38			
Crit W.S. (ft)	2.35	Flow Area (sq ft)	0.07
E.G. Slope (ft/ft)	52360050000.000000	Area (sq ft)	
0.07			
Q Total (cfs)	58563.95	Flow (cfs)	58563.95
Top width (ft)	6.33	Top width (ft)	6.33
Vel Total (ft/s)	840737.90	Avg. Vel. (ft/s)	840737.90
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.3	Conv. (cfs)	0.3
Length wtd. (ft)	91.50	wetted Per. (ft)	6.33
Min Ch El (ft)	-6.88	Shear (lb/sq ft)	
35948990000.00			
Alpha	1.00	Stream Power (lb/ft s)	1317.88 0.00
0.00			

3300640.rep
 Frctn Loss (ft) 3515018000000.00 Cum Volume (acre-ft) 1.24
 6.04 0.38
 C & E Loss (ft) Cum SA (acres) 0.21 0.64
 0.12

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 1.25*

INPUT

Description:

Station	Elevation	Data	num=	26	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	28.25	43.03	13.23	86.06	3.45	97.28	3.25	223.75	1.5			
253.84	.57	298.55	-.7	421.5	-6.25	460.38	-5	504.81	-5.75			
657.25	-6.25	840	.75	866.13	1.53	905.33	3.83	996.8	7.7			
1035.99	8.87	1109.71	11.99	1127.47	13.32	1136.68	14.15	1172.64	16.94			
1214.58	19.87	1219.39	20.41	1258.14	24.87	1262.54	25.38	1301.69	29.58			
1345.25	35											

Manning's n	Values	num=	3	Sta	n Val	Sta	n Val
0	.02	223.75	.02	840	.02		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	223.75	840		99.5	91.5	83.38	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	6159532000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	6159532000.00	Wt. n-Val.	
0.020			
W.S. Elev (ft)	-6.23	Reach Len. (ft)	99.50 91.50
83.38			
Crit W.S. (ft)	2.98	Flow Area (sq ft)	0.09
E.G. Slope (ft/ft)	29381490000.000000	Area (sq ft)	
0.09			
Q Total (cfs)	58564.49	Flow (cfs)	58564.49
Top width (ft)	8.45	Top width (ft)	8.45
Vel Total (ft/s)	629820.50	Avg. Vel. (ft/s)	629820.50
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.3	Conv. (cfs)	0.3
Length wtd. (ft)	91.50	Wetted Per. (ft)	8.45

3300640.rep
 Min Ch El (ft) -6.25 Shear (lb/sq ft)
 20173880000.00
 Alpha 1.00 Stream Power (lb/ft s) 1345.25 0.00
 0.00
 Frctn Loss (ft) 1402017000000.00 Cum Volume (acre-ft) 1.24
 6.04 0.38
 C & E Loss (ft) Cum SA (acres) 0.21 0.63
 0.12

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 1.125*

INPUT

Description:

Station Elevation Data			num= 26								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	30.12	46.51	13.11	93.03	2.23	105.16	2.12	241.88	1.25		
271.15	.33	314.64	-.99	434.25	-5.62	469.11	-5	508.95	-5.38		
645.62	-5.62	830	.88	858.07	1.77	900.17	4.42	998.4	8.85		
1040.48	10.19	1119.66	13.16	1138.73	14.16	1148.62	14.84	1187.24	17.27		
1232.29	19.94	1237.45	20.48	1279.07	24.94	1283.8	25.44	1325.85	29.79		
1372.62	35.5										

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	241.88	.02	830	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	241.88	830		99.5	91.5	83.38	.1 .3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	1967438000.00	Element	Left OB
Channel Right OB			
Vel Head (ft)	1967438000.00	wt. n-Val.	
0.020			
W.S. Elev (ft)	-5.60	Reach Len. (ft)	99.50 91.50
83.38			
Crit W.S. (ft)	3.61	Flow Area (sq ft)	0.16
E.G. Slope (ft/ft)	9383747000.000000	Area (sq ft)	
0.16			
Q Total (cfs)	58564.98	Flow (cfs)	58564.98
Top width (ft)	14.96	Top width (ft)	14.96
Vel Total (ft/s)	355953.70	Avg. vel. (ft/s)	355953.70

3300640.rep

Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)	0.01
Conv. Total (cfs)	0.6	Conv. (cfs)	0.6
Length Wtd. (ft)	91.83	Wetted Per. (ft)	14.96
Min Ch El (ft)	-5.62	Shear (lb/sq ft)	
6443621000.00			
Alpha	1.00	Stream Power (lb/ft s)	1372.62
0.00			0.00
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	1.24
0.38			6.04
C & E Loss (ft)		Cum SA (acres)	0.21
0.12			0.60

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Pond

REACH: Mill Pond

RS: 1

INPUT

Description: Two Bridge Lengths Downstream

Station Elevation Data				num=	15					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	32	50	13	100	1	260	1	447	-5	
634	-5	820	1	850	2	895	5	1000	10	
1150	15	1250	20	1300	25	1350	30	1400	36	

Manning's n values

num=

3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	260	.02	820	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
260	820	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 2300

E.G. Elev (ft)	8.36	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.10	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	7.26	Reach Len. (ft)		
Crit W.S. (ft)	3.96	Flow Area (sq ft)	1083.24	5746.60
395.63				
E.G. slope (ft/ft)	0.000626	Area (sq ft)	1083.24	5746.60
395.63				
Q Total (cfs)	58560.66	Flow (cfs)	6501.48	50452.82
		Page 38		

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1606.36				
Top width (ft)	868.54	Top width (ft)	186.08	560.00
122.46				
Vel Total (ft/s)	8.10	Avg. Vel. (ft/s)	6.00	8.78
4.06				
Max Chl Dpth (ft)	12.26	Hydr. Depth (ft)	5.82	10.26
3.23				
Conv. Total (cfs)	2339621.0	Conv. (cfs)	259747.7	2015696.0
64177.3				
Length Wtd. (ft)		Wetted Per. (ft)	186.82	560.19
122.63				
Min Ch El (ft)	-5.00	Shear (lb/sq ft)	0.23	0.40
0.13				
Alpha	1.08	Stream Power (lb/ft s)	1400.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River: Mill Pond

Reach	River Sta.	n1	n2	n3
Mill Pond	6	.02	.02	.02
Mill Pond	5.8*	.02	.02	.02
Mill Pond	5.6*	.02	.02	.02
Mill Pond	5.4*	.02	.02	.02
Mill Pond	5.2*	.02	.02	.02
Mill Pond	5	.02	.02	.02
Mill Pond	4.8*	.02	.02	.02
Mill Pond	4.6*	.02	.02	.02
Mill Pond	4.4*	.02	.02	.02
Mill Pond	4.2*	.02	.02	.02
Mill Pond	4	.02	.02	.02
Mill Pond	3.8*	.02	.02	.02
Mill Pond	3.6*	.02	.02	.02
Mill Pond	3.4*	.02	.02	.02
Mill Pond	3.2*	.02	.02	.02
Mill Pond	3	.02	.02	.02
Mill Pond	2.9	Bridge		
Mill Pond	2.8	.02	.02	.02
Mill Pond	2.68571*	.02	.02	.02
Mill Pond	2.57142*	.02	.02	.02
Mill Pond	2.45714*	.02	.02	.02
Mill Pond	2.34285*	.02	.02	.02
Mill Pond	2.22857*	.02	.02	.02
Mill Pond	2.11428*	.02	.02	.02
Mill Pond	2	.02	.02	.02
Mill Pond	1.875*	.02	.02	.02
Mill Pond	1.75*	.02	.02	.02
Mill Pond	1.625*	.02	.02	.02
Mill Pond	1.5*	.02	.02	.02
Mill Pond	1.375*	.02	.02	.02
Mill Pond	1.25*	.02	.02	.02
Mill Pond	1.125*	.02	.02	.02
Mill Pond	1	.02	.02	.02

SUMMARY OF REACH LENGTHS

River: Mill Pond

Reach	River Sta.	Left	Channel	Right
Mill Pond	6	84.8	91	97.2
Mill Pond	5.8*	84.8	91	97.2
Mill Pond	5.6*	84.8	91	97.2
Mill Pond	5.4*	84.8	91	97.2
Mill Pond	5.2*	84.8	91	97.2
Mill Pond	5	84.8	91	97.2
Mill Pond	4.8*	84.8	91	97.2
Mill Pond	4.6*	84.8	91	97.2
Mill Pond	4.4*	84.8	91	97.2
Mill Pond	4.2*	84.8	91	97.2
Mill Pond	4	105	97.6	90
Mill Pond	3.8*	105	97.6	90
Mill Pond	3.6*	105	97.6	90
Mill Pond	3.4*	105	97.6	90
Mill Pond	3.2*	105	97.6	90
Mill Pond	3	45	45	45
Mill Pond	2.9	Bridge		
Mill Pond	2.8	114	95.56	77.14
Mill Pond	2.68571*	114	95.56	77.14
Mill Pond	2.57142*	114	95.56	77.14
Mill Pond	2.45714*	114	95.56	77.14
Mill Pond	2.34285*	114	95.56	77.14
Mill Pond	2.22857*	114	95.56	77.14
Mill Pond	2.11428*	114	95.56	77.14
Mill Pond	2	99.5	91.5	83.38
Mill Pond	1.875*	99.5	91.5	83.38
Mill Pond	1.75*	99.5	91.5	83.38
Mill Pond	1.625*	99.5	91.5	83.38
Mill Pond	1.5*	99.5	91.5	83.38
Mill Pond	1.375*	99.5	91.5	83.38
Mill Pond	1.25*	99.5	91.5	83.38
Mill Pond	1.125*	99.5	91.5	83.38
Mill Pond	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Mill Pond

Reach	River Sta.	Contr.	Expan.
Mill Pond	6	.1	.3
Mill Pond	5.8*	.1	.3
Mill Pond	5.6*	.1	.3
Mill Pond	5.4*	.1	.3
Mill Pond	5.2*	.1	.3
Mill Pond	5	.1	.3
Mill Pond	4.8*	.1	.3
Mill Pond	4.6*	.1	.3
Mill Pond	4.4*	.1	.3
Mill Pond	4.2*	.1	.3

3300640.rep				
Mill Pond	4		.1	.3
Mill Pond	3.8*		.1	.3
Mill Pond	3.6*		.1	.3
Mill Pond	3.4*		.1	.3
Mill Pond	3.2*		.1	.3
Mill Pond	3		.1	.3
Mill Pond	2.9	Bridge		
Mill Pond	2.8		.1	.3
Mill Pond	2.68571*		.1	.3
Mill Pond	2.57142*		.1	.3
Mill Pond	2.45714*		.1	.3
Mill Pond	2.34285*		.1	.3
Mill Pond	2.22857*		.1	.3
Mill Pond	2.11428*		.1	.3
Mill Pond	2		.1	.3
Mill Pond	1.875*		.1	.3
Mill Pond	1.75*		.1	.3
Mill Pond	1.625*		.1	.3
Mill Pond	1.5*		.1	.3
Mill Pond	1.375*		.1	.3
Mill Pond	1.25*		.1	.3
Mill Pond	1.125*		.1	.3
Mill Pond	1		.1	.3

Profile Output Table - Six XS Bridge

Reach W.S. Vel Chnl	River Sta Frctn Loss	Profile C & E Loss	Top width	E.G. Elev Q Left	W.S. Elev Q Channel	Crit Q Right
(ft) (ft/s)	(ft)	(ft)	(ft)	(ft) (cfs)	(ft) (cfs)	(cfs)
Mill Pond 4.50	3.2* 3939.32	07AUG2011	2300 167.17	1182.76	-2.52 58562.43	
276.28 Mill Pond 4.61	3	07AUG2011	2300 29.51	128577500.00	-4.98 58561.94	
90996.66 Mill Pond 11.28	2.9 BR U	07AUG2011	2300 1165.56	13.63 14865.48	12.14 35061.21	8635.26
9.42 Mill Pond 11.29	2.9 BR D	07AUG2011	2300 1151.83	13.44 14761.36	11.29 34895.03	8905.55
11.22 Mill Pond 4.45	2.8 67151320000000.00	07AUG2011	2300 1.37	167306000000.00	-4.97 58561.93	
3282454.00 Mill Pond 3.94	2.68571* 31167840000000.00	07AUG2011	2300 1.65	162398800000.00	-5.69 58561.95	
3233958.00						

3300640.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X
XXXXXXXX XXXX      X      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      XXXXX

```

PROJECT DATA

Project Title: 3300640
Project File : 3300640.prj
Run Date and Time: 1/12/2012 7:36:36 AM

Project in English units

PLAN DATA

Plan Title: Plan 03
Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\3300640 Mill Dam Road -
Suffolk County\3300640.p03

Geometry Title: 3300640
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\3300640
Mill Dam Road - Suffolk County\3300640.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of:	Cross Sections	=	32	Multiple Openings	=	0
	Culverts	=	0	Inline Structures	=	0
	Bridges	=	1	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary	
Conveyance Calculation Method:	At breaks in n values only
Friction Slope Method:	Average Conveyance
Computational Flow Regime:	Subcritical Flow

GEOMETRY DATA

3300640.rep

Geometry Title: 3300640
 Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\3300640 Mill Dam Road
 - Suffolk County\3300640.g01

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 6

INPUT

Description: Two Bridge Lengths Upstream

Station	Elevation	Data	num=	18	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	11	10	10	88	5	119	4	138	2			
163	1	549	-2	602	-4	620	-2	789	1			
835	2	871	3	916	4	975	5	1050	6			
1125	10	1169	12	1220	14							

Manning's n	Values	num=	3	Sta	n Val	Sta	n Val
0	.02	163	.02	789	.02		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	163	789		84.8	91	97.2	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.53	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.49	Reach Len. (ft)	84.80	91.00
97.20				
Crit W.S. (ft)		Flow Area (sq ft)	2741.87	14569.24
6951.69				
E.G. Slope (ft/ft)	0.000009	Area (sq ft)	2741.87	14569.24
6951.69				
Q Total (cfs)	-39653.00	Flow (cfs)	-3790.51	-26200.35
-9662.14				
Top width (ft)	1220.00	Top width (ft)	163.00	626.00
431.00				
Vel Total (ft/s)	-1.63	Avg. Vel. (ft/s)	-1.38	-1.80
-1.39				
Max Chl Dpth (ft)	26.49	Hydr. Depth (ft)	16.82	23.27
16.13				
Conv. Total (cfs)	13351390.0	Conv. (cfs)	1276285.0	
8821804.0				
Length wtd. (ft)	91.76	Wetted Per. (ft)	174.84	626.19
439.73				
Min Ch El (ft)	-4.00	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.04	Stream Power (lb/ft s)	1220.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	254.42	1169.85
267.82				
C & E Loss (ft)		Cum SA (acres)	15.11	46.67
18.16				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond

REACH: Mill Pond

RS: 5.8*

INPUT

Description:

Station Elevation Data			num= 29			Elev Sta			Elev Sta			Elev Sta		
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	10.8	10.66	9.87	32.04	8.57	87.3	5.31	93.83	4.95					
111.33	4.38	126.88	3.86	132.95	3.32	147.14	2.05	151.37	1.87					
164.99	1.46	173.8	1	353.1	-.91	503.17	-2.15	548.4	-3.8					
577.93	-2.1	607.73	-1.74	798.99	.51	855.2	1.2	894.07	2.18					
924.49	3.12	962.52	4.09	986.61	4.59	1012.37	5.18	1075.75	6.41					
1133.04	9.69	1139.12	10.03	1176.3	11.8	1219.4	13.6							

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	173.8	.02	855.2	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	173.8	855.2		84.8	91	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.54	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.49	Reach Len. (ft)	84.80	91.00
97.20				
Crit W.S. (ft)		Flow Area (sq ft)	2937.81	15897.60
5837.02				
E.G. Slope (ft/ft)	0.000008	Area (sq ft)	2937.81	15897.60
5837.02				
Q Total (cfs)	-39716.50	Flow (cfs)	-3977.67	-27894.85
-7843.98				
Top width (ft)	1219.40	Top width (ft)	173.80	681.40
364.20				
Vel Total (ft/s)	-1.61	Avg. Vel. (ft/s)	-1.35	-1.75
-1.34				
Max Chl Dpth (ft)	26.29	Hydr. Depth (ft)	16.90	23.33
16.03				
Conv. Total (cfs)	13729290.0	Conv. (cfs)	1375010.0	
9642754.0				
Length wtd. (ft)	91.46	Wetted Per. (ft)	185.80	681.51
373.34				
Min Ch El (ft)	-3.80	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.04	Stream Power (lb/ft s)	1219.40	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	248.89	1138.02
253.56				
C & E Loss (ft)		Cum SA (acres)	14.78	45.31
17.27				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond

REACH: Mill Pond

RS: 5.6*

INPUT

Description:

Station Elevation Data			num= 29			Elev Sta			Elev Sta			Elev Sta		
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	10.6	11.33	9.73	34.03	8.43	92.73	5.24	99.66	4.89					
118.25	4.28	134.77	3.71	141.21	3.24	156.29	2.09	160.78	1.9					
175.24	1.6	184.6	1	333.07	-1.18	457.35	-2.31	494.8	-3.6					
535.86	-2.2	577.3	-1.81	843.24	.64	921.4	1.4	953.14	2.35					
977.98	3.23	1009.03	4.18	1028.71	4.69	1049.74	5.35	1101.5	6.82					
1148.28	9.77	1153.25	10.06	1183.61	11.6	1218.8	13.2							

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	184.6	.02	921.4	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	184.6	921.4		84.8	91	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.54	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.50	Reach Len. (ft)	84.80	91.00
97.20				
Crit W.S. (ft)		Flow Area (sq ft)	3135.65	17196.82
4737.32				
E.G. Slope (ft/ft)	0.000008	Area (sq ft)	3135.65	17196.82
4737.32				
Q Total (cfs)	-39780.60	Flow (cfs)	-4164.86	-29456.40
-6159.34				
Top width (ft)	1218.80	Top width (ft)	184.60	736.80
297.40				
Vel Total (ft/s)	-1.59	Avg. Vel. (ft/s)	-1.33	-1.71
-1.30				
Max Chl Dpth (ft)	26.10	Hydr. Depth (ft)	16.99	23.34
15.93				
Conv. Total (cfs)	14090870.0	Conv. (cfs)	1475254.0	
10433890.0				
Length wtd. (ft)	91.17	wetted Per. (ft)	196.77	736.88
306.96				
Min Ch El (ft)	-3.60	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.04	Stream Power (lb/ft s)	1218.80	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	242.98	1103.46
241.76				
C & E Loss (ft)		Cum SA (acres)	14.43	43.83
16.54				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond

REACH: Mill Pond

RS: 5.4*

INPUT

Description:

Station Elevation Data			num= 29			Elev Sta			Elev Sta			Elev Sta		
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	10.4	11.99	9.6	36.02	8.29	98.15	5.16	105.49	4.84					
125.16	4.19	142.65	3.57	149.48	3.16	165.43	2.14	170.19	1.94					
185.49	1.73	195.4	1	313.05	-1.45	411.52	-2.46	441.2	-3.4					
493.79	-2.3	546.87	-1.87	887.5	.76	987.6	1.6	1012.21	2.53					
1031.47	3.35	1055.55	4.27	1070.81	4.79	1087.12	5.53	1127.24	7.23					
1163.52	9.85	1167.37	10.08	1190.91	11.4	1218.2	12.8							

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	195.4	.02	987.6	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	195.4	987.6		84.8	91	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.54	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.50	Reach Len. (ft)	84.80	91.00
97.20				
Crit W.S. (ft)		Flow Area (sq ft)	3334.31	18463.60
3649.32				
E.G. Slope (ft/ft)	0.000008	Area (sq ft)	3334.31	18463.60
3649.32				
Q Total (cfs)	-39844.70	Flow (cfs)	-4352.41	-30904.73
-4587.56				
Top width (ft)	1218.20	Top width (ft)	195.40	792.20
230.60				
Vel Total (ft/s)	-1.57	Avg. Vel. (ft/s)	-1.31	-1.67
-1.26				
Max Chl Dpth (ft)	25.90	Hydr. Depth (ft)	17.06	23.31
15.83				
Conv. Total (cfs)	14429620.0	Conv. (cfs)	1576211.0	
11192040.0				
Length wtd. (ft)	90.91	wetted Per. (ft)	207.75	792.27
240.59				
Min Ch El (ft)	-3.40	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.04	Stream Power (lb/ft s)	1218.20	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	236.68	1066.21
232.40				
C & E Loss (ft)		Cum SA (acres)	14.06	42.23
15.95				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond

REACH: Mill Pond

RS: 5.2*

INPUT

Description:

Station Elevation Data		num= 29		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10.2	12.65	9.47	38.01	8.14	103.58	5.08	111.32	4.78		
132.08	4.09	150.54	3.42	157.74	3.08	174.57	2.18	179.59	1.97		
195.75	1.87	206.2	1	293.02	-1.73	365.7	-2.61	387.6	-3.2		
451.73	-2.4	516.43	-1.94	931.75	.88	1053.8	1.8	1071.28	2.71		
1084.96	3.47	1102.07	4.36	1112.9	4.9	1124.49	5.7	1152.99	7.63		
1178.76	9.92	1181.5	10.11	1198.22	11.2	1217.6	12.4				

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	206.2	.02	1053.8	.02		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	206.2	1053.8		84.8	91	97.2	.1
							.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.55	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.51	Reach Len. (ft)	84.80	91.00
97.20				
Crit W.S. (ft)		Flow Area (sq ft)	3536.17	19706.51
2576.04				
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	3536.17	19706.51
2576.04				
Q Total (cfs)	-39908.70	Flow (cfs)	-4542.18	-32249.23
-3117.29				
Top width (ft)	1217.60	Top width (ft)	206.20	847.60
163.80				
Vel Total (ft/s)	-1.55	Avg. Vel. (ft/s)	-1.28	-1.64
-1.21				
Max Chl Dpth (ft)	25.71	Hydr. Depth (ft)	17.15	23.25
15.73				
Conv. Total (cfs)	14758530.0	Conv. (cfs)	1679733.0	
11926000.0				
Length wtd. (ft)	90.66	wetted Per. (ft)	218.74	847.68
174.26				
Min Ch El (ft)	-3.20	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.03	Stream Power (lb/ft s)	1217.60	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	229.99	1026.34
225.46				
C & E Loss (ft)		Cum SA (acres)	13.67	40.52
15.51				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond

RS: 5

INPUT

Description:

Station Elevation Data		num= 16		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	40	8	109	5	139	4	166	3		
189	2	206	2	217	1	273	-2	334	-3		
486	-2	976	1	1120	2	1155	5	1194	10		
1217	12										

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	217	.02	1120	.02		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	217	1120		84.8	91	97.2	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.55	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.51	Reach Len. (ft)	84.80	91.00
97.20				
Crit w.s. (ft)		Flow Area (sq ft)	3738.90	20916.98
1515.57				
E.G. slope (ft/ft)	0.000007	Area (sq ft)	3738.90	20916.98
1515.57				
Q Total (cfs)	-39973.40	Flow (cfs)	-4733.32	-33502.43
-1737.64				
Top width (ft)	1217.00	Top width (ft)	217.00	903.00
97.00				
Vel Total (ft/s)	-1.53	Avg. vel. (ft/s)	-1.27	-1.60
-1.15				
Max Chl Dpth (ft)	25.51	Hydr. Depth (ft)	17.23	23.16
15.62				
Conv. Total (cfs)	15066050.0	Conv. (cfs)	1783999.0	
12627140.0 654920.5				
Length wtd. (ft)	90.59	wetted Per. (ft)	229.73	903.10
108.05				
Min Ch El (ft)	-3.00	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.03	Stream Power (lb/ft s)	1217.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	222.91	983.90
220.89				
C & E Loss (ft)		Cum SA (acres)	13.26	38.69
15.22				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond

RS: 4.8*

INPUT

Description:

Station Elevation Data		num= 36		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	44.5	7.88	51.27	7.59	94.71	5.83	121.26	4.72
132.45	4.33	154.63	3.62	156.66	3.55	177.31	2.8	184.67	2.6
210.25	1.8	222.17	1.8	229.16	1.73	241.4	.8	288.72	-1.69
295.87	-2.06	355.2	-3.4	369.2	-3	384.4	-3.4	519.3	-2.05
530.41	-1.94	925.85	.64	954.2	.8	1082	1.6	1100.55	2.57
1116.02	3.61	1133.02	4.51	1140.02	4.87	1153.51	5.83	1175.54	7
1179.79	7.46	1185.98	8.04	1193.32	8.7	1204.67	9.75	1213.04	10.35
1242.8	12								

Manning's n Values		num= 3		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	241.4	.02	1082	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	241.4	1082		84.8	91	97.2	.1
							.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.55	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.51	Reach Len. (ft)	84.80	91.00
97.20				
Crit W.S. (ft)		Flow Area (sq ft)	4216.01	19687.92
2556.85				
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	4216.01	19687.92
2556.85				
Q Total (cfs)	-40038.90	Flow (cfs)	-5381.32	-31620.53
-3037.05				
Top width (ft)	1242.80	Top width (ft)	241.40	840.60
160.80				
Vel Total (ft/s)	-1.51	Avg. Vel. (ft/s)	-1.28	-1.61
-1.19				
Max Chl Dpth (ft)	25.91	Hydr. Depth (ft)	17.46	23.42
15.90				
Conv. Total (cfs)	15160390.0	Conv. (cfs)	2037590.0	
11972850.0				
Length wtd. (ft)	90.69	wetted Per. (ft)	254.11	840.72
171.67				
Min Ch El (ft)	-3.40	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.03	Stream Power (lb/ft s)	1242.80	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	215.17	941.49
216.35				
C & E Loss (ft)		Cum SA (acres)	12.81	36.87
14.93				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond

REACH: Mill Pond

RS: 4.6*

INPUT

Description:

Station Elevation Data		num= 36		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	49	7.76	56.45	7.44	104.28	5.62	133.51	4.44		
145.84	4	170.26	3.23	172.5	3.16	195.23	2.35	203.33	2.2		
231.5	1.6	244.63	1.6	252.33	1.45	265.8	.6	311.79	-1.76		
318.74	-2.13	376.4	-3.8	404.4	-3	434.8	-3.8	552.61	-2.09		
562.31	-1.95	907.64	.48	932.39	.6	1044	1.2	1069.92	2.18		
1091.51	3.46	1115.27	4.38	1125.04	4.74	1143.88	5.63	1174.66	6.25		
1180.6	6.85	1189.23	7.53	1199.49	8.27	1215.34	9.49	1227.03	10.26		
1268.6	12										

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	265.8	.02	1044	.02		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	265.8	1044		84.8	91	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.55	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.52	Reach Len. (ft)	84.80	91.00
97.20				
Crit W.S. (ft)		Flow Area (sq ft)	4704.95	18437.90
3633.24				
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	4704.95	18437.90
3633.24				
Q Total (cfs)	-40105.40	Flow (cfs)	-6043.15	-29668.63
-4393.63				
Top width (ft)	1268.60	Top width (ft)	265.80	778.20
224.60				
Vel Total (ft/s)	-1.50	Avg. Vel. (ft/s)	-1.28	-1.61
-1.21				
Max Chl Dpth (ft)	26.32	Hydr. Depth (ft)	17.70	23.69
16.18				
Conv. Total (cfs)	15273670.0	Conv. (cfs)	2301460.0	
11298950.0 1673261.0				
Length wtd. (ft)	90.80	Wetted Per. (ft)	278.50	778.34
235.42				
Min Ch El (ft)	-3.80	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.04	Stream Power (lb/ft s)	1268.60	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	206.48	901.67
209.44				
C & E Loss (ft)		Cum SA (acres)	12.32	35.18
14.50				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond

RS: 4.4*

INPUT

Description:

Station Elevation Data			num= 36								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	53.49	7.64	61.64	7.29	113.85	5.42	145.77	4.16		
159.22	3.67	185.89	2.85	188.33	2.77	213.16	1.9	222	1.8		
252.75	1.4	267.09	1.4	275.49	1.18	290.2	.4	334.86	-1.84		
341.61	-2.19	397.6	-4.2	439.6	-3	485.2	-4.2	585.91	-2.14		
594.2	-1.97	889.43	.32	910.59	.4	1006	.8	1039.28	1.78		
1067.01	3.3	1097.51	4.26	1110.06	4.6	1134.25	5.42	1173.77	5.5		
1181.4	6.23	1192.49	7.02	1205.66	7.85	1226.02	9.24	1241.02	10.18		
1294.4	12										

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	290.2	.02	1006	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	290.2	1006		84.8	91		.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.56	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.52	Reach Len. (ft)	84.80	91.00
97.20				
Crit w.s. (ft)		Flow Area (sq ft)	5205.65	17175.24
4745.97				
E.G. slope (ft/ft)	0.000007	Area (sq ft)	5205.65	17175.24
4745.97				
Q Total (cfs)	-40173.50	Flow (cfs)	-6712.24	-27660.21
-5801.04				
Top width (ft)	1294.40	Top width (ft)	290.20	715.80
288.40				
Vel Total (ft/s)	-1.48	Avg. vel. (ft/s)	-1.29	-1.61
-1.22				
Max Chl Dpth (ft)	26.72	Hydr. Depth (ft)	17.94	23.99
16.46				
Conv. Total (cfs)	15415550.0	Conv. (cfs)	2575651.0	
10613900.0				
Length wtd. (ft)	90.92	Wetted Per. (ft)	302.90	715.97
299.21				
Min Ch El (ft)	-4.20	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.04	Stream Power (lb/ft s)	1294.40	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	196.84	864.47
200.09				
C & E Loss (ft)		Cum SA (acres)	11.78	33.62

13.93

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond

RS: 4.2*

INPUT

Description:

Station Elevation Data			num= 36								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	57.99	7.52	66.82	7.15	123.43	5.21	158.02	3.87		
172.61	3.33	201.52	2.47	204.17	2.39	231.08	1.45	240.66	1.4		
274.01	1.2	289.54	1.2	298.65	.91	314.6	.2	357.93	-1.92		
364.47	-2.26	418.8	-4.6	474.8	-3	535.6	-4.6	619.22	-2.18		
626.1	-1.98	871.21	.16	888.78	.2	968	.4	1008.64	1.39		
1042.5	3.15	1079.76	4.13	1095.08	4.47	1124.63	5.21	1172.89	4.75		
1182.2	5.62	1195.74	6.51	1211.83	7.42	1236.69	8.98	1255.01	10.09		
1320.2	12										

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	314.6	.02	968	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.	
	314.6	968		84.8	91	97.2	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.56	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.52	Reach Len. (ft)	84.80	91.00
97.20				
Crit W.S. (ft)		Flow Area (sq ft)	5717.21	15890.93
5893.15				
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	5717.21	15890.93
5893.15				
Q Total (cfs)	-40243.40	Flow (cfs)	-7388.69	-25601.60
-7253.12				
Top width (ft)	1320.20	Top width (ft)	314.60	653.40
352.20				
Vel Total (ft/s)	-1.46	Avg. Vel. (ft/s)	-1.29	-1.61
-1.23				
Max Chl Dpth (ft)	27.12	Hydr. Depth (ft)	18.17	24.32
16.73				
Conv. Total (cfs)	15575160.0	Conv. (cfs)	2859598.0	
9908429.0	2807129.0			
Length wtd. (ft)	91.04	Wetted Per. (ft)	327.30	653.60
363.01				
Min Ch El (ft)	-4.60	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.04	Stream Power (lb/ft s)	1320.20	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	186.20	829.93

188.22
C & E Loss (ft)
13.21

Cum SA (acres)

11.19

32.19

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond

REACH: Mill Pond

RS: 4

INPUT

Description: One Bridge Length Upstream

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	72	7	133	5	186	3	220	2
249	1	312	1	339	0	381	-2	440	-5
510	-3	586	-5	658	-2	853	0	930	0
978	1	1018	3	1062	4	1115	5	1172	4
1183	5	1199	6	1218	7	1269	10	1346	12

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	339	.02	930	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	339	930		105	97.6		.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.56	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.53	Reach Len. (ft)	105.00	97.60
90.00				
Crit W.S. (ft)		Flow Area (sq ft)	6241.03	14591.86
7075.96				
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	6241.03	14591.86
7075.96				
Q Total (cfs)	-40314.40	Flow (cfs)	-8068.25	-23504.13
-8742.03				
Top width (ft)	1346.00	Top width (ft)	339.00	591.00
416.00				
Vel Total (ft/s)	-1.44	Avg. Vel. (ft/s)	-1.29	-1.61
-1.24				
Max Chl Dpth (ft)	27.53	Hydr. Depth (ft)	18.41	24.69
17.01				
Conv. Total (cfs)	15762230.0	Conv. (cfs)	3154544.0	
9189706.0				
Length wtd. (ft)	97.51	Wetted Per. (ft)	351.71	591.25
426.83				
Min Ch El (ft)	-5.00	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.04	Stream Power (lb/ft s)	1346.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	174.56	798.09
173.75				

C & E Loss (ft)
12.35

3300640.rep
Cum SA (acres)

10.55

30.89

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond

RS: 3.8*

INPUT

Description:

Station Elevation Data		num= 42							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	69.28	7.12	86.59	6.53	112.69	5.62	127.98	5.12
153.02	4.21	178.98	3.19	201.65	2.45	211.69	2.16	239.6	1.24
249.1	1.2	300.22	1.07	326.2	.2	356.31	-.72	393.15	-1.78
480.78	-4.44	487.2	-5	545.98	-3.4	546.39	-3.41	609.8	-5
624.94	-4.29	635.04	-3.66	681.63	-1.72	695.6	-1.49	876.18	.14
953	.2	998.95	1	1005.36	1.27	1037.23	3.25	1044.33	3.53
1079.35	4.68	1088.17	4.94	1130.08	5.99	1130.79	5.99	1184.65	5.75
1195.17	6.65	1210.49	7.61	1228.68	8.59	1229.43	8.64	1277.49	11.54
1318.32	12.89	1351.2	14.2						

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	326.2	.02	953	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	326.2	953		105	97.6		.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.56	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	wt. n-Val.	0.020	0.020
0.020				
w.s. Elev (ft)	22.53	Reach Len. (ft)	105.00	97.60
90.00				
Crit w.s. (ft)		Flow Area (sq ft)	5963.53	15359.67
6347.08				
E.G. slope (ft/ft)	0.000007	Area (sq ft)	5963.53	15359.67
6347.08				
Q Total (cfs)	-40391.80	Flow (cfs)	-7777.61	-24975.12
-7639.07				
Top width (ft)	1351.20	Top width (ft)	326.20	626.80
398.20				
Vel Total (ft/s)	-1.46	Avg. Vel. (ft/s)	-1.30	-1.63
-1.20				
Max Chl Dpth (ft)	27.53	Hydr. Depth (ft)	18.28	24.50
15.94				
Conv. Total (cfs)	15566790.0	Conv. (cfs)	2997451.0	
9625278.0	2944059.0			
Length wtd. (ft)	97.66	Wetted Per. (ft)	338.91	627.02
406.88				
Min Ch El (ft)	-5.00	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.05	Stream Power (lb/ft s)	1351.20	0.00

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0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	159.85	764.53
159.89				
C & E Loss (ft)		Cum SA (acres)	9.75	29.52
11.51				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond

RS: 3.6*

INPUT

Description:

Station	Elevation	Data	num=	42						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	10	66.56	7.24	83.19	6.65	108.27	5.71	122.96	5.25	
147.01	4.41	171.95	3.37	193.74	2.58	203.39	2.32	230.2	1.48	
239.32	1.4	288.44	1.13	313.4	.4	354.73	-.54	405.3	-1.56	
525.58	-4.08	534.4	-5	581.96	-3.8	582.29	-3.81	633.6	-5	
648.71	-4.22	658.78	-3.37	705.27	-1.43	719.2	-1.11	899.36	.28	
976	.4	1019.89	1	1026.02	1.2	1056.47	3.51	1063.25	3.9	
1096.7	5.36	1105.13	5.7	1145.17	6.99	1145.84	6.99	1197.29	7.49	
1207.35	8.31	1221.98	9.22	1239.35	10.18	1240.07	10.23	1285.99	13.08	
1324.99	14.66	1356.4	16.4							

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.02	313.4	.02
		976	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	313.4	976		105	97.6		.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.57	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.53	Reach Len. (ft)	105.00	97.60
90.00				
Crit W.S. (ft)		Flow Area (sq ft)	5689.40	16086.38
5656.14				
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	5689.40	16086.38
5656.14				
Q Total (cfs)	-40469.90	Flow (cfs)	-7484.91	-26371.89
-6613.09				
Top width (ft)	1356.40	Top width (ft)	313.40	662.60
380.40				
Vel Total (ft/s)	-1.48	Avg. Vel. (ft/s)	-1.32	-1.64
-1.17				
Max Chl Dpth (ft)	27.53	Hydr. Depth (ft)	18.15	24.28
14.87				
Conv. Total (cfs)	15373940.0	Conv. (cfs)	2843412.0	
10018300.0				
Length wtd. (ft)	97.79	Wetted Per. (ft)	326.10	662.83
386.96				

Min Ch El (ft)	-5.00	3300640.rep		
0.01		Shear (lb/sq ft)	0.01	0.01
Alpha	1.05	Stream Power (lb/ft s)	1356.40	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	145.81	729.30
147.49				
C & E Loss (ft)		Cum SA (acres)	8.98	28.08
10.71				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 3.4*

INPUT

Description:

Station Elevation Data	num=	42							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
0 10 63.84 7.36 79.8 6.76 103.84 5.81 117.93 5.37									
141.01 4.61 164.93 3.56 185.83 2.72 195.08 2.47 220.79 1.72									
229.55 1.6 276.66 1.2 300.6 .6 353.16 -.36 417.45 -1.33									
570.39 -3.72 581.6 -5 617.94 -4.2 618.19 -4.21 657.4 -5									
672.47 -4.15 682.52 -3.08 728.9 -1.15 742.8 -.74 922.54 .42									
999 .6 1040.84 1 1046.68 1.13 1075.7 3.76 1082.17 4.27									
1114.06 6.04 1122.08 6.47 1160.25 7.98 1160.89 7.99 1209.94 9.24									
1219.52 9.96 1233.47 10.82 1250.03 11.78 1250.71 11.82 1294.48 14.62									
1331.66 16.44 1361.6 18.6									

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .02 300.6 .02 999 .02		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
300.6 999	105 97.6 90	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.57	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-Val.	0.020	0.020
0.020				
w.s. Elev (ft)	22.53	Reach Len. (ft)	105.00	97.60
90.00				
Crit w.s. (ft)		Flow Area (sq ft)	5418.33	16775.14
5003.17				
E.G. slope (ft/ft)	0.000007	Area (sq ft)	5418.33	16775.14
5003.17				
Q Total (cfs)	-40548.40	Flow (cfs)	-7188.35	-27696.80
-5663.25				
Top width (ft)	1361.60	Top width (ft)	300.60	698.40
362.60				
Vel Total (ft/s)	-1.49	Avg. Vel. (ft/s)	-1.33	-1.65
-1.13				
Max Chl Dpth (ft)	27.53	Hydr. Depth (ft)	18.03	24.02
13.80				
Conv. Total (cfs)	15186030.0	Conv. (cfs)	2692153.0	

3300640.rep

10372900.0	2120977.0			
Length Wtd. (ft)	97.90	Wetted Per. (ft)	313.30	698.66
367.08				
Min Ch El (ft)	-5.00	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.06	Stream Power (lb/ft s)	1361.60	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	132.42	692.49
136.47				
C & E Loss (ft)		Cum SA (acres)	8.24	26.55
9.94				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 3.2*

INPUT

Description:

Station	Elevation	Data	num=	42						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	10	61.13	7.48	76.4	6.88	99.42	5.9	112.91	5.5	
135	4.8	157.91	3.75	177.91	2.86	186.77	2.63	211.39	1.96	
219.77	1.8	264.88	1.27	287.8	.8	351.58	-.18	429.6	-1.11	
615.19	-3.36	628.8	-5	653.92	-4.6	654.1	-4.6	681.2	-5	
696.24	-4.07	706.26	-2.79	752.53	-.86	766.4	-.37	945.72	.56	
1022	.8	1061.78	1	1067.34	1.07	1094.94	4.02	1101.08	4.63	
1131.41	6.72	1139.04	7.23	1175.34	8.97	1175.95	9	1222.58	10.98	
1231.7	11.61	1244.96	12.43	1260.71	13.37	1261.36	13.41	1302.98	16.16	
1338.33	18.22	1366.8	20.8							

Manning's n Values	num=	3
Sta n Val	Sta	n Val
0 .02	287.8	.02
		1022
		.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
287.8	1022	105	97.6	90	.1		.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.57	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.53	Reach Len. (ft)	105.00	97.60
90.00				
Crit w.s. (ft)		Flow Area (sq ft)	5150.30	17425.51
4388.26				
E.G. slope (ft/ft)	0.000007	Area (sq ft)	5150.30	17425.51
4388.26				
Q Total (cfs)	-40627.90	Flow (cfs)	-6888.67	-28948.74
-4790.49				
Top width (ft)	1366.80	Top width (ft)	287.80	734.20
344.80				
Vel Total (ft/s)	-1.51	Avg. Vel. (ft/s)	-1.34	-1.66
-1.09				

Max Chl Dpth (ft)	27.53	3300640.rep	Hydr. Depth (ft)	17.90	23.73
12.73					
Conv. Total (cfs)	15001810.0		Conv. (cfs)	2543633.0	
10689290.0 1768883.0					
Length Wtd. (ft)	98.00		Wetted Per. (ft)	300.50	734.49
347.24					
Min Ch El (ft)	-5.00		Shear (lb/sq ft)	0.01	0.01
0.01					
Alpha	1.06		Stream Power (lb/ft s)	1366.80	0.00
0.00					
Frctn Loss (ft)	0.00		Cum Volume (acre-ft)	119.69	654.18
126.77					
C & E Loss (ft)			Cum SA (acres)	7.53	24.95
9.21					

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 3

INPUT

Description:

Station Elevation Data				num=	23
Sta	Elev	Sta	Elev	Sta	Elev
0	10	73	7	95	6
210	2	275	1	350	0
690	-5	705	-5	720	-4
1045	1	1088	1	1120	5
1272	15	1345	20	1372	23

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	275	.02	1045	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
275	1045	45	45	45	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.57	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.54	Reach Len. (ft)	2.50	2.50
2.50				
Crit w.s. (ft)		Flow Area (sq ft)	4885.57	18037.19
3811.94				
E.G. slope (ft/ft)	0.000008	Area (sq ft)	4885.57	18037.19
3811.94				
Q Total (cfs)	-40707.80	Flow (cfs)	-6581.77	-30102.81
-4023.22				
Top width (ft)	1367.83	Top width (ft)	275.00	770.00
322.83				
Vel Total (ft/s)	-1.52	Avg. Vel. (ft/s)	-1.35	-1.67
-1.06				
Max Chl Dpth (ft)	27.54	Hydr. Depth (ft)	17.77	23.42

3300640.rep

11.81				
Conv. Total (cfs)	14831800.0	Conv. (cfs)	2398054.0	
10967890.0 1465851.0				
Length Wtd. (ft)	2.50	Wetted Per. (ft)	287.70	770.34
323.73				
Min Ch El (ft)	-5.00	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.06	Stream Power (lb/ft s)	1372.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	107.59	614.45
118.30				
C & E Loss (ft)		Cum SA (acres)	6.85	23.26
8.52				

BRIDGE

RIVER: Mill Pond
 REACH: Mill Pond

RS: 2.9

INPUT

Description:

Distance from Upstream XS = 2.5
 Deck/Roadway width = 40
 Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num=	9													
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
95		6		-5	659.9		9		-5	660		13		5
676		13		5.5	690		13		6	705		13		5.5
720		13		5	720.1		9		-5	1120		5		-5

Upstream Bridge Cross Section Data

Station	Elevation	Data	num=	23					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	73	7	95	6	129	5	170	3
210	2	275	1	350	0	660	-3	676	-5
690	-5	705	-5	720	-4	730	-2.5	790	0
1045	1	1088	1	1120	5	1156	8	1191	10
1272	15	1345	20	1372	23				

Manning's n Values

num=	3				
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	275	.02	1045	.02

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	275	1045		.1	.3

Downstream Deck/Roadway Coordinates

num=	9													
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
95		6		-5	659.9		9		-5	660		13		5
676		13		5.5	690		13		6	705		13		5.5
720		13		5	720.1		9		-5	1120		5		-5

Downstream Bridge Cross Section Data

Station	Elevation	Data	num=	23					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	10	73	7	95	6	129	5	170	3
210	2	275	1	350	0	660	-4	676	-5
690	-4	705	-5	720	-3	730	-3	790	0

3300640.rep
 1045 1 1088 1 1120 5 1156 8 1191 10
 1272 15 1345 20 1372 23

Manning's n values num= 3
 Sta n val Sta n val Sta n val
 0 .02 275 .02 1045 .02

Bank Sta: Left Right Coeff Contr. Expan.
 275 1045 .1 .3

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 weir crest shape = Broad Crested

Number of Piers = 1

Pier Data
 Pier Station Upstream= 690 Downstream= 690
 Upstream num= 2
 width Elev width Elev
 3 -5 3 6
 Downstream num= 2
 width Elev width Elev
 3 -5 3 6

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
 Energy
 Selected Low Flow Methods = Highest Energy Answer

High Flow Method
 Energy Only

Additional Bridge Parameters
 Add Friction component to Momentum
 Do not add weight component to Momentum
 Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end
 Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #07AUG2011 1000

E.G. US. (ft)	22.57	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	22.54	E.G. Elev (ft)	100.69
103.80		W.S. Elev (ft)	22.54
Q Total (cfs)	-40707.80		
22.52			
Q Bridge (cfs)		Crit W.S. (ft)	
Q Weir (cfs)		Max Chl Dpth (ft)	27.54
27.52			
Weir Sta Lft (ft)		Vel Total (ft/s)	-70.94
-72.35			
Weir Sta Rgt (ft)		Flow Area (sq ft)	573.80
562.65			
Weir Submerg		Froude # chl	-2.38

3300640.rep

-2.43			
Weir Max Depth (ft)		Specif Force (cu ft)	102375.20
103840.00			
Min El Weir Flow (ft)	5.01	Hydr Depth (ft)	
Min El Prs (ft)	6.00	W.P. Total (ft)	153.24
151.53			
Delta EG (ft)		Conv. Total (cfs)	102797.1
100236.4			
Delta WS (ft)	0.02	Top Width (ft)	
BR Open Area (sq ft)		Frctn Loss (ft)	
BR Open Vel (ft/s)		C & E Loss (ft)	
Coef of Q		Shear Total (lb/sq ft)	36.66
38.23			
Br Sel Method	Energy/Weir	Power Total (lb/ft s)	0.00
0.00			

Note: The post processor is unable to handle negative flow through a bridge at this time. The water surfaces inside the bridge are based on projecting the outside water surface.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 2.8

INPUT

Description:

Station Elevation Data				num=	23					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	10	73	7	95	6	129	5	170	3	
210	2	275	1	350	0	660	-4	676	-5	
690	-4	705	-5	720	-3	730	-3	790	0	
1045	1	1088	1	1120	5	1156	8	1191	10	
1272	15	1345	20	1372	23					

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	275	.02	1045	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
275	1045	114	95.56	77.14	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.56	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-Val.	0.020	0.020

3300640.rep

0.020				
W.S. Elev (ft)	22.52	Reach Len. (ft)	114.00	95.56
77.14				
Crit W.S. (ft)		Flow Area (sq ft)	4881.18	18178.40
3806.79				
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	4881.18	18178.40
3806.79				
Q Total (cfs)	-40707.80	Flow (cfs)	-6511.95	-30217.28
-3978.57				
Top Width (ft)	1367.69	Top Width (ft)	275.00	770.00
322.69				
Vel Total (ft/s)	-1.52	Avg. Vel. (ft/s)	-1.33	-1.66
-1.05				
Max Chl Dpth (ft)	27.52	Hydr. Depth (ft)	17.75	23.61
11.80				
Conv. Total (cfs)	14968940.0	Conv. (cfs)	2394554.0	
11111400.0 1462986.0				
Length wtd. (ft)	96.47	Wetted Per. (ft)	287.69	770.34
323.58				
Min Ch El (ft)	-5.00	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.06	Stream Power (lb/ft s)	1372.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	107.45	613.91
118.19				
C & E Loss (ft)		Cum SA (acres)	6.84	23.24
8.51				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond

RS: 2.68571*

INPUT

Description:

Station Elevation Data				num=	34				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	11	66.93	7.82	87.1	6.78	109.63	5.95	118.28	5.65
155.87	3.68	192.55	2.56	252.14	1.29	309.45	.45	322.57	.26
394.59	-.71	613.69	-4.76	628.71	-5.71	641.81	-4.71	656.78	-4.8
667.06	-4.63	708.14	-5.71	722.09	-3.94	731.39	-3.89	787.18	-1.07
1024.29	.86	1066.42	.91	1097.78	4.37	1133.06	6.98	1148.58	7.78
1167.35	8.94	1195.33	10.8	1212.44	12.43	1235.24	14.38	1246.72	15.28
1264.89	16.8	1292.26	19.16	1318.26	21.21	1344.71	24.29		

Manning's n Values				num=	3				
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	252.14	.02	1024.29	.02				

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
252.14	1024.29	114	95.56	77.14	.1		.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.56	Element	Left OB	Channel
Right OB				

		3300640.rep		
Vel Head (ft)	0.04	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.52	Reach Len. (ft)	114.00	95.56
77.14				
Crit W.S. (ft)		Flow Area (sq ft)	4303.66	18697.49
3777.41				
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	4303.66	18697.49
3777.41				
Q Total (cfs)	-40784.50	Flow (cfs)	-5525.44	-31232.67
-4026.39				
Top width (ft)	1329.53	Top width (ft)	252.14	772.15
305.24				
Vel Total (ft/s)	-1.52	Avg. Vel. (ft/s)	-1.28	-1.67
-1.07				
Max Chl Dpth (ft)	28.23	Hydr. Depth (ft)	17.07	24.21
12.38				
Conv. Total (cfs)	15178650.0	Conv. (cfs)	2056388.0	
11623770.0 1498491.0				
Length Wtd. (ft)	96.02	wetted Per. (ft)	263.87	772.48
306.16				
Min Ch El (ft)	-5.71	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.07	Stream Power (lb/ft s)	1344.71	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	95.43	573.46
111.48				
C & E Loss (ft)		Cum SA (acres)	6.15	21.55
7.96				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond RS: 2.57142*

INPUT

Description:

Station Elevation Data			num= 34							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	12	60.86	8.64	79.21	7.55	99.69	6.63	107.56	6.31	
141.74	4.35	175.09	3.12	229.29	1.57	282.87	.7	295.15	.53	
362.49	-.42	567.38	-5.51	581.43	-6.43	602.84	-4.76	627.32	-5.33	
644.12	-5.26	711.29	-6.43	724.18	-4.87	732.78	-4.79	784.36	-2.14	
1003.57	.71	1044.84	.81	1075.56	3.74	1110.11	5.96	1125.32	6.65	
1143.7	7.89	1171.11	9.83	1187.86	12.03	1210.2	14.48	1221.45	15.55	
1239.24	17.34	1266.05	20.13	1291.51	22.42	1317.43	25.57			

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	229.29	.02	1003.57	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
229.29	1003.57	114	95.56	77.14	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.56	Element	Left OB	Channel
		Page 22		

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Right OB				
Vel Head (ft)	0.04	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.52	Reach Len. (ft)	114.00	95.56
77.14				
Crit w.s. (ft)		Flow Area (sq ft)	3758.03	19234.17
3759.90				
E.G. slope (ft/ft)	0.000007	Area (sq ft)	3758.03	19234.17
3759.90				
Q Total (cfs)	-40859.00	Flow (cfs)	-4620.09	-32160.49
-4078.42				
Top width (ft)	1292.37	Top width (ft)	229.29	774.28
288.80				
Vel Total (ft/s)	-1.53	Avg. Vel. (ft/s)	-1.23	-1.67
-1.08				
Max Chl Dpth (ft)	28.95	Hydr. Depth (ft)	16.39	24.84
13.02				
Conv. Total (cfs)	15451900.0	Conv. (cfs)	1747206.0	
12162330.0 1542361.0				
Length wtd. (ft)	95.60	wetted Per. (ft)	240.07	774.65
289.81				
Min Ch El (ft)	-6.43	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.07	Stream Power (lb/ft s)	1317.43	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	84.88	531.86
104.80				
C & E Loss (ft)		Cum SA (acres)	5.52	19.85
7.43				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond

RS: 2.45714*

INPUT

Description:

Station Elevation Data			num=	34						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	13	54.8	9.45	71.31	8.33	89.75	7.3	96.83	6.96	
127.61	5.03	157.64	3.68	206.43	1.86	256.3	.96	267.72	.79	
330.39	-.14	521.07	-6.27	534.14	-7.14	563.88	-4.8	597.86	-5.87	
621.18	-5.89	714.43	-7.14	726.27	-5.81	734.17	-5.68	781.54	-3.21	
982.86	.57	1023.26	.72	1053.34	3.11	1087.17	4.95	1102.05	5.52	
1120.06	6.83	1146.89	8.86	1163.29	11.62	1185.16	14.59	1196.17	15.83	
1213.59	17.87	1239.84	21.1	1264.77	23.63	1290.14	26.86			

Manning's n Values			num=	3		
Sta	n Val	Sta	n Val	Sta	n Val	
0	.02	206.43	.02	982.86	.02	

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
206.43	982.86	114	95.56	77.14	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.57	3300640.rep Element	Left OB	Channel
Right OB Vel Head (ft)	0.04	Wt. n-Val.	0.020	0.020
0.020 W.S. Elev (ft)	22.53	Reach Len. (ft)	114.00	95.56
77.14 Crit W.S. (ft)		Flow Area (sq ft)	3243.22	19790.24
3752.31 E.G. slope (ft/ft)	0.000007	Area (sq ft)	3243.22	19790.24
3752.31 Q Total (cfs)	-40931.70	Flow (cfs)	-3796.56	-32982.47
-4152.67 Top width (ft)	1253.90	Top width (ft)	206.43	776.43
271.04 Vel Total (ft/s)	-1.53	Avg. Vel. (ft/s)	-1.17	-1.67
-1.11 Max Chl Dpth (ft)	29.67	Hydr. Depth (ft)	15.71	25.49
13.84 Conv. Total (cfs)	15797770.0	Conv. (cfs)	1465298.0	
12729730.0 1602741.0 Length wtd. (ft)	95.22	Wetted Per. (ft)	216.27	776.87
272.21 Min Ch El (ft)	-7.14	Shear (lb/sq ft)	0.01	0.01
0.01 Alpha	1.07	Stream Power (lb/ft s)	1290.14	0.00
0.00 Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	75.72	489.05
98.15 C & E Loss (ft)		Cum SA (acres)	4.95	18.15
6.93				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond RS: 2.34285*

INPUT

Description:

Station Elevation Data			num=	34					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	14	48.73	10.27	63.42	9.11	79.81	7.98	86.11	7.61
113.48	5.7	140.18	4.24	183.57	2.14	229.72	1.22	240.3	1.05
298.29	.15	474.76	-7.03	486.86	-7.86	524.91	-4.85	568.39	-6.4
598.24	-6.51	717.57	-7.86	728.36	-6.75	735.55	-6.58	778.71	-4.29
962.14	.43	1001.69	.62	1031.11	2.48	1064.22	3.93	1078.79	4.39
1096.41	5.77	1122.67	7.9	1138.72	11.22	1160.12	14.69	1170.9	16.11
1187.95	18.4	1213.63	22.08	1238.03	24.84	1262.86	28.14		

Manning's n values			num=	3
Sta	n Val	Sta	n Val	Sta
0	.02	183.57	.02	962.14
				.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
183.57	962.14	114	95.56	77.14	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

3300640.rep

E.G. Elev (ft)	22.57	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.53	Reach Len. (ft)	114.00	95.56
77.14				
Crit W.S. (ft)		Flow Area (sq ft)	2759.54	20365.01
3753.97				
E.G. slope (ft/ft)	0.000006	Area (sq ft)	2759.54	20365.01
3753.97				
Q Total (cfs)	-41002.30	Flow (cfs)	-3061.60	-33721.84
-4218.87				
Top width (ft)	1217.60	Top width (ft)	183.57	778.57
255.46				
Vel Total (ft/s)	-1.53	Avg. Vel. (ft/s)	-1.11	-1.66
-1.12				
Max Chl Dpth (ft)	30.39	Hydr. Depth (ft)	15.03	26.16
14.69				
Conv. Total (cfs)	16203500.0	Conv. (cfs)	1209899.0	
13326370.0 1667233.0				
Length Wtd. (ft)	94.89	wetted Per. (ft)	192.49	779.10
256.85				
Min Ch El (ft)	-7.86	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.06	Stream Power (lb/ft s)	1262.86	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	67.87	445.01
91.50				
C & E Loss (ft)		Cum SA (acres)	4.44	16.45
6.47				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond

RS: 2.22857*

INPUT

Description:

Station Elevation Data			num= 34						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	15	42.66	11.09	55.52	9.88	69.88	8.65	75.39	8.27
99.35	6.38	122.73	4.81	160.71	2.43	203.15	1.48	212.87	1.32
266.2	.43	428.44	-7.78	439.57	-8.57	485.94	-4.9	538.93	-6.93
575.3	-7.14	720.71	-8.57	730.45	-7.68	736.94	-7.47	775.89	-5.36
941.43	.29	980.11	.53	1008.89	1.85	1041.28	2.91	1055.53	3.26
1072.76	4.72	1098.44	6.93	1114.15	10.81	1135.08	14.79	1145.62	16.38
1162.3	18.93	1187.42	23.05	1211.28	26.05	1235.57	29.43		

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	160.71	.02	941.43	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
160.71	941.43	114	95.56	77.14	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000
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E.G. Elev (ft)	22.57	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.53	Reach Len. (ft)	114.00	95.56
77.14				
Crit W.S. (ft)		Flow Area (sq ft)	2306.25	20956.45
3760.61				
E.G. slope (ft/ft)	0.000006	Area (sq ft)	2306.25	20956.45
3760.61				
Q Total (cfs)	-41070.90	Flow (cfs)	-2414.90	-34395.50
-4260.50				
Top width (ft)	1184.26	Top width (ft)	160.71	780.72
242.83				
Vel Total (ft/s)	-1.52	Avg. Vel. (ft/s)	-1.05	-1.64
-1.13				
Max Chl Dpth (ft)	31.10	Hydr. Depth (ft)	14.35	26.84
15.49				
Conv. Total (cfs)	16658090.0	Conv. (cfs)	979467.1	
13950590.0 1728032.0				
Length wtd. (ft)	94.61	wetted Per. (ft)	168.74	781.36
244.49				
Min Ch El (ft)	-8.57	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.06	Stream Power (lb/ft s)	1235.57	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	61.24	399.68
84.85				
C & E Loss (ft)		Cum SA (acres)	3.99	14.74
6.03				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond

RS: 2.11428*

INPUT

Description:

Station Elevation Data			num= 34								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	16	36.59	11.91	47.62	10.66	59.94	9.33	64.67	8.92		
85.22	7.05	105.27	5.37	137.86	2.71	176.57	1.74	185.44	1.58		
234.1	.72	382.13	-8.54	392.29	-9.29	446.97	-4.95	509.46	-7.47		
552.35	-7.77	723.86	-9.29	732.54	-8.62	738.33	-8.37	773.07	-6.43		
920.71	.14	958.53	.43	986.67	1.22	1018.33	1.89	1032.26	2.13		
1049.11	3.66	1074.22	5.97	1089.57	10.41	1110.04	14.9	1120.34	16.66		
1136.65	19.47	1161.21	24.03	1184.54	27.26	1208.29	30.71				

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	137.86	.02	920.71	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
137.86	920.71	114	95.56	77.14	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.57	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.53	Reach Len. (ft)	114.00	95.56
77.14				
Crit W.S. (ft)		Flow Area (sq ft)	1884.93	21569.08
3768.50				
E.G. Slope (ft/ft)	0.000006	Area (sq ft)	1884.93	21569.08
3768.50				
Q Total (cfs)	-41138.00	Flow (cfs)	-1855.09	-35009.08
-4273.83				
Top Width (ft)	1153.15	Top width (ft)	137.86	782.85
232.44				
Vel Total (ft/s)	-1.51	Avg. Vel. (ft/s)	-0.98	-1.62
-1.13				
Max Chl Dpth (ft)	31.82	Hydr. Depth (ft)	13.67	27.55
16.21				
Conv. Total (cfs)	17165860.0	Conv. (cfs)	774083.8	
14608410.0 1783362.0				
Length wtd. (ft)	94.37	Wetted Per. (ft)	145.05	783.65
234.43				
Min Ch El (ft)	-9.29	Shear (lb/sq ft)	0.00	0.01
0.01				
Alpha	1.06	Stream Power (lb/ft s)	1208.29	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	55.75	353.04
78.18				
C & E Loss (ft)		Cum SA (acres)	3.60	13.02
5.61				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond

REACH: Mill Pond

RS: 2

INPUT

Description: One Bridge Length Downstream

Station Elevation Data				num=	17				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	17	50	10	115	3	150	2	202	1
345	-10	408	-5	480	-8	727	-10	900	0
1009	1	1050	5	1065	10	1085	15	1111	20
1135	25	1181	32						

Manning's n Values

num=

3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	115	.02	900	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
115	900	99.5	91.5	83.38	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

3300640.rep

E.G. Elev (ft)	22.57	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.54	Reach Len. (ft)	99.50	91.50
83.38				
Crit W.S. (ft)		Flow Area (sq ft)	1494.28	22198.19
3775.80				
E.G. slope (ft/ft)	0.000005	Area (sq ft)	1494.28	22198.19
3775.80				
Q Total (cfs)	-41203.50	Flow (cfs)	-1375.98	-35559.39
-4268.12				
Top width (ft)	1123.18	Top width (ft)	115.00	785.00
223.18				
Vel Total (ft/s)	-1.50	Avg. Vel. (ft/s)	-0.92	-1.60
-1.13				
Max Chl Dpth (ft)	32.54	Hydr. Depth (ft)	12.99	28.28
16.92				
Conv. Total (cfs)	17722470.0	Conv. (cfs)	591837.4	
15294830.0 1835806.0				
Length Wtd. (ft)	90.92	wetted Per. (ft)	121.40	786.00
225.54				
Min Ch El (ft)	-10.00	Shear (lb/sq ft)	0.00	0.01
0.01				
Alpha	1.06	Stream Power (lb/ft s)	1181.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	51.33	305.03
71.50				
C & E Loss (ft)		Cum SA (acres)	3.27	11.30
5.20				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond

RS: 1.875*

INPUT

Description:

Station Elevation Data			num= 26								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	18.88	25.6	13.79	51.2	9.58	57.88	8.88	133.12	2.75		
167.31	1.76	218.09	.72	357.75	-9.38	416.73	-5	484.14	-7.62		
715.38	-9.38	890	.12	906.47	.37	931.17	.92	988.81	1.95		
1013.5	2.31	1059.95	6.17	1071.14	9.13	1076.95	10.69	1099.61	15.32		
1126.04	19.55	1129.06	20.07	1153.48	24.55	1156.26	25.06	1180.93	28.52		
1208.38	32.5										

Manning's n values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	133.12	.02	890	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
133.12	890	99.5	91.5	83.38	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

3300640.rep

E.G. Elev (ft)	22.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.54	Reach Len. (ft)	99.50	91.50
83.38				
Crit W.S. (ft)		Flow Area (sq ft)	1783.72	21146.41
4093.72				
E.G. slope (ft/ft)	0.000006	Area (sq ft)	1783.72	21146.41
4093.72				
Q Total (cfs)	-41266.10	Flow (cfs)	-1759.72	-34834.09
-4672.29				
Top width (ft)	1142.51	Top width (ft)	133.12	756.88
252.51				
Vel Total (ft/s)	-1.53	Avg. Vel. (ft/s)	-0.99	-1.65
-1.14				
Max Chl Dpth (ft)	31.92	Hydr. Depth (ft)	13.40	27.94
16.21				
Conv. Total (cfs)	17123750.0	Conv. (cfs)	730213.8	
14454730.0 1938811.0				
Length Wtd. (ft)	90.93	wetted Per. (ft)	137.91	757.75
254.35				
Min Ch El (ft)	-9.38	Shear (lb/sq ft)	0.00	0.01
0.01				
Alpha	1.06	Stream Power (lb/ft s)	1208.38	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	47.59	259.51
63.97				
C & E Loss (ft)		Cum SA (acres)	2.99	9.68
4.75				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond

RS: 1.75*

INPUT

Description:

Station Elevation Data			num= 26								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	20.75	29.09	13.68	58.17	8.36	65.76	7.75	151.25	2.5		
184.61	1.52	234.18	.43	370.5	-8.75	425.46	-5	488.27	-7.25		
703.75	-8.75	880	.25	898.4	.6	926	1.5	990.41	3.1		
1018	3.62	1069.9	7.33	1082.41	9.97	1088.89	11.38	1114.21	15.65		
1143.75	19.61	1147.13	20.14	1174.41	24.62	1177.51	25.13	1205.08	28.74		
1235.75	33										

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	151.25	.02	880	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
151.25	880	99.5	91.5	83.38	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

3300640.rep

E.G. Elev (ft)	22.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.54	Reach Len. (ft)	99.50	91.50
83.38				
Crit W.S. (ft)		Flow Area (sq ft)	2088.36	20111.77
4368.74				
E.G. slope (ft/ft)	0.000006	Area (sq ft)	2088.36	20111.77
4368.74				
Q Total (cfs)	-41329.70	Flow (cfs)	-2201.03	-34098.97
-5029.70				
Top width (ft)	1161.73	Top width (ft)	151.25	728.75
281.73				
Vel Total (ft/s)	-1.56	Avg. Vel. (ft/s)	-1.05	-1.70
-1.15				
Max Chl Dpth (ft)	31.29	Hydr. Depth (ft)	13.81	27.60
15.51				
Conv. Total (cfs)	16528160.0	Conv. (cfs)	880214.9	
13636520.0 2011426.0				
Length Wtd. (ft)	90.96	wetted Per. (ft)	154.55	729.49
283.19				
Min Ch El (ft)	-8.75	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.07	Stream Power (lb/ft s)	1235.75	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	43.16	216.17
55.87				
C & E Loss (ft)		Cum SA (acres)	2.66	8.12
4.24				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond

RS: 1.625*

INPUT

Description:

Station Elevation Data			num= 26						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	22.62	32.57	13.56	65.14	7.13	73.64	6.62	169.38	2.25
201.92	1.28	250.28	.15	383.25	-8.12	434.19	-5	492.41	-6.88
692.12	-8.12	870	.38	890.33	.83	920.84	2.08	992	4.25
1022.49	4.94	1079.85	8.5	1093.67	10.81	1100.84	12.07	1128.82	15.97
1161.45	19.68	1165.19	20.21	1195.34	24.68	1198.77	25.19	1229.23	28.95
1263.12	33.5								

Manning's n values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	169.38	.02	870	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
169.38	870	99.5	91.5	83.38	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

3300640.rep

E.G. Elev (ft)	22.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.54	Reach Len. (ft)	99.50	91.50
83.38				
Crit W.S. (ft)		Flow Area (sq ft)	2408.39	19094.92
4599.95				
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	2408.39	19094.92
4599.95				
Q Total (cfs)	-41394.40	Flow (cfs)	-2709.65	-33348.76
-5336.00				
Top width (ft)	1180.60	Top width (ft)	169.09	700.62
310.89				
Vel Total (ft/s)	-1.59	Avg. Vel. (ft/s)	-1.13	-1.75
-1.16				
Max Chl Dpth (ft)	30.66	Hydr. Depth (ft)	14.24	27.25
14.80				
Conv. Total (cfs)	15938480.0	Conv. (cfs)	1043321.0	
12840590.0 2054570.0				
Length Wtd. (ft)	91.01	Wetted Per. (ft)	171.06	701.24
312.07				
Min Ch El (ft)	-8.12	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.08	Stream Power (lb/ft s)	1263.12	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	38.03	175.00
47.29				
C & E Loss (ft)		Cum SA (acres)	2.30	6.62
3.67				

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond

RS: 1.5*

INPUT

Description:

Station Elevation Data			num= 26							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	24.5	36.06	13.45	72.12	5.9	81.52	5.5	187.5	2	
219.23	1.04	266.37	-.13	396	-7.5	442.92	-5	496.54	-6.5	
680.5	-7.5	860	.5	882.27	1.07	915.67	2.67	993.6	5.4	
1026.99	6.25	1089.8	9.66	1104.94	11.65	1112.78	12.76	1143.43	16.3	
1179.16	19.74	1183.26	20.28	1216.28	24.74	1220.03	25.25	1253.39	29.16	
1290.5	34									

Manning's n values			num= 3			
Sta	n Val	Sta	n Val	Sta	n Val	
0	.02	187.5	.02	860	.02	

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
187.5	860	99.5	91.5	83.38	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.58	Element	Left OB	Channel
Right OB				

Vel Head (ft)	0.04	3300640.rep		
0.020		wt. n-Val.	0.020	0.020
W.S. Elev (ft)	22.54	Reach Len. (ft)	99.50	91.50
83.38				
Crit W.S. (ft)		Flow Area (sq ft)	2748.16	18099.68
4787.97				
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	2748.16	18099.68
4787.97				
Q Total (cfs)	-41460.20	Flow (cfs)	-3345.86	-32533.61
-5580.73				
Top width (ft)	1193.58	Top width (ft)	181.10	672.50
339.98				
Vel Total (ft/s)	-1.62	Avg. Vel. (ft/s)	-1.22	-1.80
-1.17				
Max Chl Dpth (ft)	30.04	Hydr. Depth (ft)	15.17	26.91
14.08				
Conv. Total (cfs)	15382830.0	Conv. (cfs)	1241404.0	
12070830.0 2070597.0				
Length Wtd. (ft)	91.11	Wetted Per. (ft)	183.31	673.01
340.94				
Min Ch El (ft)	-7.50	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.08	Stream Power (lb/ft s)	1290.50	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	32.14	135.93
38.30				
C & E Loss (ft)		Cum SA (acres)	1.90	5.18
3.05				

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond RS: 1.375*

INPUT

Description:

Station Elevation Data	num=	26							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
0 26.38 39.54 13.34 79.09 4.68 89.4 4.38 205.62 1.75									
236.54 .8 282.46 -.42 408.75 -6.88 451.65 -5 500.68 -6.12									
668.88 -6.88 850 .62 874.2 1.3 910.5 3.25 995.2 6.55									
1031.49 7.56 1099.76 10.83 1116.2 12.48 1124.73 13.46 1158.03 16.62									
1196.87 19.81 1201.32 20.34 1237.21 24.81 1241.28 25.32 1277.54 29.37									
1317.88 34.5									

Manning's n values	num=	3
Sta n Val Sta n Val		
0 .02 205.62 .02 850 .02		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
205.62 850	99.5 91.5 83.38	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.59	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.54	Reach Len. (ft)	99.50	91.50

3300640.rep

83.38				
Crit W.S. (ft)		Flow Area (sq ft)	3112.32	17124.16
4933.34				
E.G. Slope (ft/ft)	0.000008	Area (sq ft)	3112.32	17124.16
4933.34				
Q Total (cfs)	-41526.50	Flow (cfs)	-4080.47	-31678.79
-5767.25				
Top width (ft)	1207.33	Top width (ft)	193.97	644.38
368.98				
Vel Total (ft/s)	-1.65	Avg. Vel. (ft/s)	-1.31	-1.85
-1.17				
Max Chl Dpth (ft)	29.42	Hydr. Depth (ft)	16.05	26.57
13.37				
Conv. Total (cfs)	14845450.0	Conv. (cfs)	1458740.0	
11324960.0 2061754.0				
Length Wtd. (ft)	91.23	Wetted Per. (ft)	196.42	644.79
369.78				
Min Ch El (ft)	-6.88	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.09	Stream Power (lb/ft s)	1317.88	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	25.45	98.94
29.00				
C & E Loss (ft)		Cum SA (acres)	1.47	3.79
2.37				

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond

RS: 1.25*

INPUT

Description:

Station Elevation Data			num= 26								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	28.25	43.03	13.23	86.06	3.45	97.28	3.25	223.75	1.5		
253.84	.57	298.55	-.7	421.5	-6.25	460.38	-5	504.81	-5.75		
657.25	-6.25	840	.75	866.13	1.53	905.33	3.83	996.8	7.7		
1035.99	8.87	1109.71	11.99	1127.47	13.32	1136.68	14.15	1172.64	16.94		
1214.58	19.87	1219.39	20.41	1258.14	24.87	1262.54	25.38	1301.69	29.58		
1345.25	35										

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.02	223.75	.02	840	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
223.75	840	99.5	91.5	83.38	.1	.3	

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.59	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.54	Reach Len. (ft)	99.50	91.50
83.38				
Crit W.S. (ft)		Flow Area (sq ft)	3500.63	16163.62
5036.13				

E.G. Slope (ft/ft)	0.000008	3300640.rep Area (sq ft)	3500.63	16163.62
5036.13 Q Total (cfs)	-41593.80	Flow (cfs)	-4926.98	-30772.89
-5893.94 Top width (ft)	1221.53	Top width (ft)	207.39	616.25
397.89 Vel Total (ft/s)	-1.68	Avg. Vel. (ft/s)	-1.41	-1.90
-1.17 Max Chl Dpth (ft)	28.79	Hydr. Depth (ft)	16.88	26.23
12.66 Conv. Total (cfs)	14324150.0	Conv. (cfs)	1696761.0	
10597630.0 2029764.0 Length Wtd. (ft)	91.38	Wetted Per. (ft)	210.08	616.57
398.58 Min Ch El (ft)	-6.25	Shear (lb/sq ft)	0.01	0.01
0.01 Alpha	1.10	Stream Power (lb/ft s)	1345.25	0.00
0.00 Frctn Loss (ft)	0.00	Cum volume (acre-ft)	17.89	63.98
19.46 C & E Loss (ft)		Cum SA (acres)	1.01	2.47
1.63				

CROSS SECTION

RIVER: Mill Pond
REACH: Mill Pond

RS: 1.125*

INPUT

Description:

Station Elevation Data			num=	26					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	30.12	46.51	13.11	93.03	2.23	105.16	2.12	241.88	1.25
271.15	.33	314.64	-.99	434.25	-5.62	469.11	-5	508.95	-5.38
645.62	-5.62	830	.88	858.07	1.77	900.17	4.42	998.4	8.85
1040.48	10.19	1119.66	13.16	1138.73	14.16	1148.62	14.84	1187.24	17.27
1232.29	19.94	1237.45	20.48	1279.07	24.94	1283.8	25.44	1325.85	29.79
1372.62	35.5								

Manning's n values			num=	3
Sta	n Val	Sta	n Val	Sta
0	.02	241.88	.02	830
				.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
241.88	830	99.5	91.5	83.38	.1		.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.59	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	wt. n-val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.54	Reach Len. (ft)	99.50	91.50
83.38				
Crit w.s. (ft)		Flow Area (sq ft)	3911.58	15223.12
5092.93				
E.G. slope (ft/ft)	0.000009	Area (sq ft)	3911.58	15223.12
5092.93				
Q Total (cfs)	-41662.10	Flow (cfs)	-5893.70	-29818.12

3300640.rep

-5950.29				
Top width (ft)	1235.94	Top width (ft)	221.15	588.12
426.67				
Vel Total (ft/s)	-1.72	Avg. Vel. (ft/s)	-1.51	-1.96
-1.17				
Max Chl Dpth (ft)	28.16	Hydr. Depth (ft)	17.69	25.88
11.94				
Conv. Total (cfs)	13824010.0	Conv. (cfs)	1955602.0	
9894025.0 1974381.0				
Length wtd. (ft)	91.58	Wetted Per. (ft)	224.08	588.37
427.29				
Min Ch El (ft)	-5.62	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.10	Stream Power (lb/ft s)	1372.62	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	9.43	31.01
9.76				
C & E Loss (ft)		Cum SA (acres)	0.52	1.21
0.84				

CROSS SECTION

RIVER: Mill Pond
 REACH: Mill Pond

RS: 1

INPUT

Description: Two Bridge Lengths Downstream

Station Elevation Data			num=	15						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
0	32	50	13	100	1	260	1	447	-5	
634	-5	820	1	850	2	895	5	1000	10	
1150	15	1250	20	1300	25	1350	30	1400	36	

Manning's n Values			num=	3		
Sta	n Val	Sta	n Val	Sta	n Val	
0	.02	260	.02	820	.02	

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
260	820	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #07AUG2011 1000

E.G. Elev (ft)	22.59	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.020	0.020
0.020				
W.S. Elev (ft)	22.54	Reach Len. (ft)		
Crit W.S. (ft)	2.71	Flow Area (sq ft)	4343.15	14303.40
5109.46				
E.G. slope (ft/ft)	0.000010	Area (sq ft)	4343.15	14303.40
5109.46				
Q Total (cfs)	-41731.30	Flow (cfs)	-6985.92	-28803.34
-5942.05				
Top width (ft)	1250.51	Top width (ft)	235.11	560.00
455.40				
Vel Total (ft/s)	-1.76	Avg. Vel. (ft/s)	-1.61	-2.01
-1.16				
Max Chl Dpth (ft)	27.54	Hydr. Depth (ft)	18.47	25.54

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11.22				
Conv. Total (cfs)	13350310.0	Conv. (cfs)	2234872.0	
9214509.0 1900927.0				
Length wtd. (ft)		Wetted Per. (ft)	238.28	560.19
455.97				
Min Ch El (ft)	-5.00	Shear (lb/sq ft)	0.01	0.02
0.01				
Alpha	1.11	Stream Power (lb/ft s)	1400.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River: Mill Pond

Reach	River Sta.	n1	n2	n3
Mill Pond	6	.02	.02	.02
Mill Pond	5.8*	.02	.02	.02
Mill Pond	5.6*	.02	.02	.02
Mill Pond	5.4*	.02	.02	.02
Mill Pond	5.2*	.02	.02	.02
Mill Pond	5	.02	.02	.02
Mill Pond	4.8*	.02	.02	.02
Mill Pond	4.6*	.02	.02	.02
Mill Pond	4.4*	.02	.02	.02
Mill Pond	4.2*	.02	.02	.02
Mill Pond	4	.02	.02	.02
Mill Pond	3.8*	.02	.02	.02
Mill Pond	3.6*	.02	.02	.02
Mill Pond	3.4*	.02	.02	.02
Mill Pond	3.2*	.02	.02	.02
Mill Pond	3	.02	.02	.02
Mill Pond	2.9	Bridge		
Mill Pond	2.8	.02	.02	.02
Mill Pond	2.68571*	.02	.02	.02
Mill Pond	2.57142*	.02	.02	.02
Mill Pond	2.45714*	.02	.02	.02
Mill Pond	2.34285*	.02	.02	.02
Mill Pond	2.22857*	.02	.02	.02
Mill Pond	2.11428*	.02	.02	.02
Mill Pond	2	.02	.02	.02
Mill Pond	1.875*	.02	.02	.02
Mill Pond	1.75*	.02	.02	.02
Mill Pond	1.625*	.02	.02	.02
Mill Pond	1.5*	.02	.02	.02
Mill Pond	1.375*	.02	.02	.02
Mill Pond	1.25*	.02	.02	.02
Mill Pond	1.125*	.02	.02	.02
Mill Pond	1	.02	.02	.02

SUMMARY OF REACH LENGTHS

River: Mill Pond

Reach	River Sta.	Left	Channel	Right
Mill Pond	6	84.8	91	97.2
Mill Pond	5.8*	84.8	91	97.2
Mill Pond	5.6*	84.8	91	97.2
Mill Pond	5.4*	84.8	91	97.2
Mill Pond	5.2*	84.8	91	97.2
Mill Pond	5	84.8	91	97.2
Mill Pond	4.8*	84.8	91	97.2
Mill Pond	4.6*	84.8	91	97.2
Mill Pond	4.4*	84.8	91	97.2
Mill Pond	4.2*	84.8	91	97.2
Mill Pond	4	105	97.6	90
Mill Pond	3.8*	105	97.6	90
Mill Pond	3.6*	105	97.6	90
Mill Pond	3.4*	105	97.6	90
Mill Pond	3.2*	105	97.6	90
Mill Pond	3	45	45	45
Mill Pond	2.9	Bridge		
Mill Pond	2.8	114	95.56	77.14
Mill Pond	2.68571*	114	95.56	77.14
Mill Pond	2.57142*	114	95.56	77.14
Mill Pond	2.45714*	114	95.56	77.14
Mill Pond	2.34285*	114	95.56	77.14
Mill Pond	2.22857*	114	95.56	77.14
Mill Pond	2.11428*	114	95.56	77.14
Mill Pond	2	99.5	91.5	83.38
Mill Pond	1.875*	99.5	91.5	83.38
Mill Pond	1.75*	99.5	91.5	83.38
Mill Pond	1.625*	99.5	91.5	83.38
Mill Pond	1.5*	99.5	91.5	83.38
Mill Pond	1.375*	99.5	91.5	83.38
Mill Pond	1.25*	99.5	91.5	83.38
Mill Pond	1.125*	99.5	91.5	83.38
Mill Pond	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Mill Pond

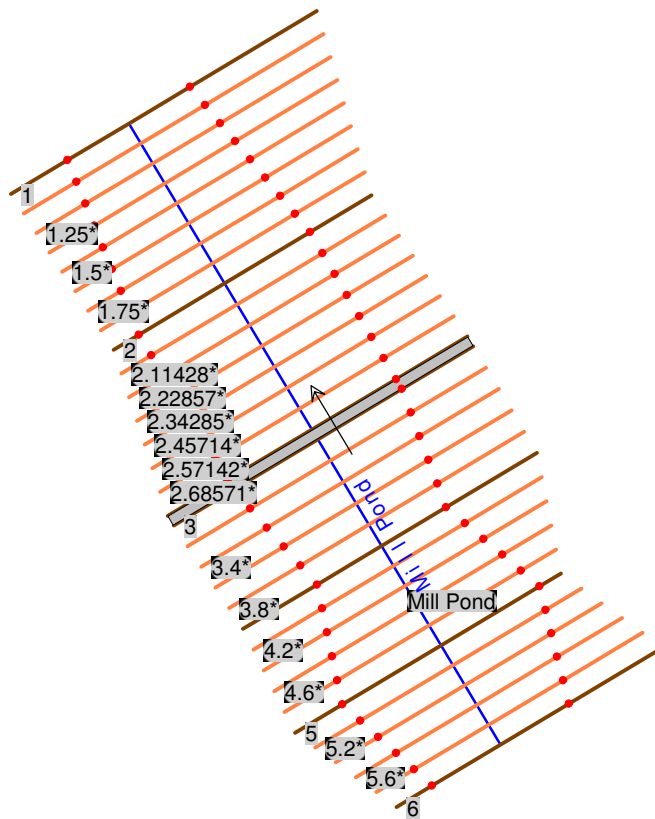
Reach	River Sta.	Contr.	Expan.
Mill Pond	6	.1	.3
Mill Pond	5.8*	.1	.3
Mill Pond	5.6*	.1	.3
Mill Pond	5.4*	.1	.3
Mill Pond	5.2*	.1	.3
Mill Pond	5	.1	.3
Mill Pond	4.8*	.1	.3
Mill Pond	4.6*	.1	.3
Mill Pond	4.4*	.1	.3
Mill Pond	4.2*	.1	.3
Mill Pond	4	.1	.3
Mill Pond	3.8*	.1	.3
Mill Pond	3.6*	.1	.3
Mill Pond	3.4*	.1	.3
Mill Pond	3.2*	.1	.3
Mill Pond	3	.1	.3

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Mill Pond	2.9	Bridge		
Mill Pond	2.8		.1	.3
Mill Pond	2.68571*		.1	.3
Mill Pond	2.57142*		.1	.3
Mill Pond	2.45714*		.1	.3
Mill Pond	2.34285*		.1	.3
Mill Pond	2.22857*		.1	.3
Mill Pond	2.11428*		.1	.3
Mill Pond	2		.1	.3
Mill Pond	1.875*		.1	.3
Mill Pond	1.75*		.1	.3
Mill Pond	1.625*		.1	.3
Mill Pond	1.5*		.1	.3
Mill Pond	1.375*		.1	.3
Mill Pond	1.25*		.1	.3
Mill Pond	1.125*		.1	.3
Mill Pond	1		.1	.3

Profile Output Table - Six XS Bridge

Reach Frctn Loss	River Sta C & E Loss	Profile Top Width	Q Left	E.G. Elev Q Channel (ft) (cfs)	W.S. Elev Q Right (ft) (cfs)	Crit W.S. Vel Chnl (ft/s)
(ft)	(ft)	(ft)	(cfs)			
Mill Pond 0.00	3.2*	07AUG2011 1000 1366.80 -6888.67		22.57 -28948.74	22.53 -4790.49	-1.66
Mill Pond	3	07AUG2011 1000 1367.83 -6581.77		22.57 -30102.81	22.54 -4023.22	-1.67
Mill Pond	2.9 BR U	07AUG2011 1000		100.69 -40707.80	22.54	-70.94
Mill Pond	2.9 BR D	07AUG2011 1000		103.80 -40707.80	22.52	-72.35
Mill Pond 0.00	2.8	07AUG2011 1000 1367.69 -6511.95		22.56 -30217.28	22.52 -3978.57	-1.66
Mill Pond 0.00	2.68571*	07AUG2011 1000 1329.53 -5525.44		22.56 -31232.67	22.52 -4026.39	-1.67



TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
Mill Dam Road over Centerport Harbor

100-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation ¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation ² (ft)	Remaining Pile Embedment (ft)
East Abutment	0	0	1	1	-1	-45	44
Center Pier	-25	0	3	3	-28	-65	37
West Abutment	0	0	5	5	-5	-45	40

500-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation ² (ft)	Remaining Pile Embedment (ft)
East Abutment	0	7.8	12	20	-20	-45	25
Center Pier	-25	7.8	7	15	-40	-65	25
West Abutment	0	7.8	18	25	-25	-45	20

1. All elevations are with reference to NAVD 88 and are taken from the 2009 Fathometric Survey by Boswell Engineering.

2. Estimate of pile tip elevation was taken from the Ayers Study (2001).

SCOUR MODE COMPUTATIONS - FLOOD TIDE
Mill Dam Road over Centerport Harbor

The following computations are made using Laursen's Equation (Equation 5.1 in HEC-18):

$$V_c = K_u \times Y_1^{1/6} \times D_{50}^{1/3}$$

100-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	7,084
APPROACH SECTION MAIN CHANNEL WIDTH (ft)	W ₁ =	770
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	9.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ^{1/3}	V _c =	3.03
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	284
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	0.04
MAIN CHANNEL SCOUR MODE		CLEAR WATER

500-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	18,037
APPROACH SECTION MAIN CHANNEL WIDTH (ft)	W ₁ =	770
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	23.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ^{1/3}	V _c =	3.55
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	30,102
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	7.43
MAIN CHANNEL SCOUR MODE		LIVE-BED

CONTRACTION SCOUR COMPUTATIONS
Mill Dam Road over Centerport Harbor
CLEAR WATER CONTRACTION SCOUR COMPUTATIONS

The following computations are made using the HEC-18 equation for Live Bed Contraction Scour:
(Equations 5.4 and 5.5)

$$Y_s = Y_2 - Y_0$$

$$Y_2 = [K_u Q^2 / D_m^{2/3} W^{2/3}]^{3/7}$$

100-YEAR FLOOD

K ₁ =0.0077 (English Units)	K _u =	0.0077
DISCHARGE THROUGH BRIDGE OR ON THE SET BACK OVBANK (cfs)	Q=	574.0
DIAM. OF THE SMALLEST NONTRANSPORTABLE PARTICLE (1.25D ₅₀)	D _m =	0.0083
BOTTOM WIDTH OF CONTRACTED SECTION LESS PIER WIDTHS (ft)	W=	770.0
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	Y ₂ =	0.38
AVERAGE WATER DEPTH AT BRIDGE (ft)	Y ₀ =	9.3
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	Y _s =	-8.9

CONTRACTION SCOUR COMPUTATIONS - FLOOD TIDE
Mill Dam Road over Centerport Harbor
LIVE BED CONTRACTION SCOUR COMPUTATIONS

The following computations are made using the HEC-18 equations for Live Bed Contraction Scour:
(Equations 5.2 and 5.3)

$$Y_s = Y_2 - Y_0$$

$$Y_2 = [(Q_2/Q_1)^{6/7} \times (W_1/W_2)^{k_1}] \times Y_1$$

500-YEAR FLOOD

ENERGY SLOPE	$S_1 =$	0.000008
FALL VELOCITY (Use Figure 5.8 in HEC-18, <i>For English: multiply by 3.28</i>)	$w =$	0.656
AVERAGE UPSTREAM CHANNEL DEPTH (ft), $Y_1 = A_1/W_1$	$y_1 =$	23.00
SHEAR VELOCITY IN UPSTREAM SECTION, $V^* = gy_1 S_1^{1/2}$	$V_* =$	0.07697272
V^*/w	$V^*/w =$	0.12
k_1	$k_1 =$	0.59
DISCHARGE IN UPSTREAM CHANNEL (cfs)	$Q_1 =$	30,102.0
DISCHARGE IN CONTRACTED SECTION (cfs)	$Q_2 =$	40,707.0
WIDTH OF UPSTREAM CHANNEL SECTION (ft)	$W_1 =$	770.0
WIDTH OF MAIN CHANNEL CONTRACTED SECTION (ft)	$W_2 =$	770.0
MEDIAN GRAIN SIZE (ft)	$D_{50} =$	0.00667
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	$Y_2 =$	29.79
AVERAGE WATER DEPTH AT BRIDGE (ft)	$Y_0 =$	22
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	$Y_s =$	7.8

LOCAL ABUTMENT SCOUR COMPUTATIONS - West Abutment
Mill Dam Road over Centerport Harbor

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	233
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	1,009
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	25.0
V _e = Q _e /A _e , (ft/s)	V _e =	0.025
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	233
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	4.3
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000089
SCOUR DEPTH, Y _s (ft)	Y _s =	4.5

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	80
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	4,886
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	6,582
V _e = Q _e /A _e , (ft/s)	V _e =	1.347
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	300
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	16.3
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.001284
SCOUR DEPTH, Y _s (ft)	Y _s =	17.7

LOCAL ABUTMENT SCOUR COMPUTATIONS - East Abutment
Mill Dam Road over Centerport Harbor

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	116
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	55
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	16.0
V _e = Q _e /A _e , (ft/s)	V _e =	0.291
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	116
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	0.5
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.009527

SCOUR DEPTH, Y _s (ft)	Y _s =	1.2

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	116
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	3,812
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	4,023
V _e = Q _e /A _e , (ft/s)	V _e =	1.055
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	360
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	10.6
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.001548

SCOUR DEPTH, Y _s (ft)	Y _s =	12.0

LOCAL PIER SCOUR COMPUTATIONS - FLOOD TIDE
Mill Dam Road over Centerport Harbor

The following computations are made using the HEC-18 CSU Equation (Eqn. 6.1):

$$y_s = (2.0K_1K_2K_3K_4(a/y_1)^{0.65}Fr^{0.43} \times y_1$$

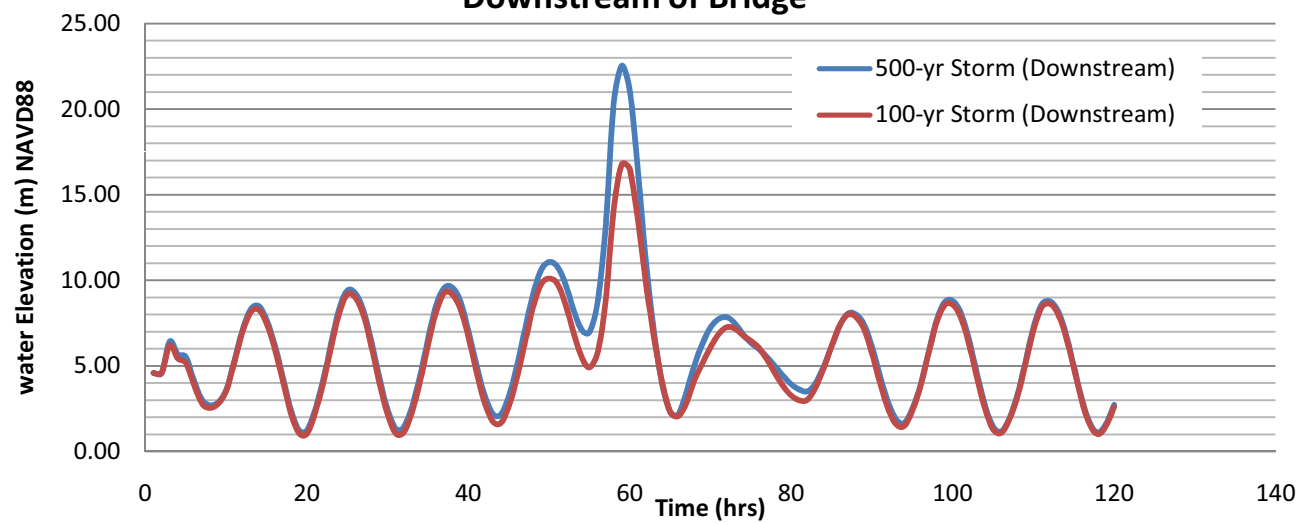
100-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE (SEE EQNS. 6.5 - 6.8)	K ₄ =	1.00
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	5.0
LENGTH OF PIER	L=	40.0
L/a (Maximum L/a value is 12)	L/a=	8.0
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	0.4
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	9.2
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	3.0

500-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE (SEE EQNS. 6.5 - 6.8)	K ₄ =	1.00
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	5.0
LENGTH OF PIER	L=	40.0
L/a (Maximum L/a value is 12)	L/a=	8.0
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	2.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	23.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Y _s =	6.7

Centerport Harbor Synthetic Hydrographs Downstream of Bridge



Stage Hydrograph for 500 and 100 Year storms

Initial Flow at RS6 = (Area x 1ft/s) =

800

SLR = 4.592 ft

3300640 - Mill Dam Road over Centerport Harbor

500 - year storm

Time	R.S. = 1 Node = s5n6					R.S. = 6 Node = s6n4				
(hrs)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)	Elevation (m) NAVD 88	Velocity (m/s)	Velocity Direction	Elevation (ft) NAVD 88 + SLR	Velocity (ft/s)
1	0.00	0.00	0.00	4.59	0.00	0.00	0.00	0.00	4.59	0.00
2	0.00	0.00	151.21	4.60	0.00	0.00	0.00	173.36	4.59	0.00
3	0.56	0.01	186.00	6.43	0.04	0.56	0.00	155.29	6.44	0.01
4	0.33	0.01	135.59	5.67	0.02	0.33	0.00	155.61	5.67	0.01
5	0.28	0.01	331.66	5.52	0.04	0.28	0.00	12.15	5.52	0.01
6	-0.14	0.10	329.26	4.14	0.31	-0.13	0.01	353.74	4.16	0.04
7	-0.48	0.02	321.02	3.03	0.08	-0.48	0.00	343.46	3.01	0.01
8	-0.58	0.01	187.94	2.71	0.03	-0.59	0.00	181.15	2.66	0.01
9	-0.53	0.04	160.59	2.87	0.13	-0.53	0.01	173.76	2.85	0.03
10	-0.30	0.05	156.82	3.61	0.18	-0.30	0.01	173.72	3.61	0.03
11	0.21	0.09	155.71	5.28	0.31	0.20	0.02	170.09	5.25	0.05
12	0.75	0.06	153.51	7.06	0.21	0.75	0.01	166.37	7.04	0.04
13	1.12	0.04	151.51	8.28	0.12	1.13	0.01	176.37	8.30	0.03
14	1.19	0.01	335.34	8.51	0.04	1.20	0.00	344.70	8.51	0.00
15	0.95	0.06	333.14	7.70	0.18	0.95	0.01	347.08	7.71	0.04
16	0.51	0.07	330.14	6.26	0.24	0.51	0.01	356.95	6.26	0.05
17	-0.07	0.08	329.15	4.35	0.26	-0.07	0.00	6.42	4.35	0.01
18	-0.65	0.08	328.06	2.45	0.25	-0.65	0.02	353.16	2.45	0.05
19	-1.02	0.05	324.05	1.25	0.15	-1.01	0.01	347.47	1.28	0.04
20	-1.03	0.03	162.72	1.23	0.09	-1.03	0.00	246.03	1.22	0.00
21	-0.66	0.06	158.22	2.42	0.20	-0.67	0.01	178.35	2.41	0.03
22	-0.14	0.09	155.94	4.14	0.29	-0.14	0.01	171.98	4.14	0.04
23	0.53	0.09	153.96	6.32	0.29	0.53	0.01	166.73	6.33	0.04
24	1.14	0.06	150.25	8.34	0.19	1.14	0.01	170.96	8.33	0.04
25	1.47	0.01	19.42	9.40	0.02	1.47	0.00	161.83	9.43	0.01
26	1.42	0.02	335.67	9.24	0.08	1.41	0.01	345.25	9.23	0.02
27	1.11	0.03	333.34	8.24	0.10	1.11	0.00	0.83	8.23	0.01
28	0.55	0.08	327.84	6.40	0.28	0.56	0.01	0.37	6.41	0.04
29	-0.11	0.08	327.71	4.23	0.26	-0.11	0.02	352.14	4.23	0.06
30	-0.66	0.07	328.26	2.42	0.22	-0.65	0.02	351.24	2.45	0.05
31	-1.00	0.02	318.60	1.33	0.06	-1.00	0.01	344.21	1.33	0.02
32	-0.97	0.02	165.86	1.43	0.07	-0.97	0.00	190.70	1.43	0.01
33	-0.61	0.07	157.65	2.59	0.22	-0.62	0.01	172.82	2.57	0.03
34	-0.07	0.08	155.73	4.38	0.27	-0.06	0.01	170.87	4.39	0.04
35	0.61	0.07	153.37	6.58	0.24	0.61	0.01	164.13	6.58	0.03
36	1.20	0.04	148.24	8.54	0.12	1.21	0.01	170.28	8.55	0.02
37	1.51	0.01	123.38	9.55	0.03	1.51	0.00	158.23	9.54	0.01
38	1.52	0.01	341.29	9.58	0.03	1.52	0.00	170.65	9.59	0.01
39	1.28	0.06	334.08	8.79	0.18	1.28	0.01	337.84	8.80	0.02
40	0.75	0.08	329.78	7.04	0.26	0.74	0.02	355.90	7.03	0.06
41	0.13	0.09	329.70	5.02	0.29	0.13	0.01	15.15	5.02	0.02
42	-0.40	0.07	327.48	3.29	0.23	-0.40	0.01	350.96	3.30	0.04
43	-0.73	0.02	319.64	2.21	0.08	-0.73	0.01	341.21	2.19	0.02
44	-0.74	0.03	160.94	2.16	0.10	-0.74	0.01	176.23	2.18	0.04
45	-0.43	0.08	156.26	3.20	0.27	-0.42	0.01	171.98	3.21	0.04
46	0.11	0.08	156.15	4.97	0.27	0.11	0.01	169.63	4.96	0.03
47	0.77	0.08	153.51	7.11	0.27	0.77	0.02	173.62	7.11	0.05
48	1.39	0.07	150.30	9.16	0.24	1.40	0.01	167.10	9.17	0.04

49	1.83	0.02	138.31	10.60	0.06	1.84	0.01	161.16	10.62	0.02
50	1.98	0.02	345.83	11.07	0.08	1.97	0.01	3.58	11.06	0.02
51	1.90	0.02	155.40	10.81	0.06	1.89	0.01	157.38	10.79	0.02
52	1.60	0.07	333.79	9.82	0.23	1.60	0.01	352.99	9.84	0.04
53	1.13	0.06	328.58	8.30	0.18	1.14	0.01	2.25	8.32	0.04
54	0.77	0.02	316.00	7.12	0.06	0.76	0.00	140.21	7.08	0.01
55	0.73	0.04	158.41	6.98	0.13	0.73	0.01	155.74	6.99	0.04
56	1.25	0.09	156.40	8.71	0.28	1.26	0.02	160.55	8.72	0.05
57	2.61	0.13	157.18	13.14	0.44	2.60	0.04	160.76	13.12	0.11
58	4.80	0.12	151.55	20.35	0.40	4.82	0.03	164.04	20.41	0.09
59	5.47	0.14	334.08	22.54	0.44	5.46	0.03	345.86	22.49	0.09
60	5.02	0.13	333.29	21.06	0.41	5.04	0.02	342.67	21.12	0.07
61	3.61	0.09	330.70	16.42	0.30	3.62	0.02	1.82	16.47	0.07
62	1.97	0.15	330.47	11.07	0.48	1.97	0.04	348.31	11.06	0.13
63	0.72	0.13	328.23	6.96	0.42	0.73	0.03	343.08	6.98	0.10
64	-0.20	0.05	323.77	3.94	0.17	-0.21	0.01	239.59	3.90	0.02
65	-0.69	0.02	323.87	2.33	0.07	-0.69	0.01	296.64	2.33	0.02
66	-0.74	0.03	164.26	2.15	0.11	-0.74	0.01	210.89	2.15	0.02
67	-0.35	0.07	158.08	3.46	0.24	-0.34	0.01	183.42	3.49	0.02
68	0.14	0.06	156.97	5.04	0.21	0.14	0.01	167.88	5.05	0.02
69	0.53	0.06	155.50	6.31	0.19	0.52	0.01	171.94	6.30	0.03
70	0.81	0.02	153.98	7.26	0.05	0.81	0.00	72.05	7.24	0.01
71	0.96	0.01	148.63	7.74	0.04	0.96	0.00	32.85	7.74	0.01
72	0.99	0.00	359.14	7.85	0.01	0.99	0.00	61.17	7.84	0.01
73	0.89	0.02	332.80	7.50	0.05	0.89	0.00	20.70	7.51	0.01
74	0.69	0.03	328.66	6.84	0.09	0.69	0.01	9.74	6.85	0.02
75	0.54	0.03	330.39	6.35	0.09	0.54	0.01	358.28	6.36	0.03
76	0.42	0.03	330.33	5.98	0.09	0.42	0.01	354.21	5.97	0.02
77	0.28	0.02	328.33	5.52	0.05	0.28	0.00	129.65	5.51	0.01
78	0.12	0.02	329.36	4.97	0.06	0.12	0.00	150.28	4.98	0.00
79	-0.05	0.02	328.83	4.42	0.06	-0.05	0.00	291.77	4.43	0.00
80	-0.21	0.02	328.50	3.92	0.07	-0.19	0.00	106.30	3.97	0.00
81	-0.30	0.01	314.25	3.62	0.02	-0.30	0.00	350.19	3.61	0.00
82	-0.33	0.01	158.44	3.51	0.05	-0.33	0.00	186.79	3.50	0.00
83	-0.19	0.04	156.16	3.98	0.12	-0.19	0.01	171.72	3.96	0.02
84	0.11	0.05	156.26	4.95	0.15	0.11	0.01	170.20	4.95	0.03
85	0.48	0.05	154.25	6.15	0.17	0.48	0.01	162.35	6.17	0.03
86	0.84	0.05	153.05	7.34	0.16	0.84	0.01	163.27	7.34	0.03
87	1.06	0.02	150.79	8.05	0.06	1.05	0.00	140.27	8.05	0.01
88	1.04	0.02	335.38	8.02	0.06	1.05	0.01	2.85	8.03	0.02
89	0.87	0.03	330.59	7.43	0.09	0.86	0.01	2.35	7.43	0.02
90	0.47	0.07	331.95	6.13	0.21	0.47	0.01	358.39	6.13	0.04
91	-0.06	0.11	330.17	4.40	0.35	-0.06	0.02	352.08	4.40	0.05
92	-0.52	0.07	327.65	2.87	0.22	-0.52	0.01	341.44	2.88	0.04
93	-0.83	0.04	326.67	1.86	0.13	-0.83	0.00	338.82	1.87	0.01
94	-0.89	0.00	216.44	1.66	0.01	-0.89	0.00	234.94	1.67	0.00
95	-0.64	0.05	157.86	2.49	0.17	-0.63	0.01	178.70	2.51	0.04
96	-0.22	0.07	155.88	3.86	0.24	-0.22	0.01	169.12	3.86	0.03
97	0.36	0.09	155.11	5.78	0.30	0.36	0.02	170.43	5.78	0.05
98	0.94	0.05	150.82	7.67	0.16	0.94	0.01	171.35	7.68	0.04
99	1.26	0.02	142.48	8.72	0.07	1.25	0.00	156.43	8.71	0.01
100	1.28	0.01	352.28	8.80	0.02	1.29	0.00	11.23	8.81	0.01
101	1.07	0.04	334.18	8.10	0.13	1.07	0.01	357.49	8.11	0.02
102	0.60	0.07	329.29	6.57	0.23	0.60	0.01	359.87	6.56	0.04
103	-0.02	0.10	330.47	4.54	0.31	-0.01	0.01	1.37	4.57	0.04
104	-0.58	0.07	328.68	2.70	0.24	-0.58	0.02	353.27	2.69	0.06
105	-0.96	0.05	326.94	1.45	0.16	-0.96	0.02	355.20	1.46	0.06

106	-1.04	0.02	163.68	1.17	0.05	-1.04	0.00	278.10	1.19	0.00
107	-0.82	0.08	156.42	1.92	0.26	-0.81	0.02	176.78	1.94	0.06
108	-0.40	0.09	155.48	3.28	0.29	-0.40	0.01	170.07	3.29	0.05
109	0.19	0.09	156.09	5.22	0.28	0.19	0.01	168.70	5.21	0.04
110	0.81	0.07	152.70	7.24	0.22	0.81	0.01	166.31	7.24	0.04
111	1.22	0.03	146.62	8.58	0.09	1.23	0.01	165.21	8.61	0.03
112	1.28	0.02	340.54	8.78	0.08	1.28	0.00	5.42	8.79	0.01
113	1.11	0.03	335.67	8.25	0.08	1.11	0.00	5.08	8.24	0.01
114	0.71	0.05	330.93	6.91	0.16	0.71	0.01	357.49	6.92	0.03
115	0.12	0.09	330.72	5.00	0.31	0.14	0.01	6.62	5.04	0.05
116	-0.47	0.09	329.68	3.06	0.29	-0.47	0.02	348.94	3.06	0.08
117	-0.90	0.07	327.99	1.65	0.22	-0.90	0.01	346.17	1.64	0.04
118	-1.06	0.02	314.26	1.10	0.05	-1.06	0.00	273.50	1.11	0.00
119	-0.91	0.05	159.48	1.62	0.15	-0.91	0.00	175.43	1.60	0.01
120	-0.57	0.07	156.67	2.73	0.22	-0.57	0.01	170.58	2.73	0.04

100-year storm

Time | R.S. = 1 Node = s5n6

R.S. = 6 Node = s6n4

(hrs)	Elevation			Elevation			Elevation			Elevation		
	(m) NAVD 88	Velocity (m/s)	Velocity Direction	(ft) NAVD 88 + SLR	Velocity (ft/s)		(m) NAVD 88	Velocity (m/s)	Velocity Direction	(ft) NAVD 88 + SLR	Velocity (ft/s)	
1	0.00	0.00	0.00	4.59	0.00		0.00	0.00	0.00	4.59	0.00	
2	0.00	0.00	151.21	4.60	0.00		0.00	0.00	173.36	4.59	0.00	
3	0.49	0.01	185.70	6.21	0.03		0.50	0.01	358.77	6.25	0.03	
4	0.26	0.00	350.62	5.43	0.01		0.26	0.00	156.76	5.45	0.01	
5	0.18	0.02	329.10	5.18	0.05		0.18	0.00	137.54	5.19	0.00	
6	-0.21	0.10	330.39	3.91	0.34		-0.20	0.02	350.84	3.92	0.06	
7	-0.55	0.01	314.46	2.80	0.05		-0.54	0.00	227.79	2.82	0.01	
8	-0.63	0.01	223.29	2.54	0.02		-0.63	0.00	332.48	2.51	0.01	
9	-0.55	0.02	165.47	2.80	0.06		-0.55	0.00	176.78	2.79	0.01	
10	-0.32	0.05	157.51	3.54	0.16		-0.32	0.01	175.20	3.55	0.03	
11	0.19	0.09	155.50	5.21	0.28		0.18	0.01	166.64	5.19	0.04	
12	0.73	0.05	154.30	6.97	0.15		0.72	0.01	171.24	6.96	0.02	
13	1.08	0.03	152.05	8.12	0.11		1.07	0.01	171.34	8.11	0.02	
14	1.13	0.01	341.57	8.30	0.03		1.14	0.00	342.59	8.32	0.01	
15	0.89	0.05	332.28	7.50	0.16		0.88	0.01	351.58	7.49	0.04	
16	0.44	0.09	329.47	6.04	0.28		0.45	0.01	356.70	6.05	0.04	
17	-0.14	0.11	330.32	4.14	0.37		-0.14	0.03	353.26	4.13	0.08	
18	-0.72	0.10	328.12	2.24	0.32		-0.72	0.02	352.43	2.23	0.06	
19	-1.07	0.03	321.76	1.08	0.11		-1.07	0.02	355.10	1.08	0.06	
20	-1.08	0.02	164.33	1.04	0.05		-1.08	0.00	326.42	1.06	0.00	
21	-0.72	0.08	156.56	2.24	0.25		-0.71	0.01	174.72	2.26	0.04	
22	-0.19	0.09	156.02	3.98	0.30		-0.19	0.01	172.69	3.97	0.04	
23	0.47	0.09	154.73	6.13	0.28		0.47	0.01	170.61	6.12	0.04	
24	1.07	0.05	150.13	8.09	0.15		1.07	0.01	166.40	8.10	0.03	
25	1.40	0.01	136.80	9.19	0.04		1.41	0.00	187.94	9.20	0.01	
26	1.34	0.03	334.17	8.99	0.09		1.34	0.00	338.51	9.00	0.01	
27	1.04	0.06	334.14	7.99	0.21		1.03	0.02	350.12	7.98	0.05	
28	0.46	0.07	328.38	6.11	0.23		0.46	0.01	4.86	6.10	0.04	
29	-0.20	0.10	329.00	3.95	0.33		-0.20	0.02	352.61	3.93	0.06	
30	-0.74	0.07	327.31	2.16	0.24		-0.75	0.03	351.41	2.13	0.08	
31	-1.08	0.04	323.79	1.05	0.14		-1.08	0.02	358.60	1.05	0.06	
32	-1.06	0.03	159.77	1.13	0.11		-1.05	0.00	182.65	1.14	0.00	
33	-0.70	0.07	157.12	2.29	0.23		-0.70	0.01	183.92	2.29	0.02	
34	-0.16	0.09	155.60	4.06	0.29		-0.16	0.01	172.96	4.06	0.04	
35	0.50	0.09	153.87	6.24	0.29		0.51	0.02	170.49	6.25	0.06	
36	1.09	0.06	149.96	8.17	0.18		1.09	0.01	170.91	8.16	0.03	
37	1.43	0.01	116.82	9.27	0.02		1.43	0.01	165.48	9.27	0.02	
38	1.40	0.02	338.31	9.18	0.07		1.40	0.00	4.42	9.18	0.01	
39	1.15	0.04	334.93	8.36	0.12		1.14	0.01	353.80	8.34	0.02	
40	0.64	0.07	328.72	6.70	0.21		0.65	0.01	2.65	6.71	0.04	
41	0.02	0.08	328.68	4.65	0.26		0.02	0.01	357.95	4.66	0.04	
42	-0.53	0.07	328.83	2.87	0.23		-0.53	0.02	346.23	2.87	0.05	
43	-0.86	0.03	322.08	1.77	0.10		-0.85	0.01	351.62	1.81	0.02	
44	-0.90	0.04	156.83	1.66	0.13		-0.88	0.00	200.61	1.69	0.01	
45	-0.60	0.08	156.58	2.62	0.28		-0.60	0.02	176.32	2.63	0.06	
46	-0.10	0.07	155.77	4.26	0.23		-0.10	0.01	172.00	4.27	0.04	
47	0.54	0.08	154.76	6.35	0.26		0.54	0.01	162.96	6.37	0.03	
48	1.17	0.05	149.71	8.42	0.17		1.17	0.02	169.78	8.44	0.05	

49	1.58	0.01	115.75	9.77	0.02	1.58	0.00	159.21	9.78	0.01
50	1.68	0.01	8.17	10.11	0.03	1.68	0.00	353.11	10.10	0.01
51	1.59	0.01	332.68	9.81	0.04	1.59	0.00	332.11	9.81	0.00
52	1.24	0.05	332.92	8.65	0.16	1.24	0.00	336.34	8.66	0.01
53	0.73	0.07	330.72	7.00	0.23	0.73	0.01	357.27	7.00	0.04
54	0.29	0.05	325.40	5.56	0.16	0.30	0.01	15.66	5.56	0.02
55	0.10	0.01	296.48	4.91	0.04	0.10	0.01	355.83	4.93	0.04
56	0.35	0.07	157.43	5.75	0.24	0.35	0.01	170.50	5.75	0.02
57	1.28	0.13	155.09	8.77	0.41	1.28	0.03	171.81	8.80	0.10
58	2.91	0.11	154.32	14.13	0.37	2.91	0.02	161.96	14.12	0.07
59	3.72	0.06	149.78	16.78	0.18	3.72	0.02	171.07	16.80	0.05
60	3.63	0.03	327.12	16.49	0.08	3.62	0.00	353.29	16.47	0.01
61	2.72	0.08	331.32	13.50	0.26	2.73	0.02	356.76	13.53	0.06
62	1.60	0.12	330.02	9.85	0.38	1.60	0.02	356.14	9.82	0.07
63	0.62	0.08	326.32	6.64	0.28	0.62	0.01	336.66	6.62	0.04
64	-0.17	0.07	328.51	4.05	0.23	-0.17	0.01	326.15	4.03	0.03
65	-0.70	0.04	325.51	2.30	0.12	-0.69	0.00	256.19	2.34	0.01
66	-0.77	0.03	162.70	2.06	0.09	-0.77	0.00	239.05	2.08	0.01
67	-0.54	0.05	158.59	2.82	0.16	-0.54	0.00	228.69	2.82	0.01
68	-0.13	0.06	158.29	4.18	0.18	-0.12	0.00	186.54	4.19	0.01
69	0.17	0.04	156.47	5.15	0.14	0.18	0.00	167.52	5.18	0.01
70	0.46	0.05	155.88	6.09	0.15	0.46	0.00	165.92	6.09	0.01
71	0.69	0.03	156.52	6.86	0.09	0.69	0.00	140.11	6.87	0.01
72	0.81	0.01	154.55	7.26	0.02	0.82	0.00	34.45	7.28	0.01
73	0.79	0.02	333.39	7.19	0.07	0.79	0.01	3.88	7.18	0.02
74	0.67	0.01	324.14	6.80	0.04	0.67	0.01	5.64	6.79	0.02
75	0.57	0.01	326.01	6.46	0.04	0.57	0.01	345.68	6.46	0.03
76	0.45	0.02	331.14	6.05	0.07	0.44	0.01	350.34	6.04	0.03
77	0.24	0.04	332.39	5.37	0.13	0.24	0.00	109.08	5.38	0.01
78	-0.01	0.04	331.14	4.56	0.14	-0.01	0.01	10.63	4.57	0.02
79	-0.23	0.04	329.25	3.82	0.13	-0.23	0.01	348.09	3.84	0.04
80	-0.41	0.02	323.99	3.26	0.06	-0.40	0.00	344.22	3.28	0.01
81	-0.49	0.01	298.75	2.99	0.02	-0.50	0.00	5.44	2.97	0.01
82	-0.48	0.01	174.15	3.02	0.02	-0.48	0.00	342.98	3.01	0.01
83	-0.26	0.04	157.37	3.74	0.14	-0.26	0.00	160.67	3.75	0.01
84	0.08	0.05	155.10	4.84	0.17	0.08	0.01	170.35	4.84	0.03
85	0.48	0.05	155.16	6.18	0.15	0.49	0.01	167.23	6.19	0.02
86	0.85	0.05	153.77	7.38	0.15	0.85	0.01	167.47	7.38	0.03
87	1.04	0.01	146.94	8.00	0.03	1.04	0.00	134.05	7.99	0.00
88	1.00	0.02	334.05	7.87	0.07	1.00	0.01	351.24	7.87	0.02
89	0.78	0.03	329.49	7.16	0.10	0.79	0.01	357.93	7.18	0.03
90	0.35	0.06	330.24	5.73	0.20	0.35	0.01	354.40	5.75	0.04
91	-0.18	0.08	329.58	3.99	0.27	-0.18	0.02	356.39	4.00	0.06
92	-0.64	0.06	327.51	2.49	0.18	-0.64	0.01	345.23	2.48	0.05
93	-0.92	0.03	322.79	1.59	0.09	-0.92	0.01	355.29	1.58	0.03
94	-0.94	0.03	157.47	1.50	0.09	-0.94	0.00	337.07	1.52	0.01
95	-0.67	0.06	156.77	2.39	0.19	-0.67	0.01	173.10	2.38	0.03
96	-0.24	0.08	155.85	3.80	0.27	-0.25	0.01	171.73	3.79	0.04
97	0.35	0.09	155.11	5.72	0.28	0.34	0.02	171.46	5.72	0.05
98	0.91	0.06	151.10	7.56	0.19	0.91	0.01	163.59	7.58	0.03
99	1.21	0.01	138.76	8.56	0.05	1.21	0.00	162.70	8.55	0.01
100	1.22	0.01	347.16	8.58	0.03	1.21	0.00	58.79	8.57	0.00
101	0.99	0.03	332.30	7.85	0.09	0.99	0.01	356.78	7.85	0.02
102	0.53	0.08	330.30	6.31	0.25	0.53	0.01	0.00	6.32	0.04
103	-0.08	0.08	328.45	4.32	0.26	-0.07	0.01	344.54	4.35	0.03
104	-0.64	0.08	329.57	2.50	0.27	-0.63	0.02	353.55	2.52	0.07
105	-1.01	0.04	327.37	1.30	0.14	-1.00	0.01	352.72	1.30	0.04

106	-1.07	0.01	198.15	1.09	0.02	-1.07	0.00	204.96	1.09	0.01
107	-0.83	0.05	158.85	1.87	0.17	-0.84	0.01	178.91	1.83	0.02
108	-0.43	0.09	155.34	3.18	0.29	-0.44	0.01	174.56	3.16	0.04
109	0.16	0.09	155.55	5.10	0.29	0.16	0.01	169.31	5.10	0.05
110	0.76	0.06	152.56	7.09	0.19	0.77	0.01	167.69	7.11	0.03
111	1.17	0.04	148.04	8.42	0.13	1.16	0.01	168.18	8.41	0.03
112	1.23	0.02	342.57	8.64	0.06	1.24	0.00	343.40	8.65	0.01
113	1.06	0.03	334.47	8.08	0.09	1.06	0.01	357.18	8.08	0.02
114	0.66	0.05	329.40	6.75	0.17	0.66	0.01	355.40	6.75	0.03
115	0.09	0.09	329.99	4.88	0.30	0.08	0.01	0.90	4.85	0.05
116	-0.51	0.08	328.19	2.94	0.26	-0.51	0.01	348.21	2.93	0.03
117	-0.93	0.04	325.36	1.54	0.14	-0.94	0.01	346.49	1.52	0.04
118	-1.09	0.01	191.76	1.01	0.03	-1.10	0.01	206.02	0.99	0.02
119	-0.94	0.05	157.52	1.50	0.17	-0.94	0.00	193.80	1.51	0.01
120	-0.61	0.06	156.22	2.60	0.20	-0.60	0.01	178.20	2.63	0.02

B.8 Sunken Meadow Parkway

OBJECTID	191	ApprGuar_1	0	UndWaterIn	N
Shape	Point	Historical	5	SpecInspe	N
StateCode	362	NavControl	0	FractCritD	0
BIN	5059070	NavVertCle	0	UndWaterDa	0
Record	1	NavHorizCl	0	SpecInspec	
Type	8	OpenPostCl	A	BridgImprC	154
LOS	1	ServiceOnB	5	RoadImprCo	78
RteNo	0	ServiceUnd	5	TotalCost	232
HighwayDis	2	StructMate	1	YearEst	2008
CountyCode	103	TypeDesign	11	BordBridge	0
PlaceCode	68000	ApprMater	0	BPercenRes	0
FeaturesIn	SUNKEN	ApprDesign	0	BordBIN	0
MEADOW CRK		NoSpansMai	1	STRAHNET	0
CritFacili		NoSpansApp	0	ParallelSt	N
Route	RTE 908K	RouteHoriz	92	DirectTraf	2
Location	SMSP AT	MainSpanLe	231	TempStruct	
SUNKEN MEADOW		StructLeng	259	HighwaySys	0
MinVertCle	9999	SdeWlkLeft	7	FedLandsHi	0
KiloPoint	17852	SdeWlkRtWi	24	YearRecon	0
BaseHwyNet	1	BrdgCb2Cb	92	DeckType	N
LRSRoute	0	BrdgOut2Ou	128	DeckWearTy	6
SubrouteNo		MinVertOve	9999	TypeMembr	2
LatDD	40	RefFeature	N	DeckProtec	N
LatMM	54	MinVertUn	0	ADTTruck	4
LatSS	30840	RefFeat	N	NatNetwk	0
LonDD	73	MinLatUn	999	PierAbutPr	
LongMM	15	MinLatUnLf	0	NBISBrdgeL	Y
LongSS	3423	Deck	0	ScourCrit	0
Latitude	40.908567	SupStruct	6	FutADT	15684
Longitude	-73.259508	SubStruct	5	YearFutADT	2026
DetourLeng	199	ChannelPro	8	MinNavVert	
Toll	2	Culverts	N	FedAgeninc	NN
MainRespon	11	MethOpRate	5	WashHead	
Owner	1	OperRating	615	NoName	425
FunctClass	12	MethOpRa_1	0	Status	0
YearBuilt	1955	InventRat	216	NoName_1	0
LanesOn	3	TructEval	5	SubStruct	7
LanesUnder	0	DeckGeo	2	ChannelPro	7
ADT	11203	UnclearVer	N	Culverts	N
YearADT	2006	BridgePost	5	MethOpRate	5
DesignLoad	0	WaterwayAd	5	OperRating	560
ApprWidth	91	ApprAlign	8	MethOpRa_1	0
Median	0	TypeWorkPr	34	InventRat	255
Skew	0	WorkBy	1	TructEval	6
StructFlar	0	LenImprov	259	DeckGeo	4
BridgeRail	0	InspDate	1107	UnclearVer	N
Transition	0	InspFreq	24	BridgePost	5
ApprGuardR	0	FractCrit	N	WaterwayAd	5

ApprAlign	8
TypeWorkPr	34
WorkBy	1
LenImprov	1648
InspDate	808
InspFreq	24
FractCrit	Y24
UndWaterIn	Y60
SpecInspe	N
FractCritD	808
UndWaterDa	804
SpecInspec	
BridgImprC	984
RoadImprCo	503
TotalCost	1487
YearEst	2008
BordBridge	0
BPercenRes	0
BordBIN	0
STRAHNET	0
ParallelSt	N
DirectTraf	2
TempStruct	
HighwaySys	0
FedLandsHi	0
YearRecon	1993
DeckType	1
DeckWearTy	2
TypeMembr	0
DeckProtec	1
ADTTruck	5
NatNetwk	0
PierAbutPr	2
NBISBrdgeL	Y
ScourCrit	0
FutADT 12530	
YearFutADT	2005
MinNavVert	
FedAgeninc	NN
WashHead	
NoName	638
Status	0
NoName_1	0

B.9 Bayonne Bridge over Kill Van Kull

OBJECTID	77	ApprGuar_1	0	UndWaterIn	Y60
Shape	Point	Historical	4	SpecInspe	N
StateCode	362	NavControl	1	FractCritD	1007
BIN	5523040	NavVertCle	411	UndWaterDa	893
Record	1	NavHorizCl	2438	SpecInspec	
Type	3	OpenPostCl	A	BridgImprC	927
LOS	1	ServiceOnB	5	RoadImprCo	468
RteNo	440	ServiceUnd	8	TotalCost	1395
HighwayDis	0	StructMate	3	YearEst	2008
CountyCode	85	TypeDesign	12	BordBridge	342
PlaceCode	51000	ApprMater	3	BPercenRes	0
FeaturesIn	Innis Street,	ApprDesign	3	BordBIN	0
KILL VAN K		NoSpansMai	1	STRAHNET	0
CritFacili		NoSpansApp	72	ParallelSt	N
Route	RTE 440	RouteHoriz	121	DirectTraf	2
Location	BAYONNE	MainSpanLe	5105	TempStruct	
BR OVR KIL VN KUL		StructLeng	20241	HighwaySys	1
MinVertCle	609	SdeWlkLeft	20	FedLandsHi	0
KiloPoint	20249	SdeWlkRtWi	20	YearRecon	0
BaseHwyNet	1	BrdgCb2Cb	121	DeckType	1
LRSRoute	0	BrdgOut2Ou	225	DeckWearTy	9
SubrouteNo		MinVertOve	609	TypeMembr	8
LatDD	40	RefFeature	H	DeckProtec	1
LatMM	38	MinVertUn	436	ADTTruck	7
LatSS	31210	RefFeat	H	NatNetwk	0
LonDD	74	MinLatUn	41	PierAbutPr	1
LongMM	8	MinLatUnLf	0	NBISBrdgeL	Y
LongSS	3181	Deck	7	ScourCrit	5
Latitude	40.642003	SupStruct	5	FutADT	38069
Longitude	-74.142169	SubStruct	5	YearFutADT	2026
DetourLeng	25	ChannelPro	7	MinNavVert	
Toll	1	Culverts	N	FedAgeninc	NN
MainRespon	32	MethOpRate	5	WashHead	
Owner	32	OperRating	737	NoName	452
FunctClass	12	MethOpRa_1	0	Status	0
YearBuilt	1931	InventRat	293	NoName_1	0
LanesOn	4	TructEval	5		
LanesUnder	4	DeckGeo	2		
ADT	27192	UnclearVer	5		
YearADT	2006	BridgePost	5		
DesignLoad	0	WaterwayAd	5		
ApprWidth	121	ApprAlign	8		
Median	0	TypeWorkPr	34		
Skew	0	WorkBy	1		
StructFlar	1	LenImprov	20241		
BridgeRail	1	InspDate	1007		
Transition	0	InspFreq	24		
ApprGuardR	0	FractCrit	Y24		

BayonneBridge.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X
XXXXXXXX XXXX      X      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      XXXXX

```

PROJECT DATA

Project Title: Bayonne Bridge
Project File : BayonneBridge.prj
Run Date and Time: 1/12/2012 7:56:56 AM

Project in English units

PLAN DATA

Plan Title: Plan 01
Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\5523040 Bayonne over Kill
Van Kull\BayonneBridge.p01

Geometry Title: Bayonne Bridge
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\5523040
Bayonne over Kill Van Kull\BayonneBridge.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of:	Cross Sections =	5	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary	
Conveyance Calculation Method:	At breaks in n values only
Friction Slope Method:	Average Conveyance
Computational Flow Regime:	Subcritical Flow

GEOMETRY DATA

BayonneBridge.rep

Geometry Title: Bayonne Bridge
 Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\5523040 Bayonne over
 Kill Van Kull\BayonneBridge.g01

CROSS SECTION

RIVER: Kill Van Kull
 REACH: Strait Station 1 RS: 6494.5

INPUT

Description:

Station Elevation Data		num=		51							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	50	4	100	1	150	0	200	1		
250	3	300	4	350	5	400	1.7	450	-1.45		
499	-4.537	500	-4.6	550	-8	600	-11	650	-14		
700	-17	750	-20	800	-23.5	850	-26.7	900	-29		
950	-33	1037	-37.8	1137	-49.5	1237	-52.5	1337	-53.8		
1437	-54.2	1537	-54.9	1637	-55.3	1737	-54.9	1837	-55.4		
1937	-56.1	2037	-55	2137	-55.3	2237	-54.8	2337	-55		
2437	-52.4	2537	-48.4	2637	-40	2737	-32	2837	-24		
2933	-16.32	2937	-16	3037	1	3137	1.5	3237	2		
3337	2.5	3437	2.5	3545	3	3721	10	3960	15		
4153	20										

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.06	499	.025	2933	.06

Bank	Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
		499	2933		1524.7	1584	1734.1	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	12.98	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-val.	0.060	0.025
0.060				
W.S. Elev (ft)	12.98	Reach Len. (ft)	1524.70	1584.00
1734.10				
Crit w.s. (ft)		Flow Area (sq ft)	5499.95	136053.00
9039.12				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	5499.95	136053.00
9039.12				
Q Total (cfs)	29888.40	Flow (cfs)	166.84	29467.58
253.98				
Top width (ft)	3863.44	Top width (ft)	499.00	2434.00
930.44				
Vel Total (ft/s)	0.20	Avg. Vel. (ft/s)	0.03	0.22
0.03				
Max Chl Dpth (ft)	69.08	Hydr. Depth (ft)	11.02	55.90
9.71				
Conv. Total (cfs)	119802300.0	Conv. (cfs)	668757.9	
118115500.0	1018020.0			
Length wtd. (ft)	1584.51	wetted Per. (ft)	505.54	2437.21
932.07				
Min Ch El (ft)	-56.10	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.17	Stream Power (lb/ft s)	4153.00	0.00
0.00				

Frctn Loss (ft)	0.00	BayonneBridge.rep	Cum Volume (acre-ft)	575.68	13922.27
473.08					
C & E Loss (ft)			Cum SA (acres)	131.43	259.42
85.09					

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Kill Van Kull
 REACH: Strait Station 1 RS: 4910.5

INPUT

Description:

Station Elevation Data		num=	31
Sta	Elev	Sta	Elev
0	15	1820	11.5
2220	0	2273	-2.915
2620	-24	2720	-27.8
3153	-58.4	3253	-58.8
3653	-59.9	3734	-34.3
4075	-5.21	4134	6
5050	20		

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
0	.06	2220	.025
		4134	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	2220	4134		87	87		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	12.98	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	Wt. n-Val.	0.060	0.025
0.060				
W.S. Elev (ft)	12.98	Reach Len. (ft)	1.00	1.00
1.00				
Crit W.S. (ft)	-55.53	Flow Area (sq ft)	3382.85	95684.34
1254.87				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	3382.85	95684.34
1254.87				
Q Total (cfs)	26306.00	Flow (cfs)	58.04	26223.66
24.29				
Top width (ft)	3443.52	Top width (ft)	1167.97	1914.00
361.54				
Vel Total (ft/s)	0.26	Avg. Vel. (ft/s)	0.02	0.27
0.02				
Max Chl Dpth (ft)	72.98	Hydr. Depth (ft)	2.90	49.99
3.47				
Conv. Total (cfs)	77137210.0	Conv. (cfs)	170202.9	
76895780.0				
Length wtd. (ft)	1.00	Wetted Per. (ft)	1168.21	1924.56
361.61				

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Min Ch El (ft)	-60.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.09	Stream Power (lb/ft s)	5050.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	420.22	9708.86
268.18				
C & E Loss (ft)	0.00	Cum SA (acres)	102.26	180.37
59.37				

BRIDGE

RIVER: Kill Van Kull
 REACH: Strait Station 1 RS: 4868

INPUT

Description:

Distance from Upstream XS = 1

Deck/Roadway width = 85

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num=	17													
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
800		60		50	1820		128		118	1971		131		121
2047		134		124	2207		137		127.4	2433		146.6		136.6
2709		156.8		146.8	3061		163		153	3161		160		150
3412.2		158		148	3613.1		155		145	3688.4		150		140
3914.4		145		135	4076.4		142		132	4126.4		140		130
4228		138		128	6000		30		20					

Upstream Bridge Cross Section Data

Station	Elevation	Data	num=	31							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	15	1820	11.5	1920	7	2020	6	2120	5		
2220	0	2273	-2.915	2320	-5.5	2420	-11	2520	-16.5		
2620	-24	2720	-27.8	2853	-57.1	2952	-59.3	3053	-58.4		
3153	-58.4	3253	-58.8	3353	-58.2	3453	-58.3	3553	-60		
3653	-59.9	3734	-34.3	3834	-25.7	3934	-20.2	4034	-13		
4075	-5.21	4134	6	4184	7	4601	15	4929	20		
5050	20										

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	2220	.025	4134	.06

Bank Sta:	Left	Right	Coeff Contr.	Expan.
	2220	4134	.1	.3

Downstream Deck/Roadway Coordinates

num=	17													
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
400		60		50	1560		128		118	1711		131		121
1787		134		124	1947		137.4		127.4	2173		146.6		136.6
2449		156.8		146.8	2801		163		153	2901		160		150
3152.2		158		148	3353.1		155		145	3428.4		150		140
3654.4		145		135	3816.4		142		132	3866.4		140		130
3968		138		128	6000		30		20					

Downstream Bridge Cross Section Data

Station	Elevation	Data	num=	32							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

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0	20	433	10	1460	10	1560	7	1660	6.3
1760	5.5	1801	2.589	1860	-1.6	1960	-9.3	2060	-17
2160	-23	2260	-29.8	2351	-58.3	2450	-57.9	2551	-58
2650	-58.1	2751	-58.8	2852	-58.9	2951	-58.3	3050	-58.9
3151	-58.5	3274	-31.5	3374	-23	3474	-18	3574	-11
3604	-6.5	3674	4	3775	7	3877	10	4214	15
4428	20	5050	20						

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.06	1801	.025
		3674	.06

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	1801	3674	.1	.3	

Upstream Embankment side slope	=	0 horiz. to 1.0 vertical
Downstream Embankment side slope	=	0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow	=	.95
Elevation at which weir flow begins	=	
Energy head used in spillway design	=	
Spillway height used in design	=	
Weir crest shape	=	Broad Crested

Number of Piers = 23

Pier Data

Pier Station	Upstream=	866	Downstream=	446
Upstream	num= 2			
width	Elev	width	Elev	
15	-70	15	163	
Downstream	num= 2			
width	Elev	width	Elev	
15	-70	15	163	

Pier Data

Pier Station	Upstream=	934	Downstream=	534
Upstream	num= 2			
width	Elev	width	Elev	
15	-70	15	163	
Downstream	num= 2			
width	Elev	width	Elev	
15	-70	15	163	

Pier Data

Pier Station	Upstream=	1056	Downstream=	656
Upstream	num= 2			
width	Elev	width	Elev	
15	-70	15	163	
Downstream	num= 2			
width	Elev	width	Elev	
15	-70	15	163	

Pier Data

Pier Station	Upstream=	1056	Downstream=	656
Upstream	num= 2			
width	Elev	width	Elev	
15	-70	15	163	
Downstream	num= 2			
width	Elev	width	Elev	
15	-70	15	163	

Pier Data

Pier Station	Upstream=	1178	Downstream=	778

BayonneBridge.rep

Upstream num= 2
width Elev width Elev
15 -70 15 163

Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 1300 Downstream= 900
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 1422 Downstream= 1022
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 1544 Downstream= 1144
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 1667 Downstream= 1267
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 1797 Downstream= 1397
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 1980 Downstream= 1580
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 2110 Downstream= 1710
Page 6

BayonneBridge.rep

Upstream num= 2
width Elev width Elev
15 -70 15 163

Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 2230 Downstream= 1830
Upstream num= 2
width Elev width Elev
60 -70 60 163
Downstream num= 2
width Elev width Elev
60 -70 60 163

Pier Data
Pier Station Upstream= 3997 Downstream= 3597
Upstream num= 2
width Elev width Elev
60 -70 60 163
Downstream num= 2
width Elev width Elev
60 -70 60 163

Pier Data
Pier Station Upstream= 4123 Downstream= 3723
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 4249 Downstream= 3849
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 4375 Downstream= 3975
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 4501 Downstream= 4101
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 4627 Downstream= 4227
Page 7

BayonneBridge.rep

Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 4627 Downstream= 4227
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 4753 Downstream= 4353
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 4879 Downstream= 4479
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 5005 Downstream= 4605
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add weight component to Momentum

Class B flow critical depth computations use critical depth

inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #Max WS

E.G. US. (ft)

12.98

Element
Page 8

Inside BR US

BayonneBridge.rep

```

Inside BR DS
W.S. US. (ft)          12.99    E.G. Elev (ft)          12.99
12.99
Q Total (cfs)          26306.00  W.S. Elev (ft)          12.99
12.99
Q Bridge (cfs)         26306.00  Crit W.S. (ft)          -55.53
-55.20
Q Weir (cfs)           Max Chl Dpth (ft)          72.99
71.89
Weir Sta Lft (ft)      Vel Total (ft/s)          0.27
0.27
Weir Sta Rgt (ft)      Flow Area (sq ft)        97284.54
97800.02
Weir Submerg          Froude # Chl          0.01
0.01
Weir Max Depth (ft)    Specif Force (cu ft)     2816916.00
2776406.00
Min El Weir Flow (ft)  13.47    Hydr Depth (ft)         30.92
28.39
Min El Prs (ft)        153.00   W.P. Total (ft)         3312.15
3627.85
Delta EG (ft)          0.00     Conv. Total (cfs)       74631080.0
74738150.0
Delta WS (ft)          0.00     Top width (ft)          3145.95
3444.49
BR Open Area (sq ft)   506186.30 Frctn Loss (ft)          0.00
0.00
BR Open vel (ft/s)     0.27     C & E Loss (ft)          0.00
0.00
Coef of Q              Shear Total (lb/sq ft)   0.00
0.00
Br Sel Method          Energy only Power Total (lb/ft s)   0.00
0.00

```

CROSS SECTION

RIVER: Kill Van Kull
 REACH: Strait Station 1 RS: 4825.5

INPUT

Description:

```

Station Elevation Data    num=    32
Sta    Elev    Sta    Elev    Sta    Elev    Sta    Elev    Sta    Elev
0      20      433    10      1460    10      1560    7      1660    6.3
1760    5.5    1801    2.589    1860    -1.6    1960    -9.3    2060    -17
2160    -23    2260    -29.8    2351    -58.3    2450    -57.9    2551    -58
2650    -58.1    2751    -58.8    2852    -58.9    2951    -58.3    3050    -58.9
3151    -58.5    3274    -31.5    3374    -23     3474    -18     3574    -11
3604    -6.5    3674    4        3775    7        3877    10     4214    15
4428    20     5050    20

```

```

Manning's n Values        num=    3
Sta    n Val    Sta    n Val    Sta    n Val
0      .06      1801    .025    3674    .06

```

```

Bank Sta: Left    Right    Lengths: Left Channel    Right    Coeff Contr.    Expan.
          1801    3674          2361.5    2479    2618.8          .1          .3

```

CROSS SECTION OUTPUT Profile #Max WS

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E.G. Elev (ft)	12.99	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	Wt. n-Val.	0.060	0.025
0.060				
W.S. Elev (ft)	12.99	Reach Len. (ft)	2361.50	2479.00
2618.80				
Crit W.S. (ft)		Flow Area (sq ft)	5416.25	93641.74
1513.92				
E.G. slope (ft/ft)	0.000000	Area (sq ft)	5416.25	93641.74
1513.92				
Q Total (cfs)	26306.00	Flow (cfs)	109.88	26164.69
31.43				
Top width (ft)	3774.49	Top width (ft)	1497.27	1873.00
404.22				
Vel Total (ft/s)	0.26	Avg. Vel. (ft/s)	0.02	0.28
0.02				
Max Chl Dpth (ft)	71.89	Hydr. Depth (ft)	3.62	50.00
3.75				
Conv. Total (cfs)	75665520.0	Conv. (cfs)	316061.8	
75259050.0 90404.2				
Length Wtd. (ft)	2478.70	Wetted Per. (ft)	1497.46	1883.30
404.33				
Min Ch El (ft)	-58.90	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.14	Stream Power (lb/ft s)	5050.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	412.56	9524.11
265.71				
C & E Loss (ft)		Cum SA (acres)	99.91	176.82
58.68				

CROSS SECTION

RIVER: Kill Van Kull
 REACH: Strait Station 1 RS: 2346

INPUT

Description:

Station Elevation Data			num=	28						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	20	331	15	585	10	1167	8	1217	4	
1254	2.89	1317	1	1367	-10	1417	-22.3	1478	-58.3	
1578	-58.4	1679	-57.9	1786	-57.2	1874	-58.6	1975	-58.8	
2083	-59.6	2182	-58.9	2270	-57.6	2371	-45.7	2421	-35	
2471	-25	2521	-12	2536	-8.1	2571	1	2621	4	
2671	5	2679	10	2922	15					

Manning's n values			num=	3		
Sta	n Val	Sta	n Val	Sta	n Val	
0	.06	1317	.025	2571	.06	

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1317	2571	2449.6	2346	2302.7	.1	.3	

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	12.98	Element	Left OB	Channel
Right OB				

BayonneBridge.rep				
Vel Head (ft)	0.00	wt. n-Val.	0.060	0.025
0.060				
W.S. Elev (ft)	12.98	Reach Len. (ft)	2449.60	2346.00
2302.70				
Crit W.S. (ft)		Flow Area (sq ft)	3939.28	75977.64
1207.74				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	3939.28	75977.64
1207.74				
Q Total (cfs)	21592.20	Flow (cfs)	82.30	21483.59
26.31				
Top width (ft)	2390.25	Top width (ft)	883.40	1254.00
252.85				
Vel Total (ft/s)	0.27	Avg. Vel. (ft/s)	0.02	0.28
0.02				
Max Chl Dpth (ft)	72.58	Hydr. Depth (ft)	4.46	60.59
4.78				
Conv. Total (cfs)	69327560.0	Conv. (cfs)	264254.1	
68978820.0				
Length Wtd. (ft)	2346.16	Wetted Per. (ft)	883.64	1272.69
254.41				
Min Ch El (ft)	-59.60	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.12	Stream Power (lb/ft s)	2922.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	158.97	4697.59
183.90				
C & E Loss (ft)		Cum SA (acres)	35.38	87.84
38.93				

CROSS SECTION

RIVER: Kill Van Kull
 REACH: Strait Station 1 RS: 0

INPUT

Description:

Station Elevation Data		num= 40									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	20	326	15	631	10	824	1	874	1		
885	1	924	1	974	0	1024	-3	1074	-6		
1124	-9	1174	-12	1224	-15	1274	-18	1324	-21		
1374	-24	1424	-27	1474	-30.5	1575	-45.7	1677	-57.4		
1784	-57.2	1885	-57.7	1985	-57.3	2085	-57.8	2184	-57.8		
2283	-57.7	2384	-57	2483	-57.4	2582	-39.1	2632	-32		
2682	-24	2732	-15	2782	-6	2832	1	2882	2		
2898	2.48	2982	5	3642	10	4330	15	7972	20		

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.06	824	.025	2832	.06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	824	2832		0	0	0		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	12.98	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-Val.	0.060	0.025

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0.060				
W.S. Elev (ft)	12.98	Reach Len. (ft)		
Crit W.S. (ft)	-55.09	Flow Area (sq ft)	1714.49	98469.94
5749.77				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	1714.49	98469.94
5749.77				
Q Total (cfs)	17215.65	Flow (cfs)	25.58	17102.56
87.52				
Top Width (ft)	3602.83	Top Width (ft)	374.78	2008.00
1220.05				
Vel Total (ft/s)	0.16	Avg. Vel. (ft/s)	0.01	0.17
0.02				
Max Chl Dpth (ft)	70.78	Hydr. Depth (ft)	4.57	49.04
4.71				
Conv. Total (cfs)	78730840.0	Conv. (cfs)	116960.1	
78213640.0 400242.8				
Length wtd. (ft)		Wetted Per. (ft)	375.01	2015.66
1220.13				
Min Ch El (ft)	-57.80	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.13	Stream Power (lb/ft s)	7972.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River:Kill Van Kull

Reach	River Sta.	n1	n2	n3
Strait Station 1	6494.5	.06	.025	.06
Strait Station 1	4910.5	.06	.025	.06
Strait Station 1	4868	Bridge		
Strait Station 1	4825.5	.06	.025	.06
Strait Station 1	2346	.06	.025	.06
Strait Station 1	0	.06	.025	.06

SUMMARY OF REACH LENGTHS

River: Kill Van Kull

Reach	River Sta.	Left	Channel	Right
Strait Station 1	6494.5	1524.7	1584	1734.1
Strait Station 1	4910.5	87	87	87
Strait Station 1	4868	Bridge		
Strait Station 1	4825.5	2361.5	2479	2618.8
Strait Station 1	2346	2449.6	2346	2302.7
Strait Station 1	0	0	0	0

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SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Kill Van Kull

Reach	River Sta.	Contr.	Expan.
Strait Station 1	6494.5	.1	.3
Strait Station 1	4910.5	.1	.3
Strait Station 1	4868	Bridge	
Strait Station 1	4825.5	.1	.3
Strait Station 1	2346	.1	.3
Strait Station 1	0	.1	.3

Profile Output Table - Six XS Bridge

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Crit W.S.
Frctn Loss	C & E Loss	Top Width	Q Left	Q Right	Vel Chnl
(ft)	(ft)	(ft)	(cfs)	(cfs)	(ft/s)
Strait Station 1	6494.5	Max WS	12.98	12.98	
0.00	3863.44	166.84	29467.58	253.98	0.22
Strait Station 1	4910.5	Max WS	12.98	12.98	-55.53
0.00	0.00	3443.52	58.04	26223.66	24.29
Strait Station 1	4868	BR U	Max WS	12.99	12.99
0.00	0.00	3145.95	73.80	26205.79	26.41
Strait Station 1	4868	BR D	Max WS	12.99	12.99
0.00	0.00	3444.49	102.88	26170.91	32.22
Strait Station 1	4825.5	Max WS	12.99	12.99	0.29
0.00	3774.49	109.88	26164.69	31.43	0.28
Strait Station 1	2346	Max WS	12.98	12.98	
0.00	2390.25	82.30	21483.59	26.31	0.28

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HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X
XXXXXXXX XXXX      X      XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      XXXXX

```

PROJECT DATA

Project Title: Bayonne Bridge
Project File : BayonneBridge.prj
Run Date and Time: 1/19/2012 5:22:02 PM

Project in English units

PLAN DATA

Plan Title: Plan 01
Plan File : g:\G. Shields\School\PhD\Dissertation\Modeling\5523040 Bayonne over Kill
Van Kull\BayonneBridge.p01

Geometry Title: Bayonne Bridge
Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\5523040
Bayonne over Kill Van Kull\BayonneBridge.g01

Flow Title :
Flow File :

Plan Summary Information:

Number of:	Cross Sections =	5	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary	
Conveyance Calculation Method:	At breaks in n values only
Friction Slope Method:	Average Conveyance
Computational Flow Regime:	Subcritical Flow

GEOMETRY DATA

BayonneBridge.rep

Geometry Title: Bayonne Bridge
 Geometry File : g:\G. Shields\School\PhD\Dissertation\Modeling\5523040 Bayonne over Kill Van Kull\BayonneBridge.g01

CROSS SECTION

RIVER: Kill Van Kull
 REACH: Strait Station 1 RS: 6494.5

INPUT

Description:

Station Elevation Data		num= 51							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	50	4	100	1	150	0	200	1
250	3	300	4	350	5	400	1.7	450	-1.45
499	-4.537	500	-4.6	550	-8	600	-11	650	-14
700	-17	750	-20	800	-23.5	850	-26.7	900	-29
950	-33	1037	-37.8	1137	-49.5	1237	-52.5	1337	-53.8
1437	-54.2	1537	-54.9	1637	-55.3	1737	-54.9	1837	-55.4
1937	-56.1	2037	-55	2137	-55.3	2237	-54.8	2337	-55
2437	-52.4	2537	-48.4	2637	-40	2737	-32	2837	-24
2933	-16.32	2937	-16	3037	1	3137	1.5	3237	2
3337	2.5	3437	2.5	3545	3	3721	10	3960	15
4153	20								

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.06	499	.025	2933	.06

Bank Sta:	Left	Right	Lengths:		Left Channel	Right	Coeff Contr.	Expan.
	499	2933			1524.7	1584	1734.1	.1 .3

CROSS SECTION OUTPUT Profile #23DEC2011 0800

E.G. Elev (ft)	17.39	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	wt. n-val.	0.060	0.025
0.060				
W.S. Elev (ft)	17.39	Reach Len. (ft)	1524.70	1584.00
1734.10				
Crit w.s. (ft)		Flow Area (sq ft)	7700.54	146787.00
13580.91				
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	7700.54	146787.00
13580.91				
Q Total (cfs)	-79955.70	Flow (cfs)	-680.01	-78240.16
-1035.53				
Top width (ft)	4052.25	Top width (ft)	499.00	2434.00
1119.25				
Vel Total (ft/s)	-0.48	Avg. Vel. (ft/s)	-0.09	-0.53
-0.08				
Max Chl Dpth (ft)	73.49	Hydr. Depth (ft)	15.43	60.31
12.13				
Conv. Total (cfs)	136991000.0	Conv. (cfs)	1165087.0	
134051700.0	1774218.0			
Length wtd. (ft)	1584.60	wetted Per. (ft)	509.95	2437.21
1120.93				
Min Ch El (ft)	-56.10	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.23	Stream Power (lb/ft s)	4153.00	0.00
0.00				

Frctn Loss (ft)	0.00	BayonneBridge.rep	Cum Volume (acre-ft)	1257.55	14867.54
978.63					
C & E Loss (ft)			Cum SA (acres)	174.93	255.92
159.45					

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Kill Van Kull
 REACH: Strait Station 1 RS: 4910.5

INPUT

Description:

Station Elevation Data		num=	31
Sta	Elev	Sta	Elev
0	15	1820	11.5
2220	0	2273	-2.915
2620	-24	2720	-27.8
3153	-58.4	3253	-58.8
3653	-59.9	3734	-34.3
4075	-5.21	4134	6
5050	20		

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
0	.06	2220	.025
		4134	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	2220	4134		87	87		.1	.3

CROSS SECTION OUTPUT Profile #23DEC2011 0800

E.G. Elev (ft)	17.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.060	0.025
0.060				
W.S. Elev (ft)	17.39	Reach Len. (ft)	1.00	1.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)	12105.39	104122.10
3393.56				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	12105.39	104122.10
3393.56				
Q Total (cfs)	-85698.30	Flow (cfs)	-886.49	-84563.42
-248.38				
Top width (ft)	4757.48	Top width (ft)	2220.00	1914.00
623.48				
Vel Total (ft/s)	-0.72	Avg. Vel. (ft/s)	-0.07	-0.81
-0.07				
Max Chl Dpth (ft)	77.39	Hydr. Depth (ft)	5.45	54.40
5.44				
Conv. Total (cfs)	89714400.0	Conv. (cfs)	928034.9	
88526340.0				
Length wtd. (ft)	1.00	Wetted Per. (ft)	2222.63	1924.56
623.58				

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Min Ch El (ft)	-60.00	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.27	Stream Power (lb/ft s)	5050.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	910.92	10305.55
640.75				
C & E Loss (ft)		Cum SA (acres)	127.35	176.86
124.76				

BRIDGE

RIVER: Kill Van Kull
 REACH: Strait Station 1 RS: 4868

INPUT

Description:

Distance from Upstream XS = 1
 Deck/Roadway width = 85
 Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num=	17													
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
800		60		50	1820		128		118	1971		131		121
2047		134		124	2207		137		127.4	2433		146.6		136.6
2709		156.8		146.8	3061		163		153	3161		160		150
3412.2		158		148	3613.1		155		145	3688.4		150		140
3914.4		145		135	4076.4		142		132	4126.4		140		130
4228		138		128	6000		30		20					

Upstream Bridge Cross Section Data

Station	Elevation	Data	num=	31						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	15	1820	11.5	1920	7	2020	6	2120	5	
2220	0	2273	-2.915	2320	-5.5	2420	-11	2520	-16.5	
2620	-24	2720	-27.8	2853	-57.1	2952	-59.3	3053	-58.4	
3153	-58.4	3253	-58.8	3353	-58.2	3453	-58.3	3553	-60	
3653	-59.9	3734	-34.3	3834	-25.7	3934	-20.2	4034	-13	
4075	-5.21	4134	6	4184	7	4601	15	4929	20	
5050	20									

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	2220	.025	4134	.06

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	2220	4134		.1	.3

Downstream Deck/Roadway Coordinates

num=	17													
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
400		60		50	1560		128		118	1711		131		121
1787		134		124	1947		137.4		127.4	2173		146.6		136.6
2449		156.8		146.8	2801		163		153	2901		160		150
3152.2		158		148	3353.1		155		145	3428.4		150		140
3654.4		145		135	3816.4		142		132	3866.4		140		130
3968		138		128	6000		30		20					

Downstream Bridge Cross Section Data

Station	Elevation	Data	num=	32					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

BayonneBridge.rep

0	20	433	10	1460	10	1560	7	1660	6.3
1760	5.5	1801	2.589	1860	-1.6	1960	-9.3	2060	-17
2160	-23	2260	-29.8	2351	-58.3	2450	-57.9	2551	-58
2650	-58.1	2751	-58.8	2852	-58.9	2951	-58.3	3050	-58.9
3151	-58.5	3274	-31.5	3374	-23	3474	-18	3574	-11
3604	-6.5	3674	4	3775	7	3877	10	4214	15
4428	20	5050	20						

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.06	1801	.025
		3674	.06

Bank Sta:	Left	Right	Coeff Contr.	Expan.
	1801	3674	.1	.3

Upstream Embankment side slope	=	0 horiz. to 1.0 vertical
Downstream Embankment side slope	=	0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow	=	.95
Elevation at which weir flow begins	=	
Energy head used in spillway design	=	
Spillway height used in design	=	
Weir crest shape	=	Broad Crested

Number of Piers = 23

Pier Data			
Pier Station	Upstream=	866	Downstream=
Upstream	num= 2		446
width	Elev	width	Elev
15	-70	15	163
Downstream	num= 2		
width	Elev	width	Elev
15	-70	15	163

Pier Data			
Pier Station	Upstream=	934	Downstream=
Upstream	num= 2		534
width	Elev	width	Elev
15	-70	15	163
Downstream	num= 2		
width	Elev	width	Elev
15	-70	15	163

Pier Data			
Pier Station	Upstream=	1056	Downstream=
Upstream	num= 2		656
width	Elev	width	Elev
15	-70	15	163
Downstream	num= 2		
width	Elev	width	Elev
15	-70	15	163

Pier Data			
Pier Station	Upstream=	1056	Downstream=
Upstream	num= 2		656
width	Elev	width	Elev
15	-70	15	163
Downstream	num= 2		
width	Elev	width	Elev
15	-70	15	163

Pier Data			
Pier Station	Upstream=	1178	Downstream=
			778

BayonneBridge.rep

Upstream num= 2
width Elev width Elev
15 -70 15 163

Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 1300 Downstream= 900
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 1422 Downstream= 1022
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 1544 Downstream= 1144
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 1667 Downstream= 1267
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 1797 Downstream= 1397
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 1980 Downstream= 1580
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 2110 Downstream= 1710
Page 6

BayonneBridge.rep

Upstream num= 2
width Elev width Elev
15 -70 15 163

Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 2230 Downstream= 1830
Upstream num= 2
width Elev width Elev
60 -70 60 163
Downstream num= 2
width Elev width Elev
60 -70 60 163

Pier Data
Pier Station Upstream= 3997 Downstream= 3597
Upstream num= 2
width Elev width Elev
60 -70 60 163
Downstream num= 2
width Elev width Elev
60 -70 60 163

Pier Data
Pier Station Upstream= 4123 Downstream= 3723
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 4249 Downstream= 3849
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 4375 Downstream= 3975
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 4501 Downstream= 4101
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 4627 Downstream= 4227
Page 7

BayonneBridge.rep

Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 4627 Downstream= 4227
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 4753 Downstream= 4353
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 4879 Downstream= 4479
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Pier Data
Pier Station Upstream= 5005 Downstream= 4605
Upstream num= 2
width Elev width Elev
15 -70 15 163
Downstream num= 2
width Elev width Elev
15 -70 15 163

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add weight component to Momentum

Class B flow critical depth computations use critical depth

inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #23DEC2011 0800

E.G. US. (ft)

17.40

Element
Page 8

Inside BR US

BayonneBridge.rep

Inside BR DS			
W.S. US. (ft)	17.39	E.G. Elev (ft)	17.40
17.40			
Q Total (cfs)	-85698.30	W.S. Elev (ft)	17.39
17.39			
Q Bridge (cfs)		Crit W.S. (ft)	
Q Weir (cfs)		Max Chl Dpth (ft)	77.39
76.29			
Weir Sta Lft (ft)		Vel Total (ft/s)	-0.76
-0.76			
Weir Sta Rgt (ft)		Flow Area (sq ft)	112491.40
112935.00			
Weir Submerg		Froude # Chl	0.02
0.02			
Weir Max Depth (ft)		Specif Force (cu ft)	3279896.00
3241953.00			
Min El Weir Flow (ft)	13.47	Hydr Depth (ft)	31.37
31.76			
Min El Prs (ft)	153.00	W.P. Total (ft)	3904.11
3890.77			
Delta EG (ft)		Conv. Total (cfs)	85495050.0
85918100.0			
Delta WS (ft)	-0.01	Top width (ft)	3585.50
3556.33			
BR Open Area (sq ft)		Frctn Loss (ft)	
BR Open Vel (ft/s)		C & E Loss (ft)	
Coef of Q		Shear Total (lb/sq ft)	0.00
0.00			
Br Sel Method	Energy/Weir	Power Total (lb/ft s)	0.00
0.00			

Note: The post processor is unable to handle negative flow through a bridge at this time. The water surfaces inside the

bridge are based on projecting the outside water surface.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

Note: Notes(60): This is an inside cross section of a perched bridge that has energy, low flow inside of the bridge and weir flow over the embankment. The reported hydraulics are based on the flow and area inside of the bridge.

CROSS SECTION

RIVER: Kill Van Kull
 REACH: Strait Station 1 RS: 4825.5

INPUT

Description:

Station	Elevation	Data	num=	32						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	20	433	10	1460	10	1560	7	1660	6.3	
1760	5.5	1801	2.589	1860	-1.6	1960	-9.3	2060	-17	
2160	-23	2260	-29.8	2351	-58.3	2450	-57.9	2551	-58	
2650	-58.1	2751	-58.8	2852	-58.9	2951	-58.3	3050	-58.9	
3151	-58.5	3274	-31.5	3374	-23	3474	-18	3574	-11	

BayonneBridge.rep

3604	-6.5	3674	4	3775	7	3877	10	4214	15
4428	20	5050	20						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	1801	.025	3674	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

1801	3674	2361.5	2479	2618.8	.1	.3

CROSS SECTION OUTPUT Profile #23DEC2011 0800

E.G. Elev (ft)	17.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	wt. n-val.	0.060	0.025
0.060				
W.S. Elev (ft)	17.39	Reach Len. (ft)	2361.50	2479.00
2618.80				
Crit w.s. (ft)		Flow Area (sq ft)	12432.60	101893.20
3878.43				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	12432.60	101893.20
3878.43				
Q Total (cfs)	-85698.50	Flow (cfs)	-1133.44	-84255.36
-309.70				
Top width (ft)	4203.36	Top width (ft)	1688.03	1873.00
642.33				
Vel Total (ft/s)	-0.73	Avg. vel. (ft/s)	-0.09	-0.83
-0.08				
Max Chl Dpth (ft)	76.29	Hydr. Depth (ft)	7.37	54.40
6.04				
Conv. Total (cfs)	88117150.0	Conv. (cfs)	1165431.0	
86633280.0 318440.6				
Length wtd. (ft)	2478.12	wetted Per. (ft)	1688.27	1883.30
642.49				
Min Ch El (ft)	-58.90	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.28	Stream Power (lb/ft s)	5050.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	910.69	10303.20
640.68				
C & E Loss (ft)		Cum SA (acres)	127.31	176.82
124.74				

CROSS SECTION

RIVER: Kill Van Kull
 REACH: Strait Station 1 RS: 2346

INPUT

Description:

Station Elevation Data		num=	28						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	20	331	15	585	10	1167	8	1217	4
1254	2.89	1317	1	1367	-10	1417	-22.3	1478	-58.3
1578	-58.4	1679	-57.9	1786	-57.2	1874	-58.6	1975	-58.8
2083	-59.6	2182	-58.9	2270	-57.6	2371	-45.7	2421	-35
2471	-25	2521	-12	2536	-8.1	2571	1	2621	4
2671	5	2679	10	2922	15				

BayonneBridge.rep
Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .06 1317 .025 2571 .06
Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
1317 2571 2449.6 2346 2302.7 .1 .3

CROSS SECTION OUTPUT Profile #23DEC2011 0800

E.G. Elev (ft)	17.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.060	0.025
0.060				
W.S. Elev (ft)	17.38	Reach Len. (ft)	2449.60	2346.00
2302.70				
Crit w.s. (ft)		Flow Area (sq ft)	8365.79	81499.78
2654.30				
E.G. slope (ft/ft)	0.000001	Area (sq ft)	8365.79	81499.78
2654.30				
Q Total (cfs)	-92910.50	Flow (cfs)	-923.00	-91690.25
-297.25				
Top width (ft)	2748.82	Top width (ft)	1143.82	1254.00
351.00				
Vel Total (ft/s)	-1.00	Avg. vel. (ft/s)	-0.11	-1.13
-0.11				
Max Chl Dpth (ft)	76.98	Hydr. Depth (ft)	7.31	64.99
7.56				
Conv. Total (cfs)	78567300.0	Conv. (cfs)	780512.9	
77535420.0 251362.0				
Length Wtd. (ft)	2346.39	wetted Per. (ft)	1144.10	1272.69
354.97				
Min Ch El (ft)	-59.60	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.24	Stream Power (lb/ft s)	2922.00	0.00
0.00				
Frctn Loss (ft)	0.00	Cum volume (acre-ft)	346.92	5084.75
444.31				
C & E Loss (ft)		Cum SA (acres)	50.55	87.84
94.89				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Kill Van Kull
REACH: Strait Station 1 RS: 0

INPUT

Description:

Station Elevation Data				num=	40				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	20	326	15	631	10	824	1	874	1
885	1	924	1	974	0	1024	-3	1074	-6
1124	-9	1174	-12	1224	-15	1274	-18	1324	-21
1374	-24	1424	-27	1474	-30.5	1575	-45.7	1677	-57.4
1784	-57.2	1885	-57.7	1985	-57.3	2085	-57.8	2184	-57.8
2283	-57.7	2384	-57	2483	-57.4	2582	-39.1	2632	-32
2682	-24	2732	-15	2782	-6	2832	1	2882	2

BayonneBridge.rep

2898	2.48	2982	5	3642	10	4330	15	7972	20

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	824	.025	2832	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

824	2832	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #23DEC2011 0800

E.G. Elev (ft)	17.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.060	0.025
0.060				
W.S. Elev (ft)	17.39	Reach Len. (ft)		
Crit W.S. (ft)	-49.82	Flow Area (sq ft)	3972.43	107325.20
14155.56				
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	3972.43	107325.20
14155.56				
Q Total (cfs)	-100761.00	Flow (cfs)	-360.43	-99369.19
-1031.39				
Top Width (ft)	5900.70	Top width (ft)	653.83	2008.00
3238.88				
Vel Total (ft/s)	-0.80	Avg. Vel. (ft/s)	-0.09	-0.93
-0.07				
Max Chl Dpth (ft)	75.19	Hydr. Depth (ft)	6.08	53.45
4.37				
Conv. Total (cfs)	91548970.0	Conv. (cfs)	327474.2	
90284400.0 937097.4				
Length Wtd. (ft)		Wetted Per. (ft)	654.10	2015.66
3238.97				
Min Ch El (ft)	-57.80	Shear (lb/sq ft)	0.00	0.00
0.00				
Alpha	1.31	Stream Power (lb/ft s)	7972.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River:Kill Van Kull

Reach	River Sta.	n1	n2	n3
Strait Station 1	6494.5	.06	.025	.06
Strait Station 1	4910.5	.06	.025	.06
Strait Station 1	4868	Bridge		
Strait Station 1	4825.5	.06	.025	.06
Strait Station 1	2346	.06	.025	.06
Strait Station 1	0	.06	.025	.06

SUMMARY OF REACH LENGTHS

River: Kill Van Kull

Reach	River Sta.	Left	Channel	Right
Strait Station 1	6494.5	1524.7	1584	1734.1
Strait Station 1	4910.5	87	87	87
Strait Station 1	4868	Bridge		
Strait Station 1	4825.5	2361.5	2479	2618.8
Strait Station 1	2346	2449.6	2346	2302.7
Strait Station 1	0	0	0	0

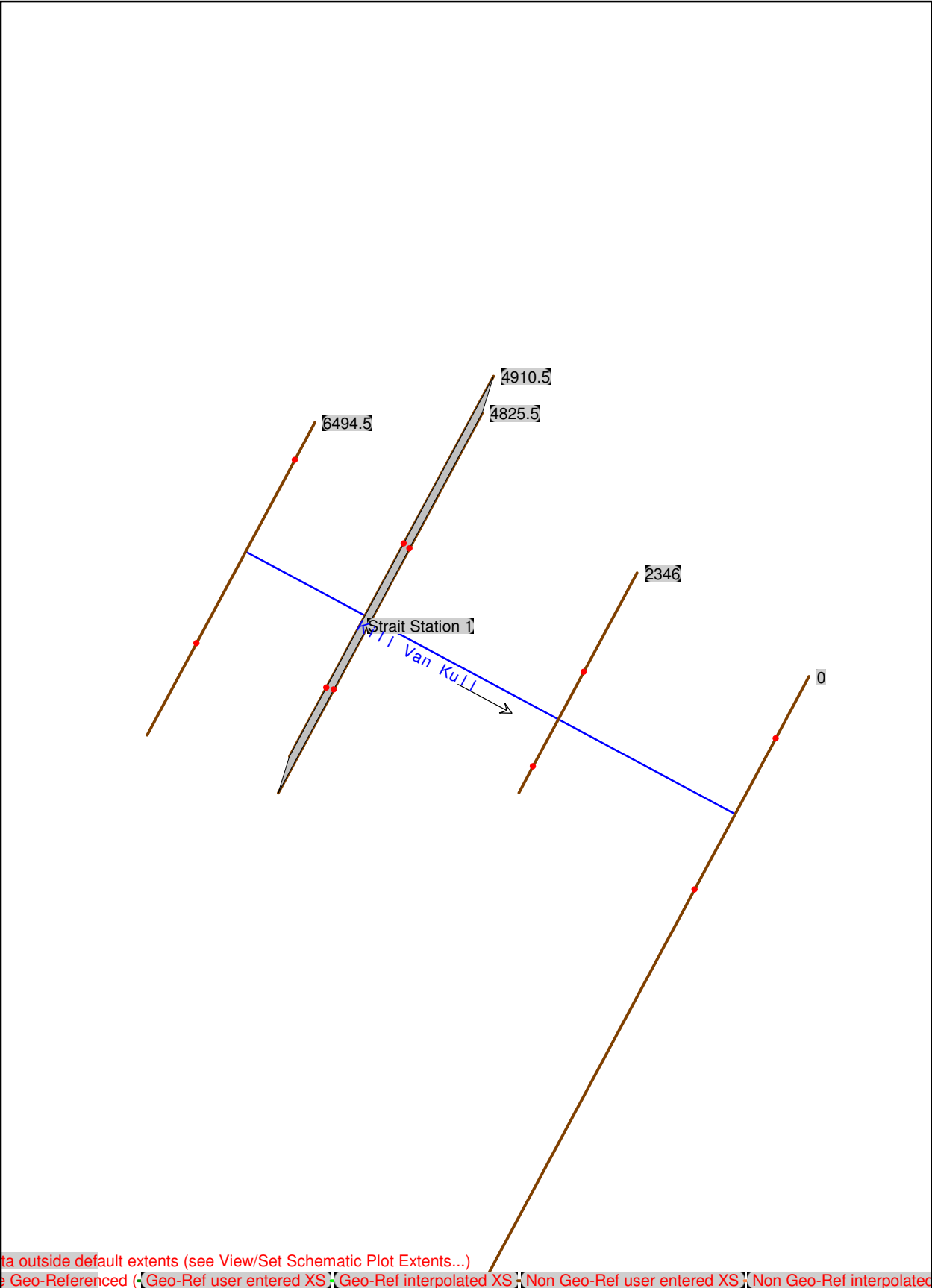
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Kill Van Kull

Reach	River Sta.	Contr.	Expan.
Strait Station 1	6494.5	.1	.3
Strait Station 1	4910.5	.1	.3
Strait Station 1	4868	Bridge	
Strait Station 1	4825.5	.1	.3
Strait Station 1	2346	.1	.3
Strait Station 1	0	.1	.3

Profile Output Table - Six XS Bridge

Reach	W.S. Frctn Loss	River Sta C & E Loss	Profile Top Width	E.G. Elev Q Left	E.G. Elev Q Channel	W.S. Elev Q Right	Crit Vel
(ft)	(ft)	(ft)	(ft)	(cfs)	(ft) (cfs)	(ft) (cfs)	
(ft/s)							
Strait Station 1 0.00		6494.5	23DEC2011 0800 4052.25 -680.01	17.39 -78240.16	17.39 -1035.53		-0.53
Strait Station 1		4910.5	23DEC2011 0800 4757.48 -886.49	17.40 -84563.42	17.39 -248.38		-0.81
Strait Station 1		4868 BR U	23DEC2011 0800 3585.50 -724.89	17.40 -84705.50	17.39 -267.91		-0.84
Strait Station 1		4868 BR D	23DEC2011 0800 3556.33 -937.77	17.40 -84464.30	17.39 -296.22		-0.85
Strait Station 1 0.00		4825.5	23DEC2011 0800 4203.36 -1133.44	17.40 -84255.36	17.39 -309.70		-0.83
Strait Station 1 0.00		2346	23DEC2011 0800 2748.82 -923.00	17.40 -91690.25	17.38 -297.25		-1.13



Some schematic data outside default extents (see View/Set Schematic Plot Extents...)
None of the XS's are Geo-Referenced [Geo-Ref user entered XS] [Geo-Ref interpolated XS] [Non Geo-Ref user entered XS] [Non Geo-Ref interpolated XS]

TOTAL SCOUR COMPUTATIONS - FLOOD TIDE
Bayonne Bridge over Kill Van Kull

100-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation ¹ (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation ² (ft)	Remaining Pile Embedment (ft)
South Abutment	6	0	2	2	4	-45	49
North Abutment	0	0	4	4	-4	-45	41

500-YEAR STORM SCOUR SUMMARY

Substructure Unit	Groundline Elevation (ft)	Contraction Scour (ft)	Local Scour (ft)	Total Scour (ft)	Scour Elevation (ft)	Pile Tip Elevation ² (ft)	Remaining Pile Embedment (ft)
South Abutment	6	0	6	6	0	-45	45
North Abutment	0	0	14	14	-14	-45	31

1. All elevations are with reference to NAVD 88.
2. Estimate of pile tip elevation is unavailable.

SCOUR MODE COMPUTATIONS - FLOOD TIDE
Bayonne Bridge over Kill Van Kull

The following computations are made using Laursen's Equation (Equation 5.1 in HEC-18):

$$V_c = K_u \times Y_1^{1/6} \times D_{50}^{1/3}$$

100-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	90,356
APPROACH SECTION MAIN CHANNEL WIDTH (ft)	W ₁ =	1,914
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	47.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ₅₀ ^{1/3}	V _c =	3.99
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	40,000
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	0.40
MAIN CHANNEL SCOUR MODE		CLEAR WATER

500-YEAR DISCHARGE
MAIN CHANNEL SCOUR MODE

Ku = 11.17 (English Units)	Ku=	11.17
APPROACH SECTION MAIN CHANNEL AREA (sq ft)	A ₁ =	104,122
APPROACH SECTION MAIN CHANNEL WIDTH (ft)	W ₁ =	1,914
APPROACH SECTION AVERAGE CHANNEL DEPTH (ft), y ₁ =A ₁ /W ₁	y ₁ =	54.0
MEDIAN GRAIN SIZE (ft)	D ₅₀ =	0.00667
BED TRANSPORT CRITICAL VELOCITY (ft/s), V _c = K _u Y ₁ ^{1/6} D ₅₀ ^{1/3}	V _c =	4.09
DISCHARGE IN APPROACH MAIN CHANNEL (cfs)	Q ₁ =	84,563
MEAN VELOCITY IN APPROACH CHANNEL (ft/s) V ₁ = Q ₁ /A ₁	V ₁ =	1.00
MAIN CHANNEL SCOUR MODE		CLEAR WATER

CONTRACTION SCOUR COMPUTATIONS
Bayonne Bridge over Kill Van Kull
CLEAR WATER CONTRACTION SCOUR COMPUTATIONS

The following computations are made using the HEC-18 equation for Live Bed Contraction Scour:
(Equations 5.4 and 5.5)

$$Y_s = Y_2 - Y_0$$

$$Y_2 = [K_u Q^2 / D_m^{2/3} W^2]^{3/7}$$

100-YEAR FLOOD

K ₁ =0.0077 (English Units)	K _u =	0.0077
DISCHARGE THROUGH BRIDGE OR ON THE SET BACK OVBANK (cfs)	Q=	40,000.0
DIAM. OF THE SMALLEST NONTRANSPORTABLE PARTICLE (1.25D ₅₀)	D _m =	0.0083
BOTTOM WIDTH OF CONTRACTED SECTION LESS PIER WIDTHS (ft)	W=	1,914.0
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	Y ₂ =	6.60
AVERAGE WATER DEPTH AT BRIDGE (ft)	Y ₀ =	49.0
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	Y _s =	-42.4

500-YEAR FLOOD

K ₁ =0.0077 (English Units)	K _u =	0.0077
DISCHARGE THROUGH BRIDGE OR ON THE SET BACK OVBANK (cfs)	Q=	101,198.0
DIAM. OF THE SMALLEST NONTRANSPORTABLE PARTICLE (1.25D ₅₀)	D _m =	0.0
BOTTOM WIDTH OF CONTRACTED SECTION LESS PIER WIDTHS (ft)	W=	1,914.0
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	Y ₂ =	14.63
AVERAGE WATER DEPTH AT BRIDGE (ft)	Y ₀ =	56.0
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	Y _s =	-41.4

LOCAL ABUTMENT SCOUR COMPUTATIONS - West Abutment
Bayonne Bridge over Kill Van Kull

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	321
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	1,396
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	54.0
V _e = Q _e /A _e , (ft/s)	V _e =	0.039
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	421
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	3.3
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000181
SCOUR DEPTH, Y _s (ft)	Y _s =	3.6

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	100
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	12,105
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	886
V _e = Q _e /A _e , (ft/s)	V _e =	0.073
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	887
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	13.6
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000083
SCOUR DEPTH, Y _s (ft)	Y _s =	13.9

LOCAL ABUTMENT SCOUR COMPUTATIONS - East Abutment
Bayonne Bridge over Kill Van Kull

The following computations are made using the HEC-18 equation for Froehlich's Abutment Equation (Eqn. 7.1):

$$y_s = (2.27(K_1 K_2 (L'/y_a)^{0.43} Fr^{0.61} + 1) \times y_a$$

100-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	201
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	423
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	11.0
V _e = Q _e /A _e , (ft/s)	V _e =	0.026
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	201
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	2.1
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000192
SCOUR DEPTH, Y _s (ft)	Y _s =	2.3

500-YEAR FLOOD

COEFFICIENT FOR ABUTMENT SHAPE	K ₁ =	1.1
ANGLE OF ATTACK (radians)	q(rads)=	90
COEFFICIENT FOR ANGLE OF EMBANKMENT TO FLOW,	K ₂ =	1.0
LENGTH OF ACTIVE FLOW OBSTRUCTED BY EMBANKMENT (ft)	L'=	100
FLOW AREA OF APPROACH OBSTRUCTED BY EMBANKMENT (ft ²)	A _e =	3,394
FLOW OBSTRUCTED BY ABUTMENT & APPROACH EMBANKMENT (cfs)	Q _e =	249
V _e = Q _e /A _e , (ft/s)	V _e =	0.073
LENGTH OF EMBANKMENT PROJECTED NORMAL TO THE FLOW (ft)	L=	623
AVERAGE DEPTH OF FLOW ON THE FLOODPLAIN, y _a = A _e /L (ft)	y _a =	5.4
FROUDE NUMBER OF APPROACH FLOW UPSTREAM OF ABUTMENT	Fr=	0.000209
SCOUR DEPTH, Y _s (ft)	Y _s =	5.7

LOCAL PIER SCOUR COMPUTATIONS - FLOOD TIDE
Bayonne Bridge over Kill Van Kull

The following computations are made using the HEC-18 CSU Equation (Eqn. 6.1):

$$y_s = (2.0K_1K_2K_3K_4(a/y_1)^{0.65}Fr^{0.43} \times y_1$$

100-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	#DIV/0!
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE (SEE EQNS. 6.5 - 6.8)	K ₄ =	1.00
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	0.0
LENGTH OF PIER	L=	0.0
L/a (Maximum L/a value is 12)	L/a=	#DIV/0!
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	0.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	0.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Ys=	#DIV/0!

500-YEAR FLOOD

Ku	Ku=	11.17
COEFFICIENT FOR PIER NOSE SHAPE	K ₁ =	1.10
COEFFICIENT FOR ANGLE OF ATTACK	K ₂ =	1.00
CORRECTION FACTOR FOR BED CONDITION	K ₃ =	1.10
CORRECTION FACTOR FOR ARMOURING BY BED MATERIAL SIZE (SEE EQNS. 6.5 - 6.8)	K ₄ =	1.00
ANGLE OF ATTACK (radians)	q(rads)=	0.000
PIER WIDTH	a=	0.0
LENGTH OF PIER	L=	0.0
L/a (Maximum L/a value is 12)	L/a=	#DIV/0!
MEAN VELOCITY OF FLOW DIRECTLY UPSTREAM OF PIER (ft/s)	V ₁ =	0.0
DEPTH OF FLOW DIRECTLY UPSTREAM OF RIVER (ft)	y ₁ =	0.0
GRAIN SIZE FOR WHICH 50% OF THE BED MATERIAL IS FINER (ft)	D ₅₀ =	0.00667
SCOUR DEPTH (ft)	Ys=	#DIV/0!

CONTRACTION SCOUR COMPUTATIONS - FLOOD TIDE
Bayonne Bridge over Kill Van Kull
LIVE BED CONTRACTION SCOUR COMPUTATIONS

The following computations are made using the HEC-18 equations for Live Bed Contraction Scour:
(Equations 5.2 and 5.3)

$$Y_s = Y_2 - Y_0$$

$$Y_2 = [(Q_2/Q_1)^{6/7} \times (W_1/W_2)^{k_1}] \times Y_1$$

500-YEAR FLOOD

ENERGY SLOPE	$S_1 =$	
FALL VELOCITY (Use Figure 5.8 in HEC-18, <i>For English: multiply by 3.28</i>)	$w =$	0.656
AVERAGE UPSTREAM CHANNEL DEPTH (ft), $Y_1 = A_1/W_1$	$y_1 =$	54.00
SHEAR VELOCITY IN UPSTREAM SECTION, $V^* = gy_1 S_1^{1/2}$	$V_* =$	0
V^*/w	$V^*/w =$	0.00
k_1	$k_1 =$	0.59
DISCHARGE IN UPSTREAM CHANNEL (cfs)	$Q_1 =$	84,563.0
DISCHARGE IN CONTRACTED SECTION (cfs)	$Q_2 =$	
WIDTH OF UPSTREAM CHANNEL SECTION (ft)	$W_1 =$	1,914.0
WIDTH OF MAIN CHANNEL CONTRACTED SECTION (ft)	$W_2 =$	
MEDIAN GRAIN SIZE (ft)	$D_{50} =$	0.00667
COMPUTED WATER DEPTH OF CONTRACTED SECTION (ft)	$Y_2 =$	#DIV/0!
AVERAGE WATER DEPTH AT BRIDGE (ft)	$Y_0 =$	
AVERAGE SCOUR DEPTH AT CONTRACTED SECTION	$Y_s =$	#DIV/0!

Stage Hydrograph for 500 and 100 Year storms

Initial Flow at Downstream (cfs) = (Area x velocity) =

50000

SLR = 4.592 ft

Assumed for dredged condition with $v < 1$ fps average

Velocity (knots) = 3.7 ft/s

5523040 - Bayonne Bridge

500 - year storm

100-year storm

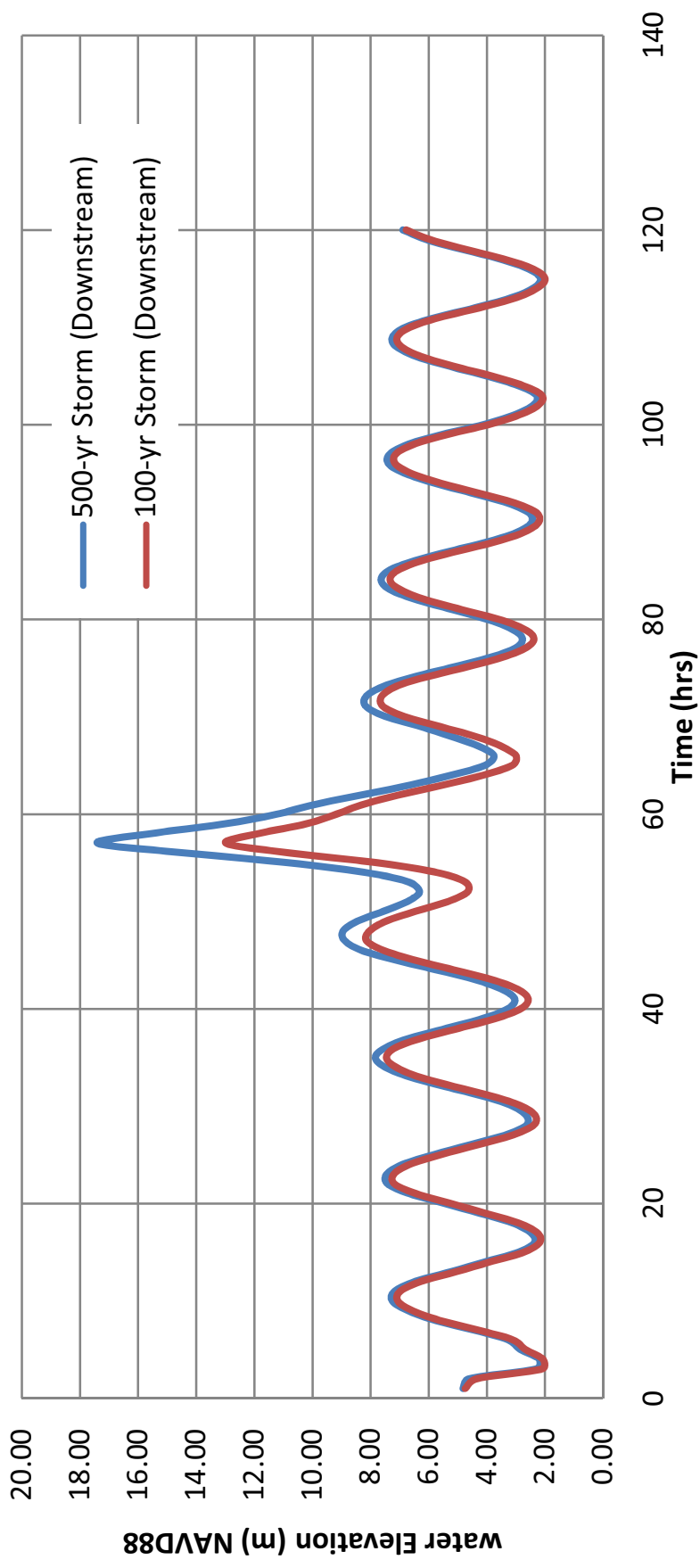
Node from FVCOM Model = 95

(hrs)	Elevation			Elevation			Elevation			Elevation		
	(m) NAVD	Velocity	Velocity	(ft) NAVD	Velocity		(m) NAVD	Velocity	Velocity	(ft) NAVD	Velocity	
	88	(m/s)	Direction	88 + SLR	(ft/s)		88	(m/s)	Direction	88 + SLR	(ft/s)	
1	0.072			4.83			0.049	0.00	0.00	4.75		
2	0.008			4.62			-0.074			4.35		
3	-0.696			2.31			-0.757			2.11		
4	-0.731			2.19			-0.766			2.08		
5	-0.53			2.85			-0.581			2.69		
6	-0.398			3.29			-0.449			3.12		
7	-0.036			4.47			-0.083			4.32		
8	0.369			5.80			0.32			5.64		
9	0.654			6.74			0.607			6.58		
10	0.814			7.26			0.757			7.07		
11	0.786			7.17			0.728			6.98		
12	0.567			6.45			0.508			6.26		
13	0.195			5.23			0.139			5.05		
14	-0.16			4.07			-0.214			3.89		
15	-0.513			2.91			-0.569			2.73		
16	-0.679			2.36			-0.732			2.19		
17	-0.638			2.50			-0.706			2.28		
18	-0.446			3.13			-0.507			2.93		
19	-0.104			4.25			-0.163			4.06		
20	0.268			5.47			0.203			5.26		
21	0.632			6.66			0.562			6.44		
22	0.861			7.42			0.789			7.18		
23	0.872			7.45			0.798			7.21		
24	0.706			6.91			0.633			6.67		
25	0.383			5.85			0.309			5.61		
26	0.01			4.62			-0.074			4.35		
27	-0.363			3.40			-0.441			3.15		
28	-0.589			2.66			-0.664			2.41		
29	-0.595			2.64			-0.687			2.34		
30	-0.449			3.12			-0.543			2.81		
31	-0.146			4.11			-0.238			3.81		
32	0.259			5.44			0.164			5.13		
33	0.632			6.66			0.533			6.34		
34	0.89			7.51			0.777			7.14		
35	0.991			7.84			0.875			7.46		
36	0.886			7.50			0.781			7.15		
37	0.623			6.64			0.5			6.23		
38	0.242			5.39			0.114			4.97		
39	-0.137			4.14			-0.27			3.71		
40	-0.399			3.28			-0.534			2.84		
41	-0.471			3.05			-0.612			2.58		
42	-0.335			3.49			-0.502			2.95		
43	-0.054			4.41			-0.229			3.84		
44	0.355			5.76			0.172			5.16		
45	0.779			7.15			0.579			6.49		
46	1.136			8.32			0.907			7.57		

47	1.313	8.90	1.085	8.15
48	1.328	8.95	1.051	8.04
49	1.178	8.46	0.879	7.48
50	0.908	7.57	0.573	6.47
51	0.658	6.75	0.234	5.36
52	0.528	6.32	0.025	4.67
53	0.637	6.68	0.045	4.74
54	1.096	8.19	0.347	5.73
55	1.906	10.84	0.973	7.78
56	2.979	14.36	1.886	10.78
57	3.903	17.39	2.556	12.98
58	3.342	15.55	2.215	11.86
59	2.562	13.00	1.711	10.20
60	2.018	11.21	1.396	9.17
61	1.622	9.91	1.116	8.25
62	1.115	8.25	0.728	6.98
63	0.62	6.63	0.271	5.48
64	0.192	5.22	-0.14	4.13
65	-0.157	4.08	-0.443	3.14
66	-0.252	3.77	-0.483	3.01
67	-0.086	4.31	-0.322	3.54
68	0.201	5.25	-0.051	4.42
69	0.52	6.30	0.319	5.64
70	0.878	7.47	0.681	6.83
71	1.084	8.15	0.904	7.56
72	1.095	8.18	0.931	7.65
73	0.935	7.66	0.8	7.22
74	0.621	6.63	0.492	6.21
75	0.216	5.30	0.077	4.84
76	-0.182	4.00	-0.308	3.58
77	-0.469	3.05	-0.575	2.71
78	-0.552	2.78	-0.672	2.39
79	-0.444	3.14	-0.571	2.72
80	-0.183	3.99	-0.305	3.59
81	0.183	5.19	0.085	4.87
82	0.554	6.41	0.458	6.09
83	0.827	7.30	0.721	6.96
84	0.931	7.65	0.837	7.34
85	0.853	7.39	0.763	7.09
86	0.586	6.51	0.512	6.27
87	0.206	5.27	0.13	5.02
88	-0.202	3.93	-0.281	3.67
89	-0.509	2.92	-0.579	2.69
90	-0.65	2.46	-0.723	2.22
91	-0.613	2.58	-0.693	2.32
92	-0.377	3.36	-0.455	3.10
93	-0.014	4.55	-0.079	4.33
94	0.375	5.82	0.309	5.61
95	0.682	6.83	0.615	6.61
96	0.853	7.39	0.783	7.16
97	0.837	7.34	0.775	7.13
98	0.643	6.70	0.584	6.51
99	0.287	5.53	0.232	5.35
100	-0.141	4.13	-0.195	3.95
101	-0.465	3.07	-0.517	2.90
102	-0.665	2.41	-0.719	2.23
103	-0.7	2.30	-0.756	2.11

104	-0.51	2.92	-0.562	2.75
105	-0.178	4.01	-0.229	3.84
106	0.219	5.31	0.172	5.16
107	0.559	6.43	0.511	6.27
108	0.771	7.12	0.716	6.94
109	0.811	7.25	0.762	7.09
110	0.677	6.81	0.63	6.66
111	0.361	5.78	0.32	5.64
112	-0.054	4.41	-0.099	4.27
113	-0.425	3.20	-0.471	3.05
114	-0.662	2.42	-0.702	2.29
115	-0.742	2.16	-0.788	2.01
116	-0.616	2.57	-0.661	2.42
117	-0.323	3.53	-0.361	3.41
118	0.08	4.85	0.042	4.73
119	0.455	6.08	0.415	5.95
120	0.703	6.90	0.668	6.78

Bayonne Synthetic Hydrographs Downstream of Bridge



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