

INDIVIDUAL HYDROLOGIC & HYDRAULIC (IHHA) ASSESSMENT REPORT

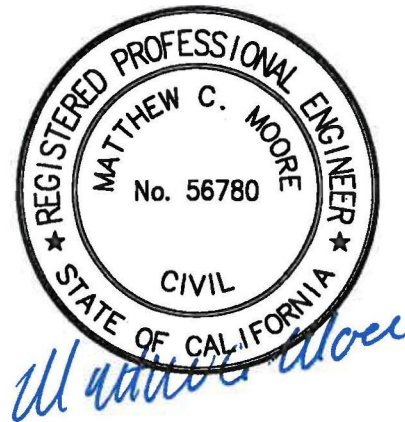
Site Name/Facility: Mission Bay High School & Pacific Beach Drive/Olney Street Channels

Master Program Map No.: Maps 36 and 37

Date: February 14, 2014

Civil Engineer: Matt Moore
(name, company, phone number): URS Corporation
858-812-9292

Registered Civil Engineer Number & Expiration Date
(place stamp here): RCE No. 56780,
Exp. 6/30/2015



***Instructions:** This form must be completed for each target facility following the completion of the Individual Maintenance Plan (IMP) report form and prior to any work being conducted in the facility. Attach additional sheets if needed.

EXISTING CONDITIONS

Executive Summary

Based on the analysis presented in this Individual Hydrologic and Hydraulic Assessment (IHHA), maintenance will significantly assist in minimizing and controlling flooding issues but maintenance alone will not prevent flooding from occurring in this area. In the Current Capacity Condition, the Mission Bay High School (MBHS) Channel conveys less than 30% of the 1-year storm event flow. The results of this IHHA indicate that for the recommended levels of maintenance, the Maintained-Sediment removed condition, the MBHS Channel will be able to convey storm flows up to the 2-year storm event.

Additionally, the Pacific Beach Drive/Olney Street (PBO) Channel's conveyance capacity is currently at the conveyance level of the 2 year storm event and in the Maintained-Sediment removed condition it would be increased to the 5-year storm event while maintaining flooding limits to the downstream half of the channel. Although the increase in the conveyance capacity within the PBO channel is not substantial, maintenance of the channel has an overall benefit of reducing the extent of the flooding in the MBHS Channel. If sediment and vegetation are not removed from the PBO channel, the extent of the flooding will increase further upstream during a 2-year storm event and reduce the capacity of MBHS Channel well below a 2-year storm event capacity. It is recommended that the sediment and vegetation within both channels be removed because of the significantly reduced conveyance capacity of the channels in the current condition. An additional benefit for this level of maintenance is that it will significantly assist in minimizing the regular flooding that occurs in critical areas such as the MBHS school bus loading/unloading zone.

Mission Bay High School & Pacific Beach Drive/Olney Street Channels
Individual Hydrologic & Hydraulic (IHHA) Assessment Report

EXISTING CONDITIONS

There are a number of reasons that flooding occurs in the Mission Bay High School (MBHS) and Pacific Beach Drive/Olney Street (PBO) Channels and the adjacent areas. The channels are located in a relatively flat area with close proximity to the bay. The southerly parking lot located along the MBHS Channel is a low lying area that is prone to flooding due to the area's topography combined with the capacity constraints in the channels. In addition to the original design and topography constraints, the analysis showed that the existing 42-inch culvert and the Mission Bay Sewage Interceptor System box at the downstream end impacts the conveyance capacity of the channels. To better depict the impacts of the different maintenance conditions on channel capacity, the MBHS Channel is considered to have reached its capacity for this analysis if only the southern 220 feet of the channel experiences flooding (see Figure No. 3) since this area is prone to flooding during most rain events.

Introduction

The City of San Diego (City) has developed the Master Storm Water System Maintenance Program (MMP; Master Maintenance Program) to optimize its business processes and environmental protection practices related to channel operation and maintenance activities. The Master Maintenance Program is intended to integrate operation and maintenance planning, implementation and assessment activities with its water quality protection programs. This document provides a summary of the Individual Hydrologic and Hydraulic Assessment (IHHA) activities conducted within the Mission Bay High School (MBHS) and Pacific Beach Drive/Olney Street (PBO) Channels in order to comply with the MMP's Programmatic Environmental Impact Report (PEIR).

The purpose of this report is to assess whether the maintenance described in the City's MMP is needed based on a hydrologic and hydraulic assessment. A number of sources were utilized in the assessment including: As-built records, SanGIS topography, ESRI ArcGIS aerial imagery, a recent limited City channel field survey, and recent site/field reconnaissance visits by URS staff provided information regarding channel dimensions, geometry, storm flows, and vegetation and sediment deposition within the channels. For the hydraulic design capacity of the channels, the Maintained Condition – Sediment removed section of this report best reflects the intended capacity of the channels, as it is based on the MMP channel dimension data and was revised based on the latest field data.

Based on this IHHA assessment, it has been determined that the MBHS and PBO Channels are subject to regular sediment deposition and vegetation establishment. The flat slopes of both the concrete-lined MBHS Channel and earthen PBO Channel result in lower flow velocities that encourage sediment particles from the upstream watershed to settle out of the storm water runoff along the channel beds. The establishment of vegetation in the deposited material continues the reduction in flow velocities, and in turn encourages more sediment to drop out.

The hydraulic analyses show that the MBHS Channel will experience flooding issues at its downstream end regardless of the levels of maintenance. There are a number of reasons that cause the flooding in the southerly portions of the MBHS Channel and its

Mission Bay High School & Pacific Beach Drive/Olney Street Channels

Individual Hydrologic & Hydraulic (IHHA) Assessment Report

EXISTING CONDITIONS

adjacent area. The first reason is that the backwater effects that occur in PBO Channel negatively impact MBHS Channel. The backwater effects are caused by an obstruction to the flow which results in an increase in the water depth in the channel. The obstructions to the flow for these channels are the excessive amounts of vegetation in the channels and the capacity of the culvert at the downstream end of PBO Channel. Under these conditions, the inflow is greater than the outflow which results in an apparent additional amount of storm water volume that cannot discharge at the downstream end. This apparent additional volume of storm water needs to be temporarily stored in the channel, which increases the depth of water (water surface elevation) in the channel. Secondly, the elevations of the affected MBHS area are lower than the increased water surface elevations at the upstream end of the PBO Channel which causes the storm water flows to flood these low lying areas.

Maintenance will not solve the flooding issues, but will significantly assist in minimizing and controlling them. For purposes of this analysis, the MBHS Channel is considered to have reached its capacity if the flooding from the channel is limited to its downstream end to the middle of the southerly parking lot, or from the southerly MBHS chain link fence to approximately ± 220 feet north of it (see Figure No. 3). It was also determined in the hydraulic analysis that the PBO Channel hydraulics are governed by the capacity of the existing 42-inch culvert at the downstream end of the channel, which in turn is impacted by the hydraulic conditions of the Mission Bay Sewage Interceptor System (MBSIS) box (see the following section for a description of the MBSIS). These hydraulic conditions contribute to the backwater effect experienced in the PBO and MBHS Channels. The maintenance efforts in the PBO Channel will have minimal impact for the channel itself but provides benefits to the upstream MBHS Channel flooding conditions.

The Current Vegetated Condition results of this IHHA show that the conveyance capacity of the MBHS Channel has been reduced down to a level that it is nearly inoperable, as most of its channel cross section along most its length is occupied by very dense and tall Freshwater Marsh (cat tail) and Non-native Grassland (ice plant) vegetation and the conveyance capacity of the PBO Channel under its Current Vegetated Condition has a maximum capacity to convey the 2-year storm event. Currently, the MBHS Channel also backs up dry weather flows and floods portions of the school bus loading/unloading zone of the high school throughout most of the year. According to Mission Bay High School officials, during the rainy season large portions of the northerly parking lot is flooded, forcing them to relocate the school bus loading/unloading zone. Based on the visual observations during the site visits, the MBHS and PBO Channels appear to be at their vegetation growth carrying capacity. Therefore, from a hydrologic and hydraulic perspective, it is assumed that the Current Vegetated Condition corresponds to that of the Ultimate Vegetated Condition.

In the Maintained-Sediment removed condition, the results of this IHHA show that the MBHS Channel will be able to convey storm flows due to the more frequent storm events up to the 2-year storm event while maintaining flooding limits to a point near the middle of the southerly parking lot. The PBO Channel's conveyance capacity is increased to the

**Mission Bay High School & Pacific Beach Drive/Olney Street Channels
Individual Hydrologic & Hydraulic (IHHA) Assessment Report**

EXISTING CONDITIONS

5-year storm event while maintaining flooding limits to the downstream half of the channel in the Maintained-Sediment removed condition.

It is recommended that the sediment and vegetation within both channels be removed because of the significantly reduced conveyance capacity of the channels in the current condition. The hydraulic analysis results show that the flooding issues currently being experienced in the study area will not be solved by maintenance alone. However, maintenance will significantly assist in minimizing the annual flooding that occurs at Mission Bay High School since the MBHS channel currently conveys less than 30% of the 1-year storm event flow. An additional benefit for this level of maintenance is that it will significantly assist in minimizing the annual flooding that occurs in critical areas such as the MBHS school bus loading/unloading zone. As seen in the photo logs (Attachment 1), vegetation growth in these channels increases rapidly with delayed maintenance exposing Mission Bay High School to more severe flooding impacts. Tables 1 and 2 below summarize the results for the MBHS and PBO Channels, respectively.

Table 1. MBHS Channel Results Summary

2-year Storm Event Flow Rate (cfs)	Calculated Design Capacity (cfs)	Current Capacity (cfs)
43	43 ¹	<10 ²

¹This flow corresponds to a high frequency (2-yr) storm event.

²This flow corresponds to a high frequency (much less than a 1-yr) storm event

Table 2. PBO Channel Results Summary

2-year Storm Event Flow Rate (cfs)	Calculated Design Capacity (cfs)	Current Capacity (cfs)
59	59 ¹	59

¹The calculated design capacity is just above the 2-year storm event.

Description of creek/channel (limits of reach, surrounding land use and area, creek/channel geometry and vegetative condition):

The channels in this study are located within the jurisdiction of the City of San Diego in the Pacific Beach community. See Figure 1, Vicinity Map, for the project location and general overview. The focal facilities consist of two channels, a concrete-lined channel and an earthen channel. The concrete-lined channel is known as the Mission Bay High School (MBHS) Channel. It is included in Map 36 of the Master Storm Water System Maintenance Program (MMP). The second channel is known as the Pacific Beach Drive/Olney Street (PBO) Channel and it is included in Map 37 of the MMP.

The channels are located within the City and California Coastal Commission's Coastal Overlay Zone (Coastal Appealable and Coastal Permit) and Pacific Beach community.

Mission Bay High School & Pacific Beach Drive/Olney Street Channels
Individual Hydrologic & Hydraulic (IHHA) Assessment Report

EXISTING CONDITIONS

The project area is zoned RS-1-7 (Residential-Single Unit) and designated as School [Senior High] and Single-Family [Residential] in the Pacific Beach Community Plan. According to the Federal Emergency Management Agency's (FEMA) the project is located outside of the Special Flood Hazard Areas Subject to Inundation by the 1% Annual Chance Flood as well as the 0.2 % Annual Chance Flood areas.

Two site visits were conducted by URS staff. The first site visit was done on August 16, 2012, and the second one was done on September 19, 2013. The purpose of the site visits was to evaluate the conditions of the channels from a hydrologic and hydraulic perspective. Additionally, the multiple site visits allowed for a visual assessment of the sediment deposition/vegetation growth changes over a one year period. The sections below provide a description of the channels as they relate to their limits, surrounding land use, and channel geometry followed by a description of their vegetative condition, debris and sediment deposition, and the increase of vegetation, debris and sediment depositions over one year's time. A photo log from the site visits is included as Attachment 1 and Site Photo Log Key Map, that shows the location and orientation of each photo, is included on Figures 3 and 4.

MBHS Channel:

The MBHS Channel runs in a north-south direction for approximately 1075 feet (ft.) from the southwesterly corner of the Mission Bay High School bus loading/unloading zone to Pacific Beach Drive, and discharges into the PBO Channel. It is bordered by Mission Bay High School to the east and a military single family residential housing development and Quincy Street to the west. The MBHS Channel is a concrete trapezoidal channel with a 4-ft. bottom width, 10-ft. top width and a 2-ft. channel depth, with a nearly flat longitudinal slope (0.25%). The MBHS Channel receives storm flows from:

- a 27-inch Reinforced Concrete Pipe (RCP) at its upstream end,
- a 36-inch RCP that is located 250 ft. south of its upstream end,
- the adjacent Mission Bay High School baseball field & northerly parking lot areas, and
- the adjacent Mission Bay High School tennis court.

PBO Channel:

The PBO Channel runs in an east-west direction for approximately 897 ft. from the southwesterly corner of Mission Bay High School to Olney Street. The channel is bordered by Pacific Beach Drive and Campland on the Bay to the south and a military single family residential development to the north. The PBO Channel is a trapezoidal earthen channel with a bottom width that varies from 3 to 5 feet, a top width that varies from 20.5 ft. to 26 ft., an average channel depth of 5 to 6 feet, and a nearly flat longitudinal slope (0.25%). The PBO Channel receives storm flows from:

- the MBHS Channel,
- an 18-inch RCP located 245 feet west of its upstream end,
- Mission Bay High School football/baseball fields, and Lee Street, and

Mission Bay High School & Pacific Beach Drive/Olney Street Channels
Individual Hydrologic & Hydraulic (IHHA) Assessment Report

EXISTING CONDITIONS

- a portion of the Campland at the Bay parking lot.

The PBO Channel discharges into a 42-inch RCP projecting barrel culvert that is located at the intersection of Pacific Beach Drive and Olney Street. The culvert conveys storm flows to the south side of Pacific Beach Drive and discharges into a concrete vault (12 ft. long by 14 ft. wide by 7.5 ft. high) known as the Mission Bay Sewage Interceptor System (MBSIS) box. This box was installed as part of the City's efforts to divert dry weather flows into the sewer system. The MBSIS box discharges into a bowl-shaped concrete basin where water then weir flows out of the basin to a natural channel that conveys the storm water to Mission Bay.

MBHS Channel Vegetative Conditions (based on the August 16, 2012 site visit)

During the first site visit of August 16, 2012, a combination of sediment deposition and organic material (approximately 3-4 inches in depth) and ponded water (approximately 6 inches in depth) were observed along the channel length (Photo No. 7 & 9). At the time, well established and dense vegetation (fresh water marsh species and non-native grasslands) and aquatic life were observed within the channel. It was also observed that at the upstream end of the MBHS Channel, the dry-weather non-storm water flows from the channel back up into the school bus loading/unloading zone to pond in the adjacent existing curb-and-gutter (Photo No. 3 & 4). The outlet of the existing 27-inch RCP storm drainpipe that discharges into the MBHS Channel was significantly obstructed by the vegetation growth within the concrete channel (Photo No. 1 & 2). On the side slope west of the MBHS Channel, ornamental vegetation, mainly unmaintained ice plant, was also observed. At the time of the site visit, the vegetation had overgrown to the degree that it had covered the channel's west side in its entirety (Photo No. 7) and in some instances, the ice plant growth had covered the channel bottom and reached the east side of the channel. Trash and debris were observed distributed throughout the channel (Photos No. 9 through 11) in those sections of the channel where vegetation was not as dense.

MBHS Channel Vegetative Conditions (based on the September 19, 2013 site visit)

During the site visit of September 19, 2013, it was observed that the combination of sediment deposition and organic material, and ponded water depth had remained unchanged (Photo No. 23 through 26, & 29). However, it was also observed that the vegetation in the channel and on the side slopes had grown significantly denser and taller than the previous year (Photo No. 27 through 30). It appears that a length of approximately 5 ft. of vegetation in the channel, that obstructed the 27-inch RCP outlet, was removed (Photo No. 23) since the previous site visit. Trash and debris amounts were not observed as the density of the vegetation did not allow it (Photo No. 27 through 30).

PBO Channel Vegetative Conditions (based on the August 16, 2012 site visit)

During the site visit of August 16, 2012, it was observed that similar conditions existed in the PBO Channel as in the MBHS Channel. A combination of sediment deposition and organic material to a depth of 6 to 7 inches on the channel bottom was observed along the channel length (Photo No 18 & 19). Well established and dense vegetation (fresh water marsh species and non-native grasslands) were observed within the channel (Photo No.

Mission Bay High School & Pacific Beach Drive/Olney Street Channels
Individual Hydrologic & Hydraulic (IHHA) Assessment Report

EXISTING CONDITIONS

12 through 20). The vegetation on the channel side slope to the north consisted of ornamental vegetation, mainly ice plant, and had overgrown along some sections to cover the channel's north side slope in its entirety. Trash and debris were observed mainly at the upstream and downstream ends of the PBO Channel.

PBO Channel Vegetative Conditions (based on the September 19, 2013 site visit)

During the site visit of September 19, 2013, it was observed that vegetation had grown significantly denser and taller than the previous year (Photo No. 31 through 37). The combination of sediment deposition and organic material deposits appeared to remain almost unchanged; however, the trash and debris loadings increased.

Hydrologic information (source of hydrologic information, summary of flow rates and return frequencies):

Review of the available records did not yield previous hydrologic information for the channels. Therefore, a hydrologic analysis was performed to calculate the peak storm flows. The Modified Rational Method was used based on the criteria and guidelines set forth in the City of San Diego Drainage Design Manual (April 1984, updated March 1989). The channel drainage area and sub-basins were developed based on 2-ft. contour interval topography and existing storm drain system data obtained through SanGIS, in conjunction with aerial imagery obtained through ESRI ArcGIS Online World Imagery. The runoff coefficients were determined from the various land uses within the watershed, which were also determined from data obtained from SanGIS and the aerial imagery. The Hydrologic Map, which shows the drainage basins, is included as Figure 2.

The CivilCADD/CivilDesign Hydrology Program Package developed by CivilDesign Corporation was used to generate the hydrologic model. The 1-, 2-, 5-, 10-, 25-, 50- and 100-year storm event peak discharges were calculated. The detailed hydrologic analysis results are included in Attachment 3, and Table 1 below summarizes the results.

Table 3. Hydrologic Analyses Summary

Channel	Watershed Area (Ac)	Storm Event						
		1-Year (cfs)	2-Year (cfs)	5-Year (cfs)	10-Year (cfs)	25-Year (cfs)	50-Year (cfs)	100-Year (cfs)
MBHS	120	33	43	58	70	80	95	104
PB/O	147	46	59	80	96	110	130	143

The 42-inch RCP that conveys channel flows conflues with an existing 60-inch RCP at the MBSIS box located at the discharge point. To determine the level of influence of the 60-inch RCP on the hydraulics of the diversion structure, a Rational Method hydrologic analysis was performed for the 500 acre watershed that is tributary to the 60-inch RCP.

The Rational Method, as applied for the 60-inch RCP, provides an approximate and conservative estimate of peak storm flows, as the 500-acre watershed is close to the Rational Method applicability limits. However, for purposes of these analyses, the calculated peak flows were deemed appropriate given the level of detail and accuracy of

Mission Bay High School & Pacific Beach Drive/Olney Street Channels

Individual Hydrologic & Hydraulic (IHHA) Assessment Report

EXISTING CONDITIONS

the SanGIS topography, as-built plans, and field observations used to develop the hydraulic models.

Hydraulic analyses (description of hydraulic models created for project):

The United States Army Corps of Engineers Hydrologic Engineering Center's River Analysis System (HEC-RAS) software was used for the hydraulic analysis of both channels. The results of the hydrologic analyses included in Table 3 above were used in the hydraulic analyses. The HEC-RAS model developed for the various storm events includes both channels.

The development of the MBHS and PBO Channel HEC-RAS model was based on data collected from a combination of sources including as-built plans and recent but limited topographic survey data provided by the City of San Diego, SanGIS 1999 2-foot contour topographic layer, field observations, and ESRI ArcGIS World Imagery. The SanGIS topography and storm drain as-built elevations are based on the National Geodetic Vertical Datum of 1929 (NGVD29). All elevation information presented throughout this analysis and report are based on NGVD29. The Manning's Roughness Coefficient values used were based on field observations performed by URS staff and vegetation data provided by the City of San Diego.

To establish the starting water surface elevations at the downstream end of the PBO Channel to initialize the HEC-RAS models, a second hydraulics computer program, the Water Surface Pressure Gradient Program (WSPG), was used. WSPG was originally developed by the Los Angeles County Department of Public Works and approved for use in FEMA studies for pressure and non-pressure pipe flow conditions. The WSPG results showed that for the 1- and 2-year storm events, a starting water surface elevation of 7.2 ft. should be used to initialize the HEC-RAS model. For the rest of the storm events (5-, 10-, 25-, 50-, and 100-year), the WSPG results showed that a starting water surface elevation that is higher than the top of the channel bank at its downstream end should be used. Because using a water surface elevation within the PBO Channel that is higher than its banks is deemed inappropriate for purposes of this study, an elevation of 8.4 ft. was used, which is equal to the top of the channel bank.

Current Vegetated Condition:

The HEC-RAS model developed for the Current Vegetated Condition reflects the field conditions based on two site visits. During the first site visit on August 16, 2012, approximate channel dimensions, vegetation type and density, and sediment deposition were determined. The vegetation and sediment deposition field data was updated based on the second site visit of September 19, 2013.

During the first site visit it was observed that vegetation growth and density in both the MBHS and PBO Channels appeared to be very close to growth capacity. A Manning's Roughness Coefficient of 0.10 was assigned for the entire channel bed, including the sections where additional vegetation growth was possible. During the second site visit it

Mission Bay High School & Pacific Beach Drive/Olney Street Channels
Individual Hydrologic & Hydraulic (IHHA) Assessment Report

EXISTING CONDITIONS

was determined that the vegetation had grown significantly denser and taller, mainly in the MBHS Channel. As a result, the Manning's Roughness Coefficient in the MBHS Channel was increased to 0.17, while the PBO Channel Manning's Roughness Coefficient was slightly increased at the upstream sections to 0.15. A range of Manning's Roughness Coefficient values from 0.015 to 0.07 were used for the channel side slopes based on the vegetated cover in each section. A sediment deposition between 3 to 4 inches was used for the MBHS Channel. A sediment deposition of 6 inches was used for the PBO Channel along most of its length, except at the entrance of the 42-inch RCP culvert where a sediment deposition of 8 inches was used.

Ultimate Vegetated Condition:

Based on the visual observations during the site visits, the MBHS and PBO Channels appear to be at their vegetation growth carrying capacity. Therefore, the Ultimate Vegetated Condition HEC-RAS models for the MBHS and PBO Channels were assumed to be the same as for the Current Vegetated Condition.

Maintained Condition – No sediment removed:

In the Maintained Condition – No sediment removed, the maintenance activities to be analyzed consist of only vegetation removal. For the MBHS Channel, the no sediment removed condition is impractical from a maintenance perspective, because of the minimal amount of sediment that is deposited in the channel. Vegetation removal would likely constitute root and associated sediment removal due to the shallow root system on top of the concrete channel. Therefore, it was assumed that the vegetation, sediment and other debris currently in the channel would be removed in this condition because MBHS Channel is a concrete lined channel and the removal of the vegetation would likely involve the removal of the sediment. It is assumed that the ornamental vegetation on its west side that has overgrown and invaded the west side slope is trimmed to the top of the channel. These activities would restore the channel capacity to its original design. A uniform Manning's Roughness Coefficient of 0.015 was selected for the MBHS Channel for this condition, while the Manning's Roughness Coefficients beyond the concrete channel (overbanks) were left unchanged from the Current Vegetated Condition.

The PBO Channel portion of the model was adjusted assuming that the vegetation that currently exists in the channel bed is removed, leaving only deposited sediment in the channel. The Manning's Roughness Coefficient assigned to the PBO Channel is 0.04 for the channel bed and for the side slopes it varies from 0.03 to 0.04. At the downstream end of the channel, where the storm flow enters the existing 42-inch RCP culvert, a Manning's Roughness Coefficient of 0.03 was assigned to account for the need to maintain a clear opening.

Mission Bay High School & Pacific Beach Drive/Olney Street Channels
Individual Hydrologic & Hydraulic (IHHA) Assessment Report

EXISTING CONDITIONS

Maintained Condition – Sediment removed (if applicable):

For the MBHS Channel portion of the model it is assumed that the vegetation removal in the concrete channel will involve sediment removal, as well.

For the PBO Channel, the Maintained Condition – Sediment removed condition, it is assumed that the vegetation and 6 to 8 inches of sediment deposition along the PBO Channel bed was removed. To reflect this, the Manning's Roughness Coefficient along the channel bed was reduced to 0.03. The channel side slopes Manning's Roughness Coefficient remains between 0.03 to 0.04.

MAINTENANCE IMPACTS

Hydraulics Results (Describe capacity of channel for each condition):

The hydraulic analysis results show that the MBHS Channel will experience flooding issues at its downstream sections regardless of the maintenance levels. For purposes of this analysis, the MBHS Channel is considered to have reached its capacity if it is overtopped from its downstream end to the middle of the southerly parking lot, or from the southerly MBHS chain link fence to approximately ± 220 feet north of it (see Figure No. 3). Storm overflows will sheet flow south to the concrete ditch along the southern boundary of the Mission Bay High School grounds before re-entering the channel system at the MBHS/PBO Channel transition. These potential flooding conditions are mainly the result of the flat topography of the surrounding area and relatively low-lying ground elevations of the high school parking lot, specifically, at its southerly end.

Current Vegetated Condition:

MBHS Channel

In the Current Vegetated Condition, the MBHS Channel capacity was calculated to be significantly less than the 1-year storm event, at less than 10 cfs. Even with a flow rate of 10 cfs, the HEC-RAS model shows the channel overtops near the midpoint between HEC-RAS Sections 11 and 12 (see Figure 3). A 1-year storm event, 33 cfs, under the Current Vegetated Condition, overtops the channel along its entire length. Table 4 below summarizes the MBHS Channel hydraulic analyses results under the Current Vegetated Condition.

**Mission Bay High School & Pacific Beach Drive/Olney Street Channels
Individual Hydrologic & Hydraulic (IHHA) Assessment Report**

MAINTENANCE IMPACTS

Table 4. MBHS Channel Results Summary

Storm Event	Storm Event Flow Rate (cfs)	Calculated Design Capacity (cfs)	Current Condition Capacity (cfs)
1-year	33	43 ¹	<10 ²
2-year	43	43 ¹	<10 ²

¹This storm flow corresponds to the 2-year storm event.

²This storm flow corresponds to a high-frequency storm event that is approximately 70% less than the 1-year storm event.

PBO Channel

In the Current Vegetated Condition, the PBO Channel capacity was calculated to be 59 cfs, which corresponds to the 2-year storm event. At the 5-year storm event, the channel is overtopped along most of its length. Table 5 below summarizes the PBO Channel hydraulic analyses results under the Current Vegetated Condition.

Table 5. PBO Channel Results Summary

Storm Event	Storm Event Flow Rate (cfs)	Calculated Design Capacity (cfs)	Current Condition Capacity (cfs)
2-year	59	59 ¹	59
5-year	80	59 ¹	59

¹The calculated design capacity is approximately just above the 2-year storm event.

Note: See attached HEC-RAS model profile

Ultimate Vegetated Condition:

MBHS and PBO Channels

As discussed in the previous section, the channel is considered to currently be at its Ultimate Vegetated Condition. Therefore, see Tables 4 and 5 above for the MBHS and PBO Channel hydraulic analyses results summary, respectively.

Note: See attached HEC-RAS model profile

Maintained Condition – No Sediment removed:

MBHS Channel

The MBHS Channel results show that the Maintained Condition - No sediment removed option will create minor improvements to the conveyance capacity along the upstream portions of the channel. The vegetation removal would reduce the flooding levels of the 1-year storm event from along the entire length down to a point that is approximately located at the southerly edge of the baseball field, HEC-RAS Section 12 (see Figure 3). During the 5-year storm event, the flooding levels would extend upstream to a location

**Mission Bay High School & Pacific Beach Drive/Olney Street Channels
Individual Hydrologic & Hydraulic (IHHA) Assessment Report**

MAINTENANCE IMPACTS

approximately 85 feet south of the southerly tennis court fence, at approximately HEC-RAS Section 13. Table 6 below summarizes the MBHS Channel hydraulic analyses results under the Maintained Condition – No Sediment removed.

Table 6. MBHS Channel Results Summary

Storm Event	Storm Event Flow Rate (cfs)	Calculated Design Capacity (cfs)	No Sediment Removed Capacity (cfs)
1-year	33	43 ¹	<10 ²
2-year	43	43 ¹	<10 ²

¹This storm flow corresponds to approximately the 2-year storm event.

²This storm flow corresponds to a high-frequency storm event that is significantly less than the 1-year storm event.

PBO Channel

The conveyance capacity increase caused by the removal of the vegetation is not readily evident in the PBO Channel, except that removal of vegetation in this section reduces the extent of the MBHS Channel flooding conditions. At the 5-year storm event, the channel is overtopped along its downstream half. Table 7 below summarizes the PBO Channel hydraulic analyses results under the Maintained Condition – No Sediment removed.

Table 7. PBO Channel Results Summary

Storm Event	Storm Event Flow Rate (cfs)	Calculated Design Capacity (cfs)	No Sediment Removed Capacity (cfs)
2-year	59	59 ¹	59
5-year	80	59 ¹	59

¹The calculated design capacity is approximately just above the 2-year storm event.

Note: See attached HEC-RAS model profile

Maintained Condition – Sediment removed:

MBHS Channel

The HEC-RAS results show that the Maintained Condition - Sediment removed option improves the conveyance in the MBHS Channel. During the 2-year storm event, storm flows would be contained within the channel for a longer distance when compared against the Current Vegetated Condition. The flooding limits would be reduced to a location approximately at the midpoint between HEC-RAS Sections 11 and 12.

For the 5-year storm event, the flooding limits would be reduced to the southerly fence of tennis courts, HEC-RAS Section 15 which will reduce overall amount of storm overflow compared to the previous conditions. Storms larger than the 5-year storm event would simply overflow the MBHS Channel along its entire length regardless of the level of maintenance in the channel. Table 8 summarizes the MBHS Channel hydraulic analyses

**Mission Bay High School & Pacific Beach Drive/Olney Street Channels
Individual Hydrologic & Hydraulic (IHHA) Assessment Report**

MAINTENANCE IMPACTS

results under the Maintained Condition – Sediment removed.

Table 8. MBHS Channel Results Summary

Storm Event	Storm Event Flow Rate (cfs)	Calculated Design Capacity (cfs)	Sediment Removed Capacity (cfs)
2-year	43	43 ¹	33
5-year	58	43 ¹	33

¹This storm flow corresponds to approximately the 2-year storm event.

PBO Channel

As in the previous conditions, the effects of the removals are not apparent in the PBO Channel but the vegetation and sediment removals have greater impacts upstream by helping to relieve the flooding conditions in the MBHS Channel. For the 5-year storm event, the extent of the flooding would be limited to the PBO Channel banks downstream half with the removal of the sediment and vegetation. Table 9 below summarizes the PBO Channel hydraulic analyses results under the Maintained Condition – Sediment removed.

Table 9. PBO Channel Results Summary

Storm Event	Estimated Storm Event Flow Rate (cfs)	Calculated Design Capacity (cfs)	Sediment Removed Capacity (cfs)
2-year	59	59 ¹	59
5-year	80	59 ¹	59

¹The calculated design capacity is approximately just above the 2-year storm event.

Note: See attached HEC-RAS model profile

Areas within channel that can be avoided (this section can be completed upon completion of Individual Biological Assessment Form):

Both channels are located within and adjacent to highly urbanized and developed areas. There are no sensitive areas within the channels themselves that can be avoided by the maintenance activities. Refer to Individual Biological Assessment (IBA).

**Mission Bay High School & Pacific Beach Drive/Olney Street Channels
Individual Hydrologic & Hydraulic (IHHA) Assessment Report**

MAINTENANCE IMPACTS

Would the velocity of storm water during a “bank-full” storm event exceed the velocities identified for unlined channels per Table 1-104.108 of the City’s Design Manual? If so, describe the appropriate form of erosion control (e.g., check dam or comparable mechanism). Is a downstream check dam or comparably mechanism required?

Table 1-104.10A does not apply to the MBHS Channel as it is a concrete-lined channel and can sustain high velocities.

For the PBO Channel, it is anticipated that the during a bank-full storm event the velocities identified for unlined channels per Table 1-104.10A will not be exceeded.

MITIGATION

Conclusion/Recommendations (Describe the limits of recommended maintenance, degree to which native vegetation within the facility can be retained, and capacity of maintained channel):

MBHS Channel

The HEC-RAS hydraulic analysis results show that the MBHS Channel will experience flooding issues at its downstream sections regardless of the maintenance levels. For purposes of this analysis, the MBHS Channel is considered to have reached its capacity if it is overtopped from its downstream end to the middle of the southerly parking lot, or from the southerly MBHS chain link fence to approximately ± 220 feet north of it (see Figure No. 3). The southern half of the MBHS Channel and the southerly Mission Bay High School areas are particularly prone to flooding due to the channel system elevation in relation to its surrounding ground elevations.

Currently, the hydraulic model shows that MBHS Channel conveys less than 30% of the 1-year storm event flow (10 cfs). In the Maintained Condition - Sediment removed condition, the MBHS Channel conveys the 2-year storm event flows. The Maintained Condition - Sediment removed also offers some improvements in containing the 5-year storm event as well. As such, it is recommended that the **Maintained Condition – Sediment removed** option be implemented.

The concrete-lined MBHS Channel was not intended to sustain any type of vegetation growth. Routine maintenance is also recommended as currently the dry weather flows floods portions of the school bus loading/unloading zone of the high school, and according to Mission Bay High School officials, during the rainy season, large portions of the school bus zone is flooded. Given its limited conveyance capacity, it is recommended that maintenance on this channel be regularly performed (every 1-2 years) to prevent the sediment and vegetation accumulation. The frequency of maintenance should be determined on an as-needed basis when the sediment deposition reaches 1-2 inches in depth.

Mission Bay High School & Pacific Beach Drive/Olney Street Channels
Individual Hydrologic & Hydraulic (IHHA) Assessment Report

MITIGATION

PBO Channel

The HEC-RAS hydraulic analysis results for the PBO Channel show that in the Current Vegetated Condition, the channel contains the 2-year storm event flows, however it does not contain the 5-year storm event flows. In the Maintained Condition – Sediment removed, the downstream half of the channel floods in the 5-year storm event. The conveyance capacity increase caused by the removal of the vegetation is not readily evident in the PBO Channel, except that removal of vegetation in this section reduces the extent of the flooding conditions along the southerly portions of the MBHS Channel and the southerly areas of Mission Bay High School. It is recommended that the **Maintained Condition – Sediment removed** option be implemented. It is important to note that regardless of the maintenance done on the PBO Channel, its conveyance capacity would not be significantly increased as it is in part limited by the capacity of the 42-inch RCP and the hydraulic impacts of the MBSIS box. As in the MBHS channel, it is recommended that maintenance on the PBO Channel be regularly (every 2-3 years) performed to prevent the sediment and vegetation accumulation. The frequency of the maintenance should be determined on an as-needed basis when the vegetation growth reaches 6-12 inches in height and/or when the sediment deposition reaches 2-4 inches.

ADDITIONAL COMMENTS OR RECOMMENDATIONS

The Recirculated Program Environmental Impact Report (PEIR) for the Master Maintenance Program lists four alternatives that would reduce the need for regular maintenance of the storm water facilities. The list of those alternatives is summarized below followed by a brief discussion as to how they apply to the MBHS and PBO Channels. The feasibility of these alternatives is based solely on the hydrologic and hydraulic assessment conducted for these channels as part of this IHHA. Additional studies may be necessary to fully assess the feasibility of these alternatives.

- Raising the channel banks by constructing walls or berms along the top of the channels – Raising the channel banks in the MBHS and PBO Channels to allow for sediment deposition and vegetation growth is not anticipated to be a feasible option. The accumulation of sediment and vegetation in the channel may cause flooding impacts upstream by raising the water surface elevation and negatively impacting upstream properties. The existing storm drainpipe systems that discharge into the channel would likely be blocked by the buildup of sediment and vegetation and may cause additional flooding impacts to the surrounding areas, mainly the school loading/unloading zone of Mission Bay High School. Additionally, due to the flat topography, the raising of the channel banks would preclude the storm flow from Mission Bay High School from entering the channel system.
- Diverting storm water in pipes around constrained segments – This option is impractical, as the flat and low lying topography of the area and the proximity to the bay does not lend itself for retrofitting this channel into an underground storm

Mission Bay High School & Pacific Beach Drive/Olney Street Channels
Individual Hydrologic & Hydraulic (IHHA) Assessment Report

ADDITIONAL COMMENTS OR RECOMMENDATIONS

drain system. The size of an underground culvert would likely need a larger cross-sectional area than the channel due to the hydraulic conditions observed as part of this study.

- Widening channels to accommodate vegetation – This alternative may be feasible for both channels however there are some possible limiting site restrictions. The PBO Channel is located between Pacific Beach Drive to the south and a housing development to the north. The MBHS Channel is within a 15-foot wide easement, and the channel is 10 feet wide at the top. For either channel to be widened, it would likely be significantly wider than the current channel widths, and therefore require additional land to expand the easement. Additionally, preliminary hydraulic analysis indicates that due to the low elevations between the MBHS grounds, Mission Bay, and the MBSIS, widening the channel would provide minimal benefits to the lower portions of the MBHS and PBO Channels. Further analysis is necessary to determine how much benefit channel widening would provide and how much adjacent property would be needed.
- Off-site runoff reduction – In flood control analysis, LID BMP features, such as impermeable area reduction, redirecting runoff to pervious areas, etc., are usually considered negligible. LID BMP design is based on the 85th percentile, or approximately a 1- or 2-year storm event flow, which is a considerably lower precipitation amount than the flood control design standard requirements of 10-, 50- or 100-year storm return events. The implementation of LID BMPs throughout the watershed is not a viable alternative for a reduction in flood control flows.

LIST OF ATTACHMENTS

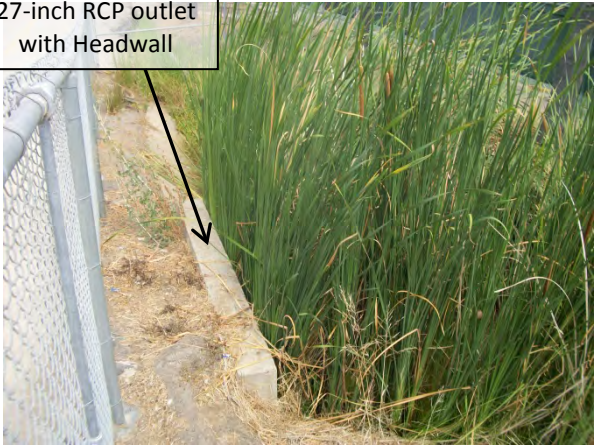

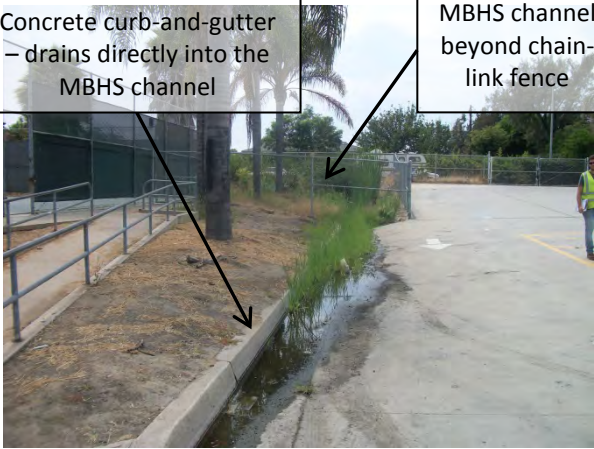
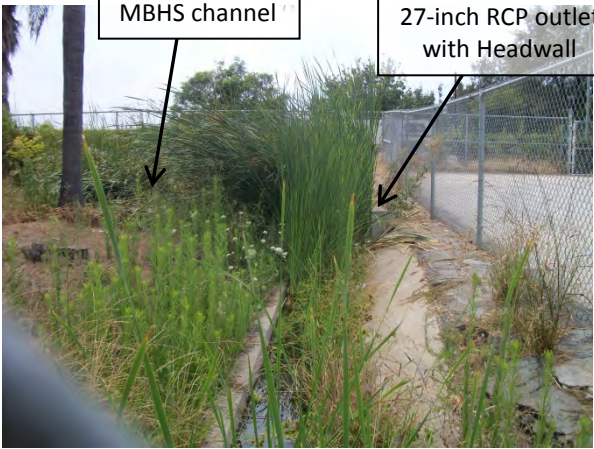
- Attachment 1 - Site Photos
- Attachment 2 – Figures
 - Figure 1. Vicinity Map
 - Figure 2. Hydrologic Workmap
 - Figure 3. Hydraulic Workmap
 - Figure 4. Hydraulic Workmap
- Attachment 3 – Detailed Hydrologic Analysis Results
 - 1-year Hydrologic Analysis Results
 - 2-year Hydrologic Analysis Results
 - 5-year Hydrologic Analysis Results
 - 10-year Hydrologic Analysis Results
 - 25-year Hydrologic Analysis Results
 - 50-year Hydrologic Analysis Results
 - 100-year Hydrologic Analysis Results
- Attachment 4 – Hydraulic Profiles
 - Current Vegetated Condition
 - Ultimate Vegetated Condition (see Current Vegetated Condition)
 - Maintained Condition – No Sediment Removed
 - Maintained Condition – Sediment Removed
- Attachment 5 –Detailed Hydraulic Analysis Results
 - Current Vegetated Condition (1-year, 2-year, 5-year, and Maximum Flow)
 - Maintained Condition – No Sediment Removed (1-year, 2-year, 5-year, and Maximum Flow)
 - Maintained Condition – Sediment Removed (1-year, 2-year, 5-year, and Maximum Flow)
 - Current Vegetated Condition (10-year, 25-year, 50-yr, and 100-yr)

- Maintained Condition – No Sediment Removed (10-year, 25-year, 50-yr, and 100-yr)
- Maintained Condition – Sediment Removed (10-year, 25-year, 50-yr, and 100-yr)

ATTACHMENT 1 - SITE PHOTOS

SITE PHOTOS:

These photographs were taken during a site visit that was conducted on August 16th, 2012. See the Hydraulic Workmap, Figures 3 & 4 for the photograph numbers, locations, and orientation. Photograph numbers 1 through 11 pertain to the Mission Bay High School (MBHS) Channel, while Photograph numbers 12 through 22 pertain to the Pacific Beach Drive\Olney Street (PBO) Channel.

 <p>27-inch RCP outlet with Headwall</p> <p>1. MBHS – Upstream end – 27-inch RCP outlet with Headwall. Existing vegetation obstructing the outlet of the existing 27-inch RCP that discharges into the MBHS concrete channel.</p>	 <p>2. MBHS – Downstream of headwall. Notice the amount of growth and density of the existing vegetation within the MBHS concrete channel. Concrete channel is not visible under vegetation.</p>
 <p>Concrete curb-and-gutter – drains directly into the MBHS channel</p> <p>MBHS channel beyond chain-link fence</p> <p>3. MBHS – Dry-weather non-storm water backing up the concrete channel and into the school bus loading\unloading zone of Mission Bay High School.</p>	 <p>MBHS channel</p> <p>27-inch RCP outlet with Headwall</p> <p>4. MBHS – Loading\unloading zone of Mission Bay High School curb-and-gutter channel transition. Dry weather ponded water backing up the channel and into the loading\unloading zone.</p>



5. MBHS – South of Baseball field looking north. Existing vegetation is ~6 ft., within the concrete channel.



6. MBHS – South of Baseball field looking south. Existing vegetation is ~6 ft., within the concrete channel.



7. MBHS – North edge of southerly parking lot looking north. Dry weather ponded water is observed. The ice plant has completely covered the west side of the channel and has partially grown across the concrete channel bottom.



8. MBHS – North edge of southerly parking lot looking south. Existing vegetation is ~6 ft. high, within the concrete channel.



9. MBHS – Midpoint of southerly parking lot. The 3 to 4-inch thick sediment layer was observed, as well as the ponded water, trash, and even a wooden pallet within the channel. The concrete channel is visible in this area.



10. MBHS – South end at edge of high school. High amounts of trash and vegetation growth were observed within the channel. Vegetation growth could become an obstruction to storm flow during a major storm event.



11. MBHS – Downstream end/Pacific Beach DR/Olney upstream end. Transition of concrete channel to earthen channel. Large amounts of vegetation growth and debris were observed.



12. PBO - upstream end looking east. High vegetation density and growth were observed at the upstream end of the earthen channel.



13. PBO - upstream end. High vegetation density and growth at the upstream end of the earthen channel were observed.



14. PBO - upstream end looking west. High vegetation density observed.



15. PBO - approximately midpoint of channel looking east. The high vegetation density and growth on the channel bed, and light vegetation growth on the south channel side slope is representative of the conditions along the earthen channel.



16. PBO - approximately 200 feet upstream of 42-inch culvert sections where vegetation tends to be lighter were observed. This image illustrates one of two sections where the vegetation growth was lighter.

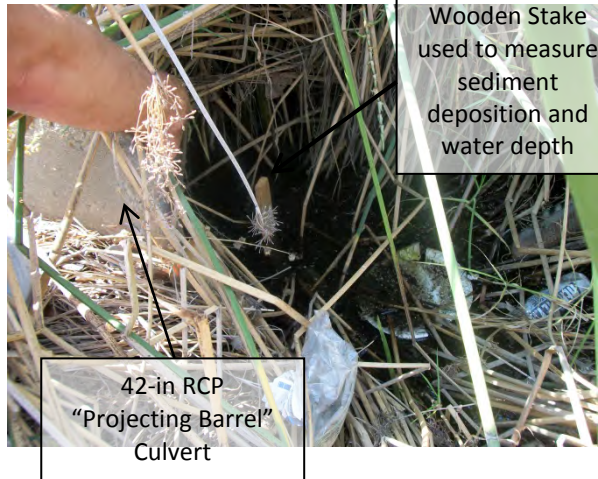


17. PBO - downstream end looking east. High vegetation density and growth were observed.



42-in RCP
"Projecting
Barrel"
Culvert

18. PBO downstream end at 42-inch culvert. High vegetation density observed at the entrance to the 42-inch projecting barrel (no headwall) type culvert where the earthen channel discharges. The vegetation obstructs approximately 50 percent of the cross sectional area of the 42-inch drainpipe.



Wooden Stake
used to measure
sediment
deposition and
water depth

42-in RCP
"Projecting Barrel"
Culvert

19. PBO - 42-inch RCP culvert. 1-foot deep ponded water was measured at the entrance and approximately 8 inches of sediment deposition.



Young
palm tree

20. PBO - At Olney Street looking east. It was observed that vegetation on the north side slope is very light. Additionally, a young palm tree is growing adjacent to the culvert entrance, which in the near future could damage the entrance to the culvert and further reduce the capacity of the culvert.



Conc. Bowl-shaped Basin

MBSIS Diversion Structure

21. Outfall at Pacific Beach Drive/Olney Street intersection. The MBSIS diversion structure is located at the downstream end of the 42-inch culvert. Water is ponded at the exit of the structure in a concrete bowl-shaped basin.



Conc. Bowl-shaped Basin

MBSIS Diversion Structure

22. Outfall at Pacific Beach Drive/Olney Street intersection. This image shows another view of MBSIS concrete diversion structure and concrete bowl-shaped basin.

SITE PHOTOS:

These photographs were taken during a site visit that was conducted on September 19th, 2013. See the Hydraulic Workmap, Figures 3 & 4 for the photograph numbers, locations, and orientation. Photograph numbers 23 through 30 pertain to the Mission Bay High School (MBHS) Channel, while Photograph numbers 31 through 37 pertain to the Pacific Beach Drive\Olney Street (PBO) Channel.



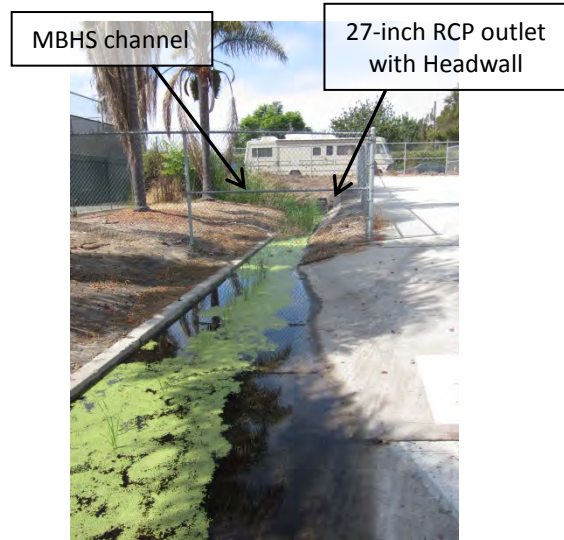
23. MBHS - Upstream end – 27-inch RCP outlet with Headwall. Existing vegetation that was obstructing the outlet of the existing 27-inch RCP has been removed in an effort to minimize flooding impacts and back flows.



24. MBHS - Downstream of headwall. Notice that the amount of growth and density of the existing vegetation within the MBHS concrete channel is significantly denser than the previous year.



25. MBHS – Dry-weather non-storm water backing up the concrete channel and into the school bus loading\unloading zone of Mission Bay High School. Notice how the removal of the vegetation at the outlet of the 27-inch RCP does not remediate the flooding in this area.



26. MBHS – Dry-weather non-storm water backing up the concrete channel and into the school bus loading\unloading zone of Mission Bay High School. Notice how the removal of the vegetation at the outlet of the 27-inch RCP does not remediate the flooding in this area.



27. MBHS – South of Baseball field looking north. Existing vegetation is ~6 ft., within the concrete channel, approximately of the same height along this section of the channel, but denser than previous year.



28. MBHS – South of Baseball field looking south. Existing vegetation is ~8 ft., within the concrete channel, taller and denser along this section of the channel than previous year.



Ice plant significantly bulging up at this location, which blocks storm flow

29. MBHS – North edge of southerly parking lot looking south. Dry weather ponded water is observed at about the same depth as previous year. The ice plant has completely covered the west side of the channel and has partially grown across the concrete channel bottom. Notice that as a result of a denser ice plant, it is actually bulging up.



30. MBHS – North edge of southerly parking lot looking south. Existing vegetation is ~8-10 ft. high, within the concrete channel, denser and taller than previous year.



31. PBO - upstream end. Taller and denser vegetation growth than previous year at the upstream end of the channel.



32. PBO - upstream end looking west. Denser vegetation than previous year observed.



33. PBO - approximately midpoint of channel looking east. The denser vegetation growth on the channel bed than previous year, and similar vegetation growth on the south channel side slope are visible.



34. PBO - approximately 200 feet upstream of 42-inch culvert section, the vegetation growth is denser than the previous year.



35. PBO - downstream end looking east. The denser vegetation growth than the previous year is observed.



42-in RCP
"Projecting
Barrel"
Culvert

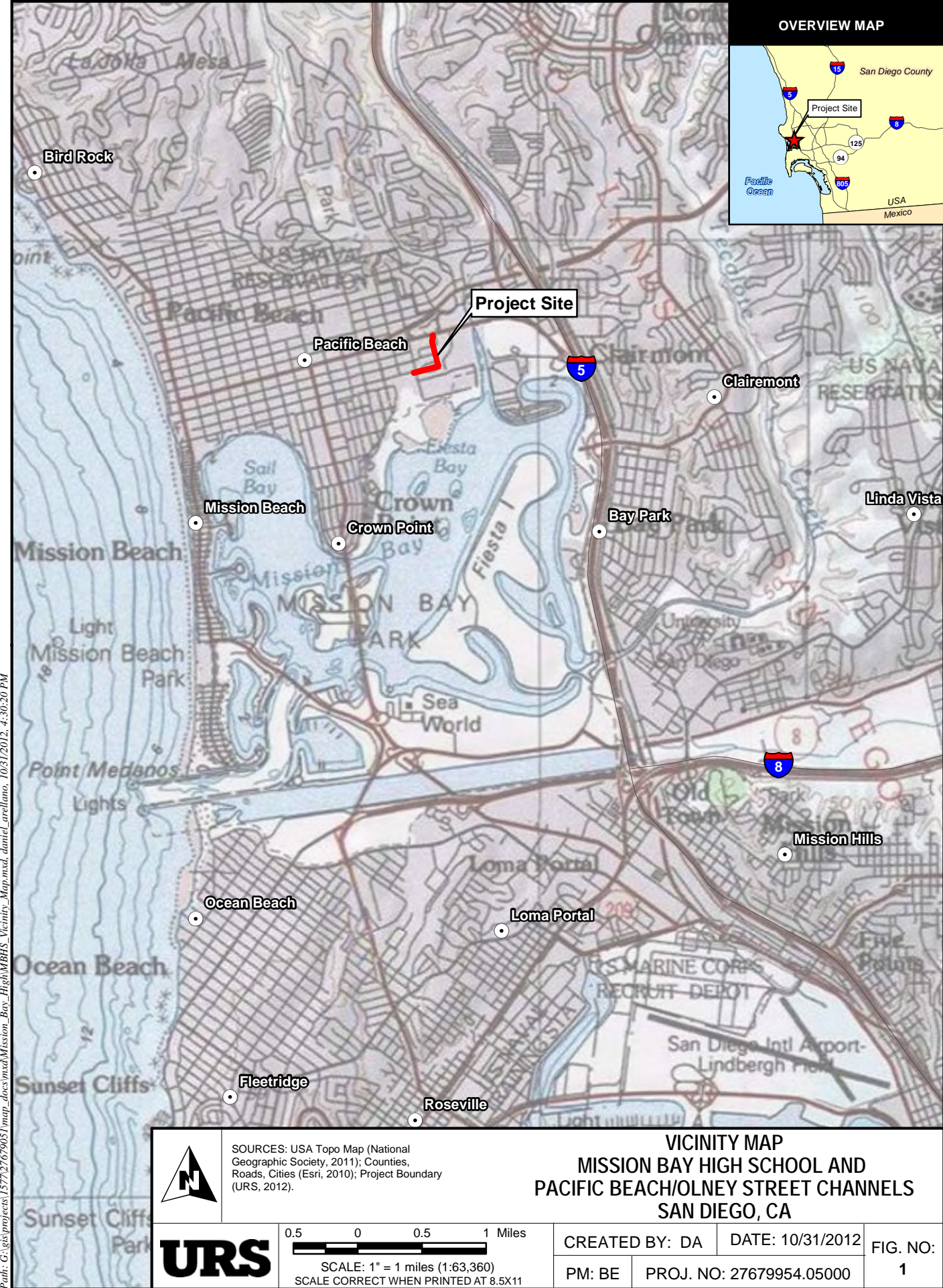
36. PBO downstream end at 42-inch culvert. Denser vegetation is observed than the previous year at the entrance of the culvert; however, sediment deposition and ponded water depth are approximately the same.



37. PBO - At Olney Street looking east. It was observed that vegetation at approximately 25 feet from the culvert is denser than the previous year. A young palm tree that was growing very close to the culvert the previous year seems to have been removed as it was not visible during the last site visit.

ATTACHMENT 2 - FIGURES

FIGURE 1. VICINTIY MAP



Path: G:\gis\projects\157727679051\map_docs\mxd\Mission_Bay_High\MBHS_Vicinity_Map.mxd; daniel_orellano, 10/31/2012, 4:30:20 PM

OVERVIEW MAP



Project Site

Pacific Beach

Mission Beach

Crown Point

Bay Park

Clairemont

Linda Vista

Mission Beach

Mission Beach

Point Medanos

Lights

Ocean Beach

Ocean Beach

Sunset Cliffs

Sunset Cliffs

Fletridge

Roseville

Loma Portal

Loma Portal

Mission Hills

Old Town

Park

San Diego

University

San Diego

San Diego

San Diego

San Diego

San Diego

San Diego

San Diego

San Diego

San Diego

San Diego

San Diego

San Diego

San Diego

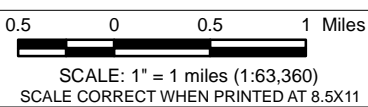
San Diego

San Diego



SOURCES: USA Topo Map (National Geographic Society, 2011); Counties, Roads, Cities (Esri, 2010); Project Boundary (URS, 2012).

**VICINITY MAP
MISSION BAY HIGH SCHOOL AND
PACIFIC BEACH/OLNEY STREET CHANNELS
SAN DIEGO, CA**



CREATED BY: DA

DATE: 10/31/2012

FIG. NO:








PM: BE

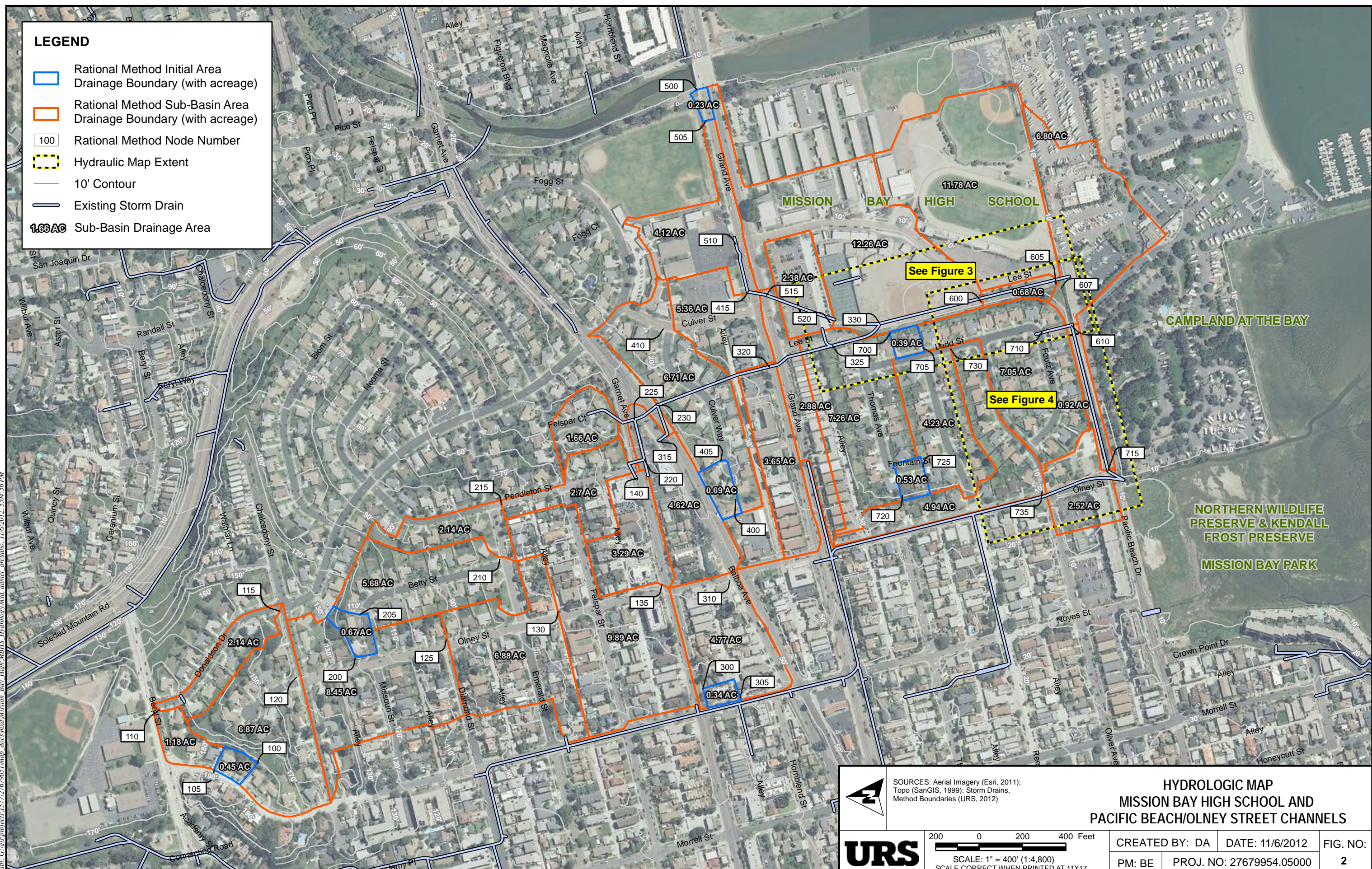
PROJ. NO: 27679954.05000

1

FIGURE 2. HYDROLOGIC WORKMAP

LEGEND

-  Rational Method Initial Area Drainage Boundary (with acreage)
-  Rational Method Sub-Basin Area Drainage Boundary (with acreage)
-  Rational Method Node Number
-  Hydraulic Map Extent
-  10' Contour
-  Existing Storm Drain
-  Sub-Basin Drainage Area



Path: G:\gis\proj\cas\1577\2767905\map_docs\mhd\Mission_Bay_High\MBHS_Hydrology.mxd, daniel_ambiano, 11/06/2012, 5:04:56 PM



SOURCES: Aerial Imagery (Esri, 2011);
Topo (SanGIS, 1999); Storm Drains,
Method Boundaries (URS, 2012)

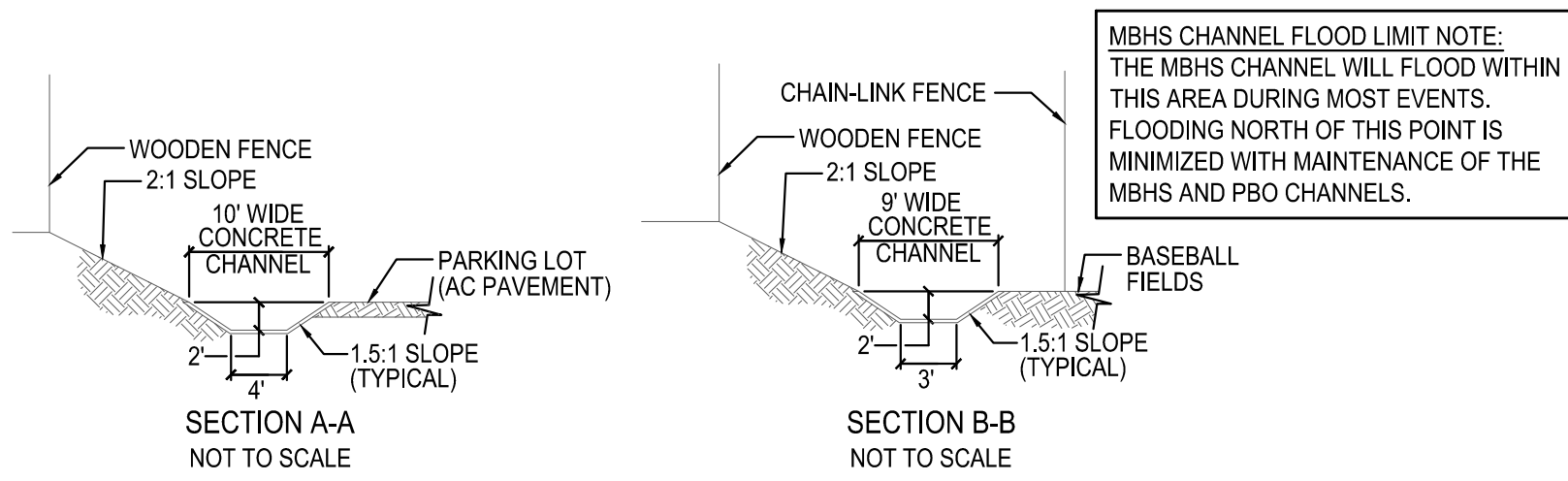


200 0 200 400 Feet
SCALE: 1" = 400' (1:4,800)
SCALE CORRECT WHEN PRINTED AT 11X17

HYDROLOGIC MAP
MISSION BAY HIGH SCHOOL AND
PACIFIC BEACH/OLNEY STREET CHANNELS

CREATED BY: DA	DATE: 11/6/2012	FIG. NO:
PM: BE	PROJ. NO: 27679954.05000	2

FIGURE 3. HYDRAULIC WORKMAP



MBHS CHANNEL FLOOD LIMIT NOTE:
 THE MBHS CHANNEL WILL FLOOD WITHIN THIS AREA DURING MOST EVENTS. FLOODING NORTH OF THIS POINT IS MINIMIZED WITH MAINTENANCE OF THE MBHS AND PBO CHANNELS.

LEGEND

HEC-RAS CROSS SECTION NO. AND LOCATION		PHOTOGRAPH LOCATION & ORIENTATION (PHOTOGRAPH DATE: AUGUST 2012)	
APPROXIMATE CHANNEL TOP WIDTH		PHOTOGRAPH LOCATION & ORIENTATION (PHOTOGRAPH DATE: SEPTEMBER 2013)	
EXIST. STORM DRAIN		DIRECTION OF FLOW	
EXIST. 2:1 SLOPE			
EXIST. CHAINLINK FENCE			
FLOOD LIMIT			

SOURCES: AERIAL IMAGERY (ESRI, 2011), SAN-GIS, URS PHOTOS (AUG. 2012 & SEP. 2013).

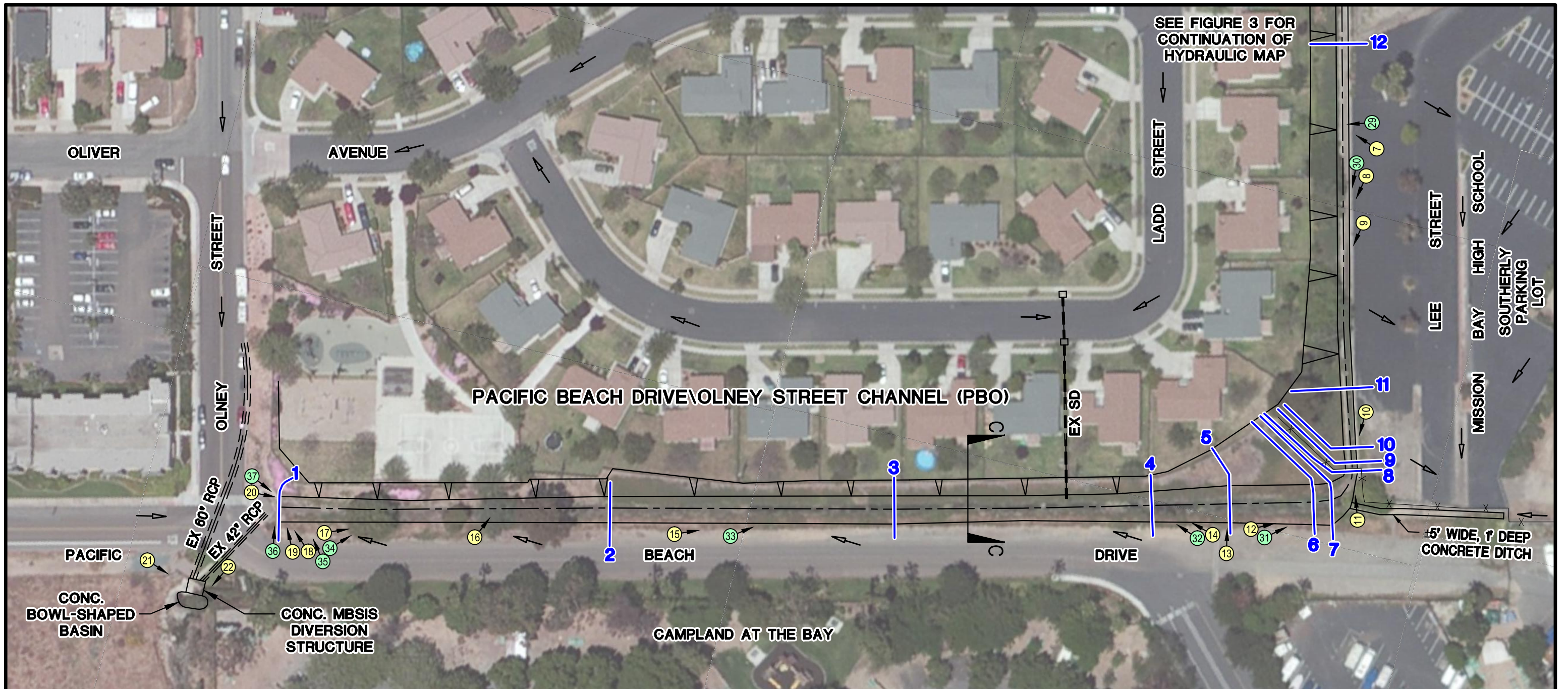
HYDRAULIC WORKMAP
MISSION BAY HIGH SCHOOL AND PACIFIC BEACH/OLNEY STREET CHANNELS

CREATED BY: JG/NR DATE: 10/4/2013 FIG. NO: 3

PM: BE PROJ. NO: 27679067.05000

URS 0 40 80 160 SCALE: 1" = 80'

FIGURE 4. HYDRAULIC MAP

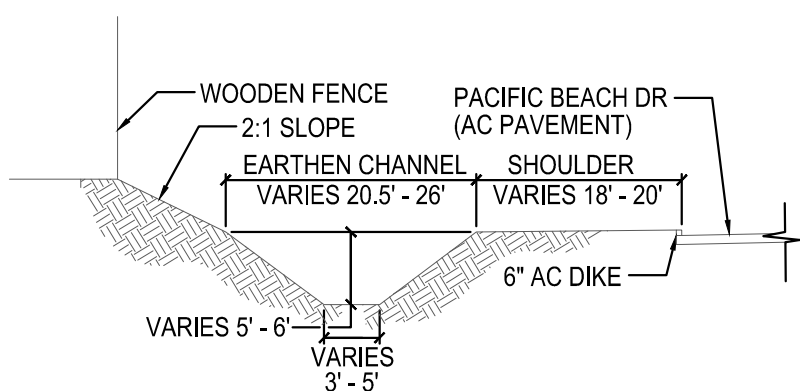


SEE FIGURE 3 FOR CONTINUATION OF HYDRAULIC MAP

PACIFIC BEACH DRIVE/OLNEY STREET CHANNEL (PBO)

CONC. BOWL-SHAPED BASIN
 CONC. MBSIS DIVERSION STRUCTURE

5' WIDE, 1' DEEP CONCRETE DITCH



SECTION C-C
NOT TO SCALE

LEGEND

- HEC-RAS CROSS SECTION NO. AND LOCATION 4 ———
- APPROXIMATE CHANNEL TOP WIDTH ———
- EXIST. STORM DRAIN ———
- EXIST. 2:1 SLOPE V V V
- EXIST. CHAINLINK FENCE * * *
- PHOTOGRAPH LOCATION & ORIENTATION (PHOTOGRAPH DATE: AUGUST 2012) 16
- PHOTOGRAPH LOCATION & ORIENTATION (PHOTOGRAPH DATE: SEPTEMBER 2013) 35
- DIRECTION OF FLOW ———>

		SOURCES: AERIAL IMAGERY (ESRI, 2011), SAN-GIS, URS PHOTOS (AUG. 2012 & SEP. 2013).		HYDRAULIC WORKMAP MISSION BAY HIGH SCHOOL AND PACIFIC BEACH/OLNEY STREET CHANNELS	
		CREATED BY: JG/NR	DATE: 10/4/2013	FIG. NO:	
PM: BE		PROJ. NO: 27679067.05000		4	

ATTACHMENT 3 – DETAILED HYDROLOGIC ANALYSIS RESULTS

1-YEAR HYDROLOGIC ANALYSIS RESULTS

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4

Rational method hydrology program based on
 San Diego County Flood Control Division 1985 hydrology manual
 Rational Hydrology Study Date: 09/27/13

 MISSION BAY HIGH SCHOOL EXIST CONDITION HYDROLOGY ANALYSIS - MMP MAPS 36
 & 37 - ASSUMPTIONS: 1. n=0.030 IN MBHS CONC CHANNEL; AND 2. n=0.035 IN
 PACIFIC BEACH/OLNEY ST EARTHEN CHANNEL
 CIVILD FILE: MBHS1YR.RSD

***** Hydrology Study Control Information *****

 Program License Serial Number 6219

Rational hydrology study storm event year is 1.0
 English (in-lb) input data Units used
 English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
 Elevation 0 - 1500 feet
 Factor (to multiply * intensity) = 1.000
 Only used if inside City of San Diego
 San Diego hydrology manual 'C' values used
 Runoff coefficients by modified rational method

 Process from Point/Station 100.000 to Point/Station 105.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 194.700(Ft.)
 Highest elevation = 186.000(Ft.)
 Lowest elevation = 185.500(Ft.)
 Elevation difference = 0.500(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 21.73 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.5500) * (194.700^{.5})] / (0.257^{(1/3)}) = 21.73$
 Rainfall intensity (I) = 0.909(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.225(CFS)
 Total initial stream area = 0.450(Ac.)

 Process from Point/Station 105.000 to Point/Station 110.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 185.500(Ft.)
 End of street segment elevation = 174.000(Ft.)
 Length of street segment = 428.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020

Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 0.520(CFS)
 Depth of flow = 0.176(Ft.), Average velocity = 2.214(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 4.044(Ft.)
 Flow velocity = 2.21(Ft/s)
 Travel time = 3.23 min. TC = 24.96 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 0.839(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 0.897
 Subarea runoff = 0.527(CFS) for 1.180(Ac.)
 Total runoff = 0.752(CFS) Total area = 1.630(Ac.)
 Street flow at end of street = 0.752(CFS)
 Half street flow at end of street = 0.752(CFS)
 Depth of flow = 0.194(Ft.), Average velocity = 2.370(Ft/s)
 Flow width (from curb towards crown) = 4.963(Ft.)

 Process from Point/Station 110.000 to Point/Station 115.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 174.000(Ft.)
 End of street segment elevation = 138.000(Ft.)
 Length of street segment = 762.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 1.246(CFS)
 Depth of flow = 0.206(Ft.), Average velocity = 3.288(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 5.547(Ft.)
 Flow velocity = 3.29(Ft/s)
 Travel time = 3.87 min. TC = 28.83 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 0.770(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 2.074
 Subarea runoff = 0.845(CFS) for 2.140(Ac.)

MBHS1YR.out

Total runoff = 1.597(CFS) Total area = 3.770(Ac.)
 Street flow at end of street = 1.597(CFS)
 Half street flow at end of street = 1.597(CFS)
 Depth of flow = 0.220(Ft.), Average velocity = 3.467(Ft/s)
 Flow width (from curb towards crown)= 6.240(Ft.)

 Process from Point/Station 115.000 to Point/Station 120.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 138.000(Ft.)
 End of street segment elevation = 137.500(Ft.)
 Length of street segment = 522.400(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 3.052(CFS)
 Depth of flow = 0.371(Ft.), Average velocity = 0.772(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 13.801(Ft.)
 Flow velocity = 0.77(Ft/s)
 Travel time = 11.27 min. TC = 40.10 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 0.625(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 5.852
 Subarea runoff = 2.062(CFS) for 6.870(Ac.)
 Total runoff = 3.659(CFS) Total area = 10.640(Ac.)
 Street flow at end of street = 3.659(CFS)
 Half street flow at end of street = 1.830(CFS)
 Depth of flow = 0.391(Ft.), Average velocity = 0.807(Ft/s)
 Flow width (from curb towards crown)= 14.815(Ft.)

 Process from Point/Station 120.000 to Point/Station 125.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 137.500(Ft.)
 End of street segment elevation = 92.000(Ft.)
 Length of street segment = 716.200(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160

MBHS1YR.out

Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 5.112(CFS)
 Depth of flow = 0.239(Ft.), Average velocity = 4.321(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 7.213(Ft.)
 Flow velocity = 4.32(Ft/s)
 Travel time = 2.76 min. TC = 42.86 min.

Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 0.599(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 10.500
 Subarea runoff = 2.630(CFS) for 8.450(Ac.)
 Total runoff = 6.289(CFS) Total area = 19.090(Ac.)
 Street flow at end of street = 6.289(CFS)
 Half street flow at end of street = 3.145(CFS)
 Depth of flow = 0.253(Ft.), Average velocity = 4.531(Ft/s)
 Flow width (from curb towards crown)= 7.892(Ft.)

 Process from Point/Station 125.000 to Point/Station 130.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 92.000(Ft.)
 End of street segment elevation = 69.000(Ft.)
 Length of street segment = 528.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 7.423(CFS)
 Depth of flow = 0.278(Ft.), Average velocity = 4.075(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.162(Ft.)
 Flow velocity = 4.08(Ft/s)
 Travel time = 2.16 min. TC = 45.02 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 0.580(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 14.284
 Subarea runoff = 2.000(CFS) for 6.880(Ac.)
 Total runoff = 8.289(CFS) Total area = 25.970(Ac.)
 Street flow at end of street = 8.289(CFS)
 Half street flow at end of street = 4.145(CFS)
 Depth of flow = 0.287(Ft.), Average velocity = 4.183(Ft/s)
 Flow width (from curb towards crown)= 9.589(Ft.)

MBHS1YR.out

```

*****
Process from Point/Station      130.000 to Point/Station      135.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 69.000(Ft.)
End of street segment elevation = 49.500(Ft.)
Length of street segment = 494.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 22.000(Ft.)
Distance from crown to crossfall grade break = 18.500(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)
Gutter hike from flowline = 1.500(In.)
Manning's N in gutter = 0.0160
Manning's N from gutter to grade break = 0.0160
Manning's N from grade break to crown = 0.0160
Estimated mean flow rate at midpoint of street = 9.867(CFS)
Depth of flow = 0.305(Ft.), Average velocity = 4.200(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 10.504(Ft.)
Flow velocity = 4.20(Ft/s)
Travel time = 1.96 min. TC = 46.98 min.
Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type ]
Rainfall intensity = 0.565(In/Hr) for a 1.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.591 CA = 21.207
Subarea runoff = 3.684(CFS) for 9.890(Ac.)
Total runoff = 11.973(CFS) Total area = 35.860(Ac.)
Street flow at end of street = 11.973(CFS)
Half street flow at end of street = 5.986(CFS)
Depth of flow = 0.322(Ft.), Average velocity = 4.400(Ft/s)
Flow width (from curb towards crown)= 11.355(Ft.)

*****
Process from Point/Station      135.000 to Point/Station      140.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 49.500(Ft.)
End of street segment elevation = 43.700(Ft.)
Length of street segment = 502.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 22.000(Ft.)
Distance from crown to crossfall grade break = 18.500(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)
Gutter hike from flowline = 1.500(In.)
Manning's N in gutter = 0.0160
Manning's N from gutter to grade break = 0.0160
Manning's N from grade break to crown = 0.0160
Estimated mean flow rate at midpoint of street = 12.522(CFS)
Depth of flow = 0.480(Ft.), Average velocity = 3.315(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 19.251(Ft.)
Flow velocity = 3.32(Ft/s)

```

MBHS1YR.out

```

Travel time = 2.52 min. TC = 49.51 min.
Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type ]
Rainfall intensity = 0.546(In/Hr) for a 1.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.613 CA = 24.003
Subarea runoff = 1.129(CFS) for 3.290(Ac.)
Total runoff = 13.102(CFS) Total area = 39.150(Ac.)
Street flow at end of street = 13.102(CFS)
Half street flow at end of street = 13.102(CFS)
Depth of flow = 0.487(Ft.), Average velocity = 3.352(Ft/s)
Flow width (from curb towards crown)= 19.588(Ft.)

*****
Process from Point/Station      135.000 to Point/Station      140.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 39.150(Ac.)
Runoff from this stream = 13.102(CFS)
Time of concentration = 49.51 min.
Rainfall intensity = 0.546(In/Hr)
Program is now starting with Main Stream No. 2

*****
Process from Point/Station      200.000 to Point/Station      205.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type ]
Initial subarea flow distance = 197.000(Ft.)
Highest elevation = 118.000(Ft.)
Lowest elevation = 111.000(Ft.)
Elevation difference = 7.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 9.11 min.
TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.5500)*( 197.000^0.5)/( 3.553^(1/3))]= 9.11
Rainfall intensity (I) = 1.452(In/Hr) for a 1.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff = 0.535(CFS)
Total initial stream area = 0.670(Ac.)

*****
Process from Point/Station      205.000 to Point/Station      210.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 111.000(Ft.)
End of street segment elevation = 75.000(Ft.)
Length of street segment = 731.500(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 22.000(Ft.)
Distance from crown to crossfall grade break = 18.500(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)

```

MBHS1YR.out

Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 2.803(CFS)
 Depth of flow = 0.211(Ft.), Average velocity = 3.427(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 5.811(Ft.)
 Flow velocity = 3.43(Ft/s)
 Travel time = 3.56 min. TC = 12.66 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.219(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 3.493
 Subarea runoff = 3.721(CFS) for 5.680(Ac.)
 Total runoff = 4.256(CFS) Total area = 6.350(Ac.)
 Street flow at end of street = 4.256(CFS)
 Half street flow at end of street = 2.128(CFS)
 Depth of flow = 0.236(Ft.), Average velocity = 3.756(Ft/s)
 Flow width (from curb towards crown)= 7.038(Ft.)

 Process from Point/Station 210.000 to Point/Station 215.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 75.000(Ft.)
 End of street segment elevation = 72.000(Ft.)
 Length of street segment = 298.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 4.973(CFS)
 Depth of flow = 0.372(Ft.), Average velocity = 2.508(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 13.827(Ft.)
 Flow velocity = 2.51(Ft/s)
 Travel time = 1.98 min. TC = 14.64 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.128(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.670
 Subarea runoff = 1.011(CFS) for 2.140(Ac.)
 Total runoff = 5.267(CFS) Total area = 8.490(Ac.)
 Street flow at end of street = 5.267(CFS)
 Half street flow at end of street = 5.267(CFS)

MBHS1YR.out

Depth of flow = 0.378(Ft.), Average velocity = 2.543(Ft/s)
 Flow width (from curb towards crown)= 14.141(Ft.)

 Process from Point/Station 215.000 to Point/Station 140.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 72.000(Ft.)
 End of street segment elevation = 43.700(Ft.)
 Length of street segment = 653.800(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 6.104(CFS)
 Depth of flow = 0.264(Ft.), Average velocity = 3.883(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.454(Ft.)
 Flow velocity = 3.88(Ft/s)
 Travel time = 2.81 min. TC = 17.45 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 1.026(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.586 CA = 6.559
 Subarea runoff = 1.465(CFS) for 2.700(Ac.)
 Total runoff = 6.732(CFS) Total area = 11.190(Ac.)
 Street flow at end of street = 6.732(CFS)
 Half street flow at end of street = 3.366(CFS)
 Depth of flow = 0.271(Ft.), Average velocity = 3.973(Ft/s)
 Flow width (from curb towards crown)= 8.809(Ft.)

 Process from Point/Station 215.000 to Point/Station 140.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 11.190(Ac.)
 Runoff from this stream = 6.732(CFS)
 Time of concentration = 17.45 min.
 Rainfall intensity = 1.026(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	13.102	49.51	0.546
2	6.732	17.45	1.026
Qmax(1) =	1.000 * 0.532 *	1.000 * 1.000 *	13.102) + 6.732) + = 16.683

MBHS1YR.out

```

Qmax(2) =
    1.000 *    0.352 *   13.102) +
    1.000 *    1.000 *    6.732) + =    11.350

Total of 2 main streams to confluence:
Flow rates before confluence point:
    13.102    6.732
Maximum flow rates at confluence using above data:
    16.683    11.350
Area of streams before confluence:
    39.150    11.190

Results of confluence:
Total flow rate =    16.683(CFS)
Time of concentration =    49.507 min.
Effective stream area after confluence =    50.340(Ac.)

*****
Process from Point/Station    140.000 to Point/Station    220.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation =    36.150(Ft.)
Downstream point/station elevation =    34.120(Ft.)
Pipe length =    151.50(Ft.)    Manning's N =    0.013
No. of pipes =    1    Required pipe flow =    16.683(CFS)
Given pipe size =    30.00(In.)
Calculated individual pipe flow =    16.683(CFS)
Normal flow depth in pipe =    12.28(In.)
Flow top width inside pipe =    29.50(In.)
Critical Depth =    16.57(In.)
Pipe flow velocity =    8.83(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =    49.79 min.

*****
Process from Point/Station    220.000 to Point/Station    225.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation =    34.120(Ft.)
Downstream point/station elevation =    31.700(Ft.)
Pipe length =    191.10(Ft.)    Manning's N =    0.013
No. of pipes =    1    Required pipe flow =    16.683(CFS)
Given pipe size =    30.00(In.)
Calculated individual pipe flow =    16.683(CFS)
Normal flow depth in pipe =    12.47(In.)
Flow top width inside pipe =    29.57(In.)
Critical Depth =    16.57(In.)
Pipe flow velocity =    8.64(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    50.16 min.

*****
Process from Point/Station    220.000 to Point/Station    225.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A =    0.000
Decimal fraction soil group B =    0.000
Decimal fraction soil group C =    0.000
Decimal fraction soil group D =    1.000
[SINGLE FAMILY area type    ]
Time of concentration =    50.16 min.
Rainfall intensity =    0.541(In/Hr) for a    1.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C =    0.605    CA =    31.476
    
```

MBHS1YR.out

```

Subarea runoff =    0.353(CFS) for    1.660(Ac.)
Total runoff =    17.036(CFS)    Total area =    52.000(Ac.)

*****
Process from Point/Station    225.000 to Point/Station    230.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation =    31.200(Ft.)
Downstream point/station elevation =    24.120(Ft.)
Pipe length =    125.43(Ft.)    Manning's N =    0.013
No. of pipes =    1    Required pipe flow =    17.036(CFS)
Given pipe size =    36.00(In.)
Calculated individual pipe flow =    17.036(CFS)
Normal flow depth in pipe =    7.97(In.)
Flow top width inside pipe =    29.89(In.)
Critical Depth =    15.83(In.)
Pipe flow velocity =    14.64(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    50.30 min.

*****
Process from Point/Station    225.000 to Point/Station    230.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number:    1
Stream flow area =    52.000(Ac.)
Runoff from this stream =    17.036(CFS)
Time of concentration =    50.30 min.
Rainfall intensity =    0.540(In/Hr)
Program is now starting with Main Stream No.    2

*****
Process from Point/Station    300.000 to Point/Station    305.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A =    0.000
Decimal fraction soil group B =    0.000
Decimal fraction soil group C =    0.000
Decimal fraction soil group D =    1.000
[MULTI - UNITS area type    ]
Initial subarea flow distance =    176.600(Ft.)
Highest elevation =    64.000(Ft.)
Lowest elevation =    30.000(Ft.)
Elevation difference =    34.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =    3.57 min.
TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.7000)*( 176.600^0.5)/( 19.253^(1/3))]=    3.57
Setting time of concentration to 5 minutes
Rainfall intensity (I) =    2.015(In/Hr) for a    1.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C =    0.700
Subarea runoff =    0.480(CFS)
Total initial stream area =    0.340(Ac.)

*****
Process from Point/Station    305.000 to Point/Station    310.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =    60.000(Ft.)
End of street segment elevation =    45.500(Ft.)
Length of street segment =    739.300(Ft.)
Height of curb above gutter flowline =    6.0(In.)
Width of half street (curb to crown) =    22.000(Ft.)
    
```

MBHS1YR.out

Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 3.844(CFS)
 Depth of flow = 0.314(Ft.), Average velocity = 3.033(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.938(Ft.)
 Flow velocity = 3.03(Ft/s)
 Travel time = 4.06 min. TC = 9.06 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 1.456(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.700 CA = 3.577
 Subarea runoff = 4.727(CFS) for 4.770(Ac.)
 Total runoff = 5.207(CFS) Total area = 5.110(Ac.)
 Street flow at end of street = 5.207(CFS)
 Half street flow at end of street = 5.207(CFS)
 Depth of flow = 0.342(Ft.), Average velocity = 3.263(Ft/s)
 Flow width (from curb towards crown)= 12.346(Ft.)

 Process from Point/Station 310.000 to Point/Station 315.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 45.500(Ft.)
 End of street segment elevation = 33.500(Ft.)
 Length of street segment = 721.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 7.561(CFS)
 Depth of flow = 0.390(Ft.), Average velocity = 3.359(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 14.764(Ft.)
 Flow velocity = 3.36(Ft/s)
 Travel time = 3.58 min. TC = 12.64 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 1.220(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area

MBHS1YR.out

(Q=KCIA) is C = 0.771 CA = 7.504
 Subarea runoff = 3.945(CFS) for 4.620(Ac.)
 Total runoff = 9.152(CFS) Total area = 9.730(Ac.)
 Street flow at end of street = 9.152(CFS)
 Half street flow at end of street = 9.152(CFS)
 Depth of flow = 0.413(Ft.), Average velocity = 3.520(Ft/s)
 Flow width (from curb towards crown)= 15.902(Ft.)

 Process from Point/Station 315.000 to Point/Station 230.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 27.800(Ft.)
 Downstream point/station elevation = 24.120(Ft.)
 Pipe length = 189.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 9.152(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 9.152(CFS)
 Normal flow depth in pipe = 10.31(In.)
 Flow top width inside pipe = 17.81(In.)
 Critical Depth = 14.05(In.)
 Pipe flow velocity = 8.73(Ft/s)
 Travel time through pipe = 0.36 min.
 Time of concentration (TC) = 13.00 min.

 Process from Point/Station 315.000 to Point/Station 230.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 9.730(Ac.)
 Runoff from this stream = 9.152(CFS)
 Time of concentration = 13.00 min.
 Rainfall intensity = 1.201(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	17.036	50.30	0.540
2	9.152	13.00	1.201
Qmax(1) =	1.000 *	1.000 *	17.036) +
	0.450 *	1.000 *	9.152) + =
Qmax(2) =	1.000 *	0.259 *	17.036) +
	1.000 *	1.000 *	9.152) + =
			13.556

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 17.036 9.152
 Maximum flow rates at confluence using above data:
 21.151 13.556
 Area of streams before confluence:
 52.000 9.730

Results of confluence:
 Total flow rate = 21.151(CFS)
 Time of concentration = 50.305 min.
 Effective stream area after confluence = 61.730(Ac.)

MBHS1YR.out

Process from Point/Station 230.000 to Point/Station 320.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 24.120(Ft.)
 Downstream point/station elevation = 11.910(Ft.)
 Pipe length = 544.91(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 21.151(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 21.151(CFS)
 Normal flow depth in pipe = 11.25(In.)
 Flow top width inside pipe = 33.37(In.)
 Critical Depth = 17.75(In.)
 Pipe flow velocity = 11.21(Ft/s)
 Travel time through pipe = 0.81 min.
 Time of concentration (TC) = 51.11 min.

 Process from Point/Station 230.000 to Point/Station 320.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 51.11 min.
 Rainfall intensity = 0.535(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.635 CA = 41.535
 Subarea runoff = 1.058(CFS) for 3.650(Ac.)
 Total runoff = 22.209(CFS) Total area = 65.380(Ac.)

 Process from Point/Station 320.000 to Point/Station 325.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 11.910(Ft.)
 Downstream point/station elevation = 8.470(Ft.)
 Pipe length = 215.48(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 22.209(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 22.209(CFS)
 Normal flow depth in pipe = 12.61(In.)
 Flow top width inside pipe = 34.35(In.)
 Critical Depth = 18.20(In.)
 Pipe flow velocity = 10.05(Ft/s)
 Travel time through pipe = 0.36 min.
 Time of concentration (TC) = 51.47 min.

 Process from Point/Station 320.000 to Point/Station 325.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Time of concentration = 51.47 min.
 Rainfall intensity = 0.532(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.627 CA = 45.528
 Subarea runoff = 2.026(CFS) for 7.260(Ac.)
 Total runoff = 24.235(CFS) Total area = 72.640(Ac.)

MBHS1YR.out

 Process from Point/Station 325.000 to Point/Station 330.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.470(Ft.)
 Downstream point/station elevation = 7.000(Ft.)
 Pipe length = 249.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 24.235(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 24.235(CFS)
 Normal flow depth in pipe = 17.44(In.)
 Flow top width inside pipe = 35.98(In.)
 Critical Depth = 19.04(In.)
 Pipe flow velocity = 7.14(Ft/s)
 Travel time through pipe = 0.58 min.
 Time of concentration (TC) = 52.06 min.

 Process from Point/Station 325.000 to Point/Station 330.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 72.640(Ac.)
 Runoff from this stream = 24.235(CFS)
 Time of concentration = 52.06 min.
 Rainfall intensity = 0.528(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 400.000 to Point/Station 405.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 189.400(Ft.)
 Highest elevation = 33.000(Ft.)
 Lowest elevation = 30.000(Ft.)
 Elevation difference = 3.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 11.69 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{1/3})$
 $TC = [1.8 * (1.1 - 0.5500) * (189.400^{.5}) / (1.584^{1/3})] = 11.69$
 Rainfall intensity (I) = 1.271(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.483(CFS)
 Total initial stream area = 0.690(Ac.)

 Process from Point/Station 405.000 to Point/Station 410.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 30.000(Ft.)
 End of street segment elevation = 15.500(Ft.)
 Length of street segment = 708.400(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street

MBHS1YR.out

Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 2.829(CFS)
 Depth of flow = 0.238(Ft.), Average velocity = 2.439(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 7.132(Ft.)
 Flow velocity = 2.44(Ft/s)
 Travel time = 4.84 min. TC = 16.53 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.057(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.070
 Subarea runoff = 3.819(CFS) for 6.710(Ac.)
 Total runoff = 4.301(CFS) Total area = 7.400(Ac.)
 Street flow at end of street = 4.301(CFS)
 Half street flow at end of street = 2.151(CFS)
 Depth of flow = 0.266(Ft.), Average velocity = 2.686(Ft/s)
 Flow width (from curb towards crown)= 8.542(Ft.)

 Process from Point/Station 410.000 to Point/Station 415.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 15.500(Ft.)
 End of street segment elevation = 13.500(Ft.)
 Length of street segment = 521.600(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 5.859(CFS)
 Depth of flow = 0.367(Ft.), Average velocity = 1.530(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 13.577(Ft.)
 Flow velocity = 1.53(Ft/s)
 Travel time = 5.68 min. TC = 22.21 min.
 Adding area flow to street
 User specified 'C' value of 0.760 given for subarea
 Rainfall intensity = 0.898(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.638 CA = 8.144
 Subarea runoff = 3.009(CFS) for 5.360(Ac.)
 Total runoff = 7.310(CFS) Total area = 12.760(Ac.)
 Street flow at end of street = 7.310(CFS)
 Half street flow at end of street = 3.655(CFS)
 Depth of flow = 0.391(Ft.), Average velocity = 1.615(Ft/s)
 Flow width (from curb towards crown)= 14.804(Ft.)

MBHS1YR.out

 Process from Point/Station 410.000 to Point/Station 415.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 12.760(Ac.)
 Runoff from this stream = 7.310(CFS)
 Time of concentration = 22.21 min.
 Rainfall intensity = 0.898(In/Hr)

 Process from Point/Station 500.000 to Point/Station 505.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.900 given for subarea
 Initial subarea flow distance = 145.000(Ft.)
 Highest elevation = 16.000(Ft.)
 Lowest elevation = 14.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.89 min.
 TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
 TC = [1.8*(1.1-0.9000)*(145.000^0.5)/(1.379^(1/3))]= 3.89
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 2.015(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.900
 Subarea runoff = 0.417(CFS)
 Total initial stream area = 0.230(Ac.)

 Process from Point/Station 505.000 to Point/Station 510.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 14.000(Ft.)
 End of street segment elevation = 11.500(Ft.)
 Length of street segment = 583.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 4.154(CFS)
 Depth of flow = 0.399(Ft.), Average velocity = 1.739(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 15.225(Ft.)
 Flow velocity = 1.74(Ft/s)
 Travel time = 5.59 min. TC = 10.59 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 1.340(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.853 CA = 3.709
 Subarea runoff = 4.552(CFS) for 4.120(Ac.)

MBHS1YR.out

Total runoff = 4.970(CFS) Total area = 4.350(Ac.)
 Street flow at end of street = 4.970(CFS)
 Half street flow at end of street = 4.970(CFS)
 Depth of flow = 0.421(Ft.), Average velocity = 1.817(Ft/s)
 Flow width (from curb towards crown)= 16.322(Ft.)

 Process from Point/Station 510.000 to Point/Station 415.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 9.520(Ft.)
 Downstream point/station elevation = 8.800(Ft.)
 Pipe length = 259.69(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.970(CFS)
 Given pipe size = 15.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 1.198(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 1.536(Ft.)
 Minor friction loss = 0.382(Ft.) K-factor = 1.50
 Pipe flow velocity = 4.05(Ft/s)
 Travel time through pipe = 1.07 min.
 Time of concentration (TC) = 11.66 min.

 Process from Point/Station 510.000 to Point/Station 415.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 4.350(Ac.)
 Runoff from this stream = 4.970(CFS)
 Time of concentration = 11.66 min.
 Rainfall intensity = 1.273(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	7.310	22.21	0.898
2	4.970	11.66	1.273
Qmax(1) =	1.000 * 0.705 *	1.000 * 1.000 *	7.310) + 4.970) + = 10.814
Qmax(2) =	1.000 * 1.000 *	0.525 * 1.000 *	7.310) + 4.970) + = 8.807

Total of 2 streams to confluence:
 Flow rates before confluence point:
 7.310 4.970
 Maximum flow rates at confluence using above data:
 10.814 8.807
 Area of streams before confluence:
 12.760 4.350
 Results of confluence:
 Total flow rate = 10.814(CFS)
 Time of concentration = 22.211 min.
 Effective stream area after confluence = 17.110(Ac.)

 Process from Point/Station 415.000 to Point/Station 515.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.800(Ft.)

MBHS1YR.out

Downstream point/station elevation = 8.550(Ft.)
 Pipe length = 84.57(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 10.814(CFS)
 Given pipe size = 18.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 1.518(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 0.896(Ft.)
 Minor friction loss = 0.872(Ft.) K-factor = 1.50
 Pipe flow velocity = 6.12(Ft/s)
 Travel time through pipe = 0.23 min.
 Time of concentration (TC) = 22.44 min.

 Process from Point/Station 415.000 to Point/Station 515.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 22.44 min.
 Rainfall intensity = 0.892(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=K CIA) is C = 0.694 CA = 13.869
 Subarea runoff = 1.563(CFS) for 2.880(Ac.)
 Total runoff = 12.377(CFS) Total area = 19.990(Ac.)

 Process from Point/Station 515.000 to Point/Station 520.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.550(Ft.)
 Downstream point/station elevation = 7.620(Ft.)
 Pipe length = 337.77(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 12.377(CFS)
 Given pipe size = 27.00(In.)
 Calculated individual pipe flow = 12.377(CFS)
 Normal flow depth in pipe = 17.63(In.)
 Flow top width inside pipe = 25.71(In.)
 Critical Depth = 14.64(In.)
 Pipe flow velocity = 4.50(Ft/s)
 Travel time through pipe = 1.25 min.
 Time of concentration (TC) = 23.69 min.

 Process from Point/Station 515.000 to Point/Station 520.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.950 given for subarea
 Time of concentration = 23.69 min.
 Rainfall intensity = 0.865(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=K CIA) is C = 0.721 CA = 16.120
 Subarea runoff = 1.568(CFS) for 2.370(Ac.)
 Total runoff = 13.945(CFS) Total area = 22.360(Ac.)

 Process from Point/Station 520.000 to Point/Station 330.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 7.620(Ft.)
 Downstream point elevation = 7.000(Ft.)

MBHS1YR.out

Channel length thru subarea = 228.700(Ft.)
 Channel base width = 3.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 13.945(CFS)
 Depth of flow = 1.263(Ft.), Average velocity = 2.256(Ft/s)
 Channel flow top width = 6.789(Ft.)
 Flow Velocity = 2.26(Ft/s)
 Travel time = 1.69 min.
 Time of concentration = 25.38 min.
 Critical depth = 0.766(Ft.)

 Process from Point/Station 520.000 to Point/Station 330.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 22.360(Ac.)
 Runoff from this stream = 13.945(CFS)
 Time of concentration = 25.38 min.
 Rainfall intensity = 0.831(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	24.235	52.06	0.528
2	13.945	25.38	0.831
Qmax(1) =	1.000 * 0.636 *	1.000 * 1.000 *	24.235) + 13.945) + = 33.103
Qmax(2) =	1.000 * 1.000 *	0.488 * 1.000 *	24.235) + 13.945) + = 25.762

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 24.235 13.945
 Maximum flow rates at confluence using above data:
 33.103 25.762
 Area of streams before confluence:
 72.640 22.360

Results of confluence:
 Total flow rate = 33.103(CFS)
 Time of concentration = 52.055 min.
 Effective stream area after confluence = 95.000(Ac.)

 Process from Point/Station 330.000 to Point/Station 600.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 7.000(Ft.)
 Downstream point elevation = 6.350(Ft.)
 Channel length thru subarea = 499.000(Ft.)
 Channel base width = 4.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Estimated mean flow rate at midpoint of channel = 34.028(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)

MBHS1YR.out

Flow(q) thru subarea = 34.028(CFS)
 Depth of flow = 2.140(Ft.), Average velocity = 2.209(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 10.000(Ft.)
 Flow Velocity = 2.21(Ft/s)
 Travel time = 3.76 min.
 Time of concentration = 55.82 min.
 Critical depth = 1.125(Ft.)
 ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 0.505(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KClA) is C = 0.660 CA = 66.161
 Subarea runoff = 0.321(CFS) for 5.310(Ac.)
 Total runoff = 33.424(CFS) Total area = 100.310(Ac.)

 Process from Point/Station 600.000 to Point/Station 605.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 6.350(Ft.)
 Downstream point elevation = 5.880(Ft.)
 Channel length thru subarea = 357.200(Ft.)
 Channel base width = 4.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Estimated mean flow rate at midpoint of channel = 33.478(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 33.478(CFS)
 Depth of flow = 2.121(Ft.), Average velocity = 2.202(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 10.000(Ft.)
 Flow Velocity = 2.20(Ft/s)
 Travel time = 2.70 min.
 Time of concentration = 58.52 min.
 Critical depth = 1.117(Ft.)
 ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 The area added to the existing stream causes a
 a lower flow rate of Q = 32.569(CFS)
 therefore the upstream flow rate of Q = 33.424(CFS) is being used
 Rainfall intensity = 0.490(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KClA) is C = 0.660 CA = 66.465
 Subarea runoff = 0.000(CFS) for 0.320(Ac.)
 Total runoff = 33.424(CFS) Total area = 100.630(Ac.)

 Process from Point/Station 605.000 to Point/Station 607.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.880(Ft.)
 Downstream point elevation = 5.820(Ft.)
 Channel length thru subarea = 25.000(Ft.)
 Channel base width = 10.000(Ft.)

MBHS1YR.out

Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 36.596(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 5.000(Ft.)
 Flow(q) thru subarea = 36.596(CFS)
 Depth of flow = 1.237(Ft.), Average velocity = 2.432(Ft/s)
 Channel flow top width = 14.329(Ft.)
 Flow Velocity = 2.43(Ft/s)
 Travel time = 0.17 min.
 Time of concentration = 58.70 min.
 Critical depth = 0.719(Ft.)
 Adding area flow to channel
 User specified 'C' value of 0.570 given for subarea
 Rainfall intensity = 0.489(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.646 CA = 77.352
 Subarea runoff = 4.408(CFS) for 19.100(Ac.)
 Total runoff = 37.832(CFS) Total area = 119.730(Ac.)

 Process from Point/Station 607.000 to Point/Station 610.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.820(Ft.)
 Downstream point elevation = 5.400(Ft.)
 Channel length thru subarea = 185.000(Ft.)
 Channel base width = 5.000(Ft.)
 Slope or 'Z' of left channel bank = 2.000
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 38.906(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 5.000(Ft.)
 Flow(q) thru subarea = 38.906(CFS)
 Depth of flow = 1.897(Ft.), Average velocity = 2.332(Ft/s)
 Channel flow top width = 12.589(Ft.)
 Flow Velocity = 2.33(Ft/s)
 Travel time = 1.32 min.
 Time of concentration = 60.02 min.
 Critical depth = 1.063(Ft.)
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 Rainfall intensity = 0.482(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.662 CA = 83.812
 Subarea runoff = 2.575(CFS) for 6.800(Ac.)
 Total runoff = 40.407(CFS) Total area = 126.530(Ac.)

 Process from Point/Station 607.000 to Point/Station 610.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 126.530(Ac.)
 Runoff from this stream = 40.407(CFS)
 Time of concentration = 60.02 min.
 Rainfall intensity = 0.482(In/Hr)
 Program is now starting with Main Stream No. 2

MBHS1YR.out

Process from Point/Station 700.000 to Point/Station 705.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 167.000(Ft.)
 Highest elevation = 16.000(Ft.)
 Lowest elevation = 14.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 12.05 min.
 TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
 TC = [1.8*(1.1-0.5500)*(167.000^0.5)/(1.198^(1/3))] = 12.05
 Rainfall intensity (I) = 1.251(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.275(CFS)
 Total initial stream area = 0.400(Ac.)

 Process from Point/Station 705.000 to Point/Station 710.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 14.000(Ft.)
 End of street segment elevation = 11.500(Ft.)
 Length of street segment = 580.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 2.701(CFS)
 Depth of flow = 0.290(Ft.), Average velocity = 1.327(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.731(Ft.)
 Flow velocity = 1.33(Ft/s)
 Travel time = 7.29 min. TC = 19.34 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 0.970(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.098
 Subarea runoff = 3.699(CFS) for 7.050(Ac.)
 Total runoff = 3.975(CFS) Total area = 7.450(Ac.)
 Street flow at end of street = 3.975(CFS)
 Half street flow at end of street = 1.987(CFS)
 Depth of flow = 0.323(Ft.), Average velocity = 1.455(Ft/s)
 Flow width (from curb towards crown) = 11.378(Ft.)

 Process from Point/Station 710.000 to Point/Station 610.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

MBHS1YR.out

Upstream point/station elevation = 8.000(Ft.)
 Downstream point/station elevation = 5.400(Ft.)
 Pipe length = 129.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.975(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 3.975(CFS)
 Normal flow depth in pipe = 6.36(In.)
 Flow top width inside pipe = 17.21(In.)
 Critical Depth = 9.15(In.)
 Pipe flow velocity = 7.12(Ft/s)
 Travel time through pipe = 0.30 min.
 Time of concentration (TC) = 19.64 min.

 Process from Point/Station 710.000 to Point/Station 610.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 7.450(Ac.)
 Runoff from this stream = 3.975(CFS)
 Time of concentration = 19.64 min.
 Rainfall intensity = 0.962(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	40.407	60.02	0.482
2	3.975	19.64	0.962

Qmax(1) =
 1.000 * 1.000 * 40.407) +
 0.501 * 1.000 * 3.975) + = 42.399
 Qmax(2) =
 1.000 * 0.327 * 40.407) +
 1.000 * 1.000 * 3.975) + = 17.201

Total of 2 main streams to confluence:

Flow rates before confluence point:
 40.407 3.975
 Maximum flow rates at confluence using above data:
 42.399 17.201
 Area of streams before confluence:
 126.530 7.450

Results of confluence:

Total flow rate = 42.399(CFS)
 Time of concentration = 60.017 min.
 Effective stream area after confluence = 133.980(Ac.)

 Process from Point/Station 610.000 to Point/Station 715.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.400(Ft.)
 Downstream point elevation = 3.860(Ft.)
 Channel length thru subarea = 668.000(Ft.)
 Channel base width = 5.000(Ft.)
 Slope or 'Z' of left channel bank = 3.000
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 42.545(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 6.000(Ft.)

MBHS1YR.out

Flow(q) thru subarea = 42.545(CFS)
 Depth of flow = 1.890(Ft.), Average velocity = 2.314(Ft/s)
 Channel flow top width = 14.452(Ft.)
 Flow Velocity = 2.31(Ft/s)
 Travel time = 4.81 min.
 Time of concentration = 64.83 min.
 Critical depth = 1.086(Ft.)
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [RURAL(greater than 0.5 Ac, 0.2 ha) area type]
 The area added to the existing stream causes a
 a lower flow rate of Q = 40.516(CFS)
 therefore the upstream flow rate of Q = 42.399(CFS) is being used
 Rainfall intensity = 0.459(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.655 CA = 88.324
 Subarea runoff = 0.000(CFS) for 0.920(Ac.)
 Total runoff = 42.399(CFS) Total area = 134.900(Ac.)

 Process from Point/Station 610.000 to Point/Station 715.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 134.900(Ac.)
 Runoff from this stream = 42.399(CFS)
 Time of concentration = 64.83 min.
 Rainfall intensity = 0.459(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 720.000 to Point/Station 725.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 168.900(Ft.)
 Highest elevation = 18.000(Ft.)
 Lowest elevation = 16.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 12.16 min.
 TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
 TC = [1.8*(1.1-0.5500)*(168.900^0.5)/(1.184^(1/3))] = 12.16
 Rainfall intensity (I) = 1.245(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.356(CFS)
 Total initial stream area = 0.520(Ac.)

 Process from Point/Station 725.000 to Point/Station 730.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 16.000(Ft.)
 End of street segment elevation = 13.500(Ft.)
 Length of street segment = 778.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)

MBHS1YR.out

Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 1.801(CFS)
 Depth of flow = 0.270(Ft.), Average velocity = 1.078(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.743(Ft.)
 Flow velocity = 1.08(Ft/s)
 Travel time = 12.04 min. TC = 24.20 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 0.855(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 2.607
 Subarea runoff = 1.872(CFS) for 4.220(Ac.)
 Total runoff = 2.228(CFS) Total area = 4.740(Ac.)
 Street flow at end of street = 2.228(CFS)
 Half street flow at end of street = 1.114(CFS)
 Depth of flow = 0.286(Ft.), Average velocity = 1.133(Ft/s)
 Flow width (from curb towards crown)= 9.549(Ft.)

 Process from Point/Station 730.000 to Point/Station 735.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 13.500(Ft.)
 End of street segment elevation = 10.000(Ft.)
 Length of street segment = 874.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 3.389(CFS)
 Depth of flow = 0.380(Ft.), Average velocity = 1.611(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 14.255(Ft.)
 Flow velocity = 1.61(Ft/s)
 Travel time = 9.05 min. TC = 33.25 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 0.705(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area

MBHS1YR.out

(Q=KCIA) is C = 0.550 CA = 5.324
 Subarea runoff = 1.525(CFS) for 4.940(Ac.)
 Total runoff = 3.753(CFS) Total area = 9.680(Ac.)
 Street flow at end of street = 3.753(CFS)
 Half street flow at end of street = 3.753(CFS)
 Depth of flow = 0.392(Ft.), Average velocity = 1.652(Ft/s)
 Flow width (from curb towards crown)= 14.834(Ft.)

 Process from Point/Station 735.000 to Point/Station 715.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 10.000(Ft.)
 End of street segment elevation = 9.000(Ft.)
 Length of street segment = 322.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 4.242(CFS)
 Depth of flow = 0.422(Ft.), Average velocity = 1.547(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 16.343(Ft.)
 Flow velocity = 1.55(Ft/s)
 Travel time = 3.47 min. TC = 36.73 min.
 Adding area flow to street
 User specified 'C' value of 0.770 given for subarea
 Rainfall intensity = 0.662(In/Hr) for a 1.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.595 CA = 7.264
 Subarea runoff = 1.054(CFS) for 2.520(Ac.)
 Total runoff = 4.807(CFS) Total area = 12.200(Ac.)
 Street flow at end of street = 4.807(CFS)
 Half street flow at end of street = 4.807(CFS)
 Depth of flow = 0.438(Ft.), Average velocity = 1.595(Ft/s)
 Flow width (from curb towards crown)= 17.153(Ft.)

 Process from Point/Station 735.000 to Point/Station 715.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 12.200(Ac.)
 Runoff from this stream = 4.807(CFS)
 Time of concentration = 36.73 min.
 Rainfall intensity = 0.662(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	42.399	64.83	0.459
2	4.807	36.73	0.662
Qmax(1) =	1.000 *	1.000 *	42.399) +

MBHS1YR.out

0.693 * 1.000 * 4.807) + = 45.732
Q_{max}(2) = 1.000 * 0.566 * 42.399) +
1.000 * 1.000 * 4.807) + = 28.826

Total of 2 main streams to confluence:

Flow rates before confluence point:

42.399 4.807

Maximum flow rates at confluence using above data:

45.732 28.826

Area of streams before confluence:

134.900 12.200

Results of confluence:

Total flow rate = 45.732(CFS)

Time of concentration = 64.829 min.

Effective stream area after confluence = 147.100(Ac.)

End of computations, total study area = 147.100 (Ac.)

2-YEAR HYDROLOGIC ANALYSIS RESULTS

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4

Rational method hydrology program based on
 San Diego County Flood Control Division 1985 hydrology manual
 Rational Hydrology Study Date: 09/27/13

 MISSION BAY HIGH SCHOOL EXIST CONDITION HYDROLOGY ANALYSIS - MMP MAPS 36
 & 37 - ASSUMPTIONS: 1. n=0.030 IN MBHS CONC CHANNEL; AND 2. n=0.035 IN
 PACIFIC BEACH/OLNEY ST EARTHEN CHANNEL
 CIVILD FILE: MBHS2YR.RSD

***** Hydrology Study Control Information *****

 Program License Serial Number 6219

Rational hydrology study storm event year is 2.0
 English (in-lb) input data Units used
 English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
 Elevation 0 - 1500 feet
 Factor (to multiply * intensity) = 1.000
 Only used if inside City of San Diego
 San Diego hydrology manual 'C' values used
 Runoff coefficients by modified rational method

 Process from Point/Station 100.000 to Point/Station 105.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 194.700(Ft.)
 Highest elevation = 186.000(Ft.)
 Lowest elevation = 185.500(Ft.)
 Elevation difference = 0.500(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 21.73 min.
 $TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^{1/3})]$
 $TC = [1.8*(1.1-0.5500)*(194.700^0.5)/(0.257^{1/3})] = 21.73$
 Rainfall intensity (I) = 1.147(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.284(CFS)
 Total initial stream area = 0.450(Ac.)

 Process from Point/Station 105.000 to Point/Station 110.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 185.500(Ft.)
 End of street segment elevation = 174.000(Ft.)
 Length of street segment = 428.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020

Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 0.656(CFS)
 Depth of flow = 0.187(Ft.), Average velocity = 2.308(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 4.615(Ft.)
 Flow velocity = 2.31(Ft/s)
 Travel time = 3.10 min. TC = 24.83 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.063(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 0.897
 Subarea runoff = 0.670(CFS) for 1.180(Ac.)
 Total runoff = 0.953(CFS) Total area = 1.630(Ac.)
 Street flow at end of street = 0.953(CFS)
 Half street flow at end of street = 0.953(CFS)
 Depth of flow = 0.207(Ft.), Average velocity = 2.486(Ft/s)
 Flow width (from curb towards crown) = 5.587(Ft.)

 Process from Point/Station 110.000 to Point/Station 115.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 174.000(Ft.)
 End of street segment elevation = 138.000(Ft.)
 Length of street segment = 762.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 1.579(CFS)
 Depth of flow = 0.219(Ft.), Average velocity = 3.459(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 6.208(Ft.)
 Flow velocity = 3.46(Ft/s)
 Travel time = 3.68 min. TC = 28.51 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 0.980(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 2.074
 Subarea runoff = 1.079(CFS) for 2.140(Ac.)

MBHS2YR.out

Total runoff = 2.033(CFS) Total area = 3.770(Ac.)
 Street flow at end of street = 2.033(CFS)
 Half street flow at end of street = 2.033(CFS)
 Depth of flow = 0.234(Ft.), Average velocity = 3.657(Ft/s)
 Flow width (from curb towards crown)= 6.961(Ft.)

 Process from Point/Station 115.000 to Point/Station 120.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 138.000(Ft.)
 End of street segment elevation = 137.500(Ft.)
 Length of street segment = 522.400(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 3.885(CFS)
 Depth of flow = 0.398(Ft.), Average velocity = 0.819(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 15.165(Ft.)
 Flow velocity = 0.82(Ft/s)
 Travel time = 10.63 min. TC = 39.13 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 0.804(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 5.852
 Subarea runoff = 2.670(CFS) for 6.870(Ac.)
 Total runoff = 4.703(CFS) Total area = 10.640(Ac.)
 Street flow at end of street = 4.703(CFS)
 Half street flow at end of street = 2.352(CFS)
 Depth of flow = 0.422(Ft.), Average velocity = 0.859(Ft/s)
 Flow width (from curb towards crown)= 16.332(Ft.)

 Process from Point/Station 120.000 to Point/Station 125.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 137.500(Ft.)
 End of street segment elevation = 92.000(Ft.)
 Length of street segment = 716.200(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160

MBHS2YR.out

Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 6.571(CFS)
 Depth of flow = 0.256(Ft.), Average velocity = 4.577(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.041(Ft.)
 Flow velocity = 4.58(Ft/s)
 Travel time = 2.61 min. TC = 41.74 min.

Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 0.771(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 10.500
 Subarea runoff = 3.391(CFS) for 8.450(Ac.)
 Total runoff = 8.094(CFS) Total area = 19.090(Ac.)
 Street flow at end of street = 8.094(CFS)
 Half street flow at end of street = 4.047(CFS)
 Depth of flow = 0.271(Ft.), Average velocity = 4.805(Ft/s)
 Flow width (from curb towards crown)= 8.781(Ft.)

 Process from Point/Station 125.000 to Point/Station 130.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 92.000(Ft.)
 End of street segment elevation = 69.000(Ft.)
 Length of street segment = 528.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 9.553(CFS)
 Depth of flow = 0.298(Ft.), Average velocity = 4.327(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.162(Ft.)
 Flow velocity = 4.33(Ft/s)
 Travel time = 2.03 min. TC = 43.78 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 0.748(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 14.284
 Subarea runoff = 2.584(CFS) for 6.880(Ac.)
 Total runoff = 10.679(CFS) Total area = 25.970(Ac.)
 Street flow at end of street = 10.679(CFS)
 Half street flow at end of street = 5.339(CFS)
 Depth of flow = 0.308(Ft.), Average velocity = 4.444(Ft/s)
 Flow width (from curb towards crown)= 10.631(Ft.)

MBHS2YR.out

```

*****
Process from Point/Station      130.000 to Point/Station      135.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 69.000(Ft.)
End of street segment elevation = 49.500(Ft.)
Length of street segment = 494.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 22.000(Ft.)
Distance from crown to crossfall grade break = 18.500(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)
Gutter hike from flowline = 1.500(In.)
Manning's N in gutter = 0.0160
Manning's N from gutter to grade break = 0.0160
Manning's N from grade break to crown = 0.0160
Estimated mean flow rate at midpoint of street = 12.712(CFS)
Depth of flow = 0.328(Ft.), Average velocity = 4.464(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 11.630(Ft.)
Flow velocity = 4.46(Ft/s)
Travel time = 1.84 min. TC = 45.62 min.
Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type ]
Rainfall intensity = 0.728(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.591 CA = 21.207
Subarea runoff = 4.759(CFS) for 9.890(Ac.)
Total runoff = 15.438(CFS) Total area = 35.860(Ac.)
Street flow at end of street = 15.438(CFS)
Half street flow at end of street = 7.719(CFS)
Depth of flow = 0.346(Ft.), Average velocity = 4.679(Ft/s)
Flow width (from curb towards crown)= 12.563(Ft.)

*****
Process from Point/Station      135.000 to Point/Station      140.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 49.500(Ft.)
End of street segment elevation = 43.700(Ft.)
Length of street segment = 502.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 22.000(Ft.)
Distance from crown to crossfall grade break = 18.500(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)
Gutter hike from flowline = 1.500(In.)
Manning's N in gutter = 0.0160
Manning's N from gutter to grade break = 0.0160
Manning's N from grade break to crown = 0.0160
Estimated mean flow rate at midpoint of street = 16.146(CFS)
Depth of flow = 0.524(Ft.), Average velocity = 3.441(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property = 1.21(Ft.)
Streetflow hydraulics at midpoint of street travel:

```

MBHS2YR.out

```

Halfstreet flow width = 21.461(Ft.)
Flow velocity = 3.44(Ft/s)
Travel time = 2.43 min. TC = 48.05 min.
Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type ]
Rainfall intensity = 0.704(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.613 CA = 24.003
Subarea runoff = 1.460(CFS) for 3.290(Ac.)
Total runoff = 16.898(CFS) Total area = 39.150(Ac.)
Street flow at end of street = 16.898(CFS)
Half street flow at end of street = 16.898(CFS)
Depth of flow = 0.533(Ft.), Average velocity = 3.453(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property = 1.65(Ft.)
Flow width (from curb towards crown)= 21.898(Ft.)

*****
Process from Point/Station      135.000 to Point/Station      140.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 39.150(Ac.)
Runoff from this stream = 16.898(CFS)
Time of concentration = 48.05 min.
Rainfall intensity = 0.704(In/Hr)
Program is now starting with Main Stream No. 2

*****
Process from Point/Station      200.000 to Point/Station      205.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type ]
Initial subarea flow distance = 197.000(Ft.)
Highest elevation = 118.000(Ft.)
Lowest elevation = 111.000(Ft.)
Elevation difference = 7.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 9.11 min.
TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.5500)*( 197.000^0.5)/( 3.553^(1/3))]= 9.11
Rainfall intensity (I) = 1.809(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff = 0.667(CFS)
Total initial stream area = 0.670(Ac.)

*****
Process from Point/Station      205.000 to Point/Station      210.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 111.000(Ft.)
End of street segment elevation = 75.000(Ft.)
Length of street segment = 731.500(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 22.000(Ft.)
Distance from crown to crossfall grade break = 18.500(Ft.)

```

MBHS2YR.out

Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 3.493(CFS)
 Depth of flow = 0.224(Ft.), Average velocity = 3.594(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 6.439(Ft.)
 Flow velocity = 3.59(Ft/s)
 Travel time = 3.39 min. TC = 12.50 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.537(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 3.493
 Subarea runoff = 4.700(CFS) for 5.680(Ac.)
 Total runoff = 5.367(CFS) Total area = 6.350(Ac.)
 Street flow at end of street = 5.367(CFS)
 Half street flow at end of street = 2.683(CFS)
 Depth of flow = 0.251(Ft.), Average velocity = 3.959(Ft/s)
 Flow width (from curb towards crown)= 7.788(Ft.)

 Process from Point/Station 210.000 to Point/Station 215.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 75.000(Ft.)
 End of street segment elevation = 72.000(Ft.)
 Length of street segment = 298.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 6.271(CFS)
 Depth of flow = 0.398(Ft.), Average velocity = 2.654(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 15.138(Ft.)
 Flow velocity = 2.65(Ft/s)
 Travel time = 1.87 min. TC = 14.37 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.430(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.670

MBHS2YR.out

Subarea runoff = 1.310(CFS) for 2.140(Ac.)
 Total runoff = 6.677(CFS) Total area = 8.490(Ac.)
 Street flow at end of street = 6.677(CFS)
 Half street flow at end of street = 6.677(CFS)
 Depth of flow = 0.405(Ft.), Average velocity = 2.695(Ft/s)
 Flow width (from curb towards crown)= 15.511(Ft.)

 Process from Point/Station 215.000 to Point/Station 140.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 72.000(Ft.)
 End of street segment elevation = 43.700(Ft.)
 Length of street segment = 653.800(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 7.738(CFS)
 Depth of flow = 0.282(Ft.), Average velocity = 4.106(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.334(Ft.)
 Flow velocity = 4.11(Ft/s)
 Travel time = 2.65 min. TC = 17.02 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 1.309(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.586 CA = 6.559
 Subarea runoff = 1.907(CFS) for 2.700(Ac.)
 Total runoff = 8.584(CFS) Total area = 11.190(Ac.)
 Street flow at end of street = 8.584(CFS)
 Half street flow at end of street = 4.292(CFS)
 Depth of flow = 0.290(Ft.), Average velocity = 4.208(Ft/s)
 Flow width (from curb towards crown)= 9.740(Ft.)

 Process from Point/Station 215.000 to Point/Station 140.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 11.190(Ac.)
 Runoff from this stream = 8.584(CFS)
 Time of concentration = 17.02 min.
 Rainfall intensity = 1.309(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	16.898	48.05	0.704

MBHS2YR.out

2 8.584 17.02 1.309
 Qmax(1) = 1.000 * 1.000 * 16.898) +
 0.538 * 1.000 * 8.584) + = 21.516
 Qmax(2) = 1.000 * 0.354 * 16.898) +
 1.000 * 1.000 * 8.584) + = 14.570

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 16.898 8.584
 Maximum flow rates at confluence using above data:
 21.516 14.570
 Area of streams before confluence:
 39.150 11.190

Results of confluence:
 Total flow rate = 21.516(CFS)
 Time of concentration = 48.051 min.
 Effective stream area after confluence = 50.340(Ac.)

 Process from Point/Station 140.000 to Point/Station 220.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 36.150(Ft.)
 Downstream point/station elevation = 34.120(Ft.)
 Pipe length = 151.50(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 21.516(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 21.516(CFS)
 Normal flow depth in pipe = 14.17(In.)
 Flow top width inside pipe = 29.95(In.)
 Critical Depth = 18.91(In.)
 Pipe flow velocity = 9.44(Ft/s)
 Travel time through pipe = 0.27 min.
 Time of concentration (TC) = 48.32 min.

 Process from Point/Station 220.000 to Point/Station 225.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 34.120(Ft.)
 Downstream point/station elevation = 31.700(Ft.)
 Pipe length = 191.10(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 21.516(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 21.516(CFS)
 Normal flow depth in pipe = 14.39(In.)
 Flow top width inside pipe = 29.98(In.)
 Critical Depth = 18.91(In.)
 Pipe flow velocity = 9.24(Ft/s)
 Travel time through pipe = 0.34 min.
 Time of concentration (TC) = 48.66 min.

 Process from Point/Station 220.000 to Point/Station 225.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]

MBHS2YR.out

Time of concentration = 48.66 min.
 Rainfall intensity = 0.698(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.605 CA = 31.476
 Subarea runoff = 0.462(CFS) for 1.660(Ac.)
 Total runoff = 21.978(CFS) Total area = 52.000(Ac.)

 Process from Point/Station 225.000 to Point/Station 230.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 31.200(Ft.)
 Downstream point/station elevation = 24.120(Ft.)
 Pipe length = 125.43(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 21.978(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 21.978(CFS)
 Normal flow depth in pipe = 9.06(In.)
 Flow top width inside pipe = 31.24(In.)
 Critical Depth = 18.08(In.)
 Pipe flow velocity = 15.77(Ft/s)
 Travel time through pipe = 0.13 min.
 Time of concentration (TC) = 48.80 min.

 Process from Point/Station 225.000 to Point/Station 230.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 52.000(Ac.)
 Runoff from this stream = 21.978(CFS)
 Time of concentration = 48.80 min.
 Rainfall intensity = 0.697(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 300.000 to Point/Station 305.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Initial subarea flow distance = 176.600(Ft.)
 Highest elevation = 64.000(Ft.)
 Lowest elevation = 30.000(Ft.)
 Elevation difference = 34.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.57 min.
 TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
 TC = [1.8*(1.1-0.7000)*(176.600^0.5)/(19.253^(1/3))]= 3.57
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 2.490(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
 Subarea runoff = 0.593(CFS)
 Total initial stream area = 0.340(Ac.)

 Process from Point/Station 305.000 to Point/Station 310.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 60.000(Ft.)

MBHS2YR.out

End of street segment elevation = 45.500(Ft.)
 Length of street segment = 739.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 4.749(CFS)
 Depth of flow = 0.333(Ft.), Average velocity = 3.191(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 11.903(Ft.)
 Flow velocity = 3.19(Ft/s)
 Travel time = 3.86 min. TC = 8.86 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 1.835(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.700 CA = 3.577
 Subarea runoff = 5.972(CFS) for 4.770(Ac.)
 Total runoff = 6.564(CFS) Total area = 5.110(Ac.)
 Street flow at end of street = 6.564(CFS)
 Half street flow at end of street = 6.564(CFS)
 Depth of flow = 0.366(Ft.), Average velocity = 3.453(Ft/s)
 Flow width (from curb towards crown)= 13.527(Ft.)

 Process from Point/Station 310.000 to Point/Station 315.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 45.500(Ft.)
 End of street segment elevation = 33.500(Ft.)
 Length of street segment = 721.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 9.532(CFS)
 Depth of flow = 0.418(Ft.), Average velocity = 3.555(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 16.154(Ft.)
 Flow velocity = 3.56(Ft/s)
 Travel time = 3.38 min. TC = 12.24 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000

MBHS2YR.out

Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 1.553(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.771 CA = 7.504
 Subarea runoff = 5.091(CFS) for 4.620(Ac.)
 Total runoff = 11.655(CFS) Total area = 9.730(Ac.)
 Street flow at end of street = 11.655(CFS)
 Half street flow at end of street = 11.655(CFS)
 Depth of flow = 0.444(Ft.), Average velocity = 3.736(Ft/s)
 Flow width (from curb towards crown)= 17.460(Ft.)

 Process from Point/Station 315.000 to Point/Station 230.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 27.800(Ft.)
 Downstream point/station elevation = 24.120(Ft.)
 Pipe length = 189.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 11.655(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 11.655(CFS)
 Normal flow depth in pipe = 12.14(In.)
 Flow top width inside pipe = 16.87(In.)
 Critical Depth = 15.60(In.)
 Pipe flow velocity = 9.19(Ft/s)
 Travel time through pipe = 0.34 min.
 Time of concentration (TC) = 12.59 min.

 Process from Point/Station 315.000 to Point/Station 230.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 9.730(Ac.)
 Runoff from this stream = 11.655(CFS)
 Time of concentration = 12.59 min.
 Rainfall intensity = 1.531(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	21.978	48.80	0.697
2	11.655	12.59	1.531
Qmax(1) =	1.000 * 0.455 *	1.000 * 1.000 *	21.978) + 11.655) =
			27.284
Qmax(2) =	1.000 * 1.000 *	0.258 * 1.000 *	21.978) + 11.655) =
			17.324

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 21.978 11.655
 Maximum flow rates at confluence using above data:
 27.284 17.324
 Area of streams before confluence:
 52.000 9.730

Results of confluence:
 Total flow rate = 27.284(CFS)
 Time of concentration = 48.796 min.

MBHS2YR.out

Effective stream area after confluence = 61.730(Ac.)

 Process from Point/Station 230.000 to Point/Station 320.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 24.120(Ft.)
 Downstream point/station elevation = 11.910(Ft.)
 Pipe length = 544.91(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 27.284(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 27.284(CFS)
 Normal flow depth in pipe = 12.87(In.)
 Flow top width inside pipe = 34.51(In.)
 Critical Depth = 20.28(In.)
 Pipe flow velocity = 12.04(Ft/s)
 Travel time through pipe = 0.75 min.
 Time of concentration (TC) = 49.55 min.

 Process from Point/Station 230.000 to Point/Station 320.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 49.55 min.
 Rainfall intensity = 0.690(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.635 CA = 41.535
 Subarea runoff = 1.382(CFS) for 3.650(Ac.)
 Total runoff = 28.666(CFS) Total area = 65.380(Ac.)

 Process from Point/Station 320.000 to Point/Station 325.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 11.910(Ft.)
 Downstream point/station elevation = 8.470(Ft.)
 Pipe length = 215.48(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 28.666(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 28.666(CFS)
 Normal flow depth in pipe = 14.47(In.)
 Flow top width inside pipe = 35.30(In.)
 Critical Depth = 20.78(In.)
 Pipe flow velocity = 10.78(Ft/s)
 Travel time through pipe = 0.33 min.
 Time of concentration (TC) = 49.88 min.

 Process from Point/Station 320.000 to Point/Station 325.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Time of concentration = 49.88 min.
 Rainfall intensity = 0.687(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area

MBHS2YR.out

(Q=KCIA) is C = 0.627 CA = 45.528
 Subarea runoff = 2.620(CFS) for 7.260(Ac.)
 Total runoff = 31.287(CFS) Total area = 72.640(Ac.)

 Process from Point/Station 325.000 to Point/Station 330.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.470(Ft.)
 Downstream point/station elevation = 7.000(Ft.)
 Pipe length = 249.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 31.287(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 31.287(CFS)
 Normal flow depth in pipe = 20.34(In.)
 Flow top width inside pipe = 35.69(In.)
 Critical Depth = 21.74(In.)
 Pipe flow velocity = 7.60(Ft/s)
 Travel time through pipe = 0.55 min.
 Time of concentration (TC) = 50.43 min.

 Process from Point/Station 325.000 to Point/Station 330.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 72.640(Ac.)
 Runoff from this stream = 31.287(CFS)
 Time of concentration = 50.43 min.
 Rainfall intensity = 0.682(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 400.000 to Point/Station 405.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 189.400(Ft.)
 Highest elevation = 33.000(Ft.)
 Lowest elevation = 30.000(Ft.)
 Elevation difference = 3.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 11.69 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{0.5}] / (\% slope^{1/3})$
 $TC = [1.8 * (1.1 - 0.5500) * (189.400^{0.5}) / (1.584^{1/3})] = 11.69$
 Rainfall intensity (I) = 1.591(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.604(CFS)
 Total initial stream area = 0.690(Ac.)

 Process from Point/Station 405.000 to Point/Station 410.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 30.000(Ft.)
 End of street segment elevation = 15.500(Ft.)
 Length of street segment = 708.400(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)

MBHS2YR.out

Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 3.539(CFS)
 Depth of flow = 0.252(Ft.), Average velocity = 2.567(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 7.862(Ft.)
 Flow velocity = 2.57(Ft/s)
 Travel time = 4.60 min. TC = 16.29 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.339(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.070
 Subarea runoff = 4.848(CFS) for 6.710(Ac.)
 Total runoff = 5.451(CFS) Total area = 7.400(Ac.)
 Street flow at end of street = 5.451(CFS)
 Half street flow at end of street = 2.726(CFS)
 Depth of flow = 0.284(Ft.), Average velocity = 2.839(Ft/s)
 Flow width (from curb towards crown)= 9.427(Ft.)

 Process from Point/Station 410.000 to Point/Station 415.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 15.500(Ft.)
 End of street segment elevation = 13.500(Ft.)
 Length of street segment = 521.600(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 7.426(CFS)
 Depth of flow = 0.393(Ft.), Average velocity = 1.621(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 14.895(Ft.)
 Flow velocity = 1.62(Ft/s)
 Travel time = 5.36 min. TC = 21.65 min.
 Adding area flow to street
 User specified 'C' value of 0.760 given for subarea
 Rainfall intensity = 1.149(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.638 CA = 8.144
 Subarea runoff = 3.907(CFS) for 5.360(Ac.)
 Total runoff = 9.358(CFS) Total area = 12.760(Ac.)
 Street flow at end of street = 9.358(CFS)

MBHS2YR.out

Half street flow at end of street = 4.679(CFS)
 Depth of flow = 0.421(Ft.), Average velocity = 1.716(Ft/s)
 Flow width (from curb towards crown)= 16.295(Ft.)

 Process from Point/Station 410.000 to Point/Station 415.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 12.760(Ac.)
 Runoff from this stream = 9.358(CFS)
 Time of concentration = 21.65 min.
 Rainfall intensity = 1.149(In/Hr)

 Process from Point/Station 500.000 to Point/Station 505.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.900 given for subarea
 Initial subarea flow distance = 145.000(Ft.)
 Highest elevation = 16.000(Ft.)
 Lowest elevation = 14.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.89 min.
 TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
 TC = [1.8*(1.1-0.9000)*(145.000^0.5)]/(1.379^(1/3))= 3.89
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 2.490(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.900
 Subarea runoff = 0.515(CFS)
 Total initial stream area = 0.230(Ac.)

 Process from Point/Station 505.000 to Point/Station 510.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 14.000(Ft.)
 End of street segment elevation = 11.500(Ft.)
 Length of street segment = 583.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 5.131(CFS)
 Depth of flow = 0.425(Ft.), Average velocity = 1.831(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 16.525(Ft.)
 Flow velocity = 1.83(Ft/s)
 Travel time = 5.31 min. TC = 10.31 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]

MBHS2YR.out

Rainfall intensity = 1.697(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.853 CA = 3.709
 Subarea runoff = 5.779(CFS) for 4.120(Ac.)
 Total runoff = 6.295(CFS) Total area = 4.350(Ac.)
 Street flow at end of street = 6.295(CFS)
 Half street flow at end of street = 6.295(CFS)
 Depth of flow = 0.453(Ft.), Average velocity = 1.926(Ft/s)
 Flow width (from curb towards crown)= 17.881(Ft.)

 Process from Point/Station 510.000 to Point/Station 415.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 9.520(Ft.)
 Downstream point/station elevation = 8.800(Ft.)
 Pipe length = 259.69(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.295(CFS)
 Given pipe size = 15.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 2.358(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 2.465(Ft.)
 Minor friction loss = 0.613(Ft.) K-factor = 1.50
 Pipe flow velocity = 5.13(Ft/s)
 Travel time through pipe = 0.84 min.
 Time of concentration (TC) = 11.15 min.

 Process from Point/Station 510.000 to Point/Station 415.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 4.350(Ac.)
 Runoff from this stream = 6.295(CFS)
 Time of concentration = 11.15 min.
 Rainfall intensity = 1.630(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	9.358	21.65	1.149
2	6.295	11.15	1.630
Qmax(1) =	1.000 * 0.705 *	1.000 *	9.358) + 6.295) + = 13.797
Qmax(2) =	1.000 * 1.000 *	0.515 * 1.000 *	9.358) + 6.295) + = 11.114

Total of 2 streams to confluence:
 Flow rates before confluence point:
 9.358 6.295
 Maximum flow rates at confluence using above data:
 13.797 11.114
 Area of streams before confluence:
 12.760 4.350
 Results of confluence:
 Total flow rate = 13.797(CFS)
 Time of concentration = 21.650 min.
 Effective stream area after confluence = 17.110(Ac.)

MBHS2YR.out

Process from Point/Station 415.000 to Point/Station 515.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.800(Ft.)
 Downstream point/station elevation = 8.550(Ft.)
 Pipe length = 84.57(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 13.797(CFS)
 Given pipe size = 18.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 2.628(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 1.458(Ft.)
 Minor friction loss = 1.420(Ft.) K-factor = 1.50
 Pipe flow velocity = 7.81(Ft/s)
 Travel time through pipe = 0.18 min.
 Time of concentration (TC) = 21.83 min.

 Process from Point/Station 415.000 to Point/Station 515.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 21.83 min.
 Rainfall intensity = 1.144(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.694 CA = 13.869
 Subarea runoff = 2.067(CFS) for 2.880(Ac.)
 Total runoff = 15.864(CFS) Total area = 19.990(Ac.)

 Process from Point/Station 515.000 to Point/Station 520.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.550(Ft.)
 Downstream point/station elevation = 7.620(Ft.)
 Pipe length = 337.77(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 15.864(CFS)
 Given pipe size = 27.00(In.)
 Calculated individual pipe flow = 15.864(CFS)
 Normal flow depth in pipe = 21.56(In.)
 Flow top width inside pipe = 21.66(In.)
 Critical Depth = 16.66(In.)
 Pipe flow velocity = 4.66(Ft/s)
 Travel time through pipe = 1.21 min.
 Time of concentration (TC) = 23.04 min.

 Process from Point/Station 515.000 to Point/Station 520.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.950 given for subarea
 Time of concentration = 23.04 min.
 Rainfall intensity = 1.110(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.721 CA = 16.120
 Subarea runoff = 2.027(CFS) for 2.370(Ac.)
 Total runoff = 17.891(CFS) Total area = 22.360(Ac.)

 Process from Point/Station 520.000 to Point/Station 330.000

MBHS2YR.out

**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 7.620(Ft.)
 Downstream point elevation = 7.000(Ft.)
 Channel length thru subarea = 228.700(Ft.)
 Channel base width = 3.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 17.891(CFS)
 Depth of flow = 1.437(Ft.), Average velocity = 2.414(Ft/s)
 Channel flow top width = 7.312(Ft.)
 Flow Velocity = 2.41(Ft/s)
 Travel time = 1.58 min.
 Time of concentration = 24.62 min.
 Critical depth = 0.883(Ft.)

 Process from Point/Station 520.000 to Point/Station 330.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 22.360(Ac.)
 Runoff from this stream = 17.891(CFS)
 Time of concentration = 24.62 min.
 Rainfall intensity = 1.069(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	31.287	50.43	0.682
2	17.891	24.62	1.069
Qmax(1) =	1.000 * 0.638	1.000 * 1.000	31.287) + 17.891) =
			42.710
Qmax(2) =	1.000 * 1.000	0.488 * 1.000	31.287) + 17.891) =
			33.163

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 31.287 17.891
 Maximum flow rates at confluence using above data:
 42.710 33.163
 Area of streams before confluence:
 72.640 22.360

Results of confluence:
 Total flow rate = 42.710(CFS)
 Time of concentration = 50.432 min.
 Effective stream area after confluence = 95.000(Ac.)

 Process from Point/Station 330.000 to Point/Station 600.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 7.000(Ft.)
 Downstream point elevation = 6.350(Ft.)
 Channel length thru subarea = 499.000(Ft.)
 Channel base width = 4.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500

MBHS2YR.out

Slope or 'Z' of right channel bank = 1.500
 Estimated mean flow rate at midpoint of channel = 43.904(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 43.904(CFS)
 Depth of flow = 2.395(Ft.), Average velocity = 2.446(Ft/s)
 !Warning: Water is above left or right bank elevations
 Channel flow top width = 10.000(Ft.)
 Flow Velocity = 2.45(Ft/s)
 Travel time = 3.40 min.
 Time of concentration = 53.83 min.
 Critical depth = 1.313(Ft.)
 ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 0.654(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.660 CA = 66.161
 Subarea runoff = 0.577(CFS) for 5.310(Ac.)
 Total runoff = 43.287(CFS) Total area = 100.310(Ac.)

 Process from Point/Station 600.000 to Point/Station 605.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 6.350(Ft.)
 Downstream point elevation = 5.880(Ft.)
 Channel length thru subarea = 357.200(Ft.)
 Channel base width = 4.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Estimated mean flow rate at midpoint of channel = 43.356(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 43.356(CFS)
 Depth of flow = 2.376(Ft.), Average velocity = 2.441(Ft/s)
 !Warning: Water is above left or right bank elevations
 Channel flow top width = 10.000(Ft.)
 Flow Velocity = 2.44(Ft/s)
 Travel time = 2.44 min.
 Time of concentration = 56.27 min.
 Critical depth = 1.297(Ft.)
 ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 The area added to the existing stream causes a
 a lower flow rate of Q = 42.261(CFS)
 therefore the upstream flow rate of Q = 43.287(CFS) is being used
 Rainfall intensity = 0.636(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.660 CA = 66.465
 Subarea runoff = 0.000(CFS) for 0.320(Ac.)
 Total runoff = 43.287(CFS) Total area = 100.630(Ac.)

 Process from Point/Station 605.000 to Point/Station 607.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

MBHS2YR.out

Upstream point elevation = 5.880(Ft.)
 Downstream point elevation = 5.820(Ft.)
 Channel length thru subarea = 25.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 47.395(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 5.000(Ft.)
 Flow(q) thru subarea = 47.395(CFS)
 Depth of flow = 1.434(Ft.), Average velocity = 2.642(Ft/s)
 Channel flow top width = 15.019(Ft.)
 Flow Velocity = 2.64(Ft/s)
 Travel time = 0.16 min.
 Time of concentration = 56.43 min.
 Critical depth = 0.844(Ft.)
 Adding area flow to channel
 User specified 'C' value of 0.570 given for subarea
 Rainfall intensity = 0.635(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.646 CA = 77.352
 Subarea runoff = 5.808(CFS) for 19.100(Ac.)
 Total runoff = 49.094(CFS) Total area = 119.730(Ac.)

 Process from Point/Station 607.000 to Point/Station 610.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.820(Ft.)
 Downstream point elevation = 5.400(Ft.)
 Channel length thru subarea = 185.000(Ft.)
 Channel base width = 5.000(Ft.)
 Slope or 'Z' of left channel bank = 2.000
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 50.489(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 5.000(Ft.)
 Flow(q) thru subarea = 50.489(CFS)
 Depth of flow = 2.164(Ft.), Average velocity = 2.502(Ft/s)
 Channel flow top width = 13.655(Ft.)
 Flow Velocity = 2.50(Ft/s)
 Travel time = 1.23 min.
 Time of concentration = 57.66 min.
 Critical depth = 1.234(Ft.)
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 Rainfall intensity = 0.626(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.662 CA = 83.812
 Subarea runoff = 3.364(CFS) for 6.800(Ac.)
 Total runoff = 52.458(CFS) Total area = 126.530(Ac.)

 Process from Point/Station 607.000 to Point/Station 610.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 126.530(Ac.)
 Runoff from this stream = 52.458(CFS)
 Time of concentration = 57.66 min.
 Rainfall intensity = 0.626(In/Hr)

MBHS2YR.out

Program is now starting with Main Stream No. 2

 Process from Point/Station 700.000 to Point/Station 705.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 167.000(Ft.)
 Highest elevation = 16.000(Ft.)
 Lowest elevation = 14.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 12.05 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.5500) * (167.000^{.5}) / (1.198^{(1/3)})] = 12.05$
 Rainfall intensity (I) = 1.566(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.345(CFS)
 Total initial stream area = 0.400(Ac.)

 Process from Point/Station 705.000 to Point/Station 710.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 14.000(Ft.)
 End of street segment elevation = 11.500(Ft.)
 Length of street segment = 580.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 3.381(CFS)
 Depth of flow = 0.308(Ft.), Average velocity = 1.400(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.661(Ft.)
 Flow velocity = 1.40(Ft/s)
 Travel time = 6.91 min. TC = 18.96 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.236(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.098
 Subarea runoff = 4.718(CFS) for 7.050(Ac.)
 Total runoff = 5.063(CFS) Total area = 7.450(Ac.)
 Street flow at end of street = 5.063(CFS)
 Half street flow at end of street = 2.531(CFS)
 Depth of flow = 0.346(Ft.), Average velocity = 1.543(Ft/s)
 Flow width (from curb towards crown) = 12.527(Ft.)

MBHS2YR.out

 Process from Point/Station 710.000 to Point/Station 610.000
 *** PIPEFLOW TRAVEL TIME (User specified size) ***

Upstream point/station elevation = 8.000(Ft.)
 Downstream point/station elevation = 5.400(Ft.)
 Pipe length = 129.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.063(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 5.063(CFS)
 Normal flow depth in pipe = 7.24(In.)
 Flow top width inside pipe = 17.65(In.)
 Critical Depth = 10.39(In.)
 Pipe flow velocity = 7.61(Ft/s)
 Travel time through pipe = 0.28 min.
 Time of concentration (TC) = 19.24 min.

 Process from Point/Station 710.000 to Point/Station 610.000
 *** CONFLUENCE OF MAIN STREAMS ***

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 7.450(Ac.)
 Runoff from this stream = 5.063(CFS)
 Time of concentration = 19.24 min.
 Rainfall intensity = 1.226(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	52.458	57.66	0.626
2	5.063	19.24	1.226
Qmax(1) =			
	1.000 *	1.000 *	52.458) +
	0.511 *	1.000 *	5.063) + = 55.044
Qmax(2) =			
	1.000 *	0.334 *	52.458) +
	1.000 *	1.000 *	5.063) + = 22.571

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 52.458 5.063
 Maximum flow rates at confluence using above data:
 55.044 22.571
 Area of streams before confluence:
 126.530 7.450

Results of confluence:
 Total flow rate = 55.044(CFS)
 Time of concentration = 57.660 min.
 Effective stream area after confluence = 133.980(Ac.)

 Process from Point/Station 610.000 to Point/Station 715.000
 *** IMPROVED CHANNEL TRAVEL TIME ***

Upstream point elevation = 5.400(Ft.)
 Downstream point elevation = 3.860(Ft.)
 Channel length thru subarea = 668.000(Ft.)
 Channel base width = 5.000(Ft.)
 Slope or 'Z' of left channel bank = 3.000

MBHS2YR.out

Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 55.233(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 6.000(Ft.)
 Flow(q) thru subarea = 55.233(CFS)
 Depth of flow = 2.148(Ft.), Average velocity = 2.480(Ft/s)
 Channel flow top width = 15.738(Ft.)
 Flow Velocity = 2.48(Ft/s)
 Travel time = 4.49 min.
 Time of concentration = 62.15 min.
 Critical depth = 1.250(Ft.)
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [RURAL(greater than 0.5 Ac, 0.2 ha) area type]
 The area added to the existing stream causes a
 a lower flow rate of Q = 52.673(CFS)
 therefore the upstream flow rate of Q = 55.044(CFS) is being used
 Rainfall intensity = 0.596(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.655 CA = 88.324
 Subarea runoff = 0.000(CFS) for 0.920(Ac.)
 Total runoff = 55.044(CFS) Total area = 134.900(Ac.)

 Process from Point/Station 610.000 to Point/Station 715.000
 *** CONFLUENCE OF MAIN STREAMS ***

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 134.900(Ac.)
 Runoff from this stream = 55.044(CFS)
 Time of concentration = 62.15 min.
 Rainfall intensity = 0.596(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 720.000 to Point/Station 725.000
 *** INITIAL AREA EVALUATION ***

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 168.900(Ft.)
 Highest elevation = 18.000(Ft.)
 Lowest elevation = 16.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 12.16 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^0.5] / (\% slope^{1/3})$
 $TC = [1.8 * (1.1 - 0.5500) * (168.900^0.5)] / (1.184^{1/3}) = 12.16$
 Rainfall intensity (I) = 1.558(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.446(CFS)
 Total initial stream area = 0.520(Ac.)

 Process from Point/Station 725.000 to Point/Station 730.000
 *** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ***

Top of street segment elevation = 16.000(Ft.)

MBHS2YR.out

End of street segment elevation = 13.500(Ft.)
 Length of street segment = 778.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 2.254(CFS)
 Depth of flow = 0.287(Ft.), Average velocity = 1.136(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.596(Ft.)
 Flow velocity = 1.14(Ft/s)
 Travel time = 11.42 min. TC = 23.58 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.095(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 2.607
 Subarea runoff = 2.410(CFS) for 4.220(Ac.)
 Total runoff = 2.856(CFS) Total area = 4.740(Ac.)
 Street flow at end of street = 2.856(CFS)
 Half street flow at end of street = 1.428(CFS)
 Depth of flow = 0.306(Ft.), Average velocity = 1.202(Ft/s)
 Flow width (from curb towards crown)= 10.566(Ft.)

 Process from Point/Station 730.000 to Point/Station 735.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 13.500(Ft.)
 End of street segment elevation = 10.000(Ft.)
 Length of street segment = 874.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 4.344(CFS)
 Depth of flow = 0.409(Ft.), Average velocity = 1.712(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 15.702(Ft.)
 Flow velocity = 1.71(Ft/s)
 Travel time = 8.52 min. TC = 32.10 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000

MBHS2YR.out

Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 0.912(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 5.324
 Subarea runoff = 1.998(CFS) for 4.940(Ac.)
 Total runoff = 4.854(CFS) Total area = 9.680(Ac.)
 Street flow at end of street = 4.854(CFS)
 Half street flow at end of street = 4.854(CFS)
 Depth of flow = 0.423(Ft.), Average velocity = 1.760(Ft/s)
 Flow width (from curb towards crown)= 16.392(Ft.)

 Process from Point/Station 735.000 to Point/Station 715.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 10.000(Ft.)
 End of street segment elevation = 9.000(Ft.)
 Length of street segment = 322.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 5.486(CFS)
 Depth of flow = 0.456(Ft.), Average velocity = 1.648(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 18.048(Ft.)
 Flow velocity = 1.65(Ft/s)
 Travel time = 3.26 min. TC = 35.36 min.
 Adding area flow to street
 User specified 'C' value of 0.770 given for subarea
 Rainfall intensity = 0.858(In/Hr) for a 2.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.595 CA = 7.264
 Subarea runoff = 1.377(CFS) for 2.520(Ac.)
 Total runoff = 6.231(CFS) Total area = 12.200(Ac.)
 Street flow at end of street = 6.231(CFS)
 Half street flow at end of street = 6.231(CFS)
 Depth of flow = 0.474(Ft.), Average velocity = 1.701(Ft/s)
 Flow width (from curb towards crown)= 18.954(Ft.)

 Process from Point/Station 735.000 to Point/Station 715.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 12.200(Ac.)
 Runoff from this stream = 6.231(CFS)
 Time of concentration = 35.36 min.
 Rainfall intensity = 0.858(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)

MBHS2YR.out

1	55.044	62.15	0.596
2	6.231	35.36	0.858

Qmax(1) =
1.000 * 1.000 * 55.044) +
0.695 * 1.000 * 6.231) + = 59.376

Qmax(2) =
1.000 * 0.569 * 55.044) +
1.000 * 1.000 * 6.231) + = 37.545

Total of 2 main streams to confluence:

Flow rates before confluence point:

55.044 6.231

Maximum flow rates at confluence using above data:

59.376 37.545

Area of streams before confluence:

134.900 12.200

Results of confluence:

Total flow rate = 59.376(CFS)

Time of concentration = 62.149 min.

Effective stream area after confluence = 147.100(Ac.)

End of computations, total study area = 147.100 (Ac.)

5-YEAR HYDROLOGIC ANALYSIS RESULTS

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4

Rational method hydrology program based on
 San Diego County Flood Control Division 1985 hydrology manual
 Rational Hydrology Study Date: 09/27/13

 MISSION BAY HIGH SCHOOL EXIST CONDITION HYDROLOGY ANALYSIS - MMP MAPS 36
 & 37 - ASSUMPTIONS: 1. n=0.030 IN MBHS CONC CHANNEL; AND 2. n=0.035 IN
 PACIFIC BEACH/OLNEY ST EARTHEN CHANNEL
 CIVILD FILE: MBHS5YR.RSD

***** Hydrology Study Control Information *****

 Program License Serial Number 6219

Rational hydrology study storm event year is 5.0
 English (in-lb) input data Units used
 English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
 Elevation 0 - 1500 feet
 Factor (to multiply * intensity) = 1.000
 Only used if inside City of San Diego
 San Diego hydrology manual 'C' values used
 Runoff coefficients by modified rational method

 Process from Point/Station 100.000 to Point/Station 105.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 194.700(Ft.)
 Highest elevation = 186.000(Ft.)
 Lowest elevation = 185.500(Ft.)
 Elevation difference = 0.500(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 21.73 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.5500) * (194.700^{.5})] / (0.257^{(1/3)}) = 21.73$
 Rainfall intensity (I) = 1.500(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.371(CFS)
 Total initial stream area = 0.450(Ac.)

 Process from Point/Station 105.000 to Point/Station 110.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 185.500(Ft.)
 End of street segment elevation = 174.000(Ft.)
 Length of street segment = 428.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020

Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 0.858(CFS)
 Depth of flow = 0.201(Ft.), Average velocity = 2.433(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 5.304(Ft.)
 Flow velocity = 2.43(Ft/s)
 Travel time = 2.94 min. TC = 24.67 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.398(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 0.897
 Subarea runoff = 0.882(CFS) for 1.180(Ac.)
 Total runoff = 1.254(CFS) Total area = 1.630(Ac.)
 Street flow at end of street = 1.254(CFS)
 Half street flow at end of street = 1.254(CFS)
 Depth of flow = 0.222(Ft.), Average velocity = 2.637(Ft/s)
 Flow width (from curb towards crown) = 6.358(Ft.)

 Process from Point/Station 110.000 to Point/Station 115.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 174.000(Ft.)
 End of street segment elevation = 138.000(Ft.)
 Length of street segment = 762.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 2.076(CFS)
 Depth of flow = 0.236(Ft.), Average velocity = 3.675(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 7.027(Ft.)
 Flow velocity = 3.67(Ft/s)
 Travel time = 3.46 min. TC = 28.13 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.296(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 2.074
 Subarea runoff = 1.434(CFS) for 2.140(Ac.)

MBHS5YR.out

Total runoff = 2.688(CFS) Total area = 3.770(Ac.)
 Street flow at end of street = 2.688(CFS)
 Half street flow at end of street = 2.688(CFS)
 Depth of flow = 0.252(Ft.), Average velocity = 3.897(Ft/s)
 Flow width (from curb towards crown)= 7.864(Ft.)

 Process from Point/Station 115.000 to Point/Station 120.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 138.000(Ft.)
 End of street segment elevation = 137.500(Ft.)
 Length of street segment = 522.400(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 5.137(CFS)
 Depth of flow = 0.433(Ft.), Average velocity = 0.878(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 16.898(Ft.)
 Flow velocity = 0.88(Ft/s)
 Travel time = 9.92 min. TC = 38.05 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.074(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 5.852
 Subarea runoff = 3.600(CFS) for 6.870(Ac.)
 Total runoff = 6.288(CFS) Total area = 10.640(Ac.)
 Street flow at end of street = 6.288(CFS)
 Half street flow at end of street = 3.144(CFS)
 Depth of flow = 0.460(Ft.), Average velocity = 0.922(Ft/s)
 Flow width (from curb towards crown)= 18.267(Ft.)

 Process from Point/Station 120.000 to Point/Station 125.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 137.500(Ft.)
 End of street segment elevation = 92.000(Ft.)
 Length of street segment = 716.200(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160

MBHS5YR.out

Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 8.784(CFS)
 Depth of flow = 0.277(Ft.), Average velocity = 4.898(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.086(Ft.)
 Flow velocity = 4.90(Ft/s)
 Travel time = 2.44 min. TC = 40.49 min.

Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.032(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 10.500
 Subarea runoff = 4.551(CFS) for 8.450(Ac.)
 Total runoff = 10.839(CFS) Total area = 19.090(Ac.)
 Street flow at end of street = 10.839(CFS)
 Half street flow at end of street = 5.419(CFS)
 Depth of flow = 0.293(Ft.), Average velocity = 5.148(Ft/s)
 Flow width (from curb towards crown)= 9.907(Ft.)

 Process from Point/Station 125.000 to Point/Station 130.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 92.000(Ft.)
 End of street segment elevation = 69.000(Ft.)
 Length of street segment = 528.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 12.792(CFS)
 Depth of flow = 0.324(Ft.), Average velocity = 4.641(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 11.432(Ft.)
 Flow velocity = 4.64(Ft/s)
 Travel time = 1.90 min. TC = 42.39 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.002(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 14.284
 Subarea runoff = 3.477(CFS) for 6.880(Ac.)
 Total runoff = 14.316(CFS) Total area = 25.970(Ac.)
 Street flow at end of street = 14.316(CFS)
 Half street flow at end of street = 7.158(CFS)
 Depth of flow = 0.334(Ft.), Average velocity = 4.769(Ft/s)
 Flow width (from curb towards crown)= 11.957(Ft.)

MBHS5YR.out

```

*****
Process from Point/Station      130.000 to Point/Station      135.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 69.000(Ft.)
End of street segment elevation = 49.500(Ft.)
Length of street segment = 494.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 22.000(Ft.)
Distance from crown to crossfall grade break = 18.500(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)
Gutter hike from flowline = 1.500(In.)
Manning's N in gutter = 0.0160
Manning's N from gutter to grade break = 0.0160
Manning's N from grade break to crown = 0.0160
Estimated mean flow rate at midpoint of street = 17.042(CFS)
Depth of flow = 0.356(Ft.), Average velocity = 4.793(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 13.063(Ft.)
Flow velocity = 4.79(Ft/s)
Travel time = 1.72 min. TC = 44.10 min.
Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type ]
Rainfall intensity = 0.977(In/Hr) for a 5.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.591 CA = 21.207
Subarea runoff = 6.401(CFS) for 9.890(Ac.)
Total runoff = 20.717(CFS) Total area = 35.860(Ac.)
Street flow at end of street = 20.717(CFS)
Half street flow at end of street = 10.359(CFS)
Depth of flow = 0.377(Ft.), Average velocity = 5.027(Ft/s)
Flow width (from curb towards crown)= 14.104(Ft.)

*****
Process from Point/Station      135.000 to Point/Station      140.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 49.500(Ft.)
End of street segment elevation = 43.700(Ft.)
Length of street segment = 502.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 22.000(Ft.)
Distance from crown to crossfall grade break = 18.500(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)
Gutter hike from flowline = 1.500(In.)
Manning's N in gutter = 0.0160
Manning's N from gutter to grade break = 0.0160
Manning's N from grade break to crown = 0.0160
Estimated mean flow rate at midpoint of street = 21.668(CFS)
Depth of flow = 0.573(Ft.), Average velocity = 3.689(Ft/s)
Warning: depth of flow exceeds top of curb
Note: depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property = 3.64(Ft.)

```

MBHS5YR.out

```

Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 22.000(Ft.)
Flow velocity = 3.69(Ft/s)
Travel time = 2.27 min. TC = 46.37 min.
Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type ]
Rainfall intensity = 0.946(In/Hr) for a 5.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.613 CA = 24.003
Subarea runoff = 1.986(CFS) for 3.290(Ac.)
Total runoff = 22.703(CFS) Total area = 39.150(Ac.)
Street flow at end of street = 22.703(CFS)
Half street flow at end of street = 22.703(CFS)
Depth of flow = 0.581(Ft.), Average velocity = 3.736(Ft/s)
Warning: depth of flow exceeds top of curb
Note: depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property = 4.03(Ft.)
Flow width (from curb towards crown)= 22.000(Ft.)

*****
Process from Point/Station      135.000 to Point/Station      140.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 39.150(Ac.)
Runoff from this stream = 22.703(CFS)
Time of concentration = 46.37 min.
Rainfall intensity = 0.946(In/Hr)
Program is now starting with Main Stream No. 2

*****
Process from Point/Station      200.000 to Point/Station      205.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type ]
Initial subarea flow distance = 197.000(Ft.)
Highest elevation = 118.000(Ft.)
Lowest elevation = 111.000(Ft.)
Elevation difference = 7.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 9.11 min.
TC = [1.8*(1.1-C)*distance^(.5)]/(% slope^(1/3))
TC = [1.8*(1.1-0.5500)*( 197.000^.5)]/( 3.553^(1/3))= 9.11
Rainfall intensity (I) = 2.321(In/Hr) for a 5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff = 0.855(CFS)
Total initial stream area = 0.670(Ac.)

*****
Process from Point/Station      205.000 to Point/Station      210.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 111.000(Ft.)
End of street segment elevation = 75.000(Ft.)
Length of street segment = 731.500(Ft.)
Height of curb above gutter flowline = 6.0(In.)

```

MBHS5YR.out

Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 4.480(CFS)
 Depth of flow = 0.239(Ft.), Average velocity = 3.799(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 7.199(Ft.)
 Flow velocity = 3.80(Ft/s)
 Travel time = 3.21 min. TC = 12.31 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.001(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 3.493
 Subarea runoff = 6.133(CFS) for 5.680(Ac.)
 Total runoff = 6.988(CFS) Total area = 6.350(Ac.)
 Street flow at end of street = 6.988(CFS)
 Half street flow at end of street = 3.494(CFS)
 Depth of flow = 0.269(Ft.), Average velocity = 4.210(Ft/s)
 Flow width (from curb towards crown)= 8.711(Ft.)

 Process from Point/Station 210.000 to Point/Station 215.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 75.000(Ft.)
 End of street segment elevation = 72.000(Ft.)
 Length of street segment = 298.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 8.166(CFS)
 Depth of flow = 0.430(Ft.), Average velocity = 2.832(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 16.769(Ft.)
 Flow velocity = 2.83(Ft/s)
 Travel time = 1.75 min. TC = 14.07 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.874(In/Hr) for a 5.0 year storm

MBHS5YR.out

Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.670
 Subarea runoff = 1.763(CFS) for 2.140(Ac.)
 Total runoff = 8.751(CFS) Total area = 8.490(Ac.)
 Street flow at end of street = 8.751(CFS)
 Half street flow at end of street = 8.751(CFS)
 Depth of flow = 0.439(Ft.), Average velocity = 2.881(Ft/s)
 Flow width (from curb towards crown)= 17.223(Ft.)

 Process from Point/Station 215.000 to Point/Station 140.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 72.000(Ft.)
 End of street segment elevation = 43.700(Ft.)
 Length of street segment = 653.800(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 10.142(CFS)
 Depth of flow = 0.304(Ft.), Average velocity = 4.379(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.425(Ft.)
 Flow velocity = 4.38(Ft/s)
 Travel time = 2.49 min. TC = 16.56 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 1.728(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.586 CA = 6.559
 Subarea runoff = 2.582(CFS) for 2.700(Ac.)
 Total runoff = 11.333(CFS) Total area = 11.190(Ac.)
 Street flow at end of street = 11.333(CFS)
 Half street flow at end of street = 5.667(CFS)
 Depth of flow = 0.313(Ft.), Average velocity = 4.497(Ft/s)
 Flow width (from curb towards crown)= 10.903(Ft.)

 Process from Point/Station 215.000 to Point/Station 140.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 11.190(Ac.)
 Runoff from this stream = 11.333(CFS)
 Time of concentration = 16.56 min.
 Rainfall intensity = 1.728(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)

MBHS5YR.out

```

1      22.703   46.37           0.946
2      11.333   16.56           1.728
Qmax(1) =
1.000 * 1.000 * 22.703) +
0.547 * 1.000 * 11.333) + =      28.907
Qmax(2) =
1.000 * 0.357 * 22.703) +
1.000 * 1.000 * 11.333) + =      19.439

```

```

Total of 2 main streams to confluence:
Flow rates before confluence point:
22.703   11.333
Maximum flow rates at confluence using above data:
28.907   19.439
Area of streams before confluence:
39.150   11.190

```

```

Results of confluence:
Total flow rate = 28.907(CFS)
Time of concentration = 46.372 min.
Effective stream area after confluence = 50.340(Ac.)

```

```

*****
Process from Point/Station 140.000 to Point/Station 220.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

```

```

Upstream point/station elevation = 36.150(Ft.)
Downstream point/station elevation = 34.120(Ft.)
Pipe length = 151.50(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 28.907(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 28.907(CFS)
Normal flow depth in pipe = 16.90(In.)
Flow top width inside pipe = 29.76(In.)
Critical Depth = 22.01(In.)
Pipe flow velocity = 10.14(Ft/s)
Travel time through pipe = 0.25 min.
Time of concentration (TC) = 46.62 min.

```

```

*****
Process from Point/Station 220.000 to Point/Station 225.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

```

```

Upstream point/station elevation = 34.120(Ft.)
Downstream point/station elevation = 31.700(Ft.)
Pipe length = 191.10(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 28.907(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 28.907(CFS)
Normal flow depth in pipe = 17.20(In.)
Flow top width inside pipe = 29.67(In.)
Critical Depth = 22.01(In.)
Pipe flow velocity = 9.93(Ft/s)
Travel time through pipe = 0.32 min.
Time of concentration (TC) = 46.94 min.

```

```

*****
Process from Point/Station 220.000 to Point/Station 225.000
**** SUBAREA FLOW ADDITION ****

```

```

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000

```

MBHS5YR.out

```

Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type ]
Time of concentration = 46.94 min.
Rainfall intensity = 0.938(In/Hr) for a 5.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.605 CA = 31.476
Subarea runoff = 0.630(CFS) for 1.660(Ac.)
Total runoff = 29.537(CFS) Total area = 52.000(Ac.)

```

```

*****
Process from Point/Station 225.000 to Point/Station 230.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

```

```

Upstream point/station elevation = 31.200(Ft.)
Downstream point/station elevation = 24.120(Ft.)
Pipe length = 125.43(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 29.537(CFS)
Given pipe size = 36.00(In.)
Calculated individual pipe flow = 29.537(CFS)
Normal flow depth in pipe = 10.52(In.)
Flow top width inside pipe = 32.75(In.)
Critical Depth = 21.12(In.)
Pipe flow velocity = 17.15(Ft/s)
Travel time through pipe = 0.12 min.
Time of concentration (TC) = 47.06 min.

```

```

*****
Process from Point/Station 225.000 to Point/Station 230.000
**** CONFLUENCE OF MAIN STREAMS ****

```

```

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 52.000(Ac.)
Runoff from this stream = 29.537(CFS)
Time of concentration = 47.06 min.
Rainfall intensity = 0.937(In/Hr)
Program is now starting with Main Stream No. 2

```

```

*****
Process from Point/Station 300.000 to Point/Station 305.000
**** INITIAL AREA EVALUATION ****

```

```

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type ]
Initial subarea flow distance = 176.600(Ft.)
Highest elevation = 64.000(Ft.)
Lowest elevation = 30.000(Ft.)
Elevation difference = 34.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 3.57 min.
TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.7000)*( 176.600^0.5)/( 19.253^(1/3))] = 3.57
Setting time of concentration to 5 minutes
Rainfall intensity (I) = 3.149(In/Hr) for a 5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff = 0.750(CFS)
Total initial stream area = 0.340(Ac.)

```

```

*****
Process from Point/Station 305.000 to Point/Station 310.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

```

Top of street segment elevation = 60.000(Ft.)
 End of street segment elevation = 45.500(Ft.)
 Length of street segment = 739.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 6.008(CFS)
 Depth of flow = 0.356(Ft.), Average velocity = 3.379(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 13.064(Ft.)
 Flow velocity = 3.38(Ft/s)
 Travel time = 3.65 min. TC = 8.65 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 2.381(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=K CIA) is C = 0.700 CA = 3.577
 Subarea runoff = 7.767(CFS) for 4.770(Ac.)
 Total runoff = 8.516(CFS) Total area = 5.110(Ac.)
 Street flow at end of street = 8.516(CFS)
 Half street flow at end of street = 8.516(CFS)
 Depth of flow = 0.395(Ft.), Average velocity = 3.680(Ft/s)
 Flow width (from curb towards crown)= 14.977(Ft.)

 Process from Point/Station 310.000 to Point/Station 315.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 45.500(Ft.)
 End of street segment elevation = 33.500(Ft.)
 Length of street segment = 721.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 12.366(CFS)
 Depth of flow = 0.452(Ft.), Average velocity = 3.791(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 17.863(Ft.)
 Flow velocity = 3.79(Ft/s)
 Travel time = 3.17 min. TC = 11.82 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 2.042(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=K CIA) is C = 0.771 CA = 7.504
 Subarea runoff = 6.805(CFS) for 4.620(Ac.)
 Total runoff = 15.321(CFS) Total area = 9.730(Ac.)
 Street flow at end of street = 15.321(CFS)
 Half street flow at end of street = 15.321(CFS)
 Depth of flow = 0.483(Ft.), Average velocity = 3.997(Ft/s)
 Flow width (from curb towards crown)= 19.395(Ft.)

 Process from Point/Station 315.000 to Point/Station 230.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 27.800(Ft.)
 Downstream point/station elevation = 24.120(Ft.)
 Pipe length = 189.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 15.321(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 15.321(CFS)
 Normal flow depth in pipe = 18.00(In.)
 Flow top width inside pipe = 0.00(In.)
 Critical Depth = 16.95(In.)
 Pipe flow velocity = 8.28(Ft/s)
 Travel time through pipe = 0.38 min.
 Time of concentration (TC) = 12.20 min.

 Process from Point/Station 315.000 to Point/Station 230.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 9.730(Ac.)
 Runoff from this stream = 15.321(CFS)
 Time of concentration = 12.20 min.
 Rainfall intensity = 2.010(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	29.537	47.06	0.937
2	15.321	12.20	2.010
Qmax(1) =	1.000 * 0.466 *	1.000 * 1.000 *	29.537) + 15.321) + = 36.678
Qmax(2) =	1.000 * 1.000 *	0.259 * 1.000 *	29.537) + 15.321) + = 22.978

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 29.537 15.321
 Maximum flow rates at confluence using above data:
 36.678 22.978
 Area of streams before confluence:
 52.000 9.730

Results of confluence:

MBHS5YR.out

Total flow rate = 36.678(CFS)
 Time of concentration = 47.063 min.
 Effective stream area after confluence = 61.730(Ac.)

 Process from Point/Station 230.000 to Point/Station 320.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 24.120(Ft.)
 Downstream point/station elevation = 11.910(Ft.)
 Pipe length = 544.91(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 36.678(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 36.678(CFS)
 Normal flow depth in pipe = 15.09(In.)
 Flow top width inside pipe = 35.53(In.)
 Critical Depth = 23.65(In.)
 Pipe flow velocity = 13.04(Ft/s)
 Travel time through pipe = 0.70 min.
 Time of concentration (TC) = 47.76 min.

 Process from Point/Station 230.000 to Point/Station 320.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 47.76 min.
 Rainfall intensity = 0.928(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.635 CA = 41.535
 Subarea runoff = 1.867(CFS) for 3.650(Ac.)
 Total runoff = 38.545(CFS) Total area = 65.380(Ac.)

 Process from Point/Station 320.000 to Point/Station 325.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 11.910(Ft.)
 Downstream point/station elevation = 8.470(Ft.)
 Pipe length = 215.48(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 38.545(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 38.545(CFS)
 Normal flow depth in pipe = 17.09(In.)
 Flow top width inside pipe = 35.95(In.)
 Critical Depth = 24.24(In.)
 Pipe flow velocity = 11.66(Ft/s)
 Travel time through pipe = 0.31 min.
 Time of concentration (TC) = 48.07 min.

 Process from Point/Station 320.000 to Point/Station 325.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Time of concentration = 48.07 min.

MBHS5YR.out

Rainfall intensity = 0.924(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.627 CA = 45.528
 Subarea runoff = 3.531(CFS) for 7.260(Ac.)
 Total runoff = 42.075(CFS) Total area = 72.640(Ac.)

 Process from Point/Station 325.000 to Point/Station 330.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.470(Ft.)
 Downstream point/station elevation = 7.000(Ft.)
 Pipe length = 249.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 42.075(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 42.075(CFS)
 Normal flow depth in pipe = 24.84(In.)
 Flow top width inside pipe = 33.30(In.)
 Critical Depth = 25.34(In.)
 Pipe flow velocity = 8.08(Ft/s)
 Travel time through pipe = 0.52 min.
 Time of concentration (TC) = 48.58 min.

 Process from Point/Station 325.000 to Point/Station 330.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 72.640(Ac.)
 Runoff from this stream = 42.075(CFS)
 Time of concentration = 48.58 min.
 Rainfall intensity = 0.918(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 400.000 to Point/Station 405.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 189.400(Ft.)
 Highest elevation = 33.000(Ft.)
 Lowest elevation = 30.000(Ft.)
 Elevation difference = 3.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 11.69 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.5500) * (189.400^{.5}) / (1.584^{(1/3)})] = 11.69$
 Rainfall intensity (I) = 2.053(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.779(CFS)
 Total initial stream area = 0.690(Ac.)

 Process from Point/Station 405.000 to Point/Station 410.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 30.000(Ft.)
 End of street segment elevation = 15.500(Ft.)
 Length of street segment = 708.400(Ft.)

MBHS5YR.out

Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 4.567(CFS)
 Depth of flow = 0.270(Ft.), Average velocity = 2.723(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.759(Ft.)
 Flow velocity = 2.72(Ft/s)
 Travel time = 4.34 min. TC = 16.02 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.756(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.070
 Subarea runoff = 6.370(CFS) for 6.710(Ac.)
 Total runoff = 7.149(CFS) Total area = 7.400(Ac.)
 Street flow at end of street = 7.149(CFS)
 Half street flow at end of street = 3.574(CFS)
 Depth of flow = 0.306(Ft.), Average velocity = 3.029(Ft/s)
 Flow width (from curb towards crown)= 10.530(Ft.)

 Process from Point/Station 410.000 to Point/Station 415.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 15.500(Ft.)
 End of street segment elevation = 13.500(Ft.)
 Length of street segment = 521.600(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 9.738(CFS)
 Depth of flow = 0.426(Ft.), Average velocity = 1.733(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 16.547(Ft.)
 Flow velocity = 1.73(Ft/s)
 Travel time = 5.02 min. TC = 21.04 min.
 Adding area flow to street
 User specified 'C' value of 0.760 given for subarea
 Rainfall intensity = 1.526(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.638 CA = 8.144
 Subarea runoff = 5.278(CFS) for 5.360(Ac.)

MBHS5YR.out

Total runoff = 12.427(CFS) Total area = 12.760(Ac.)
 Street flow at end of street = 12.427(CFS)
 Half street flow at end of street = 6.213(CFS)
 Depth of flow = 0.459(Ft.), Average velocity = 1.841(Ft/s)
 Flow width (from curb towards crown)= 18.178(Ft.)

 Process from Point/Station 410.000 to Point/Station 415.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 12.760(Ac.)
 Runoff from this stream = 12.427(CFS)
 Time of concentration = 21.04 min.
 Rainfall intensity = 1.526(In/Hr)

 Process from Point/Station 500.000 to Point/Station 505.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.900 given for subarea
 Initial subarea flow distance = 145.000(Ft.)
 Highest elevation = 16.000(Ft.)
 Lowest elevation = 14.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.89 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.9000) * (145.000^{.5})] / (1.379^{(1/3)}) = 3.89$
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 3.149(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.900
 Subarea runoff = 0.652(CFS)
 Total initial stream area = 0.230(Ac.)

 Process from Point/Station 505.000 to Point/Station 510.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 14.000(Ft.)
 End of street segment elevation = 11.500(Ft.)
 Length of street segment = 583.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 6.491(CFS)
 Depth of flow = 0.457(Ft.), Average velocity = 1.941(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 18.093(Ft.)
 Flow velocity = 1.94(Ft/s)
 Travel time = 5.01 min. TC = 10.01 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000

MBHS5YR.out

Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 2.215(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.853 CA = 3.709
 Subarea runoff = 7.564(CFS) for 4.120(Ac.)
 Total runoff = 8.216(CFS) Total area = 4.350(Ac.)
 Street flow at end of street = 8.216(CFS)
 Half street flow at end of street = 8.216(CFS)
 Depth of flow = 0.491(Ft.), Average velocity = 2.057(Ft/s)
 Flow width (from curb towards crown)= 19.807(Ft.)

 Process from Point/Station 510.000 to Point/Station 415.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 9.520(Ft.)
 Downstream point/station elevation = 8.800(Ft.)
 Pipe length = 259.69(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 8.216(CFS)
 Given pipe size = 15.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 4.524(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 4.200(Ft.)
 Minor friction loss = 1.044(Ft.) K-factor = 1.50
 Pipe flow velocity = 6.70(Ft/s)
 Travel time through pipe = 0.65 min.
 Time of concentration (TC) = 10.65 min.

 Process from Point/Station 510.000 to Point/Station 415.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 4.350(Ac.)
 Runoff from this stream = 8.216(CFS)
 Time of concentration = 10.65 min.
 Rainfall intensity = 2.148(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	12.427	21.04	1.526
2	8.216	10.65	2.148
Qmax(1) =	1.000 * 1.000 * 12.427) + 0.710 * 1.000 * 8.216) + =		18.263
Qmax(2) =	1.000 * 0.506 * 12.427) + 1.000 * 1.000 * 8.216) + =		14.509

Total of 2 streams to confluence:
 Flow rates before confluence point:
 12.427 8.216
 Maximum flow rates at confluence using above data:
 18.263 14.509
 Area of streams before confluence:
 12.760 4.350
 Results of confluence:
 Total flow rate = 18.263(CFS)
 Time of concentration = 21.039 min.
 Effective stream area after confluence = 17.110(Ac.)

MBHS5YR.out

 Process from Point/Station 415.000 to Point/Station 515.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.800(Ft.)
 Downstream point/station elevation = 8.550(Ft.)
 Pipe length = 84.57(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 18.263(CFS)
 Given pipe size = 18.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 4.793(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 2.555(Ft.)
 Minor friction loss = 2.488(Ft.) K-factor = 1.50
 Pipe flow velocity = 10.33(Ft/s)
 Travel time through pipe = 0.14 min.
 Time of concentration (TC) = 21.18 min.

 Process from Point/Station 415.000 to Point/Station 515.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 21.18 min.
 Rainfall intensity = 1.521(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.694 CA = 13.869
 Subarea runoff = 2.827(CFS) for 2.880(Ac.)
 Total runoff = 21.089(CFS) Total area = 19.990(Ac.)

 Process from Point/Station 515.000 to Point/Station 520.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.550(Ft.)
 Downstream point/station elevation = 7.620(Ft.)
 Pipe length = 337.77(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 21.089(CFS)
 Given pipe size = 27.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 1.291(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 1.566(Ft.)
 Minor friction loss = 0.655(Ft.) K-factor = 1.50
 Pipe flow velocity = 5.30(Ft/s)
 Travel time through pipe = 1.06 min.
 Time of concentration (TC) = 22.24 min.

 Process from Point/Station 515.000 to Point/Station 520.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.950 given for subarea
 Time of concentration = 22.24 min.
 Rainfall intensity = 1.481(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.721 CA = 16.120
 Subarea runoff = 2.785(CFS) for 2.370(Ac.)
 Total runoff = 23.874(CFS) Total area = 22.360(Ac.)

MBHS5YR.out

 Process from Point/Station 520.000 to Point/Station 330.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 7.620(Ft.)
 Downstream point elevation = 7.000(Ft.)
 Channel length thru subarea = 228.700(Ft.)
 Channel base width = 3.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 23.874(CFS)
 Depth of flow = 1.665(Ft.), Average velocity = 2.608(Ft/s)
 Channel flow top width = 7.996(Ft.)
 Flow Velocity = 2.61(Ft/s)
 Travel time = 1.46 min.
 Time of concentration = 23.70 min.
 Critical depth = 1.047(Ft.)

 Process from Point/Station 520.000 to Point/Station 330.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 22.360(Ac.)
 Runoff from this stream = 23.874(CFS)
 Time of concentration = 23.70 min.
 Rainfall intensity = 1.430(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	42.075	48.58	0.918
2	23.874	23.70	1.430
Qmax(1) =	1.000 * 0.642	1.000 * 1.000	42.075) + 23.874) + =
			57.398
Qmax(2) =	1.000 * 1.000	0.488 * 1.000	42.075) + 23.874) + =
			44.398

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 42.075 23.874
 Maximum flow rates at confluence using above data:
 57.398 44.398
 Area of streams before confluence:
 72.640 22.360

Results of confluence:
 Total flow rate = 57.398(CFS)
 Time of concentration = 48.584 min.
 Effective stream area after confluence = 95.000(Ac.)

 Process from Point/Station 330.000 to Point/Station 600.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 7.000(Ft.)
 Downstream point elevation = 6.350(Ft.)

MBHS5YR.out

Channel length thru subarea = 499.000(Ft.)
 Channel base width = 4.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Estimated mean flow rate at midpoint of channel = 59.002(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 59.002(CFS)
 Depth of flow = 2.743(Ft.), Average velocity = 2.753(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 10.000(Ft.)
 Flow Velocity = 2.75(Ft/s)
 Travel time = 3.02 min.
 Time of concentration = 51.60 min.
 Critical depth = 1.547(Ft.)
 ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 0.883(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KClA) is C = 0.660 CA = 66.161
 Subarea runoff = 1.010(CFS) for 5.310(Ac.)
 Total runoff = 58.408(CFS) Total area = 100.310(Ac.)

 Process from Point/Station 600.000 to Point/Station 605.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 6.350(Ft.)
 Downstream point elevation = 5.880(Ft.)
 Channel length thru subarea = 357.200(Ft.)
 Channel base width = 4.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Estimated mean flow rate at midpoint of channel = 58.501(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 58.501(CFS)
 Depth of flow = 2.726(Ft.), Average velocity = 2.752(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 10.000(Ft.)
 Flow Velocity = 2.75(Ft/s)
 Travel time = 2.16 min.
 Time of concentration = 53.77 min.
 Critical depth = 1.531(Ft.)
 ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 The area added to the existing stream causes a
 a lower flow rate of Q = 57.143(CFS)
 therefore the upstream flow rate of Q = 58.408(CFS) is being used
 Rainfall intensity = 0.860(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KClA) is C = 0.660 CA = 66.465
 Subarea runoff = 0.000(CFS) for 0.320(Ac.)
 Total runoff = 58.408(CFS) Total area = 100.630(Ac.)

MBHS5YR.out

Process from Point/Station 605.000 to Point/Station 607.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.880(Ft.)
 Downstream point elevation = 5.820(Ft.)
 Channel length thru subarea = 25.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 63.951(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 5.000(Ft.)
 Flow(q) thru subarea = 63.951(CFS)
 Depth of flow = 1.699(Ft.), Average velocity = 2.901(Ft/s)
 Channel flow top width = 15.947(Ft.)
 Flow Velocity = 2.90(Ft/s)
 Travel time = 0.14 min.
 Time of concentration = 53.91 min.
 Critical depth = 1.016(Ft.)
 Adding area flow to channel
 User specified 'C' value of 0.570 given for subarea
 Rainfall intensity = 0.858(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.646 CA = 77.352
 Subarea runoff = 7.980(CFS) for 19.100(Ac.)
 Total runoff = 66.388(CFS) Total area = 119.730(Ac.)

 Process from Point/Station 607.000 to Point/Station 610.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.820(Ft.)
 Downstream point elevation = 5.400(Ft.)
 Channel length thru subarea = 185.000(Ft.)
 Channel base width = 5.000(Ft.)
 Slope or 'Z' of left channel bank = 2.000
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 68.274(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 5.000(Ft.)
 Flow(q) thru subarea = 68.274(CFS)
 Depth of flow = 2.512(Ft.), Average velocity = 2.711(Ft/s)
 Channel flow top width = 15.049(Ft.)
 Flow Velocity = 2.71(Ft/s)
 Travel time = 1.14 min.
 Time of concentration = 55.05 min.
 Critical depth = 1.469(Ft.)
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 Rainfall intensity = 0.847(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.662 CA = 83.812
 Subarea runoff = 4.582(CFS) for 6.800(Ac.)
 Total runoff = 70.970(CFS) Total area = 126.530(Ac.)

 Process from Point/Station 607.000 to Point/Station 610.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 126.530(Ac.)

MBHS5YR.out

Runoff from this stream = 70.970(CFS)
 Time of concentration = 55.05 min.
 Rainfall intensity = 0.847(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 700.000 to Point/Station 705.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 167.000(Ft.)
 Highest elevation = 16.000(Ft.)
 Lowest elevation = 14.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 12.05 min.
 $TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^{1/3})$
 $TC = [1.8*(1.1-0.5500)*(167.000^0.5)/(1.198^{1/3})] = 12.05$
 Rainfall intensity (I) = 2.023(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.445(CFS)
 Total initial stream area = 0.400(Ac.)

 Process from Point/Station 705.000 to Point/Station 710.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 14.000(Ft.)
 End of street segment elevation = 11.500(Ft.)
 Length of street segment = 580.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 4.366(CFS)
 Depth of flow = 0.331(Ft.), Average velocity = 1.489(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 11.812(Ft.)
 Flow velocity = 1.49(Ft/s)
 Travel time = 6.50 min. TC = 18.55 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.630(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.098
 Subarea runoff = 6.236(CFS) for 7.050(Ac.)
 Total runoff = 6.681(CFS) Total area = 7.450(Ac.)
 Street flow at end of street = 6.681(CFS)
 Half street flow at end of street = 3.340(CFS)

MBHS5YR.out

Depth of flow = 0.374(Ft.), Average velocity = 1.651(Ft/s)
 Flow width (from curb towards crown)= 13.972(Ft.)

 Process from Point/Station 710.000 to Point/Station 610.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.000(Ft.)
 Downstream point/station elevation = 5.400(Ft.)
 Pipe length = 129.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.681(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 6.681(CFS)
 Normal flow depth in pipe = 8.46(In.)
 Flow top width inside pipe = 17.97(In.)
 Critical Depth = 12.00(In.)
 Pipe flow velocity = 8.19(Ft/s)
 Travel time through pipe = 0.26 min.
 Time of concentration (TC) = 18.81 min.

 Process from Point/Station 710.000 to Point/Station 610.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 7.450(Ac.)
 Runoff from this stream = 6.681(CFS)
 Time of concentration = 18.81 min.
 Rainfall intensity = 1.619(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	70.970	55.05	0.847
2	6.681	18.81	1.619
Qmax(1) =			
	1.000 *	1.000 *	70.970) +
	0.523 *	1.000 *	6.681) + = 74.466
Qmax(2) =			
	1.000 *	0.342 *	70.970) +
	1.000 *	1.000 *	6.681) + = 30.933

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 70.970 6.681
 Maximum flow rates at confluence using above data:
 74.466 30.933
 Area of streams before confluence:
 126.530 7.450

Results of confluence:
 Total flow rate = 74.466(CFS)
 Time of concentration = 55.048 min.
 Effective stream area after confluence = 133.980(Ac.)

 Process from Point/Station 610.000 to Point/Station 715.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.400(Ft.)
 Downstream point elevation = 3.860(Ft.)

MBHS5YR.out

Channel length thru subarea = 668.000(Ft.)
 Channel base width = 5.000(Ft.)
 Slope or 'Z' of left channel bank = 3.000
 Slope or 'Z' of right channel bank = 2.000

Estimated mean flow rate at midpoint of channel = 74.721(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 6.000(Ft.)
 Flow(q) thru subarea = 74.721(CFS)
 Depth of flow = 2.483(Ft.), Average velocity = 2.685(Ft/s)
 Channel flow top width = 17.414(Ft.)
 Flow Velocity = 2.69(Ft/s)
 Travel time = 4.15 min.

Time of concentration = 59.19 min.
 Critical depth = 1.484(Ft.)
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [RURAL(greater than 0.5 Ac, 0.2 ha) area type]
 The area added to the existing stream causes a
 a lower flow rate of Q = 71.369(CFS)
 therefore the upstream flow rate of Q = 74.466(CFS) is being used
 Rainfall intensity = 0.808(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.655 CA = 88.324
 Subarea runoff = 0.000(CFS) for 0.920(Ac.)
 Total runoff = 74.466(CFS) Total area = 134.900(Ac.)

 Process from Point/Station 610.000 to Point/Station 715.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 134.900(Ac.)
 Runoff from this stream = 74.466(CFS)
 Time of concentration = 59.19 min.
 Rainfall intensity = 0.808(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 720.000 to Point/Station 725.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 168.900(Ft.)
 Highest elevation = 18.000(Ft.)
 Lowest elevation = 16.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 12.16 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.5500) * (168.900^{.5})] / (1.184^{(1/3)}) = 12.16$
 Rainfall intensity (I) = 2.013(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.576(CFS)
 Total initial stream area = 0.520(Ac.)

 Process from Point/Station 725.000 to Point/Station 730.000

MBHS5YR.out

**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 16.000(Ft.)
 End of street segment elevation = 13.500(Ft.)
 Length of street segment = 778.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 2.912(CFS)
 Depth of flow = 0.308(Ft.), Average velocity = 1.208(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.650(Ft.)
 Flow velocity = 1.21(Ft/s)
 Travel time = 10.74 min. TC = 22.90 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.457(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 2.607
 Subarea runoff = 3.223(CFS) for 4.220(Ac.)
 Total runoff = 3.799(CFS) Total area = 4.740(Ac.)
 Street flow at end of street = 3.799(CFS)
 Half street flow at end of street = 1.900(CFS)
 Depth of flow = 0.332(Ft.), Average velocity = 1.288(Ft/s)
 Flow width (from curb towards crown)= 11.848(Ft.)

 Process from Point/Station 730.000 to Point/Station 735.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 13.500(Ft.)
 End of street segment elevation = 10.000(Ft.)
 Length of street segment = 874.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 5.779(CFS)
 Depth of flow = 0.446(Ft.), Average velocity = 1.837(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 17.535(Ft.)
 Flow velocity = 1.84(Ft/s)
 Travel time = 7.94 min. TC = 30.84 min.
 Adding area flow to street

MBHS5YR.out

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.226(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 5.324
 Subarea runoff = 2.731(CFS) for 4.940(Ac.)
 Total runoff = 6.530(CFS) Total area = 9.680(Ac.)
 Street flow at end of street = 6.530(CFS)
 Half street flow at end of street = 6.530(CFS)
 Depth of flow = 0.463(Ft.), Average velocity = 1.893(Ft/s)
 Flow width (from curb towards crown)= 18.378(Ft.)

 Process from Point/Station 735.000 to Point/Station 715.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 10.000(Ft.)
 End of street segment elevation = 9.000(Ft.)
 Length of street segment = 322.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 7.380(CFS)
 Depth of flow = 0.499(Ft.), Average velocity = 1.773(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 20.224(Ft.)
 Flow velocity = 1.77(Ft/s)
 Travel time = 3.03 min. TC = 33.87 min.
 Adding area flow to street
 User specified 'C' value of 0.770 given for subarea
 Rainfall intensity = 1.157(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.595 CA = 7.264
 Subarea runoff = 1.877(CFS) for 2.520(Ac.)
 Total runoff = 8.406(CFS) Total area = 12.200(Ac.)
 Street flow at end of street = 8.406(CFS)
 Half street flow at end of street = 8.406(CFS)
 Depth of flow = 0.525(Ft.), Average velocity = 1.784(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 1.26(Ft.)
 Flow width (from curb towards crown)= 21.507(Ft.)

 Process from Point/Station 735.000 to Point/Station 715.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 12.200(Ac.)
 Runoff from this stream = 8.406(CFS)
 Time of concentration = 33.87 min.
 Rainfall intensity = 1.157(In/Hr)
 Summary of stream data:

MBHS5YR.out

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	74.466	59.19	0.808
2	8.406	33.87	1.157

Qmax(1) =

1.000 *	1.000 *	74.466) +	
0.698 *	1.000 *	8.406) + =	80.336

Qmax(2) =

1.000 *	0.572 *	74.466) +	
1.000 *	1.000 *	8.406) + =	51.015

Total of 2 main streams to confluence:

Flow rates before confluence point:

74.466	8.406
--------	-------

Maximum flow rates at confluence using above data:

80.336	51.015
--------	--------

Area of streams before confluence:

134.900	12.200
---------	--------

Results of confluence:

Total flow rate = 80.336(CFS)

Time of concentration = 59.194 min.

Effective stream area after confluence = 147.100(Ac.)

End of computations, total study area = 147.100 (Ac.)

10-YEAR HYDROLOGIC ANALYSIS RESULTS

MBHS10YR.out

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4

Rational method hydrology program based on
 San Diego County Flood Control Division 1985 hydrology manual
 Rational Hydrology Study Date: 09/27/13

 MISSION BAY HIGH SCHOOL EXIST CONDITION HYDROLOGY ANALYSIS - MMP MAPS 36
 & 37 - ASSUMPTIONS: 1. n=0.030 IN MBHS CONC CHANNEL; AND 2. n=0.035 IN
 PACIFIC BEACH/OLNEY ST EARTHEN CHANNEL
 CIVILD FILE: MBHS10YR.RSD

***** Hydrology Study Control Information *****

 Program License Serial Number 6219

Rational hydrology study storm event year is 10.0
 English (in-lb) input data Units used
 English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
 Elevation 0 - 1500 feet
 Factor (to multiply * intensity) = 1.000
 Only used if inside City of San Diego
 San Diego hydrology manual 'C' values used
 Runoff coefficients by modified rational method

 Process from Point/Station 100.000 to Point/Station 105.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 194.700(Ft.)
 Highest elevation = 186.000(Ft.)
 Lowest elevation = 185.500(Ft.)
 Elevation difference = 0.500(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 21.73 min.
 $TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(%\ slope^{1/3})]$
 $TC = [1.8*(1.1-0.5500)*(194.700^0.5)/(0.257^{1/3})] = 21.73$
 Rainfall intensity (I) = 1.762(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.436(CFS)
 Total initial stream area = 0.450(Ac.)

 Process from Point/Station 105.000 to Point/Station 110.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 185.500(Ft.)
 End of street segment elevation = 174.000(Ft.)
 Length of street segment = 428.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020

MBHS10YR.out

Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 1.008(CFS)
 Depth of flow = 0.210(Ft.), Average velocity = 2.516(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 5.740(Ft.)
 Flow velocity = 2.52(Ft/s)
 Travel time = 2.84 min. TC = 24.57 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.649(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 0.897
 Subarea runoff = 1.043(CFS) for 1.180(Ac.)
 Total runoff = 1.479(CFS) Total area = 1.630(Ac.)
 Street flow at end of street = 1.479(CFS)
 Half street flow at end of street = 1.479(CFS)
 Depth of flow = 0.232(Ft.), Average velocity = 2.735(Ft/s)
 Flow width (from curb towards crown) = 6.852(Ft.)

 Process from Point/Station 110.000 to Point/Station 115.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 174.000(Ft.)
 End of street segment elevation = 138.000(Ft.)
 Length of street segment = 762.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 2.449(CFS)
 Depth of flow = 0.246(Ft.), Average velocity = 3.815(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 7.555(Ft.)
 Flow velocity = 3.82(Ft/s)
 Travel time = 3.33 min. TC = 27.91 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.535(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 2.074
 Subarea runoff = 1.703(CFS) for 2.140(Ac.)

MBHS10YR.out

Total runoff = 3.182(CFS) Total area = 3.770(Ac.)
 Street flow at end of street = 3.182(CFS)
 Half street flow at end of street = 3.182(CFS)
 Depth of flow = 0.264(Ft.), Average velocity = 4.053(Ft/s)
 Flow width (from curb towards crown)= 8.449(Ft.)

 Process from Point/Station 115.000 to Point/Station 120.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 138.000(Ft.)
 End of street segment elevation = 137.500(Ft.)
 Length of street segment = 522.400(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 6.081(CFS)
 Depth of flow = 0.456(Ft.), Average velocity = 0.915(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 18.034(Ft.)
 Flow velocity = 0.91(Ft/s)
 Travel time = 9.52 min. TC = 37.42 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.281(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 5.852
 Subarea runoff = 4.314(CFS) for 6.870(Ac.)
 Total runoff = 7.496(CFS) Total area = 10.640(Ac.)
 Street flow at end of street = 7.496(CFS)
 Half street flow at end of street = 3.748(CFS)
 Depth of flow = 0.486(Ft.), Average velocity = 0.963(Ft/s)
 Flow width (from curb towards crown)= 19.542(Ft.)

 Process from Point/Station 120.000 to Point/Station 125.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 137.500(Ft.)
 End of street segment elevation = 92.000(Ft.)
 Length of street segment = 716.200(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160

MBHS10YR.out

Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 10.473(CFS)
 Depth of flow = 0.290(Ft.), Average velocity = 5.106(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.768(Ft.)
 Flow velocity = 5.11(Ft/s)
 Travel time = 2.34 min. TC = 39.76 min.

Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.232(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 10.500
 Subarea runoff = 5.439(CFS) for 8.450(Ac.)
 Total runoff = 12.935(CFS) Total area = 19.090(Ac.)
 Street flow at end of street = 12.935(CFS)
 Half street flow at end of street = 6.467(CFS)
 Depth of flow = 0.308(Ft.), Average velocity = 5.370(Ft/s)
 Flow width (from curb towards crown)= 10.644(Ft.)

 Process from Point/Station 125.000 to Point/Station 130.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 92.000(Ft.)
 End of street segment elevation = 69.000(Ft.)
 Length of street segment = 528.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 15.265(CFS)
 Depth of flow = 0.340(Ft.), Average velocity = 4.844(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 12.266(Ft.)
 Flow velocity = 4.84(Ft/s)
 Travel time = 1.82 min. TC = 41.58 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.197(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 14.284
 Subarea runoff = 4.162(CFS) for 6.880(Ac.)
 Total runoff = 17.096(CFS) Total area = 25.970(Ac.)
 Street flow at end of street = 17.096(CFS)
 Half street flow at end of street = 8.548(CFS)
 Depth of flow = 0.352(Ft.), Average velocity = 4.979(Ft/s)
 Flow width (from curb towards crown)= 12.828(Ft.)

MBHS10YR.out

 Process from Point/Station 130.000 to Point/Station 135.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

 Top of street segment elevation = 69.000(Ft.)
 End of street segment elevation = 49.500(Ft.)
 Length of street segment = 494.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 20.352(CFS)
 Depth of flow = 0.375(Ft.), Average velocity = 5.006(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 14.006(Ft.)
 Flow velocity = 5.01(Ft/s)
 Travel time = 1.64 min. TC = 43.22 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 1.167(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.591 CA = 21.207
 Subarea runoff = 7.659(CFS) for 9.890(Ac.)
 Total runoff = 24.755(CFS) Total area = 35.860(Ac.)
 Street flow at end of street = 24.755(CFS)
 Half street flow at end of street = 12.378(CFS)
 Depth of flow = 0.397(Ft.), Average velocity = 5.252(Ft/s)
 Flow width (from curb towards crown)= 15.119(Ft.)

 Process from Point/Station 135.000 to Point/Station 140.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

 Top of street segment elevation = 49.500(Ft.)
 End of street segment elevation = 43.700(Ft.)
 Length of street segment = 502.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 25.891(CFS)
 Depth of flow = 0.604(Ft.), Average velocity = 3.872(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 5.18(Ft.)

MBHS10YR.out

Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 22.000(Ft.)
 Flow velocity = 3.87(Ft/s)
 Travel time = 2.16 min. TC = 45.38 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 1.131(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.613 CA = 24.003
 Subarea runoff = 2.397(CFS) for 3.290(Ac.)
 Total runoff = 27.152(CFS) Total area = 39.150(Ac.)
 Street flow at end of street = 27.152(CFS)
 Half street flow at end of street = 27.152(CFS)
 Depth of flow = 0.612(Ft.), Average velocity = 3.922(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 5.61(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 135.000 to Point/Station 140.000
 **** CONFLUENCE OF MAIN STREAMS ****

 The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 39.150(Ac.)
 Runoff from this stream = 27.152(CFS)
 Time of concentration = 45.38 min.
 Rainfall intensity = 1.131(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 200.000 to Point/Station 205.000
 **** INITIAL AREA EVALUATION ****

 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 197.000(Ft.)
 Highest elevation = 118.000(Ft.)
 Lowest elevation = 111.000(Ft.)
 Elevation difference = 7.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 9.11 min.
 $TC = [1.8 * (1.1 - C) * distance^{0.5}] / (\% slope^{1/3})$
 $TC = [1.8 * (1.1 - 0.5500) * (197.000^{0.5})] / (3.553^{1/3}) = 9.11$
 Rainfall intensity (I) = 2.681(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.988(CFS)
 Total initial stream area = 0.670(Ac.)

 Process from Point/Station 205.000 to Point/Station 210.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

 Top of street segment elevation = 111.000(Ft.)
 End of street segment elevation = 75.000(Ft.)
 Length of street segment = 731.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)

MBHS10YR.out

Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 5.175(CFS)
 Depth of flow = 0.248(Ft.), Average velocity = 3.926(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 7.667(Ft.)
 Flow velocity = 3.93(Ft/s)
 Travel time = 3.10 min. TC = 12.21 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.336(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 3.493
 Subarea runoff = 7.172(CFS) for 5.680(Ac.)
 Total runoff = 8.159(CFS) Total area = 6.350(Ac.)
 Street flow at end of street = 8.159(CFS)
 Half street flow at end of street = 4.080(CFS)
 Depth of flow = 0.281(Ft.), Average velocity = 4.366(Ft/s)
 Flow width (from curb towards crown)= 9.290(Ft.)

 Process from Point/Station 210.000 to Point/Station 215.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 75.000(Ft.)
 End of street segment elevation = 72.000(Ft.)
 Length of street segment = 298.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 9.534(CFS)
 Depth of flow = 0.451(Ft.), Average velocity = 2.942(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 17.802(Ft.)
 Flow velocity = 2.94(Ft/s)
 Travel time = 1.69 min. TC = 13.90 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.198(In/Hr) for a 10.0 year storm

MBHS10YR.out

Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.670
 Subarea runoff = 2.105(CFS) for 2.140(Ac.)
 Total runoff = 10.265(CFS) Total area = 8.490(Ac.)
 Street flow at end of street = 10.265(CFS)
 Half street flow at end of street = 10.265(CFS)
 Depth of flow = 0.461(Ft.), Average velocity = 2.997(Ft/s)
 Flow width (from curb towards crown)= 18.314(Ft.)

 Process from Point/Station 215.000 to Point/Station 140.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 72.000(Ft.)
 End of street segment elevation = 43.700(Ft.)
 Length of street segment = 653.800(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 11.897(CFS)
 Depth of flow = 0.317(Ft.), Average velocity = 4.550(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 11.118(Ft.)
 Flow velocity = 4.55(Ft/s)
 Travel time = 2.39 min. TC = 16.29 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 2.037(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.586 CA = 6.559
 Subarea runoff = 3.099(CFS) for 2.700(Ac.)
 Total runoff = 13.364(CFS) Total area = 11.190(Ac.)
 Street flow at end of street = 13.364(CFS)
 Half street flow at end of street = 6.682(CFS)
 Depth of flow = 0.328(Ft.), Average velocity = 4.679(Ft/s)
 Flow width (from curb towards crown)= 11.648(Ft.)

 Process from Point/Station 215.000 to Point/Station 140.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 11.190(Ac.)
 Runoff from this stream = 13.364(CFS)
 Time of concentration = 16.29 min.
 Rainfall intensity = 2.037(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)

MBHS10YR.out

```

1      27.152   45.38           1.131
2      13.364   16.29           2.037
Qmax(1) =
1.000 * 1.000 * 27.152) +
0.555 * 1.000 * 13.364) + = 34.572
Qmax(2) =
1.000 * 0.359 * 27.152) +
1.000 * 1.000 * 13.364) + = 23.112

```

```

Total of 2 main streams to confluence:
Flow rates before confluence point:
27.152   13.364
Maximum flow rates at confluence using above data:
34.572   23.112
Area of streams before confluence:
39.150   11.190

```

```

Results of confluence:
Total flow rate = 34.572(CFS)
Time of concentration = 45.384 min.
Effective stream area after confluence = 50.340(Ac.)

```

```

*****
Process from Point/Station 140.000 to Point/Station 220.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

```

```

Upstream point/station elevation = 36.150(Ft.)
Downstream point/station elevation = 34.120(Ft.)
Pipe length = 151.50(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 34.572(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 34.572(CFS)
Normal flow depth in pipe = 18.98(In.)
Flow top width inside pipe = 28.92(In.)
Critical Depth = 23.98(In.)
Pipe flow velocity = 10.55(Ft/s)
Travel time through pipe = 0.24 min.
Time of concentration (TC) = 45.62 min.

```

```

*****
Process from Point/Station 220.000 to Point/Station 225.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

```

```

Upstream point/station elevation = 34.120(Ft.)
Downstream point/station elevation = 31.700(Ft.)
Pipe length = 191.10(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 34.572(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 34.572(CFS)
Normal flow depth in pipe = 19.36(In.)
Flow top width inside pipe = 28.71(In.)
Critical Depth = 23.98(In.)
Pipe flow velocity = 10.32(Ft/s)
Travel time through pipe = 0.31 min.
Time of concentration (TC) = 45.93 min.

```

```

*****
Process from Point/Station 220.000 to Point/Station 225.000
**** SUBAREA FLOW ADDITION ****

```

```

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000

```

MBHS10YR.out

```

Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type ]
Time of concentration = 45.93 min.
Rainfall intensity = 1.122(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.605 CA = 31.476
Subarea runoff = 0.758(CFS) for 1.660(Ac.)
Total runoff = 35.330(CFS) Total area = 52.000(Ac.)

```

```

*****
Process from Point/Station 225.000 to Point/Station 230.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

```

```

Upstream point/station elevation = 31.200(Ft.)
Downstream point/station elevation = 24.120(Ft.)
Pipe length = 125.43(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 35.330(CFS)
Given pipe size = 36.00(In.)
Calculated individual pipe flow = 35.330(CFS)
Normal flow depth in pipe = 11.55(In.)
Flow top width inside pipe = 33.61(In.)
Critical Depth = 23.17(In.)
Pipe flow velocity = 18.05(Ft/s)
Travel time through pipe = 0.12 min.
Time of concentration (TC) = 46.05 min.

```

```

*****
Process from Point/Station 225.000 to Point/Station 230.000
**** CONFLUENCE OF MAIN STREAMS ****

```

```

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 52.000(Ac.)
Runoff from this stream = 35.330(CFS)
Time of concentration = 46.05 min.
Rainfall intensity = 1.121(In/Hr)
Program is now starting with Main Stream No. 2

```

```

*****
Process from Point/Station 300.000 to Point/Station 305.000
**** INITIAL AREA EVALUATION ****

```

```

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type ]
Initial subarea flow distance = 176.600(Ft.)
Highest elevation = 64.000(Ft.)
Lowest elevation = 30.000(Ft.)
Elevation difference = 34.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 3.57 min.
TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.7000)*( 176.600^0.5)/( 19.253^(1/3))]= 3.57
Setting time of concentration to 5 minutes
Rainfall intensity (I) = 3.592(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff = 0.855(CFS)
Total initial stream area = 0.340(Ac.)

```

```

*****
Process from Point/Station 305.000 to Point/Station 310.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

```

MBHS10YR.out

Top of street segment elevation = 60.000(Ft.)
 End of street segment elevation = 45.500(Ft.)
 Length of street segment = 739.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 6.853(CFS)
 Depth of flow = 0.370(Ft.), Average velocity = 3.489(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 13.758(Ft.)
 Flow velocity = 3.49(Ft/s)
 Travel time = 3.53 min. TC = 8.53 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 2.765(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.700 CA = 3.577
 Subarea runoff = 9.034(CFS) for 4.770(Ac.)
 Total runoff = 9.889(CFS) Total area = 5.110(Ac.)
 Street flow at end of street = 9.889(CFS)
 Half street flow at end of street = 9.889(CFS)
 Depth of flow = 0.412(Ft.), Average velocity = 3.817(Ft/s)
 Flow width (from curb towards crown)= 15.872(Ft.)

 Process from Point/Station 310.000 to Point/Station 315.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 45.500(Ft.)
 End of street segment elevation = 33.500(Ft.)
 Length of street segment = 721.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 14.360(CFS)
 Depth of flow = 0.473(Ft.), Average velocity = 3.934(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 18.919(Ft.)
 Flow velocity = 3.93(Ft/s)
 Travel time = 3.06 min. TC = 11.59 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000

MBHS10YR.out

Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 2.394(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.771 CA = 7.504
 Subarea runoff = 8.078(CFS) for 4.620(Ac.)
 Total runoff = 17.967(CFS) Total area = 9.730(Ac.)
 Street flow at end of street = 17.967(CFS)
 Half street flow at end of street = 17.967(CFS)
 Depth of flow = 0.509(Ft.), Average velocity = 4.114(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 0.47(Ft.)
 Flow width (from curb towards crown)= 20.722(Ft.)

 Process from Point/Station 315.000 to Point/Station 230.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 27.800(Ft.)
 Downstream point/station elevation = 24.120(Ft.)
 Pipe length = 189.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 17.967(CFS)
 Given pipe size = 18.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 4.281(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 5.553(Ft.)
 Minor friction loss = 2.408(Ft.) K-factor = 1.50
 Pipe flow velocity = 10.17(Ft/s)
 Travel time through pipe = 0.31 min.
 Time of concentration (TC) = 11.90 min.

 Process from Point/Station 315.000 to Point/Station 230.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 9.730(Ac.)
 Runoff from this stream = 17.967(CFS)
 Time of concentration = 11.90 min.
 Rainfall intensity = 2.365(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	35.330	46.05	1.121
2	17.967	11.90	2.365
Qmax(1) =	1.000 * 0.474 *	1.000 * 1.000 *	35.330) + 17.967) + = 43.844
Qmax(2) =	1.000 * 1.000 *	0.258 * 1.000 *	35.330) + 17.967) + = 27.096

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 35.330 17.967
 Maximum flow rates at confluence using above data:
 43.844 27.096
 Area of streams before confluence:
 52.000 9.730

MBHS10YR.out

Results of confluence:
 Total flow rate = 43.844(CFS)
 Time of concentration = 46.048 min.
 Effective stream area after confluence = 61.730(Ac.)

 Process from Point/Station 230.000 to Point/Station 320.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 24.120(Ft.)
 Downstream point/station elevation = 11.910(Ft.)
 Pipe length = 544.91(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 43.844(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 43.844(CFS)
 Normal flow depth in pipe = 16.69(In.)
 Flow top width inside pipe = 35.90(In.)
 Critical Depth = 25.90(In.)
 Pipe flow velocity = 13.66(Ft/s)
 Travel time through pipe = 0.66 min.
 Time of concentration (TC) = 46.71 min.

 Process from Point/Station 230.000 to Point/Station 320.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 46.71 min.
 Rainfall intensity = 1.110(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.635 CA = 41.535
 Subarea runoff = 2.273(CFS) for 3.650(Ac.)
 Total runoff = 46.117(CFS) Total area = 65.380(Ac.)

 Process from Point/Station 320.000 to Point/Station 325.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 11.910(Ft.)
 Downstream point/station elevation = 8.470(Ft.)
 Pipe length = 215.48(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 46.117(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 46.117(CFS)
 Normal flow depth in pipe = 18.98(In.)
 Flow top width inside pipe = 35.95(In.)
 Critical Depth = 26.55(In.)
 Pipe flow velocity = 12.19(Ft/s)
 Travel time through pipe = 0.29 min.
 Time of concentration (TC) = 47.01 min.

 Process from Point/Station 320.000 to Point/Station 325.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000

MBHS10YR.out

Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Time of concentration = 47.01 min.
 Rainfall intensity = 1.106(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.627 CA = 45.528
 Subarea runoff = 4.229(CFS) for 7.260(Ac.)
 Total runoff = 50.346(CFS) Total area = 72.640(Ac.)

 Process from Point/Station 325.000 to Point/Station 330.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.470(Ft.)
 Downstream point/station elevation = 7.000(Ft.)
 Pipe length = 249.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 50.346(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 50.346(CFS)
 Normal flow depth in pipe = 29.02(In.)
 Flow top width inside pipe = 28.47(In.)
 Critical Depth = 27.70(In.)
 Pipe flow velocity = 8.25(Ft/s)
 Travel time through pipe = 0.50 min.
 Time of concentration (TC) = 47.51 min.

 Process from Point/Station 325.000 to Point/Station 330.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 72.640(Ac.)
 Runoff from this stream = 50.346(CFS)
 Time of concentration = 47.51 min.
 Rainfall intensity = 1.098(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 400.000 to Point/Station 405.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 189.400(Ft.)
 Highest elevation = 33.000(Ft.)
 Lowest elevation = 30.000(Ft.)
 Elevation difference = 3.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 11.69 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{0.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.5500) * (189.400^{0.5})] / (1.584^{(1/3)}) = 11.69$
 Rainfall intensity (I) = 2.385(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.905(CFS)
 Total initial stream area = 0.690(Ac.)

 Process from Point/Station 405.000 to Point/Station 410.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

MBHS10YR.out

Top of street segment elevation = 30.000(Ft.)
 End of street segment elevation = 15.500(Ft.)
 Length of street segment = 708.400(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 5.305(CFS)
 Depth of flow = 0.281(Ft.), Average velocity = 2.821(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.322(Ft.)
 Flow velocity = 2.82(Ft/s)
 Travel time = 4.18 min. TC = 15.87 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.063(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.070
 Subarea runoff = 7.493(CFS) for 6.710(Ac.)
 Total runoff = 8.398(CFS) Total area = 7.400(Ac.)
 Street flow at end of street = 8.398(CFS)
 Half street flow at end of street = 4.199(CFS)
 Depth of flow = 0.320(Ft.), Average velocity = 3.148(Ft/s)
 Flow width (from curb towards crown)= 11.235(Ft.)

 Process from Point/Station 410.000 to Point/Station 415.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 15.500(Ft.)
 End of street segment elevation = 13.500(Ft.)
 Length of street segment = 521.600(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 11.439(CFS)
 Depth of flow = 0.447(Ft.), Average velocity = 1.803(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 17.608(Ft.)
 Flow velocity = 1.80(Ft/s)
 Travel time = 4.82 min. TC = 20.69 min.
 Adding area flow to street
 User specified 'C' value of 0.760 given for subarea
 Rainfall intensity = 1.808(In/Hr) for a 10.0 year storm

MBHS10YR.out

Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.638 CA = 8.144
 Subarea runoff = 6.327(CFS) for 5.360(Ac.)
 Total runoff = 14.724(CFS) Total area = 12.760(Ac.)
 Street flow at end of street = 14.724(CFS)
 Half street flow at end of street = 7.362(CFS)
 Depth of flow = 0.483(Ft.), Average velocity = 1.919(Ft/s)
 Flow width (from curb towards crown)= 19.402(Ft.)

 Process from Point/Station 410.000 to Point/Station 415.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 12.760(Ac.)
 Runoff from this stream = 14.724(CFS)
 Time of concentration = 20.69 min.
 Rainfall intensity = 1.808(In/Hr)

 Process from Point/Station 500.000 to Point/Station 505.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.900 given for subarea
 Initial subarea flow distance = 145.000(Ft.)
 Highest elevation = 16.000(Ft.)
 Lowest elevation = 14.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.89 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.9000) * (145.000^{.5})] / (1.379^{(1/3)}) = 3.89$
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 3.592(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.900
 Subarea runoff = 0.744(CFS)
 Total initial stream area = 0.230(Ac.)

 Process from Point/Station 505.000 to Point/Station 510.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 14.000(Ft.)
 End of street segment elevation = 11.500(Ft.)
 Length of street segment = 583.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 7.404(CFS)
 Depth of flow = 0.476(Ft.), Average velocity = 2.005(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 19.032(Ft.)
 Flow velocity = 2.00(Ft/s)
 Travel time = 4.85 min. TC = 9.85 min.
 Adding area flow to street

MBHS10YR.out

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 2.584(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KClA) is C = 0.853 CA = 3.709
 Subarea runoff = 8.840(CFS) for 4.120(Ac.)
 Total runoff = 9.584(CFS) Total area = 4.350(Ac.)
 Street flow at end of street = 9.584(CFS)
 Half street flow at end of street = 9.584(CFS)
 Depth of flow = 0.519(Ft.), Average velocity = 2.093(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 0.96(Ft.)
 Flow width (from curb towards crown)= 21.209(Ft.)

 Process from Point/Station 510.000 to Point/Station 415.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 9.520(Ft.)
 Downstream point/station elevation = 8.800(Ft.)
 Pipe length = 259.69(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 9.584(CFS)
 Given pipe size = 15.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 6.414(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 5.714(Ft.)
 Minor friction loss = 1.421(Ft.) K-factor = 1.50
 Pipe flow velocity = 7.81(Ft/s)
 Travel time through pipe = 0.55 min.
 Time of concentration (TC) = 10.40 min.

 Process from Point/Station 510.000 to Point/Station 415.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 4.350(Ac.)
 Runoff from this stream = 9.584(CFS)
 Time of concentration = 10.40 min.
 Rainfall intensity = 2.518(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	14.724	20.69	1.808
2	9.584	10.40	2.518
Qmax(1) =	1.000 * 0.718 *	1.000 *	14.724) + 9.584) + = 21.605
Qmax(2) =	1.000 * 1.000 *	0.503 * 1.000 *	14.724) + 9.584) + = 16.984

Total of 2 streams to confluence:
 Flow rates before confluence point:
 14.724 9.584
 Maximum flow rates at confluence using above data:
 21.605 16.984
 Area of streams before confluence:
 12.760 4.350

MBHS10YR.out

Results of confluence:
 Total flow rate = 21.605(CFS)
 Time of concentration = 20.694 min.
 Effective stream area after confluence = 17.110(Ac.)

 Process from Point/Station 415.000 to Point/Station 515.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.800(Ft.)
 Downstream point/station elevation = 8.550(Ft.)
 Pipe length = 84.57(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 21.605(CFS)
 Given pipe size = 18.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 6.808(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 3.576(Ft.)
 Minor friction loss = 3.481(Ft.) K-factor = 1.50
 Pipe flow velocity = 12.23(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 20.81 min.

 Process from Point/Station 415.000 to Point/Station 515.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 20.81 min.
 Rainfall intensity = 1.803(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KClA) is C = 0.694 CA = 13.869
 Subarea runoff = 3.399(CFS) for 2.880(Ac.)
 Total runoff = 25.003(CFS) Total area = 19.990(Ac.)

 Process from Point/Station 515.000 to Point/Station 520.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.550(Ft.)
 Downstream point/station elevation = 7.620(Ft.)
 Pipe length = 337.77(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 25.003(CFS)
 Given pipe size = 27.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 2.192(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 2.201(Ft.)
 Minor friction loss = 0.921(Ft.) K-factor = 1.50
 Pipe flow velocity = 6.29(Ft/s)
 Travel time through pipe = 0.90 min.
 Time of concentration (TC) = 21.70 min.

 Process from Point/Station 515.000 to Point/Station 520.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.950 given for subarea
 Time of concentration = 21.70 min.
 Rainfall intensity = 1.764(In/Hr) for a 10.0 year storm

MBHS10YR.out

Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.721 CA = 16.120
Subarea runoff = 3.427(CFS) for 2.370(Ac.)
Total runoff = 28.430(CFS) Total area = 22.360(Ac.)

Process from Point/Station 520.000 to Point/Station 330.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 7.620(Ft.)
Downstream point elevation = 7.000(Ft.)
Channel length thru subarea = 228.700(Ft.)
Channel base width = 3.000(Ft.)
Slope or 'Z' of left channel bank = 1.500
Slope or 'Z' of right channel bank = 1.500
Manning's 'N' = 0.030
Maximum depth of channel = 2.000(Ft.)
Flow(q) thru subarea = 28.430(CFS)
Depth of flow = 1.818(Ft.), Average velocity = 2.731(Ft/s)
Channel flow top width = 8.454(Ft.)
Flow Velocity = 2.73(Ft/s)
Travel time = 1.40 min.
Time of concentration = 23.10 min.
Critical depth = 1.156(Ft.)

Process from Point/Station 520.000 to Point/Station 330.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 22.360(Ac.)
Runoff from this stream = 28.430(CFS)
Time of concentration = 23.10 min.
Rainfall intensity = 1.706(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	50.346	47.51	1.098
2	28.430	23.10	1.706
Qmax(1) =	1.000 * 0.644	1.000 * 1.000	50.346) + 28.430) = 68.647
Qmax(2) =	1.000 * 1.000	0.486 * 1.000	50.346) + 28.430) = 52.908

Total of 2 main streams to confluence:
Flow rates before confluence point:
50.346 28.430
Maximum flow rates at confluence using above data:
68.647 52.908
Area of streams before confluence:
72.640 22.360

Results of confluence:
Total flow rate = 68.647(CFS)
Time of concentration = 47.512 min.
Effective stream area after confluence = 95.000(Ac.)

MBHS10YR.out

Process from Point/Station 330.000 to Point/Station 600.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 7.000(Ft.)
Downstream point elevation = 6.350(Ft.)
Channel length thru subarea = 499.000(Ft.)
Channel base width = 4.000(Ft.)
Slope or 'Z' of left channel bank = 1.500
Slope or 'Z' of right channel bank = 1.500
Estimated mean flow rate at midpoint of channel = 70.565(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 2.000(Ft.)
Flow(q) thru subarea = 70.565(CFS)
Depth of flow = 2.986(Ft.), Average velocity = 2.958(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width = 10.000(Ft.)
Flow Velocity = 2.96(Ft/s)
Travel time = 2.81 min.
Time of concentration = 50.32 min.
Critical depth = 1.703(Ft.)
ERROR - Channel depth exceeds maximum allowable depth
Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type]
Rainfall intensity = 1.058(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.660 CA = 66.161
Subarea runoff = 1.369(CFS) for 5.310(Ac.)
Total runoff = 70.016(CFS) Total area = 100.310(Ac.)

Process from Point/Station 600.000 to Point/Station 605.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 6.350(Ft.)
Downstream point elevation = 5.880(Ft.)
Channel length thru subarea = 357.200(Ft.)
Channel base width = 4.000(Ft.)
Slope or 'Z' of left channel bank = 1.500
Slope or 'Z' of right channel bank = 1.500
Estimated mean flow rate at midpoint of channel = 70.127(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 2.000(Ft.)
Flow(q) thru subarea = 70.127(CFS)
Depth of flow = 2.970(Ft.), Average velocity = 2.959(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width = 10.000(Ft.)
Flow Velocity = 2.96(Ft/s)
Travel time = 2.01 min.
Time of concentration = 52.34 min.
Critical depth = 1.703(Ft.)
ERROR - Channel depth exceeds maximum allowable depth
Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
The area added to the existing stream causes a
a lower flow rate of Q = 68.581(CFS)
therefore the upstream flow rate of Q = 70.016(CFS) is being used
Rainfall intensity = 1.032(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.660 CA = 66.465

MBHS10YR.out

Subarea runoff = 0.000(CFS) for 0.320(Ac.)
 Total runoff = 70.016(CFS) Total area = 100.630(Ac.)

 Process from Point/Station 605.000 to Point/Station 607.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.880(Ft.)
 Downstream point elevation = 5.820(Ft.)
 Channel length thru subarea = 25.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 76.660(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 5.000(Ft.)
 Flow(q) thru subarea = 76.660(CFS)
 Depth of flow = 1.881(Ft.), Average velocity = 3.067(Ft/s)
 Channel flow top width = 16.583(Ft.)
 Flow Velocity = 3.07(Ft/s)
 Travel time = 0.14 min.
 Time of concentration = 52.47 min.
 Critical depth = 1.141(Ft.)
 Adding area flow to channel
 User specified 'C' value of 0.570 given for subarea
 Rainfall intensity = 1.030(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.646 CA = 77.352
 Subarea runoff = 9.666(CFS) for 19.100(Ac.)
 Total runoff = 79.682(CFS) Total area = 119.730(Ac.)

 Process from Point/Station 607.000 to Point/Station 610.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.820(Ft.)
 Downstream point elevation = 5.400(Ft.)
 Channel length thru subarea = 185.000(Ft.)
 Channel base width = 5.000(Ft.)
 Slope or 'Z' of left channel bank = 2.000
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 81.944(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 5.000(Ft.)
 Flow(q) thru subarea = 81.944(CFS)
 Depth of flow = 2.746(Ft.), Average velocity = 2.844(Ft/s)
 Channel flow top width = 15.984(Ft.)
 Flow Velocity = 2.84(Ft/s)
 Travel time = 1.08 min.
 Time of concentration = 53.56 min.
 Critical depth = 1.625(Ft.)
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 Rainfall intensity = 1.017(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.662 CA = 83.812
 Subarea runoff = 5.523(CFS) for 6.800(Ac.)
 Total runoff = 85.205(CFS) Total area = 126.530(Ac.)

 Process from Point/Station 607.000 to Point/Station 610.000

MBHS10YR.out

**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 126.530(Ac.)
 Runoff from this stream = 85.205(CFS)
 Time of concentration = 53.56 min.
 Rainfall intensity = 1.017(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 700.000 to Point/Station 705.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 167.000(Ft.)
 Highest elevation = 16.000(Ft.)
 Lowest elevation = 14.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 12.05 min.
 $TC = [1.8*(1.1-C)*distance(Ft.)^{.5}]/(% slope^{1/3})]$
 $TC = [1.8*(1.1-0.5500)*(167.000^{.5})/(1.198^{1/3})] = 12.05$
 Rainfall intensity (I) = 2.351(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.517(CFS)
 Total initial stream area = 0.400(Ac.)

 Process from Point/Station 705.000 to Point/Station 710.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 14.000(Ft.)
 End of street segment elevation = 11.500(Ft.)
 Length of street segment = 580.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 5.075(CFS)
 Depth of flow = 0.346(Ft.), Average velocity = 1.544(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 12.540(Ft.)
 Flow velocity = 1.54(Ft/s)
 Travel time = 6.27 min. TC = 18.31 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.924(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area

MBHS10YR.out

(Q=KCIA) is C = 0.550 CA = 4.098
 Subarea runoff = 7.365(CFS) for 7.050(Ac.)
 Total runoff = 7.882(CFS) Total area = 7.450(Ac.)
 Street flow at end of street = 7.882(CFS)
 Half street flow at end of street = 3.941(CFS)
 Depth of flow = 0.393(Ft.), Average velocity = 1.719(Ft/s)
 Flow width (from curb towards crown)= 14.904(Ft.)

 Process from Point/Station 710.000 to Point/Station 610.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.000(Ft.)
 Downstream point/station elevation = 5.400(Ft.)
 Pipe length = 129.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 7.882(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 7.882(CFS)
 Normal flow depth in pipe = 9.32(In.)
 Flow top width inside pipe = 17.99(In.)
 Critical Depth = 13.05(In.)
 Pipe flow velocity = 8.53(Ft/s)
 Travel time through pipe = 0.25 min.
 Time of concentration (TC) = 18.57 min.

 Process from Point/Station 710.000 to Point/Station 610.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 7.450(Ac.)
 Runoff from this stream = 7.882(CFS)
 Time of concentration = 18.57 min.
 Rainfall intensity = 1.911(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	85.205	53.56	1.017
2	7.882	18.57	1.911
Qmax(1) =			
	1.000 *	1.000 *	85.205) +
	0.532 *	1.000 *	7.882) + = 89.399
Qmax(2) =			
	1.000 *	0.347 *	85.205) +
	1.000 *	1.000 *	7.882) + = 37.423

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 85.205 7.882
 Maximum flow rates at confluence using above data:
 89.399 37.423
 Area of streams before confluence:
 126.530 7.450

Results of confluence:
 Total flow rate = 89.399(CFS)
 Time of concentration = 53.56 min.
 Effective stream area after confluence = 133.980(Ac.)

MBHS10YR.out

Process from Point/Station 610.000 to Point/Station 715.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.400(Ft.)
 Downstream point elevation = 3.860(Ft.)
 Channel length thru subarea = 668.000(Ft.)
 Channel base width = 5.000(Ft.)
 Slope or 'Z' of left channel bank = 3.000
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 89.706(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 6.000(Ft.)
 Flow(q) thru subarea = 89.706(CFS)
 Depth of flow = 2.707(Ft.), Average velocity = 2.817(Ft/s)
 Channel flow top width = 18.534(Ft.)
 Flow Velocity = 2.82(Ft/s)
 Travel time = 3.95 min.
 Time of concentration = 57.51 min.
 Critical depth = 1.641(Ft.)
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [RURAL(greater than 0.5 Ac, 0.2 ha) area type]
 The area added to the existing stream causes a
 a lower flow rate of Q = 85.760(CFS)
 therefore the upstream flow rate of Q = 89.399(CFS) is being used
 Rainfall intensity = 0.971(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.655 CA = 88.324
 Subarea runoff = 0.000(CFS) for 0.920(Ac.)
 Total runoff = 89.399(CFS) Total area = 134.900(Ac.)

 Process from Point/Station 610.000 to Point/Station 715.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 134.900(Ac.)
 Runoff from this stream = 89.399(CFS)
 Time of concentration = 57.51 min.
 Rainfall intensity = 0.971(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 720.000 to Point/Station 725.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 168.900(Ft.)
 Highest elevation = 18.000(Ft.)
 Lowest elevation = 16.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 12.16 min.
 TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
 TC = [1.8*(1.1-0.5500)*(168.900^0.5)/(1.184^(1/3))]= 12.16
 Rainfall intensity (I) = 2.341(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.669(CFS)

MBHS10YR.out

Total initial stream area = 0.520(Ac.)

 Process from Point/Station 725.000 to Point/Station 730.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 16.000(Ft.)
 End of street segment elevation = 13.500(Ft.)
 Length of street segment = 778.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 3.386(CFS)
 Depth of flow = 0.321(Ft.), Average velocity = 1.252(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 11.316(Ft.)
 Flow velocity = 1.25(Ft/s)
 Travel time = 10.36 min. TC = 22.52 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.729(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 2.607
 Subarea runoff = 3.839(CFS) for 4.220(Ac.)
 Total runoff = 4.509(CFS) Total area = 4.740(Ac.)
 Street flow at end of street = 4.509(CFS)
 Half street flow at end of street = 2.254(CFS)
 Depth of flow = 0.349(Ft.), Average velocity = 1.342(Ft/s)
 Flow width (from curb towards crown)= 12.681(Ft.)

 Process from Point/Station 730.000 to Point/Station 735.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 13.500(Ft.)
 End of street segment elevation = 10.000(Ft.)
 Length of street segment = 874.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 6.858(CFS)
 Depth of flow = 0.470(Ft.), Average velocity = 1.916(Ft/s)

MBHS10YR.out

Streetflow hydraulics at midpoint of street travel:

Halfstreet flow width = 18.728(Ft.)
 Flow velocity = 1.92(Ft/s)
 Travel time = 7.61 min. TC = 30.13 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.467(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 5.324
 Subarea runoff = 3.299(CFS) for 4.940(Ac.)
 Total runoff = 7.808(CFS) Total area = 9.680(Ac.)
 Street flow at end of street = 7.808(CFS)
 Half street flow at end of street = 7.808(CFS)
 Depth of flow = 0.489(Ft.), Average velocity = 1.979(Ft/s)
 Flow width (from curb towards crown)= 19.684(Ft.)

 Process from Point/Station 735.000 to Point/Station 715.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 10.000(Ft.)
 End of street segment elevation = 9.000(Ft.)
 Length of street segment = 322.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 8.824(CFS)
 Depth of flow = 0.534(Ft.), Average velocity = 1.791(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 1.72(Ft.)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 21.971(Ft.)
 Flow velocity = 1.79(Ft/s)
 Travel time = 3.00 min. TC = 33.13 min.
 Adding area flow to street
 User specified 'C' value of 0.770 given for subarea
 Rainfall intensity = 1.384(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.595 CA = 7.264
 Subarea runoff = 2.244(CFS) for 2.520(Ac.)
 Total runoff = 10.052(CFS) Total area = 12.200(Ac.)
 Street flow at end of street = 10.052(CFS)
 Half street flow at end of street = 10.052(CFS)
 Depth of flow = 0.555(Ft.), Average velocity = 1.855(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 2.73(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 735.000 to Point/Station 715.000
 **** CONFLUENCE OF MAIN STREAMS ****

MBHS10YR.out

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 12.200(Ac.)
 Runoff from this stream = 10.052(CFS)
 Time of concentration = 33.13 min.
 Rainfall intensity = 1.384(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	89.399	57.51	0.971
2	10.052	33.13	1.384

Qmax(1) =
 1.000 * 1.000 * 89.399) +
 0.702 * 1.000 * 10.052) + = 96.453

Qmax(2) =
 1.000 * 0.576 * 89.399) +
 1.000 * 1.000 * 10.052) + = 61.554

Total of 2 main streams to confluence:

Flow rates before confluence point:
 89.399 10.052

Maximum flow rates at confluence using above data:
 96.453 61.554

Area of streams before confluence:
 134.900 12.200

Results of confluence:

Total flow rate = 96.453(CFS)
 Time of concentration = 57.508 min.
 Effective stream area after confluence = 147.100(Ac.)
 End of computations, total study area = 147.100 (Ac.)

25-YEAR HYDROLOGIC ANALYSIS RESULTS

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4

Rational method hydrology program based on
 San Diego County Flood Control Division 1985 hydrology manual
 Rational Hydrology Study Date: 09/27/13

 MISSION BAY HIGH SCHOOL EXIST CONDITION HYDROLOGY ANALYSIS - MMP MAPS 36
 & 37 - ASSUMPTIONS: 1. n=0.030 IN MBHS CONC CHANNEL; AND 2. n=0.035 IN
 PACIFIC BEACH/OLNEY ST EARTHEN CHANNEL
 CIVILD FILE: MBHS25YR.RSD

***** Hydrology Study Control Information *****

 Program License Serial Number 6219

Rational hydrology study storm event year is 25.0
 English (in-lb) input data Units used
 English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
 Elevation 0 - 1500 feet
 Factor (to multiply * intensity) = 1.000
 Only used if inside City of San Diego
 San Diego hydrology manual 'C' values used
 Runoff coefficients by modified rational method

 Process from Point/Station 100.000 to Point/Station 105.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 194.700(Ft.)
 Highest elevation = 186.000(Ft.)
 Lowest elevation = 185.500(Ft.)
 Elevation difference = 0.500(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 21.73 min.
 $TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^{1/3})]$
 $TC = [1.8*(1.1-0.5500)*(194.700^0.5)/(0.257^{1/3})] = 21.73$
 Rainfall intensity (I) = 1.978(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.490(CFS)
 Total initial stream area = 0.450(Ac.)

 Process from Point/Station 105.000 to Point/Station 110.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 185.500(Ft.)
 End of street segment elevation = 174.000(Ft.)
 Length of street segment = 428.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020

Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 1.132(CFS)
 Depth of flow = 0.216(Ft.), Average velocity = 2.579(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 6.063(Ft.)
 Flow velocity = 2.58(Ft/s)
 Travel time = 2.77 min. TC = 24.51 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.858(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 0.897
 Subarea runoff = 1.176(CFS) for 1.180(Ac.)
 Total runoff = 1.666(CFS) Total area = 1.630(Ac.)
 Street flow at end of street = 1.666(CFS)
 Half street flow at end of street = 1.666(CFS)
 Depth of flow = 0.239(Ft.), Average velocity = 2.809(Ft/s)
 Flow width (from curb towards crown)= 7.224(Ft.)

 Process from Point/Station 110.000 to Point/Station 115.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 174.000(Ft.)
 End of street segment elevation = 138.000(Ft.)
 Length of street segment = 762.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 2.760(CFS)
 Depth of flow = 0.254(Ft.), Average velocity = 3.921(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 7.953(Ft.)
 Flow velocity = 3.92(Ft/s)
 Travel time = 3.24 min. TC = 27.75 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.735(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 2.074
 Subarea runoff = 1.932(CFS) for 2.140(Ac.)

MBHS25YR.out

Total runoff = 3.598(CFS) Total area = 3.770(Ac.)
 Street flow at end of street = 3.598(CFS)
 Half street flow at end of street = 3.598(CFS)
 Depth of flow = 0.273(Ft.), Average velocity = 4.171(Ft/s)
 Flow width (from curb towards crown)= 8.895(Ft.)

 Process from Point/Station 115.000 to Point/Station 120.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 138.000(Ft.)
 End of street segment elevation = 137.500(Ft.)
 Length of street segment = 522.400(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 6.876(CFS)
 Depth of flow = 0.473(Ft.), Average velocity = 0.943(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 18.905(Ft.)
 Flow velocity = 0.94(Ft/s)
 Travel time = 9.23 min. TC = 36.98 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.457(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 5.852
 Subarea runoff = 4.927(CFS) for 6.870(Ac.)
 Total runoff = 8.525(CFS) Total area = 10.640(Ac.)
 Street flow at end of street = 8.525(CFS)
 Half street flow at end of street = 4.262(CFS)
 Depth of flow = 0.507(Ft.), Average velocity = 0.986(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 0.36(Ft.)
 Flow width (from curb towards crown)= 20.612(Ft.)

 Process from Point/Station 120.000 to Point/Station 125.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 137.500(Ft.)
 End of street segment elevation = 92.000(Ft.)
 Length of street segment = 716.200(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)

MBHS25YR.out

Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 11.910(CFS)
 Depth of flow = 0.301(Ft.), Average velocity = 5.265(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.294(Ft.)
 Flow velocity = 5.27(Ft/s)
 Travel time = 2.27 min. TC = 39.25 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.402(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 10.500
 Subarea runoff = 6.196(CFS) for 8.450(Ac.)
 Total runoff = 14.721(CFS) Total area = 19.090(Ac.)
 Street flow at end of street = 14.721(CFS)
 Half street flow at end of street = 7.360(CFS)
 Depth of flow = 0.319(Ft.), Average velocity = 5.540(Ft/s)
 Flow width (from curb towards crown)= 11.213(Ft.)

 Process from Point/Station 125.000 to Point/Station 130.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 92.000(Ft.)
 End of street segment elevation = 69.000(Ft.)
 Length of street segment = 528.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 17.373(CFS)
 Depth of flow = 0.353(Ft.), Average velocity = 4.999(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 12.909(Ft.)
 Flow velocity = 5.00(Ft/s)
 Travel time = 1.76 min. TC = 41.01 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.363(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 14.284
 Subarea runoff = 4.747(CFS) for 6.880(Ac.)
 Total runoff = 19.467(CFS) Total area = 25.970(Ac.)
 Street flow at end of street = 19.467(CFS)
 Half street flow at end of street = 9.734(CFS)
 Depth of flow = 0.365(Ft.), Average velocity = 5.139(Ft/s)
 Flow width (from curb towards crown)= 13.501(Ft.)

 Process from Point/Station 130.000 to Point/Station 135.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 69.000(Ft.)
 End of street segment elevation = 49.500(Ft.)
 Length of street segment = 494.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 23.174(CFS)
 Depth of flow = 0.390(Ft.), Average velocity = 5.167(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 14.735(Ft.)
 Flow velocity = 5.17(Ft/s)
 Travel time = 1.59 min. TC = 42.60 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 1.330(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.591 CA = 21.207
 Subarea runoff = 8.734(CFS) for 9.890(Ac.)
 Total runoff = 28.201(CFS) Total area = 35.860(Ac.)
 Street flow at end of street = 28.201(CFS)
 Half street flow at end of street = 14.100(CFS)
 Depth of flow = 0.413(Ft.), Average velocity = 5.422(Ft/s)
 Flow width (from curb towards crown)= 15.903(Ft.)

 Process from Point/Station 135.000 to Point/Station 140.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 49.500(Ft.)
 End of street segment elevation = 43.700(Ft.)
 Length of street segment = 502.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 29.495(CFS)
 Depth of flow = 0.628(Ft.), Average velocity = 4.010(Ft/s)
 Warning: depth of flow exceeds top of curb

Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 6.38(Ft.)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 22.000(Ft.)
 Flow velocity = 4.01(Ft/s)
 Travel time = 2.09 min. TC = 44.69 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 1.289(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.613 CA = 24.003
 Subarea runoff = 2.749(CFS) for 3.290(Ac.)
 Total runoff = 30.950(CFS) Total area = 39.150(Ac.)
 Street flow at end of street = 30.950(CFS)
 Half street flow at end of street = 30.950(CFS)
 Depth of flow = 0.637(Ft.), Average velocity = 4.062(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 6.84(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 135.000 to Point/Station 140.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 39.150(Ac.)
 Runoff from this stream = 30.950(CFS)
 Time of concentration = 44.69 min.
 Rainfall intensity = 1.289(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 200.000 to Point/Station 205.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 197.000(Ft.)
 Highest elevation = 118.000(Ft.)
 Lowest elevation = 111.000(Ft.)
 Elevation difference = 7.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 9.11 min.
 TC = $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})$
 TC = $[1.8 * (1.1 - 0.5500) * (197.000^{.5}) / (3.553^{(1/3)})] = 9.11$
 Rainfall intensity (I) = 2.929(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 1.079(CFS)
 Total initial stream area = 0.670(Ac.)

 Process from Point/Station 205.000 to Point/Station 210.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 111.000(Ft.)
 End of street segment elevation = 75.000(Ft.)

MBHS25YR.out

Length of street segment = 731.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 5.654(CFS)
 Depth of flow = 0.254(Ft.), Average velocity = 4.007(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 7.964(Ft.)
 Flow velocity = 4.01(Ft/s)
 Travel time = 3.04 min. TC = 12.15 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.585(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 3.493
 Subarea runoff = 7.949(CFS) for 5.680(Ac.)
 Total runoff = 9.028(CFS) Total area = 6.350(Ac.)
 Street flow at end of street = 9.028(CFS)
 Half street flow at end of street = 4.514(CFS)
 Depth of flow = 0.289(Ft.), Average velocity = 4.472(Ft/s)
 Flow width (from curb towards crown)= 9.686(Ft.)

 Process from Point/Station 210.000 to Point/Station 215.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 75.000(Ft.)
 End of street segment elevation = 72.000(Ft.)
 Length of street segment = 298.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 10.550(CFS)
 Depth of flow = 0.465(Ft.), Average velocity = 3.017(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 18.508(Ft.)
 Flow velocity = 3.02(Ft/s)
 Travel time = 1.65 min. TC = 13.79 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000

MBHS25YR.out

[SINGLE FAMILY area type]
 Rainfall intensity = 2.446(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.670
 Subarea runoff = 2.391(CFS) for 2.140(Ac.)
 Total runoff = 11.420(CFS) Total area = 8.490(Ac.)
 Street flow at end of street = 11.420(CFS)
 Half street flow at end of street = 11.420(CFS)
 Depth of flow = 0.477(Ft.), Average velocity = 3.077(Ft/s)
 Flow width (from curb towards crown)= 19.080(Ft.)

 Process from Point/Station 215.000 to Point/Station 140.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 72.000(Ft.)
 End of street segment elevation = 43.700(Ft.)
 Length of street segment = 653.800(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 13.235(CFS)
 Depth of flow = 0.327(Ft.), Average velocity = 4.668(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 11.603(Ft.)
 Flow velocity = 4.67(Ft/s)
 Travel time = 2.33 min. TC = 16.13 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 2.281(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.586 CA = 6.559
 Subarea runoff = 3.541(CFS) for 2.700(Ac.)
 Total runoff = 14.961(CFS) Total area = 11.190(Ac.)
 Street flow at end of street = 14.961(CFS)
 Half street flow at end of street = 7.480(CFS)
 Depth of flow = 0.339(Ft.), Average velocity = 4.809(Ft/s)
 Flow width (from curb towards crown)= 12.183(Ft.)

 Process from Point/Station 215.000 to Point/Station 140.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 11.190(Ac.)
 Runoff from this stream = 14.961(CFS)
 Time of concentration = 16.13 min.
 Rainfall intensity = 2.281(In/Hr)
 Summary of stream data:

Stream	Flow rate	TC	Rainfall Intensity
--------	-----------	----	--------------------

MBHS25YR.out

No.	(CFS)	(min)	(In/Hr)
1	30.950	44.69	1.289
2	14.961	16.13	2.281
Qmax(1) =	1.000 *	1.000 *	30.950) +
	0.565 *	1.000 *	14.961) + = 39.408
Qmax(2) =	1.000 *	0.361 *	30.950) +
	1.000 *	1.000 *	14.961) + = 26.131

Total of 2 main streams to confluence:

Flow rates before confluence point:

30.950 14.961

Maximum flow rates at confluence using above data:

39.408 26.131

Area of streams before confluence:

39.150 11.190

Results of confluence:

Total flow rate = 39.408(CFS)

Time of concentration = 44.687 min.

Effective stream area after confluence = 50.340(Ac.)

 Process from Point/Station 140.000 to Point/Station 220.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 36.150(Ft.)
 Downstream point/station elevation = 34.120(Ft.)
 Pipe length = 151.50(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 39.408(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 39.408(CFS)
 Normal flow depth in pipe = 20.86(In.)
 Flow top width inside pipe = 27.62(In.)
 Critical Depth = 25.38(In.)
 Pipe flow velocity = 10.82(Ft/s)
 Travel time through pipe = 0.23 min.
 Time of concentration (TC) = 44.92 min.

 Process from Point/Station 220.000 to Point/Station 225.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 34.120(Ft.)
 Downstream point/station elevation = 31.700(Ft.)
 Pipe length = 191.10(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 39.408(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 39.408(CFS)
 Normal flow depth in pipe = 21.33(In.)
 Flow top width inside pipe = 27.20(In.)
 Critical Depth = 25.38(In.)
 Pipe flow velocity = 10.56(Ft/s)
 Travel time through pipe = 0.30 min.
 Time of concentration (TC) = 45.22 min.

 Process from Point/Station 220.000 to Point/Station 225.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000

MBHS25YR.out

Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Time of concentration = 45.22 min.
 Rainfall intensity = 1.280(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.605 CA = 31.476
 Subarea runoff = 0.867(CFS) for 1.660(Ac.)
 Total runoff = 40.275(CFS) Total area = 52.000(Ac.)

 Process from Point/Station 225.000 to Point/Station 230.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 31.200(Ft.)
 Downstream point/station elevation = 24.120(Ft.)
 Pipe length = 125.43(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 40.275(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 40.275(CFS)
 Normal flow depth in pipe = 12.38(In.)
 Flow top width inside pipe = 34.20(In.)
 Critical Depth = 24.78(In.)
 Pipe flow velocity = 18.72(Ft/s)
 Travel time through pipe = 0.11 min.
 Time of concentration (TC) = 45.33 min.

 Process from Point/Station 225.000 to Point/Station 230.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 52.000(Ac.)
 Runoff from this stream = 40.275(CFS)
 Time of concentration = 45.33 min.
 Rainfall intensity = 1.278(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 300.000 to Point/Station 305.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Initial subarea flow distance = 176.600(Ft.)
 Highest elevation = 64.000(Ft.)
 Lowest elevation = 30.000(Ft.)
 Elevation difference = 34.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.57 min.
 TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
 TC = [1.8*(1.1-0.7000)*(176.600^0.5)/(19.253^(1/3))]= 3.57
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 3.845(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
 Subarea runoff = 0.915(CFS)
 Total initial stream area = 0.340(Ac.)

MBHS25YR.out

Process from Point/Station 305.000 to Point/Station 310.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 60.000(Ft.)
 End of street segment elevation = 45.500(Ft.)
 Length of street segment = 739.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 7.335(CFS)
 Depth of flow = 0.378(Ft.), Average velocity = 3.548(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 14.129(Ft.)
 Flow velocity = 3.55(Ft/s)
 Travel time = 3.47 min. TC = 8.47 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 3.023(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.700 CA = 3.577
 Subarea runoff = 9.897(CFS) for 4.770(Ac.)
 Total runoff = 10.812(CFS) Total area = 5.110(Ac.)
 Street flow at end of street = 10.812(CFS)
 Half street flow at end of street = 10.812(CFS)
 Depth of flow = 0.424(Ft.), Average velocity = 3.902(Ft/s)
 Flow width (from curb towards crown)= 16.430(Ft.)

 Process from Point/Station 310.000 to Point/Station 315.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 45.500(Ft.)
 End of street segment elevation = 33.500(Ft.)
 Length of street segment = 721.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 15.700(CFS)
 Depth of flow = 0.487(Ft.), Average velocity = 4.021(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 19.578(Ft.)
 Flow velocity = 4.02(Ft/s)
 Travel time = 2.99 min. TC = 11.46 min.

MBHS25YR.out

Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 2.651(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.771 CA = 7.504
 Subarea runoff = 9.080(CFS) for 4.620(Ac.)
 Total runoff = 19.893(CFS) Total area = 9.730(Ac.)
 Street flow at end of street = 19.893(CFS)
 Half street flow at end of street = 19.893(CFS)
 Depth of flow = 0.529(Ft.), Average velocity = 4.137(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 1.47(Ft.)
 Flow width (from curb towards crown)= 21.715(Ft.)

 Process from Point/Station 315.000 to Point/Station 230.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 27.800(Ft.)
 Downstream point/station elevation = 24.120(Ft.)
 Pipe length = 189.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 19.893(CFS)
 Given pipe size = 18.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 6.079(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 6.807(Ft.)
 Minor friction loss = 2.952(Ft.) K-factor = 1.50
 Pipe flow velocity = 11.26(Ft/s)
 Travel time through pipe = 0.28 min.
 Time of concentration (TC) = 11.74 min.

 Process from Point/Station 315.000 to Point/Station 230.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 9.730(Ac.)
 Runoff from this stream = 19.893(CFS)
 Time of concentration = 11.74 min.
 Rainfall intensity = 2.623(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	40.275	45.33	1.278
2	19.893	11.74	2.623
Qmax(1) =			
	1.000 *	1.000 *	40.275) +
	0.487 *	1.000 *	19.893) + =
Qmax(2) =			
	1.000 *	0.259 *	40.275) +
	1.000 *	1.000 *	19.893) + =
			30.326

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 40.275 19.893
 Maximum flow rates at confluence using above data:
 49.963 30.326

MBHS25YR.out

Area of streams before confluence:
52.000 9.730

Results of confluence:
Total flow rate = 49.963(CFS)
Time of concentration = 45.334 min.
Effective stream area after confluence = 61.730(Ac.)

Process from Point/Station 230.000 to Point/Station 320.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 24.120(Ft.)
Downstream point/station elevation = 11.910(Ft.)
Pipe length = 544.91(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 49.963(CFS)
Given pipe size = 36.00(In.)
Calculated individual pipe flow = 49.963(CFS)
Normal flow depth in pipe = 18.00(In.)
Flow top width inside pipe = 36.00(In.)
Critical Depth = 27.59(In.)
Pipe flow velocity = 14.12(Ft/s)
Travel time through pipe = 0.64 min.
Time of concentration (TC) = 45.98 min.

Process from Point/Station 230.000 to Point/Station 320.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 45.98 min.
Rainfall intensity = 1.266(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.635 CA = 41.535
Subarea runoff = 2.619(CFS) for 3.650(Ac.)
Total runoff = 52.582(CFS) Total area = 65.380(Ac.)

Process from Point/Station 320.000 to Point/Station 325.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 11.910(Ft.)
Downstream point/station elevation = 8.470(Ft.)
Pipe length = 215.48(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 52.582(CFS)
Given pipe size = 36.00(In.)
Calculated individual pipe flow = 52.582(CFS)
Normal flow depth in pipe = 20.60(In.)
Flow top width inside pipe = 35.62(In.)
Critical Depth = 28.27(In.)
Pipe flow velocity = 12.58(Ft/s)
Travel time through pipe = 0.29 min.
Time of concentration (TC) = 46.26 min.

Process from Point/Station 320.000 to Point/Station 325.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000

MBHS25YR.out

Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type]
Time of concentration = 46.26 min.
Rainfall intensity = 1.261(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.627 CA = 45.528
Subarea runoff = 4.825(CFS) for 7.260(Ac.)
Total runoff = 57.408(CFS) Total area = 72.640(Ac.)

Process from Point/Station 325.000 to Point/Station 330.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.470(Ft.)
Downstream point/station elevation = 7.000(Ft.)
Pipe length = 249.87(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 57.408(CFS)
Given pipe size = 36.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
1.917(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 1.850(Ft.)
Minor friction loss = 1.536(Ft.) K-factor = 1.50
Pipe flow velocity = 8.12(Ft/s)
Travel time through pipe = 0.51 min.
Time of concentration (TC) = 46.78 min.

Process from Point/Station 325.000 to Point/Station 330.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 72.640(Ac.)
Runoff from this stream = 57.408(CFS)
Time of concentration = 46.78 min.
Rainfall intensity = 1.252(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 400.000 to Point/Station 405.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type]
Initial subarea flow distance = 189.400(Ft.)
Highest elevation = 33.000(Ft.)
Lowest elevation = 30.000(Ft.)
Elevation difference = 3.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 11.69 min.
TC = [1.8*(1.1-C)*distance(Ft.)^(1/3)] / (% slope)^(1/3)]
TC = [1.8*(1.1-0.5500)*(189.400^(1/3)) / (1.584^(1/3))] = 11.69
Rainfall intensity (I) = 2.629(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff = 0.998(CFS)
Total initial stream area = 0.690(Ac.)

MBHS25YR.out

Process from Point/Station 405.000 to Point/Station 410.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 30.000(Ft.)
 End of street segment elevation = 15.500(Ft.)
 Length of street segment = 708.400(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 5.848(CFS)
 Depth of flow = 0.289(Ft.), Average velocity = 2.887(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.703(Ft.)
 Flow velocity = 2.89(Ft/s)
 Travel time = 4.09 min. TC = 15.78 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.304(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.070
 Subarea runoff = 8.378(CFS) for 6.710(Ac.)
 Total runoff = 9.376(CFS) Total area = 7.400(Ac.)
 Street flow at end of street = 9.376(CFS)
 Half street flow at end of street = 4.688(CFS)
 Depth of flow = 0.330(Ft.), Average velocity = 3.233(Ft/s)
 Flow width (from curb towards crown)= 11.741(Ft.)

 Process from Point/Station 410.000 to Point/Station 415.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 15.500(Ft.)
 End of street segment elevation = 13.500(Ft.)
 Length of street segment = 521.600(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 12.771(CFS)
 Depth of flow = 0.462(Ft.), Average velocity = 1.853(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 18.371(Ft.)
 Flow velocity = 1.85(Ft/s)
 Travel time = 4.69 min. TC = 20.47 min.

MBHS25YR.out

Adding area flow to street
 User specified 'C' value of 0.760 given for subarea
 Rainfall intensity = 2.038(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.638 CA = 8.144
 Subarea runoff = 7.224(CFS) for 5.360(Ac.)
 Total runoff = 16.600(CFS) Total area = 12.760(Ac.)
 Street flow at end of street = 16.600(CFS)
 Half street flow at end of street = 8.300(CFS)
 Depth of flow = 0.502(Ft.), Average velocity = 1.973(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 0.08(Ft.)
 Flow width (from curb towards crown)= 20.334(Ft.)

 Process from Point/Station 410.000 to Point/Station 415.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 12.760(Ac.)
 Runoff from this stream = 16.600(CFS)
 Time of concentration = 20.47 min.
 Rainfall intensity = 2.038(In/Hr)

 Process from Point/Station 500.000 to Point/Station 505.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.900 given for subarea
 Initial subarea flow distance = 145.000(Ft.)
 Highest elevation = 16.000(Ft.)
 Lowest elevation = 14.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.89 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (% slope^{1/3})$
 $TC = [1.8 * (1.1 - 0.9000) * (145.000^{.5})] / (1.379^{1/3}) = 3.89$
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 3.845(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.900
 Subarea runoff = 0.796(CFS)
 Total initial stream area = 0.230(Ac.)

 Process from Point/Station 505.000 to Point/Station 510.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 14.000(Ft.)
 End of street segment elevation = 11.500(Ft.)
 Length of street segment = 583.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 7.925(CFS)
 Depth of flow = 0.486(Ft.), Average velocity = 2.039(Ft/s)

MBHS25YR.out

Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 19.534(Ft.)
 Flow velocity = 2.04(Ft/s)
 Travel time = 4.77 min. TC = 9.77 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 2.841(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.853 CA = 3.709
 Subarea runoff = 9.742(CFS) for 4.120(Ac.)
 Total runoff = 10.538(CFS) Total area = 4.350(Ac.)
 Street flow at end of street = 10.538(CFS)
 Half street flow at end of street = 10.538(CFS)
 Depth of flow = 0.537(Ft.), Average velocity = 2.113(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 1.85(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 510.000 to Point/Station 415.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 9.520(Ft.)
 Downstream point/station elevation = 8.800(Ft.)
 Pipe length = 259.69(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 10.538(CFS)
 Given pipe size = 15.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 7.906(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 6.909(Ft.)
 Minor friction loss = 1.718(Ft.) K-factor = 1.50
 Pipe flow velocity = 8.59(Ft/s)
 Travel time through pipe = 0.50 min.
 Time of concentration (TC) = 10.27 min.

 Process from Point/Station 510.000 to Point/Station 415.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 4.350(Ac.)
 Runoff from this stream = 10.538(CFS)
 Time of concentration = 10.27 min.
 Rainfall intensity = 2.780(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	16.600	20.47	2.038
2	10.538	10.27	2.780
Qmax(1) =	1.000 * 0.733 *	1.000 * 1.000 *	16.600) + 10.538) = 24.326
Qmax(2) =	1.000 * 1.000 *	0.502 * 1.000 *	16.600) + 10.538) = 18.867

Total of 2 streams to confluence:

MBHS25YR.out

Flow rates before confluence point:
 16.600 10.538
 Maximum flow rates at confluence using above data:
 24.326 18.867
 Area of streams before confluence:
 12.760 4.350
 Results of confluence:
 Total flow rate = 24.326(CFS)
 Time of concentration = 20.469 min.
 Effective stream area after confluence = 17.110(Ac.)

 Process from Point/Station 415.000 to Point/Station 515.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.800(Ft.)
 Downstream point/station elevation = 8.550(Ft.)
 Pipe length = 84.57(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 24.326(CFS)
 Given pipe size = 18.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 8.698(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 4.534(Ft.)
 Minor friction loss = 4.414(Ft.) K-factor = 1.50
 Pipe flow velocity = 13.77(Ft/s)
 Travel time through pipe = 0.10 min.
 Time of concentration (TC) = 20.57 min.

 Process from Point/Station 415.000 to Point/Station 515.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 20.57 min.
 Rainfall intensity = 2.033(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.694 CA = 13.869
 Subarea runoff = 3.873(CFS) for 2.880(Ac.)
 Total runoff = 28.200(CFS) Total area = 19.990(Ac.)

 Process from Point/Station 515.000 to Point/Station 520.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.550(Ft.)
 Downstream point/station elevation = 7.620(Ft.)
 Pipe length = 337.77(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 28.200(CFS)
 Given pipe size = 27.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 3.041(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 2.799(Ft.)
 Minor friction loss = 1.172(Ft.) K-factor = 1.50
 Pipe flow velocity = 7.09(Ft/s)
 Travel time through pipe = 0.79 min.
 Time of concentration (TC) = 21.37 min.

MBHS25YR.out

Process from Point/Station 515.000 to Point/Station 520.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.950 given for subarea
 Time of concentration = 21.37 min.
 Rainfall intensity = 1.995(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.721 CA = 16.120
 Subarea runoff = 3.966(CFS) for 2.370(Ac.)
 Total runoff = 32.166(CFS) Total area = 22.360(Ac.)

 Process from Point/Station 520.000 to Point/Station 330.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 7.620(Ft.)
 Downstream point elevation = 7.000(Ft.)
 Channel length thru subarea = 228.700(Ft.)
 Channel base width = 3.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 32.166(CFS)
 Depth of flow = 1.933(Ft.), Average velocity = 2.821(Ft/s)
 Channel flow top width = 8.799(Ft.)
 Flow Velocity = 2.82(Ft/s)
 Travel time = 1.35 min.
 Time of concentration = 22.72 min.
 Critical depth = 1.234(Ft.)

 Process from Point/Station 520.000 to Point/Station 330.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 22.360(Ac.)
 Runoff from this stream = 32.166(CFS)
 Time of concentration = 22.72 min.
 Rainfall intensity = 1.934(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	57.408	46.78	1.252
2	32.166	22.72	1.934
Qmax(1) =	1.000 * 0.647 *	1.000 * 1.000 *	57.408) + 32.166) + = 78.230
Qmax(2) =	1.000 * 1.000 *	0.486 * 1.000 *	57.408) + 32.166) + = 60.046

Total of 2 main streams to confluence:

Flow rates before confluence point:
 57.408 32.166

Maximum flow rates at confluence using above data:
 78.230 60.046

Area of streams before confluence:
 72.640 22.360

Results of confluence:

MBHS25YR.out

Total flow rate = 78.230(CFS)
 Time of concentration = 46.775 min.
 Effective stream area after confluence = 95.000(Ac.)

 Process from Point/Station 330.000 to Point/Station 600.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 7.000(Ft.)
 Downstream point elevation = 6.350(Ft.)
 Channel length thru subarea = 499.000(Ft.)
 Channel base width = 4.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Estimated mean flow rate at midpoint of channel = 80.416(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 80.416(CFS)
 Depth of flow = 3.180(Ft.), Average velocity = 3.116(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 10.000(Ft.)
 Flow Velocity = 3.12(Ft/s)
 Travel time = 2.67 min.
 Time of concentration = 49.44 min.
 Critical depth = 1.844(Ft.)
 ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 1.208(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.660 CA = 66.161
 Subarea runoff = 1.692(CFS) for 5.310(Ac.)
 Total runoff = 79.922(CFS) Total area = 100.310(Ac.)

 Process from Point/Station 600.000 to Point/Station 605.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 6.350(Ft.)
 Downstream point elevation = 5.880(Ft.)
 Channel length thru subarea = 357.200(Ft.)
 Channel base width = 4.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Estimated mean flow rate at midpoint of channel = 80.050(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 80.050(CFS)
 Depth of flow = 3.166(Ft.), Average velocity = 3.120(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 10.000(Ft.)
 Flow Velocity = 3.12(Ft/s)
 Travel time = 1.91 min.
 Time of concentration = 51.35 min.
 Critical depth = 1.828(Ft.)
 ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]

MBHS25YR.out

The area added to the existing stream causes a lower flow rate of Q = 78.353(CFS) therefore the upstream flow rate of Q = 79.922(CFS) is being used
 Rainfall intensity = 1.179(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area (Q=KCIA) is C = 0.660 CA = 66.465
 Subarea runoff = 0.000(CFS) for 0.320(Ac.)
 Total runoff = 79.922(CFS) Total area = 100.630(Ac.)

 Process from Point/Station 605.000 to Point/Station 607.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.880(Ft.)
 Downstream point elevation = 5.820(Ft.)
 Channel length thru subarea = 25.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 87.507(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 5.000(Ft.)
 Flow(q) thru subarea = 87.507(CFS)
 Depth of flow = 2.025(Ft.), Average velocity = 3.192(Ft/s)
 Channel flow top width = 17.086(Ft.)
 Flow Velocity = 3.19(Ft/s)
 Travel time = 0.13 min.
 Time of concentration = 51.48 min.
 Critical depth = 1.234(Ft.)
 Adding area flow to channel
 User specified 'C' value of 0.570 given for subarea
 Rainfall intensity = 1.177(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area (Q=KCIA) is C = 0.646 CA = 77.352
 Subarea runoff = 11.115(CFS) for 19.100(Ac.)
 Total runoff = 91.038(CFS) Total area = 119.730(Ac.)

 Process from Point/Station 607.000 to Point/Station 610.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.820(Ft.)
 Downstream point elevation = 5.400(Ft.)
 Channel length thru subarea = 185.000(Ft.)
 Channel base width = 5.000(Ft.)
 Slope or 'Z' of left channel bank = 2.000
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 93.623(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 5.000(Ft.)
 Flow(q) thru subarea = 93.623(CFS)
 Depth of flow = 2.928(Ft.), Average velocity = 2.945(Ft/s)
 Channel flow top width = 16.712(Ft.)
 Flow Velocity = 2.95(Ft/s)
 Travel time = 1.05 min.
 Time of concentration = 52.53 min.
 Critical depth = 1.750(Ft.)
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 Rainfall intensity = 1.162(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area (Q=KCIA) is C = 0.662 CA = 83.812

MBHS25YR.out

Subarea runoff = 6.330(CFS) for 6.800(Ac.)
 Total runoff = 97.368(CFS) Total area = 126.530(Ac.)

 Process from Point/Station 607.000 to Point/Station 610.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 126.530(Ac.)
 Runoff from this stream = 97.368(CFS)
 Time of concentration = 52.53 min.
 Rainfall intensity = 1.162(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 700.000 to Point/Station 705.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 167.000(Ft.)
 Highest elevation = 16.000(Ft.)
 Lowest elevation = 14.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban areas overland flow method (App X-C) = 12.05 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.5500) * (167.000^{.5})] / (1.198^{(1/3)}) = 12.05$
 Rainfall intensity (I) = 2.594(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.571(CFS)
 Total initial stream area = 0.400(Ac.)

 Process from Point/Station 705.000 to Point/Station 710.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 14.000(Ft.)
 End of street segment elevation = 11.500(Ft.)
 Length of street segment = 580.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 5.601(CFS)
 Depth of flow = 0.356(Ft.), Average velocity = 1.581(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 13.037(Ft.)
 Flow velocity = 1.58(Ft/s)
 Travel time = 6.12 min. TC = 18.17 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000

MBHS25YR.out

Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.159(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.098
 Subarea runoff = 8.275(CFS) for 7.050(Ac.)
 Total runoff = 8.846(CFS) Total area = 7.450(Ac.)
 Street flow at end of street = 8.846(CFS)
 Half street flow at end of street = 4.423(CFS)
 Depth of flow = 0.407(Ft.), Average velocity = 1.768(Ft/s)
 Flow width (from curb towards crown)= 15.588(Ft.)

 Process from Point/Station 710.000 to Point/Station 610.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.000(Ft.)
 Downstream point/station elevation = 5.400(Ft.)
 Pipe length = 129.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 8.846(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 8.846(CFS)
 Normal flow depth in pipe = 10.00(In.)
 Flow top width inside pipe = 17.89(In.)
 Critical Depth = 13.81(In.)
 Pipe flow velocity = 8.77(Ft/s)
 Travel time through pipe = 0.25 min.
 Time of concentration (TC) = 18.41 min.

 Process from Point/Station 710.000 to Point/Station 610.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 7.450(Ac.)
 Runoff from this stream = 8.846(CFS)
 Time of concentration = 18.41 min.
 Rainfall intensity = 2.145(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	97.368	52.53	1.162
2	8.846	18.41	2.145
Qmax(1) =			
	1.000 * 0.542 *	1.000 * 1.000 *	97.368) + 8.846) + =
			102.159
Qmax(2) =			
	1.000 * 1.000 *	0.351 * 1.000 *	97.368) + 8.846) + =
			42.975

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 97.368 8.846
 Maximum flow rates at confluence using above data:
 102.159 42.975
 Area of streams before confluence:
 126.530 7.450

Results of confluence:

MBHS25YR.out

Total flow rate = 102.159(CFS)
 Time of concentration = 52.529 min.
 Effective stream area after confluence = 133.980(Ac.)

 Process from Point/Station 610.000 to Point/Station 715.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.400(Ft.)
 Downstream point elevation = 3.860(Ft.)
 Channel length thru subarea = 668.000(Ft.)
 Channel base width = 5.000(Ft.)
 Slope or 'Z' of left channel bank = 3.000
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 102.509(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 6.000(Ft.)
 Flow(q) thru subarea = 102.509(CFS)
 Depth of flow = 2.881(Ft.), Average velocity = 2.916(Ft/s)
 Channel flow top width = 19.405(Ft.)
 Flow Velocity = 2.92(Ft/s)
 Travel time = 3.82 min.
 Time of concentration = 56.35 min.
 Critical depth = 1.750(Ft.)

Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [RURAL(greater than 0.5 Ac, 0.2 ha) area type]
 The area added to the existing stream causes a
 a lower flow rate of Q = 98.069(CFS)
 therefore the upstream flow rate of Q = 102.159(CFS) is being used
 Rainfall intensity = 1.110(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.655 CA = 88.324
 Subarea runoff = 0.000(CFS) for 0.920(Ac.)
 Total runoff = 102.159(CFS) Total area = 134.900(Ac.)

 Process from Point/Station 610.000 to Point/Station 715.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 134.900(Ac.)
 Runoff from this stream = 102.159(CFS)
 Time of concentration = 56.35 min.
 Rainfall intensity = 1.110(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 720.000 to Point/Station 725.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 168.900(Ft.)
 Highest elevation = 18.000(Ft.)
 Lowest elevation = 16.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban

MBHS25YR.out

areas overland flow method (App X-C) = 12.16 min.
 TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
 TC = [1.8*(1.1-0.5500)*(168.900^0.5)/(1.184^(1/3))]= 12.16
 Rainfall intensity (I) = 2.584(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.739(CFS)
 Total initial stream area = 0.520(Ac.)

 Process from Point/Station 725.000 to Point/Station 730.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 16.000(Ft.)
 End of street segment elevation = 13.500(Ft.)
 Length of street segment = 778.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 3.738(CFS)
 Depth of flow = 0.330(Ft.), Average velocity = 1.283(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 11.771(Ft.)
 Flow velocity = 1.28(Ft/s)
 Travel time = 10.12 min. TC = 22.28 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.954(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 2.607
 Subarea runoff = 4.354(CFS) for 4.220(Ac.)
 Total runoff = 5.093(CFS) Total area = 4.740(Ac.)
 Street flow at end of street = 5.093(CFS)
 Half street flow at end of street = 2.546(CFS)
 Depth of flow = 0.361(Ft.), Average velocity = 1.383(Ft/s)
 Flow width (from curb towards crown)= 13.305(Ft.)

 Process from Point/Station 730.000 to Point/Station 735.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 13.500(Ft.)
 End of street segment elevation = 10.000(Ft.)
 Length of street segment = 874.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)

MBHS25YR.out

Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 7.747(CFS)
 Depth of flow = 0.487(Ft.), Average velocity = 1.975(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 19.625(Ft.)
 Flow velocity = 1.97(Ft/s)
 Travel time = 7.38 min. TC = 29.66 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.669(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 5.324
 Subarea runoff = 3.794(CFS) for 4.940(Ac.)
 Total runoff = 8.887(CFS) Total area = 9.680(Ac.)
 Street flow at end of street = 8.887(CFS)
 Half street flow at end of street = 8.887(CFS)
 Depth of flow = 0.511(Ft.), Average velocity = 2.018(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 0.56(Ft.)
 Flow width (from curb towards crown)= 20.808(Ft.)

 Process from Point/Station 735.000 to Point/Station 715.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 10.000(Ft.)
 End of street segment elevation = 9.000(Ft.)
 Length of street segment = 322.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 10.044(CFS)
 Depth of flow = 0.555(Ft.), Average velocity = 1.854(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 2.73(Ft.)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 22.000(Ft.)
 Flow velocity = 1.85(Ft/s)
 Travel time = 2.90 min. TC = 32.56 min.
 Adding area flow to street
 User specified 'C' value of 0.770 given for subarea
 Rainfall intensity = 1.578(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.595 CA = 7.264
 Subarea runoff = 2.577(CFS) for 2.520(Ac.)
 Total runoff = 11.464(CFS) Total area = 12.200(Ac.)
 Street flow at end of street = 11.464(CFS)
 Half street flow at end of street = 11.464(CFS)
 Depth of flow = 0.576(Ft.), Average velocity = 1.923(Ft/s)

MBHS25YR.out

Warning: depth of flow exceeds top of curb
Note: depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property = 3.81(Ft.)
Flow width (from curb towards crown)= 22.000(Ft.)

Process from Point/Station 735.000 to Point/Station 715.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 12.200(Ac.)
Runoff from this stream = 11.464(CFS)
Time of concentration = 32.56 min.
Rainfall intensity = 1.578(In/Hr)
Summary of stream data:

Stream Flow rate TC Rainfall Intensity
No. (CFS) (min) (In/Hr)

1 102.159 56.35 1.110
2 11.464 32.56 1.578

Qmax(1) =
1.000 * 1.000 * 102.159) +
0.704 * 1.000 * 11.464) + = 110.224

Qmax(2) =
1.000 * 0.578 * 102.159) +
1.000 * 1.000 * 11.464) + = 70.490

Total of 2 main streams to confluence:
Flow rates before confluence point:
102.159 11.464
Maximum flow rates at confluence using above data:
110.224 70.490
Area of streams before confluence:
134.900 12.200

Results of confluence:
Total flow rate = 110.224(CFS)
Time of concentration = 56.348 min.
Effective stream area after confluence = 147.100(Ac.)
End of computations, total study area = 147.100 (Ac.)

50-YEAR HYDROLOGIC ANALYSIS RESULTS

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4

Rational method hydrology program based on
 San Diego County Flood Control Division 1985 hydrology manual
 Rational Hydrology Study Date: 09/27/13

 MISSION BAY HIGH SCHOOL EXIST CONDITION HYDROLOGY ANALYSIS - MMP MAPS 36
 & 37 - ASSUMPTIONS: 1. n=0.030 IN MBHS CONC CHANNEL; AND 2. n=0.035 IN
 PACIFIC BEACH/OLNEY ST EARTHEN CHANNEL
 CIVILD FILE: MBHS50YR.RSD

***** Hydrology Study Control Information *****

 Program License Serial Number 6219

Rational hydrology study storm event year is 50.0
 English (in-lb) input data Units used
 English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
 Elevation 0 - 1500 feet
 Factor (to multiply * intensity) = 1.000
 Only used if inside City of San Diego
 San Diego hydrology manual 'C' values used
 Runoff coefficients by modified rational method

 Process from Point/Station 100.000 to Point/Station 105.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 194.700(Ft.)
 Highest elevation = 186.000(Ft.)
 Lowest elevation = 185.500(Ft.)
 Elevation difference = 0.500(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 21.73 min.
 $TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(0.257^{(1/3)})$
 $TC = [1.8*(1.1-0.5500)*(194.700^0.5)]/(0.257^{(1/3)}) = 21.73$
 Rainfall intensity (I) = 2.292(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.567(CFS)
 Total initial stream area = 0.450(Ac.)

 Process from Point/Station 105.000 to Point/Station 110.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 185.500(Ft.)
 End of street segment elevation = 174.000(Ft.)
 Length of street segment = 428.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020

Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 1.311(CFS)
 Depth of flow = 0.225(Ft.), Average velocity = 2.663(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 6.490(Ft.)
 Flow velocity = 2.66(Ft/s)
 Travel time = 2.68 min. TC = 24.42 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.162(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 0.897
 Subarea runoff = 1.371(CFS) for 1.180(Ac.)
 Total runoff = 1.938(CFS) Total area = 1.630(Ac.)
 Street flow at end of street = 1.938(CFS)
 Half street flow at end of street = 1.938(CFS)
 Depth of flow = 0.249(Ft.), Average velocity = 2.908(Ft/s)
 Flow width (from curb towards crown)= 7.715(Ft.)

 Process from Point/Station 110.000 to Point/Station 115.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 174.000(Ft.)
 End of street segment elevation = 138.000(Ft.)
 Length of street segment = 762.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 3.210(CFS)
 Depth of flow = 0.265(Ft.), Average velocity = 4.061(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.480(Ft.)
 Flow velocity = 4.06(Ft/s)
 Travel time = 3.13 min. TC = 27.55 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.025(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 2.074
 Subarea runoff = 2.262(CFS) for 2.140(Ac.)

MBHS50YR.out

Total runoff = 4.200(CFS) Total area = 3.770(Ac.)
 Street flow at end of street = 4.200(CFS)
 Half street flow at end of street = 4.200(CFS)
 Depth of flow = 0.285(Ft.), Average velocity = 4.326(Ft/s)
 Flow width (from curb towards crown)= 9.484(Ft.)

 Process from Point/Station 115.000 to Point/Station 120.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 138.000(Ft.)
 End of street segment elevation = 137.500(Ft.)
 Length of street segment = 522.400(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 8.026(CFS)
 Depth of flow = 0.496(Ft.), Average velocity = 0.980(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 20.061(Ft.)
 Flow velocity = 0.98(Ft/s)
 Travel time = 8.89 min. TC = 36.43 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.712(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 5.852
 Subarea runoff = 5.819(CFS) for 6.870(Ac.)
 Total runoff = 10.019(CFS) Total area = 10.640(Ac.)
 Street flow at end of street = 10.019(CFS)
 Half street flow at end of street = 5.009(CFS)
 Depth of flow = 0.538(Ft.), Average velocity = 1.000(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 1.89(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 120.000 to Point/Station 125.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 137.500(Ft.)
 End of street segment elevation = 92.000(Ft.)
 Length of street segment = 716.200(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020

MBHS50YR.out

Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 13.997(CFS)
 Depth of flow = 0.315(Ft.), Average velocity = 5.473(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.988(Ft.)
 Flow velocity = 5.47(Ft/s)
 Travel time = 2.18 min. TC = 38.61 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.649(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 10.500
 Subarea runoff = 7.299(CFS) for 8.450(Ac.)
 Total runoff = 17.318(CFS) Total area = 19.090(Ac.)
 Street flow at end of street = 17.318(CFS)
 Half street flow at end of street = 8.659(CFS)
 Depth of flow = 0.334(Ft.), Average velocity = 5.762(Ft/s)
 Flow width (from curb towards crown)= 11.965(Ft.)

 Process from Point/Station 125.000 to Point/Station 130.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 92.000(Ft.)
 End of street segment elevation = 69.000(Ft.)
 Length of street segment = 528.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 20.439(CFS)
 Depth of flow = 0.370(Ft.), Average velocity = 5.201(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 13.761(Ft.)
 Flow velocity = 5.20(Ft/s)
 Travel time = 1.69 min. TC = 40.31 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.604(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 14.284
 Subarea runoff = 5.599(CFS) for 6.880(Ac.)
 Total runoff = 22.917(CFS) Total area = 25.970(Ac.)
 Street flow at end of street = 22.917(CFS)
 Half street flow at end of street = 11.458(CFS)
 Depth of flow = 0.383(Ft.), Average velocity = 5.348(Ft/s)

MBHS50YR.out

Flow width (from curb towards crown)= 14.391(Ft.)

 Process from Point/Station 130.000 to Point/Station 135.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 69.000(Ft.)
 End of street segment elevation = 49.500(Ft.)
 Length of street segment = 494.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 27.280(CFS)
 Depth of flow = 0.409(Ft.), Average velocity = 5.378(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 15.700(Ft.)
 Flow velocity = 5.38(Ft/s)
 Travel time = 1.53 min. TC = 41.84 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 1.566(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.591 CA = 21.207
 Subarea runoff = 10.299(CFS) for 9.890(Ac.)
 Total runoff = 33.216(CFS) Total area = 35.860(Ac.)
 Street flow at end of street = 33.216(CFS)
 Half street flow at end of street = 16.608(CFS)
 Depth of flow = 0.434(Ft.), Average velocity = 5.645(Ft/s)
 Flow width (from curb towards crown)= 16.943(Ft.)

 Process from Point/Station 135.000 to Point/Station 140.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 49.500(Ft.)
 End of street segment elevation = 43.700(Ft.)
 Length of street segment = 502.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 34.740(CFS)
 Depth of flow = 0.660(Ft.), Average velocity = 4.190(Ft/s)

MBHS50YR.out

Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 7.98(Ft.)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 22.000(Ft.)
 Flow velocity = 4.19(Ft/s)
 Travel time = 2.00 min. TC = 43.83 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 1.520(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.613 CA = 24.003
 Subarea runoff = 3.266(CFS) for 3.290(Ac.)
 Total runoff = 36.482(CFS) Total area = 39.150(Ac.)
 Street flow at end of street = 36.482(CFS)
 Half street flow at end of street = 36.482(CFS)
 Depth of flow = 0.670(Ft.), Average velocity = 4.245(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 8.48(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 135.000 to Point/Station 140.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 39.150(Ac.)
 Runoff from this stream = 36.482(CFS)
 Time of concentration = 43.83 min.
 Rainfall intensity = 1.520(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 200.000 to Point/Station 205.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 197.000(Ft.)
 Highest elevation = 118.000(Ft.)
 Lowest elevation = 111.000(Ft.)
 Elevation difference = 7.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 9.11 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.550) * (197.000^{.5}) / (3.553^{(1/3)})] = 9.11$
 Rainfall intensity (I) = 3.313(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 1.221(CFS)
 Total initial stream area = 0.670(Ac.)

 Process from Point/Station 205.000 to Point/Station 210.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 111.000(Ft.)

MBHS50YR.out

End of street segment elevation = 75.000(Ft.)
 Length of street segment = 731.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 6.395(CFS)
 Depth of flow = 0.263(Ft.), Average velocity = 4.123(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.392(Ft.)
 Flow velocity = 4.12(Ft/s)
 Travel time = 2.96 min. TC = 12.06 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.959(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 3.493
 Subarea runoff = 9.115(CFS) for 5.680(Ac.)
 Total runoff = 10.335(CFS) Total area = 6.350(Ac.)
 Street flow at end of street = 10.335(CFS)
 Half street flow at end of street = 5.168(CFS)
 Depth of flow = 0.300(Ft.), Average velocity = 4.619(Ft/s)
 Flow width (from curb towards crown)= 10.235(Ft.)

 Process from Point/Station 210.000 to Point/Station 215.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 75.000(Ft.)
 End of street segment elevation = 72.000(Ft.)
 Length of street segment = 298.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 12.077(CFS)
 Depth of flow = 0.485(Ft.), Average velocity = 3.120(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 19.494(Ft.)
 Flow velocity = 3.12(Ft/s)
 Travel time = 1.59 min. TC = 13.65 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000

MBHS50YR.out

Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.814(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.670
 Subarea runoff = 2.805(CFS) for 2.140(Ac.)
 Total runoff = 13.141(CFS) Total area = 8.490(Ac.)
 Street flow at end of street = 13.141(CFS)
 Half street flow at end of street = 13.141(CFS)
 Depth of flow = 0.498(Ft.), Average velocity = 3.185(Ft/s)
 Flow width (from curb towards crown)= 20.135(Ft.)

 Process from Point/Station 215.000 to Point/Station 140.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 72.000(Ft.)
 End of street segment elevation = 43.700(Ft.)
 Length of street segment = 653.800(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 15.230(CFS)
 Depth of flow = 0.340(Ft.), Average velocity = 4.830(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 12.270(Ft.)
 Flow velocity = 4.83(Ft/s)
 Travel time = 2.26 min. TC = 15.91 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 2.640(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.586 CA = 6.559
 Subarea runoff = 4.178(CFS) for 2.700(Ac.)
 Total runoff = 17.319(CFS) Total area = 11.190(Ac.)
 Street flow at end of street = 17.319(CFS)
 Half street flow at end of street = 8.660(CFS)
 Depth of flow = 0.353(Ft.), Average velocity = 4.983(Ft/s)
 Flow width (from curb towards crown)= 12.910(Ft.)

 Process from Point/Station 215.000 to Point/Station 140.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 11.190(Ac.)
 Runoff from this stream = 17.319(CFS)
 Time of concentration = 15.91 min.
 Rainfall intensity = 2.640(In/Hr)
 Summary of stream data:

MBHS50YR.out

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	36.482	43.83	1.520
2	17.319	15.91	2.640
Qmax(1) =	1.000 * 0.576 *	1.000 * 1.000 *	36.482) + 17.319) + = 46.452
Qmax(2) =	1.000 * 1.000 *	0.363 * 1.000 *	36.482) + 17.319) + = 30.561

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 36.482 17.319
 Maximum flow rates at confluence using above data:
 46.452 30.561
 Area of streams before confluence:
 39.150 11.190

Results of confluence:
 Total flow rate = 46.452(CFS)
 Time of concentration = 43.835 min.
 Effective stream area after confluence = 50.340(Ac.)

 Process from Point/Station 140.000 to Point/Station 220.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 36.150(Ft.)
 Downstream point/station elevation = 34.120(Ft.)
 Pipe length = 151.50(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 46.452(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 46.452(CFS)
 Normal flow depth in pipe = 24.00(In.)
 Flow top width inside pipe = 24.00(In.)
 Critical Depth = 26.98(In.)
 Pipe flow velocity = 11.02(Ft/s)
 Travel time through pipe = 0.23 min.
 Time of concentration (TC) = 44.06 min.

 Process from Point/Station 220.000 to Point/Station 225.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 34.120(Ft.)
 Downstream point/station elevation = 31.700(Ft.)
 Pipe length = 191.10(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 46.452(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 46.452(CFS)
 Normal flow depth in pipe = 24.75(In.)
 Flow top width inside pipe = 22.80(In.)
 Critical Depth = 26.98(In.)
 Pipe flow velocity = 10.72(Ft/s)
 Travel time through pipe = 0.30 min.
 Time of concentration (TC) = 44.36 min.

 Process from Point/Station 220.000 to Point/Station 225.000
 **** SUBAREA FLOW ADDITION ****

MBHS50YR.out

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Time of concentration = 44.36 min.
 Rainfall intensity = 1.508(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area (Q=KCIA) is C = 0.605 CA = 31.476
 Subarea runoff = 1.021(CFS) for 1.660(Ac.)
 Total runoff = 47.473(CFS) Total area = 52.000(Ac.)

 Process from Point/Station 225.000 to Point/Station 230.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 31.200(Ft.)
 Downstream point/station elevation = 24.120(Ft.)
 Pipe length = 125.43(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 47.473(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 47.473(CFS)
 Normal flow depth in pipe = 13.51(In.)
 Flow top width inside pipe = 34.86(In.)
 Critical Depth = 26.92(In.)
 Pipe flow velocity = 19.59(Ft/s)
 Travel time through pipe = 0.11 min.
 Time of concentration (TC) = 44.47 min.

 Process from Point/Station 225.000 to Point/Station 230.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 52.000(Ac.)
 Runoff from this stream = 47.473(CFS)
 Time of concentration = 44.47 min.
 Rainfall intensity = 1.506(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 300.000 to Point/Station 305.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Initial subarea flow distance = 176.600(Ft.)
 Highest elevation = 64.000(Ft.)
 Lowest elevation = 30.000(Ft.)
 Elevation difference = 34.000(Ft.)
 Time of concentration calculated by the urban areas overland flow method (App X-C) = 3.57 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{0.5}] / (\% slope^{1/3})$
 $TC = [1.8 * (1.1 - 0.7000) * (176.600^{0.5})] / (19.253^{1/3}) = 3.57$
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
 Subarea runoff = 1.015(CFS)
 Total initial stream area = 0.340(Ac.)

MBHS50YR.out

 Process from Point/Station 305.000 to Point/Station 310.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

 Top of street segment elevation = 60.000(Ft.)
 End of street segment elevation = 45.500(Ft.)
 Length of street segment = 739.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 8.136(CFS)
 Depth of flow = 0.389(Ft.), Average velocity = 3.639(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 14.712(Ft.)
 Flow velocity = 3.64(Ft/s)
 Travel time = 3.39 min. TC = 8.39 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 3.425(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.700 CA = 3.577
 Subarea runoff = 11.235(CFS) for 4.770(Ac.)
 Total runoff = 12.250(CFS) Total area = 5.110(Ac.)
 Street flow at end of street = 12.250(CFS)
 Half street flow at end of street = 12.250(CFS)
 Depth of flow = 0.440(Ft.), Average velocity = 4.024(Ft/s)
 Flow width (from curb towards crown)= 17.242(Ft.)

 Process from Point/Station 310.000 to Point/Station 315.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

 Top of street segment elevation = 45.500(Ft.)
 End of street segment elevation = 33.500(Ft.)
 Length of street segment = 721.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 17.788(CFS)
 Depth of flow = 0.507(Ft.), Average velocity = 4.113(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 0.37(Ft.)
 Streetflow hydraulics at midpoint of street travel:

MBHS50YR.out

Halfstreet flow width = 20.622(Ft.)
 Flow velocity = 4.11(Ft/s)
 Travel time = 2.92 min. TC = 11.31 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 3.037(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.771 CA = 7.504
 Subarea runoff = 10.539(CFS) for 4.620(Ac.)
 Total runoff = 22.790(CFS) Total area = 9.730(Ac.)
 Street flow at end of street = 22.790(CFS)
 Half street flow at end of street = 22.790(CFS)
 Depth of flow = 0.551(Ft.), Average velocity = 4.270(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 2.57(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 315.000 to Point/Station 230.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

 Upstream point/station elevation = 27.800(Ft.)
 Downstream point/station elevation = 24.120(Ft.)
 Pipe length = 189.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 22.790(CFS)
 Given pipe size = 18.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 9.128(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 8.934(Ft.)
 Minor friction loss = 3.874(Ft.) K-factor = 1.50
 Pipe flow velocity = 12.90(Ft/s)
 Travel time through pipe = 0.25 min.
 Time of concentration (TC) = 11.55 min.

 Process from Point/Station 315.000 to Point/Station 230.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 9.730(Ac.)
 Runoff from this stream = 22.790(CFS)
 Time of concentration = 11.55 min.
 Rainfall intensity = 3.011(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	47.473	44.47	1.506
2	22.790	11.55	3.011
Qmax(1) =	1.000 * 47.473 +	1.000 * 44.47 +	1.506 * 3.011 +
	0.500 * 22.790 +	1.000 * 11.55 +	3.011 * 1.506 +
Qmax(2) =	1.000 * 47.473 +	0.260 * 44.47 +	1.506 * 3.011 +
	1.000 * 22.790 +	1.000 * 11.55 +	3.011 * 1.506 +

Total of 2 main streams to confluence:

MBHS50YR.out

Flow rates before confluence point:
 47.473 22.790
 Maximum flow rates at confluence using above data:
 58.871 35.125
 Area of streams before confluence:
 52.000 9.730

Results of confluence:
 Total flow rate = 58.871(CFS)
 Time of concentration = 44.468 min.
 Effective stream area after confluence = 61.730(Ac.)

 Process from Point/Station 230.000 to Point/Station 320.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 24.120(Ft.)
 Downstream point/station elevation = 11.910(Ft.)
 Pipe length = 544.91(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 58.871(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 58.871(CFS)
 Normal flow depth in pipe = 19.88(In.)
 Flow top width inside pipe = 35.80(In.)
 Critical Depth = 29.78(In.)
 Pipe flow velocity = 14.70(Ft/s)
 Travel time through pipe = 0.62 min.
 Time of concentration (TC) = 45.09 min.

 Process from Point/Station 230.000 to Point/Station 320.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 45.09 min.
 Rainfall intensity = 1.493(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.635 CA = 41.535
 Subarea runoff = 3.122(CFS) for 3.650(Ac.)
 Total runoff = 61.993(CFS) Total area = 65.380(Ac.)

 Process from Point/Station 320.000 to Point/Station 325.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 11.910(Ft.)
 Downstream point/station elevation = 8.470(Ft.)
 Pipe length = 215.48(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 61.993(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 61.993(CFS)
 Normal flow depth in pipe = 22.95(In.)
 Flow top width inside pipe = 34.61(In.)
 Critical Depth = 30.43(In.)
 Pipe flow velocity = 13.03(Ft/s)
 Travel time through pipe = 0.28 min.
 Time of concentration (TC) = 45.36 min.

MBHS50YR.out

Process from Point/Station 320.000 to Point/Station 325.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Time of concentration = 45.36 min.
 Rainfall intensity = 1.487(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.627 CA = 45.528
 Subarea runoff = 5.693(CFS) for 7.260(Ac.)
 Total runoff = 67.687(CFS) Total area = 72.640(Ac.)

 Process from Point/Station 325.000 to Point/Station 330.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.470(Ft.)
 Downstream point/station elevation = 7.000(Ft.)
 Pipe length = 249.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 67.687(CFS)
 Given pipe size = 36.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 3.238(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 2.572(Ft.)
 Minor friction loss = 2.136(Ft.) K-factor = 1.50
 Pipe flow velocity = 9.58(Ft/s)
 Travel time through pipe = 0.43 min.
 Time of concentration (TC) = 45.80 min.

 Process from Point/Station 325.000 to Point/Station 330.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 72.640(Ac.)
 Runoff from this stream = 67.687(CFS)
 Time of concentration = 45.80 min.
 Rainfall intensity = 1.478(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 400.000 to Point/Station 405.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 189.400(Ft.)
 Highest elevation = 33.000(Ft.)
 Lowest elevation = 30.000(Ft.)
 Elevation difference = 3.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 11.69 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{1/3})$
 $TC = [1.8 * (1.1 - 0.5500) * (189.400^{.5})] / (1.584^{1/3}) = 11.69$
 Rainfall intensity (I) = 2.997(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 1.137(CFS)

MBHS50YR.out

Total initial stream area = 0.690(Ac.)

 Process from Point/Station 405.000 to Point/Station 410.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 30.000(Ft.)
 End of street segment elevation = 15.500(Ft.)
 Length of street segment = 708.400(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 6.668(CFS)
 Depth of flow = 0.300(Ft.), Average velocity = 2.979(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.237(Ft.)
 Flow velocity = 2.98(Ft/s)
 Travel time = 3.96 min. TC = 15.65 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.659(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.070
 Subarea runoff = 9.684(CFS) for 6.710(Ac.)
 Total runoff = 10.821(CFS) Total area = 7.400(Ac.)
 Street flow at end of street = 10.821(CFS)
 Half street flow at end of street = 5.411(CFS)
 Depth of flow = 0.344(Ft.), Average velocity = 3.348(Ft/s)
 Flow width (from curb towards crown)= 12.430(Ft.)

 Process from Point/Station 410.000 to Point/Station 415.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 15.500(Ft.)
 End of street segment elevation = 13.500(Ft.)
 Length of street segment = 521.600(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 14.740(CFS)
 Depth of flow = 0.483(Ft.), Average velocity = 1.920(Ft/s)

MBHS50YR.out

Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 19.410(Ft.)
 Flow velocity = 1.92(Ft/s)
 Travel time = 4.53 min. TC = 20.18 min.
 Adding area flow to street
 User specified 'C' value of 0.760 given for subarea
 Rainfall intensity = 2.375(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.638 CA = 8.144
 Subarea runoff = 8.520(CFS) for 5.360(Ac.)
 Total runoff = 19.341(CFS) Total area = 12.760(Ac.)
 Street flow at end of street = 19.341(CFS)
 Half street flow at end of street = 9.671(CFS)
 Depth of flow = 0.532(Ft.), Average velocity = 1.988(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 1.58(Ft.)
 Flow width (from curb towards crown)= 21.835(Ft.)

 Process from Point/Station 410.000 to Point/Station 415.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 12.760(Ac.)
 Runoff from this stream = 19.341(CFS)
 Time of concentration = 20.18 min.
 Rainfall intensity = 2.375(In/Hr)

 Process from Point/Station 500.000 to Point/Station 505.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.900 given for subarea
 Initial subarea flow distance = 145.000(Ft.)
 Highest elevation = 16.000(Ft.)
 Lowest elevation = 14.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.89 min.
 $TC = [1.8*(1.1-C)*distance(Ft.)^{.5}]/(\% slope^{1/3})$
 $TC = [1.8*(1.1-0.9000)*(145.000^{.5})/(1.379^{1/3})] = 3.89$
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.900
 Subarea runoff = 0.883(CFS)
 Total initial stream area = 0.230(Ac.)

 Process from Point/Station 505.000 to Point/Station 510.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 14.000(Ft.)
 End of street segment elevation = 11.500(Ft.)
 Length of street segment = 583.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160

MBHS50YR.out

Manning's N from gutter to grade break = 0.0160
Manning's N from grade break to crown = 0.0160
Estimated mean flow rate at midpoint of street = 8.791(CFS)
Depth of flow = 0.502(Ft.), Average velocity = 2.087(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property = 0.10(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 20.350(Ft.)
Flow velocity = 2.09(Ft/s)
Travel time = 4.66 min. TC = 9.66 min.
Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type]
Rainfall intensity = 3.235(In/Hr) for a 50.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.853 CA = 3.709
Subarea runoff = 11.117(CFS) for 4.120(Ac.)
Total runoff = 12.000(CFS) Total area = 4.350(Ac.)
Street flow at end of street = 12.000(CFS)
Half street flow at end of street = 12.000(CFS)
Depth of flow = 0.557(Ft.), Average velocity = 2.190(Ft/s)
Warning: depth of flow exceeds top of curb
Note: depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property = 2.86(Ft.)
Flow width (from curb towards crown)= 22.000(Ft.)

Process from Point/Station 510.000 to Point/Station 415.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 9.520(Ft.)
Downstream point/station elevation = 8.800(Ft.)
Pipe length = 259.69(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 12.000(CFS)
Given pipe size = 15.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
10.466(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 8.959(Ft.)
Minor friction loss = 2.227(Ft.) K-factor = 1.50
Pipe flow velocity = 9.78(Ft/s)
Travel time through pipe = 0.44 min.
Time of concentration (TC) = 10.10 min.

Process from Point/Station 510.000 to Point/Station 415.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 4.350(Ac.)
Runoff from this stream = 12.000(CFS)
Time of concentration = 10.10 min.
Rainfall intensity = 3.178(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	19.341	20.18	2.375
2	12.000	10.10	3.178

Qmax(1) = 1.000 * 1.000 * 19.341) +

MBHS50YR.out

0.747 * 1.000 * 12.000) + = 28.310
Qmax(2) = 1.000 * 0.500 * 19.341) +
1.000 * 1.000 * 12.000) + = 21.679

Total of 2 streams to confluence:
Flow rates before confluence point:
19.341 12.000
Maximum flow rates at confluence using above data:
28.310 21.679
Area of streams before confluence:
12.760 4.350
Results of confluence:
Total flow rate = 28.310(CFS)
Time of concentration = 20.180 min.
Effective stream area after confluence = 17.110(Ac.)

Process from Point/Station 415.000 to Point/Station 515.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.800(Ft.)
Downstream point/station elevation = 8.550(Ft.)
Pipe length = 84.57(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 28.310(CFS)
Given pipe size = 18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
11.868(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 6.141(Ft.)
Minor friction loss = 5.978(Ft.) K-factor = 1.50
Pipe flow velocity = 16.02(Ft/s)
Travel time through pipe = 0.09 min.
Time of concentration (TC) = 20.27 min.

Process from Point/Station 415.000 to Point/Station 515.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Time of concentration = 20.27 min.
Rainfall intensity = 2.370(In/Hr) for a 50.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.694 CA = 13.869
Subarea runoff = 4.561(CFS) for 2.880(Ac.)
Total runoff = 32.871(CFS) Total area = 19.990(Ac.)

Process from Point/Station 515.000 to Point/Station 520.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.550(Ft.)
Downstream point/station elevation = 7.620(Ft.)
Pipe length = 337.77(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 32.871(CFS)
Given pipe size = 27.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
4.466(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 3.804(Ft.)
Minor friction loss = 1.592(Ft.) K-factor = 1.50

MBHS50YR.out

Pipe flow velocity = 8.27(Ft/s)
 Travel time through pipe = 0.68 min.
 Time of concentration (TC) = 20.95 min.

 Process from Point/Station 515.000 to Point/Station 520.000
 **** SUBAREA FLOW ADDITION ****

 User specified 'C' value of 0.950 given for subarea
 Time of concentration = 20.95 min.
 Rainfall intensity = 2.333(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.721 CA = 16.120
 Subarea runoff = 4.742(CFS) for 2.370(Ac.)
 Total runoff = 37.613(CFS) Total area = 22.360(Ac.)

 Process from Point/Station 520.000 to Point/Station 330.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

 Upstream point elevation = 7.620(Ft.)
 Downstream point elevation = 7.000(Ft.)
 Channel length thru subarea = 228.700(Ft.)
 Channel base width = 3.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 37.613(CFS)
 Depth of flow = 2.072(Ft.), Average velocity = 2.974(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 9.000(Ft.)
 Flow Velocity = 2.97(Ft/s)
 Travel time = 1.28 min.
 Time of concentration = 22.23 min.
 Critical depth = 1.344(Ft.)
 ERROR - Channel depth exceeds maximum allowable depth

 Process from Point/Station 520.000 to Point/Station 330.000
 **** CONFLUENCE OF MAIN STREAMS ****

 The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 22.360(Ac.)
 Runoff from this stream = 37.613(CFS)
 Time of concentration = 22.23 min.
 Rainfall intensity = 2.267(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	67.687	45.80	1.478
2	37.613	22.23	2.267
Qmax(1) =			
	1.000 * 0.652 *	1.000 * 1.000 *	67.687) + 37.613) + = 92.203
Qmax(2) =			
	1.000 * 1.000 *	0.485 * 1.000 *	67.687) + 37.613) + = 70.469

Total of 2 main streams to confluence:
 Flow rates before confluence point:

MBHS50YR.out

67.687 37.613
 Maximum flow rates at confluence using above data:
 92.203 70.469
 Area of streams before confluence:
 72.640 22.360

Results of confluence:
 Total flow rate = 92.203(CFS)
 Time of concentration = 45.796 min.
 Effective stream area after confluence = 95.000(Ac.)

 Process from Point/Station 330.000 to Point/Station 600.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

 Upstream point elevation = 7.000(Ft.)
 Downstream point elevation = 6.350(Ft.)
 Channel length thru subarea = 499.000(Ft.)
 Channel base width = 4.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Estimated mean flow rate at midpoint of channel = 94.780(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 94.780(CFS)
 Depth of flow = 3.448(Ft.), Average velocity = 3.328(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 10.000(Ft.)
 Flow Velocity = 3.33(Ft/s)
 Travel time = 2.50 min.
 Time of concentration = 48.29 min.
 Critical depth = 2.000(Ft.)
 ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 1.428(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.660 CA = 66.161
 Subarea runoff = 2.263(CFS) for 5.310(Ac.)
 Total runoff = 94.466(CFS) Total area = 100.310(Ac.)

 Process from Point/Station 600.000 to Point/Station 605.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

 Upstream point elevation = 6.350(Ft.)
 Downstream point elevation = 5.880(Ft.)
 Channel length thru subarea = 357.200(Ft.)
 Channel base width = 4.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Estimated mean flow rate at midpoint of channel = 94.617(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 94.617(CFS)
 Depth of flow = 3.436(Ft.), Average velocity = 3.336(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 10.000(Ft.)
 Flow Velocity = 3.34(Ft/s)
 Travel time = 1.78 min.
 Time of concentration = 50.08 min.

MBHS50YR.out

Critical depth = 2.000(Ft.)
 ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 The area added to the existing stream causes a
 a lower flow rate of Q = 92.705(CFS)
 therefore the upstream flow rate of Q = 94.466(CFS) is being used
 Rainfall intensity = 1.395(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.660 CA = 66.465
 Subarea runoff = 0.000(CFS) for 0.320(Ac.)
 Total runoff = 94.466(CFS) Total area = 100.630(Ac.)

 Process from Point/Station 605.000 to Point/Station 607.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.880(Ft.)
 Downstream point elevation = 5.820(Ft.)
 Channel length thru subarea = 25.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 103.431(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 5.000(Ft.)
 Flow(q) thru subarea = 103.431(CFS)
 Depth of flow = 2.220(Ft.), Average velocity = 3.355(Ft/s)
 Channel flow top width = 17.771(Ft.)
 Flow Velocity = 3.35(Ft/s)
 Travel time = 0.12 min.
 Time of concentration = 50.20 min.
 Critical depth = 1.375(Ft.)
 Adding area flow to channel
 User specified 'C' value of 0.570 given for subarea
 Rainfall intensity = 1.393(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.646 CA = 77.352
 Subarea runoff = 13.252(CFS) for 19.100(Ac.)
 Total runoff = 107.718(CFS) Total area = 119.730(Ac.)

 Process from Point/Station 607.000 to Point/Station 610.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.820(Ft.)
 Downstream point elevation = 5.400(Ft.)
 Channel length thru subarea = 185.000(Ft.)
 Channel base width = 5.000(Ft.)
 Slope or 'Z' of left channel bank = 2.000
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 110.777(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 5.000(Ft.)
 Flow(q) thru subarea = 110.777(CFS)
 Depth of flow = 3.173(Ft.), Average velocity = 3.077(Ft/s)
 Channel flow top width = 17.692(Ft.)
 Flow Velocity = 3.08(Ft/s)
 Travel time = 1.00 min.
 Time of concentration = 51.21 min.
 Critical depth = 1.906(Ft.)
 Adding area flow to channel

MBHS50YR.out

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 Rainfall intensity = 1.375(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.662 CA = 83.812
 Subarea runoff = 7.518(CFS) for 6.800(Ac.)
 Total runoff = 115.236(CFS) Total area = 126.530(Ac.)

 Process from Point/Station 607.000 to Point/Station 610.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 126.530(Ac.)
 Runoff from this stream = 115.236(CFS)
 Time of concentration = 51.21 min.
 Rainfall intensity = 1.375(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 700.000 to Point/Station 705.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 167.000(Ft.)
 Highest elevation = 16.000(Ft.)
 Lowest elevation = 14.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 12.05 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.5500) * (167.000^{.5})] / (1.198^{(1/3)}) = 12.05$
 Rainfall intensity (I) = 2.961(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.651(CFS)
 Total initial stream area = 0.400(Ac.)

 Process from Point/Station 705.000 to Point/Station 710.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 14.000(Ft.)
 End of street segment elevation = 11.500(Ft.)
 Length of street segment = 580.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160

MBHS50YR.out

Estimated mean flow rate at midpoint of street = 6.392(CFS)
 Depth of flow = 0.370(Ft.), Average velocity = 1.633(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 13.732(Ft.)
 Flow velocity = 1.63(Ft/s)
 Travel time = 5.92 min. TC = 17.97 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.504(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.098
 Subarea runoff = 9.609(CFS) for 7.050(Ac.)
 Total runoff = 10.261(CFS) Total area = 7.450(Ac.)
 Street flow at end of street = 10.261(CFS)
 Half street flow at end of street = 5.130(CFS)
 Depth of flow = 0.425(Ft.), Average velocity = 1.834(Ft/s)
 Flow width (from curb towards crown)= 16.510(Ft.)

 Process from Point/Station 710.000 to Point/Station 610.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.000(Ft.)
 Downstream point/station elevation = 5.400(Ft.)
 Pipe length = 129.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 10.261(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 10.261(CFS)
 Normal flow depth in pipe = 10.99(In.)
 Flow top width inside pipe = 17.55(In.)
 Critical Depth = 14.79(In.)
 Pipe flow velocity = 9.07(Ft/s)
 Travel time through pipe = 0.24 min.
 Time of concentration (TC) = 18.21 min.

 Process from Point/Station 710.000 to Point/Station 610.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 7.450(Ac.)
 Runoff from this stream = 10.261(CFS)
 Time of concentration = 18.21 min.
 Rainfall intensity = 2.489(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	115.236	51.21	1.375
2	10.261	18.21	2.489
Qmax(1) =			
	1.000 *	1.000 *	115.236) +
	0.552 *	1.000 *	10.261) + = 120.903
Qmax(2) =			
	1.000 *	0.356 *	115.236) +
	1.000 *	1.000 *	10.261) + = 51.242

Total of 2 main streams to confluence:
 Flow rates before confluence point:

MBHS50YR.out

115.236 10.261
 Maximum flow rates at confluence using above data:
 120.903 51.242
 Area of streams before confluence:
 126.530 7.450

Results of confluence:
 Total flow rate = 120.903(CFS)
 Time of concentration = 51.205 min.
 Effective stream area after confluence = 133.980(Ac.)

 Process from Point/Station 610.000 to Point/Station 715.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.400(Ft.)
 Downstream point elevation = 3.860(Ft.)
 Channel length thru subarea = 668.000(Ft.)
 Channel base width = 5.000(Ft.)
 Slope or 'Z' of left channel bank = 3.000
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 121.318(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 6.000(Ft.)
 Flow(q) thru subarea = 121.318(CFS)
 Depth of flow = 3.115(Ft.), Average velocity = 3.045(Ft/s)
 Channel flow top width = 20.576(Ft.)
 Flow Velocity = 3.05(Ft/s)
 Travel time = 3.66 min.
 Time of concentration = 54.86 min.
 Critical depth = 1.922(Ft.)

Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [RURAL(greater than 0.5 Ac, 0.2 ha) area type]
 The area added to the existing stream causes a
 a lower flow rate of Q = 116.155(CFS)
 therefore the upstream flow rate of Q = 120.903(CFS) is being used
 Rainfall intensity = 1.315(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.655 CA = 88.324
 Subarea runoff = 0.000(CFS) for 0.920(Ac.)
 Total runoff = 120.903(CFS) Total area = 134.900(Ac.)

 Process from Point/Station 610.000 to Point/Station 715.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 134.900(Ac.)
 Runoff from this stream = 120.903(CFS)
 Time of concentration = 54.86 min.
 Rainfall intensity = 1.315(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 720.000 to Point/Station 725.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000

MBHS50YR.out

Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 168.900(Ft.)
 Highest elevation = 18.000(Ft.)
 Lowest elevation = 16.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 12.16 min.
 $TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(%\ slope^{1/3})]$
 $TC = [1.8*(1.1-0.5500)*(168.900^0.5)/(1.184^{1/3})] = 12.16$
 Rainfall intensity (I) = 2.950(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.844(CFS)
 Total initial stream area = 0.520(Ac.)

 Process from Point/Station 725.000 to Point/Station 730.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 16.000(Ft.)
 End of street segment elevation = 13.500(Ft.)
 Length of street segment = 778.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 4.267(CFS)
 Depth of flow = 0.343(Ft.), Average velocity = 1.324(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 12.407(Ft.)
 Flow velocity = 1.32(Ft/s)
 Travel time = 9.80 min. TC = 21.96 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.281(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 2.607
 Subarea runoff = 5.102(CFS) for 4.220(Ac.)
 Total runoff = 5.946(CFS) Total area = 4.740(Ac.)
 Street flow at end of street = 5.946(CFS)
 Half street flow at end of street = 2.973(CFS)
 Depth of flow = 0.378(Ft.), Average velocity = 1.436(Ft/s)
 Flow width (from curb towards crown)= 14.138(Ft.)

 Process from Point/Station 730.000 to Point/Station 735.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 13.500(Ft.)
 End of street segment elevation = 10.000(Ft.)
 Length of street segment = 874.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)

MBHS50YR.out

Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 9.044(CFS)
 Depth of flow = 0.515(Ft.), Average velocity = 2.019(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 0.73(Ft.)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 20.982(Ft.)
 Flow velocity = 2.02(Ft/s)
 Travel time = 7.22 min. TC = 29.18 min.
 Adding area flow to street

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.960(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 5.324
 Subarea runoff = 4.491(CFS) for 4.940(Ac.)
 Total runoff = 10.437(CFS) Total area = 9.680(Ac.)
 Street flow at end of street = 10.437(CFS)
 Half street flow at end of street = 10.437(CFS)
 Depth of flow = 0.541(Ft.), Average velocity = 2.055(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 2.04(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 735.000 to Point/Station 715.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 10.000(Ft.)
 End of street segment elevation = 9.000(Ft.)
 Length of street segment = 322.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 11.795(CFS)
 Depth of flow = 0.581(Ft.), Average velocity = 1.938(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 4.05(Ft.)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 22.000(Ft.)
 Flow velocity = 1.94(Ft/s)

MBHS50YR.out

Travel time = 2.77 min. TC = 31.95 min.
 Adding area flow to street
 User specified 'C' value of 0.770 given for subarea
 Rainfall intensity = 1.858(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.595 CA = 7.264
 Subarea runoff = 3.059(CFS) for 2.520(Ac.)
 Total runoff = 13.496(CFS) Total area = 12.200(Ac.)
 Street flow at end of street = 13.496(CFS)
 Half street flow at end of street = 13.496(CFS)
 Depth of flow = 0.605(Ft.), Average velocity = 2.010(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 5.23(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 735.000 to Point/Station 715.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 12.200(Ac.)
 Runoff from this stream = 13.496(CFS)
 Time of concentration = 31.95 min.
 Rainfall intensity = 1.858(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	120.903	54.86	1.315
2	13.496	31.95	1.858
Qmax(1) =			
	1.000 *	1.000 *	120.903) +
	0.708 *	1.000 *	13.496) + = 130.456
Qmax(2) =			
	1.000 *	0.582 *	120.903) +
	1.000 *	1.000 *	13.496) + = 83.910

Total of 2 main streams to confluence:

Flow rates before confluence point:
 120.903 13.496

Maximum flow rates at confluence using above data:
 130.456 83.910

Area of streams before confluence:
 134.900 12.200

Results of confluence:

Total flow rate = 130.456(CFS)
 Time of concentration = 54.861 min.
 Effective stream area after confluence = 147.100(Ac.)
 End of computations, total study area = 147.100 (Ac.)

100-YEAR HYDROLOGIC ANALYSIS RESULTS

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4

Rational method hydrology program based on
 San Diego County Flood Control Division 1985 hydrology manual
 Rational Hydrology Study Date: 09/27/13

 MISSION BAY HIGH SCHOOL EXIST CONDITION HYDROLOGY ANALYSIS - MMP MAPS 36
 & 37 - ASSUMPTIONS: 1. n=0.030 IN MBHS CONC CHANNEL; AND 2. n=0.035 IN
 PACIFIC BEACH/OLNEY ST EARTHEN CHANNEL
 CIVILD FILE: MBHS100YR.RSD

***** Hydrology Study Control Information *****

 Program License Serial Number 6219

Rational hydrology study storm event year is 100.0
 English (in-lb) input data Units used
 English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
 Elevation 0 - 1500 feet
 Factor (to multiply * intensity) = 1.000
 Only used if inside City of San Diego
 San Diego hydrology manual 'C' values used
 Runoff coefficients by modified rational method

 Process from Point/Station 100.000 to Point/Station 105.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 194.700(Ft.)
 Highest elevation = 186.000(Ft.)
 Lowest elevation = 185.500(Ft.)
 Elevation difference = 0.500(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 21.73 min.
 $TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(%\ slope^{1/3})]$
 $TC = [1.8*(1.1-0.5500)*(194.700^0.5)/(0.257^{1/3})] = 21.73$
 Rainfall intensity (I) = 2.485(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.615(CFS)
 Total initial stream area = 0.450(Ac.)

 Process from Point/Station 105.000 to Point/Station 110.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 185.500(Ft.)
 End of street segment elevation = 174.000(Ft.)
 Length of street segment = 428.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020

Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 1.421(CFS)
 Depth of flow = 0.230(Ft.), Average velocity = 2.711(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 6.731(Ft.)
 Flow velocity = 2.71(Ft/s)
 Travel time = 2.64 min. TC = 24.37 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.350(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 0.897
 Subarea runoff = 1.492(CFS) for 1.180(Ac.)
 Total runoff = 2.107(CFS) Total area = 1.630(Ac.)
 Street flow at end of street = 2.107(CFS)
 Half street flow at end of street = 2.107(CFS)
 Depth of flow = 0.255(Ft.), Average velocity = 2.965(Ft/s)
 Flow width (from curb towards crown)= 7.997(Ft.)

 Process from Point/Station 110.000 to Point/Station 115.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 174.000(Ft.)
 End of street segment elevation = 138.000(Ft.)
 Length of street segment = 762.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 3.490(CFS)
 Depth of flow = 0.271(Ft.), Average velocity = 4.142(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.783(Ft.)
 Flow velocity = 4.14(Ft/s)
 Travel time = 3.07 min. TC = 27.44 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.208(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 2.074
 Subarea runoff = 2.472(CFS) for 2.140(Ac.)

MBHS100YR.out

Total runoff = 4.579(CFS) Total area = 3.770(Ac.)
 Street flow at end of street = 4.579(CFS)
 Half street flow at end of street = 4.579(CFS)
 Depth of flow = 0.292(Ft.), Average velocity = 4.416(Ft/s)
 Flow width (from curb towards crown)= 9.827(Ft.)

 Process from Point/Station 115.000 to Point/Station 120.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 138.000(Ft.)
 End of street segment elevation = 137.500(Ft.)
 Length of street segment = 522.400(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 8.752(CFS)
 Depth of flow = 0.512(Ft.), Average velocity = 0.987(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 0.62(Ft.)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 20.874(Ft.)
 Flow velocity = 0.99(Ft/s)
 Travel time = 8.82 min. TC = 36.26 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.871(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 5.852
 Subarea runoff = 6.372(CFS) for 6.870(Ac.)
 Total runoff = 10.951(CFS) Total area = 10.640(Ac.)
 Street flow at end of street = 10.951(CFS)
 Half street flow at end of street = 5.475(CFS)
 Depth of flow = 0.552(Ft.), Average velocity = 1.025(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 2.58(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 120.000 to Point/Station 125.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 137.500(Ft.)
 End of street segment elevation = 92.000(Ft.)
 Length of street segment = 716.200(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street

MBHS100YR.out

Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 15.299(CFS)
 Depth of flow = 0.323(Ft.), Average velocity = 5.592(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 11.388(Ft.)
 Flow velocity = 5.59(Ft/s)
 Travel time = 2.13 min. TC = 38.39 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.804(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 10.500
 Subarea runoff = 7.991(CFS) for 8.450(Ac.)
 Total runoff = 18.942(CFS) Total area = 19.090(Ac.)
 Street flow at end of street = 18.942(CFS)
 Half street flow at end of street = 9.471(CFS)
 Depth of flow = 0.343(Ft.), Average velocity = 5.889(Ft/s)
 Flow width (from curb towards crown)= 12.398(Ft.)

 Process from Point/Station 125.000 to Point/Station 130.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 92.000(Ft.)
 End of street segment elevation = 69.000(Ft.)
 Length of street segment = 528.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 22.355(CFS)
 Depth of flow = 0.380(Ft.), Average velocity = 5.316(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 14.253(Ft.)
 Flow velocity = 5.32(Ft/s)
 Travel time = 1.66 min. TC = 40.05 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 1.756(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 14.284
 Subarea runoff = 6.135(CFS) for 6.880(Ac.)
 Total runoff = 25.077(CFS) Total area = 25.970(Ac.)
 Street flow at end of street = 25.077(CFS)

MBHS100YR.out

Half street flow at end of street = 12.539(CFS)
 Depth of flow = 0.393(Ft.), Average velocity = 5.468(Ft/s)
 Flow width (from curb towards crown)= 14.906(Ft.)

 Process from Point/Station 130.000 to Point/Station 135.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 69.000(Ft.)
 End of street segment elevation = 49.500(Ft.)
 Length of street segment = 494.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 29.852(CFS)
 Depth of flow = 0.420(Ft.), Average velocity = 5.499(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 16.258(Ft.)
 Flow velocity = 5.50(Ft/s)
 Travel time = 1.50 min. TC = 41.55 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 1.715(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.591 CA = 21.207
 Subarea runoff = 11.283(CFS) for 9.890(Ac.)
 Total runoff = 36.360(CFS) Total area = 35.860(Ac.)
 Street flow at end of street = 36.360(CFS)
 Half street flow at end of street = 18.180(CFS)
 Depth of flow = 0.446(Ft.), Average velocity = 5.773(Ft/s)
 Flow width (from curb towards crown)= 17.545(Ft.)

 Process from Point/Station 135.000 to Point/Station 140.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 49.500(Ft.)
 End of street segment elevation = 43.700(Ft.)
 Length of street segment = 502.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160

MBHS100YR.out

Estimated mean flow rate at midpoint of street = 38.028(CFS)
 Depth of flow = 0.678(Ft.), Average velocity = 4.292(Ft/s)
 Warning: depth of flow exceeds top of curb

Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 8.92(Ft.)
 Streetflow hydraulics at midpoint of street travel:

Halfstreet flow width = 22.000(Ft.)
 Flow velocity = 4.29(Ft/s)
 Travel time = 1.95 min. TC = 43.50 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 1.665(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.613 CA = 24.003
 Subarea runoff = 3.596(CFS) for 3.290(Ac.)
 Total runoff = 39.956(CFS) Total area = 39.150(Ac.)
 Street flow at end of street = 39.956(CFS)
 Half street flow at end of street = 39.956(CFS)
 Depth of flow = 0.689(Ft.), Average velocity = 4.349(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 9.44(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 135.000 to Point/Station 140.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 39.150(Ac.)
 Runoff from this stream = 39.956(CFS)
 Time of concentration = 43.50 min.
 Rainfall intensity = 1.665(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 200.000 to Point/Station 205.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 197.000(Ft.)
 Highest elevation = 118.000(Ft.)
 Lowest elevation = 111.000(Ft.)
 Elevation difference = 7.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 9.11 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.5500) * (197.000^{.5})] / (3.553^{(1/3)}) = 9.11$
 Rainfall intensity (I) = 3.491(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 1.286(CFS)
 Total initial stream area = 0.670(Ac.)

 Process from Point/Station 205.000 to Point/Station 210.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

MBHS100YR.out

Top of street segment elevation = 111.000(Ft.)
 End of street segment elevation = 75.000(Ft.)
 Length of street segment = 731.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 6.738(CFS)
 Depth of flow = 0.267(Ft.), Average velocity = 4.174(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.579(Ft.)
 Flow velocity = 4.17(Ft/s)
 Travel time = 2.92 min. TC = 12.03 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 3.156(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 3.493
 Subarea runoff = 9.735(CFS) for 5.680(Ac.)
 Total runoff = 11.021(CFS) Total area = 6.350(Ac.)
 Street flow at end of street = 11.021(CFS)
 Half street flow at end of street = 5.510(CFS)
 Depth of flow = 0.305(Ft.), Average velocity = 4.690(Ft/s)
 Flow width (from curb towards crown)= 10.505(Ft.)

 Process from Point/Station 210.000 to Point/Station 215.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 75.000(Ft.)
 End of street segment elevation = 72.000(Ft.)
 Length of street segment = 298.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 12.878(CFS)
 Depth of flow = 0.495(Ft.), Average velocity = 3.170(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 19.979(Ft.)
 Flow velocity = 3.17(Ft/s)
 Travel time = 1.57 min. TC = 13.59 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000

MBHS100YR.out

Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 3.016(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.670
 Subarea runoff = 3.061(CFS) for 2.140(Ac.)
 Total runoff = 14.082(CFS) Total area = 8.490(Ac.)
 Street flow at end of street = 14.082(CFS)
 Half street flow at end of street = 14.082(CFS)
 Depth of flow = 0.511(Ft.), Average velocity = 3.201(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 0.55(Ft.)
 Flow width (from curb towards crown)= 20.797(Ft.)

 Process from Point/Station 215.000 to Point/Station 140.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 72.000(Ft.)
 End of street segment elevation = 43.700(Ft.)
 Length of street segment = 653.800(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 16.321(CFS)
 Depth of flow = 0.347(Ft.), Average velocity = 4.912(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 12.611(Ft.)
 Flow velocity = 4.91(Ft/s)
 Travel time = 2.22 min. TC = 15.81 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 2.846(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.586 CA = 6.559
 Subarea runoff = 4.585(CFS) for 2.700(Ac.)
 Total runoff = 18.667(CFS) Total area = 11.190(Ac.)
 Street flow at end of street = 18.667(CFS)
 Half street flow at end of street = 9.334(CFS)
 Depth of flow = 0.361(Ft.), Average velocity = 5.075(Ft/s)
 Flow width (from curb towards crown)= 13.296(Ft.)

 Process from Point/Station 215.000 to Point/Station 140.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 11.190(Ac.)
 Runoff from this stream = 18.667(CFS)

MBHS100YR.out

Time of concentration = 15.81 min.
 Rainfall intensity = 2.846(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	39.956	43.50	1.665
2	18.667	15.81	2.846
Qmax(1) =			
	1.000 *	1.000 *	39.956) +
	0.585 *	1.000 *	18.667) + = 50.875
Qmax(2) =			
	1.000 *	0.364 *	39.956) +
	1.000 *	1.000 *	18.667) + = 33.193

Total of 2 main streams to confluence:

Flow rates before confluence point:
 39.956 18.667

Maximum flow rates at confluence using above data:
 50.875 33.193

Area of streams before confluence:
 39.150 11.190

Results of confluence:

Total flow rate = 50.875(CFS)
 Time of concentration = 43.496 min.
 Effective stream area after confluence = 50.340(Ac.)

 Process from Point/Station 140.000 to Point/Station 220.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 36.150(Ft.)
 Downstream point/station elevation = 34.120(Ft.)
 Pipe length = 151.50(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 50.875(CFS)
 Given pipe size = 30.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 2.802(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 2.330(Ft.)
 Minor friction loss = 2.502(Ft.) K-factor = 1.50
 Pipe flow velocity = 10.36(Ft/s)
 Travel time through pipe = 0.24 min.
 Time of concentration (TC) = 43.74 min.

 Process from Point/Station 220.000 to Point/Station 225.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 34.120(Ft.)
 Downstream point/station elevation = 31.700(Ft.)
 Pipe length = 191.10(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 50.875(CFS)
 Given pipe size = 30.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 3.021(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 2.939(Ft.)
 Minor friction loss = 2.502(Ft.) K-factor = 1.50
 Pipe flow velocity = 10.36(Ft/s)
 Travel time through pipe = 0.31 min.
 Time of concentration (TC) = 44.05 min.

MBHS100YR.out

 Process from Point/Station 220.000 to Point/Station 225.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Time of concentration = 44.05 min.
 Rainfall intensity = 1.651(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.605 CA = 31.476
 Subarea runoff = 1.096(CFS) for 1.660(Ac.)
 Total runoff = 51.971(CFS) Total area = 52.000(Ac.)

 Process from Point/Station 225.000 to Point/Station 230.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 31.200(Ft.)
 Downstream point/station elevation = 24.120(Ft.)
 Pipe length = 125.43(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 51.971(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 51.971(CFS)
 Normal flow depth in pipe = 14.19(In.)
 Flow top width inside pipe = 35.18(In.)
 Critical Depth = 28.12(In.)
 Pipe flow velocity = 20.08(Ft/s)
 Travel time through pipe = 0.10 min.
 Time of concentration (TC) = 44.15 min.

 Process from Point/Station 225.000 to Point/Station 230.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 52.000(Ac.)
 Runoff from this stream = 51.971(CFS)
 Time of concentration = 44.15 min.
 Rainfall intensity = 1.649(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 300.000 to Point/Station 305.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Initial subarea flow distance = 176.600(Ft.)
 Highest elevation = 64.000(Ft.)
 Lowest elevation = 30.000(Ft.)
 Elevation difference = 34.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.57 min.
 TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
 TC = [1.8*(1.1-0.7000)*(176.600^0.5)]/(19.253^(1/3))= 3.57
 Setting time of concentration to 5 minutes

MBHS100YR.out

Rainfall intensity (I) = 4.389(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
 Subarea runoff = 1.045(CFS)
 Total initial stream area = 0.340(Ac.)

 Process from Point/Station 305.000 to Point/Station 310.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 60.000(Ft.)
 End of street segment elevation = 45.500(Ft.)
 Length of street segment = 739.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 8.372(CFS)
 Depth of flow = 0.393(Ft.), Average velocity = 3.664(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 14.878(Ft.)
 Flow velocity = 3.66(Ft/s)
 Travel time = 3.36 min. TC = 8.36 min.

Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Rainfall intensity = 3.601(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area (Q=KCIA) is C = 0.700 CA = 3.577
 Subarea runoff = 11.835(CFS) for 4.770(Ac.)
 Total runoff = 12.879(CFS) Total area = 5.110(Ac.)
 Street flow at end of street = 12.879(CFS)
 Half street flow at end of street = 12.879(CFS)
 Depth of flow = 0.447(Ft.), Average velocity = 4.074(Ft/s)
 Flow width (from curb towards crown)= 17.578(Ft.)

 Process from Point/Station 310.000 to Point/Station 315.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 45.500(Ft.)
 End of street segment elevation = 33.500(Ft.)
 Length of street segment = 721.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160

MBHS100YR.out

Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 18.702(CFS)
 Depth of flow = 0.517(Ft.), Average velocity = 4.121(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 0.87(Ft.)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 21.118(Ft.)
 Flow velocity = 4.12(Ft/s)
 Travel time = 2.92 min. TC = 11.28 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 3.230(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area (Q=KCIA) is C = 0.771 CA = 7.504
 Subarea runoff = 11.360(CFS) for 4.620(Ac.)
 Total runoff = 24.239(CFS) Total area = 9.730(Ac.)
 Street flow at end of street = 24.239(CFS)
 Half street flow at end of street = 24.239(CFS)
 Depth of flow = 0.561(Ft.), Average velocity = 4.343(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 3.06(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 315.000 to Point/Station 230.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 27.800(Ft.)
 Downstream point/station elevation = 24.120(Ft.)
 Pipe length = 189.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 24.239(CFS)
 Given pipe size = 18.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is 10.809(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 10.107(Ft.)
 Minor friction loss = 4.382(Ft.) K-factor = 1.50
 Pipe flow velocity = 13.72(Ft/s)
 Travel time through pipe = 0.23 min.
 Time of concentration (TC) = 11.51 min.

 Process from Point/Station 315.000 to Point/Station 230.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 9.730(Ac.)
 Runoff from this stream = 24.239(CFS)
 Time of concentration = 11.51 min.
 Rainfall intensity = 3.206(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	51.971	44.15	1.649
2	24.239	11.51	3.206
Qmax(1) =	1.000 *	1.000 *	51.971) +

MBHS100YR.out

0.514 * 1.000 * 24.239) + = 64.434
 Qmax(2) =
 1.000 * 0.261 * 51.971) +
 1.000 * 1.000 * 24.239) + = 37.789

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 51.971 24.239
 Maximum flow rates at confluence using above data:
 64.434 37.789
 Area of streams before confluence:
 52.000 9.730

Results of confluence:
 Total flow rate = 64.434(CFS)
 Time of concentration = 44.151 min.
 Effective stream area after confluence = 61.730(Ac.)

 Process from Point/Station 230.000 to Point/Station 320.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 24.120(Ft.)
 Downstream point/station elevation = 11.910(Ft.)
 Pipe length = 544.91(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 64.434(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 64.434(CFS)
 Normal flow depth in pipe = 21.05(In.)
 Flow top width inside pipe = 35.48(In.)
 Critical Depth = 30.91(In.)
 Pipe flow velocity = 15.01(Ft/s)
 Travel time through pipe = 0.60 min.
 Time of concentration (TC) = 44.76 min.

 Process from Point/Station 230.000 to Point/Station 320.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 44.76 min.
 Rainfall intensity = 1.634(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.635 CA = 41.535
 Subarea runoff = 3.443(CFS) for 3.650(Ac.)
 Total runoff = 67.877(CFS) Total area = 65.380(Ac.)

 Process from Point/Station 320.000 to Point/Station 325.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 11.910(Ft.)
 Downstream point/station elevation = 8.470(Ft.)
 Pipe length = 215.48(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 67.877(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 67.877(CFS)
 Normal flow depth in pipe = 24.47(In.)
 Flow top width inside pipe = 33.59(In.)
 Critical Depth = 31.53(In.)

MBHS100YR.out

Pipe flow velocity = 13.26(Ft/s)
 Travel time through pipe = 0.27 min.
 Time of concentration (TC) = 45.03 min.

 Process from Point/Station 320.000 to Point/Station 325.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Time of concentration = 45.03 min.
 Rainfall intensity = 1.628(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.627 CA = 45.528
 Subarea runoff = 6.237(CFS) for 7.260(Ac.)
 Total runoff = 74.114(CFS) Total area = 72.640(Ac.)

 Process from Point/Station 325.000 to Point/Station 330.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.470(Ft.)
 Downstream point/station elevation = 7.000(Ft.)
 Pipe length = 249.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 74.114(CFS)
 Given pipe size = 36.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 4.175(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 3.084(Ft.)
 Minor friction loss = 2.561(Ft.) K-factor = 1.50
 Pipe flow velocity = 10.48(Ft/s)
 Travel time through pipe = 0.40 min.
 Time of concentration (TC) = 45.42 min.

 Process from Point/Station 325.000 to Point/Station 330.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 72.640(Ac.)
 Runoff from this stream = 74.114(CFS)
 Time of concentration = 45.42 min.
 Rainfall intensity = 1.619(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 400.000 to Point/Station 405.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 189.400(Ft.)
 Highest elevation = 33.000(Ft.)
 Lowest elevation = 30.000(Ft.)
 Elevation difference = 3.000(Ft.)
 Time of concentration calculated by the urban

MBHS100YR.out

areas overland flow method (App X-C) = 11.69 min.
 TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
 TC = [1.8*(1.1-0.5500)*(189.400^0.5)/(1.584^(1/3))]= 11.69
 Rainfall intensity (I) = 3.189(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 1.210(CFS)
 Total initial stream area = 0.690(Ac.)

 Process from Point/Station 405.000 to Point/Station 410.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 30.000(Ft.)
 End of street segment elevation = 15.500(Ft.)
 Length of street segment = 708.400(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 7.094(CFS)
 Depth of flow = 0.305(Ft.), Average velocity = 3.023(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.497(Ft.)
 Flow velocity = 3.02(Ft/s)
 Travel time = 3.91 min. TC = 15.59 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.861(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area (Q=KCIA) is C = 0.550 CA = 4.070
 Subarea runoff = 10.436(CFS) for 6.710(Ac.)
 Total runoff = 11.646(CFS) Total area = 7.400(Ac.)
 Street flow at end of street = 11.646(CFS)
 Half street flow at end of street = 5.823(CFS)
 Depth of flow = 0.351(Ft.), Average velocity = 3.408(Ft/s)
 Flow width (from curb towards crown)= 12.796(Ft.)

 Process from Point/Station 410.000 to Point/Station 415.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 15.500(Ft.)
 End of street segment elevation = 13.500(Ft.)
 Length of street segment = 521.600(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)

MBHS100YR.out

Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 15.864(CFS)
 Depth of flow = 0.494(Ft.), Average velocity = 1.955(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 19.964(Ft.)
 Flow velocity = 1.96(Ft/s)
 Travel time = 4.45 min. TC = 20.04 min.
 Adding area flow to street
 User specified 'C' value of 0.760 given for subarea
 Rainfall intensity = 2.578(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area (Q=KCIA) is C = 0.638 CA = 8.144
 Subarea runoff = 9.349(CFS) for 5.360(Ac.)
 Total runoff = 20.995(CFS) Total area = 12.760(Ac.)
 Street flow at end of street = 20.995(CFS)
 Half street flow at end of street = 10.498(CFS)
 Depth of flow = 0.545(Ft.), Average velocity = 2.027(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 2.24(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 410.000 to Point/Station 415.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 12.760(Ac.)
 Runoff from this stream = 20.995(CFS)
 Time of concentration = 20.04 min.
 Rainfall intensity = 2.578(In/Hr)

 Process from Point/Station 500.000 to Point/Station 505.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.900 given for subarea
 Initial subarea flow distance = 145.000(Ft.)
 Highest elevation = 16.000(Ft.)
 Lowest elevation = 14.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban areas overland flow method (App X-C) = 3.89 min.
 TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
 TC = [1.8*(1.1-0.9000)*(145.000^0.5)/(1.379^(1/3))]= 3.89
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 4.389(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.900
 Subarea runoff = 0.909(CFS)
 Total initial stream area = 0.230(Ac.)

 Process from Point/Station 505.000 to Point/Station 510.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 14.000(Ft.)
 End of street segment elevation = 11.500(Ft.)
 Length of street segment = 583.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020

MBHS100YR.out

Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 9.046(CFS)
 Depth of flow = 0.508(Ft.), Average velocity = 2.088(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 0.39(Ft.)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 20.639(Ft.)
 Flow velocity = 2.09(Ft/s)
 Travel time = 4.65 min. TC = 9.65 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 3.417(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.853 CA = 3.709
 Subarea runoff = 11.767(CFS) for 4.120(Ac.)
 Total runoff = 12.675(CFS) Total area = 4.350(Ac.)
 Street flow at end of street = 12.675(CFS)
 Half street flow at end of street = 12.675(CFS)
 Depth of flow = 0.566(Ft.), Average velocity = 2.223(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 3.30(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 510.000 to Point/Station 415.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 9.520(Ft.)
 Downstream point/station elevation = 8.800(Ft.)
 Pipe length = 259.69(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 12.675(CFS)
 Given pipe size = 15.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 11.760(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 9.995(Ft.)
 Minor friction loss = 2.485(Ft.) K-factor = 1.50
 Pipe flow velocity = 10.33(Ft/s)
 Travel time through pipe = 0.42 min.
 Time of concentration (TC) = 10.07 min.

 Process from Point/Station 510.000 to Point/Station 415.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 4.350(Ac.)
 Runoff from this stream = 12.675(CFS)
 Time of concentration = 10.07 min.
 Rainfall intensity = 3.365(In/Hr)
 Summary of stream data:

Stream	Flow rate	TC	Rainfall Intensity
--------	-----------	----	--------------------

MBHS100YR.out

No.	(CFS)	(min)	(In/Hr)
1	20.995	20.04	2.578
2	12.675	10.07	3.365
Qmax(1) =	1.000 *	1.000 *	20.995) +
	0.766 *	1.000 *	12.675) + =
Qmax(2) =	1.000 *	0.503 *	20.995) +
	1.000 *	1.000 *	12.675) + =

Total of 2 streams to confluence:
 Flow rates before confluence point:
 20.995 12.675
 Maximum flow rates at confluence using above data:
 30.706 23.228
 Area of streams before confluence:
 12.760 4.350
 Results of confluence:
 Total flow rate = 30.706(CFS)
 Time of concentration = 20.040 min.
 Effective stream area after confluence = 17.110(Ac.)

 Process from Point/Station 415.000 to Point/Station 515.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.800(Ft.)
 Downstream point/station elevation = 8.550(Ft.)
 Pipe length = 84.57(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 30.706(CFS)
 Given pipe size = 18.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 14.006(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 7.224(Ft.)
 Minor friction loss = 7.032(Ft.) K-factor = 1.50
 Pipe flow velocity = 17.38(Ft/s)
 Travel time through pipe = 0.08 min.
 Time of concentration (TC) = 20.12 min.

 Process from Point/Station 415.000 to Point/Station 515.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [MULTI - UNITS area type]
 Time of concentration = 20.12 min.
 Rainfall intensity = 2.574(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.694 CA = 13.869
 Subarea runoff = 4.985(CFS) for 2.880(Ac.)
 Total runoff = 35.691(CFS) Total area = 19.990(Ac.)

 Process from Point/Station 515.000 to Point/Station 520.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.550(Ft.)
 Downstream point/station elevation = 7.620(Ft.)
 Pipe length = 337.77(Ft.) Manning's N = 0.013

MBHS100YR.out

No. of pipes = 1 Required pipe flow = 35.691(CFS)
 Given pipe size = 27.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 5.431(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 4.484(Ft.)
 Minor friction loss = 1.877(Ft.) K-factor = 1.50
 Pipe flow velocity = 8.98(Ft/s)
 Travel time through pipe = 0.63 min.
 Time of concentration (TC) = 20.75 min.

 Process from Point/Station 515.000 to Point/Station 520.000
 **** SUBAREA FLOW ADDITION ****

 User specified 'C' value of 0.950 given for subarea
 Time of concentration = 20.75 min.
 Rainfall intensity = 2.538(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.721 CA = 16.120
 Subarea runoff = 5.226(CFS) for 2.370(Ac.)
 Total runoff = 40.917(CFS) Total area = 22.360(Ac.)

 Process from Point/Station 520.000 to Point/Station 330.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

 Upstream point elevation = 7.620(Ft.)
 Downstream point elevation = 7.000(Ft.)
 Channel length thru subarea = 228.700(Ft.)
 Channel base width = 3.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 40.917(CFS)
 Depth of flow = 2.145(Ft.), Average velocity = 3.076(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 9.000(Ft.)
 Flow Velocity = 3.08(Ft/s)
 Travel time = 1.24 min.
 Time of concentration = 21.99 min.
 Critical depth = 1.406(Ft.)
 ERROR - Channel depth exceeds maximum allowable depth

 Process from Point/Station 520.000 to Point/Station 330.000
 **** CONFLUENCE OF MAIN STREAMS ****

 The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 22.360(Ac.)
 Runoff from this stream = 40.917(CFS)
 Time of concentration = 21.99 min.
 Rainfall intensity = 2.471(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	74.114	45.42	1.619
2	40.917	21.99	2.471
Qmax(1) =	1.000 * 1.000 * 74.114) +		

MBHS100YR.out

Qmax(2) = 0.655 * 1.000 * 40.917) + = 100.916
 1.000 * 0.484 * 74.114) +
 1.000 * 1.000 * 40.917) + = 76.792

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 74.114 40.917
 Maximum flow rates at confluence using above data:
 100.916 76.792
 Area of streams before confluence:
 72.640 22.360

Results of confluence:
 Total flow rate = 100.916(CFS)
 Time of concentration = 45.424 min.
 Effective stream area after confluence = 95.000(Ac.)

 Process from Point/Station 330.000 to Point/Station 600.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

 Upstream point elevation = 7.000(Ft.)
 Downstream point elevation = 6.350(Ft.)
 Channel length thru subarea = 499.000(Ft.)
 Channel base width = 4.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Estimated mean flow rate at midpoint of channel = 103.737(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)
 Flow(q) thru subarea = 103.737(CFS)
 Depth of flow = 3.606(Ft.), Average velocity = 3.451(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 10.000(Ft.)
 Flow Velocity = 3.45(Ft/s)
 Travel time = 2.41 min.
 Time of concentration = 47.83 min.
 Critical depth = 2.094(Ft.)
 ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [COMMERCIAL area type]
 Rainfall intensity = 1.566(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.660 CA = 66.161
 Subarea runoff = 2.666(CFS) for 5.310(Ac.)
 Total runoff = 103.583(CFS) Total area = 100.310(Ac.)

 Process from Point/Station 600.000 to Point/Station 605.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

 Upstream point elevation = 6.350(Ft.)
 Downstream point elevation = 5.880(Ft.)
 Channel length thru subarea = 357.200(Ft.)
 Channel base width = 4.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 1.500
 Estimated mean flow rate at midpoint of channel = 103.748(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 2.000(Ft.)

MBHS100YR.out

Flow(q) thru subarea = 103.748(CFS)
 Depth of flow = 3.597(Ft.), Average velocity = 3.461(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 10.000(Ft.)
 Flow Velocity = 3.46(Ft/s)
 Travel time = 1.72 min.
 Time of concentration = 49.55 min.
 Critical depth = 2.094(Ft.)
 ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 The area added to the existing stream causes a
 a lower flow rate of Q = 101.714(CFS)
 therefore the upstream flow rate of Q = 103.583(CFS) is being used
 Rainfall intensity = 1.530(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.660 CA = 66.465
 Subarea runoff = 0.000(CFS) for 0.320(Ac.)
 Total runoff = 103.583(CFS) Total area = 100.630(Ac.)

 Process from Point/Station 605.000 to Point/Station 607.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.880(Ft.)
 Downstream point elevation = 5.820(Ft.)
 Channel length thru subarea = 25.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 1.500
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 113.413(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 5.000(Ft.)
 Flow(q) thru subarea = 113.413(CFS)
 Depth of flow = 2.336(Ft.), Average velocity = 3.447(Ft/s)
 Channel flow top width = 18.174(Ft.)
 Flow Velocity = 3.45(Ft/s)
 Travel time = 0.12 min.
 Time of concentration = 49.67 min.
 Critical depth = 1.453(Ft.)
 Adding area flow to channel
 User specified 'C' value of 0.570 given for subarea
 Rainfall intensity = 1.528(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.646 CA = 77.352
 Subarea runoff = 14.607(CFS) for 19.100(Ac.)
 Total runoff = 118.189(CFS) Total area = 119.730(Ac.)

 Process from Point/Station 607.000 to Point/Station 610.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.820(Ft.)
 Downstream point elevation = 5.400(Ft.)
 Channel length thru subarea = 185.000(Ft.)
 Channel base width = 5.000(Ft.)
 Slope or 'Z' of left channel bank = 2.000
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 121.545(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 5.000(Ft.)
 Flow(q) thru subarea = 121.545(CFS)

MBHS100YR.out

Depth of flow = 3.315(Ft.), Average velocity = 3.152(Ft/s)
 Channel flow top width = 18.262(Ft.)
 Flow Velocity = 3.15(Ft/s)
 Travel time = 0.98 min.
 Time of concentration = 50.65 min.
 Critical depth = 2.016(Ft.)
 Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 Rainfall intensity = 1.509(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.662 CA = 83.812
 Subarea runoff = 8.270(CFS) for 6.800(Ac.)
 Total runoff = 126.459(CFS) Total area = 126.530(Ac.)

 Process from Point/Station 607.000 to Point/Station 610.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 126.530(Ac.)
 Runoff from this stream = 126.459(CFS)
 Time of concentration = 50.65 min.
 Rainfall intensity = 1.509(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 700.000 to Point/Station 705.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 167.000(Ft.)
 Highest elevation = 16.000(Ft.)
 Lowest elevation = 14.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 12.05 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{0.5}] / (\% slope^{1/3})$
 $TC = [1.8 * (1.1 - 0.5500) * (167.000^{0.5})] / (1.198^{1/3}) = 12.05$
 Rainfall intensity (I) = 3.154(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.694(CFS)
 Total initial stream area = 0.400(Ac.)

 Process from Point/Station 705.000 to Point/Station 710.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 14.000(Ft.)
 End of street segment elevation = 11.500(Ft.)
 Length of street segment = 580.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street

MBHS100YR.out

Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 6.808(CFS)
 Depth of flow = 0.377(Ft.), Average velocity = 1.658(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 14.075(Ft.)
 Flow velocity = 1.66(Ft/s)
 Travel time = 5.83 min. TC = 17.88 min.
 Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.708(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 4.098
 Subarea runoff = 10.401(CFS) for 7.050(Ac.)
 Total runoff = 11.095(CFS) Total area = 7.450(Ac.)
 Street flow at end of street = 11.095(CFS)
 Half street flow at end of street = 5.547(CFS)
 Depth of flow = 0.435(Ft.), Average velocity = 1.870(Ft/s)
 Flow width (from curb towards crown) = 17.016(Ft.)

 Process from Point/Station 710.000 to Point/Station 610.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 8.000(Ft.)
 Downstream point/station elevation = 5.400(Ft.)
 Pipe length = 129.87(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 11.095(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 11.095(CFS)
 Normal flow depth in pipe = 11.59(In.)
 Flow top width inside pipe = 17.24(In.)
 Critical Depth = 15.29(In.)
 Pipe flow velocity = 9.22(Ft/s)
 Travel time through pipe = 0.23 min.
 Time of concentration (TC) = 18.12 min.

 Process from Point/Station 710.000 to Point/Station 610.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 7.450(Ac.)
 Runoff from this stream = 11.095(CFS)
 Time of concentration = 18.12 min.
 Rainfall intensity = 2.693(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	126.459	50.65	1.509
2	11.095	18.12	2.693
Qmax(1) =			
	1.000 *	1.000 *	126.459) +

MBHS100YR.out

Qmax(2) = 0.560 * 1.000 * 11.095) + = 132.675
 1.000 * 0.358 * 126.459) +
 1.000 * 1.000 * 11.095) + = 56.322

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 126.459 11.095
 Maximum flow rates at confluence using above data:
 132.675 56.322
 Area of streams before confluence:
 126.530 7.450

Results of confluence:
 Total flow rate = 132.675(CFS)
 Time of concentration = 50.653 min.
 Effective stream area after confluence = 133.980(Ac.)

 Process from Point/Station 610.000 to Point/Station 715.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 5.400(Ft.)
 Downstream point elevation = 3.860(Ft.)
 Channel length thru subarea = 668.000(Ft.)
 Channel base width = 5.000(Ft.)
 Slope or 'Z' of left channel bank = 3.000
 Slope or 'Z' of right channel bank = 2.000
 Estimated mean flow rate at midpoint of channel = 133.131(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 6.000(Ft.)
 Flow(q) thru subarea = 133.131(CFS)
 Depth of flow = 3.251(Ft.), Average velocity = 3.119(Ft/s)
 Channel flow top width = 21.256(Ft.)
 Flow Velocity = 3.12(Ft/s)
 Travel time = 3.57 min.
 Time of concentration = 54.22 min.
 Critical depth = 2.016(Ft.)

Adding area flow to channel
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [RURAL(greater than 0.5 Ac, 0.2 ha) area type]
 The area added to the existing stream causes a
 a lower flow rate of Q = 127.540(CFS)
 therefore the upstream flow rate of Q = 132.675(CFS) is being used
 Rainfall intensity = 1.444(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.655 CA = 88.324
 Subarea runoff = 0.000(CFS) for 0.920(Ac.)
 Total runoff = 132.675(CFS) Total area = 134.900(Ac.)

 Process from Point/Station 610.000 to Point/Station 715.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 134.900(Ac.)
 Runoff from this stream = 132.675(CFS)
 Time of concentration = 54.22 min.
 Rainfall intensity = 1.444(In/Hr)
 Program is now starting with Main Stream No. 2

MBHS100YR.out

 Process from Point/Station 720.000 to Point/Station 725.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Initial subarea flow distance = 168.900(Ft.)
 Highest elevation = 18.000(Ft.)
 Lowest elevation = 16.000(Ft.)
 Elevation difference = 2.000(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 12.16 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^0.5] / (\% slope^{1/3})$
 $TC = [1.8 * (1.1 - 0.5500) * (168.900^0.5)] / (1.184^{1/3}) = 12.16$
 Rainfall intensity (I) = 3.143(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
 Subarea runoff = 0.899(CFS)
 Total initial stream area = 0.520(Ac.)

 Process from Point/Station 725.000 to Point/Station 730.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 16.000(Ft.)
 End of street segment elevation = 13.500(Ft.)
 Length of street segment = 778.500(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 4.546(CFS)
 Depth of flow = 0.349(Ft.), Average velocity = 1.345(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 12.722(Ft.)
 Flow velocity = 1.35(Ft/s)
 Travel time = 9.65 min. TC = 21.81 min.

Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.481(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 2.607
 Subarea runoff = 5.568(CFS) for 4.220(Ac.)
 Total runoff = 6.467(CFS) Total area = 4.740(Ac.)
 Street flow at end of street = 6.467(CFS)
 Half street flow at end of street = 3.234(CFS)
 Depth of flow = 0.387(Ft.), Average velocity = 1.466(Ft/s)
 Flow width (from curb towards crown) = 14.610(Ft.)

MBHS100YR.out

Process from Point/Station 730.000 to Point/Station 735.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 13.500(Ft.)
 End of street segment elevation = 10.000(Ft.)
 Length of street segment = 874.900(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 9.837(CFS)
 Depth of flow = 0.531(Ft.), Average velocity = 2.030(Ft/s)
 Warning: depth of flow exceeds top of curb
 Distance that curb overflow reaches into property = 1.55(Ft.)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 21.796(Ft.)
 Flow velocity = 2.03(Ft/s)
 Travel time = 7.18 min. TC = 28.99 min.

Adding area flow to street
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [SINGLE FAMILY area type]
 Rainfall intensity = 2.142(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.550 CA = 5.324
 Subarea runoff = 4.937(CFS) for 4.940(Ac.)
 Total runoff = 11.404(CFS) Total area = 9.680(Ac.)
 Street flow at end of street = 11.404(CFS)
 Half street flow at end of street = 11.404(CFS)
 Depth of flow = 0.555(Ft.), Average velocity = 2.106(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 2.73(Ft.)
 Flow width (from curb towards crown) = 22.000(Ft.)

 Process from Point/Station 735.000 to Point/Station 715.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 10.000(Ft.)
 End of street segment elevation = 9.000(Ft.)
 Length of street segment = 322.300(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 22.000(Ft.)
 Distance from crown to crossfall grade break = 18.500(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0160
 Manning's N from gutter to grade break = 0.0160
 Manning's N from grade break to crown = 0.0160
 Estimated mean flow rate at midpoint of street = 12.888(CFS)

MBHS100YR.out

Depth of flow = 0.596(Ft.), Average velocity = 1.985(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 4.82(Ft.)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 22.000(Ft.)
 Flow velocity = 1.98(Ft/s)
 Travel time = 2.71 min. TC = 31.70 min.
 Adding area flow to street
 User specified 'C' value of 0.770 given for subarea
 Rainfall intensity = 2.033(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.595 CA = 7.264
 Subarea runoff = 3.368(CFS) for 2.520(Ac.)
 Total runoff = 14.772(CFS) Total area = 12.200(Ac.)
 Street flow at end of street = 14.772(CFS)
 Half street flow at end of street = 14.772(CFS)
 Depth of flow = 0.621(Ft.), Average velocity = 2.059(Ft/s)
 Warning: depth of flow exceeds top of curb
 Note: depth of flow exceeds top of street crown.
 Distance that curb overflow reaches into property = 6.06(Ft.)
 Flow width (from curb towards crown)= 22.000(Ft.)

 Process from Point/Station 735.000 to Point/Station 715.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 12.200(Ac.)
 Runoff from this stream = 14.772(CFS)
 Time of concentration = 31.70 min.
 Rainfall intensity = 2.033(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	132.675	54.22	1.444
2	14.772	31.70	2.033
Qmax(1) =	1.000 * 0.710	1.000 * 1.000	132.675) + 14.772) + = 143.165
Qmax(2) =	1.000 * 1.000	0.585 * 1.000	132.675) + 14.772) + = 92.331

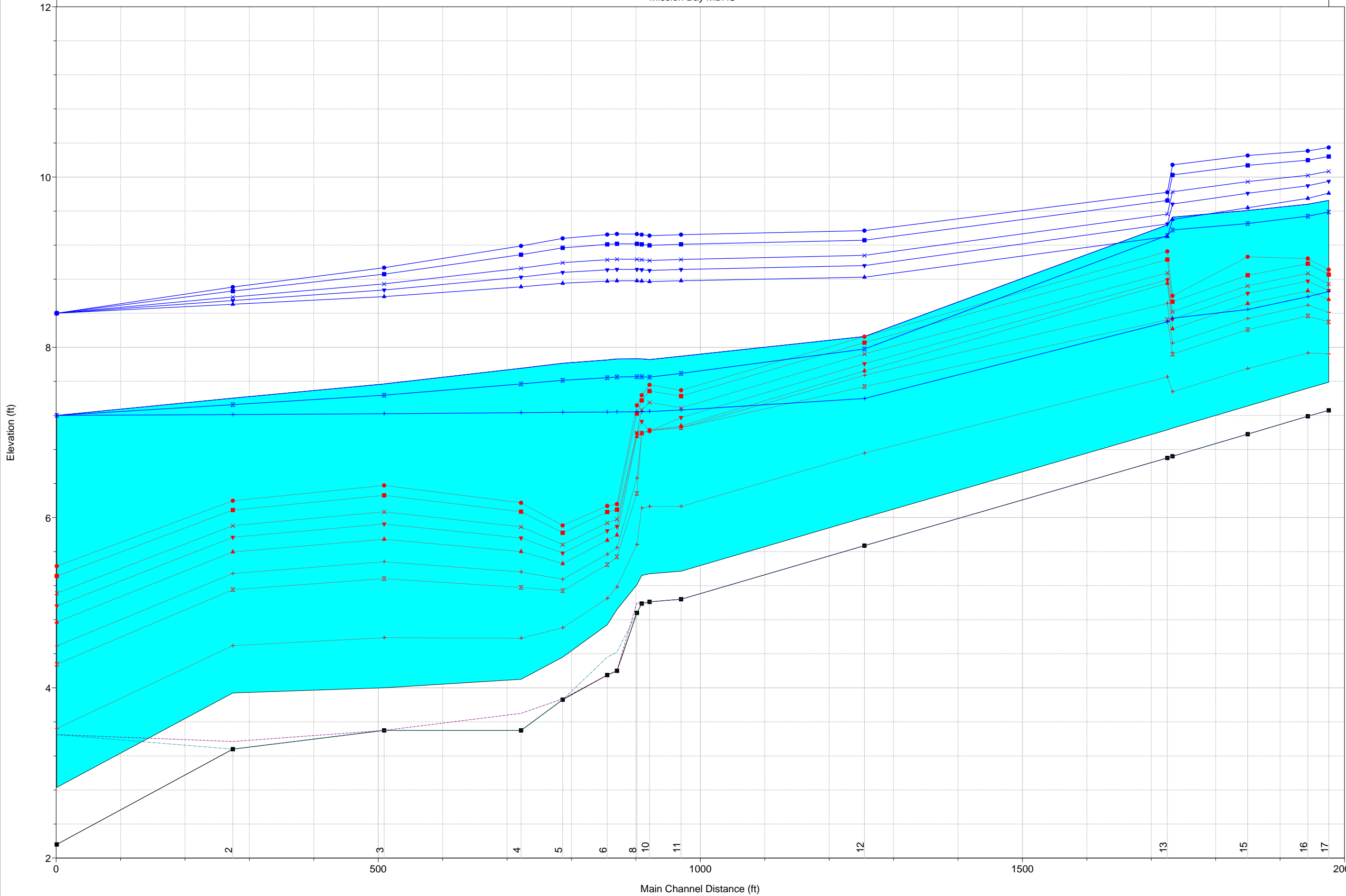
Total of 2 main streams to confluence:
 Flow rates before confluence point:
 132.675 14.772
 Maximum flow rates at confluence using above data:
 143.165 92.331
 Area of streams before confluence:
 134.900 12.200

Results of confluence:
 Total flow rate = 143.165(CFS)
 Time of concentration = 54.222 min.
 Effective stream area after confluence = 147.100(Ac.)
 End of computations, total study area = 147.100 (Ac.)

ATTACHMENT 4 – HYDRAULIC PROFILES

CURRENT VEGETATED CONDITION

Mission Bay MBHS

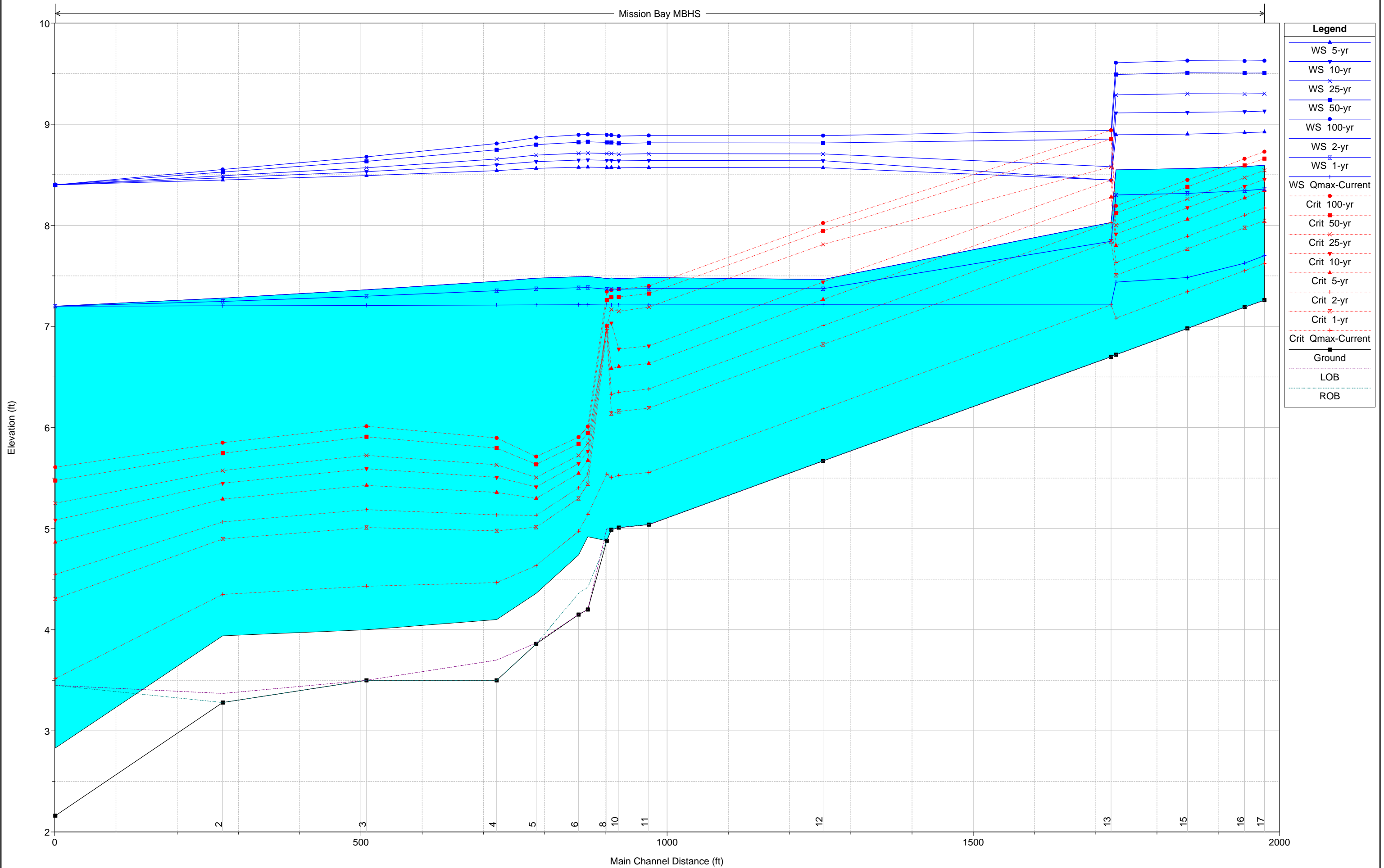


Legend

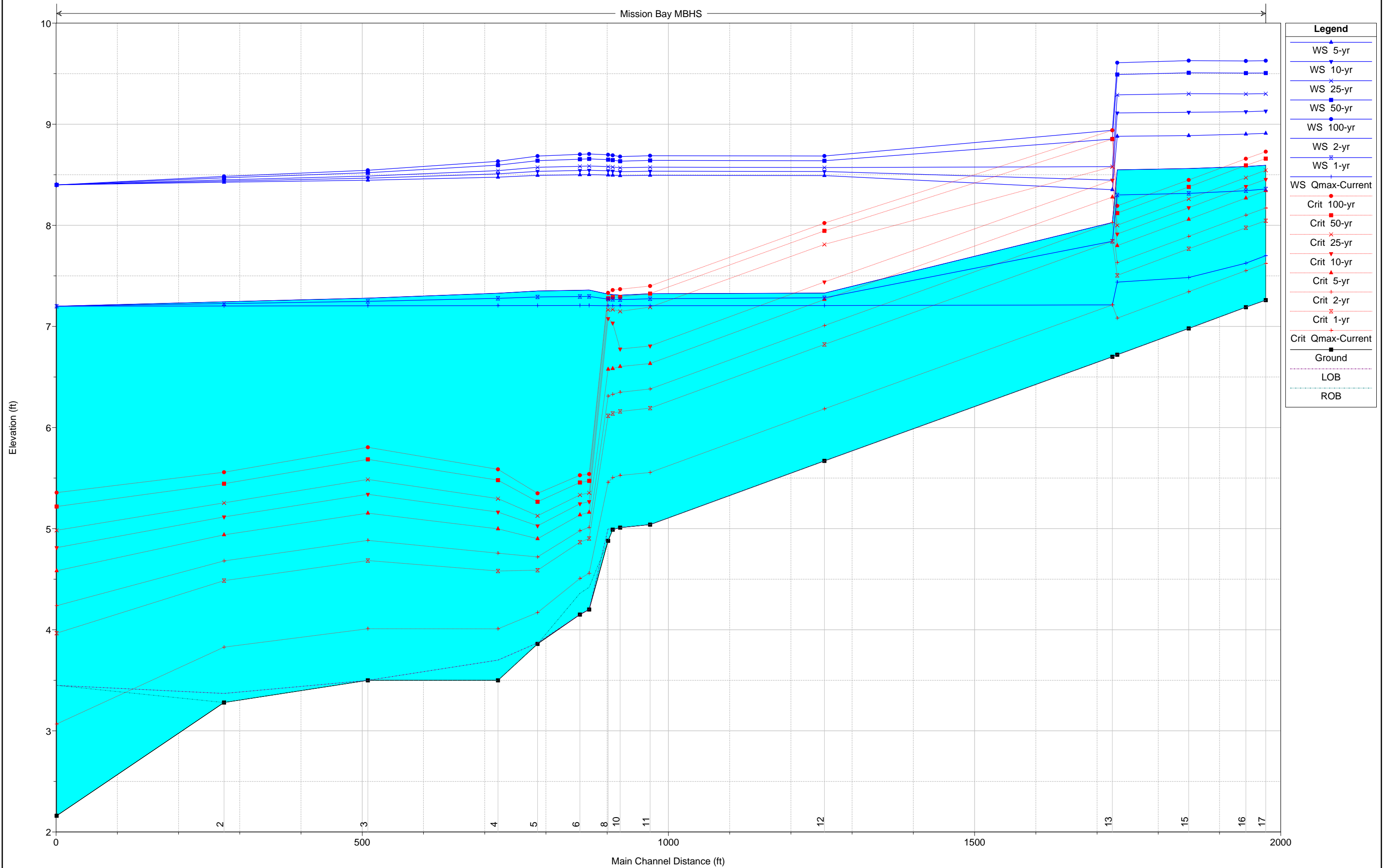
- WS 5-yr
- WS 10-yr
- WS 25-yr
- WS 50-yr
- WS 100-yr
- WS 2-yr
- WS 1-yr
- WS Qmax-Current
- Crit 100-yr
- Crit 50-yr
- Crit 25-yr
- Crit 10-yr
- Crit 5-yr
- Crit 2-yr
- Crit 1-yr
- Crit Qmax-Current
- Ground
- LOB
- ROB

ULTIMATE VEGETATED CONDITION (SEE CURRENT VEGETATED CONDITION)

MAINTAINED CONDITION – NO SEDIMENT REMOVED



MAINTAINED CONDITION – SEDIMENT REMOVED



ATTACHMENT 5. DETAILED HYDRAULIC ANALYSIS RESULTS

CURRENT VEGETATED CONDITION (1-YEAR, 2-YEAR, 5-YEAR, AND MAXIMUM FLOW)

HEC-RAS Plan: Current Vegetate River: Mission Bay Reach: MBHS

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
MBHS	17	2-yr	17.89	7.59	9.73	8.41	9.73	0.001119	0.82	24.96	41.65	0.10
MBHS	17	5-yr	23.87	7.59	9.81	8.56	9.82	0.001315	0.92	28.47	41.82	0.11
MBHS	17	1-yr	13.95	7.59	9.59	8.30	9.60	0.001458	0.90	19.30	41.38	0.11
MBHS	17	Qmax-Current	4.00	7.59	8.65	7.92	8.66	0.001457	0.59	5.95	7.18	0.10
MBHS	16	2-yr	17.89	7.52	9.68	8.50	9.69	0.001289	0.52	21.59	24.59	0.06
MBHS	16	5-yr	23.87	7.52	9.75	8.66	9.77	0.001749	0.62	23.28	24.73	0.07
MBHS	16	1-yr	13.95	7.52	9.54	8.37	9.55	0.001470	0.54	18.14	24.31	0.07
MBHS	16	Qmax-Current	4.00	7.52	8.59	7.93	8.61	0.001930	0.40	6.02	7.21	0.07
MBHS	15	2-yr	17.89	7.31	9.61	8.34	9.62	0.000558	0.36	26.40	27.95	0.04
MBHS	15	5-yr	23.87	7.31	9.64	8.51	9.66	0.000879	0.46	27.30	28.02	0.05
MBHS	15	1-yr	13.95	7.31	9.45	8.21	9.46	0.000654	0.37	22.12	27.65	0.04
MBHS	15	Qmax-Current	4.00	7.31	8.44	7.75	8.46	0.001339	0.35	6.46	7.39	0.06
MBHS	14	2-yr	17.89	7.05	9.53	8.05	9.55	0.000642	0.41	21.06	13.50	0.05
MBHS	14	5-yr	23.87	7.05	9.50	8.22	9.53	0.001211	0.55	20.69	13.44	0.06
MBHS	14	1-yr	13.95	7.05	9.38	7.92	9.39	0.000543	0.36	19.06	13.20	0.04
MBHS	14	Qmax-Current	4.00	7.05	8.34	7.48	8.35	0.000667	0.27	7.66	7.86	0.04
MBHS	13	2-yr	42.71	7.03	9.44	8.51	9.53	0.003526	0.93	23.26	15.40	0.11
MBHS	13	5-yr	57.40	7.03	9.30	8.75	9.49	0.008854	1.42	21.16	15.12	0.17
MBHS	13	1-yr	33.10	7.03	9.31	8.32	9.38	0.002846	0.81	21.36	15.15	0.09
MBHS	13	Qmax-Current	9.00	7.03	8.30	7.65	8.33	0.003090	0.57	8.74	8.79	0.09
MBHS	12	2-yr	43.29	6.00	8.13	7.67	8.22	0.002266	0.69	24.31	26.24	0.08
MBHS	12	5-yr	58.41	6.00	8.82	7.72	8.88	0.000464	0.38	43.06	27.64	0.04
MBHS	12	1-yr	33.42	6.00	7.98	7.54	8.05	0.002741	0.72	20.47	25.95	0.09
MBHS	12	Qmax-Current	9.10	6.00	7.40	6.76	7.45	0.001272	0.39	9.91	9.19	0.06
MBHS	11	2-yr	43.29	5.37	7.90	7.06	7.94	0.000506	0.36	37.21	31.20	0.04
MBHS	11	5-yr	58.41	5.37	8.78	7.08	8.80	0.000128	0.22	67.01	36.07	0.02
MBHS	11	1-yr	33.42	5.37	7.69	7.06	7.73	0.000589	0.37	30.99	30.09	0.04
MBHS	11	Qmax-Current	9.10	5.37	7.26	6.13	7.27	0.000332	0.24	18.58	27.73	0.03
MBHS	10	2-yr	43.29	5.34	7.86	7.02	7.91	0.000641	0.41	36.33	32.01	0.05
MBHS	10	5-yr	58.41	5.34	8.77	7.02	8.80	0.000147	0.24	71.10	45.55	0.02
MBHS	10	1-yr	33.42	5.34	7.65	7.02	7.69	0.000758	0.42	29.91	30.12	0.05
MBHS	10	Qmax-Current	9.10	5.34	7.25	6.13	7.25	0.000371	0.26	18.47	26.43	0.03

HEC-RAS Plan: Current Vegetate River: Mission Bay Reach: MBHS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
MBHS	9	2-yr	43.29	5.32	7.86	6.99	7.90	0.000379	0.32	44.36	43.39	0.04
MBHS	9	5-yr	58.41	5.32	8.78	6.99	8.79	0.000083	0.18	90.74	58.20	0.02
MBHS	9	1-yr	33.42	5.32	7.65	6.99	7.68	0.000469	0.33	35.57	40.03	0.04
MBHS	9	Qmax-Current	9.10	5.32	7.24	6.11	7.25	0.000270	0.22	20.47	33.47	0.03
MBHS	8	2-yr	43.29	5.21	7.87	6.47	7.89	0.000388	0.37	51.58	52.15	0.04
MBHS	8	5-yr	58.41	5.21	8.78	6.95	8.79	0.000072	0.20	120.06	83.23	0.02
MBHS	8	1-yr	33.42	5.21	7.65	6.28	7.68	0.000485	0.40	41.09	46.94	0.04
MBHS	8	Qmax-Current	9.10	5.21	7.24	5.68	7.25	0.000276	0.26	23.75	37.74	0.03
MBHS	7	2-yr	49.09	4.92	7.86	5.65	7.87	0.000563	0.48	76.75	46.37	0.05
MBHS	7	5-yr	66.39	4.92	8.78	5.79	8.79	0.000192	0.34	141.07	79.51	0.03
MBHS	7	1-yr	37.83	4.92	7.65	5.54	7.66	0.000480	0.42	67.50	40.66	0.05
MBHS	7	Qmax-Current	10.00	4.92	7.24	5.18	7.24	0.000068	0.14	53.03	30.10	0.02
MBHS	6	2-yr	49.09	4.74	7.85	5.57	7.86	0.000543	0.49	72.77	39.82	0.05
MBHS	6	5-yr	66.39	4.74	8.78	5.73	8.78	0.000216	0.37	130.44	69.24	0.03
MBHS	6	1-yr	37.83	4.74	7.64	5.45	7.65	0.000427	0.42	64.99	34.30	0.04
MBHS	6	Qmax-Current	10.00	4.74	7.24	5.05	7.24	0.000049	0.13	53.03	27.17	0.01
MBHS	5	2-yr	49.09	4.36	7.81	5.27	7.83	0.000559	0.54	66.55	26.42	0.05
MBHS	5	5-yr	66.39	4.36	8.75	5.46	8.76	0.000346	0.49	93.97	32.36	0.04
MBHS	5	1-yr	37.83	4.36	7.61	5.14	7.62	0.000427	0.45	61.34	25.59	0.04
MBHS	5	Qmax-Current	10.00	4.36	7.24	4.71	7.24	0.000050	0.14	52.00	24.03	0.01
MBHS	4	2-yr	55.04	4.10	7.75	5.36	7.78	0.000791	0.66	50.81	19.35	0.06
MBHS	4	5-yr	74.47	4.10	8.71	5.60	8.73	0.000523	0.63	70.68	22.19	0.05
MBHS	4	1-yr	42.40	4.10	7.57	5.18	7.59	0.000587	0.55	47.29	18.80	0.05
MBHS	4	Qmax-Current	11.00	4.10	7.23	4.58	7.23	0.000061	0.17	41.11	17.79	0.02
MBHS	3	2-yr	55.04	4.00	7.57	5.48	7.61	0.000791	0.65	42.83	17.46	0.06
MBHS	3	5-yr	74.47	4.00	8.60	5.75	8.63	0.000463	0.59	62.35	20.60	0.05
MBHS	3	1-yr	42.40	4.00	7.44	5.28	7.47	0.000555	0.53	40.55	17.06	0.05
MBHS	3	Qmax-Current	11.00	4.00	7.22	4.59	7.22	0.000050	0.15	36.89	16.39	0.01
MBHS	2	2-yr	55.04	3.94	7.40	5.34	7.44	0.000662	0.58	46.65	19.71	0.06
MBHS	2	5-yr	74.47	3.94	8.51	5.60	8.53	0.000353	0.51	70.55	23.68	0.04
MBHS	2	1-yr	42.40	3.94	7.33	5.15	7.35	0.000434	0.47	45.13	19.43	0.04

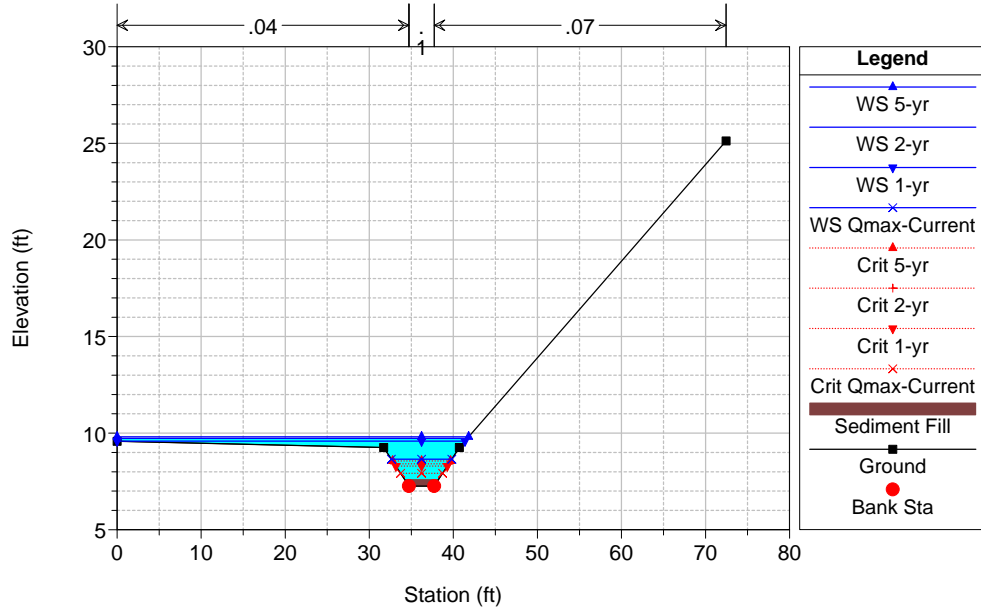
HEC-RAS Plan: Current Vegetate River: Mission Bay Reach: MBHS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
MBHS	2	Qmax-Current	11.00	3.94	7.21	4.50	7.21	0.000034	0.13	42.91	19.01	0.01
MBHS	1	2-yr	59.38	2.83	7.20	4.49	7.23	0.000895	1.10	47.79	19.32	0.09
MBHS	1	5-yr	80.34	2.83	8.40	4.77	8.42	0.000466	0.94	73.91	24.21	0.07
MBHS	1	1-yr	45.73	2.83	7.20	4.28	7.21	0.000531	0.85	47.79	19.32	0.07
MBHS	1	Qmax-Current	13.00	2.83	7.20	3.52	7.20	0.000043	0.24	47.79	19.32	0.02

MBHS Channel 2013 Plan: Current Vegetated Condition 12/9/2013

Geom: Current Vegetated Condition Flow: MBHS Channel

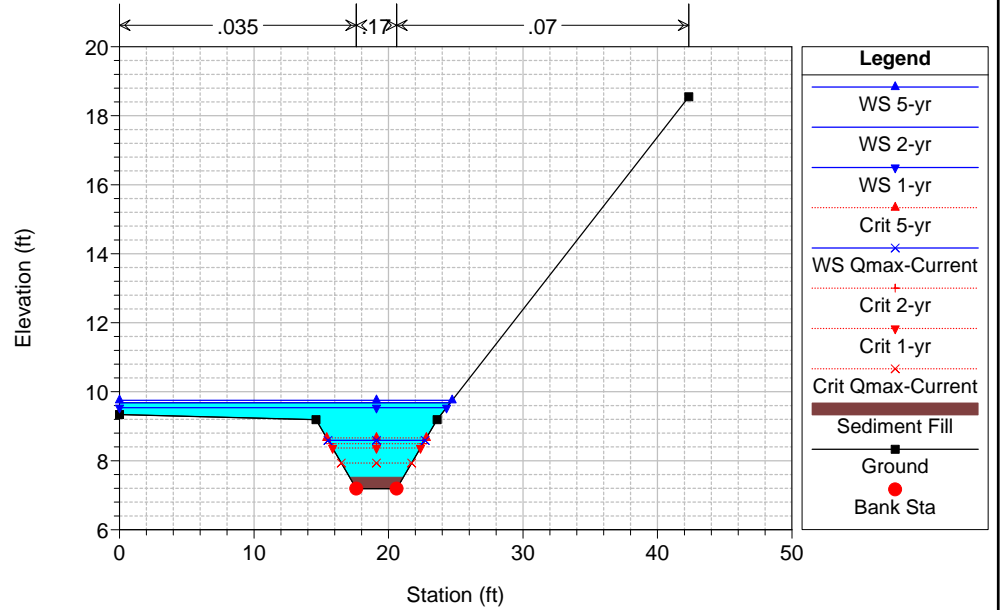
River = Mission Bay Reach = MBHS RS = 17



MBHS Channel 2013 Plan: Current Vegetated Condition 12/9/2013

Geom: Current Vegetated Condition Flow: MBHS Channel

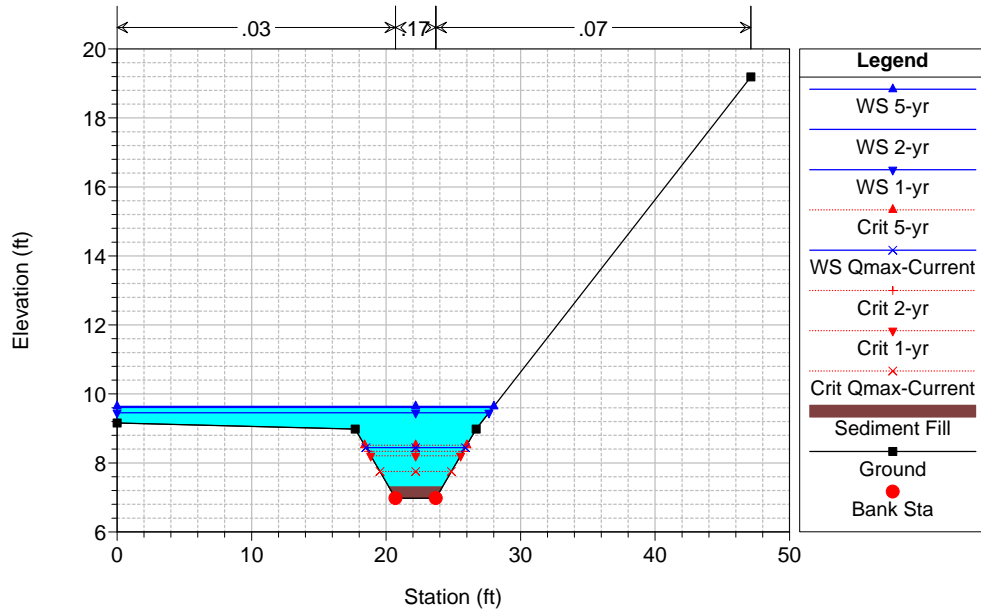
River = Mission Bay Reach = MBHS RS = 16



MBHS Channel 2013 Plan: Current Vegetated Condition 12/9/2013

Geom: Current Vegetated Condition Flow: MBHS Channel

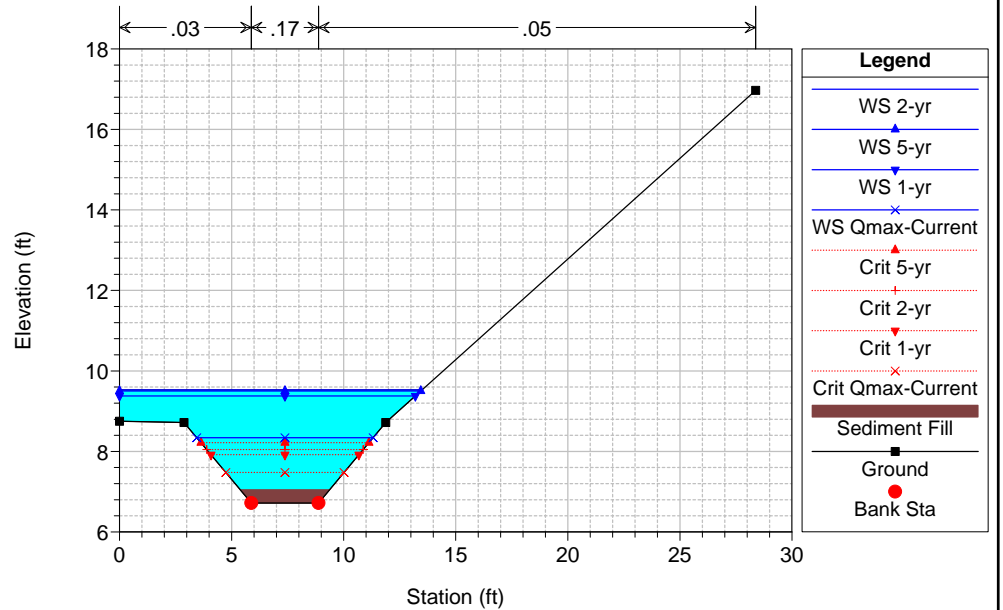
River = Mission Bay Reach = MBHS RS = 15

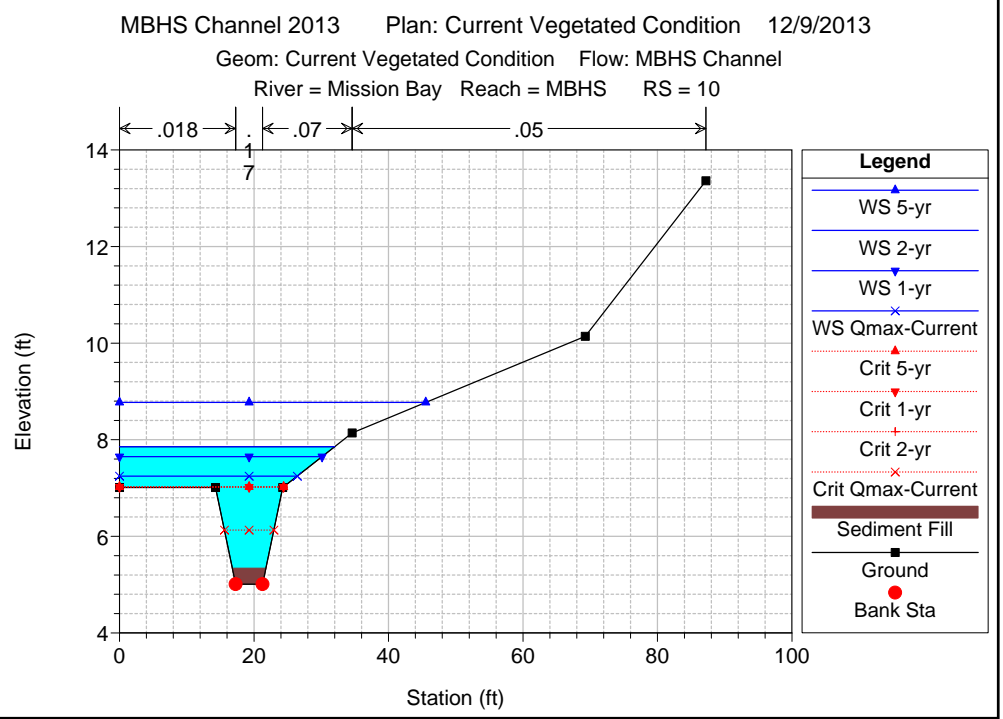
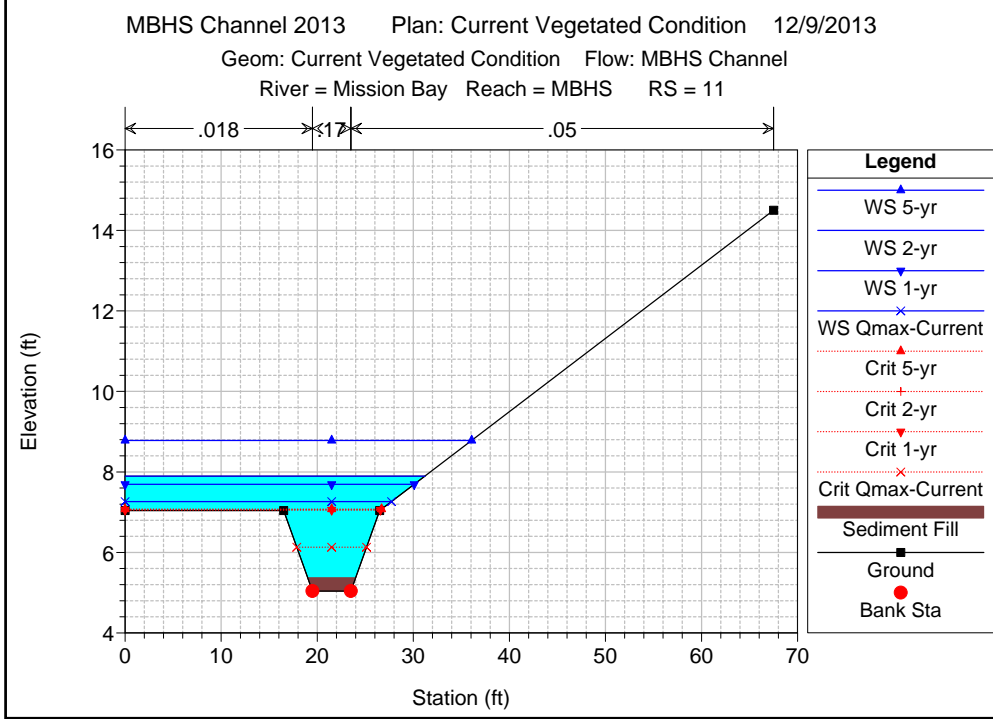
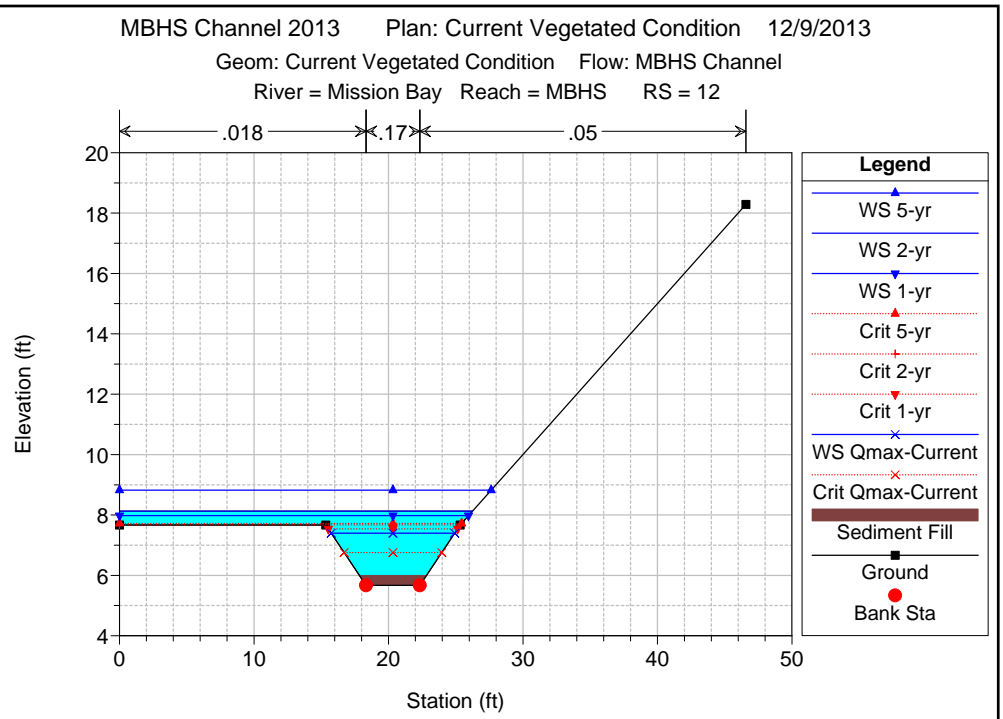
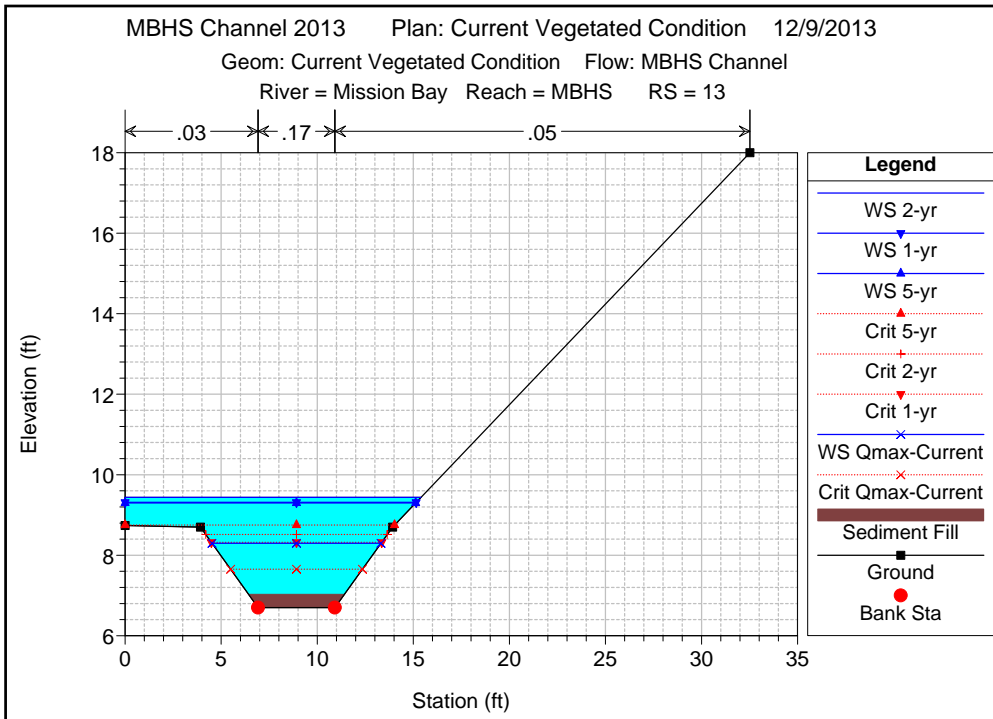


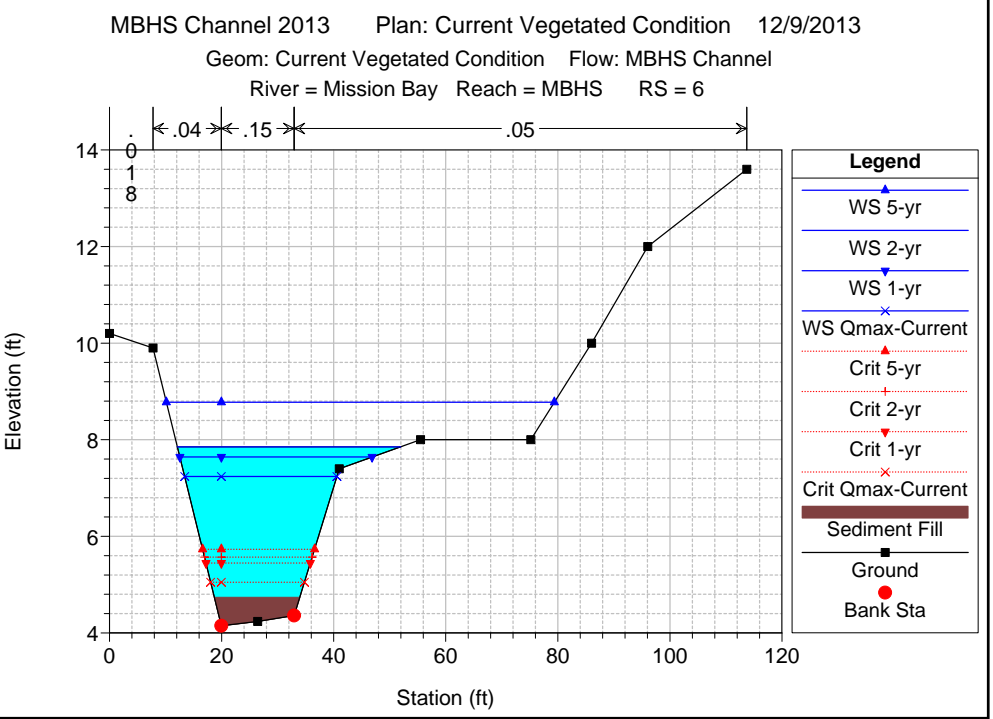
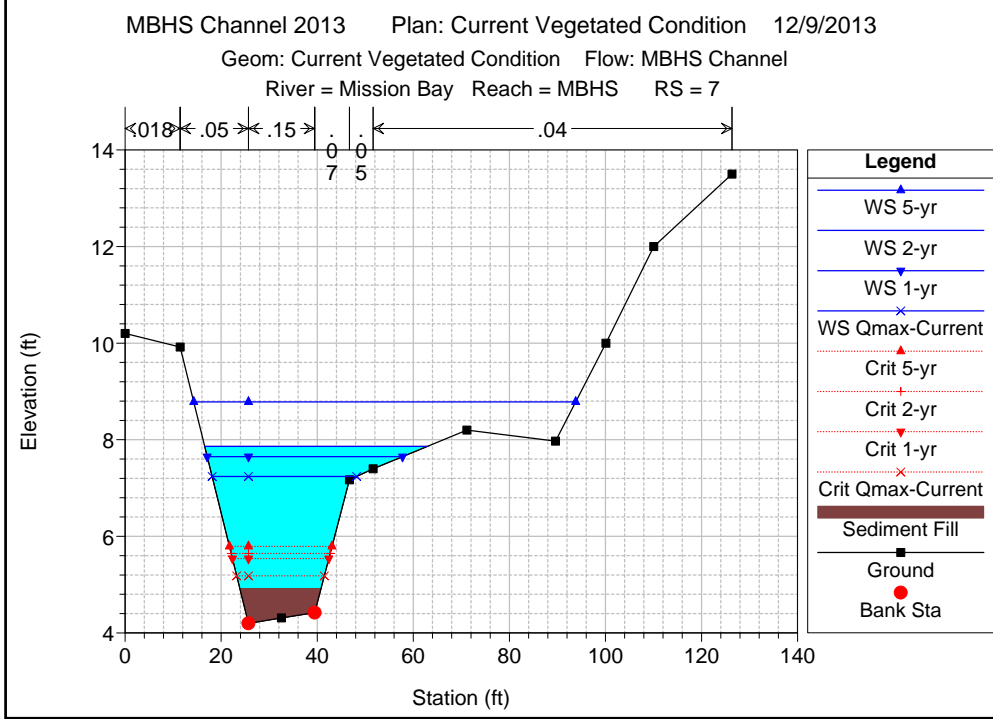
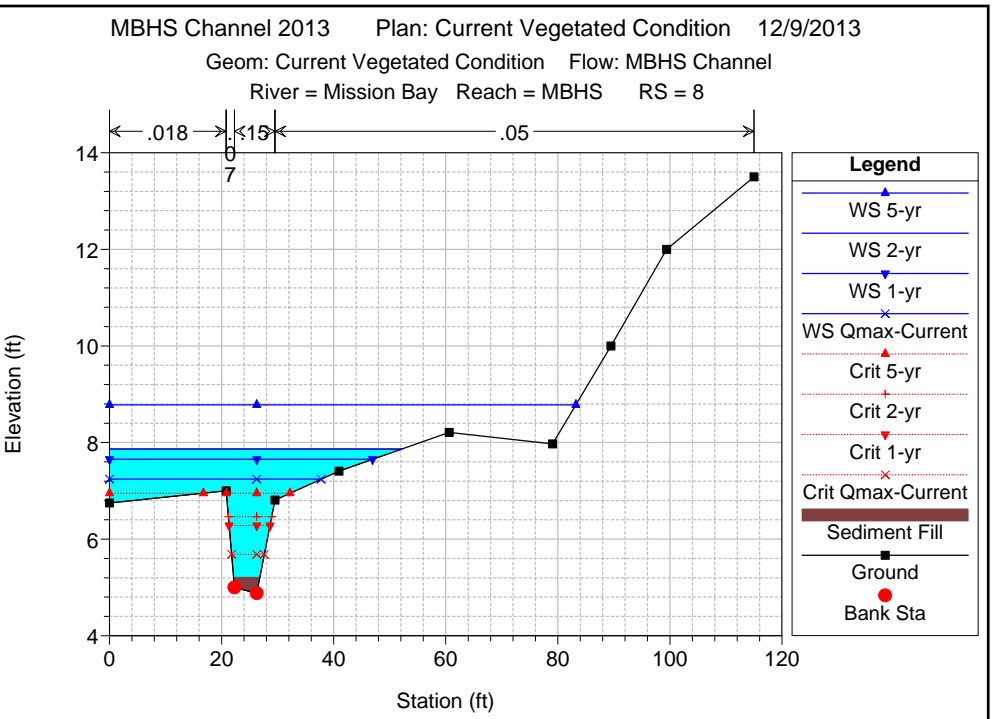
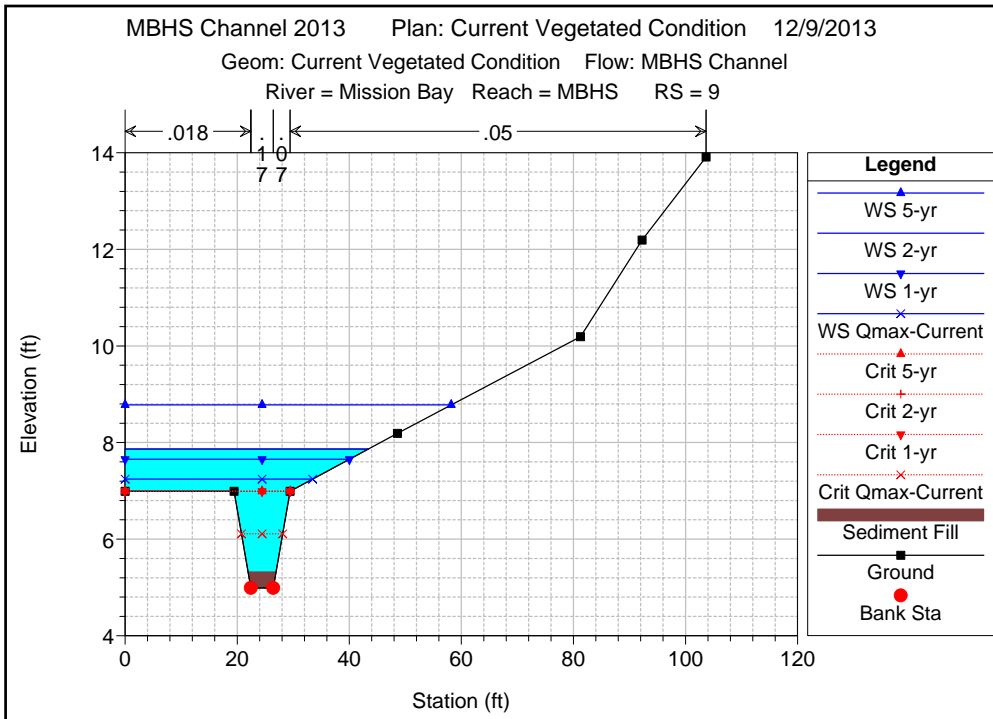
MBHS Channel 2013 Plan: Current Vegetated Condition 12/9/2013

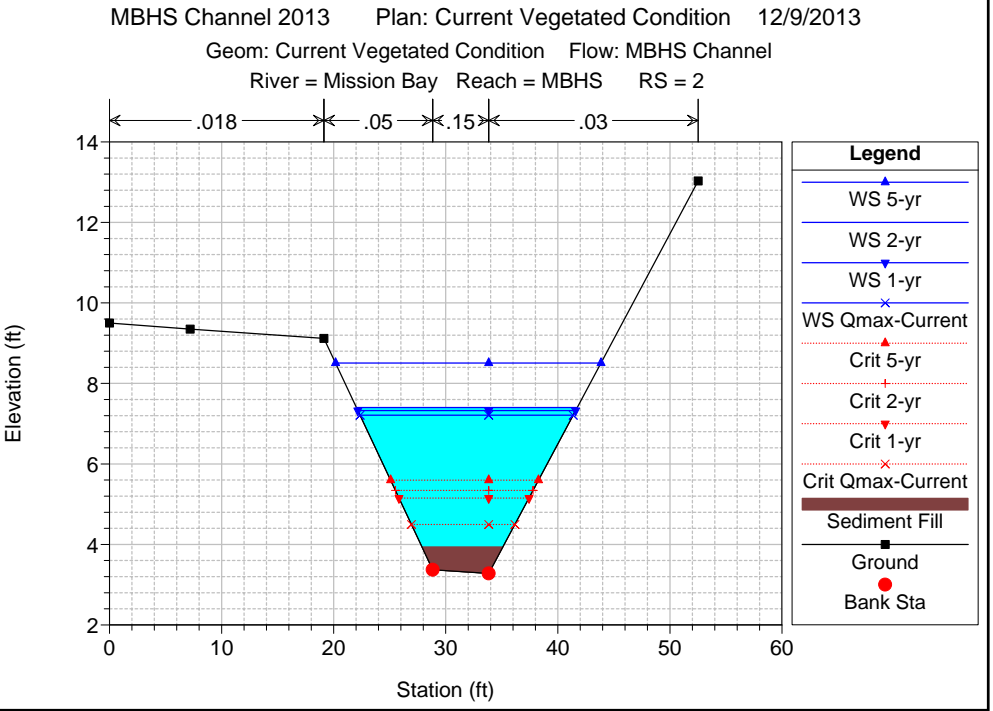
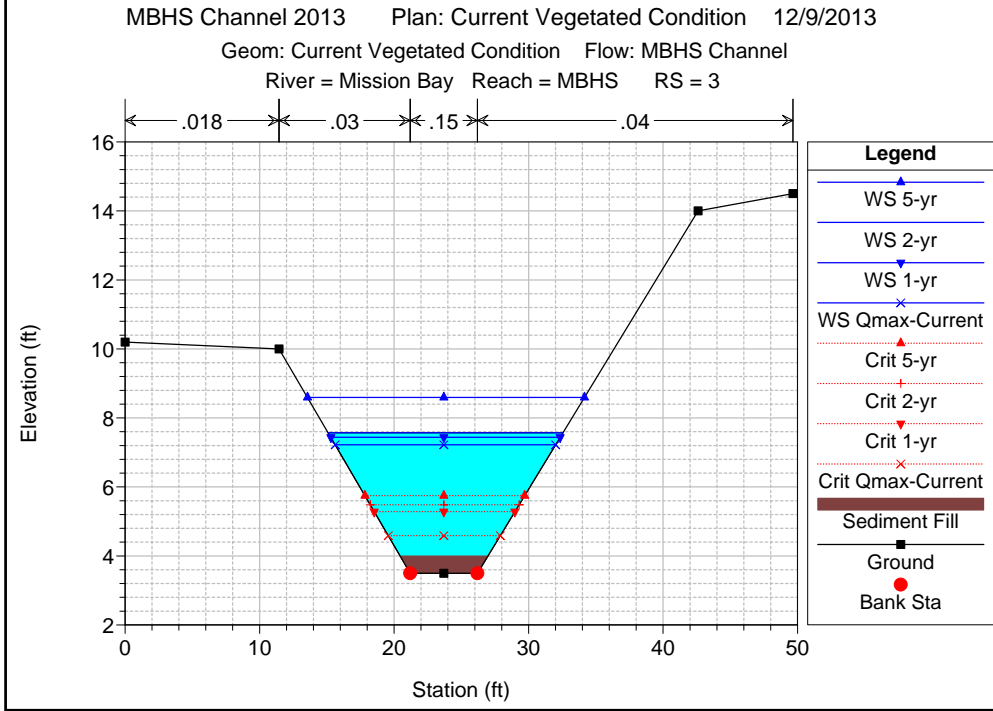
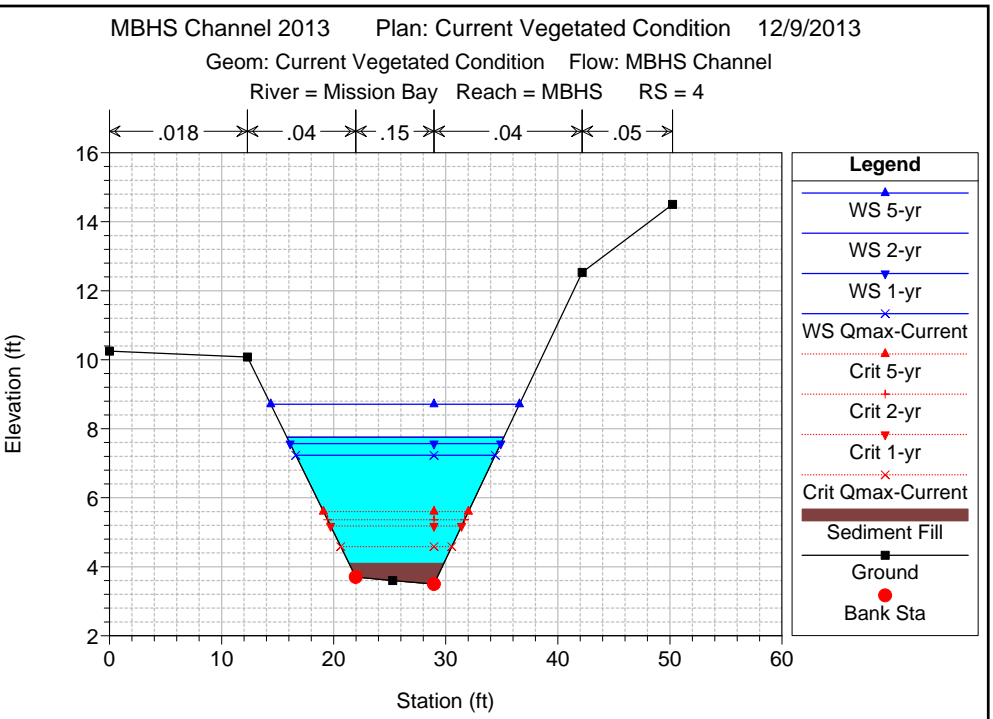
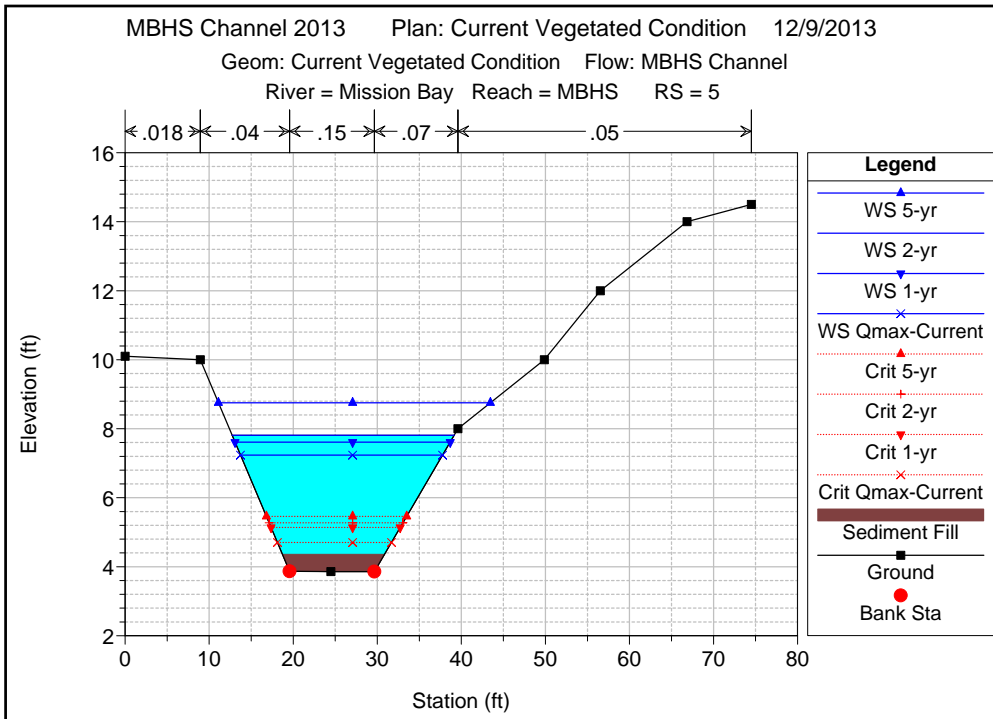
Geom: Current Vegetated Condition Flow: MBHS Channel

River = Mission Bay Reach = MBHS RS = 14





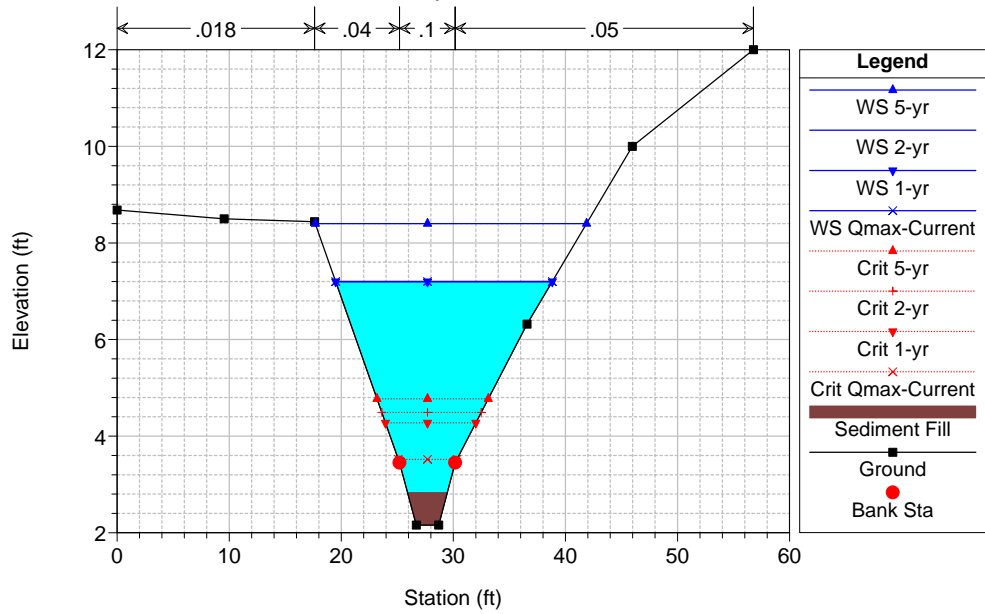




MBHS Channel 2013 Plan: Current Vegetated Condition 12/9/2013

Geom: Current Vegetated Condition Flow: MBHS Channel

River = Mission Bay Reach = MBHS RS = 1



**MAINTAINED CONDITION – NO SEDIMENT REMOVED (1-YEAR, 2-YEAR, 5-YEAR, AND
MAXIMUM FLOW)**

HEC-RAS Plan: Maintd-NoSedRmvd River: Mission Bay Reach: MBHS

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
MBHS	17	2-yr	17.89	7.26	8.59	8.17	8.73	0.000738	3.26	6.67	7.00	0.50
MBHS	17	5-yr	23.87	7.26	8.92	8.34	9.05	0.000552	3.27	9.14	7.99	0.45
MBHS	17	1-yr	13.95	7.26	8.36	8.05	8.50	0.000942	3.24	5.11	6.30	0.54
MBHS	17	Qmax-Current	4.00	7.26	7.70	7.62	7.80	0.002216	2.70	1.61	4.32	0.72
MBHS	16	2-yr	17.89	7.19	8.58	8.10	8.70	0.000625	3.09	7.08	7.17	0.46
MBHS	16	5-yr	23.87	7.19	8.92	8.27	9.03	0.000477	3.11	9.65	8.18	0.42
MBHS	16	1-yr	13.95	7.19	8.34	7.98	8.46	0.000787	3.05	5.45	6.46	0.50
MBHS	16	Qmax-Current	4.00	7.19	7.63	7.55	7.73	0.002308	2.73	1.59	4.31	0.73
MBHS	15	2-yr	17.89	6.98	8.56	7.89	8.65	0.000379	2.62	8.50	7.75	0.37
MBHS	15	5-yr	23.87	6.98	8.90	8.06	8.99	0.000310	2.70	11.31	8.77	0.34
MBHS	15	1-yr	13.95	6.98	8.32	7.77	8.40	0.000446	2.54	6.68	7.01	0.39
MBHS	15	Qmax-Current	4.00	6.98	7.48	7.34	7.56	0.001370	2.32	1.89	4.51	0.58
MBHS	14	2-yr	17.89	6.72	8.55	7.63	8.60	0.000212	2.16	10.51	8.49	0.28
MBHS	14	5-yr	23.87	6.72	8.90	7.80	8.95	0.000180	2.23	14.07	12.23	0.27
MBHS	14	1-yr	13.95	6.72	8.30	7.51	8.35	0.000231	2.04	8.49	7.74	0.29
MBHS	14	Qmax-Current	4.00	6.72	7.44	7.08	7.47	0.000380	1.55	2.93	5.15	0.32
MBHS	13	2-yr	42.71	6.70	8.03	8.03	8.55	0.002766	6.29	7.96	7.98	0.96
MBHS	13	5-yr	57.40	6.70	8.45	8.28	8.91	0.001749	6.01	11.58	9.24	0.80
MBHS	13	1-yr	33.10	6.70	7.84	7.84	8.30	0.002924	5.85	6.52	7.43	0.97
MBHS	13	Qmax-Current	9.00	6.70	7.21	7.21	7.44	0.003890	3.96	2.45	5.54	0.97
MBHS	12	2-yr	43.29	5.67	7.46	7.01	7.71	0.000900	4.39	12.00	9.38	0.58
MBHS	12	5-yr	58.41	5.67	8.57	7.27	8.62	0.000142	2.40	37.60	27.13	0.25
MBHS	12	1-yr	33.42	5.67	7.37	6.82	7.54	0.000655	3.62	11.17	9.11	0.49
MBHS	12	Qmax-Current	9.10	5.67	7.21	6.18	7.23	0.000071	1.11	9.75	8.63	0.16
MBHS	11	2-yr	43.29	5.04	7.48	6.38	7.55	0.000198	2.53	26.29	28.94	0.29
MBHS	11	5-yr	58.41	5.04	8.57	6.63	8.59	0.000047	1.58	61.03	34.92	0.15
MBHS	11	1-yr	33.42	5.04	7.37	6.19	7.42	0.000153	2.16	23.17	28.34	0.25
MBHS	11	Qmax-Current	9.10	5.04	7.21	5.56	7.22	0.000017	0.69	18.67	27.45	0.08
MBHS	10	2-yr	43.29	5.01	7.47	6.35	7.54	0.000195	2.52	26.23	28.51	0.28
MBHS	10	5-yr	58.41	5.01	8.57	6.60	8.59	0.000049	1.61	63.69	42.03	0.15
MBHS	10	1-yr	33.42	5.01	7.37	6.16	7.42	0.000148	2.14	23.28	27.55	0.25
MBHS	10	Qmax-Current	9.10	5.01	7.21	5.53	7.22	0.000016	0.67	19.10	26.13	0.08
MBHS	9	2-yr	43.29	4.99	7.48	6.33	7.53	0.000169	2.36	30.30	37.24	0.26
MBHS	9	5-yr	58.41	4.99	8.57	6.58	8.59	0.000037	1.40	80.60	54.84	0.13
MBHS	9	1-yr	33.42	4.99	7.37	6.14	7.41	0.000132	2.03	26.38	35.52	0.23
MBHS	9	Qmax-Current	9.10	4.99	7.21	5.50	7.22	0.000015	0.65	20.94	32.98	0.08

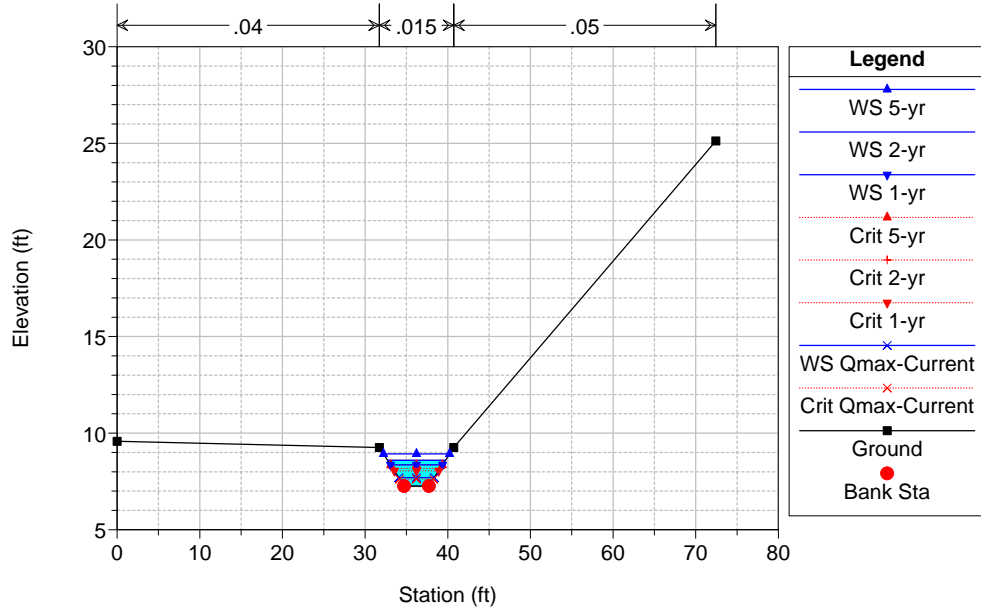
HEC-RAS Plan: Maintd-NoSedRmvd River: Mission Bay Reach: MBHS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
MBHS	8	2-yr	43.29	4.88	7.47	7.00	7.53	0.001341	0.67	34.22	42.53	0.07
MBHS	8	5-yr	58.41	4.88	8.57	7.00	8.59	0.000098	0.23	103.99	82.16	0.02
MBHS	8	1-yr	33.42	4.88	7.37	6.95	7.41	0.001313	0.65	29.86	40.16	0.07
MBHS	8	Qmax-Current	9.10	4.88	7.21	5.54	7.22	0.000233	0.26	23.82	37.18	0.03
MBHS	7	2-yr	49.09	4.92	7.49	5.54	7.51	0.000175	0.92	61.46	36.45	0.10
MBHS	7	5-yr	66.39	4.92	8.58	5.67	8.58	0.000070	0.74	124.87	77.93	0.07
MBHS	7	1-yr	37.83	4.92	7.38	5.44	7.39	0.000124	0.75	57.61	33.54	0.08
MBHS	7	Qmax-Current	10.00	4.92	7.21	5.14	7.21	0.000011	0.22	52.25	29.47	0.03
MBHS	6	2-yr	49.09	4.74	7.49	5.40	7.50	0.000168	0.95	60.11	30.34	0.10
MBHS	6	5-yr	66.39	4.74	8.57	5.55	8.58	0.000073	0.78	116.56	67.71	0.07
MBHS	6	1-yr	37.83	4.74	7.38	5.30	7.39	0.000117	0.77	56.96	27.85	0.08
MBHS	6	Qmax-Current	10.00	4.74	7.21	4.97	7.21	0.000010	0.22	52.33	27.05	0.02
MBHS	5	2-yr	49.09	4.36	7.48	5.13	7.49	0.000177	1.06	57.92	25.03	0.11
MBHS	5	5-yr	66.39	4.36	8.56	5.30	8.57	0.000100	0.97	87.98	31.06	0.08
MBHS	5	1-yr	37.83	4.36	7.37	5.01	7.38	0.000120	0.85	55.33	24.60	0.09
MBHS	5	Qmax-Current	10.00	4.36	7.21	4.63	7.21	0.000010	0.24	51.45	23.94	0.02
MBHS	4	2-yr	55.04	4.10	7.45	5.14	7.47	0.000327	1.50	45.00	18.43	0.14
MBHS	4	5-yr	74.47	4.10	8.54	5.36	8.56	0.000199	1.42	66.96	21.69	0.12
MBHS	4	1-yr	42.40	4.10	7.35	4.98	7.37	0.000216	1.20	43.29	18.15	0.12
MBHS	4	Qmax-Current	11.00	4.10	7.21	4.47	7.21	0.000017	0.33	40.76	17.73	0.03
MBHS	3	2-yr	55.04	4.00	7.36	5.19	7.40	0.000403	1.67	39.27	16.83	0.16
MBHS	3	5-yr	74.47	4.00	8.49	5.43	8.52	0.000226	1.52	60.23	20.29	0.13
MBHS	3	1-yr	42.40	4.00	7.30	5.01	7.32	0.000258	1.32	38.21	16.63	0.13
MBHS	3	Qmax-Current	11.00	4.00	7.21	4.43	7.21	0.000019	0.36	36.70	16.35	0.04
MBHS	2	2-yr	55.04	3.94	7.28	5.07	7.31	0.000338	1.53	44.24	19.27	0.15
MBHS	2	5-yr	74.47	3.94	8.45	5.29	8.47	0.000182	1.37	69.21	23.48	0.11
MBHS	2	1-yr	42.40	3.94	7.25	4.90	7.26	0.000209	1.19	43.62	19.15	0.12
MBHS	2	Qmax-Current	11.00	3.94	7.20	4.35	7.21	0.000015	0.31	42.79	18.99	0.03
MBHS	1	2-yr	59.38	2.83	7.20	4.55	7.24	0.000212	1.79	47.79	19.32	0.15
MBHS	1	5-yr	80.34	2.83	8.40	4.87	8.43	0.000130	1.65	73.91	24.21	0.12
MBHS	1	1-yr	45.73	2.83	7.20	4.31	7.22	0.000126	1.38	47.79	19.32	0.12
MBHS	1	Qmax-Current	13.00	2.83	7.20	3.52	7.20	0.000010	0.39	47.79	19.32	0.03

MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

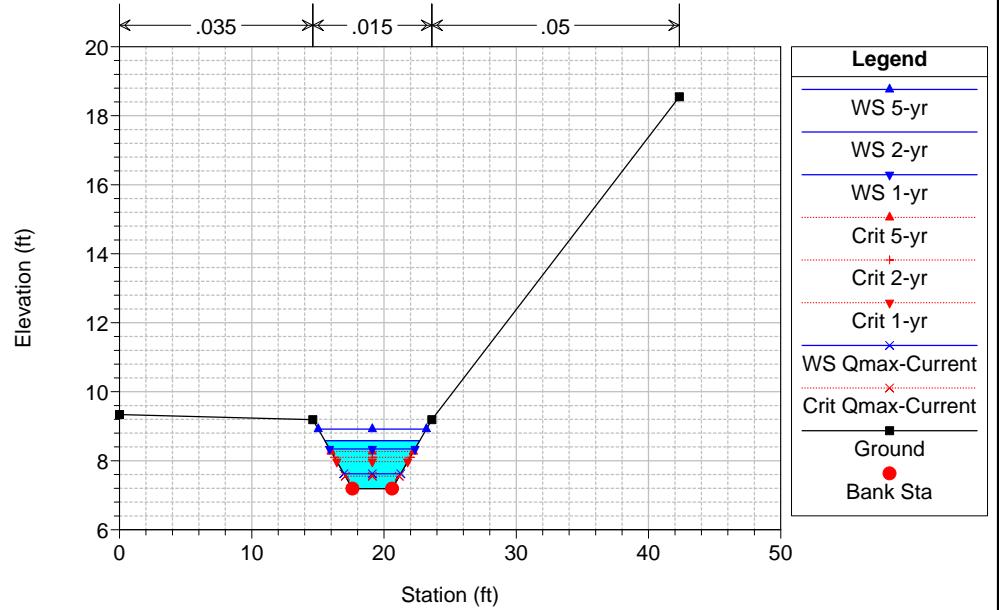
River = Mission Bay Reach = MBHS RS = 17



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

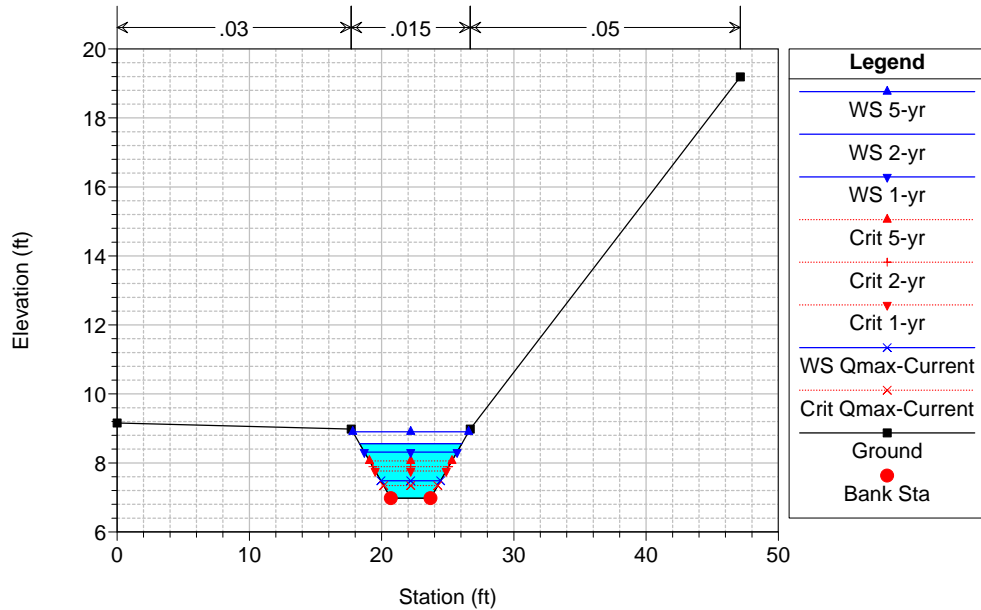
River = Mission Bay Reach = MBHS RS = 16



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

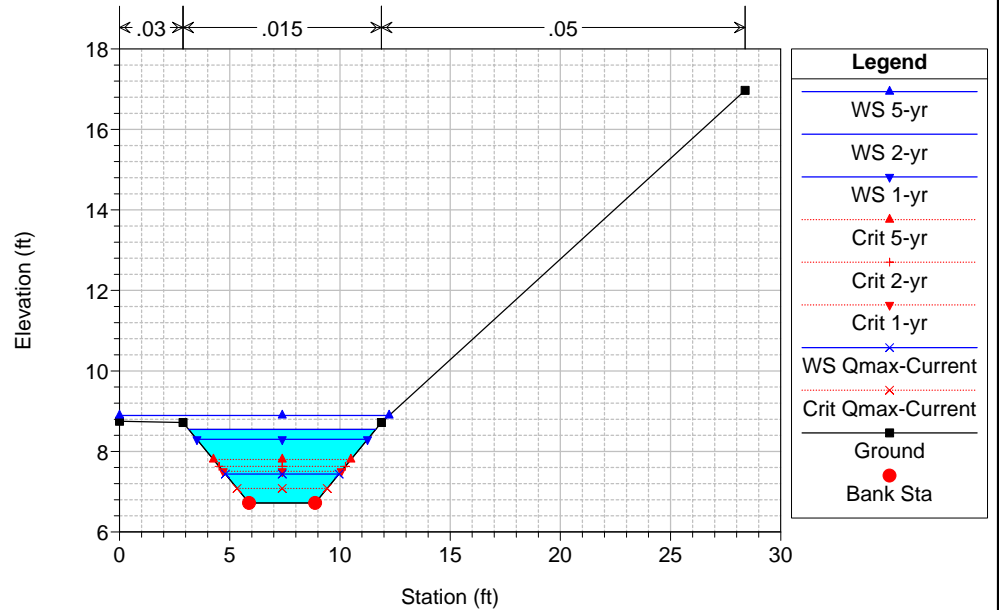
River = Mission Bay Reach = MBHS RS = 15



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

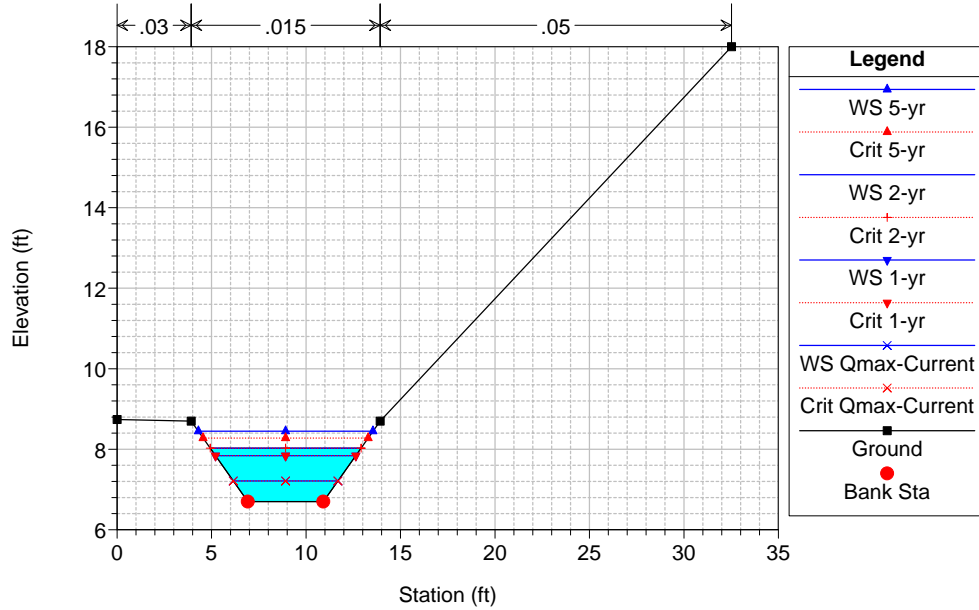
River = Mission Bay Reach = MBHS RS = 14



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

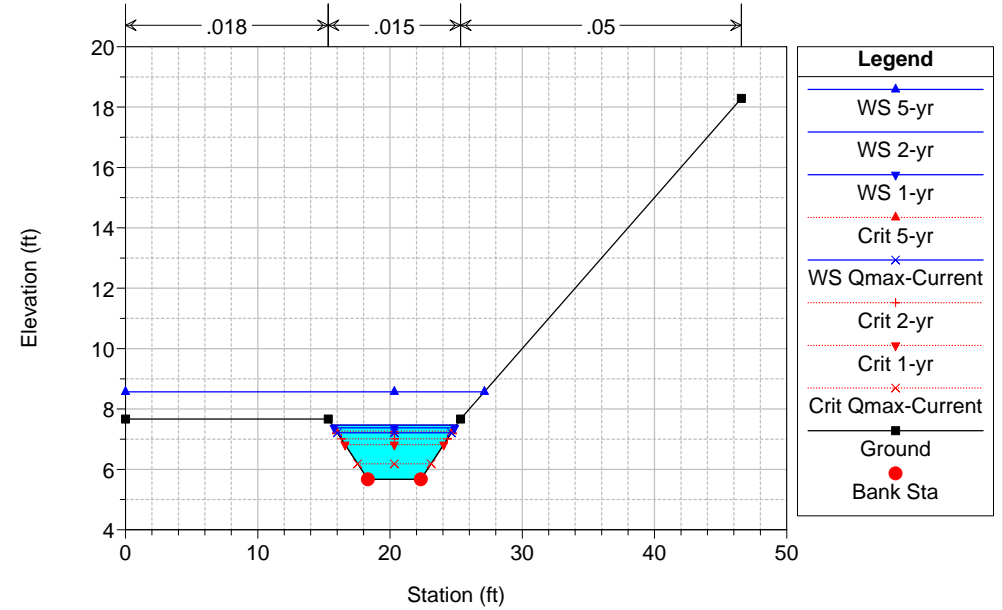
River = Mission Bay Reach = MBHS RS = 13



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

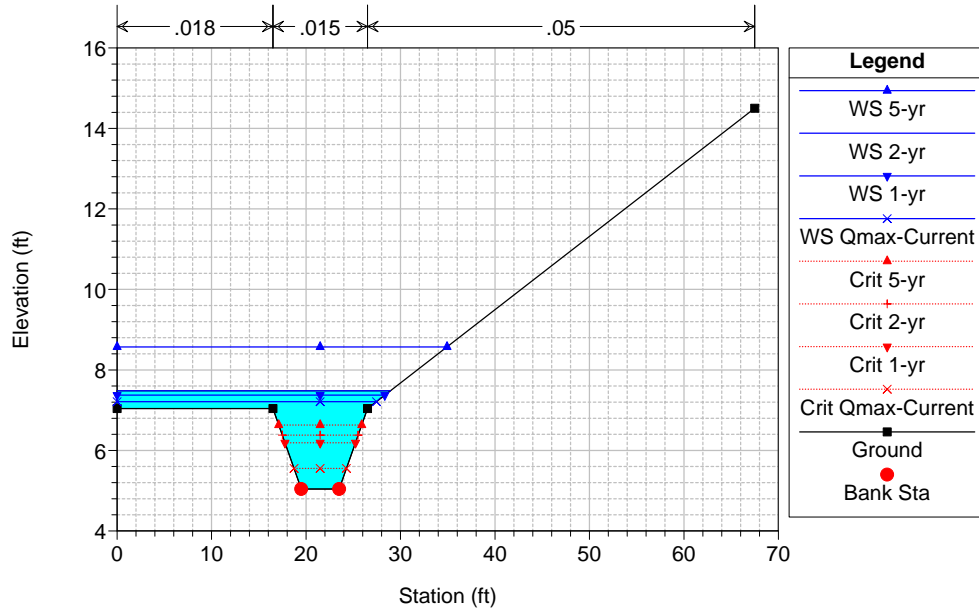
River = Mission Bay Reach = MBHS RS = 12



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

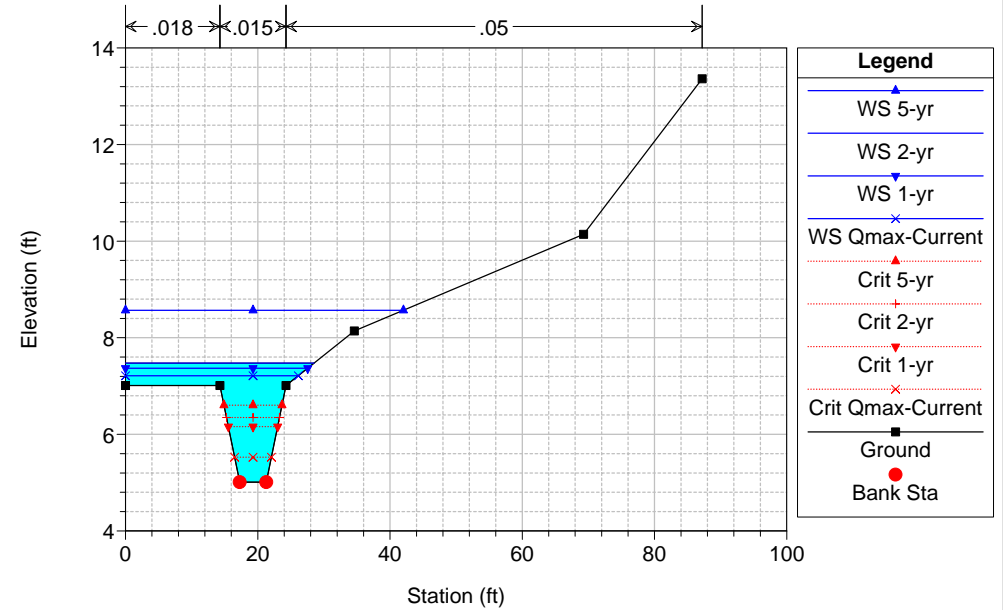
River = Mission Bay Reach = MBHS RS = 11



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

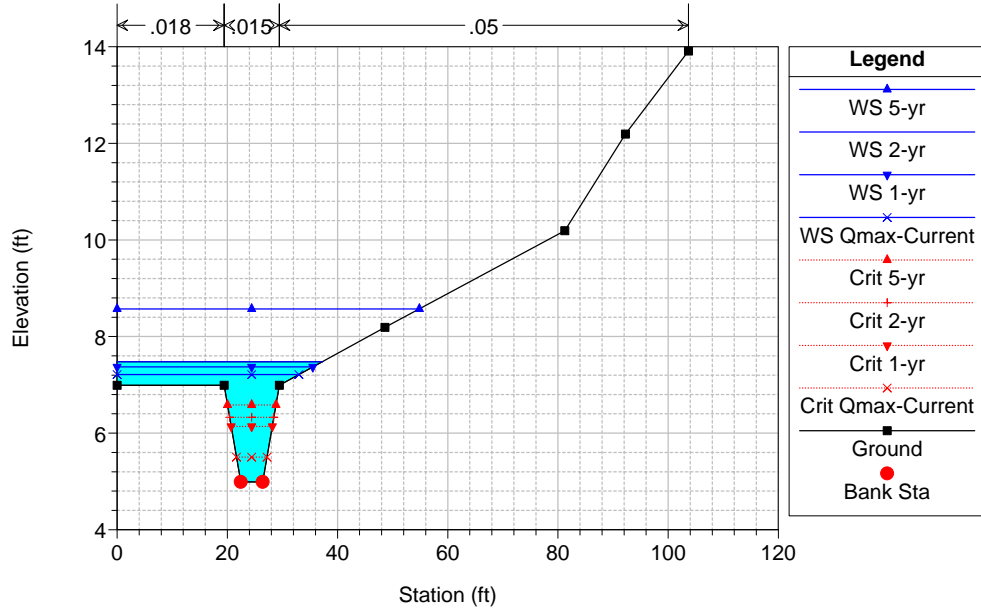
River = Mission Bay Reach = MBHS RS = 10



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

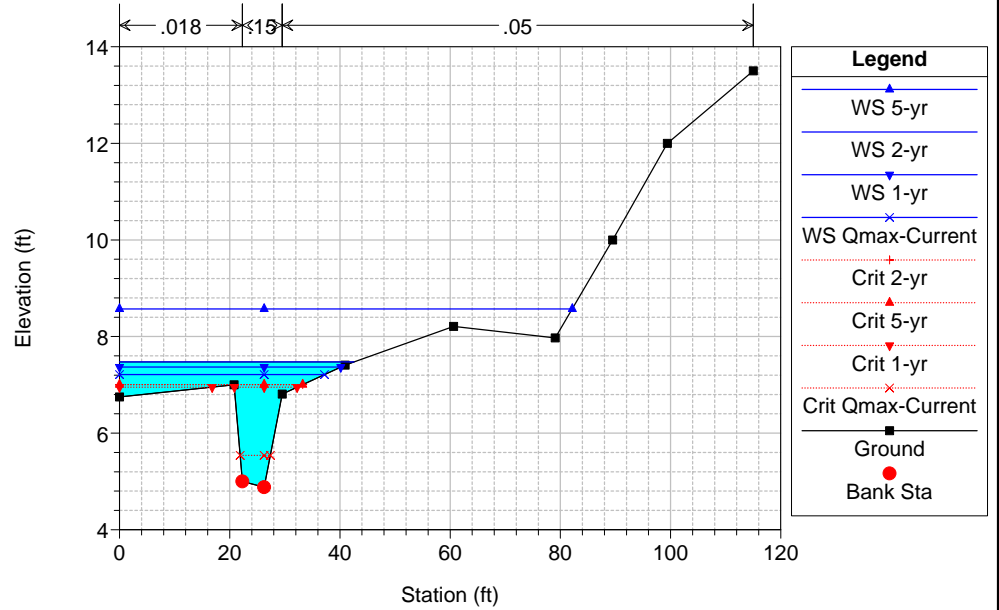
River = Mission Bay Reach = MBHS RS = 9



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

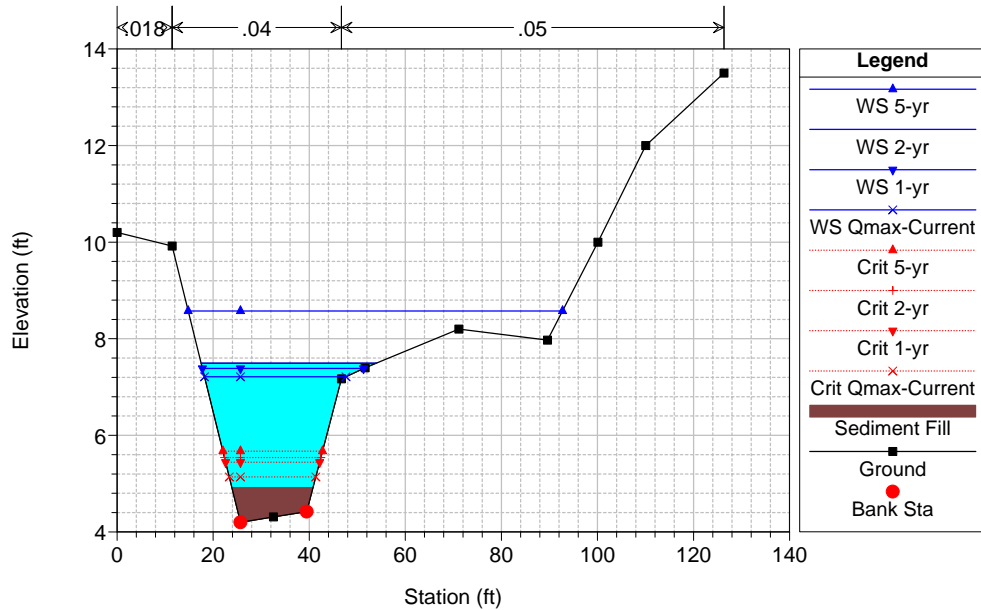
River = Mission Bay Reach = MBHS RS = 8



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

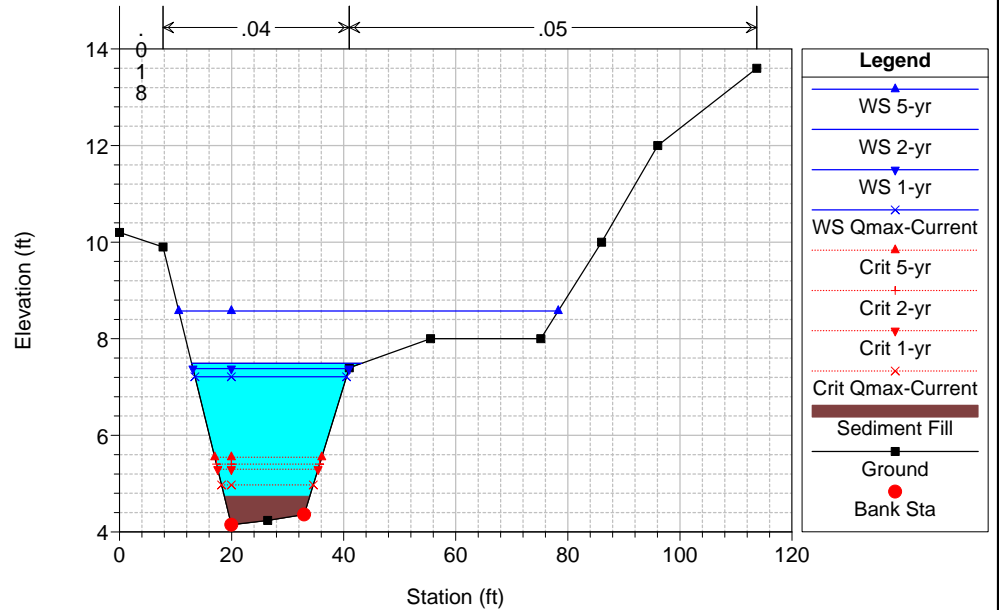
River = Mission Bay Reach = MBHS RS = 7



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

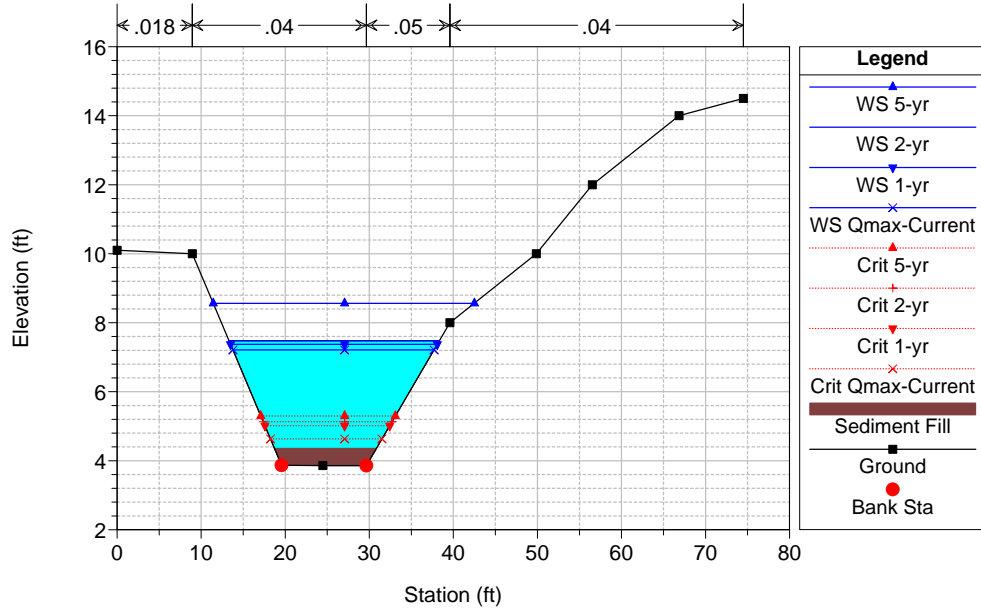
River = Mission Bay Reach = MBHS RS = 6



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

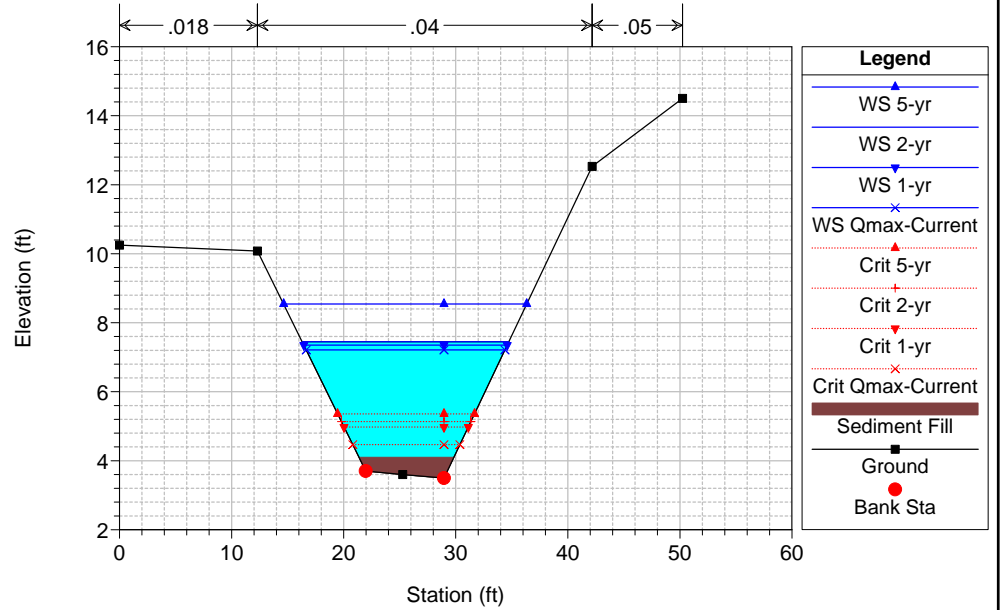
River = Mission Bay Reach = MBHS RS = 5



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

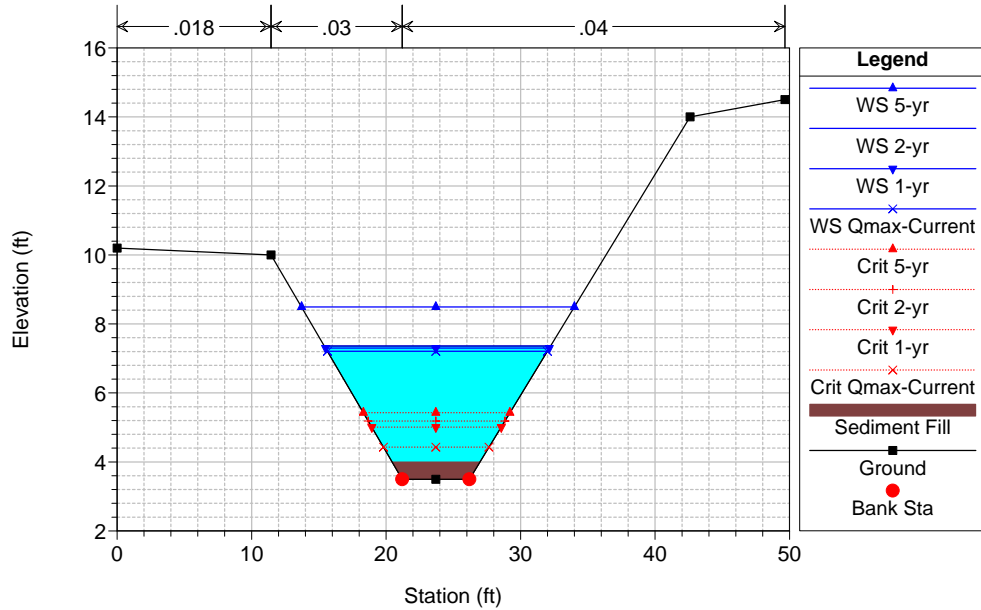
River = Mission Bay Reach = MBHS RS = 4



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

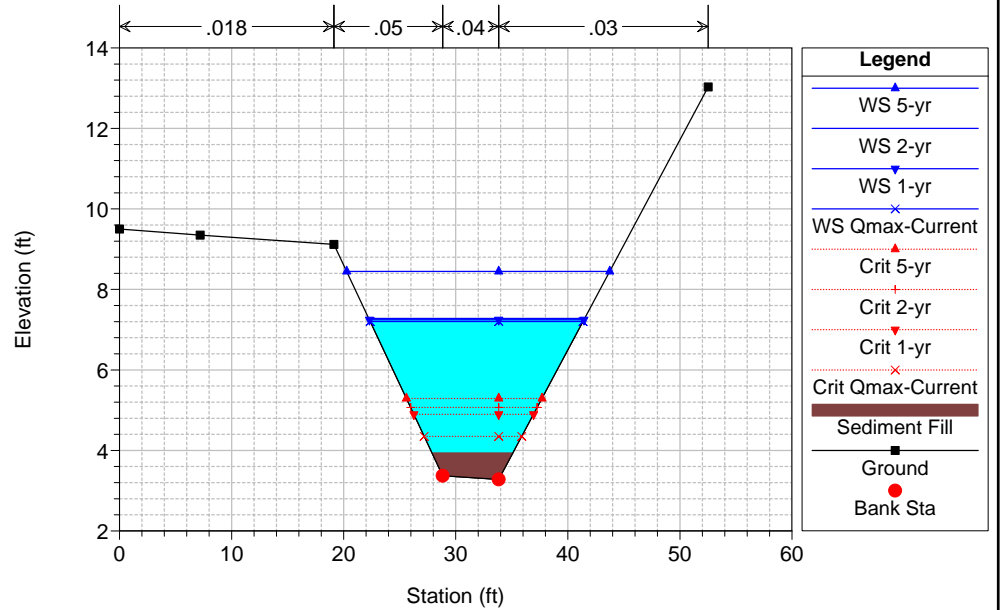
River = Mission Bay Reach = MBHS RS = 3



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

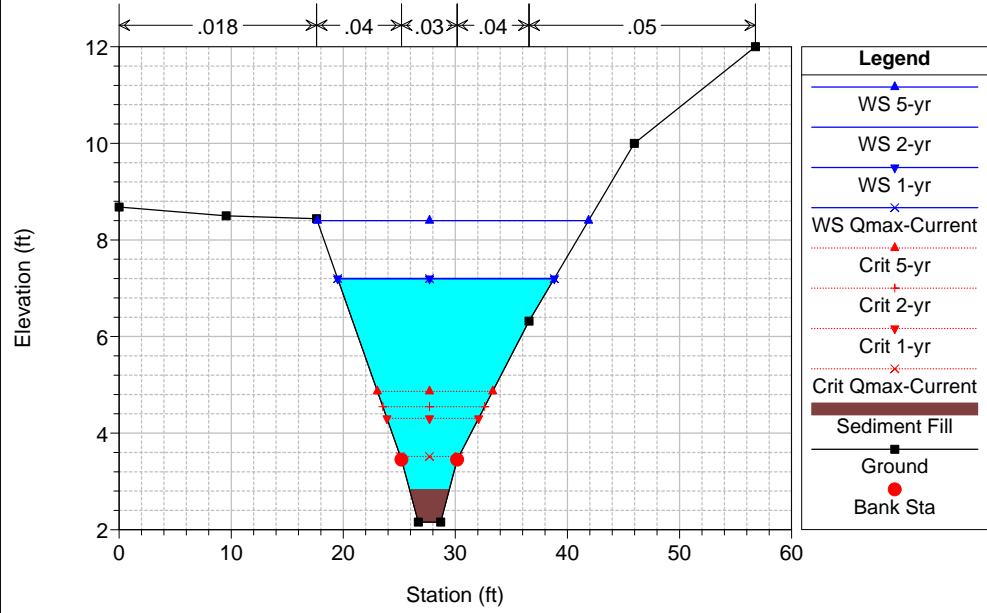
River = Mission Bay Reach = MBHS RS = 2



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

River = Mission Bay Reach = MBHS RS = 1



**MAINTAINED CONDITION – SEDIMENT REMOVED (1-YEAR, 2-YEAR, 5-YEAR, AND
MAXIMUM FLOW)**

HEC-RAS Plan: Maintd-NoSedRmvd River: Mission Bay Reach: MBHS

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
MBHS	17	2-yr	17.89	7.26	8.59	8.17	8.73	0.000738	3.26	6.67	7.00	0.50
MBHS	17	5-yr	23.87	7.26	8.92	8.34	9.05	0.000552	3.27	9.14	7.99	0.45
MBHS	17	1-yr	13.95	7.26	8.36	8.05	8.50	0.000942	3.24	5.11	6.30	0.54
MBHS	17	Qmax-Current	4.00	7.26	7.70	7.62	7.80	0.002216	2.70	1.61	4.32	0.72
MBHS	16	2-yr	17.89	7.19	8.58	8.10	8.70	0.000625	3.09	7.08	7.17	0.46
MBHS	16	5-yr	23.87	7.19	8.92	8.27	9.03	0.000477	3.11	9.65	8.18	0.42
MBHS	16	1-yr	13.95	7.19	8.34	7.98	8.46	0.000787	3.05	5.45	6.46	0.50
MBHS	16	Qmax-Current	4.00	7.19	7.63	7.55	7.73	0.002308	2.73	1.59	4.31	0.73
MBHS	15	2-yr	17.89	6.98	8.56	7.89	8.65	0.000379	2.62	8.50	7.75	0.37
MBHS	15	5-yr	23.87	6.98	8.90	8.06	8.99	0.000310	2.70	11.31	8.77	0.34
MBHS	15	1-yr	13.95	6.98	8.32	7.77	8.40	0.000446	2.54	6.68	7.01	0.39
MBHS	15	Qmax-Current	4.00	6.98	7.48	7.34	7.56	0.001370	2.32	1.89	4.51	0.58
MBHS	14	2-yr	17.89	6.72	8.55	7.63	8.60	0.000212	2.16	10.51	8.49	0.28
MBHS	14	5-yr	23.87	6.72	8.90	7.80	8.95	0.000180	2.23	14.07	12.23	0.27
MBHS	14	1-yr	13.95	6.72	8.30	7.51	8.35	0.000231	2.04	8.49	7.74	0.29
MBHS	14	Qmax-Current	4.00	6.72	7.44	7.08	7.47	0.000380	1.55	2.93	5.15	0.32
MBHS	13	2-yr	42.71	6.70	8.03	8.03	8.55	0.002766	6.29	7.96	7.98	0.96
MBHS	13	5-yr	57.40	6.70	8.45	8.28	8.91	0.001749	6.01	11.58	9.24	0.80
MBHS	13	1-yr	33.10	6.70	7.84	7.84	8.30	0.002924	5.85	6.52	7.43	0.97
MBHS	13	Qmax-Current	9.00	6.70	7.21	7.21	7.44	0.003890	3.96	2.45	5.54	0.97
MBHS	12	2-yr	43.29	5.67	7.46	7.01	7.71	0.000900	4.39	12.00	9.38	0.58
MBHS	12	5-yr	58.41	5.67	8.57	7.27	8.62	0.000142	2.40	37.60	27.13	0.25
MBHS	12	1-yr	33.42	5.67	7.37	6.82	7.54	0.000655	3.62	11.17	9.11	0.49
MBHS	12	Qmax-Current	9.10	5.67	7.21	6.18	7.23	0.000071	1.11	9.75	8.63	0.16
MBHS	11	2-yr	43.29	5.04	7.48	6.38	7.55	0.000198	2.53	26.29	28.94	0.29
MBHS	11	5-yr	58.41	5.04	8.57	6.63	8.59	0.000047	1.58	61.03	34.92	0.15
MBHS	11	1-yr	33.42	5.04	7.37	6.19	7.42	0.000153	2.16	23.17	28.34	0.25
MBHS	11	Qmax-Current	9.10	5.04	7.21	5.56	7.22	0.000017	0.69	18.67	27.45	0.08
MBHS	10	2-yr	43.29	5.01	7.47	6.35	7.54	0.000195	2.52	26.23	28.51	0.28
MBHS	10	5-yr	58.41	5.01	8.57	6.60	8.59	0.000049	1.61	63.69	42.03	0.15
MBHS	10	1-yr	33.42	5.01	7.37	6.16	7.42	0.000148	2.14	23.28	27.55	0.25
MBHS	10	Qmax-Current	9.10	5.01	7.21	5.53	7.22	0.000016	0.67	19.10	26.13	0.08
MBHS	9	2-yr	43.29	4.99	7.48	6.33	7.53	0.000169	2.36	30.30	37.24	0.26
MBHS	9	5-yr	58.41	4.99	8.57	6.58	8.59	0.000037	1.40	80.60	54.84	0.13
MBHS	9	1-yr	33.42	4.99	7.37	6.14	7.41	0.000132	2.03	26.38	35.52	0.23
MBHS	9	Qmax-Current	9.10	4.99	7.21	5.50	7.22	0.000015	0.65	20.94	32.98	0.08

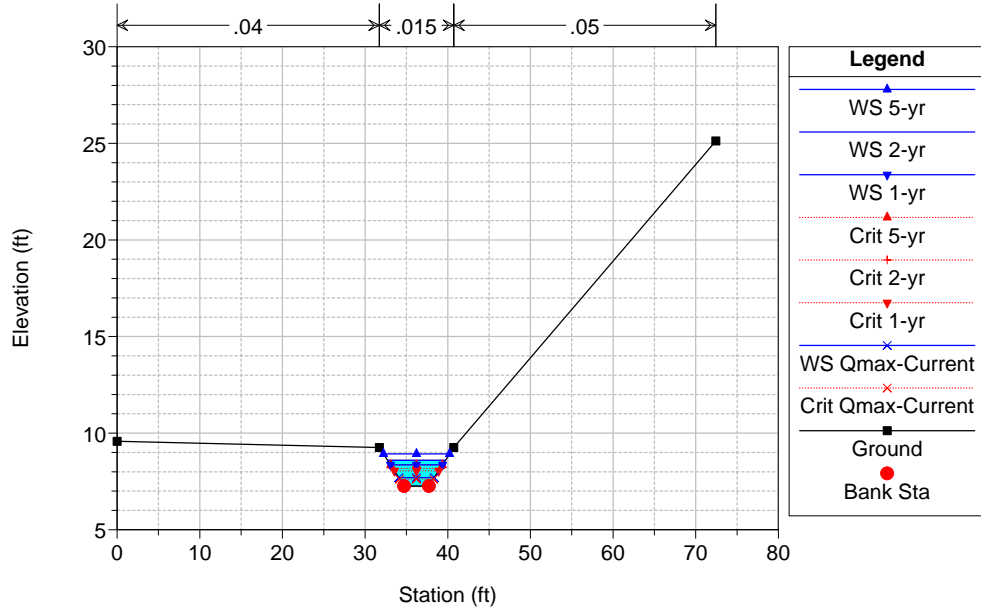
HEC-RAS Plan: Maintd-NoSedRmvd River: Mission Bay Reach: MBHS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
MBHS	8	2-yr	43.29	4.88	7.47	7.00	7.53	0.001341	0.67	34.22	42.53	0.07
MBHS	8	5-yr	58.41	4.88	8.57	7.00	8.59	0.000098	0.23	103.99	82.16	0.02
MBHS	8	1-yr	33.42	4.88	7.37	6.95	7.41	0.001313	0.65	29.86	40.16	0.07
MBHS	8	Qmax-Current	9.10	4.88	7.21	5.54	7.22	0.000233	0.26	23.82	37.18	0.03
MBHS	7	2-yr	49.09	4.92	7.49	5.54	7.51	0.000175	0.92	61.46	36.45	0.10
MBHS	7	5-yr	66.39	4.92	8.58	5.67	8.58	0.000070	0.74	124.87	77.93	0.07
MBHS	7	1-yr	37.83	4.92	7.38	5.44	7.39	0.000124	0.75	57.61	33.54	0.08
MBHS	7	Qmax-Current	10.00	4.92	7.21	5.14	7.21	0.000011	0.22	52.25	29.47	0.03
MBHS	6	2-yr	49.09	4.74	7.49	5.40	7.50	0.000168	0.95	60.11	30.34	0.10
MBHS	6	5-yr	66.39	4.74	8.57	5.55	8.58	0.000073	0.78	116.56	67.71	0.07
MBHS	6	1-yr	37.83	4.74	7.38	5.30	7.39	0.000117	0.77	56.96	27.85	0.08
MBHS	6	Qmax-Current	10.00	4.74	7.21	4.97	7.21	0.000010	0.22	52.33	27.05	0.02
MBHS	5	2-yr	49.09	4.36	7.48	5.13	7.49	0.000177	1.06	57.92	25.03	0.11
MBHS	5	5-yr	66.39	4.36	8.56	5.30	8.57	0.000100	0.97	87.98	31.06	0.08
MBHS	5	1-yr	37.83	4.36	7.37	5.01	7.38	0.000120	0.85	55.33	24.60	0.09
MBHS	5	Qmax-Current	10.00	4.36	7.21	4.63	7.21	0.000010	0.24	51.45	23.94	0.02
MBHS	4	2-yr	55.04	4.10	7.45	5.14	7.47	0.000327	1.50	45.00	18.43	0.14
MBHS	4	5-yr	74.47	4.10	8.54	5.36	8.56	0.000199	1.42	66.96	21.69	0.12
MBHS	4	1-yr	42.40	4.10	7.35	4.98	7.37	0.000216	1.20	43.29	18.15	0.12
MBHS	4	Qmax-Current	11.00	4.10	7.21	4.47	7.21	0.000017	0.33	40.76	17.73	0.03
MBHS	3	2-yr	55.04	4.00	7.36	5.19	7.40	0.000403	1.67	39.27	16.83	0.16
MBHS	3	5-yr	74.47	4.00	8.49	5.43	8.52	0.000226	1.52	60.23	20.29	0.13
MBHS	3	1-yr	42.40	4.00	7.30	5.01	7.32	0.000258	1.32	38.21	16.63	0.13
MBHS	3	Qmax-Current	11.00	4.00	7.21	4.43	7.21	0.000019	0.36	36.70	16.35	0.04
MBHS	2	2-yr	55.04	3.94	7.28	5.07	7.31	0.000338	1.53	44.24	19.27	0.15
MBHS	2	5-yr	74.47	3.94	8.45	5.29	8.47	0.000182	1.37	69.21	23.48	0.11
MBHS	2	1-yr	42.40	3.94	7.25	4.90	7.26	0.000209	1.19	43.62	19.15	0.12
MBHS	2	Qmax-Current	11.00	3.94	7.20	4.35	7.21	0.000015	0.31	42.79	18.99	0.03
MBHS	1	2-yr	59.38	2.83	7.20	4.55	7.24	0.000212	1.79	47.79	19.32	0.15
MBHS	1	5-yr	80.34	2.83	8.40	4.87	8.43	0.000130	1.65	73.91	24.21	0.12
MBHS	1	1-yr	45.73	2.83	7.20	4.31	7.22	0.000126	1.38	47.79	19.32	0.12
MBHS	1	Qmax-Current	13.00	2.83	7.20	3.52	7.20	0.000010	0.39	47.79	19.32	0.03

MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

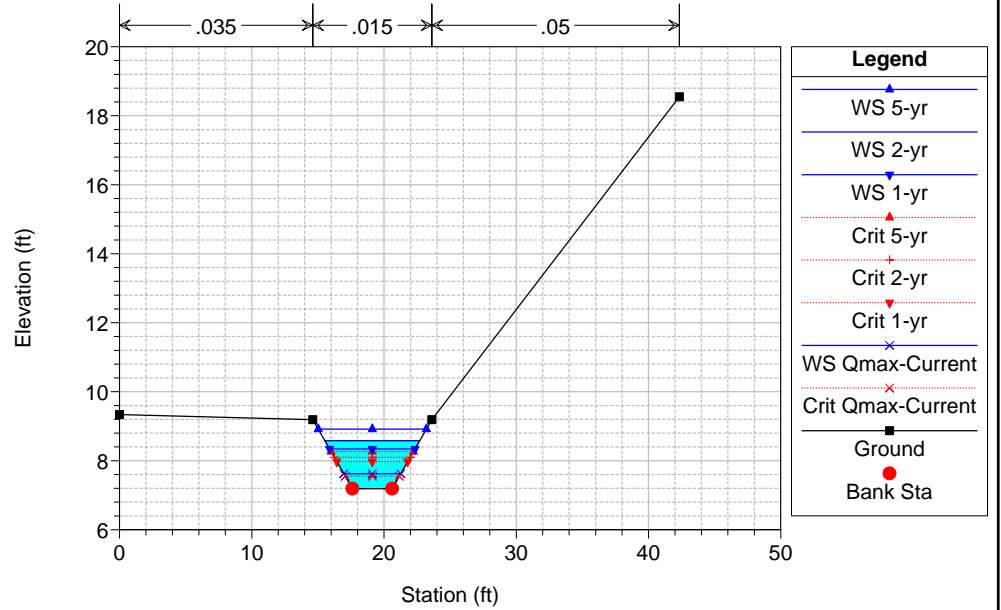
River = Mission Bay Reach = MBHS RS = 17



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

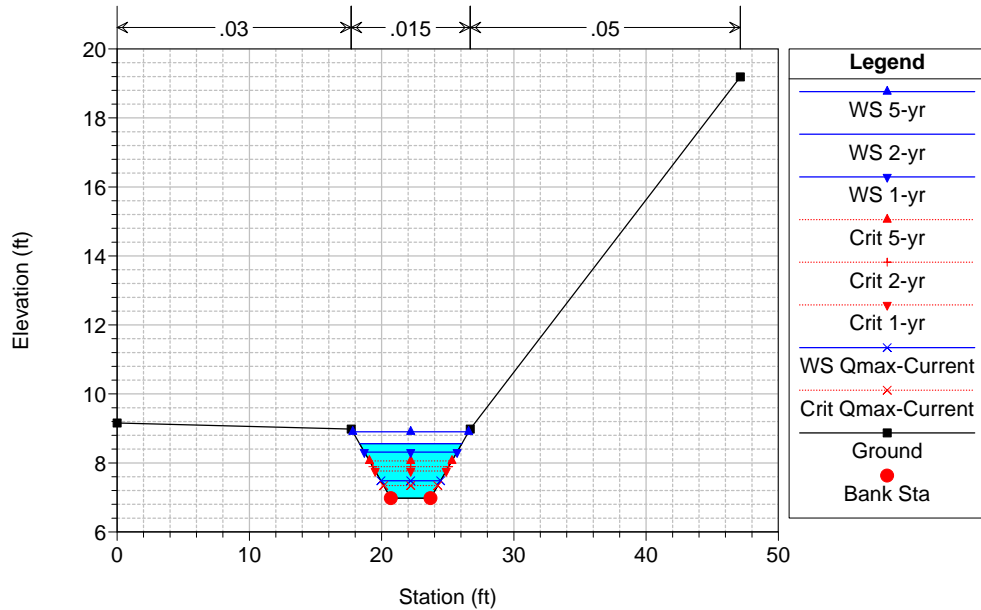
River = Mission Bay Reach = MBHS RS = 16



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

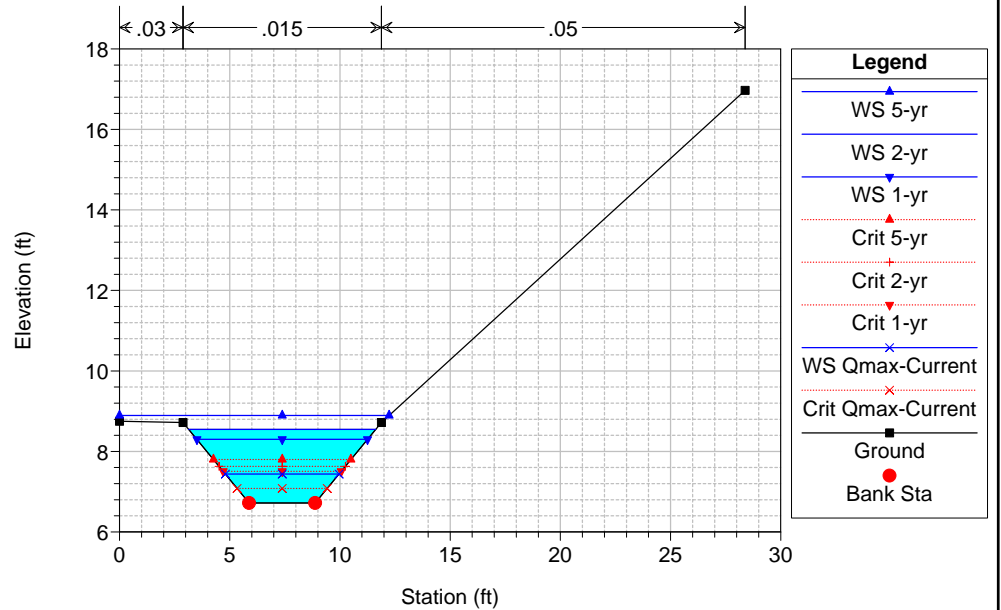
River = Mission Bay Reach = MBHS RS = 15



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

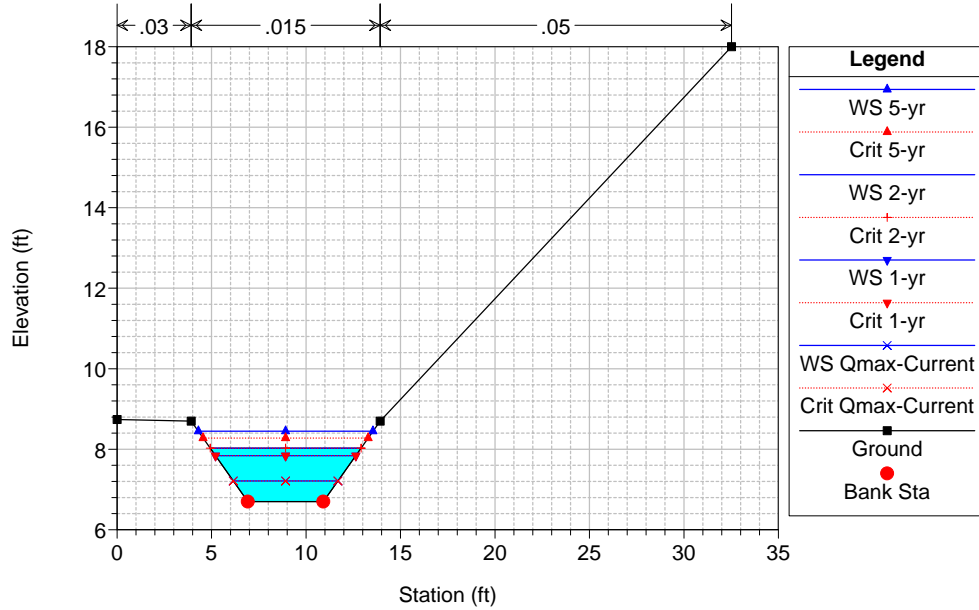
River = Mission Bay Reach = MBHS RS = 14



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

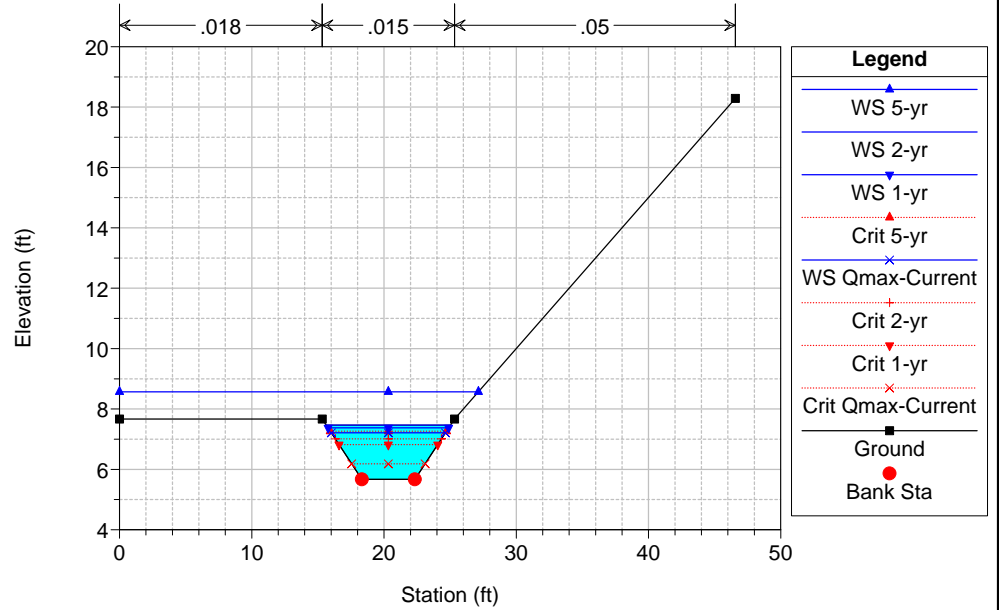
River = Mission Bay Reach = MBHS RS = 13



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

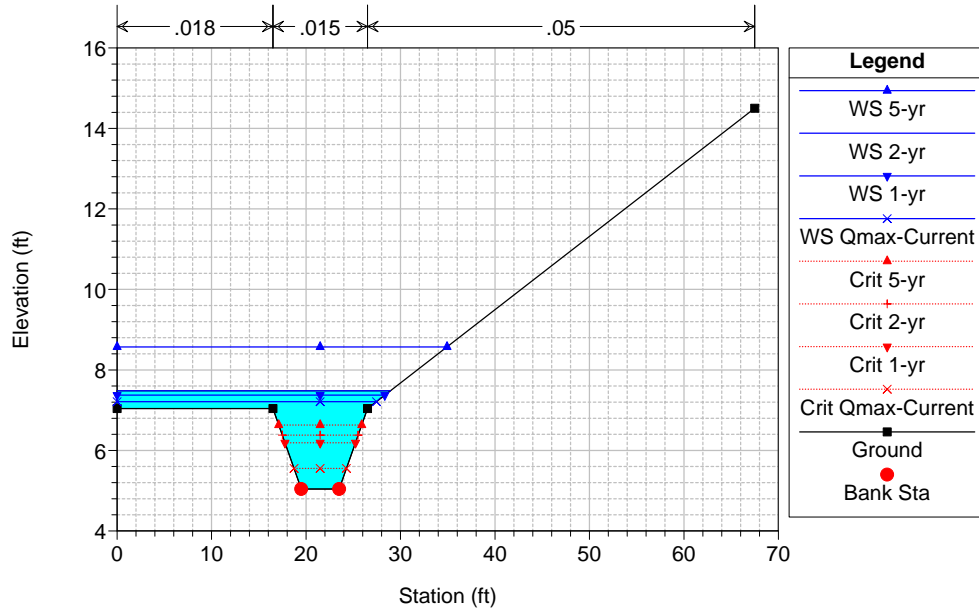
River = Mission Bay Reach = MBHS RS = 12



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

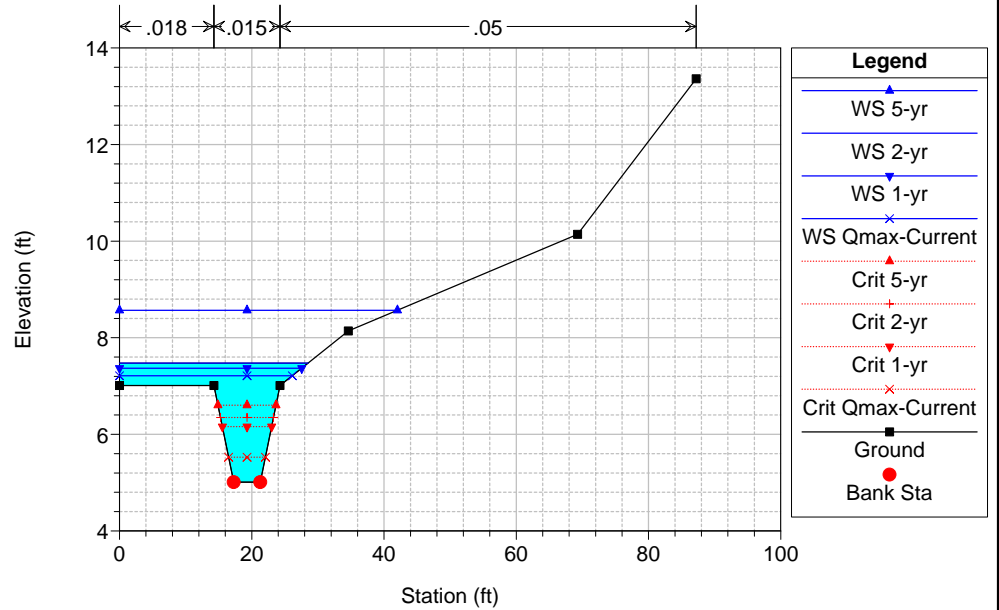
River = Mission Bay Reach = MBHS RS = 11



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

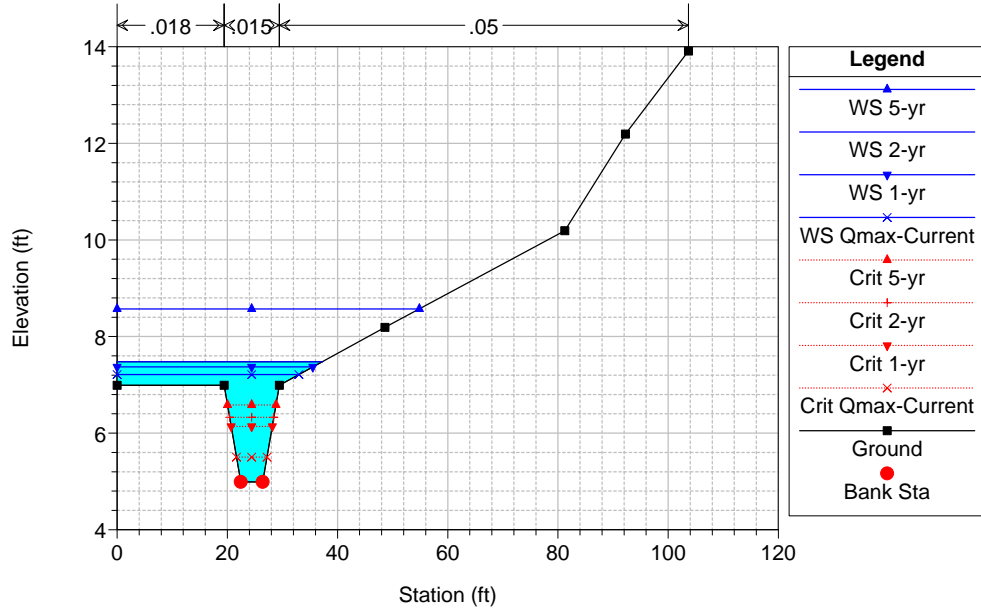
River = Mission Bay Reach = MBHS RS = 10



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

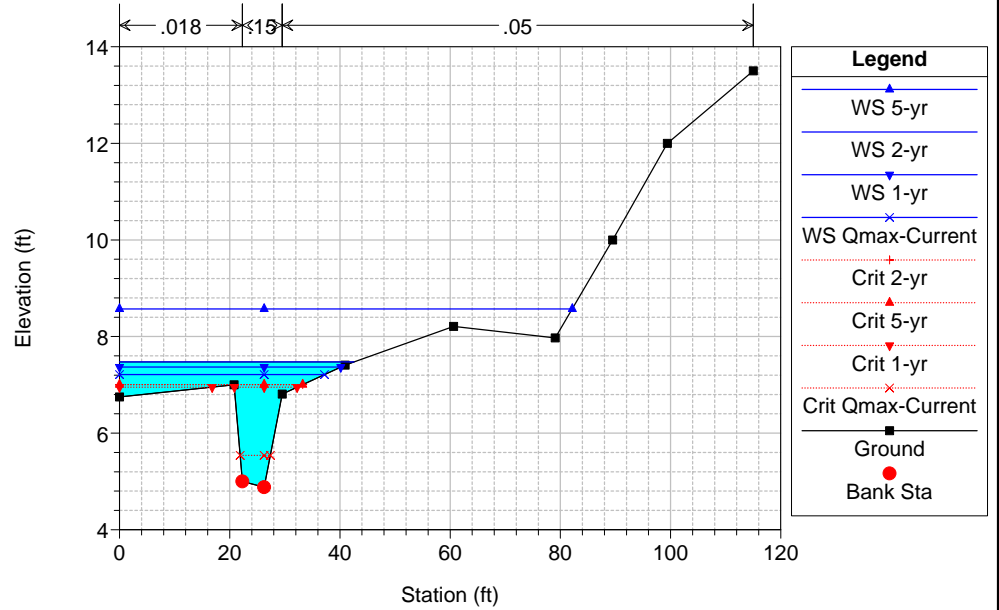
River = Mission Bay Reach = MBHS RS = 9



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

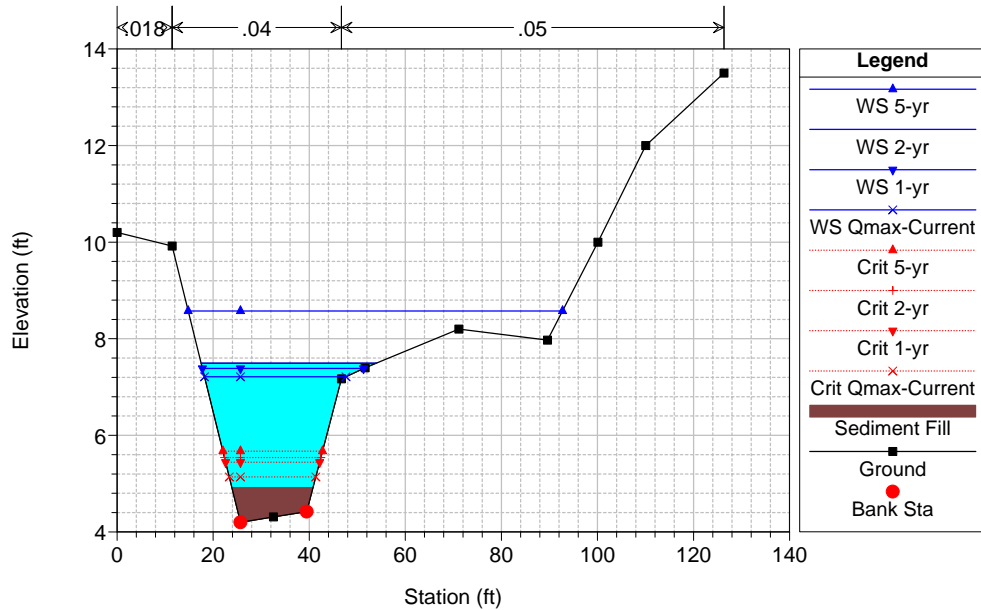
River = Mission Bay Reach = MBHS RS = 8



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

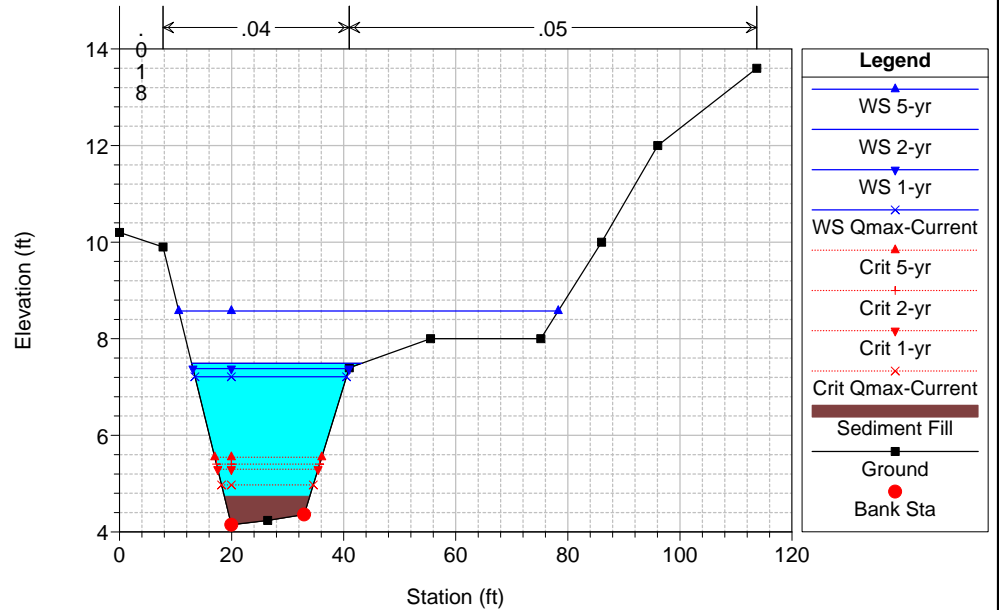
River = Mission Bay Reach = MBHS RS = 7



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

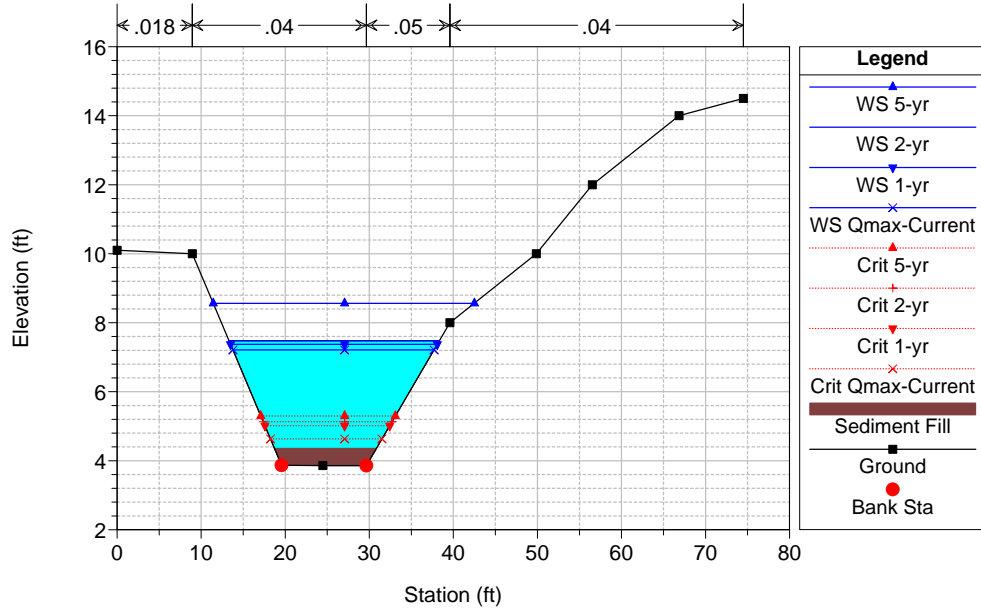
River = Mission Bay Reach = MBHS RS = 6



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

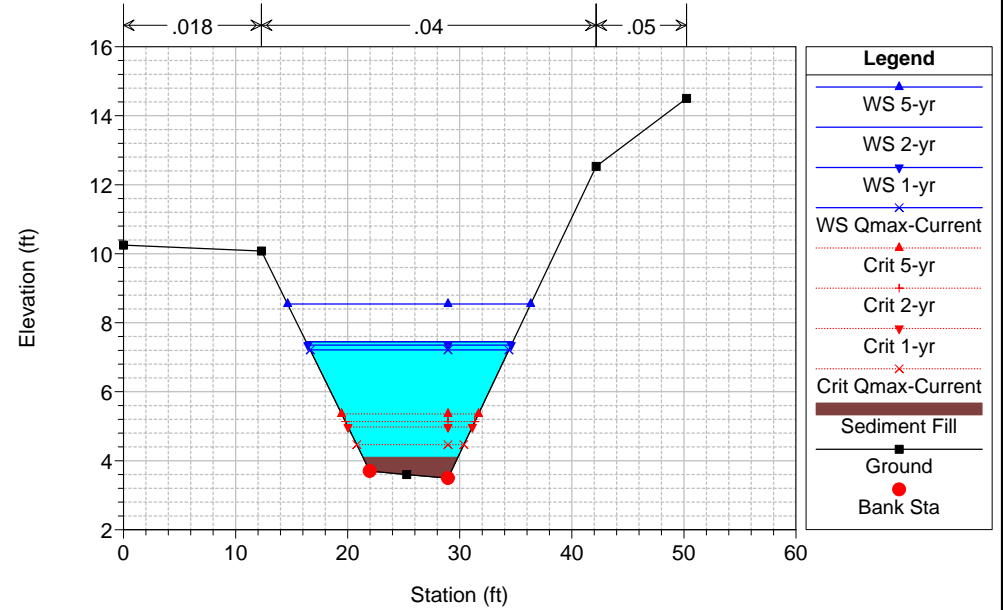
River = Mission Bay Reach = MBHS RS = 5



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

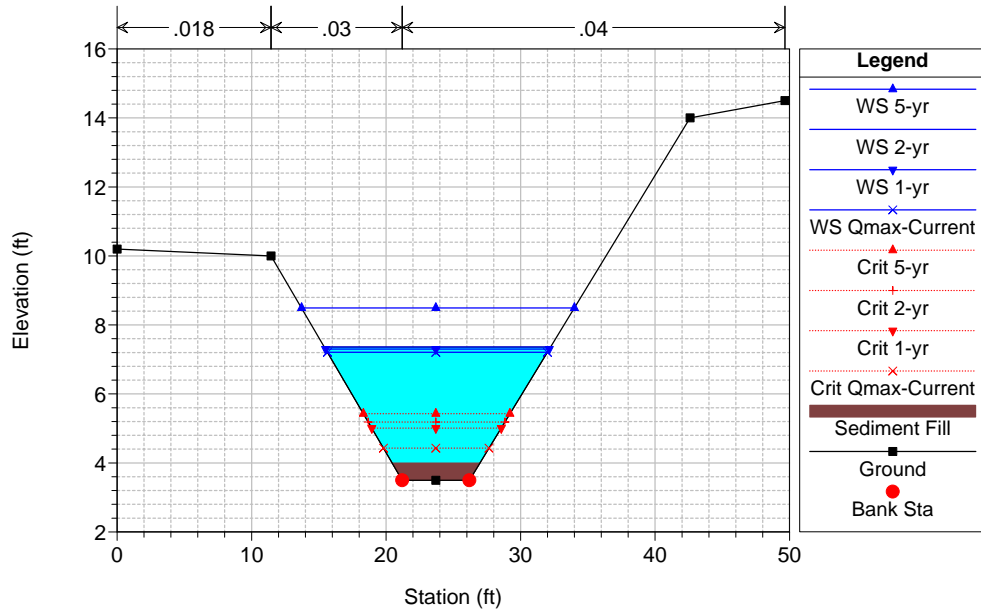
River = Mission Bay Reach = MBHS RS = 4



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

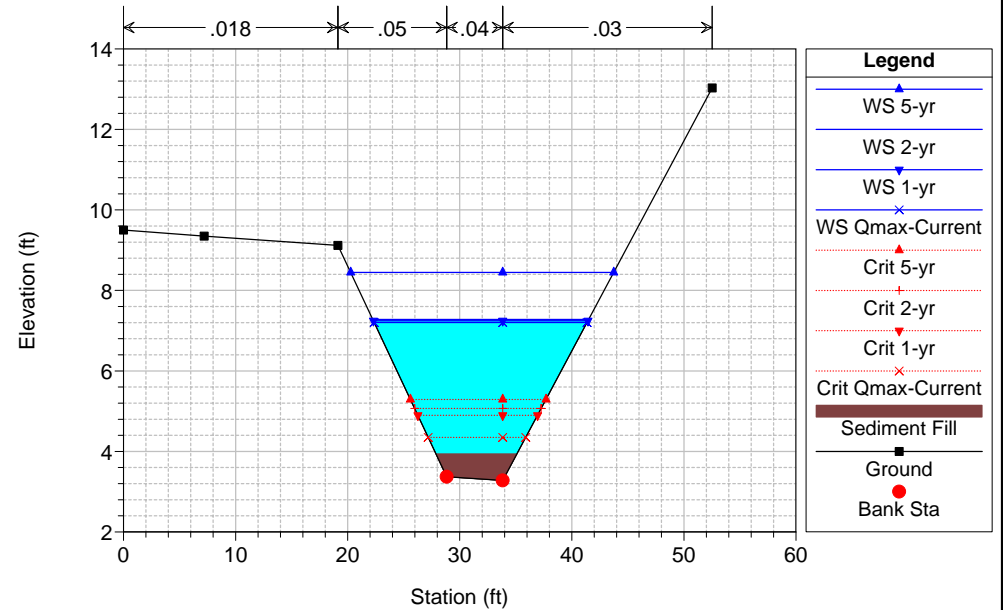
River = Mission Bay Reach = MBHS RS = 3



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

River = Mission Bay Reach = MBHS RS = 2



CURRENT VEGETATED CONDITION (10-YEAR, 25-YEAR, 50-YEAR, AND 100-YEAR)

HEC-RAS Plan: Current Vegetate River: Mission Bay Reach: MBHS

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
MBHS	17	10-yr	28.43	7.59	9.95	8.67	9.96	0.001014	0.84	34.35	42.10	0.10
MBHS	17	25-yr	32.17	7.59	10.07	8.74	10.08	0.000828	0.78	39.35	42.34	0.09
MBHS	17	50-yr	37.61	7.59	10.24	8.85	10.25	0.000641	0.72	46.68	42.68	0.08
MBHS	17	100-yr	40.92	7.59	10.35	8.91	10.36	0.000557	0.69	51.22	42.89	0.07
MBHS	16	10-yr	28.43	7.52	9.90	8.78	9.92	0.001467	0.60	26.95	25.02	0.07
MBHS	16	25-yr	32.17	7.52	10.02	8.87	10.04	0.001276	0.58	30.05	25.27	0.06
MBHS	16	50-yr	37.61	7.52	10.20	8.98	10.22	0.001067	0.55	34.57	25.63	0.06
MBHS	16	100-yr	40.92	7.52	10.31	9.04	10.33	0.000965	0.54	37.36	25.84	0.06
MBHS	15	10-yr	28.43	7.31	9.81	8.63	9.83	0.000692	0.42	32.08	28.36	0.05
MBHS	15	25-yr	32.17	7.31	9.95	8.72	9.96	0.000587	0.40	35.98	28.63	0.04
MBHS	15	50-yr	37.61	7.31	10.14	8.85	10.16	0.000486	0.39	41.49	29.01	0.04
MBHS	15	100-yr	40.92	7.31	10.25	9.06	10.27	0.000439	0.38	44.85	29.24	0.04
MBHS	14	10-yr	28.43	7.05	9.68	8.33	9.72	0.001188	0.57	23.17	13.81	0.06
MBHS	14	25-yr	32.17	7.05	9.83	8.42	9.87	0.001166	0.59	25.18	14.09	0.06
MBHS	14	50-yr	37.61	7.05	10.02	8.53	10.07	0.001139	0.61	28.01	14.49	0.06
MBHS	14	100-yr	40.92	7.05	10.14	8.60	10.19	0.001119	0.62	29.74	14.73	0.06
MBHS	13	10-yr	68.65	7.03	9.45	8.79	9.67	0.008886	1.48	23.43	15.42	0.17
MBHS	13	25-yr	78.23	7.03	9.57	8.87	9.82	0.008954	1.54	25.23	15.65	0.17
MBHS	13	50-yr	92.20	7.03	9.72	9.03	10.02	0.009026	1.61	27.76	15.97	0.17
MBHS	13	100-yr	100.92	7.03	9.82	9.13	10.13	0.009041	1.65	29.30	16.16	0.17
MBHS	12	10-yr	70.02	6.00	8.96	7.81	9.02	0.000493	0.40	46.85	27.91	0.04
MBHS	12	25-yr	79.92	6.00	9.08	7.92	9.15	0.000503	0.42	50.21	28.15	0.04
MBHS	12	50-yr	94.47	6.00	9.26	8.05	9.34	0.000504	0.43	55.26	28.51	0.04
MBHS	12	100-yr	103.58	6.00	9.37	8.12	9.46	0.000500	0.44	58.48	28.73	0.04
MBHS	11	10-yr	70.02	5.37	8.91	7.17	8.94	0.000148	0.25	71.83	36.80	0.02
MBHS	11	25-yr	79.92	5.37	9.03	7.29	9.07	0.000160	0.26	76.21	37.45	0.02
MBHS	11	50-yr	94.47	5.37	9.21	7.43	9.25	0.000173	0.28	82.96	38.43	0.03
MBHS	11	100-yr	103.58	5.37	9.32	7.50	9.37	0.000178	0.29	87.34	39.05	0.03
MBHS	10	10-yr	70.02	5.34	8.90	7.02	8.93	0.000169	0.27	77.21	47.82	0.02
MBHS	10	25-yr	79.92	5.34	9.02	7.35	9.06	0.000182	0.28	82.95	49.86	0.03
MBHS	10	50-yr	94.47	5.34	9.20	7.49	9.24	0.000194	0.30	92.08	52.94	0.03
MBHS	10	100-yr	103.58	5.34	9.31	7.56	9.36	0.000198	0.31	98.20	54.90	0.03
MBHS	9	10-yr	70.02	5.32	8.91	7.13	8.93	0.000094	0.20	98.60	60.36	0.02
MBHS	9	25-yr	79.92	5.32	9.03	7.27	9.05	0.000101	0.21	105.89	62.30	0.02

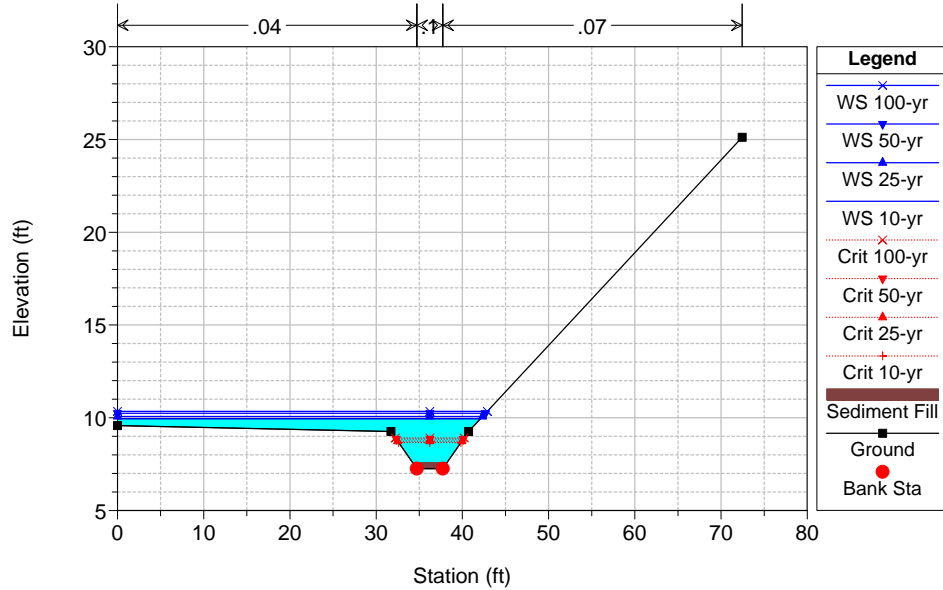
HEC-RAS Plan: Current Vegetate River: Mission Bay Reach: MBHS (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
MBHS	9	50-yr	94.47	5.32	9.21	7.38	9.23	0.000108	0.22	117.33	65.23	0.02
MBHS	9	100-yr	103.58	5.32	9.32	7.44	9.35	0.000110	0.23	124.89	67.10	0.02
MBHS	8	10-yr	70.02	5.21	8.91	6.99	8.93	0.000080	0.21	131.23	83.92	0.02
MBHS	8	25-yr	79.92	5.21	9.03	6.99	9.05	0.000084	0.22	141.32	84.53	0.02
MBHS	8	50-yr	94.47	5.21	9.22	7.22	9.23	0.000087	0.23	156.66	85.46	0.02
MBHS	8	100-yr	103.58	5.21	9.33	7.32	9.35	0.000087	0.24	166.52	86.05	0.02
MBHS	7	10-yr	79.68	4.92	8.92	5.90	8.92	0.000219	0.37	151.78	80.53	0.03
MBHS	7	25-yr	91.04	4.92	9.04	5.98	9.04	0.000233	0.39	161.50	81.45	0.03
MBHS	7	50-yr	107.72	4.92	9.22	6.09	9.22	0.000245	0.41	176.34	82.83	0.03
MBHS	7	100-yr	118.19	4.92	9.33	6.16	9.34	0.000248	0.42	185.92	83.71	0.04
MBHS	6	10-yr	79.68	4.74	8.91	5.84	8.92	0.000250	0.41	139.72	70.24	0.04
MBHS	6	25-yr	91.04	4.74	9.03	5.94	9.04	0.000271	0.43	148.16	71.14	0.04
MBHS	6	50-yr	107.72	4.74	9.21	6.07	9.22	0.000291	0.46	161.10	72.50	0.04
MBHS	6	100-yr	118.19	4.74	9.32	6.14	9.33	0.000299	0.47	169.48	73.37	0.04
MBHS	5	10-yr	79.68	4.36	8.88	5.58	8.89	0.000437	0.57	98.14	33.23	0.05
MBHS	5	25-yr	91.04	4.36	8.99	5.68	9.01	0.000507	0.62	101.99	34.02	0.05
MBHS	5	50-yr	107.72	4.36	9.17	5.82	9.19	0.000597	0.69	108.02	35.22	0.06
MBHS	5	100-yr	118.19	4.36	9.28	5.91	9.30	0.000645	0.73	111.99	35.98	0.06
MBHS	4	10-yr	89.40	4.10	8.82	5.76	8.86	0.000677	0.73	73.23	22.53	0.06
MBHS	4	25-yr	102.16	4.10	8.93	5.89	8.97	0.000802	0.80	75.59	22.84	0.06
MBHS	4	50-yr	120.90	4.10	9.09	6.07	9.14	0.000972	0.90	79.26	23.32	0.07
MBHS	4	100-yr	132.68	4.10	9.19	6.17	9.25	0.001068	0.96	81.67	23.62	0.07
MBHS	3	10-yr	89.40	4.00	8.67	5.92	8.72	0.000619	0.69	63.95	20.84	0.06
MBHS	3	25-yr	102.16	4.00	8.74	6.07	8.80	0.000754	0.77	65.45	21.06	0.06
MBHS	3	50-yr	120.90	4.00	8.86	6.26	8.93	0.000947	0.87	67.87	21.41	0.07
MBHS	3	100-yr	132.68	4.00	8.93	6.38	9.02	0.001062	0.94	69.50	21.64	0.07
MBHS	2	10-yr	89.40	3.94	8.55	5.77	8.59	0.000488	0.61	71.59	23.84	0.05
MBHS	2	25-yr	102.16	3.94	8.59	5.91	8.64	0.000611	0.68	72.60	23.99	0.06
MBHS	2	50-yr	120.90	3.94	8.66	6.09	8.73	0.000800	0.79	74.27	24.24	0.06
MBHS	2	100-yr	132.68	3.94	8.71	6.20	8.78	0.000921	0.85	75.42	24.41	0.07
MBHS	1	10-yr	96.45	2.83	8.40	4.96	8.43	0.000672	1.13	73.91	24.21	0.08
MBHS	1	25-yr	110.22	2.83	8.40	5.11	8.44	0.000878	1.29	73.91	24.21	0.10
MBHS	1	50-yr	130.46	2.83	8.40	5.31	8.45	0.001230	1.53	73.91	24.21	0.11
MBHS	1	100-yr	143.17	2.83	8.40	5.43	8.46	0.001481	1.68	73.91	24.21	0.13

MBHS Channel 2013 Plan: Current Vegetated Condition 12/9/2013

Geom: Current Vegetated Condition Flow: MBHS Channel

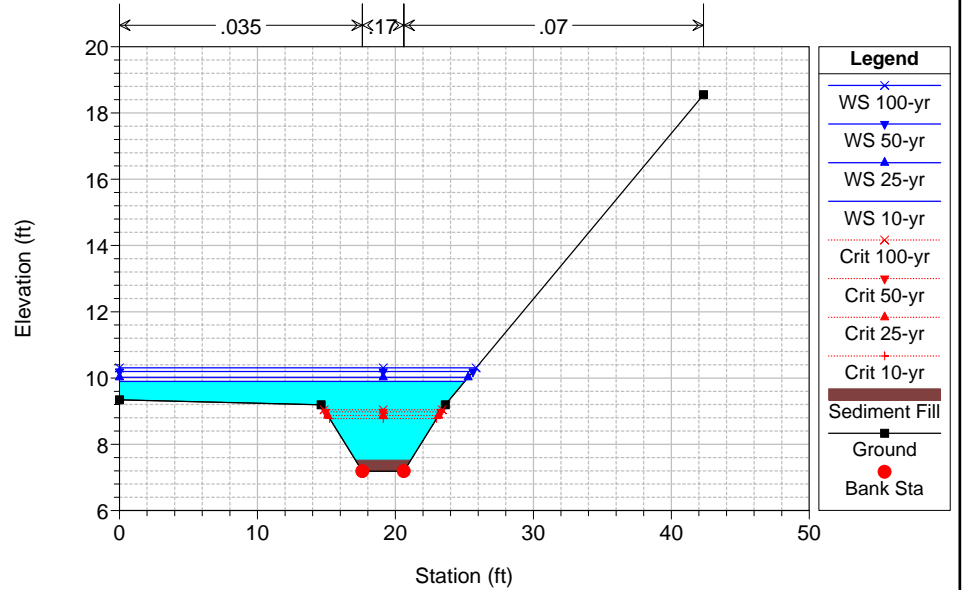
River = Mission Bay Reach = MBHS RS = 17



MBHS Channel 2013 Plan: Current Vegetated Condition 12/9/2013

Geom: Current Vegetated Condition Flow: MBHS Channel

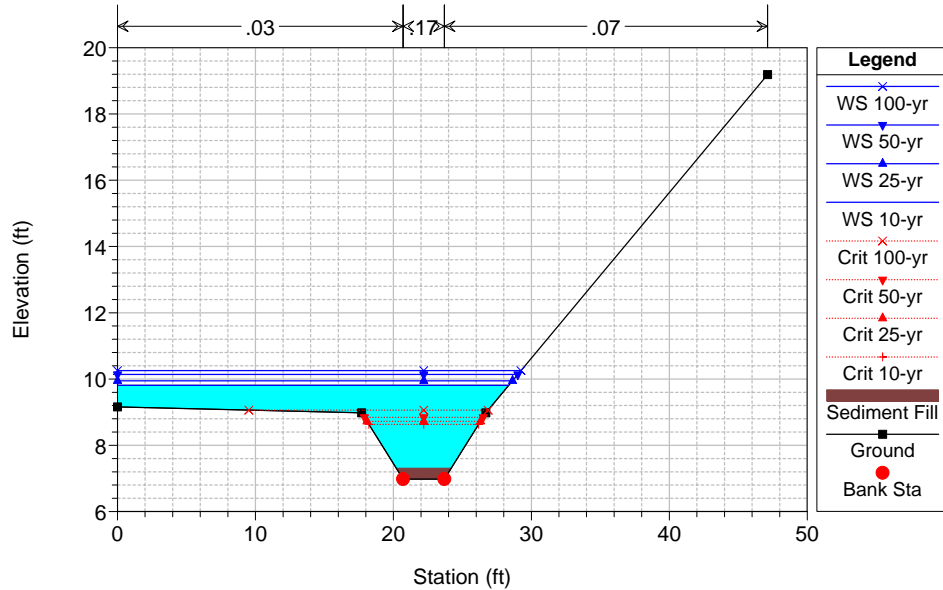
River = Mission Bay Reach = MBHS RS = 16



MBHS Channel 2013 Plan: Current Vegetated Condition 12/9/2013

Geom: Current Vegetated Condition Flow: MBHS Channel

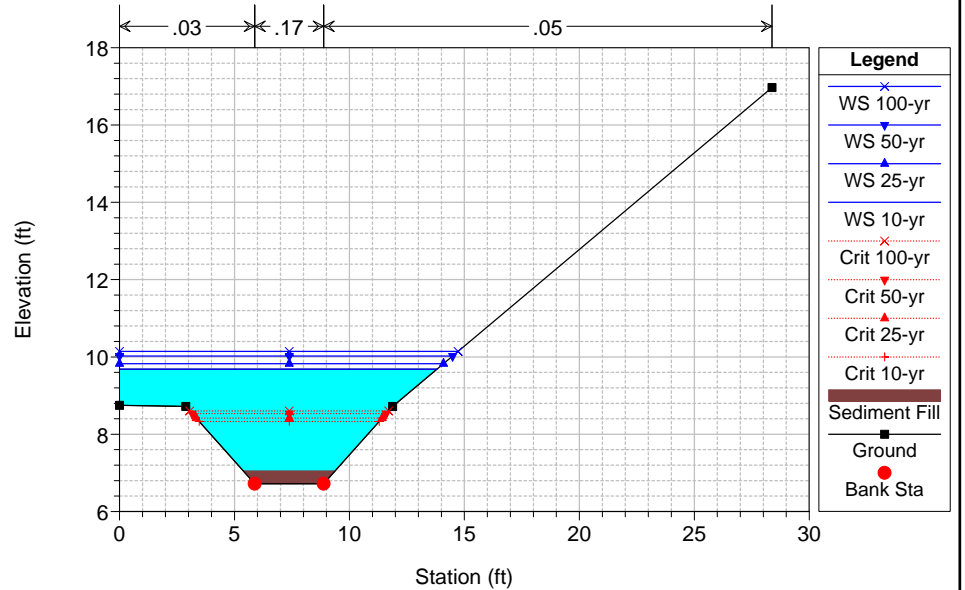
River = Mission Bay Reach = MBHS RS = 15

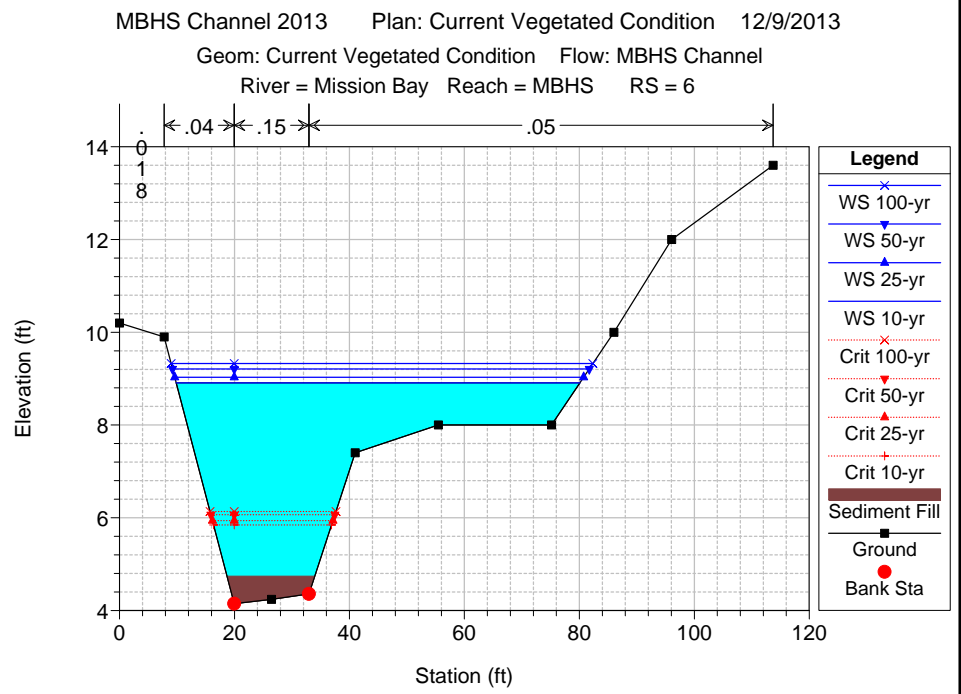
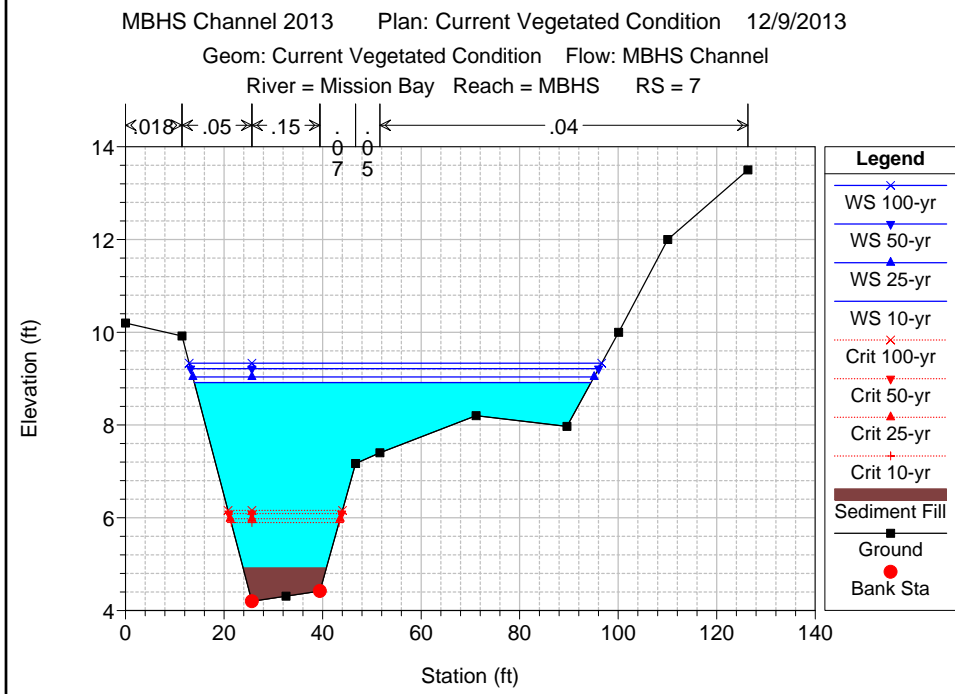
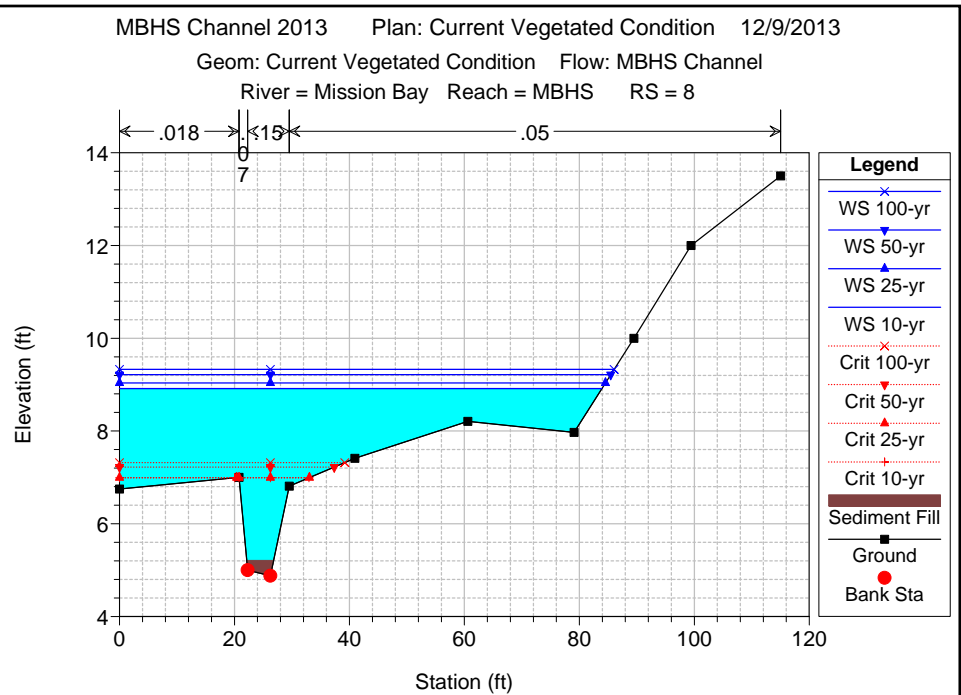
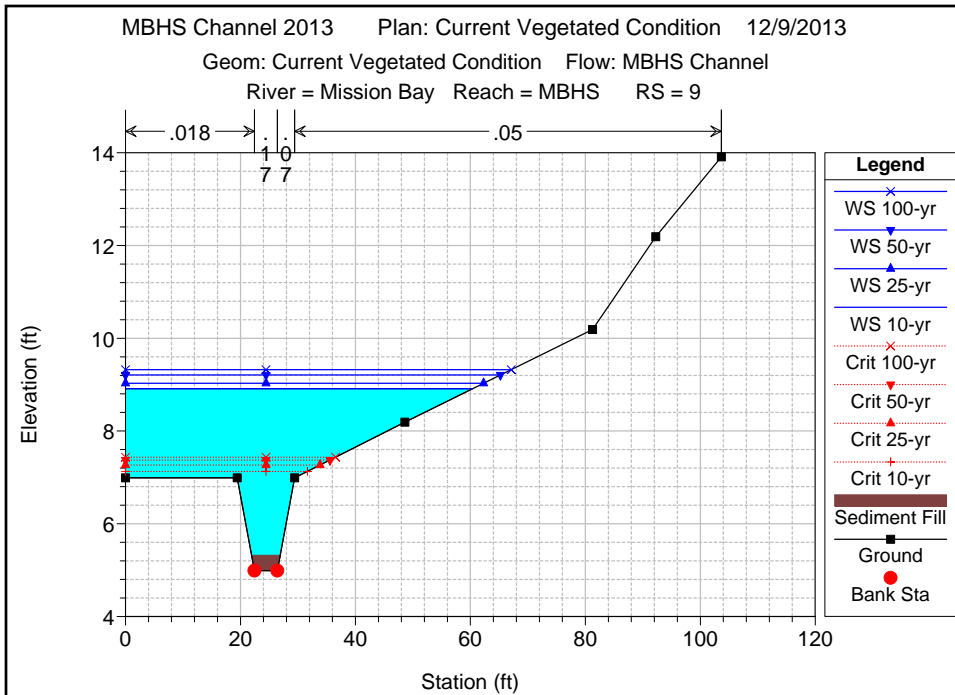


MBHS Channel 2013 Plan: Current Vegetated Condition 12/9/2013

Geom: Current Vegetated Condition Flow: MBHS Channel

River = Mission Bay Reach = MBHS RS = 14

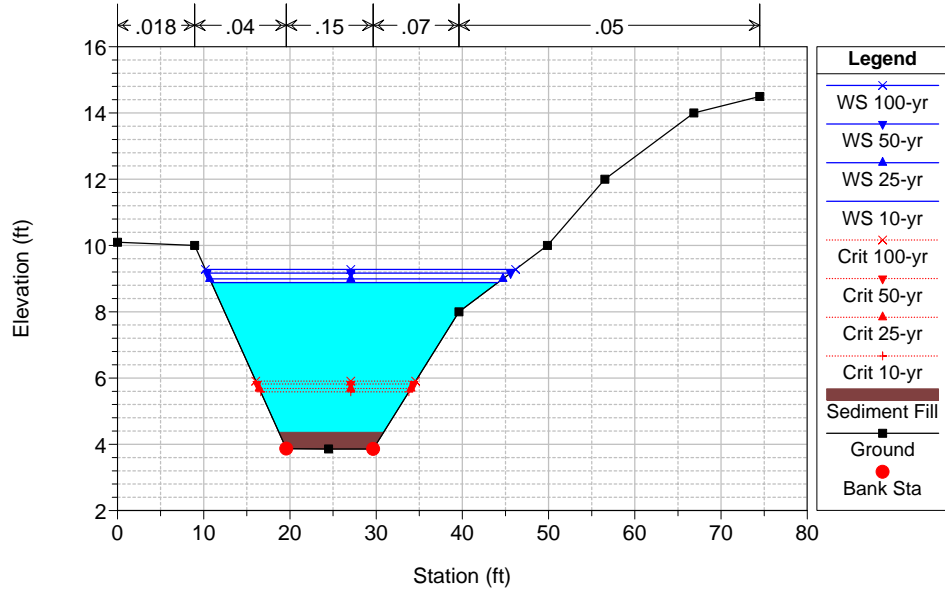




MBHS Channel 2013 Plan: Current Vegetated Condition 12/9/2013

Geom: Current Vegetated Condition Flow: MBHS Channel

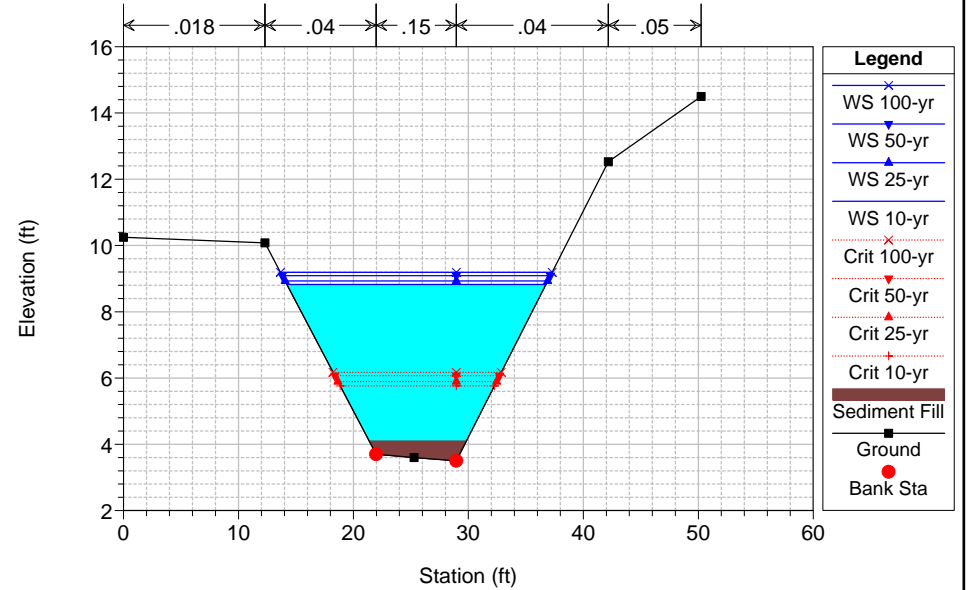
River = Mission Bay Reach = MBHS RS = 5



MBHS Channel 2013 Plan: Current Vegetated Condition 12/9/2013

Geom: Current Vegetated Condition Flow: MBHS Channel

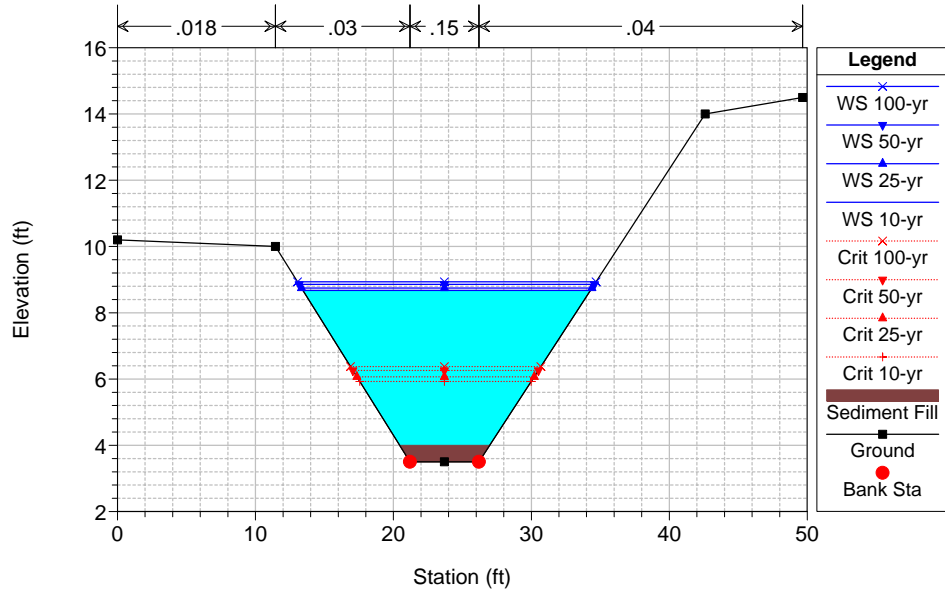
River = Mission Bay Reach = MBHS RS = 4



MBHS Channel 2013 Plan: Current Vegetated Condition 12/9/2013

Geom: Current Vegetated Condition Flow: MBHS Channel

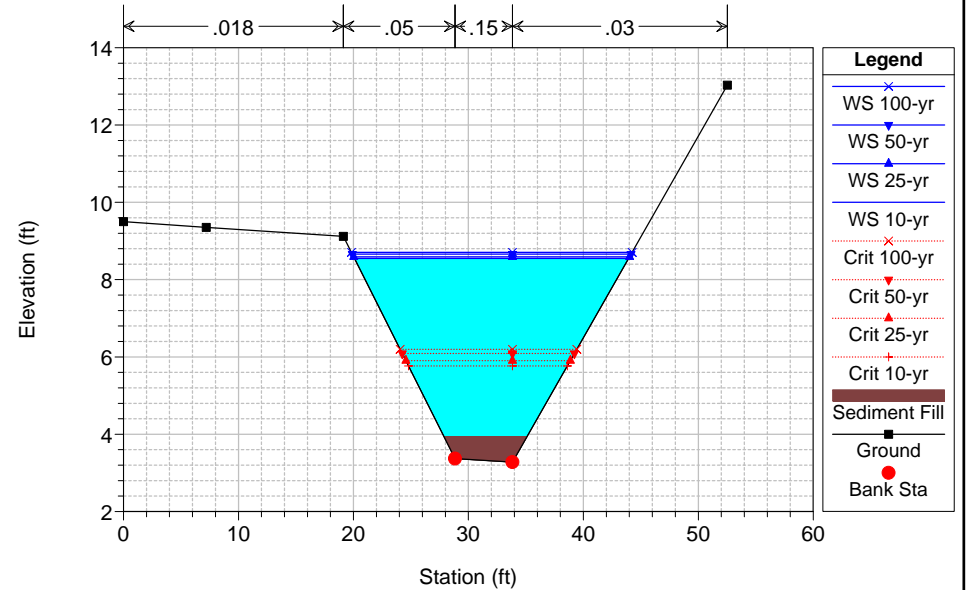
River = Mission Bay Reach = MBHS RS = 3



MBHS Channel 2013 Plan: Current Vegetated Condition 12/9/2013

Geom: Current Vegetated Condition Flow: MBHS Channel

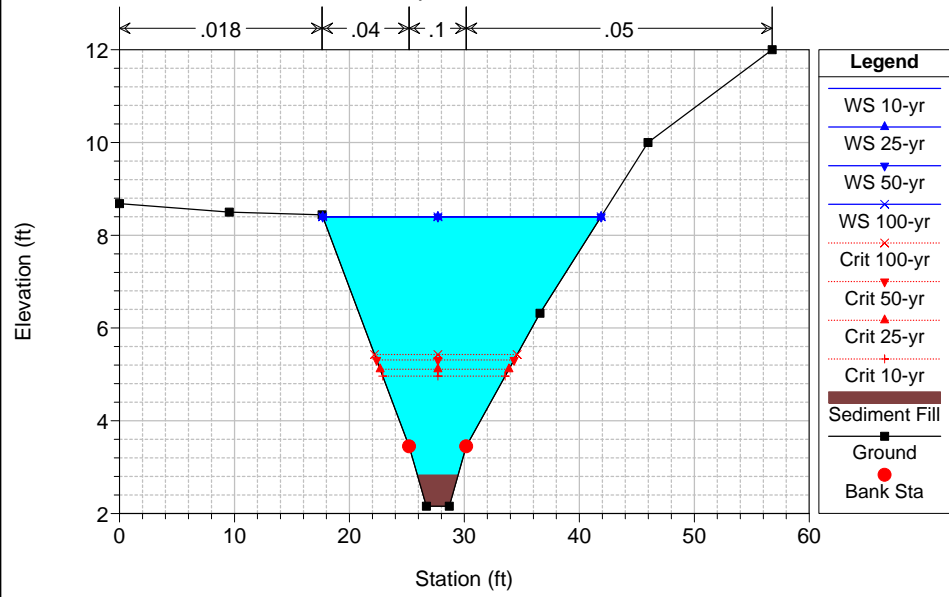
River = Mission Bay Reach = MBHS RS = 2



MBHS Channel 2013 Plan: Current Vegetated Condition 12/9/2013

Geom: Current Vegetated Condition Flow: MBHS Channel

River = Mission Bay Reach = MBHS RS = 1



**MAINTAINED CONDITION – NO SEDIMENT REMOVED (10-YEAR, 25-YEAR, 50-YEAR,
AND 100-YEAR)**

HEC-RAS Plan: Maintd-NoSedRmvd River: Mission Bay Reach: MBHS

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
MBHS	17	10-yr	28.43	7.26	9.13	8.45	9.26	0.000491	3.33	10.86	8.61	0.43
MBHS	17	25-yr	32.17	7.26	9.30	8.55	9.43	0.000436	3.33	12.47	13.25	0.41
MBHS	17	50-yr	37.61	7.26	9.51	8.66	9.62	0.000379	3.31	17.29	33.92	0.39
MBHS	17	100-yr	40.92	7.26	9.63	8.73	9.73	0.000338	3.24	22.06	41.46	0.37
MBHS	16	10-yr	28.43	7.19	9.12	8.38	9.24	0.000429	3.18	11.41	8.80	0.40
MBHS	16	25-yr	32.17	7.19	9.30	8.47	9.41	0.000375	3.16	13.59	19.93	0.38
MBHS	16	50-yr	37.61	7.19	9.51	8.59	9.61	0.000323	3.12	18.45	24.24	0.36
MBHS	16	100-yr	40.92	7.19	9.63	8.66	9.72	0.000295	3.08	21.37	24.48	0.35
MBHS	15	10-yr	28.43	6.98	9.12	8.17	9.20	0.000275	2.73	14.19	22.82	0.33
MBHS	15	25-yr	32.17	6.98	9.30	8.26	9.37	0.000230	2.63	19.09	27.34	0.30
MBHS	15	50-yr	37.61	6.98	9.51	8.38	9.57	0.000196	2.58	24.80	27.76	0.29
MBHS	15	100-yr	40.92	6.98	9.63	8.45	9.69	0.000180	2.54	28.15	28.00	0.28
MBHS	14	10-yr	28.43	6.72	9.11	7.91	9.17	0.000165	2.28	16.76	12.66	0.26
MBHS	14	25-yr	32.17	6.72	9.29	8.00	9.35	0.000153	2.30	19.06	13.02	0.25
MBHS	14	50-yr	37.61	6.72	9.49	8.12	9.55	0.000150	2.39	21.72	13.42	0.25
MBHS	14	100-yr	40.92	6.72	9.61	8.19	9.67	0.000148	2.44	23.30	13.66	0.25
MBHS	13	10-yr	68.65	6.70	8.45	8.45	9.10	0.002510	7.20	11.56	9.24	0.96
MBHS	13	25-yr	78.23	6.70	8.58	8.58	9.28	0.002451	7.47	12.82	9.64	0.96
MBHS	13	50-yr	92.20	6.70	8.85	8.85	9.49	0.001936	7.27	16.07	14.23	0.87
MBHS	13	100-yr	100.92	6.70	8.94	8.94	9.60	0.001946	7.48	17.32	14.40	0.88
MBHS	12	10-yr	70.02	5.67	8.64	7.44	8.71	0.000179	2.74	39.50	27.27	0.28
MBHS	12	25-yr	79.92	5.67	8.71	7.81	8.79	0.000207	2.99	41.33	27.40	0.30
MBHS	12	50-yr	94.47	5.67	8.81	7.95	8.91	0.000241	3.30	44.30	27.62	0.33
MBHS	12	100-yr	103.58	5.67	8.89	8.02	9.00	0.000257	3.46	46.32	27.77	0.34
MBHS	11	10-yr	70.02	5.04	8.64	6.81	8.67	0.000062	1.83	63.49	35.30	0.17
MBHS	11	25-yr	79.92	5.04	8.71	7.19	8.74	0.000073	2.01	65.86	35.67	0.19
MBHS	11	50-yr	94.47	5.04	8.82	7.33	8.86	0.000088	2.26	69.73	36.26	0.20
MBHS	11	100-yr	103.58	5.04	8.89	7.40	8.93	0.000096	2.39	72.38	36.66	0.21
MBHS	10	10-yr	70.02	5.01	8.64	6.78	8.67	0.000063	1.86	66.63	43.22	0.17
MBHS	10	25-yr	79.92	5.01	8.70	7.15	8.74	0.000075	2.05	69.52	44.37	0.19
MBHS	10	50-yr	94.47	5.01	8.81	7.29	8.85	0.000091	2.30	74.36	46.22	0.21
MBHS	10	100-yr	103.58	5.01	8.88	7.37	8.93	0.000099	2.44	77.74	47.47	0.22

HEC-RAS Plan: Maintd-NoSedRmvd River: Mission Bay Reach: MBHS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
MBHS	9	10-yr	70.02	4.99	8.64	7.03	8.66	0.000047	1.62	84.50	55.99	0.15
MBHS	9	25-yr	79.92	4.99	8.71	7.17	8.73	0.000056	1.78	88.30	57.09	0.16
MBHS	9	50-yr	94.47	4.99	8.82	7.29	8.85	0.000067	1.98	94.60	58.86	0.18
MBHS	9	100-yr	103.58	4.99	8.89	7.36	8.92	0.000072	2.09	98.96	60.06	0.19
MBHS	8	10-yr	70.02	4.88	8.64	7.00	8.66	0.000121	0.26	109.81	82.53	0.02
MBHS	8	25-yr	79.92	4.88	8.71	7.00	8.73	0.000138	0.28	115.41	82.87	0.03
MBHS	8	50-yr	94.47	4.88	8.82	7.26	8.85	0.000155	0.30	124.51	83.44	0.03
MBHS	8	100-yr	103.58	4.88	8.89	7.34	8.92	0.000163	0.32	130.68	83.81	0.03
MBHS	7	10-yr	79.68	4.92	8.65	5.77	8.66	0.000092	0.86	130.46	78.48	0.08
MBHS	7	25-yr	91.04	4.92	8.72	5.84	8.73	0.000109	0.95	135.84	79.00	0.09
MBHS	7	50-yr	107.72	4.92	8.83	5.95	8.84	0.000132	1.06	144.58	79.84	0.09
MBHS	7	100-yr	118.19	4.92	8.90	6.01	8.91	0.000145	1.12	150.51	80.41	0.10
MBHS	6	10-yr	79.68	4.74	8.64	5.64	8.65	0.000096	0.90	121.37	68.24	0.08
MBHS	6	25-yr	91.04	4.74	8.71	5.72	8.72	0.000115	1.00	126.00	68.75	0.09
MBHS	6	50-yr	107.72	4.74	8.82	5.84	8.84	0.000141	1.13	133.56	69.58	0.10
MBHS	6	100-yr	118.19	4.74	8.90	5.90	8.91	0.000155	1.20	138.69	70.13	0.10
MBHS	5	10-yr	79.68	4.36	8.63	5.41	8.65	0.000135	1.14	90.07	31.52	0.10
MBHS	5	25-yr	91.04	4.36	8.69	5.51	8.71	0.000166	1.27	92.10	31.96	0.11
MBHS	5	50-yr	107.72	4.36	8.80	5.64	8.82	0.000211	1.46	95.45	32.67	0.12
MBHS	5	100-yr	118.19	4.36	8.87	5.71	8.90	0.000238	1.57	97.76	33.15	0.13
MBHS	4	10-yr	89.40	4.10	8.60	5.51	8.63	0.000273	1.67	68.23	21.86	0.14
MBHS	4	25-yr	102.16	4.10	8.66	5.63	8.70	0.000339	1.88	69.46	22.03	0.16
MBHS	4	50-yr	120.90	4.10	8.75	5.80	8.80	0.000439	2.17	71.48	22.30	0.18
MBHS	4	100-yr	132.68	4.10	8.81	5.90	8.87	0.000501	2.34	72.87	22.49	0.19
MBHS	3	10-yr	89.40	4.00	8.53	5.59	8.57	0.000315	1.80	61.03	20.41	0.15
MBHS	3	25-yr	102.16	4.00	8.57	5.72	8.62	0.000397	2.04	61.81	20.52	0.17
MBHS	3	50-yr	120.90	4.00	8.63	5.91	8.70	0.000525	2.37	63.12	20.72	0.19
MBHS	3	100-yr	132.68	4.00	8.68	6.01	8.75	0.000608	2.56	64.04	20.85	0.21
MBHS	2	10-yr	89.40	3.94	8.47	5.45	8.50	0.000257	1.63	69.71	23.55	0.13
MBHS	2	25-yr	102.16	3.94	8.49	5.57	8.53	0.000329	1.85	70.21	23.63	0.15
MBHS	2	50-yr	120.90	3.94	8.53	5.75	8.58	0.000445	2.16	71.07	23.76	0.18

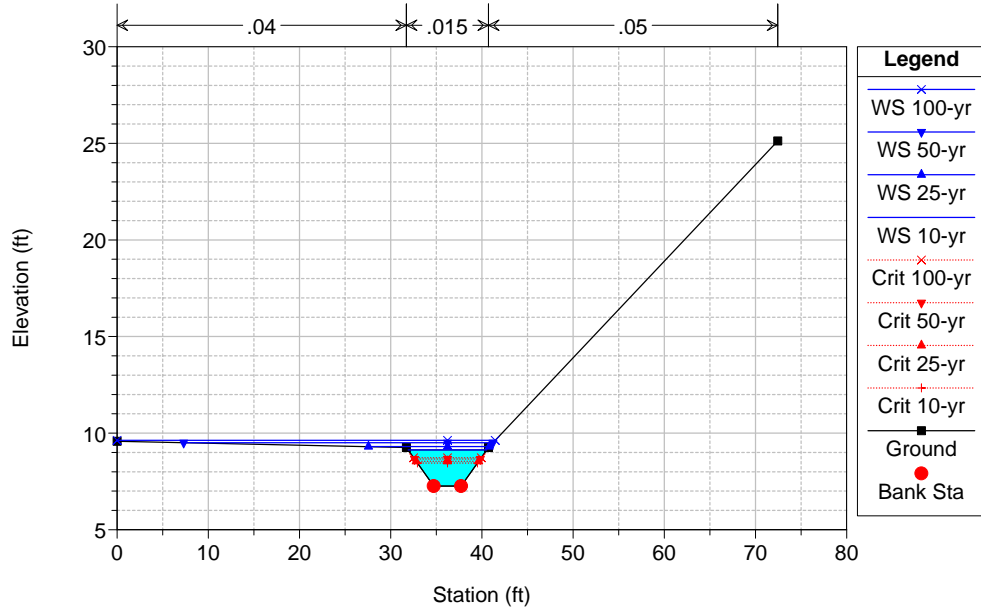
HEC-RAS Plan: Maintd-NoSedRmvd River: Mission Bay Reach: MBHS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
MBHS	2	100-yr	132.68	3.94	8.55	5.85	8.62	0.000524	2.36	71.68	23.85	0.19
MBHS	1	10-yr	96.45	2.83	8.40	5.09	8.44	0.000187	1.98	73.91	24.21	0.15
MBHS	1	25-yr	110.22	2.83	8.40	5.25	8.45	0.000244	2.27	73.91	24.21	0.17
MBHS	1	50-yr	130.46	2.83	8.40	5.48	8.47	0.000342	2.68	73.91	24.21	0.20
MBHS	1	100-yr	143.17	2.83	8.40	5.61	8.49	0.000412	2.94	73.91	24.21	0.22

MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

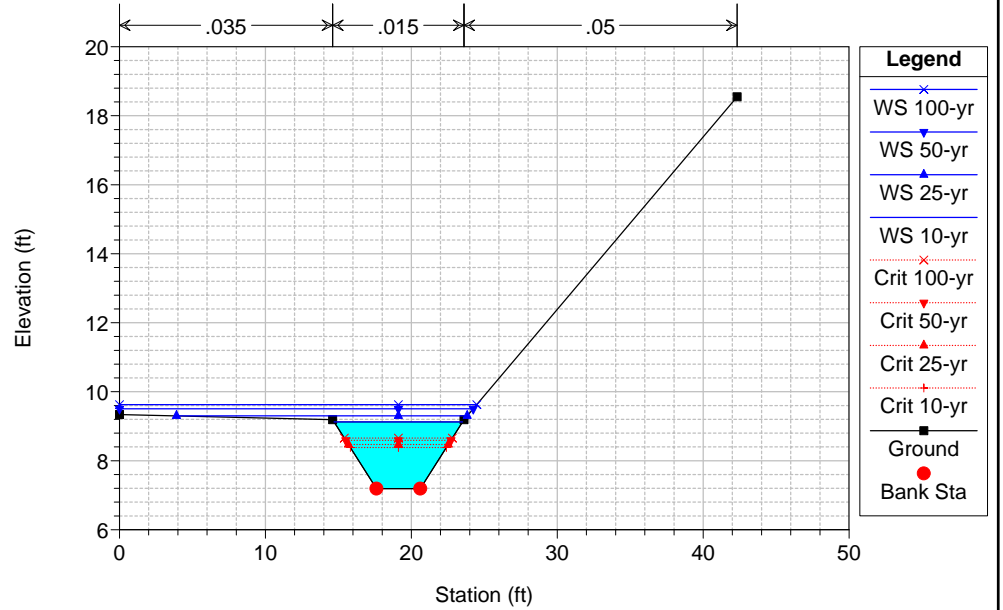
River = Mission Bay Reach = MBHS RS = 17



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

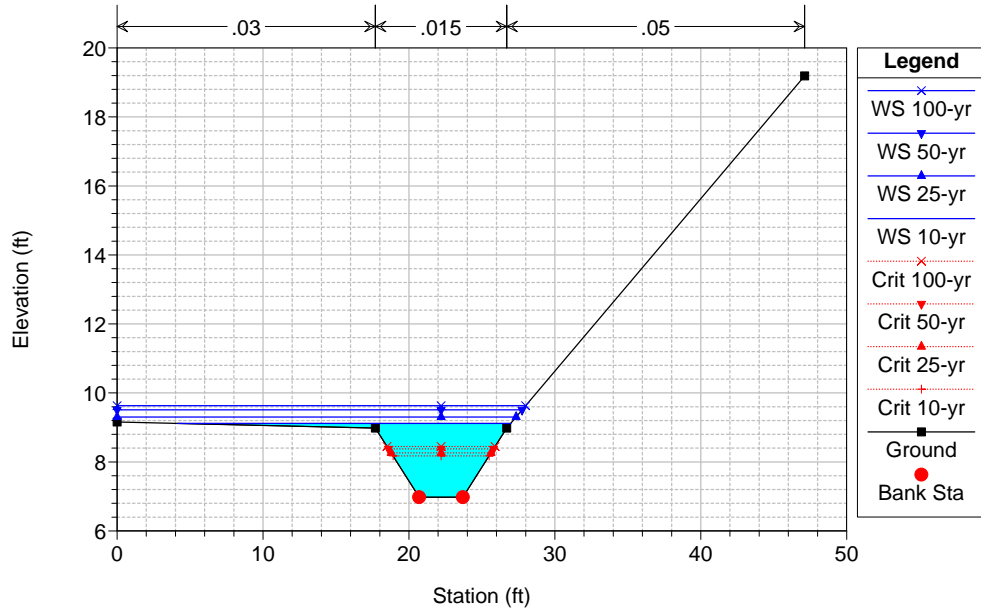
River = Mission Bay Reach = MBHS RS = 16



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

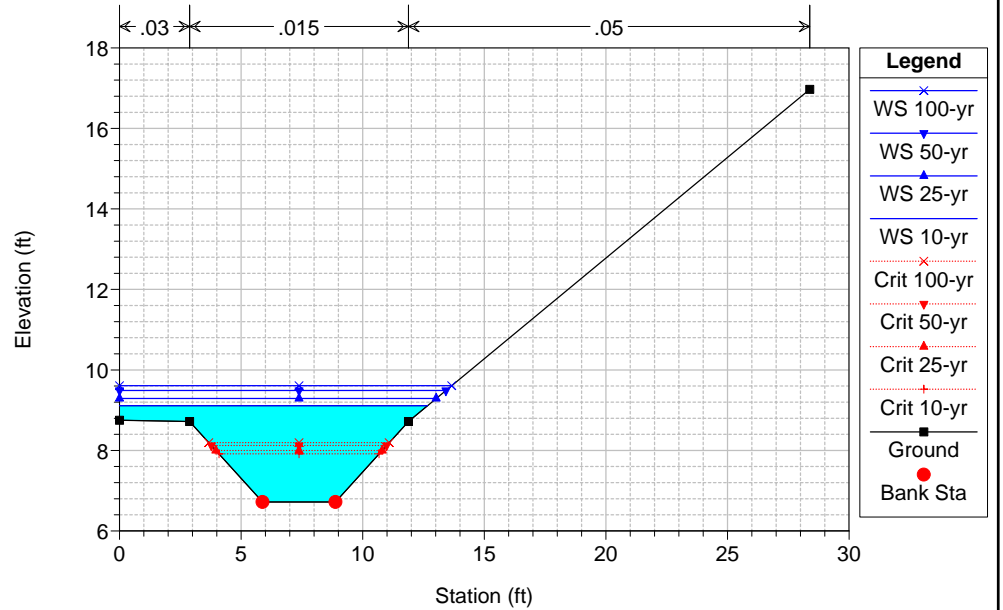
River = Mission Bay Reach = MBHS RS = 15



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

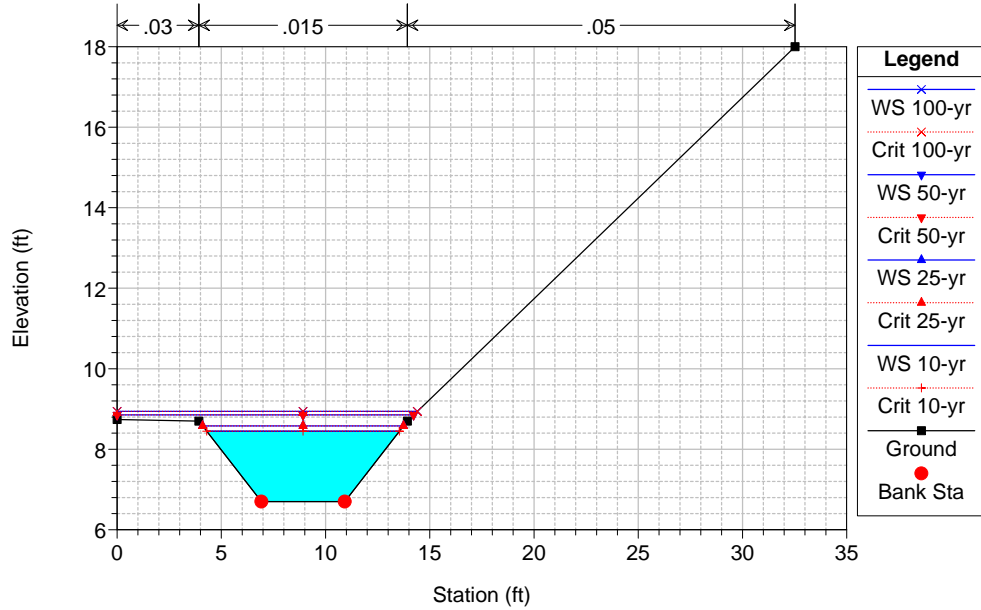
River = Mission Bay Reach = MBHS RS = 14



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

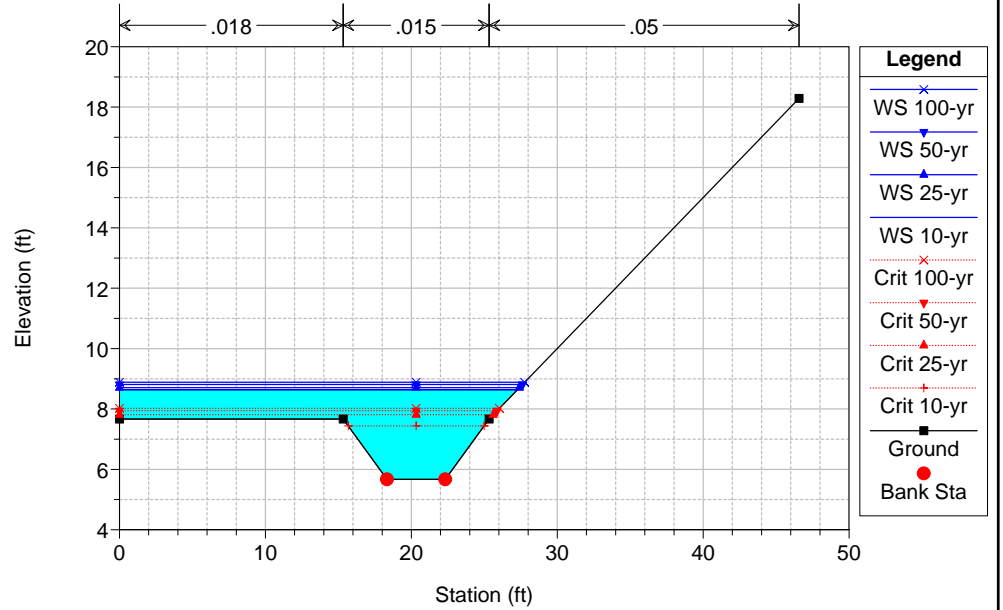
River = Mission Bay Reach = MBHS RS = 13



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

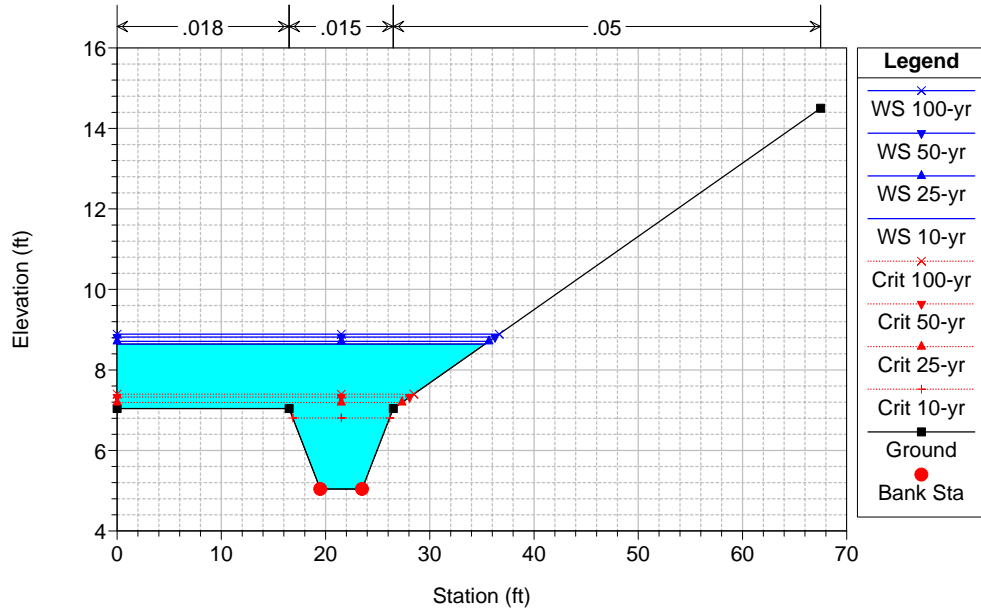
River = Mission Bay Reach = MBHS RS = 12



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

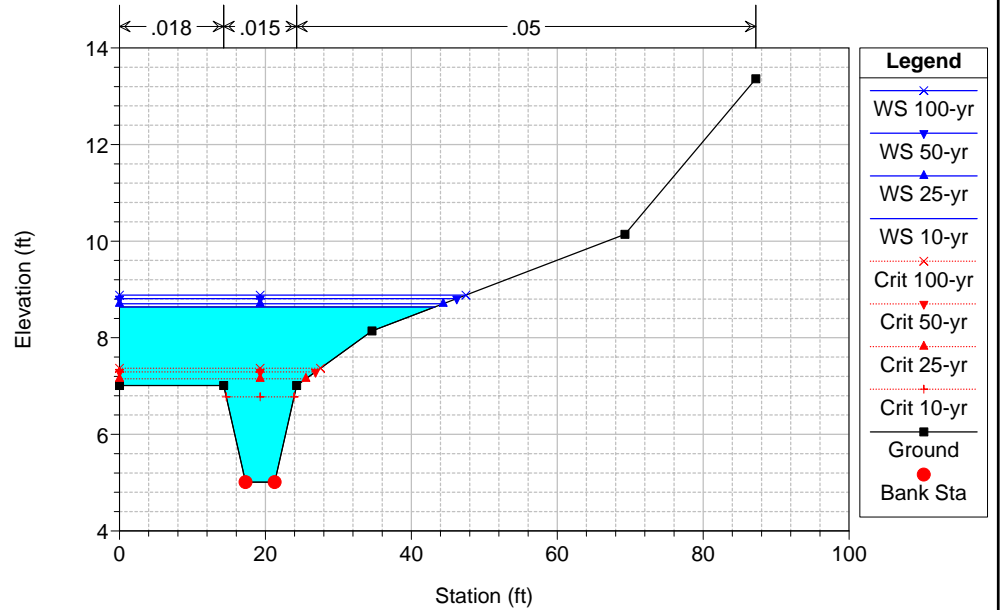
River = Mission Bay Reach = MBHS RS = 11



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

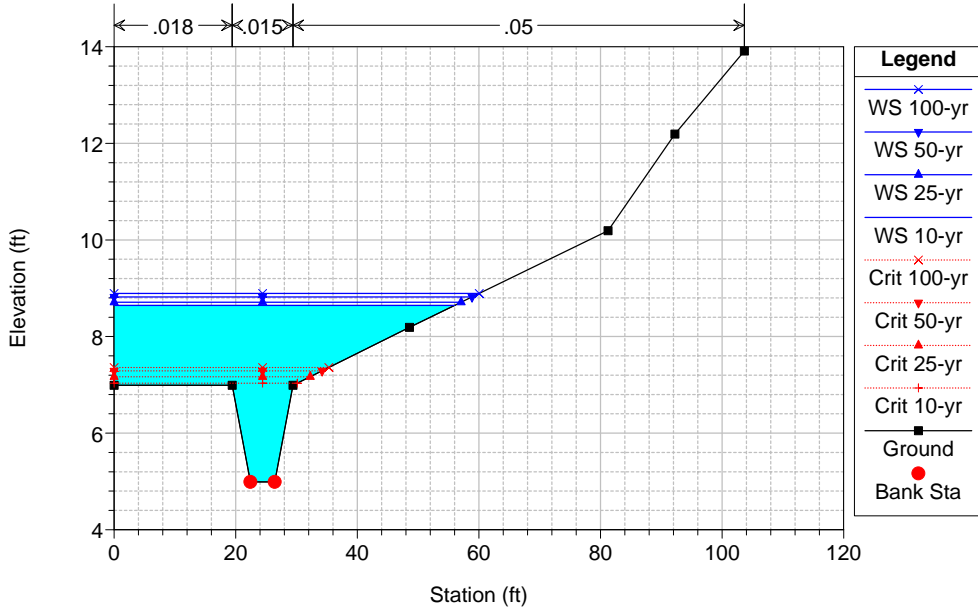
River = Mission Bay Reach = MBHS RS = 10



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

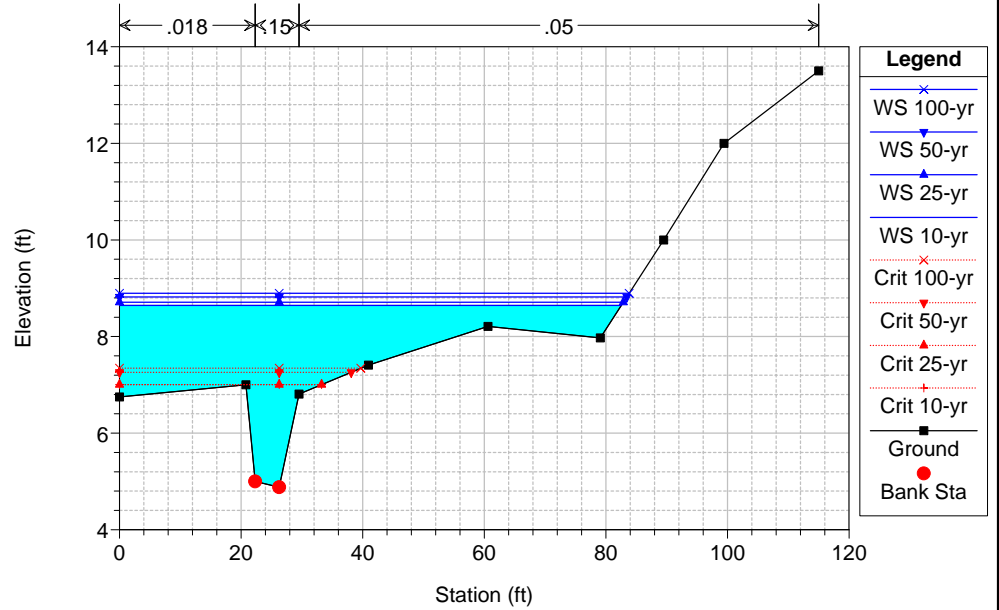
River = Mission Bay Reach = MBHS RS = 9



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

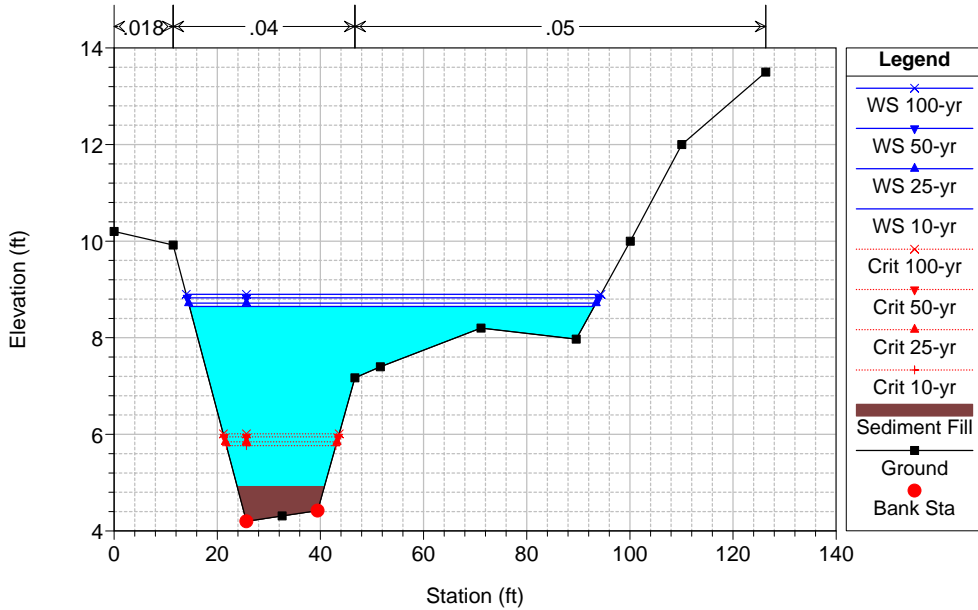
River = Mission Bay Reach = MBHS RS = 8



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

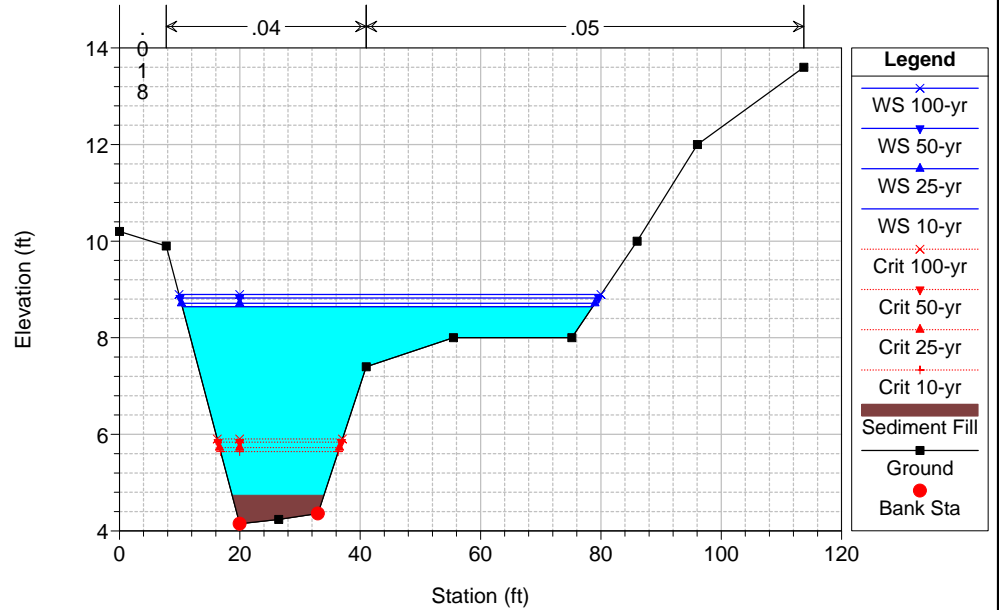
River = Mission Bay Reach = MBHS RS = 7



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

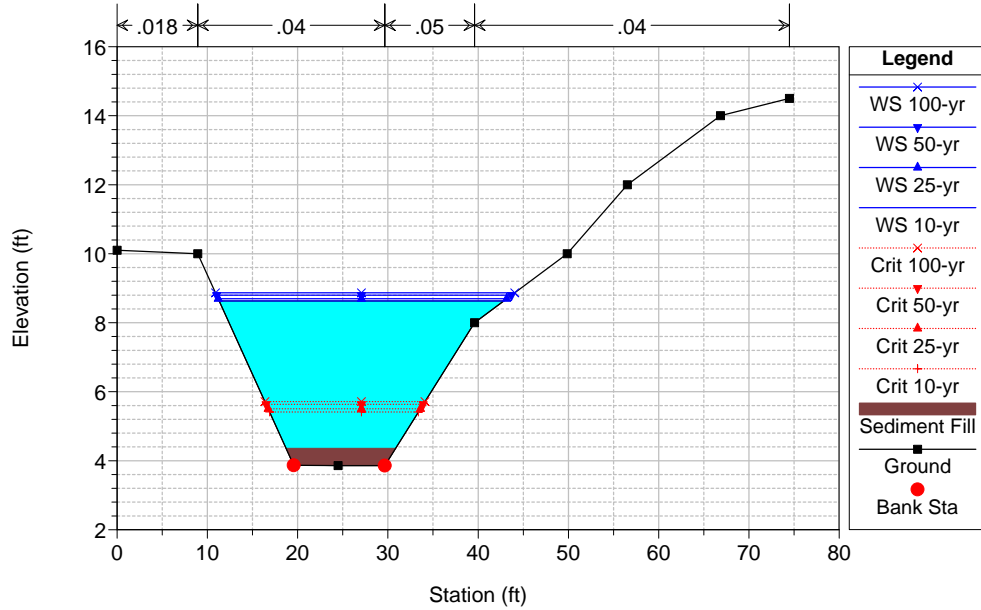
River = Mission Bay Reach = MBHS RS = 6



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

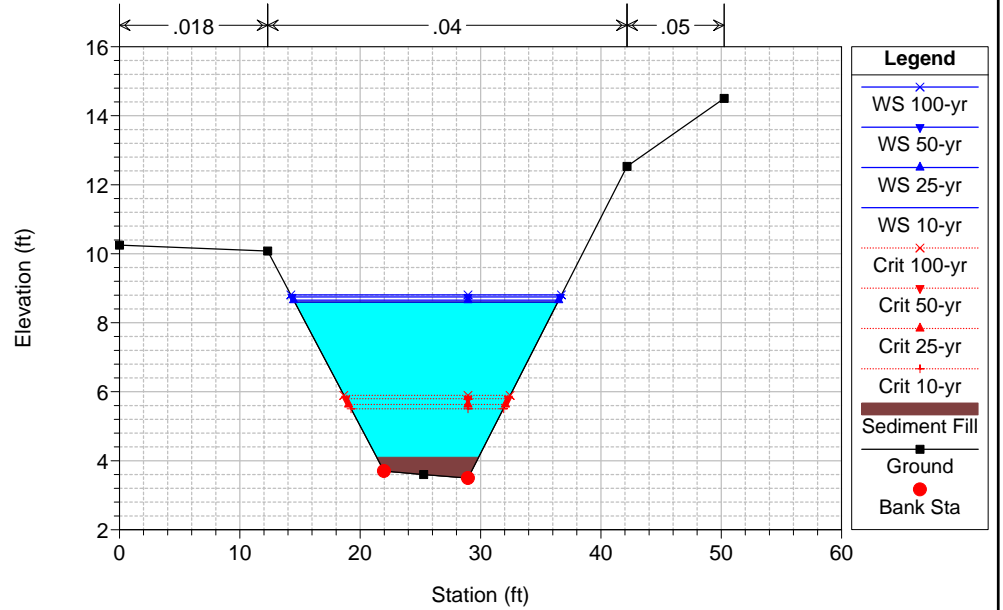
River = Mission Bay Reach = MBHS RS = 5



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

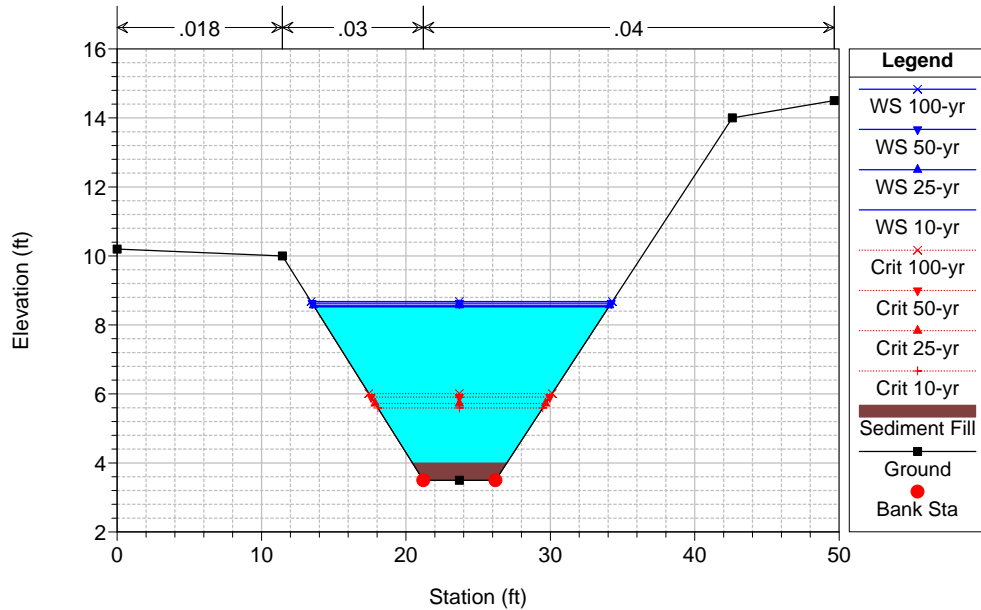
River = Mission Bay Reach = MBHS RS = 4



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

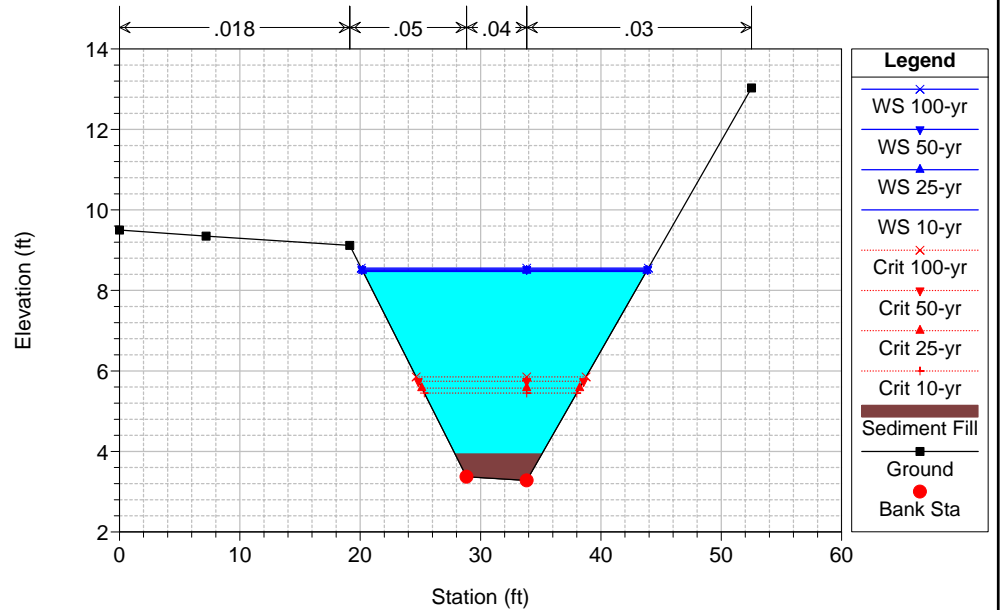
River = Mission Bay Reach = MBHS RS = 3



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

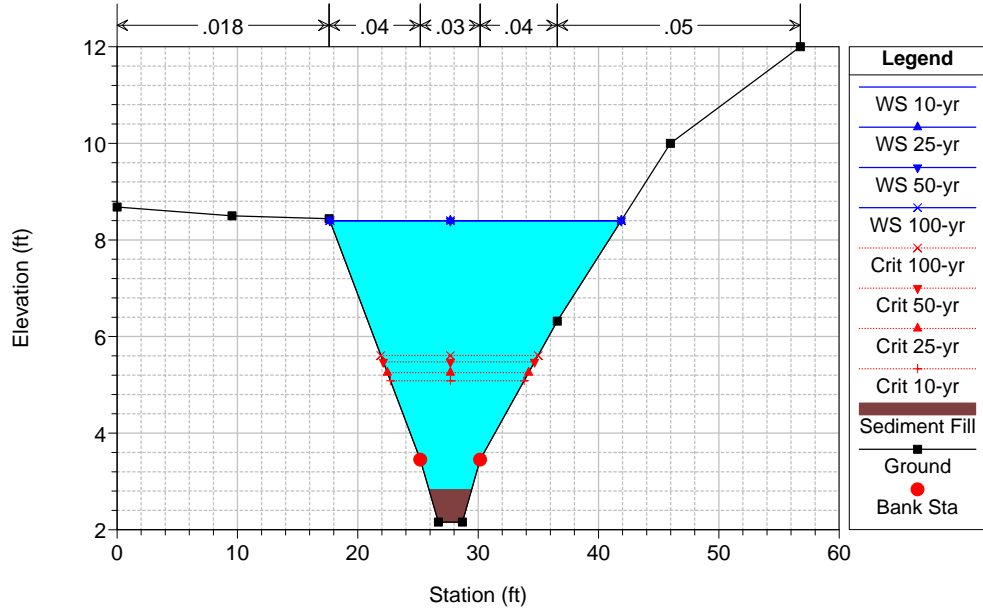
River = Mission Bay Reach = MBHS RS = 2



MBHS Channel 2013 Plan: Maintained-No Sediment Removed 12/9/2013

Geom: Maintained-No Sediment Removed Flow: MBHS Channel

River = Mission Bay Reach = MBHS RS = 1



MAINTAINED CONDITION –SEDIMENT CONDITION (10-YEAR, 25-YEAR, 50-YEAR, AND 100-YEAR

HEC-RAS Plan: Maintd-SedRemved River: Mission Bay Reach: MBHS

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
MBHS	17	10-yr	28.43	7.26	9.13	8.45	9.26	0.000491	3.33	10.86	8.61	0.43
MBHS	17	25-yr	32.17	7.26	9.30	8.55	9.43	0.000436	3.33	12.47	13.25	0.41
MBHS	17	50-yr	37.61	7.26	9.51	8.66	9.62	0.000379	3.31	17.29	33.92	0.39
MBHS	17	100-yr	40.92	7.26	9.63	8.73	9.73	0.000338	3.24	22.06	41.46	0.37
MBHS	16	10-yr	28.43	7.19	9.12	8.38	9.24	0.000429	3.18	11.41	8.80	0.40
MBHS	16	25-yr	32.17	7.19	9.30	8.47	9.41	0.000375	3.16	13.59	19.93	0.38
MBHS	16	50-yr	37.61	7.19	9.51	8.59	9.61	0.000323	3.12	18.45	24.24	0.36
MBHS	16	100-yr	40.92	7.19	9.63	8.66	9.72	0.000295	3.08	21.37	24.48	0.35
MBHS	15	10-yr	28.43	6.98	9.12	8.17	9.20	0.000275	2.73	14.19	22.82	0.33
MBHS	15	25-yr	32.17	6.98	9.30	8.26	9.37	0.000230	2.63	19.09	27.34	0.30
MBHS	15	50-yr	37.61	6.98	9.51	8.38	9.57	0.000196	2.58	24.80	27.76	0.29
MBHS	15	100-yr	40.92	6.98	9.63	8.45	9.69	0.000180	2.54	28.15	28.00	0.28
MBHS	14	10-yr	28.43	6.72	9.11	7.91	9.17	0.000165	2.28	16.76	12.66	0.26
MBHS	14	25-yr	32.17	6.72	9.29	8.00	9.35	0.000153	2.30	19.06	13.02	0.25
MBHS	14	50-yr	37.61	6.72	9.49	8.12	9.55	0.000150	2.39	21.72	13.42	0.25
MBHS	14	100-yr	40.92	6.72	9.61	8.19	9.67	0.000148	2.44	23.30	13.66	0.25
MBHS	13	10-yr	68.65	6.70	8.45	8.45	9.10	0.002510	7.20	11.56	9.24	0.96
MBHS	13	25-yr	78.23	6.70	8.58	8.58	9.28	0.002451	7.47	12.82	9.64	0.96
MBHS	13	50-yr	92.20	6.70	8.85	8.85	9.49	0.001936	7.27	16.07	14.23	0.87
MBHS	13	100-yr	100.92	6.70	8.94	8.94	9.60	0.001946	7.48	17.32	14.40	0.88
MBHS	12	10-yr	70.02	5.67	8.53	7.44	8.62	0.000219	2.95	36.58	27.05	0.31
MBHS	12	25-yr	79.92	5.67	8.57	7.81	8.67	0.000265	3.28	37.66	27.13	0.34
MBHS	12	50-yr	94.47	5.67	8.64	7.95	8.77	0.000327	3.70	39.48	27.27	0.38
MBHS	12	100-yr	103.58	5.67	8.69	8.02	8.83	0.000362	3.93	40.76	27.36	0.40
MBHS	11	10-yr	70.02	5.04	8.54	6.81	8.57	0.000072	1.93	59.76	34.72	0.18
MBHS	11	25-yr	79.92	5.04	8.58	7.19	8.61	0.000088	2.16	61.15	34.94	0.20
MBHS	11	50-yr	94.47	5.04	8.64	7.33	8.69	0.000112	2.46	63.50	35.30	0.23
MBHS	11	100-yr	103.58	5.04	8.69	7.40	8.75	0.000126	2.64	65.15	35.56	0.24
MBHS	10	10-yr	70.02	5.01	8.53	6.78	8.56	0.000074	1.97	62.10	41.37	0.19
MBHS	10	25-yr	79.92	5.01	8.57	7.15	8.61	0.000091	2.20	63.72	42.04	0.21
MBHS	10	50-yr	94.47	5.01	8.63	7.29	8.69	0.000116	2.52	66.50	43.17	0.23
MBHS	10	100-yr	103.58	5.01	8.68	7.37	8.74	0.000131	2.69	68.48	43.96	0.25

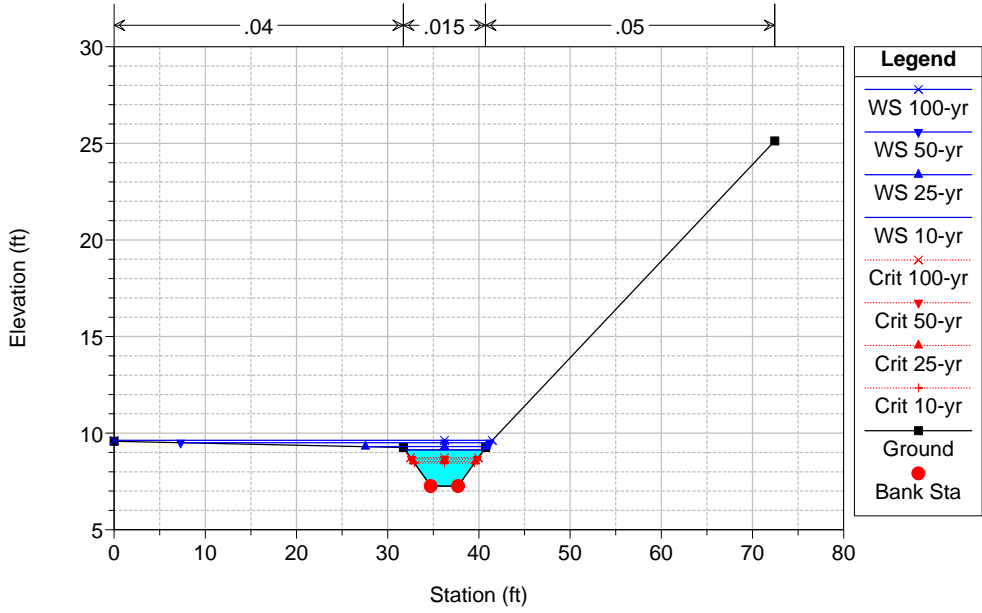
HEC-RAS Plan: Maintd-SedRemved River: Mission Bay Reach: MBHS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
MBHS	9	10-yr	70.02	4.99	8.54	7.03	8.56	0.000056	1.72	78.63	54.25	0.16
MBHS	9	25-yr	79.92	4.99	8.58	7.17	8.60	0.000068	1.91	80.84	54.91	0.18
MBHS	9	50-yr	94.47	4.99	8.64	7.29	8.68	0.000086	2.18	84.59	56.01	0.20
MBHS	9	100-yr	103.58	4.99	8.69	7.36	8.73	0.000096	2.33	87.25	56.79	0.21
MBHS	8	10-yr	70.02	4.88	8.54	7.08	8.56	0.000048	1.61	101.25	81.99	0.15
MBHS	8	25-yr	79.92	4.88	8.58	7.17	8.60	0.000058	1.79	104.64	82.20	0.17
MBHS	8	50-yr	94.47	4.88	8.65	7.28	8.68	0.000073	2.02	110.32	82.56	0.19
MBHS	8	100-yr	103.58	4.88	8.70	7.33	8.73	0.000081	2.15	114.30	82.81	0.20
MBHS	7	10-yr	79.68	4.20	8.54	5.27	8.55	0.000045	0.86	131.79	77.69	0.07
MBHS	7	25-yr	91.04	4.20	8.59	5.35	8.60	0.000055	0.97	135.08	78.01	0.08
MBHS	7	50-yr	107.72	4.20	8.66	5.47	8.67	0.000072	1.12	140.58	78.55	0.09
MBHS	7	100-yr	118.19	4.20	8.71	5.54	8.72	0.000081	1.20	144.42	78.92	0.10
MBHS	6	10-yr	79.68	4.15	8.54	5.25	8.55	0.000049	0.92	121.38	67.47	0.08
MBHS	6	25-yr	91.04	4.15	8.58	5.33	8.60	0.000061	1.03	124.20	67.78	0.09
MBHS	6	50-yr	107.72	4.15	8.65	5.46	8.67	0.000079	1.19	128.92	68.31	0.10
MBHS	6	100-yr	118.19	4.15	8.70	5.53	8.72	0.000091	1.28	132.23	68.67	0.11
MBHS	5	10-yr	79.68	3.86	8.53	5.03	8.55	0.000060	1.07	92.60	30.86	0.09
MBHS	5	25-yr	91.04	3.86	8.57	5.13	8.59	0.000075	1.21	93.82	31.13	0.10
MBHS	5	50-yr	107.72	3.86	8.64	5.27	8.66	0.000099	1.40	95.87	31.58	0.11
MBHS	5	100-yr	118.19	3.86	8.68	5.35	8.71	0.000114	1.51	97.32	31.90	0.12
MBHS	4	10-yr	89.40	3.50	8.51	5.16	8.54	0.000133	1.65	70.14	21.59	0.13
MBHS	4	25-yr	102.16	3.50	8.54	5.30	8.58	0.000169	1.87	70.84	21.69	0.15
MBHS	4	50-yr	120.90	3.50	8.59	5.48	8.65	0.000226	2.18	72.02	21.85	0.17
MBHS	4	100-yr	132.68	3.50	8.63	5.59	8.70	0.000264	2.36	72.84	21.96	0.19
MBHS	3	10-yr	89.40	3.50	8.47	5.34	8.51	0.000182	1.94	62.60	20.21	0.15
MBHS	3	25-yr	102.16	3.50	8.49	5.49	8.54	0.000234	2.21	63.01	20.27	0.17
MBHS	3	50-yr	120.90	3.50	8.52	5.69	8.59	0.000318	2.59	63.70	20.38	0.20
MBHS	3	100-yr	132.68	3.50	8.54	5.80	8.63	0.000375	2.82	64.19	20.45	0.22
MBHS	2	10-yr	89.40	3.28	8.44	5.12	8.47	0.000133	1.69	72.73	23.44	0.13
MBHS	2	25-yr	102.16	3.28	8.45	5.26	8.49	0.000172	1.93	73.01	23.48	0.15
MBHS	2	50-yr	120.90	3.28	8.47	5.44	8.52	0.000237	2.27	73.48	23.55	0.18

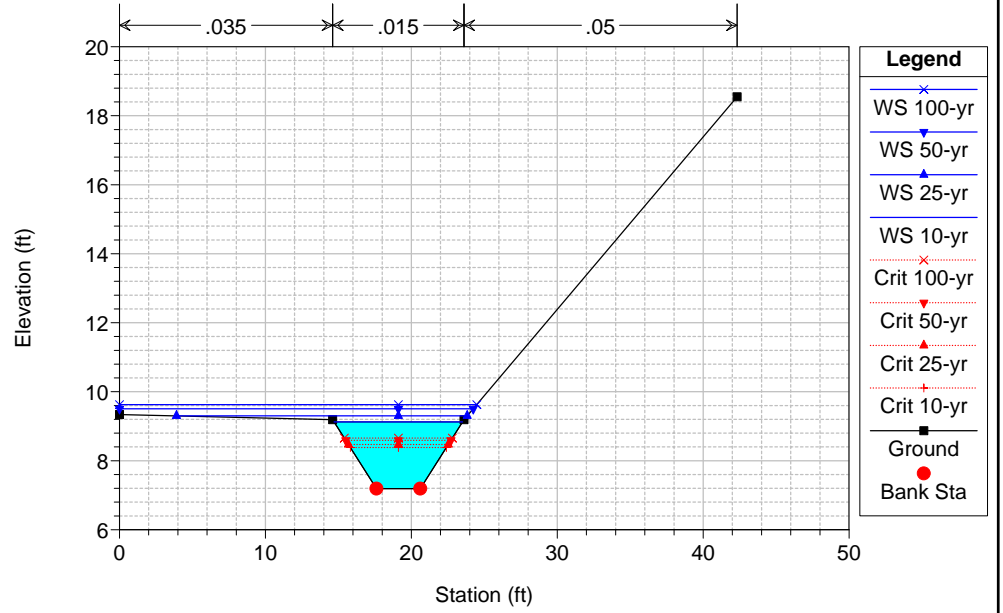
HEC-RAS Plan: Maintd-SedRemved River: Mission Bay Reach: MBHS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
MBHS	2	100-yr	132.68	3.28	8.48	5.56	8.55	0.000282	2.48	73.82	23.61	0.19
MBHS	1	10-yr	96.45	2.16	8.40	4.81	8.43	0.000137	1.67	75.77	24.21	0.12
MBHS	1	25-yr	110.22	2.16	8.40	4.98	8.44	0.000179	1.91	75.77	24.21	0.14
MBHS	1	50-yr	130.46	2.16	8.40	5.22	8.46	0.000250	2.26	75.77	24.21	0.16
MBHS	1	100-yr	143.17	2.16	8.40	5.36	8.47	0.000302	2.48	75.77	24.21	0.18

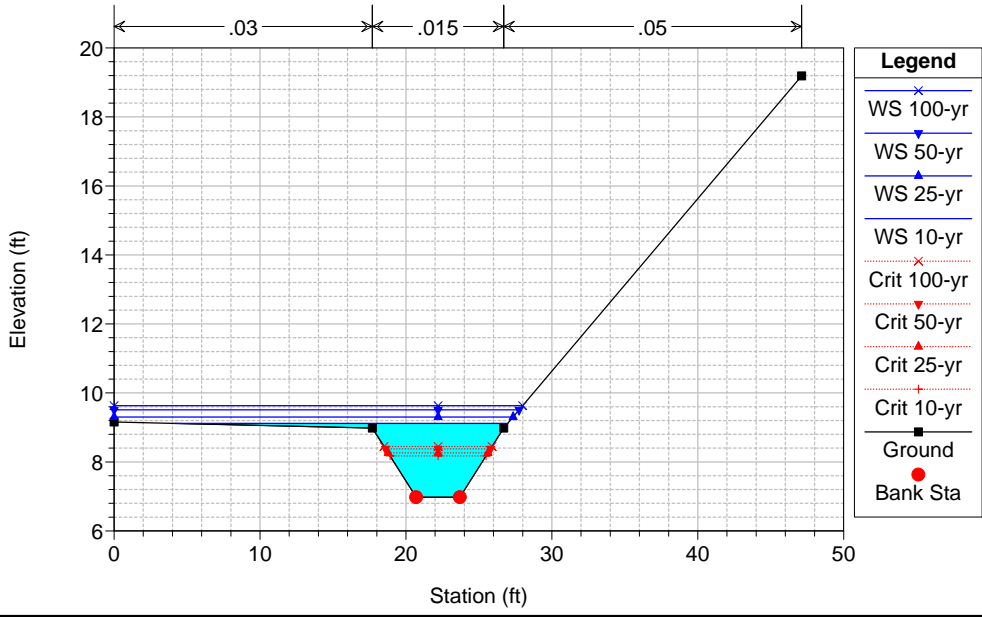
MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013
 Geom: Maintained - Sediment Removed Flow: MBHS Channel
 River = Mission Bay Reach = MBHS RS = 17



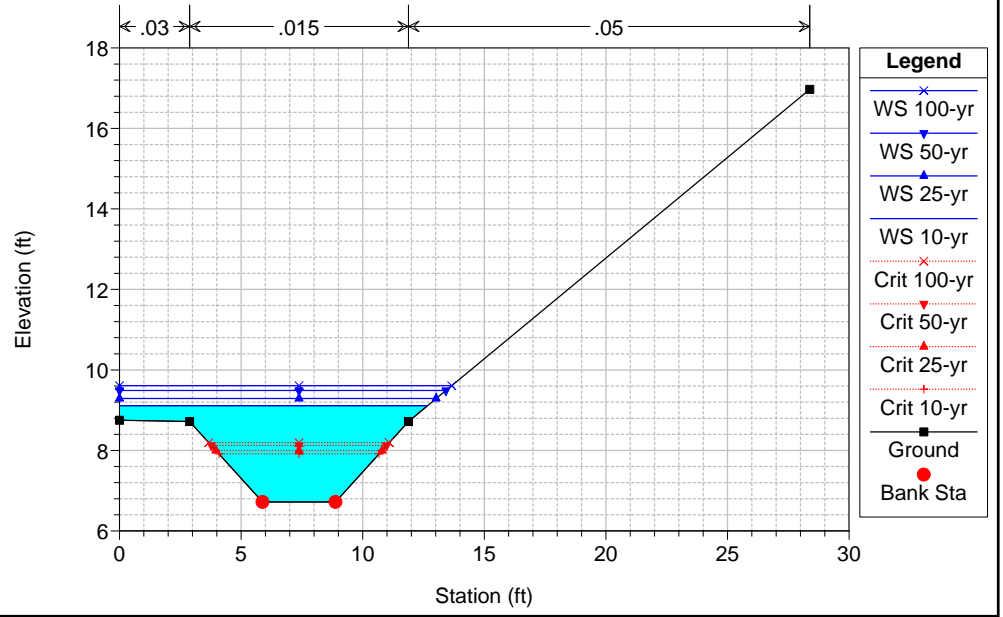
MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013
 Geom: Maintained - Sediment Removed Flow: MBHS Channel
 River = Mission Bay Reach = MBHS RS = 16



MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013
 Geom: Maintained - Sediment Removed Flow: MBHS Channel
 River = Mission Bay Reach = MBHS RS = 15



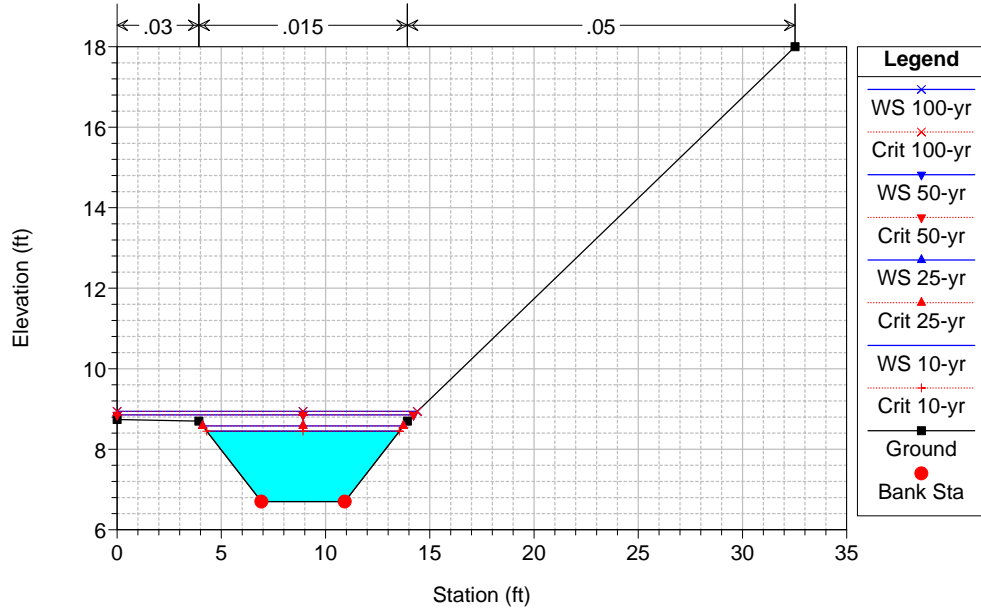
MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013
 Geom: Maintained - Sediment Removed Flow: MBHS Channel
 River = Mission Bay Reach = MBHS RS = 14



MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013

Geom: Maintained - Sediment Removed Flow: MBHS Channel

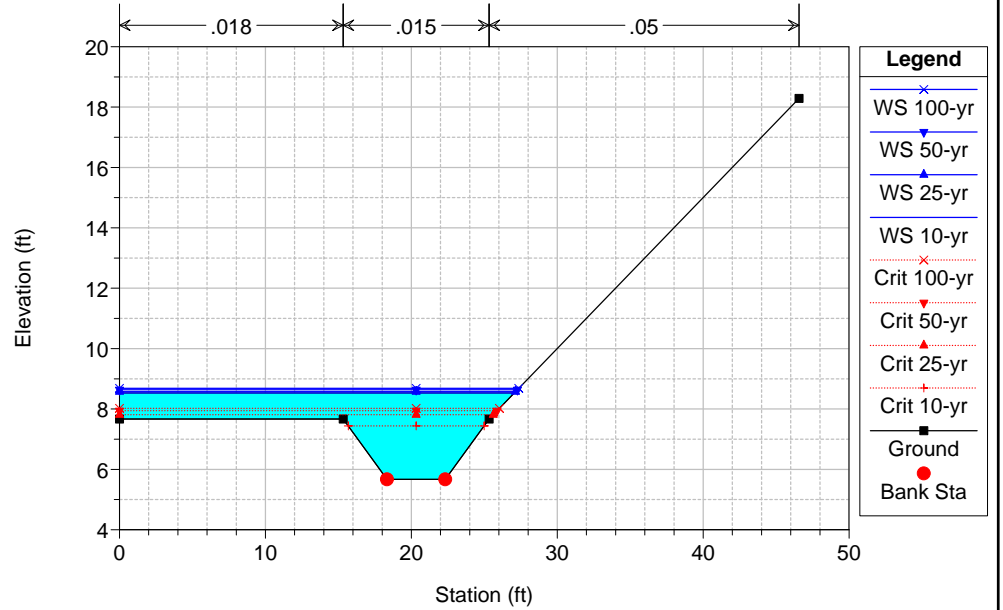
River = Mission Bay Reach = MBHS RS = 13



MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013

Geom: Maintained - Sediment Removed Flow: MBHS Channel

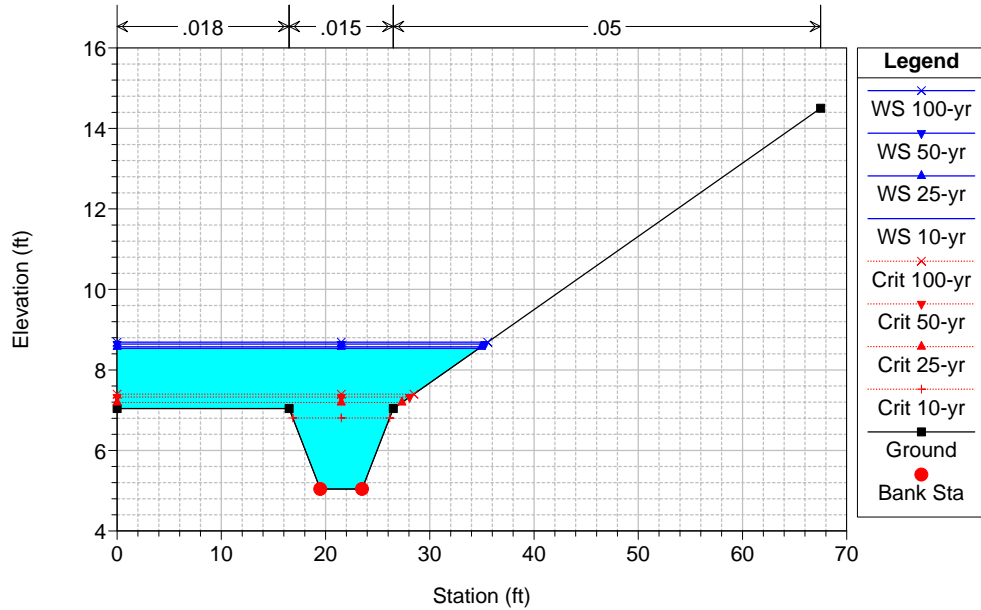
River = Mission Bay Reach = MBHS RS = 12



MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013

Geom: Maintained - Sediment Removed Flow: MBHS Channel

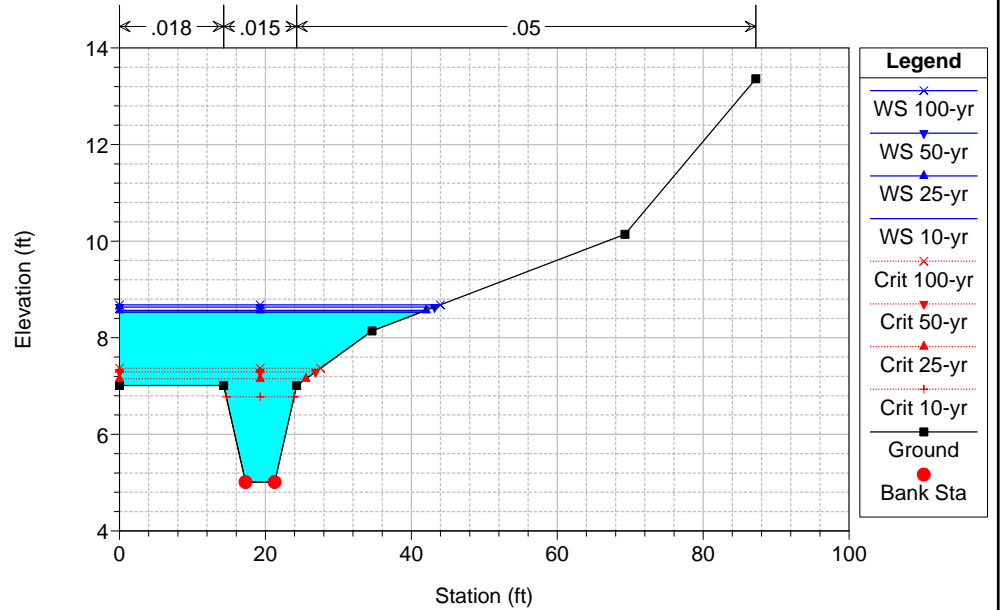
River = Mission Bay Reach = MBHS RS = 11



MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013

Geom: Maintained - Sediment Removed Flow: MBHS Channel

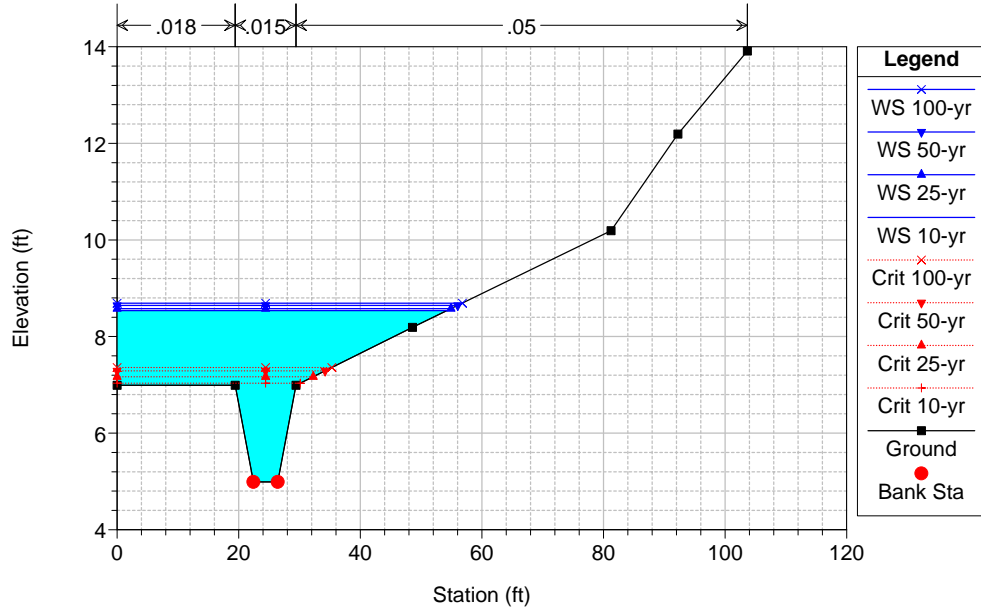
River = Mission Bay Reach = MBHS RS = 10



MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013

Geom: Maintained - Sediment Removed Flow: MBHS Channel

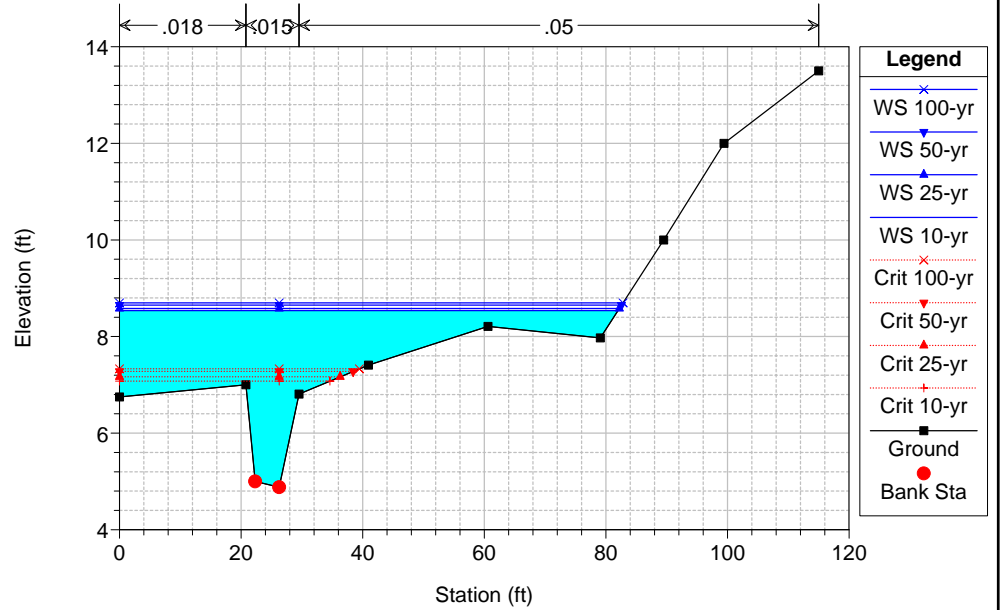
River = Mission Bay Reach = MBHS RS = 9



MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013

Geom: Maintained - Sediment Removed Flow: MBHS Channel

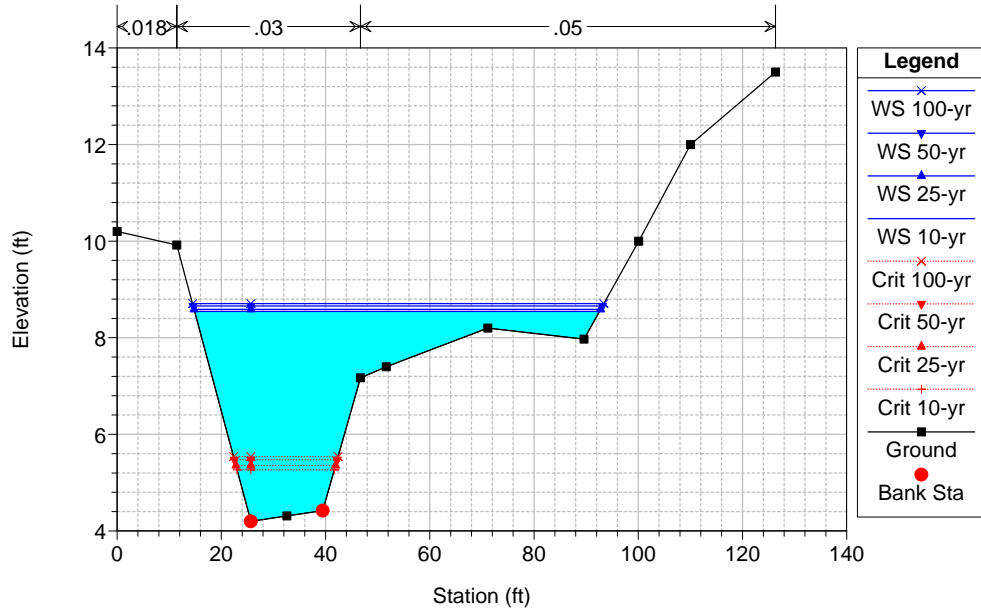
River = Mission Bay Reach = MBHS RS = 8



MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013

Geom: Maintained - Sediment Removed Flow: MBHS Channel

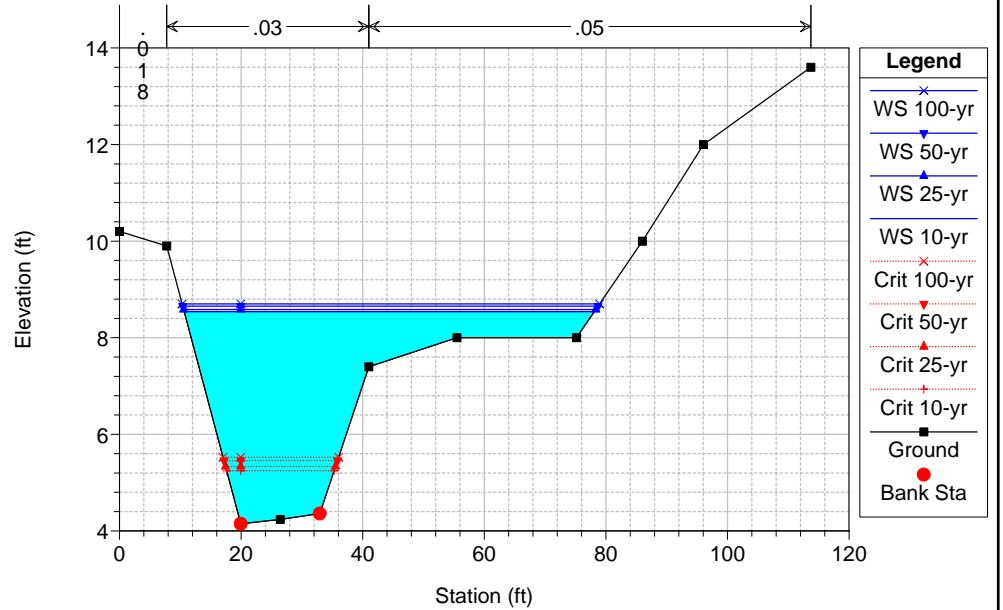
River = Mission Bay Reach = MBHS RS = 7



MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013

Geom: Maintained - Sediment Removed Flow: MBHS Channel

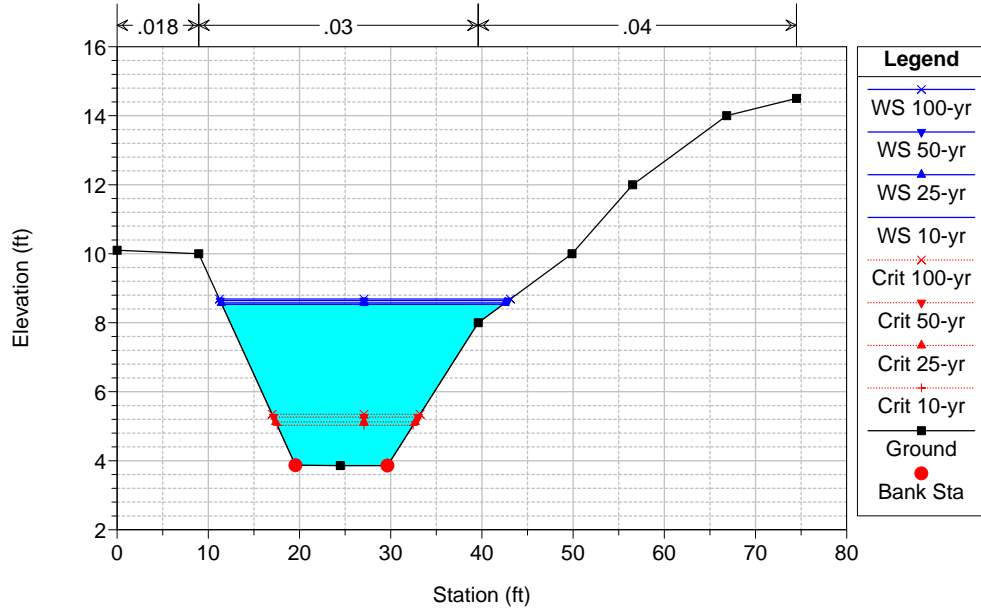
River = Mission Bay Reach = MBHS RS = 6



MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013

Geom: Maintained - Sediment Removed Flow: MBHS Channel

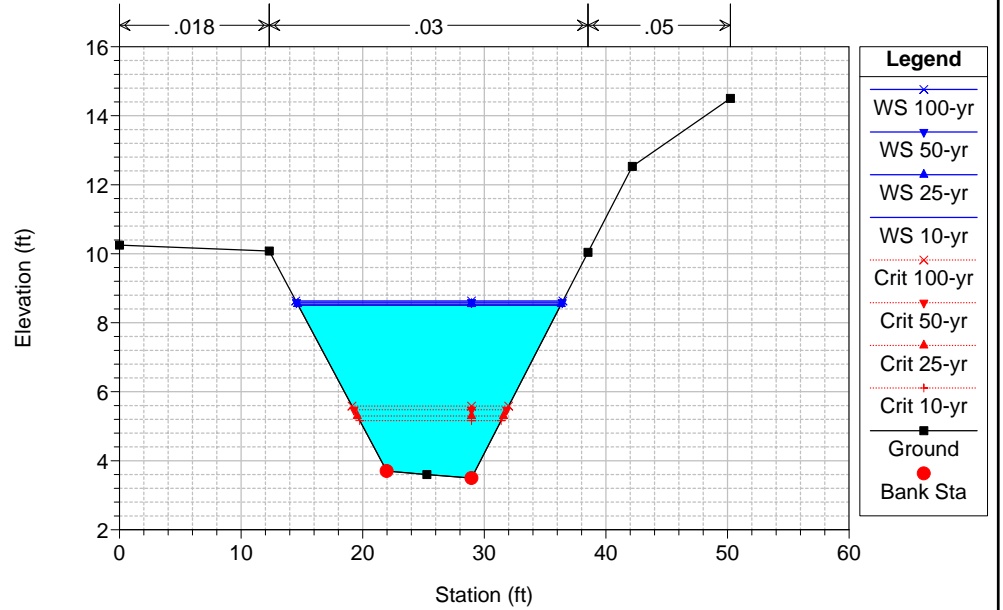
River = Mission Bay Reach = MBHS RS = 5



MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013

Geom: Maintained - Sediment Removed Flow: MBHS Channel

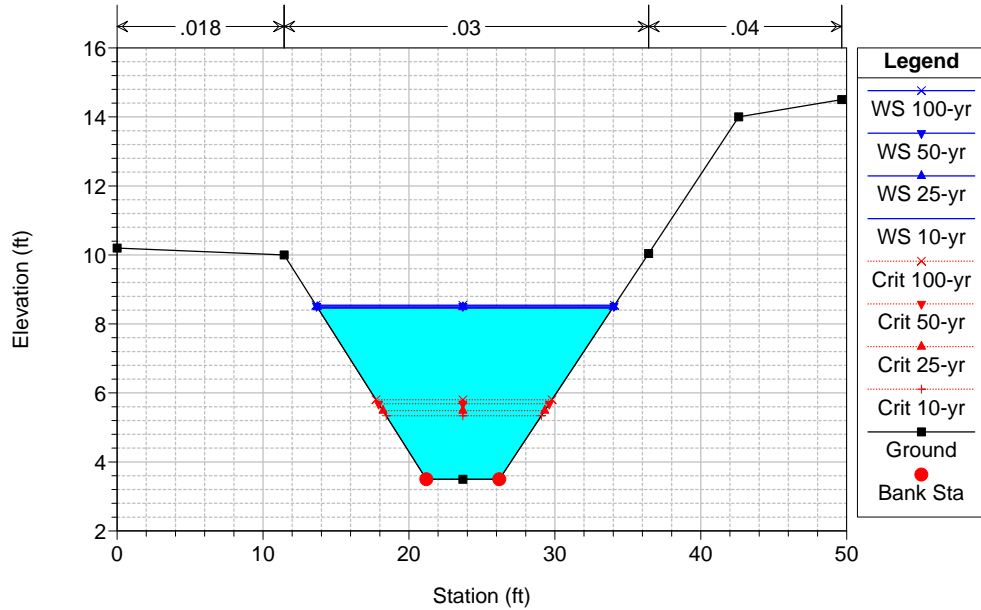
River = Mission Bay Reach = MBHS RS = 4



MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013

Geom: Maintained - Sediment Removed Flow: MBHS Channel

River = Mission Bay Reach = MBHS RS = 3



MBHS Channel 2013 Plan: Maintained - Sediment Removed 12/9/2013

Geom: Maintained - Sediment Removed Flow: MBHS Channel

River = Mission Bay Reach = MBHS RS = 2

