

ConnDOT Approved Hydraulic Engineer:



Prepared for: Naugatuck Valley Council of Governments

FLOODWAY ANALYSIS REPORT Pedestrian Footbridge over Branch Brook

BL Project No. 1800579

Naugatuck River Greenway Multi-Use Trail Towns of Watertown and Thomaston, CT

Prepared By: Brandon Rojas

Checked By:_ Date: 11/21/2019

Date: 11/21/2019

PREPARED BY: **BL** Companies 100 Constitution Plaza 10th Floor Hartford, CT 06103



	TABLE OF CONTENTS	PAGE
I.	LOCATION MAP	1
II.	INTRODUCTION	2
III.	FLOODWAY ANALYSIS	3
	FIGURES	
FIG	GURE 1: USGS MAP	
FIG	GURE 2: PROPOSED BRIDGE LOCATION	
FIG	GURE 3: ALTERNATIVE 1 - DOWNSTREAM ELEVATION	
FIG	GURE 4: ALTERNATIVE 1 - TYPICAL SECTION	
FIG	GURE 5: ALTERNATIVE 2 - DOWNSTREAM ELEVATION	
FIG	GURE 6: ALTERNATIVE 2 - TYPICAL SECTION	
FIG	GURE 7: PROFILE	
FIG	GURE 8: PROPOSED BRIDGE LOCATION WITH TEMPORARY CONDITIONS	5
FIG	GURE 9: FEMA FLOOD INSURANCE RATE MAP	

APPENDICES

APPENDIX A – HYDROLOGY

APPENDIX B – FEMA INFORMATION

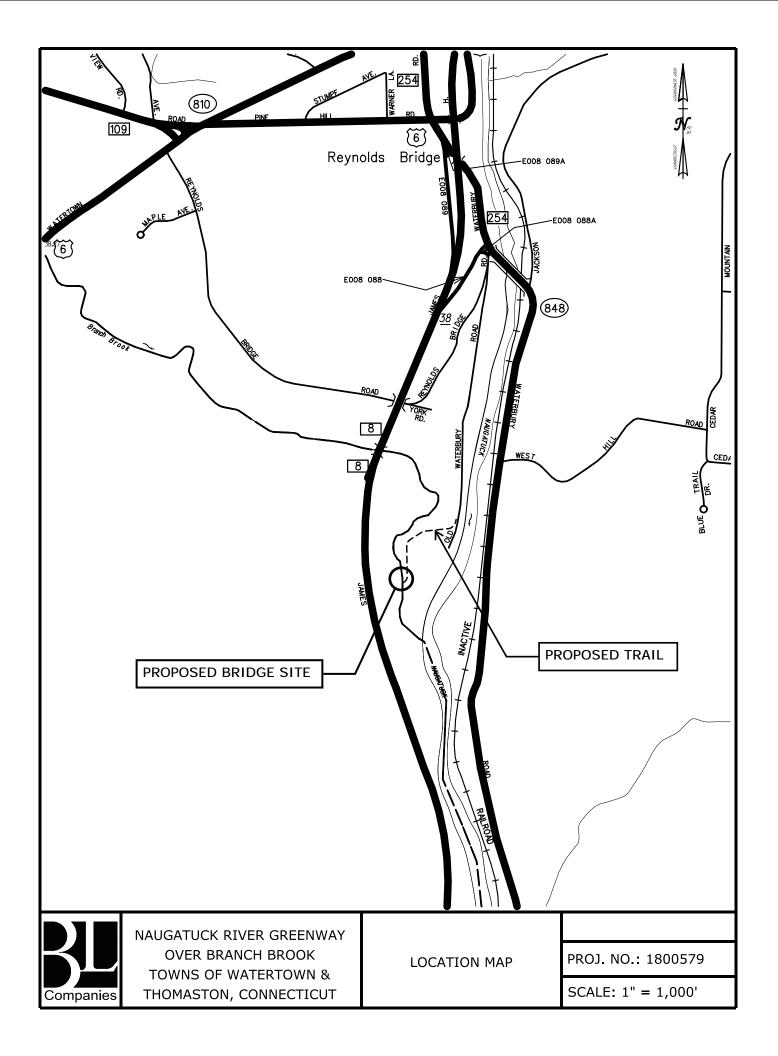
APPENDIX C - CROSS SECTION LOCATIONS & CROSS SECTIONS

APPENDIX D – EXISTING FLOODWAY MODELS

APPENDIX E – PROPOSED FLOODWAY MODELS

APPENDIX F – HYDRAULIC DATA SHEETS

APPENDIX G - HEC-2 BACK-UP DATA



II. INTRODUCTION

This project involves the construction of the Naugatuck River Greenway, a multi-use trail which includes a crossing over Branch Brook, a watercourse that forms the boundary between the towns of Watertown and Thomaston. The proposed trail is located east of Route 8 and west of the Naugatuck River. The trail crosses Branch Brook approximately 1,000 ft upstream of the brook's confluence with the Naugatuck River. Once the path crosses Branch Brook, it moves northeast just outside the ridgelines of the properties between the two watercourses (see Location Map), where it eventually connects to Old Waterbury Road.

At the site of the proposed bridge, the brook has a drainage area of approximately 22.6 square miles. The ConnDOT Drainage Manual designates the proposed bridge as a large structure due to the structure spanning a waterway with a drainage area between 10 mi² and 1,000 mi². Large structures require the 100-year storm to pass under the low chord with 2-ft of underclearance. Additionally, the 500-year storm is required to be checked. Table 1 below summarizes the approved flow discharges at the bridge location. The design flows were computed flows computed by the Flood Insurance Studies (FIS) for the Towns of Watertown and Thomaston, CT. For further information regarding the watershed characteristics and how the design flow was developed, see Appendix B.

 Multipurpose Bridge over Branch Brook

 Year
 Project Flows

 2
 450

 10
 800

 50
 800

 100
 900

 200
 1,500

 500
 2,300

TABLE 1: SUMMARY OF FLOWS (C.F.S.)

Branch Brook is a relatively sinuous, channelized watercourse, flowing from northwest to southeast through the project site. The normal stream channel is between approximately 35 to 40-ft wide through this section. Both banks are heavily vegetated with trees and light groundcover; flow impacts are accounted for through the Manning's n value.

The proposed bridge crossing site located approximately 0.5 miles downstream of Black Rock Dam; a large flood control structure built in 1971. The brook moves from the dam spillway under the Route 8 overpass located approximately 0.3 miles upstream of the proposed crossing. The confluence of Branch Brook and the Naugatuck River is approximately 1,000 downstream from the crossing site.

Within the vicinity of the project, the channel bottom is lined naturally with gravelly sand with smaller stones and cobbles. A dirt road bridge is located approximately 650 ft downstream of the subject bridge (approximately 265 ft upstream of the brook's confluence with Naugatuck

River). There is little evidence of erosion, drift, or degradation in the studied reach. The existing channel contains all the studied storm events including the design and check storm events, while the structures outside the project area are hydraulically adequate during storm events. There is currently no existing structure at the project site.

There are two proposed alternatives for the pedestrian crossing over Branch Brook, as described in the Structure Type Study (STS). Alternative 1 involves the installation of a prefabricated steel truss superstructure supported by precast concrete abutments and wingwalls. This structure is referred to as the preferred alternative in the STS. Alternative 2 consists of a timber glulam stringer superstructure founded on timber piles.

Alternative 1 spans 60-ft across Branch Brook and is founded on precast concrete abutments. The precast concrete abutments will be founded to a maximum depth of approximately 6-ft to 7-ft below existing grade and will not be adversely affected by scour. The analysis indicates the proposed alternative is hydraulically adequate for all studied storm events.

Alternative 2 provides a 60.4-ft clear span timber glulam stringer superstructure founded on timber piles and lagging. The hydraulic analysis indicates there is little difference in water surface elevations between the two alternatives during the 100-year design event. As with the preferred alternative, Alternative 2 is hydraulically adequate during all studied events and will not be adversely affected by scour.

While the initial construction cost of the preferred structure is higher, the life expectancy of Alternative 1 is approximately 25% greater than that of Alternative 2. The estimated construction duration for the preferred alternative is anticipated to be approximately 4 months.

III. FLOODWAY ANALYSIS

In general, a "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. The floodway is located within the floodplain. A floodplain is generally defined as an area that will be inundated by the base flood (100-year storm event). A floodway analysis consists of an unencroached model (without floodway) and an encroached model (with floodway). The unencroached model defines the floodplain. The encroached model defines the floodway.

A hydraulic analysis was performed using the Hydrologic Engineering Center's River Analysis System (HEC-RAS, version 5.0.7). See Appendix C for a plan view of the river showing the arrangement of surveyed and FEMA cross-sections and the FEMA Floodway limits.

Branch Brook was studied in detail in the latest FEMA Flood Insurance Studies for the Town of Watertown and Town of Thomaston, revised May 1980. Available FEMA back-up data in HEC-2 format was obtained through the FEMA Engineering Library (see Appendix G). The back-up data contained a hard copy of the input and output data for the 10-year and 100-year storm events without the floodway encroachment limits applied, and input and output data for the encroachments applied.

The HEC-2 back-up data was transcribed into HEC-RAS geometry to create the Duplicate Effective FEMA Model with certain modifications to the original model. Before running the model, there were some considerations and assumptions required for this analysis.

The most noteworthy consideration is that the floodway encroachments determined by the original study were unavailable for the studied reach. The data received from FEMA was incomplete, and physically missing at least one page of numerical floodway data. As a result, floodway encroachment information for the modelled reach is generally assumed and approximated based on available mapping and water surface data. The next noteworthy consideration is the addition of duplicate FEMA sections at bridge cross-sections. This was done to successfully run the bridge hydraulics within the RAS environment, since the HEC-2 data was insufficient on its own.

No further changes were made to the FEMA data except eliminating cross-sections not located near the bridge and modifying the deck/roadway editor at the two bridges in the model in order to have the program run without error. The Duplicate Effective Model begins and ends at FEMA lettered cross-sections and utilizes FEMA-developed flows. In the HEC-RAS model, FEMA lettered sections were named using their station value within their studied reach in the FIS as well as to account for the repeated sections.

As a result, FEMA Sections A, B, C, D, and E are represented as 200, 200.3, 201, 202, 203, respectively. Sections 200.1, 200.2, 202.1, and 202.2 are duplicates of Sections 200 and 200.3 – the sections representing bridge geometry within the backup data.

The Duplicate Effective Model (at the FEMA lettered sections) for the 10-year, 50-year, 100-year, and 500-year storm events without the floodway matched the back-up data within 0.20 ft. With the floodway limits applied, all sections matched the 100-year encroached backup data within 0.10 ft (see Table 3) at all lettered sections.

Although not included in the HEC-2 back-up data, the 10-year floodway event was computed in the Duplicate Effective Model. The computed 10-year with floodway elevations range between 0.09 ft and 0.29-ft below the 100-year with floodway elevations.

Field cross-sections were surveyed around the proposed Branch Brook crossing location. The survey information was added to the Duplicate Effective Model to create the Existing Conditions Model. The new cross-section data in the Existing Conditions Model adds several sections (200.4, 200.45, 200.5, 200.55, 200.6, 200.65, 200.7, 200.75, 200.8). These sections were added between FEMA Sections C and B to provide a more comprehensive and accurate hydraulic model that also reflects the most recently surveyed conditions at those locations.

All FEMA sections and its duplicates retain the same geometry as the Duplicate Effective Model (Sections A, B, C, D), adjusted to the 1988 vertical datum used for the survey.

Floodway Analysis Report Naugatuck River Greenway Pedestrian Bridge over Branch Brook

The FEMA Flood Insurance Rate Map was used to obtain the floodway encroachment stations at the new sections. To further increase accuracy, field survey information was supplemented with LiDAR where applicable.

Section 200.65 is the approach section. Section 200.6 is both the upstream bridge face and upstream right-of-way (ROW) section. Section 200.55 is both the downstream bridge face and downstream ROW section.

The un-encroached 100-year WSEL of the Existing Conditions Model is 0.66 ft lower than the Duplicate Effective Model at the furthest upstream cross-section. At Section 200, the furthest downstream section, the Existing Conditions FEMA model is also 0.66 ft lower than the Duplicate Effective Model (see Table 4).

There are two major reasons for the changes computed between the Existing Conditions Model, Duplicate Effective Model, and HEC-2 output. The first being that HEC-2 output data is determined using completely different, and obsolete computation methods than those used by the HEC-RAS software. Secondly, the Existing Conditions model uses survey data around the bridge site. Lastly, the backup data provided was incomplete – lacking defined encroachment data and needing to be assumed through concise engineering judgment.

The computed water surface remains within the channel, with greater events causing lower velocities and increases in water depth and flow area. In the Duplicate Effective model, the 100-year velocity without encroachments applied, is 8.83 ft/s at Section 203 matching the Existing Conditions Model. Similar changes (lower velocity, higher depth and flow area) are seen at all FEMA sections, with variations occurring in the added survey sections.

With the floodway limits applied, the 100-year WSEL for the Existing Conditions Model was generally lower than the Duplicate Effective Model. At all shared sections, the WSEL of the Existing Conditions Model is 0.66 ft lower than the Duplicate Effective Model. As with the un-encroached profile, the differences at the bridge location are due to the use of survey data and differed computation methods between hydraulic analyses.

For the 10-year with floodway event, the Existing Conditions Model is 0.66 ft greater than the Duplicate Effective Model at all FEMA lettered sections.

As noted above, the work proposed at the existing bridge will install a new prefabricated steel truss crossing over Branch Brook complete with reinforced concrete abutments, and scour protection measures. The proposed work has little effect on the computed water surface elevations.

The 100-year without floodway WSELs of the Proposed Alt1 Model match the Existing Conditions Model at all cross-sections in the model. With the floodway limits applied, the Proposed Alt1 Model's WSELs remain the same as the non-encroached WSELs (see Table 5).

A similar phenomenon occurs for the 10-year with and without floodway conditions in which proposed WSELs match the existing WSELs (see Table 7).

Floodway Analysis Report Naugatuck River Greenway Pedestrian Bridge over Branch Brook

The Manning's Roughness Coefficients used for both the upstream and downstream channel reach for the existing and proposed conditions is 0.035. The river is clean, straight and stony. The coefficients used for the side slopes and overbank areas upstream and downstream of the bridge range from 0.018 to 0.075, depending on cover. Values of 0.1 and 0.3 are used for contraction and expansion dynamic head losses, except at the bridge. At the bridge, where the flow area changes more suddenly, values of 0.3 and 0.5 are used. In the HEC-2 backup data, the contraction/expansion coefficients were noted to be 0.1 and 0.3.

The HEC-RAS existing and proposed, without and with floodway outputs are included in Appendix D and E of this report. A water surface elevation comparison of the 100-year and 10-year storm events for the existing and proposed conditions can be found in Tables 5 and 7 of this report. A velocity comparison of the 100-year and 10-year storm events for the existing and proposed conditions can be found in Tables 6 and 8 of this report.

TABLE 2: FLOODWAY ENCROACHMENT TABLE

Cross-Section	Encroachment Station (L)	Encroachment Station (R)	Width (ft)
203 (FEMA E)	1794	1837	43
202.2	1684	1730	46
Route 8 Bridge			
202.1	1684	1730	46
202 (FEMA D)	1684	1730	46
201 (FEMA C)	1604	1736	132
200.8	50.4	108.4	45
200.75	36.2	107.2	38
200.7	55.7	140.7	42
200.65	55.3	125.3	46
200.6	54.3	120.3	65
Proposed Bridge			
200.55	22.8	85.8	63
200.5	59.4	110.4	49
200.45	88.1	148.1	56
200.4	53.8	122.8	58
200.3 (FEMA B)	1407	1495	88
200.2	1120	1208	81
Dirt Road Crossing			
200.1	1120	1208	81
200 (FEMA A)	1120	1208	81

Note: Non-lettered sections were added to the hydraulic model. The FEMA Flood Insurance Rate Map and Flood Insurance Study were used to obtain the floodway encroachment stations.

TABLE 3: 100-YEAR DUPLICATE EFFECTIVE MODEL VS. FEMA BACK-UP DATA

	100-Year FEMA Back-up Data			Duplicate EMA Model	100-Year Duplicate Effective FEMA Model vs. Back-up Data		
Cross-Section	WSEL without FW	WSEL with FW	WSEL without FW	WSEL with FW	WSEL without FW	WSEL with FW	
203 (FEMA E)	331.10	331.10	331.09	331.07	-0.01	-0.03	
202.2	330.50	331.50	330.83	330.82	-0.33	-0.68	
Route 8 Bridge							
202.1	330.50	330.50	330.33	330.31	-0.17	-0.19	
202 (FEMA D)	330.00	330.00	329.97	329.96	-0.03	-0.04	
201 (FEMA C)	324.20	324.20	324.18	324.18	-0.02	-0.02	
200.3 (FEMA B)	322.00	322.80	322.03	322.80	+0.03	0.00	
200.2	321.80	322.70	321.85	322.70	+0.05	0.00	
Dirt Road Crossing							
200.1	321.80	322.70	321.82	322.69	+0.02	-0.01	
200 (FEMA A)	321.60	322.60	321.60	322.60	0.00	0.00	

Note: The elevations refer to the NGVD 1929 Datum.

TABLE 4: 100-YEAR EXISTING CONDITIONS FEMA MODEL VS. FEMA CALIBRATION MODEL

		Duplicate e Model		r Existing ons Model	100-Year Existing Conditions Model vs. Duplicate Effective Model		
Cross-Section	WSEL without FW	WSEL with FW	WSEL without FW	WSEL with FW	WSEL without FW	WSEL with FW	
203 (FEMA E)	331.09	331.07	330.43	330.41	-0.66	-0.66	
202.2	330.83	330.82	330.13	330.12	-0.7	-0.7	
Route 8 Bridge							
202.1	330.33	330.31	329.57	329.56	-0.76	-0.75	
202 (FEMA D)	329.97	329.96	328.28	328.28	-1.69	-1.68	
201 (FEMA C)	324.18	324.18	325.54	325.57	+1.36	+1.39	
200.8			324.85	324.86			
200.75			324.80	324.79			
200.7			324.79	324.78			
200.65			324.63	324.63			
200.6			324.46	324.46			
Proposed Bridge							
200.55			324.47	324.47			
200.5			324.15	324.15			
200.45			322.60	322.61			
200.4			321.52	322.24			
200.3 (FEMA B)	322.03	322.8	321.57	322.14	-0.46	-0.66	
200.2	321.85	322.7	322.04	322.04	+0.19	-0.66	
Dirt Road Crossing							
200.1	321.82	322.69	321.19	322.03	-0.63	-0.66	
200 (FEMA A)	321.6	322.6	320.94	321.94	-0.66	-0.66	

Note: The elevations refer to the NAVD 1988 Datum.

TABLE 5: FLOODWAY ANALYSIS TABLE - 100-YEAR STORM WSEL

	Ва	FEMA ickup Da	ta	Existi	Existing Conditions Model		Proposed Conditions Model			Proposed Conditions Model vs. Existing Conditions Model	
Cross-Section	WSEL without FW	WSEL with FW	WSEL Diff.	WSEL without FW	WSEL with FW	WSEL Diff.	WSEL without FW	WSEL with FW	WSEL Diff.	WSEL without FW	WSEL with FW
203 (FEMA E)	330.44	330.44	0.00	330.43	330.41	-0.02	330.43	330.41	-0.02	0.00	0.00
202.2	329.84	330.84	+1.00	330.13	330.12	-0.01	330.13	330.12	-0.01	0.00	0.00
Route 8 Bridge											
202.1	329.84	329.84	0.00	329.57	329.56	-0.01	329.57	329.56	-0.01	0.00	0.00
202 (FEMA D)	329.34	329.34	0.00	328.28	328.28	0.00	328.28	328.28	0.00	0.00	0.00
201 (FEMA C)	323.54	323.54	0.00	325.54	325.57	+0.03	325.54	325.57	+0.03	0.00	0.00
200.8				324.85	324.86	+0.01	324.85	324.86	+0.01	0.00	0.00
200.75				324.80	324.79	-0.01	324.79	324.79	0.00	-0.01	0.00
200.7				324.79	324.78	-0.01	324.79	324.78	-0.01	0.00	0.00
200.65				324.63	324.63	0.00	324.63	324.63	0.00	0.00	0.00
200.6				324.46	324.46	0.00	324.46	324.46	0.00	0.00	0.00
Proposed Bridge											
200.55				324.47	324.47	0.00	324.47	324.47	0.00	0.00	0.00
200.5				324.15	324.15	0.00	324.15	324.15	0.00	0.00	0.00
200.45				322.60	322.61	+0.01	322.60	322.61	+0.01	0.00	0.00
200.4				321.52	322.24	+0.72	321.52	322.24	+0.72	0.00	0.00
200.3 (FEMA B)	321.34	322.14	+0.80	321.57	322.14	+0.57	321.57	322.14	+0.57	0.00	0.00
200.2	321.14	322.04	+0.90	322.04	322.04	0.00	322.04	322.04	0.00	0.00	0.00
Dirt Road Crossing											
200.1	321.14	322.04	+0.90	321.19	322.03	+0.84	321.19	322.03	+0.84	0.00	0.00
200 (FEMA A)	320.94	321.94	+1.00	320.94	321.94	+1.00	320.94	321.94	+1.00	0.00	0.00

Note: The elevations refer to the NAVD 1988 Datum

TABLE 6: FLOODWAY ANALYSIS TABLE – 100-YEAR VELOCITY (ft/s)

		FEMA kup Data	1	Existing Conditions Model			Proposed Conditions Model			Proposed Conditions Model vs. Existing Conditions Model	
Cross-Section	Vel. without FW	Vel. with FW	Vel. Diff.	Vel. without FW	Vel. with FW	Vel. Diff.	Vel. without FW	Vel. with FW	Vel. Diff.	Vel. without FW	Vel. with FW
203 (FEMA E)	8.83	9.03	+0.20	8.83	9.03	+0.20	8.83	9.03	+0.20	0.00	0.00
202.2	4.81	4.88	+0.07	4.85	4.92	+0.07	4.85	4.92	+0.07	0.00	0.00
Route 8 Bridge											
202.1	5.54	5.58	+0.04	5.70	5.73	+0.03	5.70	5.73	+0.03	0.00	0.00
202 (FEMA D)	6.18	6.19	+0.01	8.93	8.93	0.00	8.93	8.93	0.00	0.00	0.00
201 (FEMA C)	6.06	6.06	0.00	1.90	2.15	+0.25	1.90	2.15	+0.25	0.00	0.00
200.8				4.28	4.28	0.00	4.28	4.28	0.00	0.00	0.00
200.75				3.98	4.04	+0.06	3.98	4.04	+0.06		
200.7				3.07	3.07	0.00	3.07	3.07	0.00	0.00	0.00
200.65				4.14	4.14	0.00	4.14	4.14	0.00	0.00	0.00
200.6				4.74	4.74	0.00	4.74	4.75	+0.01	0.00	+0.01
Proposed Bridge											
200.55				3.97	3.97	0.00	3.97	3.97	0.00	0.00	0.00
200.5				5.31	5.31	0.00	5.31	5.31	0.00	0.00	0.00
200.45				10.21	10.18	-0.03	10.21	10.18	-0.03		
200.4				6.74	5.33	-1.41	6.74	5.33	-1.41	0.00	0.00
200.3 (FEMA B)	2.24	1.97	-0.27	2.24	1.92	-0.32	2.24	1.92	-0.32	0.00	0.00
200.2	3.68	2.89	-0.79	3.68	2.90	-0.78	3.68	2.90	-0.78	0.00	0.00
Dirt Road Crossing										0.00	0.00
200.1	3.71	2.9	-0.81	3.71	2.91	-0.80	3.71	2.91	-0.80		
200 (FEMA A)	3.98	2.97	-1.01	3.98	2.98	-1.00	3.98	2.98	-1.00	0.00	0.00

Note: The FEMA floodway velocities are listed on the FIS Floodway Data Table.

TABLE 7: FLOODWAY ANALYSIS TABLE – 10-YEAR STORM WSEL

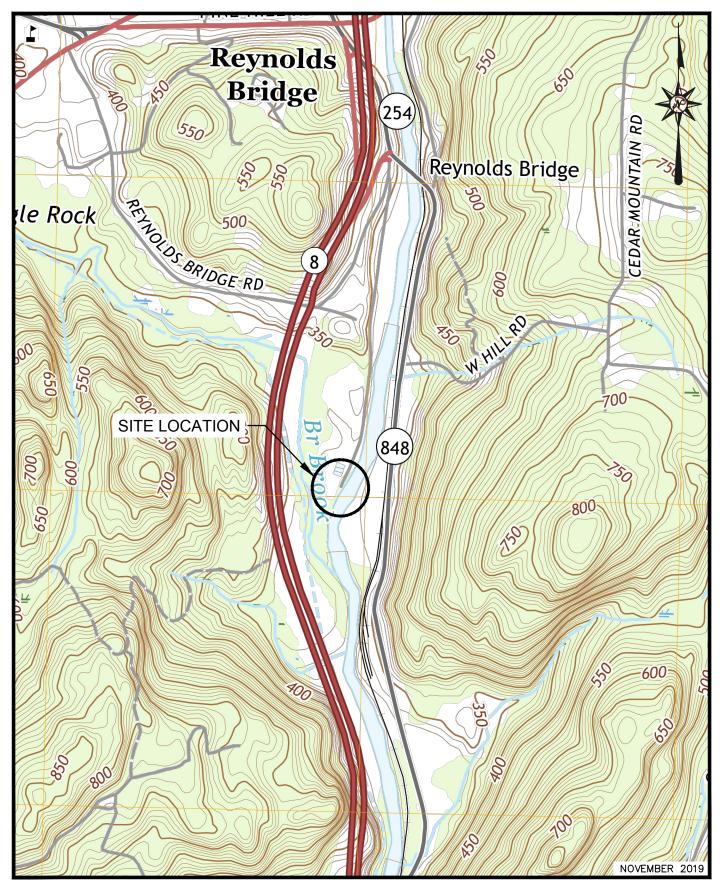
	Existing Conditions Model			Propos	sed Condi Model	itions	Proposed Conditions Model vs. Existing Conditions Model	
Cross-Section	WSEL without FW	WSEL with FW	WSEL Diff.	WSEL without FW	WSEL with FW	WSEL Diff.	WSEL without FW	WSEL with FW
203 (FEMA E)	330.22	330.20	-0.02	330.22	330.20	-0.02	0.00	0.00
202.2	329.84	329.84	0.00	329.84	329.84	0.00	0.00	0.00
Route 8 Bridge								
202.1	329.31	329.31	0.00	329.31	329.31	0.00	0.00	0.00
202 (FEMA D)	328.08	328.08	0.00	328.08	328.08	0.00	0.00	0.00
201 (FEMA C)	325.23	325.25	+0.02	325.23	325.25	+0.02	0.00	0.00
200.8	324.53	324.53	0.00	324.53	324.53	0.00	0.00	0.00
200.75	324.46	324.46	0.00	324.46	324.46	0.00	0.00	0.00
200.7	324.45	324.45	0.00	324.45	324.45	0.00	0.00	0.00
200.65	324.31	324.31	0.00	324.31	324.31	0.00	0.00	0.00
200.6	324.15	324.15	0.00	324.15	324.15	0.00	0.00	0.00
Proposed Bridge								
200.55	324.16	324.16	0.00	324.16	324.16	0.00	0.00	0.00
200.5	323.84	323.84	0.00	323.84	323.84	0.00	0.00	0.00
200.45	322.34	322.34	0.00	322.34	322.34	0.00	0.00	0.00
200.4	321.26	322.09	+0.83	321.26	322.09	+0.83	0.00	0.00
200.3 (FEMA B)	321.14	322.01	+0.87	321.14	322.01	+0.87	0.00	0.00
200.2	320.97	321.93	+0.96	320.97	321.93	+0.96	0.00	0.00
Dirt Road Crossing								
200.1	320.95	321.92	+0.97	320.95	321.92	+0.97	0.00	0.00
200 (FEMA A)	320.74	321.84	+1.10	320.74	321.84	+1.10	0.00	0.00

Note: The 10-year FEMA elevations are not included in the FIS or backup data.

TABLE 8: FLOODWAY ANALYSIS TABLE – 10-YEAR VELOCITY (ft/s)

	Existing Conditions FEMA Model				Proposed Conditions FEMA Model			Proposed Conditions Model vs. Existing Conditions Model	
Cross-Section	Vel. without with FW FW Vel. Diff.		Vel. without FW	Vel. with FW	Vel. Diff.	Vel. without FW	Vel. with FW		
203 (FEMA E)	8.58	8.75	+0.17	8.58	8.75	+0.17	0.00	0.00	
202.2	4.68	4.71	+0.03	4.68	4.71	+0.03	0.00	0.00	
Route 8 Bridge									
202.1	5.48	5.49	+0.01	5.48	5.49	+0.01	0.00	0.00	
202 (FEMA D)	8.66	8.66	0.00	8.66	8.66	0.00	0.00	0.00	
201 (FEMA C)	1.92	2.12	+0.20	1.92	2.12	+0.20	0.00	0.00	
200.8	4.10	4.10	0.00	4.10	4.10	0.00	0.00	0.00	
200.75	3.86	3.89	+0.03	3.86	3.90	+0.04	0.00	+0.01	
200.7	2.95	2.95	0.00	2.95	2.95	0.00	0.00	0.00	
200.65	3.94	3.94	0.00	3.94	3.94	0.00	0.00	0.00	
200.6	4.52	4.52	0.00	4.52	4.52	0.00	0.00	0.00	
Proposed Bridge									
200.55	3.74	3.74	0.00	3.74	3.74	0.00	0.00	0.00	
200.5	5.15	5.15	0.00	5.15	5.15	0.00	0.00	0.00	
200.45	9.86	9.86	0.00	9.86	9.86	0.00	0.00	0.00	
200.4	6.60	4.96	-1.64	6.60	4.96	-1.64	0.00	0.00	
200.3 (FEMA B)	2.09	1.75	-0.34	2.09	1.75	-0.34	0.00	0.00	
200.2	3.50	2.66	-0.84	3.50	2.66	-0.84	0.00	0.00	
Dirt Road Crossing									
200.1	3.53	2.66	-0.87	3.53	2.66	-0.87	0.00	0.00	
200 (FEMA A)	3.78	2.72	-1.06	3.78	2.72	-1.06	0.00	0.00	

Note: The 10-year FEMA velocities are not included in the FIS or backup data.

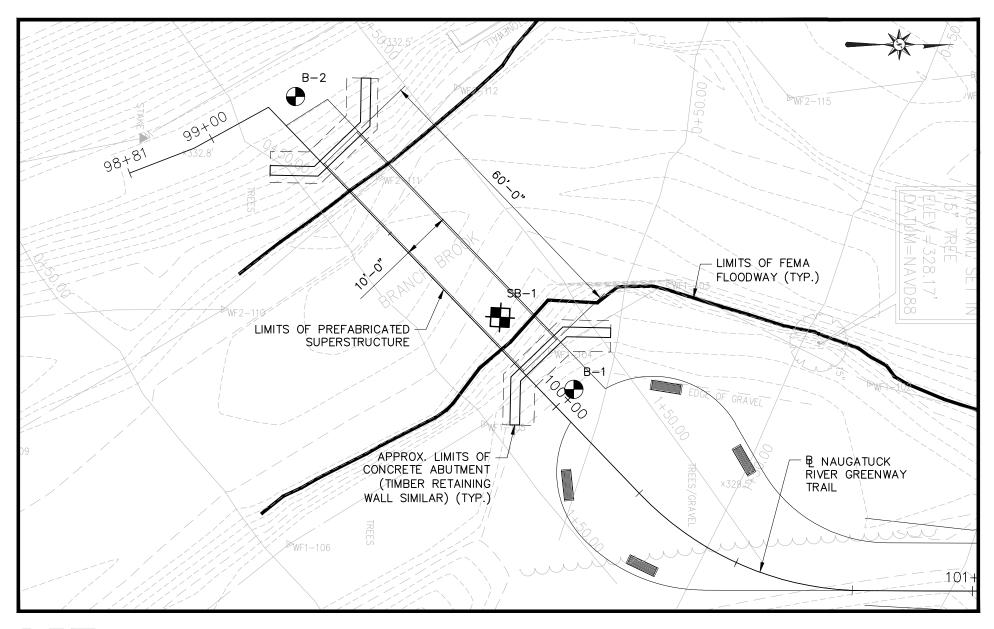




USGS LOCATION MAP
NAUGATUCK RIVER GREENWAY PEDESTRIAN
BRIDGE OVER BRANCH BROOK
THOMASTON, CT

SCALE: 1" = 1000'

FIGURE 1

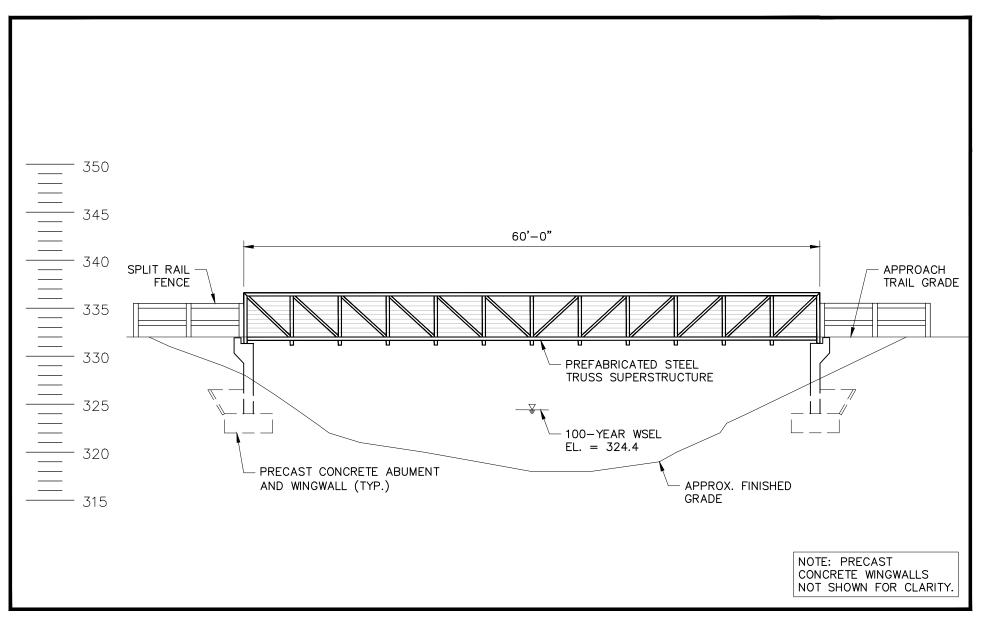




PROPOSED BRIDGE LOCATION

NAUGATUCK RIVER GREENWAY PEDESTRIAN BRIDGE OVER BRANCH BROOK THOMASTON, CONNECTICUT

FIG. 2

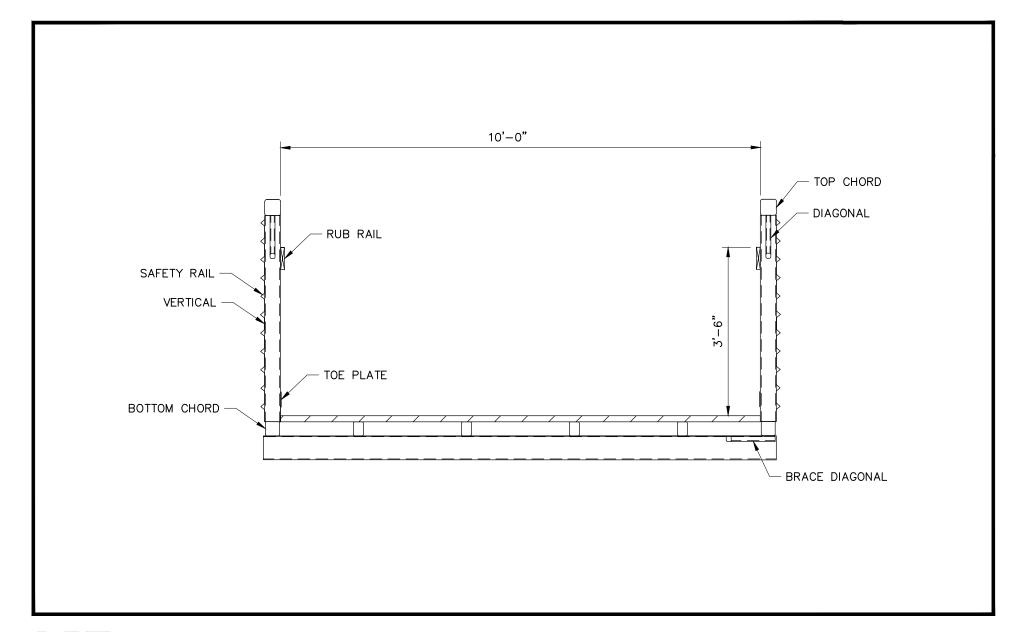




ALTERNATIVE 1 - DOWNSTREAM ELEVATION

NAUGATUCK RIVER GREENWAY PEDESTRIAN BRIDGE OVER BRANCH BROOK THOMASTON, CONNECTICUT

FIG. 3

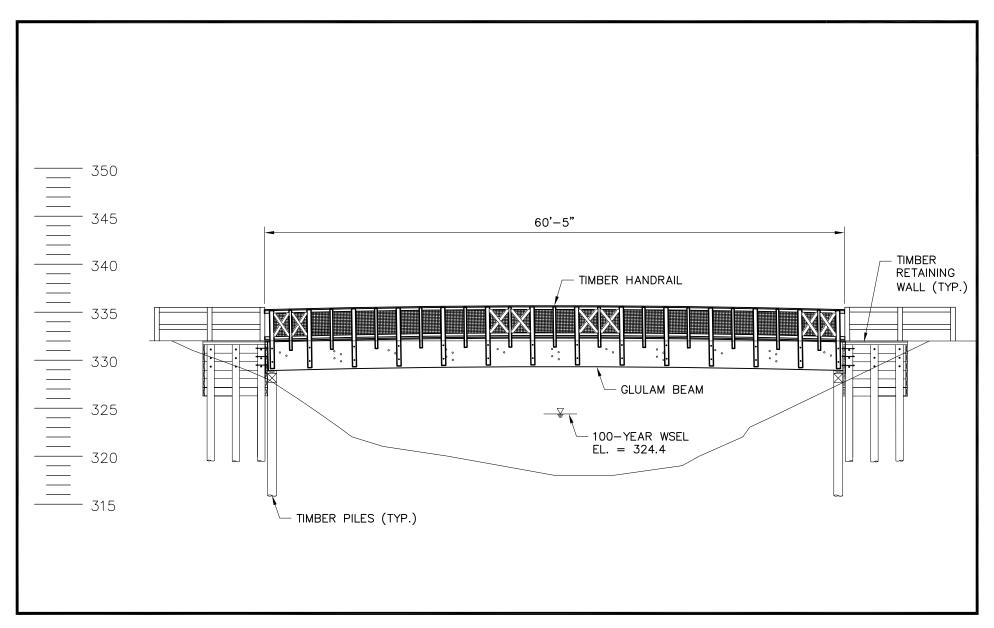




ALTERNATIVE 1 - TYPICAL SECTION

NAUGATUCK RIVER GREENWAY PEDESTRIAN BRIDGE OVER BRANCH BROOK THOMASTON, CONNECTICUT Designed M.W.
Drawn T.B.
Checked M.W.
Approved C.P.
Scale 1/2" = 1'-0"
Project No. 1800579
Date 11/2019

FIG. 4



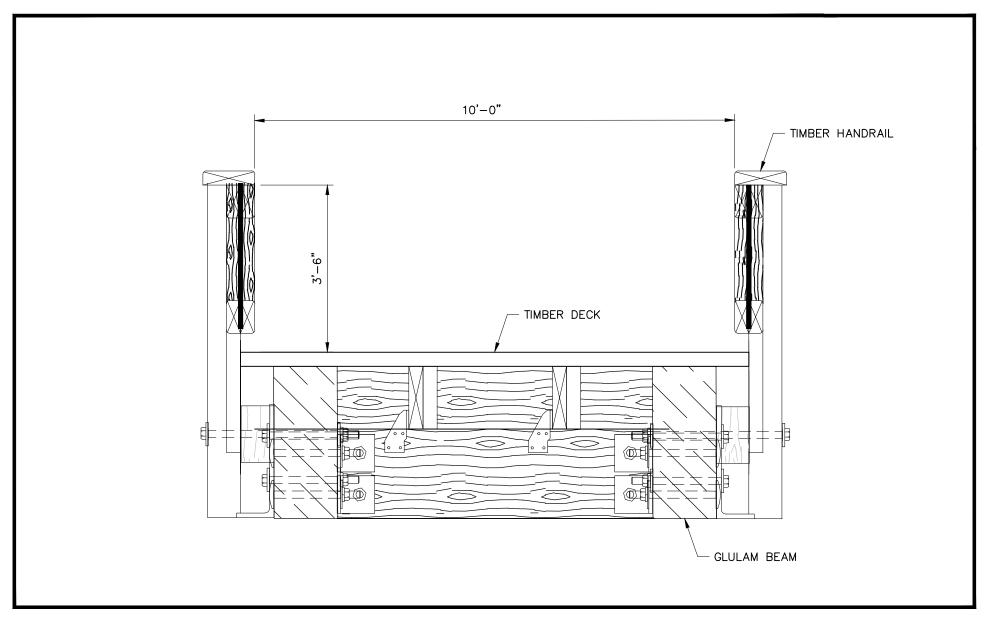


ALTERNATIVE 2 - DOWNSTREAM ELEVATION

NAUGATUCK RIVER GREENWAY PEDESTRIAN
BRIDGE OVER BRANCH BROOK
THOMASTON, CONNECTICUT

Designed M.W.
Drawn T.B.
Checked M.W.
Approved C.P.
Scale 1" = 10'-0"
Project No. 1800579
Date 11/2019
CAD File XBRG1800579_101

FIG. 5





ALTERNATIVE 2 - TYPICAL SECTION

NAUGATUCK RIVER GREENWAY PEDESTRIAN BRIDGE OVER BRANCH BROOK THOMASTON, CONNECTICUT
 Designed
 M.W.

 Drawn
 T.B.

 Checked
 M.W.

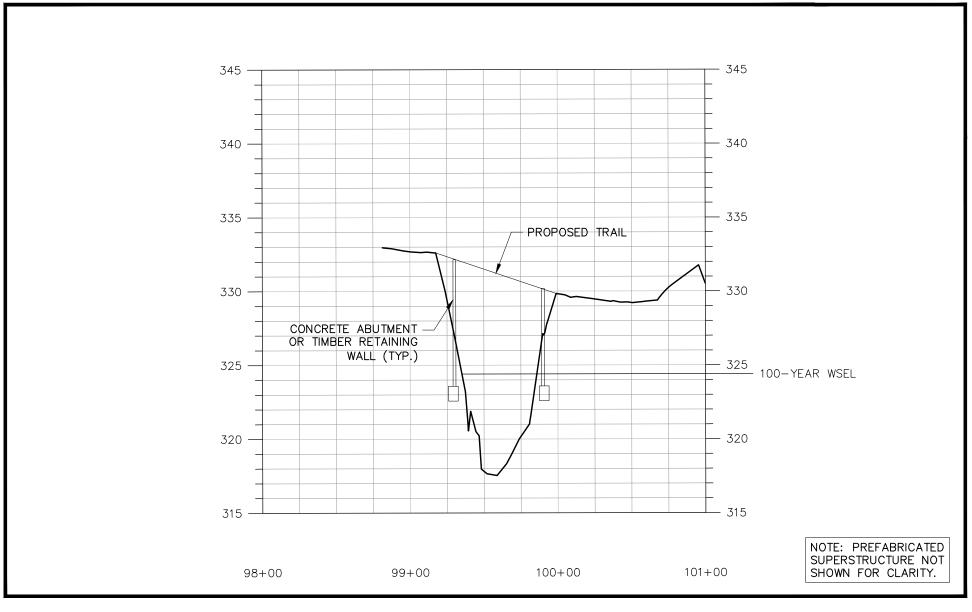
 Approved
 C.P.

 Scale
 1/2" = 1'-0"

 Project No.
 1800579

 Date
 11/2019

FIG. 6

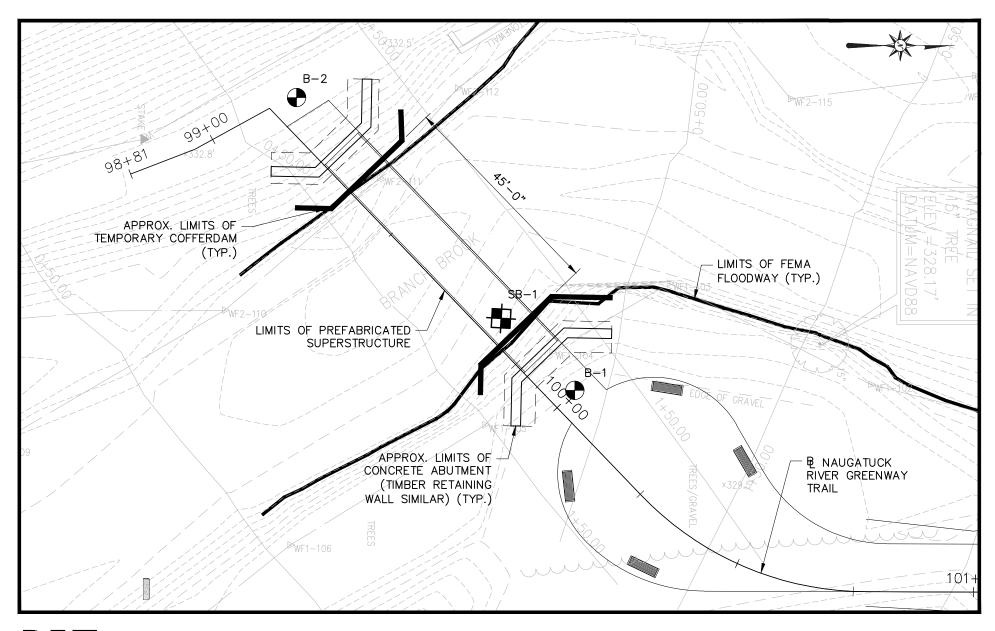




PROFILE

NAUGATUCK RIVER GREENWAY PEDESTRIAN BRIDGE OVER BRANCH BROOK THOMASTON, CONNECTICUT Designed M.W.
Drawn T.B.
Checked M.W.
Approved C.P.
Scale N.T.S.
Project No. 1800579
Date 10/2019

FIG. 7

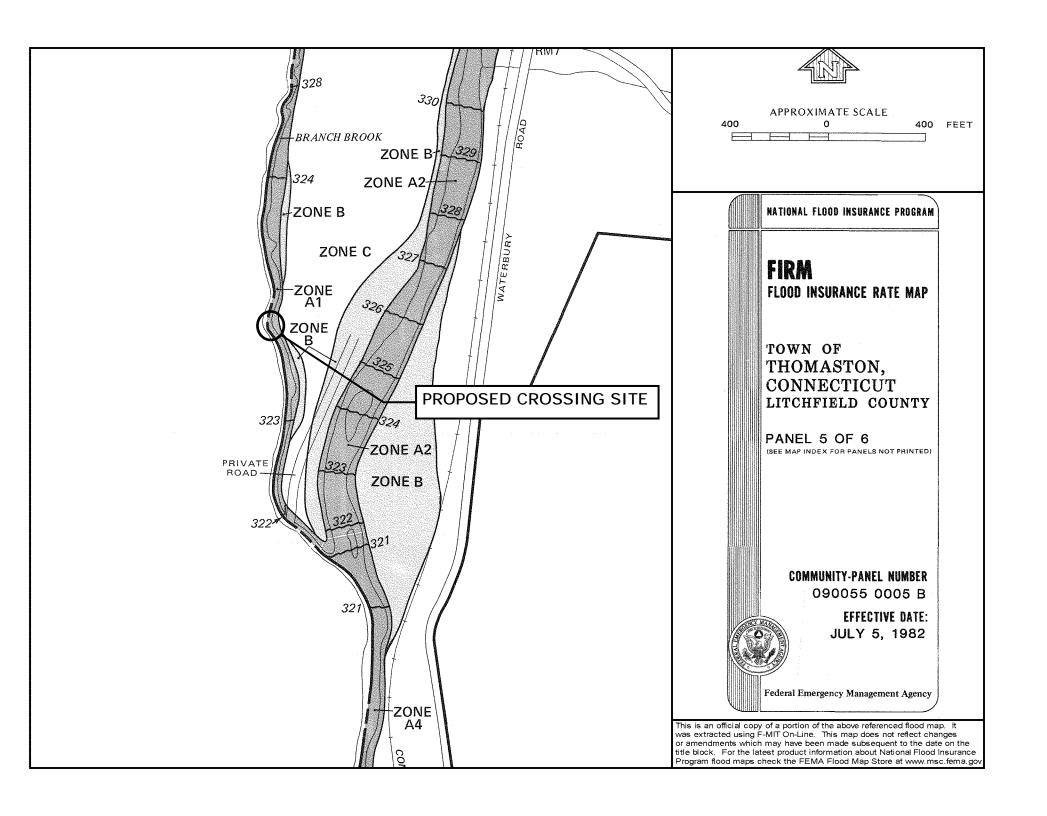




PROPOSE BRIDGE LOCATION WITH TEMPORARY CONDITIONS

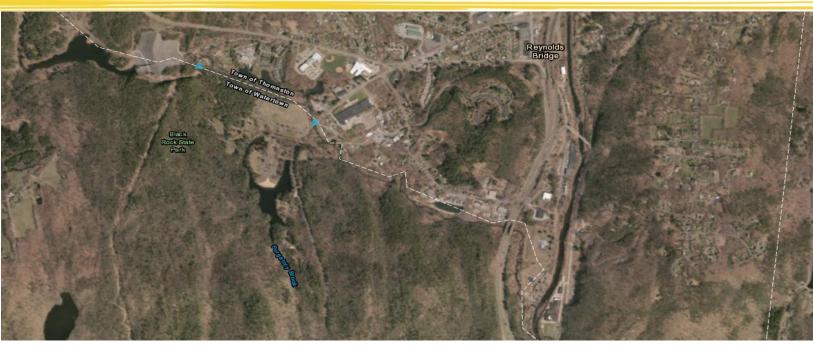
NAUGATUCK RIVER GREENWAY PEDESTRIAN BRIDGE OVER BRANCH BROOK THOMASTON, CONNECTICUT

FIG. 8



Floodway Analysis Report Naugatuck River Greenway Pedestrian Bridge over Branch Brook

APPENDIX A – HYDROLOGY



ConnDOT Approved Hydraulic Engineer:



Prepared for: Naugatuck Valley Council of Governments

HYDROLOGIC ANALYSIS REPORT Pedestrian Footbridge over Branch Brook

BL Project No. 1800579

Naugatuck River Greenway Multi-Use Trail Towns of Watertown and Thomaston, CT

Prepared By: Brandon Rojas

Date: 10/14/2019

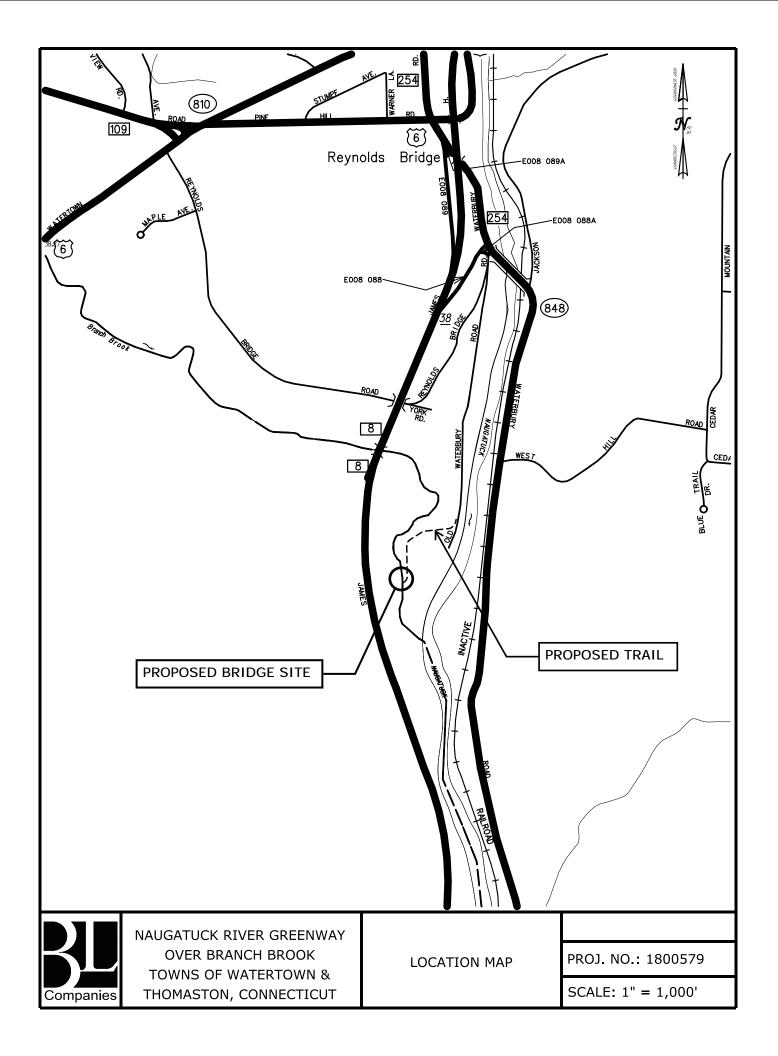
Date: 10/15/2019

Checked By:

PREPARED BY: **BL** Companies 100 Constitution Plaza 10th Floor Hartford, CT 06103



	TABLE OF CONTENTS	PAGE
I.	LOCATION MAP	1
II.	WATERSHED CHARACTERISTICS	2
III.	HYDROLOGIC METHODOLOGY	3
IV.	HISTORICAL FLOODING	
V.	STUDY RESULTS	4
	TABLES AND FIGURES	
TAI	BLE 1: SUMMARY OF FLOWS (C.F.S.)	4
TAI	BLE 2: DESIGN FLOWS (C.F.S.)	5
FIG	URE 1: PROBABILITY CHART	<i>e</i>
FIG	URE 2: WATERSHED BOUNDARY MAP	7
FIG	URE 3: SURFICIAL MATERIALS MAP	8
FIG	URE 4: FEMA FLOOD INSURANCE RATE MAP	9
	APPENDICES	
APF	PENDIX A: WEB SOIL SURVEY DATA	
APF	PENDIX B: FEMA FLOOD INSURANCE STUDY	
APF	PENDIX C: USGS STREAM GAGE NO. 01208013 – BRANCH BROOK NEAR THO	OMASTON, CT
APF	PENDIX D: PEAKFQ FLOWS – BRANCH BROOK NEAR THOMASTON, CT	
APP	PENDIX E: SUPPLEMENTARY REFERENCE DATA	



II. WATERSHED CHARACTERISTICS

This project involves the construction of the Naugatuck River Greenway, a multi-use trail which includes a crossing over Branch Brook, which forms the boundary between the towns of Watertown and Thomaston. The proposed trail is located east of Route 8 and west of the Naugatuck River. The trail crosses Branch Brook approximately 1,000 ft upstream of the brook's confluence with the Naugatuck River. Once the path crosses Branch Brook, it moves northeast just outside the ridgelines of the properties between the two watercourses (see Location Map), where it eventually connects to Old Waterbury Road.

Branch Brook flows primarily southeast, beginning just downstream of the Wigwam Reservoir Dam, located approximately 3.0 miles upstream from the confluence of Branch Brook and Naugatuck River. Beyond this point (upstream direction), the main watercourse is segmented into a series of reservoirs and several dams, each with branching tributaries contributing to the watershed. As a result of the large water storage area, typical flow estimation methods involving StreamStats are not feasible and will not be used in this analysis. The largest watercourses within this area by extension (not including Branch Brook) are: Wigwam River, Moosehorn Brook, Slab Meadow Brook, East Morris Brook and Fenn Brook.

The river upstream of the bridge has an average streambed slope of 29.3 ft/mi. At the site of the proposed bridge, the brook has a drainage area of approximately 22.6 square miles. The watershed was generated by the USGS StreamStats 4.2 online application and revised for accuracy using USGS Quadrangle Maps from the National Map online viewer (see Figure 2). Utilizing the USGS StreamStats online utility, the watershed area exhibits that 9.69% of the land use is developed, 1.07% is wetlands and the remainder is forested or other pervious area. Delineation of surficial materials indicates that approximately 2.21% of the watershed area consists of coarse-grained stratified drift (see Figure 3) and the remainder is composed of various postglacial deposits and till.

The watershed extends northwest to a local high point located approximately 1.1 miles east of the intersection of Route 118 and Route 202. The eastern side of the watershed follows a ridgeline south, bordering the western limits of the larger Naugatuck River watershed. These extents of the watershed continue along a series of high points within the Towns of Litchfield, Thomaston and Watertown until it meets the location of the proposed pedestrian footbridge. The western extents of the watershed move from the northern portion of the watershed south along a series of high points until the southernmost limits, following the limits of the various watersheds surrounding the subject area. The southern extents of the watershed move along ridgelines until connecting with the eastern watershed limits at the bridge.

The upper third of the watershed is characterized by large amounts of rural pasture area unlike the other two thirds of the watershed which are mostly wooded and remote. The middle third consists of rural residential area as well as some open pasture. This area also includes large undeveloped wooded and water storage areas, including multiple large reservoirs such as Morris Reservoir and Pitch Reservoir. The lower third is similar in composition to the middle third of the watershed, characterized by large areas of water storage and forested area, although with substantially less open pasture-like area. This portion of the watershed contains the Branch

Brook watercourse, Black Rock Reservoir and the bridge itself. The ConnDOT Drainage Manual classifies the proposed bridge as a large structure (providing waterway for drainage areas of more than 10 square miles and less than 1,000 square miles) with a 100-year design storm event and a 500-year check storm event. The bridge is within Zone A1 on the FEMA Flood Insurance Rate Map (see Figure 4).

The FEMA Flood Insurance Study (*FIS*) denotes an area of 20.8 square miles, approximately 1.75 miles upstream of the bridge site at Black Rock Dam (effectively the beginning of the Branch Brook watercourse). The brook is listed in the Gazetteer of Drainage Areas of Connecticut. At the brook's mouth above Naugatuck River, the gazetteer lists Branch Brook with a drainage area of 22.646 sq. mi. The mouth is located approximately 1,100 feet downstream (south) of the subject bridge. There is also a USGS stream gage approximately 1.25 miles upstream from the proposed bridge.

III. HYDROLOGIC METHODOLOGY

The flows in this hydrologic study were prepared utilizing the methods described below:

- 1. Method 1 FEMA Flood Insurance Study (FIS): This data was obtained from the Flood Insurance Study (FIS), Prepared for the Town of Watertown, Connecticut, revised May 1980 by the Federal Emergency Management Agency (FEMA). The FIS contains published flows along Branch Brook at three locations along the watercourse: at the mouth of the brook (the confluence with the Naugatuck River), at Black Rock Dam and at Wigwam Dam. At these locations, the drainage areas listed in the FIS are 22.8, 20.4, and 17.5 sq. miles, respectively. Black Rock Dam is the first structure upstream of the proposed bridge location. It is composed of a 933-ft long and 154-ft high earthen dam, a gated 4-ft by 5-ft concrete conduit in the right abutment of the dam, and a chute spillway with a 140-ft long crest adjacent to the right abutment. The structure has storage equivalent to 8 inches of runoff from the drainage area of 20.4 sq. miles. According to the FIS, the flows at Black Rock Dam are estimated based on hydrographs of major events routed through the reservoir. Refer to Appendix B of this report for additional Flood Insurance Study information. The FIS flows will be utilized for the hydraulic analysis.
- 2. Method 2 PeakFq Gage Analysis: A gage analysis was performed on Gage No. 01208013 Branch Brook near Thomaston, CT. The USGS program PeakFq, Version 7.2, computed estimates for the gages based on the Expected Moments Algorithm (EMA). Gage flow information was found in StreamStats, and is listed in the USGS publication, Regression Equations for Estimating Flood Flows for the 2-, 10-, 25-, 50-, 100-, and 500-Year Recurrence Intervals in Connecticut, Report 2004-5126 (Ahearn, 2004). Refer to Appendix D for analysis of the stream gage in PeakFq. The flows computed by PeakFq and transferred to the site using the CTDOT Drainage Manual's flow transfer equation will not be utilized for the hydraulic analysis.

The flows calculated using the above methods are listed in "Table 1: Summary of Flows".

IV. HISTORICAL FLOODING

Numerous major floods have occurred within the Naugatuck River Basin, many of which caused severe damage to property and even loss of life. According to the FEMA FIS, the major floods of the century within the watershed occurred in August 1955 which saw the failure of multiple dams and bridges. This includes the downstream reaches of the Thomaston Dam where the Naugatuck River claimed an estimated 36 lives and caused damages estimated at \$193,000,000. Stream flow records at the USGS gaging station along upstream of Black Rock Dam indicate that the August 1955 flood was greater than that of a 100-year event (FIS). Refer to Atlas 14 data (see Appendix E) to view relevant rainfall data.

V. STUDY RESULTS

The flows provided in the FEMA *Flood Insurance Study* at the mouth of Branch Brook will be utilized as the design flows for the hydraulic analysis. The FEMA and PeakFq rates are similar for all but the 500-year event. As noted in the *FIS*, the FEMA discharges for the 100-year and 500-year events "are estimated based on hydrographs of major events routed through the reservoir". The PeakFq flows are from a regression-based analysis and the 500-year flow appears too low for use. The flows within the *FIS* at the mouth of Branch Brook appear most accurate for the nature and use of the contributing watershed.

TABLE 1: SUMMARY OF FLOWS (C.F.S.)

Summary of Flows (cfs) vs. Design Frequency (years) Pedestrian Bridge over Branch Brook – Watertown/Thomaston, CT										
	Drainage Area (mi ²)	2-Year	10-Year	25-Year	50-Year	100-Year	200-Year	500-Year		
FEMA at Branch Brook mouth	22.8	-	800	-	800	900	-	2,300		
FEMA at Black Rock Dam	20.4	-	800	-	800	900	-	2,300		
PeakFq at Gage - No. 01208013	22.6	560	770	870	940	1,010	1,080	1,180		

As previously mentioned, the proposed bridge is classified as a large structure. Large structures have a 100-year design storm event and a 500-year check storm event. At the location of the proposed bridge, the selected method has a 100-year flow of 900 cfs and a 500-year flow of 2,300 cfs. See Table 2 for the design flows recommended for this project.

TABLE 2: DESIGN FLOWS (C.F.S.)

Design Flows (cfs) vs. Design Frequency (years) Aircraft Road Bridge over Quinnipiac River – Southington, CT							
Year Flow							
Average Daily Flow	40						
Average Spring Flow	80						
2	450*						
5	560*						
10	800						
25	800*						
50	800						
100 (Design Storm Event)	900						
200	1,500*						
500 (Check Storm Event)	2,300						

^{*}These values were obtained based on a linear evaluation of the logarithmic chart.

To comply with the National Flood Insurance Program and the CT DEEP hydraulic guidelines for work within a regulated floodway, the FEMA FIS flows will also be used in the floodway analysis.



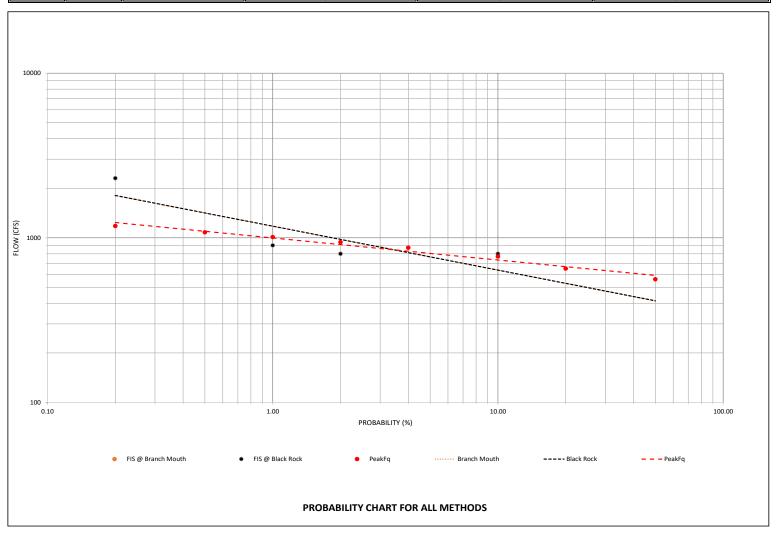
100 Constitution Plaza, 10th Floor Hartford, Connecticut 06103 PROJECT: Naugatuck River Greenway Multi-Use Trail

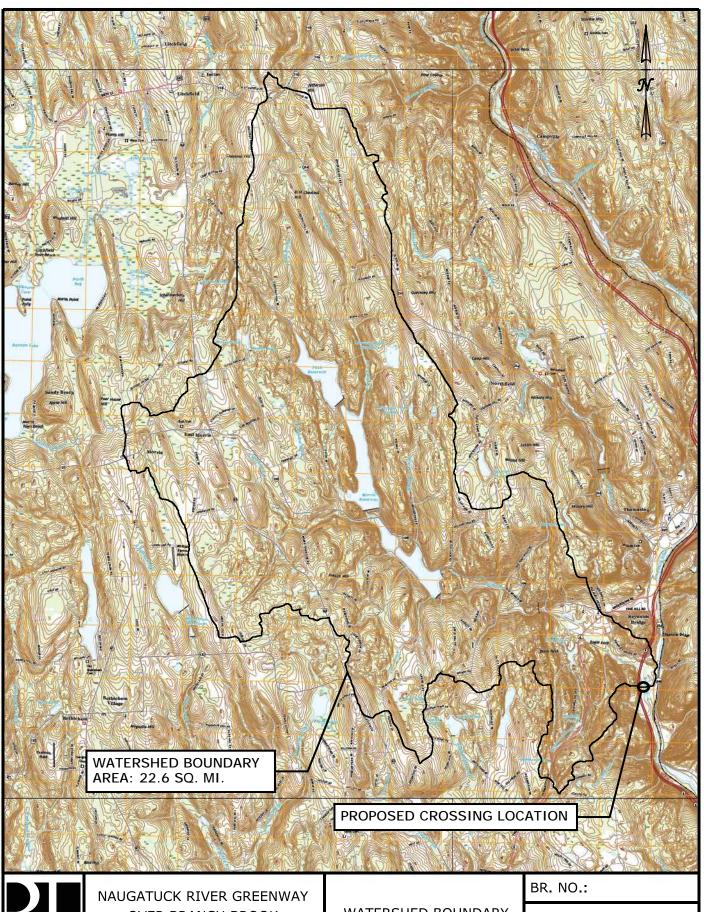
Towns of Watertown & Thomaston, CT

PREPARED BY: Brandon Rojas

снескед ву: David Cicia

Year		PROBABILITY (%)	FEMA FIS at mouth of Branch Brook	FEMA FIS at Black Rock Dam	PeakFq at USGS Stream Gage No. 1208013
2	0.5	50			560
5	0.2	20			650
10	0.1	10	800	800	770
25	0.04	4			870
50	0.02	2	800	800	940
100	0.01	1	900	900	1,010
200	0.005	0.5			1,080
500	0.002	0.2	2,300	2,300	1,180





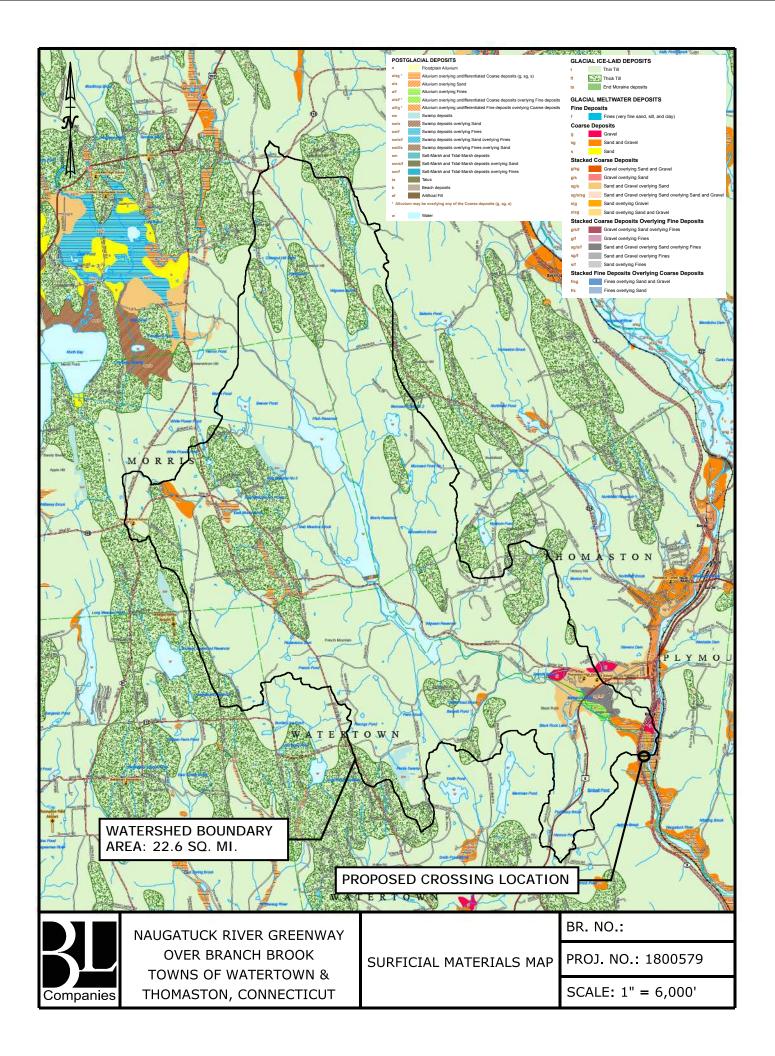
Companies

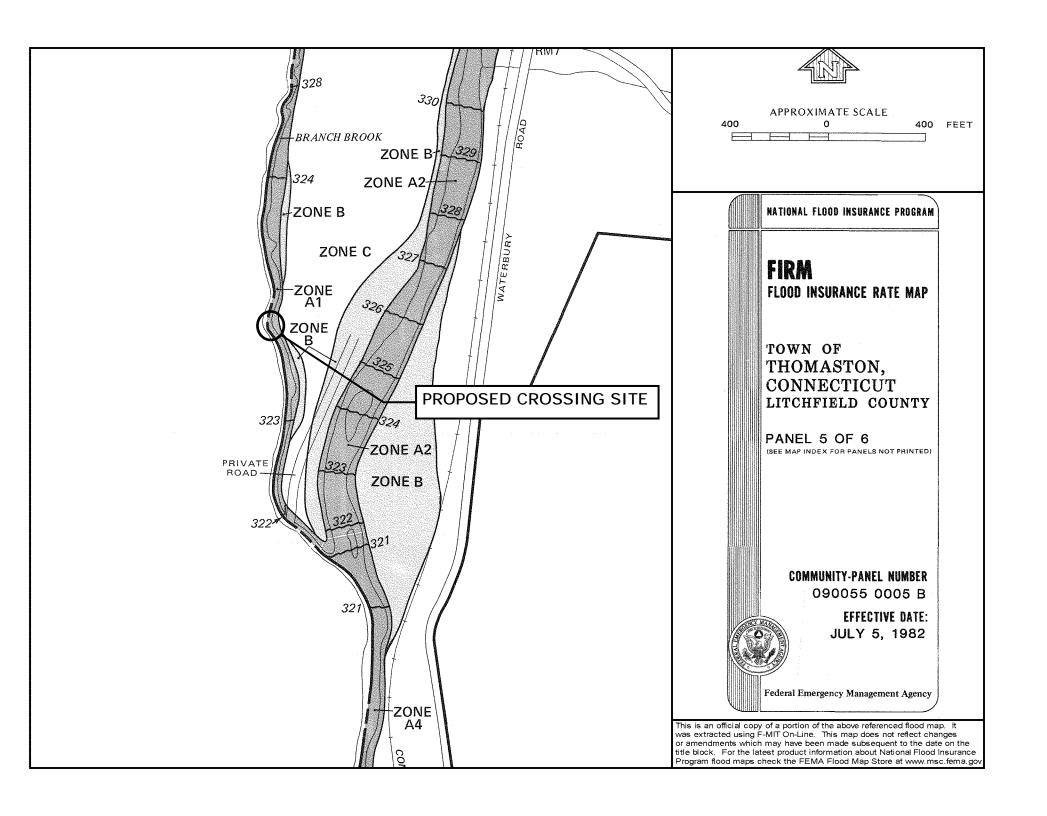
NAUGATUCK RIVER GREENWAY OVER BRANCH BROOK TOWNS OF WATERTOWN & THOMASTON, CONNECTICUT

WATERSHED BOUNDARY
MAP

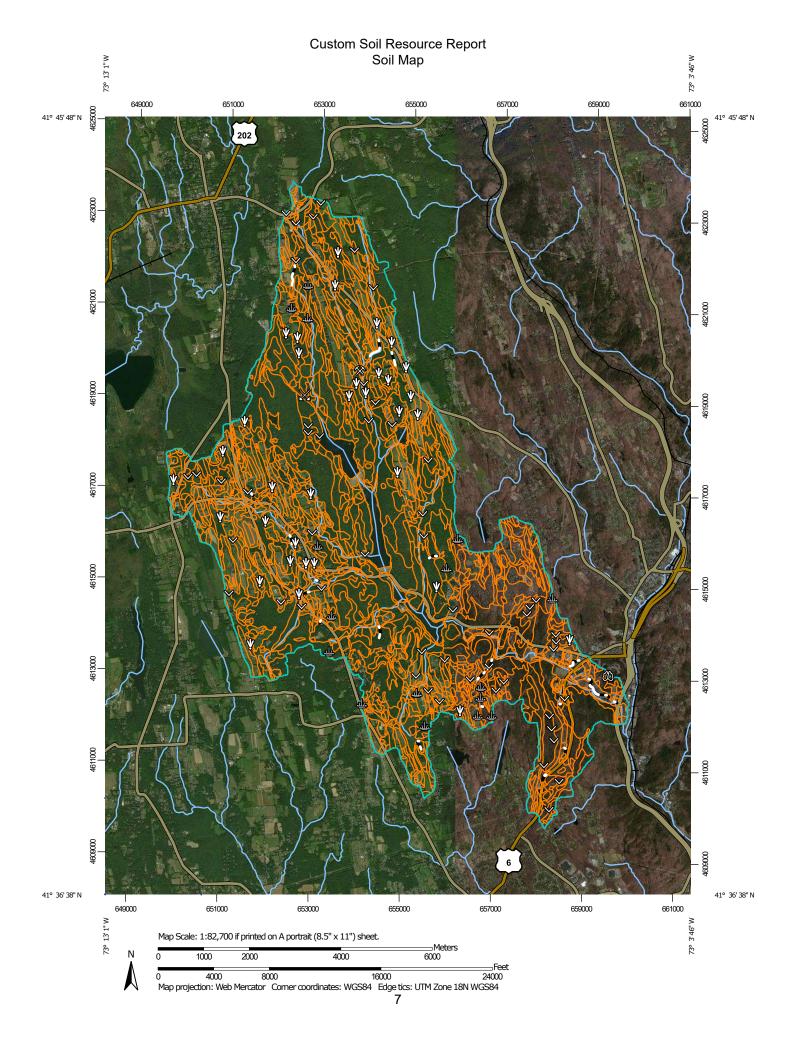
PROJ. NO.: 1800579

SCALE: 1" = 6,000'





Hydrologic Analysis Report Naugatuck River Greenway Footbridge over Branch Brook – Wo	atertown/Thomaston, C	Τ	
APPENDIX A: WEB SOIL	SURVEY DATA		



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly SpotLandfill

▲ Lava Flow

16

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

→ Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

SEND

Spoil Area

Stony Spot

Yery Stony Spot

Wet Spot

△ Other

Special Line Features

Water Features

Streams and Canals

Transportation

+++ Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12.000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut Survey Area Data: Version 19, Sep 13, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 28, 2011—Oct 5, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2	Ridgebury fine sandy loam, 0 to 3 percent slopes	126.3	0.9%
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	727.8	5.0%
4	Leicester fine sandy loam	23.2	0.2%
12	Raypol silt loam	9.0	0.1%
13	Walpole sandy loam, 0 to 3 percent slopes	16.5	0.1%
15	Scarboro muck, 0 to 3 percent slopes	22.1	0.2%
16	Halsey silt loam	42.4	0.3%
17	Timakwa and Natchaug soils, 0 to 2 percent slopes	11.6	0.1%
18	Catden and Freetown soils, 0 to 2 percent slopes	160.1	1.1%
30B	Branford silt loam, 3 to 8 percent slopes	12.3	0.1%
34A	Merrimac fine sandy loam, 0 to 3 percent slopes	13.8	0.1%
34B	Merrimac fine sandy loam, 3 to 8 percent slopes	t slopes	
34C	Merrimac fine sandy loam, 8 to 15 percent slopes	46.3	0.3%
38A	Hinckley loamy sand, 0 to 3 percent slopes	25.2	0.2%
38C	Hinckley loamy sand, 3 to 15 percent slopes	162.5	1.1%
38E	Hinckley loamy sand, 15 to 45 percent slopes	22.3	0.2%
45A	Woodbridge fine sandy loam, 0 to 3 percent slopes	44.8	0.3%
45B	Woodbridge fine sandy loam, 3 to 8 percent slopes	431.2	3.0%
45C	Woodbridge fine sandy loam, 8 to 15 percent slopes	55.2	0.4%
46B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	87.5	0.6%
46C	Woodbridge fine sandy loam, 8 to 15 percent slopes, very stony	17.4	0.1%
47C	Woodbridge fine sandy loam, 3 to 15 percent slopes, extremely stony	549.8	3.8%

Custom Soil Resource Report

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI		
50A	Sutton fine sandy loam, 0 to 3 percent slopes	9.2	0.1%		
50B	Sutton fine sandy loam, 3 to 8 percent slopes	29.8			
51B	Sutton fine sandy loam, 0 to 8 percent slopes, very stony	23.6	0.2%		
52C	Sutton fine sandy loam, 2 to 15 percent slopes, extremely stony	77.7	0.5%		
57C	Gloucester gravelly sandy loam, 8 to 15 percent slopes	0.2	0.0%		
59C	Gloucester gravelly sandy loam, 3 to 15 percent slopes, extremely stony	29.1	0.2%		
59D	Gloucester gravelly sandy loam, 15 to 35 percent slopes, extremely stony	17.2	0.1%		
60B	Canton and Charlton fine sandy loams, 3 to 8 percent slopes	396.4	2.7%		
60C	Canton and Charlton fine sandy loams, 8 to 15 percent slopes	193.8	1.3%		
60D	Canton and Charlton soils, 15 to 25 percent slopes	49.9	0.3%		
61B	Canton and Charlton fine sandy loams, 0 to 8 percent slopes, very stony	95.8	0.7%		
61C	Canton and Charlton fine sandy loams, 8 to 15 percent slopes, very stony	70.0	0.5%		
62C	Canton and Charlton fine sandy loams, 3 to 15 percent slopes, extremely stony	245.5	1.7%		
62D	Canton and Charlton fine sandy loams, 15 to 35 percent slopes, extremely stony	168.1	1.2%		
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	1,095.9	7.6%		
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	221.1	1.5%		
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	2,329.2	16.1%		
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	1,623.2	11.2%		
76E	Rock outcrop-Hollis complex, 3 to 45 percent slopes	309.2	2.1%		
76F	Rock outcrop-Hollis complex, 45 to 60 percent slopes	92.8	0.6%		

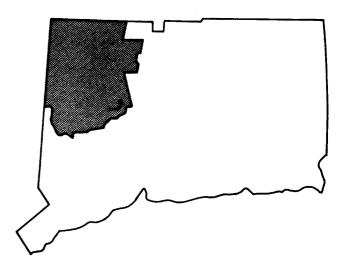
Custom Soil Resource Report

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
84B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes	1,590.5	11.0%
84C	Paxton and Montauk fine sandy loams, 8 to 15 percent slopes	1,000.4	6.9%
84D	Paxton and Montauk fine sandy loams, 15 to 25 percent slopes	224.3	1.5%
85B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes, very stony	156.5	1.1%
85C	Paxton and Montauk fine sandy loams, 8 to 15 percent slopes, very stony	247.6	1.7%
86C	Paxton and Montauk fine sandy loams, 3 to 15 percent slopes, extremely stony	165.4	1.1%
86D	Paxton and Montauk fine sandy loams, 15 to 35 percent slopes, extremely stony	359.5	2.5%
100	Suncook loamy fine sand	2.9	0.0%
101	Occum fine sandy loam	66.1	0.5%
102	Pootatuck fine sandy loam	8.8	0.1%
107	Limerick and Lim soils	1.6	0.0%
108	Saco silt loam	16.1	0.1%
109	Fluvaquents-Udifluvents complex, frequently flooded		0.2%
301	Beaches-Udipsamments complex, coastal		0.0%
306	Udorthents-Urban land complex	107.7	0.7%
307	Urban land	14.7	0.1%
308	Udorthents, smoothed	112.5	0.8%
309	Udorthents, flood control	49.6	0.3%
702A	Tisbury silt loam, 0 to 3 percent slopes	12.1	0.1%
702B	Tisbury silt loam, 3 to 8 percent slopes	3.3	0.0%
703B	Haven silt loam, 3 to 8 percent slopes	10.2	0.1%
703C	Haven silt loam, 8 to 15 percent slopes	2.4	0.0%
W	Water	488.6	3.4%
Totals for Area of Interest		14,475.5	100.0%

Hydrologic Analysis Naugatuck River Gre Footbridge over Bra	eenway	own/Thomaston, CT	,	
APPENDIX B: I	FEMA FLOOD	INSURANCE S	STUDY	



TOWN OF WATERTOWN, CONNECTICUT



MAY 1980



federal emergency management agency federal insurance administration

The population of Watertown has increased steadily from 3,100 in 1900 to 18,610 in 1970. This population growth is a reflection of the change in Watertown from rural and agricultural in character to urban and suburban. Thirty percent of the town's land area, however, is still used for agricultural purposes. A modern superhighway system, which connects Watertown to the City of Waterbury, reducing commuting time, encourages suburban development.

Residential development in Watertown, as a whole, consists mainly of single- family detached houses. The most developed portion of the town's land area is arranged in a land use pattern consisting of an elongated urban core surrounded by suburban areas, that extend northwestward into rural countryside.

Watertown has only a small supply of easily developable land available. Much of the land presents problems for urban development because of uneven topography and less than ideal subsoil conditions.

The climate in Watertown is variable, with the average annual precipitation ranging between 44 and 52 inches. Temperatures in the area range from below 0 degrees Fahrenheit (°F) to greater than 100°F, with an annual average of approximately 50°F.

2.3 Principal Flood Problems

Numerous damaging floods have occurred in the Naugatuck River basin which have affected the Town of Watertown. Floods causing significant damage in this century occurred in 1927, 1936, 1938, 1948 and 1955.

The August, 1955 flood was the greatest flood ever recorded in the Naugatuck River basin with peak discharges three to four times the magnitude of any other flood. Between August 11-15, Hurricane Connie brought 4 to 8 inches of rainfall to the basin. Due to the unusually dry antecedent conditions, very little runoff resulted from this storm. However, when Hurricane Diane deposited 10 to 13 inches of rainfall in 24 hours, runoff of major proportions occurred due to the saturated condition of the soil. The failure of many dams and bridges contributed substantially to peak discharges. Downstream of the Thomaston Dam, the Naugatuck River claimed 36 lives and caused an estimated loss of nearly 193,000,000 dollars. Over 80 percent of this loss occurred in Waterbury, Watertown, Naugatuck and Ansonia.

High-water mark data were recorded at 332.5, 326.4, 314.9 and 309.9 feet, for the Naugatuck River at the mouth of Jericho Brook, at the mouth of Nibbling Brook, at Frost Bridge, and 0.1 mile below Frost Bridge, respectively.

Major floods occurred in the upper Naugatuck River basin in November 1927, March 1936, September 1938, December 1948, August 1955, and October 1955. With the exception of the August 1955 flood, the peak discharges of the other events generally ranged from 15,000 to 20,000 cubic feet per second (cfs) in the Naugatuck River at Waterbury, with estimated frequencies ranging from approximately 15 to 30 years. The August 1955 event was the greatest flood of record, by far, with a flow in the Naugatuck River at Waterbury of 90,000 cfs, with a corresponding frequency considered in excess of 100 years. The peak discharge on Branch Brook in 1955 was estimated at 10,300 cfs, approximately equal to the Leadmine Brook peak flow of 10,400 cfs.

In addition to the Naugatuck River, Steele Brook also has a history of damaging floods, the most serious of which occurred in August 1955. Areas close to the brook are susceptible to intense and sudden floods as a result of the steep sloping streets and terrain of the basin. The floodwaters converge from the fan-shaped drainage area and due to the limited natural storage in the upper basin, quickly exceed the channel capacity and overflow into the flood plain. Additionally, numerous restrictions such as low bridges, overhanging buildings, private dams and sharp bends in the channel all contribute to the flooding problems. In June 1973, and again in July 1975, Steele Brook overflowed its banks and resulted in extensive damage to commercial and manufacturing properties, homes and town installations.

Since 1955, the COE has constructed a system of reservoirs in the basin which will modify all future floods. In a repeat of historic flood events, the system would generally reduce flows on the Naugatuck River at Waterbury by 60 to 75 percent depending on storm orientation. Black Rock Reservoir on Branch Brook would generally maintain flows to safe channel capacity.

2.4 Flood Protection Measures

Following the devastating flood of 1955 along the Naugatuck River, the COE completed seven flood control dams and reservoirs in the Naugatuck River basin. Four of these, namely Thomaston, Hancock Brook, Black Rock and Northfield Brook, provided protection to the Town of Watertown.

was developed between the log of the 2-year flood and the drainage area and it was found that for New England, discharges vary in accordance with the drainage area raised to the exponent power of 0.70.

There are no discharge records for Branch Brook. In 1970, the COE completed Black Rock Dam, located on Branch Brook about two miles above the mouth. Discharges from the dam are controlled by gate operations. The anticipated releases for the 10- and 50-year events would probably not exceed the nondamaging downstream channel capacity and these releases would not be made until downstream flood conditions subsided. The 100- and 500-year discharges are estimated based on hydrographs of major events routed through the reservoir. On Branch Brook above Wigwam Reservoir, peak discharge frequencies were determined by using relationships based on records for the USGS gaging station on nearby Leadmine Brook and then relating it to the Branch Brook watershed based on a direct drainage area relationship. A regional study was not undertaken to determine the drainage areadischarge relationship for Leadmine and Branch Brooks. However, the runoff characteristics of Leadmine Brook are considered to be similar to those of Branch Brook.

A summary of drainage area-peak discharge relationships is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

	DRAINAGE AREA		PEAK DISC	HARGES (cf	s)
FLOODING SOURCE AND LOCATION	(sq. miles)	10-YEAR	50-YEAR	100-YEAR	500-YEAR
NAUGATUCK RIVER					
At downstream corporate					
limits	137	5,300	5,400	8,000	21,600
At upstream corporate				·	•
limits	131	5,000	5,000	5,200	14,000
BRANCH BROOK					
At mouth	22.8	800	800	900	2,300
At Black Rock Dam	20.4	800	800	900	2,300
At Wigwam Dam	17.5	2,200	5,300	7,600	16,500
STEELE BROOK					
At downstream corporate					
limits	12.4	1,410	2,740	3,550	6,245
Above Wattles Brook	9.0	1,130	2,200	2,840	5,000
At Hemingway Pond	5.7	820	1,600	2,060	3,600
Below Smith Pond Brook					
confluence	4.0	640	1,250	1,600	2,800

FLOODING SOU	SOURCE		FLOODWAY			BASE WATER SURFA	BASE FLOOD SURFACE ELEVATION	
CROSS SECTION	DISTANCE	wютн 3 (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Naugatuck River								
T L	20,4401	164	1,295	6.2	319.0	319.0	319.3	0.3
Þ	22,3001	118	884	5.7	320.5	320.5	320.6	0.1
•								
Branch Brook	1002	[0	303	~	3 1.65	321.6	322.6	1.0
₩ 1	100	1 0	000) -	322 0	322 0	322.8	8.0
жа ⁽	265	00 [604) - U	327.2	324.2	324.2	0.0
U	L, 700-	L32	149 747	T.0	330 0	330 0	330 0	0 0
Ω	2,400°	40	T40	7.0	0.000	0) · [cc) (
ഠ	2,6004	43	102	ω. ω	331.1	331.I	33L.L	0
Ēч	3,590 ²	89	186	4.8	338.1	338.1	338.1	0.0
U	5,410 ²	70	123	7.3	349.0	349.0	349.0	0.0
Н	$6,320^{2}$	72	218	4.1	353.6	353.6	353.7	0.1
Н	7,130 ²	78	143	6.3	356.7	356.7	356.8	0.1
ט	7,2902	54	119	7.6	357.5	357.5	357.5	0.0
×	8,4002	38	141	6.4	365.2	365.2	365.2	0.0
H	10,0002	31	92	8.6	381.9	381.9	381.9	0.0
X	20,500 ²	1,536	32,010	0.2	567.4	567.4	568.0	9.0
Z	24,2702	370	4,953	1.5	567.4	567.4	568.0	9.0
0	24,670 ²	914	11,814	9.0	569.3	569.3	569.3	0.0
			THE RESERVE THE PROPERTY OF TH	The same and the same of the s				

¹Feet above corporate limits ²Feet above confluence with Naugatuck River ³This width extends beyond corporate limits

FEDERAL EMERGENCY MANAGEMENT AGENCY Federal Insurance Administration TOWN OF WATERTOWN, CT (LITCHFIELD CO.)

FLOODWAY DATA

NAUGATUCK RIVER AND BRANCH BROOK

TABLE 2

		ELEV BETWEEN 1	ELEVATION DIFFERENCE ² BETWEEN 1.0% (100-YEAR) FLOOD AND	CE ² LOOD AND	<u>.</u>	ZONE	BASE FLOOD
FLOODING SOURCE	PANEL	10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)	L C	1200 1200 1200 1200 1200 1200 1200 1200	ELEVATION ³ (NGVD)
Naugatuck River							
Reach 1	03	-1.7	-1.6	+6.1	015	A3	Varies
Reach 2	02,03	-2.0	-1.9	+7.6	020	A4	Varies
Branch Brook							•
Reach 1	01,02	9.0-	-0.3	+1.7	900	Al	Varies
Reach 2	04	-3.6	-1.7	+3.5	035	A7	Varies
				1			
Steele Brook							
Reach 1	90	-2.6	-0.8	+2.2	025	A5	Varies
Reach 2	90	-4.0	-1.4	+0.9	040	A 8	Varies
Reach 3	90	-2.1	-0.5	+1.2	020	A4	Varies
Reach 4	90	-2.3	-0.7	+1.8	025	A5	Varies
Reach 5	90	-4.8	-1.5	+1.4	050	A10	Varies
Reach 6	90	-7.5	-4.1	+5.6	075	A15	Varies
Reach 7	90,20	-1.8	9.0-	+2.2	020	A4	Varies
Reach 8	05	-2.3	8.0-	+2.3	025	A5	Varies
Reach 9	05	-5.4	-1.9	+5.4	055	A11	Varies
Reach 10	05	-3:0	-1.2	+3.2	030	A6	Varies
Reach 11	05	-1.3	-0.3	+0.9	015	А3	Varies
1							

1Flood Insurance Rate Map Panel

²Weighted average

 $\tilde{3}$ Rounded to the nearest foot - see map

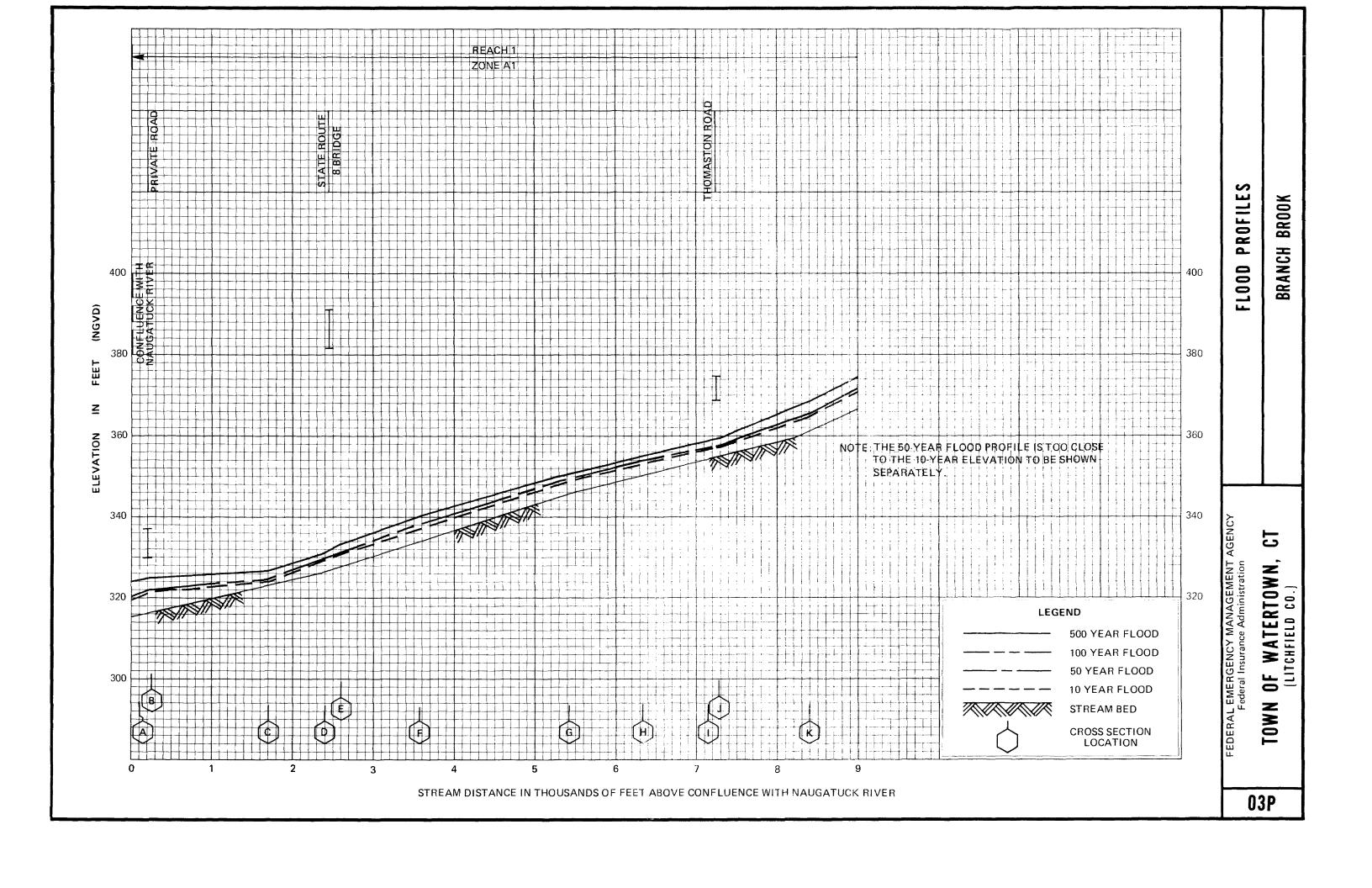
FLOOD INSURANCE ZONE DATA

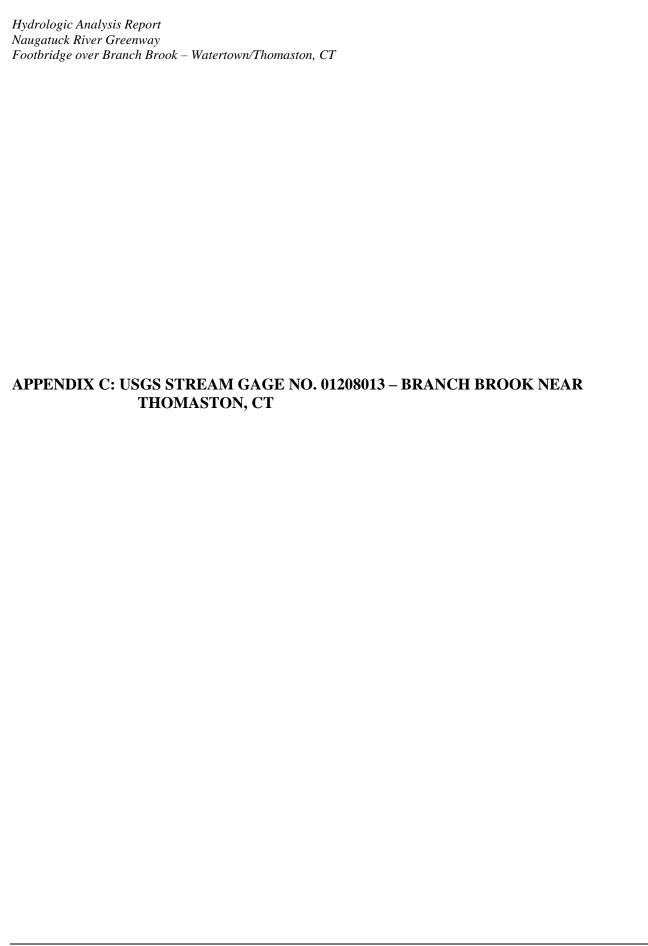
NAUGATUCK RIVER, BRANCH BROOK AND STEELE BROOK

TOWN OF WATERTOWN, CT (LITCHFIELD CO.)

FEDERAL EMERGENCY MANAGEMENT AGENCY Federal Insurance Administration

TABLE 3







StreamStats Data-Collection Station Report

USGS Station Number 01208013

Station Name BRANCH BROOK NR THOMASTON, CT.

Click here to link to available data on NWIS-Web for this site.

Descriptive Information

Station Type Streamgage, continuous record

Location Gage

Regulation and Diversions

Regulated? Unknown Period of Record 1971-2001

Remarks Peak flows affected by flood control.

Latitude (degrees NAD83) 41.65371 Longitude (degrees NAD83) -73.09483 Hydrologic unit code 01100005

County -HCDN2009 No

Physical Characteristics

Characteristic Name	Value	Units	Citation Number
Descriptive Information			
Datum_of_Latitude_Longitude	NAD83	dimensionless	<u>30</u>
District_Code	09	dimensionless	<u>30</u>
Begin_date_of_record	10/1/1974	days	<u>41</u>
End_date_of_record	5/13/1993	days	<u>41</u>
Number_of_days_of_record	5549	days	<u>41</u>
Number_of_days_GT_0	5549	days	<u>41</u>
Basin Dimensional Characteristics			
Drainage_Area	20.8	square miles	<u>30</u>

Streamflow Statistics

Statistic Name	Value	Units	Citation Number	Preferred	of	,	Variance	Lower 95% Confidence Interval	Upper 95% Confidence Interval	Start	Remarks
Flow-Duration Statistics											
1_Percent_Duration	383.06	cubic feet per second	<u>41</u>	Y	15						
5_Percent_Duration	111	cubic feet per second	<u>41</u>	Y	15						
10_Percent_Duration	68	cubic feet per second	<u>41</u>	Y	15						
20 Percent Duration	43	cubic feet per	<u>41</u>	Y	15						

0/10/2010			00.	arriotato Bt	ata 00110
		second			
25_Percent_Duration	37	cubic feet per second	<u>41</u>	Y	15
30_Percent_Duration	32	cubic feet per second	<u>41</u>	Y	15
40_Percent_Duration	23	cubic feet per second	<u>41</u>	Y	15
50_Percent_Duration	18	cubic feet per second	<u>41</u>	Y	15
60_Percent_Duration	13	cubic feet per second	<u>41</u>	Y	15
70_Percent_Duration	9.92	cubic feet per second	<u>41</u>	Y	15
75_Percent_Duration	8.3	cubic feet per second	<u>41</u>	Y	15
80_Percent_Duration	7.03	cubic feet per second	<u>41</u>	Y	15
90_Percent_Duration	3.6	cubic feet per second	<u>41</u>	Y	15
95_Percent_Duration	1.5	cubic feet per second	<u>41</u>	Y	15
99_Percent_Duration	0.41	cubic feet per second	<u>41</u>	Y	15
General Flow Statistics					
Minimum_daily_flow	0.18	cubic feet per second	<u>41</u>	Y	15
Maximum_daily_flow	713	cubic feet per second	<u>41</u>	Y	15
Std_Dev_of_daily_flows	63.769	cubic feet per second	<u>41</u>	Y	15
Average_daily_streamflow	34.999	cubic feet per second	<u>41</u>	Y	15
Base Flow Statistics					
Number_of_years_to_compute_BFI	15	years	<u>42</u>	Y	
Average_BFI_value	0.395	dimensionless	<u>42</u>	Y	
Std_dev_of_annual_BFI_values	0.112	dimensionless	<u>42</u>	Y	

Citations

Citation Number	Citation Name and URL
30	Imported from NWIS file
41	Wolock, D.M., 2003, Flow characteristics at U.S. Geological Survey streamgages in the conterminous United States: U.S. Geological Survey Open-File Report 03-146, digital data set
42	Wolock, D.M., 2003, Base-flow index grid for the conterminous United States: U.S. Geological Survey Open-File Report 03-263, digital data set



Program PeakFq Version 7.2 3/28/2018 U. S. GEOLOGICAL SURVEY
Annual peak flow frequency analysis

Seq.002.000
Run Date / Time
10/09/2019 11:00

--- PROCESSING OPTIONS ---

Plot option = Graphics device

Basin char output = None
Print option = Yes
Debug print = No
Input peaks listing = Long

Input peaks format = WATSTORE peak file

Input files used:
 peaks (ascii) -

G:\JOBS18\04\1800579\ENG-TECH\TRANS\Hydra\Hydrology\PEAK_01208013_TEST.TXT

specifications -

G:\JOBS18\04\1800579\ENG-TECH\TRANS\Hydra\Hydrology\PKFQWPSF.TMP

Output file(s):

main -

G:\JOBS18\04\1800579\ENG-TECH\TRANS\Hydra\Hydrology\PEAK_01208013_TEST.PRT

*** User responsible for assessment and interpretation of the following analysis ***

1

Program PeakFq Version 7.2 3/28/2018 U. S. GEOLOGICAL SURVEY Annual peak flow frequency analysis Seq.001.001 Run Date / Time 10/09/2019 11:00

Station - 01208013 BRANCH BROOK NEAR THOMASTON, CT

TABLE 1 - INPUT DATA SUMMARY

Number of peaks in record 25 Peaks not used in analysis 0 Gaged peaks in analysis 25 Historic peaks in analysis 0 = Beginning Year 1971 = Ending Year 1995 = Historical Period Length 25 Skew option WEIGHTED Regional skew 0.340 Standard error 0.510 Mean Square error 0.260 Gage base discharge 0.0 User supplied high outlier threshold = User supplied PILF (LO) criterion = Plotting position parameter 0.00 Type of analysis EMA PILF (LO) Test Method **MGBT** Perceptible Ranges: Start Year End Year Lower Bound Upper Bound 1971 1995 0.0 INF **DEFAULT**

TABLE 2 - DIAGNOSTIC MESSAGE AND PILF RESULTS

WCF002J-CALCS COMPLETED. RETURN CODE = 2 EMA002W-CONFIDENCE INTERVALS ARE NOT EXACT IF HISTORIC PERIOD > 0

MULTIPLE GRUBBS-BECK TEST RESULTS

MULTIPLE GRUBBS-BECK PILF THRESHOLD 494.0 NUMBER OF PILFS IDENTIFIED CLASSIFICATION OF PILFS: NUMBER OF ZERO FLOWS 0 NUMBER OF CENSORED FLOWS 0 NUMBER OF GAGED PEAKS GAGED PEAKS AND CORRESPONDING P-VALUES 145.0 (0.1052) 145.0 (0.0011)288.0 (0.2320) 288.0 (0.0440) 308.0 (0.0155) 332.0 (0.0057)355.0 (0.0014) 390.0 (0.0007)

Kendall's Tau Parameters

MEDIAN No. of TAU P-VALUE SLOPE PEAKS

Program PeakFq U. S. GEOLOGICAL SURVEY Seq.001.002
Version 7.2 Annual peak flow frequency analysis Run Date / Time 10/09/2019 11:00

Station - 01208013 BRANCH BROOK NEAR THOMASTON, CT

TABLE 3 - ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

		LOGARITHMIC	
	MEAN	STANDARD DEVIATION	SKEW
EMA WITHOUT REG SKEW EMA WITH REG SKEW	2.7402 2.7476	0.1189 0.1062	-0.423 0.134

EMA ESTIMATE OF MSE OF SKEW WITHOUT REG SKEW 0.2364
EMA ESTIMATE OF MSE OF SKEW W/GAGED PEAKS ONLY (AT-SITE) 0.2364

TABLE 4 - ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL <- EMA ESTIMATE -> <- FOR EMA ESTIMATE WITH REG SKEW ->							
EXCEEDANCE	WITH	WITHOUT	LOG VARIANCE	<-CONFIDENC	E LIMITS->		
PROBABILITY	REG SKEW	REG SKEW	OF EST.	5% LOWER	95% UPPER		
0.9950	307.2	243.7	0.0090	128.0	396.4		
0.9900	324.4	267.4	0.0071	149.3	405.1		
0.9500	377.6	339.9	0.0035	220.4	437.3		
0.9000	410.3	383.2	0.0023	265.1	460.9		
0.8000	454.6	439.9	0.0013	322.0	497.5		
0.6667	501.2	496.9	0.0008	372.6	543.0		
0.5000	556.3	560.5	0.0005	429.3	609.3		
0.4292	581.1	588.0	0.0005	492.1	643.8		
0.2000	685.9	695.0	0.0006	620.8	798.7		
0.1000	767.7	769.6	0.0009	684.7	941.4		
0.0400	867.7	851.5	0.0015	755.6	1160.0		
0.0200	940.4	905.3	0.0021	803.9	1349.0		
0.0100	1012.	954.0	0.0028	848.9	1559.0		
0.0050	1083.	998.7	0.0035	891.1	1791.0		
0.0020	1177.	1053.	0.0047	943.3	2136.0		

Program PeakFq U. S. GEOLOGICAL SURVEY Seq.001.003
Version 7.2 Annual peak flow frequency analysis Run Date / Time 10/09/2019 11:00

Station - 01208013 BRANCH BROOK NEAR THOMASTON, CT

TABLE 5 - INPUT DATA LISTING

WATER	PEAK	PEAKFO	FLOW INTERVALS (WHERE LOWER BOUND NOT = UPPER BOUND)
YEAR	VALUE		LOWER BOUND UPPER BOUND REMARKS
1971	494.0	K	
1972	390.0	K	
1973	585.0	K	
1974	555.0	K	
1975	795.0	K	
1976	590.0	K	
1977	500.0	K	
1978	705.0	K	
1979	750.0	K	
1980	145.0	K	
1981	725.0	K	
1982	805.0	K	
1983	755.0	K	
1984	683.0	K	
1985	308.0	K	
1986	538.0	K	
1987	766.0	K	
1988	145.0	K	
1989	604.0	K	
1990	539.0	K	
1991	573.0	K	
1992	288.0	K	
1993	355.0	K	
1994	288.0	K	
1995	332.0	K	

Explanation of peak discharge qualification codes

PeakFQ NWIS
CODE CODE DEFINITION

D	3	Dam failure, non-recurrent flow anomaly
G	8	Discharge greater than stated value
Χ	3+8	Both of the above
L	4	Discharge less than stated value
K	6 OR C	Known effect of regulation or urbanization
Н	7	Historic peak

- Minus-flagged discharge -- Not used in computation
 -8888.0 -- No discharge value given
- Minus-flagged water year -- Historic peak used in computation

Program PeakFq	U. S. GEOLOGICAL SURVEY	Seq.001.004
Version 7.2	Annual peak flow frequency analysis	Run Date / Time
3/28/2018		10/09/2019 11:00

Station - 01208013 BRANCH BROOK NEAR THOMASTON, CT

TABLE 6 - EMPIRICAL FREQUENCY CURVES -- HIRSCH-STEDINGER PLOTTING POSITIONS

WATER	RANKED	EMA	FLOW INTERVALS (WHERE LOWER BOUND NOT = UPPER
BOUND)			
YEAR	DISCHARGE	ESTIMATE	LOWER BOUND UPPER BOUND
1982	805.0	0.0383	
1975	795.0	0.0768	
1987	766.0	0.1152	
1983	755.0	0.1537	
1979	750.0	0.1922	
1981	725.0	0.2307	
1978	705.0	0.2691	
1984	683.0	0.3076	
1989	604.0	0.3461	
1976	590.0	0.3846	
1973	585.0	0.4230	
1991	573.0	0.4615	
1974	555.0	0.5000	
1990	539.0	0.5385	
1986	538.0	0.5770	
1977	500.0	0.6154	
1971	494.0	0.6539	
* 1972	390.0	0.6924	
* 1993	355.0	0.7309	
* 1995	332.0	0.7693	
* 1985	308.0	0.8078	
* 1992	288.0	0.8848	

*	1994	288.0	0.8463
*	1980	145.0	0.9617
*	1988	145.0	0.9232

^{*} DENOTES PILF (LO)

Program PeakFq U. S. GEOLOGICAL SURVEY Seq.001.005 Version 7.2 Annual peak flow frequency analysis Run Date / Time 3/28/2018 10/09/2019 11:00

Station - 01208013 BRANCH BROOK NEAR THOMASTON, CT

<--- USER-ENTERED

TABLE 7 - EMA REPRESENTATION OF DATA

----><------ FINAL ------>
WATER <---- OBSERVED ----><----- EMA -----><- PERCEPTIBLE RANGES -><PERCEPTIBLE RANGES ->
YEAR Q_LOWER Q_UPPER Q_LOWER Q_UPPER LOWER UPPER
LOWER UPPER

YEAR	Q_LOWER	Q_UPPER	Q_LOWER	Q_UPPER	LOWER	UPPER
LOWER	UPPER					
1971	494.0	494.0	494.0	494.0	0.0	INF
494.0	INF					
1972	390.0	390.0	0.0	494.0	0.0	INF
494.0	INF					
1973	585.0	585.0	585.0	585.0	0.0	INF
494.0	INF					
1974	555.0	555.0	555.0	555.0	0.0	INF
494.0	INF					
1975	795.0	795.0	795.0	795.0	0.0	INF
494.0	INF					
1976	590.0	590.0	590.0	590.0	0.0	INF
494.0	INF					
1977	500.0	500.0	500.0	500.0	0.0	INF
494.0	INF					
1978	705.0	705.0	705.0	705.0	0.0	INF
494.0	INF					
1979	750.0	750.0	750.0	750.0	0.0	INF
494.0	INF					
1980	145.0	145.0	0.0	494.0	0.0	INF
494.0	INF					
1981	725.0	725.0	725.0	725.0	0.0	INF
494.0	INF					
1982	805.0	805.0	805.0	805.0	0.0	INF
494.0	INF					
1983	755.0	755.0	755.0	755.0	0.0	INF
494.0	INF					

1984	683.0	683.0	683.0	683.0	0.0	INF
494.0	INF					
1985	308.0	308.0	0.0	494.0	0.0	INF
494.0	INF					
1986	538.0	538.0	538.0	538.0	0.0	INF
494.0	INF					
1987	766.0	766.0	766.0	766.0	0.0	INF
494.0	INF					
1988	145.0	145.0	0.0	494.0	0.0	INF
494.0	INF					
1989	604.0	604.0	604.0	604.0	0.0	INF
494.0	INF					
1990	539.0	539.0	539.0	539.0	0.0	INF
494.0	INF					
1991	573.0	573.0	573.0	573.0	0.0	INF
494.0	INF					
1992	288.0	288.0	0.0	494.0	0.0	INF
494.0	INF					
1993	355.0	355.0	0.0	494.0	0.0	INF
494.0	INF					
1994	288.0	288.0	0.0	494.0	0.0	INF
494.0	INF					
1995	332.0	332.0	0.0	494.0	0.0	INF
494.0	INF					
1						

End PeakFQ analysis.

Stations processed: 1
Number of errors: 0
Stations skipped: 0
Station years: 25

Data records may have been ignored for the stations listed below. (Card type must be Y, Z, N, H, I, 2, 3, 4, or *.) (2, 4, and * records are ignored.)

For the station below, the following records were ignored:

FINISHED PROCESSING STATION: 01208013 USGS BRANCH BROOK NEAR THOMASTON,

For the station below, the following records were ignored:

FINISHED PROCESSING STATION:

Hydrologic Analysis Report Naugatuck River Greenway Pedestrian Bridge over Branch Brook – Watertown/Thomaston, CT

APPENDIX E: SUPPLEMENTARY REFERENCE DATA

- CTDOT Drainage Manual Transfer Calculations
- StreamStats Computation at Bridge Site
- NOAA Atlas 14 Data
- USGS Reference Publications

Hydrology 6.11-1

6.11 Transferring Gaged Data

6.11.1 Procedure

Gaged data can be transferred up or downstream on the gaged stream <u>only</u>. If the drainage area for the location of concern is $\geq 75\%$ and $\leq 125\%$ of the drainage area at the gage, then the gaged data can be transferred with equation 6.12.

6.11.2 Transfer Equation

The following equation shall be used to transfer gage data:

$$\frac{Q_1 / A_1}{Q_2 / A_2} = \frac{A_1^{[(0.894 / A_1^{0.048}) - 1]}}{A_2^{[(0.894 / A_2^{0.048}) - 1]}}$$
(English only)
(6.12)

 Q_1 and A_1 represent the discharge rate and watershed area at one point in the watershed and Q_2 and A_2 represent the rate and area at the gage or known outlet which remain constant while Q_1 and A_1 are varied.

Q = discharge in cubic feet per second

A = drainage area in square miles

Source: Adopted from Mockus, V., SCS National Engineering Handbook, Section 4, Hydrology, 1972

 Prepared By: BGR
 Date:
 10/9/2019

 Checked By: DMC
 Date:
 10/11/2019

 A1 =
 22.6
 sq mi
 Proposed Drain. Area

 A2 =
 20.8
 sq mi
 Gage Drain. Area

*PeakFQ trans. to Bridge

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
Q2 =	556.3	685.9	767.7	867.7	940.4	1012	1177

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year	*Site Flows
Q1 =	587	724	811	916	993	1069	1243	

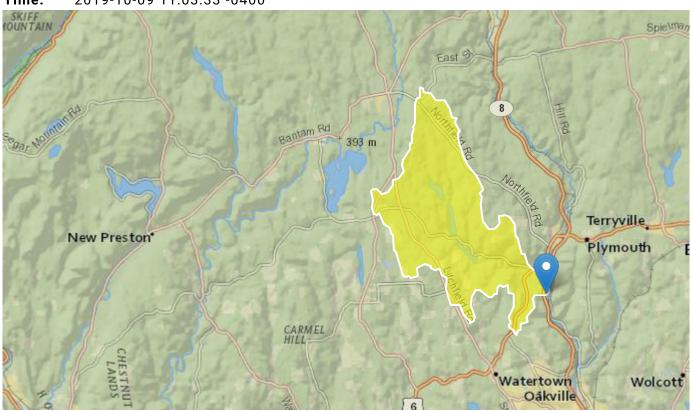
StreamStats Report

Region ID: CT

Workspace ID: CT20191009150317053000

Clicked Point (Latitude, Longitude): 41.64395, -73.08096

Time: 2019-10-09 11:03:33 -0400



Basin Characte	eristics		
Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	22.6	square miles
124H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	3.391	inches
ELEV	Mean Basin Elevation	859	feet
I24H10Y	Maximum 24-hour precipitation that occurs on average once in 10 years	4.807	inches
I24H25Y	Maximum 24-hour precipitation that occurs on average once in 25 years	5.867	inches

Parameter Code	Parameter Description	Value	Unit
124H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	6.835	inches
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	7.957	inches
CRSDFT	Percentage of area of coarse-grained stratified drift	2.21	percent
NOVAVPRE	Mean November Precipitation	4.5	inches
PRCWINTER	Mean annual precipitation for December through February	3.8	inches
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	9.69	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	1.59	percent
MAPM	Mean Annual Precip Basin Average	51.543	inches
SGSL	Total stream length intersecting sand and gravel deposits (in miles)	6.57	miles
SOILPERM	Average Soil Permeability	2.941	inches per hour
STRMTOT	total length of all mapped streams (1:24,000-scale) in the basin	68.4	miles
WETLAND	Percentage of Wetlands	1.07	percent

General Disclaimers

The delineation point is in an exclusion area. Warning! Peak flows affected by flood control structures. Peak-flow statistics represent near natural conditions or conditions prior to flood-control.

Peak-Flow Statistics Parameters[Statewide Multiparameter]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22.6	square miles	1.69	715
124H2Y	24 Hour 2 Year Precipitation	3.391	inches	2.95	3.82

Parameter Code	Parameter Name	Value Units	Min Limit	Max Limit
ELEV	Mean Basin Elevation	859 feet	169	1310
I24H10Y	24 Hour 10 Year Precipitation	4.807 inches	4.15	5.53
124H25Y	24 Hour 25 Year Precipitation	5.867 inches	4.93	7
124H50Y	24 Hour 50 Year Precipitation	6.835 inches	5.62	8.36
I24H100Y	24 Hour 100 Year Precipitation	7.957 inches	6.41	9.99

Peak-Flow Statistics Flow Report[Statewide Multiparameter]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp	Equiv. Yrs.
2 Year Peak Flood	776	ft^3/s	31.8	31.8	3.5
10 Year Peak Flood	1640	ft^3/s	32.7	32.7	8.1
25 Year Peak Flood	2170	ft^3/s	34.4	34.4	10.9
50 Year Peak Flood	2630	ft^3/s	35.9	35.9	12.7
100 Year Peak Flood	3130	ft^3/s	37.6	37.6	14.3
500 Year Peak Flood	4980	ft^3/s	45	45	14.9

Peak-Flow Statistics Citations

Ahearn, E.A., 2004, Regression Equations for Estimating Flood Flows for the 2-, 10-, 25-, 50-, 100-, and 500-Year Recurrence Intervals in Connecticut: U.S. Geological Survey SRI 2004-5160, 62 p. (http://water.usgs.gov/pubs/sir/2004/5160/)

November Flow-Duration Statistics Parameters[Duration Flow 2010 5052]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22.6	square miles	0.92	150
NOVAVPRE	Mean November Precipitation	4.5	inches	3.48	4.93
CRSDFT	Percent Coarse Stratified Drift	2.21	percent	0.1	55.1

November Flow-Duration Statistics Flow Report[Duration Flow 2010 5052]

Statistic Value Unit

Statistic	Value	Unit
November 25 Percent Duration	45.8	ft^3/s
November 50 Percent Duration	24.5	ft^3/s
November 75 Percent Duration	12.4	ft^3/s
November 90 Percent Duration	5.35	ft^3/s
November 99 Percent Duration	1.91	ft^3/s

November Flow-Duration Statistics Citations

Ahearn, E.A.,2010, Regional regression equations to estimate flow-duration statistics in Connecticut: U. S. Geological Survey Scientific Investigations Report 2010-5052, 45 p. (http://pubs.usgs.gov/sir/2010/5052/)

Seasonal Flow Sta	atistics Parameters[Duration Flow 2010 5052]				
Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22.6	square miles	0.92	150
PRCWINTER	Mean Annual Winter Precipitation	3.8	inches	3.19	4.4
CRSDFT	Percent Coarse Stratified Drift	2.21	percent	0.1	55.1
Seasonal Flow Sta	atistics Flow Report[Duration Flow 2010 5052]				
Statistic				Value	Unit
25 Percent Du	ration December to February			57.1	ft^3/s
50 Percent Du	ration December to February			34.1	ft^3/s
75 Percent Du	ration December to February			20.6	ft^3/s
95 Percent Du	ration DEC FEB			9.31	ft^3/s
99 Percent Dui	ration December to February			4.88	ft^3/s
25 Percent Dui	ration March to April			96	ft^3/s
50 Percent Dui	ration March to April			61.9	ft^3/s
75 Percent Dui	ration March to April			38.5	ft^3/s
95 Percent Dui	ration March to April			21.4	ft^3/s

Statistic	Value	Unit
25 Percent Duration July to October	13.5	ft^3/s
50 Percent Duration July to October	5.53	ft^3/s
75 Percent Duration July to October	2.56	ft^3/s
80 Percent Duration July to October	2.16	ft^3/s
99 Percent Duration July to October	0.378	ft^3/s

Seasonal Flow Statistics Citations

Ahearn, E.A.,2010, Regional regression equations to estimate flow-duration statistics in Connecticut: U. S. Geological Survey Scientific Investigations Report 2010-5052, 45 p. (http://pubs.usgs.gov/sir/2010/5052/)

May Flow-Duration Statistics Parameters[Duration Flow 2010 5052]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22.6	square miles	0.92	150
CRSDFT	Percent Coarse Stratified Drift	2.21	percent	0.1	55.1

May Flow-Duration Statistics Flow Report[Duration Flow 2010 5052]

Statistic	Value	Unit
May 25 Percent Duration	57.6	ft^3/s
May 50 Percent Duration	35.7	ft^3/s
May 75 Percent Duration	23.4	ft^3/s
May 95 Percent Duration	11.7	ft^3/s
May 99 Percent Duration	7.43	ft^3/s

May Flow-Duration Statistics Citations

Ahearn, E.A.,2010, Regional regression equations to estimate flow-duration statistics in Connecticut: U. S. Geological Survey Scientific Investigations Report 2010-5052, 45 p. (http://pubs.usgs.gov/sir/2010/5052/)

June Flow-Duration Statistics Parameters[Duration Flow 2010 5052]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22.6	square miles	0.92	150
CRSDFT	Percent Coarse Stratified Drift	2.21	percent	0.1	55.1
WETLAND	Percent Wetlands	1.07	percent	0.3	18.1

June Flow-Duration Statistics Flow Report[Duration Flow 2010 5052]

Statistic	Value	Unit
June 25 Percent Duration	28	ft^3/s
June 50 Percent Duration	13.7	ft^3/s
June 75 Percent Duration	7.12	ft^3/s
June 90 Percent Duration	4.72	ft^3/s
June 99 Percent Duration	2.06	ft^3/s

June Flow-Duration Statistics Citations

Ahearn, E.A.,2010, Regional regression equations to estimate flow-duration statistics in Connecticut: U. S. Geological Survey Scientific Investigations Report 2010-5052, 45 p. (http://pubs.usgs.gov/sir/2010/5052/)

Flow-Duration Statistics Parameters[Duration Flow 2010 5052]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22.6	square miles	0.92	150
ELEV	Mean Basin Elevation	859	feet	168	1287
CRSDFT	Percent Coarse Stratified Drift	2.21	percent	0.1	55.1

Flow-Duration Statistics Flow Report[Duration Flow 2010 5052]

Statistic	Value	Unit
25 Percent Duration	50.7	ft^3/s
99 Percent Duration	0.576	ft^3/s

Flow-Duration Statistics Citations

Ahearn, E.A.,2010, Regional regression equations to estimate flow-duration statistics in Connecticut: U. S. Geological Survey Scientific Investigations Report 2010-5052, 45 p. (http://pubs.usgs.gov/sir/2010/5052/)

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

USGS Software Disclaimer: This software has been approved for release by the U.S. Geological Survey (USGS). Although the software has been subjected to rigorous review, the USGS reserves the right to update the software as needed pursuant to further analysis and review. No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the software and related material nor shall the fact of release constitute any such warranty. Furthermore, the software is released on condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from its authorized or unauthorized use.

USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.3.8



NOAA Atlas 14, Volume 10, Version 3 Location name: Watertown, Connecticut, USA* Latitude: 41.6436°, Longitude: -73.0809° Elevation: 321.56 ft**

6436°, Longitude: -73.0809°
vation: 321.56 ft**

source: ESRI Maps

** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF tabular | PF graphical | Maps & aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
Duration	1	2	5	10	25	50	100	200	500	1000
5-min	0.364 (0.277-0.478)	0.433 (0.329-0.569)	0.546 (0.413-0.720)	0.639 (0.481-0.847)	0.768 (0.562-1.06)	0.866 (0.622-1.22)	0.967 (0.675-1.40)	1.07 (0.719-1.60)	1.22 (0.790-1.88)	1.34 (0.846-2.10)
10-min	0.516 (0.392-0.677)	0.613 (0.466-0.807)	0.773 (0.585-1.02)	0.906 (0.682-1.20)	1.09 (0.796-1.50)	1.23 (0.881-1.73)	1.37 (0.956-1.99)	1.52 (1.02-2.27)	1.73 (1.12-2.67)	1.89 (1.20-2.98)
15-min	0.607 (0.461-0.797)	0.722 (0.548-0.949)	0.910 (0.689-1.20)	1.07 (0.803-1.41)	1.28 (0.936-1.77)	1.45 (1.04-2.03)	1.61 (1.13-2.34)	1.79 (1.20-2.67)	2.04 (1.32-3.14)	2.23 (1.41-3.50)
30-min	0.821 (0.624-1.08)	0.977 (0.742-1.29)	1.23 (0.932-1.63)	1.44 (1.09-1.91)	1.73 (1.27-2.39)	1.95 (1.40-2.75)	2.18 (1.52-3.16)	2.42 (1.62-3.61)	2.76 (1.78-4.25)	3.02 (1.91-4.74)
60-min	1.04 (0.787-1.36)	1.23 (0.935-1.62)	1.55 (1.18-2.05)	1.82 (1.37-2.41)	2.19 (1.60-3.01)	2.47 (1.77-3.46)	2.75 (1.92-3.99)	3.06 (2.04-4.55)	3.48 (2.25-5.36)	3.81 (2.41-5.98)
2-hr	1.36 (1.04-1.78)	1.61 (1.23-2.10)	2.00 (1.52-2.63)	2.33 (1.76-3.07)	2.78 (2.04-3.81)	3.13 (2.25-4.36)	3.48 (2.43-5.01)	3.85 (2.58-5.70)	4.34 (2.82-6.66)	4.73 (3.00-7.41)
3-hr	1.58 (1.21-2.06)	1.87 (1.43-2.43)	2.33 (1.77-3.04)	2.71 (2.05-3.56)	3.23 (2.38-4.42)	3.63 (2.62-5.06)	4.04 (2.84-5.81)	4.48 (3.01-6.62)	5.07 (3.30-7.76)	5.54 (3.52-8.64)
6-hr	2.00 (1.54-2.59)	2.38 (1.83-3.09)	3.01 (2.31-3.91)	3.53 (2.69-4.62)	4.25 (3.15-5.79)	4.79 (3.48-6.66)	5.35 (3.80-7.72)	5.99 (4.04-8.82)	6.89 (4.49-10.5)	7.64 (4.87-11.9)
12-hr	2.45 (1.89-3.15)	2.98 (2.31-3.84)	3.86 (2.97-4.99)	4.59 (3.52-5.96)	5.59 (4.17-7.62)	6.33 (4.65-8.83)	7.14 (5.13-10.4)	8.10 (5.48-11.9)	9.55 (6.24-14.5)	10.8 (6.91-16.7)
24-hr	2.85 (2.22-3.65)	3.56 (2.77-4.56)	4.72 (3.65-6.06)	5.68 (4.37-7.33)	7.00 (5.27-9.53)	7.97 (5.90-11.1)	9.04 (6.58-13.2)	10.4 (7.05-15.2)	12.5 (8.21-19.0)	14.4 (9.24-22.2)
2-day	3.21 (2.50-4.07)	4.07 (3.18-5.18)	5.48 (4.26-7.00)	6.66 (5.15-8.54)	8.27 (6.26-11.2)	9.44 (7.05-13.2)	10.8 (7.91-15.8)	12.5 (8.49-18.2)	15.3 (10.1-23.1)	17.8 (11.5-27.4)
3-day	3.48 (2.73-4.41)	4.43 (3.47-5.62)	5.99 (4.67-7.61)	7.28 (5.65-9.31)	9.05 (6.88-12.3)	10.3 (7.75-14.4)	11.8 (8.71-17.3)	13.7 (9.35-20.0)	16.9 (11.1-25.4)	19.7 (12.7-30.2)
4-day	3.73 (2.93-4.71)	4.75 (3.72-6.00)	6.40 (5.01-8.12)	7.78 (6.05-9.92)	9.67 (7.36-13.1)	11.0 (8.29-15.4)	12.6 (9.32-18.4)	14.6 (10.00-21.3)	18.0 (11.9-27.1)	21.1 (13.6-32.2)
7-day	4.44 (3.50-5.58)	5.58 (4.39-7.02)	7.44 (5.84-9.39)	8.98 (7.01-11.4)	11.1 (8.48-14.9)	12.7 (9.52-17.5)	14.4 (10.6-20.9)	16.6 (11.4-24.1)	20.3 (13.4-30.4)	23.6 (15.3-36.0)
10-day	5.16 (4.08-6.47)	6.36 (5.02-7.98)	8.32 (6.55-10.5)	9.95 (7.78-12.6)	12.2 (9.31-16.3)	13.8 (10.4-19.0)	15.6 (11.5-22.5)	18.0 (12.3-25.9)	21.7 (14.4-32.4)	25.0 (16.2-38.0)
20-day	7.43 (5.90-9.25)	8.68 (6.89-10.8)	10.7 (8.48-13.4)	12.4 (9.76-15.6)	14.7 (11.3-19.5)	16.5 (12.4-22.3)	18.3 (13.5-25.9)	20.6 (14.2-29.5)	24.1 (16.0-35.8)	27.1 (17.6-41.1)
30-day	9.32 (7.43-11.6)	10.6 (8.42-13.1)	12.6 (10.0-15.8)	14.4 (11.3-18.0)	16.7 (12.8-21.9)	18.5 (13.9-24.8)	20.3 (14.9-28.4)	22.5 (15.6-32.1)	25.7 (17.1-38.0)	28.3 (18.5-42.8)
45-day	11.6 (9.30-14.4)	12.9 (10.3-16.0)	15.0 (12.0-18.7)	16.8 (13.3-21.0)	19.2 (14.7-24.9)	21.0 (15.8-27.9)	22.9 (16.7-31.5)	24.9 (17.3-35.4)	27.7 (18.5-40.8)	29.8 (19.5-45.0)
60-day	13.5 (10.8-16.7)	14.9 (11.9-18.4)	17.1 (13.6-21.1)	18.9 (15.0-23.5)	21.4 (16.4-27.6)	23.3 (17.5-30.7)	25.2 (18.2-34.3)	27.0 (18.8-38.3)	29.4 (19.7-43.3)	31.2 (20.4-46.9)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

Back to Top

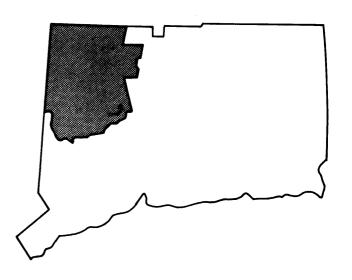
PF graphical

Floodway Analysis Report Naugatuck River Greenway Pedestrian Bridge over Branch Brook

APPENDIX B – FEMA INFORMATION



TOWN OF WATERTOWN, CONNECTICUT



MAY 1980



federal emergency management agency federal insurance administration

was developed between the log of the 2-year flood and the drainage area and it was found that for New England, discharges vary in accordance with the drainage area raised to the exponent power of 0.70.

There are no discharge records for Branch Brook. In 1970, the COE completed Black Rock Dam, located on Branch Brook about two miles above the mouth. Discharges from the dam are controlled by gate operations. The anticipated releases for the 10- and 50-year events would probably not exceed the nondamaging downstream channel capacity and these releases would not be made until downstream flood conditions subsided. The 100- and 500-year discharges are estimated based on hydrographs of major events routed through the reservoir. On Branch Brook above Wigwam Reservoir, peak discharge frequencies were determined by using relationships based on records for the USGS gaging station on nearby Leadmine Brook and then relating it to the Branch Brook watershed based on a direct drainage area relationship. A regional study was not undertaken to determine the drainage areadischarge relationship for Leadmine and Branch Brooks. However, the runoff characteristics of Leadmine Brook are considered to be similar to those of Branch Brook.

A summary of drainage area-peak discharge relationships is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

	DRAINAGE AREA	PEAK DISCHARGES (cfs)						
FLOODING SOURCE AND LOCATION	(sq. miles)	10-YEAR	50-YEAR	100-YEAR	500-YEAR			
NAUGATUCK RIVER								
At downstream corporate								
limits	1 27	F 200	F 400					
	137	5,300	5,400	8,000	21,600			
At upstream corporate								
limits	131	5,000	5,000	5,200	14,000			
BRANCH BROOK								
At mouth	22.8	800	800	900	2,300			
At Black Rock Dam	20.4	800	800	900	2,300			
At Wigwam Dam	17.5	2,200	5,300	7,600	16,500			
STEELE BROOK								
At downstream corporate								
limits	12.4	1,410	2,740	3,550	6,245			
Above Wattles Brook	9.0	1,130	2,200	2,840	5,000			
At Hemingway Pond	5.7	820	1,600	2,060	3,600			
Below Smith Pond Brook			•	•	•			
confluence	4.0	640	1,250	1,600	2,800			

FLOODING SOL	SOURCE		FLOODWAY			BASE WATER SURFA	BASE FLOOD SURFACE ELEVATION	
CROSS SECTION	DISTANCE	wютн 3 (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Naugatuck River (continued)								
E→	20,440	164	1,295	6.2	319.0	319.0	319.3	0.3
D	22,3001	118	884	5.7	320.5	320.5	320.6	0.1
Branch Brook								
	1002	81	303	3.0	321.6	321.6	322.6	1.0
м	2652	88	469	1.9	322.0	322.0	322.8	8.0
ı O	1,7002	132	149	6.1	324.2	324.2	324.2	0.0
Ω	2,4002	46	146	6.2	330.0	330.0	330.0	0.0
, E1	2,6002	43	102	8.8	331.1	331.1	331.1	0.0
। <u>फि</u>	3,5902	68	186	4.8	338.1	338.1	338.1	0.0
υ	5,410 ²	70	123	7.3	349.0	349.0	349.0	0.0
Ж	6,3202	72	218	4.1	353.6	353.6	353.7	0.1
Н	7,130 ²	78	143	6.3	356.7	356.7	356.8	0.1
ט	7,2902	54	119	7.6	357.5	357.5	357.5	0.0
×	8,4002	38	141	6.4	365.2	365.2	365.2	0.0
Н	10,0002	31	92	8.6	381.9	381.9	381.9	0.0
Ø	20,500	1,536	32,010	0.2	567.4	567.4	568.0	9.0
Z	24,2702	370	4,953	1.5	567.4	567.4	268.0	9.0
0	24,6702	914	11,814	9.0	569.3	569.3	569.3	0.0
		Apr., projekte sa smetato en Vancour A T. (Abla). Artiklamonomia. Apr 7 i a.	AND ASSESSMENT OF THE PROPERTY					

¹Feet above corporate limits ²Feet above confluence with Naugatuck River ³This width extends beyond corporate limits

FEDERAL EMERGENCY MANAGEMENT AGENCY Federal Insurance Administration

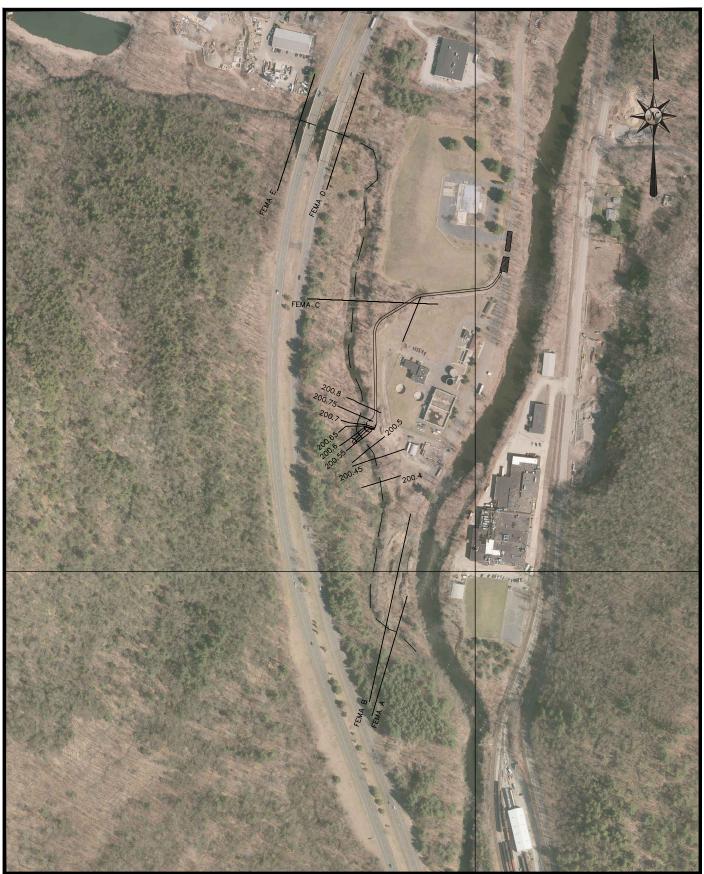
TOWN OF WATERTOWN, CT (LITCHFIELD CO.)

FLOODWAY DATA

NAUGATUCK RIVER AND BRANCH BROOK

TABLE 2

Floodway Analysis Report Naugatuck River Greenway Pedestrian Bridge over Branch Brook	BL Project No. 1800579
APPENDIX C – CROSS-SECTION LOCA	TIONS & CROSS-SECTIONS



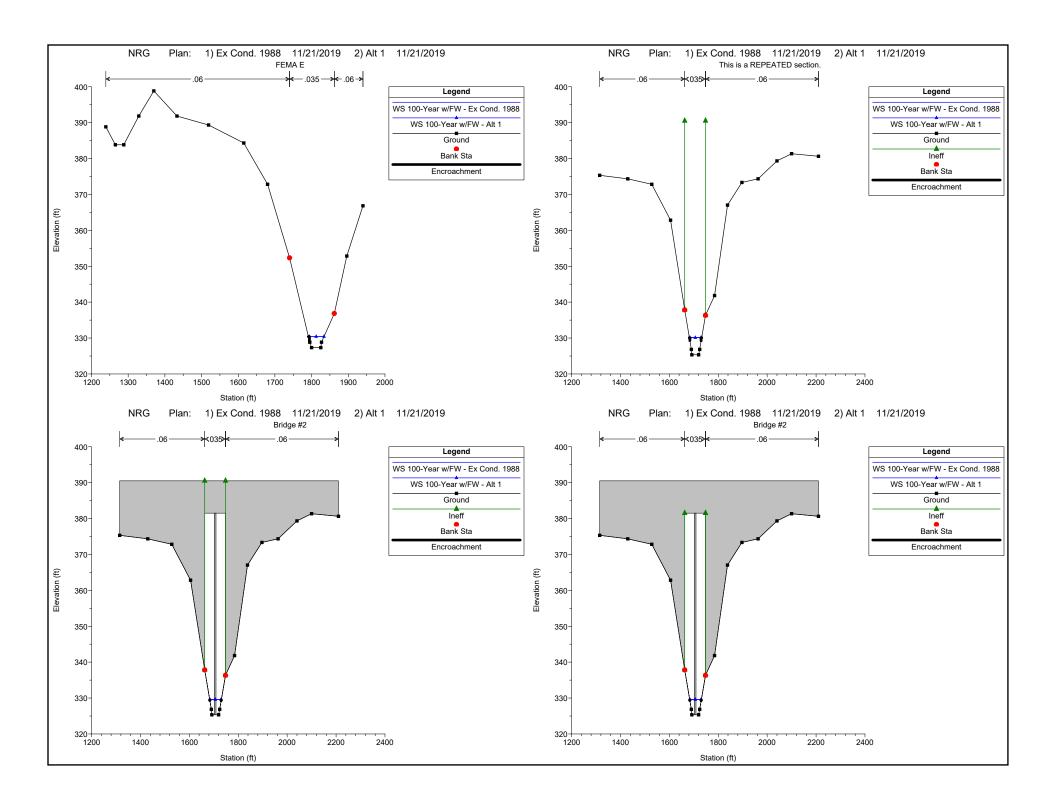


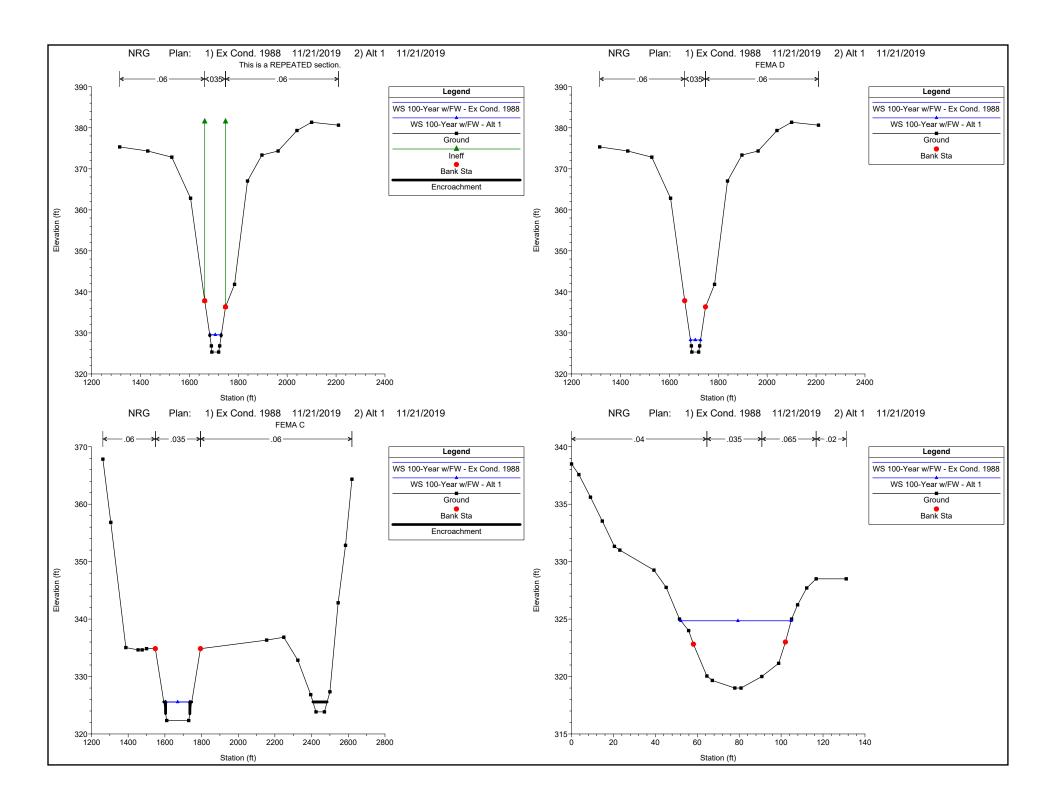
CROSS-SECTION LOCATION

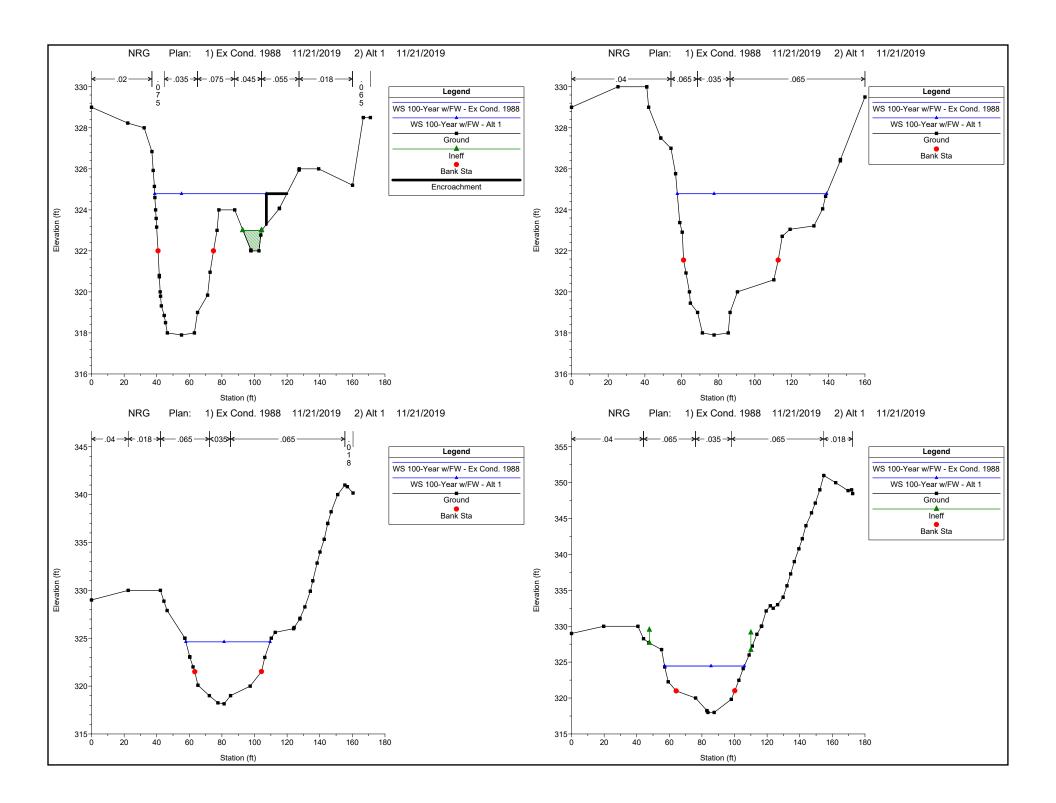
NAUGATUCK RIVER GREENWAY PEDESTRIAN BRIDGE OVER BRANCH BROOK Designed
Drawn
Reviewed
Scale
Project No.
Date
CAD File

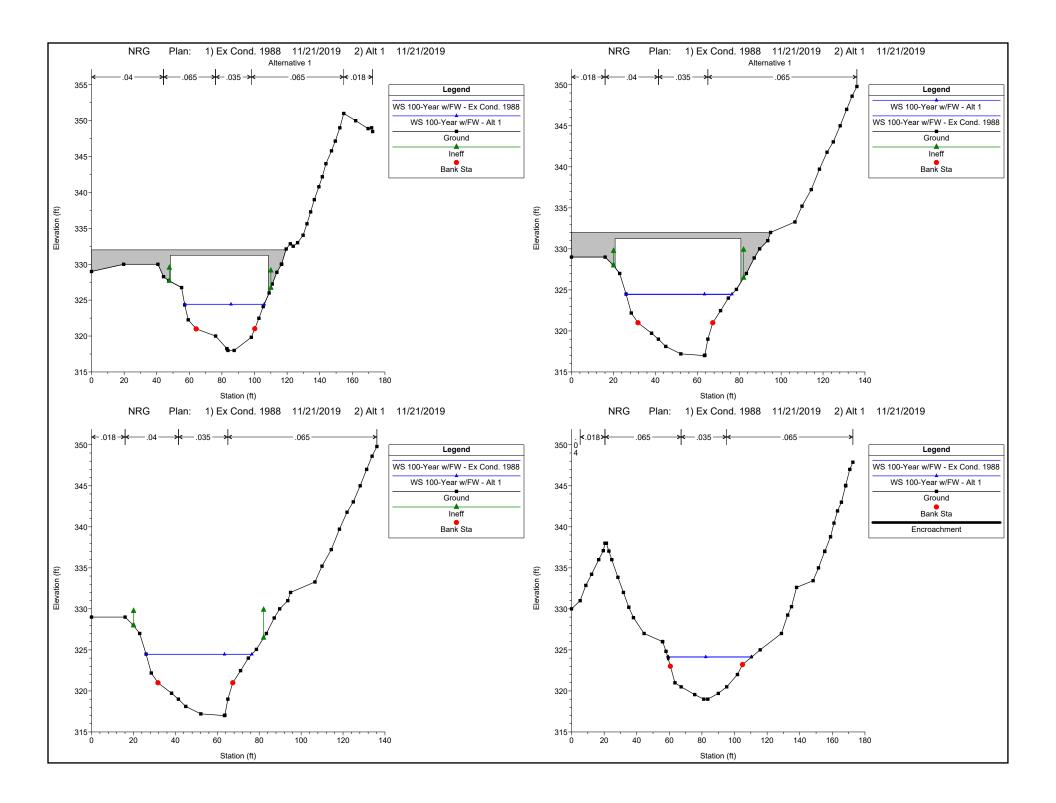
B.G.R. B.G.R. D.M.C. 1"= 400' 1800579 11/13/19 CROSS_SECTIONS

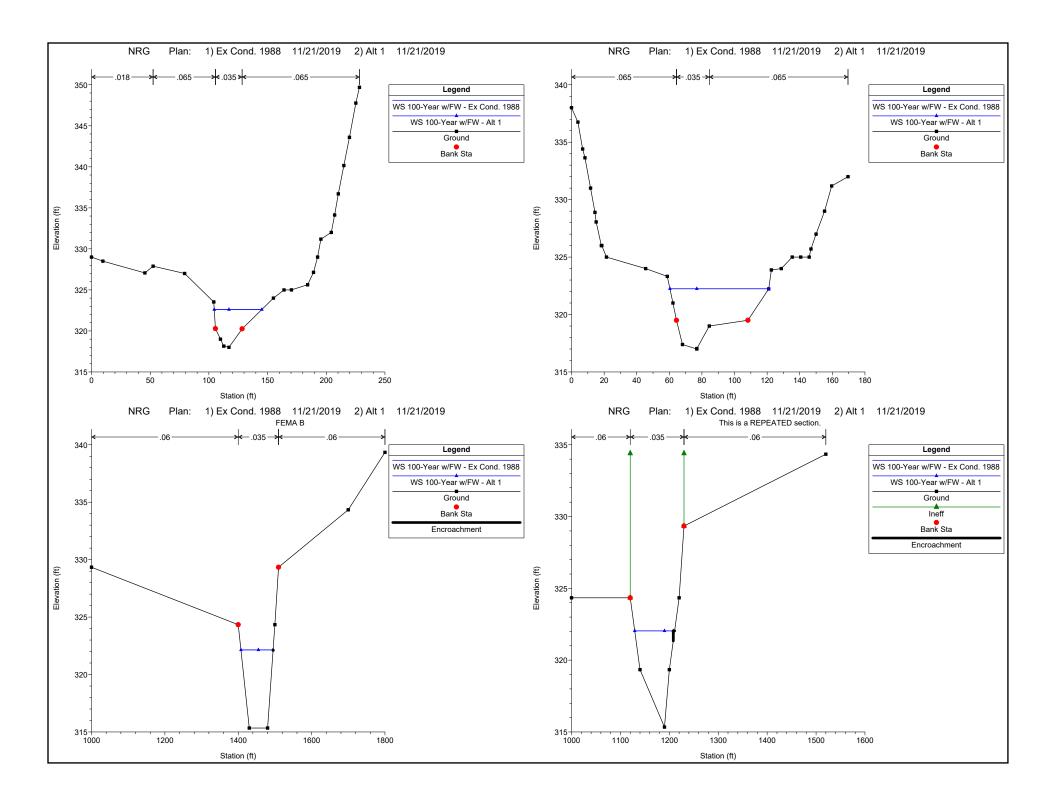
LOC

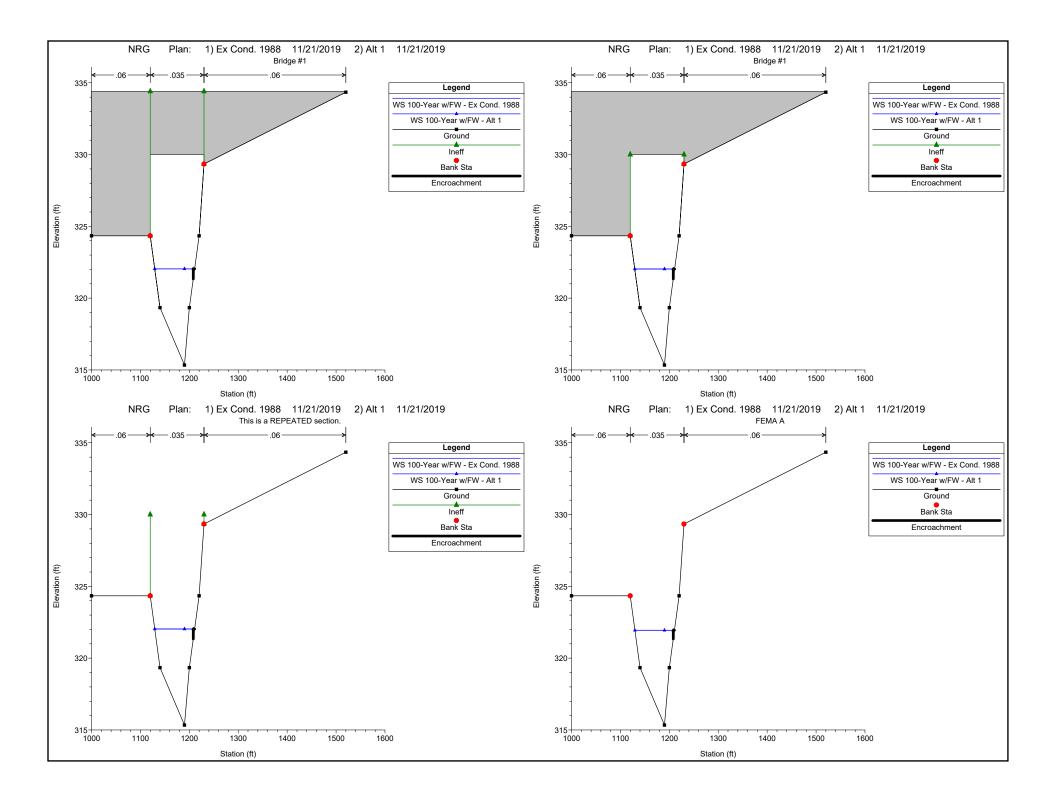










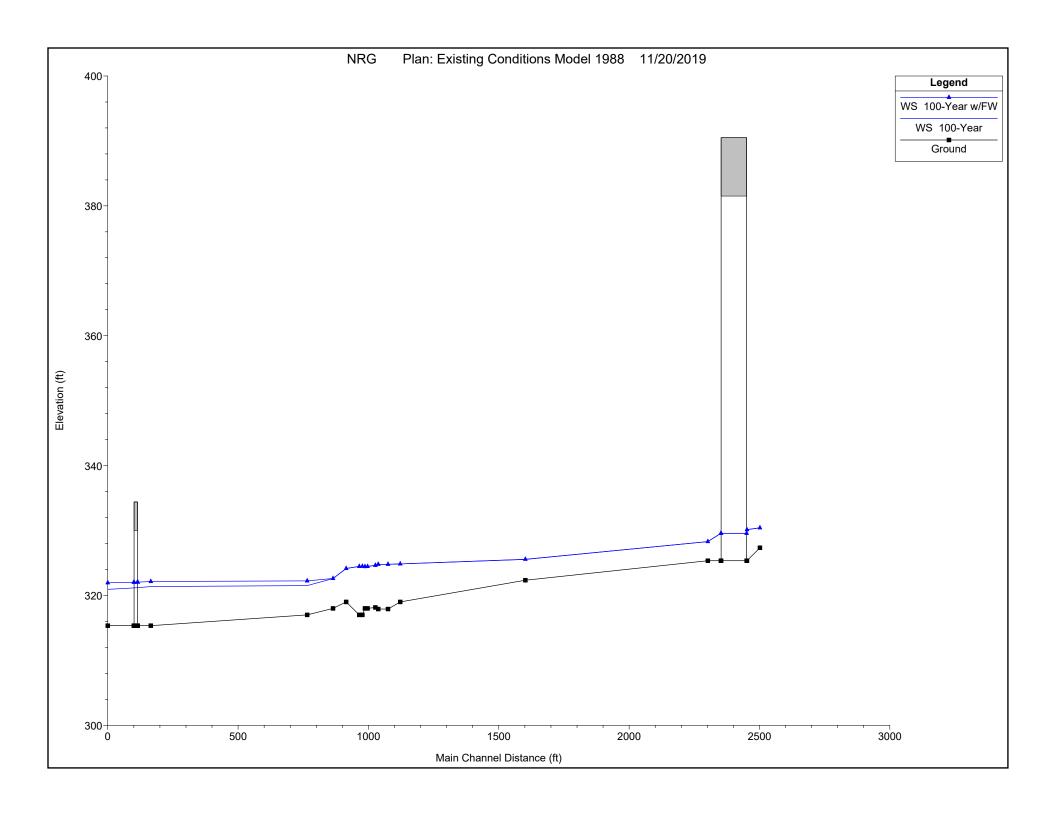


APPENDIX D – EXISTING FLOODWAY MODELS

- HEC-RAS Existing 100-Year Profile Output Table
- HEC-RAS Existing 100-Year Profiles
- HEC-RAS Existing 10-Year Profile Output Table
- HEC-RAS Existing 10-Year Profile

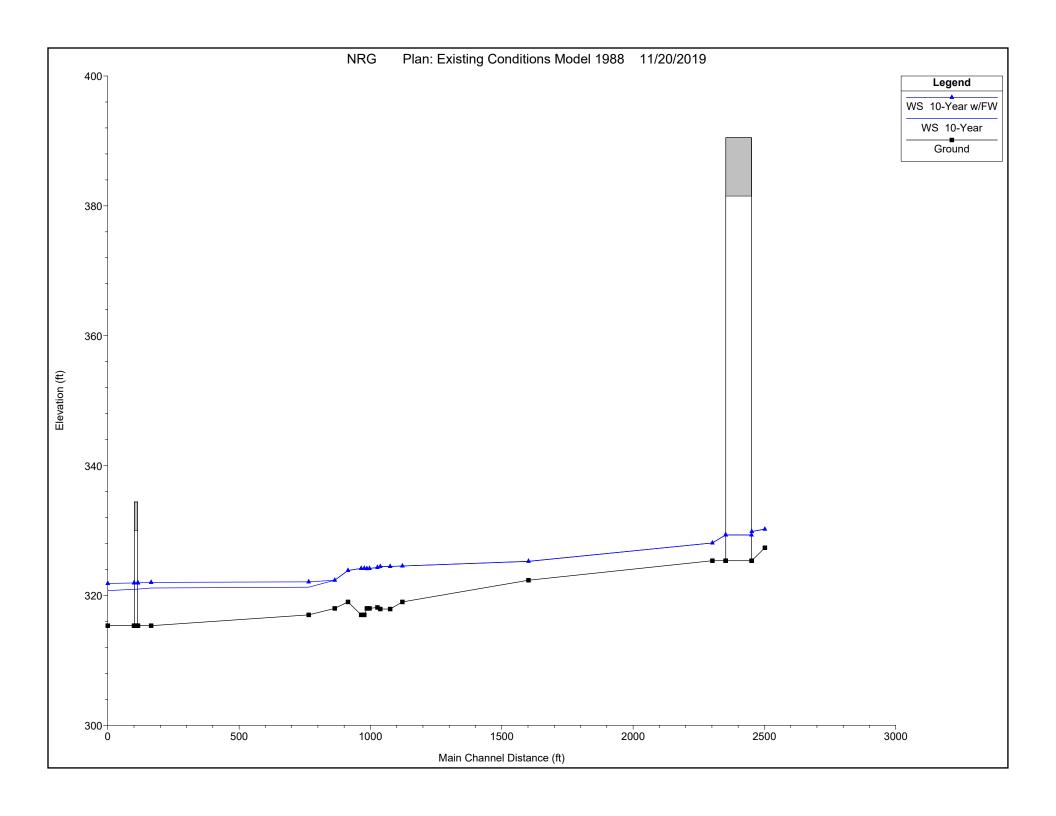
HEC-RAS Plan: Ex Cond. 1988 River: Branch Bk Reach: NRG

Reach	River Sta	Profile	Reach: NRG 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
rcacii	Triver ota	1 TOILIC	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	1 Todde # Offi
NRG	203	100-Year	900.00	327.34	330.43	330.43	331.64	0.014050	8.83	101.95	42.65	1.0
NRG	203	100-Year w/FW	900.00	327.34	330.41	330.41	331.68	0.014280	9.03	99.68	39.86	1.0
NRG	202.2	100-Year	900.00	325.34	330.13	328.30	330.50	0.002422	4.85	185.55	50.41	0.45
	202.2	100-Year w/FW	900.00	325.34	330.12	328.30	330.50	0.002341	4.92	183.09	46.00	0.43
	/-											
NRG	202.15		Bridge									
NRG	202.1	100-Year	900.00	325.34	329.57	328.30	330.07	0.003839	5.70	157.78	47.59	0.55
NRG	202.1	100-Year w/FW	900.00	325.34	329.56	328.30	330.07	0.003779	5.73	157.12	46.00	0.55
	202	100-Year	900.00	325.34	328.28	328.28	329.52	0.013992	8.93	100.80	41.19	1.0
NRG	202	100-Year w/FW	900.00	325.34	328.28	328.28	329.52	0.013997	8.93	100.79	41.19	1.0
NRG	201	100-Year	900.00	322.34	325.54		325.59	0.000498	1.90	540.26	229.27	0.20
	201	100-Year w/FW	900.00	322.34	325.57		325.64	0.000575	2.15	418.58	132.00	0.2
	200.8	100-Year	900.00	319.00	324.85		325.14	0.002142	4.28	215.62	52.64	0.35
NRG	200.8	100-Year w/FW	900.00	319.00	324.86		325.14	0.002140	4.28	215.68	52.65	0.35
NRG	200.75	100-Year	900.00	317.90	324.80		325.02	0.002118	3.98	263.16	81.16	0.29
	200.75	100-Year w/FW	900.00	317.90	324.79		325.02	0.002110	4.04	251.91	68.47	0.29
NRG	200.7	100-Year	900.00	317.90	324.79		324.93	0.001472	3.07	322.32	81.43	0.23
NRG	200.7	100-Year w/FW	900.00	317.90	324.78		324.92	0.001474	3.07	322.20	81.42	0.23
NDO	000.05	400 \/	000.00	040.45	204.00		204.00	0.000050	4.44	000.00	54.00	0.00
NRG NRG	200.65	100-Year 100-Year w/FW	900.00	318.15 318.15	324.63 324.63		324.89 324.89	0.002853 0.002855	4.14 4.14	228.09 228.01	51.69 51.69	0.32
IVING	200.03	100-1eai w/i vv	900.00	310.13	324.03		324.09	0.002833	4.14	220.01	31.09	0.32
NRG	200.6	100-Year	900.00	318.00	324.46	322.19	324.80	0.002803	4.74	206.21	48.95	0.37
NRG	200.6	100-Year w/FW	900.00	318.00	324.46	322.19	324.80	0.002807	4.74	206.13	48.94	0.37
	200.58	100-Year	900.00	318.00	324.43		324.77	0.002870	4.78	204.58	48.86	0.38
NRG	200.58	100-Year w/FW	900.00	318.00	324.43		324.77	0.002873	4.78	204.50	48.85	0.38
NRG	200.57	100-Year	900.00	317.00	324.49		324.72	0.001056	3.96	245.26	50.54	0.28
NRG	200.57	100-Year w/FW	900.00	317.00	324.48		324.72	0.001057	3.96	245.17	50.53	0.28
	200.55	100-Year	900.00	317.00	324.47	321.09	324.71	0.001065	3.97	244.51	50.47	0.28
NRG	200.55	100-Year w/FW	900.00	317.00	324.47	321.09	324.71	0.001066	3.97	244.43	50.47	0.28
NRG	200.5	100-Year	900.00	319.00	324.15		324.59	0.005030	5.31	172.52	51.64	0.48
	200.5	100-Year w/FW	900.00	319.00	324.15		324.59	0.005039	5.31	172.36	51.00	0.48
NRG	200.45	100-Year	900.00	318.00	322.60	322.60	324.13	0.010618	10.21	103.83	40.50	0.94
NRG	200.45	100-Year w/FW	900.00	318.00	322.61	322.61	324.13	0.010540	10.18	104.13	40.55	0.94
NRG	200.4	100-Year	900.00	317.00	321.52		322.21	0.008058	6.74	142.32	56.21	0.69
	200.4	100-Year w/FW	900.00	317.00	321.32		322.21	0.008038	5.33	184.44	60.63	0.49
NRG	200.3	100-Year	900.00	315.34	321.37		321.45	0.000353	2.24	402.28	83.49	0.18
NRG	200.3	100-Year w/FW	900.00	315.34	322.14		322.20	0.000227	1.92	468.61	87.67	0.15
NDO	000.0	400 \/	000.00	045.04	204.40	040.04	204.40	0.004500	0.00	044.04	74.70	0.00
	200.2	100-Year 100-Year w/FW	900.00	315.34 315.34	321.19 322.04	319.24 319.24	321.40 322.17	0.001586 0.000779	3.68 2.90	244.61 310.34	74.79 78.81	0.36
INTO	200.2	100-Teal W/FVV	900.00	313.34	322.04	319.24	322.17	0.000779	2.90	310.34	70.81	0.20
NRG	200.15		Bridge									
			•									
	200.1	100-Year	900.00	315.34	321.16	319.24	321.37	0.001625	3.71	242.50	74.56	0.36
NRG	200.1	100-Year w/FW	900.00	315.34	322.03	319.23	322.16	0.000786	2.91	309.35	78.76	0.26
NRG	200	100 Year	900.00	315.34	320.94	240.22	224 40	0.001983	3.98	226 24	72.00	0.40
INICO	200	100-Year 100-Year w/FW	900.00	315.34	320.94	319.22 319.22	321.19 322.08	0.001983	2.98	226.24 302.32	72.80 78.40	



HEC-RAS Plan: Ex Cond. 1988 River: Branch Bk Reach: NRG

Reach	River Sta	1988 River: Branch 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)	
NRG	203	10-Year	800.00	327.34	330.22	330.22	331.36	0.014294	8.58	93.23	41.25	1.01
NRG	203	10-Year w/FW	800.00	327.34	330.20	330.20	331.39	0.014496	8.75	91.45	38.95	1.01
NRG	202.2	10-Year	800.00	325.34	329.84	328.08	330.18	0.002417	4.68	170.89	48.94	0.44
NRG	202.2	10-Year w/FW	800.00	325.34	329.84	328.09	330.18	0.002336	4.71	169.90	46.00	0.43
NRG	202.15		Bridge									
NRG	202.1	10-Year	800.00	325.34	329.31	328.08	329.78	0.003794	5.48	145.90	46.33	0.54
NRG	202.1	10-Year w/FW	800.00	325.34	329.31	328.09	329.78	0.003794	5.49	145.81	46.00	
NDC	200	40 %	000.00	205.24	200.00	200.00	200.04	0.044000	0.00	00.44	40.47	4.04
NRG NRG	202	10-Year 10-Year w/FW	800.00 800.00	325.34 325.34	328.08 328.08	328.08 328.08	329.24 329.24	0.014263 0.014263	8.66 8.66	92.41 92.41	40.17 40.17	1.01
INING	202	10-real W/FVV	800.00	323.34	320.00	320.00	329.24	0.014203	0.00	92.41	40.17	1.01
NRG	201	10-Year	800.00	322.34	325.23		325.29	0.000571	1.92	471.10	220.57	0.21
NRG	201	10-Year w/FW	800.00	322.34	325.25		325.32	0.000637	2.12	377.40	132.00	0.22
NRG	200.8	10-Year	800.00	319.00	324.53		324.79	0.002159	4.10	198.84	50.75	0.34
NRG	200.8	10-Year w/FW	800.00	319.00	324.53		324.79	0.002156	4.10	198.92	50.76	
NRG	200.75	10-Year	800.00	317.90	324.46		324.68	0.002153	3.86	236.32	78.78	
NRG	200.75	10-Year w/FW	800.00	317.90	324.46		324.68	0.002196	3.89	229.25	68.26	0.29
NRG	200.7	10-Year	800.00	317.90	324.45		324.58	0.001482	2.95	295.33	79.98	0.23
NRG	200.7	10-Year w/FW	800.00	317.90	324.45		324.58	0.001482	2.95	295.33	79.98	0.23
NRG	200.65	10-Year	800.00	318.15	324.31		324.55	0.002812	3.94	211.80		0.32
NRG	200.65	10-Year w/FW	800.00	318.15	324.31		324.55	0.002812	3.94	211.80	50.57	0.32
NRG	200.6	10-Year	800.00	318.00	324.15	321.97	324.46	0.002774	4.52	191.12	48.05	0.37
NRG	200.6	10-Year w/FW	800.00	318.00	324.15	321.97	324.46	0.002774	4.52	191.12	48.05	
NRG	200.58	10-Year	800.00	318.00	324.12		324.43	0.002842	4.55	189.55		0.37
NRG	200.58	10-Year w/FW	800.00	318.00	324.12		324.43	0.002842	4.55	189.55	47.96	0.37
NRG	200.57	10-Year	800.00	317.00	324.17		324.38	0.001004	3.73	229.68	49.07	0.27
NRG	200.57	10-Year w/FW	800.00	317.00	324.17		324.38	0.001004	3.73	229.68		0.27
NRG	200.55	10-Year	800.00	317.00	324.16	320.86	324.37	0.001013	3.74	229.00		
NRG	200.55	10-Year w/FW	800.00	317.00	324.16	320.86	324.37	0.001013	3.74	229.00	49.00	0.27
NRG	200.5	10-Year	800.00	319.00	323.84		324.25	0.005303	5.15	156.81	49.31	0.49
NRG	200.5	10-Year w/FW	800.00	319.00	323.84		324.25	0.005303	5.15	156.81	49.31	0.49
NRG	200.45	10-Year	800.00	318.00	322.34	322.34	323.78	0.010938	9.86	93.61	38.54	0.94
NRG	200.45	10-Year w/FW	800.00	318.00	322.34	322.34	323.78	0.010938	9.86	93.61	38.54	0.94
NRG	200.4	10-Year	800.00	317.00	321.26		321.93	0.008421	6.60	128.13	54.63	0.71
NRG	200.4	10-Year w/FW	800.00	317.00	322.09		322.46	0.003631	4.96	175.54	59.75	0.46
		40.14		0.504	20111		201.01			200.44		
NRG NRG	200.3	10-Year 10-Year w/FW	800.00	315.34 315.34	321.14 322.01		321.21 322.06	0.000321	2.09	383.41	82.22	0.17 0.13
INING	200.3	10-Teal W/FVV	800.00	313.34	322.01		322.00	0.000193	1.75	457.18	87.06	0.13
NRG	200.2	10-Year	800.00	315.34	320.97	319.06	321.16	0.001517	3.50	228.78	73.08	0.35
NRG	200.2	10-Year w/FW	800.00	315.34	321.93	319.06	322.04	0.000673	2.66	301.27	78.35	0.24
NRG	200.15		Bridge									
IIII	200.10		bridge									
NRG	200.1	10-Year	800.00	315.34	320.95	319.05	321.14	0.001555	3.53	226.83	72.86	
NRG	200.1	10-Year w/FW	800.00	315.34	321.92	319.04	322.03	0.000678	2.66	300.42	78.30	0.24
NRG	200	10-Year	800.00	315.34	320.74	319.04	320.96	0.001893	3.78	211.84	71.20	0.39
NRG	200	10-Year w/FW	800.00	315.34	321.84	319.04	321.95	0.001893	2.72	294.50		

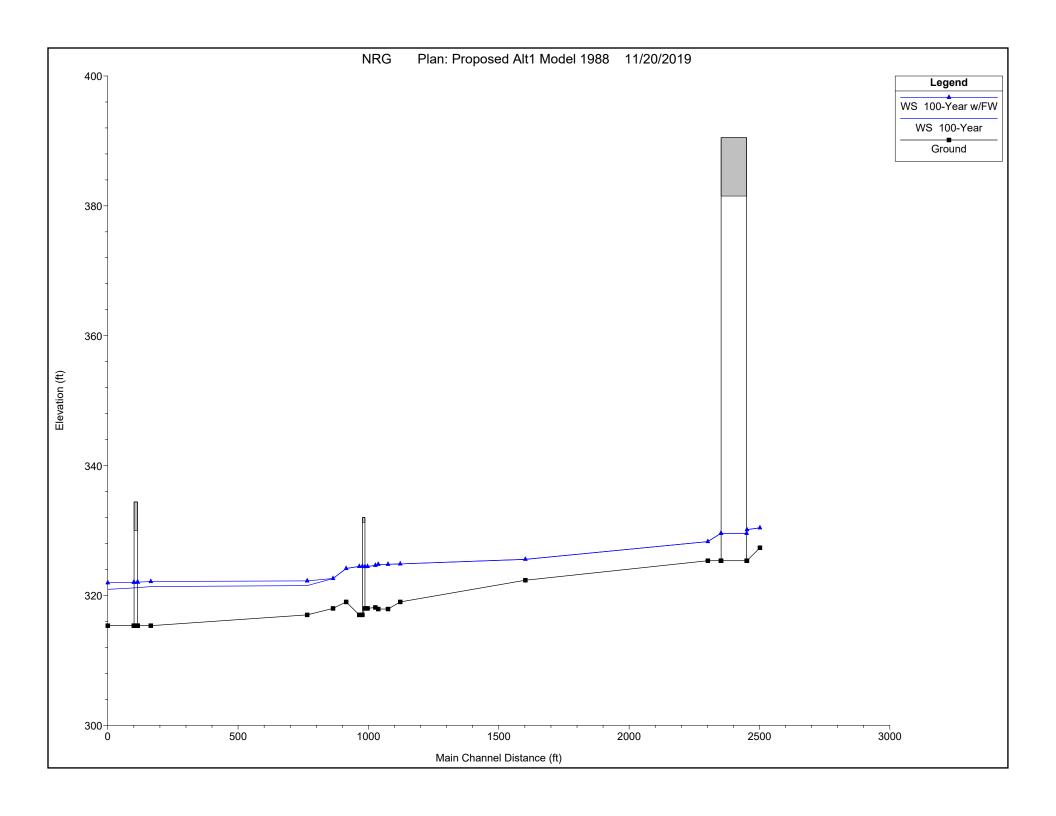


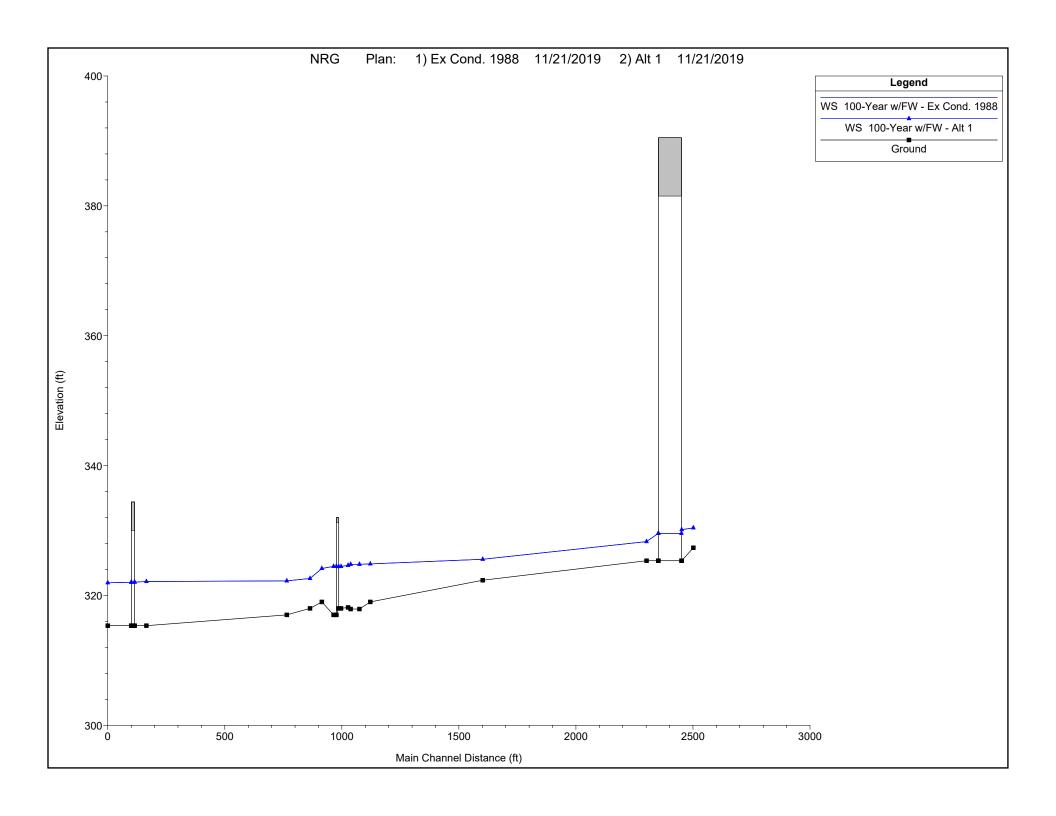
APPENDIX E – PROPOSED FLOODWAY MODELS

- HEC-RAS Proposed 100-Year Profile Output Table
- HEC-RAS Proposed 100-Year Profiles
- HEC-RAS 100-Year Floodway Comparison Profile
- HEC-RAS Proposed 10-Year Profile Output Table
- HEC-RAS Proposed 10-Year Profiles
- HEC-RAS 10-Year Floodway Comparison Profile

HEC-RAS Plan: Alt 1 River: Branch Bk Reach: NRG

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
rtodon	Tuvor ota	1 101110	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	1 Toddo // Offi
NRG	203	100-Year	900.00	327.34	330.43	330.43	331.64	0.014050	8.83	101.95	42.65	1.01
NRG	203	100-Year w/FW	900.00	327.34	330.41	330.41	331.68	0.014280	9.03	99.68	39.86	1.01
NRG	202.2	100-Year	900.00	325.34	330.13	328.30	330.50	0.002422	4.85	185.55	50.41	0.45
NRG	202.2	100-Year w/FW	900.00	325.34	330.12	328.30	330.50	0.002422	4.03	183.09	46.00	0.43
TATO	202.2	100-10ai Wii VV	300.00	323.04	330.12	320.30	300.30	0.002541	7.52	100.00	40.00	0.43
NRG	202.15		Bridge									
NRG	202.1	100-Year	900.00	325.34	329.57	328.30	330.07	0.003839	5.70	157.78	47.59	0.55
NRG	202.1	100-Year w/FW	900.00	325.34	329.56	328.30	330.07	0.003779	5.73	157.12	46.00	0.55
NDO	000	100 1/	202.00	205.04	202.00	222.22	202 52	2.242222	0.00	400.00	44.40	
NRG	202	100-Year	900.00	325.34	328.28	328.28	329.52	0.013992	8.93	100.80	41.19	1.01
NRG	202	100-Year w/FW	900.00	325.34	328.28	328.28	329.52	0.013997	8.93	100.79	41.19	1.01
NRG	201	100-Year	900.00	322.34	325.54		325.59	0.000498	1.90	540.22	229.27	0.20
NRG	201	100-Year w/FW	900.00	322.34	325.57		325.64	0.000575	2.15	418.56	132.00	0.21
NDC	200.0	100 Vaar	000.00	240.00	224.05		225 14	0.000140	4.00	245.60	FO 64	0.25
NRG	200.8	100-Year 100-Year w/FW	900.00	319.00	324.85		325.14	0.002142	4.28	215.60	52.64	0.35
NRG	200.8	100-Year W/FVV	900.00	319.00	324.86		325.14	0.002140	4.28	215.66	52.65	0.35
NRG	200.75	100-Year	900.00	317.90	324.79		325.02	0.002118	3.98	263.13	81.16	0.29
NRG	200.75	100-Year w/FW	900.00	317.90	324.79		325.02	0.002192	4.04	251.89	68.47	0.29
NDC	200.7	100 Vaar	000.00	247.00	324.79		224.02	0.001473	2.07	322.29	04.40	0.23
NRG NRG	200.7	100-Year 100-Year w/FW	900.00	317.90 317.90	324.79		324.93 324.92	0.001473	3.07 3.07	322.29	81.43 81.42	0.23
							52.102					7.20
NRG	200.65	100-Year	900.00	318.15	324.63		324.89	0.002853	4.14	228.07	51.69	0.32
NRG	200.65	100-Year w/FW	900.00	318.15	324.63		324.89	0.002856	4.14	227.99	51.69	0.32
NRG	200.6	100-Year	900.00	318.00	324.46	322.19	324.80	0.002804	4.74	206.19	48.95	0.37
NRG	200.6	100-Year w/FW	900.00	318.00	324.46	322.19	324.80	0.002808	4.74	206.11	48.94	0.37
NRG	200.58		Bridge									
NRG	200.55	100-Year	900.00	317.00	324.47	321.09	324.71	0.001065	3.97	244.51	50.47	0.28
NRG	200.55	100-Year w/FW	900.00	317.00	324.47	321.09	324.71	0.001066	3.97	244.43	50.47	0.28
NDC	200 5	100 Vaar	000.00	240.00	224.45		224.50	0.005020	F 24	170.50	E4 C4	0.40
NRG NRG	200.5	100-Year 100-Year w/FW	900.00	319.00 319.00	324.15 324.15		324.59 324.59	0.005030 0.005039	5.31 5.31	172.52 172.36	51.64 51.00	0.48 0.48
TITO	200.0	100 Tour Wit VV	500.00	010.00	024.10		024.00	0.000000	0.01	172.00	01.00	0.40
NRG	200.45	100-Year	900.00	318.00	322.60	322.60	324.13	0.010618	10.21	103.83	40.50	0.94
NRG	200.45	100-Year w/FW	900.00	318.00	322.61	322.61	324.13	0.010540	10.18	104.13	40.55	0.94
NRG	200.4	100-Year	900.00	317.00	321.52		322.21	0.008058	6.74	142.32	56.21	0.69
NRG	200.4	100-Year w/FW	900.00	317.00	322.24		322.66	0.004025	5.33	184.44	60.63	0.49
NRG	200.3	100-Year	900.00	315.34	321.37		321.45	0.000353	2.24	402.28	83.49	0.18
NRG	200.3	100-Year w/FW	900.00	315.34	322.14		322.20	0.000227	1.92	468.61	87.67	0.15
NRG	200.2	100-Year	900.00	315.34	321.19	319.24	321.40	0.001586	3.68	244.61	74.79	0.36
NRG	200.2	100-Year w/FW	900.00	315.34	322.04	319.24	322.17	0.000779	2.90	310.34	78.81	0.26
NRG	200.15		Bridge									
			30									
NRG	200.1	100-Year	900.00	315.34	321.16	319.24	321.37	0.001625	3.71	242.50	74.56	0.36
NRG	200.1	100-Year w/FW	900.00	315.34	322.03	319.23	322.16	0.000786	2.91	309.35	78.76	0.26
NRG	200	100-Year	900.00	315.34	320.94	319.22	321.19	0.001983	3.98	226.24	72.80	0.40
NRG	200	100-Year w/FW	900.00	315.34	321.94	319.22	322.08	0.000842	2.98	302.32	78.40	0.27
			222.50	2.2.3.			522.50					

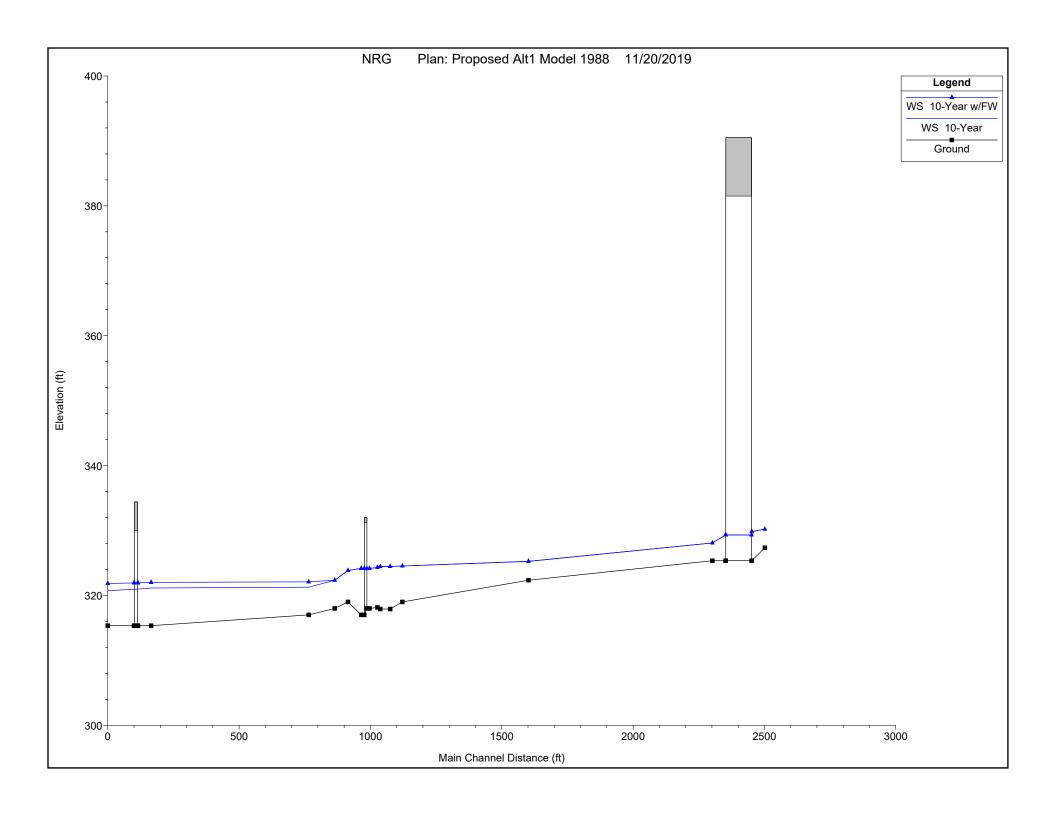


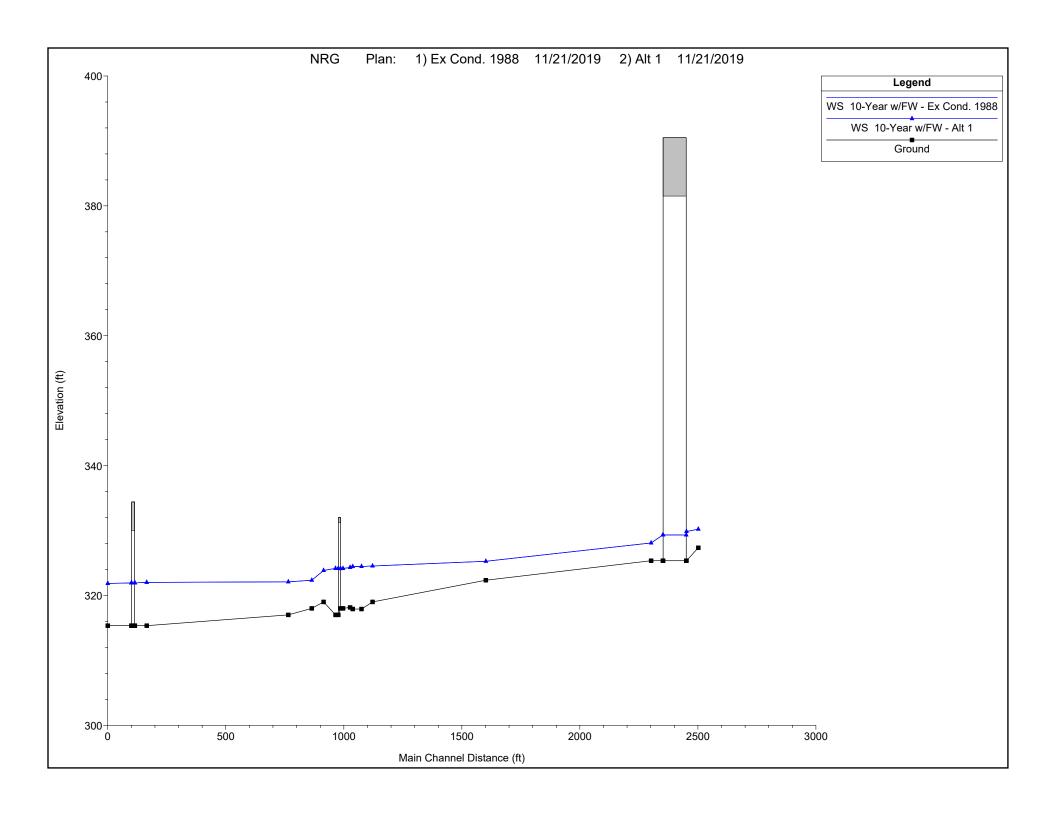


HEC-RAS Plan: Alt 1 River: Branch Bk Reach: NRG

Reach	River Sta	er: Branch Bk Rea 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)	
NRG	203	10-Year	800.00	327.34	330.22	330.22	331.36	0.014294	8.58	93.23	41.25	1.01
NRG	203	10-Year w/FW	800.00	327.34	330.20	330.20	331.39	0.014496	8.75	91.45	38.95	1.01
NRG	202.2	10-Year	800.00	325.34	329.84	328.08	330.18	0.002417	4.68	170.89	48.94	0.44
NRG	202.2	10-Year w/FW	800.00	325.34	329.84	328.09	330.18	0.002336	4.71	169.90	46.00	0.43
_												
NRG	202.15		Bridge									
NRG	202.1	10-Year	800.00	325.34	329.31	328.08	329.78	0.003794	5.48	145.90	46.33	0.54
NRG	202.1	10-Year w/FW	800.00	325.34	329.31	328.09	329.78	0.003779	5.49	145.81	46.00	0.54
NRG	202	10-Year	800.00	325.34	328.08	328.08	329.24	0.014263	8.66	92.41	40.17	1.01
NRG	202	10-Year w/FW	800.00	325.34	328.08	328.08	329.24	0.014263	8.66	92.41	40.17	1.01

NRG	201	10-Year	800.00	322.34	325.23		325.29	0.000571	1.92	471.06	220.56	0.21
NRG	201	10-Year w/FW	800.00	322.34	325.25		325.32	0.000637	2.12	377.37	132.00	0.22
NRG	200.8	10-Year	800.00	319.00	324.53		324.79	0.002159	4.10	198.82	50.75	0.34
NRG	200.8	10-Year w/FW	800.00	319.00	324.53		324.79	0.002157	4.10	198.90	50.75	0.34
	200.0	10 1001 1111 11	000.00	0.10.00	021.00		021110	0.002101		100.00	55.75	0.0 .
NRG	200.75	10-Year	800.00	317.90	324.46		324.68	0.002154	3.86	236.29	78.78	0.29
NRG	200.75	10-Year w/FW	800.00	317.90	324.46		324.68	0.002197	3.90	229.23	68.26	0.29
NRG	200.7	10-Year	800.00	317.90	324.45		324.58	0.001482	2.95	295.30	79.98	0.23
NRG	200.7	10-Year w/FW	800.00	317.90	324.45		324.58	0.001482	2.95	295.30	79.98	0.23
NRG	200.65	10-Year	800.00	318.15	324.31		324.55	0.002813	3.94	211.78	50.57	0.32
NRG	200.65	10-Year w/FW	800.00	318.15	324.31		324.55	0.002813	3.94	211.78	50.57	0.32
NRG	200.6	10-Year	800.00	318.00	324.15	321.97	324.46	0.002774	4.52	191.10	48.05	0.37
NRG	200.6	10-Year w/FW	800.00	318.00	324.15	321.97	324.46	0.002774	4.52	191.10	48.05	0.37
NDC	200.50		Daidas									
NRG	200.58		Bridge									
NRG	200.55	10-Year	800.00	317.00	324.16	320.86	324.37	0.001013	3.74	229.00	49.00	0.27
NRG	200.55	10-Year w/FW	800.00	317.00	324.16	320.86	324.37	0.001013	3.74	229.00	49.00	0.27
NRG	200.5	10-Year	800.00	319.00	323.84		324.25	0.005303	5.15	156.81	49.31	0.49
NRG	200.5	10-Year w/FW	800.00	319.00	323.84		324.25	0.005303	5.15	156.81	49.31	0.49
NRG	200.45	10-Year	800.00	318.00	322.34	322.34	323.78	0.010938	9.86	93.61	38.54	0.94
NRG	200.45	10-Year w/FW	800.00	318.00	322.34	322.34	323.78	0.010938	9.86	93.61	38.54	0.94
NRG	200.4	10-Year	800.00	317.00	321.26		321.93	0.008421	6.60	128.13	54.63	0.71
NRG	200.4	10-Year w/FW	800.00	317.00	322.09		322.46	0.003631	4.96	175.54	59.75	0.46
NRG	200.3	10-Year	800.00	315.34	321.14		321.21	0.000321	2.09	383.41	82.22	0.17
NRG	200.3	10-Year w/FW	800.00	315.34	322.01		322.06	0.000193	1.75	457.18	87.06	0.13
NRG	200.2	10-Year	800.00	315.34	320.97	319.06	321.16	0.001517	3.50	228.78	73.08	0.35
NRG	200.2	10-Year w/FW	800.00	315.34	321.93	319.06	322.04	0.000673	2.66	301.27	78.35	0.24
NRG	200.15		Bridge									
NRG	200.1	10-Year	800.00	315.34	320.95	319.05	321.14	0.001555	3.53	226.83	72.86	0.35
NRG	200.1	10-Year w/FW	800.00	315.34	321.92	319.04	322.03	0.000678	2.66	300.42	78.30	0.24
NRG	200	10-Year	800.00	315.34	320.74	319.04	320.96	0.001893	3.78	211.84	71.20	0.39
NRG	200	10-Year w/FW	800.00	315.34	321.84	319.05	321.95	0.000720	2.72	294.50	78.00	0.25





Floodway Analysis Report Naugatuck River Greenway Pedestrian Bridge over Branch Brook

APPENDIX F – HYDRAULIC DATA SHEETS

HYDRAULIC DATA FORMS

- Data Collection and Field Review (pages 4 to 14)
- Hydraulic Data (pages 15 to 18)

A. DATA COLLECTION AND FIELD REVIEW

I. GENERAL PROJECT DATA

Bridge No.: N/A	
Town: Watertown & Thomaston	County: Litchfield
Feature carried: Multipurpose Path	Feature crossed: Branch Brook
Quadrangle: Thomaston	DEP watershed basin no.: 6910
Functional class: urban principal arterial-interstate urban principal arterial-other expwy. urban principal arterial-other urban minor arterial urban collector urban local	rural principal arterial-interstate rural principal arterial-other expwy. rural principal arterial-other rural minor arterial rural major collector rural minor collector Other
Year built: New Construction	Year of reconstruction:
Overall NBIS structure rating:	NBIS Item 113:
USGS total scour index:	Sufficiency rating:
Plans available?	⊠ no
II. SUPERSTRUCTURE INFORMATION	
Bridge width: N/A ft Number of spans: N/A	Bridge length: N/A ft Bridge skew: N/A
Bearing connection type:	ve connection No positive connection
III. HYDROLOGIC AND HYDRAULIC IN	FORMATION
Watershed area: 22.6 Is it tidally influenced? yes	sq. mi.
25 It trainly infractions.	<u> </u>
What information is available? ☐ floodway analysis report ☐ FEMA F.I.S.	hydraulic report scour report SCEL analysis comparative report Other: FEMA HEC-2 Backup Data

	Courac	2 Yr.	10 Yr.	50 Yr.	100 Yr.	500 Yr.
	Source	Event	Event	Event	Event	Event
	FEMA FIS	-	800	800	900	2,300
F1 (-f-)	StreamStats	780	1640	2630	3130	4980
Flow rates (cfs)						
Precipitation (in)	NOAA Atlas 14 24-hr	3.56	5.68	7.97	9.04	12.5

Lievations (it.)									
Α	At Structure		Water S	urface at Ap	proach Cro	ss-Section ((200.65)		
Streambed	Low	Doodyyay	2 Yr.	10 Yr.	50 Yr.	100 Yr.	500 Yr.		
Streambed	Chord	Roadway	Event	Event	Event	Event	Event		
318.00	NA	NA	-	324.31	324.31	324.63	327.90		
Pressure flow at design storm?									
Comments:		new structu ion 200.6, th			•				
		he WSELs l		_					
	0	00.65, the a			ne L'aisting	Conditions	s wiouci at		
	Section 2	ov.vs, me a	ppi vacii sec	MUII.					

Elevations (ft.)

IV. SITE DATA

A. Existing structure(s) – Provide sketch of culvert/structure with dimensions and brief description.

No Existing Structure See Figures See Appendix A (Photographs)

Comments: Include structure or culvert type and condition. Note particularly any scour adjacent to abutments or at culvert outlet and the presence of debris or sediment. Also note the location of any utilities in the area of the crossing.

B. High water marks – Describe the nature and location of any apparent high-water marks and relate to a date of occurrence, if possible.

N/A

C. Maximum allowable headwater – Describe the nature of the apparent controlling feature and note its location.

N/A

D. Fish passage requirements – Comment on the apparent need for fish passage or impediments to same; such as dams or restrictive crossings in the area.

The proposed bridge allows fish passage. Fish passage is blocked approximately 0.5 miles upstream of the subject location by the Black Rock Dam spillway.

V. PERIPHERAL SITE DATA

A. Hydraulic control – Note location and description.

The flood control structure upstream and known FEMA WSELs downstream of the project site at the mouth of Naugatuck River control.

B. Upstream and downstream structures – Provide sketches and brief descriptions of existing bridges/culverts. Include dimensions.

Upstream

• Route 8 Overpass – twin span, 8-ft wide pier, 381.50 ft low chord, 85 ft span abutment to abutment.

Downstream

• Dirt road crossing – 330.00 ft low chord, 100 ft wide opening

C. Watershed area – Check watershed boundaries for accuracy. Note current land uses within watershed.

See Appendix A

D. Flow control structures within watershed – Note the location and type of all significant flow control structures (dams, etc.) within the watershed. Provide sketches with dimensions as required.

Spillway 2,100-ft upstream. See Appendix A.

E. Site photographs – Attach to report. Include an index and sketch of photograph locations. **No current photographs.**

VI. STREAM CHANNEL AND RELATED ASPECTS

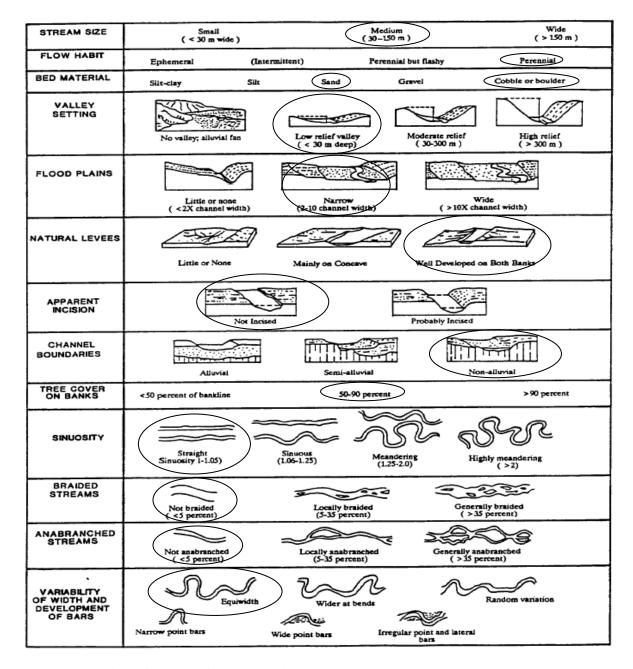
A. Stream characterization

Twenty Groupings of Stream Characteristics (check box)

	Identifier	Drainage Area	Streambed Slope	Streambed Soils	Land Use
	Α	Large	Low	SD	S/F
	В	Large	Low	SD	Urban
\boxtimes	С	Large	Moderate	SD	Forested
	D	Medium	Moderate	SD	Urban
	Е	Medium	Moderate	SD	S/F
	F	Medium	Moderate	CLAY	S/F
	G	Medium	Moderate	TILL	S/F
	Н	Medium	Moderate	SD	Forested
	1	Medium	Moderate	TILL	Forested
	J	Small	Low	SD	Urban
	K	Small	Moderate	TILL	Urban
	L	Small	Low	SD	S/F
	М	Small	Moderate	SD	S/F
	N	Small	Moderate	SD	Forested
	0	Small	Low	CLAY	S/F
	Р	Small	Steep	TILL	S/F
	Q	Small	Moderate	TILL	S/F
	R	Small	Low	TILL	S/F
	S	Small	Moderate	TILL	Forested
	Т	Small	Steep	TILL	Forested

	Drainage area	Small Medium Large	≤ 64.75km² (25 mi²) > 64.75km² (25 mi²) and ≤ 259 km² (> 259 km² (100 mi²)	100 mi ²)
	Streambed slope	Low Moderate Steep	≤ 4.76 m/km (25 ft/mi) > 4.76 m/km (25 ft/mi) and ≤ 19.05 m > 19.05 m/km (100 ft. mi)	n/km (100 ft. mi)
	Streambed soils	SD = Stratified I	Drift	
	Land Use	S/F = Suburban	or Farming	
В. С	hannel stability			
Pr	revious NBIS Item 61 ra	nting: <u>NA</u>		
	Lateral stability:		stable	unstable
	Bank erosion: none light	ht fluvial erosio	n heavy fluvial erosion	mass wasting
	Streambed:	⊠ stable	aggradating	degrading
	Armoring potential:	none	⊠ low □ me	oderate high

Geomorphic factors that affect stream stability (circle factors that apply)



Source: Adapted From Brice and Blodgett, 1978

(See also FHWA HEC-20, "Stream Stability at Highway Structures" for discussion of the above factors)

Pedestrian Bridge over Branch Brook boulders Secondary bed material: manmade sand gravel silt/clay cobble bedrock Bank protection Type modified intermediate standard none concrete slope paving absent other Condition slumped n/a good weathered missing fair poor Comment on the need (if any) for training walls, cutoff walls or special slope or channel protection. The side slopes of the brook in the vicinity of the bridge are generally stable. Backwater from the crossing downstream reduces velocities in project location. C. Channel and overbank roughness coefficients Basic channel description: channel cut into rock channel in earth channel fine gravel channel coarse gravel Surface irregularity of channel: smooth – best obtainable section for materials involved minor – slightly eroded or scoured side slopes moderate – moderately sloughed or eroded side slopes severe – badly sloughed banks of natural channels or badly eroded sides of man-made channels – jagged and irregular sides or bottom sections of channels in rock Variations in shape and size of cross sections changes in size or shape occurring gradually large and small sections alternating occasionally or shape changes causing occasional shifting of main flow from side to side moderate – moderately sloughed or eroded side slopes large and small sections alternating frequently or shape changes causing frequent shifting of main flow from side to side Channel obstructions – (Judge the relative effect of obstructions – consider the degree to which the obstructions reduce the average cross sectional area, character of obstructions, and location and spacing of obstructions). NOTE: Smooth or rounded objects create less turbulence than sharp, angular objects. The effect of obstructions is: negligible minor appreciable severe Degree of Vegetation (Note amount and character of foliage)

Floodway Analysis Report

Naugatuck River Greenway

BL Project No. 1800579

Floodway Analysis Report Naugatuck River Greenway Pedestrian Bridge over Branch Brook

The effect of vegetative g	growth upon flow	conditions is:		
LOW – Dense growths of flexible turf grasses where average depth of flow is 2 to 3 times the height of vegetation. Supple seedling tree switches where the average depth of flow is 3 to 4 times the height of the vegetation.				
MEDIUM – Turf grasses where the average depth of flow is 1 to 2 times the height of vegetation. Stemmy grasses, weeds or tree seedlings (moderate cover) where the average depth of flow is 2 to 3 times the height of vegetation. Bushy growths (moderately dense along channel side slopes with no significant vegetation along channel bottom).				
HIGH – Turf grasses where average height is about equal to the average depth of flow. Willow or cottonwood trees 8 to 10 years old with some weeds or brush. Bushy growths about 1 year old with some weeds. No significant vegetation along channel bottom.				
VERY HIGH – Turf grasses where the average depth of flow is less than ½ the height of vegetation. Bushy growths about 1-year old intergrown with weeds. Dense growth of cattails along channel bottom. Trees intergrown with weeds and brush (thick growth).				
Additional Comments	: See Appendix A	A		
VII. HYDRAULIC VULNER	ABILITY			
Previous Item 71 rating: 1	<u>NA</u>			
Is there confluence prese	nt?	s	⊠ no	
Angle of attack (flood flo	ow):	s	ono no	
Bends in channel:	= *	stream of bridge aight channel reach	downstream of bridge at bridge	
Velocity order of magnitu	de: 4.14 ft/s (ap)	oroach section)		
Trapping potential:	⊠ low	medium	high	
Debris potential:	⊠ low	medium	high	
Overtopping relief:	none on bridge	left approach relief bridge	right approach cannot be determined	
Primary bed material:		gravel cobble	boulders	
Comments: The channel is comprised of gravelly sand, small cobbles and boulders.				

VIII. VISUAL SCOUR EVIDENCE

USGS observed scour index: N/A			
History of scour problem:			
Comments: There is no existing bridge at the crossing site.			
Note: Comment should address any evidence of scour at ALL substructure units.			
CONTRACTION SCOUR SUSCEPTIBILITY			
Channel width upstream: 40-ft Channel width under bridge: N/A Channel width ratio (channel width upstream / channel width under the bridge: N/A			
Overbank flow:			
Percent of flow in main channel of the approach section: >90% 75%-90% 50%-75% 25%-50% <25%			
Average bed material size (D ₅₀): @ approach section			
Contraction scour susceptibility rating:			
Comments: Scour with the proposed structure is unlikely due to the elevation of the substructure and velocities at the structure.			

ABUTMENT SUSCEPTIBILITY

Which abutment is worse?	right		
Observed scour depth: Remaining embedment in river bed:			
Abutment shape:	spillthrough		
Abutment location:	set back		
Abutment foundation: unknown spread footing friction piles EB piles	pile bent set in rock		
Pile type:	l stone		
Pile length: m (ft)			
Abutment material;	l stone		
Angle of inclination: (degrees)			
Primary bed material: sand gravel boulders manmade silt/clay cobble bedrock			
Are borings available?			
Abutment protection			
Type: modified intermediate standard	slope		
concrete other absent	none		
Permanent or Temporary:	temporary		
Condition: good weathered slumped N/A	missing		
Abutment exposure due to scour:			
□ none □ no exposure □ footing exposed □ piles exposed □ undermining □ settlement □ failed			
Abutment susceptibility rating:			
Comments: No existing abutments			

PIER SUSCEPTIBILITY

Worst pier number: No Existing Piers Observed scour depth: Remaining embedment in river bed:			
Angle of attack flood flow: (degrees)			
Pier foundation: Unknown Spread footing Dile bent EB piles Set in rock Friction piles N/A			
Pile type:			
Pile length:			
Pier material:			
Pier shape: solid pier with square nose solid pier with round nose column with sharp nose column with sharp nose column with square nose column with square nose column with round nose cylinders/group of cylinders			
Pier width: Pier dimensions:			
Cap/Footing dimensions:			
Pier exposure due to scour: none piles exposed piles exposed failed no exposure undermining settlement			
Pier protection			
Type:			
Primary bed material: Sand Silt/clay			
Are borings available?			
Pier susceptibility rating:			
Comments:			

B. HYDRAULIC DATA

Location

1)

	a)	Town(s):	Thomaston Watertown	&	State Project No.(s):						
	b)	Highway:	N/A		Station(s): <u>N</u>	J/A				
	c)	Location Re	elative to Highway	Lanc	dmark: _		eximately 0.27 miles south of 8 crossing over Branch Brook.				
	d)	Stream: I	Branch Brook								
	e)	Location Re	elative to Stream L	andm	nark: _	Approximately 1,000 ft upstream of the confluence with Naugatuck River.					
2)	Desi	ign Flood									
	a)	Hydrologic	Procedure Used for	or Des	sign:	FEMA	A Flood Insurance Study Flows				
	b)	Hydrologic	Procedure Used by	y FEN	MA:	log-Pe	earson Type III				
	c)	Drainage A	rea:		_	22.6 s	quare miles				
	d)	ConnDOT 1	Drainage Manual S	Struct	ure Classi	ficatio	n: Large				
	e)	Design Stor	rm Frequency:	100	-Year, In	vestiga	ate 500-Year				
	f)	Required U	nderclearance at D	esign	n Discharg	ge: 2	ft				
	g)	Design Disc	charge: 900 cfs								
		i. D.O.T	. Design: N/A								
		ii. FEMA	A: 900 cfs	}							
		iii. SCEL	: N/A								
3)	<u>Hyd</u>	lraulic Anal	ysis Procedure								
	a)	Model Used	d and Version No.:	<u>H</u>	EC-RAS	Versio	on 5.0.7				
	b)	Flow Regin	ne: Subcritical								

	c)		•	`	ng water surface and critical depth, ra	at the ends of the river system ating curve, etc.):	em – 1.e. known
		i.	Downstream:	Know	n WSELs		
		ii.	Upstream:	N/A			
	d)	Othe	er Method(s):	N/A			
)			Control (i.e.c		bridge, dam (we	ir), channel construction	n, tide, known
	a)	Type	e of Control:	Dam			
	b)	Loca	tion Relative to	Propos	sed Construction:	0.5 miles upstream	
5)	<u>Coe</u>	fficien	ts of Roughne	<u>ss</u>			
	a)	Dow	nstream:	Cha	nnnel <u>0.035</u>	Overbank	0.065-0.08
	b)	At C	rossing:	Cha	nnnel <u>0.035</u>	Enclosed Conduit	N/A
	c)	Upst	ream:	Cha	nnnel <u>0.035</u>	Overbank	0.065-0.08
6)	Exis	sting S	<u>tructures</u>				
	Ups	tream:	Route 8 br	ridge			
	a)	Type	e: Two-span channel	bridge	on concrete ab	outments with wingwalls	s aligned with
	b)	Gros	s Waterway Op	ening:	4,040 square f backup data)	Ceet (dimensions obtaine	d from FEMA
	At S	Site:	None				
	a)	Type	e: N/A				
	b)	Gros	s Waterway Op	ening:	N/A		
	c)	Effec	ctive Waterway	Openin	ng: N/A		
	d)	Over	all Width of W	aterway	Opening: N /A	A	

	e)	Effective Depth of Waterway Opening: N/A
	f)	Minimum Low Chord Elevation: N/A
	g)	Minimum Roadway Elevation: N/A
	h)	Computed Water Surface Elevation at Approach Section Upstream of Structure at Design Discharge: 324.63-ft (Section 200.65)
	i)	Underclearance at Design N/A Discharge:
	j)	Mean Velocity of Channel: 4.14 ft/s (Approach Section)
	Dow	vnstream: Dirt road crossing
	a)	Type: Clear-span bridge
	b)	Gross Waterway Opening: Approximately 1,120 square feet (dimensions from FEMA backup data)
7)	<u>Proj</u> a)	<u>posed Structures</u> Type: Prefabricated steel truss superstructure on precast concrete abutments
	ŕ	· · · · · · · · · · · · · · · · · · ·
	b)	Gross Waterway Opening: 590± sq ft
	c)	Effective Waterway Opening: 208± sq ft
	d)	Overall Width of Waterway Opening: 60 ft
	e)	Effective Depth of Waterway Opening: 6.5 ft
	f)	Minimum Low Chord Elevation: 331.25 ft
	g)	Minimum Roadway Elevation: 332 ft (Proposed trail elevation)
	h)	Computed Water Surface Elevation at Approach Section Upstream of Structure at Design Discharge: 324.63 ft at Section 200.65
	i)	Maximum Regulatory Elevation: 325.58 ft (natural conditions + 1-ft) calculated at Approach Section 200.65

j)	Other Controlling Water Surface Elevation (If Below Maximum Regulatory Elev.):
	Known FEMA WSELs	

k) Difference in Water Surface Elevation (Approach Section) Proposed vs. Existing and Proposed vs. Regulatory @ Design Discharge:
 At Section 200.65, the Proposed WSEL is 324.63-ft, equivalent to the Existing

At Section 200.65, the Proposed WSEL is 324.63-ft, equivalent to the Existing WSEL, and approximately 0.05-ft higher than the Natural Conditions (324.58 ft). The Proposed WSEL is 0.95-ft below the Regulatory Elevation (Natural plus 1 ft).

- Underclearance at Design Discharge with Respect to Structure Low Chord:
 6.62-ft
- m) Mean Velocity Through Structure: **4.40 ft/s Bridge Open Velocity**

8) Remarks

- a) Navigational Requirements: N/A
- b) Tidal Conditions: N/A
- c) Record Floods: August 1955, Over 500-year storm (FIS Report/CT Drainage Manual/NOAA Data)
- d) Average Daily Flow: 39.7 cfs

 $(Q_{AD}(cfs) = [A (sm)]^{0.98} * 1.87)$

e) Average Spring Flow: **78.8 cfs**

 $(Q_{AS}(cfs) = [A (sm)]^{0.988} * 3.62)$

- f) Flood Hazard Zone: **Zone A1**
- g) Vertical Datum: NAVD 1988 (FEMA data in NAVD 1929)

Floodway Analysis Report Naugatuck River Greenway Pedestrian Bridge over Branch Brook

APPENDIX G – HEC-2 BACK-UP DATA

Branch Brook

> WATERTOWN (TN)CT SC 5992

	*** *** C T1 T2	ERHOR CORR 1001F1CATEC ************************************	= 01.02 IN - 50.51	V 78 UPDATED ,52,53 FLOOD INSURANC	******					FLOO	H BROO D Way 22/19
	13		EAR FLOOD	0_900 CFS	en e			e de la companya de l			
	J‡	1 CHE CK	190	NINV IDI	R STRT	METRIC	HAINS	0	MSEL .	F 0	
		0,	5	0,,	0, 0,002000	0,		0, 3	30,000	o ,	پین بین از اینیت با تنفیده به سینستانده این از از از
·	J2_	NPROF	TPLOT	PRFVS XSE	oyxsedH_	FN	ALLDC	Тви	CHNIM	TRACE	
		1.000	0.	-1.000 0	0.	0 +	0 •	0 •	Ü•	0.	
	J3	VÄRTABLE.	CODES FOR	SUMMARY PRINTO	ut .	· · · · · · · · · · · · · · · · · · ·	ليميدون المداوي بالمستخفية الدارات				
* * ** * *** * * *	بديهم دخد	200,000	110,000	0. 0		0		<u> </u>	0	0,	
•	NC 01 ET	0,060 4,000 U,		0,035 0 900,000 10,400	0,100 900,000 10,400	5.300 900,000 10.400	0.	0, 0, 0,	0 1	0,	0,
	X1 GR GŘ NO	3/5,000 325,000	1000.000	325,000 330,000 0,	1230,000 1120,000 1230,000 0,300	0, 320,000 335,000	0. 1140.000 1520.000	316,000 0:	1190,000	320,000	1200.000
	ET	- U+	0.	10,410	10,510	10,610	0.	. 0	0,	0.	, i û.
		D/	S FACE DIRT	F POAD.	m. A chart or the anti-particular puller is a section to the			gand Selvide . It i from to sail to a configuracy system	nderkalande and der ein edges ved delete bestehe i de de	in the protection of many is a second of the	•
TO THE STATE OF THE STATE OF	x1 x3 SR	200,100	n.	0, 0, 2,500	0. 0. 75.000	75,000 0. 50.000	20,000	100,000		330,000 316,000	0; 0; 316,000
· · · · · · · · · · · · · · · · · · ·		UZ	S FACE DIRT	ROAD				- real Publishers in the Section of the Section Sectio			
• • •	X1 X2 X3 N0	200,200 0. 10.000	0 · · · · · · · · · · · · · · · · · · ·	0, 1,000 0,	330,000 0, 0,100	15,000 334,400 0, 0,300	15.000	15,000 0. 0.	0. 0. 334.Ano	0, 0, 334,400	0. 0. 0.
	y 1 1442 1442	250,260 850,660 850,060	8,000 1000,000 1:50,000	1460,000 325,000	1510,006 1400,000 1700,600	50,900 \$16,000 \$70,000	50.000 1436,880 1800,880	>0,000 316,000 0,	0. 1480.0nn 0.	0,	1500.600

4.5												
	ĞR	337,000	2155,000	337,500	2248,000	335,500	2325.000	327,500	2395,000	324,500	2424.000	
	GR	324,500	. 2470.000	328,000	2500.000	343,500	2545.000	353,500	2585,000	365,000 \	2620.000	
and a company of the	<u>X1</u>	202,000	15,000	1663,000	1748,000	920,000	680,000	700,000	0,		0,	
	X4 GR	2,000 376,000	326,000 1315,000	1692,000. 375,000	326,000 1430,000	1720,000	0. 1528.000	0,	/ 01	0,	0.	
	GR	327,500	1690.000	327.500	1724.000	373,500 337,000	1748,000	303,500 342,500	1605,000 1785,000	338,500 \ 367,700	1663,000	
	GR	374.000	1897,000	375,000	1963,000	380.000	2040+000	382.000	2100.000	381,300	2210,000	-
araban grader , arbi	ИC	0.1	01	0,	0,300	0,500	0.	0.	0,	0.	0.	
		D/S	FACE RTE &	BRIDGE						,		
	χi	202,100	0 • 1	<u> </u>	0.	50.000	50,000	50,000	0.	0.	0,	
	X3	10.000	1,500	0.	0.	90,000	7.000	0.	381.500	381,500	Ŏ,	
	\$5	1.250	1,200	2,500	240.000	A0 1000	7.000	5700.000	2.500	326,800	326.800	
			FACE RTE 8	BRIDGE			<u></u>					
	х1	202,200	0,	0,	0,	100,000	100.000	100,000		0		٠
	x2 x3	0,	0.	1.000	381,500	390,500	0.	0.	0.	Ò,	0,	
	NC X3	10.000	0.	0 • 0 •	0. 0.100	0. 0.300	0.	0 . 0 .	390,500	390,500	0.	
				······································				·	0.	0 •	0.	
	x1	203,000	15,000	1740,000	1862,000	50,000	50,000	50,000	0.	0.	O	
	X 4	2,000	328,000	1800,000	328,000	1825,000	Ü	0.	0.	0,	0.	
	GR GR	349,500 392,500	1239,000 1433,000	384,500 390,000	1265.000 1519.000	384,500	1286,000	392,500	1329,000	399,500	1370.000	
	GH	325.500-	1795.000	329 500	1827,000	385.000 337.500	1615.000 1862.000	373,500 353,500	1680.000 1896.000		1740.000 1940.000	
									•			
	t X	204,000	17,000	1685', 000	1805.000	1000,000	1020.000	990,000	0.	0.	0.	·
	X4 GR	2,000 374,500	334,000	1740.000	334,000	1760.000	U .	352,500	0,	U,	0,	
	GR∵⊸	348,000	- 1200,000 - 1325,000 -	374,500 343,500	1220,000 1368,000	373,500 337,500	1240.000	339,500	1290,000 1480,000	344,200 342,500	1310,000	
	GR	342,800	1635,000	342,000	1685,000	335.000	1735.000	335,000	1770.000	344,800	1805.000	
	GH	347,300	1875,000	349,500	1910,000	0.	0.	0,	0.	0.	0.	
		0.5	07	7401	74. 1 9							
	- X1 - X4	205,000	23,000 345,700	3425,000 3480,000	3570,000 345,700	-1860,000 -3500;000	1600,000	1820,000	0;		0,	
	GR	391,500	2580,000	390.300	2630.000	390.300	2670.000	389,000	2725,000	357,500	2855,000	
	GR.	375.000	2920+000	376,500	2960.000	303,500	3010:000	358.500	3093,000	349,/00	3168,000	•
	GR	349,500	~326n.000 ~	349,/00-	3345,000 mm	351,300	3425,000		-3475:000	347.3ng -		****
	GR GR	353,000 354,500	3570,000 3875,000	356,000 363,500	3635.000 3930.000	353,500 373,500	3700.000 3980.000	350,500 0,	3735.000 0.	348,500 0,	3840.000	
	• • •		<u>Timbi</u>	: ```							0,	
	X1	206,000	21,000	2840,000	2965,000	880,000	960.000	910,000	0.	0,	0.	
	ΩR X∃	₹+000° 306+300	350,000	2870.000 *** 366.000	350,000	2910,000 T	04.96	766 540	0.7	· · · · · · · · · · · ·		
	นR	353,800	2010.000 2460.000	352,500	209 5. 000 2550.000	პიპ,მიე პ5 7. ნიე	2185.000 2020.000	366,500 353,500	2250,000 2655,000	356,000 356,509	2350.000	
•	68	363,500	2705,000	358,500	2735 000	363,800 -	~ 2780,000~~~	354,800	2840.000	351,000 °	2680,000 2865,000	
	GĐ	351.000	2920.00n	361.000	2705.000	370.000	3015.000	370.000	3070.000	372,400	3175,000	
	trix	400,400	3245,000	Ü į	u ,	U	0.	Ú.	Ü,	0.	0,	
		2-7 . 96a	∀. 30√	772 Cal	راداد ،	ահայերինի Մահու	http://de	620,000		.1		1
		2 7	4			- 94000		OZUTOCU	₩.	U,	Ü.,	تأنه أأهدمه س

D/S	FACE	RTE	6	BR	IDGE

	U/S	FACE RIE	o putnes					, ;		\
X1	207,100	0,	0.	0.	80,000	80.000	80,000	' 0 •	0.	0,
\$8	0.000	n, 1,500	2.500	150,000	0. 00.000	0.	900,000	368,700	368,700 354,100	354,100
The second secon	UŽS	FACE RTE	6 URINGE		· · ·	· · · · · · · · · · · · · · · · · · ·				
x1	207,200	0	0 •		35,000	35,000	35,000	0,		
X2	0.	0	1,000	368,700	373,500	0.	0	U.	0,	0, 0.
X3	10,000	0,	0,	0.100	0,300	0:	0.	373,500	373,500	<u> </u>
					0,000			0.	0.	9
x1		25,000		2810.000	45,000	45.000	45,000	0.		
X 4	2.000	354,500	2745.000	354,500	2770.000	0,	0.	0.	0.	0 • 0 •
G _R	386,500	2310.000	384,500	2380,000	385,700	2460.000	381,800	2535.000	378,500	2585.000
GR	373,500	2635,000		2070:000	355,500	2740.000	355,500	2775.000	265,900	2810.000
GR GR	362,500 362,500	2865,000 3140.000	362,500° 363,000	2940.000 3235.000	361,500 362,500	3000.000 3300.000	364,000	3050.000	364.000	3080.000
	361,500	3430.000	372,500	3485,000	378,500	3555.000	361,500 381,500	3360.000 3620.000	359,500 399,300	3400.000 3705.000
			•						4.71000	0.001000
	209,000	25,000	2150,000	2265,000	1200,000	1050:000	1110,000	0.		
х3	10,000	0.	0,	0.	0,	0,	0.		0.	0
х4	2.000	361,000	2170,000	361.000	2200,000	0.	0	Ů.	- 0.	0
GR	383.000	1390.000	380.500	1490.000	377,500	1005.000	375.500	1695,000	374,500	1785.000
GR GR	373,000 374,500	1850.000 2030.000	362,000	1880,000	3>2.000	1940.000	372,500	1965,000	363,500	5000.000
GR .	366,500	2205,000	362,500 370,500	2055,000 2265,000	362,500 371,000	2130.000 2370.000	374.300 370.500	2150.000 2455.000	366,500	2165,000
GR	369,300	2645,000	372,000	2730.000	375.500	2810.000	383,500	2850.000	369,500 387,500	2560.000 2920.000
والرائيس والدارمينيات بميسرة تومطوا فالمدارات				*				·	·	
X1	210,000	15,000	1735,000	1880,000	1550.000	1650.000	1600,000	ū.	0.	0.
χ4	1,000	376,000	1840,000	0,	0 +	0.	0 .	0.1	Ŏ.	Ö,
GR.	433,5pg- 379,500	1340,000- 1830,000	423,500	1405.000	413,500	1560.000	411,500	1640.000	408,800	1735,000
GR	463,700	-2130,000	393,500 474,500	1880,000 - 2170,000 -	388,000 495,700	1930,000"" 2230,000""	392,500 ··· 490,000 ···	1985,000	453,500	2080.000
e american in a manageria and a service as a		210011100	1,11,500	21/01000	7/2//00	22301000	4501000	2285,000	493,500	2330,000
X1	211,000	15,000	1588,000	1690.000	600,000	300,000	F40 000			2
	353 500	1350,000	542.000	1395,000	531,50g	1445,000	500.000 522,000		522,000	1520.000
· GR	497,500	1588,000	488,700	1640,000	492,700	1690,000	503,500	1780.000	513,700	1863,000
GR	523,700	1945,000	533,500	2020,000	539,500	2090.000	539,500	2178,000	539,500	2301,000
•										
on the control of the section of the control of the	. 50 F	EET U/S BL	ACK ROCK DAM							
- * · X1 =	211,100	6,000	1062,000	1204,000	50,000	50,000	50,000		··· n	
х3	10,000		Û,	0.	0,		0,	0 ·	0.	0
X5	4.000	525.000	525,000	525,000	525,000	0.	0	101/	0.	0,
(#R GR	540,700 560,000	1000,000 1210,000	540,700	1060,000	519,600	1062,000	519,600	1202 00	540.700	1204,000
- To	4.000	-7600.000-	7600,000		7600,000	O,	<u>0</u> ,	0.	0.	0,
										
والمراجع المراجعين والأراء والمراجع والمراجع	n Ti D u	IST TUZS WI	GWAM DAM					· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	and the second s
				. 44		-		-		
	218,100 570 000 -	5,000 "'1509 556'"	1200,000 		3800,000 531 500	8400,000 	9540,000	U .	571 386	140 N O N N
•		, ,	1971 - 619 1	1 4 11 11 11 11	מוחות ויחוד	3.350.000	ማ/፣ በበበ		571 BAA	4400 000

GR		1							7			
Color				2670.000							and the second s	
GR 577,100 100,100 570,000 105,000 555,000 1050,000 553,500 1100,000 553,500 100,000 55,500 100,000 10		. .		4.7.01.000		6. 551410	2071200	27701000	0,	• •	ų į	٠,
GR 577,100 100,100 570,000 105,000 555,000 1050,000 553,500 1100,000 553,500 100,000 55,500 100,000 10		X1	~~~24.9.74mm~~			**** T'42 n'****	መሰለለ ከሰለ	- ***********	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			
GH		GR	575,000		570.000							
X1 229,200 2 3 6 0 100,000 100,000 100,000 0 0 0 0 0 0 0 0										0,	0.	0, 🏂
X1		NU	V•	0.	<u>5 35/U •</u> - <u>3</u>	0,300	0.500	Q. •	0 .	0. ;	0.	Ų,
X1		**								· · · · · · · · · · · · · · · · · · ·		······································
X3 10,000 0, 2550 0 300,000 05,000 0 800,000 0 5553,500 553,500 5 800,000 0 800,000 0 800,000 0 8553,500 553,5			D/S	FACE FOOTB	RIDGE							
X1 219 300 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0				0	0,	0.	100,000	100,000	100.000	0.	0.	0.
U/S FACE FOOTBRIDGE X1 219,300 0 0 0, 11,000 566,000 588,000 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,			************	0 ,	() () () () () () () () () ()					566,600	566,600	0.
X1 219,300 0, 0, 0, 6, 15,000 15,000 15,000 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,		50	0 4	1.200	2,200		05.000		800.000		553,500	553,500
X1 219,300 0, 0, 0, 6, 15,000 15,000 15,000 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,				CASE POSTS	D.I. D.O.E.							
X2			0/2	FACE FOUTH	RIDGE		·			•		
X3				0.	0,			15.000	15.000	0.	0.	0.
NC 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,							568,800					0.4
X1 270,000 15,000 1290,000 2230,000 700,000 45,000 285,000 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.					0.	0.100	0.300	<u>V</u> :	<u>0:</u>			
X4 2,000 554,000 1350,000 554,000 2150,000 0. 0. 0. 0. 0. 0. 0.						•		•	• ,	-,	••	• •
X4 2,000 554,000 1350,000 554,000 2150,000 0. 0. 0. 0. 0. 0. 0.	*****	x f	220.000	15.000	1290.000	2230.000	700.000	45. ddi	285.000			
98			2.000	554,000	1350,000	554,000	2150.000		0.			
GR 569,500 2230,000 571,500 2270,000 575,500 2335,000 576,300 2395,000 500,000 2555,000 500,000 2555,000 500,000 2555,000 500,000 2555,000 500,000 2555,000 500,000 2555,000 500,000 2555,000 555,000	and a company of the same of t						613,500			1160.000	588,000	1200.000
200 FEET U/S CORPORATE LIMITS X1 221,000 13,000 1320,000 1595,000 1650,000 2350,000 2230,000 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.					571.500							
X1 221,000 13,000 1320,000 1555,000 1650,000 2350,000 2230,000 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.												2227,000
X4	··· ••· • • • • • • • • • • • • • • • •	:	200	FEET U/S C	DRPORATE LIMI	TS	· · · · · · · · · · · · · · · · · · ·					
X4		_x1	221,000	13,000	1320,000	1555.000	1650,000	2350.000	2230,000	0.		·····
GR 569;500 1320;000 560;500 1340;000 560;500 1510;000 568;500 1555;000 569;500 1580;000 GR 569;700 1630,000 571;500 1705;000 575;500 1765;000 U,									Ü,	0,	0.	0,
GR 569,700 1630.006 571,500 1705,000 575,500 1765,000 U, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,	····		569.500							1275,000		
EJ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,		GΗ	569,700		571,500							
		FJ	<u> </u>	0,	0,	0.	0.	0.	0,	0.	0,	
			•		* -	•						•
											•	•
			: <u></u>	· •• •• • • • • • • • • • • • • • • • •							- '- <u>-</u>	
	• • • • •								* =	:		
											· · · · · · · · · · · · · · · · · · ·	
								•	•			,
									****		· · · · · · · · · · · · · · · · · · ·	
	ىنى دىسىسەدىدەرىيە	····										
										' ik	•	
				er alle de la grande							territoria de la composição de la compos	
	•	-					•					
			*						 	···		
									•			

· · · · · · · · · · · · · · · · · · ·	*** H	+++++++++ EC2 RELEAS	********* E DATED N	0V 76 UPDA1	######## ED AUG197	******	·····		· · · · · · · · · · · · · · · · · · ·			
en region grows to grow growing as a	***	RROR CORR	eretetee Ki		*****	******					······	
	† <u>1</u> †2 †3	BRANC FLOOD	H BROOK THO	1 2		<u>Y</u>						· · · · · · · · · · · · · · · · · · ·
a North San Americkie de Affredd de graph State .	J1	1 CHECK	(1)	NINV	1DIR 0, 0,	STRT	METRIC 0.	O.	0	322,600 WSEL	ГQ 0.	
	J 5	NEROF	IPCOT	PRFVS	XSECV	XSECH	ķи	ALLDC	I B W	CHNIM	1TRACE '	
		19,000%	072367 483164	-1,000 a,va	. 0	0.7	0,	0.	0,	0,	0,	**************************************
*												
		230.750 230.750	17.7.7.7. 3.18.18.1	ij. +8	347.44		1 1 1 1 1 1 1 1 1 1					
and a second		7 7 7 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6										
		\$0 .000 26<400	377.97 397.97	9.76	15 10 , 20 11 15 60			-	THE STATE OF THE S	· ·		
	•	20 143 10 1	1 1 2 1		· · · · · · · · · · · · · · · · · · ·							
		र्गाः । इस् राज्याः	. 1988 #4 		3 (4) (5) 3 (4) (5)		/ *	* p 3544***********************************	o din salah	· · · · · · · · · · · · · · · · · · ·		
		* 10 (0. 1		1 , 1					•			
		endrugge Englisher				· · · · · · · · · · · · · · · · · · ·		,				
	······································	į.	3 . 3 5 . 3				· · · · · · · · · · · · · · · · · · ·	10 1 N 10 1		, h.	1	

.

.

সন্ধ ু

-785 -₹

1

. Fe 00

	SECNO	CHSEL	DIFKHS	, EG	TOPWID	0L08	фан ,	0R0B	PERENC	STENCL	STOHL	STOH
	207,100	357,60		357,86	95,41	0,	900.00	0.	0.	. 0.	2720.00	. 2880
	207,100	357,59	*0.01	357,85	95,30	0.	900.00	0.	0,	2720.00	2720.00	2880
بالمائية عامد الدين والويد المداعة الموافقة الموادية .	207,200	357,73	0.	357,97	97,96	0,	900,00	0.	0,	0.	2720.00	2880
·	207,200	357.73	+0.01	357,96	97,83	0.	900.00	C .	0 •	2720.00	2720.00	2880
	208:000	357.50		358;38	54,56	0.	900.00	0.	· 0,	0 .	2670,00	2810
	208+000	357.49	10.0	358,38	54,48	0 •	900.00	0 •	.0.	2670.00	2670.00	2810
فالمهملهمان المداومينية والممتب فيقات فالمشتهب المساوية م	209.000	365,17	(85 0 ·)	365,80	37,58	0.	900.00	0.	0.	0.	2150.00	2265
	209+000	365,18	/. ≥ (a 0 · 01	365,81	37,59	, 0•	800+00	0 +	0	2150.00	2150.00	2265
·	210,000	381;93	0.	383,43	31,44	0.	900.00	0,	0,			1880
· · · · · · · · · · · · · · · · · · ·	210.000	381,93	0.00	383,43	31,44	0.	900.00	0	0 •	1735.00	1735.00	1880
***************************************	211,000	492.27	0.	493.18	65,64	0.	900.00	0.	0 +		1588.00	1690
	211.000	492,27	-0.00	493,18	65,64	0+	900.00	0.	0.00	1588.00	1588.00	1690
	211,100	525.00	0.	525.02	141.02	0,13	899,87		0,	0.	1062.00	1204
	211,100	525.00	Ŏ.	525.02	140.51	Ŏ,	900.00	Ŏ,	0.00	1062.00	1062.00	1204
***************************************	218,100	565,50	0.	567,22	253.34	732,35	6866,92	0,73	o.	0.	1200.00	1360
*	218,100	565.71	0.20	567.78	160.00	0.	7600,00	0,	0,12	1200.00	1200.00	1360
	219,000	567,40	o	567,40	1658.87	0,	7590.64	9,36	0.		1130.00	2670
	219,000	567,99	0.60	567,99	1535.54	Ŏ.	7600.00	0,000	0,00	1130.00	1130.00	2670
	219-100	567,38	0. 7	567,42	417,52	2.14	7589,14	8,72				
•	219,100	567,97	0,60	568,01	370.00	0.	7600.00	0,72	0,00	1050.00	1050.00	1420
	2197200	567,38-	o.	567-42	417.57	2.15	7589711	8,74	0		1050.00	1420
	219:200	567,98-	0.60	568 D1-	370.00	0.	7600,00	0,	<u>0,,</u> 00	1050.00	1050.00	1420
	219,300	569,29		569:32	455,81	8,17		33,29		· · · · · · · · · · · · · · · · · · ·		
	219,300	567,97	#1,32	568,02	417,57	0	7600.00	0.00	0.	1050.00	1050.00	1420 1420
·	2207000	569.32		569 - 33	929:59		7600.00					•
	220,000	568,02	-1.30	- 568 03	···· 914,16···		- 7600.00	0,	0.00	1290.00	1290.00	2230 2230
	221,000	569,23]
	221,000	567,90	0, -1,33	569,42 568,16	252,71 228,09	0.	7598,4 <u>1</u> 7600,00	1,59	0+00	1320.00	1320,00	1555 1555
<u> </u>		• •	·	• •	**	•		. ,	0,900	*~=0100	7~50+00	1000

SUMMARY OF ERRORS

						•	
CAUTION		201.000	PROFILE* 1	CRITICAL	DEPTH ASSUM	هور جايترمور ED	į.
CAUTION	SECNO=	201.000	PROFILER 1	PROBABLE	MINIMUM SPE	CIFIC ENERGY	
CAUTION	"SECNO"	201,000	PROFILE 1	ZO TRIALS	STATTEMPTED	TO BALANCE WS	EL
CAUTION	SECNO=	201.000	PROFILE= 2	CRITICAL	DEPTH ASSUM	ED	
CAUTION	SECNO= "	201,000	PROFILE= 2	PROBABLE	MINIMUM SPE	CIFIC ENERGY	
CAUTION	SECNO=	201,000	PROFILE="2"	20 TRIALS	S`ATYEMPTĒD"	TO BALANCE WS	EC.
	•						

CAUTION SECNO= 203,000 PROFILE= 1 CRITICAL BEPTH ASSUMED

PROFILE NO. 2	FLOODHAY DATA,	100	YEAR P	LOOD	0.900	CFS
FEOGRAVAR	PROFILE NO. 2	71 1		337.35		
FLOODHAY RE		12				
	***		FLOOD	IAY +		

			FLOODHAY .		HATER S	URFACE ELE	VATION
	STATION	HIDIN	SECTION	MEAN	WITH	TUORYIW	DIFFERENCE
•		(FT)	AREA	ELOCITY	FLOODWAY	FLOODWAY	
	200.000	81,	3037	3.0	322,8	321,6	1.0
	200.100	82,	7 310.	2.9	322,7	321.8	
,	200.200	82.	3117	2.9	322.7	321.8	0.9
	200.300	88.	469.	1.9	322.8	322.0	0.8.
•	201.000	132	149.	6.1	324,2	324,2	Ğ.
	202,000	46.	.146	6.2	330.0	330.0	Ŏ.
	202.100	48,	163	5.5	330,3	330,3	0.
	202,200	54,	222.	4,1	331,5	330,5	1.0
	203,000	43.	102.	8,8	331,1	331,1	0,
	204,000	66,	186	4,8	338,1	338,1	0.
	205.000	70.	123,	(j 7 , 3	349.0	349,0	0 •
	206,000	72,	218,	4.1	353,7	353.6	0.1
11	207.000	78,	143	6,3	356,8	356,7	0.1
	207.100	95,	219,	4.1	357,6	357,6	0 .
	207,200	98.	231,	3,9	357,7	357,7	0
1	508.000	54,	119,	7.6	357,5	357,5	0.
	505,000	38,	141.	6.4	365.2	365,2	0
	210,000	31,	92,	9,8	361.9	381,9	0
	211.000	66,	117,	7.7	492,3	492,3	0,
] 	211,100	141,	757,	1,2	525.0	525,0	0.
	218,100	160.	657,	11,6	565.7	565,5	0,2
	219,000	1536,	32010,		568.0	567,4	0.6
.'	219,100	37.0.	4953.	1.5	568.0	567,4	0,6
	219,200	370.	4954	1.5	568.0	567.4	0.6
	219,300	418	4555	1.7	568 1	569,3	-1.2
	220,000	914,	11814	0.6	568.1	569,3	-1,2
	221,000	228,	1873	4.1	568.0	569,2	*1.2

MYZYGO'Y OUT

endopmentality 31 to	ومعور والمعادة	e i ng mga gang nyang pagabah an	enter de la principa de la compositoria della compo	i gada, hayini gariyan a ki sa kasan, yi sanan san	والمراجعة المراجعة	ng a Alvaner talan a salpgangasar rawasaka araw		(MULTIPLE	RUN
	***	FCO RELEAS	# NATED NOV	76 UPDATED	************ AUR:4977	*			1		
•	ę	RÁOR CORR	01.02 N = 50,51.	(李佳/635-1)	1.			•	1	,	
	М	ODIFICATIO	N - 50/51	52,53					u	Y REACH D	ETERHINATION
		******									The second secon
· is an impart and description from					***	**************************************	re duceronada bustanuarios nota trovaran en su				A CONTRACT OF THE PARTY OF THE
	T1 T2		H BROOK	LOOD INSURAN	CE STUDY			*,			
	""†3 <u>"</u>	10 YE	AR FLOOD A	1800 OF 6						t design of the design of the second of the	a marang baran sa mining manjali pang kanang kanana a a marang kanana a sa marang kanana a sa marang kanana an
	'.J1''	TCHECK	. INO	NINY ID	IR STRŤ	HETRIC	HAINZ	Q	HSEL	FQ	A STATE OF THE PROPERTY OF T
و د ده د که در د د د د د د د د د د د د د د د د د د	3				0. 0.002000	0.	0.	0,	324,000	A	
							, , ,	, 0,	544,000	0,	7) 1 - 10 - 10 - 10 - 10 - 10 - 10 - 10 -
and manufacturing the property of the control of th	J2	NPROF	19LOT	PAFVS XSI	CV XSECH	FN.	ALLDO	184	CHNIM	TRACE '	
	•	1.000	0,	-1.000	1	0 +			·		
The same							· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·			And the second s
	. اب	VARTABLE	CODES FOR SE	JHHARY PRINTO	ont		•		-		
a deli er letaria. La caracteria	م وس ماء مسم مساد ما	150.000	202.000	95.000 13	5.000 0.	0.	0.	0.	0.	0,	Andreas and the same
4-2	NG '	0.060	ሰ. ስልስ	0.035	0,100	0.300	<u></u>		· · · · · · · · · · · · · · · · · · ·		
Frank.	OŤ.	4.000	800,000	800.000	900,000	2300,000	ĭ. ŏ.	ů.			
									•		
manana operia ana a	~~x1~~		8,000	1120,000	1230.000	0,	0.	0.	0.		
1	GR GR	325,000	1000.000	325.000	1120.000	320.000	1140.000		0 1190.00	0 320.000	1200.000
، سيمي نو م وسو د. دخ وم	าหัดา		1220,000	0.	1230,000	335.000	1520.000	0:	V •		.
									7 -	- •	154
Section of the sectio			S-FACE DIRT	ROAD							and the boots of the comment of the state of
		e en reja - a - en rei kan							•		The second secon
المحدومة والمحددة			0.		0	75,000		100.00	0 0. 	0)	O .
	SH	· • 0 •	1.500	2,500	75.000	50.000	0 •	200.00		316,000	
-		and wear a string was the see the second respective to a supply of	·	بينتها ستيدهم سنده وبرييسهمهم							
			FACE DIRT	ROAD		•					
a service assessment	x1	200.200				15.000	15.000	15.00	A control of the cont	in comments and a property of the contract of	and the second s
	XS	0 •		1.000	330.000	334,400		0	0.	0.	0
دار مشتاع العرب	∴ X3 No	10.000		0	0.	0 +	0.	0 .	334.40(334,400	0.
	NG	· • • • • • • • • • • • • • • • • • • •		0.	0,100	0.300	V.j	· · · · · · · · · · · · · · · · · · ·	0.		0,
ر معرف المستوال		 	in in the second se	······································	en e						· · · · ·
	X1 T	200,300 330,000	8,000 1000,000	1400,000 325,000	1510.000	50.000 316.000	50.000 1430.000	50,00 316,00		0. 325.000	1500.000
	GR	330,000	1510,000	335,000	1700.000	340.000	1860,000	0.010	0.	0. 0.	0
						•	energy system in the control of the				
·	x 1	201,000	25,000	1548,000	1794,000	1000,000	1400.000	1435,000	o	0.	0,
•	jeat GR	2,010 368,500	323,000 1252,000	1620,000 357,500	323,000 1,305,000	1720,000 335,700	387,000	0. 335,3n	0.	0.	1470.000
	คล -	335,500	1500,000	335,500	1548,000	323.000	1610.000	323,000	1730.000	335,300 335,200	1794,000
	•	ere ere	on a see a factor of	Company		menne kili e	t Server bereich	*** ****	0.64 4 6 600	10 10 10 10 10 10 10 10 10 10 10 10 10 1	**************************************

	X4 CR GR GR NO	2.000 376.000 327,500 374.000	326,000 1315,000 1690,000 1897,000	375,000 327,500	326.000 1430.000 1724.000 1963.000	1720.000 373.500 337.000 380.000 0.500	0. 1528.000 1748.000 2040.000	0, 363,500 342,500 382,000	0, 1605,000 1785,000 2100,000	338,500 367,700 381,300	0. 1663.000 1838.000 2210.000
										U • ·	0.
		DZS	FACE RTE	8 BRIDGE					;		
	x1 x3 \$8	202.100 10.000 1.250	0. 0. 1.50ρ	0. 0. 2.500	0. 0. 240.000	50.000 0. 90.000	50.000 0. 7.000	50.000 0, 5700.000	0: 381.500 2.500	0. 381.500 326.800	0. 0. 326.800
		1178	FACE RTE	e aptnes						· ·	
					ويعلي بعد وللابد ودراء الربح	ويواد والمحدود المحادد المحادد					man andrew of the second
	X1 X2	202,200	n. 0.	0. 1.000	0. 381.500	100.000 390.500	100.000 0.	100,000	0.	0.	0. 0.
	NC NC	10.000	0.	0.	0. 0.100	0.300	0.	0.	390.500	390,500 T	0.
•	X1 X4	203,000 2,000	15.000 328.000	1740.000 1800.000	1862.000 328.000	50.000 1825.000	50.000 0.	50.000 0.	0 • 0 •	0.	0 •
	GR	389,500	1239,000	384.560	1265.000	384,500	1288.000	392.500	1329.000	399.5ng	. 1370.000
	AO AO	392,500 329,500	1433.000 1795.000	390,000 329,500	1519.000 1827.000	385,000 337 ,50 0	1615.000 1862.000	373,500 353,500	1680.000 1896.000	353,000 367,500	1740.000
		;					the same			0	17.01000
	X1	204.000	17,000	1685,000	1805,000	1003.000	1020.000	990,000	0.	. 0	0.
	X4 GR	2,000 374,500	334,000 1200,000	71740.000 374,500	334,000 1220,000	1760.000 373.500	0.	0.	0.	0.	0.
4	GR	348,000	1325,000	343,500	1368,000	337,500	1240.000 1420.000	352,500 339,500	1290.000 1480.000	344,500 342,500	1310.000
	GR	342,890	1635,000	342,000	1685,000	335.000	1735.000	335,000	1770.000	344,800	1805,000
	GR	347,300	1875,000	349,500	1910.000	0.	0 •	0.	0.	0.	0.
	X1	205.000	23 404	7406 000	7570 000				Service Control of the Control of th	-	
	X 4	2,000	23,000 345,700	3425.000 3480.000	3570,000 345,7no	1860.000 3500.000	1600.000 "	1820.000	0.	0	0.
· · · · · · · · · · · · · · · · · · ·	GR "	391,500	~~258n,non~	390,300	~~ 2630,000 ~~	390.300	2670,000	389,000	2725.000	357,500 ⁻	2855,000
	GR GR	375,000 349,500	2920,000 3260,000	376,500 349,700	2960.000⊬ 3345.000	363,500 351,300	3010.000	358,500	3093.000	349,700	3168.000+
* * *	CR "	353.000	3570.000	356,000	3635.000	353.500	3425.000	347.300 350.500	3475.000 3735.000	347,300 . 348,500	3505,000 ×
	GR	354,500	3875.000	363.500	3930.000	373.500	3980.000	0.	0.	0.	0.
territoria de la companione de la compan	· · ·			125	{				·····		
1	x 1 x 4	206+000	21.000		2965.000	880.000	960.000	910.000	0 •	0 +	0.
	GR	2+000 366,300	350.000 2010.000	2870.000 366.000	350.000 2095,000	2910.000 363,800	2185,000	0+ 	0. 2250,000	0 -	0 •
•	GΗ	353.800	2460:000	352:500	2550.000	357.500	2620:000	353.5ng	2655.000	356,000 356,500	2350,000 2680,000
	gb G	363.500	2705+000	358.500	2735.000	363.800	2780:000	- 364,800.	2840.000	351.000	2865.000
	GR '→ GR	351 000 400 000	2920+000 3245,000	361.000 *** 0.	2965.000 0.	370.000	7.3015.000 777	370.000	3070.000	372.000	3175.000
			0		•		0 •	f) :	0.	0 .	0.
	X1	207,000	9,000	2720.000	ኃዩዩስ ሰላል	950 000	964 440				
	x4	8,000	354,400	2810,000	2880,000 354,000	850.000 2840.000	850.000	810,000	0.	0.	0.
• .	GR	3#3,800	2525,000	361,500	2720.000	355.300	2800.000	355,300	2850.000	0. 359.7no	0. 2880,000
	GR - พ.ศ 1	359,800 0:	2960.000 '8,	363,500 0.	3050,000	367,500 .	3140.000	368,500	3160,000	0.	0
		V ş	er 3	Ø 1	6.300	0.500	J.	0.	0,	0.	0,

0,

3.8 3.8	10.000 0.	1,500	V. 2.500	150,000	°°,000	₩ • 0 •	900.000	300,/8U 8.	354,100	354,100
	ÚZS	FACE RTE 6	BRIDGE	*	ajus symilarini makkarin aki mini				\\	o sumbage contributo de appareiro e o
X1 X2 X3 NC	207,200 0. 10.000	0 + 0 + 0 +	0 e' 1 e 0 0 0 0 e	368.700 0. 0.100	35.000 373.500 0. 0.300	35.000 0. 0.	35.000 0, 0,	0. 0. 373,500	0, 0, 373,500	0 + 0 • 0 •
Χī	208,000	25,0006	2670,000	2810.000	45.000	45.000	45.000	A .		0
X4 ~	2.000	354.500	2745.000	354,500	2770.000	0+	0.	0,	0	
GR GR	386.500 373.500	2310,000	384.500 369.500	2380,000 26 ⁷ 0,000	385,700	2460.000 2740.000	381,800 355,500	2535.000 2775.000	378,500 ′ 362,8 ₀₀	2585,000
GR	362.500	2635+000 2865+000	362.500	2940+000	355+500 361+500	3000.000	364.000	3050.000	364+000	2810+000 3080+000
GR	362,500	3140+000	363,000	3235.000	362.500	3300:000	361.500	3360.000	359.500	3400.000
GR	361.500	3430+000	372.500	3485.000	378,500	3555.000	381.500	3620 000	399.000	3705.000
X1	209,000	25,000	2150,000	2265,000	1200.000	1050,000	_ 1110,000	0.	0.	0.
Х3 Х4	10.000	0. 361.000	0. 2170.000	0. 361.000	0. 2200.000	0 . 0 •	0.	0.	0.	0.
GR	363,000	1390.000	380.500	1490.000	377.500	1605.000	0. 375.560	0. 1695.000	0. 374,500	0. 1785.000
GR	373,000	1850,000	362.000	1880.000	362.000	1940,000	372,500	1965,000	363,500	2000.000
GR GR	374,500 366,500	2030,000 2205,000	362,500 370,500	2055,000	362,500 371,000	2130.000 2370.000	374,300 370,500	2150.000	366,500 369,500	2165,000
GR,	369,300	2645,000	372.000	2265,000 2730,000	375.500	2810.000	383,500	2455.000 2850.000	387.300	2560.000 2920.000
X1	210,000	15,000	1735,000	1880,000	~1550.000 ~	~~1650,000 ~~	1600,000		0.	0.
X 4	1,000	376,000	1840,000	0,	0.	0.	0.	0,	0,	0.
GR GR	433,500 379,500	1340,000 1830,000	423,500 · 393,500	1405,000	413.500	1560.000 1930.000	411,500 392,500	1640,000 1985,000	408,800 453,500	1735.000 2080.000
GR	463,700	2130,000	474,500	2170,000	495,700	2230,000	490,000	2285,000	493,500	2330.000
	211.000	15,000	1588,000	1690.000	600+000	300.000	500:000	0	0,	0 +
GR	553,500	1350.000	542.000	1395,000	531,500	1445.000	522,000	1500.000.	522.000	1520.000
68 -	497,500	1588,000	488 , 700		492,700	1690.000	- 503,500	-1780,000	513,700	1863,000
GR	523.700	1945,000	533.500	5050·000	539,500	2090:000	539,500	2178.000	539,500	2301.000
	50	FEET U/S BLA	CK ROCK DAM		-	a basis at Visib w	-	• • • • • •	•	
X1	211.100	"6,ngn '	1062+000	1204.000 "	50.000	50.000	50+000 ··	·- 0 •	0.	0 • · · ·
х3	10.000	0	0.	0.	0.	0 •	0 +	Ŏ +	Õ.	O.
χ۶	4.000	525,000	525,800	525,000	525.000	0;	0.	0.	0.	0.
GR GR	540,700 560,000	1000,000 1210,000	540.700 °	~~1060.000 0.	519.600°°	~_{1062.000~~	519,600 U.	1202,000	540,700 0,	1204,000
uT.	4.000	2200,000	5300.000	7600,000	16500.000	0.	0.	0.	0.	0.
•	11	ust uzs wie	· WAM TIAM				·	$(-1)^{-1} \sqrt{2} = \frac{1}{2}$		
					****					•
Χ1. GR	218,100 570,000	5,000 1000,000	1200,000 541,600	1360,000 1200,000	8800.000 561.600	8400.000 1360.000	9540,000 5/1,000	1361,000	0, 571,000	1400.000
₹3	2 · v. noo	3.តាក្ន	1130,000°	nee,evos	⊕50.00U	2063,000	410,000	0,	4 •	0.
-, 4	2,080	640.466	CA Carlo	° ১৭6, গ্রহ	2540.000	0.	Ð.	Ú.	σ.	0, 6

	X1 GR GR NG	219,100 575,000 565,000		1050.000 570.000 570.000	1420.000 1030.000 1500.000 0,300	4000.000 565.000 575.000 0.500	3600.000 1050.000 1560.000	3770,000 553,500 0,	0. 1100.000 0. 0.	0. 553,500 0.	0. 1400.000 0. 0.
		D/s	FACE FOOTB	RIDGE	and a contract of the contract		•				
	X1 X3 SB	219.200	0. 0. 1.500		300,000	100.000	100.000	100.000 800.000	566,600	0. 566,600 553,500	553.500
			FACE FOOTB								
	X1 X2 X3 NC	219.300	0.	0.	566.600 0. 0.100	568.800 0.	15,000 0, 0,	15.000 0. 0.	0. 0. 568.600	0, 0, 568,800	0
•	X1 X4 GR GR GR	220,000 2,000 640,000 548,000 569,500	15.000 554.000 1000.000 1230.000 2230.000	1290,000 1350,000 627,500 580,000 571,500	2230,000 554,000 1049,000 1260,000 2270,000	700.000 2150.000 613.500 571.500 575.500	45,000 0: 1100.000 1290.000 2335.000	285.000 0. 592.000 560.500 576.300	0: 0: 1160:000 1335:000 2395:000	0, 0, 588.000 560.500 600.000	0. 0. 1200.000 2160.000 2555.000
	٠.٠	500	FEFT U/S CO	DRPORATE L'ÎM	TTS						
	X1 X4 GR GR GR EJ	221,000 2,000 642,500 569,500 569,700	13,000 558,000 1000,000 1320,000 1630,000	1320,000 1350,000 621,500 560,500 571,500	1555,000 558,000 1060,000 1340,000 1705,000	1650.000 1500.000 605.500 560.500 575.500	2350,000 0, 1130,000 1510,000 1765,000	2230,000 0, 572,500 568,500 0,	0. 0. 1275.000 1555.000 0.	0. 0. 570.000 569.500 0.	0. 0. 1290.000 1580.000 0.
					.						
	• • • •					er en Veren en de	·····				
te e e e e e e		r e - Franke versaer:		**************************************		ekade e a aan aa sa sa saasaa a	er permitant en		The second secon		
	*** -	· · · · · · · · · · · · · · · · · · ·		nakanana ke sapanka na manaka	v - make eksember . A district a section			يونينيو وليد ديا المجتمد مجموعة		· · · · · · · · · · · · · · · · · ·	
•			.		· · · · · · · · · · · · · · · · · · ·		······································				M A MA
•								Albertain Control of Control	i 'iA'		

The contract of the second of

er garage

	M	DOAD BADD	01.02 N = 50	************ NOV 76 UPDA 51,52,53	_						-	
· · · · · · · · · · · · · · · · · · ·	T ₁ T ₂ T ₃	BRANC	H BROOK.	N.FLOOD INS	URANCE ST	rud y	ag e gr - e tragggerren gelektrin gy tress als abbrekt -					
	Ji	ICHECK	ING	NINV	IDIR	STRT	METRIC	HVINS		WSEL	Fo	
		0.	3,	0,	0.	0.002000	. 0.	0 •	0.	328,000	0	- college of the second
يا السلامات المالية	15	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	184	CHNIM	ITRACE	
		2.000	0.	-1.000	0.	0.	0.	0.	0.	0 +	0.	•
The second secon						······································						THE TOTAL STATE COMMANDER STATE COMMANDER AS A CASA CANADA STATE COMMANDER STA
· · · · · · · · · · · · · · · · · · ·				· · · · · · · · · · · · · · · · · · ·		• • • • • • •						
			¥ 47-7-7-7-10-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1								The conserver of the conserver of	to a construction of the c
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,										TO THE BEAUTIFUL OF THE	-
to the second section of the									· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	For the second s
									erreng memberah di piranjahan sasar sa	The William Property of the Control of Control of Control	eminimate in the second se	to the second decoder and antique comments
		.,	- · · · · · ·					· ·				
							and the second s			**************************************		Transition and the second seco
	*****	*										
									_	i 18.		
		a a a a a a a a a a a a a a a a a a a				***************************************			* * * * * * * * * * * * * * * * * * *			

/ 1														:								
•																					X.	
•	١		,														•					
n de la companya de l	· 	****	****	******	*****	*****	*****	***	*****	<u> </u>	deli-territorio desservi pode											- /-
gen expenses a succession.	!	HEC2 REL	LEASE	E DATED = 01.02 N = 50.	NOV 76) UPDĄ	ATED AU	JG19;	77	- 0.4				· · · · · · · · · · · · · · · · · · ·		سوست ۵۰۰				•		\
· · · · · · · · · · · · · · · · · · ·	##1	*******	****	▼ 20± ** <u>**</u> ********************************	91,92, \$*****	`\$3 !#####	********	****	******	**								1				
min i maka maka pikata pik Pikata pikata pikat	T1 T2 T3	WÁ 9F 1/	TERY	YOWN, CON H BROOK EAR FLOO	N.FL00	IÑ THS	SURANCE	STUI	ρŶ	رغيد شمهد خديده .	*****	Bills Mr. Alfres melecome.								And comes and comes		
	Ji	ICHFCK		INQ	7.00 M M		IDIR		STRT		METRIC	н۷	INS	Q		WSEL	L .	FO		****		
		0 ,		4,	*********	0,	0.	, 0,	105000	<i>i</i> .	. 0 .		0 •		0	330.00	00	0.		***		
e service de la proprie de la composition della	15	NPROF	· · · · · · · · · · · · · · · · · · ·	IPLOT	PRF		XSECV	<u>!</u>	XSECH	1	FN	ALLI	DC	IBH		CHNIN	м	ITRAC	ÇE :			
		3.00) ()	0,	71	.000	0.		0.		0	1	0 .	0	•	0.		0.				
h .							**************		The State of		******	Primary Serve 1			~~~~							
			*******	y . e												-						
														**	•	-					-	-
tions made majores and as a		and the second s		# 1-#6-1-#	P-1, 6-1-4, 1-2-4-6-4-4-4-4-4-4-4-4-4-4-4-4-4-4-4-4-4				رجيات جيونونسو مشتمو مرسان	4: 22 +	**************************************					,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				*** ****		
The property of the property of the same and			******								****				~							
													. i.			· - · · ·			. *	•		
	, , , , , , , , , , , , , , , , , , , 	. **			-		4-1			je vilagosila i naspana pi araspa	A Transmission was a party of the		***************************************				i_					
managa bangangangan anaga	• •	-									-							·				
																		• -		• ===		
-		1				- O Paris or with the species	,					*	Here were a series	**********		-						~
					*********																·	
					•						· · · · · · · · · · · · · · · · · · ·			···································			·· · · · · · · · · · · · · · · · · · ·		٠.			
with the second spokes and the second		* *******		*	•		************														٠.	

												= -										

A STANDARD CONTROL OF THE STAN

and a second particular contract with the property of the prop

. . . .

	* * * F	FC2 PELEAS	SE DATE	NOV 76 UPI	DATED AUG	1977						
•	***		UN = 31 ******	;,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	******	*****					•	
	-4			in and the second of the secon	ration to an extra							
	13	BRANG	CH BROOK	00 0_2300 C		TUDY					to the second section of the second s	titi. I van katalisi alaman kanan ka alaman ka
		ICHECK	1 NQ	VNIN	IDIR	STRT	METRIC	HVINS	Q	MSEL	FO	
*		0 +	5,	0,	0,	0.002000	. 0,	0.	0	332,000	0	e to committee a se seem amorphis e appropriate parts to the see a second section of
	75	NPROF	.IPLOT	PRFVS	XSECV	XSECH	FN	ALLDO	IBM	CHNIM	ITRACE	
		15.000	0 •	-1.000	0.	0.	0.	0.	0 •	0	0.	
		et - ++ A etAccelerate designer			**************************************		- Mightly - Mit Brownste feling sign of the Millians of guest		^	en e		The state of the s
					terrene est communication		. Transfer Contribute & White Color Co.		e garrier de l'inclusion .	exemple of the second second		· · · · · · · · · · · · · · · · · · ·
•								· · · · · · · · · · · · · · · · · · ·				
		·	**************************************						· · · · · · · · · · · · · · · · · · ·			tin and a strain rapid representation of the strain designation of the strain of the s
				•								
												
								-				· · ·
					,							- vista S habita in a quadramentary and a graying
ويساورون والمحافظ المحافظ المحافظة		· · · · · · · · · · · · · · · · · · ·								•		
			· 									**************************************
		· · · · · · · · · · · · · · · · · · ·		··	·						• •	** * · · · · · · · · · · · · · · · · ·
		•										***************************************
		 			- T							•
-			•			· •						*
		,			······································				·			
•			•									
		· · · · · · · · · · · · · · · · · · ·								ر المستقدمين المدر المستدرين بله فوت واستونية المام المدر المدر المدر		
		• • • • • • • •										-
		r to all the minimum and quality grade and							· ·			
					•					1 19		•
******* * **** * * *****		y pam na 1 nam pi ntoné despité de Restaulité propulétique										

and the control of the second of the control of the

HEC2 RELEASE DATED NOV 76 UPDATED AUG1977
ERROR CORR = 01.02
MODIFICATION = 50,51,52,53

NOTE- ASTERISK INTEST LEFT OF CROSS-SECTION NUMBER INDICATES HESSAGE IN SUMHARY OF ERRORS LIST

10 YEAR FLOOD 0.800 CFS SUMMARY PRINTOUT TABLE 150

	•		** Y										
·	SECNO	XFCH	ELTRO	ELLC	ELMIN	Q	CWSEL	CRINS	EG	10K*S	VCH	AREA	
Λ	200:000	0 +	0 +	0 •	316:00	800.00	321,36	. 0+	321.58	19.77	3.83	208	•
. 71	200+000	0 •	0•	0•	316.00	8,,,,,	321,34	Ö٠	321,57	19,99	3.85	207	
	500 1000	0.	0.	0.	316.0n	···900+00-	321,59	0,	321,84	19.93		225	-
	200,000	0 •	0 •	0.	316,00	2300.00	324,15	0 •	324,58	19.99	5.25	437	
	200.100	100.00	0.	0	316.00	800.00	321,57	0.	321,77	16.06	3.57	224	
	200,100	100,00	0.	0,	316,00	800,00	321,56	0.	321,76	16,19	3.5A	223	
	200,100	100.00	0.	0,	316,00	900.00	321,82	0.	322,03	16,31	3,72	242	
	200,100	100,00	0,	0 ,	316.00	5300.00	324,39	0	324,78	17.37	4.99	460	
	200,200	15.00	334,40	330,00	316.00	800.00	321,60	0.	321,80	15,65	3.53	226	
	\$00'50U_	15.00	334,40	330,00	316.01	800.00	321,59	0.	321,79	15.77	3,54	225	-
	200,200	15.00	334,40	330,00	316,00	900.00	321,84	8.	322,06	15.91	3.68	244	
	500.500	15,00	334,40	330.00	316,00	2300,00	324,42	0,	324,80	17.06	4.96	463	
	200,300	50,00	0.	0.	316,00	800.00	321,77 -	·- · · · · · · · · · · · · · · · · · ·	321,84	3,26	2.10	381	
	200,300	50.00	0.	0,	316,01	800,00	321,76	0.	321,83.	3,28	2.10	380	
V	200.300	50.00	0,	0,	316,00	900.00	322,02	0,	322,10	3,54	2,24	401	٠
	20,0,300	50.00	0.	0.	316,00	2300.00	324,67	0.	324,87	6,06	3,58	642	
بع د.د ه ا بند د بودسه نستان د. ب	201+000	<u>1435</u> • 00			323.00	800:00-	324.09-	324.09	324,62	· -178.28	5.84	137	
· · · · · · ·	201+000	- 1435.0n	0 •	· · · · · · · · · · · · · · · · · · ·	323.0n	800.00	324.09	324.09	324,62	178,29	5.84	137	
	201,000	1435.00	- ··· 0 • ·	ų •	323:00	900.00	324 18 -	324+18	324,75	174.05	• 6.ცრ	148	
***************************************	201+000	1435.00	0 +	0 •	323,00	2300.00	326 , 25	0 ,	326,57	3 ₀ ,58	-·· 4.76 ···	55 ₀	
	202,000	700.00	0 +	0.	326.00	800+00	329,76	0 •	330,30	46.12	5.87	136	
	202.000	7no.oo	0	0.	326, ₀₀	800.00	 329,76	0	33 ₀ ,3 ₀	46.12	5.87	136	• -
D *	202.000	700.00	0,	0 1	326.00	900.00	329,97	Ü	330,56	48.32	6.18	145	
***	202,000	700.00	0,	0.	326.0n	2300.00	331,15	331.15	333,13	121.51	11.29	203	
	202+100	50.00	0 •	0 •	326.00	800.00	$330 \cdot 09$	0 •	330.52	34.07	5.28	151	
	202:100	50.00	0 •	0 •	326.an	800.00	330.09	0 •	330,52	34.07.	5.28	151	
	··· 202,100···	50.00	0.	0.	326,00	900.00	330,32	0.	330,80	35,30	5 , 5 4	- 162 -	
	202,100	50.00	0.	0	326,8n	2300.00	332,87	0.	333,78	40.92	7.65	300	
ميين يا دود و معطوها	505,200	100.00	390,50	381,50	326,00	800,00	330,24	0,	330,64	29,92	5.05	··· 158	٠.
	505.500	100.00	390,50	381,50	326,00	800.00	330.24	0.	330,64	29,92	5.05	158	
	202,200	100.00	390,50	381,50	326,00	900.00	330,49	0,	330,93	30,73	5,28	170	
	502,200	100.00	390,50	381,50	326.00	2300,00	333,19	0.	333,99	34,14	7,17	320	•

1								-				
na a service source and a service service	SECNO	, XLCH	ELTRD	ELLC	ELMIN	Q	CHSEL	CRINS	EG	10K+S	VcH	AREA
	* 203,000	50.00	0	0.	328,00	800.00	330,88	330,88	332,02	142,62	8,57	93
Fi	* 203,000	50.00	<u>0 •</u> _	0	328.00	800.00	330,88	330,88	332.02	142.62	8,57	93
· · · · · ·	* 203.000" * 203.000	50.00 50.00	0	0	328.00 328.00	900.00 2300.00	331.09 333,27	331,09 333,27	332,30	139,93	8 82	102
* 1000 ** 1100 **		•						300+27	335,11	121.32	10.91	. 210
	204.000 204.000	990.00	0 •	0.	334.00 334.00	800.00 800.00	337,86 337,86	0 ,	338,19	34.11	4.67	173
F	204.000	990.00	0	0.	334.00	900.00	338,08	0 •	338,19 338,44	34.11 34.15	4.67 4.82	173 192
	204,000	990.00	Ŏ.	0.	334.00	2300.00	340,18	0.	340.65	30.86	5.79	492
	205.000	1820.00		0	345.70	800.00	348,78	348,77	349,59	* 4.4 0.4	7 04	447
	205,000	1820.00	ŏ	ŏ,	345.70	800.00-	348.78	348,77	349,59	144.81	7.21	113 113
67		1820.00	0 •	0.	345.70	900.00	348,96	348.96	349.78	138.86	7.26	129
	205.000	1820.00	<u> </u>	0	345.70	5300.00	350.37	350.37	351.02	93.02	7.24	497
	506.000	910.00	0.	0.	350+00	800.00	353,43	0 •	353.66	21.04	3.87	236
<i>.</i>	206,000	910.00	0 •	U .	350.00	800.00	353,43	0 •	353,66	21.04	3.87	236
•	\$06.000 \$06.000	910.00 910.00	0	0	350.00	900,00	353,62	0 •	353,86	21,48	4.03	265
			٠.	,	350.00	2300.00	355.02	0 •	355.43	29.60	5.72	589
	207,000	810.00	0.	0.	354.00	800.00	356,47	0.	357,12	113.71	6.43	124
	Z 207.000 207.000	810.00 810.00			354.00	800.00	356,47	0•	357,12	113,71	6,43	124
	207,000	810.00	0, 0,	0.	354.00 354.00	900.00	356,66 358,45		357,32 359,32	108.19 81.38	6.51 7.48	- 138 307
·	207,100	90.00	•	•	784 04			_				
1	207,100	80.00 80.00	0	V	354,00 354,00	800,00 800,00	357,42 357,42		357,66 357,66	30,39 30,39	3.95	_ 202
	207,100	80.00	·····		354.00	900,00	357,60	0 i	357,86	30,94	3,95 4,10	202 219
7 th 11 - 12 th 12 personnel (4 th 12 th 1	207,100	80,00	0, ,	0.	354.00	2300,00	359,39	ŏ,	359,85	35.01	5.46	420
٠	207,200	35,00	373,50	368,70	354.00	800,00	357,55	0.	357,77	26,03	3.73	24.4
As anaporable waterment of the con-	247.200	35.00	373,50	368,70	354,00	800.00	357,55	Ů;	357,77	26,03	3.73	214 214
	207,200	35.00	373,50	368,70	354.00	900.00	357,73	0.	357,97	26,63	3.88	231
	207,200	35,00	373,50	368,70	354.00	2300.00	359,56	0.	359,98	30.28	5.18	444
The second secon	208,000	45.00	0.	0.	354,50	800.00	357,35	0,	358,15	106,96	7.16	111
77	. 208,000 208,000	45.00 45.00	0.	0.	354,50	800,00	357,35	0.	358,15	106,96	7.16	111
	208.000	45.00	<u>0</u> :	0	354,50 354,50	900,00 <u></u>	357,50 359,19		358,38 360,80	112.41	7.53	119
	J. 2							0>71	000100	123177	10.20	225
والرموان والموانية والمتعاددة والمتعادد	209.000	1110.00	0 •	0.	361+00	800.00	364.87	0 •	365.46	44.37	6.16	129
l	209,000	1110.00	0.	0.	361:00 361:00	800,00 900,00	364,87 365,17	0 •	365,46 365,80	44.37	6.16	129
	209,000	1110.00	0 •	0.	361.00	2300.00	368,50	0 • 0 •	369,38	44.08 51.44	6.39 7.5 ₀	140 306
•	* 210,000		0.	0.	376 n	800.00	381,66	381.66	207 40			
L_	* .210:000	1500.00	0.	0	376:00	800.00	381.66	381.66	383,09 383,09	143.33 143.33	9,6 <u>1</u> 9,61	83 83
e trade de la compansa desse.	* 210:000-	1600.00	0 .	0	~ 376±00 ~	900,00	381,93	- 381,93 -	388 . 43,	140.87	9.83	9 ₁
	* 210:000	1600.00	0 •	0 •	376 • 0 ก	2300.00	384.63	384.63	386.78	120.65	11.69	196
	* 211,000	500.00	₀ .	0.	488,70	800.00	492,10,	492,10	492,98	155,56	7.51	106
f¥1	* 211,000	500,00	0.	0.	488,70	800,00	492,10	492.10	492,98	155,56	7.51	106
•	* 211,000 * 214,000	500,00 500,00	0	0	488,70	900.00	492,27	492.27	493,18	153,13	7.69	117
	* 211,000	500.00	0 .	0.	488.70	2300.00	493,85	~~493 ₁ 85 ~~	495,31	125,86	9.71	241

and the second s	SECNO	XL CH -	ELTRO	ELLC	ELMIN	G	CMSEL	CRIWS	E G	10K*S	усн .	AREA	
*	211.100	50.00	0	0 .	519,60	800.00	525.00	0.	525.02	0.69	1.06	758	
*	211,100	50.00	0	0.	519,60	800,00	525,00	0.	525.02	0.69	1.06	758	
	211,100	50,00	0.	0.	519.60	900.00	525,00	0,	525,02	0.87	1.19	758	
•	211,100	50.00	0.	0.	519,60	2300.00	525,00	0.	525,14	5,66	3.04	758	
*****	218,100	9540.00	0.	0.	561,60	2200,00	563,36	563,36	564,19	146,29	7 - 47	317	
N :	218,100	9540.00	0.	0.	561.60	5300.00	564.70	564,70	566,10	118,48	9.83	611	
14 *	218,100	9540.00	€ 44 0 •	0 •	561.60	7600+00	565,50	565.50	567,22	109.16	11.00	806	
	218 100	9540100	0 •	0	561.60	16500+00	568,02	567,93	570.54	86.65	13.66	1520	
	219:000	410.00	0 •	0 •	546.00	2200:00	564.27	0 •	564.27	0.00	0 • 08	26325	
	219:000	410.00	0 +	0.	~~546+0n;	5300.00	566.24	0	~ 566,25	0.00	0.18	29475	
0	219:000	410.00	0 +	O •	546+00	7600:00	567,40	0+	567,40	0.01	0.24	31366	
<u>.</u>	219.000	410.00	0 •	0 •	546.00	16500.00	570.80	O+	570.80	0.02	0 • 45	37116	
	219:100	3770:00	0.	0	553.50	2200.00	564.27	0 +	564,27	0 • 10	0.61	3583	
. ⊕	219:100	3770.00	0		553.50	5300.00	566 23	0.	566,26	0.32	1.23	4323	
	219,100	3770.00	0.		553,5n	7600.00	567,38	ŏ	567.42	0.48	1,60	4788	٠.
	219,100	3770.00	0.	0.	553,50	16500,00	570,74	ő,	570,85	1,03	2,73	6304	
processors and an area areas	219,200	100,00	ò	0;	553,5n	2200,00	564,27	0	564,28	0.10	0.61	″ 358 3	
•	219,200	100.00		0.	553,50	5300.00	566.24	0.	566,26	0.32	1.23	4309	
-	,219,200	100.00	. 0,	0.	553,50	7600,00	567.38	0	567,42	0.48	1.60	4789	
4	219,200	100.00	0.	0.	~553,5h	16500.00	570,75	0.	570,86	1.03	2.73	6306	
	219,300	15,00	568,80	566,60	553,50	2200,00	564,27	0.	564,28	0.10	0.61	3583	
	219,300	15.00	568,80	566,60	~~553 . 50~	5300.00	566.24	0 ,	566,26	0.32	1.23	4309	٠
•.	219,300	15.00	568,80	566.60	553 , 50	7600.00	569,29	0.	569,32	0.30	1,39	5624	
· · · · · · · · · · · · · · · · · · ·	219,300	15.00	568,80	566,60	553,50	16500.00	573,50	0.	573,58	0.59	2.30	7708	
	220,000	285,00	0.	0.	554,00	2200.00	564,28	0 1	564,28	0.02	0.26	8478	
0.	550:000	285.00	0 •	0 •	554.00	5300.00	566,26	0 +	566,27	0 • 0 6	0.52	10225	
	220.000	585 · 00 ·	0 .	0.	554.00	7600.00	569 , 32		-569,33	0.06	0.58	13012	•
	550:000	285:00	0 •	0 •	554.00	16500:00	573,58	0 •	573,59	0 • 11	0.97	17180	
e present somer and a sical accura-	-221.000-	-2230.00-		0	558.gg-	2200.00		O • - 	564,31	2,36	2.01	- 1091	
	551 000	2230.00	0• .	0 •	558.00	5300.00	566,17	0 •	566,37	5.37	3.56	1489	
	221.000	2230.00	0 •	0.	558.00	7600.00	569,23	Ð •	569,42	3.50	3,48	2188	
	-221.000-	2230:00	0 +		558,00-	-1 6500.00	573,41	0 :	573,77	4,35	4.97	- :3845	-
					-							:	

The state of the s

10	YEAR	FLOOD	0_500	CFS
SUM	MARY	PRINTÒ	OF TABL	F 150

٠.

. . .

. .

a sub-recommend in the special sections	SECHO	Q	CHSEL :	DIFWSP	DIFWSX	DIFKHS	TOPHID	ХЕСН			
	200,000	800.00	321,36		. 0 .	-2.64	70,84	0.100	FROM	MOUTH.	-11.
·	500:000	800.00	321.34	-0.01	0.	+6,66	70,84 70,75	0.			
	200.000	900.00	321.59	0.25	0 •	-8,41 -7,85	72,75	0+	6 of 1646, djungerdamen _6 g.s.	erande esta esta sul un un esta esta esta esta esta esta esta esta	ويار ياريمينها بالمائد ويدان فليه والأسر لواد لدايات المحا
•	500.000	5300.00	324.15	2,56	Ö٠	-7,85	93,20	ő.			
	200,100	800.00	321,57	à:	0.22		72,59	100,00	·		
	200,100	800.00	321.56	-0.01	0.22	0,	72.52	100,00		-	
	200,100	900.00	321.82	0,25	0.22	0,	74,53	100,00	•		
e a company of the second	200.100	2300.00	324 39	····- ž¦šý…	0.24		~~~ 95¦12~	100,00			
						• •	- • "	100100	•		
	200+200	800.00	321,60	0 .	0.03	0 •	72,81	15.00	•	i	
	500.500	800.00	321.59	*0.01	0.03	0.	72,74	15.00			A STATE OF THE STA
	200,200	900.00	321.84	0.25	0.03	0.	74,76	15.00			•
in the amount of the control of the	200,200	23n0.00	324,42	2,58	0.03	0,	95,38	15,00			•
	000 700	0	704 77	_							
	200,300 200,300	800.00	321,77	0.	0 + 17	٥٠	82,06	50.00			
		<u>800,00</u>	321,76	+0,01	0.17.		82,02	50,00			
ら	200,300 200,300	900.00	322.02	0.26	0.18	. 0.	83,47	50.00			
	5001000	2300.00	324,67	2,65	0,25	0,	98,17	50,00	-		
*	201.000	800.00	324,09	0.	2,32	0.	131,01	1435,00			
C *	201:000	8110,00	324.09	-0.00	2,33	.0 .	131.01	1435,00			
	201,000	900.00	324.18	0.09	2.16	0+	131,89	1435.00			
	201,000	2300.00	326,25	2,07	1,57	. 0	230,55	1435,00			The same and the second
-	202,000	8n0.0n	329,76	· 6	5,67	٨.	45,28	700.00			
* *******	202:000	800.00	329,76	0 00	5.67	0.	45,28	700.00			e e come e mangement anche annue.
\mathcal{D}^{\star}	202,000	900.00	329,97	0.20	5,79	0.	46,29	700.00			,
	202,000	2300.00	331.15	1.18	4.90	0.	52,17	700.00			
									*		er i var i kirikerishkara aan aan aan aan aa aa aa aa aa aa aa a
	202+100	800.00	330,09	0.	0.35	0 •	46,92	50.00		· 1 .	• • • • • • • • • • • • • • • • • • • •
ernem romany romany and a company	202,100	800,00	330,09	0,00	0,33	0	46,92	50.00			•
	202,100	900.00	330.32	0.23	0,36	0.	48,08	50,00			to the management state at the
	202,100	2300.00	332,87	2,54	1,72	0.	60,72	50.00			•
	505.500	800.00	330.24	0.	0,15	0.	47.67	100.00	*	. ويوا بينيديم، المجاسمة.	
	505 500	800.00	330.24	0.00	0.15	0,	47,67	100,00	= = = =		•
المصيدون أوالدار والمحاص والعامد	202-200	900.00	330,49	0.25	0.17	0 •	48,91	100.00			-
	505:500	2300.00	333.19	2,70	0.33	0.	62,36	100.00			ere trade incommende and an action of the commende and a second
•	203,000	800.00	330.88	0.	0,64	0 •	41,27	50.00	•		
	203,000	8n0.00·	330,88···		0,64 ···	·ŏ ·	41,27	50.00			
Ē *	203,000	900.00	331.09	0.21	0.60	0,	42.67	50.00			- • •
T de la companion	203.000	2300.00	333.27	2,18	0.07	0 •	57.29	50.00			* *
	204.000	800.00	337.86	0	4 00		70 47	000 00	1		
	204,000	800.00	337,86	0.	6.98 6.98	0 •	79.43	990.00	•		
The second secon	204,000	900.00	338.08	0.23 ···	~ 6.99		79,43	990.00			
I"	204,000	2300.00	340.18	2,10	6.92	0 :	90,33	990.00			
			0.0110	€ † £ 0	0177	0.	192,23	990,00			
	502:000	800,00	348,78	0.	10,93	0	M1, 87	1820.00			***
9.	500,000	800.00	348,78	υ.	10.93	Ú,	41,87	1820.00			
1 •	205,000	900,00	348,96	0,18	10.88	0.	96.88	1820.00			
,		** * * * * * * * * * * * * * * * * * *	350 33	, 1, ,		• •	100 10	* * * * * * * * * * * * * * * * * * * *			- was a great on a significant

•

لورارد المتدانوسيان وو

. ...

,								•			
, '										• ,	
w. 10 - 10 - 10 - 10 - 10 - 10 - 10 - 10	-	SECNO		CHSEL.	DIFWSP	DIFWSX	DIFKHS	TOPWID	ХССН		
•		206,000 206,000	800.00 800.00	353,43 353,43	0.	4,65	0.	148,27	910.00		The second secon
	\mathcal{H}	206,000	900.00	353,62 355,02	0.19	4,65		148,27/ 166,59	910.00		era i i kalandari i kalandari kalandari kalandari kalandari kalandari kalandari kalandari kalandari kalandari Lambarari kalandari
		207.000	800.00	356,47	1,40	4,65	O•	292,58	910,00		The second secon
	$.\overline{\mathcal{I}}$	207.000	00.00 00.00 00.00	396,47	0. 0. 0.18	3,04 3,04 3,04	0 + 0 + 0 +	73,18 73,18 76,80	810.00 810.00	•	
		207.000	2300.00	358,45	1.79	3.43	0	112.15	- 810.00 810.00	·	• • • • • • • • • • • • • • • • • • •
• • • • • • • • • • • • • • • • • • • •		207,100 207,100	800.00	357.42 357,42	0.	0.94	0:	91,83 91,83	80.00		The state of the second control of the secon
		207,100	900.00 2300.00	357,60 359,39	0.18 1.79	0.94 0.94	8.	95,41 130.57	80,00 80,00	. `	
		207.200	800.00	357.55	0.	0:13	0 •	94,36	35.0n	AMERICAN DE LA CALLES DEL CALLES DE LA CALLE	I
nga sa sanga alipin sa Villa		207,200	8n0.0n 9n0.0n	357,55 357,73	0.18	0.13	0,	94,36 97,96	35,00 35,00	The same of the sa	er i de la companya della companya della companya de la companya della companya d
		207,200	2300.00	359,56	1,83	0.18	0.	134,07	35.00		
		208,000	8n0.00	457, 45 357, 35	0	0.20	Qı	63,17	45,00		
	1_	208,000	2300.00 2300.00	357,50 359,19	0, 0,14 1,69	-0,20 -0,24 -0,38	0.	53,17 54,56	45.00 45.00	T & Printer of the Complete Continued to the Continued to	
		209,000	800.00	364,87	0	7,52	0.	71,10	45,00		
		209,000	800.00	364,87 365,17	0.30	7,52	0;	37,05 37,05 37,58	1110.00 <u> </u>		en e
		503,000	2300,00	368,50	3,34	9,32	0.	73,92	1110,00 1110,00	e e e e e e e e e e e e e e e e e e e	
	, * , *	210,000 210,000	8no,oo 8no.oo	381,66 381,66	0 a.	16.79 16.79	0.	29.94 29.94	1600.00 1600.00		•
THE RESERVE OF THE PARTY OF THE	<u>€</u> ∰	210+000 210+000	2300.00	381.93 384.63	0.27	16.76	0+	31,44 ··· 46,37	1600.00 T		
	ست سرا المالية	211+000-		492,10-	······································	110,44	0,	62,62	500,00		- 14 - 14 - 15 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
ĺ	ท :	211,000 211,000	800.00 900.00	492.10	0. 0.16	110,44 110,33	0 • 0 •	62,62 65,64	500.00 500.00		
,		211.000	•	~ -493,85··-	1,58	109.22	0 •		500.0n 		r mere en la paramegara les la que escala de las es
		211.100 211.100	800.00	525.00 - 525.00 -	0.	32,90 32,90	0,	141.02 141.02	50.00 50.00		
	*.	211:100 211:100	900.00 2300.00	525.00 525.00	0 •	32.73 31.15	0 + 0 +	141.02 141.02	50.00 50.00		
	*	218 100	2200.00	563,36	0 •	38,36	0+	201,99	9540.00	The second secon	entra de deservolución de la companya del companya de la companya de la companya del companya de la companya del la companya del la companya de la companya
W	*	218,100	53n0.0n 76n0.0n	564,70 565,50	1.35	39.70 40.50	······································	234,25 253,34	9540.00 9540.00	A	· ··· ·— · · · · · · · · · · · · · · ·
		218,100	16500.00	568,02	2,52	43,02	0.	313,61	9540.00		• •
	9	219,000	2200.00 5300.00	564,27 566,24	0.	0.92 T	0.	1551,12 1625,78	410,00 410,00		tion of the second experience of the control of the
	·	219,000	76na.on 165no.oo	567,40 570,80	3,40	1.89	···	1658,87 1737,00	410,00	The state of the s	

· · · · · · · · · · · · · · · · · · ·										
							:			
·						*				
								•		,
	SECNO	· o	CWSEL	DIEUCD	DIFLION	0154110	ZADUIA	W. 2		\
	SECINO	· · · · · · · · · · · · · · · · · · ·	CMORF	DIFWSP	DIFWSX	DIFKHS	TOPHID	XLCH		The state of the s
	219,100	2200.00	564.27	0	-0.00	•	745 EB	7770 00		\
	219,100	5300.00	566.23	0. 1.96	-0.01	0,	365,55 394,66	3770.00	1	\
	P 219,100	7600.00	567.38	1.14	=0.02		417,52	3770.00		
•	219,100	16500.00	570 74	3,36	-0.06	0 •	483.29	3770.00	المنتف المنتف المناسي	1
• • • • • • • • • • • • • • • • • • • •	~1.1700	75500100				0 •	400127_	3770.00	* * * * * * * * * * * * * * * * * *	
	219,200	2200.00	564.27-	0	0,00	·	365,55	100.00		
	219,200	5300.00	566 24	1.97	0.00	0 +				
	219,200	7600.00	567.38	1.14	0.00	0 ·	370,00 417,57	100.00		•
		16500.00	~~ 570 75	3.37	A TOTAL CONTRACT OF THE PARTY O		483,38	100,00_		
	LATILOU	100100	279112	0107	. 0:01	0 • .	400100	100.00	·· ·· · · · · · · · · · · · · · · · ·	المهاأوا استنتاها فالمتعدد
	219,300	2200.00	564,27	ก	0.00	0.	365,56	15,00		
	219,300	5300.00	566.24	1,97	0.00		370.00			The same of the sa
	219.300	7600.00	569,29	3.05	1.91		455,81	15,00		
•	219,300	16500.00	573.50	4,21	2.75	0 • 8 •	533.04	15.00 15.00	•	
							200107	"" Tainn"		المراجعين المستحدين المراجع ال
*	220,000	2200.00	564,28	·			060.70	005 00	· · · · · ·	and the second second
	220,000	5300.00	566.26	1,98	0.01 0.02	0,	869,79 893,30	285.00		
	220,000	7600.00	~ 569.32~	3.06	0.03		929,59	285.00 285.00	ورداد الدرانسياسة بشهوميساهم الدوماساه	The experience where the entry of the configuration
•	550.000	16500.00	573,58	4,26	0.08					
	***************************************	7~~110.00	2.0120	7160	0100	Q +	1021.15	285.00		
or magnetic group	221,000	2200.00	564,25			A	400 40		or the control to the control of the	The second secon
•, ,	221,000	5300.00	566,17	- 4 02	+0.03	¥ !	199,40	2230.00		
÷	221,000	7600.00	569.23	1.92 3.06	0.09	, U •	214,49	2230.00	1	
·		16500.00	573.41	4,18	0.09	.,	252,71	2230,00	danidi serangan sa kedisampahpan sa sa ayan aya aya .	TABLE
	-41100	70200100	270[7]	4,10	#0.17	0 •	462,61	2230.00		•
									•	
,	eran yengen kamanan kalan dan dan dan dan dan dan dan dan dan d									e merekan managan ang managan managan ang managan mana
	SUMMARY OF E	RRORS	•••				•			the second second second
						•	-			•
	CAUTION SECN	O# 201,000	PROFILE		CAL DEPTH					The second secon
	CAUTION SECN		PROF!LE=	1 PROBAI	BLE HINIMU	M SPECIFIC	CENERGY			
	CAUTION SECN		PROFILE	1 20 TR	TALS ATTEM	PTED TO BA	ALANCE WSEL			
	CAUTION SECN		PROFILE#	2 CRITI	CAL DEPTH :	ASSUMED				ر النام المحمد والمستوفد المستوفد المس
-	CAUTION SEGN		PROFILE=	2 PROBAI	BLE MINIMU	4 SPECIFIC	C ENERGÝ	· · ·		
	CAUTION SECN		PROFILE=	2 20 TR	IALS ATTEM	PTED TO BA	ALANCE WSEL			
	CAUTION SECN		PROFILE=		CAL DEPTH /				A terrational control of the second s	ere di nondi. I e uniquina i entiquità dia n <u>aturalità di distributione di la capita. I</u>
	CAUTION SECN		PROFILE=	: 3 PROBA	BLE MINIMUI	4 SPECIFIC	CENERGY			•
	CAUTION SECN	0= 201.000	PROFILE=	3 2n TR:	TALS ATTEMI	PTED TO BA	ALANCE WSEL			,
	CHITTON CCAN	•	22							**
	CAUTION SECN		PRÖFILE≃		CAL DEPTH !	ASSUMED				•
	CAUTION SECN	0= 202,000	PROFILE=	4 PROBAR	SPE WINTHAN	1_SPECIFIC	ENERGY	•		•
	CAUTION SECN	ns 505*000	BROLITE	4 20 18	IALS ATTEM	STED TO BY	LANCE MSEL			*****
	CAUTION SECN	۸ 	DOORTER	00.71		Oallynn				• •
	CAUTION SECN		PROFILE	1 CK1 11	AL DEPIH A	SOMED	·			•
	CAUTION SECN		6.00 L L L E	I FRUBAL	ILE MINIMUN	PECIFIC	ENERGY	_		
•	CAUTION SECN		00001102	2 001110	IALO ALIEME	LED IN BY	LANCE MARE			* *****
,	CAUTION SECNI		PROFILE=	a Brunsa n nutili	ow Devite A	GOOVMEU L mbcatet≃	CHEACH		*	
	CAUTION SECN		PROFILE #	C PRUBAR	rre winiunn) Step to m:	ENERGY		3/	The company of the co
	CAUTION SECNE			2 20 IN	ALS ATTEME	TED IN BA	LANUE MOEL		• (
. • •			PROFILE	3 0000 C	AL DEPTH A	SSUMED				
			PROFILE	J PROHAR	THE WINING	SEECTEIC	ENERGY		- "	a company and a second
	CAUTION SECNO		PROFILE *	O 10 14/1	WEST WEST LIN	TED TO BE	LANCE WSEL			
	CAUTION SECNO		PROFILER	4 CRITIC	AL DEPTH A	SSUMED	m			
	CAUTION SECNE		PROFILE#	4 PROBAR	RE MINIMUM	SPECIFIC	ENERGY			
	CAUTION SECNI	0 203,000	PPOFILE=	4 ZH IR]	ALS ATTEMP	TEN TO BA	LANCE WSEL			

				-,	company and a second					BRANCH	BROOK	#
	HECR RELEASE ERHO: CORR W HOUIFICATION RANAMARAA	01,02 + 50,51	,52,53	D AUG	*********						TPLE RUN)
C T1 T2	BRANCH	0×0.0000.1 0×0.000.0	LUOD INSUR	IANCE 81	IUDY							(5000)
. VI				IDIR	STRT	METRIC	HVIN8		MSEL	FQ.		
	. w],	2,	0.		0,002000	ø.	0,		24.000	* * * * * * * * * * * * * * * * * * * *		
Jg	ирко́Р	THEOT .	PREVS	XSECY	XSECH	FN	ALLDE	. IBw (CHNIM	THACE	** ** ** *** *** ***	
	1.000	Q. •		_ Q	9.4	0	Q	0.	1.0.		ent constitut and a second second	
.13	VARIABLE C	ODES FOR S	SUMMARY PRI	NTOUT			1					
#1. v.	150,000						0.	\	0.	9.		> **
: NC GT	0.060	800,000) 800.00	5 <u></u> 9	0,100	2300,000	0.	0.	0.	0 • · · · ·	0 a	<u></u> i
X t GR Gn	325,000	1000,000	325.00 330.00	0 11	30,000 20,000 30,000		0. 1140.000 1520.000	316,000	1140.00	0,000	1200,000	
NC	٥.	٥.	0.		0.300	0.500	0.	0 •	0 •	0 ,	0,	
•	0/8	FACE DIRT	ROAD				· ·					
	200,100_				_9	75.000	20,000			0,,,,,,	0	*****
. X 3 . SB	•	0. 1.500	2,50	0	75,000	0, 50,000	0	260,000	330.00 0.	0 350,000 316,000	316,000	
	U/S	FACE DIRT	ROAD			···	· · · · · · · · · · · · · · · · · · ·	_\				
x1 X2 X3	0,	0.	1,00	0 3		15,000 534,400 0.	15,000	15.000	0. 0. 334.40	0. 0. 3.54.400	0.	
v) C	Ů,	٥.	0,		0.100	0,300	0 .	10.	Φ.	٥.	0.	
दे <u>१</u> ५४ ५४	200,300 330,000 336,000,	8,600 1000,000 1510,000	325,000	0 14	10,000 00,000 00,000	50,000 \$15,000 \$40,000	50,000 1030,000 1890,000	50,000 316,000	0, 1480,000	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0. 1500.000	
1	201 (5 + 3) 5 (5 5)	29 ,3 40 50 5 ,090) ⁴ (44 _# 11 () 1 () _* () _* ()		164 1614 154 (1011	izve, an Liter, an	1866,000	1700.000 C.	(1 g (1 g	0 s	6 . u .	

• •					······································						8 K
X1 X4 GR	#2.000 2.000	15.000	1663,000	1748,000 326,000	920,000 1720,000	480,000 0,	700.000	0.	0.	0.	,
GR	376,000 327.500_	1315,000 1690,000-	375,000 327,500_	1430,000 1724.000	373,500 337,000	1528,000 1748,000	363,500 342,500	1605,000 1785,000	338,500 367,700	1663.000	
GR	374,000	1897,000	375,000	1963.000	380,000	2040.000	382.000	2100,000	381,300	2210,000	······································
NC	0	0 .	0 🐧	0.300	0.500	0.	0.	0	, 0	0.	, ,
	0/8	FACE RTE 8	BRIDGE							~•	
X 1	202,100	0,	0.	0.	50,000	50,000	50,000	0,	0,		
X3	10,000	0 .	0 .	0	0	0	0.	381 500	381 500	0.	
\$B	1.250	1.500	2,500	240.000	90.000	7.000	5700.000	2.500	326.800	326,000	····
								•	Ì		
·	UZS	_FACE_RTE_A	BRIDGE			· · · · · · · · · · · · · · · · · · ·					
X 2	202,200	0.	1,000	0. 381.500	100,000	100,000	100.000	0.	0.	0.	
- X3	10.000		0,	Q	0	0	. Q.	390,500	390,500	0,	
NC.	Q	0.	0	0,100.	0.300	0	0.	0	0.	. 0	
X t	203,000	15,000 326,000	1740.000	1862,000	50,000	50,000	50.000	0.	0,	0.	***************************************
GR	389,500	1239,000	. 384,500	\$28,000 1265,000	1825.000	1288,000	392,500	1329.000	399,500	1370,000	
GR	392,500	. 1433,000.	.390.000	1519,000	385,000	1615.000	373,500	1680.000	353,000	1740.000	
	329,500	1.795,000,	329,500	1827.000_	337.500	1862.000	353.590	1896,000	367.500		
		_					•				
X1 X4	204.000.	17.000	1685.000	1805.000	1000.000	1020.000	990.000		Q	0.	
ĜŔ	2,000 374.500	334.000 1200.000	1740.000 374.500	334,000 1220,000	1760.000	1240.000	0. 352.500	1290,000	0. ************************************	0.	•
GR.	34B.000	. 1325.000	343.500	1368.000	337.500	1420.000	319,500	1480,000	342.500	1510,000	*
GR	342,800	1635,000	342,000	1685,000	335,000	1735,000	335,000	1770,000	344.800	805,000	A parameter in the second of the last
GR 	347.300	1875,000	349,500	1910,000	0,	0,	0 •	0.	0	0.	
X 1	205,000	23.000	3425,000	3570,000	1860,000	1600,000	1820.000	0.	0.	0.	
X4 G8	2.000 391.500	345.700 2580.000	3480.000	345.700	3500.000				0	0	
GR	375.000	2920,000	390,300 376,500	2630,000 2960,000	390,300 363,500	2670,000 3010.000	389,000 358,500	2725.000 3093.000	357,500 349,700	2855.000	
GR	349.500	3260.000	349.700	3345.000	351,300	3425.000	347,300	3475,000	347.300	3168,000 3505,000	
GR	353.000	3570,000	356,000	3635,000	353,500	3700,000	350,500	3735,000	348 500	3840,000	
- GR '	354,500	3875,000	363,500	3930,000	373,500	3980.000	0 .	0 .	0	0 ,	
, ,	304 000	. 24 000	2042	20/1			· · · · · · · · · · · · · · · · · · ·			* *	
X 1 X 4	000,005	21,000 350,000	2840,000 2870,000	2965,000 350,000	880,000	960.000	910.000	0.	. 0.	0.	
GR	366,300	2010.000	366,000	350,000 2095,000	2910,000 363,800	0, 2185,000	366,500	2250,000	356,000	0.000 2350,000	
GR	353,800	2460.000	352,500	2550.000	357,500	2620.000	353,500	2655,000	356,500	2680,000	
GR	363,500		358,500	2735.000	363,800	2780.000	364.800	2840,000	/351.000	2865,000	-
6 K	551.000 400.000	2920,000 3245,000	361,000 0.	2965,000 0,	370,000	3015,000	370.000	3070.000	372,000	3175,000	
	• • •		₹ ♥	▼ •	* •	V .	V • · · · · · · · · · · · · · · · · · ·	0.	0 ,	0,	
λį	201,000	9,000	2720,000	2880,000	650,000	850,000	800,000	0 ,	0.	 O,	•
X 4	5,000	354,000	\$810,000 _	354 <u>.</u> 000	2840,000	0.	0 •	0	0	0.	
GR	383,860	2525,000	361,500	2720,000	355,300	2800,000	355,300	2850.000	359.700	2880,000	

X 1 X 3 S 8	*07,100 10,000 0,	0. 0., 1.500	0. 2.500	0. 0. 150.000	130,000 0. 60,000	130,000 0, 0,	140,000	368.700 0.	368.700 354.100	0. 0. 354,100	
	U/8	FACE RTE 6	BRIDGE	l I			**************************************			ermaningan da i su der da si suuranu u	
.X1 .		0,			35.000 .	35,000	35.000	Q		0	
X 2	0,	0.	1.000	368,700	373,500	0 .	0	U .	. ۷	0	
X 3 NC	10,000			0.100_		0	0	373,500	373,500 .	0 •	
		•		• • • • • • • • • • • • • • • • • • • •							
X1	208.000_	25,000	2670.000	2810.000	30.000	30.000	30.000	0.	0.	0.	
X 4	2,000.	354,500.	2745,000	354,500	2770,000		0	. 0,	0.		
GR	386,500	2310,000	384,500	2380,000	385,700	2460,000	381,800	25.5,000	378,500:	2585,000	
GR GR	373,500 362,500	2635,000_ 2865,000	369.500	2670.000	355.500	2740.000	355.500	2775.000 <u></u>	362.800	2810.000	· · · · · · · · · · · · · · · · · · ·
GR	362,500	3140,000	362,500 363,000	2940,000 3235,000	361,500 362,500	3000,000 3300,000	364,000 361,500	3050,000 3360.000	364,000	3080,000	
ĞR			372.500	3485,000	378.500	3555.000	381.500	3620.000	359,500 399,000	3400.000 3705.000	
X.1	209.000	25.000	2150.000	2265,000	1200.000	1050.000_	1120.000		à.	0	
X3	10,000	0,	0	0.	0.	0.	0.	0,	V •		·····
X 4	2.000	361,000	2170,000	361,000	2200,000	0.	0.	0	0.	0	
GR		1390.000_	380,500	1490.000	377.500	1605.000	375,500	1695,000	374,500	1785.00Q	and the state of t
GR GR	373.000	1850,000	- 362,000	1880,000	362,000	1940.000	372,500	1965,000	363,500	2000,000	
GR	374,500366,500	2030.000 2205.000_	362,500 370,500	2055,000 2265,000	362,500 371,000	2130,000 2370,000	374,300 370,500	2150,000	366,500	2165,000	
GR	369,300	2645.000	372,000	2730.000	375.500	2810,000	383,500	2455,000 2850,000	369.500 <u>.</u> 387.300	2560,000_ 2920,000	
		·	·	·	•		, , , , , , , , , , , , , , , , , , ,		, , , , , , , , , , , , , , , , , , ,	-/	
X 1	210,000	15,000	1735,000	1880,000	1550,000	1650,000	1600.000	0.		·	·
Хų	1,000	376,000	1840,000	0	0	0.	0.	0	0.	. 0,	
GR	433.500	1340.000	423,500	1405.000	413,500	1560,000	411.500	1640.000	408.800	1735.000	
GR	379.500	1830,000	393,500	1880.000	388,000	1930,000	392,500	1985,000	453,500	2080,000	•
GR	463,700	2130,000	474,500	2170,000	495.700	2530,000	490.000	2285,000	493,500	2330,000	
				-						***	
Χ1 . Co .	211,000	15,000		_ 1690,000 .	600,000	300,000 .	500,000	0.	0,	0,	
GR	497,500	1350,000 1508,000	542,000 488,700	1395,000	531.500 492.700	1445.000	522.000	1500.000	522.000	1520.000	
GR	523,700	1945.000	533,500	2020,000	539,500	1690.000 2090.000	503,500 539,500	1780.000 2178.000	513,700 539,500	1863,000 2301,000	•
									3371300		
- ····		EET U/S BLA	CK ROCK DAM		- · · · · · · · · · · · · · · · · · · ·						
Χį	211,100	6,000	1062,000	1204,000	50,000	50,000	50,000	0 :			····
X 3	10,000	0	0	0,	0.	0.	90,000	0 . 0 .	0.	0,	
X5	4 , 0.0 0	525,000	525,000	525,000	525.000	ō	Ŏ		Õ	0	
GR .	540.700	1000,000	540,700	1060,000	519,600	1062,000	519,600	1202,000	540.700	1204,000	
БА Эт	560.000 4.000	1210,000. 2200.000	0. 5300.000	7600 000		0	0 .	0	ν 0 •,	0.	
							U		بـــــــــــــــ ♦ لا ـــــــــــــــــــ		- 7 V (
	50f:	EETUZSKIG	KAD_DAM	ere carrer	· m	· · · · · · · · · · · · · · · · · · ·		····			
C t	218,100	5,000	1200,000	1360,000	8800.000	8400,000 :	9540.000		^		
- 6		1000,000	* #* * * * * * * * * * * * * * * * * *	* 3 D A * A II A	00004000	DMAG*000 ,	V 7 4 11 4 0 0 0	0.	0	0 .	

	7 V V V V V		· · · · · · · · ·			***			•	•	
X1 GR GR NC	219,100 \$75,000 565,000	8,000 1570,000 1420,000	1050,000 570,000 570,000	1420,000 1030,000 1500,000	4000.000 565,000 575,000	3690,000 1050,000 1560,000	3770,000 553,500	1100,000	953.500 0.	1400,000	
	·	:	•	;		· · · · · · · · · · · · · · · · · · ·		,		***************************************	
	0/8	LEACELEDOIS									
	- 219,200	_ 0, _	0		100.000	100,000	100.000	0 •	0.	0.	
X3 -	10,000							566.600	566,600		·
នម	0 4	1.500	2,500	300,000	65,000	0.	800,000	0 .	553,500	553,500	•
	U/8	FACE FOOTB	RIDGE	·			and the same control of the same and the sam				
¥ 1	219.300	a	Λ.	0,		15 000					
X5	0.	0	1,000	566,600	568,800	· 0 •	12000	0, /			
×3	10.000	0	0.	0.	0	Ŏ.	ŏ, /	568 800	568 800	ŏ.	
N¢			0.	0.100	0.300		·	0			-
		* * * *					1				
X 1	220.000_	15.000	000.0001	2230,000	700.000	50.000,	300,000	, 0 -	0, ′	n .	
X 4	5,000	554,000	1350,000	554,000	2150.000	0.	0,	0	0	0.	
3R	640.000	1000,000	627.500	1049.000	613,500	1100,000	592,000	1160,000	588,000	1200,000	
R	588.000	1230.000	580.000		571.500		560.500	1335,000	560.500	2160.000	
R	569,500.	2230.000	571,500	2270.000	575.500	2335,000	576.300	2395.000	600,000	2555,000	
	,		÷ ,	• •			\		-		
	500	FEET U/S CO	PROPATE LIM	118	****						
X 1	221.000	13.000	1320.000	1555,000	1650.000	2350.000	2230.000		٨	Λ	
Χu	2,000	558,000	1350.000	558,000	1500,000	0	0.	0	0.	0	***
38	642,500	1000,000	621,500	1060,000	605,500	1130,000	572.500.	1275.000	570.000	1290.000	•
}K				1340.000		_1510.000		1555,000		1580,000	
13 [J	569,700 0.	1630,000	571,500 0.	1705,000	575,500 0.	1765,000	0 •(0 •	0.	0,	0,	٠.
			· · · · · · · · · · · · · · · · · · ·	•	•	0,	U (0	0.	
	- · ·										
	Total Marks (1977)		· ····································				-				
					•		1				
						1	1				
											
						· · · · · · · · · · · · · · · · · · ·	\				
	ente de la marca de la compositiva della composi						/- /			,	
							<u> </u>			n de la companya de l	·
<u></u>		Authority - Manual Authority and Authority								nere e commune de qua	······································
)					
								· · · · · · · · · · · · · · · · · · ·			
								*	<i>y</i>		
								***************************************	J		
								\$	· · · · · · · · · · · · · · · · · · ·		
								\$			
								\$ 1	· · · · · · · · · · · · · · · · · · ·		
								\$	· · · · · · · · · · · · · · · · · · ·		

COK
(

HUCTIPLE RUN

		0.000 CE	o							SUMMARY	PEINTOU	7
, OY	EAR_ELDOD.	_0>800_CE	4 5 4							30MITTEL	, , , , , , , , ,	,
JUMM.	ARY PRINTO	BUBAT TUC	124					;				1.
		٨	rueri	DIFHSP	DIEWSX	_DIEKH8	TOPWID	XLCH				- 1
	8ECN0	Q				and the second s			na Toam	moustt)	_	±
		800,00	321.36		0,	#2,64	70.84	- 0 • (∕	OG CO			and the second s
	200,000	000 00	321,34	m0.01	0		7.0 . 75	0				
4	200,000		321.59	0,25	0.	-8,41	72.75	0 •			•	
1	200,000	900.00	324.15	2,56	0	-7. 85	93.20	0 •				
	200,000	2300,00	JET 8 LO			سادات وجوز بتسوسي						
		000 00	321,57	0.	0.22	0.	72,59	100.00		•		•
-	200,100	800.00	321,56	=0.01	0,22	. 0,	72,52	100.00				للها أني ميلويات بدوايا تحديثها ويوافي مصارف والموافية
	200,100	800.00 900.00		0.25	0.22.		74,53.	100.00.	المياء والمنازعين بالماهيمين بالماهية والماها والماها والماها			•
	200,100 -		324,39	2,57	0.24	0.	95,12	100.00				•
	200,100	2300.00	364437		•			45 00				بالما الماد فيدون مودي مطاري ويماد موديد
		000 00	321,60.	0	0.03	0	72,81	15.00				
	200,200_		321,59	0.01	0,03	0 .	72,74	15.00				
	200,200	800,00	321.84	0.25	0,03	0	74,76	15,00				
	200,200	900,00		2,58	0.03.	0	95,38	15.00				
	200, 200	2300.00	and the second section is the second		•			50,00				
		800,00	321,77	0 .	0,17	0 •	82,06	50,00				
	200,300	800,00	321.76.	20.01	0.17		82.02	50.00		4.,		
P	200,300	900.00	322.02	0.26	0.18	0 •	83,47	30,00	= * -		•	- :
•	500 × 200	2300.00	324.67	2,65	0,25	0	98,17	50,00				and the second s
	200,300	2300.00	32.40.					1700.00				
		800,00	324,09	0.	2.32	0	131,01	7				
* /-	201,000	800,00	324.09	#0.00	2.33	0	131.01	1100000			+	
* 6-	501.000	900.00		0.09	2.16	Ω	131.89	1700.00				•
	201,000	2300.00		2,21	1.78	0	236,24	1100100		***		•
	201,000	5200 ton		•			ue na	900.00				عاداء والسيسمين فينبد بدست واستهيده
•	000,505	800.00	329.76	0	5.67		45.28	700.00				
<i>D</i>	505,000	800.00	329,76	0,00	5,67		45,28 46,29	700,00				•
ν	505,000	900.00	329.97	0.20	5.79	0,	52,28					
	505,000	2300.00		1.20	4,72						•	e e e e e e e
Baran	CAPABAR					4 44	46,92	50.00			•	•
	202,100	800.00	330,09		0,33	0.	46.92					
	202,100	800.00		0.00_	0.33		48.08	50,00				
 	202,100	900.00	330.32	0,23	0.36	0.	60,65		i.	•		
	202,100	2300.00		2,53	1,68	0.	00,03	20,00				. د حد مع منسل بسدو د معتبر بسد د د
	F021.00						47,67	100.00)			
	202,200	800.00	330,24	Q •	0.15	0.	47.67		1		•	
	202,200			. 0.00	0.15		48.91					
	505,200		330.49		0.17		62,31	100.00				
*****	202,200	2300.00	335,18	2,69	0,35	0,	06131	, , , , ,				
_	# 11 to \$ 21 to 2	*****			0.11	. ^	41.27	50.09)			
<u>.</u>	203,000	800.00	330,88) <u></u>	Q • 6 4		41,27	50.00)			
	*** **	800.00	330,88	0.	0,64		42.67	50.00	} _	1 9		
*6	203.000	900.00	331.09	0.21	0.60		57.28	50.00)		تعليبه والمتا السويان براء الواد بدويا بالعبير	and the second s
* .	7		333.27	2.18.	9.01	2	· · · · · · · · · · · · · · · · · · ·				_	
				А	6,98	3 0.	79.43	990.00)		•	
	204,006	800.00					79.43		0 <u> </u>	£		
F	204,000	800 + 00			6,99	9 Y • -	90,33	990.0	D			
•	204,000	900.0			6,9	2 0.	192.24		348.78 348.78			
	204,000		540,19	2,10	0 4 74	. *•	•		34818	معاطا ليمار والراب الراكات والمصورون		
	3								1.45.45			

t de nombre describe	SECNO	Q	CHSEL	DIFWSP	DIEWSX	DIFKH8	10PWID.	XLGH	,	
•	206,000	800.00	353,43	- 0,	4.65	0.	148.27	910.00		,
\mathcal{H}_{-}	206.000	800 QC	353,43		4.65		148.27		1	•
	206,000	900,00	353,62	W 0.19 .	4,65	0	166.59	910.00		*
	206,000	2300.00	355,02		4,65	. 0,	292,58	910.00		,
**	207,000	800,00	356,45		3,02	0,	72,79	800,00	The state of the s	
\mathcal{I}	207,000	800.00	356,45	0.	3,02	9.	72,79	800.00		•
	_ 207.00Q	900.00		0.10	3.02.		76,41		7 6 11	
	207,000	2300.00	358,43	1,79	3,41	0,	111,72	800,00		
	207,100 .		357,63			0	45,97	130.00	. The profit of the second of the second state of the second seco	With the second control of the second contro
	207,100	800,00	357,63	0.	1,18	- 0.	95,97	130,00	, , , , , , , , , , , , , , , , , , , ,	
	207,100	900,00	357,82	0,18	1,18	٥,	99.61	130,00	/	•
	207.100	2300.00_	359,65	1.83	1,22		135,93.:	├130,90	Control of the contro	******
	207.200	800,00	. 357,73	0.	0,10	0.	97.98	35.00		
** *********	. 207.200.	800.00	357,73.		0,10.	0 ,	97,98	35,00		The second of th
	207.200	700.00	351,92	0.19	0.10	٥.	101.68	35,00	1	•
	207,200	2300.00	359,78	1,86	0,13	٥.	137.78	35.00		
	208,000	800.00	357.48	- O,	-0.25	0.	54.44	30.00		
.]	508,000	800.00	357,481	0	+0.25	0	54,44	30.00		
	200,000	900.00	:357,63				,55,92_	30,00		ر. بر المراجع وريم وأد المستخدم ومدم من مدم سمار و فراها الا العاد الراجع
* .	208,000	2300,00	359,19	1,55	=0,59	0.	71.1,1	30,00		
	209.000	800.00	364.78		7.30		36.88	1120.00	4	•
K.	209,000	800,00	364 78	0	7.30	•	36.88	1120.00	The forther by the more war and the second to the second t	the first of the control to the second secon
	209,000	900.00	. 365,07	0.28	7,43	0		1120.00	, ar	
	209,000	2300.00	368,53	3,46	9 , 34	0	74,3,0	1120.00	en e	The three same same destructions grown again as a second second second second second second second second second
*	210,000	800.00	381,66-	- O.	16.88	0,	29.94	1600,00		•
* *	_210.000	800.00			16.88_			1600.00		•
8	210,000	900,00			16.86	0,	31.43	1600.00		The state of the s
* ,	210,000	2300,00	384,63		16,10	0,	46.36	1600.00		
*	211,000	800.00	492.10 -	- 0,	110,44	Ú,	62.62	500.00		entre un un en este en
*	211,000	800,00	492,10	0	110.44	0	62,62	500,00		
~~ !! ~~	211.000	900.00			110.34		65,64 \	500.00	er er der vertregelen de z. schenden werde av dekommen av ankannek kontributer anstekan de spil generaties (m. d. dessen av spil anstek av ankanne	
. A .	211.000	2300.00	493,85	1,58	109.22	0 .	90,00	500,00		
	211.100	800.00	525,00		32.90	٠٠.		/ 50.00	A Committee of the Comm	
* M	211,100	800,00	525.00	Ü	32,90	0		50.00 50.00	e e e e e e e e e e e e e e e e e e e	and a second control and a
*	211,100	900.00	525.00	0	32,73	ŏ.	141.02	50,00		•
*	211,100		525.00		31,15		141.02	\.\50.00		
			. <u> </u>	_	•	•	•	1 /		
* 1	218,100	2200,00	563.36-		38,36		201,99	9540.00		
	218,100	7600,00	564,70		39.70	<u></u> Q •	234,25	9540.00	and the same of th	
• •		16500,00	- 1565,50 - 568,02	. 0,80 2,52	40,50 43,02	0	255 ₊ 34 313 ₊ 61	9540,00		
	-					0.	212401	9540,00		· · · · · · · · · · · · · · · · · · ·
	219,000	2200.00	564,27		9.92	0	1551,12	410.00		
	219,000	5300.00	566,24	1,97	1.54	9.	1625.78	410+65		
	219,960 219,000	7500,00 15560,00	567,40 ↔ 570,86		1,89	<i>g</i> .	1556 87	016.00	· · · · · · · · · · · · · · · · · · ·	. *
	f " , 1, 4,	\$ 6-24 to \$ 4 to	aruşen	5 , 411	C.11	e •	1757,60	416.000		J.

i

~··	SECNO	Q	CHSEL	DIFHSP	DIEW8X	DIEKH8.	IOPWID	xlch	militaring freelegge also falls freely on a superior and several system of the last of several system.	<u> </u>
	219,100	2200,00	564,27	0,	-0,00	0.	365,55	3770.00		•
P	219,100.		•						and the control of th	
	219,100	7600,00 16500.00	567,38	1,14	0.02	0,	417,52	3770.00		
	E	10300,00	2/0,/4		· #0.05		483,29	3770.00		
	219,200	2200.00	564.27	0.	0.00	0.	365,56	100.00	Company of the Compan	
	219,200	5300,00	566.24	1.97	0.00	0.	370.00	100.00		
	219,200	7600.00-	567,38_	1,14	0.00.					
٠.	219,200	16500,00	- 570,75	3 . 37	0.01	0		100,00		
	319 300	3300 00	 ELB 34							
*******	219,300	5300,00	566,24	1,97			365,56_		The second secon	
		7600,00	569.29	3.05	1.91	0.	370,00 455,81	15.00	•	
	219,300	16500.00	S73.S0_	4.21	2.75	0.	533.04	15,00 15,00		
	•-								and the state of t	
-	550,000	5500.00	564,28	0.	0.01	0.	869.79	300.00		•
G		5100,00_	•	1,99	0.02		893,30	300.00		
6-4	CC01000	7600,00	569,32	3,06	0,03	0.	929,59	300,00		The second secon
	220,000	16500,00	573,58	4,26	0.08	0,	1021,16	300,00		
	221.000	2200.00	564,25	0.	-0.03	0.			المراجعة والمنافعة والمراجعة والمنافعة والمناف	
		5300.00		1,92			.199,40 214,49	2230.00	•	
	221,000	7600.00	569.23	3.06			252.71	2230,00		:
	221,000	16500,00	573,41	4.18	#0,17	0	462,61	2230,00		A CONTRACTOR OF THE PARTY OF TH
				•			• • •			٠.
********	SUMMARY OF E		PDOETIF	I CRITIC	AI DEDYU	L R O LIME A	· -			
C/	AUTION SECN	0# 201,000 0# 201,000	PROFILE:	1 PROBAB	LE MINIMUM ALS ATTEM	SPECIFICATION	C ENERGY BALANCE MSEL			
C A	AUTION SECNI	0= 201.000	PROFILE	RABORG C:	LF MINIMUM	SPECIFI	TO ENEDRY		· · · · · · · · · · · · · · · · · · ·	
C A	NUTIONSECNI	o <u>⊫</u> 201.000	PROFILE#	:.220.TRI	ALS ATTEM	TED TO B	BALANCE WSEL			the state of the s
•	44.14.00 AMBIN		LUOLIFER	, 3 PUTITO	AL UEPIN A	133UMLD				
	WITTON SECNI	201,000	PROFILE#	: 3 PROBAB	LE MINIMUM	SPECIFI	C ENERGY			
U.S	MITON SECUL	J# 401 • U U O	RROFILES	320. TRI	ALS. ATJEMP	TEO TO B	ALANCE WEEL			
CA	UTTON SECNO	n= 202.000	PROFILER	a certic	AL DEPTH A	COUNTS	•	•	energy and the second second	
		202.000	#4114089	A PROBARI	NE DEFIN P	. SDECTET	C SMEDOV	Ē		
C A	UTION SECNO	000,505 a	PROFILE	4 20 TRI	ALS ATTEMP	TED TO B	ALANCE WELL		and the state of t	and the second s
	UTION SECNO	203,000	PROFILES	1 CRITICA	AL DEPTH A	SSUMED	- ,	,		•
ÜΑ	UTION SECNO	000.cos	PROFILE	1 PROBABI	E MINIMUM	SPECIFI	C ENERGY			
C A	UTION SECNO	000,000	PROFILER	1 20 TRI/	ALS ATTEMP	TED TO B	ALANCE WSEL			
CA	UTION SECNO	000°502 wi	PROFILE	Z CKITICA	AL DEPTH A	SSUMED			Samuel Control	
	UTION SECNO	000 E0S #1			MUMINIM 3	SPECIFI	C ENFRGY		-	
CA	UTION SECNO	203.000		3 CHITICA	ALG ALIEMP M DEUTH A	SEN IN B	ALANCE WSEL			
	UTTON SECNO	= 205.000	PROFILE	3 PROBABI	.E MINIMUM	SUPPLE 1	r succes .			.,
		203,000	PROFILE#	3 20 TRIA	ULS ATTEMP	TEO TO H	ALANCE WHEL			
	UTION SECNO		PROFILE	4 CHITTLA	U. BEPTH A	550860	-			
•	UTION SECNO	s 203,000	PROFILE®	4 PRUBABL	ម្រាម មិន មា	24861414	CENERGY			• 1
				. , , ,						<u> </u>

BRANCH BR	200	ハく
-----------	-----	----

(C	OODWA	4

FLOODWAY DATA, 100 YEAR FLOOD 0,900 CFS PROFILE NO. 2							METHOD 4		
• • • •	STATION	W107H	FLOODHAY SECTION AREA	MEAN VELOCITY	WATER : WITH FLOODWAY	SURFACE ELE HITHOUT FLOODWAY	VATION DIFFERENCE		
-}	200.000	61,	310	3,0	322,6	321.6	1.0		
}_	200,200 200,300 201,000	132	7111- 1691 1491	2,9	322,7 322,6 324,2	321.8 322.0 324.2			
)	202,000	46.	146,	6,2	330,0 330,3	330.0	0, - M(CC)		
ر. اد	203,000 204,000	43,		5,8 4,8	334,5 331,1 338,1	331,1			
」 []	205.000 206.000 207.000	70 72, 78,>	123. 218. 142.	7:3 4:1 6:3	349.0 353.7 356.7	349,0 353,6 356,6	0,1 = 63+20 0,1 = 9433		
-	207,200 208,000 209,000	56 37	126, 134,	7,1 6,5	357,6 365,1	357,6 357,6 365,1	0, 12790 V		
4	211 (0 0 0 -	31, 	92, 117, 762	9,8	301,9	381,9	100100 - 1001		
-	249-440 	100 116 -120	32818 32818 32818	11 6 	909.7 - 569.0 - 568.0	565 15 967 14 567 1	012 016 295100 V 705120		
-	2177200 2177300 220 000	- 170 	1054	1,	560+B 560+1	547,4 547,3 			
٠.	721 000 	200		11	20070				

.

•

.

7,1

....

```
219,500
             24585,
                     5.00
                             ·=3.05
                                       4,21
   250,000
             24885. -5.04
                             -5.00
   221.000
                                       4.26
             27115. -4.99
                             -5.06
                                       4.10
 EIGHTED AVE FOR MEACH -1.41
                                       5.23
 "HE FOR THE REACH # 015 WITH 35.21 OF THE REACH WITHIN 0.5 FEFT
          BRANCH BROOK
           REACH DETERMINATION
 OUTTNUOUS FLOOD HAZARD FACTORS BY EVEN INCREMENTS
            ACTIGHTED AVE DIFFERENCE
      TOTAL
     LENGTH
              BETAEEN BASE FLOOD AND
                  15.0 . . 11
              101
53 10600.
             -0.21
                  -0.21 2.24
HE FOR REACH 1 = 005 WITH 100. F OF THE REACH WITHIN 0.5 FEET
ONE FOR THE REACH = A 1
20000. -1.06 -0.40 . 1.26
ME FOR REACH 12 = 010 WITH 75.1 OF THE REACH WITHIN 0.5 FEET
OUF FUR THE REACH # A 2
   27000, 45.75 41.81 3.64
HE FOR HEACH 3 # 040 WITH 89.1 OF THE REACH WITHIN 1.0 FEET
"FC2 MELEASE DATED MAY 76 UPDATED AUG1977
53-0- COMP - 01.02
 "I-ICATTON - 50.51,52.53
```

1 3