

**U.S. Army Corps  
of Engineers**  
New England District  
Concord, Massachusetts

**SUPPLEMENTAL DESIGN INFORMATION  
FOR PHASE 2 - ELM STREET TO DAWES AVENUE -  
OF THE 1.5 MILE REACH REMOVAL ACTION**

DCN: GE-022704-ACBK

March 2004

**Environmental Remediation Contract  
General Electric (GE)/Housatonic River Project  
Pittsfield, Massachusetts**

Contract No. DACW33-00-D-0006  
Task Order No. 0005

This document provides supplemental information prepared as part of the finalization of the Phase 2 design for Station 527+60 to Station 543+50 (Dawes Avenue). The paragraphs below provide a brief description of the information, and related tables and figures are included as Attachments. The following two main elements are included:

- Tables listing excavation and backfill volumes and associated flood storage changes for Phase 2 - Station 527+60 to Station 543+50 (Dawes Avenue) and for the entire Phase 2 reach from Station 522+18 (Elm Street) to Station 543+50 (Dawes Avenue) of the 1.5 Mile Reach.
- Documentation of the HEC-RAS model results for Elm Street to Dawes Avenue.

### **Final Excavation and Backfill Volumes**

Weston has conducted analysis and calculations relative to the excavation and backfill amounts and resulting flood storage capacity changes based on the final design of Phase 2 - Station 527+60 to Station 543+50 (Dawes Avenue). The results of the calculations are provided in Attachment A in eight tables. Table A-1 through Table A-4 present the calculations completed for the Phase 2 - Station 527+60 to Station 543+50 (Dawes Avenue) reach and Table A-5 through Table A-8 present the calculations completed for the entire Phase 2 reach from Station 522+18 (Elm Street) to Station 543+50 (Dawes Avenue). These tables are as follows:

Table A-1	Excavation and Backfill Volumes – Final Design Phase 2 Station 527+60 to Station 543+50
Table A-2	Excavation Volumes by Soil/Sediment Classification – Final Design Phase 2 Station 527+60 to Station 543+50
Table A-3	Summary of Estimated Flood Storage Capacity (FSC) Changes – Final Design Phase 2 Station 527+60 to Station 543+50
Table A-4	Comparison of In-Place Excavation Volume Estimates – Final Design Phase 2 – Station 527+60 to Station 543+50
Table A-5	Design Excavation and Backfill Volumes – Elm to Dawes
Table A-6	Design Excavation Volumes by Soil/Sediment Classification – Elm to Dawes
Table A-7	Summary of Estimated Flood Storage Capacity (FSC) Changes – Elm to Dawes
Table A-8	Comparison of In-Place Excavation Volume Estimates – Elm to Dawes

Based on the calculations and as documented in the tables listed above, the total amount of estimated flood storage capacity gain in Phase 2 – Station 527+60 to Station 543+50 (Dawes Avenue) is 500 cubic yards, and the total amount of estimated flood storage capacity gain from Elm Street to Dawes Avenue is 1,000 cubic yards.

## **HEC-RAS Model Results**

Summarized below and in Attachment B are the updated results of the HEC-RAS modeling based on input of the final design cross sections for the entire reach from Elm Street to Dawes Avenue. Also presented below are conclusions derived from the modeling results. Note that these results and associated documentation will be incorporated into the Final Basis of Design for Phase 2.

The HEC-RAS model water surface elevation results were evaluated from Station 522+18 to Station 543+50 (Elm Street to Dawes Avenue). A tabular summary of the model results is provided in Table B-1. Four model output figures (B-1 through B-4) are also provided depicting flood stage heights for the 100, 50, 10 and 5-year storm events. These figures compare the flood stage height between existing conditions and design conditions.

The modeling results for Elm Street to Dawes Avenue show that the implementation of the removal action as designed will not significantly alter flood elevations or river flow velocities in this reach. The maximum increase in river flow velocity is 3.94 ft/sec (increase from 6.96 ft/sec to 10.90 ft/sec) during the 2 year storm event (2047 cfs) at Station 522+18 (under the Elm Street Bridge). However, this increase in velocity is accompanied by a decrease in water surface elevation. The restored riverbed and banks in this area are considered stable under this velocity condition. Overall, any increases in velocity can be attributed to a general smoothing of the river channel.

The maximum water surface elevation increase is 0.26 ft. at Station 524+50 (approximately 250 feet downstream of Elm Street), which occurs during the 100-year storm event. The increase in water surface elevation at this station is accompanied by a decrease in velocity, however. Even with this increase, the modeled flood stage height at for the 100 year storm event Station 524+50 is several feet below the top of bank elevation.

# ATTACHMENT A

**Table A-1**  
**Excavation and Backfill Volumes**  
**Final Design - Phase 2 Station 527+60 to Station 543+50**

	Cut (CY)	Fill (CY)
East Bank	5,200	5,300
River Bed	7,600	6,700
West Bank	4,500	3,600
<b>Total</b>	<b>17,300</b>	<b>15,600</b>
Overexcavation (@10%)	1,700	1,700
<b>Total (w/ overexcavation)</b>	<b>19,000</b>	<b>17,300</b>

**Table A-2**  
**Excavation Volumes by Soil/Sediment Classification**  
**Final Design - Phase 2 Station 527+60 to Station 543+50**

Soil/Sediment Classification	In-Place Volume (CY)	Total With Overexcavation Factor of 10% (CY)
Bank Soil (TSCA)	1,100	1,200
Riverbed (TSCA)	900	1,000
Total TSCA	2,000	2,200
non-TSCA	15,300	16,800
<b>Total</b>	<b>17,300</b>	<b>19,000</b>

**Table A-3**  
**Summary of Estimated Flood Storage Capacity (FSC) Changes**  
**Final Design - Phase 2 Station 527+60 to Station 543+50**

Section	Volume (CY) <sup>1</sup>
Volume of Material to be Excavated	19,000
Volume of Material to be Backfilled <sup>2</sup>	(18,500)
<b>Net Change between the Existing Conditions and Restored Conditions<sup>3</sup></b>	<b>500</b>

<sup>1</sup> Positive value indicates net increase and negative value indicates loss.

<sup>2</sup>The volume of material to be backfilled presented in this calculation (18,500 cy), represents no underfill in the riverbed. The 17,300 cy figure presented in Table 1 represents underfilling the riverbed by approximately 6 inches from Station 527+60 to Station 543+50, except where filling is required to meet bank slope requirements.

<sup>3</sup>All of the 500 cy of increased flood storage capacity is located within the HEC-RAS modeled 100-year floodplain.

**Table A-4**  
**Comparison of In-Place Excavation Volume Estimates**  
**Final Design - Phase 2 Station 527+60 to Station 543+50**

<b>Location</b>	<b>EE/CA (CY)</b>	<b>Final Design Calculation (CY)</b>
East Bank	4,200	5,200
River	6,300	7,600
West Bank	4,100	4,500
<b>Total (in place)</b>	<b>14,600</b>	<b>17,300</b>
<b>Total with 10% Overexcavation Factor</b>	<b>16,100</b>	<b>19,000</b>

C:\Ryan\Documents\EE-CA\Phase II\Design\Flood Storage\Flood Storage from Cross Sections\FSC Tables 02-26-04  
 Elm to Dawes (NEW-revised).xls]527+60 to Dawes

**Table A-5  
Design Excavation and Backfill Volumes  
Elm to Dawes**

	Elm to 527+60		527+60 to Dawes		Elm to Dawes	
	Cut (CY)	Fill (CY)	Cut (CY)	Fill (CY)	Cut (CY)	Fill (CY)
East Bank	2,800	1,400	5,200	5,300	8,000	6,700
River Bed	2,400	2,400	7,600	6,700	10,000	9,100
West Bank	200	900	4,500	3,600	4,700	4,500
<b>Total</b>	<b>5,400</b>	<b>4,700</b>	<b>17,300</b>	<b>15,600</b>	<b>22,700</b>	<b>20,300</b>
Overexcavation (@10%)	500	500	1,700	1,700	2,200	2,200
<b>Total (w/ overexcavation)</b>	<b>5,900</b>	<b>5,200</b>	<b>19,000</b>	<b>17,300</b>	<b>24,900</b>	<b>22,500</b>

**Table A-6  
Design Excavation Volumes by Soil/Sediment Classification  
Elm to Dawes**

Soil/Sediment Classification	Volume in cubic yards					
	Elm to 527+60		527+60 to Dawes		Elm to Dawes	
	In-Place Volume	Total With Overexcavation Factor of 10%	In-Place Volume	Total With Overexcavation Factor of 10%	In-Place Volume	Total With Overexcavation Factor of 10%
Total TSCA Material	500	500	2,000	2,200	2,500	2,700
non-TSCA	4,900	5,400	15,300	16,800	20,200	22,200
<b>Total</b>	<b>5,400</b>	<b>5,900</b>	<b>17,300</b>	<b>19,000</b>	<b>22,700</b>	<b>24,900</b>

**Table A-7  
Summary of Estimated Flood Storage Capacity (FSC) Changes  
Elm to Dawes**

	Volume in cubic yards <sup>1</sup>		
	Elm to 527+60	527+60 to Dawes	Elm to Dawes
Volume of Material to be Excavated	5,900	19,000	24,900
Volume of Material to be Backfilled <sup>2</sup>	(5,400)	(18,500)	(23,900)
<b>Net Increase in Flood Storage Capacity<sup>3</sup></b>	<b>500</b>	<b>500</b>	<b>1,000</b>

<sup>1</sup>Positive value indicates net increase and negative value indicates loss.

<sup>2</sup>The volume of material to be backfilled presented in this calculation represents no underfill in the riverbed. The figures presented in Table 1 represent underfilling the riverbed, except where filling is required to meet 2:1 bank slope requirements.

<sup>3</sup>Of the 1000 cy of increased flood storage capacity from Elm to Dawes, approximately 900 cy is within the HEC-RAS modeled 100-year floodplain and approximately 100 cy is outside of the 100-year floodplain.

**Table A-8  
Comparison of In-Place Excavation Volume Estimates  
Elm to Dawes**

Location	Volume in cubic yards					
	Elm to 527+60		527+60 to Dawes		Elm to Dawes	
	EE/CA	Final Design Calculation	EE/CA	Final Design Calculation	EE/CA	Final Design Calculation
East Bank	1,200	2,800	4,200	5,200	5,400	8,000
River	2,700	2,400	6,300	7,600	9,000	10,000
West Bank	1,700	200	4,100	4,500	5,800	4,700
<b>Total (in place)</b>	<b>5,600</b>	<b>5,400</b>	<b>14,600</b>	<b>17,300</b>	<b>20,200</b>	<b>22,700</b>
<b>Total with 10% Overexcavation Factor</b>	<b>6,200</b>	<b>5,900</b>	<b>16,100</b>	<b>19,000</b>	<b>22,300</b>	<b>24,900</b>

C:\Ryan\Documents\EE-CA\Phase II\Design\Flood Storage\Flood Storage from Cross Sections\FSC Tables 02-26-04 Elm to Dawes (NEW-revised).xls\Elm to Dawes

# ATTACHMENT B

Table B-1

## Summary of HEC-RAS Predictions for Changes in Water Surface Elevations for Phase 2 from Elm St to Dawes Ave.

Stationing		Storm		Existing		Phase 2 Design		Change (Design - Existing)			
Const Sta	River Sta	Profile	Q (cfs)	EI. (ft.)	V (fps)	EI. (ft)	V (fps)	Δ EI	MAX??	Δ V (fps)	MAX??
49763		<b>Lyman Street Bridge</b>									
522+18	49733	Avg Annual	134	970.14	4.68	970.14	4.68	0.00		0.00	
522+18	49733	0.5-yr	1422	974.12	6.6	972.74	9.77	-1.38		3.17	
522+18	49733	1-yr	1670	974.72	6.75	973.09	10.25	-1.63		3.50	
522+18	49733	1.5-yr	1761	974.93	6.8	973.22	10.41	-1.71		3.61	
<b>522+18</b>	<b>49733</b>	<b>2-yr</b>	<b>2047</b>	<b>975.56</b>	<b>6.96</b>	<b>973.59</b>	<b>10.9</b>	-1.97		<b>3.94 MAX</b>	
522+18	49733	5-yr	3336	978.01	7.62	976.07	10.33	-1.94		2.71	
522+18	49733	10-yr	4375	979.72	8.06	978.07	9.91	-1.65		1.85	
522+18	49733	50-yr	7239	983.49	9.23	982.48	10.06	-1.01		0.83	
522+18	49733	100-yr	8721	985	9.9	984.06	10.63	-0.94		0.73	
522+33.99	49721	Avg Annual	134	969.73	2.81	969.24	2.75	-0.49		-0.06	
522+33.99	49721	0.5-yr	1422	974.14	6.05	972.88	7.16	-1.26		1.11	
522+33.99	49721	1-yr	1670	974.74	6.27	973.34	7.58	-1.40		1.31	
522+33.99	49721	1.5-yr	1761	974.94	6.34	973.5	7.72	-1.44		1.38	
522+33.99	49721	2-yr	2047	975.57	6.55	973.98	8.15	-1.59		1.60	
522+33.99	49721	5-yr	3336	978.02	7.35	976.31	8.99	-1.71		1.64	
522+33.99	49721	10-yr	4375	979.72	7.83	978.19	9.2	-1.53		1.37	
522+33.99	49721	50-yr	7239	983.52	8.94	982.51	9.81	-1.01		0.87	
522+33.99	49721	100-yr	8721	985.06	9.51	984.09	10.38	-0.97		0.87	
522+50	49673	Avg Annual	134	969.65	2.75	969.21	2.67	-0.44		-0.08	
522+50	49673	0.5-yr	1422	974.03	6.11	972.96	6.23	-1.07		0.12	
522+50	49673	1-yr	1670	974.61	6.37	973.45	6.54	-1.16		0.17	
522+50	49673	1.5-yr	1761	974.82	6.45	973.62	6.65	-1.20		0.20	
522+50	49673	2-yr	2047	975.44	6.71	974.12	6.98	-1.32		0.27	
522+50	49673	5-yr	3336	977.86	7.59	976.49	7.74	-1.37		0.15	
522+50	49673	10-yr	4375	979.58	8.01	978.36	8.03	-1.22		0.02	
522+50	49673	50-yr	7239	983.39	9.06	982.69	8.74	-0.70		-0.32	
522+50	49673	100-yr	8721	984.93	9.61	984.28	9.27	-0.65		-0.34	
522+79.36	49633	Avg Annual	134	969.56	2.51	969.19	2.39	-0.37		-0.12	
522+79.36	49633	0.5-yr	1422	973.77	6.42	972.79	6.74	-0.98		0.32	
522+79.36	49633	1-yr	1670	974.34	6.77	973.24	7.2	-1.10		0.43	
522+79.36	49633	1.5-yr	1761	974.54	6.88	973.39	7.35	-1.15		0.47	
522+79.36	49633	2-yr	2047	975.14	7.2	973.85	7.82	-1.29		0.62	
522+79.36	49633	5-yr	3336	977.49	8.27	976.14	8.8	-1.35		0.53	
522+79.36	49633	10-yr	4375	979.18	8.83	978.01	9.05	-1.17		0.22	
522+79.36	49633	50-yr	7239	982.85	10.29	982.35	9.62	-0.50		-0.67	
522+79.36	49633	100-yr	8721	984.28	11.09	983.92	10.16	-0.36		-0.93	
523+10	49588	Avg Annual	134	969.47	2.24	969.15	2.39	-0.32		0.15	
523+10	49588	0.5-yr	1422	973.39	6.89	972.72	6.69	-0.67		-0.20	
523+10	49588	1-yr	1670	973.91	7.31	973.17	7.07	-0.74		-0.24	
523+10	49588	1.5-yr	1761	974.1	7.45	973.33	7.2	-0.77		-0.25	
523+10	49588	2-yr	2047	974.67	7.83	973.81	7.56	-0.86		-0.27	
523+10	49588	5-yr	3336	976.95	8.99	976.17	8.2	-0.78		-0.79	
523+10	49588	10-yr	4375	978.66	9.46	978.06	8.35	-0.60		-1.11	
523+10	49588	50-yr	7239	982.48	10.54	982.42	8.81	-0.06		-1.73	
523+10	49588	100-yr	8721	983.94	11.23	984.01	9.31	0.07		-1.92	
523+50	49538	Avg Annual	134	969.37	2.27	969.11	2.41	-0.26		0.14	
523+50	49538	0.5-yr	1422	973.22	6.21	972.64	6.68	-0.58		0.47	
523+50	49538	1-yr	1670	973.77	6.5	973.09	7.06	-0.68		0.56	
523+50	49538	1.5-yr	1761	973.96	6.59	973.25	7.18	-0.71		0.59	
523+50	49538	2-yr	2047	974.55	6.87	973.73	7.53	-0.82		0.66	
523+50	49538	5-yr	3336	976.9	7.81	976.12	8	-0.78		0.19	
523+50	49538	10-yr	4375	978.64	8.28	978.04	8.02	-0.60		-0.26	
523+50	49538	50-yr	7239	982.53	9.42	982.43	8.36	-0.10		-1.06	
523+50	49538	100-yr	8721	984.03	10.09	984.02	8.81	-0.01		-1.28	

**Table B-1**  
**Summary of HEC-RAS Predictions for Changes in Water Surface Elevations for Phase 2 from Elm St to Dawes Ave.**

Stationing		Storm		Existing		Phase 2 Design		Change (Design - Existing)			
Const Sta	River Sta	Profile	Q (cfs)	EI. (ft.)	V (fps)	EI. (ft)	V (fps)	Δ EI	MAX??	Δ V (fps)	MAX??
524+00	49488	Avg Annual	134	968.76	4.87	968.68	4.9	-0.08		0.03	
524+00	49488	0.5-yr	1422	972.96	5.77	972.28	7.62	-0.68		1.85	
524+00	49488	1-yr	1670	973.54	5.95	972.75	7.91	-0.79		1.96	
524+00	49488	1.5-yr	1761	973.75	6.02	972.91	8.01	-0.84		1.99	
524+00	49488	2-yr	2047	974.37	6.23	973.41	8.28	-0.96		2.05	
524+00	49488	5-yr	3336	976.78	7.06	975.9	8.35	-0.88		1.29	
524+00	49488	10-yr	4375	978.55	7.55	977.89	8.15	-0.66		0.60	
524+00	49488	50-yr	7239	982.48	8.77	982.34	8.28	-0.14		-0.49	
524+00	49488	100-yr	8721	983.98	9.45	983.94	8.68	-0.04		-0.77	
524+50	49433	Avg Annual	134	968.63	1.93	968.51	2.08	-0.12		0.15	
524+50	49433	0.5-yr	1422	972.81	5.23	972.4	5.79	-0.41		0.56	
524+50	49433	1-yr	1670	973.4	5.52	972.87	6.15	-0.53		0.63	
524+50	49433	1.5-yr	1761	973.61	5.62	973.03	6.27	-0.58		0.65	
524+50	49433	2-yr	2047	974.23	5.92	973.53	6.61	-0.70		0.69	
524+50	49433	5-yr	3336	976.63	7.02	975.95	7.19	-0.68		0.17	
524+50	49433	10-yr	4375	978.39	7.65	977.9	7.22	-0.49		-0.43	
524+50	49433	50-yr	7239	982.27	9.12	982.37	7.35	0.10		-1.77	
<b>524+50</b>	<b>49433</b>	<b>100-yr</b>	<b>8721</b>	<b>983.72</b>	<b>9.92</b>	<b>983.98</b>	<b>7.65</b>	<b>0.26</b>	<b>MAX</b>	<b>-2.27</b>	
525+00	49378	Avg Annual	134	968.62	1.18	968.51	1.31	-0.11		0.13	
525+00	49378	0.5-yr	1422	972.79	4.22	972.39	4.95	-0.40		0.73	
525+00	49378	1-yr	1670	973.39	4.47	972.86	5.33	-0.53		0.86	
525+00	49378	1.5-yr	1761	973.6	4.56	973.02	5.45	-0.58		0.89	
525+00	49378	2-yr	2047	974.23	4.82	973.52	5.81	-0.71		0.99	
525+00	49378	5-yr	3336	976.68	5.8	975.89	6.6	-0.79		0.80	
525+00	49378	10-yr	4375	978.45	6.38	977.8	6.78	-0.65		0.40	
525+00	49378	50-yr	7239	982.37	7.75	982.25	7.07	-0.12		-0.68	
525+00	49378	100-yr	8721	983.85	8.47	983.85	7.4	0.00		-1.07	
525+50	49333	Avg Annual	134	968.52	2.23	968.41	2.41	-0.11		0.18	
525+50	49333	0.5-yr	1422	972.4	5.62	971.91	6.71	-0.49		1.09	
525+50	49333	1-yr	1670	973.01	5.76	972.34	7.13	-0.67		1.37	
525+50	49333	1.5-yr	1761	973.22	5.81	972.49	7.27	-0.73		1.46	
525+50	49333	2-yr	2047	973.86	5.96	972.95	7.65	-0.91		1.69	
525+50	49333	5-yr	3336	976.37	6.54	975.34	8.09	-1.03		1.55	
525+50	49333	10-yr	4375	978.2	6.83	977.33	7.93	-0.87		1.10	
525+50	49333	50-yr	7239	982.25	7.6	981.88	7.86	-0.37		0.26	
525+50	49333	100-yr	8721	983.76	8.11	983.47	8.17	-0.29		0.06	
526+00	49293	Avg Annual	134	968.4	2.07	968.31	2.32	-0.09		0.25	
526+00	49293	0.5-yr	1422	972.23	5.17	971.74	6.46	-0.49		1.29	
526+00	49293	1-yr	1670	972.84	5.35	972.17	6.86	-0.67		1.51	
526+00	49293	1.5-yr	1761	973.06	5.41	972.32	6.98	-0.74		1.57	
526+00	49293	2-yr	2047	973.7	5.59	972.78	7.34	-0.92		1.75	
526+00	49293	5-yr	3336	976.21	6.23	975.16	7.75	-1.05		1.52	
526+00	49293	10-yr	4375	978.06	6.55	977.17	7.61	-0.89		1.06	
526+00	49293	50-yr	7239	982.11	7.43	981.74	7.57	-0.37		0.14	
526+00	49293	100-yr	8721	983.61	7.97	983.32	7.91	-0.29		-0.06	
526+50	49233	Avg Annual	134	967.92	3.94	967.76	4.9	-0.16		0.96	
526+50	49233	0.5-yr	1422	971.86	5.92	970.63	9.38	-1.23		3.46	
526+50	49233	1-yr	1670	972.5	5.99	971.14	9.43	-1.36		3.44	
526+50	49233	1.5-yr	1761	972.73	6.02	971.32	9.45	-1.41		3.43	
526+50	49233	2-yr	2047	973.39	6.13	971.86	9.53	-1.53		3.40	
526+50	49233	5-yr	3336	975.94	6.63	974.63	8.78	-1.31		2.15	
526+50	49233	10-yr	4375	977.83	6.83	976.76	8.28	-1.07		1.45	
526+50	49233	50-yr	7239	981.92	7.63	981.47	7.89	-0.45		0.26	
526+50	49233	100-yr	8721	983.41	8.19	983.06	8.22	-0.35		0.03	

Table B-1

## Summary of HEC-RAS Predictions for Changes in Water Surface Elevations for Phase 2 from Elm St to Dawes Ave.

Stationing		Storm		Existing		Phase 2 Design		Change (Design - Existing)			
Const Sta	River Sta	Profile	Q (cfs)	EI. (ft.)	V (fps)	EI. (ft)	V (fps)	Δ EI	MAX??	Δ V (fps)	MAX??
527+00	49188	Avg Annual	134	966.99	3.77	967.05	3.65	0.06		-0.12	
527+00	49188	0.5-yr	1422	971.78	4.9	970.62	7.28	-1.16		2.38	
527+00	49188	1-yr	1670	972.43	5.05	971.13	7.5	-1.30		2.45	
527+00	49188	1.5-yr	1761	972.66	5.11	971.32	7.57	-1.34		2.46	
527+00	49188	2-yr	2047	973.33	5.27	971.86	7.79	-1.47		2.52	
527+00	49188	5-yr	3336	975.88	5.93	974.58	7.76	-1.30		1.83	
527+00	49188	10-yr	4375	977.77	6.25	976.67	7.59	-1.10		1.34	
527+00	49188	50-yr	7239	981.89	7.01	981.37	7.56	-0.52		0.55	
527+00	49188	100-yr	8721	983.39	7.49	982.94	7.92	-0.45		0.43	
527+50	49133	Avg Annual	134	966.5	2.91	966.27	5.1	-0.23		2.19	
527+50	49133	0.5-yr	1422	971.69	4.49	970.27	7.53	-1.42		3.04	
527+50	49133	1-yr	1670	972.34	4.69	970.81	7.71	-1.53		3.02	
527+50	49133	1.5-yr	1761	972.57	4.76	971	7.77	-1.57		3.01	
527+50	49133	2-yr	2047	973.23	4.97	971.57	7.95	-1.66		2.98	
527+50	49133	5-yr	3336	975.77	5.71	974.35	7.82	-1.42		2.11	
527+50	49133	10-yr	4375	977.67	6.06	976.49	7.57	-1.18		1.51	
527+50	49133	50-yr	7239	981.76	6.98	981.23	7.43	-0.53		0.45	
527+50	49133	100-yr	8721	983.26	7.53	982.8	7.77	-0.46		0.24	
528+00	49105	Avg Annual	134	966.18	2.86	965.96	3.61	-0.22		0.75	
528+00	49105	0.5-yr	1422	971.49	4.75	970.07	7.13	-1.42		2.38	
528+00	49105	1-yr	1670	972.13	4.96	970.61	7.39	-1.52		2.43	
528+00	49105	1.5-yr	1761	972.36	5.03	970.8	7.48	-1.56		2.45	
528+00	49105	2-yr	2047	973.02	5.24	971.37	7.74	-1.65		2.50	
528+00	49105	5-yr	3336	975.54	5.96	974.08	7.93	-1.46		1.97	
528+00	49105	10-yr	4375	977.46	6.23	976.22	7.74	-1.24		1.51	
528+00	49105	50-yr	7239	981.61	6.93	980.99	7.64	-0.62		0.71	
528+00	49105	100-yr	8721	983.11	7.4	982.55	7.99	-0.56		0.59	
528+50	49078	Avg Annual	134	965.94	2.64	965.77	3.05	-0.17		0.41	
528+50	49078	0.5-yr	1422	971.31	4.49	970.02	6.1	-1.29		1.61	
528+50	49078	1-yr	1670	971.95	4.7	970.58	6.34	-1.37		1.64	
528+50	49078	1.5-yr	1761	972.17	4.77	970.78	6.42	-1.39		1.65	
528+50	49078	2-yr	2047	972.83	4.98	971.36	6.66	-1.47		1.68	
528+50	49078	5-yr	3336	975.35	5.74	974.04	6.98	-1.31		1.24	
528+50	49078	10-yr	4375	977.25	6.02	976.16	6.91	-1.09		0.89	
528+50	49078	50-yr	7239	981.48	6.42	980.95	6.76	-0.53		0.34	
528+50	49078	100-yr	8721	983	6.81	982.52	7.08	-0.48		0.27	
529+00	49028	Avg Annual	134	965.81	2.06	965.66	2.4	-0.15		0.34	
529+00	49028	0.5-yr	1422	971.2	4.08	969.98	5.39	-1.22		1.31	
529+00	49028	1-yr	1670	971.83	4.3	970.54	5.65	-1.29		1.35	
529+00	49028	1.5-yr	1761	972.05	4.37	970.74	5.74	-1.31		1.37	
529+00	49028	2-yr	2047	972.7	4.59	971.32	5.99	-1.38		1.40	
529+00	49028	5-yr	3336	975.22	5.33	973.97	6.48	-1.25		1.15	
529+00	49028	10-yr	4375	977.1	5.67	976.08	6.5	-1.02		0.83	
529+00	49028	50-yr	7239	981.33	6.3	980.83	6.6	-0.50		0.30	
529+00	49028	100-yr	8721	982.85	6.72	982.39	6.95	-0.46		0.23	
529+50	48978	Avg Annual	134	965.69	2.17	965.56	2.34	-0.13		0.17	
529+50	48978	0.5-yr	1422	971	4.44	969.79	5.72	-1.21		1.28	
529+50	48978	1-yr	1670	971.62	4.66	970.35	5.98	-1.27		1.32	
529+50	48978	1.5-yr	1761	971.84	4.73	970.55	6.07	-1.29		1.34	
529+50	48978	2-yr	2047	972.49	4.95	971.13	6.32	-1.36		1.37	
529+50	48978	5-yr	3336	974.97	5.72	973.76	6.77	-1.21		1.05	
529+50	48978	10-yr	4375	976.85	6.03	975.88	6.74	-0.97		0.71	
529+50	48978	50-yr	7239	981.1	6.57	980.66	6.74	-0.44		0.17	
529+50	48978	100-yr	8721	982.63	6.96	982.22	7.03	-0.41		0.07	

**Table B-1**  
**Summary of HEC-RAS Predictions for Changes in Water Surface Elevations for Phase 2 from Elm St to Dawes Ave.**

Stationing		Storm	Existing	Phase 2 Design		Change (Design - Existing)					
Const Sta	River Sta	Profile	Q (cfs)	EI. (ft.)	V (fps)	EI. (ft)	V (fps)	Δ EI	MAX??	Δ V (fps)	MAX??
530+00	48928	Avg Annual	134	965.65	1.68	965.52	1.81	-0.13		0.13	
530+00	48928	0.5-yr	1422	970.91	3.66	969.79	4.68	-1.12		1.02	
530+00	48928	1-yr	1670	971.54	3.83	970.37	4.86	-1.17		1.03	
530+00	48928	1.5-yr	1761	971.76	3.88	970.57	4.93	-1.19		1.05	
530+00	48928	2-yr	2047	972.41	4.06	971.17	5.11	-1.24		1.05	
530+00	48928	5-yr	3336	974.93	4.69	973.81	5.51	-1.12		0.82	
530+00	48928	10-yr	4375	976.82	4.99	975.92	5.55	-0.90		0.56	
530+00	48928	50-yr	7239	981.11	5.58	980.69	5.63	-0.42		0.05	
530+00	48928	100-yr	8721	982.64	5.97	982.25	5.93	-0.39		-0.04	
530+50	48868	Avg Annual	134	965.61	1.54	965.5	1.63	-0.11		0.09	
530+50	48868	0.5-yr	1422	970.77	3.72	969.66	4.87	-1.11		1.15	
530+50	48868	1-yr	1670	971.39	3.9	970.24	5.07	-1.15		1.17	
530+50	48868	1.5-yr	1761	971.62	3.96	970.44	5.14	-1.18		1.18	
530+50	48868	2-yr	2047	972.27	4.14	971.03	5.34	-1.24		1.20	
530+50	48868	5-yr	3336	974.78	4.76	973.67	5.75	-1.11		0.99	
530+50	48868	10-yr	4375	976.69	5.01	975.78	5.76	-0.91		0.75	
530+50	48868	50-yr	7239	981.01	5.45	980.55	5.9	-0.46		0.45	
530+50	48868	100-yr	8721	982.56	5.75	982.11	6.22	-0.45		0.47	
531+00	48828	Avg Annual	134	965.54	1.85	965.43	2.01	-0.11		0.16	
531+00	48828	0.5-yr	1422	970.63	3.82	969.58	4.74	-1.05		0.92	
531+00	48828	1-yr	1670	971.25	4.01	970.15	4.94	-1.10		0.93	
531+00	48828	1.5-yr	1761	971.47	4.07	970.36	5	-1.11		0.93	
531+00	48828	2-yr	2047	972.12	4.25	970.95	5.2	-1.17		0.95	
531+00	48828	5-yr	3336	974.62	4.88	973.59	5.64	-1.03		0.76	
531+00	48828	10-yr	4375	976.53	5.14	975.71	5.68	-0.82		0.54	
531+00	48828	50-yr	7239	980.88	5.51	980.49	5.64	-0.39		0.13	
531+00	48828	100-yr	8721	982.45	5.74	982.07	5.79	-0.38		0.05	
531+50	48768	Avg Annual	134	965.31	3.02	965.17	3.34	-0.14		0.32	
531+50	48768	0.5-yr	1422	970.44	4.12	969.34	5.42	-1.10		1.30	
531+50	48768	1-yr	1670	971.07	4.28	969.93	5.58	-1.14		1.30	
531+50	48768	1.5-yr	1761	971.28	4.34	970.13	5.63	-1.15		1.29	
531+50	48768	2-yr	2047	971.93	4.51	970.74	5.8	-1.19		1.29	
531+50	48768	5-yr	3336	974.43	5.13	973.4	6.09	-1.03		0.96	
531+50	48768	10-yr	4375	976.34	5.38	975.54	6.03	-0.80		0.65	
531+50	48768	50-yr	7239	980.7	5.84	980.35	5.75	-0.35		-0.09	
531+50	48768	100-yr	8721	982.28	6.08	981.95	5.8	-0.33		-0.28	
532+00	48733	Avg Annual	134	965.36	1	965.25	1.04	-0.11		0.04	
532+00	48733	0.5-yr	1422	970.43	2.9	969.46	3.52	-0.97		0.62	
532+00	48733	1-yr	1670	971.06	3.08	970.05	3.71	-1.01		0.63	
532+00	48733	1.5-yr	1761	971.27	3.14	970.25	3.77	-1.02		0.63	
532+00	48733	2-yr	2047	971.92	3.31	970.86	3.96	-1.06		0.65	
532+00	48733	5-yr	3336	974.43	3.92	973.51	4.43	-0.92		0.51	
532+00	48733	10-yr	4375	976.35	4.16	975.63	4.51	-0.72		0.35	
532+00	48733	50-yr	7239	980.76	4.32	980.39	4.46	-0.37		0.14	
532+00	48733	100-yr	8721	982.35	4.53	981.99	4.61	-0.36		0.08	
532+50	48668	Avg Annual	134	965.28	2.01	965.2	1.74	-0.08		-0.27	
532+50	48668	0.5-yr	1422	970.32	3.15	969.44	3.12	-0.88		-0.03	
532+50	48668	1-yr	1670	970.95	3.3	970.04	3.23	-0.91		-0.07	
532+50	48668	1.5-yr	1761	971.17	3.35	970.25	3.27	-0.92		-0.08	
532+50	48668	2-yr	2047	971.82	3.5	970.87	3.38	-0.95		-0.12	
532+50	48668	5-yr	3336	974.33	3.98	973.53	3.66	-0.80		-0.32	
532+50	48668	10-yr	4375	976.25	4.13	975.66	3.7	-0.59		-0.43	
532+50	48668	50-yr	7239	980.66	4.39	980.39	3.89	-0.27		-0.50	
532+50	48668	100-yr	8721	982.25	4.64	981.99	4.12	-0.26		-0.52	

**Table B-1**  
**Summary of HEC-RAS Predictions for Changes in Water Surface Elevations for Phase 2 from Elm St to Dawes Ave.**

Stationing		Storm		Existing		Phase 2 Design		Change (Design - Existing)			
Const Sta	River Sta	Profile	Q (cfs)	EI. (ft.)	V (fps)	EI. (ft)	V (fps)	Δ EI	MAX??	Δ V (fps)	MAX??
533+00	48633	Avg Annual	134	964.81	3.87	964.95	2.87	0.14		-1.00	
533+00	48633	0.5-yr	1422	970.01	4.41	969.25	4.21	-0.76		-0.20	
533+00	48633	1-yr	1670	970.64	4.54	969.84	4.35	-0.80		-0.19	
533+00	48633	1.5-yr	1761	970.85	4.59	970.05	4.4	-0.80		-0.19	
533+00	48633	2-yr	2047	971.5	4.74	970.66	4.56	-0.84		-0.18	
533+00	48633	5-yr	3336	973.96	5.34	973.29	4.92	-0.67		-0.42	
533+00	48633	10-yr	4375	975.88	5.52	975.42	4.95	-0.46		-0.57	
533+00	48633	50-yr	7239	980.3	5.87	980.15	5.15	-0.15		-0.72	
533+00	48633	100-yr	8721	981.87	6.18	981.72	5.45	-0.15		-0.73	
533+50	48568	Avg Annual	134	964.49	3.15	964.3	4.59	-0.19		1.44	
533+50	48568	0.5-yr	1422	969.72	4.59	968.96	5.37	-0.76		0.78	
533+50	48568	1-yr	1670	970.36	4.73	969.54	5.56	-0.82		0.83	
533+50	48568	1.5-yr	1761	970.58	4.79	969.74	5.63	-0.84		0.84	
533+50	48568	2-yr	2047	971.23	4.96	970.34	5.83	-0.89		0.87	
533+50	48568	5-yr	3336	973.68	5.61	972.94	6.25	-0.74		0.64	
533+50	48568	10-yr	4375	975.63	5.79	975.09	6.2	-0.54		0.41	
533+50	48568	50-yr	7239	980.11	6.07	979.9	6	-0.21		-0.07	
533+50	48568	100-yr	8721	981.7	6.31	981.48	6.22	-0.22		-0.09	
534+00	48528	Avg Annual	134	964.51	1.49	964.48	1.23	-0.03		-0.26	
534+00	48528	0.5-yr	1422	969.64	3.91	968.98	4.32	-0.66		0.41	
534+00	48528	1-yr	1670	970.27	4.14	969.55	4.6	-0.72		0.46	
534+00	48528	1.5-yr	1761	970.48	4.23	969.76	4.69	-0.72		0.46	
534+00	48528	2-yr	2047	971.13	4.46	970.35	4.97	-0.78		0.51	
534+00	48528	5-yr	3336	973.55	5.27	972.89	5.7	-0.66		0.43	
534+00	48528	10-yr	4375	975.49	5.56	975.02	5.84	-0.47		0.28	
534+00	48528	50-yr	7239	979.98	5.94	979.78	5.89	-0.20		-0.05	
534+00	48528	100-yr	8721	981.57	6.2	981.37	6.09	-0.20		-0.11	
534+50	48483	Avg Annual	134	964.48	1.47	964.45	1.48	-0.03		0.01	
534+50	48483	0.5-yr	1422	969.52	4.16	968.84	4.74	-0.68		0.58	
534+50	48483	1-yr	1670	970.14	4.42	969.41	5.03	-0.73		0.61	
534+50	48483	1.5-yr	1761	970.35	4.51	969.61	5.12	-0.74		0.61	
534+50	48483	2-yr	2047	970.98	4.77	970.19	5.41	-0.79		0.64	
534+50	48483	5-yr	3336	973.35	5.67	972.69	6.16	-0.66		0.49	
534+50	48483	10-yr	4375	975.29	5.96	974.83	6.24	-0.46		0.28	
534+50	48483	50-yr	7239	979.81	6.32	979.6	6.07	-0.21		-0.25	
534+50	48483	100-yr	8721	981.43	6.51	981.23	6.19	-0.20		-0.32	
535+00	48423	Avg Annual	134	964.42	1.9	964.39	1.97	-0.03		0.07	
535+00	48423	0.5-yr	1422	969.38	4.44	968.65	5.28	-0.73		0.84	
535+00	48423	1-yr	1670	970	4.66	969.21	5.55	-0.79		0.89	
535+00	48423	1.5-yr	1761	970.21	4.74	969.41	5.64	-0.80		0.90	
535+00	48423	2-yr	2047	970.83	4.97	969.99	5.92	-0.84		0.95	
535+00	48423	5-yr	3336	973.2	5.79	972.48	6.57	-0.72		0.78	
535+00	48423	10-yr	4375	975.15	6.02	974.64	6.55	-0.51		0.53	
535+00	48423	50-yr	7239	979.72	6.24	979.45	6.11	-0.27		-0.13	
535+00	48423	100-yr	8721	981.35	6.37	981.11	6.14	-0.24		-0.23	
535+50	48378	Avg Annual	134	964.29	2.52	964.2	3.04	-0.09		0.52	
535+50	48378	0.5-yr	1422	969.16	4.88	968.4	5.86	-0.76		0.98	
535+50	48378	1-yr	1670	969.78	5.07	968.97	6.07	-0.81		1.00	
535+50	48378	1.5-yr	1761	969.98	5.15	969.17	6.14	-0.81		0.99	
535+50	48378	2-yr	2047	970.61	5.36	969.76	6.37	-0.85		1.01	
535+50	48378	5-yr	3336	972.95	6.17	972.27	6.9	-0.68		0.73	
535+50	48378	10-yr	4375	974.93	6.35	974.46	6.79	-0.47		0.44	
535+50	48378	50-yr	7239	979.56	6.46	979.21	6.71	-0.35		0.25	
535+50	48378	100-yr	8721	981.19	6.59	980.86	6.86	-0.33		0.27	

**Table B-1**  
**Summary of HEC-RAS Predictions for Changes in Water Surface Elevations for Phase 2 from Elm St to Dawes Ave.**

Stationing		Storm		Existing		Phase 2 Design		Change (Design - Existing)			
Const Sta	River Sta	Profile	Q (cfs)	EI. (ft.)	V (fps)	EI. (ft)	V (fps)	Δ EI	MAX???	Δ V (fps)	MAX???
536+00	48328	Avg Annual	134	964.16	2.39	964.07	2.42	-0.09		0.03	
536+00	48328	0.5-yr	1422	969.01	4.72	968.36	5.09	-0.65		0.37	
536+00	48328	1-yr	1670	969.63	4.91	968.94	5.3	-0.69		0.39	
536+00	48328	1.5-yr	1761	969.83	4.98	969.14	5.36	-0.69		0.38	
536+00	48328	2-yr	2047	970.46	5.19	969.73	5.58	-0.73		0.39	
536+00	48328	5-yr	3336	972.81	5.89	972.24	6.13	-0.57		0.24	
536+00	48328	10-yr	4375	974.81	5.97	974.43	6.06	-0.38		0.09	
536+00	48328	50-yr	7239	979.46	6.18	979.17	6.23	-0.29		0.05	
536+00	48328	100-yr	8721	981.05	6.51	980.79	6.57	-0.26		0.06	
536+50	48273	Avg Annual	134	964.12	1.61	964.04	1.71	-0.08		0.10	
536+50	48273	0.5-yr	1422	968.94	4.08	968.31	4.63	-0.63		0.55	
536+50	48273	1-yr	1670	969.55	4.3	968.88	4.87	-0.67		0.57	
536+50	48273	1.5-yr	1761	969.76	4.38	969.09	4.95	-0.67		0.57	
536+50	48273	2-yr	2047	970.38	4.61	969.68	5.2	-0.70		0.59	
536+50	48273	5-yr	3336	972.7	5.44	972.16	5.88	-0.54		0.44	
536+50	48273	10-yr	4375	974.7	5.66	974.33	5.92	-0.37		0.26	
536+50	48273	50-yr	7239	979.41	5.78	979.12	5.95	-0.29		0.17	
536+50	48273	100-yr	8721	981.03	5.94	980.78	6.11	-0.25		0.17	
537+00	48228	Avg Annual	134	964.05	1.92	963.98	1.87	-0.07		-0.05	
537+00	48228	0.5-yr	1422	968.76	4.49	968.13	5.09	-0.63		0.60	
537+00	48228	1-yr	1670	969.37	4.72	968.7	5.34	-0.67		0.62	
537+00	48228	1.5-yr	1761	969.57	4.8	968.9	5.43	-0.67		0.63	
537+00	48228	2-yr	2047	970.17	5.05	969.48	5.7	-0.69		0.65	
537+00	48228	5-yr	3336	972.46	5.88	971.92	6.42	-0.54		0.54	
537+00	48228	10-yr	4375	974.48	5.99	974.11	6.35	-0.37		0.36	
537+00	48228	50-yr	7239	979.26	5.94	978.97	6.2	-0.29		0.26	
537+00	48228	100-yr	8721	980.89	6.07	980.64	6.32	-0.25		0.25	
537+50	48178	Avg Annual	134	964.04	1.21	963.97	1.19	-0.07		-0.02	
537+50	48178	0.5-yr	1422	968.74	3.85	968.13	4.26	-0.61		0.41	
537+50	48178	1-yr	1670	969.34	4.1	968.71	4.53	-0.63		0.43	
537+50	48178	1.5-yr	1761	969.54	4.19	968.91	4.62	-0.63		0.43	
537+50	48178	2-yr	2047	970.15	4.44	969.49	4.9	-0.66		0.46	
537+50	48178	5-yr	3336	972.42	5.38	971.89	5.69	-0.53		0.31	
537+50	48178	10-yr	4375	974.43	5.67	974.06	5.75	-0.37		0.08	
537+50	48178	50-yr	7239	979.18	6.02	978.92	5.91	-0.26		-0.11	
537+50	48178	100-yr	8721	980.77	6.33	980.57	6.15	-0.20		-0.18	
538+00	48128	Avg Annual	134	964.03	1.21	963.96	1.28	-0.07		0.07	
538+00	48128	0.5-yr	1422	968.66	3.94	968.02	4.54	-0.64		0.60	
538+00	48128	1-yr	1670	969.26	4.18	968.58	4.82	-0.68		0.64	
538+00	48128	1.5-yr	1761	969.46	4.27	968.78	4.91	-0.68		0.64	
538+00	48128	2-yr	2047	970.06	4.52	969.36	5.19	-0.70		0.67	
538+00	48128	5-yr	3336	972.32	5.41	971.71	6.02	-0.61		0.61	
538+00	48128	10-yr	4375	974.36	5.62	973.9	6.07	-0.46		0.45	
538+00	48128	50-yr	7239	979.12	5.88	978.79	6.2	-0.33		0.32	
538+00	48128	100-yr	8721	980.72	6.2	980.43	6.46	-0.29		0.26	
538+50	48078	Avg Annual	134	964	1.31	963.92	1.61	-0.08		0.30	
538+50	48078	0.5-yr	1422	968.59	3.77	967.87	4.91	-0.72		1.14	
538+50	48078	1-yr	1670	969.19	3.99	968.43	5.17	-0.76		1.18	
538+50	48078	1.5-yr	1761	969.38	4.07	968.63	5.26	-0.75		1.19	
538+50	48078	2-yr	2047	969.98	4.31	969.2	5.54	-0.78		1.23	
538+50	48078	5-yr	3336	972.24	5.12	971.52	6.34	-0.72		1.22	
538+50	48078	10-yr	4375	974.29	5.22	973.75	6.32	-0.54		1.10	
538+50	48078	50-yr	7239	979.07	5.39	978.65	6.37	-0.42		0.98	
538+50	48078	100-yr	8721	980.66	5.7	980.27	6.7	-0.39		1.00	

Table B-1

Summary of HEC-RAS Predictions for Changes in Water Surface Elevations for Phase 2 from Elm St to Dawes Ave.

Stationing		Storm		Existing		Phase 2 Design		Change (Design - Existing)			
Const Sta	River Sta	Profile	Q (cfs)	EI. (ft.)	V (fps)	EI. (ft)	V (fps)	Δ EI	MAX??	Δ V (fps)	MAX??
539+00	48023	Avg Annual	134	963.93	1.92	963.84	1.96	-0.09		0.04	
539+00	48023	0.5-yr	1422	968.45	4.22	967.76	4.94	-0.69		0.72	
539+00	48023	1-yr	1670	969.04	4.42	968.33	5.14	-0.71		0.72	
539+00	48023	1.5-yr	1761	969.24	4.49	968.53	5.21	-0.71		0.72	
539+00	48023	2-yr	2047	969.83	4.71	969.1	5.43	-0.73		0.72	
539+00	48023	5-yr	3336	972.06	5.5	971.45	6.08	-0.61		0.58	
539+00	48023	10-yr	4375	974.12	5.61	973.7	5.94	-0.42		0.33	
539+00	48023	50-yr	7239	978.9	5.81	978.61	5.99	-0.29		0.18	
539+00	48023	100-yr	8721	980.48	6.15	980.23	6.3	-0.25		0.15	
539+50	47988	Avg Annual	134	963.79	2.29	963.68	2.57	-0.11		0.28	
539+50	47988	0.5-yr	1422	968.36	4.09	967.65	4.85	-0.71		0.76	
539+50	47988	1-yr	1670	968.96	4.22	968.24	4.94	-0.72		0.72	
539+50	47988	1.5-yr	1761	969.16	4.27	968.45	4.97	-0.71		0.70	
539+50	47988	2-yr	2047	969.77	4.42	969.04	5.09	-0.73		0.67	
539+50	47988	5-yr	3336	972.02	5.01	971.43	5.49	-0.59		0.48	
539+50	47988	10-yr	4375	974.1	5.06	973.7	5.32	-0.40		0.26	
539+50	47988	50-yr	7239	978.91	5.29	978.63	5.41	-0.28		0.12	
539+50	47988	100-yr	8721	980.49	5.59	980.26	5.68	-0.23		0.09	
540+00	47923	Avg Annual	134	963.73	1.62	963.62	1.72	-0.11		0.10	
540+00	47923	0.5-yr	1422	968.29	3.78	967.6	4.31	-0.69		0.53	
540+00	47923	1-yr	1670	968.9	3.93	968.19	4.44	-0.71		0.51	
540+00	47923	1.5-yr	1761	969.1	3.99	968.4	4.48	-0.70		0.49	
540+00	47923	2-yr	2047	969.7	4.16	969	4.64	-0.70		0.48	
540+00	47923	5-yr	3336	971.96	4.82	971.39	5.11	-0.57		0.29	
540+00	47923	10-yr	4375	974.05	4.89	973.67	5.03	-0.38		0.14	
540+00	47923	50-yr	7239	978.89	5.05	978.62	5.16	-0.27		0.11	
540+00	47923	100-yr	8721	980.49	5.27	980.26	5.39	-0.23		0.12	
540+50	47868	Avg Annual	134	963.62	2.18	963.54	2.04	-0.08		-0.14	
540+50	47868	0.5-yr	1422	968.12	4.37	967.37	5.09	-0.75		0.72	
540+50	47868	1-yr	1670	968.73	4.48	967.96	5.23	-0.77		0.75	
540+50	47868	1.5-yr	1761	968.93	4.52	968.17	5.27	-0.76		0.75	
540+50	47868	2-yr	2047	969.54	4.66	968.77	5.38	-0.77		0.72	
540+50	47868	5-yr	3336	971.81	5.23	971.21	5.69	-0.60		0.46	
540+50	47868	10-yr	4375	973.93	5.19	973.54	5.43	-0.39		0.24	
540+50	47868	50-yr	7239	978.85	5.01	978.57	5.25	-0.28		0.24	
540+50	47868	100-yr	8721	980.46	5.21	980.22	5.45	-0.24		0.24	
540+75	47818	Avg Annual	134	963.56	1.93	963.5	1.95	-0.06		0.02	
540+75	47818	0.5-yr	1422	968.04	4.28	967.34	4.89	-0.70		0.61	
540+75	47818	1-yr	1670	968.66	4.45	967.92	5.05	-0.74		0.60	
540+75	47818	1.5-yr	1761	968.86	4.52	968.13	5.11	-0.73		0.59	
540+75	47818	2-yr	2047	969.45	4.73	968.72	5.29	-0.73		0.56	
540+75	47818	5-yr	3336	971.68	5.51	971.11	5.89	-0.57		0.38	
540+75	47818	10-yr	4375	973.79	5.63	973.43	5.82	-0.36		0.19	
540+75	47818	50-yr	7239	978.62	6.02	978.37	6.12	-0.25		0.10	
540+75	47818	100-yr	8721	980.19	6.39	979.97	6.51	-0.22		0.12	
541+00	47773	Avg Annual	134	963.48	2.19	963.46	2.03	-0.02		-0.16	
541+00	47773	0.5-yr	1422	967.79	5.11	967.25	5.02	-0.54		-0.09	
541+00	47773	1-yr	1670	968.4	5.22	967.84	5.16	-0.56		-0.06	
541+00	47773	1.5-yr	1761	968.6	5.28	968.05	5.22	-0.55		-0.06	
541+00	47773	2-yr	2047	969.2	5.42	968.66	5.37	-0.54		-0.05	
541+00	47773	5-yr	3336	971.52	5.66	971.07	5.64	-0.45		-0.02	
541+00	47773	10-yr	4375	973.71	5.4	973.44	5.23	-0.27		-0.17	
541+00	47773	50-yr	7239	978.65	5.23	978.46	5.03	-0.19		-0.20	
541+00	47773	100-yr	8721	980.25	5.38	980.1	5.19	-0.15		-0.19	

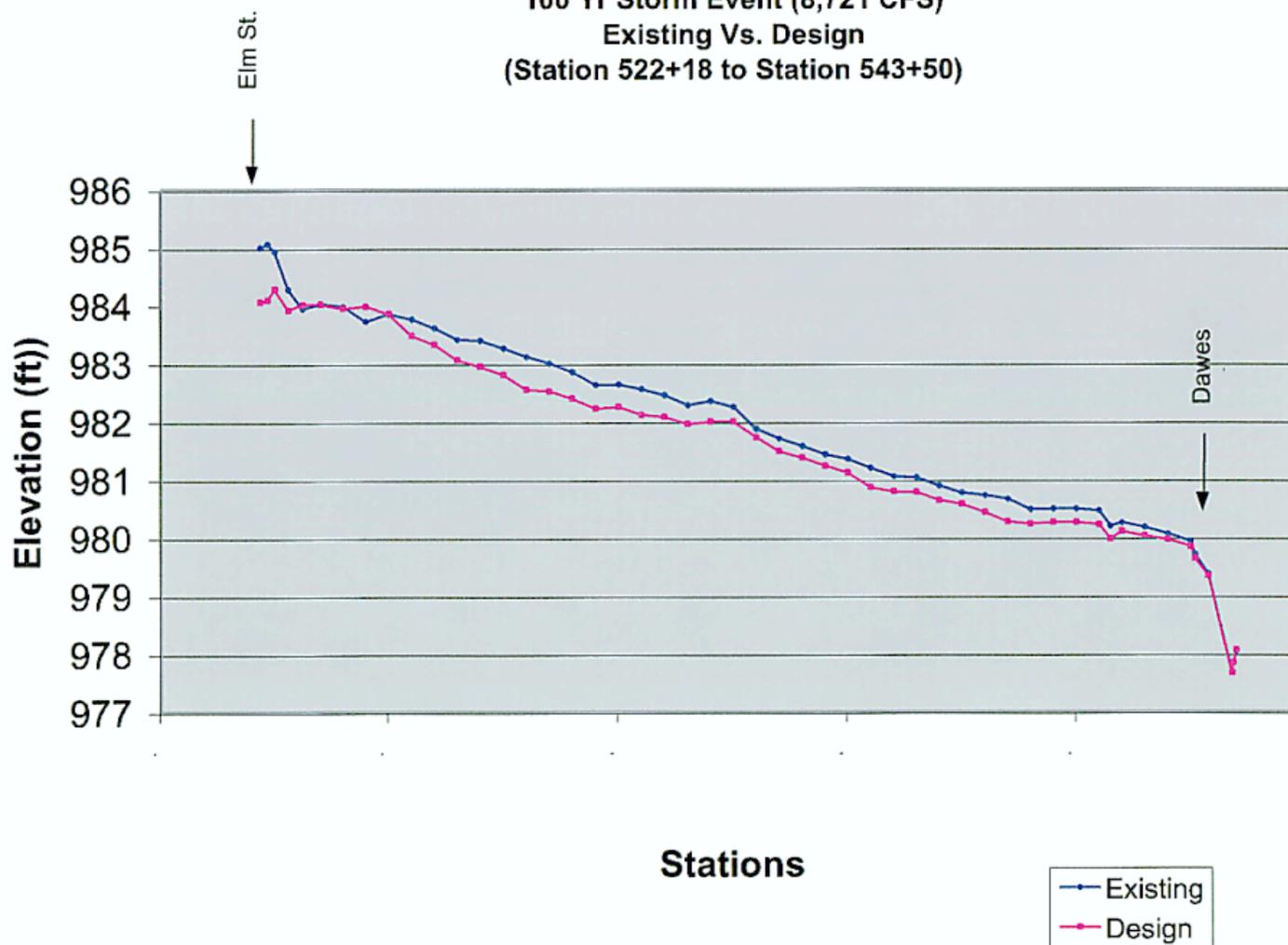
**Table B-1**  
**Summary of HEC-RAS Predictions for Changes in Water Surface Elevations for Phase 2 from Elm St to Dawes Ave.**

Stationing		Storm		Existing		Phase 2 Design		Change (Design - Existing)			
Const Sta	River Sta	Profile	Q (cfs)	EI. (ft.)	V (fps)	EI. (ft)	V (fps)	Δ EI	MAX??	Δ V (fps)	MAX??
541+50	47718	Avg Annual	134	963.35	2.16	963.3	2.54	-0.05		0.38	
541+50	47718	0.5-yr	1422	967.63	4.17	967.14	4.91	-0.49		0.74	
541+50	47718	1-yr	1670	968.24	4.25	967.75	4.95	-0.49		0.70	
541+50	47718	1.5-yr	1761	968.45	4.29	967.96	4.97	-0.49		0.68	
541+50	47718	2-yr	2047	969.06	4.4	968.59	5.02	-0.47		0.62	
541+50	47718	5-yr	3336	971.36	4.9	970.96	5.35	-0.40		0.45	
541+50	47718	10-yr	4375	973.59	4.82	973.35	5.09	-0.24		0.27	
541+50	47718	50-yr	7239	978.56	4.84	978.38	5.03	-0.18		0.19	
541+50	47718	100-yr	8721	980.18	4.98	980.02	5.21	-0.16		0.23	
542+00	47706	Avg Annual	134	962.98	3.26	963.04	2.85	0.06		-0.41	
542+00	47706	0.5-yr	1422	967.3	4.59	967.03	4.8	-0.27		0.21	
542+00	47706	1-yr	1670	967.92	4.67	967.64	4.86	-0.28		0.19	
542+00	47706	1.5-yr	1761	968.13	4.7	967.85	4.88	-0.28		0.18	
542+00	47706	2-yr	2047	968.75	4.79	968.49	4.94	-0.26		0.15	
542+00	47706	5-yr	3336	971.09	5.2	970.86	5.31	-0.23		0.11	
542+00	47706	10-yr	4375	973.4	4.99	973.26	5.03	-0.14		0.04	
542+00	47706	50-yr	7239	978.43	4.94	978.32	4.98	-0.11		0.04	
542+00	47706	100-yr	8721	980.06	5.06	979.96	5.14	-0.10		0.08	
542+50	47694	Avg Annual	134	962.41	3.19	962.31	4.58	-0.10		1.39	
542+50	47694	0.5-yr	1422	966.99	4.66	966.88	4.94	-0.11		0.28	
542+50	47694	1-yr	1670	967.62	4.72	967.51	4.98	-0.11		0.26	
542+50	47694	1.5-yr	1761	967.83	4.75	967.72	5	-0.11		0.25	
542+50	47694	2-yr	2047	968.47	4.84	968.36	5.08	-0.11		0.24	
542+50	47694	5-yr	3336	970.82	5.33	970.71	5.54	-0.11		0.21	
542+50	47694	10-yr	4375	973.2	5.14	973.13	5.29	-0.07		0.15	
542+50	47694	50-yr	7239	978.28	5.13	978.19	5.27	-0.09		0.14	
542+50	47694	100-yr	8721	979.93	5.25	979.84	5.42	-0.09		0.17	
542+60.13	47682	Avg Annual	134	962.41	2.44	962.35	2.7	-0.06		0.26	
542+60.13	47682	0.5-yr	1422	966.95	4.55	966.88	4.65	-0.07		0.10	
542+60.13	47682	1-yr	1670	967.57	4.68	967.51	4.77	-0.06		0.09	
542+60.13	47682	1.5-yr	1761	967.78	4.73	967.72	4.81	-0.06		0.08	
542+60.13	47682	2-yr	2047	968.42	4.88	968.36	4.97	-0.06		0.09	
542+60.13	47682	5-yr	3336	970.73	5.61	970.66	5.68	-0.07		0.07	
542+60.13	47682	10-yr	4375	973.08	5.59	973.05	5.62	-0.03		0.03	
542+60.13	47682	50-yr	7239	978.1	5.98	978.03	6.03	-0.07		0.05	
542+60.13	47682	100-yr	8721	979.7	6.33	979.63	6.43	-0.07		0.10	
542+87.68	47658	Avg Annual	134	962.34	2.07	962.28	2.18	-0.06		0.11	
542+87.68	47658	0.5-yr	1422	966.91	4.26	966.87	4.28	-0.04		0.02	
542+87.68	47658	1-yr	1670	967.52	4.51	967.49	4.53	-0.03		0.02	
542+87.68	47658	1.5-yr	1761	967.73	4.6	967.7	4.62	-0.03		0.02	
542+87.68	47658	2-yr	2047	968.36	4.88	968.32	4.9	-0.04		0.02	
542+87.68	47658	5-yr	3336	970.57	6.07	970.53	6.09	-0.04		0.02	
542+87.68	47658	10-yr	4375	972.86	6.38	972.85	6.39	-0.01		0.01	
542+87.68	47658	50-yr	7239	977.73	7.33	977.69	7.36	-0.04		0.03	
542+87.68	47658	100-yr	8721	979.37	7.51	979.34	7.55	-0.03		0.04	
	47630	<b>Dawes Avenue Bridge</b>									
543+40	47603	Avg Annual	134	962.15	1.81	962.15	1.83	0.00		0.02	
543+40	47603	0.5-yr	1422	966.84	4.06	966.82	4.07	-0.02		0.01	
543+40	47603	1-yr	1670	967.45	4.32	967.43	4.33	-0.02		0.01	
543+40	47603	1.5-yr	1761	967.66	4.42	967.64	4.43	-0.02		0.01	
543+40	47603	2-yr	2047	968.28	4.7	968.27	4.71	-0.01		0.01	
543+40	47603	5-yr	3336	970.48	5.9	970.47	5.91	-0.01		0.01	
543+40	47603	10-yr	4375	971.85	6.77	971.83	6.78	-0.02		0.01	
543+40	47603	50-yr	7239	975.71	8.29	975.7	8.29	-0.01		0.00	
543+40	47603	100-yr	8721	977.67	8.61	977.66	8.61	-0.01		0.00	

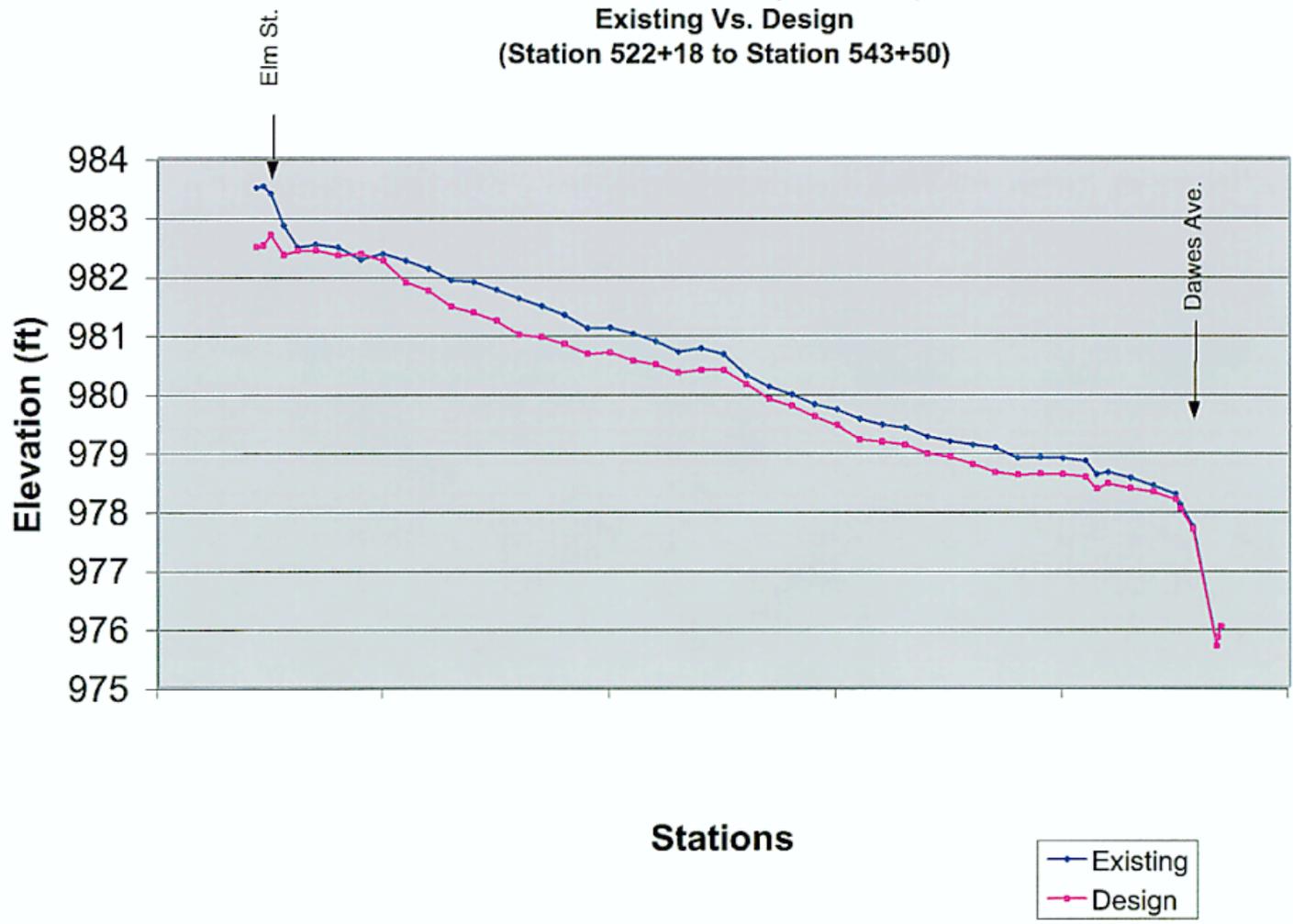
**Table B-1**  
**Summary of HEC-RAS Predictions for Changes in Water Surface Elevations for Phase 2 from Elm St to Dawes Ave.**

Stationing		Storm		Existing		Phase 2 Design		Change (Design - Existing)			
Const Sta	River Sta	Profile	Q (cfs)	EI. (ft.)	V (fps)	EI. (ft)	V (fps)	Δ EI	MAX??	Δ V (fps)	MAX??
543+43	47566	Avg Annual	134	962.03	2.42	962.03	2.42	0.00		0.00	
543+43	47566	0.5-yr	1422	966.7	4.59	966.69	4.6	-0.01		0.01	
543+43	47566	1-yr	1670	967.33	4.73	967.32	4.74	-0.01		0.01	
543+43	47566	1.5-yr	1761	967.55	4.78	967.54	4.79	-0.01		0.01	
543+43	47566	2-yr	2047	968.19	4.91	968.18	4.93	-0.01		0.02	
543+43	47566	5-yr	3336	970.45	5.67	970.45	5.68	0.00		0.01	
543+43	47566	10-yr	4375	971.86	6.27	971.85	6.28	-0.01		0.01	
543+43	47566	50-yr	7239	975.85	7.15	975.85	7.16	0.00		0.01	
543+43	47566	100-yr	8721	977.84	7.4	977.83	7.41	-0.01		0.01	
543+50	47565	Avg Annual	134	962	2.41	962	2.48	0.00		0.07	
543+50	47565	0.5-yr	1422	966.76	3.83	966.75	3.82	-0.01		-0.01	
543+50	47565	1-yr	1670	967.39	3.98	967.39	3.98	0.00		0.00	
543+50	47565	1.5-yr	1761	967.61	4.04	967.6	4.03	-0.01		-0.01	
543+50	47565	2-yr	2047	968.26	4.2	968.25	4.2	-0.01		0.00	
543+50	47565	5-yr	3336	970.54	4.87	970.53	4.89	-0.01		0.02	
543+50	47565	10-yr	4375	971.97	5.3	971.97	5.36	0.00		0.06	
543+50	47565	50-yr	7239	976.02	5.71	976.03	5.82	0.01		0.11	
543+50	47565	100-yr	8721	978.04	5.7	978.05	5.84	0.01		0.14	

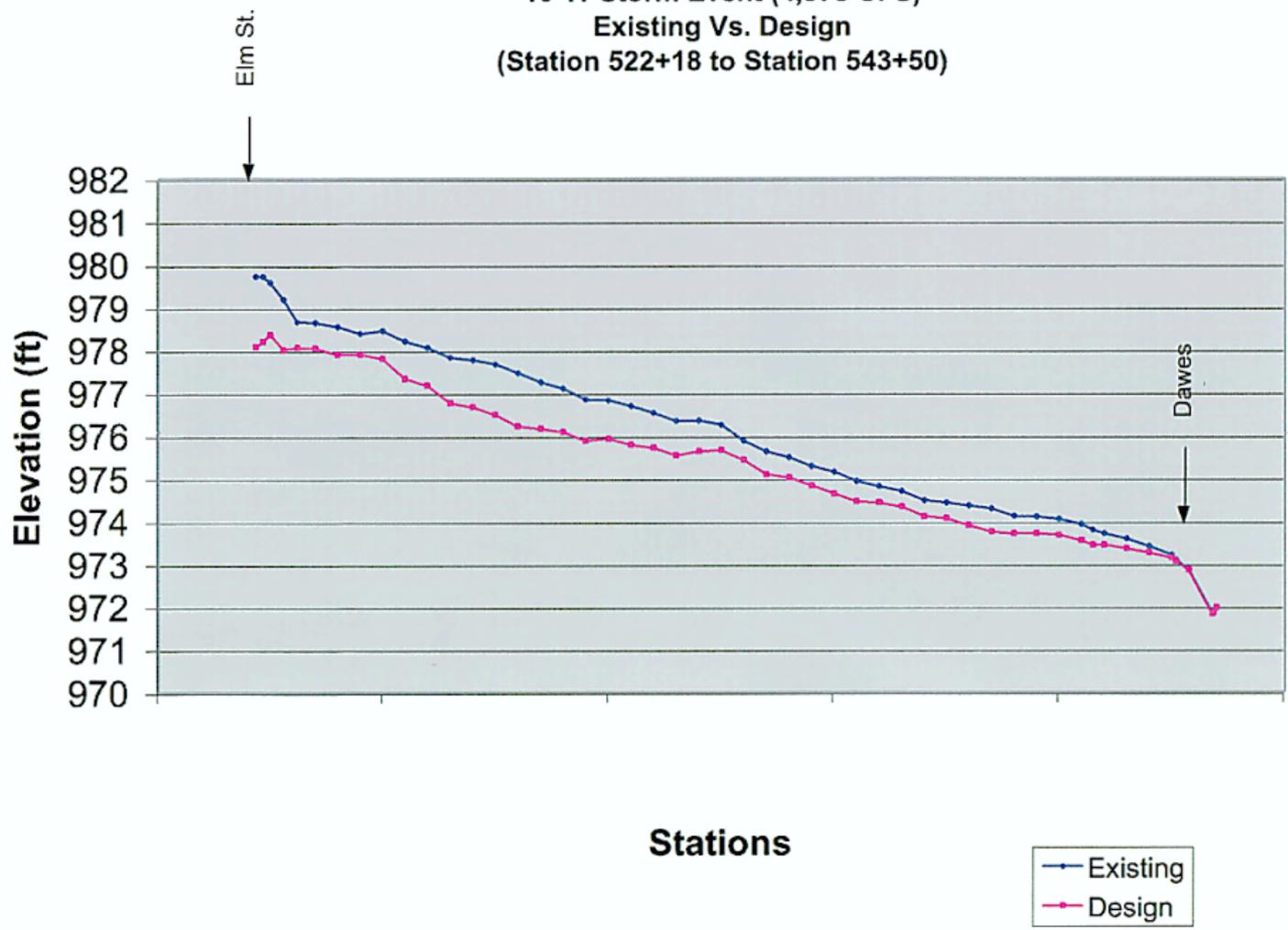
**Figure B-1**  
**Elm St. Bridge to Dawes Ave. Bridge**  
**100 Yr Storm Event (8,721 CFS)**  
**Existing Vs. Design**  
**(Station 522+18 to Station 543+50)**



**Figure B-2**  
**Elm St. Bridge to Dawes Ave. Bridge**  
**50 Yr Storm Event (7,239 CFS)**  
**Existing Vs. Design**  
**(Station 522+18 to Station 543+50)**



**Figure B-3**  
**Elm St. Bridge to Dawes Ave. Bridge**  
**10 Yr Storm Event (4,375 CFS)**  
**Existing Vs. Design**  
**(Station 522+18 to Station 543+50)**



**Figure B-4**  
**Elm St. Bridge to Dawes Ave. Bridge**  
**5 Yr Storm Event (3,336 CFS)**  
**Existing Vs. Design**  
**(Station 522+18 to Station 543+50)**

