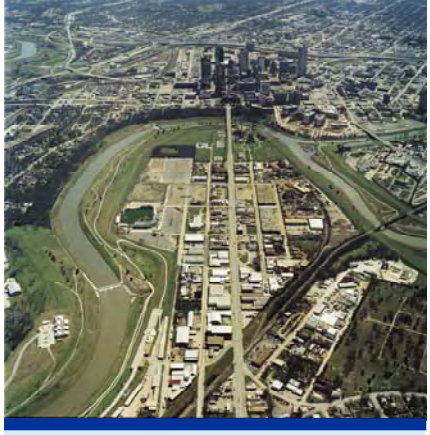
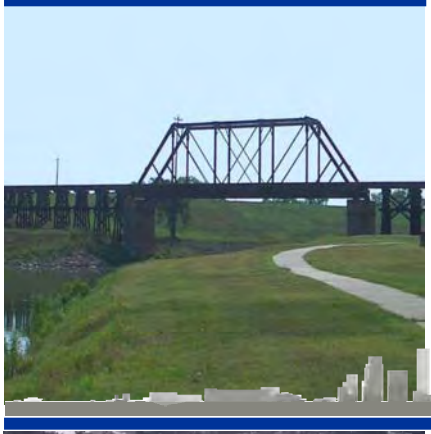
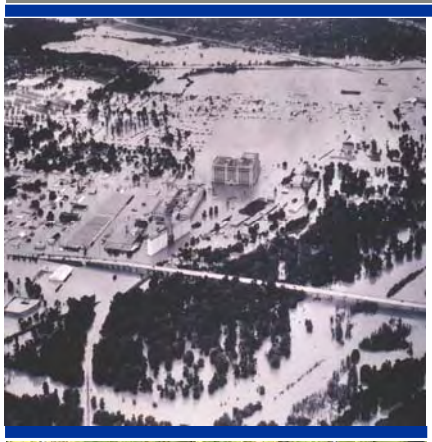
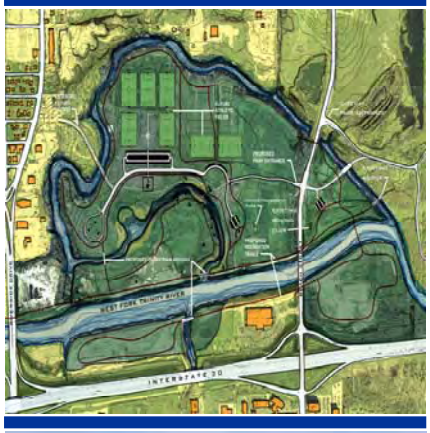




Fort Worth Central City Preliminary Design

Hydrology and Hydraulics





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Final Supplement No. 1
to the Final Environmental
Impact Statement

Appendix A

March 2008

Fort Worth Central City Preliminary Design

Hydrology and Hydraulics

Final Supplement No.1 to the Final Environmental Impact Statement

Appendix A

March 2008

This document is released for the purpose of review under the authority of Eric D. Loucks, Texas PE License 94545 on 28-February-2008. It is not to be used for construction, bidding, permitting or other purposes.

FORT WORTH CENTRAL CITY
Preliminary Design Supplement

Table of Contents

APPENDIX A

Hydraulics and Hydrology

1.0	Hydraulic and Hydrology	1-1
1.01	Background	1-1
2.0	Regulatory Constraints	1-1
2.01	USACE Record of Decision	1-1
2.02	Corridor Development Certificate	1-1
2.03	Federal Emergency Management Agency	1-2
3.0	Analysis	1-2
3.01	FWCC Baseline Conditions	1-3
3.02	Modified Central City Proposed Conditions	1-3
3.03	Samuels Avenue Dam Modification	1-6
3.04	Marine Creek Baseline Conditions	1-7
3.05	Marine Creek Proposed Conditions	1-7
4.0	Results	1-7
4.01	Valley Storage	1-7
4.02	Water Surface Elevation	1-8
4.03	Head Loss	1-8

TABLE OF TABLES:

Table No.	Table Title
3-1	Riverside Oxbow-Gateway Park Proposed Manning "n" Values
3-2	Marine Creek Water Surface Elevations – Baseline and Proposed Conditions
4-1	Valley Storage Calculations for Baseline and Proposed Conditions
4-2	Water Surface Elevations – Baseline and Proposed Conditions

TABLE OF FIGURES:

Figure No.	Figure Title
1-1	Project Location
2-1	Existing FEMA Floodplains
3-1	Overview of Valley Storage Mitigation and Ecosystem Restoration Sites
3-2	Overview of Riverside Oxbow-Gateway Park Ecosystem Restoration Sites

Appendix A
Hydraulics and Hydrology

1.0 Hydraulics and Hydrology

This appendix summarizes the development of the hydrologic and hydraulic models and associated hydrologic and hydraulic analyses for the modified Fort Worth Central City (FWCC) Project. These analyses were completed by CDM on behalf of the U.S. Army Corps of Engineers (USACE) in collaboration with the Tarrant Regional Water District (TRWD), and the City of Fort Worth.

1.01 Background

Hydraulic analyses included revisions to the previously approved HEC-RAS proposed conditions model to reflect the changes resulting from combining the approved Central City project and the Oxbow Ecosystem Restoration project. The essential components of the modified Central City project are shown in Figure 1-1.

2.0 Regulatory Constraints

2.01 USACE Record of Decision

In the mid-1980's, USACE prepared a regional programmatic environmental impact statement (EIS) to establish a floodplain development permitting strategy for the Upper Trinity River and its tributaries. USACE issued a Record of Decision (ROD) in April 1988 specifying criteria the USACE would use to evaluate permit applications in the Upper Trinity River Corridor. The Record of Decision sets forth various criteria for hydraulic impacts, level of protection, habitat mitigation and other considerations related to the Regional EIS.

2.02 Corridor Development Certificate

As a result of the 1988 Record of Decision, the cities and counties in the Upper Trinity River Corridor formed the Trinity River Steering Committee, facilitated by the North Central Texas Council of Governments. The Steering Committee developed and is responsible for implementing the Corridor Development Certificate (CDC) process to meet the 1988 Record of Decision.

Criteria

The CDC process has adopted a common set of permit criteria based on the Record of Decision which describe a consistent design level of protection that should be met for all projects unless granted a variance. These criteria applicable to the Central City project include:

1. Water Surface Elevations. No rise in the 100-year flood or significant rise in the Standard Project Flood water surface elevations for the proposed condition will be allowed.

2. Valley Storage Capacity. The maximum allowable loss in storage capacity for projects in the regulatory zone for the 100-year flood and Standard Project Flood discharges will be 0% and 5%, respectively. The decrease in allowable storage is computed with respect to the amount of storage originally available in the proposed project tract. The loss in storage capacity will be determined on a project-by-project basis.

3. Velocities. Alterations of the floodplain may not increase erosive water velocity on-site or off-site.

4. Conveyance. Alterations of the floodplain must be modeled using equal conveyance reductions on both sides of the channel.

2.03 Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) maintains maps of local floodplains as a part of its administration of the National Flood Insurance Program. For the Central City Project area, Figure 2-1 illustrates the existing 100-yr and 500-yr floodplains as maintained by FEMA. The floodplains shown in Figure 2-1 were obtained from FIRM Panels 48439C0290J, 48439C0295J, 48439C0270J, and 48439C0410J, all effective August 23, 2000.

3.0 Analysis

The baseline conditions hydraulic model used for the initial study was the current CDC model which was developed and is maintained by the USACE. The CDC model was originally developed using the hydraulic step-backwater software program HEC-2 Water Surface Profiles which calculates water surface elevations and computes resulting river reach storage (usually referred to as valley storage) and flow velocities. The model was subsequently converted to HEC-RAS River Analysis System version 3.1.3 by the USACE.

The West Fork Trinity River CDC model limits are the confluence of the West Fork and the Elm Fork in Dallas County on the downstream side and the confluence to Lake Worth Dam on the upstream side, a distance of 58.08 miles.

The original CDC West Fork hydraulic models were developed by extensive use of digitized 2-foot contour interval topography. The topographic data in the channel and overbank areas above the water surface was developed from February/March 1991 aerial photography. The majority of the cross-section data was supplied by the surveying contractor and generated from the topographic data, with cross section locations developed by the USACE. Channel data below

the water surface originated from 1975 field surveys. Additional cross sections were developed from the topographic files and included in the models as necessary. Other information used in the development of the CDC models originated from bridge plans, bridge surveys, field reconnaissance, and levee surveys. Aerial photographs and field reconnaissance were used to determine roughness coefficients.

The hydraulic evaluation of the proposed bypass channel alignment for the FWCC Project was performed using the latest version of U.S. Army Corps of Engineers (USACE) HEC-RAS version 3.1.3. In order to demonstrate compliance with the CDC criteria, the steady-flow capabilities of HEC-RAS were employed and flow inputs were obtained from the HEC-1 hydrologic analysis developed for the regional CDC process.

3.01 FWCC Baseline Conditions

Hydrologic and Hydraulic Models

The hydrologic and hydraulic analyses of the Fort Worth Central City Project were based upon models of the Upper Trinity River system provided by the USACE. The models were developed for the regional CDC process and are maintained by the USACE Fort Worth District. These models are the basis for the baseline conditions and proposed conditions models for the project area.

The baseline HEC-1 model was developed to provide the best available representation of Year 2050 flows in the existing configuration of the floodway. Discussion of the hydrologic and hydraulic baseline condition models was previously presented and approved in Appendix A to the Final EIS for the authorized Central City project. No changes were made to the baseline conditions models due to the merged projects. Therefore, no further discussion is presented.

3.02 Modified Central City Proposed Conditions

The hydraulic evaluation of the proposed valley storage changes to the Modified Central City Project was performed using the U.S. Army Corps of Engineers (USACE) HEC-RAS version 3.1.3. The hydraulic elements of the modified valley storage sites and features were incorporated into the previously approved proposed conditions model to create the modified proposed conditions model. Valley storage sites no longer used in the modified project were removed.

The revised dam location was also incorporated into the modified proposed conditions model. The gate opening, crest elevation, and dam configuration remained the same as in the approved project. The dam was modeled assuming the gates were in the fully open position for both the 100-year and the SPF flood events.

Construction of the proposed bypass channel effectively shortens the West Fork by approximately 7,000 feet and is estimated to cause a net loss of approximately 2,850 acre feet of valley storage under SPF conditions. An estimated additional 2,400 acre-feet would be lost due to drawdown if no action is taken to reduce drawdown. The drawdown on the West Fork is caused by a combination of this shortening of the river as well as the efficient conveyance of the bypass channel, which has a steeper slope and higher velocity than the existing West Fork channel it bypasses. Figure 3-1 shows an overview of proposed valley storage mitigation sites in relation to the HEC-RAS cross sections. Mitigation of valley storage loss is proposed to be provided by:

- Riverside Oxbow – Gateway Park storage mitigation site;
- Off-line storage within the existing Gateway Park ball field levees;
- Two in-line, overbank sites downstream of Samuels Avenue;
- One in-line, overbank site in Riverside Park upstream of Belknap Avenue;
- One in-line, overbank site in Rockwood Park West;
- Ham Branch (West Fork Sump 31) off-line storage mitigation site;
- Drawdown mitigation by raising University Drive; and
- Utilization of the interior water feature for valley storage.

The Riverside Oxbow – Gateway Park valley storage mitigation site is located adjacent to the West Fork between Station 2063+40 and 2228+96 in the HEC-RAS model. This site would provide an additional 1,975 acre feet of storage in the 100-year flood and an additional 1,845 acre feet in the SPF. Figure 3-2 shows the proposed Riverside Oxbow – Gateway Park storage sites in relation to the HEC-RAS cross sections. Refer to Appendix C, Volume II – Supplemental Plans for proposed Riverside Oxbow – Gateway Park grading plans. Existing Manning "n" values in the Riverside Oxbow – Gateway Park overbank area vary from 0.04 to 0.20. CDM coordinated with the USACE Ecosystem and Hydrology and Hydraulics branches to determine acceptable Manning "n" values for the areas modified in the proposed restoration plan. The recommended Manning "n" values for the areas to be modified are shown in Table 3-1, Riverside Oxbow – Gateway Park Proposed Manning "n" Values.

Table 3-1
Riverside Oxbow - Gateway Park
Proposed Manning "n" Values

n	Description
0.06	Recreation Fields
0.065	Scattered Vegetation
0.085	Light Vegetation - Clusters of Trees, Minimal Shrubs
0.15	Dense Vegetation - High/Low Canopy Trees, Low-Lying Shrubs

In the baseline and proposed HEC-RAS models, the area within the existing Gateway Park ball field levees is modeled as a blocked obstruction, and therefore does not contribute to valley storage. The existing levees provide only partial flood protection. The proposed project will raise the levees to SPF, thus allowing this area to provide approximately 270 acre feet of additional valley storage when constructed with appropriate inlet and outlet structures.

Downstream of Samuels Avenue, two valley storage areas will be developed by excavating overbank areas between Station 2417+08 and 2392+62. These sites were incorporated into the model cross-sections because portions of the facilities can both convey and store flow. The storage volume they provide was calculated in HEC-RAS and is approximately 490 acre feet in the SPF.

Upstream of Belknap Avenue, within Riverside Park, a storage area will be developed by excavating the east overbank between Station 2330+91 and 2317+00. This site was incorporated into the HEC-RAS model cross-sections and provides approximately 147 acre feet of storage volume in the SPF.

An additional overbank excavation area will be developed in the upper West Fork, in the vicinity of Rockwood Golf Course, between Station 2723+77 and 2702+49. The proposed excavation will occur in the west overbank, and provides approximately 58 acre feet of storage volume in the SPF.

The Ham Branch Sump (West Fork Sump 31) is located on the west side of the West Fork downstream of East 4th Street. The proposed project will convert the existing sump near the confluence of Ham Branch and the West Fork to a valley storage area. Under the plan, the sump would serve as a valley storage facility by leaving the existing gate structure open at all times, allowing the sump level to rise and fall with the adjacent river level. The performance of the proposed facility was evaluated in a separate analysis using the proposed conditions unsteady flow HEC-RAS model that was developed to evaluate system operation in the EIS for the authorized Central City project. Based on the analysis, Ham Branch Sump will provide 750 acre feet of valley storage during the SPF event on the West Fork.

University Drive at Station 2625+48 on the West Fork would be raised to return the 100-year and SPF water levels upstream of University Drive to near the levels

of baseline conditions, thereby recovering a portion of the drawdown loss. This site was evaluated and reviewed during the authorized Central City EIS process. No changes are proposed to the approved plan to raise University Drive.

Interior Drainage

The project will require appropriate interior drainage storage and conveyance facilities to prevent structure flooding in interior areas. Three distinct interior drainage areas were evaluated and reviewed during the authorized Central City EIS process. No changes are proposed to the approved interior drainage plan. Based on preliminary operations modeling of the interior area with HEC-RAS, approximately 140 acre feet of valley storage will be available during the SPF event.

3.03 Samuels Avenue Dam Modification

The authorized Central City EIS proposed to site the dam downstream from Samuels Avenue and the adjacent three railroad bridges, approximately 1,300 feet downstream from the confluence with Marine Creek. This location resulted in potential impacts on Marine Creek due to both the high backwater elevation of 525 NGVD as well as additional operations when passing flood flows on the Marine Creek watershed. The original site also impacted the lower segment of Lebow Creek by loss of habitat resulting from rerouting of the creek downstream of the dam. In addition, the geotechnical conditions at this site were not optimal; therefore a review of alternate site locations was conducted.

Alternative sites for the dam were evaluated on the West Fork upstream of the Marine Creek confluence, ranging from immediately at the confluence to just downstream of Northside Drive. Sites south of Northside Drive were eliminated due to impacts on Northside Drive, limited area, and conflicts with the bypass channel. Placing the dam too close to the confluence could introduce scour potential at the Samuels Avenue Bridge, while placing it further upstream towards Northside Drive reduced or eliminated options to maintain hydraulic connectivity with Marine Creek.

The revised location of the dam is proposed on the main stem of the West Fork of the Trinity River just upstream of the confluence with Marine Creek. This dam is still referred to as the Samuels Avenue dam due to its proximity to the Samuels Avenue Bridge. The dam is sited approximately 1,750 feet downstream of Northside Drive, immediately upstream from the confluence of Marine Creek. During normal dry weather operation the dam will maintain the normal water pool level elevation of 524.3. The revised site plan for the dam was incorporated into the modified proposed conditions HEC-RAS model.

The benefits of this dam site include reduced backwater impacts to Marine Creek as well as simplifying the operational requirements of Samuels Avenue Dam by allowing Marine Creek flood flows to pass without affecting the urban lake pool elevation. Hydraulic connectivity is maintained, which satisfies project objectives.

An additional benefit to this dam site is the elimination of impacts to Lebow Creek and associated habitat.

3.04 Marine Creek Baseline Conditions

Marine Creek is a tributary of the West Fork of the Trinity River which enters the river along its north bank just upstream of Samuels Avenue. The baseline condition hydraulic model used for Marine Creek was the current effective FEMA Flood Insurance Study (FIS) model which was provided by the USACE. The FIS model was originally developed using the hydraulic step-backwater software program HEC-2. The model was subsequently converted to HEC-RAS version 3.1.3. Marine Creek is not within the CDC Regulatory Zone, and therefore is only regulated by FEMA criteria.

3.05 Marine Creek Proposed Conditions

A fixed low water dam is proposed on Marine Creek approximately 300 feet upstream of the confluence with the main stem of the West Fork of the Trinity River. Several alternatives were evaluated for the Marine Creek dam including both the use of a gated or fixed structure as well as varying the crest width and height. A fixed structure is recommended on Marine Creek as it is able to meet the design requirements of maintaining existing 100-year water surface elevations on Marine Creek while also reducing construction, operation, and maintenance costs.

The fixed dam will pass lower frequency storms on Marine Creek without operation or controls, which was not possible under the previous Samuels Avenue Dam location downstream of the Marine Creek confluence. This structure will have a crest elevation of 516.5 and a crest length of 200 feet. The Marine Creek channel will need to be widened by approximately 50 feet near the dam site in order to accommodate the 200 feet of crest length needed to pass the 100-year flow without causing adverse impacts to water surface elevations upstream. Table 3-2 shows a comparison of 100-year and 500-year baseline and proposed water surface elevations for Marine Creek based on the HEC-RAS model. While the minor water surface elevation increases shown in Table 3-2 would be reduced or eliminated during final design, they would be allowable under FEMA criteria.

4.0 Results

4.01 Valley Storage

Computed valley storage for baseline and proposed conditions for both the 100-year and SPF events is summarized in Table 4-1. All valley storage volumes were obtained from HEC-RAS models except for the Gateway Park ball field levee sites, which were obtained using MicroStation InRoads software. As indicated in Table 4-1, the valley storage loss in the 100-year flood is mitigated well over 100%. The net gain of valley storage in SPF is approximately 37 acre feet. Therefore the SPF

mitigation is 100% as well. The modeled geometry is expected to change slightly during the design process as field survey data is collected and incorporated into the baseline and proposed condition models. During the design process, the final design will be configured to provide 100% mitigation of valley storage in SPF.

4.02 Water Surface Elevation

Steady-flow baseline and proposed conditions water surface elevations for both 100 year and SPF events are shown in Table 4-2. The project decreases or maintains baseline water levels at all locations with just a few minor exceptions. Water levels increase in the 100-year event at the ten cross-sections between Samuels Avenue Dam and the bypass channel. The maximum water level increase is 0.25 feet immediately upstream of Samuels Avenue Dam. Water levels increase in the SPF a maximum of 0.02 feet at the downstream end of the Clear Fork. The increases are confined to areas that will be purchased and maintained by TRWD, thus would have no impact on private property if the increases actually occur. As new levees will be constructed in the immediate project area, additional levee protection can easily be provided to compensate.

4.03 Head Loss

The construction of the bypass channel effectively shortens the West Fork by approximately 7,000 feet. The drawdown on the West Fork is caused by a combination of this shortening of the river as well as the efficient conveyance of the bypass channel, which has a steeper slope and higher velocity than the existing West Fork channel it bypasses. This results in a reduction in head loss that must be partly restored in order to prevent significant additional loss of valley storage. Head loss has been put back into the system through modification or addition of structures. These include raising University Drive, restrictive bypass channel sections, Samuels Avenue Dam and the two pedestrian bridges. As shown in Table 4-2, the SPF drawdown is 5.39 feet at the confluence of the West Fork and the bypass channel, and this drawdown is reduced significantly upstream of University Drive (RS 262599). Approximately 0.5 feet of drawdown remains at this point, which is then gradually reduced to 0.02 feet at the upstream end of the West Fork model (RS 306246), which is approximately 400 feet downstream of Lake Worth Spillway.

Table 3-2: Marine Creek Water Surface Elevations - Baseline and Proposed Conditions

100-yr					500-yr				
Reach	River Station	Water Surface Elevation (ft)			Reach	River Station	Water Surface Elevation (ft)		
		Existing	Proposed	Proposed - Baseline			Existing	Proposed	Proposed - Baseline
upper	6080	546.28	546.28	0	upper	6080	547.57	547.57	0
upper	6010	546	546	0	upper	6010	547.23	547.23	0
upper	5950				upper	5950			
upper	5890	545.61	545.61	0	upper	5890	546.83	546.83	0
upper	5810	545.7	545.7	0	upper	5810	546.94	546.94	0
upper	5730	545.62	545.62	0	upper	5730	546.9	546.9	0
upper	5500	545.23	545.23	0	upper	5500	546.53	546.53	0
upper	5410	545.09	545.09	0	upper	5410	546.44	546.44	0
middle	5370	545.13	545.13	0	middle	5370	546.49	546.48	-0.01
middle	5330	544.96	544.96	0	middle	5330	546.21	546.21	0
middle	5280				middle	5280			
middle	5230	541.78	541.77	-0.01	middle	5230	543.2	543.21	0.01
middle	5180	540.65	540.65	0	middle	5180	542.49	542.49	0
middle	5130	540.27	540.27	0	middle	5130	542.31	542.31	0
middle	5030	540.08	540.08	0	middle	5030	542.13	542.13	0
middle	4990	539.88	539.88	0	middle	4990	541.87	541.88	0.01
middle	4930	539.72	539.72	0	middle	4930	541.72	541.72	0
middle	4840	539.44	539.44	0	middle	4840	541.49	541.49	0
middle	4795	539.68	539.67	-0.01	middle	4795	541.71	541.71	0
middle	4765	539.84	539.84	0	middle	4765	541.86	541.87	0.01
middle	4675				middle	4675			
middle	4585	538.88	538.88	0	middle	4585	540.45	540.45	0
middle	4570	538.92	538.92	0	middle	4570	540.49	540.49	0
middle	4535	538.51	538.51	0	middle	4535	540.08	540.09	0.01
middle	4465	538.6	538.6	0	middle	4465	540.19	540.2	0.01
middle	4455	538.18	538.18	0	middle	4455	539.8	539.8	0
middle	4450				middle	4450			
middle	4445	538.09	538.09	0	middle	4445	539.73	539.73	0
middle	4340	537.98	537.97	-0.01	middle	4340	539.64	539.64	0
middle	4310	537.96	537.96	0	middle	4310	539.62	539.62	0
middle	4280	537.99	537.98	-0.01	middle	4280	539.64	539.64	0
middle	4210	537.16	537.16	0	middle	4210	538.87	538.88	0.01
middle	4160	536.08	536.08	0	middle	4160	538.02	538.03	0.01
middle	4120	535.73	535.74	0.01	middle	4120	537.83	537.84	0.01
middle	4090	534.3	534.31	0.01	middle	4090	536.15	536.17	0.02
lower	4030	534.12	534.12	0	lower	4030	536.03	536.05	0.02
lower	3970	533.89	533.9	0.01	lower	3970	535.67	535.69	0.02
lower	3900	533.69	533.69	0	lower	3900	535.52	535.54	0.02
lower	3840	533.56	533.56	0	lower	3840	535.43	535.45	0.02
lower	3780	533.54	533.55	0.01	lower	3780	535.4	535.43	0.03
lower	3725	533.55	533.56	0.01	lower	3725	535.4	535.42	0.02
lower	3610	533.41	533.42	0.01	lower	3610	535.27	535.29	0.02
lower	3480	533.28	533.29	0.01	lower	3480	535.13	535.16	0.03
lower	3385	532.96	532.97	0.01	lower	3385	534.82	534.85	0.03
lower	3060	532.79	532.8	0.01	lower	3060	534.66	534.68	0.02
lower	2930	531.08	531.09	0.01	lower	2930	532.71	532.75	0.04
lower	2890	531.27	531.28	0.01	lower	2890	532.94	532.98	0.04
lower	2865				lower	2865			
lower	2840	531.02	531.03	0.01	lower	2840	532.66	532.7	0.04
lower	2790	530.69	530.71	0.02	lower	2790	532.26	532.31	0.05
lower	2410	529.7	529.72		lower	2410	531.15	531.21	
lower	2360	529.55	529.57	0.02	lower	2360	531	531.06	0.06
lower	2355				lower	2355			
lower	2350	528.77	528.79	0.02	lower	2350	529.96	530.05	0.09
lower	2300	528.82	528.85	0.03	lower	2300	530.05	530.14	0.09
lower	1760	527.53	527.57	0.04	lower	1760	528.63	528.77	0.14
lower	1710	527.39	527.43	0.04	lower	1710	528.52	528.67	0.15
lower	1700	527.45	527.49	0.04	lower	1700	528.67	528.83	0.16
lower	1650	526.89	526.93	0.04	lower	1650	527.63	527.79	0.16
lower	1480	526.63	526.67	0.04	lower	1480	527.31	527.49	0.18
lower	1430	526.51	526.56	0.05	lower	1430	527.17	527.35	0.18
lower	1420				lower	1420			
lower	1410	526.11	526.16	0.05	lower	1410	526.6	526.81	0.21
lower	1360	525.98	526.03	0.05	lower	1360	526.41	526.64	0.23
lower	1240	525.91	525.96	0.05	lower	1240	526.32	526.56	0.24
lower	840	525.33	525.39	0.06	lower	840	525.48	525.77	0.29
lower	600				lower	600			
lower	550	525.03	525	-0.03	lower	550	525.05	525	-0.05
lower	500	525	525	0	lower	500	525	525	0

Table 4-1
Valley Storage Calculations for Baseline and Proposed Conditions

		100-year			SPF		
Reach	**River Station**	**Baseline (ac-ft)**	**Proposed (ac-ft)**	**Difference (ac-ft)**	**Baseline (ac-ft)**	**Proposed (ac-ft)**	**Difference (ac-ft)**
East First St. to Riverside Dr. (Gateway / Oxbow)	206218 - 222998	9709	11681	1972	17890	19733	1843
Riverside Dr. to Bypass Confluence[1]	222998 - 245866	6652	7147	495	12594	13101	507
Lower Bypass	0 - 3656	0	579	579	0	1073	1073
Upper Bypass	3656 - 8421	0	505	505	0	1135	1135
West Fork above Bypass[2]	257426 - 306246	9105	8950	-155	18446	17787	-659
Clear Fork above Bypass	3590 - 65616	5382	5313	-69	22529	22587	58
Clear Fork Interior	0 - 3590	584	0	-584	1592	0	-1592
West Fork wf3 Interior	245866 - 254346	1378	0	-1378	2879	0	-2879
West Fork wf4 Interior	255442 - 257426	297	0	-297	608	0	-608
Additional storage areas							
Interior Area (estimated)	-	0	0	0	0	140	140
Gateway Park Ball Field Levees	-	0	0	0	0	270	270
Ham Branch	-	0	0	0	0	750	750
TOTAL		33107	34175	1068	76539	76576	37

[1] Includes Riverside Park and Samuels Avenue Mitigation Sites

[2] Includes Rockwood West Mitigation Site

Table 4-2: Trinity River Water Surface Elevations - Baseline and Proposed Conditions

100-yr					SPF				
Reach	River Station	Water Surface Elevation (ft)			Reach	River Station	Water Surface Elevation (ft)		
		Existing	Proposed	Proposed - Baseline			Existing	Proposed	Proposed - Baseline
wf4	306246	569.28	569.28	0	wf4	306246	574.24	574.22	-0.02
wf4	305256	568.92	568.91	-0.01	wf4	305256	573.78	573.76	-0.02
wf4	304259	567.85	567.84	-0.01	wf4	304259	572.63	572.6	-0.03
wf4	304214	567.79	567.79	0	wf4	304214	572.56	572.53	-0.03
wf4	304213	567.94	567.93	-0.01	wf4	304213	572.74	572.71	-0.03
wf4	304208	567.93	567.93	0	wf4	304208	572.73	572.7	-0.03
wf4	304207	568.06	568.06	0	wf4	304207	572.81	572.78	-0.03
wf4	304157	568.03	568.03	0	wf4	304157	572.77	572.75	-0.02
wf4	303421	567.57	567.57	0	wf4	303421	572.41	572.38	-0.03
wf4	302041	566.6	566.59	-0.01	wf4	302041	571.79	571.75	-0.04
wf4	301177	565.9	565.9	0	wf4	301177	571.26	571.22	-0.04
wf4	300278	564.59	564.58	-0.01	wf4	300278	570.6	570.55	-0.05
wf4	299590	563.86	563.85	-0.01	wf4	299590	570.26	570.2	-0.06
wf4	299546	563.81	563.8	-0.01	wf4	299546	570.23	570.18	-0.05
wf4	299545	563.72	563.71	-0.01	wf4	299545	570.22	570.17	-0.05
wf4	299540	563.71	563.7	-0.01	wf4	299540	570.22	570.17	-0.05
wf4	299539	563.72	563.71	-0.01	wf4	299539	570.21	570.15	-0.06
wf4	299489	563.66	563.65	-0.01	wf4	299489	570.18	570.12	-0.06
wf4	298645	562.5	562.48	-0.02	wf4	298645	569.6	569.53	-0.07
wf4	298300	561.56	561.54	-0.02	wf4	298300	569.38	569.31	-0.07
wf4	298260	561.39	561.36	-0.03	wf4	298260	569.17	569.09	-0.08
wf4	298259	561.24	561.21	-0.03	wf4	298259	569.18	569.11	-0.07
wf4	298249	561.22	561.19	-0.03	wf4	298249	569.18	569.1	-0.08
wf4	298248	561.63	561.61	-0.02	wf4	298248	569.2	569.13	-0.07
wf4	298198	561.6	561.57	-0.03	wf4	298198	569.18	569.11	-0.07
wf4	297822	561.42	561.4	-0.02	wf4	297822	569.07	569	-0.07
wf4	297265	561.01	560.98	-0.03	wf4	297265	568.37	568.3	-0.07
wf4	297146	560.96	560.93	-0.03	wf4	297146	568.16	568.09	-0.07
wf4	297126				wf4	297126			
wf4	297107	560.87	560.84	-0.03	wf4	297107	568.05	567.98	-0.07
wf4	296992	560.68	560.66	-0.02	wf4	296992	568.03	567.95	-0.08
wf4	296125	560.18	560.15	-0.03	wf4	296125	567.76	567.68	-0.08
wf4	295195	559.56	559.52	-0.04	wf4	295195	567.15	567.06	-0.09
wf4	294211	559.14	559.1	-0.04	wf4	294211	566.92	566.83	-0.09
wf4	293744	558.89	558.85	-0.04	wf4	293744	566.91	566.81	-0.1
wf4	293642	558.46	558.42	-0.04	wf4	293642	566.18	566.07	-0.11
wf4	293621				wf4	293621			
wf4	293600	558.35	558.31	-0.04	wf4	293600	566.1	565.99	-0.11
wf4	293499	558.51	558.47	-0.04	wf4	293499	566.42	566.32	-0.1
wf4	292711	557.81	557.76	-0.05	wf4	292711	565.64	565.53	-0.11
wf4	291834	557.27	557.22	-0.05	wf4	291834	565.15	565.03	-0.12
wf4	291282	556.98	556.93	-0.05	wf4	291282	565.36	565.24	-0.12
wf4	290271	556.32	556.27	-0.05	wf4	290271	564.35	564.22	-0.13
wf4	289479	555.84	555.78	-0.06	wf4	289479	563.83	563.69	-0.14
wf4	289442	555.81	555.75	-0.06	wf4	289442	563.8	563.66	-0.14
wf4	289441	555.82	555.75	-0.07	wf4	289441	563.84	563.7	-0.14
wf4	289429	555.81	555.74	-0.07	wf4	289429	563.84	563.69	-0.15
wf4	289428	555.79	555.73	-0.06	wf4	289428	563.69	563.55	-0.14
wf4	289379	555.77	555.7	-0.07	wf4	289379	563.66	563.52	-0.14
wf4	289313	555.58	555.52	-0.06	wf4	289313	563.25	563.1	-0.15
wf4	289274				wf4	289274			
wf4	289236	555.4	555.34	-0.06	wf4	289236	563.03	562.88	-0.15
wf4	289136	555.55	555.48	-0.07	wf4	289136	563.39	563.24	-0.15
wf4	288475	555.19	555.12	-0.07	wf4	288475	562.95	562.79	-0.16
wf4	287615	554.54	554.46	-0.08	wf4	287615	562.51	562.34	-0.17
wf4	286976	554.17	554.09	-0.08	wf4	286976	562.04	561.87	-0.17
wf4	286880	554.08	554	-0.08	wf4	286880	561.73	561.55	-0.18
wf4	286844				wf4	286844			
wf4	286808	553.91	553.83	-0.08	wf4	286808	561.5	561.32	-0.18
wf4	286710	553.81	553.72	-0.09	wf4	286710	561.53	561.34	-0.19
wf4	285970	553.46	553.37	-0.09	wf4	285970	561.23	561.03	-0.2
wf4	284944	552.84	552.74	-0.1	wf4	284944	560.65	560.44	-0.21
wf4	283853	551.97	551.85	-0.12	wf4	283853	559.82	559.58	-0.24
wf4	283400	551.68	551.56	-0.12	wf4	283400	559.5	559.25	-0.25
wf4	282801	551.17	551.03	-0.14	wf4	282801	559.03	558.76	-0.27
wf4	281871	551.28	551.15	-0.13	wf4	281871	559.24	558.98	-0.26
wf4	281832	551.27	551.14	-0.13	wf4	281832	559.23	558.97	-0.26

Table 4-2: Trinity River Water Surface Elevations - Baseline and Proposed Conditions

100-yr					SPF				
Reach	River Station	Water Surface Elevation (ft)			Reach	River Station	Water Surface Elevation (ft)		
		Existing	Proposed	Proposed - Baseline			Existing	Proposed	Proposed - Baseline
wf4	281831	551.21	551.07	-0.14	wf4	281831	559.25	558.99	-0.26
wf4	281821	551.2	551.06	-0.14	wf4	281821	559.15	558.88	-0.27
wf4	281820	551.05	550.91	-0.14	wf4	281820	559.11	558.84	-0.27
wf4	281771	551.02	550.88	-0.14	wf4	281771	558.97	558.7	-0.27
wf4	281199	550.28	550.13	-0.15	wf4	281199	558.08	557.78	-0.3
wf4	280042	549.68	549.51	-0.17	wf4	280042	557.55	557.23	-0.32
wf4	279002	549.2	549.02	-0.18	wf4	279002	557.3	556.95	-0.35
wf4	278130	548.81	548.61	-0.2	wf4	278130	556.9	556.54	-0.36
wf4	277391	548.43	548.22	-0.21	wf4	277391	556.56	556.17	-0.39
wf4	276853	547.8	547.57	-0.23	wf4	276853	555.91	555.49	-0.42
wf4	276692	547.74	547.5	-0.24	wf4	276692	555.9	555.48	-0.42
wf4	276627				wf4	276627			
wf4	276562	547.38	547.12	-0.26	wf4	276562	555.62	555.19	-0.43
wf4	276325	547.08	546.81	-0.27	wf4	276325	555.18	554.73	-0.45
wf4	275969	546.9	546.62	-0.28	wf4	275969	555.04	554.58	-0.46
wf4	275461	546.2	545.89	-0.31	wf4	275461	554.51	554	-0.51
wf4	274754	546.23	545.9	-0.33	wf4	274754	554.74	554.23	-0.51
wf4	273902	545.43	545.03	-0.4	wf4	273902	554.31	553.76	-0.55
wf4	273102	544.67	544.17	-0.5	wf4	273102	553.99	553.41	-0.58
wf4	272377	544.89	544.58	-0.31	wf4	272377	554.06	553.58	-0.48
wf4	271794	544.71	544.47	-0.24	wf4	271794	553.92	553.49	-0.43
wf4	271402	544.49	544.35	-0.14	wf4	271402	553.82	553.42	-0.4
wf4	270730	544.49	544.29	-0.2	wf4	270730	553.88	553.43	-0.45
wf4	270249	544.07	543.94	-0.13	wf4	270249	553.72	553.27	-0.45
wf4	269743	544.01	543.8	-0.21	wf4	269743	553.72	553.24	-0.48
wf4	269070	543.75	543.53	-0.22	wf4	269070	553.62	553.14	-0.48
wf4	268190	543.46	543.23	-0.23	wf4	268190	553.41	552.92	-0.49
wf4	267221	542.97	542.71	-0.26	wf4	267221	553.23	552.71	-0.52
wf4	266213	542.95	542.68	-0.27	wf4	266213	553.27	552.76	-0.51
wf4	264804	542.87	542.59	-0.28	wf4	264804	553.25	552.74	-0.51
wf4	263531	542.78	542.45	-0.33	wf4	263531	553.22	552.68	-0.54
wf4	262705	542.07	541.53	-0.54	wf4	262705	552.99	552.27	-0.72
wf4	262599	541.38	540.17	-1.21	wf4	262599	553.02	551.42	-1.6
wf4	262548				wf4	262548			
wf4	262497	540.64	539.7	-0.94	wf4	262497	552.88	548.78	-4.1
wf4	262394	540.55	539.6	-0.95	wf4	262394	552.88	548.98	-3.9
wf4	261002	540.7	539.25	-1.45	wf4	261002	552.75	548.77	-3.98
wf4	260385	540.62	539.07	-1.55	wf4	260385	552.68	548.59	-4.09
wf4	259657	539.69	537.9	-1.79	wf4	259657	551.76	547.26	-4.5
wf4	259538	538.93	536.34	-2.59	wf4	259538	551.47	546.51	-4.96
wf4	259500				wf4	259500			
wf4	259463	538.57	535.4	-3.17	wf4	259463	551.28	546.18	-5.1
wf4	259337	538.97	535.73	-3.24	wf4	259337	551.59	546.51	-5.08
wf4	259003	538.98	535.69	-3.29	wf4	259003	551.69	546.63	-5.06
wf4	258678	539	535.69	-3.31	wf4	258678	551.73	546.65	-5.08
wf4	258103	539.02	535.72	-3.3	wf4	258103	551.73	546.68	-5.05
wf4	257654	538.33	535.47	-2.86	wf4	257654	551.4	546.54	-4.86
wf4	257557	538.21	533.89	-4.32	wf4	257557	551.37	545.96	-5.41
wf4	257546				wf4	257546			
wf4	257536	538.06	533.38	-4.68	wf4	257536	551.19	545.8	-5.39
wf4	257535	538.06	533.37	-4.69	wf4	257535	551.19	545.8	-5.39
wf4	257426	538.01	528.42	-9.59	wf4	257426	551.19	545.8	-5.39
wf3	245866	526.33	526.41	0.08	wf3	245866	539.26	539.2	-0.06
wf3	244898	525.84	525.91	0.07	wf3	244898	538.45	538.39	-0.06
wf3	244798	525.75	525.83	0.08	wf3	244798	538.37	538.32	-0.05
wf3	244797	525.75	525.83	0.08	wf3	244797	538.37	538.31	-0.06
wf3	244766				wf3	244766			
wf3	244736	525.62	525.7	0.08	wf3	244736	538.17	538.11	-0.06
wf3	244735	525.62	525.7	0.08	wf3	244735	538.17	538.11	-0.06
wf3	244635	525.54	525.62	0.08	wf3	244635	538.05	537.99	-0.06
wf3	243785	525.24	525.32	0.08	wf3	243785	537.72	537.66	-0.06
wf3	243471	525.04	525.13	0.09	wf3	243471	537.72	537.7	-0.02
wf3	242998	525.04	525.29	0.25	wf3	242998	537.95	537.93	-0.02
wf3	242813	524.98	524.93	-0.05	wf3	242813	537.9	537.78	-0.12
wf3	242451	524.7	524.36	-0.34	wf3	242451	537.59	537.33	-0.26
wf3	242363	524.66	524.33	-0.33	wf3	242363	536.89	536.62	-0.27
wf3	242340				wf3	242340			

Table 4-2: Trinity River Water Surface Elevations - Baseline and Proposed Conditions

100-yr					SPF				
Reach	River Station	Water Surface Elevation (ft)			Reach	River Station	Water Surface Elevation (ft)		
		Existing	Proposed	Proposed - Baseline			Existing	Proposed	Proposed - Baseline
wf3	242318	524.39	524.04	-0.35	wf3	242318	536.58	536.28	-0.3
wf3	242259	524.31	523.95	-0.36	wf3	242259	536.79	536.49	-0.3
wf3	242222	524.35	523.99	-0.36	wf3	242222	536.86	536.56	-0.3
wf3	242121	524.35	524	-0.35	wf3	242121	536.76	536.46	-0.3
wf3	242120	524.35	524	-0.35	wf3	242120	536.76	536.46	-0.3
wf3	242110				wf3	242110			
wf3	242100	524.29	523.94	-0.35	wf3	242100	536.57	536.27	-0.3
wf3	242099	524.29	523.94	-0.35	wf3	242099	536.57	536.27	-0.3
wf3	241948	524	523.63	-0.37	wf3	241948	536.2	535.89	-0.31
wf3	241947	524	523.62	-0.38	wf3	241947	536.19	535.88	-0.31
wf3	241937				wf3	241937			
wf3	241927	523.94	523.56	-0.38	wf3	241927	535.83	535.55	-0.28
wf3	241926	523.94	523.56	-0.38	wf3	241926	535.83	535.55	-0.28
wf3	241839	523.94	523.57	-0.37	wf3	241839	535.86	535.58	-0.28
wf3	241838	523.94	523.57	-0.37	wf3	241838	535.86	535.58	-0.28
wf3	241825				wf3	241825			
wf3	241812	523.76	523.38	-0.38	wf3	241812	535.18	534.9	-0.28
wf3	241811	523.76	523.38	-0.38	wf3	241811	535.18	534.9	-0.28
wf3	241708	523.89	523.5	-0.39	wf3	241708	535.39	535.1	-0.29
wf3	241255	523.8	523.59	-0.21	wf3	241255	535.37	535.26	-0.11
wf3	240517	523.67	523.53	-0.14	wf3	240517	535.14	535.13	-0.01
wf3	239744	523.48	523.31	-0.17	wf3	239744	534.74	534.67	-0.07
wf3	239369	523.34	523.17	-0.17	wf3	239369	534.38	534.35	-0.03
wf3	239262	523.32	523	-0.32	wf3	239262	534.22	533.86	-0.36
wf3	239261	523.32	523	-0.32	wf3	239261	534.22	533.86	-0.36
wf3	239229				wf3	239229			
wf3	239198	523.25	522.93	-0.32	wf3	239198	534.12	533.75	-0.37
wf3	239197	523.25	522.93	-0.32	wf3	239197	534.12	533.75	-0.37
wf3	239095	523.19	522.87	-0.32	wf3	239095	534	533.63	-0.37
wf3	238751	522.99	522.66	-0.33	wf3	238751	534.01	533.62	-0.39
wf3	238508	522.98	522.64	-0.34	wf3	238508	534.1	533.72	-0.38
wf3	238412	523.09	522.76	-0.33	wf3	238412	534.23	533.86	-0.37
wf3	238411	523.09	522.76	-0.33	wf3	238411	534.23	533.86	-0.37
wf3	238401				wf3	238401			
wf3	238391	523.07	522.73	-0.34	wf3	238391	534.19	533.84	-0.35
wf3	238390	523.06	522.73	-0.33	wf3	238390	534.19	533.84	-0.35
wf3	238288	522.91	522.57	-0.34	wf3	238288	534.01	533.64	-0.37
wf3	237615	522.87	522.53	-0.34	wf3	237615	533.88	533.51	-0.37
wf3	236729	522.9	522.56	-0.34	wf3	236729	533.95	533.58	-0.37
wf3	235522	522.68	522.33	-0.35	wf3	235522	533.51	533.13	-0.38
wf3	235413	522.7	522.35	-0.35	wf3	235413	533.52	533.14	-0.38
wf3	235412	522.7	522.35	-0.35	wf3	235412	533.52	533.14	-0.38
wf3	235354				wf3	235354			
wf3	235297	522.66	522.31	-0.35	wf3	235297	533.46	533.07	-0.39
wf3	235296	522.66	522.31	-0.35	wf3	235296	533.46	533.07	-0.39
wf3	235192	522.7	522.35	-0.35	wf3	235192	533.57	533.19	-0.38
wf3	234857	522.65	522.3	-0.35	wf3	234857	533.48	533.09	-0.39
wf3	233994	522.6	522.25	-0.35	wf3	233994	533.36	532.96	-0.4
wf3	233091	522.49	522.18	-0.31	wf3	233091	533.1	532.84	-0.26
wf3	232217	522.21	521.99	-0.22	wf3	232217	532.47	532.4	-0.07
wf3	231700	522.12	521.92	-0.2	wf3	231700	532.29	532.27	-0.02
wf3	231452	522.22	521.95	-0.27	wf3	231452	532.5	532.3	-0.2
wf3	231341	522.01	521.73	-0.28	wf3	231341	532.01	531.8	-0.21
wf3	231340	522.01	521.73	-0.28	wf3	231340	532.01	531.8	-0.21
wf3	231316				wf3	231316			
wf3	231292	521.92	521.64	-0.28	wf3	231292	531.81	531.6	-0.21
wf3	231291	521.92	521.64	-0.28	wf3	231291	531.81	531.6	-0.21
wf3	231242	521.95	521.68	-0.27	wf3	231242	531.9	531.69	-0.21
wf3	231188	522.02	521.75	-0.27	wf3	231188	532.05	531.85	-0.2
wf3	231101	522	521.72	-0.28	wf3	231101	532.01	531.8	-0.21
wf3	231100	522	521.72	-0.28	wf3	231100	532.01	531.8	-0.21
wf3	231025				wf3	231025			
wf3	230950	521.95	521.67	-0.28	wf3	230950	531.84	531.64	-0.2
wf3	230949	521.95	521.67	-0.28	wf3	230949	531.84	531.64	-0.2
wf3	230852	521.94	521.66	-0.28	wf3	230852	531.82	531.62	-0.2
wf3	230254	521.8	521.52	-0.28	wf3	230254	531.41	531.2	-0.21
wf3	229630	521.64	521.36	-0.28	wf3	229630	530.99	530.77	-0.22

Table 4-2: Trinity River Water Surface Elevations - Baseline and Proposed Conditions

		100-yr					SPF		
Reach	River Station	Water Surface Elevation (ft)			Reach	River Station	Water Surface Elevation (ft)		
		Existing	Proposed	Proposed - Baseline			Existing	Proposed	Proposed - Baseline
wf3	229527	521.63	521.34	-0.29	wf3	229527	530.91	530.7	-0.21
wf3	229526	521.63	521.34	-0.29	wf3	229526	530.91	530.69	-0.22
wf3	229494				wf3	229494			
wf3	229463	521.59	521.3	-0.29	wf3	229463	530.72	530.52	-0.2
wf3	229462	521.59	521.3	-0.29	wf3	229462	530.72	530.52	-0.2
wf3	229429	521.57	521.28	-0.29	wf3	229429	530.72	530.51	-0.21
wf3	229428	521	520.68	-0.32	wf3	229428	529.59	529.35	-0.24
wf3	229412	520.99	520.67	-0.32	wf3	229412	529.57	529.33	-0.24
wf3	229394	521.34	521.03	-0.31	wf3	229394	530.24	530.02	-0.22
wf3	229360	521.32	521.02	-0.3	wf3	229360	530.26	530.04	-0.22
wf3	228755	521.17	520.86	-0.31	wf3	228755	530.05	529.82	-0.23
wf3	228208	521.1	520.79	-0.31	wf3	228208	529.9	529.66	-0.24
wf3	228106	521	520.68	-0.32	wf3	228106	529.52	529.28	-0.24
wf3	228105	521	520.68	-0.32	wf3	228105	529.52	529.28	-0.24
wf3	228095				wf3	228095			
wf3	228085	520.94	520.62	-0.32	wf3	228085	529.3	529.06	-0.24
wf3	228084	520.94	520.62	-0.32	wf3	228084	529.3	529.06	-0.24
wf3	227980	521.02	520.7	-0.32	wf3	227980	529.66	529.42	-0.24
wf3	227288	521.02	520.71	-0.31	wf3	227288	529.63	529.39	-0.24
wf3	226962	520.99	520.67	-0.32	wf3	226962	529.61	529.37	-0.24
wf3	225923	520.91	520.58	-0.33	wf3	225923	529.47	529.22	-0.25
wf3	225658	520.89	520.57	-0.32	wf3	225658	529.43	529.18	-0.25
wf3	225271	520.89	520.56	-0.33	wf3	225271	529.45	529.21	-0.24
wf3	224594	520.82	520.49	-0.33	wf3	224594	529.34	529.09	-0.25
wf3	223820	520.7	520.36	-0.34	wf3	223820	529.23	528.98	-0.25
wf3	223377	520.29	519.92	-0.37	wf3	223377	528.51	528.22	-0.29
wf3	223089	520.18	519.81	-0.37	wf3	223089	528.19	527.88	-0.31
wf3	222998	520.01	519.63	-0.38	wf3	222998	527.81	527.48	-0.33
wf3	222947				wf3	222947			
wf3	222897	519.35	518.83	-0.52	wf3	222897	526.78	526.44	-0.34
wf3	222896	519.35	518.83	-0.52	wf3	222896	526.78	526.44	-0.34
wf3	222789	519.69	519.1	-0.59	wf3	222789	527.53	526.99	-0.54
wf3	222503	519.7	519.12	-0.58	wf3	222503	527.52	527.02	-0.5
wf3	221820	519.67	519.05	-0.62	wf3	221820	527.57	526.98	-0.59
wf3	221650	519.66	519.07	-0.59	wf3	221650	527.56	526.97	-0.59
wf3	221044	519.65	519.08	-0.57	wf3	221044	527.56	526.99	-0.57
wf3	220594	519.63	519.06	-0.57	wf3	220594	527.52	526.96	-0.56
wf3	220310	519.61	519.01	-0.6	wf3	220310	527.5	526.88	-0.62
wf3	220050	519.59	518.99	-0.6	wf3	220050	527.46	526.83	-0.63
wf3	219536	519.44	518.79	-0.65	wf3	219536	527.32	526.61	-0.71
wf3	218677	519.32	518.7	-0.62	wf3	218677	527.12	526.46	-0.66
wf3	218560	518.84	518.17	-0.67	wf3	218560	526.12	525.37	-0.75
wf3	218528				wf3	218528			
wf3	218496	518.77	518.04	-0.73	wf3	218496	525.45	524.78	-0.67
wf3	218384	518.79	518.11	-0.68	wf3	218384	525.5	525	-0.5
wf3	218000	518.78	518.19	-0.59	wf3	218000	525.59	525.14	-0.45
wf3	217999	518.57	518.19	-0.38	wf3	217999	525.5	525.15	-0.35
wf3	217981.5	518.57	518.18	-0.39	wf3	217981.5	525.49	525.14	-0.35
wf3	217980.5	518.64	518.18	-0.46	wf3	217980.5	525.52	525.11	-0.41
wf3	217780	518.6	518.16	-0.44	wf3	217780	525.48	525.08	-0.4
wf3	217369	518.63	518.09	-0.54	wf3	217369	525.57	525	-0.57
wf3	215762	517.7	517.48	-0.22	wf3	215762	524.8	524.46	-0.34
wf3	214946	517.27	517.01	-0.26	wf3	214946	524.32	523.94	-0.38
wf3	214788	517.13	516.9	-0.23	wf3	214788	524.14	523.78	-0.36
wf3	213435	516.17	516.07	-0.1	wf3	213435	523.26	522.94	-0.32
wf3	212737	515.5	515.11	-0.39	wf3	212737	522.44	522.17	-0.27
wf3	212018	514.97	514.59	-0.38	wf3	212018	521.98	521.65	-0.33
wf3	211133	514.3	513.44	-0.86	wf3	211133	521.5	520.97	-0.53
wf3	210574	513.91	513.4	-0.51	wf3	210574	521.16	520.84	-0.32
wf3	209960	513.3	513.16	-0.14	wf3	209960	520.82	520.65	-0.17
wf3	209288	513.08	513	-0.08	wf3	209288	520.57	520.48	-0.09
wf3	208797	512.92	512.82	-0.1	wf3	208797	520.38	520.31	-0.07
wf3	206439	512.12	512.15	0.03	wf3	206439	519.9	519.92	0.02
wf3	206340	512.16	512.16	0	wf3	206340	519.93	519.93	0
wf3	206327				wf3	206327			
wf3	206314	511.87	511.87	0	wf3	206314	519.8	519.8	0
wf3	206218	511.83	511.83	0	wf3	206218	519.72	519.72	0

Table 4-2: Trinity River Water Surface Elevations - Baseline and Proposed Conditions

		100-yr					SPF		
Reach	River Station	Water Surface Elevation (ft)			Reach	River Station	Water Surface Elevation (ft)		
		Existing	Proposed	Proposed - Baseline			Existing	Proposed	Proposed - Baseline
cf	65616	629.39	629.39	0	cf	65616	636.28	636.28	0
cf	65344	629.39	629.39	0	cf	65344	636.28	636.28	0
cf	64380	629.39	629.39	0	cf	64380	636.28	636.28	0
cf	62953	629.39	629.39	0	cf	62953	636.28	636.28	0
cf	62405	629.39	629.39	0	cf	62405	636.28	636.28	0
cf	61472	629.39	629.39	0	cf	61472	636.28	636.28	0
cf	60451	628.76	628.76	0	cf	60451	635.56	635.56	0
cf	58850	626.31	626.31	0	cf	58850	634	634	0
cf	57021	623.98	623.98	0	cf	57021	632.64	632.64	0
cf	54806	622.09	622.09	0	cf	54806	631.3	631.3	0
cf	53901	620.82	620.82	0	cf	53901	630.46	630.46	0
cf	53352	619.91	619.91	0	cf	53352	629.79	629.79	0
cf	52242	618.54	618.54	0	cf	52242	629.15	629.15	0
cf	52192	618.4	618.4	0	cf	52192	629.13	629.13	0
cf	52140	618.41	618.41	0	cf	52140	629.09	629.09	0
cf	51599	617.88	617.88	0	cf	51599	628.88	628.88	0
cf	50598	616.53	616.53	0	cf	50598	628.32	628.32	0
cf	49420	614.5	614.5	0	cf	49420	627.62	627.62	0
cf	46736	610.62	610.62	0	cf	46736	624.37	624.37	0
cf	46611	610.44	610.44	0	cf	46611	622.77	622.77	0
cf	46610	610.44	610.44	0	cf	46610	622.77	622.77	0
cf	46550				cf	46550			
cf	46490	610.16	610.16	0	cf	46490	621.09	621.09	0
cf	46489	610.16	610.16	0	cf	46489	621.08	621.08	0
cf	46175	610.12	610.12	0	cf	46175	621.3	621.3	0
cf	45544	609.27	609.27	0	cf	45544	620.22	620.22	0
cf	45015	608.02	608.02	0	cf	45015	618.34	618.34	0
cf	44342	607.02	607.02	0	cf	44342	616.16	616.16	0
cf	43324	606.26	606.26	0	cf	43324	615.14	615.14	0
cf	41045	600.93	600.93	0	cf	41045	611.05	611.05	0
cf	40178	597.99	597.99	0	cf	40178	607.63	607.63	0
cf	40064	598.12	598.12	0	cf	40064	607.64	607.64	0
cf	40020.5				cf	40020.5			
cf	39977	597.98	597.98	0	cf	39977	607.46	607.46	0
cf	39879	598	598	0	cf	39879	607.73	607.73	0
cf	39380	597.59	597.59	0	cf	39380	606.93	606.93	0
cf	39101	597.35	597.35	0	cf	39101	607.1	607.1	0
cf	39068	594.87	594.87	0	cf	39068	601.76	601.76	0
cf	39056	593.81	593.81	0	cf	39056	600.69	600.69	0
cf	39023	592.16	592.16	0	cf	39023	601.88	601.88	0
cf	38738	591.15	591.15	0	cf	38738	600.67	600.67	0
cf	38091	590.61	590.61	0	cf	38091	600.28	600.28	0
cf	37449	590	590	0	cf	37449	600.04	600.04	0
cf	36466	588.65	588.65	0	cf	36466	599.07	599.07	0
cf	35969	587.87	587.87	0	cf	35969	598.78	598.78	0
cf	35519	587.4	587.4	0	cf	35519	598.56	598.56	0
cf	35076	586.56	586.56	0	cf	35076	598.27	598.27	0
cf	35016	585.91	585.91	0	cf	35016	598.03	598.03	0
cf	34957	586.3	586.3	0	cf	34957	597.89	597.89	0
cf	34915	585.15	585.15	0	cf	34915	595.77	595.77	0
cf	34896.5				cf	34896.5			
cf	34878	584.56	584.56	0	cf	34878	595.15	595.15	0
cf	34846	584.32	584.32	0	cf	34846	594.81	594.81	0
cf	34830				cf	34830			
cf	34814	583.37	583.37	0	cf	34814	593.47	593.47	0
cf	34699	584.08	584.08	0	cf	34699	594.61	594.61	0
cf	34116	582.55	582.55	0	cf	34116	592.43	592.43	0
cf	33577	581.58	581.58	0	cf	33577	591.32	591.32	0
cf	32940	580.42	580.42	0	cf	32940	590.11	590.11	0
cf	32371	579.68	579.68	0	cf	32371	590.11	590.11	0
cf	31770	578.46	578.46	0	cf	31770	589.02	589.02	0
cf	30913	577.14	577.14	0	cf	30913	587.83	587.83	0
cf	30174	576.01	576.01	0	cf	30174	587.25	587.25	0
cf	29663	574.71	574.71	0	cf	29663	586.56	586.56	0
cf	29638	571.69	571.69	0	cf	29638	584.38	584.38	0
cf	29613	573.35	573.35	0	cf	29613	585.1	585.1	0
cf	29535	573.3	573.3	0	cf	29535	585.59	585.59	0

Table 4-2: Trinity River Water Surface Elevations - Baseline and Proposed Conditions

		100-yr					SPF		
Reach	River Station	Water Surface Elevation (ft)			Reach	River Station	Water Surface Elevation (ft)		
		Existing	Proposed	Proposed - Baseline			Existing	Proposed	Proposed - Baseline
cf	29485	572.7	572.7	0	cf	29485	585.2	585.2	0
cf	29435	572.83	572.83	0	cf	29435	585.13	585.13	0
cf	28689	571.64	571.64	0	cf	28689	582.4	582.4	0
cf	27364	569.33	569.32	-0.01	cf	27364	579.95	579.95	0
cf	26300	567.98	567.98	0	cf	26300	578.79	578.79	0
cf	25421	567.17	567.17	0	cf	25421	577.86	577.86	0
cf	25371	566.93	566.93	0	cf	25371	577.51	577.51	0
cf	25321	566.88	566.88	0	cf	25321	577.29	577.29	0
cf	24456	565.44	565.44	0	cf	24456	576	576	0
cf	24355	565.58	565.58	0	cf	24355	576.31	576.31	0
cf	24326				cf	24326			
cf	24298	565.42	565.42	0	cf	24298	576.13	576.13	0
cf	24297	565.42	565.42	0	cf	24297	576.12	576.12	0
cf	24198	564.71	564.71	0	cf	24198	575.02	575.02	0
cf	23535	563.57	563.57	0	cf	23535	573.72	573.72	0
cf	22604	562.19	562.19	0	cf	22604	572.11	572.11	0
cf	21844	561.09	561.09	0	cf	21844	570.85	570.85	0
cf	21329	560.47	560.47	0	cf	21329	570.14	570.14	0
cf	21279	559.99	559.99	0	cf	21279	569.66	569.66	0
cf	21239	560.29	560.29	0	cf	21239	570.01	570.01	0
cf	20351	559.26	559.26	0	cf	20351	568.32	568.32	0
cf	19645	558.49	558.49	0	cf	19645	567.22	567.22	0
cf	18867	557.63	557.62	-0.01	cf	18867	566.07	566.07	0
cf	18275	557.08	557.08	0	cf	18275	565.87	565.87	0
cf	17746	556.79	556.79	0	cf	17746	565.72	565.72	0
cf	17302	556.22	556.21	-0.01	cf	17302	565.41	565.41	0
cf	17206	556.15	556.14	-0.01	cf	17206	565.15	565.15	0
cf	17183.5				cf	17183.5			
cf	17162	556.02	556.01	-0.01	cf	17162	564.59	564.59	0
cf	17161	556.02	556.01	-0.01	cf	17161	564.59	564.59	0
cf	17057	555.59	555.58	-0.01	cf	17057	564.57	564.57	0
cf	16746	555.52	555.52	0	cf	16746	564.61	564.61	0
cf	16547	555.3	555.29	-0.01	cf	16547	564.09	564.09	0
cf	16268	555.3	555.29	-0.01	cf	16268	564.23	564.23	0
cf	16161	555.26	555.26	0	cf	16161	563.92	563.92	0
cf	16140				cf	16140			
cf	16120	555.19	555.19	0	cf	16120	563.69	563.69	0
cf	16100	555.26	555.25	-0.01	cf	16100	563.81	563.81	0
cf	16077.5				cf	16077.5			
cf	16054	555.2	555.2	0	cf	16054	563.6	563.61	0.01
cf	15948	555.15	555.14	-0.01	cf	15948	563.67	563.67	0
cf	15613	554.57	554.56	-0.01	cf	15613	562.76	562.76	0
cf	15442	554.45	554.44	-0.01	cf	15442	562.92	562.92	0
cf	14949	554.05	554.04	-0.01	cf	14949	562.17	562.17	0
cf	14297	553.62	553.61	-0.01	cf	14297	561.72	561.72	0
cf	13396	552.71	552.69	-0.02	cf	13396	561.17	561.17	0
cf	13386				cf	13386			
cf	13381	552.66	552.65	-0.01	cf	13381	560.98	560.99	0.01
cf	13376	552.65	552.64	-0.01	cf	13376	560.98	560.98	0
cf	12988	552.37	552.36	-0.01	cf	12988	560.59	560.59	0
cf	12887	552.29	552.28	-0.01	cf	12887	559.47	559.47	0
cf	12886	552.29	552.28	-0.01	cf	12886	559.47	559.47	0
cf	12826				cf	12826			
cf	12766	552.07	552.06	-0.01	cf	12766	559.11	559.11	0
cf	12765	552.07	552.06	-0.01	cf	12765	558.99	558.99	0
cf	12719	552.11	552.09	-0.02	cf	12719	558.94	558.94	0
cf	12703.5				cf	12703.5			
cf	12688	551.93	551.92	-0.01	cf	12688	558.53	558.53	0
cf	12665	551.95	551.93	-0.02	cf	12665	558.6	558.6	0
cf	12626	551.96	551.95	-0.01	cf	12626	558.72	558.72	0
cf	12616				cf	12616			
cf	12565	547.53	547.38	-0.15	cf	12565	557.82	557.83	0.01
cf	12541	547.2	547.05	-0.15	cf	12541	557.46	557.47	0.01
cf	12411	547.09	546.94	-0.15	cf	12411	557.18	557.18	0
cf	12313	546.97	546.81	-0.16	cf	12313	556.94	556.94	0
cf	12287				cf	12287			
cf	12262	546.69	546.52	-0.17	cf	12262	556.41	556.42	0.01

Table 4-2: Trinity River Water Surface Elevations - Baseline and Proposed Conditions

		100-yr					SPF		
Reach	River Station	Water Surface Elevation (ft)			Reach	River Station	Water Surface Elevation (ft)		
		Existing	Proposed	Proposed - Baseline			Existing	Proposed	Proposed - Baseline
cf	12261	546.69	546.52	-0.17	cf	12261	556.41	556.42	0.01
cf	12131	546.68	546.51	-0.17	cf	12131	556.37	556.37	0
cf	12130	546.67	546.51	-0.16	cf	12130	556.54	556.54	0
cf	12075				cf	12075			
cf	12020	546.48	546.31	-0.17	cf	12020	556.21	556.21	0
cf	12019	546.48	546.31	-0.17	cf	12019	556.21	556.21	0
cf	11918	546.33	546.15	-0.18	cf	11918	555.86	555.87	0.01
cf	11006	545.91	545.72	-0.19	cf	11006	555.83	555.83	0
cf	10956	544.91	544.66	-0.25	cf	10956	555.54	555.54	0
cf	10906	545.51	545.29	-0.22	cf	10906	555.73	555.74	0.01
cf	10175	545.17	544.94	-0.23	cf	10175	555.5	555.5	0
cf	9614	544.9	544.66	-0.24	cf	9614	555.29	555.29	0
cf	9566	544.3	544.02	-0.28	cf	9566	555.16	555.16	0
cf	9515	544.63	544.37	-0.26	cf	9515	555.18	555.19	0.01
cf	9045	544.28	544	-0.28	cf	9045	554.98	554.99	0.01
cf	8293	543.46	543.11	-0.35	cf	8293	554.61	554.62	0.01
cf	8243	542.69	542.12	-0.57	cf	8243	554.67	554.67	0
cf	8200	542.96	542.49	-0.47	cf	8200	554.31	554.32	0.01
cf	8189				cf	8189			
cf	8179	542.78	542.27	-0.51	cf	8179	554.06	554.06	0
cf	8178	542.78	542.27	-0.51	cf	8178	554.06	554.06	0
cf	8073	542.75	542.23	-0.52	cf	8073	554.24	554.24	0
cf	7400	541.96	541.34	-0.62	cf	7400	553.79	553.79	0
cf	6757	541.64	540.95	-0.69	cf	6757	553.69	553.69	0
cf	6707	541.53	540.8	-0.73	cf	6707	553.67	553.67	0
cf	6656	541.65	540.94	-0.71	cf	6656	553.69	553.7	0.01
cf	6258	541.58	540.83	-0.75	cf	6258	553.75	553.76	0.01
cf	6158	541.19	540.33	-0.86	cf	6158	553.62	553.63	0.01
cf	6129.5				cf	6129.5			
cf	6102	541.13	540.26	-0.87	cf	6102	553.59	553.6	0.01
cf	6101	541.13	540.26	-0.87	cf	6101	553.59	553.6	0.01
cf	5990	541.25	540.42	-0.83	cf	5990	553.58	553.59	0.01
cf	5170	540.16	539.12	-1.04	cf	5170	552.33	552.34	0.01
cf	4535	539.81	538.6	-1.21	cf	4535	552.41	552.42	0.01
cf	4433	539.7	538.44	-1.26	cf	4433	552.4	552.41	0.01
cf	4402				cf	4402			
cf	4372	539.58	538.27	-1.31	cf	4372	552.27	552.28	0.01
cf	4371	539.58	538.27	-1.31	cf	4371	552.27	552.28	0.01
cf	4267	539.56	538.25	-1.31	cf	4267	552.19	552.2	0.01
cf	4057	539.67	538.4	-1.27	cf	4057	552.22	552.24	0.02
cf	3803	539.42	538.04	-1.38	cf	3803	552.1	551.98	-0.12
cf	3590	539.4	537.93	-1.47	cf	3590	552.09	551.83	-0.26

N
W
E
S

LEGEND

- BYPASS CHANNEL
- MARINE CREEK LOW WATER DAM
- SAMUELS AVENUE DAM
- PEDESTRIAN BRIDGES
- INTERIOR WATER FEATURE
- ROAD IMPROVEMENTS
- TRINITY UPTOWN AREA
- PREFERRED VALLEY STORAGE MITIGATION SITES

MARINE CREEK LOW WATER DAM
SAMUELS SITES
MARINE CREEK
PEDESTRIAN BRIDGE
SAMUELS AVENUE DAM
WEST FORK TRINITY RIVER
SAMUELS AVE
ROCKWOOD PARK - WEST SITE
WEST FORK TRINITY RIVER
N MAIN ST BRIDGE
TRWD GATE
RIVERSIDE PARK SITE
BYPASS CHANNEL
UNIVERSITY DR
PEDESTRIAN BRIDGE
WHITE SETTLEMENT RD BRIDGE
TRINITY POINT GATE
TRINITY UPTOWN AREA
PEDESTRIAN BRIDGE
HENDERSON ST BRIDGE
MAIN ST
HAM BRANCH SITE
PARK ROAD ENTRANCE
WHITE SETTLEMENT RD BRIDGE
INTERIOR WATER FEATURE
SYCAMORE CREEK
CLEAR FORK GATE
PEDESTRIAN BRIDGES
BEACH STREET RECONSTRUCTION
CLEAR FORK TRINITY RIVER
RIVERSIDE OXBOW/GATEWAY PARK SITES

0 2,500 5,000
SCALE IN FEET

CDM

FORT WORTH CENTRAL CITY
SUPPLEMENT NO. 1 TO THE FEIS
APPENDIX A - HYDROLOGY AND HYDRAULICS

FIGURE 1-1
PROJECT LOCATION

DATE: MARCH 2008 | SHEET 1 OF 1

FORT WORTH CENTRAL CITY
SUPPLEMENT NO. 1 TO THE FEIS
APPENDIX A - HYDROLOGY AND HYDRAULICS

FIGURE 2-1

EXISTING
FEMA FLOODPLAINS

CDM

DATE: MARCH 2008

SHEET 1 OF 1

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LEGEND

- BYPASS CHANNEL
- MARINE CREEK LOW WATER DAM
- SAMUELS AVENUE DAM
- PREFERRED VALLEY STORAGE MITIGATION SITES
- CROSS SECTIONS

SAMUELS AVENUE

MARINE CREEK

WEST FORK TRINITY RIVER

WEST FORK TRINITY RIVER

ROCKWOOD PARK WEST

RIVERSIDE PARK

HAM BRANCH SUMP

CLEAR FORK TRINITY RIVER

RIVERSIDE OXBOW / GATEWAY PARK

242421 240517 239744 239369 238508 242813 243471 242353 241255 244898 244635 245960 247207 247178 248861 249891 250903 251970 252218 252603 253414 254165 255442 256107 257010 257654 258103 257426 259337 259657 258678 261002 262394 263531 262705 264804 266213 267221 268190 270249 271402 272377 273102 273902 274754 275461 275969 276853 276325 277391 278130 279002 281831 235192 236729 234957 233994 233091 232217 231452 230852 230254 229462 229360 228755 227980 225271 224594 222789 221650 221044 220310 219536 210574 209960 206439 206218 4+77 13+24 22+49 34+23 45+35 51+70 62+58 66+56 67+57 74+00 80+79 82+99 96+14 109+06

0 2,500 5,000

SCALE IN FEET

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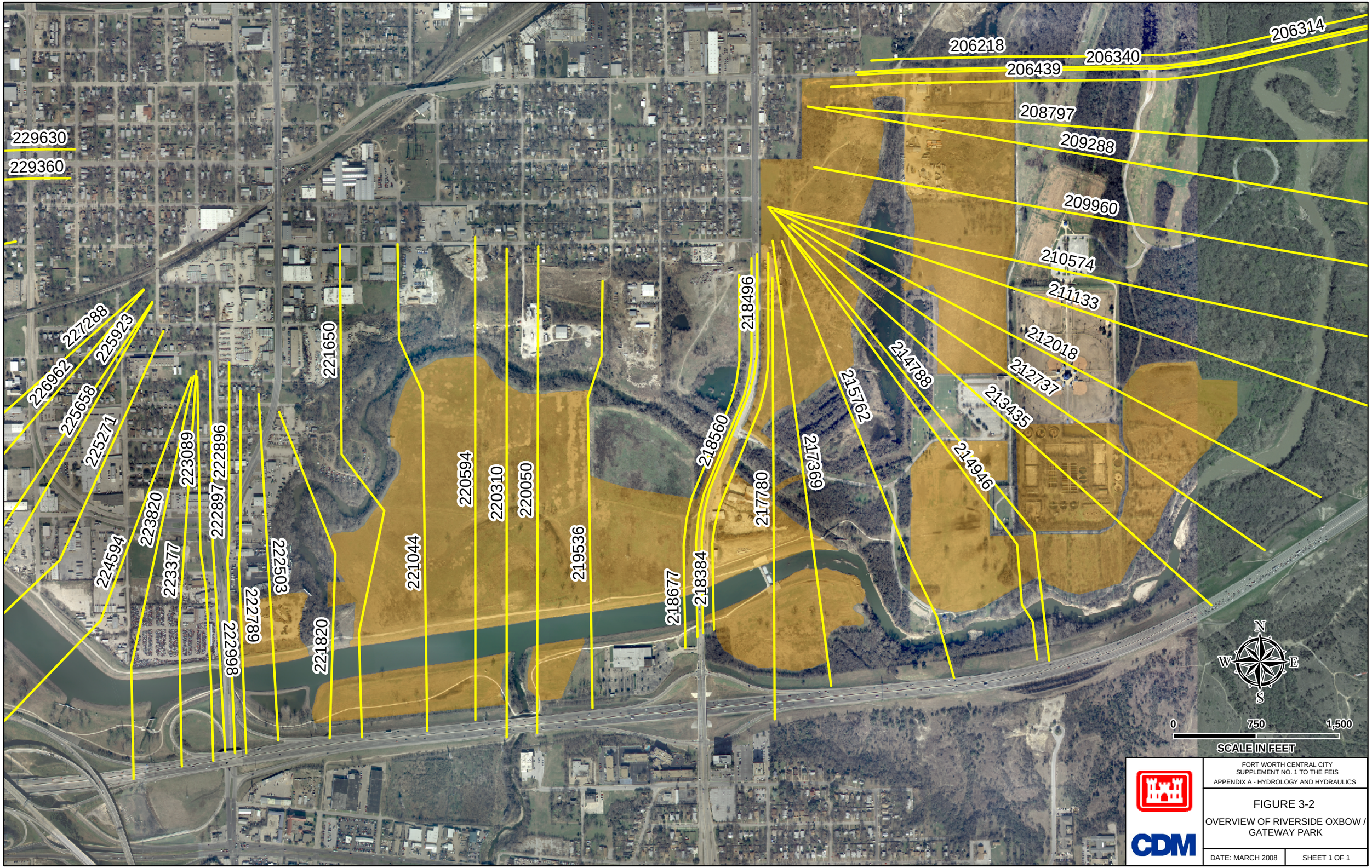
SUPPLEMENT NO. 1 TO THE FEIS
APPENDIX A - HYDROLOGY AND HYDRAULICS

FIGURE 3-1

OVERVIEW OF VALLEY STORAGE MITIGATION

DATE: MARCH 2008

SHEET 1 OF 1



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SUPPLEMENT NO. 1 TO THE FEIS
APPENDIX A - HYDROLOGY AND HYDRAULICS

FIGURE 3-2

OVERVIEW OF RIVERSIDE OXBOW / GATEWAY PARK

DATE: MARCH 2008

SHEET 1 OF 1

FORT WORTH CENTRAL CITY
SUPPLEMENT NO. 1

APPENDIX A - HYDROLOGY AND HYDRAULICS

FIGURE 4-1

PROPOSED
FEMA FLOODPLAINS

CDM

DATE: MARCH 2008

SHEET 1 OF 1