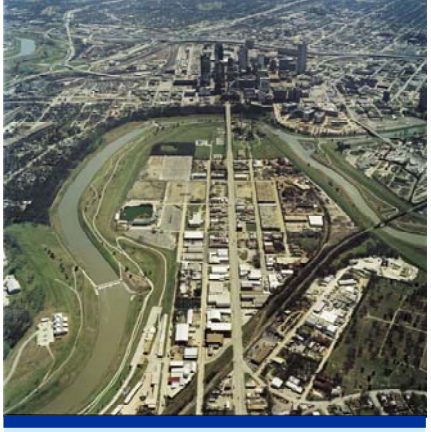

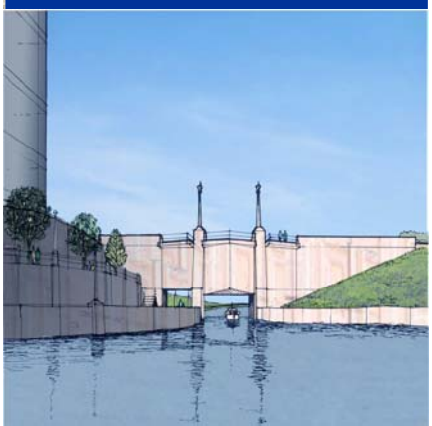

Images courtesy of CDM, Gideon Toal, and Bing Thom Architects

Upper Trinity River
Central City
Fort Worth, Texas

Final Environmental Impact Statement

Prepared by:
U.S. Army Corps of Engineers
Fort Worth District

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LIST OF ACRONYMS

AAHU ..... Average Annual Habitat Unit
ADA ..... American Disabilities Act
APE ..... Area of Potential Effects
ASTM ..... American Society for Testing Material
AQCR ..... Air Quality Control Region
BCC ..... Birds of Conservation Concern
BCR ..... Bird Conservation Region
CBD ..... Central Business District
CDC ..... Corridor Development Certificate
CDM ..... Camp, Dresser, & McGee
CE/ICA ..... Cost Effectiveness / Incremental Cost Analysis
CEDR ..... Center for Economic Development and Research
CEQ ..... Council of Environmental Quality
CF ..... Clear Fork
CFC ..... Chlorinated Fluorocarbons
CFR ..... Code of Federal Regulations
CHR ..... Channel Realignment
CWA ..... Clean Water Act
DDE ..... Dichlorodiphenyldichloroethylene
DDR ..... Detailed Documentation Report
DDT ..... Dichlorodiphenyltrichloroethane
DEIS ..... Draft Environmental Impact Statement
DFE ..... Dallas Floodway Extension
DFW ..... Dallas-Fort Worth
DSHS ..... Department of State Health Services
EAD ..... Expected Annual Damages
EIS ..... Environmental Impact Statement
EO ..... Executive Orders
EPA ..... Environmental Protection Agency
EQ ..... Environmental Quality
ESA ..... Environmental Site Assessment
EqAD ..... Equivalent Annual Damages
FAA ..... Federal Aviation Administration
FEIS ..... Final Environmental Impact Statement
FEMA ..... Federal Emergency Management Agency
FIRM ..... Flood Insurance Rate Map
FONSI ..... Finding of No Significant Impact
FPPA ..... Farmland Protection Policy Act
FW&W ..... Fort Worth and Western
FWS ..... Fish and Wildlife Service
FY ..... Fiscal Year
GIS ..... Geographic Information Systems
H&H ..... Hydrology and Hydraulics

HEP ..... Habitat Evaluation Procedures
HOV ..... High Occupancy Vehicle
HSI ..... Habitat Suitability Index
HTRW ..... Hazardous, Toxic, and Radioactive Waste
HU ..... Habitat Units
IH ..... Interstate Highway
IBI ..... Index of Biological Integrity
ICA ..... Incremental Cost Analysis
ITR ..... Independent Technical Review
IWR ..... Institute for Water Resources
LEED ..... Leadership in Energy and Environmental Design
MLK ..... Martin Luther King
MOA ..... Memoranda of Agreement
NAAQS ..... National Ambient Air Quality Standards
NCTCOG ..... North Central Texas Council of Governments
NED ..... National Economic Development
NEPA ..... National Environmental Policy Act
NER ..... National Ecosystem Restoration
NGVD ..... National Geodetic Vertical Datum
NHPA ..... National Historic Preservation Act
NPDES ..... National Pollutant Discharge Elimination System
NRCS ..... Natural Resource Conservation Service
NRHP ..... National Register of Historic Properties
NWP ..... Nationwide Permit
O&M ..... Operations and Maintenance
OSE ..... Other Social Effects
P&G ..... Principles and Guidelines
P&S ..... Plans and specifications
P.L. ..... Public Law
PA ..... Programmatic Agreement
PCA ..... Project Cooperation Agreement
PCB ..... Polychlorinated Biphenyls
PED ..... Preconstruction Engineering and Design
PEIS ..... Programmatic Environmental Impact Statement
PM ..... Particulate Matter
POTW ..... Publicly Owned Treatment Works
POV ..... Privately Owned Vehicle
RCC ..... Roller Compacted Concrete
RCI ..... Riparian Corridor Improvement
RCRA ..... Resource Conservation & Recovery Act
REC ..... Recognized Environmental Concern
RED ..... Regional Economic Development
ROD ..... Record of Decision
RWD ..... Riparian Woodland Development
SH ..... State Highway
SHPO ..... State Historic Preservation Officer

SL ..... Slope Restoration
SPF ..... Standard Project Flood
SR ..... Slope Restoration
SVTRMP ..... Streams and Valleys Trinity River Master Plan
SWPPP ..... Storm Water Pollution Prevention Plan
T&P ..... Texas and Pacific
TAC ..... Texas Administrative Code
TAD ..... Tarrant Appraisal District
TARL ..... Texas Archeological Research Laboratory
TCC ..... Tarrant County College
TCEQ ..... Texas Commission on Environmental Quality
TDSHS ..... Texas Department of State Health Services
THC ..... Texas Historical Commission
TIF ..... Tax Increment Financing
TMDL ..... Total Maximum Daily Loads
TNRCC ..... Texas Natural Resource Conservation Commission
TPDES ..... Texas Pollutant Discharge Elimination System
TPWD ..... Texas Parks and Wildlife Department
TREIS ..... Trinity River and Tributaries Environmental Impact Statement
TRV ..... Trinity River Vision
TRWD ..... Tarrant Regional Water District
TUP ..... Trinity Uptown Plan
TWDB ..... Texas Water Development Board
TXDOT ..... Texas Department of Transportation
TXU ..... Texas Utilities
USACE ..... U.S. Army Corps of Engineers
U.S.C. ..... United States Code
USGS ..... United States Geological Survey
USFWS ..... U.S. Fish and Wildlife Service
UST ..... Underground Storage Tank
VCP ..... Voluntary Cleanup Program
VOC ..... Volatile Organic Carbons
VRAP ..... Visual Resource Assessment Procedure
WD ..... Wetland Development
WF ..... West Fork
WI ..... Wetland Improvement
WPA ..... Works Progress Administration

EXECUTIVE SUMMARY

The Central City study area is located at the confluence of the Clear Fork and West Fork of the Trinity River in the heart of Fort Worth in Tarrant County, Texas (Figures 1 - 1 and 1 - 2). The Central City study area is bounded generally by the Fort Worth Stockyards to the North, University Drive to the West, I-30 to the South, and Sylvania Avenue to the East (Figure 1 - 3).

Purpose

The Central City Final Environmental Impact Statement (FEIS) documents existing conditions in the study area, identifies problems and opportunities in the study area, describes the array of alternative solutions designed to address the problems and opportunities, and compares those alternatives to the No Action Alternative. A preferred plan is identified along with identification of aspects of that plan that could be undertaken by the Corps of Engineers. The EIS also identifies and addresses, to the extent possible, the actions of others that may be connected to or stem from a project within the Central City Study Area. Within the framework of the National Environmental Policy Act (NEPA), this document is tiered from the Upper Trinity River Programmatic Environmental Impact Statement dated June 2000.

The purpose of this study is to evaluate potential modifications to the existing system of levees and channels that would enhance existing levels of flood protection, restore components of the natural riverine system that were sacrificed in the construction of the existing flood control system, facilitate urban revitalization, and provide major quality-of-life enhancements (ecosystem improvements and recreation) for citizens of the region.

Current Authority

Current USACE investigations into water resources problems and opportunities in the Upper Trinity River Basin were authorized by the United States Senate Committee on Environment and Public Works Resolution, dated 22 April 1988. On 29 August 1990, the USACE and the North Central Texas Council of Governments (NCTCOG) executed a Feasibility Study Cost Sharing agreement to conduct such investigations jointly. This agreement provides the operating framework for a number of site-specific investigations throughout the region, of which the Central City project investigation is one. Well into the study process for Central City, the study authority was modified by Public Law 108-447, dated 8 December 2004, which authorized Corps of Engineers participation for construction as follows:

- "Sec. 116 Central City, Fort Worth, Texas. The project for flood control and other purposes on the Trinity River and Tributaries, Texas, authorized by the River and Harbor Act of 1965 (Public Law 89-298), as modified, is further modified (Public Law 108-447, Section 116) to authorize the Secretary to undertake the Central City River Project, as generally described in the Trinity River Vision Master Plan, dated April 2003, as amended, at a total

> cost not to exceed $220,000,000, at a Federal cost of $110,000,000, and a non-Federal cost of $110,000,000, if the Secretary determines the work is technically sound and environmentally acceptable. The cost of the work undertaken by the non-Federal interests before the date of execution of a project cooperation agreement shall be credited against the non-Federal share of the project costs if the Secretary determines that the work is integral to the project."

The project authorization contained in P.L. 108-447, Section 116, authorizes Corps of Engineers participation in the Central City project at a total cost not to exceed $220,000,000. Section 116 further establishes that the Federal (Corps of Engineers) and non-Federal share of that project will each be $110,000,000. Based on this language, the Project Cooperation Agreement (PCA) to be signed between the Department of the Army and the Sponsor defines specific components of the Community Based Alternative which will comprise the authorized Corps participation component of the overall project. Coordination within the project team has established that the Corps Project would be comprised of the hydraulic features and related items. Specifically, the Corps Project includes the bypass channel, the isolation gates, Samuels Avenue Dam, required hydraulic, environmental and cultural mitigation as well as the real estate and property and/or business owner relocations associated with these features, and soft costs.

In addition to the Corps of Engineers, Federal funds may be contributed to the project through the Federal Highway Administration, the Environmental Protection Agency, the Economic Development Administration and other agencies. Under NEPA, Environmental Impact Statements (EIS) are required for "major federal actions" significantly affecting the quality of the human environment. 42 USC §4332(c). NEPA's regulations also require Federal agencies to consider "connected actions" within the scope of analysis of "major federal actions" analyzed in EIS documents. 40 CFR §1508.25(a)(1). In this EIS, the Corps has analyzed the authorized Corps participation in the Central City project as a "major federal action" under NEPA. See, e.g. 40 CFR §1508.18 (definition of "major federal action"). The Corps has identified the exact features of the Corps participation in the Central City project in Chapter 5, Project Implementation of this EIS. As will be reflected in the Project Cooperation Agreement (PCA) for the Central City Project, Corps participation features and non-Corps participation features are interdependent parts of the larger Central City Project and depend on the larger Central City Project for their justification, and the non-Corps components cannot proceed unless the Corps component is implemented. See 40 CFR §1508.25(a)(1)(iii). The Corps has therefore also considered other features of the Central City project that are not included within the Corps participation component, as well as, the Trinity Uptown project to be "connected actions" to the Corps "major federal action" and has included these other features within the scope of analysis of this EIS.

Previous Authorities

The Fort Worth Floodway, as a Federal project, was authorized by Section 2 of Public Law No. 14, 79th Congress, 2nd Session approved 2 March 1945. The project was initiated in 1950 and completed in 1957. In 1960, the Flood Control Act provided for an extension upstream of the completed Fort Worth Floodway on the West Fork of the Trinity River. The construction of this extension project was initiated in March 1965 and completed in June 1971. The Flood Control Act dated October 23, 1962 authorized an extension of the levee system along the Clear Fork of

the Trinity River between the existing Fort Worth Floodway and State Highway (SH) 183. Construction of this extension began in January 1966 and was completed in September 1971.

Evolution of the Study

The Fort Worth Floodway was constructed in downtown Fort Worth in 1957 by the Corps and Tarrant County Water Control and Improvement District #1 (Now the Tarrant Regional Water District). The original project included widening and straightening the Clear Fork channel from Lancaster Street Bridge to the confluence with the West Fork, and continued along the West Fork to Riverside Drive. Leveed flood protection was also provided along the West Fork upstream of the confluence. The resulting floodway channel was 9.9 miles long, with levees of varying height, but an average of approximately 13 feet above ground elevation. The floodway has been subsequently modified with extension of the Clear Fork levee towards Benbrook Lake and extension of the West Fork Levee downstream of Lake Worth. Several other modifications including the construction of a low 5200-foot long levee along the north overbank in the vicinity of Riverside Drive occurred during the 1980s.

Since the mid-1980s there have been a series of Trinity River planning and floodplain management initiatives, all of which have lead in some form or another to the current planning effort. The Trinity River and Tributaries Environmental Impact Statement (TREIS) identified inadequacies with the regional floodplain management policies of the time, and the study concluded that reduced levels of flood protection within the region's major urban areas had already occurred. Further, the document indicated that without a common set of criteria for floodplain development, the level of flood protection would continue to degrade. The TREIS Record of Decision (ROD) was signed in 1988 and established hydrologic and hydraulic criteria for actions that require USACE permits under Section 10 of the Clean Water Act (CWA) and/or Section 404 of the CWA. Because the ROD left the possibility for development of floodplains outside of the USACE jurisdiction which would lead to increases in flood frequency and extent, a Corridor Development Certificate (CDC) program was initiated. As a joint effort of the North Central Texas Council of Governments (NCTCOG), the USACE, Fort Worth District, and member NCTCOG cities and counties, the CDC establishes a set of permit criteria and procedures for development of the Trinity River Corridor similar to those developed in the TREIS.

Measures implemented through the TREIS and CDC stabilized existing levels of flood protection. However, the degradation of flood protection, which occurred between the 1950s when the floodway was built and the 1980s when more rigorous floodplain management measures were implemented, was not restored. During the 1990s, a series of studies were conducted by USACE in cooperation with other entities to investigate the opportunities to restore the original level of flood protection. In 1999, Streams and Valleys, Inc. developed a plan through intense public dialog which, while recognizing the flood protection function of the floodway, challenged traditional concepts of how the protection should be provided. This plan outlined recreation-oriented improvements to an eight mile loop of the river around downtown Fort Worth. In 2001, TRWD in cooperation with Streams and Valleys, Inc., the City of Fort Worth and Tarrant County, developed the "Trinity River Vision Master Plan". This plan was developed with an emphasis on community-based input and integrated the two purposes of recreation and flood protection by emphasizing quality-of-life enhancements and environmental integrity for the Trinity River, while ensuring the watercourse could manage stormwater runoff, water

conservation, and flood control in a manner that protects public safety and property. One community goal clearly communicated through the public involvement process was a desire to "connect" to the water of the Trinity River, to which the current levee system is a barrier. The resolution conceived during urban planning workshops was a bypass channel and flood isolation gates that could eventually allow removal of portions of the existing levee system.

In May 2004, the USACE and Tarrant Regional Water District (TRWD) modified the Project Management Plan for the West Fork/Clear Fork Interim Feasibility Study to focus exclusively on problems and opportunities in the Central City river reach.

Existing Conditions

Flood Protection

The existing floodway was designed and constructed to provide a level of protection equivalent to the Standard Project Flood (SPF) with four feet of freeboard on the levees. Analyses from the Clear Fork/West Fork feasibility study indicate that 86 percent of the linear extent of the levee system is currently less than the current design level of protection. A minimum levee freeboard of four feet was considered necessary in order to allow for possible deviation from the adopted design discharge as a result of the rapid rise in flood discharge for this type of watershed, as well as, for allowing for wave action, outer bend ride-up, unclear vegetation, levee settlement, floating debris buildup, duration of high water against the levees, upper river improvements, and future urbanization. The original SPF Fort Worth Floodway design discharges are 95,000 cfs on the West Fork below the confluence with the Clear Fork, 50,000 cfs on the West Fork above the Clear Fork, and 75,000 cfs on the Clear Fork. Hydrologic analysis of the river system for this study indicates that the SPF design discharge on the West Fork below the confluence with the West Fork is 118,900 cfs, 59800 cfs on the West Fork above the Clear Fork, and 78300 cfs on the Clear Fork. The SPF discharges on the West Fork below the Clear Fork increase to 127,300 at the end of the Fort Worth Floodway at Riverside Drive. These discharges are "future conditions" discharges and were used as the basis for design of this project. This is consistent with the CDC process use of future conditions discharges as design discharges. Expected annual flood damages for existing conditions are approximately $334.3 thousand (July 2003 prices).

The Fort Worth Floodway interior drainage system consists of sump areas, served by 30 drainage structures, which collect and store local runoff behind the levees to discharge via gravity flow into the West Fork and the Clear Fork once the river levels recede. The original design capacity of the sump areas is the 50-year flood. Recent studies have indicated that this level of protection has diminished for several sumps. Total flood damages from the 50-year event for sumps 26 and 14/15W were estimated to be $5,122,300, and $13,916,300 for the 100-year flood event.

Ecosystem

The natural resources within the study area have been modified by urban development and past flood damage reduction activities. The entire study reach has been channelized and levees have been constructed along the area to protect large areas of former floodplain. The terrestrial habitat between the levees is maintained in a modified state which allows only grasses, predominantly

non-native species, to grow and survive. The aquatic habitat is also a modified community due to the channelization and construction of numerous low-water dams, resulting in a system that essentially functions more as a lentic (lake) environment than a true lotic (river) system. The exceptions to this condition can be found on two tributaries in the study area, Marine Creek and Lebow Creek.

Terrestrial habitats found within the study area include riparian and upland forest, wetlands, and modified grassland communities. Historically, riparian woodlands were the dominant community occupying the near-water lands; today they occupy approximately 6 percent of their former range within the study area. These remaining riparian communities are predominantly occupied by in-mature, early successional trees. Coupled with the presence of non-native invaders such as Chinaberry and Ligustrum, which suppress the reproduction and recruitment of new canopy trees, the ability for the remaining riparian woodlands to provide the necessary components of quality habitat is severely diminished. Wetlands within the study area are generally small, ephemeral, and poor quality. Most of the grasslands within the study area are non-native mown urban type grasses, and the largest portion of these is located within the existing floodway. The ability of the grasslands to provide quality habitat is severely limited as they do not provide the height, structure, diversity, or seed production that native, unmaintained grassland would contain. Upland woodlands are scattered throughout the study area, and several locations provide high quality upland habitat.

Based upon the result of the habitat evaluations performed by U.S. Fish and Wildlife, there are approximately 323 acres of riparian woodlands which provide approximately 189 habitat units; 523 acres of upland woodlands which provide approximately 305 habitat units; 14 acres of wetlands which provide approximately 5 habitat units; 2,363 acres of modified grasslands providing 956 habitat units.

Much of the river channel within the study area is characterized as pool habitat, which is created by a series of low-water dams. The historic pool-riffle-run sequences of a river system are lacking from much of the main channel. The confluence of Marine and Lebow Creeks with the West Fork Trinity River occur within the study area, and the aquatic habitats within these creeks and a downstream reach of the West Fork include these highly productive aquatic habitat sequences. Because these areas include pool-riffle-run sequences, and are more natural with respect to their sinuosity and thus have more balanced sediment transport functions, they also contain more appropriate substrate materials for successful aquatic life reproduction.

Habitat suitability indices were calculated by U.S. Fish and Wildlife based upon an Index of Biotic Integrity (IBI) value. The Clear Fork Trinity contains 39.54 surface acres of water which provides approximately 33.07 habitat units, while the West Fork Trinity contains 168.87 surface acres of water and provides 149.05 habitat units. Approximately 1875 linear feet of Marine Creek and 2700 linear feet of Lebow Creek were considered by USFWS to contain exceptional or high quality habitat. The lower portion of Marine Creek, beginning at its confluence with the Trinity River provides the best habitat with a calculated HSI value of 0.93, and the upper portion of the creek provides some of the lowest quality aquatic habitat within the study area with a HSI of 0.75. Lebow Creek upstream to Brennan Avenue was also associated with better overall habitat conditions with an average HSI of 0.87. The creek was found to be populated with species considered to be intolerant of conditions disruptive to quality habitat.

Water quality within the study area is primarily influenced by base flows from upstream Lake Benbrook and Lake Worth releases, urban runoff from upstream adjacent watershed areas, and the check dams at various locations along the watercourse. TCEQ has set water quality standards and designated the water use for two stream segments within the study area. According to TCEQ use designations, the immediate study area is designated for high aquatic life use, contact recreation use, general use, fish consumption use, and public water supply use (TNRCC 2000a). Existing water quality test results in project area tend to fully support these uses except fish consumption (due to presence of legacy pollutants in fish tissue) and contact recreation (due to insufficient bacteria testing).

Cultural Resources

A records search indicated two previously recorded cultural resources sites in the immediate vicinity of the study area. Both sites are deeply buried prehistoric sites consistent with other such sites discovered along the West Fork, its tributaries, and Lake Worth. Thirty properties were identified as having potential for listing on the National Register of Historic Properties (NRHP), and one property, the Paddock Viaduct is already listed on the NRHP and recognized as a Texas Civil Engineering Landmark and a Recorded Texas Historical Landmark.

Hazardous, Toxic, and Radioactive Waste

Results from a records review indicate that the majority of known major soil and groundwater contamination is in the North Main Street area. Within the study area, there are numerous sites (i.e. vehicle maintenance, dry cleaners, USTs, etc.) where environmental issues could typically occur. There are four sites within the North Main Street area where significant releases to the environment have occurred. Soil and groundwater data collected along the route of the proposed bypass channel associated with the Community Based Alternative indicate minimal subsurface contamination. Therefore, widespread subsurface contamination is not likely to be encountered throughout the project area. However, although below action levels, the presence of some contaminants may indicate the potential for nearby soil contamination in excess of regulatory levels. Based on these findings it appears that contamination from individual properties is likely to be restricted to private industrial properties.

Recreation

There are approximately 830 acres of recreational lands dispersed among 17 different facilities (golf courses, community parks, urban parks, neighborhood parks, and special use areas) located within the study area. Additionally, there are approximately 15 miles of existing trails. These recreational opportunities are some of the 10,555 acres of parkland available for public use within the City of Fort Worth. Currently, these existing facilities provide 19.5 acres of recreational lands per 1000 persons, which is short of the 21.25 acres per 1000 person goal established by the City in 1998. It is estimated that by 2023, based on current population trends, that the City of Fort Worth will need an additional 4,700 acres of parkland to meet the 21.25 acre per 1000 person standard.

Socio-economics

The existing socio-economic character was established for two contexts, the study area and the immediate project area. The study area is approximately 9,700 acres in size and provides a broader context for the socio-economic assessment. A subset of the 9,700 acres was assessed as the project area. The project area was thought to be the area most impacted by a bypass channel, a measure under consideration during the planning study, and ultimately identified as a part of the preferred alternative.

The project area consists of an area whose population is predominantly Hispanic. Although there has been improvement between the 1990 and 2000 census, a larger percentage of residents in the project area have lower levels of income and educational attainment compared relative to Tarrant County as a whole. Unemployment for the project area is more than twice that of the County. The proportion of owner occupied housing within the project area is roughly 80 percent compared to that of the County. Additionally, the poverty rate is more than twice as high in the project area as it is in Tarrant County. Coinciding with the appearance of an area that may be considered economically depressed, land values for the project area compares similarly with other areas of the city such as Riverside and MLK. Comparing the land values with those of the downtown area, the contrast is enormous, especially in light of the proximity of the two areas.

Coordination and Public Involvement

A Notice of Public Scoping Meeting was mailed to all known interested parties on October 11, 2002 outlining the study authority, major projects being proposed by USACE within the study area, and the date and location of the public scoping meeting. USACE also issued a news release on October 24, 2002, announcing the scoping meeting and the opportunity for citizens to offer comments, suggestions or any other information that might benefit the USACE in preparing the Final EIS. The scoping meeting was held on October 29, 2002 with approximately 50 individuals attended. A brief description of the overall study and schedule for the NEPA process was discussed and members of the public were allowed to present statements regarding their concerns on the feasibility study.

From April to June 2001, ten public meetings were held with neighborhood groups and land owners, including those neighborhood groups within close proximity to the project area, with subsequent rounds of public meetings occurring in January 2002 and between November 2002 and June 2004. In December 2004, the public exhibit of Trinity Uptown opened following the adoption of the TRV Master Plan by the TRWD Board, the Streams and Valleys Board, the City of Fort Worth and Tarrant County in 2003. Meetings including neighborhood groups close to the project area were conducted in the Rose Marine Theater in the heart of the traditionally Hispanic Northside of Fort Worth and in the Botanic Gardens. Comments from neighborhood groups reflect concerns about maintaining the historical integrity of their neighborhoods, accessibility to project amenities from neighborhoods such as Oakhurst and Riverside as well as those neighborhoods with limited amounts of park space. Additional comments were voiced with regard the availability of mass transit to relieve anticipated traffic congestion in the area, as well as, concern regarding the potential acquisition and relocation of businesses.

Additionally, during data collection for the socioeconomic assessment, a meeting was held with the president of the Hispanic Chamber of Commerce to help determine what impacts, both positive and negative, the Hispanic community may expect and how the Chamber may be used to disseminate information. Discussions included construction and bidding opportunities for Hispanic businesses and public outreach to the community through Spanish language television and radio.

In June of 2005 the Draft EIS was released for public comment. Approximately 3,000 Notices of Availability were mailed to interested citizens. The document was available on the district website, CD, and hard copy (special request only.) Public meetings to receive comments on the DEIS were held on 26 and 27 July. The format of the public meetings was a combined "open house" and formal public hearing. Approximately 300 persons attended and 43 statements were received on 26 July; attendance on 27 July was similar, and 42 statements were received. Numerous persons made statements both nights.

Testimony presented at the public meetings generally took the form of statements in favor of or opposed to the Community Based Alternative. Opposition was primarily grounded in concern over the public expenditure, by either the Federal Government or the City of Fort Worth (or both) and over the potential use of eminent domain to acquire needed real estate. Very few concerns relative to environmental or technical issues, or the content of the DEIS, were received.

The Notice of Availability for the DEIS appeared in the Federal Register on 24 June 2005. The original 45 day comment period was extended 30 days at the request of numerous parties. The public comment period closed on 7 September 2005. During the original 45-day comment period, 37 written comments were received, either via email or post. Federal agencies providing comments included the Federal Aviation Administration (FAA), the Department of the Interior (DOI), and the Environmental Protection Agency (EPA). The Texas Commission on Environmental Quality (TCEQ) and the North Central Texas Council of Governments (NCTCOG) provided State comments, while Streams and Valleys, Inc. provided local comments.

An additional 56 comments were received during the 30-day extension. Wit the exception of one commenter, who provided extensive, detailed comments on the DEIS and supporting analyses, the written comments mirrored the statements made at the hearings, generally taking the form of statements for or against the Community Based Alternative. Eleven landowners, one civic group, and 58 citizens-at-large opposed the recommendation, generally on the grounds of excessive cost or the potential use of eminent domain. Nine citizens-at-large and three civic groups expressed support for the project.

Goals and Objectives

Based upon the existing condition analysis, four general categories of problems and opportunities were identified. The goals and objectives established for each category are:

Flood Protection

- Restore the design level of protection (SPF+4 feet) throughout the system

- Maintain or improve flood protection associated with interior drainage to the floodway system

Ecosystem Improvement

- Restore, improve, and diversify aquatic habitat associated with the Clear and West Forks of the Trinity River for native aquatic organisms
- Improve and increase quantity of emergent wetland habitat for migratory birds of ecological importance
- Establish continuity and connectivity within and between regionally and nationally significant ecosystems
- Protect and improve existing pockets of high quality bottomland hardwoods adjacent to the river system

Urban Revitalization

- Provide aesthetic and recreational focal points for the Central City
- Encourage a higher density of people living, working, playing, and learning in the Central City
- Orient mixed use development directed toward the river
- Create an interior water feature, or focal point
- Provide a higher normal water level
- Eliminate or modify levees where feasible, while maintaining the level of flood protection
- Create new and enhance existing linkages to neighborhoods and districts
- Enhance redevelopment potential of Central City lands

Recreation

- Provide extensive and direct public access to the river and waterfront
- Facilitate a water-based system of linkages between Downtown, Stockyards, and the Cultural District
- Provide recreational and open space amenities

- Provide a continuity of urban trails through Downtown consistent with the Trinity Trails system

- Create additional trail linkages with neighborhoods and cultural amenities

Alternatives Considered

In addition to the No Action, two action alternatives are presented in this Final EIS. The two action alternatives share three common objectives, Flood Protection, Ecosystem Improvement, and Recreation. One additional objective was associated with providing Urban Revitalization opportunities; only one action alternative was formulated with this purpose in addition to the three common purposes. The action alternatives were developed under two parallel formulation strategies. Development of the Principles and Guidelines (P&G) Based Alternative followed the principles, standards, and procedures outlined in the Water Resources Council's "Economic and Environmental Principles and Guidelines for Water Related Land Resources Implementation Studies". The strategies presented in that document provide the basis for Corps planning activities. The Community Based Alternative was formulated with a broader community input based approach, which included extensive public participation with unconstrained development of goals and objectives. The result of these two different planning processes was the development of two very different plans for addressing the problems and opportunities of the study area.

Under the No Action Alternative, which is equivalent to the description of the future without-project condition, no measures would be taken to address the objectives and goals developed for flood protection, environmental improvement, urban revitalization, or recreation. The existing inefficiencies of the floodway would remain. The expected annual flood losses in the future without-project condition were estimated to be $500.1 thousand (July 2003 prices). This represents an almost 50% increase in the Total Expected Annual Damages over the existing condition. While environmental conditions between the levees of the floodway would remain the same, the environmental conditions in locations outside the floodway would essentially continue to degrade. With the No Action Alternative, land use in the immediate project area would remain at levels significantly less productive than those of surrounding portions of the study area. Finally, there is an existing shortfall in recreational facilities available for the current population of Fort Worth, and under the future without-project condition that shortfall would increase.

The P&G Based Alternative includes levee raises along portions of the existing channel to bring the system within the study area into compliance with CDC criteria, and return the flood protection levels to the original design criteria of SPF+4 foot. This alternative provides approximately $230,000 in expected annual flood damage reduction benefits. This alternative does not provide any improvements to the existing interior drainage problems. The ecosystem improvement component of the P&G Based Alternative would provide approximately 56 acres of riparian woodland development, and 65 acres of existing riparian corridor would be improved. These riparian woodland measures would increase riparian habitat outputs by 38.5 AAHUs over the No Action Alternative. Approximately 22 acres of new wetlands would be developed and approximately 3 acres would be improved, providing an additional 21.8 AAHUs over the future without-project condition. Two historic meanders which were disconnected from the main channel would be reconnected to provide approximately 2.5 acres of scarce riverine habitat and add 2.2 AAHUs to the output of the aquatic community. The P&G Based Alternative would also

include 1.5 acres of slope restoration involving shrub plantings to restore the new channel slopes of the restored meanders. Recreation features included in the P&G Alternative provide for approximately 7,800 linear feet of new multipurpose trail which would link the southern end of the study area to the Trinity Trail System. Other amenities would include four new trail heads, self-guided interpretive signage, mile marker signage, and six benches. Less than one mile of existing trail would need to be replaced due to disturbance to construct this alternative.

The Community Based Alternative would provide SPF+4 feet of protection through construction of a bypass channel extending just downstream of Fifth Street on the Clear Fork to just upstream of Northside Drive on the West Fork, approximately 8,400 feet in length and 300 – 400 feet wide between the top of the levees. Three isolation gates designed to restrict flood flows to the new bypass channel and to isolate the interior area from flood flows would be constructed. This alternative would provide the same magnitude of economic benefit for flood damage reduction as the P&G Based Alternative; however, the hydraulic efficiency of the bypass channel also improves the interior drainage problems which exist in the system. Damages associated with the 50-year event for sump 26 ($773,500) and the 100-year event ($4,846,900) would be eliminated. Twenty acres currently within sump 16W would be raised above the elevation of the 100-year event. University Drive between the West Fork and Jacksboro Highway and Henderson Street in the vicinity of White Settlement Road and the Fort Worth and Western Railroad would be raised out of the 100-year floodplain.

Additional urban design features which would enhance the urban revitalization potential of the area include a dam on the West Fork, approximately 1,100 feet downstream of Samuels Avenue, designed to create a normal water surface elevation of approximately 525 feet National Geodetic Vertical Datum (NGVD) and an interior water feature approximately 900 feet in length at the confluence area of the Clear Fork and West Fork Channels. The ecosystem improvement components of this alternative are tied primarily to the areas proposed for valley storage mitigation, which would be required for implementation of this alternative. In addition to restoring 5 acres and 4.3 AAHUs of riverine habitat through the reconnection of two historic river meanders, the Community Based Alternative would improve the quality of the future wetland values by 12.5 AAHUs while providing approximately 6.2 additional acres. The quality and quantity of riparian woodlands would be increased by 42.1 AAHUs and an additional 85 acres over the without-project condition. There would also be an approximately 118 acres of additional surface water created by the Samuels Avenue Dam and interior water feature. Recreational features of the Community Based Alternative would enhance river accessibility by providing approximately 10 miles of waterfront trails, 2 new pedestrian bridges, and approximately 3.5 miles of contiguous boating loop. Three new vehicular bridges would be required to maintain existing traffic flows to and through the area. These bridges would provide access over the bypass channel for North Main Street, Henderson Street, and White Settlement Road and the Henderson Street and White Settlement Road bridges would improve safety due to grade separations with the FW&W Railroad.

Preferred Alternative

After careful consideration of the impacts associated with the three presented alternatives, the Community Based Alternative is determined to be technically sound and environmentally acceptable, subject to concurrence by the Assistant Secretary of the Army for Civil Works. That portion which is currently authorized, and defined in Chapter 5, Identification of Corps

Component, is recommended for Corps of Engineers cost sharing and implementation, subject to completion of this NEPA process. The exact features of the Corps participation in the Central City project are identified in the FEIS, Chapter 5, Project Implementation.

The Community Based Alternative addresses all four project objectives, i.e. flood protection, ecosystem improvement, urban revitalization, and recreation. This alternative provides the design level of protection within the system, and improves the performance of the interior drainage components, reducing damages associated with the 100-year flood event for sumps 16W and 26. By following the valley storage mitigation outlined below, the proposal fully complies with the criteria established in the Corridor Development Certificate process, and, in fact, exceeds the criteria relative to mitigation of valley storage for the SPF volume. Additionally, the Community Based Alternative would cause no long-term adverse environmental impacts within the study area. Initial adverse impacts to the aquatic habitats of Marine and Lebow Creeks would be fully mitigated in accordance with the Mitigation Plan discussed below. Adverse impacts to cultural resources either buried or in the cultural landscape would be identified and appropriate mitigation completed. Business relocations required to support the Community Based Alternative may, initially, have an adverse impact on local employment. Most affected businesses are expected to relocate in proximity to the project, mitigating this effect. Long term economic growth and land use intensification would offset the employment effect many times over.

Hydraulic Mitigation

Construction of the bypass channel would require mitigation of valley storage to compensate for the increased efficiency of the bypass channel. Hydraulic analysis quantified the approximate volume of valley storage that would be lost as 5,250 acre-feet (8.47 million cubic yards) without mitigation. Of this, an estimated 2,850 acre-feet would be lost due to creation of the shorter bypass channel (versus existing river channel) and approximately 2,400 acre-feet of valley storage would be lost due to drawdown.

These valley storage losses would be mitigated by the following:

- Partial levee removal and excavation in the Riverbend site approximately three miles upstream of University Drive;
- Excavation of additional sites immediately downstream of Samuels Avenue Dam, and adjacent to Interstate Highway 35; and
- Modification of the University Drive roadway embankment, north of the bridge over the West Fork

In combination, these measures have been verified to fully mitigate for 100 percent of the valley storage inputs, in full compliance with CDC criteria and exceeding the criteria relative to mitigation of valley storage for the SPF volume.

Ecological Mitigation

Implementation of the Community Based Alternative would result in losses to wetlands, riparian woodlands, and upland woodlands primarily in the hydraulic mitigation site(s). However, with

construction of the hydraulic mitigation features mentioned previously and ecosystem improvement components of the alternative, the quality of all and quantity of some of these habitats would ultimately be improved through the period of analysis.

Marine Creek aquatic habitat has been assessed by U.S. Fish and Wildlife as being exceptional during some times of the year. Additionally, the Community Based Alternative would fill the lowermost 400 linear feet of Lebow Creek in order to prevent inundation to the upper reaches and associated effects to the 100-year water surface elevation.

USFWS has coordinated with the USACE and local sponsors and has approved a mitigation plan for the impacts to Marine and Lebow Creeks. Mitigation measures include diverting flows varying by season up to 5 cubic feet per second to the mid-reach of Lebow Creek. A gravity flow pipeline from the Samuels Avenue Dam impoundment would be possible to a point on the stream where the bottom elevation is approximately 525 NGVD feet, which appears to be near Brennan Avenue. In addition, investigation of the potential to add additional aquatic habitat area by modifying the channel bottom of Lebow Creek within the reach downstream of Brennan Avenue including the 1500 feet of downstream diversion of Lebow Creek.

Additional aquatic mitigation at Ham Branch was found to be necessary to fully compensate aquatic impacts and would be completed following studies to determine a stream configuration that is geomorphically stable based upon hydrology, sediment characteristics and slope. Typical cross-section and plan view of proposed mitigation features are presented in Appendix G.

Development of a riparian forested buffer of 50 foot in width on either side. Contouring of the channel bank as necessary to provide appropriate interaction between the riparian vegetation and the aquatic environment would be done prior to reforestation. The Riparian plantings would include dense development of shrubs and overhanging grasses near the creek channel. Approximately 305 feet of the existing channel would be relocated to provide adequate width for riparian forest development adjacent to an existing fenced soccer field. Riparian forest would be planted on 7.4 acres and the existing 1.4 acres of riparian forest would be improved to provide a total 8.8 acres along the creek. Pending further investigation, approximately 25 percent of the total length (3,568 feet) of the stream segment would be modified to provide approximately 900 linear feet of rock based riffles at locations to be determined by those additional studies.

Following implementation of the Community Based Alternative, Trinity Uptown Features, ecosystem improvements there would be 20.52 acres of wetlands having 14.39 AAHUs within the study area. Provided the alternative is implemented completely as proposed, including the ecosystem improvements at Riverbend, the alternative would adequately mitigate the 1.31 AAHUs of wetland lost. Therefore, construction and management of 1.43 acres of wetlands would provide annual benefits the 1.31 AAHUs over a 50-year analysis period, and thereby, provide compensatory mitigation for wetland impacts.

To achieve the compensatory mitigation goal of 18.36 AAHUs of riparian woodland outputs, the establishment of 33.2 acres of riparian forest and management of an existing 5.3 acres of existing riparian forest will be required.

A total of 48.82 AAHUs would be required to mitigate for upland woodland losses. Compensatory mitigation of these losses would require both in-kind and out-of-kind forest habitat development and/or management. Contributing to in-kind compensation would include

establishment of 45.5 acres of upland forest and management of 13.3 acres of existing upland forest. Out-of-kind mitigation would include establishment of 43.0 acres and management of 6.9 acres of riparian forest within the Riverbend and Rockwood environmental mitigation area. The combined in- and out-of-kind mitigation of 108.7 acres for upland forest losses would provide 48.87 AAHUs of forest habitat gain.

In addition to the specific average annual habitat unit mitigation goals identified, it is also proposed that a specific plan to identify the precise mitigation tract within the Ecosystem Improvement area for wetlands, riparian forest and upland forest would be identified during the Plans and Specifications phase. In addition, management plans, including monitoring and providing for adaptive management will also be developed for the identified aquatic, wetland and terrestrial mitigation objectives.

Implementation and Costs of the Preferred Alternative

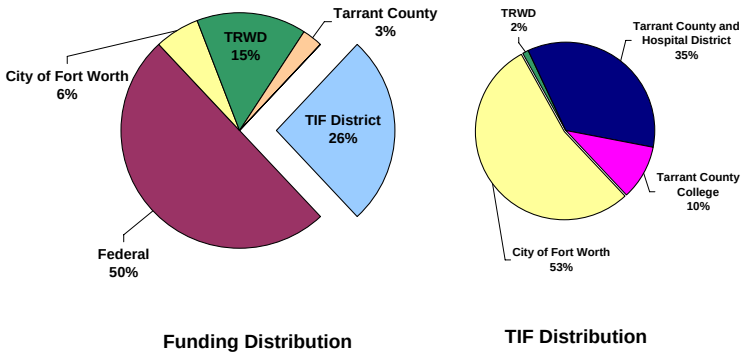
Total project costs are estimated at $435 million; a preliminary cost schedule for the Community Based Alternative is shown in the following table. The subset of the Community Based Alternative identified as the Corps Project is limited in cost to $220,000,000; this subset is defined in Chapter 5, Identification of Corps Component. Included in the Corps component would be the acquisition of required real estate and business and property relocations. The real estate footprint for the Corps component is currently estimated at approximately 687 acres

All costs shown are in January 2005 dollars. Annual operation and maintenance costs are estimated to be $256,443.

Table ES-1. Project First Costs (2005 Dollars)

Item	Estimate ($)
Property and Relocation	95,000,000
Valley Storage Mitigation	17,000,000
Samuels Avenue Dam	35,500,000
Ecosystem Improvements	2,000,000
Ecological Mitigation	4,600,000
Roads and Bridges	64,000,000
Bypass Channel	39,500,000
Stormwater Pumping Station	4,900,000
Water Feature	13,100,000
Flood Control and Diversion Structures	35,200,000
Building Demolition and Utilities	33,000,000
HTRW	25,000,000
Design Survey, Testing, Legal Fees	8,000,000
Planning, Engineering, Design and Permitting	24,000,000
Program Management	17,500,000
Construction Management	16,700,000
Total	**435,000,000**

Tarrant Regional Water District will serve as the primary non-Federal sponsor; however a variety of sources will provide local, state, and federal funds. The anticipated contribution of each participating entity is shown below.



Funding Distribution **TIF Distribution**

Additional Information

Copies of this Environmental Impact Statement are primarily provided in electronic format through the internet or compact disks in .pdf format. The supporting appendices of this Environmental Impact Statement have also been placed on compact disks in a .pdf format. The electronic files on compact disk can be accessed using Adobe Acrobat. Hard copies of either the report or appendices are available upon request.

Contact Information

Comments or questions regarding the Upper Trinity River, Central City, Final Environmental Impact Statement or the Preferred alternative can be addressed to Dr. Rebecca Griffith, Project Manager, CESWF-PER-P, U.S. Army Corps of Engineers, Fort Worth District, P.O. Box 17300, Fort Worth, Texas 76102-0300, or call 817-886-1820, or use electronic mail at rebecca.s.griffith@swf02.usace.army.mil.

INTRODUCTION

ACTION AND LOCATION

The Central City study area is located at the confluence of the Clear Fork and West Fork of the Trinity River in the heart of Fort Worth, Texas (Figure 1 - 1 and Figure 1 - 2). This project-specific Final Environmental Impact Statement (DEIS) describes existing conditions in the study area; identifies problems and opportunities within the study area; describes an array of alternative solutions to address those problems and opportunities; compares these alternatives to a No Action condition; and identifies a set of recommendations for Federal Action. Additionally, the document addresses future actions of others that may be connected with or stem from Central City project features and future with-project conditions. Within the framework of NEPA compliance, this document is tiered from the Upper Trinity River Programmatic Environmental Impact Statement dated June 2000.

Purpose and Need of Action

Between 2000 and 2003, a comprehensive plan was developed by a consortium of local entities for the 88 miles of the Upper Trinity River and its major tributaries within the greater Fort Worth area. An early product of this comprehensive planning effort was recognition of the unique urban characteristics and opportunities within the Central City Segment of the river. The Central City Study Area is bounded generally by the Fort Worth Stockyards to the North, University Drive to the West, I-30 to the South, and Sylvania Avenue to the East (Figure 1 - 3). In October, 2004 the Study Area was expanded upstream on the West Fork. This DEIS documents analyses conducted by the United States Army Corps of Engineers (USACE) and the Project Sponsor, the Tarrant Regional Water District (TRWD), to examine problems and opportunities associated with the floodplain of the Trinity River in the Central City area. The focus of the effort has been to evaluate potential modifications to the existing system of levees and channels that would protect or enhance existing levels of flood protection, restore components of the natural riverine system that were sacrificed in the construction of the existing flood control system, facilitate urban revitalization, and provide major quality-of-life enhancements for citizens of the region.

Project Authority

Current USACE investigations into water resources problems and opportunities in the Upper Trinity River Basin were authorized by the United States Senate Committee on Environment and Public Works Resolution, dated 22 April 1988. On 29 August 1990, the USACE and the North Central Texas Council of Governments (NCTCOG) executed a Feasibility Study Cost Sharing agreement to conduct such investigations jointly. This agreement provides the operating framework for a number of site-specific investigations throughout the region, of which the Central City project investigation is one. Well into the study process for Central City, the study authority was modified by Public Law

108-447, dated 8 December 2004, which authorized Corps of Engineers participation for construction as follows:

> - "Sec. 116 Central City, Fort Worth, Texas. The project for flood control and other purposes on the Trinity River and Tributaries, Texas, authorized by the River and Harbor Act of 1965 (Public Law 89-298), as modified, is further modified (Public Law 108-447, Section 116) to authorize the Secretary to undertake the Central City River Project, as generally described in the Trinity River Vision Master Plan, dated April 2003, as amended, at a total cost not to exceed $220,000,000, at a Federal cost of $110,000,000, and a non-Federal cost of $110,000,000, if the Secretary determines the work is technically sound and environmentally acceptable. The cost of the work undertaken by the non-Federal interests before the date of execution of a project cooperation agreement shall be credited against the non-Federal share of the project costs if the Secretary determines that the work is integral to the project."

The project authorization contained in P.L. 108-447, Section 116, authorizes Corps of Engineers participation in the Central City project at a total cost not to exceed $220,000,000. Section 116 further establishes that the Federal (Corps of Engineers) and non-Federal share of this cost will each be $110,000,000. Based on this language, this EIS will identify the extent to which the recommended project can be implemented by the Corps of Engineers under this currently authorized funding level. Further discussion is provided in Chapter Five, Project Implementation.

The overall Central City project will be financed from a variety of Federal and local sources. In addition to funding for the Corps Project, Federal Funds have been appropriated through the Department of Transportation for design and construction of the North Main and Henderson Street bridges. An EDI grant from the Department of Housing and Urban Development has also been made and additional federal funds are anticipated through DOT, HUD, and the Environmental Protection Agency. However, Corps of Engineers' participation is necessary for a Central City project to proceed and therefore this EIS will address all features ultimately included in the recommended project regardless of the implementing agency. Under NEPA, Environmental Impact Statements (EIS) are required for "major federal actions" significantly affecting the quality of the human environment. 42 USC §4332(c). NEPA's regulations also require Federal agencies to consider "connected actions" within the scope of analysis of "major federal actions" analyzed in EIS documents. 40 CFR §1508.25(a)(1). In this EIS, the Corps has analyzed the authorized Corps participation in the Central City project as a "major federal action" under NEPA. See, e.g. 40 CFR §1508.18 (definition of "major federal action"). The Corps has identified the exact features of the Corps participation in the Central City project in Chapter 5, Project Implementation of this EIS. As will be reflected in the Project Cooperation Agreement (PCA) for the Central City Project, Corps participation features and non-Corps participation features are interdependent parts of the larger Central City Project and depend on the larger Central City Project for their justification, and the non-Corps components cannot proceed unless the Corps component is implemented. See 40 CFR §1508.25(a)(1)(iii). The Corps has therefore also considered other features of the Central City project that are not included within the Corps participation component, as well as, the Trinity Uptown project to be "connected actions" to the Corps "major federal action" and has included these other features within the scope of analysis of this EIS.

Study Participants

Partnering with USACE and TRWD in the development of the Central City project are the City of Fort Worth and Tarrant County. Other important participants include Streams and Valleys, Inc., NCTCOG, the U.S. Fish and Wildlife Service (FWS) and various private consultants including GideonToal (urban planning) and CDM (engineering).

Prior Studies and Reports

The Trinity River within North Central Texas and, in particular, Tarrant County has been extensively studied and modified over the past century and a half, both by the Federal Government and by non-Federal entities. Most, if not, all of these studies and modifications are relevant, in one way or another, to the current planning effort for the Central City segment of the river. This planning history is summarized below.

Evolution of the Central City Project

The USACE and TRWD (formerly Tarrant County Water Control and Improvement District No. 1) have been partnering to address water resources needs associated with the Trinity River for more than fifty years. The TRWD is the local sponsor for the Fort Worth Floodway, one of the very first projects undertaken by the Fort Worth District of the USACE in the late 1940s. (A more complete description of the Fort Worth Floodway and its authorizing documents can be found in Chapter 3, Section One-Flood Protection) The most current planning effort is the culmination of a series of Trinity River planning and floodplain management initiatives that have been underway almost continually since the mid-1980s. Figure 1 - 4 identifies major milestones in this evolutionary process; each of which is discussed more fully in the following sections.

Trinity River and Tributaries Environmental Impact Statement

The Trinity River and Tributaries Environmental Impact Statement (TREIS) was prepared by the USACE in the mid-1980s to address the increase in floodplain development that was occurring in the upper Trinity River basin. The TREIS focused on actions requiring USACE permits under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (CWA) of 1972, as amended, with emphasis on addressing cumulative impacts of granting multiple permits. Two conclusions of this planning effort were that existing regional floodplain management policies were inadequate to maintain existing levels of flood protection within the region's major urban areas and that additional, more stringent, floodplain management criterion were needed. In particular, this effort identified the system's valley storage as a critical element requiring protection through the permitting process.

The Record of Decision (ROD) for the TREIS was signed in 1988. A ROD is a document that outlines the decisions the agency made based on the conclusions of the EIS, lists all alternatives considered, identifies the "environmentally preferable alternative," discusses the factors the agency considered in making its decisions, and states whether or not the agency adopted all practicable mitigation measures for the alternative it selected. The TREIS ROD included hydrologic and

hydraulic criteria for actions that require USACE permits, such as the 100-year flood and Standard Project Flood (SPF) water surface elevations along the Clear Fork, Elm Fork, and West Fork of the Trinity River, as well as tributaries that have drainage areas in excess of 100 square miles. The ROD also included criteria for projects in the floodplains of other tributaries of the Trinity River and established guidelines for mitigation of habitat losses resulting from projects in floodplain areas covered by the TREIS. The SPF is defined as an estimate representing flood discharges that may be expected from the most severe combination of meteorologic and hydrologic conditions that are considered reasonably characteristic of the geographical region involved, excluding extremely rare combinations.

The criteria of the TREIS ROD apply only to permit applications for projects involving work in, or affecting, navigable waters of the United States under Section 10 of the CWA and discharges of dredged or fill material into waters of the United States, including wetlands, under Section 404 of the CWA. The criteria do not apply to projects for which the USACE has no regulatory authority. The TREIS raised awareness that a large area of floodplain lands within the Upper Trinity River Basin could be developed outside the jurisdiction of the USACE and that, if developed following only Federal Emergency Management Agency (FEMA) requirements, increases in flooding frequency and extent would continue to occur in adjacent and downstream areas. Subsequently, local area governments (cities and counties) established the Corridor Development Certificate (CDC) process as a means to address those floodplain actions that were not regulated by the USACE.

Corridor Development Certificate

The Corridor Development Certificate (CDC) program is a joint effort of the NCTCOG, the USACE, Fort Worth District, and member NCTCOG cities and counties with jurisdiction over the Trinity River floodplain. The purpose of the CDC process is to affirm local government authority for local floodplain management while establishing a common set of permit criteria and procedures for development within the Trinity River Corridor. Criteria used in the program mimic those developed by the USACE through the Regional EIS process described above. Member cities, counties, and the NCTCOG administer the CDC program with technical advice by the USACE. After a review by all other cities within the CDC program and an evaluation by the USACE, the proponent decides whether to allow a proposed floodplain alteration. CDC program members include the cities of Arlington, Carrollton, Coppell, Dallas, Farmers Branch, Fort Worth, Grand Prairie, Irving, and Lewisville as well as Dallas and Tarrant counties.

Upper Trinity River Basin, Trinity River, Texas -- Reconnaissance Report

The TREIS and CDC heightened regional awareness relative to flood hazards. The process generated broad recognition that flood hazards could (and would) deteriorate in the future, absent regional strategies to protect both conveyance and valley storage. A byproduct of this effort, however, was a general understanding that flood hazards had already increased during the years subsequent to construction of the floodway system, and that the level of protection in the regional system had deteriorated. While adherence to the CDC and the mitigation outlined in the ROD could stabilize the existing situation, following these guidelines would not restore the protection that had been lost in the decades between the 1950s and the 1980s.

To address this aspect of flood hazards, thirteen sponsors (including nine municipalities, three counties, and the TRWD) petitioned Congress for a new study authority. The United States Senate

Committee on Environment and Public Works Resolution, dated 22 April 1988, directed the USACE to "… provide improvements in the interest of flood protection, environmental enhancement, water quality, recreation, and other allied purposes in the Upper Trinity River Basin." The Reconnaissance Report conducted under this authority was completed in March 1990.

Results of these analyses indicated that all of the existing USACE projects were designed using criteria applicable to the time of their construction. This study, however, affirmed that urban development had exceeded previously projected expectations, causing increased runoff and peak discharges. Based upon thirteen structural alternatives investigated and the social and environmental impacts of each of the alternatives, eleven viable flood control projects were identified. Other water and land resource problems and needs identified during the study included water quality improvement, environmental and fish and wildlife enhancement, recreational development, and the need for preservation of open space within the Dallas-Fort Worth Metroplex area.

Upper Trinity River Basin, Texas Information Paper, "A Benefit-Cost Analysis"

Following the Reconnaissance Report, the USACE entered into a Feasibility Study Cost Sharing Agreement with the NCTCOG acting as local sponsor on behalf of the 13 regional governments. The Feasibility Phase Study was initiated in August 1990, with the intent to conduct more rigorous investigations of the flood control concepts preliminarily identified as feasible by the Reconnaissance Study. In 1995, an “information paper” was issued containing the study results to date. Some 88 feasible multi-purpose measures were identified and evaluated. Of particular significance was the finding that a detention structure at the Boyd Site on the West Fork in Wise County would mitigate flood hazards in Tarrant County and restore the design level of protection to the Fort Worth Floodway system. Generally speaking, citizens in Wise County strenuously objected to further study of the Boyd Detention Structure and local sponsorship for further study was not forthcoming.

Streams and Valleys Trinity River Master Plan

The intense public dialog surrounding preparation and release of the Information Paper generated additional planning activity at the local level. Streams and Valleys, Inc., a local independent non-profit entity chartered in 1971, initiated a broad scale community-based effort to develop a Master Plan for the West and Clear Forks of the river within Tarrant County. This plan, completed in 1999, often referred to as “the Tilley Plan” focused on eight miles of river looping around downtown Fort Worth and outlined recreation-oriented improvements including trail linkages, check dams, urban river edges, white water features, pedestrian bridges, and 50 new trail heads. Most importantly, the plan recognized the flood protection function of the Trinity River Floodway System, but challenged traditional concepts of how such protection should be provided.

As TRWD began to implement portions of the Tilley plan, focus shifted back to the USACE and the opportunities identified in the Information Paper, because there was a high degree of compatibility and many of the initiatives were felt to be highly compatible. In 1999, the USACE and TRWD entered into a cost-sharing agreement, conducted under the umbrella of the Upper Trinity River Feasibility Study, to prepare a comprehensive study of the Clear Fork and West Fork of the Trinity River between Lake Worth/Benbrook and Riverside Drive.

Clear Fork/West Fork Interim Feasibility Study

Early scoping efforts for this study identified nine discreet river segments having numerous opportunities for flood damage restoration and ecosystem restoration. Of particular interest was flooding in the study area associated with the sump system for the Fort Worth Floodway. Under existing conditions (as of year 2000) expected annual flood damages associated with Sumps 3W, 7W, 8W, and 12W were estimated to be $120,600. Several alternatives, including buyout programs and excavation to increase sump capacity were preliminarily evaluated, but no measures were found to be economically viable under the USACE Federal criteria.

During this period, the Fort Worth District of the USACE was in the process of completing a feasibility study on a flood control project along Johnson Creek in Arlington, and was initiating interim feasibility studies for Trinity River projects in Dallas and, with TRWD, on the Riverside Oxbow in Fort Worth. Because of the wide variety of initiatives being studied under the Clear Fork/West Fork Interim Feasibility Study and these other initiatives, the USACE concluded that adequate evaluation of the cumulative impacts of these projects required a programmatic environmental evaluation. Accordingly, concurrent with the Clear Fork/West Fork Interim Feasibility Study, work was initiated on a Programmatic Environmental Impact Statement.

Upper Trinity River Basin -- Final Programmatic Environmental Impact Statement

The National Environmental Policy Act of 1969 (NEPA), as amended, is the nation's charter for environmental protection. A key provision of NEPA requires Federal agencies to fully document and evaluate the cumulative impacts of their proposals, as well as their direct and indirect impacts. Because of the large number and wide variety of projects identified as potentially feasible throughout the Upper Trinity basin, the USACE and local sponsors concluded that a programmatic assessment would be needed to fully comply with NEPA.

This programmatic EIS, dated June 2000, focuses on various potential USACE projects that were being investigated at the time. Reasonably foreseeable projects being pursued by other entities within the study area were also identified and potential direct and cumulative impacts resulting from implementation of the entire suite of projects on the human and natural environment were assessed. The document provides a general description of the environmental setting of the Upper Trinity River Basin, which encompasses the Clear Fork and West Fork watersheds. In addition, the document also analyzes recreation use trends and makes projections for future recreational needs in the Upper Trinity River Basin. Most importantly, this EIS set the stage for focused evaluation of discreet segments of the river (such as the Central City Segment) for flood damage reduction, ecosystem restoration, and recreation purposes.

Trinity River Vision Master Plan

In 2001, TRWD, in cooperation with Streams and Valleys, Inc. and the City of Fort Worth, undertook the creation of a new Master Plan for the river, titled “Trinity River Vision Master Plan.” The purpose of the TRV Master Plan was to provide quality of life enhancements and environmental integrity for the Trinity River, while ensuring that the watercourse could manage stormwater runoff, water conservation, and flood control in a manner that protects public safety and property. This planning process emphasized community-based input, and was initiated with a series of neighborhood workshops that were conducted in early 2001. In October 2001, urban planning and waterfront

redevelopment experts came to Fort Worth for a two-day planning workshop focusing on the Central City area at the Clear Fork/West Fork confluence. A radically different approach to flood control evolved from this workshop. Challenged by the expressed community desire to "connect" to the water through increased access and vertical and horizontal spatial proximity, the experts focused on altering the levee system, which was seen as a barrier to this community goal. A bypass channel and flood isolation gates, much like the original flood protection system in San Antonio that enabled the famed Riverwalk improvements, was conceived. Workshop participants believed this approach could lead to eventual removal of much of the levee system along the existing river channel near downtown and permit development within a few feet of the water's edge.

The technical feasibility of the innovative bypass channel approach was further explored in a companion engineering study, *Trinity River Vision: Evaluation of the Trinity River Floodway Channel Realignment.* This study was partially funded by TRWD and a Texas Water Development Board grant and was completed by CDM in April 2003.

The TRV Master Plan, incorporated by reference, includes consideration of environmental quality, conservation, flood control, recreation facilities, trail development, reforestation, beautification, and linkage to neighborhoods including Downtown and other special districts. It was through the development of this vision for the Trinity River that the concepts for the Central City project were first formulated, and this project is a direct outgrowth of that planning effort. The Central City project was developed in a collaborative and holistic approach because the various community and regional issues required multi-disciplinary, multi-agency, multi-stakeholder, and multi-sector solutions. The TRV Master Plan, published in April 2003, was adopted by TRWD and Tarrant County in May 2003 and the City of Fort Worth in June 2003. The excitement and enthusiasm engendered by the development of the TRV Master Plan led TRWD to temporarily suspend planning efforts on the overall Clear Fork/West Fork Interim Feasibility Study in order to focus resources and attention on the Central City segment of the Trinity River.

Central City Interim Feasibility Study and Draft EIS

Between April 2003 and May 2004, TRWD presented the USACE with a series of exploratory concepts for a realignment of the river in the Central City Segment. In May 2004, the USACE and TRWD agreed to modify the Project Management Plan for the West Fork/Clear Fork Interim Feasibility Study to focus exclusively on problems and opportunities in this river reach. In December 2004, Congress authorized USACE participation in the construction of the project, as generally described in the April 2003 TRV Master Plan, subject to a determination of technical soundness and environmental acceptability.

Other Relevant Projects

The previous section described the evolution of the USACE/TRWD planning partnership, which has culminated in the current Central City planning effort. In addition to these activities, which are directly related to the Central City Project, a long history of additional planning activities and construction projects within the region has influenced the current state of the Trinity River. These projects and activities are shown on Figure 1 - 5 and described below.

Federal

USACE Reservoir Projects

Several USACE reservoirs have been authorized and constructed in the Upper Trinity River Basin. The reservoir projects are Ray Roberts Lake and Lewisville Lake located on the Elm Fork of the Trinity River; Grapevine Lake located on Denton Creek, a tributary of the Elm Fork; Joe Pool Lake on Mountain Creek, a tributary of the West Fork of the Trinity about 10 miles southwest of Dallas; and Benbrook Lake, located on the Clear Fork of the Trinity River. Of these, it was determined only Benbrook has a clear and definitive effect on both the hydrology of the river system and the planning efforts for the Central City project.

Benbrook Lake is located approximately 10 miles upstream of the Central City study area, southwest of downtown Fort Worth on the Clear Fork of the Trinity River. The project was authorized by the Rivers and harbors Act of 1945 for flood control and water conservation and has been operational since the date of impoundment 29 September 1952. The dam is a rolled earth fill type with a maximum height of 130 feet and top width of 28 feet. The dam controls a total drainage area of approximately 430 square miles. At conservation pool elevation the lake covers a surface area of 3,770 acres. The flood control pool covers a surface are of 7,360 acres and provides storage for a maximum of 164,800 acre-feet at the top of the spillway north crest (elevation 710.0), which is the top of the controlled flood storage. One acre-foot is equivalent to 325,900 gallons. At this point water would flow over the "emergency" spillway. The discharges associated with these types of events are a critical input to the baseline engineering analyses for evaluating flood hazards and potential flood damage reduction projects in downstream areas, including the Central City project area.

Riverside Oxbow

The USACE and TRWD completed a planning study in 2003 for an ecosystem restoration project in the Riverside Oxbow. This project is located immediately downstream of the Central City project area, just east of downtown Fort Worth on the West Fork of the Trinity River, and includes the old West Fork channel, which was cut off from flow when the channel was realigned for flood control purposes. Ecosystem restoration features include reestablishment of low flows through the old oxbow, creation of 21 acres of emergent wetlands, creation and/or enhancement of 18 acres of open water habitat, restoration of 29 acres of forested pond vegetation, improvement of 133 acres of existing forest tract habitat, including establishment of a 150 foot wide riparian buffer along the West Fork from Riverside Drive to East 1st Street; restoration of 43 acres of native grassland buffer along the old oxbow, establishment of native grasses and forbs mixed with tree mottes or habitat islands on approximately 229 acres of land, and reforestation of roughly 73 acres of open space using a variety of native hard and soft mast trees and shrubs. The project lands, approximately 600 acres, are adjacent to roughly 400 acres of City-owned park and open space. Together these lands would provide 1000 acres of fish and wildlife habitat, open space, and outdoor education and recreation opportunities for local citizens within a rapidly growing and developing urban area. Approximate cost of the project is $22,198,000 based on October 2002 price levels. Specific Congressional Authorization will be required prior to construction/implementation.

Dallas Floodway Extension

A description of the Dallas Floodway Extension (DFE) project is presented in the Upper Trinity River Basin PEIS and is incorporated herein by reference. The DFE is described in A General Reevaluation Report and Integrated Environmental Impact Statement, dated February 1999, and in Supplement One to the Environmental Impact Statement dated April 2003. The project is currently under construction.

Dallas Floodway

A description of the Dallas Floodway multi-objective project is presented in the Upper Trinity River Basin PEIS and is incorporated herein by reference. This study has been recently reactivated in conjunction with studies undertaken by the Federal Highway Administration relative to new roadway alignments adjacent to and within the Floodway system.

Non-Federal

Eagle Mountain Lake

Eagle Mountain Lake was authorized by the State of Texas under permit number 1074, which was issued 1 May 1928, with a priority date of 13 July 1925. The project provides water supply for the City of Fort Worth, and contains no dedicated flood control storage. It is located upstream of the Central City study area on the West Fork of the Trinity River, 14 miles northwest of Fort Worth. The dam is composed of two sections of earth fill and a concrete spillway by high ground of Eagle Mountain and Burgess Gap. The structure is 4,800 feet in length, 85 feet at its highest point and has a top width of 25 feet. Construction started 23 January 1930, and water was first impounded 28 February 1934. The local sponsor for the project was Tarrant County Water Control and Improvement District No. 1, now known as TRWD.

Lake Worth

Lake Worth is also upstream of the Central City project area on the West Fork. Similar to Eagle Mountain Lake, its purpose is water supply, and it contains no dedicated flood control storage. The lake was authorized by the State of Texas by certified filing No. 757 on 27 June 1914. The location of the project is on the West Fork of the Trinity River, in northwest Fort Worth. The dam is earth fill with a concrete spillway. The length of the structure is 3,200 feet, with a maximum height of 50 feet and the top width varying to 40 feet. Originally this dam had a total drainage area of 2,064 square miles, but with the construction of Eagle Mountain Lake just a few miles upstream, the drainage area was reduced considerably. Construction on the reservoir started in 1912 and the dam was completed in October of 1914. The city of Fort Worth was the owner and developer of the project.

Riverside Drive Levee

In the early 1970s, TRWD constructed a low levee in the north overbank, from Riverside Drive upstream to the Railtran Line Bridge. The levee is part of the overall flood control system, and is approximately 8 to 12 feet in height with a crown width of about 14 feet and a length of approximately one mile. According to the hydrologic and hydraulic modeling conducted as part of the Riverside Oxbow study, it has been determined that the levee currently provides protection for approximately a 30-year flood event.

Beach Street Dam

The Beach Street Dam project, which consists of a low water dam located downstream of Beach Street, was completed by TRWD. The dam was constructed within the West Fork River channel approximately 750 feet downstream of Beach Street, just upstream of the confluence of the Riverside oxbow with the West Fork. At normal elevation, the impoundment will cover approximately 56.6 surface acres and contain 340 acre-feet of water. The work entailed removal of 264,000 cubic yards of silt and gravel from the improved channel and laying back the banks of the channel in order to meet the valley storage criteria for approval under Corridor Development Certification (CDC) requirements.

RadioShack Corporation World Headquarters Riverfront Campus

RadioShack held a groundbreaking in April 2003 for construction of their 38 acre corporate campus which features three six-story buildings, a commons building, flagship store, and a multi-level parking garage. The grand opening ceremonies were held March 2005 with the opening of the 900,000 square foot facilities, which are bounded by the Trinity River and Henderson, West Belknap, and Taylor Streets. The campus is located at the confluence of the Clear and West Forks of the Trinity River and offers the approximately 2,400 employees views of the river with public gardens and landscaping. The campus design incorporates extensive hardscape and landscape with water features and pedestrian spaces. The campus was designed and built using Leadership in Energy and Environmental Design (LEED) performance and sustainability standards. LEED emphasizes state of the art strategies for sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

Pier 1 Imports Corporate Headquarters

Pier 1 broke ground in January 2003 to build a 440,000 square foot, 20-story corporate headquarters, which opened in August 2004. The facility houses approximately 900 employees. Located on the western periphery of downtown Fort Worth, where North Forest Park Boulevard meets Belknap Street, the headquarters building sits on the banks of the Clear Fork of the Trinity River upstream of the confluence with the West Fork. Design of the building gives consideration to the importance and location of employee amenities including green space and dining overlooking terraced gardens leading to the river.

Tarrant County College Downtown Campus

In 2004, Tarrant County College purchased 55 acres in downtown Fort Worth to build a fifth comprehensive college campus. Phase I of the campus is expected to open in September 2008. Initially the campus will comprise approximately 500,000 square feet and will be built north and south of the Trinity River, east of Main Street. Eventually, a sky bridge will be constructed to link the north and south sections. Initial enrollment is estimated at 3,750 students, with enrollment reaching an anticipated 10,000 in approximately seven years. It is anticipated that the rapid growth will require expansion of the facility in the first 10-year time frame. With 80,000 people currently living or working in a three-mile radius of the new campus site, the primary function will be to serve the fast-growing area with a special concentration in programs to prepare professionals for the medical services field.

Tarrant Regional Water District/Streams and Valleys Recreation Improvements

As a part of the operation and maintenance of the existing floodway, TRWD has recently completed some shoreline stabilization near the upper end of the study area on the Clear Fork. Another recently completed TRWD project involves the modification of existing low water dams to facilitate recreational canoe and kayak passage. TRWD also continues to work with Streams and Valleys, Inc. to extend the existing trail system and provide additional trailheads at various locations along the river.

Trinity Bluffs

Trinity Bluffs in UpTown is a thirty acre mixed-use development in the northeast quadrant of downtown Fort Worth on the east banks of the Trinity River. The area has recently been incorporated into the Fort Worth Central Business District. Much of Trinity Bluffs in UpTown sits on the bluffs approximately ninety feet above the river and is proposed to include restaurants, retail space, and 2,200 residential units.

Subsequent chapters address the conditions currently existing within the study area, describe the project goals and objectives, explain the development of measures and alternative plans, and assess the comparative impacts of the various alternatives.

Figure 1 - 1. Vicinity Map for Fort Worth - Dallas Metroplex in Texas.

Figure 1 - 2. Vicinity Map for Study Area in Fort Worth, Texas.

Figure 1 - 3. Study Area Boundaries.

Figure 1 - 4. Timeline for the Evolution of the Central City Project Study.

Figure 1 - 5. Relevant Federal and Non-Federal Projects.

AFFECTED ENVIRONMENT

RESOURCE DESCRIPTIONS

This chapter describes the Central City study area and outlines its major features and existing conditions with respect to various categories pertinent to this study. The categories include Climate, Geology, Soils, and Topography, Hydrology and Hydraulics, Aquatic Resources, Terrestrial Resources, Wildlife, Threatened and Endangered Species, Cultural Resources, Hazardous, Toxic, and Radioactive Waste, Recreational Resources, Socio-Economics, Environmental Justice, Land Use, Transportation Resources, Air Quality, Noise, Light, and Aesthetics. A broader description of the river basin and its natural resources is provided in the Upper Trinity River Basin Programmatic Environmental Impact Statement (PEIS), and is incorporated by reference herein.

Location

The study area is located adjacent to the business district of downtown Fort Worth on the floodplains of Clear and West Forks of the Trinity River as described in Chapter 1. The initially identified study area lies along the Clear Fork downstream of Interstate Highway 30, downstream of University Drive on the West Fork and extends to a point just upstream of Riverside Drive. During 2004, it was determined that it was necessary to expand the detailed study area to include resources upstream of University Drive on the West Fork. The current study area extends upstream on the West Fork approximately 5 miles upstream of the existing confluence with the Clear Fork.

The natural resources within the study area have been modified by urban development and past flood damage reduction activities. The entire study reach has been channelized and levees have been constructed along the area to protect large areas of former floodplain.

Climate

The climate in the Upper Trinity River watershed is humid subtropical with hot summers and mild winters. Snowfall and sub-freezing temperatures are experienced occasionally during the winter

season. Generally, the winter temperatures are mild with occasional cold periods of short duration resulting from the rapid movement of cold pressure air masses from the northwest Polar Regions and the continental western highlands. Recorded temperatures at the Dallas-Fort Worth (DFW) International Airport have ranged from a high of 113°F in June 1980 to a low of -1°F in December 1989. The average annual temperature in the watershed varies from 64°F at Bridgeport in the northwest extremity of the watershed to 66°F at DFW International Airport. The mean annual relative humidity for the DFW Metroplex is about 65 percent. The average annual precipitation over the watershed varies from about 30 inches at Jacksboro, in the northwest extremity of the watershed, to about 32 inches in the DFW Metroplex. The extreme annual precipitation amounts since 1887 include a maximum of 53.54 inches in 1991 at DFW and a minimum of 17.91 inches in 1921 in the City of Fort Worth. The maximum recorded precipitation in a 24-hour period was 9.57 inches in Fort Worth on September 4-5, 1932. A large part of the annual precipitation results from thunderstorm activity, with occasional very heavy rainfall over brief periods of time. Thunderstorms occur throughout the year, but are more frequent in the late spring and early summer. The average length of the warm season (freeze-free period) in the DFW Metroplex is about 249 days, extending from mid-March to mid-November.

Geology, Soils, and Topography

The study area lies within the Trinity River alluvium overlying the Fort Worth Limestone and Duck Creek Formation undivided. The alluvium consists of sands, sandy clays, and gravel that were deposited by the river. The underlying primary materials are formations of calcareous clay and limestone that were deposited in a sedimentary geologic environment during the Cretaceous Period.

According to the *Soil Survey of Tarrant County, Texas*, (U.S. Department of Agriculture et al. 1981) the soil unit in the study area belongs to the Frio-Trinity association. The Frio series consists of well-drained, deep clayey soils that were formed in calcareous, recent alluvium. Typical pedon consists of moderately alkaline, dark grayish brown silty clays that are plastic, firm to very hard, moderately fine, and have a medium blocky structure. The underlying soil is a moderately alkaline, silty clay loam that is plastic, dark brown to brown, very hard, moderately fine, and has a medium subangular blocky structure. The permeability of the Frio soil is moderately slow and the available water capacity is high. Generally, these soils are well suited for use as rangeland and are moderately suited for recreation paths and trails, but have severe limitations for other recreational uses. The main limitation of the Frio soils is the hazard to flooding. The Trinity series consists of somewhat poorly drained, deep, clayey soils on floodplains that were formed in alkaline, clayey alluvial sediment. Typical pedon consists of moderately alkaline, dark gray clay, extremely hard, very firm, very sticky and plastic and with a moderate medium blocky structure. The permeability of the Trinity soil is slow and the available water capacity is high. Generally these soils are well suited for use as rangeland and have severe limitations for recreational uses due to poor percolation. The main limitation of the Trinity soils is the hazard to flooding.

Most of the Trinity River channel in the study area has been modified to provide a higher level of flood protection. The levees along this reach were constructed from native soils on 3H: 1V slopes. A 3H: 1V slope indicates that for every three feet in a horizontal direction, the bank rises one foot in a vertical direction. The embankments are grass covered and well maintained. The river is generally non-meandering and has limited surface erosion and scouring of the channel sides and bottom. Sedimentation build-up within the channel bottom is minimal.

Generally, the channel has side slopes of 2H: 1V. The bottom width of the channel varies from 50 to 200 feet and has an average depth of 25 feet. Channel dams have been constructed on the West Fork and Clear Fork to confine low flows.

Prime Farmland Soils

According to the American Farm Trust, from 1992 to 1997 Texas lost approximately 332,800 acres of quality farmland to development, which was a 42 percent increase in rate of loss over the previous five years. That amount was more than any other state during the same period. The Texas Blackland Prairie, which includes the metropolitan region of Dallas-Fort Worth, was one of two regions that were most affected. As required by Section 1541(b) of the Farmland Protection Policy Act (FPPA) of 1980 and 1995, 7 U.S.C. 4202(b), federal and state agencies, as well as projects funded with federal funds, are required to (a) use the criteria to identify and take into account the adverse effects of their programs on the preservation of farmland, (b) consider alternative actions, as appropriate, that could lessen adverse effects, and (c) ensure that their programs, to the extent practicable, are compatible with state and units of local government and private programs and policies to protect farmland.

According to the Natural Resource Conservation Service (NRCS) there are 27 soils considered to have the characteristics of prime farmland in Tarrant County. Of those 27, soils only one occurs in the study area. While the Frio silty clay, occasionally flooded soil (Map Symbol 26) does occur within the study area, all locations of this soil would be considered urban, built-up, or water areas, and therefore, would not be considered prime farmland soils.

Hydrology and Hydraulics

Watershed Description

The drainage area of the Trinity River, from its headwaters to the confluence of Five Mile Creek near Interstate Highway 20 in south Dallas is commonly referred to as the Upper Trinity River watershed. The watershed encompasses an area of approximately 6,275 square miles in size and includes the Dallas-Fort Worth Metroplex. Terrain elevation of this watershed varies from approximately 1,200 feet NGVD at the headwaters of the West Fork of the Trinity River northeast of Olney, Texas, to approximately 380 feet NGVD at the confluence with Five Mile Creek.

Five USACE flood control reservoirs are located in the watershed. Benbrook Lake, Lewisville Lake, and Grapevine Lake were impounded in the early 1950s. Joe Pool Lake and Ray Roberts Lake were

impounded in January 1986 and June 1987, respectively. Additional major USACE flood control projects in the study area include the Fort Worth Floodway and Dallas Floodway.

The two largest non-Federal lakes in the watershed, Lake Bridgeport and Eagle Mountain Lake, are located on the West Fork of the Trinity River. Lake Bridgeport is located west of Bridgeport in Wise County. Eagle Mountain Lake is located in northwest Tarrant County, upstream from the much smaller Lake Worth, which is owned by the City of Fort Worth. Eagle Mountain Lake has two sets of outlet gates and an emergency spillway. Since it has no dedicated flood control storage, large releases are required during flooding periods.

Smaller lakes within the Upper Trinity watershed include: Lake Amon Carter, located on Big Sandy Creek south of Bowie in southwestern Montague County; Lake Weatherford, located on the Clear Fork of the Trinity River northeast of Weatherford in Parker County; Marine Creek Lake, located upstream of Marine Creek near Sansom Park Village in northwest Fort Worth; Lake Arlington, located on Village Creek in western Arlington in Tarrant County; and Mountain Creek Lake, located on Mountain Creek in Grand Prairie in western Dallas County.

Fort Worth Floodway

Original System

The original Fort Worth Floodway levees were constructed by local interests in 1910. These levees were overtopped by the flood of 1922, and were increased in height by repairs made shortly thereafter. Further work on the levees was completed in 1936 with Works Progress Administration (WPA) funds. Additional modifications were made by local interests in 1942. The Fort Worth Floodway, as a Federal project, was authorized by Section 2 of Public Law No. 14, 79th Congress, 2nd Session approved 2 March 1945. The project, however, had not been constructed when the flood of May 1949 occurred, and the failure of the levee system during that event confirmed the need for improvements to and extension of the system.

The Federal project was initiated in 1950 and completed in September 1957. Improvements entailed the construction and/or strengthening of levees and the widening and straightening of the Clear Fork channel from Lancaster Street to its confluence with the West Fork, the construction and/or strengthening of levees and widening and straightening of the West Fork channel from White Settlement Road to Riverside Drive, and the construction of levees in the upper reaches of the West Fork in the Crestwood and Brookside neighborhoods. The project also included allied features such as removal of timber and debris from the floodway, reconstruction and alteration of bridges and public utilities to conform to the proposed channel and floodway, re-alignment of roads crossing the floodway, and changing channel diversion and drainage structures, where necessary.

West Fork Extension

The Flood Control Act of 1960 provided for an extension upstream of the completed Fort Worth Floodway Project

(Figure 2 - 1). The project, located on the West Fork of the Trinity River from White Settlement Road upstream to just downstream of Meandering Road, consists of improvements to 4.1 miles of river channel as well as construction of 6.2 miles of levee, appurtenant drainage facilities, and 1.6 miles of diversion channels. Construction was initiated in March 1965 and completed in June 1971.

Clear Fork Extension

The Clear Fork Extension Project, authorized by the Flood Control Act dated 23 October 1962, is located along the Clear Fork of the Trinity River between the existing Fort Worth Floodway, as described above, and State Highway (SH) 183, also known as Southwest Boulevard. The extension comprised channel improvements to a 6.5-mile stretch of the Clear Fork, construction of 2.3 miles of levee; provision of interior drainage facilities consisting of three sump areas, gate-controlled sluices, and one mile of diversion channels and appurtenant works; alteration of highway and railroad bridges; relocation and alteration of three channel dams; and control of about 566 acres of rights-of-way. Construction was initiated in January 1966 and completed in September 1971.

Interior Drainage

The interior drainage requirements of the Fort Worth Floodway are served by 30 sumps, as shown in Figure 2 - 1. The sumps include naturally low areas as well as excavations that are intended to serve as collection points for local runoff. The sumps store runoff from the interior of the levee system temporarily for discharge through the levees into the river via gravity flow through a floodgate. Each gate was designed to discharge the drainage from a 50-year storm quickly enough to keep water surface elevations within the sump boundary.

Existing Levels of Protection

Floodway

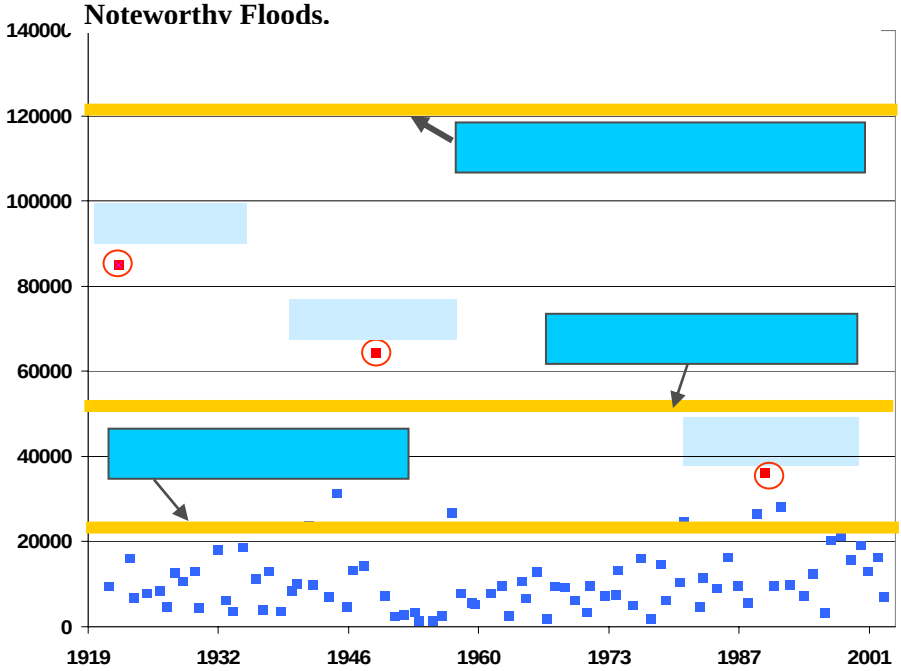
The Fort Worth Floodway was designed and constructed to provide a level of protection equivalent to the Standard Project Flood (SPF) with four feet of freeboard on the levees. The SPF is defined by USACE to be an estimate representing flood discharges that may be expected from the most severe combination of meteorological and hydrologic conditions that are considered reasonably characteristic of the geographical region involved, excluding extremely rare combinations.

The SPF is not typically assigned an exceedance probability; however it would be considerably larger and rarer than the one percent exceedance frequency flood event forming the basis of the Federal Emergency Management Agency (FEMA) floodplain management program.

The floodway design discharges calculated at the time of initial construction for the SPF were 95,000 cubic feet per second (cfs) on the West Fork downstream of the Clear Fork confluence, 75,000 cfs on the Clear Fork and 50,000 cfs on the West Fork upstream of the Clear Fork confluence. The functionalities of Benbrook Lake, Bridgeport Lake, Eagle Mountain Lake and Lake Worth were

included in the design calculations. However, over the 50 years since the initial design of the system, two factors have affected SPF calculations.

Figure 2 - 2. Discharges for Current SPF and Other Noteworthy Floods.



The first factor is 50 additional years of rainfall and runoff data, a virtual doubling of the statistical data base compared to that available in the original design effort. The second major factor is the extensive urbanization of the watershed upstream of the floodway system. The additional rooftops, parking lots, and other impervious surfaces have profoundly affected the rate of rainfall runoff resulting in higher peak discharges for any rainfall of a given duration and intensity. As a result, SPF discharges calculated for the latest update of the CDC model (2004) are 118,900 cfs on the West Fork below the confluence, 59,800 on the West Fork above the Clear Fork, and 78,300 cfs on the Clear Fork. These discharges are "future conditions" discharges and were used as the basis for design for this study. This is consistent with the CDC process use of future conditions discharges as design discharges. For purposes of comparison, current SPF discharges, along with those associated with several other floods of note, are shown in Figure 2 - 2.

A review of past annual and periodic inspection reports developed by USACE of the floodway system show that TRWD has performed maintenance and operational functions consistently and in an exceptional manner. The reduction in flood protection was not due to lack of maintenance by the local sponsor; rather, it was the result of increases in the design discharges over the past 50 years that have led to the erosion of the design level of protection in the system. Figure 2 - 3 identifies the deficiencies present in the existing levee system, when compared to the design criterion for protection (SPF plus 4 feet).

Interior Drainage

The level of protection in the interior drainage subsystem of the floodway has likewise degraded over time. In addition to the Federal government's interest in the 50-year frequency storm as indicative of the original design protection, City government maintains an interest in evaluating the system at the 100-year level of protection, as that event forms the basis of local land use controls. As early as the 1970s, studies indicated that the sump system was not uniformly functioning at the 50-year level of protection and that damages from interior drainage began at much more frequent events.

Aquatic Resources

Water Quality

The water quality in the study area is influenced primarily by base flows from upstream Lake Benbrook and Lake Worth releases, urban runoff from upstream adjacent watershed areas, and the check dams at various locations along the watercourse.

Designated Water Quality Uses

The Texas Commission on Environmental Quality (TCEQ) is charged with the responsibility of maintaining and enhancing the waters in the state. TCEQ has divided surface waters in the State into numbered segments for the purpose of organizing water quality data and designating water uses and classifications. The immediate study area is located in stream segments *0806 West Fork Trinity River below Lake Worth* and *0829 Clear Fork Trinity River below Benbrook Lake*. West Fork Segment 0806 extends from the Lake Worth dam in west-central Tarrant County downstream to the confluence of Village Creek in east-central Tarrant County. Segment 0806 is approximately 32 miles long and, of this length, only the upstream 11 miles of this segment are included in the study area. Clear Fork Segment 0829 is located in Fort Worth and extends from Benbrook Lake dam in southwest Tarrant County, downstream to the confluence with the West Fork Trinity River. This segment is approximately 12 miles long with only 2 miles occurring within the study area. Figure 2 - 4 displays the locations of these two stream segments. TCEQ has set water quality standards and designated the water use for these stream segments within the study area. According to TCEQ use designations, the immediate study area is designated for high aquatic life use, contact recreation use, general use, fish consumption use, and public water supply use (TNRCC, 2000a).

Contributing Flows

Immediately upstream from the study area are two major water supply reservoirs, Lake Benbrook and Lake Worth. Lake Benbrook (TCEQ *Stream Segment 0830*) is a reservoir upstream of the study area on the Clear Fork. Lake Worth (TCEQ *Stream Segment 0807*) is a reservoir upstream of the study area on the West Fork upstream of the Clear Fork confluence. Lake Benbrook and Lake Worth trap sediment and prevent the natural downstream migration of a sizable portion of suspended material.

Below the major lakes, upstream of the immediate study area, there are only two relatively minor point source industrial discharges requiring National Pollutant Discharge Elimination System (NPDES) permits.

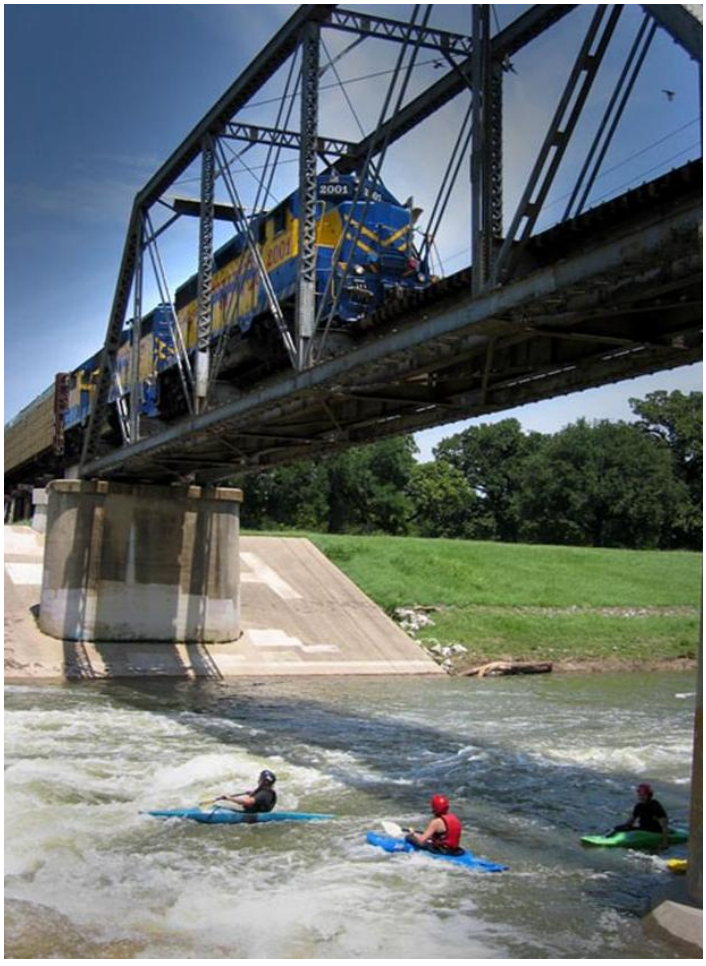
Segments 0829 and 0806 drain an 188,666-acre watershed below Benbrook Lake and Lake Worth dams. Based on a 1999 Texas Natural Resource Conservation Commission (TNRCC) report, the watershed was 62 percent urban and 34 percent agricultural/undeveloped. The city of Fort Worth accounts for most of the watershed area and 74 percent of the population (TNRCC, 2000b).

Designated Uses and Existing Water Quality

Public Water Supply and General Use

In the 2002 Texas Water Quality Inventory Status of All Waters, TCEQ has designated segments 0806 and 0829 as fully supporting their designated use for public water supply and general use (which includes parameters of pH, chlorides, sulfates, and total dissolved solids). This is not expected to change when the 2004 biennial assessment is finalized.

Fish Consumption



TCEQ has designated the lower mile of Segment 0829 as not supporting its recommended use for fish consumption primarily because of the presence of chlordane in fish tissue (2002 Texas Water Quality Inventory Status of All Waters - TCEQ). The lower 22 miles of segment 0806 is shown as not supporting due to chlordane and PCBs in fish tissue. As a result, the Department of State Health Services (DSHS) has issued advisories in January 1990 against the consumption of fish from portions of Segments 0829 and 0806. Fishing is not prohibited, but State law prohibits the possession of fish from waterbodies with consumption advisories (TAC 8436.011). Therefore, any fish caught must be released.

In April 2004, U.S. Fish and Wildlife Service completed a supplemental report on pesticide contaminated fish tissue taken from the study area. Specimens collected for this study were taken in July 2003 (USFWS, 2004). Analysis was conducted on 13 fish specimens and one mussel taken from 5 locations within the immediate study area. All fish tissue samples indicated the

presence of pesticide residual. Contaminants of primary concern in fish tissue included chlordane, DDE, dieldrin, and toxaphene.

It is important to note that chlordane, DDT, DDE, Dieldrin, and PCBs are part of a group known as legacy pollutants. Legacy pollutants are chemicals that have been banned or severely restricted, but which persist in the environment. TCEQ has established the total maximum daily load (TMDL) allowable for these contaminants as "zero" (TCEQ 2001). With regulation and enforcement, it is anticipated that the presence of these chemicals will reduce in fish tissue to a degree that TDH fish consumption bans will be lifted in the distant future.

Contact Recreation

Contact recreation designated use refers to aquatic recreational activities such as swimming, in which direct water contact occurs, resulting in a risk for water ingestion. Currently, Segment 829 is meeting State water quality standards for bacterial indicators based on the State's biennial water quality review process which include samples taken within and adjacent to the study area (TCEQ 2002). This is not expected to change for the pending biennial update (TCEQ 2004a). The lower 22 miles of Segment 0806 are shown as not supporting based on samples taken downstream of the study area (TCEQ 2000). This is not expected to change for the pending biennial update (TCEQ 2004a).

Aquatic Life Use

TCEQ has designated stream segments 0829 (Clear Fork) and 0806 (West Fork, 33 miles below Lake Worth) for high aquatic life use (TNRCC, 2000a). Based on information taken from the 2002 and Draft 2004 Water Quality Inventory prepared by TCEQ, portions of these segments were deemed fully supporting of a high aquatic life use.

Historic Fish Kills

Three notable recent fish kills occurred downstream of the study area in the Segment 0806 West Fork of the Trinity. One occurrence in August 1996 at Beach Street and downstream included the loss of 18 fish and was believed to be the result of low dissolved oxygen levels. In July 1998, 237 fish were killed in a downstream tributary at Colleyville. Another smaller fish kill of 13 occurred in April 2000 in another downstream tributary in Euless. Each of these occurrences were located downstream of the study area.

Existing Water Quality Aesthetics

Aesthetics of the water course depend on water appearance, odor, and taste (if a drinking source). The water color and clarity in the general vicinity of the project area is similar to other portions of the Trinity River. Stream water at times will exhibit suspended sediment following heavy rainfall events. During extended dry winter periods with low rainfall and low or no wind conditions, the water course may appear to be relatively clear as suspended material settles. Algae at certain times of the summer months may be visible. In deeper impoundment areas of the stream, the water may stratify in late summer and subsequently lead to notable odor changes in late fall as water in stream impoundments overturn due to thermal changes and/or inflows from storms. It should be noted that the TCEQ report "Draft 2004 Texas Water Quality Inventory" (TCEQ, 2004) documented that algal growth was of "no

concern" in a relatively large portion (about 9 of 14 miles) of the Clear Fork below Benbrook Lake (TCEQ Stream Segment 0829) based on 1996-2001 chlorophyll *a* water sample test data and the remaining portion of this stream segment was not assessed for algal growth. In the same report, water in the West Fork in an 11-mile reach below Lake Worth was not assessed for algal growth, but water below this reach (lower 22 miles of TCEQ Stream Segment 0806) was identified as an algal growth "concern" based on a 2002 algal assessment. Based on this information, the existing water in the vicinity of the project area could have probable episodes of algal growth in late spring-summer months. On such occasions, water color may take on a green cast, but significant floating algal mats are not anticipated to occur.

Aquatic Habitat

USFWS, with assistance from Texas Parks and Wildlife Department (TPWD), and USACE, conducted fisheries studies within the study area during the summer of 2003 to establish baseline data on the general quality of aquatic habitat in the study area as demonstrated by the fish assemblage present. Five sites were selected on the Clear and West Forks of the Trinity River. An additional survey was conducted in January 2005 to determine baseline fish community structure of Marine Creek, a tributary to the West Fork. A survey of Lebow Creek, tributary to West Fork just downstream of Marine Creek was conducted in April, 2005.

Information from all studies was used to establish an index of biological integrity (IBI) value for each site. The IBI combines indicators of biological condition into a value which was then compared to regional and statewide reference values to provide an assessment of the relative health of the system. Comparing the calculated values to statewide and regional values provides a qualitative aquatic life use category for each site of exceptional, high, intermediate, or limited. In addition to calculating the IBI values, a fish-community degradation index was calculated, which results in a rating of low, moderate, or high degradation. Using the site specific IBI and the regional IBI, a habitat suitability index (HSI) was calculated for each site. The HSI values range from 0.0 to 1.0, with 1.0 representing the highest habitat quality possible. Multiplying the HSI value by the area (in acres) of available habitat provides the number of habitat units (HU) and thus another measure of habitat quality. Existing aquatic habitat quality and quantity are displayed in Table 2 - 1.

Table 2 - 1. Summary of Existing Aquatic (Riverine) Habitat

Study Reach	Regional IBI	Calculated HSI	Surface Area	Habitat Units
West Fork				
Fourth St dam to TRWD Dam	50	0.91	105.62	96.02
TRWD dam to Nutt Dam	48	0.87	23.55	20.55
Nutt Dam to Rockwood Park	45	0.82	39.7	32.48
Clear Fork				
Confluence to 1st Dam	46	0.84	19.6	16.39
1st Dam to 2nd dam	46	0.84	4.3	3.60
2nd Dam to 3rd dam	46	0.84	4.6	3.85
3rd Dam to 4th dam	46	0.84	5.3	4.43
4th dam to City Dam	46	0.84	5.74	4.80
Marine Creek				
Confluence to waterfall	51	0.93	1.72	1.60
Waterfall to Exchange Ave	41	0.75	1.49	1.12
Lebow Creek				
Confluence to bedrock shelf	49	0.89	0.23	0.20
Shelf to Brennan Ave.	47	0.85	0.36	0.31

Electroshocking and seining during the 2003 study resulted in the collection of over 4600 individual fish comprising 12 families and 30 species from five sites within the study area. Species observed are listed in Table 2 - 2. In general, the fish assemblages within the study area fell into the moderate to high aquatic life use categories. Community degradation was low, indicating a fish community that is comprised of species that are intolerant to physical and chemical disturbances and represent a balanced trophic structure. The aquatic habitats at the five sites sampled consisted of large, deep pools. These pools, which developed as a result of a series of in-stream low water dams, function more as a lentic (lake) environment than a true lotic (river) system. Four of the five sites are within the portion of the Trinity River on the Texas 303(d) List as being an impaired water body as they do not meet the designated fish consumption use due to elevated chlordane and polychlorinated biphenyls in fish tissues (TCEQ 2002; TDSHS 2003).

Table 2 - 2. Species collected in Central City Study area during Summer 2003 fish sampling.

Species	Scientific name	Species	Scientific name
Inland silverside	*Menidia beryllina*	Red shiner	*Cyprinella lutrensis*
River carpsucker	*Carpiodes carpio*	Common carp	*Cyprinus carpio*
Smallmouth buffalo	*Ictiobus bubalus*	Fathead minnow	*Pimephales promelas*
Spotted Sucker	*Minytrema melanops*	Bullhead minnow	*Pimephales vigilax*
Green Sunfish	*Lepomis cyanellus*	Blackstripe topminnow	*Fundulus notatus*
Warmouth	*Lepomis gulosus*	Channel catfish	*Ictalurus punctatus*
Orangespotted sunfish	*Lepomis humilis*	Flathead catfish	*Pylodictis olivaris*
Bluegill	*Lepomis macrochirus*	Spotted gar	*Lepisosteus oculatus*
Longear sunfish	*Lepomis megalotis*	Longnose gar	*Lepisosteus osseus*
Redear sunfish	*Lepomis microlophus*	White bass	*Morone chrysops*
Spotted bass	*Micropterus punctulatus*	Bluntnose darter	*Etheostoma chlorosomum*
Largemouth bass	*Micropterus salmoides*	Orangethroat darter	*Etheostoma spectabile*
White crappie	*Pomoxis annularis*	Bigscale logperch	*Percina macrolepida*
Gizzard shad	*Dorosoma cepedianum*	Western mosquitofish	*Gambusia affinis*
Threadfin shad	*Dorosoma petenense*	Freshwater drum	*Aplodinotus grunniens*

The IBI and HSI data do not tell the complete story of the aquatic condition for the study area. Wetlands and open water ponds found in the floodplain adjacent to the river generally support the

same types of aquatic invertebrates and fish species as the river channel. However, the altered hydrologic regime of the floodplain as a result of flood protection measures upstream allows for only occasional overbank flows. Consequently, these wetlands often do not retain water throughout the year and no longer function effectively within the watershed as reproductive and nursery sites for the species of aquatic organisms which require such habitats. Therefore, recruitment (the addition of new individuals to a population) of species requiring these special breeding and rearing habitats is minimal except for where some minor streams feed the study area.

In certain areas, the river channel has a variety of aquatic resources (i.e. riffles, runs, and pools associated with low water dams) which provide habitat for several species of invertebrates and fish. However, other sites suffer from lack of edge and instream vegetation and structure. The lower segment of Marine Creek and Lebow Creek upstream to Brennan Avenue, and the reach of the West Fork above the Fourth Street Dam are associated with better overall habitat conditions. The lower Marine Creek site (sampled 11 January 2005) contained three species of darters generally associated with clean water and perennial streams characterized by riffles and pools. Lebow Creek (sampled 13 April 2005) was found to be populated with many of the same species found in Marine Creek including orangethroat darter, spotted sucker, and blackstripe top minnow. Approximately 1875 linear feet of Marine Creek and 2700 linear feet of Lebow Creek contain exceptional or high quality habitat. The lower segment of the West Fork was recently modified by the addition of an in-channel dam that inundated areas of grass and herbaceous vegetation that serve as spawning, and hiding areas for fisheries. In addition, the substrate contains more areas that are sandy and lack the silt layers that have accumulated in upstream sites.

During the July 2003 sampling effort to evaluate fisheries conditions within the West Fork and Clear Fork, several fish were retained and were evaluated for organochlorine levels in tissues. This effort was done to determine if conditions were improving over time. The results of that analysis indicate that elevated levels of contaminants in fish tissues are still of concern (Appendix G).

Wetlands

Much of the land within the study area has been disturbed by human activities that have altered the topography of the local landscape. Construction, operation, and maintenance of the existing flood damage reduction features including the extensive levees, channel system and manicured floodway likely removed some emergent and possibly some forested wetlands.

The essential characteristics that define a wetland are constant or recurrent shallow inundation or saturation at or near the surface of the substrate and the presence of physical, chemical, and biological features that reflect these conditions. Common diagnostic features of wetlands are hydric soils and hydrophytic vegetation.

Emergent wetlands identified in this study were typically small with a total of only 14.3 acres identified within the approximate 3500 acres that were evaluated. Riparian vegetation is more widespread, but very little of this vegetation type is inundated sufficiently enough to meet jurisdictional criteria.

Terrestrial Resources

The area of the West Fork from upstream of Riverside Drive in Fort Worth to the Lake Worth Dam has been channelized and leveed as a part of the Fort Worth Floodway project. The vegetation in this area is more reminiscent of manicured parkland than that of a bottomland hardwood community. The current vegetational landuse for the study area is displayed on Figure 2 - 5. More trees are found within the study area near I-30 on the Clear Fork. Very little understory or herbaceous vegetation is present over most of this forested area because of its use as a parkland. Tree species within this area are generally burr oaks, pecan, and cedar elm. The trees generally do not have to compete for resources with other species or the seedlings and saplings that would be found in more natural riparian corridors, thus they tend to be larger in size.

Several tributaries of the West Fork within the study area are bordered by a narrow fringe of riparian woodlands usually less than 100 feet wide and composed of oaks, green ash, cottonwood, black willow, and a dense understory of greenbriar, immature hardwoods, and invader shrubs. Forblands are scattered in old fields throughout the floodplain on drier sites.

Wildlife

Historically, the river channel, wetlands, open water areas, and bottomland hardwood forests supported a variety of wildlife species by providing for cover, food, and den or nesting sites. Under the existing condition, the vast majority of the study area is highly urbanized, and the wildlife that lives in this area occupies a modified habitat which is influenced by the surrounding urban complex. Wildlife species occurring in the area are those tolerant of human activity such as rabbits, songbirds, squirrels, and small rodents (Details provided in Appendix G).

Bird species which were observed or have been reported in the area by resource agencies include migratory warblers, sparrows, meadowlark, mourning dove, crow, red-tailed hawk, red-shouldered hawk, American kestrel, herons, egrets, mallard, wood duck, blue-winged teal, green-winged teal, lesser scaup, grackle, scissor- tailed flycatcher, kingbird, logger-head shrike, black bird, swallows, blue jay, chickadees, downy woodpecker, red-belly woodpecker, and barred owl. Amphibians,

reptiles, and mammals common to the area include frogs, toads, snakes, turtles, cottontail rabbit, cotton rat, field mice, opossum, raccoon, bobcat, beaver, nutria, and coyotes.

Quality of existing terrestrial habitat was determined using the Habitat Evaluation procedures developed by USFWS. Representatives of the USFWS, Texas Parks and Wildlife Department, and USACE participated in selection of wildlife models to use for the evaluation and participated in the collection of field data beginning in late spring 2003. Additional work was conducted during late Summer 2004 to determine existing conditions on the expanded study area that extended upstream of University Drive on the West Fork to include the area adjacent to Sumps 7W, 8W, and 9W.

Based upon the field data collected, USFWS provided habitat suitability indices for each wildlife habitat evaluated in the study area (Table 2 - 3). These quality indicators were based upon data collected at numerous sites within each vegetative cover type in the study area. Wildlife habitats represented within the study area included riparian woodlands, upland woodlands, emergent wetlands, and grasslands. Overall there were 323 acres of riparian woodlands; these woodlands provide approximately 59 percent of their optimum output with 188.9 total habitat units. The upland woodlands consist of approximately 523 acres and produce 305 habitat units of output, which is approximately 58 percent of their potential. Currently, the study area contains only approximately 14 acres of wetland spread among three locations. All of these wetlands have HSI values less than 0.4, and collectively they provide just 35 percent of their optimum output. The majority of the grasslands within the study area are within the existing floodway boundaries. These grasslands are maintained by regular mowing, and therefore, their value as wildlife habitat is low. The 2,363 acres of grasslands provide 955.92 habitat units, a value equivalent to 40 percent of their full potential.

Table 2 - 3. Habitat Suitability Indices and Habitat Units for Existing Habitat Categories.

	Riparian Forested			Upland Forest			Emergent Wetland			Grassland			Water *	Disturbed /Urban
Study Zone	**Acres**	**HSI**	**HU**	**Acres**	**HSI**	**HU**	**Acres**	**HSI**	**HU**	**Acres**	**HSI**	**HU**	**Acres**	**Acres****
Clear Fork West	187.5	0.62	116.25	80.7	0.56	45.19	0.0	0.0	0.0	402.5	0.48	193.20	39.4	589.8
Clear Fork East	0.0	0.0	0.00	41.9	0.50	20.95	0.0	0	0.0	102.2	0.35	35.77	21.9	162.3
North Main	11.6	0.62	7.19	145.6	0.56	81.54	2.9	0.30	0.87	404.1	0.48	193.96	52.5	407.7
West Fork North	3.2	0.60	1.92	77.1	0.41	31.61	0.0	0	0.0	308.1	0.35	107.83	59.0	188.9
West Fork South	2.6	0.30	0.75	126.0	0.50	63.00	2.6	0.19	0.49	665.7	0.35	233.0	75.8	345.1
W F/ Riverbend/Rockwood	118.1	0.53	62.6	51.6	0.80	41.28	8.8	0.44	3.87	480.4	0.40	192.16	51.0	104.6
TOTALS	**323.0**		**188.94**	**522.9**		**323.8**	**14.3**		**5.23**	**2363.0**		**955.92**	**299.6**	**1798.4**

*See Aquatic Section for discussion of quality. ** Habitat Quality for Urban Disturbed habitat not quantified.

Significance of Resources

The significance of resources is established based on institutional recognition that the importance of an environmental resource is acknowledged in the laws, adopted plans, and other policy statements of public agencies, tribes, or private groups. The 1988 amendment to the Fish and Wildlife Conservation Act that mandates the U.S. Fish and Wildlife Service (USFWS) to "identify species, subspecies, and populations of all migratory non-game birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973." The *Birds of Conservation Concern 2002* (*BCC 2002*) report is the most recent effort to carry out this mandate. The overall goal is to accurately identify the migratory and non-migratory bird species (beyond those already designated as Federally threatened or endangered) that represent the highest conservation priorities and draw attention to species in need of conservation action.

In consultation with USFWS, it was determined that the study area lies within Bird Conservation Region (BCR) 21 (Oaks and Prairies). There are 23 species (See Table 8 in Appendix G.1) in BCR 21 that are likely to become candidates for listing under the Endangered Species Act of 1973 without additional conservation actions. Of those 23 species, eleven are known to occur in the riparian and floodplain habitats associated with the Upper Trinity watershed. Nine of these eleven species are of national concern due to their downward population trends.

Wetlands, riparian forests and riverine aquatic habitats make up the ecosystem components associated with the study area that is significant at the institutional level.

These habitats are also significant based upon on public recognition. For example, the Trinity River Vision Master Plan was commenced in August 2000 by the Tarrant Regional Water District (TRWD) and the architecture/planning firm Gideon Toal. At least 11 meetings were held within the local community during 2001. Among the many goals identified by the public during this process for the Central City segment of the Trinity River Vision Master Plan, expanding wildlife habitat associated with the floodplain was identified. The general public has identified and recognizes the importance of wildlife habitat and water quality within the study area.

The riparian resources within the study area also demonstrate national levels of significance based on technical recognition, or "technical" merits, which are based on scientific knowledge or judgment of critical resource characteristics. Technical significance is generally described in terms of one or more of the following criteria or concepts: scarcity, representativeness, status and trends, connectivity, critical habitat, and biodiversity.

As evidence, riparian forests, especially those occurring in the South, were designated by Noss et al. in 1995 as a nationally endangered ecosystem. There has been an 84% decline in riparian forests on a national scale since early settlement (Noss et al., 1995). The bottomland hardwood ecosystem in Texas prior to European settlement once extended over 6.5 million hectares; it is estimated that less than 40% of this original extent still remains (Frye, 1986), with only a few small and isolated patches of old growth scattered among the floodplains of the eastern third of the state. Losses of intact bottomland hardwoods in the past 50 years have at times been greater than 120,000 hectares per year (Barry and Knoll, 1999). For the most part, factors such as urbanization, channelization, timber harvest, agriculture, and the introduction of exotic species have all contributed to the degradation and

declining trend of riparian forests. Classification of the habitat types within the study area indicate that only six percent of the area is serving as riparian forest habitat. This number is very low considering that the study area is limited to the floodplain of the Clear and West Forks of the Trinity River

Threatened and Endangered Species

USFWS records indicate that the threatened, endangered, proposed threatened, and candidate species shown in Table 2 - 4 have been documented, or are known to occur in Tarrant County. No designated critical habitat for listed species exists in Tarrant County.

Table 2 - 4. Species of Special Status by USFWS in Central City Study Area

Species Common Name	Species Scientific Name	Status
Interior least tern	*Sterna antillarum*	Endangered
Whooping crane	*Grus americana*	Endangered
Bald eagle	*Haliaeetus leucocephalus*	Threatened

The endangered interior least tern (Sterna antillarum) nests from May through August in colonies on bare to sparsely vegetated sandbars along rivers and streams in Texas. Because natural nesting sites have become sparse, interior least terns have nested in atypical/non-natural areas, which provide similar habitat requirements. In recent years, terns have been utilizing artificial habitat more frequently within the Dallas-Fort Worth Metroplex area; however, no interior least terns are currently known to nest within the study area.

Endangered whooping cranes (Grus americana) may be encountered in any County in north central Texas, including Tarrant, during migration. Autumn migration normally begins in mid-September, and spring migration occurs during March and April. Whooping cranes prefer isolated areas away from human activity for feeding and roosting, with vegetated wetlands and wetlands adjacent to cropland being utilized along the migration route. Due to the lack of suitable habitat and its urbanized nature, it is unlikely that this species would utilize any of the study area.

Bald eagles (Haliaeetus leucocephalus) are considered winter and possible spring residents of Tarrant County. Bald eagles nest, roost, and perch in tall trees near water and feed primarily on fish and waterfowl. Winter habitat includes reservoirs, lakes, playas, rivers, and marshes. The study area and/or adjacent lands contain large trees suitable for perching and nesting by bald eagles. Due to the development and disturbance in the study area, it is unlikely that the area would be used by eagles.

Cultural Resources

Cultural resources are defined as the broad pattern of events, real properties, and cultural lifeways or practices that have significance to humans. Buildings and places where significant events occurred, archaeological sites containing significant information about human activities, traditional places or activities that hold special significance, and folkways which are practiced as either cultural or life sustaining, are all part of the broad category features of groups of people that combine to form the cultural resource landscape. For the purpose of this study, a cultural resource is further defined as a

historic property listed on, or eligible to be listed on, the National Register of Historic Places (NRHP). Sites eligible for the NRHP that can be affected by a federal undertaking must undergo compliance with Section 106 of the National Historic Preservation Act of 1966 as amended (Section 106). Under Section 106, historic properties impacted by this undertaking must undergo consultation with the Texas Historical Commission (THC) and interested parties to seek ways to avoid, lessen, or mitigate adverse impacts to these historic properties.

Archaeological Resources

A review of state archaeological site records kept by the Texas Archeological Research Laboratory (TARL) at the University of Texas at Austin indicated two previously recorded cultural resources sites in the immediate vicinity of the study area. One site is located at the East First Street Bridge and one is located near the confluence of the West Fork of the Trinity River and Sycamore Creek, between Riverside Drive and Beach Street. Both of these sites are deeply buried (between 0.5 and 4 meters, [1.5 to 13 feet] below current ground surface) prehistoric sites consistent with other prehistoric sites discovered along the West Fork, it's tributaries, and Lake Worth. These are deeply buried deposits of charcoal, ash, fire-cracked rock, animal bone and mussel shell, and possible hearth features. Some of the faunal material shows evidence of thermal alteration, and spiral fractures of long bones are not uncommon. Typically, few if any lithics are present.

The proposed project's Area of Potential Effects (APE) includes several areas along the immediate river channel, totaling approximately 291 acres as defined by the study area. The APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking and may vary for different kinds of effects caused by the undertaking.

A preliminary investigation of the 291-acre APE was carried out to assess the potential for buried, intact, archaeological resources. The investigation consisted of intensive coring throughout the hydraulic mitigation area upstream of the downtown project area, the stream bank near the Samuels Avenue dam, and proposed recreation areas near the Interstate Highway (IH) 35W bridge over the Trinity River. A total of 79 cores were excavated and the geomorphology of the sediments examined for indication of likely locations of buried cultural resources. This investigation was designed to assist planning for more localized sub-surface investigations for buried resources. The coring plan was approved by the State Historic Preservation Office prior to execution. Due to the sensitive nature of archaeological sites, specific locations of materials recovered will not be released. However, general statements can be made about the potential for locating cultural deposits within the area of potential affect.

Preliminary analysis of the cores extracted in the downstream portion of the APE revealed two potential archaeological sites near the IH 35 overpass. Artifacts were observed on the surface in both localities, and artifacts and burned clay and rock were recovered from core samples at one locality. This area will require intensive archaeological testing to determine the extent of these sites and their eligibility for the National Register of Historic Places (National Register). In the upstream hydraulic mitigation area, five areas were identified as having a particularly high potential for buried cultural resources, including one locality where cultural material was recovered from an extracted core sample. These areas will also need intensive archaeological testing to determine to what extant

archaeological deposits have remained in tact despite extensive past channel modification in this area. Any sites located during the testing phase of the cultural resources investigation for the project will be evaluated for eligibility in the National Register.

Should these localities, or any others, contain sites determined eligible for the National Register, mitigation measures will be developed in consultation with the State Historic Preservation Office and carried out prior to construction activities that may otherwise destroy these resources.

Architectural Resources

The following information was compiled from a cultural resource study entitled, "Below the Bluff: Urban Development at the Confluence of the West Fork and Clear Fork of the Trinity River, 1849-1965, a Historic Context, Inventory and Assessment of the Central City Segment of the Trinity River Vision Plan, Fort Worth, Texas." The report was produced in February 2005 and sent to the Texas Historical Commission (THC) for review and comment. THC comment was received in an April 1, 2005 letter to the Corps (See Appendix J). The Corps is currently compiling additional information requested by the THC to confirm National Register of Historic Places (NRHP) eligibility of properties.

The Area of Potential Effect (APE) for this project is shown in (Figure 2 - 6). The APE is largely defined by the oxbow section of the Trinity River at the confluence of the West and Clear forks of the Trinity River immediately north of downtown Fort Worth. It is bound by the Stockyards to the north, the St. Louis, San Francisco and Texas and the St. Louis and Southwestern railroads to the west and by Samuels Avenue to the east. Land uses within this APE are primarily commercial or industrial. The THC has concurred with the Corp's APE determination in their April 1, 2005 letter.

All properties built on or before 1966 were inventoried and assessed. The year 1966 was selected due to a very preliminary estimate that the project would be substantially complete by 2016 and invoking the 50-year guideline for consideration of historic properties (2016 - 50 = 1966). The result of the inventory and evaluation effort was a preliminary determination of eligibility of the properties below for inclusion on the NRHP.

The majority of the properties recommended as potentially eligible for listing on the NRHP based on either criteria A or C. Under Criterion A, properties may be eligible for listing in the NRHP if they are associated with events that have made a significant contribution to the broad patterns of human history. Under Criterion C, properties may be eligible for listing in the NRHP if they embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction.

Properties USACE recommended as eligible are listed in the Table 2 - 5. In addition, the Paddock Viaduct (Property Number 103) is already listed on the NRHP and is recognized as a Texas Civil Engineering Landmark and a Recorded Texas Historical Landmark. The Tarrant County Courthouse (Property Number 107) is also listed on the NRHP and is a Texas Historic Landmark. Thirty-three properties related to the historic context were recommended as eligible under Criteria A and C. All properties not listed in Table 2 - 5 were found not eligible for the National Register of Historic Places.

Once it is determined that historic properties are present within the APE and what impacts to historic properties will result from the government's undertaking the USACE will begin consultation with the THC and interested parties to lessen or mitigate adverse impacts to historic properties.

Table 2 - 5. NRHP-Eligible Pre-1966 Buildings, Structures, and Landscapes within the APE.

Address	Central City Survey Property Number	Year Built	Theme	Description	Integrity	Eligibility Status[1]
Fort Worth Power and Light/TXU	1-A	1910	Industry	Masonry multi-storied structures with arched windows.	High	Eligible A[2], C[3]
Fort Worth Power and Light/TXU	1-B	1940	Industry	Concrete Retention Pond	Moderate	Eligible A, C
Fort Worth Power and Light/TXU	1-C	1940	Industry	Concrete Intake Station	Moderate	Eligible A, C
Fort Worth Power and Light/TXU	1-F	1940	Industry	One-story masonry with arched windows	High	Eligible A, C
818 North Main Bud Sellers Auto	40	c 1921	Industry	Brick masonry with colored design patterns; sheet metal building in back with newer 2-bay addition.	Moderate	Eligible A, C
834-842 North Main *Texas Refinery Co.*	50	c 1928	Industry	Masonry and stucco, tile roof accent; Spanish style.	High	Eligible A, C
900 North Main Walter Dearman Truck	53	c 1946	Industry	One-story metal frame with bowstring truss roof. CMU administration building attached to front.	High	Eligible A, C
909 North Main Texas Refinery Co.	52	1946	Industry	One-story flat roof masonry, glass block windows.	Poor	Eligible A, C
917/919 North Main *Texas Refinery Co.*	56/57	c 1946	Industry	One-story masonry steel windows.	High	Eligible A, C

Address	Central City Survey Property Number	Year Built	Theme	Description	Integrity	Eligibility Status[1]
1012 North Main Ellis Pecan Company	62	1926	Social History/ Commerce	Brick auditorium; arched steel sash window.	High	Eligible A, C
601 North Throckmorton Hutchinson Pipe & Waste Material Co.	13	1940	Industry	Block masonry with shingled barrel vault roof.	High	Eligible A, C
806 North Throckmorton Southwestern Brass Works	42-A	1927	Industry	Sheet metal manufacturing building; original materials.	High	Eligible A, C
806 North Throckmorton Southwestern Brass Works	42-B	1927	Industry	Single story wood frame.	High	Eligible A
901 North Throckmorton *McKinley Iron Works*	47-A	1931	Industry	Two story masonry.	Moderate	Eligible A, C
901 North Throckmorton *McKinley Iron Works*	47-B	1931	Industry	Two story masonry.	Moderate	Eligible A, C
901 North Throckmorton *McKinley Iron Works*	47-C	c 1945	Industry	One-story masonry loading dock.	High	Eligible A, C
609 North Houston *Hobbs Trailers*	14	1950	Industry	Brick masonry; concrete construction with large plate glass; shingle roof accent	Moderate	Eligible A, C

Address	Central City Survey Property Number	Year Built	Theme	Description	Integrity	Eligibility Status[1]
841 North Houston McKinley Iron Works	48-A	1935	Industry	One-story metal frame corrugated siding, bowstring roof truss.	High	Eligible A, C
205 North 7th Street National Educators Life Warehouse	31	1949	Industry	Two story brick Modern; steel sash windows; limestone banding.	High	Eligible A, C
625 North Commerce *Hobbs Trailers*	15	1928	Industry	One-story metal frame corrugated siding.	High	Eligible A, C
648 North Commerce *Carruthers Stone*	18	1930	Industry	One-story metal corrugated siding.	High	Eligible A, C
1024 North Commerce Western Paint & Roofing	64	1920	Industry	One-story load bearing brick; clerestory lighting.	High	Eligible A, C
825 North Calhoun	46	1947	Industry	Dual one-story metal buildings with bow truss roof.	Moderate	Eligible A, C
1107 North Calhoun *Machine Shop*	65	1939	Industry	One-story load bearing brick; clearstory lighting.	High	Eligible A, C
336 Greenleaf Street	70	1925	Residential	Single family residence; wood frame with corrugated metal roof; possible addition to side of house.	Moderate	Eligible A, C
701 North Henderson Triple A Package Store	87	1946	Commerce	One-story masonry Streamline Modern.	High	Eligible A, C
900 Woodward	96-A	1940	Industry	Two story masonry smokestack and boiler house.	High	Eligible C

Address	Central City Survey Property Number	Year Built	Theme	Description	Integrity	Eligibility Status[1]
Henderson Street Bridge	101	1930	Transportation/ Engineering	Open spandrel concrete arch.	High	Eligible A, C
SL, SF and Texas Railway Bridge	102	1902	Transportation/ Engineering	Iron through-truss span with concrete piers	High	Eligible A, C
Paddock Viaduct	103	1902	Transportation/ Engineering	Long timber trestles, with steel truss supported by concrete piers.	High	NRHP-listed
Flood Control System	104	1910-1957	Flood Control Development/ Engineering	Levees, sumps, sluices, Nutt Dam, USGS Water Gauge	Moderate–High	Eligible A, C

[1] Eligibility Status: Recommendation indicates criteria from 36 CFR 60.4 that are met.

[2] Under Criterion A, properties may be eligible for listing in the NRHP if they are associated with events that have made a significant contribution to the broad patterns of human history.

[3] Under Criterion C, properties may be eligible for listing in the NRHP if they embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction.

Hazardous, Toxic, and Radioactive Waste

Pursuant to ER 1165-2-132, USACE, in conjunction with CDM, conducted a Hazardous, Toxic, and Radioactive Waste (HTRW) investigation for the Central City Interim Feasibility Study, Fort Worth, Texas. The results of this investigation are presented in the *Hazardous, Toxic, Radioactive Waste (HTRW) Phase I Environmental Site Assessment (ESA)*, prepared January 2005 by CDM and included as Appendix D of this DEIS.

The purpose of this study was to facilitate early identification and consideration of HTRW issues. This included: 1) Initial characterization of soil and groundwater within portions of the study area (see Appendix D, Figure 1-1), 2) Identifying properties with HTRW potential, and 3) Outlining a plan for the next project phrase. First, a review of standard environmental records in accordance with ASTM Practice E 1527 was conducted throughout the study area. Additionally, data from site assessment and groundwater monitoring reports along with conversations with officials from the City of Fort Worth and TCEQ were used to complete this evaluation. Finally, a preliminary subsurface characterization was conducted within public right-of-ways. No sampling or site inspections on private property were performed due to lack of access.

Highlights from the HTRW investigation include:

- Results from the records review indicate the majority of known major soil and groundwater contamination is located in the North Main Street area. Within the study area there are numerous sites (i.e. vehicle maintenance, dry cleaners, USTs, etc.) where experience indicates environmental issues could typically occur. There are four sites within the North Main Street area where known significant releases to the environment have occurred. These sites may warrant further investigation depending on where project features are located.

- In June 2004 eight soil borings were completed within the study area on publicly owned property (See Appendix D, Figure3-1). The analyses of the soil included volatile organic compounds (VOCs), total petroleum hydrocarbons, pesticides, polychlorinated biphenyls (PCBs), RCRA metals, molybdenum, and cobalt. No analytes were detected above the applicable regulatory criteria.

- Groundwater was sampled in June and October 2004. The groundwater samples were tested for Priority Pollutant metals, semi-volatile organic hydrocarbons, pesticides, PCBs, and VOCs. Arsenic and bis (2-ethylhexyl) phthalate were detected above the Texas Tier 1 Protective Concentration Limit during the first round of sampling. The preliminary laboratory report indicated that these chemicals were not detected during the second sampling event. Bis (2-ethylhexyl) phthalate is a common artifact of sampling and laboratory procedures. Additionally, the background concentration of arsenic in the native soil may be sufficient to produce the observed concentrations in the groundwater.

- Soil and groundwater data collected indicate minimal subsurface contamination over most of the study area. Therefore, widespread subsurface contamination is not likely to be encountered throughout the project area. However, although below action levels, the presence of some contaminants may indicate the potential for nearby soil contamination in excess of regulatory levels. Based on these findings it appears that contamination from individual properties is mainly restricted to private industrial properties and has migrated minimally into adjacent areas. Also, analytical results from the HTRW investigation imply that soil and groundwater from the area sampled should not require special handling, disposal, or remediation. However, as a precaution, water encountered during construction should be tested prior to discharging. If appropriate, discharge permits and/or remediation should be established.

Recreational Resources

General Description

Approximately 10,555 acres of parkland, including neighborhood, community, linear, and city parks are available for present and future public use within the City of Fort Worth (Table 2 - 6). These public lands and facilities provide recreational opportunities for residents of the Metroplex, especially those who are unable to travel to recreational sites outside the metropolitan area. In 1998, the City of Fort Worth adopted a 21.25 acre of parkland per 1000 person standard. Currently, Fort Worth provides 19.50 acres per 1000 person, and based upon current population trends by 2023 the city will need approximately 4,700 acres of parkland to meet the 21.25 acres per 1000 person standard. A detailed recreational write-up is provided in Appendix H.

Table 2 - 6. City of Fort Worth Recreational Facilities.

Recreational Resource	Number available
Playgrounds	145
Practice fields	105
Competition baseball/softball fields	33
Competition soccer fields	22
Basketball courts	108
Tennis courts	96
Swimming pools	7
Golf Courses	6
Trails (miles)	56

Table 2 - 7 provides a listing of the existing recreational facilities within the Central City study area (Figure 2 - 7). Included are golf courses, community parks, urban parks, neighborhood parks, and special use areas. Approximately 15.5 miles of trail exist within the study area. A large portion (42

percent) of the study area lacks sufficient shade, thus it is inhospitable for recreational use during certain times of the year.

Table 2 - 7. Recreational Facilities in the Central City Study Area.

Recreational Facility	Type	Year Built	Acres
West Fork			
Rockwood Park Municipal Golf Course	Special Use - Golf Course	1927	200.00
Rockwood Park	Community	1927	35.41
Heritage Park Plaza	Large Urban Park	1975	112.00
Delga Park	Neighborhood - Pocket Park	1968	4.06
Riverside Park	Community	1974	30.80
Greenway Park	Neighborhood	1926	13.50
Harmon Field Park	Community	1952	97.50
Clear Fork			
Trinity Park	Large Recreational	1892	252.00
Marine Creek			
Saunders Park	Special Use - Urban Park	1977	0.48
Rodeo Park	Neighborhood	1971	5.30
Others in Study Area			
Trail Drivers Park	Community	1928	39.61
Northside Park	Community	1946	15.00
Circle Park	Special Use - Urban Park	1909	3.06
Marine Park	Community	1894	12.00
Linwood Park	Neighborhood - Pocket Park	1957	4.00
Traders Oak Park	Special Use - Historic Park	1953	4.11
Oakhurst Park	Neighborhood - Mini Park	1944	0.75
Cultural District			
LaGrave Field			

The Trinity Trail System

The City of Fort Worth is an active participant in the Trinity Trail System, which involves a regional collaboration to develop a continuous public-access recreation corridor with a multi-use trail along the Trinity River Corridor in North Central Texas and northward to the Red River. The Trinity Trails Advisory Committee consists of

representatives appointed by each participating local government along the Trinity in North Central Texas, and by the Texoma COG for the northern arm of *Dalhoma*. Most representatives are elected officials or park board members. Lead staff support is provided by the North Central Texas Council of Governments (NCTCOG), with the U.S. Army Corps of Engineers responsible for the technical study efforts.

In 1996, the Trinity Trails Advisory Committee adopted a proposed alignment for most of the 250-mile "spine" of the regional system. This alignment is shown in Figure 2 - 8. It is centered at the confluence of the three major forks of the Trinity River, the -- West Fork, Elm Fork and the Mainstem -- near downtown Dallas.

The 125-mile northward spine, referred to as *Dalhoma*, is planned to extend along the Elm Fork to Lakes Lewisville and Ray Roberts, then along major highway and rail corridors to Lake Texoma at the Oklahoma border. The 50-mile southeastern spine initially extends to the Dallas/Ellis County line. The 75-mile western spine extends to Lakes Benbrook and Eagle Mountain through the heart of the Central City study area. The Fort Worth Segment of the Trinity Trail System is currently comprised of some 41 miles of continuous hard surface hike and bike trail extending from Lake Benbrook to the Clear Fork/West Fork confluence. The upstream terminus of the West Fork Segment of the hard surface trail is at Trail Head 9 near University Drive; a crushed limestone trail extends to Trail Head 11 in River Oaks. The trails join on the west side of the Clear Fork/West Fork confluence, in the vicinity of the Marine Creek Trail extension linking Buck Sansom Park with the spine. A seven mile extension through the project area to connect with Gateway Park was completed in 2004. The City of Fort Worth and Community Parks Service Department continues to work with the City of Arlington to explore opportunities to create a regional trail system to connect the two cities.

Boating

The Clear Fork near Trinity Park is the site of Class II and III whitewater rapids. Three whitewater chutes exist in an approximately 1 mile section of the Clear Fork and are used extensively by kayakers. Water-skiers also utilize a three-mile section of the Trinity River downstream of Samuels Avenue. The site includes a slalom course and separate areas for open skiing/wakeboarding.

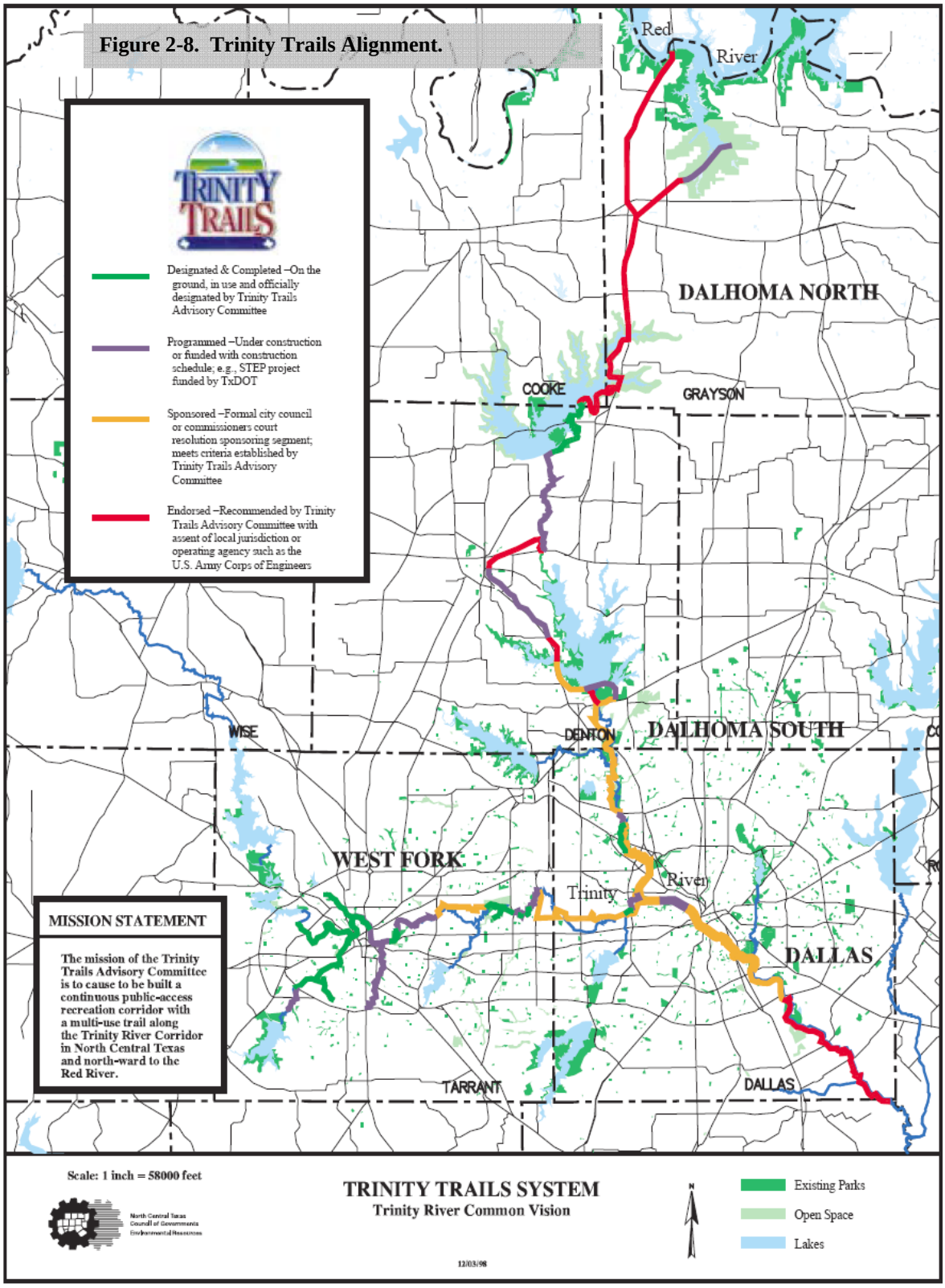
Socio-economics

The following text summarizes the socioeconomic context of the study. Descriptions are provided for Tarrant County, the study area (Figure 1 - 3) and, where appropriate, for the immediate project area (Figure 2 - 9). Refer to Appendix J for more detailed results from this assessment.

Study Area versus Project Area

The study area used for the socioeconomic assessment is an area of approximately 9,700 acres. The Study Area was viewed in the broader context of the socioeconomic assessment as it includes the area that will be most impacted and the surrounding area subject to more indirect impacts of the project and any ancillary development. Conversely, the Project Area is thought to be the most impacted by proposed project components and is centered within the study area. It is bounded by the

Figure 2-8. Trinity Trails Alignment.



Burlington Northern Railroad on the west, the Trinity River and Clear Fork on the east, Marine Creek on the north, and West 7th Street on the south.

In assessing the demographic characteristics of the project area, an area larger than the delineated project area described above was used. This area coincides with the three census blocks that intersect the project area. Census block 1020.001, on the southern end of the project area, additionally captures the area west of the Burlington Northern Railroad to University Drive and the south to I-30 including the area surrounding the Will Rogers Complex east of Montgomery Street. The primary demographic data captured within this census block is the Linwood Addition which is regarded as being homogenous to the project area. Additionally, census block 1010.002 which makes up the majority of the project area captures information from the Ripley Arnold housing project where Radio Shack's new corporate headquarters is now located. Again, the population demographics of the housing project are considered indicative of the population demographics of the project area.

Demographics

Race and Ethnicity

The following table depicts the racial and ethnic makeup for Tarrant County, the study area, and the project area for the years 1990 and 2000.

Table 2 - 8. County and Study Area Demographic Composition (Numbers in 1000s).

	Tarrant County				Study Area				Project Area			
	1990		2000		1990		2000		1990		2000	
Demographic	#	%	#	%	#	%	#	%	#	%	#	%
Male	578.1	49.4	713.5	49.3	19.2	52.1	20.4	52.4	2.40	57.1	3.08	65.39
Female	592.0	50.6	732.7	50.7	17.7	47.9	18.5	47.6	1.80	42.9	1.63	34.61
Hispanic	134.0	11.5	285.3	19.7	18.9	51.3	23.6	60.7	1.40	33.0	2.03	43.08
White	859.9	73.5	895.4	61.9	11.3	30.7	10.3	26.6	1.40	32.9	1.38	29.31
Black	140.5	12.0	180.4	12.5	6.1	16.5	4.3	11.0	1.40	32.6	1.23	26.13
Asian, Hawaiian, PI	29.2	2.5	52.3	3.6	0.3	0.8	0.3	0.8	0.00	0.0	0.06	1.25
American Indian	5.6	0.5	6.8	0.5	0.2	0.5	0.2	0.4	0.05	1.2	0.005	0.11
Other	1.0	0.1	25.8	1.8	0.1	0.3	0.2	0.4	0.20	0.4	0.006	0.13
Total	**1170.1**	**100.0**	**1446.2**	**100.0**	**36.9**	**100.0**	**38.9**	**100.0**	**4.20**	**100.00**	**4.71**	**100.00**

The total population of Tarrant County increased almost 24 percent from 1990 to 2000, while total population for the study area increased five percent and 41 percent for the project area. All ethnic groups experienced increases in population in Tarrant County with the Hispanic population having the largest, an increase of 113 percent. Hispanic population increased almost 25 percent in the study

area and 135 percent for the project area. White population had the smallest percentage increase for the County at just over four percent while decreasing over 8.6 percent in the study area but increasing 26 percent for the project area. Population for blacks increased 28 percent for the County but decreased almost 30 percent for the study area and just over six percent for the project area.

Income Levels

Charts 2 - 1 and 2 - 2 illustrate the income distribution for Tarrant County, the study area, and the project area in 1990 based on household income from the 1990 census. Chart 2 - 1 displays a relatively even distribution of income for the County with only 11.7 percent of the households having incomes less than $10,000. Almost 29 percent of the households in the study area had incomes less than $10,000 compared with 45 percent for the project area. By contrast, Chart 2 - 2 shows the income distribution for the County, the study area, and the project area for 2000. In 2000, the percentage of households having incomes less than $10,000 decreased to 7.2 percent for Tarrant County and decreased to 16.6 percent for the study area. Households having incomes less than $10,000 dropped to 35 percent for the project area.

Chart 2 - 1. Income distribution for 1990

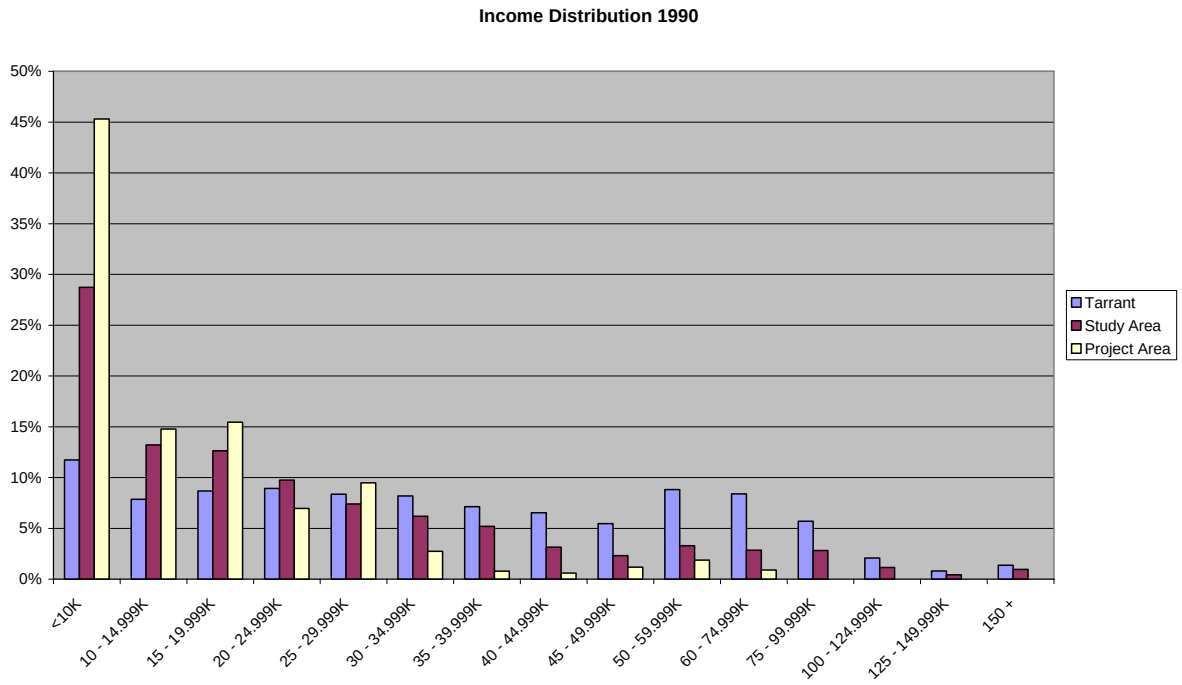
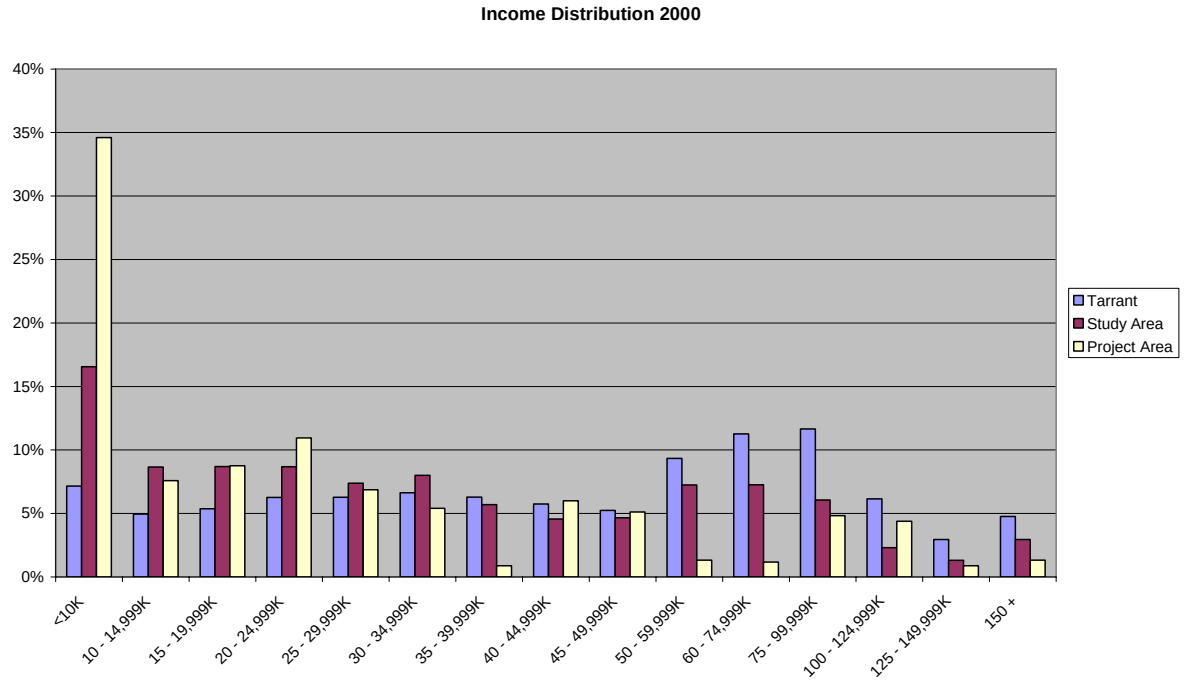


Chart 2 - 2. Income Distribution in 2000.



Poverty Status

Table 2 - 9 describes the poverty status of Tarrant County, study area, and project area.

Table 2 - 9. County and Study Area Poverty Status

	Tarrant County		Study Area		Project Area	
Population Parameter	**1990**	**2000**	**1990**	**2000**	**1990**	**2000**
Total Population	1,149,013	1,421,383	33,959	35,737	2,423	2,064
Total Population Above Poverty Level	1,022,460	1,270,895	23,307	27,715	1,187	1,193
Total Population Below Poverty Level	126,553	150,488	10,652	8,022	1,236	871
Percent Above Poverty Level	89.00	89.40	68.60	77.60	48.99	57.80
Percent Below Poverty Level	11.00	10.60	31.40	22.40	51.01	42.20

The percentage of the population in Tarrant County living below the poverty level was eleven percent for 1990 and declined slightly to 10.6 percent in 2000. The study area by contrast, had 31.4 percent of its population living below the poverty level in 1990. The percentage living below the poverty level decreased to 22.4 percent in 2000. The project area had over 51 percent of its population living below the poverty level in 1990 and declining to 42.2 percent in 2000.

Educational Attainment

Chart 2 - 3 depicts educational attainment for Tarrant County, the study area, and the project area for 1990. In 1990, almost 28 percent of the population of the study area age 25 or greater had less than a

ninth grade education. This compares with only 7.4 percent of the population 25 and over for Tarrant County. About 18 percent of the project area's population had less than a ninth grade education. Almost 25 percent had less than a high school education in the study area and 28 percent for the project area, while 12.7 percent of the over 25 population had less than a high school education for the County.

Chart 2 - 4 depicts educational attainment for 2000. This chart displays many of the same disparities in educational attainment between Tarrant County and the study area. The study area did see small percentage reductions in lower levels of educational attainment for 2000. These were offset by increases in higher levels of educational attainment, particularly attainment of bachelor's degrees as well as professional and graduate degrees. The project area saw an increase in the percentage of the population with less than a high school education and other lower levels of education. Additionally, the project area saw decreases in higher levels of educational attainment with the exception of graduate and professional degrees.

Chart 2 - 3. Educational attainment for 1990.

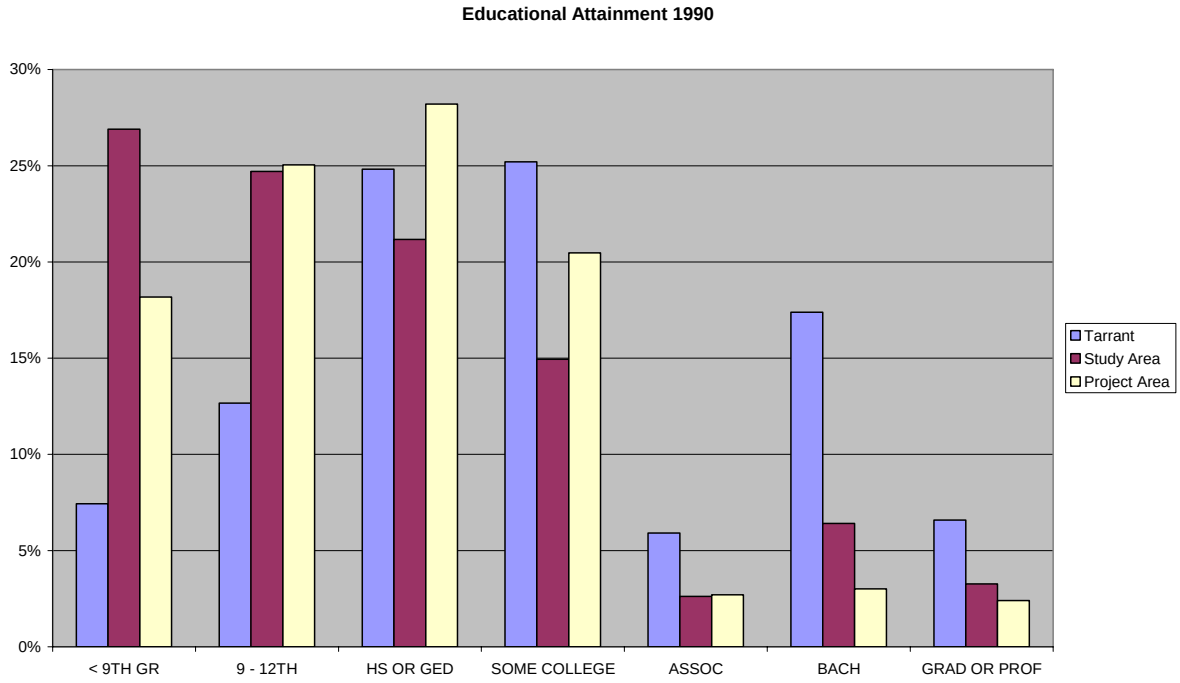
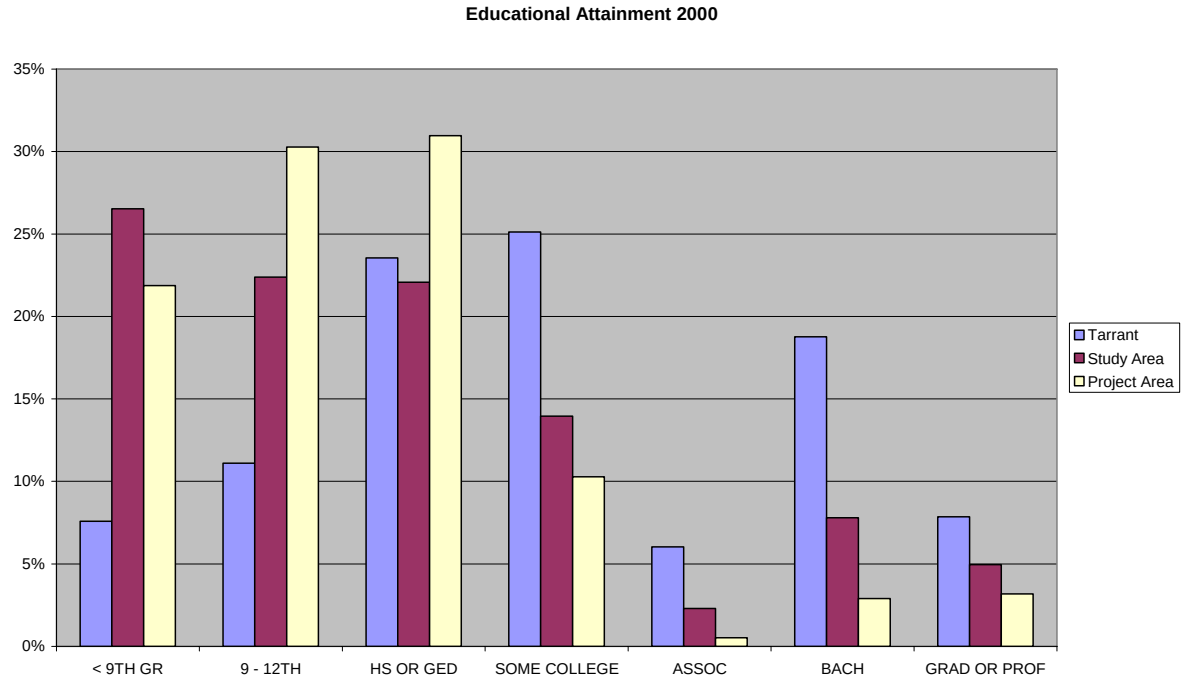


Chart 2 - 4. Educational attainment for 2000.



Unemployment

Table 2 - 10 displays the unemployment rates in 1990 and 2000 for Tarrant County, study area and the project area.

Table 2 - 10. County and Study Area Unemployment Rates

	Tarrant County		Study Area		Project Area	
	1990	2000	1990	2000	1990	2000
Male Labor Force	349,640	408,737	8,893	9,488	546	446
Employed	329,516	391,793	7,852	8,723	473	381
Unemployed	20,124	16,944	1,041	752	73	65
Unemployment Rate	5.80%	4.10%	11.70%	7.90%	13.37%	14.57%
Female Labor Force	285,758	340,752	5,648	6,280	388	284
Employed	269,429	323,594	4,959	5,489	306	240
Unemployed	16,329	17,158	689	791	82	44
Unemployment Rate	5.70%	5.00%	12.20%	12.60%	21.13%	15.49%
Combined Labor Force	635,398	749,489	14,541	15,768	934	730
Employed	598,945	715,387	12,811	14,212	779	621
Unemployed	36,453	34,102	1,730	1,543	155	109
Unemployment Rate	5.70%	4.60%	11.90%	9.80%	16.60%	14.93%

The combined unemployment rate for Tarrant County in 1990 stood at 5.7 percent. The same rate for the study area was 12.2 percent and 16.6 percent for the project area. In 2000, the combined

unemployment rate for Tarrant was 4.6 percent, 9.8 percent for the study area and 14.9 percent for the project area, an improvement for all three areas.

Study Area Housing Characteristics

The following table describes the average home values, percentage of home ownership, and percentage of rentals.

Table 2 - 11. Housing Characteristics

	Tarrant County		Study Area		Project Area	
	1990	2000	1990	2000	1990	2000
Total Housing Units	491,152	565,830	13,260	12,958	1,180	761
Occupied Housing Units	438,634	533,864	11,622	11,829	982	698
Vacant Housing Units	52,518	31,966	1,638	1,129	198	63
Owner Occupied	254,897	324,754	5,610	5,669	179	189
Renter Occupied	183,737	209,110	6,012	6,160	803	509
Agg. Val. For Owner Occ. Units	20,212,397,000	33,328,205,000	315,415,500	469,925,000	5,097,500	7,975,000
Avg. Val. For Owner Occ. Units	79,296	102,626	56,224	82,894	28,478	42,196
Owner Occupied %	58.10	60.80	48.30	47.90	18.23	27.08
Renter Occupied %	41.90	39.20	51.70	52.10	81.77	72.92
Vacancy Rate	10.70	5.60	12.40	8.70	16.78	8.28

Environmental Justice

In accordance with Executive Order 12898, "*Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*," the percentage of minority and low income populations within the study area was determined. Within the study area, 25 of the 40 Census blocks for year 2000 have minority populations over 50 percent. Of the 25 census blocks, 20 contain Hispanic populations of more than 50 percent while the remaining five have African American populations of more than 50 percent (Table 2 - 12).

In assessing the existence of low-income populations in the study area, median household incomes for all 40 census blocks within the study area were examined (Figure 2 - 10). Based on a poverty threshold for a family size of three (considering that average number of persons per household for Tarrant County is 2.74) an income of $13,290 was used as comparison. Using this poverty threshold, four census blocks within the study area fall below the poverty level, two of which are identified as minority census blocks. When threshold levels are adjusted for census block specific household size, three of the four census blocks described above remain below the poverty level. Census block 1021.006, with an average household size of two, translates into a poverty threshold of $10,869. With a median household income of $12,035, the median household income for this Census block is $1,166 above the poverty threshold.

Table 2 - 12. Low Income Populations within Study Area by Census Block

Census Block	Median Household Income	Poverty Threshold for Family of Three	Amount Below Poverty Threshold
1010.002	$7,683	$13,290	-$5,607
1017.002	$6,382	$13,290	-$6,908
1017.003	$7,976	$13,290	-$5,314
1021.006	$12,035	$13,290	-$1,255

As noted earlier, the project area intersects three census blocks within the center of the study area including 1009.001and 1020.001, identified as predominantly Hispanic, and 1010.002, identified as low income. The demographic characteristics captured within these two Hispanic census blocks are from neighborhoods lying outside the project area delineation and include the Linwood Addition for census block 1020.001 and the M.G. Ellis, North Fort Worth, and Googins Additions for census block 1009.001. The low income parcel, 1010.002 reflects the demographic characteristics of the Ripley Arnold housing project which has since been demolished and replaced with Radio Shack's new corporate headquarters and is also outside the project area delineation. A total of three parcels zoned as residential are located within the project area

Land Use

Using data obtained from the Tarrant County Tax Appraisal District, properties within the study area were categorized by their State Land Use Classification Code (Table 2 - 13) (Figure 2 - 11). Many cities in Texas have zoning and land use regulations that require project approval or permitting. State Land Use Codes provide a land use coding system that designates the primary use of each property. Appraisal districts may use the State classification system (which the Tarrant Appraisal District uses) or use a system devised by another public entity such as the County. "Commercial/ Industrial" refers to any land use whose primary use is commercial, industrial, or for billboards. "Vacant" refers to any platted lots or tracts with no improvements and may be include uses for residential, commercial, rural, or right-of-way. "Residential" refers to the two main categories of residential use; *Single-family* which includes single family residences, mobile homes, and condominiums and townhouses, and *Multi-family* which includes apartments, duplexes, triplexes, and quadraplexes. "Acreage" refers to any land whose primary use is ranch land, farm land, timberland, or undeveloped. "Utilities" refers to land used by water, gas, electric, or telephone companies. It also includes uses for railroads, pipelines, and cable companies. "Farm/Ranch" refers to parcels more than five acres that may include either a house, mobile home, or other improvement. "Residential Inventory" refers to vacant lots where residential structures have been removed. "Unclassified" refers to land that has not been given a classification and generally refers to public land not valuated by the appraisal district including freeway embankments river shoreline property.

Approximately 43 percent of the approximately 7200 acres in the study area are classified for commercial or industrial use. An additional 20 percent is classified as vacant, while approximately 17 percent is classified as residential, and almost eleven percent was classified as acreage (non-resident ranch, timber, farm, or undeveloped).

Table 2 - 13. Existing Land Use Classification

Classification	Number of Parcels	Square Acres	Percent
Commercial/Industrial	2396	3103.3	43.1
Vacant	2227	1438.7	20.0
Residential	6300	1251.8	17.4
Acreage	42	785.6	10.9
Unclassified	492	343.7	4.8
Utilities	103	223.4	3.1
Farm/Ranch	3	52.1	0.7
Residential Inventory	33	7.2	0.1
Total	**11596**	**7205.8**	100.0

Land Values

To assess the value of properties within the study area relative to comparably sized areas of the city, 700-acre sections were drawn using Geographic Information Systems (GIS). The sections used for the comparison included the study area, Downtown Fort Worth, the Stockyards, the Hospital District, Riverside, MLK Freeway, River Oaks, White Settlement Road, and Haltom City. Based on data obtained from the Tarrant County Tax Appraisal District, Table 2 - 14 displays the average land values per acre for each of the aforementioned sections of the City. The study area's average value per acre ranked as the third lowest, with only the MLK and Riverside sections having lower average per acre values. When contrasted with the average land values of the city, the total per acre land value for the study area is about 5.6 percent that of Downtown. Similarly, average residential values for the study area are 6.3 percent of the same values for Downtown while average per acre commercial and industrial values for the study area are 6.7 percent that of Downtown.

Table 2 - 14. Comparative Average Land Values Per Acre and Percentage of Vacant Land

Area	Residential	Commercial/Industrial	Total	% Vacant
MLK	$11,457	$36,710	$16,210	23
Riverside	$18,768	$46,699	$29,771	11
Project Area	$18,252	$60,481	$31,307	14
Haltom	$27,650	$47,825	$33,234	20
Stockyards	$27,225	$61,746	$45,405	12
River Oaks	$35,225	$84,740	$49,174	10
White Settlement Rd.	$51,334	$145,119	$123,897	9
Hospital	$141,591	$203,779	$175,463	25
Downtown	$291,754	$897,993	$563,384	9

Transportation Resources

Transportation into the downtown area of Fort Worth is facilitated by two Interstate Highways, I-35W running north-south, and I-30 running east-west. Major access streets to the study area include North Main Street (Bus. 287) and Henderson Street (SH 199) running north-south through downtown and

the study area. East-west access is provided on the northern end of the study area by Northside Drive and on the southern end by Belknap Street and Weatherford Streets. White Settlement Road provides east-west access to the area just west of the confluence of the West and Clear Forks Trinity River. Public transit carries generally less than five percent of peak period passenger travel in the city. Improvements in service over the last few years have increased ridership, particularly the commuter rail service, which operates between Dallas and Fort Worth. However, transportation in Fort Worth is still predominately by private cars or trucks.

The City of Fort Worth provided forecasts of traffic volumes on the regional road network in the City as a basis for identifying the expected levels of external background traffic on the major streets passing through the study area. These traffic forecasts were developed by NCTCOG Transportation Planners using a regional transportation forecasting model that includes the cities of Fort Worth and Dallas as well as the entire surrounding region. The model provides forecasts of traffic based on assumptions regarding the magnitude and distribution of future population and employment in zones throughout the region.

In the vicinity of the study area, the regional roads included in the NCTCOG model are North Main Street, Henderson Street, and White Settlement Road. Table 2 - 15 shows the daily two-way traffic volumes along those three regional roads in 1999.

Table 2 - 15. Daily Traffic Volumes for Year 1999

Route	Direction	Year 1999
North Main Street	North-South	15,560
Henderson Street	North-South	22,750
White Settlement Road	East-West	11,820

Air Quality

This proposed project is located within EPA Air Quality Control Region (AQCR) 215 for the state of Texas. Air Quality Control Region 215 consists of 19 counties including Dallas, Denton, Collin, and Tarrant counties, Texas. The EPA uses six “criteria pollutants” as indicators of air quality and has established a maximum concentration for each of them above which adverse effects on human health may occur. These threshold concentrations are referred to as the National Ambient Air Quality Standards (NAAQS) (Table 2 - 16). Areas of the country where the air pollutant concentration meet the national primary air quality standard are designated as in “attainment.” Areas of the country where air pollution levels persistently exceed the standards may be designated “nonattainment.” An “unclassifiable” designation is ascribed to areas of the country that cannot be classified based on available information. A subclassification may be ascribed by the EPA to areas that are currently in

nonattainment. This sub-classification describes the level of a particular air pollutant as being Severe 17, Severe 15, Serious, Moderate, Marginal, Submarginal, Section 185A, or Incomplete (no data).

The NAAQS threshold value for ozone is 0.12 parts per million (ppm) or 125 parts per billion (ppb), measured as one-hour average concentration. A new eight-hour average concentration standard of 0.08 ppm or 0.85 ppb was established in 1997. Tarrant County is part of the DFW nonattainment area, which also includes Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall and Tarrant Counties. The DFW nonattainment area is classified as a moderate nonattainment area for the eight-hour ozone standard and as an attainment area or unclassified for all other criteria pollutants.

Table 2 - 16. National Ambient Air Quality Standards (NAAQS)

Criteria Pollutant	Primary	Secondary
Particulate Matter		
PM_{10}		
Annual Arithmetic Mean	50 $\Phi g/m^3$	50 $\Phi g/m^3$
24-hour average	150 $\Phi g/m^3$	150 $\Phi g/m^3$
$PM_{2.5}$		
Annual Arithmetic Mean	15 $\Phi g/m^3$	15 $\Phi g/m^3$
24-hour average	65 $\Phi g/m^3$	65 $\Phi g/m^3$
Sulfur Dioxide (SO_2)		
Annual Arithmetic Mean	0.03 ppm	No Standard
24-hour average	0.14 ppm	No Standard
3-hour average	No Standard	0.50 ppm
Carbon Monoxide (CO)		
8-hour average	9 ppm	No Standard
1-hour average	35 ppm	No Standard
Ozone (O_3)		
1-hour average*	0.12 ppm	0.12 ppm
8-hour average	0.08 ppm	0.08 ppm
Nitrogen Dioxide (NO_2)		
Annual Arithmetic Mean	0.053 ppm	0.053 ppm
Lead (Pb)		
Quarterly average	1.5 $\Phi g/m^3$	No Standard

Noise

The study area is located adjacent to Downtown, but is generally buffered from the main urban traffic noises. Localized low speed traffic crosses the study area on Seventh, Henderson, Northside and Main Streets. Ongoing construction near the study area has increased the background sound level temporarily. Traffic conditions vary but generally are more intense during morning and evening rush hour periods. Traffic on I-30 and I-35 generally travels at higher speeds and often consists of trucks in addition to automobiles. The study area lies within the southern flight path of Fort Worth Meacham International Airport and is east of the Naval Air Station Joint Reserve Base Fort Worth.

Light

The study area has areas of direct lighting from business activities and from street lighting. Evening baseball games at the renovated LaGrave Field generate additional lighting of the area. Several special events are held outdoors each year within the study area. Many of these events include evening activities.

Aesthetics

A Visual Resource Assessment Procedure (VRAP) was conducted to inventory and evaluate the visual resources of the study area documented resources ranging from distinct to below average visual quality. Visual resources identified as having positive qualities included:

- Trinity Park, which contains active and passive recreation with a duck pond, fishing area, playground, and picnic facilities.
- Natural Bluffs which, currently, provide a mixed visual quality viewshed.
- Historical structures including the Paddock Viaduct and Tarrant County Courthouse.
- Stockyard, including numerous historic buildings, daily cattle drives, and restaurants.
- Several parks located adjacent to the Trinity River.
- Rockwood Golf Course, a public facility owned by the City of Fort Worth.
- Confluence of the Clear Fork and West Fork Trinity River

Areas or resources identified as having potential for, or need of, modification to improve their visual quality included:

- Underutilized and vacant or abandoned industrial sites.
- Numerous aging manufacturing and commercial establishments.

- Marine Creek, which has deteriorated with overgrown banks, service entries abutting the creek, and unattractive store and restaurant backs facing the waterway.

- Vehicular and rail traffic corridor.
- The transitional area along the West Fork of the Trinity, which is the interface between urban, rural, and aquatic landscapes.

In general, the study area includes quality aesthetic resources which range from man-made features such as the river channels, low-water dams, manicured grasses, and high-rise buildings of downtown to natural features such as those found in Trinity Park and the riparian woodland stringers associated with Marine Creek. Aesthetic values for the area were recently enhanced by the increased water surface upstream of, and the riffle effect downstream of, the newly constructed Beach Street Dam. The West Fork Channel, which flows through Gateway Park remains in a natural condition providing additional natural visual values to the area. However, the visual resources of unique and above average quality are interspersed among areas which are of average to below average visual quality. These low quality visual resources are generally associated with locations, which were never of high visual quality, but have since been abandoned and deteriorated. Additionally, natural areas with potential aesthetic value have been left to become overgrown with an aesthetically unpleasing structure and composition.

This chapter has described the existing natural and socio-economic environment of the study area. These existing conditions establish the baseline from which the following chapter will describe study planning goals, objectives, and constraints. Chapter 3 will also present a summary of the planning process that led to the development of three study alternatives presented in that chapter.

Figure 2 - 1. Existing Fort Worth Flood Protection System.

Figure 2 - 2. Noteworthy floods

Figure 2 - 3. Deficiencies of the Existing Levee System in Comparison to Design Criteria.

Figure 2 - 4. Location of TCEQ Stream Segments 0806 and 0829.

Figure 2 - 5. Existing Vegetational Landuse.

Figure 2 - 6. Area of Potential Effect for Architectural Resources.

Figure 2 - 7. Existing Recreational Park Facilities.

Figure 2 - 8. Trinity Trails Systems Alignment.

Figure 2 - 9. Immediate Project Area for Socio-Economic Analysis.

Figure 2 - 10. Distribution of Minority and Low Income Census Blocks.

Figure 2 - 11. State Landuse Classification Codes.

DEVELOPMENT OF ALTERNATIVES

This chapter will present the plan formulation/development of alternatives. The comparison of environmental impacts associated with each developed alternative will be presented in Chapter 4.

The USACE Planning Manual defines problem identification and specification as the first step in a planning process. This step produces the mission statement(s) for the project, ensures unanimity of purpose within the project partnership, and provides a focal point for all stakeholders in the planning process. In the case of the Central City project, four general areas of problems and opportunities have been identified. These categories include flood protection, Ecosystem Improvement, urban revitalization, and recreation, and are discussed in detail below.

FLOOD PROTECTION

Problems and Opportunities

As indicated in Chapter Two, the level of protection in the Fort Worth Floodway system has degraded over time, such that the existing levels are less than those originally authorized and constructed. In fact, preliminary analyses developed as part of this study and using future conditions SPF discharges and water surface profiles, indicates that 86 percent of the total linear length of the existing Fort Worth Floodway levees within the study area, specifically the West Fork Levee Loop, North Main Levee, and the Clear Fork Levee Loop, have less than the authorized level of protection. The current state of flood protection within the system is shown in Figure 2 - 3.

In order to quantify the economic extent of the flooding problem, the study area was delineated into twelve reaches as shown in Figure 3 - 1. Within these twelve reaches, existing development was determined through a structure inventory along the Clear and West Forks during the summer of 2003. Damageable properties were categorized as either residential, commercial, or industrial. Damageable vehicles were categorized as either public vehicles or personal vehicles. Single-event (i.e., frequency) and expected annual flood damages were calculated by integrating hydrologic, hydraulic, and structural characteristics. Specifically, the analysis estimates damages based on the depth of flooding for various (single frequency) flood events and a relationship between the depth of flooding and the finished floor of a structure. Estimates of expected annual damages were calculated using frequency-damage data in an integrated process. Additional details describing the analytical techniques are found in Appendix J.

The expected annual flood losses for existing conditions were approximately $334.3 thousand (July 2003 prices), of which four percent was associated with residential development. Table 3 - 1 displays the existing condition expected annual damages (EAD) for all twelve reaches.

Table 3 - 1. Existing Conditions Expected Annual Damages (all values shown in $1000s)

Reach	Commercial	Industrial	Public	POV	Multi-Family	Single Family	Total EAD
			CLEAR FORK				
East-Lower	0.3	---	---	---	0.1	---	**0.4**
East-Water Works	---	---	---	---	---	---	**---**
West-Upper	2.4	---	17.7	---	---	---	**20.1**
East –Upper	0.6	---	---	---	---	0.1	**0.7**
EAD Subtotal	**3.3**	**---**	**17.7**	**---**	**0.1**	**0.1**	**21.2**
			WEST FORK				
South	---	---	---	---	---	---	**---**
North-Riverside	96.3	---	7.6	0.7	0.6	1.4	**106.6**
North-Middle	---	---	---	0.1	---	0.1	**0.2**
North-Upper	1.9	---	0.1	---	---	---	**2.0**
North-Main Marine Creek	19.1	---	---	---	---	---	**19.1**
North-Main Levee Loop	28.4	2.6	0.3	0.1	---	0.2	**31.5**
Cultural District Levee	109.5	2.1	7.1	1.0	5.5	3.9	**129.4**
North Main Jacksboro	2.3	---	21.9	---	---	---	**24.2**
EAD Subtotal	**257.5**	**4.7**	**37.0**	**1.9**	**6.1**	**5.6**	**313.1**
Grand Total	**260.8**	**4.7**	**54.7**	**1.9**	**6.2**	**5.7**	**334.3**

In addition to degradation of protection provided by the levees relative to river flooding, the Fort Worth Floodway system has deficiencies in its provisions for interior drainage. Table 3 - 2 identifies the sumps relevant to the Central City study area, and shows the water surface elevation at the top of the sump and the number of structures affected for the 50-year (design) event as well as the regulatory 100-year event. A sump is an area where stormwater is stored during high river stages until the water level within the river decreases enough for the stormwater to be discharged into the river channel.

Table 3 - 2. Sumps and Corresponding 50-year and 100-year Water Surface Elevations.

Sump	50-yr Elevation	# of Structures	100-yr Elevation	# of Structures
14W 15W	536.7*	290*	537.5*	323*
16W 25C	533.8 534.6	0 1	538.0*	123*
19C 20C 21C	542.8*	7*	543.2*	7*
22C 23C	539.5*	156*	539.7*	158*
26	532.7	158	533.1	164
28	523.4	0	523.5	0
29	517.3	0	520.9	0
30	520.3	3	520.8	4
31	516.1	0	516.7	0

* Shaded groups are adjacent sumps whose water surfaces are not separate for the designated flood event, and therefore, they perform as a single unit at or above the stated water surface elevation.

As a part of the initial economic evaluation of the Fort Worth Floodway during development of the 1995 Information Paper, it became apparent that the most problematic of the sumps were 14W/15W and 16W/25C (Cultural District Levee) and 26 (North Main Levee Loop). The damages estimated to be associated with a 50-year event are $753,000 for sump 26 and $4,369,300 for 14/15W. For the 100-year event the damages in sump 26 are estimated at $4,846,000 and $9,070,300 for 14/15W. The extent of the 100 year floodplain in these areas is shown in Figure 3 - 2.

Goals and Objectives

Based on the preceding analysis, two primary project objectives were established for the Central City project relative to flood protection. These objectives are:

- Restore the design level of protection (SPF+4') within the project area.
- Maintain or improve flood protection associated with interior drainage to the floodway system.

Constraints

Any project altering the hydraulic system of the Trinity River in the Central City project area would be subject to the requirements of the Corridor Development Certificate (CDC) process discussed in Chapter One. All measures to be evaluated must comply with technical protocols and criteria contained in the Regional CDC manual in consideration of both conveyance requirements and preservation of valley storage (NCTCOG 2002). Additionally, because the measures to be considered

would affect an existing Federal flood control project, all engineering analyses must be performed to USACE standards.

ECOSYSTEM IMPROVEMENT

Problems and Opportunities

The floodplain lands within the study area have undergone extensive alterations in the past 95 years due to the construction of the floodway system, and urbanization along the floodway, which has affected the physical characteristics of the watershed. Field evaluations performed by U.S Fish and Wildlife Service (USFWS), Texas Parks and Wildlife Department, and USACE coupled with coordination with representatives of the project sponsor (TRWD) and the City of Fort Worth led to the identification of several problems in the overall condition of existing ecosystem quality.

Terrestrial

The existing flood damage reduction features, including the channelized Clear Fork and West Forks of the Trinity River, largely influence the existing ecosystem characteristics of the study area. In addition, required maintenance of most of the floodplain and levees keeps existing vegetation restricted to mowed grasses.

Within the existing riparian woodlands and emergent wetlands, the effects of urbanization have disturbed the overall quality for natural resource uses. Problems identified during the study for terrestrial resources include:

- Riparian and bottomland hardwood forest represent approximately 6.1 percent of the Central City study area that was formerly dominated by floodplain forests.

- Most woodlands which are dominated by non-mature trees resulting in poor conditions for cavity production for bird nesting, mast production, hiding cover and general forest stability.

- Non-native invaders including Chinaberry, ligustrum (privet and glossyleaf), and honeysuckle within the riparian woodlands are diminishing habitat quality by causing extensive areas of dense understory plants. The ligustrum species and honeysuckle are extremely hardy and resistant to cold weather, thereby gaining a competitive advantage to native wildlife beneficial forbs and shrubs.

- Remnant stands of riparian woodlands are isolated and lack interspersion with wetlands or standing waters, which is needed to provide the diversity of habitats required by many species (e.g. wood duck).

- The entire floodway is mowed several times per year. This is part of the federally required maintenance regime to restrict natural succession that would result in development of shrubs and trees that could adversely impact the floodway's purpose of providing flood damage reduction.

Wetlands

Wetlands within the study area are generally small and poor in quality. Primarily they occur adjacent to maintained drainages associated with the existing flood damage reduction project, and as such, they are ephemeral in nature. Bird perching sites adjacent to or overhanging wetlands are also limited.

Aquatics

The channelized portion of the Clear Fork and West Fork dominate the aquatic environment of the study area. Most tributaries are ephemeral and are characterized by limited riparian zones. The Clear and West Forks are inundated by a series of low water dams that have changed the overall character of the system, which currently displays a lacustrine or lake-like appearance. The channelized and impounded reaches also function more as lakes during low flow periods. Substrate may be gravelly or clay but generally gravels are covered with silt over most of the area, thus reducing acceptable breeding habitats.

Although no specific sampling was conducted to determine abundance, low numbers of invertebrates were noted during site investigations within the areas inundated by in-channel dams. Lack of in-channel structure diversity and the continued presence of contaminants in fish tissues (within the Clear Fork below Seventh Street and the West Fork below the confluence) are the greatest problems identified. Conversely, the low-water dams provide long term fisheries habitat in a stream system that can experience long periods of little or no flow. Some impediment of fisheries movements attributable to the West Fork dams is likely due to the height of the dams.

Goals and Objectives

The planning objectives for Ecosystem Improvement within the Central City study area are defined as follows.

- Restore, improve, and diversify aquatic habitat associated with the Clear and West Forks of the Trinity River for native aquatic organisms.

- Improve and increase quantity of emergent wetland habitat for migratory birds of ecological importance.

- Establish continuity and connectivity within and between regionally and nationally significant ecosystems.

- Protect and improve existing pockets of high quality bottomland hardwoods adjacent to the river system.

Constraints

During the course of plan formulation, differing degrees of known constraints were identified that affected the types, sizes, and locations of ecosystem measures to be considered.

Although suggested by a team of interagency biologists during early plan formulation stages of the study, it was determined soon thereafter that removing or breaching the existing levee system for the purpose of restoring floodplain in the confluence area was not practical due to the high costs of acquisition of real estate. In addition, current agency policy favors restoring aquatic based ecosystems or those adjacent habitats having a strong connection to riverine, riparian or wetland communities. Therefore plan formulation that would result in restoration of native grasslands and upland forests was not pursued beyond initial screening.

Some riparian grassland associated with the existing floodway could be restored in a manner that would benefit the aquatic habitat and would derive value directly from the close physical association with the aquatic habitat. However, the hydraulic capacity of the existing system is based on a condition of mowed vegetation. Any change in that condition would adversely affect the performance of the system and further degrade flood protection, thus restricting this option.

These constraints led to the conclusion during plan formulation that measures considered during final plan formulation must be compatible with the federal flood control system and the associated requirements of the regional Corridor Development Certificate (CDC).

URBAN REVITALIZATION

Problems and Opportunities

The Trinity River within the Central City area was historically flanked by industrial, railroad, and highway corridors growing out of the industrial revolution of the first half of the 20th century. Businesses associated with the production of electricity and chemicals, scrap metal salvage yards, and oil refining operations developed in conjunction with the discovery of oil in East Texas all tended to locate in the Central City area. Land use orientation was away from the river, which was viewed strictly as a means of drainage.

As was the case in most American cities between 1940 and 1970, residential and retail growth in Fort Worth shifted to suburban areas. Downtown remained a strong office and governmental center but began to lose much of its residential and retail focus. Fort Worth's Northside began to experience difficult economic times during this period when the meat packing industries decentralized. Land uses in the Central City area continued to be primarily industrial, several of the major industries began to decline, and sites increasingly were abandoned. Many of these sites contain a legacy of their industrial past in the form of a variety of organic and metal contaminants.

Lack of orientation to the river was exacerbated by the flood control projects of the 1950s, 1960s, and 1970s. Approximately fifteen miles of the Trinity River in central Fort Worth were transformed to a trapezoidal channel and levee system, which created a barrier between the river and redevelopment.

Land use in the Central City area is currently a mix of vacant or abandoned industrial sites interspersed with small manufacturing businesses and commercial establishments. City tax records indicate that land values in the immediate Central City area are depressed relative to adjacent areas. When contrasted with the average land values of the City, the total per acre land value for the study area is about 5.6 percent that of Downtown. Similarly, average residential values for the study area are 6.3 percent of the same values for Downtown while average per acre commercial and industrial values for the study area are 6.7 percent that of Downtown.

Other quality of life issues currently affecting the study area include limited emergency access, lack of balance between residential and commercial land uses, and an almost total lack of the urban fabric needed to support mixed-use residential/commercial development.

Goals and Objectives

As stated previously in Chapter 1, the overall purpose of the TRV Master Plan is to preserve and enhance the river and its corridors so that they remain essential greenways for open space, trails, neighborhoods, wildlife, and recreation. These riparian corridors are critical in preserving environmental quality and creating a high quality of life that attracts people to locate and stay in Fort Worth. The purpose of the Central City segment of the TRV Master Plan is to concentrate on the unique urban characteristics of the river confluence area, and to address these unique elements within the context of the overall plan.

The TRV Master Plan identifies the Central City as the “hub” of the entire river system within Tarrant County. The study area is centrally located within a triangle formed by the City’s three major districts: Downtown, the Stockyards, and the Cultural District (Figure 3 - 3). In addition, one of the goals in the City of Fort Worth’s Comprehensive Plan is to attract a greater number of people to the Central City area. The Trinity River confluence could become a focal point linking the City's major districts and for bringing people back to Downtown by forming a “critical mass” of mixed use development in the heart of the City.

Fort Worth is currently experiencing a growing resurgence of people wanting to move back to the central city. These people are generally seeking the opportunity to live, work, play, and learn in a vital urban environment. The overarching objective is to provide connectivity and access to the river. Specific goals include:

- Provide aesthetic and recreational focal points for the Central City;
- Encourage a higher density of people living, working, playing and learning in the Central City;
- Orient mixed use development directed toward the river;
- Create an interior water feature, or focal point;
- Provide a higher normal water level;
- Eliminate or modify levees where feasible, while maintaining the level of flood protection;

- Create new and enhance existing linkages to neighborhoods and districts; and
- Enhance redevelopment potential of Central City lands.

Constraints

Minimizing impacts to businesses operating in the study area and avoiding residential properties to the extent possible are important constraints to planning for urban revitalization goals. Additionally, any urban revitalization strategy should minimize damaging those aspects of the existing urban context that are important cultural icons and/or that contribute to overall project goals. In the case of the Central City project, these include such structures as the Main Street Bridge, the TXU plant, and other historic structures. The FW&W Railroad also presents a physical barrier to redevelopment efforts as do many of the sites with environmental contamination.

RECREATION

Problems and Opportunities

The Upper Trinity River has not historically been considered an important recreational resource. Described by A.W. Moore in 1846 as a "little narrow deep stinking affair" and by the State Health Department in 1926 as "a mythological river of death," the relationship of the river to the recreating public has been somewhat uneven, at best. Major regional investments in water quality throughout the past several decades have improved the recreational capacity of the river. However, the Trinity River within Fort Worth currently falls considerably short of its full potential as a recreational and quality of life amenity for residents.

Efforts to improve and beautify the Trinity River in Fort Worth and to bring people back to its banks began even before construction was complete on the flood control system. Trinity Park was established by the City of Fort Worth in 1892. Comprising 252 acres of land along the Clear Fork just west of downtown, this park was protected through the flood control "era" by the determined efforts of many Fort Worth citizens. In 1969, the Fort Worth City Council appointed the Streams and Valleys Committee to improve the river within the city limits. This committee incorporated as an independent non-profit corporation in 1971, Streams and Valleys, Inc. During the last 30 years, Streams and Valleys, in concert with TRWD, the City of Fort Worth, and Tarrant County constructed retention dams, trails, and trail heads, planted trees, and established the Mayfest Celebration and other festivals and activities along the riverbanks.

Almost all of the recreational development associated with the river has historically been land based. TRWD, in partnership with the Texas Parks and Wildlife Department, sponsors an annual put-and-take trout fishing event. Sustained fishing activities are limited by the ban on fish consumption established by the Texas Department of State Health Services (TDSHS), based on concerns related to chlordane polychlorinated biphenyls in the tissues of fish found in the study area. Contact recreation is limited by considerations of water quantity, water quality, and public access.

Trail development along the river historically has been focused in Southwest Fort Worth, linking recreational resources at Benbrook Lake with Trinity Park. An extension of the trail system through the southern portion of the Central City to Downtown was added in the late 1970s. In the 1980s and 1990s emphasis began to shift to the eastern side of the City with river trails being developed through Gateway Park. A linkage between these two systems through the Central City area is currently under construction. However, trail connections between the "through-trail" and the Stockyards, LaGrave Field, and the Cultural District are absent. The system also lacks a comprehensive network of pedestrian bridges to link all of the recreational components of the system that come together at the river confluence in the Central City area.

Baseball has been an important component of the recreational base of the Central City for almost 100 years. The Fort Worth Cats were one of the first five Texas League baseball teams formed in 1884. The team began play in Haynes Park in East Fort Worth, but moved to North Fort Worth in 1911. The team built Panther Park, west of North Main, and then proceeded to build a larger field in 1926, named for the team's business manager, Paul LaGrave. In 1949, a fire heavily damaged the field and its wooden stands. A new LaGrave Field was constructed in 1950, which was used by the Cats until 1964. In 1967, LaGrave field was torn down, and the site remained vacant for some 35 years.

On May 2002, professional baseball returned to Fort Worth. LaGrave Field was reconstructed on the exact site of its predecessor from the 1950s. Currently, the Fort Worth Cats play 50 games here in a season, bringing some 4,000 people per game directly into the Central City area. However, the area lacks restaurants and other entertainment venues which could support and expand the recreational experience of any visitor to LaGrave Field; nor does LaGrave Field have any direct access or connection with other recreational, cultural, and historic assets in the City.

Goals and Objectives

The most important recreational goal for the Central City project is to provide extensive and direct public access to the river and waterfront and facilitate a water-based system of linkages between Downtown, the Stockyards, and the Cultural District. Providing recreational and open space amenities that are supportive of urban revitalization goals is also important. A third recreational objective is to provide a continuity of urban trails through Downtown, consistent with the overall Trinity Trails system and to create additional trail linkages with neighborhoods and cultural amenities.

Constraints

As with other project purposes, it is important to note that any recreational features affecting the hydraulic performance of the river system must comply with the requirements of the Corridor Development Certificate process. In addition, planning for the Central City area should ensure that existing trail resources and connections are preserved.

FORMULATION STRATEGIES

The development of measures and alternatives to address the problems and opportunities presented in the study area occurred under two parallel planning frameworks. The USACE initially sought to develop a solution to the water resource needs of the study area within the framework established for the Federal government by the Water Resources Principles and Guidelines. A broader, community-based planning effort, unconstrained by the Principles and Guidelines, was undertaken by a partnership of local entities. This community-based planning effort results in a very different alternative for addressing study area problems and opportunities. The two formulation strategies are discussed in more detail in the following sections.

"Principles and Guidelines" Formulation Strategy (P&G Based Alternative)

The Water Resources Planning Act of 1962 (P.L 89-80) provides for the optimum development of the Nation's natural resources through the coordinated planning of water and related land resources. This Act established the Water Resources Council (comprised of the Secretaries of Interior; Agriculture; Army, Health, Education, and Welfare; and the Chairman of the Federal Power Commission) and required the Council to establish principles, standards, and procedures for Federal participants to use in the formulation of Federal water and land resources projects. The Principles and Standards initially developed by the Water Resources Council were replaced by the "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" (hereinafter referred to as Principles and Guidelines) in 1983. Planning activities of USACE, the Bureau of Reclamation, the Tennessee Valley Authority, and the Natural Resources Conservation Service are governed by these Principles and Guidelines.

The Principles and Guidelines establish that the Federal objective of water resources planning is to contribute to national economic development, consistent with protecting the Nation's environment. Contributions to National Economic Development (NED) are defined as increases in the net value of the national output of goods and services, expressed in monetary units. Other project considerations are categorized as Environmental Quality (EQ), Regional Economic Development (RED), or Other Social Effects (OSE). In the language of the Principles and Guidelines, these categories are called "accounts." The NED account is the only required account, and Federal agencies are directed by the Principles and Guidelines to formulate a plan that reasonably maximizes net national economic development benefits. The Principles and Guidelines further direct that the plan providing for the greatest net economic benefits, consistent with protecting the Nation's environment, (identified as "the NED plan") should be selected, unless the Secretary of the department grants an exception, based on some overriding consideration.

The Principles and Guidelines also establish procedures for calculating NED benefits attributable to water resources proposals under consideration. The Principles and Guidelines distinguish between "primary" benefit categories and those benefit categories which are "ancillary." Generally speaking, for a project to be initially justified, its benefits in one or more primary benefit categories must exceed the project costs. Features which produce benefits in an ancillary category may be added to an initially justified proposal, if the incremental benefits of those features exceed their incremental costs. Primary NED benefit categories include Flood Damage Reduction and Navigation.

In 1996, Congress passed a Water Resources Development Act that established Environmental Restoration as a primary mission of USACE on a co-equal basis with Flood Damage Reduction and Navigation. Since that time, USACE has developed policy guidance that provides for accounting of National Ecosystem Restoration (NER) benefits in a way that is analogous to the calculation and evaluation of NED benefits. An exception exists in that NER benefits need not be measured in monetary units but may be quantified using some non-monetary metric for ecosystem outputs.

The section titled "Development of the Principles and Guidelines Based Alternative, provided later in this chapter, describes the measures formulated and evaluated by USACE in the development of one alternative for the Central City area in accordance with the Principles and Guidelines planning framework as described above. Benefit categories that apply to the Central City project include those in the NED and NER.

Community-Based Formulation Strategy (Community Based Alternative)

In comparison with the structured Federal planning framework utilized by USACE in developing the Principles and Guidelines Based Alternative, the Community Based Alternative was developed at the "grassroots" level. This alternative was developed through an extensive public participation process based primarily on unconstrained goals and objectives. Approximately 200 community meetings were held between January 2001 and May 2005 with members of the public, various organizations, elected officials, and other stakeholders. The purpose of the meetings was to gather input on community needs, preferences for project components, environmental concerns, timing and schedule. A detailed list of these community meetings, including a summary of important meetings, is provided in Appendix L.

This community-based approach led to a coordinated and cohesive partnership between TRWD, the City of Fort Worth, Tarrant County, Streams and Valleys Inc., USACE, and the North Central Texas Council of Governments (NCTCOG). This consensus building process provided stakeholders the opportunity to investigate integrated approaches that would not have been possible under the structured Principles and Guidelines formulation requirements, nor under the normal programs of each entity acting independently.

DEVELOPMENT OF THE NO ACTION ALTERNATIVE (FUTURE WITHOUT-PROJECT ASSESSMENTS)

For the purpose of planning and determining net outputs for various measures and alternatives, an assessment was performed to determine the future condition of the Central City area should no actions be initiated. The No Action Alternative is equivalent to the future without-project condition. Establishment of the No Action outputs began with the values presented for existing conditions presented in Chapter 2. No Action output values were determined using available data and consensus of professional opinion from subject matter experts. General assumptions, methodologies, and trends are presented below for each of the four general problem and opportunity categories. Quantitative data associated with outputs of the No Action Alternative are presented in Chapter 4.

Flood Protection

Hydrologic and hydraulic analyses were conducted for future without-project conditions to determine the impacts on the Central City area due to an urbanizing watershed as well as processes such as sedimentation and channel degradation and the resulting impacts on potential flooding. Updated water surface profiles and stage/discharge uncertainty data were used to compute expected annual damages under future conditions with no action. Results indicate a 17 percent increase in expected annual damages over the existing condition for the West Fork (WF) North-Main Levee Loop, 19 percent for the WF North-Riverside, and 105 percent for the WF Cultural District Levee reaches. Continued degradation of sump capacity is also predicted, although the extent of this degradation was not quantified.

Ecosystem

To facilitate formulation of the ecosystem improvements for the P&G Based Alternative, the study area was delineated into six reaches, which are shown on Figure 3 - 4. Ecosystem measures can require long periods of time to realize their full benefits, especially those associated with woody plantings. However, predicting future without-project conditions beyond 50 years has inherent inaccuracies. Therefore, to balance the need for accurately predicting ecosystem benefits and predicting the future without-project condition, a 50-year period of analysis was utilized for all ecosystem restoration / mitigation analysis.

Wetlands

Due to the overall poor quality and limited extent of wetlands in the area, continued floodway maintenance, and other encroachment into and around these wetlands, deterioration of values is predicted to continue over the 50-year study period. For the quantitative analysis, it was assumed that existing values would diminish to one half of their current value by year 10 and to the point of having no value by year fifty.

Woodlands

Due to the recognized significance of riparian forest, (discussed in Chapter 2 of this EIS) public awareness and interest, and existing regulatory constraints, it was determined that acreages of riparian forest would not be diminished during the study period. While some areas could be impacted, new areas could be either intentionally developed or allowed to redevelop. However, within the more actively maintained zones of the existing flood damage reduction project, no new riparian forest acreages would develop either through natural succession or as a result of man's activities. The degree of management devoted to maintaining or improving the value of riparian woodlands is currently limited to nonexistent. Therefore, it was determined that for planning purposes, the acreage of riparian woodlands would not change over the 50 year period for the No Action condition. However, it was estimated that due to the lack of active management, invasion by non-native shrubs and trees would continue, thus diminishing habitat values. It was estimated that values would decrease to 97.5 percent of existing values by year ten and to 90 percent of existing values by year fifty.

Existing upland forest is more evenly distributed throughout the study area than riparian woodlands. The largest areas are within the North Main and the West Fork South zones (Figure 3 - 4). Similar to the evaluation of riparian woodlands, management of upland woodlands was found to be generally lacking within the area. Also, these resources are more vulnerable to development because they are generally located at higher elevations and within a zone less susceptible to flooding conditions. As a result, planning assumptions for this resource estimate a loss of 20 percent of the existing acreage and 10 percent of existing habitat suitability over the planning period.

Within the overall study area, grasslands are the predominant terrestrial vegetation type. Most of the grasslands are mowed and manicured. Some areas of grassland would be converted by others to urban or disturbed habitat in the future even if no action was taken by USACE. However, a large amount of the area lies within the existing federally authorized flood damage reduction project, which limits the amount of grassland that would be modified by projects initiated by others. Within the urban environment, little to no maintenance changes can be foreseen. As a result, no changes to future habitat quality of grasslands in the study area are anticipated. However it is anticipated that a minimum of 15 percent of grassland vegetation would be lost during the 50-year planning period.

Aquatic Habitats

Aquatic habitats within the study area include the Clear and West Forks of the Trinity River and Marine Creek and Lebow Creek, tributaries to the West Fork. No detailed analysis was conducted of the aquatic habitat of the West Fork above University Drive; however, this reach is similar to the reach immediately downstream and little variation should be anticipated.

Existing conditions for the aquatic habitat associated with the rivers and tributary streams were determined by intensive sampling of existing fisheries resources. When considering No Action conditions for the study area, it is important to consider that the Clear and West Forks within the area have long been a part of a major flood damage reduction project. Maintenance to keep the channel and overbank morphology conducive to flood conveyance is extensive. Modifications to several in-channel dams were completed prior to the aquatic habitat studies and it is not anticipated that substantial new modifications would occur for the No Action condition. As a result of these past actions, the aquatic habitat within the river channels is generally more lake-like (lentic) than river-like (lotic), and even as flood events occur the water surface is confined to a smooth well-manicured grasslined channel for all but the more rare flooding events. Although not directly utilized in the assessment of existing physical habitat conditions, levels of contaminants within fish tissue have prompted the state of Texas to prohibit consumption of fish from the Clear Fork below Seventh Street and from the West Fork downstream of the confluence. Insufficient information is currently available to predict when the ban may be removed. Therefore, the no action condition is assumed to be the same as existing conditions.

Urban Revitalization

Based upon long-range forecasts performed by the NCTCOG, the number of households in Tarrant County is predicted to increase by 60 percent by 2030 (NCTCOG 2003). Within the study area (Figure 1 - 3), which includes Downtown, the Cultural District, and a large part of North Fort Worth, the number of households is expected to grow by 90 percent over the same time period. This can be attributed to the variety of residential and mixed- use projects at various stages of development

throughout the study area including but not limited to the Tower, Cotton Depot, T&P Terminal, the Neil P. at Burnett Park, the Trinity Bluffs, and South of Seventh Street. However, virtually all this activity is occurring (or is projected to occur) south of the river or east of the FW&W Railroad. In the immediate project area (generally the area between the FW&W Railroad and the Clear Fork Levee and North Main Levee Loop) little or no increase in households is expected due to the absence of any economic stimulus which would affect a major land use shift away from the current industrial/commercial mix and toward a mix including a large residential component.

Employment in Tarrant County for the period 2000 - 2030 is projected by NCTCOG to grow by almost 61 percent. Employment within the study area (Figure 1 - 3) is projected to increase by 37 percent. As indicated in Chapter One, a number of commercial ventures are currently developing along the south side of the river. In addition, Tarrant County Community College is developing a Master Plan for a downtown campus that would span both sides of the river. However, there are clear indications that this economic growth is occurring in anticipation of a major river project in the Central City area. Absent such an economic injection, sustained economic development and growth in employment within the immediate project area cannot, with confidence, be projected.

Under a No Action scenario, those factors that have historically defined the economic activity with the immediate project area are expected to continue to do so. Physical isolation due to the railroad embankment and the levees, the continued threat of flooding, inadequate interior drainage, and the lingering potential for environmental contamination are all expected to constrain urban revitalization in the immediate project area under the No Action Future Condition.

Recreation

It is anticipated that the demand for recreational facilities will continue to increase. The 2006 Texas Recreation Plan demonstrates that the State's most populous urban areas including Fort Worth are generally underserved by the in terms of outdoor recreation. Public dialog sponsored by the City of Fort Worth, Streams and Valleys, Inc., and the Corps suggests repeatedly that the public is demanding increased access to open space and trail networks, as well as, other forms of outdoor recreation. With an estimated 4 million person increase in the population expected in the DFW Metroplex by 2030, the demand for outdoor recreation facilities and open space will only increase.

Some reasonably foreseeable projects are being implemented by others that should mitigate the predicted shortfall. The City of Fort Worth has several projects planned including construction of new trailheads, a 3-mile trail through Trinity Park, a pedestrian bridge over the Trinity River just south of Lancaster, and various improvements to the Trinity Trail System. Additionally, TRWD has new trailheads and trail extension plans. However, these improvements and additions are not expected to fully meet the anticipated recreational demand during the period of analysis.

DEVELOPMENT OF THE PRINCIPLES AND GUIDELINES (P&G) BASED ALTERNATIVE

Flood Protection

Flooding and Damages

The Trinity River, and in particular, the Upper Trinity River Basin, has been known for its reoccurring flooding problems since the founding of the cities of Dallas and Fort Worth. Over the years, a substantial number of Federal and State projects have been constructed to reduce the threat of flooding in the Upper Trinity River basin. The most effective have been the USACE reservoirs, the Dallas Floodway, and the Fort Worth Floodway. However, these projects have not totally eliminated the flooding problems. The West Fork upstream of Fort Worth does not have a flood control lake containing dedicated flood storage. This, together with ongoing urbanization, has resulted in continuing flooding problems within the basin. Hydrologic and Hydraulic analyses performed for the Central City area indicate that flood flows resulting from frequent flooding events are generally contained within the channel banks of the Clear Fork and West Fork. However, during low-probability events, flood flows may overtop the channel banks and existing levees, inundating many residential, commercial, and public facilities.

Measures Considered but not Carried Forward

A wide variety of flood damage reduction measures for the Trinity River within Fort Worth were preliminarily considered as part of the 1995 Information Paper on the Upper Trinity River Basin. Construction of dedicated flood control storage on the West Fork was a priority component of that analysis. The only realistic site for such a structure is located on the West Fork in Wise County near the town of Boyd, and this initiative initially appeared promising. However, public reaction to the proposal was immediate, vocal, and extremely negative. No support or sponsorship for further evaluation of upstream detention was forthcoming, and none has evolved over the intervening ten years. Accordingly, analysis of flood damage measures conducted during the Central City study did not re-open the Boyd Reservoir Plan.

A "buyout program" in which the homes of residents in flood prone areas are bought by the government was briefly considered. The viability of floodplain buyouts is usually challenged by both the economics of the situation and by public acceptance. Typically, realistic buyout proposals are limited to situations were flooding is frequent and severe, and where the number of persons to be relocated is fairly small. Based on the future no action evaluation, the number of structures that would be involved in a buyout to achieve SPF-level protection for the Cultural District Levee and the North Main Levee Loop is approximately 750, with an estimated value exceeding $170 million. Given the low probability associated with an SPF event, the annualized value of the buyout benefits would be very low. This factor, coupled with the very large number of persons affected led the study team to conclude that a non-structural alternative such as a buyout program was infeasible.

In contrast, measures intended to improve or expand upon the efficacy of the existing system quickly became the focus of the evaluation efforts. In a system containing both levee and channel components, it is almost always more feasible to raise the top of the levee than to drop the floor of the

channel. The reason for this is that changing the water surface elevation by excavating the floor of the channel requires that the excavation be continuous throughout the system, whereas the levee raise need only occur in the low sections. Accordingly, the excavation option would require orders of magnitude more earthwork than would a levee raise option to accomplish the same objective. In light of this, a levee raise option was the primary strategy evaluated by the team during the initial screening process.

The study team also conducted an initial screening of damage centers within the study area in order to focus evaluation efforts in terms of project geography. Due to small expected annual damages, no further formulation for flood damage reduction was considered for any Clear Fork reaches or the following West Fork reaches: South, North-middle, North-upper, North-main Marine creek, or North-main Jacksboro (Figure 3 - 1). The West Fork North-riverside reach was investigated in the Upper Trinity River Clear Fork West Fork Interim Feasibility Study in 2001. That unpublished data indicated a non-Federal levee in the area built by the TRWD, and the levee does not appear to "fail" as a result of overtopping, but rather floods during large events due to backwater originating outside the study reach. Therefore, levee raise measures would not resolve flooding issues in this reach.

Measures Considered and Carried Forward

To meet the design levels of flood control established by the CDC and to reduce the potential for flood damages, a raise of the existing levees within West Fork Cultural District Levee and West Fork North Main Levee Loop reaches was investigated. These two reaches are adjacent and have been determined to be hydraulically interdependent. The existing floodwall under the Main Street Bridge provides 500-year level protection; however, the SPF event overtops the structure. Therefore, it was included in the analysis as it currently requires modification to meet new flood protection criteria.

Investigated Alternatives

In order to develop a sense of the stage-damage relationships, the initial evaluation considered levee raise alternatives at four variations on the level of protection, ranging from the elevation of the Standard Project Flood (SPF) through and including that elevation with the design criterion of four feet of freeboard (SPF+4'). Based on existing levee crests along the longitudinal axis, the measures needed to bring the Cultural District and North Main Loop Levees to the specified level are discussed below, and shown graphically in Figure 3 - 5.

SPF + 0'

The existing Floodwall under the Main Street Bridge along the left bank of the West Fork Trinity River would have to be raised. In order to minimize cost and provide an effective solution, this wall would be removed and replaced with an earthen levee. The new levee would consist of the following dimensions:

- Top width crest - 15'
- Base width – 75'
- Crest Elevation 546.7'

- Length – 700’
- Cubic Yards of Fill – 7,200

The Tarantula Railroad has a bridge crossing the West Fork Trinity River approximately 2,880 feet upstream of the confluence of the West and Clear Forks of the Trinity River. The predicted breach of the current level of protection is within the error range of the modeling effort. Therefore, the use of sand bags would be proposed across this bridge crossing for developing a plan of action and cost comparison.

The levee along the right bank of the West Fork just upstream of the Tarantula Railroad crossing would require some improvements in order to meet the new design levels of protection for the SPF event. Based on existing survey information an area of the levee that is approximately 200 feet upstream of the railroad and levee crossing would require minimal backfill on the crest of the levee which would total to 133 cubic yards of new material. The existing ground would need to be prepared and then re-turfed for erosion protection.

SPF + 1’

The existing Floodwall under the Main Street Bridge would be removed and replaced with an earthen levee having the following dimensions:

- Top width crest - 15’
- Base width – 85’
- Crest Elevation 547.7’
- Length – 700’
- Cubic Yards of Fill – 8,650

The Tarantula Railroad Bridge was evaluated in the same fashion as the SPF + 0 measure (i.e. assumed use of sandbags). If the final field surveys during the engineering and design phase of the project determine that the breach would exceed more than 1.5 feet, then a permanent structure may be considered as a final solution.

The levee that provides protection along the right bank of the West Fork and the left bank of the Clear Fork would require improvement at three locations. The improvements would consist of raising three sections of the levee with earthen material. The total amount of fill required for this construction would be 17,625 cubic yards. Specific dimensions for this proposed measure are included in Appendix C.

Due to raising segments of the levee loop in the areas mentioned above, the new fill material was estimated to be placed on the river side of the levee in order to stay within the current right-of-way limits and not disturb sump areas and private property. This placement of material would be, in turn, subject to compliance with CDC criteria. In order to mitigate for hydraulic losses caused by the additional fill material within the floodway, an area located on the left bank of the West Fork approximately 1,000 feet upstream of the Tarantula Railroad Bridge would be excavated. The area

designated for hydraulic mitigation covers approximately one acre with an average depth of six feet and 1V:3H side slopes.

SPF + 2'

This alternative is similar to the two described previously except that the levee replacing the Main Street Floodwall would be one foot higher (crest elevation of 548.7), five feet wider (base width of 90'), and have a total volume of 10,375 cubic yards. This alternative includes permanent improvements to the Tarantula Railroad Bridge, including a three foot high hinged gate that could be closed by a winch during peak flows. Required improvements to the three low sections of the levee loop are described in detail in Appendix C.

SPF + 4'

This alternative is similar to the three described previously except that the levee replacing the Main Street Floodwall would have a crest elevation of 550.7', a base width of 110', and a total volume of 14,490 cubic yards.

This level of protection requires measures to address two potential breaches in addition to that previously discussed at the Tarantula Bridge. At this level of protection, the Tarantula Bridge would consist of a five-foot hinged gate that could be closed with a winch during peak flows. Along the left bank of the Clear Fork the road profile for Henderson Street does not meet the flood criteria elevations. A gated structure would be required to correct this breach. This structure would consist of double swing gates that could be closed by a winch. The third structure required to meet the SPF+4' flood control levels would be along Seventh Street on the left bank of the Clear Fork. The structure would be similar to the Henderson Street gated structure. Both structures would be two feet in height.

Improvements required to the three low sections of the levee loop are described in detail in Appendix C. CDC mitigation consists of an 18-acre site excavated to an average depth of six feet as shown in Figure 3 - 6.

Alternatives Analysis

Estimates of the flood damage reduction benefits and net benefits attributable to each alternative levee raise scenario are shown in Table 3 - 3 and Table 3 - 4, respectively. Project benefits are annualized over a 50-year project life at an interest rate of 5 5/8 percent.

Table 3 - 3. Equivalent Annual Damages (In $1,000s).

Reach	Alternative	Equivalent Annual Damage		Flood Damage Reduction Benefits
		Total Without Project	Total With Project	
WF Cultural District Levee	SPF + 0'	223.4	88.6	134.8
WF Cultural District Levee	SPF + 1'	223.4	3.9	219.5
WF Cultural District Levee	SPF+2'& +4'	223.4	-	223.4
WF-North Main Levee Loop	SPF+1'	34.1	12.2	21.9
WF-North Main Levee Loop	SPF+2'& +4'	34.1	-	34.1

* Note: Equivalent Damages are Existing (Without Project) Damages plus discounted Future Without Project Damages. These future damages are calculated by using the existing structure database (counts and values), but using the future hydraulic stages tied to particular frequency events. The Federal discount rate is then used to place future damages into current dollar values.

Table 3 - 4. Net Benefits and Benefit-Cost Analysis Estimates (in $1,000s)

Alternative	Total Annual Benefits	Total Annual Cost	Net Benefits
SPF + 0'	156.7	20.4	136.3
SPF + 1'	219.5	39.2	180.3
SPF + 2'	223.4	186.5	36.9
SPF + 4'	223.4	401.4	(178.0)

Any levee raise above SPF+1' would eliminate flood damages in both the Cultural District Levee and the North Main Levee Loop and reduce the annualized with-project damages to zero. The SPF+1 alternative would produce the greatest net benefits and, under the Principles and Guidelines framework would be identified as the National Economic Development (NED) plan. However, based on the regional significance ascribed to the SPF+4' level of protection as a result of the existing project authorization, the project's goals and objectives, and the CDC requirements, there is a strong preference for the SPF+4' alternative. This alternative (SPF+4) is carried forward into the final array of alternatives as the foundation for the Principles and Guidelines Based Alternative.

Ecosystem Improvement

Habitat Evaluations

An interagency biologist team collected field data during April of 2001; May, June, and October of 2003; and March of 2004. Twenty-nine randomly selected sites within four terrestrial habitats were located within the study area. The habitats represented were riparian woodlands, grasslands, upland woodlands, and emergent wetlands. The data collected were analyzed using the USFWS Habitat

Evaluation Procedures (HEP) (U.S. Fish and Wildlife Service 1980) to describe the various existing habitats in the study area. The HEP requires the use of Habitat Suitability Index (HSI) models for indicator species that best represent groups of species that use the habitats.

The HEP model for each indicator species contains a list of structural habitat composition variables that are contained in optimum habitat. These variables are used as indicators of habitat condition or value. Baseline habitat conditions are expressed as a numeric function (HSI value) ranging from 0.0 to 1.0, where 0.0 represents no suitable habitat for an indicator species and 1.0 represents optimum conditions for the species. Habitat units are calculated by multiplying the HSI by the acres of habitat available for each species.

HSIs and HUs were developed for different times during the period of analysis, and HUs are annualized to estimate an average annual habitat unit (AAHU). Therefore, HEP provides information for two general types of wildlife habitat comparisons. The first is the relative value of different areas at the same point in time. The second is the relative value of the same area at future points in time. Therefore, the impact of land and water use changes on wildlife habitat can be estimated.

Measures Considered but not Carried Forward

To provide for a larger range of project alternatives an interagency group of biologists from Texas Parks and Wildlife Department, USACE, USFWS, EPA, and individuals knowledgeable of local resource issues was assembled to present environmental opportunities within the study area. This group of biologists developed a alternative that took advantage of opportunities to restore "natural" geomorphic characteristics of the river, such as sinuosity, pools, riffles, and runs. By planning with the idea of providing a more balanced sediment transport through the study area, water quality would be improved due to the creation of a more stable system with reduced erosion, sediment load, and flooding. Measures associated with geomorphic restoration would create more riverine habitat and improve aesthetics of the area. Other goals of the team included restoring, enhancing, or creating wildlife habitat with herbaceous wetlands, riverine aquatics, riparian (bottomland) woodland, and prairie/native grassland. Additionally, there was a desire to create a continuous riparian habitat connection along one side of the river to provide a wildlife corridor.

The alternative developed was conceptual in nature and was not constrained by knowledge of elevations, floodplains, historic sites, existing structural boundaries, and hydraulic or other restrictions. This unconstrained alternative, if practicable to implement, would create an additional 584 acres of riparian woodlands, 123 acres of emergent wetlands, and 17 acres of aquatic habitat over the future no action conditions. The basic components of the alternative include:

- Cut back portions of the bank to create wetlands for aquatic habitat, assist in flood control, and reduce velocity;
- Create off-stream herbaceous wetlands;
- Relocate portions of the levee system;
- Plant native trees and shrubs to create bottomland hardwood woodlands where appropriate soils are available;

- Plant native grasses and herbs to create native prairies where appropriate soils are available.

While the intent of the unconstrained alternative was maintained throughout the formulation and analyses of environmental features, measures contained in the original alternative were dropped or modified in the process of balancing the myriad of human health and safety, cultural, social, and community needs of the area. Among the specific measures that were modified or screened from further consideration include:

- Acquisition of flood protected areas due to prohibitive costs;

- The following were eliminated from further consideration because introduction of woody vegetation within the floodway would require re-engineering of the system making such features cost prohibitive.

    - No woodlands within 50-foot of either side of the toe of the levee;

    - No woodlands within 50-foot of channel bank;

    - No woody understory or midstory between the levees; and

    - No trees planted closer than 50-foot on center.

The final list of measures carried forward for consideration is discussed in the next section.

Formulation of Alternatives

Restoration alternatives were formulated using various combinations of six restoration measures: riparian woodland development, riparian corridor improvement, wetland development, wetland improvement, channel realignment, and slope restoration. A brief description of these measures is presented below.

- **Riparian Woodland Development (RWD)** is very restricted due to hydraulic constraints. Restoration would be limited to plantings of hard and soft mast trees (no shrubs allowed) at 50 foot on center spacing, no closer than 50 feet from top of bank, and 50 feet from toe of levee.

- **Riparian Corridor Improvement (RCI)** would consist of planting five to ten trees and shrubs per acre consisting of hard mast and fruit bearing natives. Some minor thinning of non-native invaders would also be done with the intent of trying to restore a more natural composition to the forest.

- **Wetland Development (WD)** would involve the clearing of sediment, contouring, and wetland planting in the aquatic zone only.

- **Wetland Improvement (WI)** would involve the planting of aquatic plants only within the footprint of the existing wetlands.

- **Channel realignment (CHR)** would involve the restoration of two historic meanders which were present prior to the channelization project.

- **Slope Restoration (SL)** would involve dense plantings of shrubs (80 to 100 shrubs per acre) to help protect and restore the new channel slopes that would result from the restoration of the meanders.

In accordance with standard USACE planning guidance, the guidelines in the Evaluation Investments Procedures Manual (Robinson et al. 1995) and Cost Effectiveness (CE) / Incremental Cost Analysis (ICA) procedures were used to formulate and analyze restoration alternatives. Proposed restoration measures were evaluated in terms of average annual habitat units (AAHUs) produced and average annual cost. The CE / ICA procedure evaluated the multiple combinations of restoration measures, based upon a user-defined set of relationships, to develop alternatives that are cost effective and efficient in production (i.e. - best-buy plans). Best-buy plans were then evaluated using tabular and graphical summaries to determine the National Ecosystem Restoration (NER) Plan for the study. A complete discussion of and presentation of the tables and graphics are provided in Appendix G. Site specific applications of the six restoration measures described above were developed and input to IWR-Plan as scales of an individual measure.

Over 1.6 billion possible combinations were analyzed culminating in 158 “cost-effective” plans. Cost-effective plans are those that produce a particular level of output at the least cost. Of these, ICA identified 22 “best-buy” plans or alternatives, including the “no action” alternative.

The 22 best-buy alternatives were evaluated with consideration for acceptability, completeness, efficiency, effectiveness, and significance of restoration outputs to determine the National Ecosystem Restoration (NER) Plan. Based on this evaluation, an alternative was identified which best met the objectives and goals while maximizing ecosystem outputs for the dollars spent, while providing restoration/improvement to significant restoration benefits. This alternative, identified as Best-Buy Plan 19 in Appendix G.1, was determined to the NER Plan.

The components of the NER Plan are displayed on Figure 3 - 7. The NER Plan consists of riparian corridor improvements (RCI) to 64.5 acres of existing riparian woodland within the study area. The alternative would also provide wetland improvements to 2.8 acres of existing wetlands, and the development of 21.6 acres of new wetlands. Fifty-five and one half (55.5) acres of riparian woodland would be developed and two historic channel meanders would be restored, which would create an additional 2.5 surface acres of aquatic habitat. This alternative is fully compatible with the improvements identified in the previous section and complies with CDC restrictions.

Total investment costs for the ecosystem improvement component of this alternative are preliminarily estimated to be $2.2 million. Amortization over 50 years at 5 5/8 percent would result in an annual cost of $134,000.

Urban Revitalization

The P&G Based Alternative does not address urban revitalization as an explicit project purpose, and no measures were formulated by the study team to meet that set of project goals and objectives.

Recreation

The formulation of recreational features is based on the educational and social potential afforded by the environmental components of the project. The justification for Federal participation in recreational features as part of a alternative is defined in Policy Guidance Letter No. 59, Recreation Development at Ecosystem Restoration Projects. Following this guidance, the recreational features of the Central City project were formulated with the following framework;

- Features are ancillary;
- Features seize upon recreational opportunities within the project;
- Features are not vendible; and
- Features would not exist without the project.

The proposed recreational features are compatible with the flood damage reduction and NER measures previously identified and would serve the surrounding neighborhoods and region by providing non-consumptive recreational opportunities. Based on the Texas Outdoor Recreation Plan, feedback from public meetings conducted as part of this study effort, surveys conducted by the Corps at project sites throughout Texas, and observed usage of trail resources in the project area, the project team placed a high priority on providing trail resources as part of the recreation improvements. The Dallas/Fort Worth area is considered to have excess demand for trail resources such that any new trails to be provided could, with confidence, be predicted to receive usage at or near capacity based on use standards. Recreational features of the P&G Based Alternative would restore recreational amenities impacted by construction of the NER Plan, provide new connections, increase access and resting opportunities, and provide for self-guided learning.

A total of 7,818 linear feet of new 12-foot wide multi-purpose trail would be established. The new trail would link the southern end of the P&G Based Alternative to the Proposed Riverside Oxbow project, thus creating a continuous link along the Trinity Trail System. Disturbed trails totaling 5,189 linear feet would be replaced "in-kind" with the type of trail that was removed. Connection to existing and future planned trails was an integral part of the trail design effort. Increased access opportunities that link surrounding neighborhoods have been identified as highly desired by the public and the City of Fort Worth, and several new trail heads were woven into the P&G Based Alternative to accommodate this request. Other trail features include self-guided interpretive signage, mile marker signage, and benches (Figure 3 - 8).

Economic Justification

An evaluation of competing facilities, existing and expected future use with and without the P&G Based Alternative, and unfulfilled demand are used as a basis for economic justification of recreational features. According to the TPWD, *Land and Water Resources Conservation and Recreation Plan*, the demand for recreation facilities such as trails is steadily increasing. TPWD also states that Fort Worth ranks below average with respect to the number and size of recreational facilities provided for all outdoor activities. Applying the appropriate participation rates to the population of potential users, the new recreation features would be used at capacity from the time they become available to the public throughout the period of analysis.

Current standards indicate the type of trails proposed could accommodate 57,662 visitors per year per mile of trail; therefore, for the 7,818 linear-foot of trail proposed, the total capacity usage would be 85,379 visitor days per year. Point values are assigned based upon selective criteria applicable to the proposed trail. The criteria and assigned points are as follows:

- Several general activities 7 points
- Several within one hour travel; few within 30 minutes 3 points
- Adequate facilities for use without deterioration 8 points
- Fair access to site; good roads within site 15 points
- Above average aesthetic quality 40 points

The current unit day value for fiscal year 2003 is $5.51 for 40 points. With 34,122 visitor-days per year, this results in a benefit of approximately $470,500 per year. Table 3 - 5 displays the costs associated with the recreational features and a summary of their expected annual costs and benefits.

Table 3 - 5. Economic Justification of Recreational Features (September 2003 Price Level)

Alternative	First Cost	Annual Cost	Annual Benefit	Benefit-Cost Ratio
1.5 mile trail	$520,000	$31,300	$470,500	15.0

The benefit-cost ratio (BCR) indicates the economic performance of an investment. Generally, to be economically justified, the return for an investment should equal or exceed the amount invested (BCR $\exists$ 1). With a BCR of 15.0 the P&G Recreation Alternative is economically justified, returning an expected $15.00 for every $1.00 invested.

Total investment costs for the recreation component of this alternative are preliminarily estimated to be $520,000. Amortization over 50 years at 5 5/8 percent would result in an annual cost of $31,300.

SUMMARY OF P&G BASED ALTERNATIVE

The preceding pages have presented the plan formulation process and analyses that led to the identification of the P&G Based Alternative. This alternative is the sum of the flood damage reduction features, environmental features, and recreation features described in the previous pages. The total investment costs for this alternative are estimated to be $9.1 million with an annual cost of $559,420. For easy reference, the features of the alternative have been listed below and are displayed graphically on Figure 3 - 9.

- Levee Raise which brings flood protection to the SPF+4’ level
- Riparian woodland development on 55.47 acres

- Riparian corridor improvement on 64.51 acres
- Wetland development on 21.56 acres
- Wetland improvement on 2.76 acres
- Channel realignment equaling 2.54 acres
- Slope restoration on 1.40 acres
- Installation of 7,818 linear feet of new 12-foot wide concrete multipurpose trail linking the southern end of the proposed project to the Trinity Trail System
- Replacement of 5,189 linear feet of trail disturbed during construction
- Four new trail heads to provide linkage for surrounding neighborhoods
- Self-guided interpretive signage
- Mile marker signage
- Six benches

The following sections reiterate the project's goals and objectives, classified by four major categories at the beginning of this chapter. A description of how each component of the P&G Based Alternative would contribute to those goals and objectives is also included.

Flood Protection

The project's goals and objectives with regard to flood protection are:

- Restore the design level of protection (SPF+4') throughout the system the project area.
- Maintain or improve flood protection associated with interior drainage to the floodway system.

The levee raise would provide full SPF+4' protection for a large portion of the Central City area. The levee raise to protect against riverine flooding does not have any impact on interior drainage or sump performance. Separate measures to address sump flooding problems have not been economically justified under the P&G framework in other recent Corps analyses.

Ecosystem Improvement

As stated previously, the project's goals and objectives with regard to Ecosystem Improvement are:

- Restore, improve, and diversify aquatic habitat associated with the Clear and West Forks of the Trinity River for native aquatic organisms;
- Improve and increase quantity of emergent wetland habitat for migratory birds of ecological importance;
- Establish continuity and connectivity within and between regionally and nationally significant ecosystems, and
- Protect and improve existing pockets of high quality bottomland hardwoods adjacent to the river system.

The P&G Based Alternative contributes to virtually all these goals in a variety of ways. It would restore 2 historic channel meanders, creating and additional 2.5 acres of aquatic habitat. The alternative would create or restore almost 25 acres of wetland habitat and improve the quality and connectivity of riparian corridors/bottomland hardwoods through improvements to over 64 acres of this habitat type and development of 55.5 acres of this habitat type.

Urban Revitalization

As stated previously, the project's goals and objectives with regard to urban revitalization are:

- Provide connection and access to the Trinity River
- Develop a high density environment for people to live, work, play, and learn
- Orient mixed use development to the river front
- Create and enhance linkages to and between neighborhoods and Downtown, the Stockyards, and the Cultural District
- Maintain water quality
- Increase the physical amount of water edge
- Develop aesthetic and recreational focal points

However, urban revitalization is not a project purpose under the Principles and Guidelines framework. No measures for urban revitalization are included in this alternative and neither the levee raise component nor the ecosystem improvement components of the P&G Based Alternative are believed to contribute incidentally to the goals and objectives identified above.

Recreation

As stated previously, the project's goals and objectives with regard to recreation are:

- Provide extensive and direct public access to the river and waterfront;

- Facilitate a water-based system of linkages between Downtown, the Stockyards, and the Cultural District;
- Provide recreational and open space amenities that are supportive of urban revitalization goals;
- Provide a continuity of urban trails through Downtown, consistent with the overall Trinity Trails system; and
- Create additional trail linkages with neighborhoods and cultural amenities.

The recreational components of the P&G Based Alternative supports the recreation goals and objectives related to trails and trail connectivity in that it would provide 7,818 linear feet of new trail (net increase of 1,629 feet and replacement/upgrade of 5,189 feet) linking the downtown trail to that proposed as part of the separate Riverside Oxbow project. The P&G Based Alternative does not contribute materially to the goals and objectives related to water-based linkages or river access.

DEVELOPMENT OF THE COMMUNITY BASED ALTERNATIVE

The following sections outline key events in the evolution of the Community Based Alternative and describe the connection between the Community Based Alternative and specific themes and elements of a companion urban design plan (the Trinity Uptown Plan). A technical description of the alternative measures considered in the development of individual components of the Community Based Alternative is also provided, including a summary of the process followed to identify the recommended components.

Key Events Leading up to the Development of the Community Based Alternative

Halprin Plan

The idea of implementing community-focused improvements in the Central City area of the Trinity River was first presented in 1970 when the Halprin Plan was published by Lawrence Halprin and Associates. This Master Plan suggested community-oriented improvements to the Central City area of the river such as large scenic fountains and bicycle trails. Part of the Halprin Plan included the creation of Heritage Park in the central business district and Gateway Park on the east side of the city.

USACE Upper Trinity River Studies

Several USACE studies on the Upper Trinity River conducted during the late 1980s and early 1990s played an important role in development of the Community Based Alternative. These studies were described in detail in Chapter 1. Improved flood protection recommended in these studies provided further impetus to community-focused planning efforts regarding the Trinity River in Fort Worth. While USACE continued to focus on evaluating flood protection enhancements for the region,

entities such as TRWD, Streams and Valleys, and the City of Fort Worth began to investigate the role of the existing flood protection system in context with green space, recreation, and accessibility, among other criteria.

Streams and Valleys Trinity River Master Plan

In 1999, Streams and Valleys published the Streams and Valleys Trinity River Master Plan (SVTRMP). This Master Plan, also called the Tilley Plan, was the result of a broad scale community-based effort to develop a plan for 8 miles of the West and Clear Forks of the Trinity River. The primary objective of the plan was to preserve the environmental quality of the river while enhancing the quality of life in the surrounding community. Modifications to the floodway levees to provide enhanced public access were another objective of this plan.

Trinity River Vision Master Plan

In August 2000, TRWD, in association with Streams and Valleys, the City of Fort Worth, USACE, and Tarrant County, with assistance from the architecture/planning firm of Gideon Toal commenced development of the Trinity River Vision (TRV) Master Plan. An important goal of the TRV Master Plan focused on the preservation and enhancement of the river and its corridors so that they remain essential greenways for open space, trails, neighborhoods, wildlife, and special recreation. The TRV Master Plan addressed eight segments of the Trinity River and its tributaries: Central City, Clear Fork (North), Clear Fork (South), Marine Creek, Mary's Creek, Sycamore Creek, West Fork (East), and West Fork (West). Many components of the Community Based Alternative described herein were developed from the goals presented in the Halprin, Tilley, and TRV Master Plans, including:

- Help assure the greater Fort Worth area has open space, recreation and conservation areas to support a growing population and economy, while continuing to provide essential flood protection;

- Provide trails and greenways that link attractions of the City together (such as major recreation areas, parks, neighborhoods, and districts);

- Preserve the river's natural beauty and provide and preserve open space and vegetation that is needed to attain air quality, water quality, wildlife habitat, and temperature moderation that will all help assure we can sustain environmental health over the long term;

- Improve public accessibility to the river, attract more people to its banks, and increase its prominence within the City; and

- Provide quality-of-life and ecosystem improvements, while assuring the watercourses can manage stormwater runoff, water conservation, and flood control in a manner that protects public safety and property.

The TRV planning process commenced in February 2001 with a kick-off meeting and the formation of a Steering and Advisory Committee. Segment Chairs representing each of the eight segments of the Trinity River were selected and public meetings for each segment were held between April and

June 2001. The purpose for holding these public meetings was to gather information from the public on their vision for the future of the Trinity River, including preferences and concerns.

Based upon this initial public input, draft concepts were developed and presented to the public in a series of follow-on meetings during January 2002. The purpose of the second series of public meetings was to determine if the ideas, thoughts, and concerns raised by the public were adequately captured and addressed in the draft concepts.

Contributors to the TRV Master Plan realized that the Central City segment held unique urban characteristics and decided to address these unique elements independently. Goals and objectives for the Central City segment included the following:

- Provide aesthetic and recreational focal points for the Central City;
- Encourage a higher density of people living, working, playing, and learning in the Central City;
- Orient mixed use development directed toward the river;
- Create an interior water feature, or focal point;
- Provide a higher normal water level;
- Eliminate or modify levees where feasible, while maintaining the level of flood protection;
- Provide continuity of urban trails through Downtown consistent with the overall Trinity Trail System;
- Maintain water quality and expand wildlife habitat;
- Create new and enhance existing linkages to neighborhoods and districts; and
- Enhance redevelopment potential of Central City lands.

In October 2001, stakeholders conducted the first of a series of workshops focused specifically on the Central City segment. Experts in waterfront design and urban planning led a two-day charette focusing on elements specific to design of the Central City area. The idea of re-channeling the Trinity River in the Central City area was an important outcome of this workshop. As a result, TRWD commissioned CDM to conduct a concept-level feasibility study of a bypass channel in the Central City segment.

The City of Fort Worth approved the TRV Master Plan in May 2003 as a guide for future development along the Trinity River and its tributaries. The City Council also amended the City of Fort Worth Comprehensive Plan and the Park, Recreation, and Open Space Master Plan to incorporate the TRV Master Plan and authorized the Mayor to appoint representatives to the TRV Leadership Council.

Central City Channel Realignment Feasibility Study

Building on recommendations for the Central City area in the TRV Master Plan, the Central City Channel Realignment Feasibility Study was completed in April 2003 by CDM for TRWD in association with the Texas Water Development Board (TWDB). This study investigated the technical feasibility of constructing a bypass channel within the Central City Segment of the Trinity River and related engineering components. Technical descriptions of the bypass channel and other components of the Community Based Alternative, first identified in this 2003 study, are provided in the Hydraulic Elements section below and in Appendices A through D.

The 2003 study concluded that various configurations of a bypass channel to divert flood flows around the Central City were feasible, and paved the way for furthering the bypass channel concept.

Central City Design Workshops

A series of design workshops were held in late 2003 through mid-2004 to gather input on the most appropriate design for urban elements of the evolving Community Based Alternative. These workshops focused on such urban design and planning concepts as street grids, layouts, landscaping, and recreation. A team of urban planners and architects worked closely with a team of engineers continuing to evaluate the technical feasibility of the bypass channel and associated engineering components. In addition to the urban planners and engineers, the design workshops typically included community members and representatives of non-profit organizations (Streams and Valleys), TRWD, USACE, City of Fort Worth, and Tarrant County. Based on this series of workshops culminating in mid-2004, the project proponents determined which elements to include in the Community Based Alternative, and thus, these elements are discussed in this EIS.

Trinity Uptown Plan

The Trinity Uptown Plan (TUP) was published in late 2004 at the conclusion of the design workshops. This Plan presented a comprehensive vision for the Central City area, the scope of which included elements of urban revitalization (above and beyond the reasonably foreseeable components included in the Community Based Alternative and discussed in this EIS) including land use plans, transportation plans, urban design guidelines, and recommendations for parks, schools, and other community facilities. The TUP Model, a room-size scale model of the features of the TUP, was unveiled at the Fort Worth Community Arts Center in December 2004.

Urban Design Elements of the Community Based Alternative

The Trinity Uptown Plan (TUP) described previously played an important role in developing the resultant Community Based Alternative. Notable elements or themes of the TUP are discussed in this section as they relate to the development of physical components of the Community Based Alternative.

A primary objective of the TUP is to reconnect urban Fort Worth to the Trinity River by eliminating the barriers created by levees, as well as to encourage activity on the water and along waterfront

areas. As such, water is the main theme for the area and would be used to create a variety of unique places. The water-related elements of the area would be used to create a unique urban oasis, adjacent to downtown Fort Worth. Urban designers expended extensive effort to optimize public access and amenities while observing historically significant features of the area (existing river confluence, bluff, etc.) and view corridors (Tarrant County Courthouse, FW & W railroad bridge, etc.) Another important objective of the TUP is to link Fort Worth's iconic destinations (i.e. the Stockyards, Downtown, and the Cultural District) via the Trinity River.

Waterways

Bypass Channel

The bypass channel is a key component of the Community Based Alternative, primarily for its role in the flood control system as the means of conveying flood flows away from downtown. The bypass channel would also be an amenity and central element in defining the urban design of the area, as a corridor for people to enjoy water and outdoor activities. The eastern edge of the bypass channel would provide an urban waterfront character, with a levee system including a series of terraced retaining walls, walkways and landscaping. The lower walkway would be close to the water's edge while the upper wall would be designed to allow future development overlooking the water. The western edge of the bypass channel would convey a more natural character, which would provide a greenbelt in proximity to the urban area on the opposite side of the bypass channel.

Interior Water Feature

Another key objective for the Central City segment of the TRV Master Plan, identified during the planning process, is the creation of a water feature or focal point. The interior water feature would provide the primary identity of the area and would accentuate views of the existing confluence as well as provide a "civic center" in proximity to downtown and other waterfront sites.

Similar to the bypass channel, the water feature would have two distinct edges to provide additional character enhancements. The east or north edge (from the TXU site to the Fort Worth and Western Railroad bridge) would provide an urban character, while the west edge would be curved to emulate the natural meander of the existing river channel. The water feature would be wider in the center than at its two connection points (to the bypass channel and the existing West Fork) to provide enhanced vistas and view corridors.

Transportation Network

Street Character

As envisioned, the street network for the area would build upon the existing street grid, with North Main Street and Henderson Street maintained as the major north-south arterials linking downtown to Northside neighborhoods. An extension of White Settlement Road and its improved intersection with Henderson Street would provide an additional thoroughfare to connect neighborhoods west of the new bypass channel into the area. The TUP also proposes tree-lined streets and roadways. Future development would be encouraged to build to the property line to establish a strong street wall,

further lending to the urban character of the area. Regional plans for public transit (buses and light rail) would be accommodated in the street grid layout.

Bridges

Several new bridges would be required to maintain and improve the traffic flow through the project area. The design process addressed construction of new road bridges for Henderson Street, White Settlement Road and North Main Street. A key element of the urban design framework was for the North Main Street Bridge to be a prominent structure, marking the entry to the area from the north, echoing how the existing Paddock Viaduct marks the entry from Downtown.

Viewscapes

The urban design for the Community Based Alternative takes advantage of several visual resources present in the project area. A key visual theme is the potential for strong contrast between the two banks of the river within the project interior. On the bluff side, any potential development would take into consideration preserving and restoring the bluff, while on the opposite bank, a vibrant and diverse urban development would be created. Prominent project features would be oriented to focus and frame other important visual resources such as the Tarrant County Courthouse. In addition, the urban design calls for the eventual removal of the existing Floodway levees in order to seamlessly integrate the waterway system with the urban development.

Analysis of Alternative Measures

Hydraulic Elements

The hydraulic elements of the Community Based Alternative include a bypass channel, dam, flood isolation gates, and an interior water feature, as well as the vehicular and pedestrian bridges that would cross them. Four major regulatory protocols impact the hydraulic design of this alternative, as follows.

- Record of Decision from the Trinity River and Tributaries Environmental Impact Statement (TREIS) (described in Chapter 1);
- Corridor Development Certificate (CDC) (described in Chapter 1);
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Revision Requirements Conditional Letter of Map Revision/Letter of Map Revision requirements; and
- Section 404 permit requirements per the Clean Water Act.

A discussion of alternative measures and alignments considered during the development of the hydraulic elements of the Community Based Alternative, as well as a description of the evolution of the required mitigation features is provided in the following sections.

Bypass Channel

As stated previously, a variety of technical studies were conducted beginning in 2003 to determine the feasibility of bypass channel design alternatives. Based on these technical studies, and subsequent design workshops, the bypass channel configurations were narrowed to three general alignments, identified as Alternative A, Alternative B, and the Community Based Alternative alignment.

Alternative Alignment A

The general alignment of Alternative A is shown on Figure 3 - 10. In this alternative, the bypass channel would begin on the Clear Fork between Seventh Street and Henderson Street and traverse northwesterly to the western side of the existing Fort Worth and Western (FW&W) Railroad right-of-way following the current route of the railroad to just east of Main Street. At this point, the channel would continue northeasterly to merge with the West Fork of the Trinity River upstream of the Northside Drive Bridge. In this alternative, the bypass channel would be approximately 9,540 feet in length and would result in a project interior of approximately 440 acres. This alignment reasonably maximizes the project's urban revitalization objective, but would require relocation of the FW&W Railroad and the acquisition of all or part of approximately 200 properties.

Alternative Alignment B

The general alignment of Alternative B is shown on Figure 3 - 10. In this alternative, the bypass channel would begin on the Clear Fork just downstream of Henderson Street, traverse northerly, parallel to the existing eastern right-of-way of the FW&W Railroad until reaching Calhoun Street, then continue to the northeast to intersect with the West Fork, further upstream of Northside Drive Bridge. This alternative would be approximately 5,340 feet in length, would result in a project interior of approximately 275 acres, and would not require relocation of the FW&W Railroad. This alignment would require acquisition of all or part of 62 properties.

Community Based Alternative Alignment

Alternative Alignments A and B were both portrayed in TRV: Evaluation of the Trinity River Floodway Channel Realignment, published in April 2003, which identified Alignment A as the preferred alignment. The Community Based Alternative Alignment built upon characteristics from both Alternatives A and B, and was further refined during stakeholder/public and design team workshops in late 2003 and early 2004. This alternative was developed to convey the Standard Project Flood (SPF) without raising water levels, while addressing various project constraints. The constraints affecting the bypass channel alignment were identified by various sources, (Urban design team, USACE, and the City of Fort Worth) and were evaluated and addressed through an iterative process during development of this alternative alignment. The major constraints included:

- Relocation or construction activity negatively impacting the FW&W Railroad or its right-of-way should be avoided or minimized;

- The bypass channel should be constructed between Seventh Street on the Clear Fork and Northside Drive on the West Fork such that neither of these bridges would need to be removed;

- The channel should be built with a "hard" edge on the east bank and of natural material on the west bank. The "hard" edge should be built of concrete to support walkways and urban landscape features;

- Channel structures that would impede water craft passage should be avoided;

- The design should avoid the physical modification of the Ellis Pecan Building and minimize the impacts to other important historic structures to the extent practicable;

- The major downtown stormwater outfall located south of Radio Shack should discharge into the bypass channel;

- Relocation of the large diameter sanitary sewer interceptor near West Fifth Street and Greenleaf should be avoided; and

- The channel bottom at the upstream end must match that of the Clear Fork where they intersect. As the bypass channel crosses the West Fork upstream of the existing confluence, the channel bottoms should also match.

Based on these constraints, a series of variations for bypass channel alignments A & B were evaluated. These alternatives differed in terms of channel location, channel dimensions, hydraulics, edge treatments, and degree of impact on adjacent properties. The Community Based Alternative alignment for the bypass channel, shown in Figure 3 - 11, was determined to be the most desirable compromise between the urban revitalization objective and the project's physical and hydraulic constraints.

The channel configuration selected as the Community Based Alternative alignment would be 8,420 feet long with a bottom slope of approximately 0.18 percent. The bottom profile would meet the grade of the Clear Fork and upstream West Fork crossing. This configuration would result in a project interior of approximately 327 acres, and would not require relocation of the FW&W Railroad. This alignment would require acquisition of all or part of 149 private properties.

The bypass channel would function in two segments; the upper bypass would carry flow from only the Clear Fork, while the lower bypass would carry the combined flow of the Clear Fork and Upper West Fork. The channel would pass the SPF discharge with the required four feet of freeboard. The Upper Bypass would be approximately 290 feet wide while the lower bypass would be generally designed to be 320 feet wide. The Upper Bypass segment would start approximately 940 feet north of the West Seventh Street Bridge and proceed northeast until it intersects the confluence with the West Fork Trinity River east of the existing FW&W Railroad Bridge.

The horizontal alignment from White Settlement Road until the confluence with the West Fork would be controlled primarily by right-of-way constraints to the northwest by the FW&W Railroad. The horizontal alignment (on the lower segment) would be generally controlled by the proposed bridge crossing of Main Street and the FW&W Railroad right-of-way to the northwest. The bypass channel alignment would maintain the existing at-grade street crossing of Main Street and the FW&W Railroad in order to avoid impacting the Ellis Pecan Building, which is eligible for listing on the NRHP.

As discussed in the previous section regarding urban design elements of the Community Based Alternative, the bypass channel would include a hard edge on the east side and a soft edge on the west side. This hard edge would contain a series of tiered retaining walls, multiple walkways, and landscape areas.

The lower interior retaining wall would be located adjacent to the base flow channel, with a top of wall elevation of approximately 530 feet NGVD. Immediately adjacent and parallel to the lower interior wall would be a walkway. The lower walkway would allow pedestrian access to the "park-like" environment of the bypass channel. Access to this lower walkway would be provided at various entry points by means of a combination of stairs and Americans with Disabilities Act (ADA) compliant ramps.

The remainder of the grade differential from the lower interior wall and walkway to an upper interior wall would be accomplished with a series of terraced retaining walls. The series of interior retaining walls would raise the grade to an elevation ranging from 545 to 552 feet. At this elevation, the channel would pass the SPF discharge with the required four feet of freeboard. The height of retaining walls on the hard edge would vary along the length of the bypass channel, but would be designed with three walls, each varying in height from 5-10 feet. Landscape planters and other landscaping options would be considered to enhance the tiered walls and walkways.

The soft (western) edge of the bypass channel would incorporate an earthen levee designed to be "park-like" or natural while providing adequate side slope erosion protection. Unlike the existing levee/channel floodway system, the bypass channel associated with the Community Based Alternative alignment would be sized to allow for the incorporation of natural vegetation, greatly enhancing the visual and environmental aspects of the channel. The soft edge would contain recreational trails, vegetation, and access for maintenance and emergency vehicles on both the top and bottom of the levee. A 20-foot wide recreational trail would be located approximately 5-feet above the normal base flow water surface and comply with ADA requirements. The recreational trail would allow bikers, walkers, and roller-bladers to access the “park-like” area. Portions of the recreational trail could also be used for equestrian use. A second trail would be provided on the top of the levee and this recreational trail could also be used for emergencies and maintenance as necessary.

Samuels Avenue Dam

In order to achieve the urban design objectives, a channel dam would be needed to maintain water levels in the project interior at a relatively constant normal water surface elevation of approximately 525 NGVD. The dam also must have the capability to lower the crest elevation to allow the passage of flood flows.

Location

A key project goal identified during the TRV planning process for the Central City segment is to enhance linkages to neighborhoods and districts via water. Navigability throughout the Central City area to connect Downtown to the Stockyards, the Cultural District, and the Rockwood Park area is also desired. To meet this project objective of navigability and to create desired neighborhood linkages, dam siting considerations were limited to locations downstream of the confluence of Marine Creek in the West Fort of the Trinity River. The initial dam location identified in the TRV Master

Plan was near the Samuels Avenue Bridge, downstream from the junction of Marine Creek and the West Fork of the Trinity River.

Design analyses subsequent to those published in the 2003 Feasibility Study considered several alternatives for the location of the Samuels Avenue Dam. Initially, a site immediately downstream of the confluence of Marine Creek but upstream of Samuels Avenue was considered. However, due to this site's proximity to Samuels Avenue, the potential for considerable scour of the Samuels Avenue Bridge exists. Additionally, boat traffic entering and exiting Marine Creek would be forced into traffic patterns involving potentially unsafe proximity to the structure.

Sites immediately downstream of Samuels Avenue (and upstream of the railroad bridges) were also considered. However, a dam located just upstream of the railroad bridges could also result in the potential scour of railroad bridge piers. Thus, sites immediately downstream of Samuels Avenue (and upstream of the railroad bridges) were eliminated from further consideration.

Additional potential sites downstream of Samuels Avenue and the railroad bridges were also considered. Based upon various constraints, a site 700 feet downstream of the Union Pacific Railroad was selected as the most appropriate location for the dam. This site meets the goals and objectives of the TRV Master Plan to enhance neighborhood linkages by impounding water upstream on Marine Creek, thus providing a navigable waterway to connect the Cultural District, Downtown, and the Rockwood Park area to the Stockyards area. This dam is referred to as the Samuels Avenue Dam in the Community Based Alternative due to its proximity to the Samuels Avenue Bridge. Additional siting considerations, resulting in the selection of the proposed dam site include the following:

- Safety – It was assumed that a safety plan could be more easily implemented to keep the public away from the dam, particular during high flow events, by installing a buoy system immediately upstream from the Samuels Avenue Bridge and placing the dam downstream from the bridges. This will also allow for more open, usable water surface upstream from Samuels Avenue.

- Aesthetics – During workshops with the Urban Design team, a preference was identified to site the dam downstream from the Samuels Avenue and railroad bridges to provide the appearance of a large normal water surface, a more attractive perspective of the existing bridges, and to reduce the visual impact of the proposed dam.

Structural Components

Several alternatives for the design of the dam and its method of handling flood flows were evaluated, including the following:

- Leaf, crest, or bascule, gates that operate by lying down with flood flows overtopping the gate;

- Radial gates that operate by rotating upwards, allowing flood flows to flow underneath;

- A rubber bladder dam that releases flood flows as it deflates; and

- An Obermeyer gate - a steel leaf gate supported and controlled by an inflatable rubber bladder.

Based upon input from various design workshops and technical analyses of the operations and maintenance associated with each alternative, leaf gates were determined to be preferable for the following reasons, leaf gates:

- Provide more dependability than the rubber dam or the Obermeyer structure;
- Provide more flexible release control during smaller flood events;
- Cost the same or less than the other alternatives; and
- Require a much less visible structure over the river than radial gates.

Based on hydraulic modeling of the various flood flows in the river, including the SPF, the dam would operate with seven 48-foot wide and 18-foot high leaf gates. Operating equipment for each gate would be located on each pier, accessed by a bridge across the structure set just above the SPF elevation.

The gates would be operated either by a hydraulic system or by a lifting cable and drum system. Stop logs and appropriate slots would be constructed to allow for future maintenance. The mass concrete portion of the dam underneath the gates would be constructed primarily of reinforced concrete and roller compacted concrete (RCC). A separate, small control building to house the operational controls for the gates would be needed in the area. Possible locations of the control building include: attached to the dam itself, on or near the south levee, or adjacent to the nearby railroad embankments, out of the effective flow area of the channel.

Under this design concept, a stilling basin would also be needed. It would be sized to fully contain a hydraulic jump for energy dissipation of the gate releases. Vertical walls would be required for both the approach and the exit to transition to and from the 390-foot wide structure to the approximately 250-foot wide channel.

The spillway design would require a bridge across the top of the piers for maintenance. The low girder elevation would be set at an elevation of 538 feet, just above the SPF level. The bridge would allow access to all operating systems and provide a means for routing the hydraulic lines to each gate operator. A concrete on steel bridge would be sized for foot traffic and possibly small vehicle loads. If vehicular traffic is allowed, a ramp to the bridge for access would be added.

A short, wide berm constructed on both the north and south banks of the river would tie the dam to the base of the railroad bridge. The ground in this area on the south side is currently lower than the projected normal water level of approximately 525 feet. This area would be graded up to an elevation of 530 feet NGVD once the construction of the spillway is complete and the diversion channel can be backfilled.

Water Surface Elevation

The dam would be designed and operated to maintain a normal water level of approximately 525 feet NGVD during normal flow conditions. During the early planning phases of the TRV Master Plan, a

range in water surface elevations between 525 and 530 feet NGVD was considered due to the following criteria:

- Provide higher normal water surface elevation while maintaining providing storage or freeboard in the interior area (existing West Fork) to accommodate stormwater drainage from the interior area;
- Prevent 100-year water surface elevations on Marine Creek and on the West Fork in the vicinity of Samuels Avenue from exceeding the existing 100-year FEMA floodplain elevations; and
- Meet urban design criteria with regard to pedestrians' proximity to water, based on studies of other urban waterfronts

A normal water surface elevation of 525 NGVD was selected based on the 2003 Feasibility Study of the proposed concept due to the previously mentioned criteria.

Isolation Gates

The hydraulic design for the Community Based Alternative includes three isolation gates to protect the interior area from flood flows. The proposed gate locations and names are indicated in Figure 3 - 12. During normal flow conditions, the gates would be open to allow free exchange of flow and water craft passage between the bypass channel and the interior area. During flood events, the gates would be closed to protect the interior area. The gates would confine the high flows to the bypass channel, which would be designed to convey the flow downstream. The design capacity of the system would be such that the SPF could be passed entirely through the bypass channel (gates closed) while maintaining the required four feet of freeboard and providing protection to the interior area.

Six configurations of flood isolation gates were considered. As the environmental and socio-economic implications of the gate configuration are virtually identical, assessment of gate configuration was made solely on the basis of its mechanical characteristics. Each gate type was evaluated based upon the following functional, operational, and aesthetic requirements:

- Allow capability of closing under its own weight without power;
- Provide a clear opening, capable of passing small watercraft in the boat channels, and pedestrian traffic along walkways;
- Incorporate a design with self-cleaning characteristics;
- Integrate a design whereby gate can essentially be hidden within structure; and
- Require a minimal amount of concrete to support the gate structure and operating equipment.

Based upon these criteria, it was determined that fixed-wheel (roller) gates would be superior to the other choices due to ability to close during a power outage; the relative ease to conceal gate leaves in a narrow concrete structure; and maintenance accessibility while in the open position.

Interior Drainage

Drainage of the interior area must be provided for conditions when the isolation gates are closed. Approximately 612 acres of land would drain to this interior area; storm sewers and surface grading would be required to convey surface runoff in this area. During normal flow conditions, runoff would drain freely to the West Fork through open isolation gates. During high flow conditions, the isolation gates would be closed and runoff would be confined to the interior area.

Three alternative approaches for providing drainage for interior areas were considered, including gravity discharge, storage of flow, or pumping via a stormwater pump station. The Community Based Alternative incorporates a combination of these approaches to provide storm drainage for the interior area. Gravity discharge would be used when the isolation gates are open; however, gravity flow is not feasible during floods because the design maximum water level in the bypass channel would be higher than in the interior area. During these conditions, a combination of storage and pumping would be used. The interior water feature could provide about 270 acre-feet (equivalent to 88 million gallons) of flood storage by allowing the water level to rise up to 528 feet.

City of Fort Worth drainage criteria are based on the ability to convey flow from a 100-year event. To meet these requirements, the interior area footprint would require a pumping capacity of 300 cfs and 250 acre-feet of storage. Based on these requirements, the proposed pumping and storage system would provide more than two feet of free board between the maximum water level and the minimum building foundation construction elevation of 530 feet NGVD.

A stormwater pump station is proposed for construction on the east side of the interior area near the TRWD gate. During major flood events, the isolation gates would be closed and excess interior drainage would be pumped. The pump station would house four pumps with 100 cfs capacity per pump. One pump would be a spare pump, allowing maintenance to be performed without reducing the capacity of the pump station below 300 cfs at any time. Routine inspection of pump capacity and maintenance would be part of the project sponsor's O&M obligations and subject to annual audit by USACE.

Hydraulic Mitigation

Construction of the bypass channel as proposed in the Community Based Alternative would require the mitigation of floodplain storage, referred to as "valley storage" to compensate for the increased hydraulic efficiency of the bypass channel. Valley storage loss caused by the construction of the bypass channel would be comprised of two components. First, routing the existing Clear Fork and West Fork through the bypass channel in comparison to the existing configuration would reduce the total length of river channel, resulting in less in-line floodplain storage. Second, during high flow scenarios (100-year and SPF conditions), the shorter channel length would also create a drawdown effect on water surface elevations in the Clear Fork and West Fork upstream of the bypass channel. This drawdown effect would also effectively reduce the upstream valley storage.

The amount of valley storage mitigation required for the Community Based Alternative was determined by hydraulic modeling analyses and compliance with the criteria established by the regional Corridor Development Certificate guidelines. The hydraulic analyses quantified the approximate volume of valley storage that would be lost as 5,250 acre-feet (8.47 million cubic yards), without mitigation. Of this, an estimated 2,850 acre-feet would be lost due to the creation of the

shorter bypass channel (reduced length versus existing river channel) and approximately 2,400 acre-feet of valley storage would be lost due to drawdown.

Approach and Methodology for Storage Alternatives

Typical options for creating or replacing valley storage include excavating a wider channel or providing an off-line storage basin. Numerous storage mitigation sites were investigated in an effort to determine the most suitable alternatives and storage sites based on cost effectiveness, proximity to the core project, and other factors. The investigation included a review of aerial photography, existing USACE topography, parcel ownership information, and utilities. Site reconnaissance trips were made along the existing levee system to identify, confirm and visually evaluate potential mitigation sites.

Definition of the geographic area considered for valley storage mitigation reflected a detailed understanding of the hydrologic, meteorologic, and institutional parameters affecting project performance. Valley storage mitigation sites located upstream on the West Fork provide effective valley storage mitigation in compliance with the CDC criteria. The vast majority of the valley storage requirement arises from changes on the West Fork so it is appropriate to provide mitigation on the West Fork. In the SPF, the West Fork flow is the dominant flood peak. The watershed of the West Fork is more than four times larger than the Clear Fork, thus storage located on the West Fork is more likely to provide benefit. The West Fork was investigated from downstream of Riverside Drive to upstream of Westworth Boulevard. The Clear Fork was investigated from its confluence with the West Fork to U.S. Interstate 30.

The evaluation of storage mitigation sites included three phases:

1) identification/investigation, 2) ranking, and 3) findings. The following is a summary of the site identification/investigation, ranking rationale, and findings which determined the most suitable storage mitigation sites.

Site Identification/Investigation

The primary emphasis during the site identification and investigation was to select undeveloped sites in the immediate vicinity of the Trinity River. Aerial photographs and existing site topography were used to develop a set of preliminary valley storage mitigation sites which could be investigated by the project team. Property ownership and existing site utilities were researched and identified for each of the potential sites. A total of forty (40) individual sites were identified and subsequently investigated to estimate the potential amount of valley storage that could be created on each site. The amount of valley storage was then compared to the cost to acquire the property and the cost of necessary site improvements to create the additional storage. The valley storage mitigation sites were divided into two groups and referred to as the Valley Storage Mitigation Sites - Lower West Fork and Upper West Fork as shown on Figures 2-5 and 2-6, of Appendix C respectively.

Site visits were conducted by both CDM and TRWD personnel to further quantify the viability and desirability of each of the sites. The following is a summary of the steps taken in determining the total site improvement costs for each of the preliminary sites.

Site Improvements

Each valley storage mitigation site was investigated for its potential storage capacity based on 100-year and SPF water surface elevations from the hydraulic modeling and USACE topographic data. Based upon this information, each site was evaluated for cuts and fills to determine the potential valley storage volumes on a balanced site basis. Balancing the site meant that all excavation cut materials would be retained on-site, considered to be the most economically favorable alternative, if feasible. The existing topography initially determined which sites could be balanced or required haul-off. Excavation is required below the SPF water surface elevation and fill limited to above SPF on each site to create a net gain in valley storage. A majority of the valley storage mitigation sites did not provide substantial benefit from balancing the excavated material and were subsequently investigated as haul-off sites. After evaluating sites as either balanced, haul-off or a combination, the preliminary excavation and valley storage volumes were tabulated for each of the sites. These volume quantities and respective areas impacted by the various cut and fill operations were tabulated and units prices assigned for each element of work.

Parcel Ownership

Initial parcel ownership identification was performed using parcel ownership information provided by the TRWD geographical information system. Parcel queries were performed on an individual site basis to determine ownership and the current assessed parcel value including site improvements if applicable. Valley storage sites that share off-site fill sites had the parcel costs prorated based on the approximate volume of material to be disposed of at each site.

Additional parcel ownership checks were made through the Tarrant Appraisal District (TAD) website if the initial query did not cover the full extents of the valley storage mitigation sites. Parcel acquisition costs were then tabulated and grouped as either public or private.

Utilities

Public and private utilities conflicts and impacts were initially screened using available City-wide data from the geographical information system. Once the initial screening was completed and the most suitable sites were identified, public and private utility carriers were contacted to confirm the extent and nature of utilities on the preferred sites. Utilities were considered either regional or local depending on the service area they covered. Regional utilities serve larger service areas than that of each individual valley storage mitigation site or serve as major transmission facilities. If the utilities only serve the immediate area of the valley storage mitigation site, then they are considered local.

For estimation purposes local, utility facilities were considered to not require replacement since they could be abandoned or removed at minimal cost without significantly impacting the overall utility service grid. Regional utility facilities given their system-wide importance were assumed to be fully replaced or protected if within the impact limits of each of the valley storage mitigation sites.

Ranking Rationale

The site improvements, costs, parcel ownership and values, and utility relocation costs were tabulated for each site and are shown on Table 2-3 of Appendix C. The sites were then ranked using the ratio of total cost versus storage ($/ AC-FT) with the intent of identifying the most economical sites. These rankings are shown on Table 2-4 of Appendix C.

Site Findings

Cost was one component in the overall evaluation of the storage mitigation sites. Other factors, such as proximity to other improvements, project staging, impacts to existing vegetation, implementation, and ecosystem improvement opportunities were also considered in the final findings. Based on this evaluation, several potential valley storage mitigation sites were identified as favorable to include the Community Based Alternative. The largest site is located approximately three miles upstream of University Drive on the West Fork, and is referred to as the Riverbend site (See Figure 3-13). Through a combination of partial levee removal and excavation, it is estimated that approximately 3,200 acre-feet of valley storage could be created in the Riverbend area. Development of the specific grading plan for this area incorporates opportunities to develop ecological value in conjunction with meeting valley storage requirements. This is described in more detail in subsequent sections. Additional sites located downstream of the proposed Samuels Avenue Dam, between the dam and Interstate Highway 35 were also identified as suitable sites for additional valley storage mitigation.

Utilizing a combination of the Riverbend site and the sites downstream of Samuels Dam would result in valley storage mitigation of approximately 4,050 acre-feet. However, an additional 1,200 acre-feet of valley storage mitigation would be required to fully mitigate valley storage loss associated with the hydraulic elements of the Community Based Alternative.

Drawdown Alternatives

In addition to excavating replacement storage, storage lost due to drawdown can also be mitigated by providing structures or channel roughness to reduce or eliminate the drawdown. However, constricting or otherwise impeding the flow in the bypass channel below the West Fork/Clear Fork confluence is not feasible because it would create unacceptable water surface elevation increases upstream on the Clear Fork. Drawdown mitigation analyses accordingly focus on West Fork sites upstream of the confluence to the bypass channel, and are summarized below.

Channel Dam

A channel dam could be constructed in the West Fork upstream of the confluence with the bypass channel to mitigate or eliminate the drawdown. This concept was rejected because it would impede water craft passage and detract from the aesthetics of the Community Based Alternative.

Large Bridge

A large bridge that would act as a dam during high flows could be constructed on the West Fork upstream of the FW&W Railroad Bridge to mitigate drawdown by allowing water craft passage through restricted flow conveyance openings while impeding flood flows. However, a large bridge would obstruct views of the FW&W Railroad Bridge and Downtown and would require a very wide cross-sectional area for structural integrity. The thickness of the proposed structure would be viewed as an impediment to pedestrian traffic on trails adjacent to the river. This type of bridge would also be extremely expensive to construct.

Channel Obstructions/Modifications

Various combinations of channel modifications to impede flood flows were also considered for the area between University Drive and the FW&W Railroad. Possible obstructions included partially filling the channel, constructing transverse dikes in the floodplain, and installing grade control

structures. These approaches were generally considered to be more aesthetic than the channel dam or bridge described previously.

However, analysis of these approaches indicated that, while it would be possible to eliminate drawdown upstream of University Drive, the channel modifications would require fill in the floodplain resulting in valley storage loss in the area where they are located. The channel obstructions considered in this option were not as effective in mitigating drawdown loss nor were the channel obstructions as cost effective in comparison with other options.

University Drive Modifications

Under existing conditions, a large portion of the 100-year and SPF flows pass over the University Drive embankment north of the bridge over the West Fork. This embankment could be raised to eliminate nearly all of the drawdown upstream of University Drive. About 75 percent of the total West Fork drawdown loss could be mitigated in this way, which is more cost-effective than other alternatives. This option also produces an additional benefit of raising University Drive out of the 100-year flood, allowing additional emergency use of the roadway.

Summary of Hydraulic Mitigation

In summary, valley storage loss associated with the hydraulic elements of the Community Based Alternative would be mitigated by the following:

- Partial levee removal and excavation in the Riverbend site approximately three miles upstream of University Drive;
- Excavation of additional sites immediately downstream of the Samuels Avenue Dam, and adjacent to Interstate Highway 35; and
- Modification of the University Drive roadway embankment, north of the bridge over the West Fork.

In combination, these measures have been verified to fully mitigate for 100 percent of the valley storage inputs, in full compliance with CDC criteria.

Interior Water Feature

The Samuels Avenue Dam would create a backwater impoundment upstream in portions of the West Fork and the Clear Fork, providing the opportunity for inclusion of a focal point, or interior water feature. Community input and stakeholder discussions, both before and after publication of the TRV Master Plan, identified a desire to maintain the location of the existing Clear Fork/West Fork confluence and the associated view corridors. This suggested that the best location for a water feature would generally be between the confluence of the Clear and West Forks and the FW&W Railroad Bridge. A more detailed evaluation of configuration and location for the interior water feature was conducted and is described in the following section.

Alternative Layouts

Several configurations were considered for the location, size and shape of the interior water feature. These options primarily affect the aesthetics of the water feature; however, the size and shape of the interior water feature can also affect view corridors, green space, excavation quantity, evaporation loss, interior flood storage, water circulation, and potentially developable area. Aesthetics, scale, and compatibility with the urban design were also important factors in the selection of the preferred layout. For example, a water feature that is too wide would discourage pedestrian crossing, while a water feature that is too small would discourage boating and other aquatic activities. The location of the water feature was also influenced (constrained) by the potential for environmental contaminants in adjacent areas. The alternatives examined are as follows:

Round Water Feature near Clear/West Fork Confluence

This alternative would provide an enlargement of the natural confluence by widening and reshaping a portion of the existing West Fork channel across from Taylor Street (Figure 3 - 14). The surface area would be small, potentially restricting views of the water from the interior area and adjacent banks. Also due to the small size, both pedestrian and boating connectivity could be limited in this concept. The appearance would be somewhat inconsistent with the natural shape of a river channel. In addition, this water feature configuration would require a substantial amount of excavation outside the existing channel and near potentially contaminated material.

Asymmetrical Elongated Water Feature

This alternative builds upon the Round Water Feature concept, but includes a more elongated water feature to tie into the West Fork near the FW&W Railroad Bridge (Figure 3 - 14). With this configuration, the existing view corridor of the West Fork would be maintained and access to the water from points west of the FW&W Railroad Bridge would be enhanced. An asymmetrical portion on the northeastern bank of the water feature would provide an opportunity for increased shoreline and potentially a marina-type facility for small boats. However, to design and construct a water feature with this configuration would also require excavation outside of the existing channel, increasing the amount of total excavation. In addition, it would require removal of existing monitoring wells installed as part of an agreement between TXU and TCEQ.

Elongated Water Feature in Existing River Channel

This alternative configuration is similar to the Asymmetrical Elongated Water Feature concept (Figure 3 - 14). This configuration would maintain the concept of the natural confluence and view corridors but would restrict the width of the feature. By limiting the northeastern edge to within the current levee system, existing monitoring wells at TXU would remain. This alternative would provide connectivity for recreational activities from points west of the FW&W Railroad Bridge and would allow for minimal excavation outside of the existing channel and levee system.

The Elongated Water Feature in Existing River Channel was selected preliminarily as the preferred configuration for the Community Based Alternative, due to the opportunity to maintain existing view corridors at the confluence of the Clear and West Forks, and the minimal excavation required.

Bridges

The Community Based Alternative (in particular the bypass channel) would affect existing streets and roads in the area. In order to maintain existing traffic flows to and through the area, new bridges over the bypass channel for North Main Street, Henderson Street, and White Settlement Road would be required. Initial transportation analyses also suggested that an extension of White Settlement Road into the project interior would improve traffic flow and access. Such an extension would also require a bridge across the interior water feature. In addition to these four vehicular bridges, the Community Based Alternative has evolved to include two new pedestrian bridges to increase connectivity and facilitate recreational and foot traffic to and through the Central City area.

Henderson Street Bridge

The recommended bypass channel configuration transects Henderson Street (otherwise known as Jacksboro Highway, State Highway 199) about 3,000 feet below the upstream end of the bypass channel. Therefore, Henderson Street would need to be elevated to pass over the top of the new bypass channel levees. A bridge alignment for Henderson Street that would provide an above-grade crossing at the FW&W Railroad was identified. This alignment was selected partly due to the public safety enhancement provided for the railroad crossing and geometric constraints of the bypass channel due to its height and proximity to the railroad. The proposed Henderson Street Bridge includes four to six lanes of moving traffic and 10 foot wide sidewalks. Two support piers would be built in the channel, but the current design calls for them to be placed on either side of the base flow channel.

White Settlement Road Bridge

The bypass channel would transect White Settlement Road approximately 2,000 feet downstream of the upstream end of the bypass. The construction and layout of this bridge would be very similar to that of the Henderson Street Bridge, with the bridge elevated to pass over the new levees of the bypass channel, as well as the FW&W Railroad. The proposed White Settlement Road Bridge over the bypass channel includes four lanes of moving traffic and 10 foot wide sidewalks. Two support piers would be built in the channel, but placed outside (on either side) of the base flow channel.

Main Street Bridge

The bypass channel for the Community Based Alternative would cross North Main Street approximately 1,580 feet upstream of the downstream end of the bypass channel. Main Street would bridge over the bypass with the low chord of the bridge at the tops of the new levees. The bridge would include four lanes of moving traffic and 10 foot wide sidewalks. In contrast to the Henderson Street and White Settlement Road Bridges, the Main Street Bridge would be constructed with a single pier due to the desire of the urban designers for this structure to be a signature element.

The urban design team and other stakeholders indicated a strong preference for a "signature" bridge for Main Street, as the bridge would be a symbolic or gateway structure. This bridge would be a prominent feature of the Community Based Alternative, when viewed from any angle, in particular approaching North Main Street from the Paddock Viaduct or the Stockyards (Figure 3 - 15).

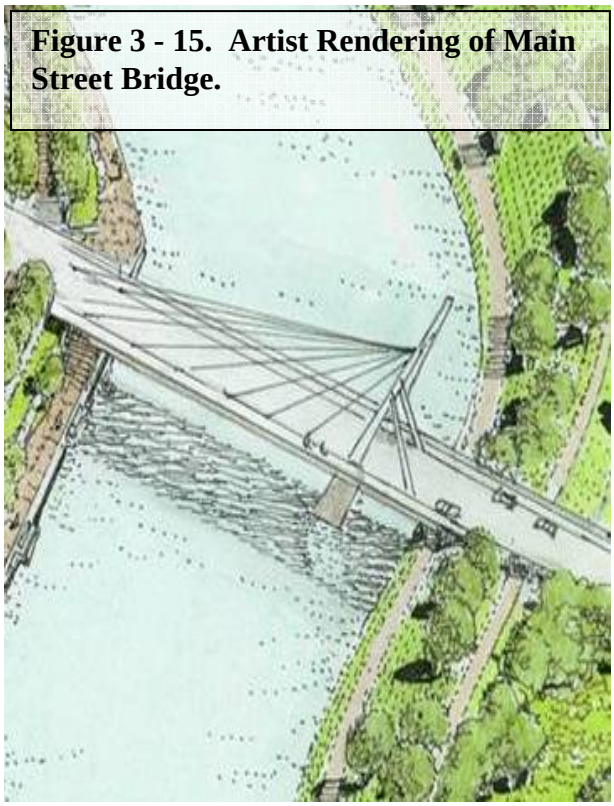


Figure 3 - 15. Artist Rendering of Main Street Bridge.

Pedestrian Bridges

Providing and/or improving continuity in the existing trail system was of paramount importance in the development of the Community Based Alternative. A number of workshops were held with stakeholder groups relative to the location of pedestrian bridges that would be needed to maintain critical trail connections. Key connection criteria included: providing a continuity of urban trails through Downtown consistent with the overall Trinity Trail system and creating and enhancing linkages to neighborhoods and districts (Cultural District, Rockwood, Downtown, Stockyards).

The Community Based Alternative, as currently proposed, would include two pedestrian bridges. One pedestrian bridge would be located on the upper bypass approximately 1,000 feet downstream of Henderson Street and the second pedestrian bridge would be on the West Fork approximately 500 feet upstream of the FW&W Railroad.

Factors influencing the configuration of the bridges included a desire to keep the bridge deck elevation relatively close to the normal water surface elevation (avoiding stairs or steep ramps as an approach), a need to maintain clearance under the bridges for small boat traffic, and a need to minimize the effect of the bridge on flood flows and to avoid creating a potential debris hazard. Due to the equestrian use of the Trinity Trail system, particularly on the West Fork trails, equestrian traffic was also considered in evaluating the configuration of the West Fork pedestrian bridge. Three configurations were considered for the pedestrian bridges:

- Elevating the bottom chord of the pedestrian bridges above the top of levee;
- Positioning the bottom chord between the 100-year flood and SPF water level; or
- Locating the lowest bridge beam chord well below the 100-year water surface elevation at an elevation near the normal water surface level.

The first option would require users to climb nearly three stories above trails proposed along the river edge in order to cross over the bypass channel. This was considered to be impractical as well as

undesirable. The third alternative would preclude the small boat traffic considered essential to maintaining the water-based connectivity which was a key element of the urban design. The second configuration appears to provide the best compromise, and the precise locations, elevation, and design of the bridges would be the result of careful engineering analyses intended to minimize the hydraulic effect of the bridges. The recommended configuration is shown in Figure 3 - 16. The proposed pedestrian bridge on the West Fork would be wider and more structurally intensive to allow equestrian use, providing connectivity for equestrian trails along the west side of the bypass channel.

Ecosystem Improvement

During development of the Community Based Alternative, opportunities for ecosystem improvement were also evaluated. A primary goal of the habitat and ecosystem improvement measures is to restore some of the natural habitat that has been heavily impacted by past flood damage reduction projects and urban development. This includes improving habitat diversity and quality to benefit a variety of resident and migratory wildlife species.

The ecosystem improvement areas identified as part of the Community Based Alternative are tied primarily to the areas proposed for valley storage mitigation, described in the previous section. The sites identified for valley storage mitigation/ecosystem improvement are located in three general areas: the Riverbend site - where the bulk of the ecosystem improvement activities will occur; Rockwood Park - where two oxbows will be reconstituted, and the area generally referred to as Riverside - adjacent to Interstate Highway 35 and Riverside Park.

As indicated in the Purpose and Need section, one objective of the ecosystem improvement activities is to create or enhance riparian woodlands/bottomland hardwood forests. USACE, USFWS, and TRWD staff held substantial discussions on ecosystem improvement activities during the development of the Community Based Alternative. Input was provided regarding areas for ecosystem improvement, the type of ecosystem improvement appropriate for each area, the preferred hydroperiod for riparian woodlands, and the preferred species for planting as a part of ecosystem improvement. The ecosystem improvement activities proposed as part of the Community Based Alternative include the preservation of existing high value trees, establishment of new riparian and upland woodlands, establishment of native grasslands, reestablishment of former oxbow stream channels, and creation of emergent wetlands.

Based on the recommendations, a series of ecosystem improvement activities are proposed. The extent and location of each is shown on Figure 3 - 17.

- Existing grasslands dominated by non-native species would be converted to native grasslands, upland and riparian woodlands, aquatic (oxbow) stream habitat, or emergent wetlands;

- Existing upland woodlands would be enhanced or converted to riparian woodlands or aquatic (oxbow) stream habitat;

- Existing riparian woodlands (two locations) would be enhanced;

- Existing aquatic habitat would be re-established as aquatic (oxbow) stream habitat or emergent wetlands; and

- Breaks in the existing levee would be used to create the large area of riparian woodlands that would be the major ecosystem improvement feature.

Ecosystem improvement activities include 42 acres of grassland, 140 acres of riparian woodland, 59 acres of upland woodlands, 5 acres of aquatic oxbows, and 15 acres of emergent wetlands. Ecosystem improvement areas would contain a total of 147 Habitat Units (HUs) upon implementation of the Community Based Alternative.

Recreational Features

Recreational features associated with the Community Based Alternative were developed in conjunction with the various stakeholders such as TRWD, the City of Fort Worth, Streams and Valleys, and Tarrant County. A major objective of this community-based approach is providing trails and greenways to link people with the river and the City; thus, an enhanced trail network was evaluated.

Consideration was given to the overall continuity with the regional trail system, as the bypass channel essentially intersects an important segment of existing trail which allows high-speed bicyclists to continue downstream on the west side of the existing West Fork channel adjacent to downtown. Bicyclists traveling from either Benbrook or Lake Worth would access the trail on the west side of the bypass channel.

Other connection criteria included providing access points for neighborhoods on the west side of the bypass channel to cross the channel into the interior area (and vice versa). Due to the new confluence the bypass channel would create, additional connection criteria on the West Fork include the ability for equestrian traffic to continue downstream along the west side of the bypass channel.

Additional trails recommended for inclusion in the Community Based Alternative are shown in Figure 3 - 18. Trails would be provided along both sides of the new bypass channel, and along one side of the interior water feature. An additional trail is proposed for the Riverbend site, a site selected for valley storage mitigation and ecosystem/habitat restoration. In total, approximately 10 miles of additional trails are proposed, with the majority of the trails provided along the bypass channel and water feature. Appendix H includes more detail on proposed trails within the Central City area.

Improving river accessibility via enhanced navigability of waterways is another feature of the Community Based Alternative. As described previously, the bypass channel and associated hydraulic elements (dam, isolation gates, bridges, etc.) are being designed in a manner to promote water-based recreation. A contiguous boating loop of approximately 3.5 miles would be created, including the bypass channel and the existing West Fork channel adjacent to downtown.

SUMMARY OF THE COMMUNITY BASED ALTERNATIVE

The preceding pages have presented the plan formulation process and analysis which have led to the identification of the Community Based Alternative. This alternative is the sum of the flood damage reduction, Ecosystem Improvement, urban revitalization, and recreation features described in the

previous pages. For easy reference the features of the alternative have been listed below and are graphically displayed on Figure 3 - 19. Additional information and illustrations of isolation gates and Samuels Avenue Dam are included in Appendix C.

- Bypass channel extending just downstream of Fifth Street on the Clear Fork to just upstream of Northside Drive on the West Fork, approximately 8,400 feet in length and 300-400 feet wide between the top of levees;
- Levee system, adjoining embankment, natural edge on the western edge of the bypass channel and "hard edge" design on the eastern edge of the bypass channel.
- Samuels Avenue Dam on the West Fork, approximately 1,100 feet downstream from Samuels Avenue, designed to create a normal water surface elevation of approximately 525 feet;
- Three isolation gates designed to restrict flood flows to the new bypass channel and to isolate the interior area from flood flows;
- Street and highway improvements for the following:
    - Henderson Street (SH 199) and White Settlement Road Bridges over the bypass channel, including railroad grade separations,
    - North Main Street (US287) Bridge over the bypass channel,
    - Pavement and traffic engineering improvements to improve capacity, movement and provision for automobiles and public transit,
    - Improved White Settlement intersection with Henderson Street and extension of White Settlement Road east, to intersect with North Main Street,
    - Additional White Settlement Road bridge over the proposed interior water feature;
    - Modifications to University Drive north of the existing bridge over the West Fork to the intersection with Jacksboro Highway (State Highway 199) raising a section of University Drive out of the 100-year floodplain;
    - Other street improvements associated with bypass channel, levee and major thoroughfare work;
- Utility relocations, including water, sanitary and storm sewer, electric, gas, and telecommunications to enable construction of the bypass channel, levee system, and transportation and storm drainage improvements;
- Interior area for urban revitalization, bordered by the existing West Fork to the north, east, and south and the bypass channel to the west;
- An interior water feature approximately 900 feet in length;

- Valley storage mitigation sites at Riverbend (coupled with ecosystem improvements) and downstream of Samuels Avenue Dam; and

- Enhanced river accessibility, including a trail network of approximately 10 miles of waterfront trails and an approximately 3.5 mile contiguous boating loop.

The following sections reiterate the project's goals and objectives, classified by four major categories at the beginning of this chapter. A description of how each component of the Community Based Alternative would contribute to those goals and objectives is also included.

Flood Protection

The project's goals and objectives with regard to flood protection are:

- Restore the design level of protection (SPF+4') throughout the system the project area.

- Maintain or improve flood protection associated with interior drainage to the floodway system.

The bypass channel would provide full SPF+4' protection for a large portion of the Central City area. This would be accomplished through the construction of new levees that would confine flood flows to the bypass channel. The bypass channel would also create lower water levels on a reach of the West Fork between the FW&W Railroad and University Drive. This would improve levee protection and reduce interior flooding in a damage prone area (Sumps 14W and 15W). In addition, the bypass channel would eliminate one interior drainage area (Sump 16W), removing approximately 20 acres from the 100-year floodplain.

The University Drive modifications would remove a section of the roadway from the 100-year floodplain and would reduce the depth and frequency of road overtopping on University Drive.

The stormwater pump station and the isolation gates would operate together to eliminate structure flooding in two interior drainage areas (sumps 25C and 26) where currently an estimated 171 structures are at risk of flooding.

The Riverbend valley storage area would provide approximately 3,000 acre-feet of flood storage. This storage would reduce peak flows between the site and the FW&W Railroad, thus increasing the level of flood protection in this reach. This reach currently has areas with less than SPF+4' protection.

Ecosystem Improvement

As stated previously, the project's goals and objectives with regard to Ecosystem Improvement are:

- Restore, improve, and diversify aquatic habitat associated with the Clear and West Forks of the Trinity River for native aquatic organisms;

- Improve and increase quantity of emergent wetland habitat for migratory birds of ecological importance;
- Establish continuity and connectivity within and between regionally and nationally significant ecosystems, and
- Protect and improve existing pockets of high quality bottomland hardwoods adjacent to the river system.

The bypass channel, two reconstituted oxbows at Rockwood Park, and a new oxbow within the Riverbend valley storage/ecosystem improvement site would add additional stream length to the West and Clear Forks. This additional stream length would improve existing fisheries. The oxbows at Rockwood Park would restore previous aquatic habitat, while the new oxbow at Riverbend could potentially create aquatic habitat amenable to shallower species, which would provide additional diversity within the study area.

Over 14 acres of new emergent wetlands would be established within the Riverbend valley storage/Ecosystem Improvement site. Much of this area (over 13 acres) would be concentrated in a single location with substantial opportunity to improve the site to maximize the value of the habitat for migratory waterfowl. The Riverbend site would also improve and develop approximately 140 acres of riparian forest within a 260 acre floodplain complex. This complex would add value to an existing public greenbelt.

As part of a regional effort, North Texas communities have contributed to the Trinity River Common Vision which, in part, has established long-terms goals to create a contiguous natural and recreational greenbelt along the corridors of the major tributaries of the Trinity River in North Texas (NCTCOG 2004). The proposed project would contribute greatly to this effort by restoring ecosystems within the River's corridor. The Riverbend valley storage/Ecosystem Improvement site would be constructed in close proximity to other notable regional natural areas.

Urban Revitalization

As stated previously, the project's goals and objectives with regard to urban revitalization are:

- Provide connection and access to the Trinity River
- Develop a high density environment for people to live, work, play, and learn
- Orient mixed use development to the river front
- Create and enhance linkages to and between neighborhoods and Downtown, the Stockyards, and the Cultural District
- Maintain water quality
- Increase the physical amount of water edge
- Develop aesthetic and recreational focal points

The bypass channel would contribute to the urban revitalization goals and objectives by creating a corridor for people to enjoy water activities as well as walking, running, biking, roller-blading, and horseback riding along the water's edge.

The interior water feature would provide a focal point for the area by accentuating views of the confluence as well as providing public open space in proximity to Downtown and other waterfront sites. It would also provide additional public access to the water.

The extension of White Settlement Road and construction of the White Settlement Road Bridge would provide a connection between the residential areas west of the bypass channel and the Central City area as well as providing an additional thoroughfare across the Central City area to Main Street.

The North Main Street Bridge would be a signature bridge of aesthetic design that would welcome residents and visitors to the Central City area.

The trail enhancements and two pedestrian bridges would provide a continuity of trails through the area consistent with the existing Trinity River trail system and would also enhance linkages to residential areas and other districts within the Fort Worth area, such as the Cultural District, Rockwood, Downtown, and the Stockyards.

In general, the sum of the Community Based Alternative's components would encourage urban revitalization by creating an urban environment conducive to living, working, playing, and learning while also providing connectivity and access to the Trinity River.

Recreation

As stated previously, the project's goals and objectives with regard to recreation are:

- Provide extensive and direct public access to the river and waterfront;
- Facilitate a water-based system of linkages between Downtown, the Stockyards, and the Cultural District;
- Provide recreational and open space amenities that are supportive of urban revitalization goals;
- Provide a continuity of urban trails through Downtown, consistent with the overall Trinity Trails system; and
- Create additional trail linkages with neighborhoods and cultural amenities.

The recreational components of the Community Based Alternative include the construction of approximately ten miles of new trails and greenways as well as the promotion of water-based recreational activities due to the increased navigability of the Trinity River resulting from the hydraulic components of the alternative. Together, these recreational components increase public access to the water, create water- and trail-based linkages between Fort Worth's many districts, and provide open space and recreational facilities. All of these recreational components contribute to the achievement of the project's recreational goals and objectives listed previously.

In addition, the bypass channel, interior water feature, and pedestrian bridges would contribute to the recreational goals and objectives stated above by providing increased access to both the Central City area and the waterways. The Valley Storage mitigation sites and ecosystem improvement areas would provide additional greenspace.

Trinity Uptown Features

The Trinity Uptown Plan describes additional features which could be added to the project area by private developers once the infrastructure components associated with the Community Based Alternative have been implemented. These features represent the full maturation of the urban design, and include removal of the levees within the project interior, expansion of the system of water linkages and water features, transportation improvements, and a significant degree of land use intensification. As a statement of design intent, however, the features described in the Uptown Plan are conceptual in nature, and are representative of an anticipated scenario of future development rather than a set of specific proposals having identified proponents.

This chapter has presented the formulation process and identified the features of two action alternatives, P&G Based and Community Based. Additionally, the No-Action, or Future without-project, Alternative was presented. A comparison of the environmental impacts of each of the 3 alternatives and their impacts when considered with other reasonably foreseeable actions are presented in the next chapter. Finally, Chapter 4 will identify the preferred alternative.

Figure 3 - 1. Flood Damage Reduction Study Reaches.

Figure 3 - 2. Extent of 100-year Floodplain in Cultural District Levee and North Main Levee Loop.

Figure 3 - 3. Downtown, Stockyards, and Cultural Districts.

Figure 3 - 4. Ecosystem Improvement Study Reaches.

Figure 3 - 5. Measures Analyzed under the P&G Based Alternative for Bringing Cultural District and North Main Levees to Specified Level of Protection.

Figure 3 - 6. CDC Mitigation Site Required for Implementation of the P&G Based Alternative.

Figure 3 - 7. Ecosystem Improvement Component of P&G Based Alternative.

Figure 3 - 8. Recreational Features of the P&G Based Alternative.

Figure 3 - 9. Flood Damage Reduction, Ecosystem Improvement, and Recreation Components of the P&G Based Alternative.

Figure 3 - 10. Alignment for Bypass Channel Alternatives A and B.

Figure 3 - 11. Bypass Channel Alignment for Community Based Alternative.

Figure 3 - 12. Proposed Locations of Isolation Gates for Community Based Alternative.

Figure 3 - 13. Valley Storage Mitigation Sites for Community Based Alternative.

Figure 3 - 14. Configurations Considered for Interior Water Feature.

Figure 3 - 15. Artist Rendering of Main Street Bridge.

Figure 3 - 16. Configuration for Pedestrian Bridge Crossing of Bypass Channel.

Figure 3 - 17. Ecosystem Improvement Components of Community Based Alternative.

Figure 3 - 18. Recreation Features of Community Based Alternative.

Figure 3 - 19. All Features of the Community Based Alternative.

ENVIRONMENTAL CONSEQUENCES

FINAL ARRAY OF FULLY FORMED ALTERNATIVES

The environmental consequences of three alternatives are presented in this chapter. The two action alternatives were developed in accordance with the planning objectives, planning constraints, and formulation strategies presented in Chapter 3. The No Action Alternative, which was developed within the future without-project framework, is presented as an alternative to the two action alternatives. The outputs and impacts of the Principles and Guidelines (P&G) Based and Community Based Alternatives are presented below and compared to outputs and impacts of the No Action Alternative. Additionally, the impacts from a group of connected actions, which are anticipated to occur in response to implementation of the Community Based Alternative, are presented.

No Action Alternative

The No Action Alternative is equivalent to the description of the future without-project conditions described in Chapter 3. Under this alternative, no further measures would be taken to bring the existing flood protection back to the design level or to bring the floodway into compliance with the CDC standards.

Under the No Action Alternative, no measures would be implemented to improve the ecosystem function within the study area. The existing environmental conditions within the floodway would remain the same for the No Action Alternative, while the environmental condition in locations outside the floodway would essentially continue to degrade.

There are several projects that would provide some urban revitalization in the form of additional housing and mixed use development for the study area under the No Action Alternative. Examples include Trinity Bluffs, South of 7th Street, and a variety of downtown residential projects redevelopment of the Cotton Depot and the Neil P. Anderson building. Additional information is can be found in Table 4-8. However, if the No Action Alternative were implemented, land use in the immediate project area would remain at levels significantly less productive than those of surrounding portions of the study area.

Several recreational projects are planned that do not require the P&G Based or Community Based Alternatives for implementation. These projects would ease access to the existing recreational system, but the existing recreational demand is not being met, and under the future without-project condition that shortfall would increase.

P&G Based Alternative

Implementation of the P&G Based Alternative would raise the existing level of flood protection to SPF +4; the required level under the Regional CDC standards. The alternative consists of a levee raise, construction of a small length of flood wall and provision for flood gates at areas that currently are not high enough to provide SPF protection.

The levee replacing the Main Street Floodwall would have a crest elevation of 550.7 feet, a base width of 110', a length of 700', and a total volume of 14,490 cubic yards. The Tarantula Railroad Bridge crosses the West Fork Trinity River approximately 2880 feet upstream of the confluence of the West Fork and the Clear Fork Trinity Rivers. Breaches at the Tarantula Railroad would be closed by use of a permanent five foot high hinged gate that can be closed during peak flows.

In addition, Henderson Street crosses the levee system in two locations. Along the left bank of the Clear Fork Trinity River the road profile for Henderson Street does not meet the SPF +4 flood criteria elevations. In order to correct this breach, a gated structure is proposed. This structure is envisioned to consist of double swing gates. The third structure required to meet the SPF flood criteria elevations would be along 7th Street on the left bank of the Clear Fork Trinity River. The structure would be similar to the Henderson Street gated structure. Both structures would be two feet in height.

Improvements are proposed for two low sections of the levee system (along the Right Bank of the West Fork Trinity River and the Left bank of the Clear Fork Trinity River). The total amount of fill required for this construction would be approximately 180,700 cubic yards. To raise segments of the levee system in the areas mentioned above, the new fill material would be placed on the riverside of the levee in order to stay within the current right-of-way limits and not disturb sump areas and private property. This placement of material is, in turn, subject to compliance with Regional CDC criteria. Hydraulic mitigation necessary to meet CDC criteria consists of an 18-acre site excavated to an average depth of 6 feet and 1V:3H side slopes.

Riparian woodland improvements would be implemented on approximately 64.5 acres of existing lower quality woodlands. These improvements would include planting five to ten hard and soft mast producing trees and shrubs per acre, and some minor thinning of non-native invaders to assist restoring more natural species composition to the woodlands. An additional 55.5 acres would be planted with hard and soft mast trees for riparian corridor development. Twenty-one acres would be converted to wetlands, while another 2.8 acres of existing wetlands would be improved by planting additional aquatic plants. Two historic river meanders would be restored and reconnected to the main channel of the river.

An additional 1.5 miles of 12-foot wide concrete, multipurpose recreation trail would be provided. The trail would link the southern end of the proposed project to the existing Trinity Trail System. The surrounding neighborhoods would be provided additional trail access and rest stations through four new trail heads and six benches. Additional user information would be provided through self-guided interpretive signage and mile markers.

The P&G Based Alternative was developed within the framework described in Chapter 3 (Formulation Strategies). Therefore, formulation for urban revitalization was not performed for this alternative, and no significant urban revitalization benefits are anticipated.

Community Based Alternative

The Community Based Alternative consists of a bypass channel, levee system, and associated improvements to divert flood flows around a segment of the existing Trinity River adjacent to downtown Fort Worth. The proposed bypass channel is approximately 8,400 feet long and approximately 300 feet wide between the top of levees and would be approximately 30 feet below the existing grade. The channel would extend from the Clear Fork downstream of West Seventh Street to the West Fork, intersecting the West Fork approximately 2,600 feet upstream of the existing confluence with the Clear Fork. The channel would continue to the northeast and rejoins the West Fork 8,500 feet downstream of the existing confluence with the Clear Fork.

Water levels in the bypass channel and adjacent waterways would be controlled by a dam with crest gates. The dam would be located on the West Fork of the Trinity River just east of Samuels Avenue Bridge and would include adjustable gates designed to open downward, thus lowering the crest to allow major flood events to pass. The crest would be at 524.3 feet NGVD, and the dam is designed to maintain normal water levels of approximately 525 feet NGVD in the bypass channel and interior area. Three isolation gates would be located upstream at the confluence of the bypass channel and the Clear Fork, at the midpoint of the bypass channel and the West Fork confluence, and downstream at the confluence of the bypass channel and the West Fork. These gates are designed to protect the interior area east of the bypass channel from flood flows during large events.

Construction of the bypass channel, dam, and isolation gates would allow approximately two miles of the existing West Fork Trinity River to function as a controlled, quiescent watercourse. A water feature or urban lake, approximately 900 feet long, is proposed for the interior area. The interior water feature would extend from the bypass channel southeast to the existing West Fork and Clear Fork confluence of the Trinity River.

Six bridges are proposed for the project, including four vehicular bridges and two pedestrian bridges. Vehicular bridges are proposed over the bypass channel at North Main Street, over the bypass channel and the Fort Worth and Western Railroad (FW&W Railroad) at Henderson Street and White Settlement Road, and on the White Settlement Road extension over the interior water feature. Two pedestrian bridges are also proposed, across the bypass channel downstream of Henderson Street, and across the West Fork, approximately 500 feet upstream of the existing FW&W Railroad Bridge.

The project also includes proposed modifications to University Drive, which would effectively raise the roadway approximately 10 feet from existing grade and out of the 100-year floodplain. The proposed modifications begin north of the existing bridge over the West Fork extending to Jacksboro Highway (State Highway 199).

Without mitigation, the project would result in a loss of floodplain or valley storage due to the fact that the bypass channel is shorter and more efficient than the existing river channel. With no corrective action, as much as 5,250 acre feet of valley storage could be lost. To mitigate for this potential loss of storage, valley storage mitigation sites are included. Three areas would provide valley storage mitigation, along the West Fork of the Trinity River upstream of the project area, in the vicinity of the Samuels Avenue Dam, and slightly downstream of the dam in proximity to Riverside Park. Construction of the bypass channel and associated valley storage sites would not increase downstream water surface elevations or downstream flow.

The ecosystem restoration areas for the Community Based Alternative are tied to the areas proposed for valley storage mitigation. The extents of the areas included for ecosystem restoration are located in the three general areas described above for valley storage mitigation. The proposed ecosystem restoration activities include establishment of native grasslands, enhancement of upland woodlands where appropriate, enhancement of existing riparian woodlands, creation of a large area of riparian woodlands with breaks in existing levees, reestablishment of historic oxbow stream channels, and creation of emergent wetlands.

Implementation of the bypass channel and other flood protection measures contained in the Community Based Alternative would allow urban revitalization, removal of the existing levees, and restoration of the interior of the project to its original river orientation. These flood protection measures (in particular the bypass channel and the dam described previously) would be designed in such a manner as to enhance the urban revitalization of the area. The bypass channel would incorporate a floodwall or retaining wall along the east edge, which would allow future construction immediately adjacent to the amenities offered by the river. An interior water feature would expand the water surface area within the area.

Recreational benefits associated with the Community Based Alternative would provide an enhanced trail network, water-based recreation, and open space. The enhanced trail network provides connectivity to existing trails and is consistent with the Trinity River Vision Master Plan with consideration given to the overall continuity with the regional trail system. The recreation components include approximately 10 additional miles of trails provided in three locations. Nine miles of trail would be located along both the east and west sides of the bypass channel, with trails at two levels on each side of the channel. A trail would also be provided adjacent to the interior water feature. One proposed pedestrian bridge would provide access into the Central City area from points west of the bypass channel, while another pedestrian bridge would provide continuity of the proposed trail on the west edge of the bypass channel. A trail would also be provided at the Riverbend site upstream on the West Fork.

Community Based Alternative Trinity Uptown Features

Implementation of the Community Based Alternative is expected to trigger additional actions related to the urban revitalization within the Central City study area. For the purposes of this EIS, these actions are defined as Trinity Uptown Features.

The Trinity Uptown Plan describes additional features which could be added to the project area by private developers once the infrastructure components associated with the Community Based Alternative have been implemented. These features represent the full maturation of the urban design. As such, they are a statement of design intent rather than a set of specific proposals having identified proponents. The actual private market response to the Community Based Alternative could, in fact, take an infinite variety of forms over the anticipated 50-year build out period. The decision-maker and the public should remain mindful when reading this document that the possibilities for future development are both infinite and beyond the control of the Corps of Engineers. Although it is impossible to predict with certainty the final outcome of this private development, the Trinity Uptown Features do, however, represent the best currently- available description of the future development scenario anticipated to be associated with implementation of the Community Based Alternative. As such, and in order to meet the purpose of NEPA to disclose as fully as possible the impacts of all reasonable alternatives to both the decision-maker and the public, these features have been used in

this document as the basis for assessing impacts of actions related to and stemming from implementation of the Community Based Alternative. However, because it is entirely possible that none of these plans will actually occur, the impacts of the Community Based Alternative are shown with and without the Trinity Uptown Features. Figure 4 - 1 identifies the area of consideration for the Trinity Uptown Features.

An anticipated result if the Community Based Alternative is implemented would be intensive land use changes within the study area. A scale model illustrating one possible scenario of development has been designed and displayed for public review and comment. Additionally, a document titled The Trinity Uptown Plan was compiled by Gideon Toal and Bing Thom in 2004. The City of Fort Worth has developed a set of draft Development Guidelines which are intended to influence land use changes in the project area in ways that would be compatible with the Trinity Uptown Plan. These guidelines would be implemented through expansion of the existing Downtown Development District which functions essentially as a zoning overlay. Based upon the model and report, four possible categories of actions were defined as connected to implementation of the Community Based Alternative. These actions are defined below.

- Levee Removal. The bypass channel and its appurtenant structures replace (and enhance) the flood protection currently provided by portions of the existing levee system, rendering some 8,800 linear feet of existing levee unnecessary (see Figure 4 - 2). Since this portion of the existing levee serves as a barrier to the river, the Trinity Uptown Plan envisions removal of the remaining portions of levees at some future time in conjunction with private sector redevelopment project(s). Complete removal would engender the movement of some 460,000 cubic yards of earthen fill. The earthen fill could be used at that time to further level the interior area as envisioned by the Trinity Uptown Plan.

- Land Use Intensification. The Trinity Uptown Plan envisions the project interior (some 327 acres) to transition from predominately heavy industry to mixed land uses with an emphasis on urban residential with support retail and commercial. The 50-year build out is estimated to be approximately 12 million square feet of total development, which would include about 10,000 homes, about 1.1 million square feet of retail/commercial, and about 500,000 square feet of civic and educational facilities. The land use goals are designed to complement and support the surrounding districts which include the Near North Neighborhoods (north of Oakwood Cemetery), Samuels Ave. Neighborhood, North Main Street corridor, Stockyards Area, Cultural District, and Downtown. Combined with these districts Trinity Uptown can provide a much needed sustainable population to support the economic base of this greater central city area.

- Transportation Modifications. In addition to the bridges and street improvements described in Chapter Three (which are integral components of the Central City Project) the Trinity Uptown Plan envisions improvements to the transportation system in conjunction with land use intensification. Examples of the type of street improvements which may be appropriate include realignment of North 4th Street in order to link the proposed campus of Tarrant County Community College to North Main Street and extension of Northeast 7th Street across the river to connect with Samuels Avenue. A new Waterfront Drive along the base of the bluff is also contemplated, as presented in the Trinity Uptown Plan. All such street improvements

would be subject to the standard State and local processes for financial approval and environmental evaluation at the time definitive plans develop.

- Modification/Extension of the Water Linkages. Water is the main theme of the urban design for the Trinity Uptown Plan and is used in that design to create a variety of unique places within the site. The water and associated landscape are intended to create an urban oasis. To extend the presence of water throughout the project site, the Trinity Uptown Plan envisions one or more canals extending through the project interior. An artist's rendering of the canal concept is shown in Figure 4 - 3. Other potential modifications to the system of water linkages include reduction in the width and depth of the original river channel to enhance connectivity across the river and increase the variety of potential uses. Another option is extension of the interior water feature to accommodate a small boat marina. These concepts, if actually proposed, would be developed as components of future private sector projects, and would be subject to engineering evaluation and environmental review through the standard processes for such development projects.

Figure 4-3. Artist's rendering of canal concept.

Impacts to the natural and socio-economic environment within the study area that may occur as a result of implementation of the Community Based Alternative and the above categories of Trinity Uptown Features were given consideration during the analysis of the direct, indirect, and cumulative impacts of the Community Based Alternative.

ALTERNATIVE OUTPUTS AND EFFECTS

This section presents the effects and outputs of each alternative and, to the level possible, the effects of the Trinity Uptown Features. The effects of each alternative are presented for each objective category (flood protection, environment, urban revitalization, and recreation) and are summarized in Table 4 - 7 (page 197). An analysis of these effects and their impacts to the natural and socio-economic environment are presented under the heading Alternative Impact Assessment, which immediately follows this section.

Flood Protection

Flood damage reduction is a primary consideration in the development of measures and alternative plans for the Central City project. As such, evaluation of project impacts that would manifest themselves in a hydraulic dimension has been extensive. A full team of specialists from the Corps of Engineers, the local sponsor (TRWD), the City of Fort Worth and private sector engineers has been heavily engaged throughout the study to analyze the hydraulic and flood protection performance of the alternatives. In addition, the engineering analyses have been subject to an Independent Technical

Review by engineers in the USACE Tulsa District. The following assessment represents the full consensus of the public and private sector engineering team.

No Action

The expected annual flood losses in the future without-project condition were estimated to be $500.1 thousand (July 2003 prices). This represents an almost 50% increase in the Total Expected Annual Damages (EAD) for the future without-project over the existing condition. The highest impact of the future without-project analysis was shown in the total EAD for the WF North-Main Levee Loop, WF North-Riverside, and WF Cultural District Levee reaches, with increases over the existing condition of approximately 17 percent, 19 percent, and 105 percent, respectively. Table 4 - 1 displays the future without-project condition EAD for all twelve reaches.

Table 4 - 1. Without Project Conditions Expected Annual Damages. All values shown in $1000s.

Reach	Commercial	Industrial	Public	POV	Multi-Family	Single Family	Total EAD
CLEAR FORK							
East-Lower	0.3	---	---	---	0.2	---	**0.5**
East-Water Works	---	---	---	---	---	---	**---**
West-Upper	2.6	---	17.8	---	---	---	**20.4**
East -Upper	0.8	---	---	0.1	---	0.1	**1.0**
EAD Subtotal	**3.7**	**---**	**17.8**	**0.1**	**0.2**	**0.1**	**21.9**
WEST FORK							
South	---	---	---	---	---	---	**---**
North-Riverside	114.7	---	9.0	0.7	1.7	1.7	**126.9**
North-Middle	---	---	---	---	0.1	0.1	**0.2**
North-Upper	2.5	0.1	0.1	---	---	---	**2.7**
North-Main Marine Creek	21.6	0.1	---	---	0.1	0.1	**21.8**
North-Main Levee Loop	32.8	3.4	0.3	---	0.2	0.2	**36.8**
Cultural District Levee	223.5	4.3	14.9	12.1	8.0	8.0	**264.8**
North Main Jacksboro	2.6	---	22.4	---	---	---	**25.0**
EAD Subtotal	**397.7**	**7.9**	**46.7**	**12.8**	**10.1**	**10.1**	**478.2**
Grand Total	**401.4**	**7.9**	**64.5**	**13.0**	**10.2**	**10.2**	**500.1**

Using the existing and future without-project data, the equivalent annual damages (EqAD) were calculated. The EAD are used to demonstrate the current value of the existing and future damages for each reach based on the probability of flooding and the predicted dollar value of the associated damage, and they represent the summation of the base year (2005) expected annual damages plus the discounted value of the most likely future year (2030) expected annual damages. Table 4 - 2 displays the EqAD for the twelve reaches. The without project EqAD totaled $443.1 thousand. The three reaches with the highest EAD were the West Fork - Cultural District Levee, North Riverside, and North-Main Levee Loop. Cumulatively these three reaches account for approximately 83% of the total EAD.

Table 4 - 2. Without Project Conditions Equivalent Annual Damages. All values shown in $1000s.

Reach	Commercial	Industrial	Multi-Family	Public	POV	Single Family	Total EqAD
CLEAR FORK							
East-Lower	0.3	---	0.1	---	---	---	0.4
East-Water Works	---	---	---	---	---	---	---
West-Upper	2.5	---	---	17.7	---	---	20.2
East -Upper	0.7	---	---	---	---	0.2	0.9
EAD Subtotal	**3.5**	**---**	**0.1**	**17.7**	**---**	**0.2**	**21.5**
WEST FORK							
South	---	---	---	---	---	---	---
North-Riverside	105.3	---	0.6	8.3	0.8	1.5	116.5
North-Middle	---	---	---	---	0.1	0.1	0.2
North-Upper	2.2	0.1	---	0.1	---	---	2.4
North-Main Marine Creek	20.3	0.1	---	---	---	---	20.4
North-Main Levee Loop	30.5	3.0	---	0.3	0.1	0.2	34.1
Cultural District Levee	170.5	7.9	8.7	28.6	1.5	6.2	223.4
North Main Jacksboro	2.4	---	---	22.2	---	---	24.6
EAD Subtotal	**331.2**	**11.1**	**9.3**	**59.5**	**2.5**	**8.0**	**421.6**
Grand Total	**334.7**	**11.1**	**9.4**	**77.2**	**2.5**	**8.2**	**443.1**

P&G Based Alternative

Implementation of the P&G Based Alternative as described in Chapter Three would restore the design level of protection to the Floodway system and would virtually eliminate the flood hazard associated with the No Action Alternative for those areas protected by the North Main Levee Loop and the Cultural District Levee. This alternative provides approximately $230,000 in expected annual benefits strictly for flood damage reduction. The P&G Based Alternative does not provide any improvements to the existing problems with interior drainage in sumps 14W/15W or 26 and no interior drainage benefits were identified.

Community Based Alternative

Implementation of the Community Based Alternative would also restore the design level of protection of the Fort Worth Floodway system, providing the same magnitude of economic benefit for flood damage reduction as does the P&G Based Alternative. However, the hydraulic efficiency of the bypass channel also provides for the improvement of some portion of the interior drainage problems currently existing in the system. Damages associated with the 50-year event for sump 26 ($773,500) and the 100-year event ($4,846,900) would be eliminated. Additionally, 20 acres currently within sump 16W would be raised above the elevation of the 100-yr event.

Though the flood damage reduction measures for the Community Based Alternative would adversely impact the valley storage within the system, mitigation measures were developed which would effectively re-establish the valley storage requirements. Therefore any adverse impacts to system's

efficiency would be offset. Based on the evaluation conducted by the USACE, as part of its responsibility in implementing the regional CDC program, with the proposed hydraulic mitigation measures, the Community Based Alternative would fully comply with CDC criteria with

The Riverbend off-line valley storage mitigation site is located adjacent to the West Fork approximately 5 miles upstream of the existing confluence of the Clear and West Forks. It would be constructed by cutting "openings" in the existing levee and allowing flow to occupy the low-lying area behind the levee, returning this large area to floodplain. A back levee would be constructed to prevent flooding of any private property. The proposed back levee is positioned such that it would encroach partially into existing interior drainage sump numbers 7 and 8. Preliminary investigations indicate that this encroachment may be feasible. However, additional investigation is underway to affirm that the appropriate level of flood protection from these sumps could be maintained with the proposed configuration of the Riverbend site.

If, based upon the final hydraulic and earthwork analyses, the level of encroachment of the back levee into sumps 7 and 8 needs to be lessened to maintain or improve flood protection, several adjustments to the alternative are available to accomplish this while maintaining the same level of valley storage mitigation required under the CDC process. These adjustments would include:

- Augmentation the conveyance capacity of the sumps by improving the outlet works and/or a pumping system.

- Redirection of flows previously going to sump number 9 into a new sump behind the back levee. It would then be necessary to perform additional excavation within the Riverbend site to reclaim the associated reduction in valley storage mitigation

- Adjusting the position of the back levee to reduce the encroachment. It would then be necessary to perform additional excavation within the Riverbend site to reclaim the associated reduction in valley storage mitigation.

- Eliminating the back levee completely, reducing the encroachment to sumps 7 and 8, and performing additional excavation within the Riverbend site to reclaim the associated reduction in valley storage mitigation.

The final configuration of the Riverbend site must maintain flood protection and provide the necessary valley storage mitigation required under the CDC process. The final configuration would be based on an optimization of costs to construct and maintain the site and the benefits to aquatic habitat, terrestrial habitat, and recreational opportunities.

Trinity Uptown Features

The Trinity Uptown Features described in the previous section would be located within the project interior, which is isolated from the river by the hydraulic elements of the Community Based Alternative. By definition, the activities within that zone are hydraulically neutral with respect to river flooding. The Trinity Uptown Features, therefore, would have no effect on flood stages within the river or bypass channel. Interior drainage within the project footprint is provided by the waterways and pump station, as described in Chapter Three. This system was designed and sized to accommodate full development of the project interior as envisioned in the Trinity Uptown Plan.

Ecosystem Improvement

Table 4 - 3 presents a quantitative comparison of the changes in various habitats for each alternative. The acreages listed for the alternatives is the acreage at the end of the 50-year period of analysis and the average annual habitat units (AAHU) is calculated over the 50-year period of analysis. Table 4 - 4 displays the acreage and habitat units at year 10 and 50 of the period of analysis for each alternative. For all alternatives, the analysis assumes the same degree of habitat degradation and loss of acreage due to factors in the study area that are discussed for the No Action Alternative and are not associated with the alternatives. Therefore, the acreage at year 50 and the AAHU over the period of analysis will differ from the initial changes that occur due to implementing the alternatives.

Table 4 - 3. Environmental Outputs of the Central City Alternatives.

Alternative	Output	Wetland	Riparian Woodland	Upland Woodland	Grassland	Oxbow	Impounded River	Marine Creek
Existing Condition	Acres	14.3	323.0	522.9	2363.0	0.0	292	3.2
	HU	5.2	188.9	305.5	955.9	0.0	252	2.7
No Action Alternative	Acres	14.3	323.0	418.3	2008.6	0.0	292	3.2
	AAHU	1.9	179.1	232.7	876.7	0.0	252	2.7
P&G Based Alternative	Acres	33.7	397.4	418.3	1926.6	2.5	292	3.2
	AAHU	23.7	217.6	232.7	863.9	2.2	253.7	2.7
Community Based Alternative	Acres	20.5	408.3	414.9	1737.2	5.1	410	0
	AAHU	14.4	221.2	216.0	776.4	4.3	254.2	0
Community Alternative and Trinity Uptown Features	Acres	20.5	407.1	398.6	1614.4	5.1	410	0
	AAHU	14.4	220.7	199.3	712.8	4.3	254.2	0

Table 4 - 4. Environmental Outputs at Year 10 and 50 of the Period of Analysis.

Alternative	Output	Wetland	Riparian Woodland	Upland Woodland	Grassland	Oxbow	Impounded River	Marine Creek
No Action Year 10	Acres	14.3	323.0	470.6	2244.9	0.0	291.9	3.2
	HU	2.6	184.2	242.4	908.1	0.0	252.0	2.7
P&G Year 10	Acres	33.7	397.4	470.6	2153.3	2.5	291.9	3.2
	HU	25.7	243.2	242.4	893.6	2.2	294.1	2.7
Community Year 10	Acres	20.5	408.3	460.8	1894.2	5.1	410.4	0.0
	HU	16.2	202.4	211.4	768.0	4.4	294.1	0.0
No Action Year 50	Acres	14.3	323.0	418.3	2008.6	0.0	291.9	3.2
	HU	0.0	170.1	204.2	812.5	0.0	252.0	2.7
P&G Year 50	Acres	33.7	397.4	418.3	1926.6	2.5	291.9	3.2
	HU	23.1	269.0	204.2	799.5	2.2	294.1	2.7
Community Year 50	Acres	20.5	408.3	416.1	1695.8	5.1	410.4	0.0
	HU	14.27	260.3	206.6	712.1	4.4	294.1	0.0

No Action Alternative

The environmental conditions within the study area are likely to change over time even without the influences of construction or management alterations. The fringe vegetation of the study area would tend to mature and slight alterations in ongoing maintenance of the flood control channel might periodically occur. The changes that would occur within this heavily urbanized study area would be associated with on-going man-made modifications and continued habitat deterioration due to non-native plants invading riparian and upland forests.

Due to continued encroachment, the value of the existing wetlands would degrade under the No Action Alternative. Only 14.3 acres of existing wetlands were identified in the entire study area with an overall value of 5.2 habitat units. Of this total 8.8 acres were located within the Riverbend/Rockwood zone of the West Fork. Due to the overall poor quality of wetlands observed for wildlife usage and the continued maintenance of the floodway and other encroachment into and around these wetlands, deterioration of value was estimated to continue over the 50-year study period. It was assumed that existing values would diminish to one half of their current value by year 10 and to the point of having no value by year 50 (Table 4 - 4). The estimated future without project condition would provide only 1.9 average annual habitat units (AAHUs).

The largest area of riparian woodlands (187.5 acres) within the study area are located within the Clear Fork West zone mostly associated with existing parks managed by the City of Fort Worth for recreational use. An additional 118.1 acres was identified within the Riverbend/Rockwood area as

shown in Figure 3 - 4. No riparian woodlands were identified in the Clear Fork east zone and only 17.4 acres were identified within the other 3 zones.

Due to the location of the riparian woodlands within the floodplain, and the nationally recognized significance of this resource, it was determined that sufficient protection exists and public interest is sufficient to encourage protection of existing acreages of riparian woodlands. While some areas could be impacted, new areas of riparian woodlands could be either intentionally created or allowed to redevelop naturally. Active management to maintain or improve the value of existing riparian woodlands is currently limited. Therefore, it was determined that for planning purposes, the acreage of riparian woodlands would not change over the 50 year period for the without project condition. However, due to the lack of active management and continued invasion by non-native shrubs and trees it was estimated that the value would decrease to 97.5 percent of existing value by year 10 and to 90 percent of existing value by year 50. As a result the existing 323 acres having a value of 188.94 habitat units would produce 179.1 AAHUs in the without project condition.

Upland woodlands are more evenly distributed throughout the study area than the riparian woodlands. The largest areas are within the North Main and the West Fork South zones. Similar to the evaluation for riparian woodlands, active management of upland woodlands was found to be generally lacking within the area. Also, these resources are more vulnerable to development since they generally are located at higher elevations and within zones less susceptible to flooding. As a result planning assumptions for this resource was there would be a loss of 20 percent of the existing acreage and 10 percent of habitat value over the planning period. As a result the 522.9 acres of existing upland woodland would diminish to 418.3 acres at the end of the study period providing 232.7 AAHUs for the without project condition.

Within the study area, grasslands are the predominant terrestrial vegetation type. Most of the grasslands consist of non-native Bermuda grass and are mowed and manicured as would be expected in the urban environment. Some areas of grassland would be converted by others to urban or disturbed habitat in the future without project condition. However a large amount lies within the existing federally authorized flood damage reduction project which limits the amount that could be modified. Within the urban environment, little to no maintenance changes are foreseen, therefore no changes to future habitat value of grasslands is anticipated. However, it is anticipated that 15 percent of grassland area would be lost during the 50-year planning period. Based upon these assumptions, after 50 years there would be 2008.6 acres of grassland and 876.7 AAHUs for the without project condition.

Aquatic habitats within the study area include the Clear and West Forks of the Trinity River and Marine and Lebow Creek which are tributaries to the West Fork. No detailed analysis was conducted of the aquatic habitat of the West Fork above University Drive. However, this reach is similar to the reach immediately downstream and little variation should be anticipated.

Existing conditions for the aquatic habitat associated with the rivers and tributary streams were determined by intensive sampling of the fisheries resources. When considering without project conditions for the study area, it is important to consider that the Clear and West Forks within the area have long been a part of a major flood damage reduction project. Management measures to maintain the existing channel and stream bank configuration are intensive. Modifications to several in-channel dams were completed prior to the aquatic habitat studies and it is not anticipated that significant new modifications would occur for the without-project condition. As a result of these past actions, the aquatic habitat within the river channels is generally more lentic (lake-like) than lotic (river-like) and

even as flood events occur, the water surface is confined to a smooth, well-manicured grass lined channel for all but the more rare flooding events. No substantive change to the existing acreage or value of aquatic habitats is anticipated for the without project condition.

Although not directly utilized in the assessment of existing physical habitat conditions, levels of contaminants within fish tissue have prompted a ban by the state of Texas prohibiting retention of fish from the Clear Fork below 7th street and from the West Fork downstream of the confluence throughout the study area. Insufficient information is currently available to predict when the ban may be removed. Due to the persistent nature of the contaminants, it is reasonable to presume that the ban would remain in place in the near future. Therefore, the future without-project conditions are assumed to be the same as existing conditions relative to aquatic contaminants.

P&G Based Alternative

As discussed in Chapter 3, the P&G Based Alternative includes wetland development on 21.6 acres and improvements to 2.8 existing wetland acres. This results in an increase of 21.8 AAHUs over the No Action Alternative.

Riparian woodland habitat outputs would increase with implementation of the P&G Based Alternative by 38.5 AAHUs over the No Action Alternative. This increase would be the result of improved management of 47 acres of existing riparian woodlands and the development of 74.4 acres of additional riparian woodland communities throughout the study area.

No specific measures were considered to directly improve the existing upland woodlands, and none of the identified measures of the P&G Based Alternative would negatively impact upland woodland values. Therefore, the net outputs anticipated for upland woodlands would remain the same as those expected under the No Action Alternative.

Some grassland would be temporarily disturbed due to implementation of the P&G Based Alternative by construction actions associated with the levee raise and excavation of eighteen acres to offset the loss of valley flood storage attributed to woodland restoration. However, these areas would be reestablished and ultimately achieve the same habitat value that existed prior to disturbance. Conversion of grassland to riparian woodland and wetlands would result in a loss of 20.9 AAHU and 82 acres from the No Action Alternative. This effect is not considered significant because of the abundance and relatively low wildlife value of this type of habitat.

The P&G Based Alternative would restore 2.5 acres of oxbow habitat which would provide a gain of 2.2 AAHUs over the No Action Alternative. This oxbow habitat would provide better quality spawning and nursery habitat for the local fish population due to decreased water velocity and better cover. In addition, this oxbow habitat would increase the adjacent impounded river habitat value by 1.7 AAHUs over the No Action Alternative by increasing productivity.

Community Based Alternative

Construction activities in the Riverbend/Rockwood area associated with mitigation of valley flood storage would result in a loss of 8.8 acres of emergent wetlands. However, following these activities, 15 acres of wetlands would be restored in this area and would be of higher value due to more frequent

interchange with the river and long-term maintenance commitments. The Community Based Alternative would result in an increase of 6.2 acres and 12.5 AAHUs over the No Action Alternative.

The Community Based Alternative would result in the initial loss of 34.5 acres of riparian woodlands. The majority of these losses would occur in the Riverbend/Rockwood zone due to excavation for valley storage mitigation. This represents a permanent impact to the existing trees but only a short term impact to riparian woodlands values. If left as a grassland this would result in significant and permanent loss of riparian woodland values. However, the Community Based Alternative also includes riparian habitat improvement and development in this area that would result in a net increase of 85.3 acres and 42.1 AAHUs over the No Action Alternative. Riparian habitat improvement and development would include control of invasive species, planting trees and shrubs to increase the density and diversity of existing woodlands, and reforestation.

As a result of construction and valley storage mitigation, there would be an initial loss of 64.4 acres of upland woodlands from all six study zones (Figure 3 - 4). This represents a permanent impact to the existing trees, and a permanent loss of some impact to upland woodlands values. However, within the Riverbend/Rockwood valley storage mitigation area, the proposed ecosystem improvements would include management of 13.3 acres of existing upland woodland and development of 45.5 acres of upland woodland. These habitat gains in combination with the aforementioned losses would result in a net loss of 3.4 acres of upland forest and a net loss of 16.7 AAHUs from the No Action Alternative. This is not considered significant because the net increase in riparian woodland would more than compensate for this loss.

As a result of inundation and conversion of grassland to other habitat types there would be an initial loss of 372.9 acres of grassland habitat. After considering the changes that would occur to grassland even without a project, however, the Community Based Alternative would result in a loss of 271.4 acres of grassland and 100.3 AAHUs from the No Action Alternative. These impacts primarily occur in the Riverbend and West Fork North study reaches and are related to construction of the bypass channel and the hydraulic mitigation at Riverbend. This includes the 42.2 acres of native grassland that would be established in the Riverbend area. This net loss of grassland habitat is not considered significant due to its low value to wildlife and its relative abundance in the area.

The Community Based Alternative adds approximately 112 acres of impounded river through construction of the bypass channel and approximately 6 acres by increasing the existing water surface elevation in the West and Clear Fork and in Marine Creek. Samuels Avenue Dam would be operated so that at most inflows, the existing water surface elevation would be increased to 525 feet NGVD. This would increase depth and water surface area throughout the existing impounded river and bypass channel and could increase the probability and duration of stratification during the summer months. The capability to cause mixing of the water column and maintain water quality is possible through operation of the isolation gates and outlet gates at Samuels Avenue Dam depending on inflows. Further study including a physical model would be completed to refine this operation. The increase in water surface area of 112 acres was not considered to increase aquatic habitat as open water habitat is abundant in the study area. Evaluation of the information available indicates that the better aquatic habitat is associated with the shallow inundated edges of the channel. The project would shorten the channel length, but would increase the impounded water's edge. The USACE and USFWS have concluded that the additional inundation would not cause significant adverse impact to the impounded Trinity River channel (other than to Marine Creek), nor does it add additional value.

Reconnection of 5.1 acres of abandoned oxbows would occur under this alternative which would result in a gain of 4.3 AAHUs over the No Action Alternative. This oxbow habitat would provide better quality spawning and nursery habitat for the local fish population due to decreased water velocity and better cover. In addition, this oxbow habitat would increase the adjacent impounded river habitat value by 2.2 AAHUs over the No Action Alternative by increasing productivity.

The most significant permanent change to the aquatic habitat values would be the inundation of 3.2 additional acres of Marine Creek. Preliminary investigations by the US Fish and Wildlife Service (see Appendix G) indicate this stream has exceptional riffle pool habitat during some times of the year. There is particular concern about the loss of approximately 1875 linear feet of riffle pool habitat that exists from just below the railroad to just upstream of 23rd Street. In addition, the Community Based Alternative would fill the lowermost 400 linear feet of Lebow Creek in order to prevent inundation to the upper reaches and associated effects to the 100 year water surface elevation.

Trinity Uptown Features

No wetlands were identified within the area potentially impacted by the Trinity Uptown Features, and therefore, no impacts to wetlands are anticipated due to the Trinity Uptown Features. Approximately 1.2 acres (0.5 AAHU) of riparian woodlands would be lost due to the Trinity Uptown Features. However, when considered with the Community Based Alternative and its ecosystem improvements, there would still be a net gain in riparian woodlands of 41.60 AAHUs from the No Action Alternative.

The anticipated development which would occur within the study area as a result of the Trinity Uptown Features would impact an additional 16.3 acres and result in the loss of an additional 16.9 AAHUs of upland woodlands. Therefore, when considered with the Community Based Alternative and its ecosystem improvements, there would be a net loss of 19.7 acres of upland woodland and a net loss of 33.4 AAHUs in comparison to the No Action Alternative. Again, this is not considered a significant impact because the increase in riparian woodlands would more than compensate.

Additionally, the identified Trinity Uptown Features would impact an estimated 122.8 acres (63.6 AAHU) of grassland habitat. In combination with the Community Based Alternative and its ecosystem improvements there would be a loss of 394.2 acres and 163.9 AAHUs in comparison with the No Action grassland values. This loss of grassland habitat is not considered significant due to its low value to wildlife and its relative abundance in the area.

The Trinity Uptown Features would not provide additional significant quantifiable impacts or benefits to the aquatic habitat over those determined for the Community Based Alternative. One concept of the master plan for the area of impact considered for the Trinity Uptown Features is that local runoff would be treated and improved through series of artificial wet areas or holding areas that could provide some improvement in storm water runoff quality. While these singular improvements are not quantifiable, they should be encouraged as cumulatively there could be demonstrable benefits to the West Fork Trinity River aquatic habitats if more of these type runoff treatment facilities are incorporated into other proposed developments.

Environmental Mitigation

Aquatic

The USFWS has provided Planning Aid Letters, the Draft, and the Final Fish and Wildlife Coordination Act Reports. These reports include their analyses of the fish and wildlife habitat, review of the proposed ecosystem mitigation, restoration, and potential improvements. The report contains the Services' environmental recommendations which have been incorporated into the FEIS to the maximum extent practicable. The Service's recommendation to minimize the aquatic impacts by relocating Samuels Avenue Dam were evaluated but found not to be feasible to implement, resulting in the need to include the aquatic compensatory mitigation outlined in the FEIS. The Service subsequently concurred with proposed project based on inclusion of the aquatic mitigation. The Service reviewed the aquatic mitigation plan concurred that the plan was feasible and would offset the impacts. All of the Information received from the USFWS was utilized during the planning of this project and has been coordinated with the Corps and local sponsors. The alternative to mitigate the impacts caused by inundating 1875 linear feet of exceptional and high quality Marine Creek lentic aquatic habitat and filling of approximately 400 linear of exceptional quality Lebow Creek aquatic habitat as result of implementing the Community Based Alternative has been reviewed and accepted by both the Corps and the local sponsor. Mitigation measures under evaluation include diverting flows, varying by season up to 5 cubic feet per second, to the mid-reach of Lebow Creek. A gravity flow pipeline from the Samuels Avenue Dam would be possible to a point on the stream where the bottom elevation is approximately 525 feet, which appears to be near Brennan Avenue. In addition, investigation of the potential to add additional aquatic habitat area by modifying the channel bottom of Lebow Creek within the reach downstream of Brennan Avenue including the 1500 feet of downstream diversion.

Additional aquatic mitigation at Ham Branch was found to be necessary to fully compensate aquatic impacts and would be completed following studies to determine a stream configuration that is geomorphically stable based upon hydrology, sediment characteristics and slope. Typical cross-section and plan view of proposed mitigation features are presented in Appendix G.

Development of a riparian forested buffer of 50 foot in width on either side. Contouring of the channel bank as necessary to provide appropriate interaction between the riparian vegetation and the aquatic environment would be done prior to reforestation. The Riparian plantings would include dense development of shrubs and overhanging grasses near the creek channel. Approximately 305 feet of the existing channel would be relocated to provide adequate width for riparian forest development adjacent to an existing fenced soccer field. Riparian forest would be planted on 7.4 acres and the existing 1.4 acres of riparian forest would be improved to provide a total 8.8 acres along the creek. Pending further investigation, approximately 25 percent of the total length (3,568 feet) of the stream segment would be modified to provide approximately 900 linear feet of rock based riffles at locations to be determined by those additional studies.

Water quality improvement, if found necessary to benefit aquatic habitat resources development, would be provided by construction of small off channel wetlands. An area has been identified that could provide approximately 0.6 acres of emergent wetlands. In addition, a triangular shaped area between existing railroads at the outfall draining downtown Fort Worth could be modified to develop up to approximately 0.7 acre of sediment- and floating materials-trap if needed.

Aquatic habitat benefits on Ham Branch would accrue on 3,568 linear feet of stream channel and should provide up to 0.80 AAHU over without project conditions. Stream habitat alternations proposed within Lebow Creek and Ham Branch should provide a combined 1.52 AAHU over without a project conditions thereby compensating for unavoidable impacts to Marine Creek and lower Lebow Creek. The benefits to mitigating within Ham Branch would go beyond the creek proper. It is anticipated that significant benefits to the water quality and fisheries within the West Fork immediately adjacent to the confluence should occur; however, current methods to quantify those benefits are unavailable. In addition, the construction of the riparian corridor adjacent to Ham Branch would provide additional significant forest resources in the lower end of the study area, supporting resource agencies recommendations to provide resources of this type at additional locations within the study area.

Wetlands

The Community Based Alternative with Trinity Uptown Features exclusive of the ecosystem improvements proposed at Riverbend area would impact 8.8 acres of wetlands but would only impact 1.31 average annual habitat units as compared to the without a project future conditions. Approximately 15.02 acres of wetlands would be provided by addition of ecosystem improvements at Riverbend that would result in the ultimate provision of 13.78 AAHUs of wetland values. Following implementation of the Community Based Alternative, Trinity Uptown Features, ecosystem improvements there would be 20.52 acres of wetlands having 14.39 AAHUs within the study area. Provided the alternative is implemented completely as proposed, including the ecosystem improvements at Riverbend, the alternative would adequately mitigate the 1.31 AAHUs of wetland lost. Construction and management of only 1.43 acres of wetlands would provide annual benefits of 1.31 AAHUs over a 50-year analysis period, thereby providing compensatory mitigation for wetland impacts.

Woodlands

Riparian Woodlands

The Community Based Alternative would adversely impact 34.5 acres having 17.67 AAHUs associated with riparian woodlands. The Community Based Alternative and Trinity Uptown Features would impact about 35.7 acres and 18.36 AAHUs as compared to the without a project condition. However, Ecosystem Improvements at Riverbend and Rockwood areas would more than offset that loss, providing a net gain of 41.47 AAHUs of riparian forest. To satisfy project goals 18.36 AAHUs of the Ecosystem Improvements should be designated as environmental mitigation for riparian forest. To achieve the compensatory mitigation goal of 18.36 AAHUs would require the establishment of 33.2 acres of riparian forest and the management of an existing 5.3 acres of existing riparian forest (total of 38.5 acres) within the Riverbend and Rockwood environmental mitigation area.

Upland woodlands

The Community Based Alternative and Trinity Uptown Features would cause a loss of 67.9 acres of upland forest and a loss of 48.82 AAHUs compared to the future without a project condition. After development of Ecosystem Improvements at Riverbend and Rockwood areas a net loss of 33.40 AAHUs would occur to upland forest. Upland forests in the study area were identified by the Fish and Wildlife Service having a Resource Category 4 in accordance with their mitigation policy. Consistent with that categorization, it is appropriate to consider either to mitigate out of kind or to

mitigate with additional upland forest habitat development. As currently planned there are more benefits attributable to the riparian forests than are lost, and it is appropriate to consider those surplus benefits toward mitigation of upland forest losses. As there was a net gain of 41.47 AAHUs of riparian forest compared to the net loss of 33.40 AAHUs of upland forest, out of kind mitigation by designation of an additional 33.40 AAHUs of the riparian forest Ecosystem Improvement benefits is recommended as the mitigation strategy for upland forest habitat losses. Compensatory mitigation would require both in-kind and out-of-kind forest habitat development. Contributing to in-kind compensation would include establishment of 45.5 acres of upland forest and management of 13.3 acres of existing upland forest. Out-of-kind mitigation would include establishment of 43.0 acres and management of 6.9 acres of riparian forest within the Riverbend and Rockwood environmental mitigation area. The combined in- and out-of-kind mitigation acres (108.7 acres) for upland forest mitigation would provide 48.87 AAHUs of forest habitat gain achieving the mitigation goal of 48.82 AAHUs.

In addition to the specific average annual habitat unit mitigation goals identified, it is also proposed that a specific plan to identify the precise mitigation tract within the Ecosystem Improvement area for wetlands, riparian forest and upland forest would be identified during later planning phases. In addition, management plans, including monitoring and providing for adaptive management will also be developed for the identified aquatic, wetland and terrestrial mitigation objectives.

Urban Revitalization

No Action

Some degree of economic development and urban revitalization is projected to occur in the study area under the no action alternative, although the rate of economic growth is expected to lag behind that of Tarrant County as a whole. Economic projections for the No Action alternative were developed by the Center for Economic Development and Research (CEDR) at the University of North Texas using the IMPLAN economic input/output model which tracks how spending flows through a regional economy. Data for these projections was collected by CEDR during a series of interviews with local government officials, business leaders and owners, and developers during the winter of 2004-2005.

The development anticipated to occur under the No Action Alternative would generate $638.8 million in total economic activity from construction impacts and $497.6 million in total economic activity from recurring business operations over the 40-year planning horizon (Table 4 - 5). Total wages, salaries, and benefits would total $200.4 million for construction impacts and $197.8 million for recurring business, employing 5,940 and 5,040 per year respectively. Total property income for construction impacts would be $54.6 million per year and $46.4 million per year for recurring businesses. State and local governments would bring in almost $21 million per year in taxes from construction projects and $14.7 million in taxes from recurring business.

Table 4 - 5. Future Without Project Conditions at 40-Year Development (2005 Price Levels)

Description	Construction Impacts	Recurring Impacts of Business Operations
Direct Construction Costs/ Business Activity	$354,816,000	$295,019,000
Total Economic Activity	$638,762,000	$497,608,000
Total Wages, Salaries, Benefits	$200,436,000	$197,756,000
Total Employment	5,940	5,040
Total Property Income	$54,555,000	$46,363,000
State and Local Taxes	$20,976,000	$14,672,000

These projections are for the study area as a whole, which includes a number of areas south of the river and west of the Fort Worth and Western Railroad. The majority of the economic expansion associated with the No Action alternative is expected to occur in those areas outside the project footprint. Within the immediate project interior, urban revitalization would continue to be constrained by numerous physical and institutional barriers.

P&G Based Alternative

The P&G Based Alternative does not explicitly address Urban Revitalization. Except insofar as the existing flood hazard constrains economic activity within the study area, the P&G Based Alternative would make no contribution to the project goals and objectives under the Urban Revitalization purpose.

Community Based Alternative

The elements of the Community Based Alternative are intended to provide the pubic sector infrastructure (waterways, roads, and bridges) needed to re-orient the project site to the river and provide incentives for private sector revitalization projects. Construction of the project elements for the Community Based Alternative would, in and of themselves, be a major economic engine. CEDR estimates the direct construction impact alone to exceed $600,000,000 as construction wages multiply through the regional economy. Total employment directly or indirectly derived from construction of the Community Based Alternative is estimated at 6,100 jobs. Additional information is contained in Appendix J, Socioeconomic Assessment.

Trinity Uptown Features

The land use intensification connected with the Central City project is the primary focus of this plan's urban revitalization objective. Removal of the levees, development of any canals or other waterways, and transportation enhancements all contribute as well. A consistent theme emerging from the CEDR interviews with developers, business groups, and city officials is that the Community Based Alternative for the Central City project would dramatically alter the development and redevelopment path for the downtown and near downtown vicinity. The project's planning phase alone is being credited with sparking significant development dialog.

The Trinity Uptown Plan envisions future land use intensification to take the form of high-density mixed use development that includes approximately 10,000 residential households. Achieving a residential population of this size in the area between Downtown, the Northside/Stockyards, and the Cultural District would provide a strong support base for businesses and activities in those areas as well.

Table 4 - 6 compares the total economic and fiscal impacts associated with the Community Based Alternative and its Trinity Uptown Features. As the table indicates, the total economic impact of the project is predicted to be almost $4.3 billion. This compares to a without-project total economic impact of just over $1.1 billion, representing a difference of almost $3.2 billion over the 40-year period of analysis. Total employment associated with the Community Based Alternative and Trinity Uptown Features is projected at almost 42,000, an increase of 31,000 over the No Action employment with in the project area.

Table 4 - 6. Comparison of With and Without Project Economic and Fiscal Impacts (Shown in 1000's).

Description	Bypass Construction	Residential and Commercial Construction	Recurring Business	Total	Without Project	Difference
Construction Spending/Direct Business Activity	$357,000	$1,151,999	$957,855	$2,466,854	$649,835	$1,817,019
Economic Activity	$609,181	$2,073,903	$1,615,610	$4,298,694	$1,136,370	$3,162,324
Wages, Salaries, Benefits	230,184	$650,766	$642,065	$1,523,015	$398,192	$1,124,823
Employment	6	19	16	42	11	31
Property Income	$55,406	$177,128	$150,530	$383,064	$100,918	$282,146
State and Local Taxes	$16,020	$68,104	$47,635	$131,759	$35,648	$96,110

Recreation

No Action

Recreation projects predicted to be constructed independent of the Central City project, were identified in Chapter Three. Completion of these projects would be expected to partially mitigate the predicted shortfall for trail-based recreation within the City of Fort Worth by 2030. However, a substantial deficit relative to the City's adopted standard would still be predicted. Under the No Action alternative, no steps are taken to address the project goal of providing extensive and direct public access to the river and waterfront, as the physical conditions needed (i.e. removal of the levees) are not present.

P&G Based Alternative

The P&G Based Alternative would add 7,818 linear feet of 12'concrete multipurpose trail to the Trinity Trail System, providing an estimated 34,122 user experiences per year. The P&G Based Alternative also includes replacement of 5,189 linear feet of existing trail that would be affected by the levee raise. This alternative would provide for trailheads at University Drive and in the vicinity of LaGrave Field as well as linkages into neighborhoods north and east of downtown as shown on Figure 3 - 8. The P&G Based Alternative does not address the project goal of providing direct access to the river; the levees forming the primary barrier to such access are, in fact, increased in size under the P&G Based Alternative.

Community Based Alternative

The Community Based Alternative would add approximately 52,800 linear feet of trail to the Trinity Trail system. Approximately 9,500 linear feet of the new trail would be located in the Riverbend valley storage mitigation/ecosystem improvement site. This trail would be primarily intended for bird watching and other environmental education type activities and is envisioned to be constructed of gravel or similar material. The remainder of the new trail would be located within and adjacent to the project footprint adjacent to the downtown area. Trails and walkways on the east side of the bypass channel would generally be incorporated into the floodwall and would be hard surfaces varying in width from 12-18 feet. Trails on the west side of the levee would be approximately 15 feet in width. Based on the current standards for trail usage, the trail extensions associated with the Community Based Alternative would support over 500,000 visitor experiences per year.

The Community Based Alternative would provide trail linkages over the Trinity River in key locations, as follows:

- Enhanced access would be provided for the Near North neighborhoods due to proposed trail connections near North Main Street and the proposed bypass channel.
- Trails would be provided on both sides of the bypass channel providing continuous linkage.
- A new pedestrian bridge on the West Fork just west of the FW&W Railroad would provide a critical connection that currently does not exist.
- Sufficiently wide pedestrian walkways would be provided on both sides of three proposed bridges: White Settlement Road (Henderson Street), and North Main Street. These would provide critical linkages from existing residential and business neighborhoods to the trail system.

The Community Based Alternative provides direct public access to the water's edge along the bypass channel through its system of trails and walkways. This feature contributes substantially to meeting project goals and objectives for recreational amenities. In addition, the Community Based Alternative provides direct access to recreation on the water. All waterways associated with the Community Based Alternative will be designed to accommodate canoes, kayaks and low-clearance public excursion boats. The bypass channel included in the Community Based Alternative adds some 8,400 linear feet of water to the system, extending the water surface available for small boat traffic. The

bypass channel, in connection with the interior river channel and interior water feature provide for a 3.5 mile boating loop, enhancing the recreational experience. Additionally, the Community Based Alternative would provide the opportunity to link the Cultural District, Downtown, and the Northside/Stockyards by water. Projected increases in water traffic have not been quantified but could be substantial.

Connection of the nature trail envisioned to be associated with the Riverbend Hydraulic Mitigation Area to the existing Trinity Trail "spine" would be expected to enhance neighborhood use of the site for public open space and be considered a quality of life enhancement for those adjacent neighborhoods.

Trinity Uptown Features

The recreational features of the Community Based Alternative were developed in the context of the overall Trinity Uptown Plan, which includes the Trinity Uptown Features. The availability of the recreational amenities of the Community Based Alternative is expected to attract private sector re-development of the project's interior. This redevelopment would, in turn, be expected to further extend and enhance the recreational opportunities provided by the Community Based Alternative. Development of an estimated 450 acres of neighborhood parks, plazas, and other open space features would contribute significant recreational space and provide for many and varied opportunities to link Trinity Uptown to the Trinity Trail System. Removal of the levees would represent the full maturation of the project's goal to provide direct public access to the river, and development of a canal system through the project's interior, as well as the other potential enhancements to the water-based linkages, further extends the length of the available boating surface and substantially enhances the water-based linkages developed by the Community Based Alternative.

Table 4 - 7. Comparison of Alternative Outputs and Effects

	No Action	P&G Based Alternative	Community Based Alternative	Community Based Alternative Plus Trinity Uptown
Flood Protection				
Restores Design Level of Protection (SPF+4')	No	Yes	Yes	Yes
Improves Sump Flooding	No effect	No effect	S26 –eliminates 50-yr &100-yr damages S16W-removes 20 acres from 100-yr floodplain	Same as CBA
Ecosystem Improvements				
Wetland Habitat Units (Yr 50)	1.9	23.7	14.4	14.4
Riparian Woodland HU's (Yr 50)	179.1	217.6	221.2	220.7
Upland Woodland HU's (Yr 50)	232.7	232.7	216.0	199.3
Grassland HU's (Yr 50)	876.7	863.9	776.4	712.8
Oxbow HU's (Yr 50)	0	2.2	4.3	4.3
Impounded River HU's (Yr 50)	252	253.7	254.2	254.2
Marine Creek HU's (Yr 50)	2.7	2.7	0	0
Urban Revitalization				
Provides direct water access	No	No	Yes –bypass channel	Yes –bypass channel, river channel, canals
Physically Increases Water "Edge"	No	No	Yes –bypass channel	Yes –bypass channel river channel, canals
Establishes Water Linkages	No	No	Links Stockyards, Downtown & Cultural District	Links Stockyards, Downtown, Uptown, Cultural District
Develops High-Density Urban Environment	No	No	Creates enabling infrastructure	Capitalizes on enabling infrastructure
Develops Urban Focal Points	No	No	North Main Bridge	North Main Bridge & Others
Economic Stimulus (40-Years)	$1,136.4M	$1,136.4M	$1,736.4M	$4,298.7M
Recreation				
Provides public access to river	No	No	Yes –bypass channel Creates 3.5 mile boating loop	Yes –bypass channel, river channel, canals
Facilitates Water Based Linkages	No	No	Links Stockyards, Downtown & Cultural District	Links Stockyards, Downtown, Uptown, & Cultural District
Expands Urban Trail Network	No	Creates 1.5 miles new or improved trail	Creates 10 (+) miles new trails including nature trail in Riverbend Site	Links Uptown to 10 (+) miles of new trail
Improves trail connections & linkages	No	Adds 4 trailheads	Additional trailheads	Additional neighborhood trail & water linkages

ALTERNATIVE IMPACT ASSESSMENT

The impacts of the alternatives and the Trinity Uptown Features to resources other than those discussed in the preceding sections are discussed below.

Water Quality

Temporary Term Impacts

No Action

The No Action Alternative would not undergo any watercourse or construction activities, and there would be no change in water quality.

P&G Based Alternative

Construction of the P&G Based Alternative would cause temporary adverse water quality impacts. Construction of the raised levy and associated features (riparian woodland restoration, wetland restoration, slope restoration, and recreation) would generate the production of dust and temporarily subject the watercourse to turbidity conditions. These turbidity conditions are expected to be temporary and have no long term effects to the water course. These conditions would be further lessened with implementation of storm water controls and best management practices during construction.

Community Based Alternative

Similar to the P&G Based Alternative, the construction of the Community Based Alternative would cause temporary adverse water quality impacts. Construction of the channel/impoundment features (bypass channel, Samuel Avenue Dam, isolation gates, pump station, interior water feature, recreation, bridge modification, hydraulic mitigation, and ecosystem improvements) would generate production of dust and temporarily subject the watercourse to turbidity conditions. Direct construction in the water course would mix sediment into the water column. These turbidity conditions are expected to be temporary and have no long term effects to the water course. These conditions would be further lessened with implementation of storm water controls and best management practices during construction.

Trinity Uptown Features

The Trinity Uptown Features of the Community Based Alternative could cause temporary adverse water quality impacts. Transportation modifications, levee removal, water body modification, and development can all generate the production of dust and temporarily subject the watercourse to increased turbidity. The conditions are expected to be temporary with no long term effects. These conditions would be further lessened with as construction operators comply with stormwater control measures as required by TCEQ permit requirements

Long Term Impacts

No Action

There are no long term water quality effects for the No Action Alternative.

P&G Based Alternative

The raising of the levees would not have a long term water quality affect. The project wetland restoration feature would provide a slight water quality improvement for the long-term. Wetlands provide a mechanism to partially remove excess nutrients through plant life uptake and retain or filter sediments and other suspended solids. Riparian woodlands restoration feature would not have a direct affect on the water. The proposed tree plantings are not immediately adjacent to the stream and would not provide beneficial shading for lowering summertime water temperatures. The construction of recreation features (trails, etc.) for the P&G Based Alternative would have no long term water quality effects. Overall, the P&G Based Alternative would have a slight beneficial long term benefit due to the implementation of the wetland restoration feature.

Community Based Alternative

The Community Based Alternative with its various features and varying operating schemes is subject to more water quality variability than the P&G Based Alternative. The basic plan involving linear impoundments for the bypass channel, interior area (existing West Fork), isolation gates, and pump station is operationally more complex.

There is potential for water stagnation and algal problems to occur on a greater frequency during summer due to increased evaporation as stream water surface area is enlarged and stream water is retained. This would occur if fresh water circulation is not maintained in the project area. However, it should be noted that the design for the Community Based Alternative is flexible and includes optional features that could produce a slightly improved water quality if operations were conducted to optimize water quality. A dialog with TCEQ was started to provide the Commission with the information and modeling analyses developed as part of the water quality assessment for the Community Based Alternative. TCEQ provided initial comments on the analyses, which were reviewed and incorporated into this document (See Appendix G).

Since maintenance of acceptable water quality is critical to the overall success of the Community Based Alternative, a number of operational strategies were identified to mitigate water quality problems should they develop. These strategies include variation in water depth with the project interior to minimize temperature stratification and the opportunity for water “turning”, periodic flushing of the interior waterways with flood flows or make-up water, control of nutrient runoff through the institution of stormwater controls With water quality monitoring, the operations of the Community Based Alternative could be further improved to best jointly meet pool elevation and water quality purposes.

The proposed project creates an additional 112 acres of water surface and an additional 2,114 acre-feet of volume within the system. The additional annual evaporative loss as a result of this increase in surface area is 275 acre-feet. This loss would be compensated by existing water rights that are either currently held by TRWD or would be obtained by TRWD from other owners.

Beyond the water right(s) associated with the additional evaporation incurred, the project would also investigate the means to provide additional water flowing through the waterway and to also help maintain the level of the waterway (avoiding drawdown in dry periods) and to assist in maintaining the aesthetics of the waterbody.

Several means of inducing additional flow within the system would be considered during the design phase of the project:

- *Augmenting flow with additional surface water*. Additional water rights might be cost-effectively secured that allow for additional releases from upstream reservoirs during dry periods to supplement flow in the proposed waterways.

- *Augmenting flow with groundwater*. The Trinity Aquifer can produce water of suitable quality at rates up to 300 gallons per minute per well. Wells could be placed in the area to draw water from the aquifer to supplement the surface water supply.

- *Augmenting flow with reclaimed wastewater*. Reclaimed wastewater, most likely from a from a new ultra-pure satellite wastewater treatment facility located in the project could be used to supply additional water to the waterbody.

Wetland development is a beneficial feature to the Community Based Alternative. Depending on the wetland size and water retention characteristics, this feature could offset much of the slight adverse effects of the Community Based Alternative. Wetland development proposed in the Community Based Alternative would contribute minimally to water quality improvement.

Trinity Uptown Features

Several changes in water quality could occur based on connected items.

- The potential addition of more canals and extension of the urban water feature would tend to create more water surface subject to evaporation. As a result, water would be held in the impounded sections for longer detention times and relatively less water would be released unless an additional make-up water supply source is provided. This condition would result in stagnation without fresh make-up water or aeration mechanisms.

- Land use intensification through real estate development in the project area would also tend to slightly degrade the water quality as impervious surfaces are increased with parking lot pavements, concrete sidewalks, hard road surfaces, and buildings. The increase in impervious surfaces near the water would increase the incidence for urban contaminants to be picked up in stormwater runoff and carried directly to the water. Additional concrete and pavement would also tend to become irradiated and conduct heat during the hot summertime months. However, urban design concepts for re-development associated with the Community Based Alternative outline aggressive stormwater quality practices. This would offset much of the impact. During such occurrences, the stream water would have a tendency to also be heated due to close proximity of pavement and concrete structures

- As development progresses, transportation modifications would be necessary to accommodate the increased traffic resulting in the project area. The effects of this activity are similar to land intensification discussed above. Construction of impervious road surfaces (asphalt, concrete, etc.) would also allow contaminants on these surfaces to be readily picked-up by storm water runoff. Typical contaminants lying on these surfaces include exhaust particulates, various petroleum residues (oils, greases, etc.), and street litter. Because there would be more traffic in the project area, there is also a greater risk for accidental chemical spills on bridges and ramps. Road and bridge construction would also incur temporary increases in stream turbidity.

- Levee removal would also likely temporarily increase stream turbidity during the construction activity. The use of best management construction techniques to prevent and control storm water pollution would offset most of these temporary adverse effects. Long term effects from the removal of the levee itself are not considered to be significant and could be slightly beneficial or slightly adverse depending on the associated follow-up activity. Removal of the levee and creation of wetlands would create an opportunity to improve instream water quality. Whereas, increased urban infrastructure development in closer proximity to the water course because of levee removal would tend to slightly degrade the water quality.

Cultural Resources

Cultural resources are divided into two broad categories for the purposes of this analysis; archaeological or buried resources, and architectural or standing resources. These two categories of resources would be analyzed independently for clarity of potential impacts.

Archaeological

To mitigate for the potential impacts caused by deeper construction disturbance associated with the alternatives, buried archaeological resources within the area of potential effect (APE) for the selected Plan would be identified by professional archaeologists prior to implementation of that Plan. All resources that are located would be evaluated for significance in accordance with 36 CFR Part 800.4(d)(1). Mitigation is mandatory for federally funded actions that may impact significant cultural resources. Mitigation measures and/or a monitoring plan would be developed through consultation with the Texas State Historic Preservation Office (SHPO), for impacts to resources that cannot be avoided. Mitigation normally consists of excavation of known sites to extract all data available before the resource is destroyed by construction activities. Appropriate mitigation measures for all known significant resources would be developed in consultation with the State Historic Preservation Office.

No survey can cover 100% of an APE, and some resources may go undetected despite the best efforts to locate and identify them. Unknown resources inadvertently discovered during construction would also be evaluated and mitigated before construction in the vicinity is allowed to continue.

No Action

Under the No Action Alternative, no construction would take place. As such, no direct impacts to buried archaeological resources are anticipated. In addition, under the No Action alternative, the location of previously unidentified archaeological resources would remain unknown and thus subject to adverse impacts from natural processes (e.g. erosion) and private development not obligated to identify and mitigate for impacts to cultural resources under Section 106 of the National Historic Preservation Act (NHPA). Therefore, the No Action alternative has the potential to adversely impact buried cultural resources.

P&G Based Alternative

Under the P&G Based Alternative, the proposed levee raise and the recreation component of the alternative would not adversely impact buried cultural resources. The proposed riparian woodland, wetland and slope restoration aspects of the P&G Based Alternative could impact previously unidentified buried cultural resources.

Community Based Alternative

The Community Based Alternative has the greatest potential to adversely impact buried cultural resources as many of the key features in this alternative require extensive excavation of culturally sensitive river bank locations. In consultation with the Texas Historical Commission (THC) as well as stakeholder groups including the National Trust for Historic Preservation, Historic Fort Worth, Inc., North Fort Worth Historical Society, Tarrant County Historical Commission, Historic Landmarks, Inc., City of Fort Worth Historic and Cultural Landmarks Commission, as well as several neighborhood preservation groups, a plan to mitigate the impacts of the Community Based Alternative on archeological resources has been developed. This mitigation program fulfills the Army's responsibilities under Section 106 of the National Historic Preservation Act and will be operationalized through a Programmatic Agreement (PA) to be executed between the Department of the Army (Corps of Engineers) and the Texas Historical Commission. The PA is currently under review by THC and will be signed prior to any Record of Decision on this EIS.

The draft PA specifies that the Corps of Engineers, in consultation with the THC, will make appropriate identification efforts for archeological sites prior to the start of construction activities and will monitor construction activities for evidence of cultural deposits. Any site determined to be NRHP eligible that will be adversely affected by the undertaking, will be mitigated in consultation with the THC.

Trinity Uptown Features

This alternative includes modifications to transportation routes and existing levees, the addition of small interconnected canals and changes in primary land use within the project area. The impacts from this alternative are difficult to assess as these changes and modifications may or may not come to fruition, and if they do, may not be subject to Section 106 review. Only undertakings involving Federal funds or permits are required to undergo Section 106 review, therefore many private development projects are under no obligation to address impacts to cultural resources. As such, previously unrecorded deeply buried prehistoric sites may be adversely impacted from development, particularly those in sensitive areas close to the historic river channel. These resources would likely

be lost as a result of the impacts. In addition, there is potential for buried historic sites (remnants of building, structures, farms or other evidence of past land use in the area) to be impacted through development not subject to Section 106 compliance.

Human remains unearthed by development are subject to consultation with the SHPO and subject to further investigation by a professional archaeologist as the SHPO find appropriate, regardless of federal interest in the development.

Architectural

Modifications that significantly alter the historic integrity of a historic property would be considered to have adverse impacts, while modifications that conform to the Secretary of the Interior's Standards for Historic Preservation would not be considered adverse. Mitigation measures would be developed through consultation with the SHPO and interested parties for adverse impacts that cannot be avoided. These mitigation measures would be executed prior to start of construction as stipulated in a legal agreement between the involved parties that satisfies the requirements of Section 106 of the National Historic Preservation Act of 1966.

No Action

Under the No Action Alternative, no new construction or modification of existing structures would take place. As such, no direct impacts to architectural resources eligible to the National Register of Historic Places (NRHP) are anticipated. Unanticipated impacts could occur, such as private development not obligated to identify and mitigate for impacts to architectural resources under Section 106 of the National Historic Preservation Act (NHPA). These impacts are impossible to predict under the No Action alternative.

P&G Based Alternative

Modifications to the levee system that significantly alter the historic integrity of the system would have an adverse impact, while modifications that conform to the Secretary of the Interior's Standards for Historic Preservation (Standards) would be considered to have no effect. Construction details of the proposed modifications would be coordinated with the Texas Historical Commission to determine if the impact is adverse or conforms to the Standards.

Construction of trails and pedestrian bridges could have adverse impacts on historic architectural properties. Adverse impacts would occur to National Register eligible properties to be demolished by construction activity, and there is potential for adverse impacts to historic properties that lie within view of the new construction or modifications.

Community Based Alternative

Construction of a bypass channel has the potential to have adverse impacts on historic architectural properties eligible for the National Register of Historic Places. Adverse impacts would occur to eleven of the 35 National Register eligible properties listed in Table 4 - 8. Construction of the Samuels Avenue Dam could have adverse visual impacts on the adjacent historic railroad bridges within their view shed. Construction of trails and pedestrian bridges could have adverse impacts on

historic architectural properties. Additionally, Henderson and the North Main Street Bridge are historic architectural properties eligible for the National Register of Historic Places, thus there is a potential for adverse visual impacts to these structures.

In consultation with the Texas Historical Commission (THC) as well as stakeholder groups including the National Trust for Historic Preservation, Historic Fort Worth, Inc., North Fort Worth Historical Society, Tarrant County Historical Commission, Historic Landmarks, Inc., City of Fort Worth Historic and Cultural Landmarks Commission, as well as several neighborhood preservation groups, a plan to mitigate the impacts of the Community Based Alternative on historic architectural resources has been developed. This mitigation program fulfills the Army's responsibilities under Section 106 of the National Historic Preservation Act and will be operationalized through a Programmatic Agreement (PA) to be executed between the Department of the Army (Corps of Engineers) and the Texas Historical Commission. The PA is currently under review by THC and will be signed prior to any Record of Decision on this EIS. Specific components of the mitigation plan contained in the PA are as follows:

1. Recordation:

The purpose of the recordation is to provide current and future generations access to archival information and narrative history that comprehensively documents the Central City area from its beginnings to the time prior to the initiation of the construction of the Central City Project.

Many of the affected structures are undistinguished architecturally, although together, they form a cohesive portrait of the Central City area. The intent of the document is to capture the historic nature of the area as a whole rather than to document individual parts in order to produce a more comprehensive understanding of the area's historical development.

To achieve this, the current historic context entitled Below the Bluff, Development at the Confluence of the West and Clear Fork of the Trinity River, 1849-1966, will be expanded to include:

- An expanded contextual history of the area, including examination of the importance of the built and natural environment in relationship to historical social/economic development of the surrounding neighborhoods.

- Expanded coverage of the construction and history of the existing Corps levee system.

- Inclusion of additional historic photographs and maps of the area, including fold-out historic aerial photographs and Sanborn maps.

- Large format photography of up to 75 views of the area, including at least one view of every historic structure adversely effected by the undertaking. Demolition of the NHRP eligible structures listed as adversely effected in Appendix A may commence upon acceptance of the mitigative photography by the TXSHPO. The Corps will forward photographic proofs to the SHPO for a 30 day review and comment

period, upon which the TXSHPO will furnish an e-mail or letter approval of the number of photographs and the quality of the compositional views, or a detailed request of views needed to adequately document the affected structures.

- A detailed architectural description of each NRHP eligible structure in the area of potential effect that meets the Historical American Building Survey Level III requirements.

- Ethnographers will conduct oral histories of up to 20 persons with social, economic or historical ties to the area. The interview subjects will be selected in consultation with the Tarrant County Historical Commission and other local historical societies. Transcripts will be included in the appendix.

- 100 hardbound copies of the revised historic context on archival paper will be provided to distribute among signatories, concurring parties and regional libraries and educational institutions.

- 200 compact disks containing the document in the Adobe Acrobat Portable Document File (PDF) format will be made available to the public.

2. Curation of Original Materials

- One set of labeled archival photographic contact prints will be given to the Tarrant County Historical Commission, one set to the THC and one set with the original negatives will be given to the University of Texas at Arlington Library special collections.

- The oral history tapes will be given to University of Texas at Arlington Library special collections.

The revised historic context document will serve as mitigative documentation of the adversely effected structures as required under Section 110 of the NHPA.

3. Architectural Salvage

On properties that will be demolished by the undertaking, the USACE and its Partners will consult with the THC to determine if the property contains significant architectural features that could be reused, displayed, interpreted or curated. If such features exist, the signatories, with the property owner, will consider measures to ensure that selected features are removed in a manner that minimizes damage and are delivered to an appropriate party for curation and reuse at the expense of the party receiving the materials.

4. National Register Nominations

All properties listed as eligible that are not destroyed or substantially altered to preclude nomination by the Central City Project, will be nominated to the NRHP, barring the objection

of the property owner. All nominations will be submitted by USACE to the THC in draft form within 24 months of the Corps receipt of funding for the nomination.

5. Educational Materials

The historic context developed in Stipulation (a)(1) above will be used to develop a training module to be available for use in the Fort Worth Independent School District (FWISD) to educate students on the history of the Central City area and to gain understanding of the importance of the built and natural environment in relationship with historical context. The training module will be developed in consultation with the FWISD to meet their curriculum specific needs.

The training module will be complete and ready for use by the FWISD before 24 months from the Corps receiving funding for this activity.

Trinity Uptown Features

Transportation improvements that require modification of historic architectural properties could have adverse impacts, depending upon the action taken. Building new bridges could have visual effects on historic properties in the viewshed. Construction of canals that require modification of historic architectural properties could cause adverse impacts, depending upon the action taken. The anticipated build-out of the area as a result of the construction of the bypass channel could also adversely impact historic properties, visually and by the adverse modification of their character defining features. The Corps of Engineers has no control over the subsequent build-out by private development resulting from this undertaking in the coming years or any method available to influence the protection of historic properties outside of a federal undertaking. Measures in place under existing City of Fort Worth laws and regulations that will promote the protection of NRHP-eligible structures potentially affected by Trinity Uptown Features include:

Properties currently designated by the City of Fort Worth as Demolition Delay, Historic and Cultural Landmark or Highly Significant Endangered will be reviewed for all actions taken, which may alter or demolish in whole or in part the property, including any change to the appearance or materials. This review will require a public hearing before the Historic and Cultural Landmarks Commission (HCLC) and may result in the approval or denial of any request.

Written notification will be sent via standard mail to the property owners of all eligible properties providing information about the local designation process, benefits and types of designation, and the requirements of owning a locally designated historic property, as follows:

1. Demolition Delay: Properties identified as resources within the City that merit protection and are subject to a delay in the issuance of a wrecking permit for a maximum of 180 days in order to explore alternatives to demolition. The structure may be changed without constraints.
2. Historic and Cultural Landmark: Properties identified as important to the history of the City and are subject to review by the HCLC for any changes to the exterior of

the structure and property. Demolition may be granted only where loss of significance or economic hardship can be proven.

3. Highly Significant Endangered: Properties identified as the City's most important historic sites and have been deemed endangered. The properties are subject to the same requirements as Historic and Cultural Landmark properties.

Where owners consent to local historic designation, the City of Fort Worth will provide assistance in obtaining the desired designation. However, because the property within the Area of Potential Effect is located within the Tax Increment Finance District #9, created in December 2003, any property designated after that date will not be eligible for the city tax incentives available to locally designated properties until after the retirement of the district.

Table 4 - 8. Impacts to NRHP Eligible Pre-1966 Buildings, Structures, and Landscapes within the Central City APE.

Address	Central City Survey Property Number	Year Built	Theme	Description	Integrity	Effect/Impacts	Eligibility Status
Fort Worth Power and Light/TXU	1-A	1910	Industry	Masonry multi-storied structures with arched windows.	High	No Adverse/Indirect	Eligible A, C
Fort Worth Power and Light/TXU	1-B	1940	Industry	Concrete Retention Pond	Moderate	No Adverse/Indirect	Eligible A, C
Fort Worth Power and Light/TXU	1-C	1940	Industry	Concrete Intake Station	Moderate	No Adverse/Indirect	Eligible A, C
Fort Worth Power and Light/TXU	1-F	1940	Industry	One story masonry with arched windows	High	No Adverse/Indirect	Eligible A, C
Fort Worth Power and Light/TXU	1-G	Circa 1940	Industry	Smokestacks (Demolished 9/2005)	High	No Adverse/Indirect	Eligible A, C
818 North Main *Bud Sellers Auto*	40	c 1921	Industry	Brick masonry with colored design patterns; sheet metal building in back with newer 2-bay addition.	Moderate	No Adverse/Indirect	Eligible A, C
834-842 North Main *Texas Refinery Co.*	50	c 1928	Industry	Masonry and stucco, tile roof accent; Spanish style.	High	No Adverse/Indirect	Eligible A, C
900 North Main *Walter Dearman Truck*	53	c 1946	Industry	One story metal frame with bowstring truss roof. CMU administration building attached to front.	High	Adverse/ Direct	Eligible A, C
909 North Main *Texas Refinery Co.*	52	1946	Industry	One story flat roof masonry, glass block windows.	Poor	Adverse/ Direct	Eligible A, C
917/919 North Main *Texas Refinery Co.*	56/57	c 1946	Industry	One story masonry steel windows.	High	Adverse/ Direct	Eligible A, C
1012 North Main *Ellis Pecan Company*	62	1926	Social History/ Commerce	Brick auditorium; arched steel sash window.	High	No Adverse/Indirect	Eligible A, C

Address	Central City Survey Property Number	Year Built	Theme	Description	Integrity	Effect/Impacts	Eligibility Status
601 North Throckmorton *Hutchinson Pipe & Waste Material Co*.	13-A	1940	Industry	Block masonry with shingled barrel vault roof.	High	Adverse/ Direct	Eligible A, C
601 North Throckmorton *Hutchinson Pipe & Waste Material Co*.	13-B	1940	Industry	Block masonry with sheet metal building on a concrete foundation	High	Adverse/ Direct	Eligible A, C
806 North Throckmorton *Southwestern Brass Works*	42-A	1927	Industry	Sheet metal manufacturing building; original materials.	High	Adverse/ Direct	Eligible A, C
806 North Throckmorton *Southwestern Brass Works*	42-B	1927	Industry	Single story wood frame.	High	Adverse/ Direct	Eligible A
901 North Throckmorton *McKinley Iron Works*	47-A	1931	Industry	Two story masonry.	Moderate	Adverse/ Direct	Eligible A, C
901 North Throckmorton *McKinley Iron Works*	47-B	1931	Industry	Two story masonry.	Moderate	Adverse/ Direct	Eligible A, C
901 North Throckmorton *McKinley Iron Works*	47-C	c 1945	Industry	One story masonry loading dock.	High	Adverse/ Direct	Eligible A, C
609 North Houston *Hobbs Trailers*	14	1950	Industry	Brick masonry; concrete construction with large plate glass; shingle roof accent	Moderate	Adverse/ Direct	Eligible A, C
841 North Houston *McKinley Iron Works*	48-A	1935	Industry	One story metal frame corrugated siding, bowstring roof truss.	High	Adverse/ Direct	Eligible A, C
205 North 7th Street *National Educators Life Warehouse*	31	1949	Industry	Two story brick Moderne; steel sash windows; limestone banding.	High	Adverse/ Direct	Eligible A, C
625 North Commerce *Hobbs Trailers*	15	1928	Industry	One story metal frame corrugated siding.	High	No Adverse/Indirect	Eligible A, C
648 North Commerce *Carruthers Stone*	18	1930	Industry	One story metal corrugated siding.	High	No Adverse/Indirect	Eligible A, C
1024 North Commerce *Western Paint & Roofing*	64	1920	Industry	One story load bearing brick; clerestory lighting.	High	No Adverse/Indirect	Eligible A, C
825 North Calhoun	46	1947	Industry	Dual one story metal buildings with bow truss roof.	Moderate	No Adverse/Indirect	Eligible A, C

Address	Central City Survey Property Number	Year Built	Theme	Description	Integrity	Effect/Impacts	Eligibility Status
1107 North Calhoun *Machine Shop*	65	1939	Industry	One story load bearing brick; clearstory lighting.	High	No Adverse/Indirect	Eligible A, C
336 Greenleaf Street	70	1925	Residential	Single family residence; wood frame with corrugated metal roof; possible addition to side of house.	Moderate	No Adverse/Indirect	Eligible A, C
701 North Henderson *Triple A Package Store*	87	1946	Industry	One story masonry Streamline Moderne.	High	No Adverse/Indirect	Eligible A, C
900 Woodward *City of Fort Worth*	96-A	1940	Industry	Two story masonry incinerator.	High	No Adverse/Indirect	Eligible A, C
Henderson Street Bridge	101	1930	Transportation/Engineering	Open spandrel concrete arch.	High	No Adverse/Indirect	Eligible A, C
SL, SF and Texas Railway Bridge	102	1902	Transportation/Engineering	Iron through-truss span with concrete piers	High	No Adverse/Indirect	Eligible A, C
Paddock Viaduct	103	1902	Transportation/Engineering	Long timber trestles, with steel truss supported by concrete piers.	High	No Adverse/Indirect	NRHP-listed
Flood Control System	104	1910-1957	Flood Control Development/Engineering	Levees, sumps, sluices, Nutt Dam, USGS Water Gauge	Moderate–High	Adverse/Direct	Eligible A, C
Tarrant County Courthouse	107	1895	Community Development	Four story granite Renaissance Revival courthouse	High	No Adverse/Indirect	NRHP-listed

Removal of the levees would produce adverse impacts properties that are eligible for the National Register of Historic Places. The levee removal would require USACE approval and is considered a Federal undertaking under Section 106 of the National Historic Preservation Act, requiring consultation to mitigate the adverse effect through Memorandum of Agreement.

Hazardous, Toxic, Radioactive Waste

No Action

Implementation of the No Action Alternative would have no impacts to HTRW sites within the study area. No significant removal or remediation of contaminants would be predicted to occur absent a major public sector project to stimulate such activity.

P&G Based Alternative

There are known HTRW sites located within the North Main area associated with the Technicoat and American Cyanamid facilities. The North Main portion of the proposed recreation trail is located near these sites. If ground disturbance were involved in construction of these trails a potential to impact HTRW would exist. However, if the North Main portion of the trail was constructed such that no ground disturbance occurred, then no impact to HTRW would be anticipated. No impact to known HTRW sites would be expected with implementation of any other component of the P&G Based Alternative.

Community Based Alternative

There are known HTRW sites within the construction footprint of the Community Based Alternative. A significant amount of additional environmental testing is envisioned during the design phase, of this alternative. The project cost estimate includes remediation of Recognized Environmental Concern (REC) properties, and a contingency to cover remediation of additional sites within the project area identified during the design phase testing. This remediation would be a beneficial effect of the project.

Groundwater monitoring wells at two sites adjacent to the interior water feature (Jay's Salvage and TXU) indicate the presence of chlorinated solvents, total petroleum hydrocarbons, arsenic, and lead, in groundwater at concentrations exceeding regulatory standards (Section 2 of Appendix D). Eight monitoring wells were installed along the proposed bypass channel during the preliminary geotechnical investigations. Preliminary data from the initial groundwater monitoring along the proposed bypass channel indicate groundwater remediation may not be required for groundwater characterized by the eight monitoring wells. Additional groundwater data would be collected during the design phase to determine if groundwater contamination exists at other locations within the project area.

Recommendations:

- Valley Storage Sites – Limited additional investigations are proposed for those valley storage sites noted as having a potential "Recognized Environmental Concern" on adjacent property. Analytical testing would be tailored depending on what releases are suspected on the adjacent property.

- Bypass Channel – More extensive investigations will be required in this area due to its varied use for commercial and industrial activities. There will be sites with lesser degrees of contamination that will require assessment to validate the absence of HTRW and to determine waste disposal requirements. In the next phase, specific properties within the footprint of the bypass channel and those immediately adjacent to it will be the focus of the investigation. A drilling and sampling program will be developed for the properties of concern to assess any suspected releases at the site.

- Interior Water Feature – This feature is located immediately adjacent to the TXU site and Jay's Salvage site. These sites have known contamination issues. Each of these will be addressed separately below.

    - Construction on the TXU site is not recommended. The western portion of the site contains three capped solvent disposal pits. Any action that will disturb the integrity of the cap will require extensive coordination and the approval of the TCEQ. Extremely high, potentially hazardous, levels of lead have also been detected in the soil at this site. On-going groundwater sampling activities should also be monitored during the life of this project to insure contaminants from the TXU site will not negatively impact the project.

    - Construction on the Jay's Salvage site should be avoided if possible or undertaken only after thorough investigation. A variety of contaminants have been detected in previous investigations.

    - Sediment in the Trinity River has been contaminated by a variety of chemicals, primarily pesticides used for termite control. Sampling of the sediments along the interior water feature and where the bypass channel connects to the existing river channel is recommended for the next phase.

- As with many developed urban areas, groundwater throughout the study area is expected to contain a wide variety of low level contaminants from historic sources. As more site specific investigations are conducted during future phases, the groundwater will be sampled to identify and quantify the contaminants present. This testing will be used to determine how to properly dispose of the water. It is believed that most of the water can be discharged back into the Trinity River. Any groundwater requiring treatment will be discharged to a publicly owned treatment works (POTW), if possible, or pre-treated by the contractor before disposal to a POTW.

- It is anticipated the excavated soils will be reused in other portions of the study area to balance cut and fill as much as possible. Investigations during the next phase will identify areas where the soils need to be segregated and tested prior to re-use. Any soils that are contaminated and cannot be used as part of the project will be disposed of in an appropriate manner.

- A number of buildings will have to be demolished as part of construction of the project, particularly within the footprint of the Bypass Channel. Given the age and use of many of the buildings there is a high likelihood lead-based paint, asbestos and other regulated materials (thermostats with mercury switches, fluorescent light ballasts with PCBs, fluorescent light tubes with mercury, cooling equipment with CFCs, etc.) will be present. As part of the project design it will be necessary to conduct surveys of the buildings to be demolished. The construction contractor will abate and dispose of all identified hazardous materials.

- The above discussions are focused on those areas that will be impacted by the features constructed by the USACE. As the Trinity Uptown features are refined and developed by other entities they will need to conduct their own due diligence efforts to identify and address HTRW contamination. For example, the former Techni-coat/American Cyanamid site identified as part of this effort lies outside the boundaries of the project. Both sites are currently part of the TCEQ Voluntary Cleanup Program (VCP) and are currently being used as a parking lot. Future development of this site for use other than as a parking lot may require significant additional effort to characterize the site for its new intended use. It is likely other similar, but as yet unidentified, sites lie within the overall study area. As new sites are developed, they will need to be carefully evaluated for the existing conditions and remediated as needed for the intended use. The EPA Brownfields Program and the TCEQ VCP are potential tools that could be utilized to facilitate this process.

Trinity Uptown Features

There are known contaminants within the area where the Community Based Alternative's Trinity Uptown Features are expected to occur, and the potential exists for any or all of those actions to involve HTRW issues. Any such HTRW issues would require remediation of the hazard prior to implementation of the Trinity Uptown Features. Economic projections suggest market incentives for land use intensification, would be sufficiently powerful to bring private sector resources to bear in order to accomplish the required remediation. This remediation would be of significant benefit to the study area.

Socio-economics

No Action

This alternative would have no impacts to the socio-economic character of the study area. Even without a major economic stimulus, however, some economic development would be expected to occur. This development is expected to generate $638.8 million in total economic activity from construction impacts of projects and $497.6 million in total economic activity from recurring business operations at the 40-year planning horizon. Total wages, salaries, and benefits will total $200.4 million for construction impacts and $197.8 million for recurring business, employing 5,940 and 5,040 per year respectively. Total property income for construction impacts will be $55.6 million per year and $46.4 million per year for recurring businesses. State and local governments will bring in almost $21 million per year in taxes from construction projects and $14.7 million in taxes from recurring business. Appendix I contains additional information relative to the basis for these estimates.

P&G Based Alternative

The levee raise component of the P&G Based Alternative would have some adverse impacts to the socio-economic character of the study area in that the literal and economic division between the study area, downtown, and other areas of the city would be perpetuated. Conversely, measures associated

with ecosystem improvement would have beneficial impacts for land use and could provide minor quality of life improvements for adjacent neighborhoods. The recreational components of this alternative would provide beneficial impacts by enhancing access to and utilization of the Trinity Trails System.

In terms of overall economic activity, it is anticipated that the Principles and Guidelines Based Alternative would not materially affect the socio-economic landscape of the project area or significantly alter the No Action prediction. While the flood protection deficiencies addressed by the P&G Based Alternative are real and measurable, nothing in the data collection effort for this evaluation suggests that they significantly constrain land use intensification or materially influence economic development activities in immediate project area.

Community Based Alternative

Construction of the bypass channel would likely have significant impacts on a number of socioeconomic categories. Land use on the 149 private parcels which have been preliminarily identified for full or partial acquisition would be modified. This acquisition would have adverse impacts on businesses facing relocation. In order to preliminarily quantify those impacts, The Tarrant Regional Water District contracted with Pinnacle Consulting Management Group, Inc. to assess the relocations needs of those populations and businesses potentially affected by construction of the bypass channel and associated roadways. Pinnacle identified 56 landlord displacements, 93 business displacements, 220 storage unit displacements, and an indeterminable number of street bazaar vendors. Residential displacements are confined to four long-term residents of an effected motel, and one business is also a permanent place of residence.

To aid in the identification of minority and female owned businesses, surveys were conducted by to assess business relocation as a result of construction of the bypass channel and to help determine the racial and gender makeup of business owners and employees. Of the 93 businesses identified as facing relocation, 17 businesses responded that they were female and/or minority owned representing 18 percent of the potentially dislocated businesses. This compares to 41 percent of businesses in Tarrant County that are female or minority owned. The percentage of potentially impacted businesses could be higher due to businesses not responding to this particular question. Additionally, of the 56 landlord displacements, 18 identify themselves as being female and/or minority owned representing 32 percent of those landlords potentially facing displacement. Those businesses and landlords facing potential displacement do not appear to disproportionately impact those owned by minority and/or females.

Business owners were also asked about the minority composition of their employees. Of those businesses responding to the question, 21 reported having significant minority and/or female composition, at least half their employees are minority and/or female. These 21 businesses represent approximately 23 percent of the dislocated businesses. The percentage of potentially impacted businesses with significant minority/female compositions could also be higher due to businesses not responding to this particular question.

Some of the potentially dislocated businesses may have more difficulty in relocating then others due to: 1) substantial investments in plant and equipment, or those with outdated equipment and equipment that is difficult to move; 2) those that are subject to State and Federal regulations and permitting; 3) those that handle controlled substances such as explosives; and 4) those that need

access to transportation networks. Of the approximately 93 businesses potentially dislocated businesses, several have been identified as facing potential difficulties in having to relocate. Of those, all require some sort of permitting process in order to relocate. However, all these businesses should have sufficient lead time to secure the permitting necessary to relocate, minimizing their operational transition. Three businesses have equipment that will be difficult to relocate, two of which are considered historically underutilized businesses (HUB). One of these businesses will most likely move its operations to another facility, and another has indicated it will relocate within the area since it is a defense contractor with contracts in the area. Aside from the permitting issues, it is not anticipated that these businesses will face any other significant impediments to relocation; therefore, impacts to employment should not be significant or disproportionate.

While the relocations in and of themselves do pose a significant hardship for those affected, it does not appear that minority owned business, or those with significant minority compositions are being disproportionately targeted when considering the overall racial composition of the project study area. Consideration is also given to those businesses that may face significant obstacles to relocate due to permitting issues and access to transportation networks. The number of businesses that fall into this category is relatively small. Additionally, the number of businesses facing difficulty in relocating is also relatively small

The City of Fort Worth has developed an incentive package intended to help mitigate potentially adverse impacts to relocating businesses and retain these businesses within the City. The package includes expedited plan review and zoning processes, waiver of certain liens and fees, and a three-year graduated tax abatement on real and personal property based on the location to which the business related. This incentive package has been presented to the City Council and is pending approval in November of 2005.

In contrast, bypass channel construction would be expected to directly create 6,100 new jobs and generate an additional 35,659 jobs from recurring business and from residential and commercial related activities for a total employment impact of 41,759 jobs.

Transportation impacts during construction would be associated with the re-routing of traffic while bridge construction and other required modifications are underway. Ultimately, the Community Based Alternative would have a beneficial effect on transportation, eliminating the existing at-grade railroad crossings at Henderson Street and White Settlement Road with grade-separation structures. An improved intersection of Henderson Street and White Settlement Road would also be provided, including turning lanes and enhancing visibility. White Settlement Road would be extended to provide a through-connection to North Main Street. University Drive would be elevated above the 100-year floodplain in the section between the West Fork and Jacksboro Highway, improving access during significant flood events.

The bypass channel is expected to have a significant beneficial impact on property values and tax revenues. Moderate benefits should result for residential growth but this could have a moderate adverse impact on environmental justice if “historical” residents are not able take advantage of new amenities in the area. Even though residential displacement is not impacted, community cohesion could be slightly adversely impacted due to new “borders” created by the bypass channel. The potential exists for increased land values to translate into increased property taxes but should be offset by improved employment opportunities provided by the ancillary development occurring in the area. Property owners will also have the option of selling higher valued property and buying suitable property elsewhere.

The interior water feature would have significant impacts similar to the bypass channel. This feature is one important mechanism for spurring commercial and residential development. Most of the land required for construction of the interior water feature is currently owned by TRWD. Total employment generated by the associated residential and commercial development adjacent to the water feature is predicted to be 19,300 with tax revenues of $68 million. Property income of $177 million is expected for land adjacent to the water feature. Community cohesion should be moderately benefited with the advent of new residential development. There would be significant beneficial impacts to residential development as well as increased economic activity totaling over $2 billion over the 40-year planning horizon. Local populations could experience moderate adverse impacts with respect to environmental justice if they are economically shutout from enjoying the new housing developments.

Likewise, transportation networks immediately adjacent to the interior water feature would be adversely impacted during construction. However, long term impacts of the White Settlement extension over the interior water feature, connecting to Main Street would be beneficial, providing an additional point of access to North Main Street.

Significant beneficial impacts should be realized in relation to residential growth and transportation in the project area. Projected 2025 daily total traffic volumes for the proposed Henderson and White Settlement Street bridges are expected to be 46,000 and 22,800 vehicles respectively, while the North Main Street Bridge is expected to convey 33,000 vehicles. Additionally, traffic volume on North Main is expected to increase 91 percent and traffic on Henderson and White Settlement is expected to increase 51 and 59 percent respectively. Bridge modification should moderately benefit land use, employment, property values, community cohesion, and economic activity. Slight benefits should accrue for tax revenues from the construction of these modifications. Moderately adverse impacts could occur for business displacements although the majority of these businesses that would be impacted are accounted for in the business displacements identified for the bypass channel. There are however, nine private business parcels that may be impacted from road improvements that are not included in the bypass channel parcels. Residential displacements are not impacted and environmental justice issues are not expected.

Trinity Uptown Features

Transportation Modifications – Impacts to traffic flow would be anticipated as the street grid structure is improved to provide additional connectivity. In additional, regional transportation planners envision the introduction of light rail along North Main Street, although a detailed plan has yet to be formulated. The Trinity Uptown Plan introduces the concept of movement between the City's major destination areas by river taxi. Overall, the sustainability of the projected growth in the area would be significantly enhanced by the development of public transit.

Levee Removal – This action would provide significant beneficial impacts for land use, as this would facilitate the joining of the project area with downtown. This should also produce moderate benefits for property values, residential growth, and economic activity and produce slight benefits for employment and community cohesion. Generally no impacts are anticipated for the other categories.

Extension of water-based linkages– These would be expected to produce moderately beneficial impacts for land use, property values, and residential growth, although this is highly speculative. Slight beneficial impacts may be expected for employment, tax revenues, community cohesion,

residential growth, and transportation. No impacts are expected for residential and business displacement, and for no impacts are predicted to disproportionately affect minority populations.

Land Use Changes – Land use changes can be expected to produce significantly beneficial impacts for several socioeconomic categories including land use, employment, tax revenues, property values, residential growth, and economic activity. These changes are however, a precondition for the actions under the Community Based Alternative to take place such as the bypass channel and interior water feature. Future land use patterns as depicted in the City's comprehensive plan categorized the project area as a mixed-use growth center which incorporates many of the characteristics of a downtown such as concentration of jobs, housing units, public transportation hubs, and pedestrian activity within a relatively small geographic area. This differs from the linearity of a commercial corridor. The Trinity Uptown Plan calls for over 10 million square feet of residential space, over 1 million square feet of retail commercial space, 310,000 square feet in community space, 250,000 square feet of space for TCC at the 50-year build out. This development would have an estimated value of $1.1 billion (current year dollars.)

The City of Fort Worth has expressed strong support for ensuring that land use changes within the project area include affordable housing and encourage diversity in the residential population. The City is considering a variety of land use management tools, including affordable housing set-asides, to achieve these goals.

Air Quality

No Action

Implementation of the No Action Alternative would result in no impacts to the existing air quality of the study area.

P&G Based Alternative

No long-term adverse impacts would occur from implementation of the P&G Based Alternative. Some adverse impacts may occur as a result of airborne pollutants. These impacts would occur for the duration of the construction period, which is estimated to be approximately 3-years. These air quality impacts would mainly consist of airborne particulate matter (PM) generated by earth moving activities and construction traffic on unpaved roads, as well as emissions from construction equipment. It is expected that particulate emissions from earth-moving activities would be controlled through best practice control measures to maintain compliance with the TCEQ visible emission regulations. The P&G Based Alternative is expected to have less air emissions from construction activities than the Community Based Alternative because there are less ground disturbance activities associated with the P&G Based Alternative.

The P&G Based Alternative is expected to have less air emissions from construction activities than the Community Based Alternative because there are less ground disturbance activities associated with the P&G Alternative.

Community Based Alternative

Impacts to air quality from implementation of the Community Based Alternative would be similar to those discussed for the P&G Based Alternative. Section 176(c)(1) of the Clean Air Act (CAA) and 40 CFR 51 Subpart W contain requirements for what is termed "General Conformity". The General Conformity rule prohibits any Federal agency from supporting or approving any action or project that does not conform to an EPA-approved State Implementation Plan (SIP). In the Texas SIP, EPA has approved TCEQ's request for "*de minimis*" levels for determining what projects require a detailed General Conformity analysis; projects that have annual emissions less than the *de minimis* levels do not require a conformity analysis. For the D/FW nonattainment area, the *de minimis* levels established in the SIP are 100 ton/yr of nitrous oxides (NO_x) or volatile organic carbon (VOC).

Emissions of NO_x and VOC from the Community Based Alternative would result primarily from engines in off-road construction equipment. Emissions for NO_x and VOC were calculated using emission factors from EPA's draft NONROAD 2004 emission model. Construction activity levels, in the form of hours of operation for specific types of construction machinery, were estimated for the highest-activity year (i.e., the year with the most equipment activity). Based upon reasonable estimations on the type and operation of equipment, the calculated emissions of pollutants NO_X, and VOC are less than 100 tons/yr; the highest emitted pollutant was NO_X at 75 tons/yr. An additional detailed analysis for general conformity determination is therefore not required. Further details on the NO_x and VOC estimates are shown in the letter report dated December 16, 2005 included in Air Quality Technical Section of Appendix G of this EIS.

The use of blasting is also being considered in construction to excavate the by-pass channel. The local quality would be temporarily affected by the upward dispersion of particulates, but the use of a steel blanket would limit the dispersion of particulates into the air. Blasting under such conditions would not significantly affect air quality. No increase in NO_x and VOC emissions are anticipated with blasting.

Trinity Uptown Features

Impacts to air quality resulting from any of the Trinity Uptown Features would be long-term temporary impacts related to construction activities. As these actions are not clearly defined and no construction schedules are developed, the length of construction, and thus the impact is unknown; however, given the nature of these types of activities, it is anticipated that the impacts would be intermittent for five or more years.

Noise

No Action

Implementation of the No Action Alternative would result in no impacts to the existing noise levels within the study area.

P&G Based Alternative

Implementation of the P&G Based Alternative would result in impacts to noise levels. These impacts would be associated with construction activities. Because construction activity would not be occurring throughout the entire project area simultaneously, these impacts would be intermittent across approximately a 3-year construction period.

Community Based Alternative

Implementation of the Community Based Alternative would result in impacts to noise levels. These impacts would be associated with construction activities. Noise impacts would be expected to be confined to daylight hours and would be temporary in nature, as construction activities would not be occurring throughout the entire project area simultaneously. These impacts would be intermittent across approximately a 10-year construction period. In the residential neighborhoods surrounding the Riverbend hydraulic mitigation area, temporary construction noise could well be more noticeable than in the highly urbanized commercial and industrial areas adjacent to the bypass channel feature.

The use of blasting may be considered to excavate the by-pass channel. This limited blasting is not anticipated to create a substantial noise impact in the area. The City of Fort Worth permits the use of blasting as a part of construction operations within the city limits. Approval for blasting is granted through the Fire Department after review of the blasting plan by the Fire and Engineering Departments.

There could be some long term noise impacts associated with implementation of the transportation features of the Community Based Alternative where road alignments would be modified. These potential impacts would be expected to be confined to the downtown portions of the project where ambient noise levels already reflect a highly urbanized setting.

Light

No Action

No impacts to light levels would occur as a result of implementing the No Action Alternative.

P&G Based Alternative

No impacts to light levels would occur as a result of implementing the P&G Based Alternative.

Community Based Alternative

No impacts to light levels in the downtown or Riverbend portions of the study area are expected to occur as a result of implementing the Community Based Alternative.

Trinity Uptown Features

The land use changes identified as Trinity Uptown Features of the Community Based Alternative could have an impact to ambient light levels within the study area due to the intensification of residential and business activity within the area. This area is already highly urbanized with significant ambient light levels; any changes are expected to be minor in nature.

Public Facility and Service

No Action

There would be no effect to Public Facilities and Service as a result of implementing the No Action Alternative.

P&G Based Alternative

Implementation of the P&G Based Alternative would result in beneficial impacts to Public Services and Facility resources. Ecosystem improvements and recreational amenities would provide additional public facilities. Flood damage reduction measures would decrease the community investment of resources for emergency response activities.

Community Based Alternative

The Community Based Alternative would have beneficial impacts to Public Services and Facility resources. Ecosystem improvements and recreational amenities would provide additional public facilities. Flood damage reduction measures would decrease the community investment of resources for emergency response activities.

Trinity Uptown Features

Land use changes identified as a connected action would increase the level of visitors and provide opportunities to bring a large number of permanent residents to the study area. Therefore, the connected land use changes would impact public services and facilities due to an increased need for these services.

Human Health and Safety

No Action

The No Action Alternative would have adverse impacts to human health and services. Implementation of this alternative would not address the risk of flooding which currently exists in the study area.

P&G Based Alternative

Implementation of the P&G Based Alternative would have impacts to human health and safety. This alternative would provide positive impacts by reducing the flood damage risk through a levee raise. There exists a minor risk of increased mosquito spread diseases due to the wetland development components of the alternative.

Community Based Alternative

The Community Based Alternative would provide positive impacts to human and health and safety by reducing the flood damage risk through construction of the bypass channel and its associated features. Additionally, this alternative has less possibility of increasing the exposure to wetland borne insects and diseases by concentrating the ecosystem improvements within a single area. Grade-separations at Henderson at White Settlement would provide significant benefits to safety by reducing accident risk, as would the environmental remediation associated with project construction.

Trinity Uptown Features

Transportation modifications identified as a connected action to the Community Based Alternative could have a beneficial impact to human health and safety by increasing capacity and thus relieving congestion and reducing accident risks. Significant cleanup of environmental contaminants is also predicted.

Irreversible or Irretrievable Commitments of Resources

The Council on Environmental Quality (CEQ) regulations for implementing NEPA requires consideration of irreversible and irretrievable commitments of resources that would result from implementing any of the study alternatives. However, CEQ has not defined these terms. For the purposes of this document, irreversible and irretrievable resources are those that cannot be recovered if the project is implemented. Irreversible effects primarily result from use and destruction of a specific resource that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action. In addition to the irretrievable commitment of non-renewable energy resources, which would occur as a result of constructing, maintaining, and operating either the P&G or Community Based Alternative, other resources which would be impacted are discussed below.

All alternatives, including the No Action Alternative and the Trinity Uptown Features would have an irreversible impact to grassland quality and/or quantity. These grasslands consist primarily of non-native Bermuda grasses, which are mown and maintained within an urban environment. The value of these grasslands is not considered to be of significance due to their abundance and low value as wildlife habitat, and therefore, impacts to this resource would not be mitigated.

Implementation of the No Action Alternative, Community Based Alternative, and Trinity Uptown Features would cause an irreversible and/or irretrievable loss to upland woodlands within the study area. Additionally, as there are no measures identified in the P&G Based Alternative which would prevent the upland woodland losses, which occur for the No Action Alternative, it is assumed these

losses would occur despite the implementation of the P&G. The upland woodlands within the overall study area are located within a highly disturbed urban environment, and generally these woodlands would not embody habitat significant to a level which affords any local, regional, or Federal conservation or protection. However, the upland forests impacted in the Riverbend area were considered of higher quality, and losses to the woodlands associated with Community Based Alternative are proposed to be mitigated.

Selection of the No Action Alternative for implementation would result in the irretrievable loss of wetland values. While construction activities associated with the Community Based Alternative would initially impact wetlands, the quality and quantity of this resource would ultimately be increased, and therefore, there would be no irretrievable or irreversible impact to wetland resources from implementing this alternative or the P&G Based Alternative. Impacts to this significant resource associated with the No Action Alternative would not be mitigated, as these impacts would not be the result of any Federal Action, but rather with the lack of action.

There would be 1875 linear feet of riffle-pool habitat value within Marine Creek which would be irretrievably lost due to inundation and 400 linear feet of Lebow Creek which will be irreversibly lost due to fill activities associated with the Community Based Alternative. These aquatic resources are considered significant by both the USACE and USFWS, and appropriate and adequate mitigation for these losses would be required if the Community Based Alternative is implemented.

USFWS has coordinated with the USACE and local sponsors and has approved a mitigation plan for the impacts to Marine and Lebow Creeks. Mitigation measures include diverting flows varying by season up to 5 cubic feet per second to the mid-reach of Lebow Creek. A gravity flow pipeline from Samuels Avenue Dam impoundment would be possible to a point on the stream where the bottom elevation is approximately 525 NGVD feet, which appears to be near Brennan Avenue. In addition, investigation of the potential to add additional aquatic habitat area by modifying the channel bottom of Lebow Creek within the reach downstream of Brennan Avenue including the 1500 feet of downstream diversion of Lebow Creek. Additional aquatic mitigation will occur at Ham Branch to fully compensate for aquatic impacts. Mitigation occurring at Ham Branch would be completed following studies to determine a stream configuration that is geomorphically stable based upon hydrology, sediment characteristics and slope. A typical cross-section and plan view of proposed mitigation features are presented in Appendix G.

CUMULATIVE IMPACTS

In 1997, the Council on Environmental Quality (CEQ) developed a handbook that contained guidelines for addressing cumulative impacts in analyses prepared under the National Environmental Policy Act. The assessment of cumulative impacts is addressed in NEPA by its reference to interrelations of all components of the natural environment. The CEQ defined cumulative impacts as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. The term "reasonably foreseeable" implies that the project may only have a general public knowledge or acceptance at a point in time and that detail of design and project specific impacts are yet to be developed or disclosed by the project proponent. Clearly, within the Upper Trinity River Basin, potential for cumulative impacts is high. However, establishing the significance of cumulative impacts is much more difficult to accomplish.

This cumulative impacts analysis uses the level of information available at the time this EIS was prepared to describe these other projects and their respective potential impacts on the environment. If sufficient data or information on specific proposed projects were not available to complete an analysis comparable to the evaluation of other projects, and reasonable efforts to obtain that information were unsuccessful, professional judgment was used to estimate the potential impacts.

Numerous flood damage reduction, channelization, transportation, and recreation projects, along with general urbanization of the area has resulted in significant alterations to the historical condition of the Upper Trinity River Basin and within the downtown Fort Worth vicinity. Historical information related to the impacts of these past projects is unavailable and unattainable. Therefore, this cumulative impacts analysis considered the existing conditions to be a result of the past and present projects that have occurred in the study area and serves as a baseline to address impacts of the reasonably foreseeable projects.

Identification of Reasonably Foreseeable Projects

The Regulatory Program of the U.S. Army Corps of Engineers (USACE) plays a critical role in the protection of the aquatic ecosystem and navigation. Important elements of the program implemented by the USACE under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899 include evaluating activities in jurisdictional areas and authorizing them through individual and general permits. Authorized activities are tracked by a USACE database that contains spatial and other information including the description of the proposed action, the rational of the permit decision, acreages of impacts to important resources and mitigation acreage required as conditions to the authorized activities.

The following method was utilized to determine potential cumulative impacts of past, present or reasonably foreseeable future permitted activities within the floodplain. The USACE Regulatory database was queried for permit actions within the period of January 1998 to February 2005 within Tarrant and Dallas Counties. The cumulative impacts of previously permitted actions was considered and addressed within the Programmatic Environmental Impact Statement, Upper Trinity River Basin, Trinity River, Texas, that was finalized in June 2000. Cumulative impacts discussed in that document are incorporated by reference. The query also limited the results by the type of permit activities that resulted in or could cause impacts to jurisdictional areas. The resultant data set was reviewed by USACE Regulatory personnel and filtered to remove permit actions for consideration that did not or would not impact the physical, chemical or biotic integrity of the nation's water. This data was filtered by location within a 200 meter buffer surrounding and including the 100 year floodplain along the West Fork and Clear Fork of the Trinity River, as defined by USACE Hydrology & Hydraulics personnel. Upstream limits were Benbrook Dam on the Clear Fork, Lake Worth Dam on the West Fork. The downstream limit of the search was at the confluence of West and Elm Forks of the Trinity near Dallas, Texas. The resulting 109 projects either concluded or continue under Regulatory consideration for action (Figure 4 - 4) were reviewed by USACE biologists and compared with results of other searches to define the final list of identified past, present and future reasonably foreseeable projects within the geographic area that should be included in the cumulative impact assessment.

The base study area for identifying projects having potential to contribute to cumulative impacts to environmental resources includes the area defined by the floodplain of the Trinity basin with upstream limits of Benbrook Dam on the Clear Fork and Lake Worth Dam on the West Fork. The downstream limit of the study area was at the confluence of West and Elm Forks of the Trinity near

Dallas, Texas. Reasonably foreseeable projects that occur totally or cross this area were identified for further consideration in the cumulative impact assessment. The study area was not set based upon political boundaries, but by reviewing Table 4 - 8 it can be seen that the boundaries of the cumulative impact assessment included most of Tarrant County and extended into portions of Dallas and Johnson Counties, Texas.

The base study area for social resources was determined to coincide primarily with the general project study area, however, any projects identified as “reasonably foreseeable” for environmental resource impacts were also considered in the cumulative impact assessment.

Hydrology and hydraulics cumulative impact assessment study area includes the contributing watersheds above the Central City study area and extended downstream to the confluence of West and Elm Forks.

To assess the cumulative impacts on the economic and environmental resources within the Central City study area, the reasonably foreseeable projects of others that could, in concert with the P&G and Community Based Alternatives, contribute to cumulative impacts were identified. Several methods were used to identify these projects including informal verbal requests, database searches, literature reviews, and Internet searches from agencies and organizations that have information on proposed activities that could occur in the study area. Several criteria were used to initially screen projects to determine if they were by definition, reasonably foreseeable. These criteria included factors such as whether funds were allocated for the projects, if plans had been made public, if the actions were portions of ongoing studies or projects, or if construction was currently underway. This process resulted in the identification of approximately 205 projects ranging from minor maintenance activities to larger, more complex activities such as major transportation studies. The projects were entered into a database and then reviewed by an interdisciplinary team from the Fort Worth District Corps of Engineers in an attempt to screen those that would not contribute to cumulative impacts or that were known not to have future funds available to be implemented. Only three of the 205 identified projects were removed from further analysis as a result of this screening. Table 4 - 9 below lists and gives a brief description the projects considered for this cumulative impacts analysis.

Table 4 - 9. Projects Considered During the Cumulative Impact Analysis.

PROJECT	RESPONSIBLE	DESCRIPTION	LOCATION	PHASE
		Ecosystem Restoration		
Riverside Oxbow	USACE	Create / restore 56.5 acres of wetland, restore / improve 250 acres bottomland hardwoods and deciduous forest; restore 253 acres of prairie / grassland	East of Downtown Fort Worth on West Fork of Trinity	Plans and Specs
		Flood Damage Reduction		
Farmers Branch	USACE	The NED plan consists of grass lined channelization with periodic gabion structures downstream of Las Vegas Trail to upstream of White Settlement (6300 linear feet of stream). Buyout would also accompany the plan in the upper most reaches and lower reaches of the Farmers Branch. Total affected acres from the project plan are approximately 21 acres of a possible total project area of 325 acres.	City of White Settlement, Texas. White Settlement is approximately 8 miles west of downtown Ft. Worth, Texas.	Feasibility
Little Fossil	USACE	7,350 ft. of grass and concrete lined trapezoidal channel with some erosion control; mitigation includes 11 acres of forested habitat, 20 acres of open water, 33 acres of old field, and 10 acres of wetland	Northeast of downtown Fort Worth from confluence of Big Fossil Creek to Beach Street	Plans and Specs
		Section 404, Section 10, Other Permitted Projects		
Fills, Permits, Utilities, and Other Activities	Multiple	92 authorized and 42 pending individual, nationwide / general permit actions	Upper Trinity Watershed area extending from Benbrook Lake and Lake Worth to confluence of Elm Fork.	Planning to construction
Benbrook to Eagle Mountain Pipeline	TRWD	Construction of 96-inch pipeline between Benbrook and Eagle Mountain Lakes, booster pump station, and associated electric line trench; pipeline crosses 30 streams, electric line crosses one. ROW width varies between 90-150 ft.	Benbrook to Eagle Mountain Lake	EA for easement across USACE property awaiting approval – 404 (NWP 12) issued
		Transportation Projects		
Hyde Park Transit Plaza	City of Fort Worth, GSA, and The T	Design and construction of transit oriented plaza	9th and Throckmorton	Design Phase
IH 30 Realignment	TXDOT	Relocation of IH 30 south of Downtown Fort Worth for Lancaster Corridor Improvements	South of Downtown Fort Worth	Complete

PROJECT	RESPONSIBLE	DESCRIPTION	LOCATION	PHASE
IH 30 Corridor	TXDOT	Expand from three general purpose lanes to four/five general purpose lanes in each direction along with one reversible HOV lane between Fielder Road and SH 161.	Between Oakland Blvd. and SH 161	Planning
IH 35W Study	TXDOT	Expand from two-three general. Purpose lanes to four general. Purpose lanes and one reversible HOV lane.	IH 35W from IH 820 to 4th Street	Planning
IH 820 Northeast Corridor Study - IH 35W to SH 26	TXDOT	Expand from two general. Purpose lanes in each direction to five general. Purpose lanes each direction with on reversible HOV lane.	IH 820 from IH 35W to SH 26.	Environmental Document Review
IH 820 East Corridor - North Interchange at SH 121 to Randal Mill Road	TXDOT	Expand east IH 820 including from 8 lane highway with frontage roads to 8/10 lanes with auxiliary lanes where needed; includes reconstruction of south interchange with SH 121 and continuous frontage roads and reversible HOV lane between the north interchange at SH 121 and Trinity Blvd.	From north interchange at SH 121 to Randal Mill Road	FONSI Issued in March 2004.
IH 820 Corridor Plans Analysis – IH 30 to IH 20	TXDOT	Still under study	IH 820 corridor from Meadowbrook Drive to IH 20 and the 2.5 mile IH 20 corridor between IH 820 and US 287.	Planning
SH 114/SH 121 north of DFW Airport	TXDOT	Addition of express/managed lanes (express and HOV). Expand four through lanes each direction to five through lanes and add 2 HOV lanes each direction at intersection of 114 and 121; expand frontage roads from two to three lanes.	North of DFW involving SH 114 from BS 114L to International Parkway and SH 121 from SH 360 to SH 121 Bypass near Lewisville.	Planning
SH 121/SH 183 Study from IH 820 to SH 161	TXDOT	Expand from three general. Purpose lanes in each direction to five general. Purpose lanes each direction with two reversible HOV lanes in the median along SH 121 to IH 820 to SH 183. Four general. Purpose lanes each direction with three lane reversible HOV lane in median are planned for SH 183 from SH 121 to SH 161.	Airport freeway from IH 820 to SH 161	Planning
SH 121T - 1187 to near Summit Avenue	TXDOT	The State Highway (SH) 121 project is a multi-lane controlled access highway that extends from Interstate Highway (IH) 30 near downtown Fort Worth in Tarrant County to Farm-to-Market Road (FM) 1187, for a total project length of 15 miles. The entire facility is proposed on a new alignment. It would traverse a large portion of the City of Fort Worth with major interchanges at IH 30 and IH 20/SH 183.	See left.	Comment period for Final EIS

PROJECT	RESPONSIBLE	DESCRIPTION	LOCATION	PHASE
SH 360 Corridor Improvement Study from IH 20 to IH 30	TXDOT	Park and Ride facilities suggested for SH 360/Mayfield and SH 360/Abrams; bike and pedestrian improvements are recommended; possible commuter rail; expand Collins Street to six lanes from IH 20 to SH 183; expand Great Southwest Parkway to continuous six lane arterial; The main lanes of SH 360 from Abram Street to IH 30 would be totally reconstructed as an 8 lane freeway, with allowance for possible future expansion to 10 lanes built into the median. Flyover ramps directly connecting the main lanes of IH 30 to SH 360 would be added. Division Street and the adjacent Union Pacific Railroad bridge would be reconstructed to accommodate the new SH 360 main lanes and permit continuous frontage roads. The existing inside shoulders of SH 360 south from Abrams Road to IH 20 are constructed 12 feet wide, with full depth pavement to facilitate expansion to eight lanes. All widening in this segment would be to the inside of the existing lanes.	See left.	Planning
Lancaster Corridor Improvements	City of Fort Worth	Streetscape and Infrastructure Improvements	Lancaster between IH 35W and Henderson	Under Construction
7th Street Bridge	City of Fort Worth	Replacement of Bridge	7th Street above Forest Park Blvd. And Clear Fork of Trinity River	Planning Phase
9th Street Improvements	City of Fort Worth and The T	Streetscape improvements between Jones and Houston	9th Street between Jones and Houston	Design Phase
Sewer Improvements	City of Fort Worth	Infrastructure Improvements	Unknown	Under Construction
North Main Corridor Project - Streetscape	City of Fort Worth and TX DOT	Streetscape and Pedestrian Improvements	North Main Street between the Tarrant County Courthouse and the Historic Stockyards	Planning
Hemphill Underpass	City of Fort Worth	Construction underpass beneath IH 30 and the UP Railroad connecting downtown Fort Worth to the Medical District and near-south neighborhoods	Hemphill at IH 30	Planning Phase
		Housing Developments		
Trinity Bluffs	Private Individual	650 apartments and 175 townhomes	Samuels Avenue	Final Planning
Flatiron Building	Private Individual	Renovation of historic building	1010 Houston Street	Under Construction
South of Seventh	UC Urban	100 townhouses and 180 condos	2600 block of W. Lancaster	Under Construction
Tandy Center	Private Individual	334 condos	150 Throckmorton	Planning

PROJECT	RESPONSIBLE	DESCRIPTION	LOCATION	PHASE
Neil P. Anderson	Amicus Interests	60-70 condos	411W. 7th Street	Under Development
Versailles	Private Individual	7 residential units	409 N. Henderson	Under Construction
Bluff Street	Private Individual	4 residential units	959 W. Bluff Street	Under Construction
Le Bijou	Private Individual	15 townhomes	400 block E. 6th/E. 7th	Fall 2004 – Const. Begins
The Tower	Private Individual	315 condos	500 Throckmorton	Under Construction
T&P Terminal	Private Individual	100 new apartments and 138 renovated apartments	South Side of Lancaster – 221 W. Lancaster	Final Permit
T&P Warehouse	Private Individual	Mixed use	South Side of Lancaster – 401 W. Lancaster	Planning
Transport Life Building	Private Individual	65 rental units	714 Main Street	Planning
Kress Building	Private Individual	24 rental units	605 Houston Street	Planning
Cotton Depot	Private Individual	210 rental units	700 block E. 4th	Under Construction
Pecan Place	Private Individual	7 condos	NE corner E. 1st/Pecan	Complete
The Ruins	Private Individual	49 residential units	Unknown	Planning
		Commercial / Other		
Stockyard Hotel / Amerisuites	Amerisuites?	Hotel and parking lot - The hotel would be built through a partnership with Stockyards Station and TEKMAK Development Co. The architect is Schwerdt Design Group, the civil engineer is Kimley-Horn and Associates, and the contractor is Hillcrest Development.	Between Exchange and Marine Creek	Under Construction
TCC Campus	Tarrant County College	Develop new downtown campus	East side of N. Main at Trinity River	Planning Phase
Montgomery Wards	Private Individual	Mixed Use Redevelopment of 45 acre site – Weber/Kimco and Supertarget	Trinity Park Urban Village and West 7th Street corridor	Under Construction
Pier 1 Headquarters	Pier 1 Corporate	460,000 sq. ft. corporate headquarters	100 Summit	Finished
Radio Shack Headquarters	Radio Shack Corporate	1.2 million sq. ft. corporate campus	400 W. Belknap	Phase 1 completed

PROJECT	RESPONSIBLE	DESCRIPTION	LOCATION	PHASE
Omni Convention Center Hotel	Omni Hotels	600 rooms	West side of Houston btw. 11th and 14th Street	Planning Phase
D.R. Horton	D.R. Horton and City Centers	160,000 sq. ft. / 10 year lease	Unknown	Early 2005
Worthington Upgrades	Worthington Hotel	Hotel Renovation	Houston at W. 2nd	Under Construction
Baker Building	XTO Company	Renovation of historic office building	711 Houston	Under Construction
Embassy Suites	Private Individual	300 room hotel	SE corner Lancaster/Main	Vote required
Radisson Plaza Fort Worth	Radisson Plaza	Renovation	815 Main	Under Construction
Family Law Center	Tarrant County	258,000 sq. ft. court building	200 E. Weatherford	Under Construction
Civil Law Center	Tarrant County	180,000 sq. ft. court building	Unknown	Proposed – vote required
Municipal Parking Garage	City of Fort Worth	Build new parking garage of 600+ spaces	Unknown	Planning
Recreation				
Build new trailhead and trail on top of levee (2005)	TRWD	Construct new trailhead and trail on top of levee	4th to Beach Street	Would be completed in 2005
Extend trail on top of levee (2006)	TRWD	Extension of trail on top of levee	Tucker Dam to 183	Would be completed in 2006
Relocation of Rotary Park	City of Fort Worth	Relocation of Rotary Park from the intersection in front of Pier One to the east side of the river just below Lancaster. Project includes in-house construction of a trailhead and relocating the Rotary Monument to this site	Near Pier One east of the Trinity river and below Lancaster Ave.	Unknown
Pedestrian Bridge South of Lancaster	City of Fort Worth	Construction of a pedestrian bridge over the Trinity River just south of the Lancaster Bridge. Proposed bridge would connect the proposed Rotary Park with the Trinity Trail system	South of Lancaster Ave. Bridge	Unknown
Various Improvements to the Trinity Trail System	City of Fort Worth	Unknown	Unknown	2008
Parking Lot Improvements	City of Fort Worth	Unknown	Rockwood Park, Trinity Park, and Forest Park	2005-2006

PROJECT	RESPONSIBLE	DESCRIPTION	LOCATION	PHASE
Ball field Renovations	City of Fort Worth	Unknown	Rockwood Park	2007
Trinity Loop Trail	City of Fort Worth	3-mile chat trail through Trinity Park. Part of Trinity River Vision	Trinity Park	Under Construction
Build new trailhead (2006)	TRWD	Construct new trailhead	Crystal Springs	Completion in 2006
		Operations and Maintenance		
Mowing and Trash Collection	TRWD	Mowing of approximately 27 miles of Trinity River floodplain; begins March 1st and ends Oct 15th; mowed once every 3-4 weeks	Throughout Clear Fork, West Fork of Trinity River in Tarrant County	Annual / Ongoing
Replace existing street and storm-water drain (2005)	TRWD	See Project Column to left	White Settlement Road and Trinity River	Completion in 2005
Erosion Control (2005)	TRWD	See Project Column to left	Farmers Branch and West Fork of Trinity	Completion in 2005
Erosion Control (2005)	TRWD	Remove rip-rap, replace with gabions, and re-vegetate	White Settlement Bridge	Completion in 2005
Install floatable debris catcher (2005)	TRWD	See Project Column to left	Hulen and Clear Fork of Trinity	Completion in 2005
Replace outfall sump 19 and remove sediment (2006)	TRWD	Replacement of broken sump and light dredging of sediment	Trinity Park	Completion in 2006
Replace existing storm drain outlet (2006)	TRWD	See Project Column to left	121 and Belknap on West Fork	Completion in 2006
Repair downstream side wing-wall of low water dam (2006)	TRWD	See Project Column to left	Southwest Blvd. on Clear Fork	Completion in 2006
Repair storm-water outfall on small tributary (2006)	TRWD	See Project Column to left	Trinity Park	Completion in 2006

Assumptions

Several key assumptions were made during the completion of this cumulative impacts analysis to ensure consistency throughout the analysis. Below is a list of the key assumptions used for completing the cumulative impacts assessment:

- All Trinity Uptown Features (transportation modifications, levee removal, canals, and land use changes) would occur after implementation of the Community Based Alternative and therefore are considered as one alternative known as the Community Based Alternative plus Trinity Uptown Features Plan.

- All reasonably foreseeable projects listed above would be implemented and were considered for cumulative impacts for the P&G Based Alternative as well as the Community Based Alternative plus Trinity Uptown Features Plan.

- Only those resources that were impacted by direct / indirect impacts of the P&G and Community Based Alternative plus Trinity Uptown Features Plans were considered for cumulative impacts.

Cumulative Impacts Assessment

This evaluation was completed in a slightly different fashion than that used for the direct / indirect analysis in that the P&G and Community Based Alternative plus Connected Action Alternatives were assessed as a whole, versus individual features or components. To assess the cumulative impacts to economic and environmental resources that could be impacted by the P&G and Community Based Alternative plus Trinity Uptown Features Alternatives, coupled with multiple reasonably foreseeable projects, an interdisciplinary team from the Fort Worth District U.S. Army Corps of Engineers was assembled. Descriptions of the identified reasonably foreseeable projects, the P&G Based Alternative, and Community Based Alternative plus Trinity Uptown Features Alternative were provided to the team members. Each team member was assigned specific resource categories based on their area of technical expertise and asked to qualitatively assess cumulative impacts of the above projects. The assessment was completed resulting in Table 4 - 10 below.

No Action

Under the No Action Alternative no Federal Project would be constructed. Therefore, selection of this alternative would not result in any cumulative impacts beyond the direct and indirect impacts to resources identified earlier in this chapter for the No Action (Future without-project) Alternative.

Table 4 - 10. Cumulative Impact Analysis of Study Alternatives with Reasonably Foreseeable Projects of Others for Environmental and Economic Resources within the Central City Study Area.

Environmental and Economic Resources Impacted	P&G Based Alternative with Actions of Others	Community Alternative + Trinity Uptown Features with Projects of Others
Hydrology and Hydraulics (100-YR +)	O	O
Water Quality	O	□
Wetlands	□	□
Terrestrial Habitat		
Woodlands	□	□
Grasslands	O	O
Aquatic Habitat	O	O
Cultural		
Archaeological	O	□
Architectural	□	□
Hazardous, Toxic, Radioactive Waste	O	□
Recreation	□	□
Socio-economic	□	□
Aesthetics	O	O
Air Quality	O	O
Noise	O	□
Light	O	□
Public Services and Facilities	O	O
Human Health and Safety	O	O

1 – Pending adoption and completion of compensatory mitigation plan for Marine Creek Aquatic Environment

Legend: O No Effect □ Adverse □ Beneficial

Cumulative Impacts to Resources for P&G Based Alternative

The potential interaction of the P&G Based Alternative with some subset of the Projects Proposed by others to produce cumulative environmental impacts was considered by the study team. No potential for cumulative impacts to HTRW issues, environmental justice, light, noise, air quality, water quality, or human health and safety, or public services were identified. Cumulative impacts to regional floodplain management (H&H considerations) are explicitly controlled by the CDC process; that process requires the with-project hydraulic performance to mimic that of the without-project condition, virtually eliminating additive hydraulic impacts. The potential for cumulative impacts (or benefits) to ecological variables, recreation resources, cultural resources, and socio-economic variables is discussed below.

Ecological Variables

Only one project listed in 4 - 8 was considered to have interaction with the ecological aspects of the P&G Based Alternative. The Riverside Oxbow Project is located just downstream of the Central City study area, east of downtown Fort Worth and Riverside Drive. The proposed project would provide ecosystem restoration to a currently disconnected river oxbow and the surrounding lands. The proximity of this project to the area of proposed ecosystem improvements for Central City provide an

opportunity for some of the ecosystem communities of these two projects to interact positively. An examination of the remaining projects listed in Table 4 - 9 did not indicate any other projects which would interact, either positively or negatively, with the ecological variables of the P&G Based Alternative.

The ecosystem improvement components of the P&G Based Alternative would have positive impacts when considered cumulatively with the ecosystem restoration components of the Riverside Oxbow Project. Cumulatively, the two would provide an additional 78 acres of wetlands and improve or restore 370 acres of riparian woodland within a 9.6 mile reach of the West Fork and a 2.3 mile reach of the Clear Fork Trinity River. Improvements to woodlands under the P&G Based Alternative would include removal of non-native and invasive species. Removal of these species reduce the number of seed and scions available to establish elsewhere down the watercourse, which would provide benefits for the goals of sustainable woodland improvements in the Riverside Oxbow Project. Additionally, the Riverside Oxbow Project includes measures for the removal of exotic and invasive species, thus when considered with the P&G Based Alternative a cumulative benefit would occur by reducing the amount of reproductive components of these species available for colonization downstream. Additionally, the P&G Based Alternative would reconnect historic river meanders to the mainstem of the Trinity. These meanders have the components of a functioning riparian and river system, except they lack a permanent source of water. The Riverside Oxbow Project also reconnects a historic oxbow to the Trinity River. Re-establishing permanent flow through these intact remnants provides small areas of riverine habitat within a system which has been degraded to the point of having primarily lentic (lake-like) functions. While these two project areas would be geographically distant for cumulative impact for the aquatic environment, their juxtaposition is adequate to expect some beneficial cumulative impact due to increasing the amount of this habitat, especially within an urban environment, for bird species which rely upon these types of communities.

Recreation Resources

Features of the recreation plan developed in conjunction with the P&G Based Alternative were expressly intended to interact with other ongoing projects to produce cumulative benefits. Enhancing connectivity to trails, environmental education opportunities, and other recreation resources associated with the Riverside Oxbow project, TRWD trailhead improvements and various Trinity Trail Improvements proposed by others were all driving forces in the formulation of the recreation components of the P&G Based Alternative.

Cultural

Any potential impacts of the P&G Based Alternative to buried cultural resources were not expected to interact with Projects Proposed by others to produce cumulative impacts. However, some potential does exist for the development of cumulative impacts in the built environment. Modification of the levee system represents a minor modification to the landscape context to historic architectural resources in the project vicinity. In conjunction with Projects of Others including, but not limited to the, 7th Street Bridge, North Main Corridor Project, Hemphill Underpass, Trinity Bluffs Housing Project, Bluff Street Housing Project, TCC Campus, Radio Shack Headquarters, TRWD Trailhead Improvements, and Various Improvements to the Trinity Trail System, significant modifications to the landscape context of historic resources may be identified. Those historic properties adversely affected within the area of potential effect of the proposed action would have to be mitigated through

an agreement developed in consultation between the Army, the Texas Historical Commission and other interested parties.

Socio-economic

The P&G Based Alternative is predicted to interact as described above with other projects to produce cumulative benefits to ecological and recreation resources. These benefits can be considered to enhance quality of life for residents and recreation users and, as such, to produce cumulative socio-economic benefits as well. Project construction would create jobs locally, and this job creation would be expected to multiply through the regional economy in conjunction with the affects of construction activity associated with the projects of others. However, the magnitude of the construction injection associated with the P&G Based Alternative is relatively minor, and no cumulative labor shortages or inflationary pressures are predicted.

The P&G Based Alternative is not predicted to materially change land use or the level of economic activity in the project area. While the Projects of Others, particularly the numerous Public, commercial and housing project planned for the Downtown and Northside areas (e.g. TCC, Trinity Bluffs, Montgomery Wards, Stockyards Hotel, etc.) may stimulate major land use changes in adjacent areas, the existing barriers to such changes which have constrained economic growth in the project area (i.e. the physical isolation derived from the levee system and the presence of environmental contaminants) would continue to exist and would be expected to perpetuate the status quo in terms of project area land use.

Cumulative Impacts to Resources for Community Based Alternative plus Trinity Uptown Features

The potential interaction of the Community Based Alternative with some subset of the Projects Proposed by others to produce cumulative environmental impacts was considered by the study team. Cumulative impacts to regional floodplain management (H&H considerations) are explicitly controlled by the CDC process; that process requires the with-project hydraulic performance to mimic that of the without-project condition, virtually eliminating additive hydraulic impacts. The potential for cumulative impacts (or benefits) to ecological variables, recreation resources, cultural resources, air and water quality, HTRW issues, light, noise and socio-economic variables is discussed below.

Ecological Variables

Only one project listed in Table 4 - 8 was considered to have interaction with the ecological aspects of the Community Based Alternative. The Riverside Oxbow Project is located just downstream of the Central City study area, east of downtown Fort Worth and Riverside Drive. The proposed project would provide ecosystem restoration to a currently disconnected river oxbow and the surrounding lands. The proximity of this project to the area of proposed ecosystem improvements for Central City provide an opportunity for some of the ecosystem communities of these two projects to interact positively. An examination of the remaining projects listed in Table 4 - 9 did not indicate any other projects which would interact, either positively or negatively, with the ecological variables of the Community Based Alternative.

Measures included in the Community Based Alternative for ecosystem improvement include many of the same features as the P&G Based Alternative and thus the potential for similar cumulative impacts. When considered collectively, the Community Based Alternative and the Riverside Oxbow Project would improve or provide an additional 377 acres of riparian woodlands and 71.5 acres of wetlands. These improvements would occur within a 9.6 mile reach of the West Fork and a 2.3 mile reach of the Clear Fork Trinity River. Removal of exotic and invasive species within both project areas would provide beneficial cumulative impacts for downstream riparian communities. A primary component of the Riverside Oxbow Project is reconnection of the upstream end of a historic river remnant with the mainstem of the Trinity River. The Community Based Alternative includes measures which would also reconnect two remnant oxbow channels to the mainstem. Re-establishing the riverine function to these remnants would provide beneficial cumulative impacts for bird species which rely upon these types of communities, which can be scarce in an urban environment.

Recreation Resources

As with the P&G Based Alternative, the features of the recreation plan developed in conjunction with the Community Based Alternative were expressly intended to interact with other ongoing projects to produce cumulative benefits. Enhancing connectivity to neighborhoods throughout the City, existing trails, environmental education opportunities, and other recreation resources associated with the Riverside Oxbow project, TRWD Trailhead Improvements and Various Trinity Trail Improvements proposed by others was a driving force in the formulation of the recreation components of the Community Based Alternative.

Cultural

Archaeological

The Community Based Alternative has the potential to adversely impact buried cultural resources, as many of the key features in this alternative require extensive excavation of culturally sensitive river bank locations. However, due to Federal involvement, a legal requirement exists that would ensure impacts to resources identified as significant would be mitigated prior to impact. Thus, the Community Based Alternative would not be expected to contribute to the cumulative loss of archeological data which could result from the Actions of Others which do not have Federal involvement and which might engender unmitigated impacts to archaeological resources.

Architectural

The Community Based Alternative plus Trinity Uptown Features could have impacts, some possibly adverse, on architectural properties eligible for the National Register of Historic Places. In accordance with legal requirements, these impacts would be fully mitigated. In conjunction with Projects of Others including, but not limited to the, 7th Street Bridge, North Main Corridor Project, Hemphill Underpass, Trinity Bluffs Housing Project, Bluff Street Housing Project, TCC Campus, Radio Shack Headquarters, TRWD Trailhead Improvements, and Various Improvements to the Trinity Trail System, significant modifications to the landscape context of historic resources may be identified. If Federal funds are involved, those historic properties adversely affected within the area of potential effect of the proposed action would have to be mitigated through an agreement developed in consultation between the Army, the Texas Historical Commission and other interested parties.

Air Quality

An express purpose of the Community Based Alternative with Trinity Uptown Features is to encourage the development of high-density residential neighborhoods in the Central City. At full build-out some 10,000 additional households are predicted to be located in the project area. Additional developments planned by others have the similar goal of expanding the residential component of the downtown land use mix. Cumulatively, these households would be expected to include automobiles, with a net increase in automobile traffic and its associated discharges. However, the cumulative impacts of the Central City project on air quality would be mitigated by the project's emphasis on high-density development, where non-motorized methods of transportation are feasible, and its emphasis on public transportation infrastructure. Where such conditions exist, automobile density on a per-household basis is significantly less than that associated with more typical low-density suburban environments. Results of the carbon monoxide (CO) model analysis of the street intersection to be most affected by increased traffic indicate infrastructure modifications and urban development associated with the Central City project will not result in exceedance of CO standards. See the *Air Quality Assessment Report Fort Worth Central City Project, Fort Worth, Texas (*February 2005) in Appendix G.7.

Results of carbon monoxide (CO) model analysis of the street intersection to be most affected by increased traffic indicate infrastructure modifications and urban development associated with the Central City project will not result in exceedance of CO standards. See the *Air Quality Assessment Report Fort Worth Central City Project, Fort Worth, Texas (February 2005)* in the Air Quality Technical Section in Appendix G.

Water Quality

Increases in impervious surface area associated with land use intensification within the Central City project area under the Community Based Alternative with Trinity Uptown Features condition would be expected to contribute cumulatively to nonpoint source water quality issues, along with similar increases in impervious cover associated with other downtown/uptown development projects. However, these impacts can be extensively mitigated through the consistent application of innovative Best Management Practices. The City of Fort Worth is currently performing a comprehensive evaluation of the existing stormwater management practices with the intent of improving the quality of urban stormwater runoff on a city-wide basis. These improvements have the potential to reduce or eliminate cumulative water quality impacts.

Hazardous, Toxic, and Radioactive Waste

If implemented, the Community Based Alternative plus Trinity Uptown Features alternative could require considerable amounts of HTRW remediation. Impacts from reasonably foreseeable actions of others should, if anything, have a slight beneficial impact on HTRW, as the Trinity Uptown Features would spur redevelopment, providing an otherwise non-existent impetus to remediate contaminated sites.

Noise and Light

The Community Based Alternative with Trinity Uptown Features would be expected to contribute cumulatively to minor increases in noise and light levels in the Central City project area. However, since the entire project area is currently within and surrounded by a dense urban fabric, the implications of this increase are predicted to be minor.

Socio-Economic Variables

As previously noted, there are numerous public, residential, and commercial/mixed-use development projects evolving in proximity to the project area. Indeed, the project area is virtually surrounded by these type initiatives. Major new developments are planned --or in place-- for the area immediately to the west of the Central City (e.g. Montgomery wards), to the south (e.g. Pier One, Radio Shack, and the TCC campus), to the east (e.g. Trinity Bluffs), and to the north (The Mercado, North Main Streetscape Improvements, Stockyards Hotel.) A clear sentiment in the local business community is that the Community Based Alternative with Trinity Uptown Features would create significant synergy with these projects and provide an impetus for major shifts in economic activity and land use patterns.

The cumulative effect of this growth and economic activity is predicted to be major increases in employment, households, property values, and tax revenues. A significant portion of the increase in tax revenues would be, under this Plan, initially diverted, through the Trinity River Vision Tax Increment Financing District, to finance the Central City infrastructure. However, 20% of the increase in tax revenues generated by the increase in tax base would be immediately available to augment the City's General Revenues and thereby support public initiatives throughout the City. The fiscal analysis suggests that the City of Fort Worth would recoup its initial investment of general revenue funds within 25 years; after that time, the TIF would be phased out and the full value of the $1.1 billion dollar increase in tax base would be available to the general revenue fund.

In addition to the Trinity River Vision Tax Increment Financing District, the City of Fort Worth has established eight other TIF Districts, each supporting major city infrastructure initiatives. These include TIF's for the Speedway, Downtown, the Southside/Medical District, Riverfront, North Tarrant Parkway, Lancaster, Lone Star, and Southwest Parkway. The existence of these additional TIF's adequately addresses fiscal concerns that public investment in the Central City project area would cumulatively disadvantage other sectors of the City having their own planned or programmed economic stimuli.

The net effect of the cumulative changes to land use and patterns of economic activity on minority populations within the study area is strongly dependant on the actions of local governments, primarily the City of Fort Worth to require or provide incentives affordable housing. The City has achieved affordable housing goals in association with other downtown development projects such as Hillside, the Electric Building and others through the use of affordable housing set-asides. Similar institutional tools are envisioned to be incorporated into the Trinity Bluffs project and other development projects in the study area in order to maintain diversity in the area's population and avoid adverse impacts to minority populations. The primary issues regarding environmental justice encompass potentially impacted populations and businesses, particularly minority populations and minority-owned businesses from adverse and disproportionate effects resulting from construction of the project and the associated development.

PREFERRED ALTERNATIVE

Congress authorized Corps of Engineers participation in the Central City project, as generally described in the Trinity River Vision Master Plan, in December 2004. Corps of Engineers participation in the project is authorized if the Secretary of the Army determines the work is technically sound and environmentally acceptable. Details on the authorization are included in Chapter 1. This authorization was a key event as it provided the community and key stakeholders additional momentum to continue refining the Community Based Alternative. In effect this authorization changed the purpose and need of the project under study by USACE by including urban revitalization. The project authorization contained in P.L. 108-447, Section 116, authorizes Corps of Engineers participation in the Central City project at a total cost not to exceed $220,000,000. Section 116 further establishes that the Federal (Corps of Engineers) and non-Federal share of that project will each be $110,000,000. Specifically, the Corps Project includes the bypass channel, the isolation gates, Samuels Avenue Dam, required hydraulic, environmental and cultural mitigation as well as the real estate and relocations associated with these features, and soft costs. The Corps project is a component of the Community Based Alternatives; subsequently the Corps portion must meet the ASA determination of technical and acceptability, while fulfilling the overall project objective and vision of the Central City Project and the Trinity River Vision.

In summary, the No Action alternative would perpetuate degradation of the flood protection delivered by the authorized Fort Worth Floodway project as well as a continued degradation of land use and ecological functions within the immediate project environs. The No Action alternative fails to meet any of the identified urban design and quality of life objectives for the citizens of Fort Worth and the region.

In contrast, the Principles and Guidelines Based Alternative would restore the design level of protection for the Fort Worth Floodway system, based on the current estimation of the SPF discharge, but fails to address any portion of the interior drainage issues. Limited environmental restoration and recreation components could be incorporated into the P&G Based Alternative, but virtually no aspects of the urban revitalization, urban design, or other Quality of Life objectives would be addressed by this Alternative.

The Community Based Alternative addresses four dimensions of the project purpose, i.e. Flood Damage Reduction, Ecosystem Restoration, Urban Revitalization and Recreation. It provides the design level of protection within the system, and improves the performance of the interior drainage components, eliminating damages associated with the 100 year flood event for sump 26W and reducing the 100-year floodplain in sump 16W. Based on the Corps' technical evaluation of the engineering work supporting the Community Based Alternative, the proposal fully complies with the criteria established in the Corridor Development Certificate process, and, in fact, exceeds the criteria relative to restoration of valley storage for the SPF volume. Additionally, the Community Based Alternative would cause no long-term adverse environmental impacts within the study area. Initial adverse impacts to the aquatic habitats of Marine and Lebow Creeks would be fully mitigated in accordance with the Mitigation Plan previously discussed and detailed in Appendix G. Adverse impacts to cultural resources either buried or in the cultural landscape, would be identified and appropriate mitigation completed. Further cultural testing and monitoring are required during the construction phase, and are included in the project cost estimate.

Business relocations required to support the Community Based Alternative may, initially, have an adverse impact on local employment. Most affected businesses are expected to relocate in proximity to the project, mitigating this effect. Long term economic growth and land use intensification would offset the employment effect many times over.

The Community Based Alternative is recommended for implementation, subject to additional feedback and comments received as a result of agency and public review.

Figure 4 - 1. Area of Impact Considered for Trinity Uptown Features.

Figure 4 - 2. Potential Levee Removal Associated with Community Based Alternative Trinity Uptown Features.

Figure 4 - 3. Regulatory Permits Considered During Cumulative Impact Analysis.

PROJECT IMPLEMENTATION

STATUS OF ENVIRONMENTAL COMPLIANCE

The Central City Study was conducted in compliance with and in regard to the requirements of several laws, regulations, Executive Orders (EO), and Memoranda of Agreement (MOA) pertaining to Federal water resource projects. Table 5 - 1 and following text provides information regarding the current compliance status of the preferred alternative with these various environmental laws, regulations, EO, and MOA. At this time, the studies conducted, and evaluations performed, indicate that the preferred alternative is currently in compliance with environmental laws, orders and agreements prior to commencement of construction. Discussion to support these conclusions is incorporated within the main body of the report and supporting appendices (Specific references are provided in Table 5 - 1). Additional summary discussion is needed for the following:

Environmental Justice, Executive Order 12898

A Notice of Public Scoping Meeting was mailed to all known interested parties on October 11, 2002. This notice outlined the study authority, major projects being proposed by USACE within the study area, and the date and location of the public scoping meeting. USACE also issued a news release on October 24, 2002, announcing the scoping meeting and the opportunity for citizens to offer comments, suggestions or any other information that might benefit the USACE in preparing the Draft EIS. The scoping meeting was held on October 29, 2002 with approximately 50 individuals attending. A brief description of the overall study and schedule for the NEPA process was discussed and members of the public were allowed to present statements regarding their concerns on the feasibility study. See Appendix K for a complete summary of all public meetings and involvement.

From April to June 2001, ten public meetings were held with neighborhood groups and land owners, including those neighborhood groups in proximity to the project area, with subsequent rounds of public meetings occurring in January 2002 and between November 2002 and June 2004. In December 2004, the public exhibit of Trinity Uptown opened following the adoption of the TRV Master Plan by the TRWD Board, the Streams and Valleys Board, the City of Fort Worth and Tarrant County in 2003. Meetings including neighborhood groups close to the project area were conducted in the Rose Marine Theater in the heart of the traditionally Hispanic Northside of Fort Worth and in the Botanic Gardens. Comments from neighborhood groups reflected concerns about maintaining the historical integrity of their neighborhoods, accessibility to project amenities from neighborhoods such as Oakhurst and Riverside as well as those neighborhoods with limited amounts of park space. Additional comments regard the availability of mass transit to relieve anticipated traffic congestion in the area, and concern regarding the potential buying out and relocation of businesses.

During the formulation of the DEIS, consideration was given to those potentially impacted populations as directed under Executive Order 12898, "*Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations.*" While neighborhoods would not be directly impacted, some 90 businesses located along the predominantly Hispanic North Main Corridor, or along the White Settlement Road/North Henderson area face potential relocation as a

result of the project. During data collection for the socioeconomic assessment, a meeting was held with the president of the Hispanic Chamber of Commerce to help determine what impacts, both positive and negative, the Hispanic community might expect and how the Chamber might be used to disseminate information. Discussions included construction and bidding opportunities for Hispanic businesses and public outreach to the community through Spanish language television and radio.

The Hispanic Chamber indicated that their view of the project was that it would provide great development opportunities for both businesses and residents of the North Side as well as construction opportunities for Hispanics. One concern expressed by the Chamber related to the potential difficulty of older residents in adapting to the changing environment brought on by the project. In order to help facilitate dissemination of the DEIS to North Side residents and businesses, both English and Spanish versions of the Notice of Availability was sent to the Hispanic Chamber and copies of the DEIS were placed at the Hispanic Chamber, including a Spanish translation of the Executive Summary. A Spanish translator was present and available during the open house/public meeting events on both July 26 and 27, 2005.

During the public comment period, the chairman of the Hispanic Chamber expressed the support for the project both from the Chamber's board and from its members citing the creation of substantial redevelopment on the near North Side of the city and its associated job creation. Additional support for the project was voiced during the comments period from the chair of the North Main Corridor Oversight Committee which works to improve conditions along North Main. The view expressed was that the project will accomplish many things including reclaiming the Central City and facilitating the reuse of land that has been dormant for fifty years. The City of Fort Worth has expressed strong interest in assisting relocating business to remain in Fort Worth and is currently considering a plan to provide tax incentives to achieve this goal.

Invasive Species, Executive Order 13112

The Executive Order establishes the concerns for widespread introduction of non-native plants and wildlife species to the United States and the potential for economic and environmental harm associated with those that have ability to spread relatively unchecked. This EO establishes processes to deal with this issue and among other items establishes that Federal agencies "will not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions."

Invasive plants have been identified as being established and detrimental within the study area. The preferred alternative would assist in the removal of invasive Ligustrum species within the ecosystem improvement area associated with the improvement of existing riparian and upland woodlands and the long term management of that area. No project feature would directly promote the spread of invasive species.

Clean Water Act

The Corps of Engineers, under direction of Congress, regulates the discharge of dredged and fill material into all waters of the United States, including wetlands. Although the Corps of Engineers does not issue itself permits for construction activities that would affect waters of the United States, the Corps must meet the legal requirement of the Clean Water Act. A Section 404 (b)(1) analysis has been completed and is presented in Appendix G. This analysis identifies the Community Based Alternative as the least environmentally damaging practicable alternative subject the aquatic mitigation plan discussed in Chapter 4 (See Page 222). The comprehensive Central City Community Based Alternative fulfills the overall objective of the sponsor and is the least damaging practicable alternative. The Corps participation is a component of this plan. As such all discharge activities were reviewed in the analysis to ensure that the overall project impacts were not piece-mealed which is prohibited by 33 CFR and to address the cumulative impacts. This analysis does not negate the requirement for the non-federal sponsor to apply for and obtain a Section 404 permit prior to the commencement of construction activities. This evaluation also forms the basis of future coordination with the Texas Commission on Environmental Quality in order to obtain a State Water Quality Certificate prior to the initiation of construction activities involving discharges to waters of the United States.

The construction activities that disturb upland areas (land above Section 404 jurisdictional waters) are subject to National Pollutant Discharge Elimination System (NPDES) requirements of Section 402(p) of the Clean Water Act (CWA). Within Texas, Texas Commission of Environmental Quality (TCEQ) is the permitting authority and administers the federal NPDES program through its Texas Pollutant Discharge Elimination System (TPDES) program. Construction activities that disturb one or more acres are subject to complying with TPDES requirements. Operators of construction activities that disturb 5 or greater acres must prepare a Storm Water Pollution Prevention Plan (SWPPP), submit a Notice of Intent to TCEQ, conducting onsite posting and periodic self-inspection, and accordingly follow and maintain the requirements of the SWPPP. In accordance with these requirements, during construction, the operator will assure that measures are taken to control erosion, reduce litter and sediment carried offsite (silt fences, hay bales, sediment retention ponds, litter pick-up, etc.), promptly clean-up accidental spills, utilize best management practices onsite, and stabilize site against erosion before completion. The operator of Community Based Alternatives project will be required to comply with these construction storm water permits requirements.

Section 176 (c) Clean Air Act

Federal agencies are required by this Act to review all air emissions resulting from Federal funded projects or permits to insure conformity with the State Implementation Plans in non-attainment areas. An analysis was conducted of the authorized plan, including the likely development that would occur as a result of the preferred alternative implementation, and it was determined that the project would not interfere with State Implementation Plans for the area. Emissions during construction from off-road construction equipment was calculated and found to be less than the de minimis levels established in the SIP of 100 tons/yr of NO_x or VOC; the highest emitted pollutants was NO_x at 75 tons/yr. Based on this, no further general conformity determination analysis is required.

Advisory Circular – Hazardous Wildlife Attractants on or Near Airports

The advisory circular provides guidance on locating certain land uses having the potential to attract hazardous wildlife to or in the vicinity of public-use airports. The circular provides guidance on wetlands in and around airports and establishes notification procedures if reasonably foreseeable projects either attract or may attract wildlife.

In response to the Advisory Circular, the United States Army as well as other Federal agencies, signed a Memorandum of Agreement (MOA) with the Federal Aviation Administration (FAA) to address aircraft-wildlife strikes. The MOA establishes procedures necessary to coordinate their missions to more effectively address existing and future environmental conditions contributing to aircraft-wildlife strikes throughout the United States. The Corps of Engineers has initiated coordination with FAA providing verbal and written descriptions of the authorized project. Meachum International Airport has flight paths over the heart of the authorized project area; however, no wetlands would be constructed near the within the area under or adjacent to the flight path. By letter dated July 22, 2005, the FAA indicated their conclusion that land use changes potentially associated with implementation of the Community Based Alternative "present no potential hazard to aircraft operations."

Table 5 - 1. Status of Environmental Compliance

Law, Executive Order, MOA	Status
Section 401 - Water Quality Certification	Section 404(b)(1) analysis of the preferred alternative is included in the FEIS. Corps will obtain a State Water Quality Certificate from TCEQ prior to initiating construction of features involving discharges into waters of the United States.
Section 404 -Clean Water Act	Section 404(b)(1) analysis of authorized plan conducted included in document. The report describes the preferred alternative, provides discussion of why the project must include modifications to waters of the United States and discloses impacts to waters of the United States. Appropriate environmental mitigation for unavoidable impacts to Marine Creek and Lebow channel is currently being determined in coordination with resource agencies.
Construction Storm Water	The preferred alternative, as proposed, will likely cause disturbance to more than one acre of soils, and prior to commencement of construction a stormwater pollution prevention plan would be developed and a Notice of Intent would be submitted to TCEQ, followed by submittal of a Notice of Termination once the construction site has reached final stabilization. The project is in full compliance at this time.
Executive Order 11988 Flood Plain Management	The preferred alternative is in full compliance.
Trinity River EIS Record of Decision and Local Corridor Development Certification	The preferred alternative is in full compliance.
Section 202 (C) Water Resources Development Act of 1996	Sponsor will be required to develop a flood management plan within one year of signing the Project Cooperation Agreement, and then implement the plan within one year after project completion.
Executive Order 11990 Protection of Wetlands	The preferred alternative would initially impact lower quality wetlands, but ultimately it would increase the size and functional quality of wetlands occurring within the study area. The plan is in full compliance. See Page 187.
Executive Order 13112 Invasive Species	The preferred alternative is not likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere and is in compliance with the E.O.
Public Law 93-205 Endangered Species Act	U.S. Fish and Wildlife Service have reviewed the proposed project and concurs that the project is not likely to adversely affect threatened or endangered species. Prior to construction, a review would be conducted to determine if additional new species or impact information is available which warrants further consideration.

Fish and Wildlife Coordination Act	The USFWS has provided Planning Aid Letters, information that was utilized during the planning of this project, and has concurred in a plan to mitigate the impacts caused to aquatic habitats in Marine and Lebow Creeks as result of implementing the preferred alternative. Planning Aid letters and Draft and Final Fish and Wildlife Coordination Act Report have been submitted and considered during preparation of this final EIS. (See Appendix G)
Native American Graves Protection and Repatriation Act	The preferred alternative is in full compliance through preparation final EIS.
Archaeological and Historic Preservation Act	The preferred alternative is in full compliance through preparation final EIS. (See Page 227)
Farmland Protection Policy Act/EPA Policy to protect environmentally significant agricultural lands.	No prime or environmentally significant agricultural lands would be impacted by the preferred alternative.
National Environmental Policy Act	In full compliance through preparation of Final EIS.
Sections 9 and 10 of Rivers and Harbors Act	No preferred alternative features would impact navigable waterways
Section 176(c) Clean Air Act	The preferred alternative is in compliance with the Clean Air Act.
Section 106 National Historic Preservation Act	The preferred alternative is in full compliance through preparation Final EIS. A Programmatic Agreement for Section 106 compliance has been coordinated with the State Historic Preservation Officer and is pending signature.
U.S. Army MOA with FAA and Advisory Circular - Hazardous Wildlife Attractants on or Near Airports	FAA has determined that the project presents no potential hazard.
Environmental Justice, E.O. 12898	The preferred alternative is in full compliance.
Land and Water Conservation Fund Act	Preferred alternative is in compliance.

IMPLEMENTATION

IMPLEMENTATION CONSIDERATIONS

There are several variables and constraints which must be considered when implementing the Community Based Alternative. These include site access, real estate acquisition, relocation, environmental remediation and permitting, which must be balanced with the desire to implement the project in the shortest amount of time to minimize the impact to local residents and business, provide flood protection, and achieve project objectives. In addition, the project involves a number of different political entities and agencies who will participate and be involved in the review and approval process.

Due to the number of jurisdictional interests, funding, constraints, and desire to minimize impacts, the implementation plan will sequence the project in a way that allows construction to start on segments of the project while other segments are still in design phase. It is anticipated that this method of project sequencing will result in multiple design contracts, which will lead to multiple construction packages. Individual design contract packages are not yet determined, but a general sequence of construction is provided in the following section.

Implementation Schedule

A preliminary sequence of construction for the Community Based Alternative has been established based on assumptions that environmental assessments, land acquisition, permitting, and funding activities will not adversely impact the schedule. These pre-construction activities were incorporated into segments 1 and 2. The draft sequence includes eight basic segments, as described below and shown in Figure 5 - 1 through 5 - 8. Actual contract packages, construction contract size, and specific timing will be developed in more detail as the project detailed design progresses.

- Segment 1 – Roadways and Bridges: 2006-2009. This segment includes construction of temporary roadway bypasses at Henderson, Main Street and White Settlement; construction of bridge piers, bridges, and roadway approaches at all three locations; and completion of roadway improvements and tie-in to the new bridges. This allows for the construction of the bridges and roadways “in the dry” without the need for temporary bridgeworks. This segment includes HTRW cleanup, utility relocation and other site preparation and environmental work for segment 1 and 2.

- Segment 2 - Interior Bypass Channel: 2009-2010. The second construction segment includes the interior portions of the upper and lower bypass channels without breaching the existing levees to the river. Incorporated within this segment are excavation, utility relocations, new levee construction, and interior retaining walls. This approach allows for a major portion of the channel to be constructed “in the dry” condition, except for potential groundwater. This segment also includes site preparation and environmental work for subsequent segments.

- Segment 3 - Riverbend Mitigation: 2010-2011. Once interior portions of the bypass channel are complete, the next segment would involve developing the Riverbend mitigation site including, grading, ecosystem restoration and levee modifications. This would provide additional valley storage to compensate for the potential hydraulic drawdown when the bypass channel is initially opened.

- Segment 4 - Bypass Channel Tie-ins: 2011–2012. Upon completion of the hydraulic mitigation, the bypass channel can be connected to the river. This segment would include construct of the remaining reaches of the upper and lower bypass channel excavation, levee, and retaining walls. The existing levees would then be breached, and tie-in to the bypass channel established, beginning from lower (downstream) to upper channel connections. This would minimize the amount of construction within the existing channel and reduce the amount of coffer dam construction.

- Segment 5 - University Drive Mitigation: 2012-2013. This construction segment would reconstruct University Drive to raise it out of the 100 year flood elevation and to provide additional valley storage mitigation. This component is required to partially restore the 100-year and SPF flood elevations from the drawdown effect of the bypass channel on the West Fork. Construction would be deferred until the bypass channel is complete so there would not be an increase in flood elevations during construction.

- Segment 6 - Isolation Gates: 2013–2014. After the completion of the bypass channel and "upstream" valley storage mitigation, the existing West Fork interior channel can be taken out of service for major flow events. This would allow for the construction of the isolation gates for the interior area. Coffer dam construction is envisioned to segregate the construction area and provide protected working conditions from river flows. This segment includes the construction of all three isolation gates, tie-ins to the bypass channel, retaining walls, levees, and the stormwater pump station at the TRWD gate.

- Segment 7 - Samuels Avenue Dam: 2013-2014. Construction of the Samuels Avenue Dam would also include the remaining downstream valley storage mitigation sites. Construction of these improvements would be concurrent with the construction of the isolation gates, thus providing the remaining valley storage when the interior area is completely isolated.

- Segment 8 - Interior Water Feature and Connector: 2014-2015. Completion of the isolation gates and valley storage sites would enable the re-routing of flows from the interior area to the new bypass channel. This allows for the construction of the interior water feature and the completion of the White Settlement Connector.

Total Project Cost

Based on the engineering feasibility analyses conducted during development of this Environmental Impact Statement, the preliminary cost schedule for the Community Based Alternative is shown in

Table 5 -2 below. All costs shown are in January 2005 dollars. Estimated annual operation and maintenance costs, as well as annualized replacement and rehabilitation costs are shown in Table 5 - 3.

Table 5 - 2. Project First Cost (January 2005 Dollars)

Item	Estimate ($)
Property and Relocation	95,000,000
Valley Storage Mitigation	17,000,000
Samuels Avenue Dam	35,500,000
Ecosystem Improvements	2,000,000
Ecological Mitigation	4,600,000
Roads and Bridges	64,000,000
Bypass Channel	39,500,000
Stormwater Pumping Station	4,900,000
Water Feature	13,100,000
Flood Control and Diversion Structures	35,200,000
Building Demolition and Utilities	33,000,000
HTRW	25,000,000
Design Survey, Testing, Legal Fees	8,000,000
Planning, Engineering, Design and Permitting	24,000,000
Program Management	17,500,000
Construction Management	16,700,000
Total	**435,000,000**

Table 5 - 3. Preliminary Operations and Maintenance Cost Summary.

Area	Description	Total Cost
Bypass Channel	Soft Edge	60,466
	Hard Edge	91,000
Assets	Samuels Dam, Isolation Gates, & Storm Pump Station	84,875
Valley Storage Mitigation/Ecosystem Improvements	River Bend	20,102
	Total Annual Estimate O&M Cost	**256,443**

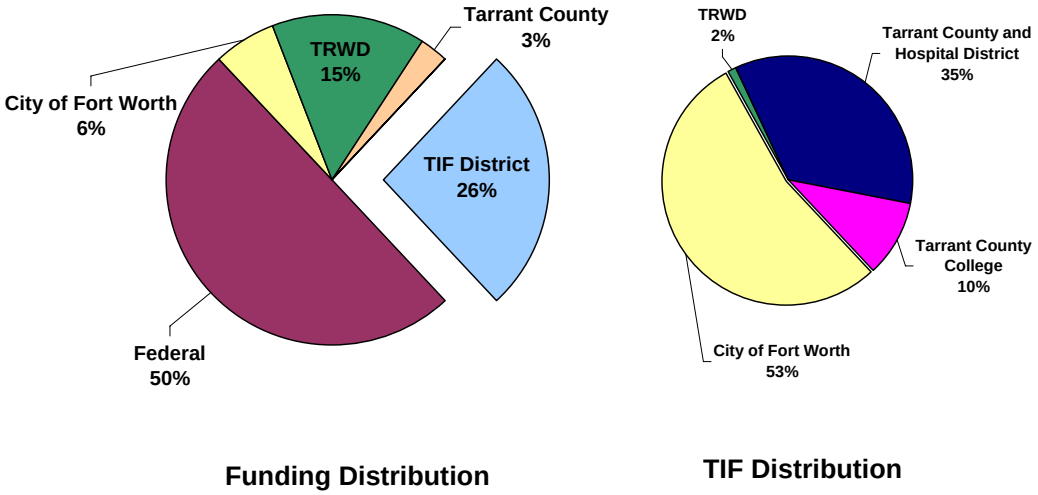
Financial Plan and Capability Assessment

Project Financing

Implementation of the Community Based Alternative is distinguished by inter-local cooperation that will provide local, state, and federal funds from a variety of sources. Tarrant Regional Water District

serves as the primary non-Federal sponsor. The anticipated contribution of each participating entity is shown in Figure 5 - 9, below.

Figure 5 - 9. Anticipated Contribution of Project Partners



Under the current authorization, all transportation components of the Community Based Alternative, the interior water feature, ecosystem improvements, the recreation features, utility relocations, and HTRW cleanup would be accomplished by other Federal and local partners with funding sources other than the Corps. In order to ensure appropriate use of and results from the Corps investment, the Project Cooperation Agreement for the Corps Project would be conditionalized to require construction of the North Main and Henderson bridges, utility relocations, and HTRW cleanup prior to construction start.

Federal funds have been appropriated through the Department of Transportation for design and construction of the North Main and Henderson Street bridges. An EDI grant from the Department of Housing and Urban Development has also been made and additional federal funds are anticipated through DOT, HUD, and the Environmental Protection Agency. These funds would be included in the non-Corps funding stream, as well as non-Federal funding from Tarrant Regional Water District, the City of Fort Worth, Tarrant County, and the Tax Increment Financing District, as discussed below.

Statement of Financial Capability

The statement of financial capability is based on information provided by the Tarrant Regional Water District (TRWD), and is a description of its capability to meet its financial obligations for the project. The TRWD is a political subdivision of the State of Texas, formed in 1924 for the purposes of water supply and flood control. One of the largest raw water suppliers in the state, TRWD serves over 30 wholesale customers with over 1.5 million users including the cities of Fort Worth, Arlington, Mansfield and the Trinity River Authority. TRWD owns and maintains four reservoirs and utilizes

three others for terminal storage. In addition, TRWD is authorized by law to engage in drainage or flood control activities and may acquire land, an interest in land, materials, water grounds, easements, rights-of-way, equipment, contract or permit rights or interests, and other property, real or personal, considered necessary for the accomplishing of any of the district's purposes. The district may acquire by condemnation any land, easements, or other property inside or outside of the district boundaries, for any of its projects or purposes, and may elect to condemn either the fee simple title or a lesser property interest. Cooperation with other governmental entities is permitted. Contributions by others will likely be tax revenue bond proceeds, or enterprise funds.

TRWD has General Fund assets totaling $52,960,000 and $35,251,000 for Fiscal Years 2004 and 2003, respectively. Total liabilities for the same time periods were $1,522,000 and $1,317,000, respectively.

Within the government fund types, TRWD had total revenues (from the sale of water, property taxes, land lease rentals, oil and gas royalties, sale of rock and gravel, and investment income) of $27,010,000 and $13,947,000, compared to expenditures of $12,105,000 and $9,847,000 in FY 2004 and 2003, respectively. When taking into account non-operating revenues and expenses, and retained earnings/fund balance at the beginning of the year, the retained earnings/fund balances for FY 2004 and FY2003 were $33,123,500 and $18, 219,000, respectively.

TRWD plans to fund their portion of the project, including real estate acquisition and relocations, using funds available from their general fund.

Based on the previous discussion of TRWD's financial capabilities and proposed financing plan, it is reasonable to expect that TRWD has ample resources available to satisfy their portion of the non-Federal financial obligation for the Community Based Alternative. Their balance sheet demonstrates significant assets in excess of liabilities, and their anticipated cash flow, and available cash balances are more than sufficient to satisfy their financial obligation.

In addition to TRWD, the City of Fort Worth, Tarrant County, and the Tarrant County College District have indicated strong financial support for the Community Based Alternative. These entities have put into place a Tax Increment Financing District to provide approximately 26% of the project costs.

Tax Increment Financing is a tool authorized by Chapter 311 of the Texas Tax Code, by which local governments can publicly finance structural improvements and enhanced infrastructure within a defined area called a reinvestment zone. The tax increment is derived from the difference in appraised value between the year in which the reinvestment zone is established (base year) and in each subsequent year the reinvestment zone is in existence. A municipality establishes a TIF reinvestment zone according to guidelines in the Texas Tax Code, and other taxing entities may elect to participate in TIF by approving a participation agreement setting forth the percentage of tax increment the taxing entity is willing to dedicate to the TIF fund. A board of directors, consisting of 5 to 15 members who are representatives from the participating taxing entities and representatives of other areas as set forth in the Tax Code, is established for each TIF.

The boundaries of the Trinity River Vision TIF are shown in Figure 5 - 10. Between 2004 and 2029, the TIF is predicted to generate cumulative income in excess of $220 million. Twenty percent of the TIF revenues would be returned annually to the taxing jurisdictions, while 80% is available to support project-based expenditures.

The City of Fort Worth has already approved, via bond election, $5.9 million of a proposed $26 million contribution to the project. These funds are envisioned to primarily fund certain street improvements and waterfront amenities that are integral to the project. Specifically, the City has identified $4.5 million in street bond monies to fund improvements to the Henderson Street/White Settlement network within the project area and $1.4 million for urban waterfront development (park bonds.) The City of Fort Worth currently has a General Obligation (GO) and Water and Sewer Revenue bond rating of AA+ from Standard and Poor's and a bond rating of AA from Fitch.

Tarrant County financing for the project includes $10 million in cash contributions and $1 million in in-kind services, primarily road, and other transportation improvements.

IDENTIFICATION OF CORPS COMPONENT

The project authorization contained in P. L. 108-447, Section 116, authorizes Corps of Engineers participation in the Central City project at a total cost not to exceed $220,000,000. Section 116 further establishes that the Federal (Corps of Engineers) and non-Federal share of that project will each be $110,000,000. Based on this language, the Project Cooperation Agreement (PCA) to be signed between the Department of the Army and the Sponsor defines specific components of the Community Based Alternative which will comprise the authorized Corps participation component of the overall project. Coordination with OASA (CW) has identified features which should characterize the $220M Corps Project. Specifically, the Corps Project must:

- Be consistent with the Trinity River Vision Master Plan (April 2003)
- Maintain the flood protection and reliability provided by the existing Floodway
- Not exceed $220 million in total cost
- Be a stand-alone functional feature
    - Include standard post-feasibility project costs
    - Function if other portions of the Central City project are not constructed
- Be technically sound
- Be environmentally acceptable
- Should implement plan elements related to Corps mission areas

Three alternative configurations for the Corps Project have been considered by the project team. The first configuration places the greatest priority on selecting plan components which relate to Corps mission areas (i.e. hydraulic systems) while the second and third configuration of project features place greater emphasis on the "stand alone" characteristic and on standard cost-sharing requirements. All three alternatives for the Corps participation component contain the same amount of environmental mitigation designed to mitigate the potential adverse environmental affects of the entire Central City Project.

The "A" configuration includes the by-pass channel, the isolation gates, Samuels Avenue Dam, and the hydraulic, environmental, and cultural resources mitigation for the project as well as real estate acquisition, business relocations, and soft costs associated with these features. No transportation elements were included within in this configuration of the Corps Project. These elements, along with the other project features, utility relocations, and HTRW cleanup would be accomplished by project partners with funding from sources other than the Corps. The "B" and "C" configurations would each

drop a hydraulic component (Samuels Ave Dam and the isolation gates, respectively) in order to incorporate the White Settlement Bridge and utility relocations within the Corps funding stream without exceeding the cost constraint established in the project authorization. All three configurations for the Corps Project consider that the North Main Bridge, the Henderson Bridge, and related street improvements would be funded separately through the Department of Transportation and local partners.

The project team's assessment of these alternative financial configurations was heavily influenced by the requirement within the authorization to document technical soundness. The hydraulic modeling performed by the sponsor and the Corps to formulate and evaluate the Community Based Alternative included, in all cases, the bypass channel, Samuels Avenue Dam, and the isolation gates, and technical documentation supporting Corps participation in any configuration without all three hydraulic components was lacking. In contrast, full and robust technical documentation is readily available for the "A" configuration to support a determination of its technical soundness. Primarily on this basis, the project team has concurred in the "A" configuration for the Corps participation in the project.

Based on this determination, Corps funding and participation in the overall Central City Project (Community Based Alternative) would include construction of the bypass channel, the isolation gates, Samuels Avenue Dam, and the hydraulic, environmental, and cultural resources mitigation for the project. Also included in the Corps component would be the acquisition of required real estate and business and property relocations. The real estate footprint for the Corps component is currently estimated at approximately 687 acres. Generally, implementation of the Corps component would be comprised of three general phases. They are preconstruction engineering and design, construction, and operation and maintenance of the completed project. The Corps of Engineers processes for these three phases are described below.

Corps Preconstruction Engineering and Design Phase

During the Preconstruction Engineering and Design (PED) phase, various activities will take place including the completion of a detailed design report, plans and specifications, execution of a Design Agreement and the Project Cooperation Agreement, real estate acquisition, and contract award activity. The PED phase is a cost shared activity. Each of the PED activities is briefly described below.

Detailed Documentation Report

The Detailed Design Report (DDR) includes completing project feature final design for each component or segment. As part of the DDR, remaining ground surveys, utility surveys, drilling and testing for subsurface (geotechnical) conditions, drilling and testing for potential site-specific contaminants will be completed. The final channel alignment, structure, and erosion protection locations and aquatic habitat development will be verified based on the final hydraulic analyses. It is anticipated that multiple DDRs may be prepared. Design parameters for all project features will be defined for development of the plans and specifications. All cultural resource investigations and mitigation requirements will be finalized prior to the final project design for each segment.

Plans and Specifications

Plans and specifications (P&S) are the development of project construction drawings, project construction specifications, estimation of final quantities, and the government cost estimate. These documents (with the exception of the government cost estimate) are made available to contractors interested in bidding on the construction of the proposed project. It is anticipated that multiple sets of P&S will be developed for the various segments of the bypass channel, special structures, and aquatic habitat development. All cultural resource investigations and mitigation requirements will be finalized prior to the final project design.

PCA and Non-Federal Responsibility

Prior to commencement of construction of the Corps component, the non-Federal sponsor (Tarrant Regional Water District) must enter into a binding agreement with the Corps of Engineers to provide its required cooperation, the Project Cooperation Agreement (PCA). The PCA is an agreement setting forth the obligations of each party. Items typically governed by a PCA include project cost-sharing, specification of real estate, relocations, and right-of-way acquisition responsibilities, Operation and Maintenance requirements and liability issues. Prior to advertising and awarding the contract, Federal funds for the Corps Project must be appropriated, and the non-Federal partner must provide any applicable cash contribution.

Real Estate Acquisition

The Non-Federal sponsor is responsible for acquiring all privately, as well as local government or public, owned lands, easements, rights-of-way, relocations, and disposal areas required for project construction, operation, and maintenance. All acquisition will comply with applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17. Uniform Regulations contained in 49 CFR part 24, also apply.

Contract Advertisement and Award

Once the PCA is executed, a set of plans and specifications completed, and right of entry has been provided to the Fort Worth District, a construction contract will be solicited and advertised as provided for in the PCA. Typically, this is a Government action, performed in close cooperation and consultation with the non-Federal sponsor. Prior to awarding the contract, the non-Federal partner must provide any applicable cash contribution.

Construction Phase

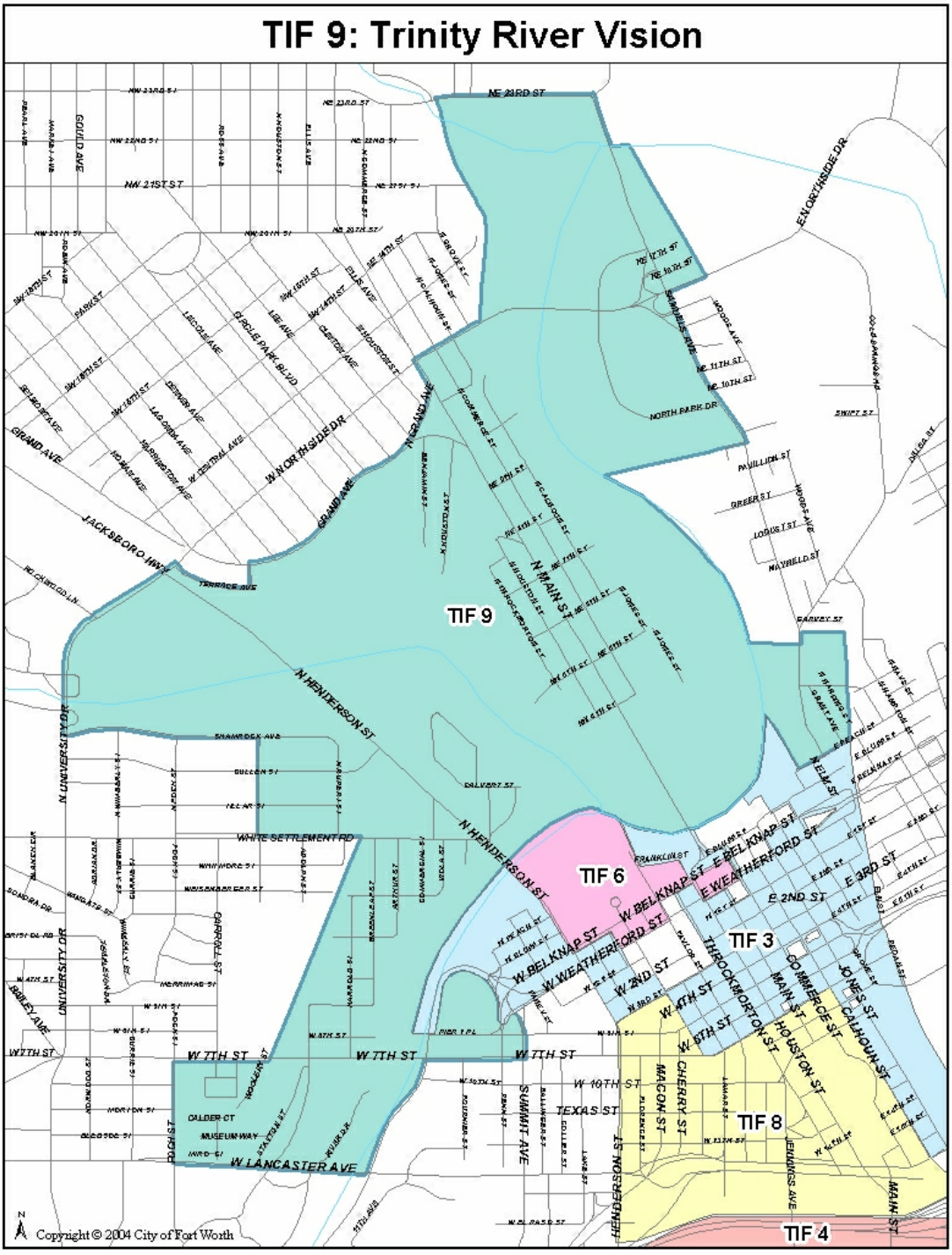
After award of a construction contract for features included within the Corps Project (See Identification of Corp Component, page 256) , the project construction will be managed pursuant to the terms of the PCA. Multiple construction contracts would be awarded in accordance with the project phasing; these construction contracts would be in addition to contracts awarded by the non-

Federal sponsor for relocations and any needed environmental work. It is anticipated that full compliance with the National Historic Preservation Act will require the on-site presence of an archeologist. Should any previously undiscovered significant cultural resources be identified, mitigation procedures would occur in accordance with the protocols established in the pending Programmatic Agreement with the State Historic Preservation Officer. The total construction period is estimated at 8-9 years.

Operation, Maintenance, Repair, Replacement, and Rehabilitation Phase

The non-Federal sponsor will be responsible for all operation, maintenance, repair, replacement, and rehabilitation of the completed project. An operations and maintenance manual will be completed prior to completion of construction which will specify criteria for operations, maintenance, and inspections. As is the case currently with the existing Fort Worth Floodway, the Corps of Engineers will inspect the operation and maintenance activities of the non-federal sponsor for compliance with the Manual and would invoke legal remedy, should compliance not be achieved.

Figure 5 - 10. Boundaries of the Trinity River Vision Tax Increment Financing.



Coordination, Public Views, and Comments

As discussed in Chapter One, the Central City project study is the direct outgrowth of a regional planning process that has been underway, more or less continually, for almost twenty years. Literally hundreds of public meetings, workshops, or information briefings have occurred as part of an extensive grass-roots dialog concerning the public's vision for the river and its environs. A public scoping meeting was held in October 2002 and attended by approximately 50 individuals. During the summer of 2004, the project team determined that the study area needed to be expanded further upstream on the West Fork to accommodate identification of sites for valley storage required by the Community Alternative. Approximately 1200 public notices were issued announcing the proposed expansion of the study area and requesting the identification of any new or additional issues. No comments were received. Appendix K contains a detailed summary of the meetings and briefings held since the formal initiation of the Central City study.

In June of 2005 the Draft EIS was released for public comment. Approximately 3,000 Notices of Availability were mailed to interested citizens. Media coverage of the EIS release included 2 radio and one TV interviews as well as articles in the Fort Worth Star-Telegram and the Fort Worth Weekly. The document was available on the district website, CD, and hard copy (special request only.) Potentially impacted property owners were mailed hard copies of the document. Public meetings to receive comments on the DEIS were held on 26 and 27 July. Post cards announcing the date and location of these meetings were sent to all persons on the distribution list and a press release was made. Radio and television spots relative to the meetings and their purpose were aired prior to the meetings and media coverage of the meetings was extensive.

The format of the public meetings was a combined "open house" and formal public hearing. Kiosks presenting materials relative to project Hydraulics and Hydrology issues, Environmental issues, Recreation issues, Project Financing, and Urban Design issues were set up and staffed by team members from 4:00 pm to 7:00 pm on both days. Corps and sponsor real estate personnel were also present to address questions relative to acquisition and relocations policy. A Spanish translator was available to assist. Approximately 100-150 persons attended these question-and-answer sessions on each of the two days. At 7:00 pm, the meeting re-convened as a formal public hearing to receive comments. Approximately 300 persons attended and 43 statements were received on 26 July; attendance on 27 July was similar, and 42 statements were received. Numerous persons made statements both nights. Complete transcripts of the hearings are included in Appendix L.

Testimony presented at the public meetings generally took the form of statements in favor of or opposed to the Community Based Alternative. Opposition was primarily grounded in concern over the public expenditure, by either the Federal Government or the City of Fort Worth (or both) and over the potential use of eminent domain to acquire needed real estate. Very few concerns relative to environmental or technical issues, or the content of the DEIS, were received. Table 5 - 4 summarizes the input received.

Table 5 - 4. Public Meeting Input

Number	Category
6	Elected Officials
13	Potentially impacted land or business owners opposing the Community Based Alternative
30	At-large Citizens opposing the Community Based Alternative
7	At-large Citizens in favor of the Community Based Alternative
2	Civic or Business Groups opposing or expressing concern about the Community Based Alternative
16	Civic or Business Groups in favor of the Community Based Alternative

The Notice of Availability for the DEIS appeared in the Federal Register on 24 June 2005. The original 45 day comment period was extended 30 days at the request of numerous parties. The public comment period closed on 7 September 2005. Federal agencies providing comments included the Federal Aviation Administration (FAA), the Department of the Interior (DOI), and the Environmental Protection Agency (EPA). The Texas Commission on Environmental Quality (TCEQ), the Texas Parks and Wildlife Department (TPWD), and the North Central Texas Council of Governments (NCTCOG) provided State comments, while Streams and Valleys, Inc. provided local comments.

The Federal Aviation Administration concluded that the project would present "no potential hazard to aircraft." The DOI comment letter contained a request for an explicit evaluation of impacts to park lands purchased with Land and Water Conservation Funds pursuant to the Land and Water Conservation Fund Act (P.L. 88-578), encouraged the Corps to consider adding additional ecosystem improvements to the preferred alternative, requested a 150' vegetation buffer on the west side of the proposed bypass channel, expressed a desire to continue dialog with the Corps relative to project mitigation requirements and provided a number of organizational and format comments. The Environmental Protection Agency letter noted an absence of impacts to wetland or riparian resources and requested that the Final Environmental Impact Statement contain a more explicit air quality impact analysis. As noted in the comment/response material contained in Appendix L, the Corps of Engineers has concurred in these requests with the exception of full concurrence in the 150' buffer strip and some of the format changes requested by DOI.

TCEQ provided two comment letters. The first, from the Air Quality Division, requested an explicit air quality analysis. The second comment letter, from the Water Quality Division, indicated some potential water quality issues that could be associated with the operational aspects of the Community Based Alternative and suggested additional modeling for the design phase. TPWD concurred with the proposed plan for mitigating impacts to fish and wildlife resources. NCTCOG's comments were generally supportive of the project goals and objectives as well as the DEIS. Streams and Valleys, Inc. identified a number of trail connectivity issues requiring attention during the design phase and expressed a desire to be thoroughly engaged in recreation and trail design.

An additional 82 comments were received. With the exception of one commenter, who provided extensive, detailed comments on the DEIS and supportive analyses, the written comments mirrored the statements made at the hearings, generally taking the form of statements for or against the Community Based Alternative. Eleven landowners, one civic group, and 58 citizens-at-large opposed the recommendation, generally on the grounds of excessive cost or the potential use of eminent domain. Nine citizens-at-large and three civic groups expressed support for the project. The detailed technical comments covered virtually all aspects of the document including the plan formulation, the H&H modeling, the environmental analysis, proposed cultural resources mitigation and the project cost estimate. Appendix L contains a copy of each comment received as well as the Corps of

Engineers response.

In addition to the written comments, two telephone comments (one in favor and one opposed to the Community Based Alternative) were received during the comment period. Form letters requesting a second extension of the comment period for an additional 90 days were received from 52 individuals. These letters are contained in Appendix J.

In addition to the extensive dialog with the pubic, a number of public agencies have been extensively involved in the development and evaluation of project features. Texas Parks and Wildlife Department and the U.S. Fish and Wildlife Service were extensively involved in assessment of baseline ecological conditions, evaluation of project impacts, and development of the restoration measures and features included in the Principles and Guidelines Based Alternative as well as the Community Based Alternative. The Planning Aid Letter and Fish and Wildlife Coordination Act Report are included in Appendix G.

Extensive coordination has also occurred with the Texas Historical Commission and other stakeholder groups relative to cultural resources and the potential impact of the Community Based Alternative thereon. The Advisory Council on Historic Preservation was invited to consult, but declined. As noted in Chapter Four, all impacts to cultural resources will be fully mitigated in compliance with Section 106 of the National Historic Preservation Act. The specific parameters of the required mitigation have been codified in a draft Programmatic Agreement between the Army and the THC. This Programmatic Agreement has been coordinated with and concurred in by the City of Fort Worth, numerous stakeholder groups, and the Texas Historic Commission. The Programmatic Agreement will be executed by the THC and the Army prior to completion of the NEPA process.

Coordination has been initiated with the Texas Commission on Environmental Quality. Based on the information provided to date, they have indicated no objections. A state water quality certificate will be acquired prior to the start of any construction activities involving a discharge in to waters of the United States. The project sponsor is continuing coordination with the TCEQ relative to the State water rights implications of the project, and the TCEQ comment letter contained in Appendix L indicates they believe adequate water rights are available.

Discussion, Conclusion, Recommendations

The following conclusions are based on the study findings developed in connection with this Environmental Impact Statement:

- The No Action Alternative would perpetuate degradation of the flood protection delivered by the authorized Fort Worth Floodway project as well as a continued degradation of land use and ecological functions within the immediate project environs. The No Action alternative fails to meet any of the identified urban design and quality of life objectives for the citizens of Fort Worth and the region.

- The Principles and Guidelines Based Alternative would restore the design level of protection for the Fort Worth Floodway system, based on the current estimation of the SPF discharge, but fails to address any portion of the interior drainage issues. Limited environmental restoration and recreation components could be incorporated into the P&G Based alternative, but virtually no aspects of the urban revitalization, urban design, or other Quality of Life objectives would be addressed by this alternative.

- The Community Based Alternative robustly addresses all four dimensions of the project purpose, i.e. Flood Damage Reduction, Ecosystem Restoration, Urban Revitalization and Recreation. It provides the design level of protection within the system, and improves the performance of the interior drainage components, reducing the 100-year floodplain in sumps 16W, 24C, 25C, and 26 by 180 acres.

- Based on the Corps' technical evaluation of the engineering work supporting the Community Based Alternative, the proposal fully complies with the criteria established in the Corridor Development Certificate process, and, in fact, exceeds the criteria relative to restoration of valley storage for the SPF volume.

- The Community Based Alternative would cause no long-term adverse environmental impacts within the study area. Initial adverse impacts to the aquatic habitats or Marine and Lebow Creeks will be fully mitigated in accordance with the Mitigation Plan discussed in Chapter Four and in Appendix G. Adverse impacts to cultural resources either buried or in the cultural landscape, will be identified and appropriate mitigation completed. Further cultural testing and monitoring are required during the construction phase, and are included in the project cost estimate.

- Business relocations required to support the Community Based Alternative may, initially, have an adverse impact on local employment. Most affected businesses are expected to relocate in proximity to the project, mitigating this effect. The City of Fort Worth has expressed intent to provide incentives for relocating businesses to remain in Fort Worth. Long term economic growth and land use intensification will offset the employment effect many times over.

- The Community Based Alternative is technically sound and environmentally acceptable, subject to concurrence by the Assistant Secretary of the Army for Civil Works.

- In consideration of these conclusions, the Community Based Alternative is the Preferred Alternative. That portion of the Community Based Alternative currently authorized (defined subject to the cost limitations established in Section 116 of P.L. 108-447) for cost-sharing and implementation by the Corps of Engineers includes:

    - A bypass channel extending from just downstream of 5th Street on the Clear Fork to just upstream of Northside Drive on the West Fork. The length of the proposed bypass channel is approximately 8,400 feet with a width of approximately 300-400 feet. The bypass channel also includes an adjoining levee/embankment system with a natural edge on the western side of the bypass channel and a "hard edge" design on the eastern side.

        - A dam on the West Fork of the Trinity River, approximately 1,100 feet downstream from Samuels Avenue. The variable-level control dam will be designed to pass high flow events while creating a normal water surface elevation of approximately 525 feet NGVD.

        - Three isolation gates to restrict flood flows to the bypass channel, and isolate the interior area from flood flows

        - Hydraulic mitigation for valley storage losses, including an upstream site on the West Fork in the Riverbend area, in the vicinity of University Drive and Rockwood Park, and just downstream of the Samuels Dam

        - Environmental and cultural resources mitigation as described in Chapter Four

        - Decommissioning of a portion of the levee improvements comprising the existing Fort Worth Floodway, as referenced in Figure 4 - 2 and breaching of the existing federal levee as shown in Figure 3 - 17.

- Trinity Uptown Features which have been considered in the preliminary identification of the Preferred alternative include removal of the residual levees, construction of canals or other features within the project interior to increase the amount of water "edge," and land use intensification in the interior as generally discussed in the Trinity Uptown Plan. Given the information currently available, no significant environmental issues were identified to be associated with or stem from these Trinity Uptown Features. Site-specific evaluations thereof may be required to ensure compliance with State and Federal requirements, as proposals for Trinity Uptown Features mature and project-specific proponents are identified.

- The total first cost of the Community Based Alternative is $435,000,000 (January 2005 Dollars.) The total cost of the subset defined as the Corps Project is $220,000,000. Annual O&M is estimated at approximately $256,500.

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The people primarily responsible for contributing to the preparation of this Environmental Impact Statement are listed below.

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Figure 5 - 1. Preferred Alternative Implementation Segment 1 - Roads and Bridges.

Figure 5 - 2. Preferred Alternative Implementation Segment 2 - Interior Bypass Channel.

Figure 5 - 3. Preferred Alternative Implementation Segment 3 - Riverbend.

Figure 5 - 4. Preferred Alternative Implementation Segment 4 - Bypass Channel Tie-ins.

Figure 5 - 5. Preferred Alternative Implementation Segment 5 - University Drive.

Figure 5 - 6. Preferred Alternative Implementation Segment 6 - Isolation Gates and Levees.

Figure 5 - 7. Preferred Alternative Implementation Segment 7 - Samuels Avenue Dam.

Figure 5 - 8. Preferred Alternative Implementation Segment 8 - Interior Water Feature and Connector.

Figure 5 - 9. Anticipated Contribution of Project Partners.

Figure 5 - 10. Boundaries of the Trinity River Vision Tax Increment Financing.

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