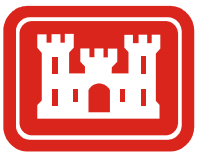
DRAFT ENVIRONMENTAL ASSESSMENT

EAST FORK REUSE PROJECT
KAUFMAN, ROCKWALL, AND COLLIN COUNTY, TEXAS



Prepared for

Lake Lavon Project Office

by

U.S. Army Corps of Engineers
Fort Worth District

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CHAPTER 1

INTRODUCTION

GENERAL

As required by the National Environmental Policy Act (NEPA) of 1969 and subsequent implementing regulations promulgated by the Council on Environmental Quality (CEQ), this Environmental Assessment (EA) was prepared to determine the potential impacts associated with the North Texas Municipal Water District's (NTMWD) East Fork Reuse Project. The U.S. Army Corps of Engineers (USACE) has three actions associated with the project: Section 404 permitting under the Clean Water Act, out granting of USACE fee property for portions of the project, and approval of modifications to federal levees. The objective of NEPA is to ensure consideration of the environmental aspects of proposed actions in the Federal decision-making process and to make environmental information available to the public before decisions are made and actions taken. Six water supply alternatives, six water conveyance pipeline alignment alternatives, and four Lake Lavon outfall alternatives were considered.

PURPOSE AND NEED

Recent long-range water supply planning efforts have identified significant increases in water demands that must be met through conservation and increased water supplies. During the past several years, water demand in the NTMWD service area, as well as in much of north central Texas, has increased significantly. NTMWD has investigated a number of options to obtain additional raw water supplies to meet the increasing demand. One of the more promising technologies is the indirect reuse of wastewater treatment plant effluent discharged to the river by diverting a portion of that river water into a constructed wetland for further treatment and returning the treated water to upstream lakes to augment the water supply.

A conclusion of the above-mentioned investigations was that, without a significant increase in the indirect reuse of wastewater treatment plant effluent, there would be inadequate supplies to meet demand beginning around 2008. No other alternative could be realized before 2020.

SUMMARY OF PROPOSED ACTION

To provide water supply to meet the near future demand in the service area, an East Fork Reuse Project has been developed. Planned to begin in 2006, reclaimed water originating from NTMWD sources that are discharged into the East Fork of the Trinity River would be diverted from the river near Crandall in Kaufman County and pumped to a large constructed wetland for nutrient removal and water quality polishing. After passage through the constructed wetland, water would be pumped to Lake Lavon for storage, blending, and water supply use. After project completion in 2008, the East Fork Reuse Project would provide a supply of 81,400 acre-feet per year (ac-ft/yr) by 2010, 96,400 ac-ft/yr by 2020, and 102,000 ac-ft/yr by 2030.

To accomplish the above, the East Fork Reuse Project would require an East Fork Trinity River diversion structure and pump station, a constructed wetland with plant nurseries and a nature center, a conveyance pump station and pipeline, and a lake outfall.

The constructed wetland would be located on Seagoville Ranch in Kaufman County within a leveed area adjacent to the East Fork of the Trinity River. All referenced figures in this report are included in Appendix A. Figure 1 shows the location of the river diversion structure and pump station, constructed wetland, and conveyance pump station in Kaufman County near the City of Crandall. Figure 2 shows the location of approximately 43 miles of 84-inch pipeline that would be constructed to carry water northward through Kaufman, Rockwall, and Collin Counties to a lake outfall at Lake Lavon.

Diversion Pump Station

The pump station would be a concrete structure measuring approximately 68 feet by 87 feet by 40 feet high and supported by concrete columns supported on 36-inch augur-drilled concrete piers. The pump station structure would be constructed just outside (east) of an existing agricultural levee. A concrete-lined trapezoidal intake channel about 900 feet in length would be constructed between the pump station and the East Fork Trinity River. The intake channel would have an invert at approximate elevation 330 feet mean sea level (msl) at the river and would be sloped to an approximate elevation of 324 feet msl at the pump station. The sides of the concrete channel would rise at a 1:1 slope to an elevation around 344 msl at which elevation a 15-foot bench would be constructed to serve as a maintenance roadway for the channel. From the bench, the slopes would be continued to the top of original grade at a slope of 3:1 and this slope would be grassed. Figure 1 identifies the location of the proposed diversion pump station.

Constructed Wetland

The constructed wetland would be located on Seagoville Ranch within a levied area west of the East Fork of the Trinity River (Figure 1). The wetland would consist of sedimentation basins; wetland cells; distribution, collection and conveyance canals; a collection pool; wetland plant nurseries and a nature center. The wetland would be located within the footprint of a 2,000-acre easement and would include about 1,840 acres of wetted surface. The balance of the wetland area would include berms, flow distribution and flow control structures, and access ways.

The constructed wetland area is divided into three sections (north, central, and south sections) by both topographic and manmade features (Figure 1). All three sections of the project area are located west of the East Fork and protection from floods is provided by a series of levees along the west bank of the river. The land within the three sections of the wetland project area was previously cleared, graded, subdivided into fields, and ditched for growing agricultural crops. Perimeter canals were constructed around the central and south sections to route drainage from the fields to two pump stations that pumped the collected rainfall runoff to the East Fork. The former pump stations are still located on the site but are no longer functional. Multiple 36-inch diameter culverts convey drainage through the levees to the East Fork. Stop logs in front of the culverts enable varying levels of water to be retained within the collection canals for livestock use.

Multiple stop log flow control structures installed from 1988 through 1991 in the drainage collection ditches were employed to develop and manage waterfowl habitat in various areas of the central and south sections of the project area. Approximately 243.3 acres characterized as emergent marsh habitat, black willow swamp, sloughs, a hillside seep/bog, and on-channel ponds were identified as jurisdictional features in a preliminary jurisdictional determination conducted by Advanced Ecology, Incorporated dated January 2005. Approximately 154.2 acres of identified jurisdictional areas consisting primarily of emergent marsh habitat and black willow swamp lie within the proposed constructed wetland footprint.

Conveyance Pipeline Construction

A conveyance pump station would be located north of FM 3049 in the vicinity of where the East Fork Trinity River crosses FM 3049 in Kaufman County, Texas. From the conveyance pump station, a 40-foot wide permanent easement is planned for pipeline segments in Kaufman, Rockwall, and Collin Counties continuing approximately 43 miles to the Lake Lavon Outfall structure. In addition to the permanent easement, temporary construction easement is required, so that the total permanent and temporary easement is 120 feet wide.

Narrower easements would likely be required in areas of urban-congestion to protect existing construction, and at creek crossings to minimize impacts to stream channels and associated riparian areas. These issues would be incorporated into the final design to minimize the impacts to the maximum extent practicable.

Pipeline installation would be accomplished by excavating a 10.5-ft wide by 20-ft deep trench, boxed for the installation of the pipeline. The trench would be backfilled in three layers; (1) the pipeline embedment layer that extends from 6 inches below the pipe to 12 inches above the pipe; (2) a layer extending from 12 inches above the pipe to between 12 and 24 inches below the existing ground; and a layer that completes the backfill to ground surface. The last 12 inches of the pipe trench would typically be topsoil. For pipeline crossings of waters of the U.S., the top 6 inches of fill would be topsoil originally excavated from the area.

In addition to the 84-inch pipe, a flowable fill or flexible base backfill with a rock riprap would replace the excavated material within the creek or stream crossings. The rock riprap would be placed in the top portion of the trench to a 2-ft deep by 20-ft wide. All stream crossings would be returned to original elevations.

Lake Lavon Outfall

The proposed outfall location would be located in the northern portion of Lake Lavon. The stilling basin would be based on the United States Bureau of Reclamation (USBR) Type VI impact stilling basin design that has been used successfully for large diameter pipeline outfalls, including NTMWD's Cooper Lake Pipeline outfall into Lake Lavon. Figures 8 and 9 show a typical plan and profile of the proposed impact stilling basin design.

The outfall structure would include a rock riprap apron into the lake to prevent erosion. The rock riprap would be placed within the lake to the 25th percentile elevation of 487.5 feet MSL. This

is at the 25th percentile elevation within the flood pool per historical data obtained from USACE. Figure 10 shows a profile section of the outfall structure.

SPONSORING ENTITY

The sponsoring entity for this project is the North Texas Municipal Water District. The NTMWD can be contacted at the following address and telephone number:

North Texas Municipal Water District
505 East Brown Street
P.O. Box 2408
Wylie, Texas 75098

Telephone: (972) 442-5405
Fax: (972) 442-5405
Contact: James M. (Jim) Parks, Executive Director

The NTMWD has secured the professional services of Alan Plummer Associates, Inc. (APAI). Questions concerning the content of this EA may be directed to APAI at the following address and telephone numbers:

Alan Plummer Associates, Inc.
7524 Mosier View Court
Fort Worth, Texas 76118

Telephone: 817-806-1700
Fax: 817-589-0072
Contact: Ms. Loretta Mokry

This document is required by NEPA and subsequent regulations promulgated by CEQ. Questions concerning compliance with NEPA and regulatory issues may be directed to the USACE at the following address and telephone numbers:

U.S. Army Corps of Engineers
Environmental Resources Division
819 Taylor Street, Room 3A14
Fort Worth, TX 76102-0300

Telephone: (817) 886-1716
Fax: (817) 886-6499
Contact: Jeff Tripe

CHAPTER 2

PROPOSED ACTION AND ALTERNATIVES

WATER SUPPLY ALTERNATIVES

The following summarizes the analysis of various NTMWD water supply alternatives presented in the Alternatives Analysis for the 404 permit application for the East Fork Reuse Project.

No Action Alternative

Census data show that areas served by NTMWD have been among the fastest population growth areas in the US between 1990 and 2000 (e.g., Collin County and Rockwall County grew about 86 percent and 68 percent, respectively). For this reason, the "No Action" alternative would not permit NTMWD to meet near-term and long-term demands for water. Thus, "no action" is not considered a viable alternative.

East Fork Reuse Alternative

The East Fork Reuse Project is the alternative for which this EA is being developed. Planned to begin in 2006, reclaimed water originating from NTMWD sources that are discharged into the East Fork of the Trinity River would be diverted from the river near Crandall in Kaufman County and pumped to a large constructed wetland for nutrient removal and water quality polishing. After passage through the constructed wetland, water would be pumped to Lake Lavon for storage, blending, and water supply use. After project completion in 2008, the East Fork Reuse Project would provide a supply of 81,400 acre-feet per year (ac-ft/yr) by 2010, 96,400 ac-ft/yr by 2020, and 102,000 ac-ft/yr by 2030.

The East Fork Reuse Project is the only supply option that can be implemented by 2008 that would allow the NTMWD to meet 2008 water demands. Long-range planning indicates that the next feasible water supply source for NTMWD would be the Lower Bois d'Arc Creek Reservoir on Bois d'Arc Creek in the Red River drainage basin. This reservoir is under study now and could be available within 15 years (2020). The yield of the Lower Bois d'Arc Creek Reservoir is about 98,000 ac-ft/yr. The East Fork Reuse Project would supply 96,400 ac-ft/yr in 2020 and, because of increases in wastewater flows related to population growth, would supply 102,000 ac-ft/yr by 2030.

Senate Bill 1 requires the Texas Water Development Board to undertake regional water supply planning to identify projects in Texas that are planned to meet water demands. The *Region C Water Plan* was amended in January 2005 to specifically recommend the East Fork Reuse Project as a water management strategy for the NTMWD.

Expansion of Existing Water Supplies (Lake Lavon Reuse/Lake Texoma Supply/Customer Conservation)

The NTMWD plans to expand existing programs to reuse treated wastewater in Lake Lavon, supply water from Lake Texoma, and encourage Customer Conservation. Though these programs account for only a small percentage of the water demand, they are important in that they allow more time to implement larger water supply projects that are under consideration. As these projects represent planned expansions of existing programs, they do not affect the selection of other alternatives, and are therefore not discussed further in the impacts assessment chapters of the EA.

Oklahoma Water

The State of Oklahoma has water supplies that exceed projected water needs in the State. The 2001 *Region C Water Plan* suggests that NTMWD could possibly obtain a supply of 50,000 ac-ft/yr from Oklahoma sources. To date, negotiations for this supply have not been successful and the Oklahoma Legislature has enacted a moratorium on the sale of Oklahoma water to Texas interests. Accordingly, this alternative cannot be considered as dependable until a number of political and institutional problems are resolved, and therefore, is not discussed further in the impacts assessment chapters of the EA.

Lower Bois d'Arc Creek Reservoir

NTMWD has plans to construct Lower Bois d'Arc Creek Reservoir in the Red River basin by the year 2020. As mentioned above, this alternative would not provide the water supplies needed to address the water shortage projected between present and 2020, and therefore, is not discussed further in the impacts assessment chapters of the EA.

Marvin Nichols I Reservoir

The *Region C Water Plan* indicates the potential use of this reservoir as a NTMWD water supply by the year 2030. Because of the timing and various permitting, contractual, and environmental issues along with significant local opposition, Marvin Nichols I cannot be considered as a near-term water supply source. Therefore, this water supply source is not discussed further in the impacts assessment chapters of the EA.

PIPELINE ALIGNMENT ALTERNATIVES

The Project Team evaluated six pipeline alignments (See Figure 11). The alignments were analyzed using aerial photography, USGS topography, tax maps, field investigations, and CAD computer software. Each alignment is described in detail below. The initial route evaluation summary is included in Table 1.

Table 1. Initial Route Evaluation Summary

Type	Description	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
		Length (miles)	Length (miles)	Length (miles)	Length (miles)	Length (miles)	Length (miles)
1	Rural, Open	36.4	38.5	36.7	38.8	37.3	39.4
2	Rural, Wooded	5.5	2.8	5.6	2.9	4.2	1.5
3	Urban/Congested	1.9	1.9	0.1	0.1	2.9	2.9
4	Creek Crossings	0.6	0.5	0.7	0.6	0.7	0.7
5	Road Crossings	0.3	0.4	0.4	0.4	0.4	0.4
6	Tunnel Crossings	0.6	0.5	0.3	0.3	0.4	0.4
	Total	45.2	44.6	43.8	43.2	45.9	45.2

Rockwall Water with West Southern Section (Option 1)

The Rockwall Water with West Southern Section route consists of segments S1, C1, N1, N4, and N5 as shown in Figure 11. The pipeline starts at the conveyance pump station at the south end of the constructed wetland and discharges to Lake Lavon. A portion of the pipe runs underneath the wetland and into a portion of Dallas County. It starts in Kaufman County and continues to Rockwall and Collin Counties. The total length of the route is about 45.2 miles with 80 percent of the route being in the Rural-Open Field land type.

Rockwall Water with East Southern Section (Option 2)

The Rockwall Water with East Southern Section route consists of segments S2, C1, N1, N4, and N5 as shown in Figure 11. This route is similar to the Option 1 route, except that the pipeline follows the east side of the constructed wetland and stays within Kaufman, Rockwall and Collin Counties. The pipeline starts at the conveyance pump station, south of the constructed wetland and discharges to Lake Lavon. The total length of the route is about 44.6 miles with 86 percent of the route being in the Rural-Open Field land type.

FM 549 with West Southern Section (Option 3)

The FM 549 with West Southern Section route consists of segments S1, C2, N2, N4, and N5 as shown in Figure 11. This route starts at Kaufman County continues through Dallas and Rockwall Counties and discharges in Lake Lavon in Collin County. As was the case for Option 1, a portion of the Option 3 route is underneath the constructed wetland. The total length of the route is about 43.8 miles with 84 percent of the route being in the Rural-Open Field land type.

FM 549 with East Southern Section (Option 4 – Preferred Alignment)

The FM 549 with East Southern Section route consists of segments S2, C2, N2, N4, and N5 as shown in Figure 11. The total length of the route is about 43.2 miles with 90 percent of the route being classified as Rural-Open Field, 7 percent Rural-Wooded, and 3 percent combined for Urban, Creek, Farm Road, and Highway crossing. This route is similar to the Option 3 route,

except that the pipeline follows the east side of the constructed wetland and stays within Kaufman, Rockwall and Collin Counties. The pipeline starts at the conveyance pump station, south of the constructed wetland and discharges to Lake Lavon.

ONCOR with West Southern Section (Option 5)

The ONCOR with West Southern Section route consists of segments S1, C3, N3, and N5 as shown in Figure 11. As was the case for Options 1 and 3, this alignment option is in Kaufman, Dallas, Rockwall and Collin Counties and a portion of the pipeline runs underneath the constructed wetland. An adjustment for additional pumping cost due to increased static head was added to the overall total cost in evaluating this option. The total length of the route is about 45.9 miles with 81 percent of the route being in the Rural-Open Field land type.

ONCOR with East Southern Section (Option 6)

The ONCOR with East Southern Section route consists of segments S2, C3, N3, and N5 as shown in Figure 11. This route is similar to the Option 5 route, except that the pipeline follows the east side of the constructed wetland and stays within Kaufman, Rockwall and Collin Counties. As was the case for Option 5, the overall total cost evaluation included an adjustment for additional static head. Total length of the route is about 45.2 miles with 87 percent of the route being in the Rural-Open Field land type.

Preferred Alignment. Pipeline alignment Option 4, "FM 549 with East Southern Section" was determined to be technically feasible and the most economically attractive route alternative, and was designated as the "Preferred Alignment" for further development. The other pipeline alignments outlined above would have similar impacts to existing habitat types and creek crossings (Table 1). Since alignment Option 4 has the shortest distance from the diversion pump station to the end of segment N5 (Table 1, Figure 11), it was deemed the most economically attractive route. Therefore, the other pipeline alignments were not carried forward for detailed analysis and design and are not discussed in detail in the impacts assessment chapters of the EA.

A Federally authorized and constructed levee and floodway are associated with the constructed wetland and conveyance pipeline portions of the proposed project. In Kaufman County it would be necessary to convey flows from the central section to the southern section of the above-mentioned constructed wetland via a flow control structure. A section of the northernmost section of the federally authorized levee would be temporarily cut open to allow installation of the flow control structure to move water from one section of the constructed wetlands to another. Conveyance of treated flow from the constructed wetland would also require a pipeline bored under the USACE levee at the south end of the wetland. Since installation of both pipelines would be conducted by boring, there would be no impact to the USACE levee.

The conveyance pipeline would be about 43 miles of an 84-inch diameter pipe with a design pressure up to class 300. Planned easement widths typically include a 40-foot wide permanent easement plus an 80-foot temporary construction easement for a total width of 120 feet. Where additional space is required for a future NTMWD pipeline, a 50-foot wide permanent easement is planned. Specifically, a 50-foot permanent easement is planned for the pipeline between the

intersection of FM 548 and US 80, in Forney, Texas, and continuing north to about the intersection of FM 2755 and CR 541 in Collin County. A planned 54-inch potable water pipeline will parallel this portion of the pipeline. A 40-foot wide permanent easement is planned for the segments south of the intersection of FM 548 and US 80, in Forney, Texas, and the pipeline segments north of the intersection of FM 2755 and CR 541 in Collin County continuing to the Lake Lavon Outfall. Narrower easements will likely be required in areas of urban-congestion to protect existing structures and improvements, and at creek crossings to minimize impacts to stream channels and associated riparian areas. These issues will be incorporated into the final design to minimize the impacts to the maximum extent practicable.

Since a portion of the conveyance pipeline and the lake outfall would be placed on USACE property, easements across the USACE property would need to be acquired. Portions of the northern segment of the pipeline shown in Figure 3 would cross USACE property. Locations of these USACE property crossings are shown in detail on Aerial Map 3 (Figure 4), Aerial Map 4 (Figure 5), and Aerial Map 5 (Figure 6).

As shown in Figure 4, the conveyance pipeline first enters USACE property in Collin County southeast of the Price Creek/George Creek arm of Lake Lavon approximately 2,400 feet east of State Highway (SH) 76. Figure 4 shows approximately 7,920 feet of pipeline located on USACE property from the above starting point northward to the Capital Commercial property about 1,000 feet north of County Road 543. The pipeline then continues northward along private property to a point at the northeast corner of the Derek Stewart property (See Figure 5). From this point the pipeline continues across USACE property approximately 2,800 feet northward to the Kansas City Southern (KCS) Railroad (See Figure 6) at which point it turns northeast and runs parallel to the railroad a distance of approximately 1,600 feet on USACE property to a TXU power easement. From the intersection of the KCS Railroad and the power easement, the pipeline crosses private property in a northwesterly direction, crosses SH 78, and continues to follow the power easement across private property to a point about 240 feet east of the northwest corner of the Clifford Carpenter property at which point the pipeline turns west. From the northwest corner of the Clifford Carpenter property, the pipeline again enters USACE property for a distance of approximately 800 feet to the proposed outfall location (See Figure 7).

The approximate total length of the project that would cross USACE property (pipeline, outfall structure and rock riprap apron) is approximately 13,000 feet. From the above, it is estimated that the project would temporarily affect a total of about 36 acres of USACE property with the permanent easement affecting approximately 13 acres.

OUTFALL LOCATION ALTERNATIVES

This EA considers the following Lake Lavon outfall alternatives as shown in Figure 12.

A. Return water to the upper portion of the lake on the east side.
B. Return water to the Elm Creek arm of the lake on the east side.
C. Return water to the first arm of the lake on the east side.

Outfall Location A

Outfall Alternative A would discharge the wetland treated water to the northern portion of the lake, discharging into segment 1, as shown on Figure 12 included in Appendix A.

Outfall Location B

Outfall Alternative B would discharge the wetland-treated water near the Elm Creek arm of the lake, discharging into segment 3, as shown on Figure 12 included in Appendix A. Although this outfall alternative location would require less pipeline, a lowering of the multiple barrier threshold associated with natural attenuation processes in the lake, i.e., percent blend and detention time offsets the benefit of lower pipeline cost.

Outfall Location C

Outfall Alternative C would discharge at the most southerly creek that flows to Lake Lavon from the east side, discharging into segment 4, as shown on Figure 12 included in Appendix A. This outfall alternative location would require the least pipeline, but also the least percent blend and detention time within Lake Lavon for the reuse water to provide enhancement of natural attenuation processes considered an important component of the multiple barrier approach for water reuse.

Water Quality Standards. The selection of a discharge point included consideration of the costs for the pipeline to reach various discharge points and water quality considerations for ultimate use of the raw water for potable purposes after water treatment.

The NTMWD intends to use a conservative approach in the design of this raw water augmentation project, especially as pertains to water quality. The intake for the raw water is from the East Fork of the Trinity River near Crandall, Texas. The quantity of water that NTMWD proposes to divert from the East Fork is based on the amount of wastewater treated effluent that is discharged into the East Fork below Lake Lavon. NTMWD realizes that the water to be diverted from the East Fork would be a blend of natural river flow mixed with treated effluent from area wastewater treatment plants. NTMWD also realizes that at times in the historical past, the base flow of the river has been at or near zero. For this reason, NTMWD has elected to consider the water that it diverts as being effluent dominated and has approached water quality from that aspect.

The water quality evaluation for the East Fork reuse project included consideration of the Texas Surface Water Quality Standards (TSWQS), as well as potential impacts not addressed by current state or federal regulations. With respect to the latter, there are a number of emerging or unknown constituents that may be present in reclaimed water about which little is known with respect to the effectiveness of various treatment processes and the potential human health impacts. Although no adverse human health impacts have been reported for other indirect reuse projects throughout the United States, the EPA's guidelines for water reuse specifically encourage a multiple barrier approach for projects that seeks to augment potable water supply with reclaimed water. In states for which regulations exist that address indirect reuse, a multiple

barrier approach is normally specified. Barriers typically include some form of advanced treatment at the wastewater treatment plant, at the water treatment plant, or both; upper limits on the percent blend of reclaimed water; lower limits on detention time; as well as monitoring and testing programs.

The use of a multiple barrier approach provides the opportunity for a variety of mechanisms to protect against potential adverse impacts of any particular constituent. For example, some constituents that are resistant to traditional wastewater treatment processes may decay quite rapidly with exposure to sunlight or when acted on by other natural processes. Thus, a constructed wetland located at the diversion point was incorporated into the project for polishing and detention time. The mechanics of the constructed wetland are ideally suited for nutrient removal, but secondarily the wetland is also a barrier for constituents that cannot withstand the effects of sunlight or other natural processes extant in wetlands.

Thus for this project a multiple barrier approach was used to address water quality for the East Fork reuse project, beginning at the diversion point and carrying through to the discharge location in the lake for detention time considerations.

Detention in Lake Lavon. Criteria for limits on percent blend and detention time were established based on a historical analysis of treated effluent discharges directly to Lake Lavon, analyses of other planned and unplanned reuse projects throughout the state, and consideration of experience and regulatory trends in other states. This evaluation resulted in target criteria that seeked to maintain an average percent blend of reclaimed water in Lake Lavon that is not greater than 30 percent, and average detention times that are not less than 6-12 months. It is important to note that the existing major wastewater discharges to the upper East Fork area of Lake Lavon have historically been consistent with these criteria.

Selection of East Fork Reuse Pipeline Discharge Location. Evaluation of an appropriate discharge location for water diverted from the East Fork (as related to water quality in Lake Lavon) was primarily based on the guidelines established for percent blend and detention time referenced above. As shown schematically in Figure 12, three potential discharge locations were considered. Location “A” is in the northern portion of the lake, discharging into segment 1, and Location “B” is near the Elm Creek arm of the lake and discharges into segment 3, and Location “C” is at the most southerly creek that flows to the lake from the east side.

While discharging to Location B or C has obvious economic benefits in terms of pipeline costs, a lowering of the barrier threshold associated with natural attenuation processes in the lake, i.e., percent blend and detention time offsets these benefits. For evaluation purposes, the lake was subdivided into segments. At conservation pool, segments 1 and 2 represent approximately 23 percent of the total volume of segments 1 through 4. Discharge at Location B would result in an increase in average percent blend of about 5 percent and decrease in detention time on the order of one to two months relative to water discharged at Location A. The diminution in effectiveness is even more pronounced for Location C, since it discharges only into segment 4. The impact on detention time is particularly relevant given that overall detention times within the lake would continue to decrease as NTMWD demands increase in the future. It should also be noted that additional detention time in the upper portion of the lake (within segments 1 and 2) is

likely to be more beneficial than detention time in the deeper areas of the lake since natural degradation associated with sunlight and benthic processes would have a greater opportunity to act in these shallower regions. Given these considerations, Location A has been selected as the recommended discharge location for the East Fork water.

In summary, a multiple barrier approach was adopted for the augmentation of water supply in Lake Lavon with reclaimed water as a conservative practice in order to provide protection against impacts from emerging or unknown constituents. This approach includes the use of natural attenuation processes (as measured by blending and detention time) as a barrier. Evaluation of the three potential discharge locations shown in Figure 12 indicates that there is significant water quality advantages associated with discharge at Location A. In particular, the added detention time in the upper portion of the lake is likely to enhance natural attenuation processes and is considered to be an important component of the multiple barrier approach to implementation of this project. Therefore, outfall locations B and C were not considered for detailed analysis and design and are not discussed in detail in the impacts assessment chapters of the EA.

OUTFALL DESIGN OPTIONS

Two preliminary design options for the Lake Lavon Outfall were developed and presented to the USACE during a preliminary meeting on December 16, 2004. Option 1 includes reconstruction of an existing creek from the pipeline outfall structure to the lake. Option 2 places the outfall structure closer to the lake and limits the impact to existing streams. See Figure 7 of Chapter 1 for a plan view of the two options.

Option 1

In Option 1, the pipeline continues parallel to CR 555 until it turns northwest and ends in an existing creek. An impact basin would be installed at the end of the pipeline in the existing channel. This option includes modifying and reinforcing the existing channel from the impact basin to the lake.

It would be necessary for the channel to be modified and reinforced from the impact basin to Lake Lavon to convey the proposed flows without excessive erosion. The existing channel would be excavated deeper and wider to convey the pipeline discharge. Due to the near continual pipeline discharge it would be necessary to use hard armoring on the channel bottom and sides. The channel would be lined with articulated concrete blocks or reinforced concrete up to the flow depth for the peak pipeline discharge. Above this depth, the channel would be lined with a turf reinforcement mat to prevent erosion due to combined pipeline discharge and storm runoff. Based on discussions with the USACE, there would be significant environmental mitigation costs associated with the channel modifications.

A rock riprap apron would be installed at the end of the modified channel and extend into the lake. Historical lake level data were obtained from the USACE, Fort Worth District Reservoir Control Office. Data from May 1, 1977, to October 31, 2004 was used to determine the

25th percentile elevation of 487.5 feet MSL. Rock riprap would be placed in the lake from the end of the channel to this elevation.

Option 2

In Option 2, the pipeline continues parallel to the TXU electric easement before turning west at the north side of the Carpenter property. An impact basin would be installed at the intersection with the flood pool water surface elevation (503 feet MSL). A rock riprap apron would extend from the basin into the lake similar to that described for Option 1.

Stilling Basin. In both options, an impact basin would be installed at the end of the pipeline. The basin would be based on the United States Bureau of Reclamation (USBR) Type VI impact stilling basin design. This design has been used successfully for the outfall of large diameter pipelines, including the NTMWD's Cooper Lake Pipeline outfall into Hickory Creek. The impact basin for the East Fork Reuse Pipeline would be similar in size to that structure. The maximum tested design flow for the USBR Type VI impact basin is 260 MGD at up to 50 fps; the hydraulics of the proposed pipeline fall within these parameters. The detailed design would be refined based upon project- specific hydraulics.

Outfall Design Recommendations. A preliminary opinion of probable cost was developed for both options. The estimated construction cost (including contingencies) for Option 1 and Option 2 is $1,830,000 and $2,060,000, respectively. These costs are analyzed from the point where the two options diverge and include the cost of pipe, channel lining, rock riprap, and impact basin structure. Construction of Option 1 would result in a savings of about $230,000 when compared to Option 2. However, due to the cost of permits, mitigation, and the need for continual channel maintenance, Option 2 is the preferred alternative.

From the outfall structure, a rock riprap apron would extend across USACE property a distance of approximately 1,400 feet to elevation 487.5 in Lake Lavon. The outfall structure would be located outside of the Lake Lavon normal pool elevation of 492 feet. The impact of the fill associated with the rock riprap placed below the normal pool elevation of the lake is also being addressed in the Section 404 permit application and mitigation of any adverse impacts at this location are being included in the mitigation plan.

CHAPTER 3

EXISTING ENVIRONMENT

The following paragraphs describe the existing environment of the project area from the diversion pump station at the East Fork Trinity River to the point at which the rock riprap outfall of the preferred route terminates in the upper portion of Lake Lavon.

DIVERSION PUMP STATION

Land Use

The diversion pump station structure would be constructed just outside (east) of an existing agricultural levee immediately north of the State Highway (SH) 175 right-of-way. A concrete-lined trapezoidal intake channel approximately 900 feet in length would be constructed between the pump station and the East Fork Trinity River (Appendix E, Figures 4 and 5). The agricultural levee has a maintained grass cover on the top and western slope but is wooded along the east slope continuing through the East Fork floodway to the river channel. Within the wooded floodway lies a remnant of the former river channel currently functioning as an oxbow slough. This wooded bottomland occurs in a habitat area that would have originally comprised the river terrace. However, as with many areas of Seagoville Ranch, the gradient and elevation have been altered significantly by historic channelization and dredging activities associated with the river. In addition, field investigation of this area indicates some additional impacts sustained during construction of the adjacent bridge and roadway of SH 175.

Since this bottomland forest lies within the levee-constrained floodway, it is subjected to flood process associated with the East Fork. However, floods in the East Fork cannot be regarded as entirely natural because of substantial human alterations upstream (Lake Lavon and Lake Ray Hubbard) and various channelization projects. Nevertheless, this forested bottomland indicates exclusion of active land use (except for noncommercial recreational hunting) for approximately the last 50-70 years. No evidence of recent logging is present and the stand is not subject to livestock grazing.

Geology and Soils

Soils are Trinity clay, occasionally flooded. According to the soil survey for Kaufman and Rockwall Counties (Pringle 1977), these are nearly level, deep calcareous, clayey soils found in bottomlands. They are composed of calcareous alluvium that formed under land cover of mixed hardwoods with tall and mid grasses in openings. These somewhat poorly drained soils have slow permeability and high available water capacity with a perched water table to depths of 15 inches in some areas during winter and spring. Because of the levee system, these soils are not subjected to the natural floods under which they formed.

Jurisdictional Waters of the U.S.

The hydroperiod in these stands is influenced exclusively by floodwaters of the East Fork. Watermarks on trees and debris piles indicate that overbank floods occur. However, most of these floods are known to be of short duration. The presence of certain upland species (such as eastern red cedar) indicates that prolonged flooding is infrequent.

Vegetation

The general aspect of the forested bottomland in the vicinity of the diversion pump station is an open floodplain forest comprised of some large trees with moderate midstory and understory. Downed timber is abundant, possibly the result of drought and ice storm events. Regeneration of midstory and overstory species is also common. The overstory is dominated by green ash (*Fraxinus pennsylvanica*), sugarberry (*Celtis laevigata*), cedar elm (*Ulmus crassifolia*), winged elm (*Ulmus alata*), and boxelder *(Acer negundo*). Cottonwood (*Populus deltoides*) and pecan (*Carya illinioenses*) are sparse within the stand. Bur oak (*Quercus macrocarpa*) is uncommon in this area but occurs occasionally in stands. Shumard oak (*Quercus shumardii*) is also found occasionally.

The dominant midstory species are possumhaw (*Ilex decidua*) and boxelder. Individual eastern red cedar (*Juniperus virginiana*) is common in heights to about seven feet. The presence of red cedar suggests infrequent prolonged flooding. Red mulberry (*Morus rubra*) saplings and seedlings are commonly encountered as is soapberry (*Sapindus saponaria*). Greenbriar (*Smilax spp.*) is very abundant along with poison ivy (*Toxicondendron radicans*) and trumpet-creeper (*Campsis radicans*) along the edge where sunlight exposure is more abundant. Other understory species present include violets (*Viola spp.*) and inland sea-oats (*Chasmanthium latifolium*). Presently, the side slope of the levee exhibits young stands of green ash, winged elm, hawthorn (*Crataegus spp.*) and black willow (*Salix nigra*).

CONSTRUCTED WETLAND

Land Use

Seagoville Ranch has been used for agricultural purposes for many decades. The main agricultural areas were established in the flood plain of the East Fork and were protected from flooding by levees constructed for that purpose. This is typical of the agricultural lands along the East Fork below Lake Ray Hubbard extending to the confluence with the Trinity River approximately 10 river miles below the project site. The project area is divided into three sections (north, central, and south sections) by both topographic and manmade features (Figure 1). All three sections of the project area are located west of the East Fork. The north section is located north of U.S. Highway 175 and is approximately 143 acres. The central section is located south of U.S. 175 and north of a topographic ridge containing the ranch headquarters and a former railway roadbed. This section is approximately 1,130 acres. The south section is located south of the topographic ridge and contains approximately 727 acres.

The constructed wetland project area lies within the floodplain of the East Fork of the Trinity River but some protection from floods is provided by a series of levees along the west bank of the river. The land within the three sections of the wetland project area was previously cleared, graded, subdivided into fields, and ditched for growing agricultural crops. Perimeter canals were constructed around the central and south sections to route drainage from the fields to two pump stations that pumped any collected rainfall runoff to the East Fork. The former pump stations are still located on the site but are no longer functional. Collected drainage is currently conveyed by large diameter culverts (36-inches) through the flood levees to the East Fork. Stop logs in front of the culverts enable varying levels of water to be retained within the collection canals for livestock use. Multiple stop log flow control structures installed from 1988 through 1991 in the drainage collection ditches were employed to develop and manage duck habitat in various areas of the central and south sections of the project area.

Geology and Soils

Based on conversations with the ranch manager (Mr. Richard Braddock), for several years annual drawdowns for moist soil management to promote germination of annual species were conducted for the wetland areas. However, the annual drawdowns were discontinued due to the resulting dominance of cocklebur (*Xanthium strumarium*) each year following the drawdowns. For the last 4-5 years, the water levels have been maintained so that the wetland areas have stayed inundated year round resulting in development of a diverse vegetative community dominated by more perennial aquatic species. The dominant perennial species common to the emergent wetland areas are water pepper (*Polygonum hydropiperoides*), spikerush (*Eleocharis spp.*), grassy arrowhead (*Sagittaria graminea*), soft rush (*Juncus effusus*), and crowfoot sedge (*Carex crus-corvi*).

Jurisdictional Waters of the U.S.

Based on the preliminary jurisdictional determination conducted by Advanced Ecology, Inc. (AEI) for Wetlands Management, L.P. for the western portion of Seagoville Ranch, Kaufman County Texas, and presented in a report dated January 2005, several jurisdictional wetland areas were identified within the footprint of the proposed constructed wetland for the NTMWD East Fork Reuse Project. These included emergent wetlands (EW1, EW2, EW3, and EW4) and an area identified as a black willow swamp. In addition to the constructed wetland area, modifications and/or replacement of the existing flow control structures for the proposed stormwater routing system to convey runoff from the hillsides west of the project site through the existing on-channel pond, slough, and wetland areas identified as EW5, EW6, and EW7 will also produce some minimal impacts. General description of Seagoville Ranch and the identified jurisdictional areas as described in the AEI report follows.

Vegetation

EW1 is an emergent marsh area of approximately 46.2 acres. The emergent vegetation in the wetland is estimated to cover about 40 percent of the area. Dominant plant species identified in the AEI report for this area include water pepper, soft rush, crowfoot sedge, other sedges, and spikerushes. Small patches of buttonbush (*Cephalanthus occidentalis*) are scattered throughout the marsh. This woody species occupies less than 5 percent of the wetland. A one-acre stand of black willow occurs on the west margin of the wetland. Much of this area was observed to be too deep for emergent plants, as about 60 percent is open water. No species of submergent plants were observed.

EW2 is a small wet meadow complex associated with the slightly higher elevations of the western portion of the basin. This site is dominated by soft rush, spikerush, and water pepper with occasional stands of crowfoot sedge. Standing water is largely absent, but the soil was observed to appear saturated for long periods. Livestock trampling and grazing for extended periods impact this site heavily.

EW3 is an emergent wetland easternmost in a series of cells that were created by installation of levees and water control structures during the earlier development which was targeted for the management of waterfowl habitat. Cell EW3 retains the herbaceous species of water pepper, soft rush, and spikerush as well as some of the same extensive growth of black willow observed in the cell to the west. Some portions of this cell also contains dense stands of sumpweed (*Iva annua*) an indicator of soil drying during mid-late summer, as well as denuding of vegetative cover by livestock activity.

The black willow swamp is located between the emergent wetlands designated EW2 and EW3. This is a black willow dominated area that developed in the created wetland cells originally intended for waterfowl habitat in the early 1990s. Low levees fitted with water control devices were constructed to manage water from the storm runoff collection/drainage system for the central section. The stands of black willow are even-aged and uniform in structure and occupy several cells in this wetland complex. The overstory canopy of willow is estimated at 80-90 percent with the trees about 30 feet in height and approximately 6-8 inches in diameter to breast height (dbh).

EW4 is an emergent wetland located in the south section that is described in the AEI report as having three basic vegetation communities resulting from micro-relief in the terrain of this area. About 50 percent of the area has saturated soil to very shallow water one to four inches in depth with dense growth of spikerushes, sedges, and soft rush. The deeper water of the south end of this wetland is a mixture of emergent aquatic plants and about 30 percent open water.

The emergent wetland areas EW5, EW6, and EW7 are primarily linear wetland pools containing a mixture of emergent and submerged vegetation and open water located adjacent to the western side of the hillside levee. These areas were created by earthen dams constructed with water level control structures in the borrow ditch/diversion canal beside the levee.

CONVEYANCE PIPELINE ROUTE

Land Use

Starting from the conveyance pump station located at the south end of the constructed wetland in Kaufman County, the conveyance pipeline route traverses Kaufman, Rockwall, and Collin Counties for approximately 43 miles prior to the discharge location located along the upper reaches of the eastern side of Lake Lavon. During the preliminary evaluation of route alternatives, the preferred pipeline route was characterized as being 90 percent Rural-Open Field, 7 percent Rural-Wooded, and 3 percent combined for Urban, Creek, Farm Road, and Highway crossing.

Geology and Soils

The soils in the area of the proposed diversion pump station are classified as Trinity Clay, occasionally flooded. The soils of the emergent wetland and black willow swamp areas are Trinity Clay, frequently flooded, Trinity Clay, occasionally flooded, and Wilson silt loam. A total of 20 mapped soil units are traversed by the proposed pipeline as listed in Table 2.

Table 2. Description of Soils along the Conveyance Pipeline Route

KAUFMAN, ROCKWALL, AND COLLIN COUNTIES		
Map Unit #	**Soil Series**	**Soil Description**
AiD2	Altoga	Altoga silty clay. 5 to 8 percent slopes, eroded
AtD2	Altoga	Altoga silty clay, 3 to 12 percent slopes, eroded
EnC2	Engle	Engle clay loam, 3 to 5 percent slopes, eroded
FeD2	Ferris	Ferris clay, 5 to 12 percent slopes, eroded
FhC	Ferris-Heiden	Ferris-Heiden complex, 2 to 5 percent slopes
FeE3	Ferris-Houston	Ferris-Houston clays, 5 to 12 percent slopes, severely eroded
HeC	Heiden	Heiden clay, 3 to 5 percent slopes
HeD	Heiden	Heiden clay, 5 to 8 percent slopes
HcC2	Houston	Houston clay, 3 to 5 percent slopes, eroded
HcD2	Houston	Houston clay, 5 to 8 percent slopes, eroded
HoA	Houston Black	Houston Black clay, 0 to 1 percent slopes
HoB	Houston Black	Houston Black clay, 1 to 3 percent slopes
HoB2	Houston Black	Houston Black clay, 2 to 4 percent slopes, eroded
HoC	Houston Black	Houston Black clay, 3 to 5 percent slopes
LaD2	Lamar	Lamar clay loam, 5 to 8 percent slopes, eroded
LaE3	Lamar	Lamar clay loam, 5 to 12 percent slopes, severely eroded
LeC2	Lewisville	Lewisville silty clay, 3 to 5 percent slopes, eroded
Tf	Trinity	Trinity clay, frequently flooded (0 to 1 percent slopes)
Te/To	Trinity	Trinity clay, occasionally flooded (0 to 1 percent slopes)
WcB	Wilson	Wilson clay loam, 1 to 3 percent slopes

Jurisdictional Waters of the U.S.

Based on the field investigations along the pipeline route, there are approximately 99 projected crossings of jurisdictional waters including stream channel, open water (impoundments), and adjacent wetlands. The proposed pipeline route initially crosses under (via boring) the Kaufman Levee District 5 levee (a federally authorized and USACE constructed levee) between the south section of the constructed wetland and the west side of the East Fork. The route then goes northward within the maintained floodway of the East Fork between the federally constructed levees. Routinely maintained herbaceous cover characterizes this area with limited woody growth primarily along the cutbank of the East Fork and small discharge drainage feeders. The river channel in this reach was channelized in the 1970s-1980s in conjunction with the construction of the federally authorized flood control project. From the constructed wetland to the proposed outfall site, the conveyance pipeline would cross numerous jurisdictional waters (see Table 7).

Vegetation

Approximately 1/3 of the channel crossings have at least some wooded riparian area associated, but these are typically very limited in width. The riparian areas are typically dominated by relatively young growth with average age of trees less than 50 years old.

The pipeline route traverses the Blackland Prairie soils belt and the Blackland Prairie vegetation region. The Blackland Prairie is an almost treeless rolling prairie of short and bunch grasses. There are, however, hardwoods such as elm, hackberry, pecan, oak, and bois d'arc occurring along streams. Brushy species such as honey mesquite and eastern red cedar have invaded many portions of the grasslands.

The portion of the proposed project crossing USACE-owned property south of County Road 543 includes approximately 2.99 acres of wooded area, 10.8 acres of open field, 0.96 acres of cleared existing easement, and 0.34 acres of open land resulting from fluctuations of water level in Lake Lavon. This area is shown on Figure 4.

The portion of the proposed project crossing USACE-owned property north of County Road 543 to the Tom Bean-Elm Creek arm of Lake Lavon includes approximately 1.45 acres of wooded area and 1.63 acres of open field. The above area is also shown on Figure 4.

The portion of the proposed project that crosses USACE-owned property at the Tom Bean-Elm Creek arm of Lake Lavon includes approximately 8.11 acres of wooded area and 2.66 acres of open field. This area is shown on Figures 5 and 6.

LAKE LAVON OUTFALL

Land Use

The outfall area at Lake Lavon includes approximately 2.35 acres of open field/grassland with a mixture of native grasses including switchgrass (*Panicum virgatum*) and 0.4-acre of periodically inundated lake edge totaling approximately 2.75 acres. As can be seen from Figures 3 through 7, the conveyance pipeline would cross USACE property associated with each of the three outfall alternatives (i.e., first arm of the lake on the east side, Elm Creek arm of the lake, and upper portion of the lake).

A review of recent aerial photographs and onsite reconnaissance of the project shows a mixture of agricultural, park, lake recreation, and wildlife management land use. Agricultural and residential uses are associated with contiguous private properties. A series of aerial photographs from the 1950s through 2004 for each of the alternative outfall locations is included in Appendix B that reflect the changes in land use and vegetative cover of the regional landscape during the past five decades.

Geology and Soils

Shoreline geology along the east side of Lake Lavon within the project area consists primarily of fluviatile terrace deposits ("Qt"), gravel, sand, and silt. Alluvium ("Qal") floodplain and channel deposits of sand, silt, clay, and gravel are located in stream channels flowing into Lake Lavon in the project area. Small areas near the confluence of these stream channels and the lake show deposits of Wolfe City Sand ("Kwc"). Between one and four miles east of the lake and south of Elm Creek/Tom Bean Creek the geology is predominately Pecan Gap Chalk ("Kpg") with small pockets of Marlbrook Marl.

Based on the Soil Survey of Collin County, Texas (United States Department of Agriculture, Soil Conservation Service in cooperation with the Texas Agricultural Experiment Station), a total of 11 different soil types are found within the project area. The soil types located in the project area are listed in Table 3.

Table 3. Soil Description for the Outfall Area

Soil Description
Engle clay loam, 3 to 5 percent slopes, eroded
Ferris-Houston clays, 5 to 12 percent slopes, severely eroded
Houston clay, 3 to 5 percent slopes, eroded
Houston clay, 5 to 8 percent slopes, eroded
Houston Black clay, 0 to 1 percent slopes
Houston Black clay, 1 to 3 percent slopes
Houston Black clay, 2 to 4 percent slopes, eroded
Lamar clay loam, 5 to 8 percent slopes, eroded
Trinity clay, frequently flooded
Trinity clay, occasionally flooded
Wilson clay loam, 1 to 3 percent slopes

Jurisdictional Waters of the U.S.

The surface water resources within the project area primarily consist of Lake Lavon and inflow from the East Fork of the Trinity River. Other significant streams draining into Lake Lavon include Wilson Creek, Sister Grove Creek, and Pilot Grove Creek. Smaller streams contributing inflow to Lake Lavon in the project area include Elm Creek, Tom Bean Creek, Price Creek, and George Creek.

A preliminary determination of jurisdictional wetlands and waters of the U.S. was conducted by Alan Plummer Associates, Inc. to examine the extent of potential jurisdictional wetlands and waters of the U.S. along the proposed pipeline and outfall route. This preliminary determination was documented in a report dated March 4, 2005. The report has been submitted to the USACE-Regulatory Branch for their concurrence. The proposed pipeline route easements across USACE property would intersect Elm Creek, Tom Bean Creek, Price Creek, George Creek, and unnamed tributaries to these creeks and Lake Lavon. The proposed pipeline and outfall structure would be within the 100-year floodplain in areas where the project crosses USACE property at various locations along the east side of Lake Lavon.

Vegetation

Collin County lies in the Texan biotic province, a transitional zone between the forested Austroriparian province to the east and the grassland provinces (Kansan and Balconian) to the west. While the region exhibits a combination of eastern forest and western prairie flora and fauna, the bottomlands are primarily Austroriparian species.

Collin County is in the Blackland Prairie soils belt and the Blackland Prairie vegetation region. The Blackland Prairie is an almost treeless rolling prairie of short and bunch grasses. There are, however, hardwoods such as elm, hackberry, pecan, oak, and Bois d'Arc occurring along streams. Brushy species such as honey mesquite and eastern red cedar have invaded many portions of the grasslands as a result of the minimization of natural and manmade fires.

The dominant canopy species along creeks in the above areas include Pecan (*Carya illinoensis*), black willow (*Salix nigra*), cedar elm (*Ulmus crassifolia*), and eastern cottonwood (*Populus deltoides*). The dominant sapling/shrub species within both areas include young tree species, buttonbush (*Cephalanthus occidentalis*), flameleaf sumac (*Rhus lanceolata*), and roughleaf dogwood (*Cornus drummondii*). Finally, herbaceous species near the aquatic resources were dominated by wild rye (*Elymus spp.*), smartweed (*Polygonum spp.*), cocklebur (*Xanthium strumarium*), inland seaoats (*Chasmanthium latifolium*), cattail (*Typha latifolia*), and caric sedge (*Carex spp.*) and the herbaceous species within the upland areas were dominated by giant ragweed (*Ambrosia trifida*), Bermuda grass (*Cynodon dactylon*), and perennial ryegrass (*Lolium perenne*).

RESOURCES COMMON TO ALL PROJECT COMPONENTS

Groundwater

There are no significant groundwater sources in the immediate project area. However, it is possible that surface water infiltration into the Wolfe City Sand formation may occur along some streams along the east side of Lavon Lake. The Texas Commission on Environmental Quality and/or the Texas Water Development Board does not recognize the Wolfe City Sand formation as an aquifer (either major or minor). It is possible it would have some limited value for domestic, shallow wells.

Air Quality

The air quality surrounding the subject area is generally of higher quality than that of the major cities within the Dallas-Fort Worth metroplex. However, Kaufman, Rockwall, and Collin Counties are included in the Dallas-Fort Worth Non-attainment Area for ozone. Collin County is classified as a "Serious Non-attainment Area"; Kaufman and Rockwall Counties are classified as "Moderate Non-attainment Areas."

Noise

Car and truck traffic noise from various Highways (US 175, IH 20, US 80, IH 30, and SH 78) and other roadways in the project area could be evident along various portions of the project right-of-way. Train noise from the KCS Railroad is also a possibility as is periodic boat noise associated with lake recreation. Noise associated with construction of this project is expected to be short-term and should not significantly affect residential areas. Aerial photographs indicate that the proposed pipeline route is near three sparsely populated residential areas along the east side of Lake Lavon.

Wildlife

A variety of mammals are known to be near the project area. These include opossum (*Didelphis virginiana*), cave bat (*Myotis velife*), beaver (*Castor canadensis*), nutria (*Myocastor coypus),* plains pocket gopher (*Geomys bursarius*), eastern flying squirrel (*Glaucomys volans*), eastern gray squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), California jackrabbit (*Lepus californicus*), eastern cottontail (*Sylvilagus floridanus*), white-tailed deer (*Odocoileus virginianus*), nine-banded armadillo (*Dasypus novemcinctus*), raccoon (*Procyon lotor*), mink (*Mustela vison*), spotted skunk (*Spilogale putorius*), red fox (*Vulpes vulpes*), coyote (*Canis latrans*), and bobcat (*Lynx rufus*). Many of these species have been able to tolerate urbanization, while species that formerly inhabited the region such as black bear (*Ursus americanus*), gray and red wolves (*Canis lupus* and *Canis rufus*, respectively), mountain lion (*Felis concolor*), river otter (*Lutra canadensis*), and bison (*Bos bison*) were extirpated from the area due to hunting, trapping, and/or behavioral intolerance to human activity.

The situation is similar for birds, reptiles, and amphibians. The species more intolerant to human activity have declined, while the more tolerant species have flourished. Common reptile species documented near the project area include lizards and various snakes, such as the copperhead (*Agkistodon contortrix*), cottonmouth (*Agkistodon piscivorus*), bullsnake (*Pituophis melanoleucus sayi*), and diamondback rattlesnake (*Crotalus atrox*) while amphibians seen occasionally include turtles and frogs. A large number of bird species utilize the stream bottomlands in Collin County and species such as the house sparrow (*Passer domesticus*), grackle (*Quiscalus mexicanus*), American crow (*Corvus brachyrhynchos*), and European starling (*Sturnus vulgaris*) dominate the more urbanized areas.

Finally, the common fish species known to be in Lake Lavon as well as its significant tributaries include various species of bass (*Micropterus spp.*), bluegill (*Lepomis macrochirus*), drum (*Aplodinotus grunniens*), gar (*Atractosteus spatula*), sunfish (Family Centrarchidae), and shad (*Dorsoma spp*.).

Threatened and Endangered Species

Table 4 shows the federal and state listed threatened and endangered species in Kaufman, Rockwall, and Collin Counties. The U.S. Fish and Wildlife Service (USFWS) lists three threatened or endangered species as occurring or potentially occurring. These are the Bald Eagle (threatened), Interior Least Tern (endangered), and the Whooping Crane (endangered). The Texas Parks and Wildlife Department (TPWD) lists an additional five threatened or endangered species as occurring or potentially occurring. These species are Artic Peregrine Falcon (threatened), White-faced Ibis (threatened), Wood Stork (threatened), Texas Horned Lizard (threatened), and Timber/Canebrake Rattlesnake (threatened).

Surveys for the species of concern as well as their preferred and designated critical habitat as listed by the USFWS and the TPWD was conducted in January and February, 2005 by Alan Plummer Associates, Inc. for the proposed project area. During the on-site investigation, the project area was visually assessed for the listed species as well as its suitability for the same species. Designated critical habitat was not present for any of the federally listed threatened or endangered species within the project area. Additionally, none of the federally or state listed species were observed during the on-site investigation.

Several species such as the bald eagle (*Haliaeetus leucocephalus*), Arctic peregrine falcon (*Falcon peregrinus tundrius*), and whooping crane (*Grus americana*) are known to migrate through, but not nest in the area.

None of the state listed threatened or endangered species were observed during the on-site investigation. The white-faced ibis (*Plegadis chihi*) and wood stork (*Mycteria americana*) are migratory birds through the area and breed along the coast; therefore, the likelihood of the species occurring within the project area would be extremely rare. The interior least tern (*Sterna antillarum athalassos*) is known to migrate through, but not

nest in the area. Habitat preferred by other state listed species such as the Texas horned lizard (*Phrynosoma cornutum*) and the timber/canebrake rattlesnake (*Crotalus horridus*) was not observed within the project area; therefore, the likelihood of observing these species within the project area is rare.

Finally, there are no federally listed threatened or endangered plants within the vicinity of the project area. The State of Texas does not protect any additional plant species other than the federally protected species.

Table 4. Federal and State Listed Threatened and Endangered Species

	Common Name	Scientific Name	Habitat	Status Within County		
				Kaufman	Rockwall	Collin
Birds	Artic Peregrine Falcon	*Falco peregrinus tundrius*	Areas with high, massive with expansive views near water where prey are numerous and diverse	Federally Delisted; State listed as Threatened	Federally Delisted; State listed as Threatened	Federally Delisted; State listed as Threatened
	Bald Eagle	*Haliaeetus laeucocephalus*	Large lakes, nesting in tall trees or cliffs near water; feeds in areas of open water where food is available	Federally and State listed as threatened; Proposed Delisted	Federally and State listed as threatened; Proposed Delisted	Federally and State listed as Threatened
	Interior Least Tern	*Sterna antillarum athalassos*	Nests along sand and gravel bars within braided streams and rivers	Federally and State listed as Endangered	Federally and State listed as Endangered	Federally and State listed as Endangered
	White-faced Ibis	*Plegardis chihi*	Freshwater marshes, sloughs, and irrigated rice fields; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats	State listed as Threatened	State listed as Threatened	State listed as Threatened
	Whooping Crane	*Grus americana*	Marshes, river bottoms, potholes, prairies, and cropland (migratory)	Federally and State listed as Endangered	Federally and State listed as Endangered	Federally and State listed as Endangered
	Wood Stork	*Mycteria americana*	Prairie ponds, flooded pastures or fields, ditches, and other shallow standing water; roosts communally in tall snags	State listed as Threatened	State listed as Threatened	State listed as Threatened
Reptiles	Texas Horned Lizard	*Phrynosoma cornutum*	Open, arid and semi-arid regions with sparse vegetation	State listed as Threatened	State listed as Threatened	State listed as Threatened
	Timber/Canebrake Rattlesnake	*Crotalus horridus*	Swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland, limestone bluffs; sandy soil or black clay; prefers dense ground cover	State listed as Threatened	State listed as Threatened	State listed as Threatened

Cultural Resources

APAI subcontracted with AR Consultants, Inc. to conduct a cultural resources investigation of the East Fork Reuse Project pipeline. During January through March 2005, AR Consultants, Inc. conducted an intensive pedestrian archaeological survey along with deep testing of the proposed pipeline route from the proposed conveyance pump station at the end of the constructed wetland through the floodplain of the East Fork of the Trinity River in northwest Kaufman County, Texas to the terminus of the pipeline at the proposed outfall to Lake Lavon in the upper portion of the lake which is located in Collin County. The scope of the archaeological survey included a records review, a field survey, the recording of sites, if present, and the preparation of a summary report. The cultural resources survey report prepared by AR Consultants, Inc. to document the investigation is submitted as a separate document designated Appendix C to this report.

As presented in the cultural resources survey report, the proposed pipeline route is underlain by the Upper Cretaceous age undivided Neylandville formation and the Marlbrook Marl, the Wolfe City Formation, and the Pecan Gap Chalk. Quaternary alluvium fills the East Fork valley, and an older Quarternary terrace comprises the surface deposits along almost all of the east side of the valley. The proposed pipeline route crosses not only the modern floodplain of the East Fork, but its T-1 and T-2 terraces as well, especially in stream valleys. The T-2 terrace is approximately 15,000+ years old.

Based on previous investigations conducted in the region summarized in the cultural resources survey report prepared by AR Consultants, Inc., historic and prehistoric cultural resources are present, but are widely scattered with sites small in size and frequently located along surface deposits in uplands. Noted in the report was the fact that lithic procurement sites are found in upland areas where metaquartzite gravels occur. Habitation sites are reported to be near available water sources.

Based on the results of the intensive survey conducted by AR Consultants, Inc. for the proposed pipeline route right-of-way, four twentieth century residential sites were found, two cisterns, a well, and a house site. The residences represented by the cisterns and the well are no longer present and it was not possible to reconstruct the footprint of the respective houses and their associated work areas and outbuildings. Consequently, these three sites have lost their historic integrity and are not eligible for nomination to the National Register of Historic Places. The house, which is located at the intersection of Neal Road and Valley View Road, is in poor state of repair since it was abandoned in 1968, but it represents a good example of post-Depression/pre-World War II rural residence. In addition, it also contains historic artifacts, which were apparently left in place when the house was abandoned. This residence was considered eligible for consideration for inclusion on the National Register of Historic Places. The proposed pipeline is routed along the road frontages around this residence and it is not anticipated to disturb the structures.

A site representing two shell lens was investigated along the originally proposed pipeline route within the floodplain of the East Fork of the Trinity River on the Seagoville Ranch in Kaufman County. This site represents an example of a buried and partially sealed off prehistoric occupation site known to be present throughout the Upper Trinity River Basin. The pipeline

route was shifted to the west to avoid this site and the revised pipeline route investigated to confirm that no additional sites were along the revised route.

Based upon the results of the survey, AR Consultants, Inc. recommended that the proposed project area has low archaeological potential and that further cultural investigations are unwarranted.

Socioeconomic Conditions

One of the fastest growing regions in the US, Kaufman, Rockwall, and Collin County's economy includes government/services, manufacturing, retail and wholesale, recreation, mineral production, agribusiness, education, telecommunications, medical services, newspaper printing, research, financial services, and aerospace.

According to the 2000 U.S. Federal Census, Collin County had a population of 491,675 (an 86 percent increase over 1990). Kaufman County had a population of 71,313 (a 37 percent increase over 1990). Rockwall County had a population of 43,080 (a 68 percent increase over 1990).

Collin County has a labor force of 294,810 with a 2.3 percent unemployment rate and an average weekly wage of $726. Total property value in the County is about $38.2 billion, annual retail sales are about $6.5 billion, 1999 median household income was $70,835 with 4.9 percent of persons below the poverty level. Kaufman County had 1997 retail sales of approximately $573 million. Median 1999 household income was estimated at $44,783 with 10.5 percent of persons below the poverty level. Rockwall County had 1997 retail sales of approximately $267 million. Median 1999 household income was estimated at $65,164 with 4.7 percent of persons below the poverty level.

Hazardous Waste / Substances

A search for possible hazardous material sites was conducted by reviewing available state and federal records regarding any documentation of pollution control activities, documented incidents, or violations of environmental laws or regulation, and the potential for environmental pollution in the immediate area (Appendix D). The information obtained from numerous databases from the United States Environmental Protection Agency (EPA) and the Texas Commission on Environmental Quality (TCEQ) included the following:

ASTM Databases

- Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) (Active)
- Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) (NFRAP Archive)
- Emergency Response Notification System (ERNS)
- Facility Index System (FINDS)
- National Priorities List (NPL)
- Resource Conservation and Recovery Information System (RCRIS)

- Resource Conservation and Recovery Act (RCRA) Treatment, Storage, and Disposal (TSD)
- RCRA Corrective Action Sites (RCRA COR)
- Resource, Conservation and Recovery Act (RCRA) Generators List (RCRA GEN)
- Resource Conservation and Recovery Information System sites No Longer Regulated (RCRA NLR)

Non-ASTM Databases

- Hazardous Materials Incident Response System (HMIRS)
- National Compliance Database (NCDB)
- National Pollution Discharge Elimination System (NPDES)
- National Radon Database (NRDB)
- The Nuclear Regulatory Commission's (NRC) list of permitted nuclear facilities (Nuclear)
- PCB Activity Database System (PADS)
- 1995 TIGER census listing of schools and hospitals that may house individuals deemed sensitive to environmental discharges due to their fragile immune systems (Receptors)
- Air and Surface Water Releases (RELEASES): A subset of the EPA's ERNS database which have impacted only air or surface water
- State Soil Geographic (STATSGO) data for the conterminous United States (Soils)
- Toxic Release Inventory System (TRIS)
- TCEQ listing of all permitted solid waste landfills, transfer stations, and incinerators (LANDFILLS)
- Texas Leaking Underground Petroleum Storage Tank (LUST) List
- State Superfund Registry (STATE SITES)
- TCEQ Texas Petroleum Storage Tank (UST) List
- Public Water Supply Sources database of public drinking water well and surface water intake sites (STATE WELLS)
- TCEQ listing of all former industrial properties that lie dormant or underutilized due to liability associated with real or perceived contamination (BROWNFIELD)
- Texas Spills List
- Texas Industrial Hazardous Waste Notice of Registration (IHW NOR) data
- OTHER – Texas Industrial Hazardous Waste Notice of Registration (IHW NOR) data. The TCEQ enters all information submitted by industrial and hazardous waste transporters, receivers (including recyclers), generators and one time shipments into a database that tracks industrial and hazardous waste generation and management activities in the state.

The database search was divided into three sections corresponding with the three locations where the pipeline crosses USACE property. The three reports for the three portions of pipeline route crossing USACE property are included in Appendix D. The search identified the following facilities within 0.50-mile of the project easement area that are 1) RCRA generators, 2) are known to have or to have had petroleum storage tanks located on site, and 3) sites listed under other.

RCRA Generators List. This list provides information on facilities, which are classified as hazardous waste generators, which create more than 100 kilograms of hazardous waste per month or meet other requirements of RCRA. Additionally, compliance and corrective action information is included. There is one RCRA generator located on U.S. Highway 78, 1.5 miles south of U.S. Highway 380 in Farmersville, TX listed as Environmental Service Process. This facility is identified as a trucking facility with current status as inactive.

Other. The facility identified above from the RCRA Generators List was also identified under OTHER as a small quantity generator (generates 100-1,000 kg/month of hazardous waste) and a transport – transporter. A second site identified under OTHER was Rogers Cottonseed in Farmersville, TX, listed with a registration number but no reported generation of waste, receiver of waste, transport of waste, of other activity with waste. This site was also reported as inactive.

Texas UST List. This list provides the location of registered petroleum storage tanks. Two sites were identified as having registered underground storage tanks. Rogers Store in Farmersville, TX has two (2) underground storage tanks located on site for gasoline, each with a capacity of 4,000 gallons, which are listed as still in use. Another 6,000-gallon tank for diesel is listed for this same location, also identified as still in use.

The Flying J Ranch in Farmersville, TX is identified as having one (1) 1,000-gallon tank for gasoline that has been removed from ground.

DOWNSTREAM WATER QUALITY AND HYDROLOGY

Downstream Water Quality

The water quality model, QUAL-TX, was used to evaluate the impact of the proposed diversion on water quality conditions, specifically dissolved oxygen (DO) concentrations, in the East Fork Trinity River. The Stream Standard for DO in the river segment downstream of the South Mesquite Creek/East Fork Trinity River confluence is 4.0 mg/L. The Texas Commission on Environmental Quality (TCEQ) assumes that Stream Standards will be met if model results for DO are 3.8 mg/L or greater.

The TCEQ recently updated its QUAL-TX water quality model of the East Fork Trinity River (Segment 0819) to account for present and near future permit limits for wastewater dischargers to this segment. As part of the evaluation for the East Fork Reuse Project, this model was utilized to assess the water quality impacts on the East Fork Trinity River of water withdrawals for the following flow conditions:

1. Present and pending permitted WWTP discharges with no releases from Lake Ray Hubbard;
2. Present and pending permitted WWTP discharges, including releases from Lake Ray Hubbard equal to the combined flows from WWTPs that are operated by the NTMWD and that discharge to Lake Ray Hubbard (i.e., Rowlett Creek WWTP, Muddy Creek WWTP, Squabble Creek WWTP, Rush Creek WWTP, Terry Lane WWTP, and Southside WWTP);

3. Future WWTP discharges (for approximately the year 2050), with no releases from Lake Ray Hubbard; and
4. Future WWTP discharges including releases from Lake Ray Hubbard equal to the projected combined flows from Rowlett Creek WWTP and Muddy Creek WWTP.

Results of the QUAL-TX modeling for the conditions listed are outlined in Chapter 4.

Downstream Hydrology

The East Fork Reuse Project will result in changes in flows of the East Fork Trinity River. A study was conducted to evaluate the impacts on water flows and quality within the East Fork downstream of the diversion point.

Due to significant wastewater discharges to the East Fork Trinity River and its watershed, flows within the East Fork have been steadily increasing as this area has developed. Historical 10-year average flows at the USGS Crandall gage have increased from less than 2 cubic feet per second (cfs) in the 1950s to nearly 65 cfs in the 10-year period from 1994 to 2003. Thus, increased wastewater discharges have significantly altered the natural flow conditions within this portion of the East Fork Trinity River. Two major impoundments have been constructed on the East Fork above the Crandall gage site. Lavon Lake (constructed in the 1950's and modified for additional conservation storage in the early 1970's) provides for water supply and flood control, while Lake Ray Hubbard (constructed in the 1960's) provides water supply. The significant increases in river flows have occurred even as the uncontrolled watershed was preempted by the construction and operation of the two major water supply reservoirs.

CHAPTER 4

IMPACTS OF PROPOSED ACTION AND ALTERNATIVES

GENERAL

As discussed in Chapter 1 and 2, the NTMWD faces an immediate need for water supply that has been occasioned by the rapid population growth in its service area. Various alternative actions other than the East Fork Reuse Project have been evaluated, but none would provide the water supplies needed to address the water shortage projected between now and 2020. Given the long-range growth projections versus all of the alternatives evaluated, this project would be required to meet the NTMWD water supply needs by 2008. Water conservation has been evaluated and the NTMWD has embarked on a water conservation program involving its member and customer cities. The No Action Alternative or water conservation only, would not permit NTMWD to meet near-term water demands within its rapidly growing service area.

Though there are no viable water supply alternatives to the East Fork Reuse Project, the Project included an evaluation of three outfall locations and six pipeline routes previously described in Chapter 2. Pipeline alignment Option 4, "FM 549 with East Southern Section" was determined to be technically feasible and the most economically attractive route alternative, and was designated as the "Preferred Preliminary Alignment" for further development. The other pipeline alignments would have similar impacts to existing resources and Option 4 would result in the shortest distance from the diversion pump station to the end of segment N5, resulting in the most economically attractive route. Therefore, the other pipeline alignments were not carried forward for detailed analysis and design and are not discussed in detail in the impacts assessment chapters of the EA.

As described in Chapter 2, a multiple barrier approach was adopted for the augmentation of water supply in Lake Lavon in order to provide protection against impacts from emerging or unknown constituents. This approach includes the use of natural attenuation processes (as measured by blending and detention time) as a barrier. Evaluation of the three potential discharge locations indicated that there was significant water quality advantages associated with discharge at Location A. In particular, the added detention time in the upper portion of the lake is likely to enhance natural attenuation processes and is considered to be an important component of the multiple barrier approach to implementation of this project. Therefore, outfall locations B and C were not considered for detailed analysis and design and are not discussed in detail in the impacts assessment chapters of the EA. The following is an assessment of the impacts of the Preferred Alternative.

LAND USE CHANGES

The current land use within the footprint of the preferred alternative may be permanently and temporarily affected due to construction of the project components. Approximately 42,265 square feet of existing levee and bottomland area would be replaced with concrete and soil cement for development of the intake channel and river erosion protection components of the

diversion pump station. Approximately 2,000 acres of land that was previously used for agricultural uses would be converted to an emergent wetland complex. The constructed wetland has a nominal area of 2,000 acres that will include about 1,840 acres of wetted surface. The balance of the wetland is berms, flow distribution and control structures, and access ways. Existing land uses along the conveyance pipeline would be temporarily disturbed during installation of the pipeline. However, the construction areas along the conveyance pipeline would be returned to preconstruction contours and vegetation reestablished upon completion of construction, thereby reducing impacts to existing land uses. The preferred alternative (Option 4) would have similar impacts to existing land uses as compared to the other pipeline alignment options and would result in the shortest pipeline distance between the diversion pump station and the end of segment N5 (Figure 11). Where available, the preferred alternative would follow existing utility easements to result in the least disruption of existing land uses. A preliminary assessment of land use effects in Kaufman, Rockwall, and Collin Counties is included in Table 1. The Lake Lavon outfall structures would convert approximately 2.75 acres of existing lake edge and open grassland habitat to a stilling basin and rock riprap apron.

GEOLOGY AND SOILS

Impacts to geology and soils associated with all alternatives considered would be limited to soil grading, trench excavation, and boring activities. The impacts from all proposed project components would be comparable in nature and scope.

Impacts to existing soils within the diversion pump structure footprint would occur due to excavation of the intake channel and slope protection. Within the constructed wetland, grading of the areas would be needed to facilitate construction of perimeter berms, collection channels, and topography modification to facilitate even distribution of flows across the treatment wetland area. The topography to be developed in the constructed wetland cells would include a mixture of deep water areas (>4 feet deep) and marsh areas varying in water depths from about 6 inches to about 20 inches. The upper six inches of topsoil from the existing emergent wetland areas would be stripped and stockpiled separately prior to grading of the areas for the proposed constructed wetland cells. This topsoil would be used for final grading of the marsh areas within the constructed wetland cells to encourage development of a varied and dense emergent vegetative cover within the marsh areas.

Typically the 84-inch pipeline installation would involve excavating a boxed 10.5-ft wide by 20-ft deep trench. The trench would be backfilled in three layers; (1) the pipeline embedment layer that extends from 6 inches below the pipe to 12 inches above the pipe; (2) a layer extending from 12 inches above the pipe to between 12 and 24 inches below the existing ground; and a layer that completes the backfill to ground surface. The last 12” of the pipe trench would typically be topsoil. For pipeline crossings of jurisdictional wetland areas, the top 6” of fill would be topsoil originally excavated from the wetland area.

For creek or stream crossings, a flowable fill or flexible base backfill would be used for embedment and to fill the trench to between 18 inches to two feet of the surface. Rock riprap would be placed to complete filling the trench. All material excavated from the trench would be transported to an upland site, spread and seeded. All stream crossings would be returned to

original elevations. As indicated in Table 1, a limited part of the proposed pipeline may require tunnel excavation.

Local geology could effect pipeline excavation from the standpoint of trench safety requirements (stability of open excavation). The trenches would be constructed in residual soils of parent geologic formations or alluvial soils in stream corridors. Clay and silty or sandy clay soils are considered to be the predominant soil types for surficial soils. Clayey shale may be encountered with depth. All excavation areas would be returned to pre-existing grades and contours upon completion of all boring and trenching activities. Excess excavated material would be removed by the contractor and disposed of at an off-site location.

Impacts to geology and soils at the outfall structure location are expected to be minimal and would be primarily associated with pipeline construction. Lake Outfall Location A would have a somewhat greater impact on geology and soils because of the greater length of pipeline required than for Locations B or C.

JURISDICTIONAL WATERS OF THE U.S.

The intake channel for the diversion pump station begins in the river (jurisdictional waters) and a portion of the intake channel crosses an approximately fifty foot wide section of an abandoned meander of the river (jurisdictional waters). Table 5 provides an estimate of amounts of surface area of jurisdictional area impacted.

Table 5. Jurisdictional Impacts at Diversion Pump Station

Material Being Discharged	Location of Discharge	Total Project Sq Ft	Discharge to Jurisdictional Waters Sq Ft
Concrete	Intake Channel	7,200	504
Soil-Cement	Intake Channel	35,000	2,450
Soil Cement	River Erosion Protection	65	65
Total Concrete		**7,200**	**504**
Total Soil Cement		**35,065**	**2,515**

Clay soils from excavation of the sedimentation basins, deepwater zones, and canals would be used for construction of berms and fill of existing ditches. The wetland cells would be graded to achieve appropriate elevation drop across the cells for control of water depth in marsh areas. Topsoil from the emergent marsh areas that require grading would be stripped and stockpiled separately for use in final grading of wetland cells to facilitate establishment of aquatic plant cover. Materials on-site are being incorporated into the design so that no imported materials would be necessary. The following information in Table 6 is a description of construction activities that would occur within jurisdictional areas associated with the Constructed Wetland and the surface area affected by each activity. Reference is made to Figures 2 and 3, Appendix C of *Wetland Delineation & Habitat Evaluation Western Portion of the Proposed Bunker Sands Mitigation Bank Seagoville Ranch, Kaufman County, Texas* prepared by Advanced Ecology, Inc. for detailed location of areas listed in Table 6 and described in Chapter 3.

Table 6. Jurisdictional Impacts Within The Constructed Wetland Footprint

Material Being Discharged	Location of Discharge	Area Affected (Acres)
None; Re-grade Existing Area	EW1, Figure 2 in above referenced study	46.2
Onsite soil as fill	Re-grading of EW2, Figure 2 in above referenced study	18.3
Onsite soil as fill	Re-grading of EW3, Figure 2 in above referenced study	18.5
None; Re-grade Existing Area	EW4, Figure 3 in above referenced study	44.9
60 LF of Pre-cast RCP Concrete Wing-wall Concrete headwall	EW5, Figure 3 in above referenced study; Replacement of existing flow-control structure	0.1
60 LF of Pre-cast RCP Concrete Wing-wall Concrete headwall	EW6, Figure 3 in above referenced study; Replacement of existing flow-control structure	0.1
60 LF of Pre-cast RCP Concrete Wing-wall Concrete headwall	EW7, Figure 3 in above referenced study	0.1
Onsite soil	Re-grading of Black Willow Swamp. See Figure 2 in above referenced document	26.3
Concrete spillway and drainage structure	Discharge end of pond southwest of EW3. See Figure 2 in above referenced study; Replacement of existing flow-control structure	0.1
Total		**154.6**

A total of about 40,000 cubic yards of existing soil would be excavated from about 80 individually identified jurisdictional areas (streams, open water areas, and identified wetlands). An additional 20 aquatic resources were identified within the proposed 120-foot total easement width for both permanent and temporary, but the proposed efforts to minimize disturbance should allow avoidance of any impacts to these. The material would be excavated from streams and wetlands encountered along the pipeline alignment. Material removed would be disposed offsite and in accordance with applicable environmental requirements and laws. Table 7 provides descriptions and quantities of surface area of impacts by pipeline crossings.

An outfall channel would be constructed from a stilling basin to Lake Lavon. About 0.457 acres within the jurisdictional area of the lake edge would be affected by work associated with the outfall channel. The lake edge was determined at the conservation pool elevation at 492 feet msl.

Table 7. Summary of Waters of the U.S., Adjacent Wetlands, and Open Waters Within the Project Area
(Easement Area of the Proposed Pipeline Route)

Identification #	Aquatic Resource	Classification	Project Vicinity			Proposed Impacts*	
			Width at OHWM (Feet)	Length (L.F.)	Area (Acres)	Length (L.F.)	Area (Acres)
1	Water 16 - Remnant East Fork Trinity River Channel (Crossing 1)	Open Water	N/A	N/A	1.250	N/A	0.100
2	Water 16 - Remnant East Fork Trinity River Channel (Crossing 2)					N/A	0.040
3	East Fork Trinity River	Perennial	167.0	15,750.0	60.400	344.1	0.400
4	Wetland 1	Isolated**	N/A	N/A	0.610	N/A	N/A
5	Wetland 4	Isolated**	N/A	N/A	0.900	N/A	N/A
6	Wetland 2 - North of SH 175	Emergent	N/A	N/A	0.090	N/A	0.081
7	Wetland 3 - North of SH 175	Emergent	N/A	N/A	0.330	N/A	0.091
8	Stream 61A - Unnamed Tributary to Mustang Creek	Intermittent	4.0	2,236.9	0.205	18.1	0.002
9	Stream 60 - Mustang Creek (Crossing 1)	Intermittent	8.0	1,012.2	0.186	71.2	0.002
10	Stream 60 - Mustang Creek (Crossing 2)					54.6	0.010
11	Stream 53 - Unnamed Tributary to Mustang Creek	Ephemeral	2.5	199.9	0.011	51.6	0.003
12	Stream 1 - Unnamed Tributary to Mustang Creek (Continuation of Stream 53)	Intermittent	4.5	351.4	0.036	42.1	0.004
13	Water 18 - Impoundment (Beaver Pond)	On-Channel	N/A	N/A	1.500	N/A	0.121
14	Stream 62 - (Continuation of Streams 53 and 1)	Ephemeral	1.5	348.2	0.012	21.6	0.001
15	Water 1 - Impoundment	On-Channel	N/A	N/A	0.264	N/A	0.031
16	Stream 2 - Unnamed Tributary to Mustang Creek	Ephemeral	2.0	333.0	0.015	50.3	0.002
17	Stream 3 - Unnamed Tributary to Mustang Creek	Ephemeral	2.5	506.4	0.030	59.9	0.003
18	Stream 4 - Unnamed Tributary to Mustang Creek	Ephemeral	1.0	307.0	0.007	188.6	0.004
19	Wetland 8	Emergent	N/A	N/A	0.141	N/A	0.053
20	Stream 96 - Unnamed Tributary to Mustang Creek	Ephemeral	1.5	222.0	0.008	29.7	0.001
21	Wetland 9	Emergent	N/A	N/A	0.225	N/A	0.031
22	Stream 8 - Unnamed Tributary to Mustang Creek	Intermittent	10.0	188.7	0.043	40.9	0.009
23	Stream 9 - Unnamed Tributary	Ephemeral	3.5	105.3	0.008	105.3	0.008
24	Stream 10 - Unnamed Tributary	Ephemeral	3.5	80.5	0.006	80.5	0.006
25	Water 27 - Impoundment	On-Channel	N/A	N/A	0.058	N/A	0.035
26	Stream 82 - Unnamed Tributary	Ephemeral	1.5	194.4	0.007	60.1	0.002
27	Wetland 7	Emergent	N/A	N/A	0.036	N/A	0.003
28	Water 28 - Impoundment	On-Channel	N/A	N/A	0.760	N/A	N/A

Table 7. Summary of Waters of the U.S., Adjacent Wetlands, and Open Waters Within the Project Area
(Easement Area of the Proposed Pipeline Route)

Identification #	Aquatic Resource	Classification	Project Vicinity			Proposed Impacts*	
			Width at OHWM (Feet)	Length (L.F.)	Area (Acres)	Length (L.F.)	Area (Acres)
29	Water 29 - Impoundment	On-Channel	N/A	N/A	0.250	N/A	0.002
30	Stream 11 - Unnamed Tributary	Ephemeral	1.0	103.9	0.002	66.4	0.002
31	Stream 12 - Unnamed Tributary	Ephemeral	3.0	145.4	0.010	48.4	0.003
32	Stream 14 - Unnamed Tributary	Ephemeral	3.5	157.5	0.013	129.0	0.010
33	Stream 13 - Unnamed Tributary	Ephemeral	2.5	113.6	0.007	44.0	0.004
34	Water 32 - Impoundment	On-Channel	N/A	N/A	0.850	N/A	N/A
35	Stream 15 - Unnamed Tributary to Long Branch	Intermittent	8.0	201.0	0.037	42.0	0.008
36	Stream 89 - Unnamed Tributary to Long Branch	Ephemeral	1.5	469.7	0.016	42.3	0.001
37	Stream 67 - Unnamed Tributary to Long Branch	Ephemeral	3.5	431.9	0.035	50.2	0.004
38	Stream 70 - Unnamed Tributary to Stream 67	Ephemeral	2.5	146.6	0.008	43.3	0.002
39	Water 23 - Impoundment	On-Channel	N/A	N/A	0.055	N/A	N/A
40	Stream 69 - Unnamed Tributary to Stream 68	Ephemeral	2.0	276.6	0.013	62.4	0.003
41	Stream 68 - Unnamed Tributary to Long Branch	Ephemeral	4.0	461.3	0.042	60.4	0.006
42	Stream 16 - Unnamed Tributary to Long Branch	Ephemeral	1.5	190.8	0.007	42.5	0.001
43	Stream 93 - Long Branch (Crossing 1)	Intermittent	9.0	889.9	0.184	149.4	0.031
44	Stream 93 - Long Branch (Crossing 2)					104.5	0.022
45	Stream 94 - Unnamed Tributary to Long Branch	Ephemeral	3.0	203.4	0.014	44.5	0.003
46	Water 37 - Flood Plain for Long Branch	Open Water	N/A	N/A	0.048	N/A	0.026
47	Stream 92 - Long Branch	Intermittent	9.0	252.9	0.052	41.0	0.008
48	Water 30	Remnant Channel	N/A	N/A	0.012	N/A	0.009
49	Stream 85 - Unnamed Tributary to Long Branch	Ephemeral	3.0	136.1	0.009	40.5	0.003
50	Stream 17 - Long Branch	Intermittent	9.0	199.3	0.041	51.4	0.011
51	Stream 19 - Overflow Channel for Long Branch	Ephemeral	2.0	88.6	0.004	42.1	0.002
52	Stream 18 - Long Branch	Intermittent	6.0	115.6	0.016	46.7	0.006
53	Stream 20 - Unnamed Tributary to Long Branch (Crossing 1)	Ephemeral	3.5	671.6	0.054	53.3	0.004
54	Stream 20 - Unnamed Tributary to Long Branch (Crossing 2)					48.5	0.004
55	Water 33 - Impoundment	Stock Tank	N/A	N/A	0.078	N/A	N/A
56	Stream 21 - Unnamed Tributary to Camp Creek	Ephemeral	3.0	151.5	0.010	60.1	0.004
57	Water 40 - Impoundment	Isolated	N/A	N/A	0.444	N/A	N/A

Table 7. Summary of Waters of the U.S., Adjacent Wetlands, and Open Waters Within the Project Area
(Easement Area of the Proposed Pipeline Route)

Identification #	Aquatic Resource	Classification	Project Vicinity			Proposed Impacts*	
			Width at OHWM (Feet)	Length (L.F.)	Area (Acres)	Length (L.F.)	Area (Acres)
58	Stream 22 - Unnamed Tributary to Camp Creek	Ephemeral	3.0	123.9	0.009	43.1	0.003
59	Stream 23 - Unnamed Tributary to Camp Creek	Ephemeral	1.5	166.2	0.006	43.0	0.001
60	Stream 54 - Camp Creek	Intermittent	11.0	4,098.8	1.035	42.4	0.011
61	Stream 55 - Unnamed Tributary to Camp Creek	Ephemeral	4.0	393.1	0.036	168.8	0.016
62	Stream 24 - Unnamed Tributary to Camp Creek	Ephemeral	2.0	410.9	0.019	44.2	0.002
63	Stream 25 - Unnamed Tributary to Camp Creek	Ephemeral	4.5	240.7	0.025	44.1	0.004
64	Stream 51 - Unnamed Tributary to Camp Creek	Ephemeral	2.5	208.9	0.012	48.9	0.003
65	Stream 81 - Unnamed Tributary to Camp Creek	Ephemeral	6.0	210.9	0.029	53.8	0.007
66	Water 10 - Plunge Pool Associated with Stream 81	Plunge Pool	N/A	N/A	0.083	N/A	N/A
67	Stream 50 - Unnamed Tributary to Camp Creek	Ephemeral	2.0	354.5	0.016	40.4	0.002
68	Stream 29 - Bluff Creek (below large on-channel impoundment)	Ephemeral	4.0	183.4	0.017	50.3	0.005
69	Stream 28 - Unnamed Tributary to Bluff Creek	Ephemeral	4.0	164.6	0.015	44.8	0.004
70	Water 5 - Impoundment	On-Channel	N/A	N/A	2.400	N/A	0.041
71	Stream 31 - Unnamed Tributary to Bear Creek	Ephemeral	4.0	883.9	0.081	N/A	N/A
72	Water 6 - Impoundment	On-Channel	N/A	N/A	0.144	N/A	0.070
73	Stream 32 - Bear Creek (Crossing 1)	Intermittent	12.0	1,826.5	0.500	58.0	0.016
74	Stream 32 - Bear Creek (Crossing 2)					49.3	0.014
75	Stream 32 - Bear Creek (Crossing 3)					152.1	0.042
76	Water 31 - Impoundment	On-Channel	N/A	N/A	0.300	N/A	0.022
77	Stream 86 - Unnamed Tributary	Ephemeral	1.0	208.7	0.005	27.0	0.001
78	Stream 33/100 - Unnamed Tributary to Price Creek	Ephemeral	4.5	551.6	0.057	41.4	0.004
79	Water 22 - Price and George Creeks Arm of Lavon Lake	Open Water	N/A	N/A	0.666	N/A	0.109
80	Stream 35 - George Creek	Intermittent	22.0	184.4	0.093	50.9	0.026
81	Stream 36 - Price Creek	Intermittent	8.0	406.3	0.075	71.2	0.013
82	Stream 37 - Unnamed Tributary to Price Creek (2 Crossings)	Ephemeral	1.5	413.8	0.014	85.6	0.003

Table 7. Summary of Waters of the U.S., Adjacent Wetlands, and Open Waters Within the Project Area
(Easement Area of the Proposed Pipeline Route)

Identification #	Aquatic Resource	Classification	Project Vicinity			Proposed Impacts*	
			Width at OHWM (Feet)	Length (L.F.)	Area (Acres)	Length (L.F.)	Area (Acres)
83	Stream 40 - Unnamed Tributary to Stream 38 (Crossing 1)	Ephemeral	2.0	270.3	0.012	51.9	0.002
84	Stream 40 - Unnamed Tributary to Stream 38 (Crossing 2)					109.5	0.005
85	Stream 38 - Unnamed Tributary to Elm Creek (Crossing 1)	Ephemeral	3.5	945.5	0.076	28.8	0.002
86	Stream 38 - Unnamed Tributary to Elm Creek (Crossing 2)					95.3	0.008
87	Stream 39 - Unnamed Tributary to Elm Creek	Ephemeral	4.0	171.3	0.016	48.5	0.004
88	Stream 87 - Unnamed Tributary to Elm Creek	Ephemeral	4.0	250.0	0.023	40.4	0.004
89	Stream 88 - Unnamed Tributary to Elm Creek	Ephemeral	2.5	169.0	0.010	42.4	0.002
90	Water 25 - Impoundment	Open Water	N/A	N/A	0.122	N/A	N/A
91	Stream 75 - Tom Bean Creek	Intermittent	7.0	244.4	0.039	54.8	0.009
92	Stream 99 - Elm Creek	Intermittent	24.0	350.6	0.193	77.4	0.043
93	Stream 77/98 - Unnamed Tributary to Stream 57	Ephemeral	3.0	362.7	0.025	51.1	0.004
94	Stream 43 - Unnamed Tributary to Elm Creek	Ephemeral	3.5	453.8	0.036	78.2	0.006
95	Water 9 - Impoundment	On-Channel	N/A	N/A	0.031	N/A	N/A
96	Water 4 - Impoundment	On-Channel	N/A	N/A	0.715	N/A	0.182
97	Water 7 - Impoundment	On-Channel	N/A	N/A	0.083	N/A	0.001
98	Water 8 - Impoundment	On-Channel	N/A	N/A	0.016	N/A	N/A
99	Stream 44 - Unnamed Tributary	Ephemeral	3.5	269.1	0.022	64.2	0.005
Total				**41,760.9**	**76.505**	**4,433.3**	**1.918**

***Calculation of impacts based on 40-foot wide permanent easement at creek, wetland, and water crossings.**
****Isolated from the East Fork Trinity River 100-year floodplain by federal and agricultural levees. Determined as non-jurisdictional**

VEGETATION

Vegetation impacts associated with the diversion pump station would include permanent removal of approximately 1.0 acre of existing wooded and grassland habitat within the footprint of the intake channel, pump station, and river erosion stabilization. The constructed wetland would convert approximately 2,000 acres of existing emergent wetland, black willow swamp, grassland, pastureland, and old-field habitat to emergent wetland habitat.

The conveyance pipeline would impact approximately 43 miles of existing open field and wooded habitat. The portion of the proposed project crossing USACE-owned property south of County Road 543 includes approximately 2.99 acres of wooded area, 10.8 acres of open field, 0.96 acres of cleared existing easement, and 0.34 acres of open land resulting from fluctuations of water level in Lake Lavon. The portion of the proposed project crossing USACE-owned property north of County Road 543 to the Tom Bean-Elm Creek arm of Lake Lavon includes approximately 1.45 acres of wooded area and 1.63 acres of open field. The portion of the proposed project that crosses USACE-owned property at the Tom Bean-Elm Creek arm of Lake Lavon includes approximately 8.11 acres of wooded area and 2.66 acres of open field.

The outfall area at Lake Lavon includes approximately 2.35 acres of open field/grassland and 0.4-acre of periodically inundated lake edge totaling approximately 2.75 acres. Lake Outfall Alternative A would have a greater impact on vegetation than Alternatives B or C because the length of pipeline to Location A would require crossing more vegetative areas than for Locations B or C. Table 8 summarizes the impacts for the various components of the project (Diversion Pump Station, Constructed Wetland, Conveyance Pipeline, and Outfall Structure).

Table 8. Summary of Vegetation Impacts by Project Component

Project Component	Description	Impacts to Existing Vegetation (acres)	
		Habitat Type	Impacts (Acres)
Diversion Pump Station	Intake channel from East Fork to Wetland	Wooded	1.00
Constructed Wetland	Regrading and installation of new flow control structures for stormwater system	Wetland, Black Willow Swamp	154.60
Constructed Wetland	Regrading and installation of new flow control structures for stormwater system	Pasture, Old-Field	1685.40
Conveyance Pipeline	Pipeline Stream Crossings	Wooded, Stream	0.870
Conveyance Pipeline	Pipeline Wetland Crossings	Wetland	0.259
Conveyance Pipeline	Pipeline Open Water Crossings	Wooded, Open Water	0.789
Conveyance Pipeline	Pipeline Terrestrial Habitat Crossings	Wooded	13.50
Conveyance Pipeline	Pipeline Terrestrial Habitat Crossings	Open Field, Grassland, Existing Easement	19.00
Conveyance Pipeline	Pipeline Terrestrial Habitat Crossings	Lake Edge Periodically Flooded	0.36
Outfall	Outfall Channel to Lake Lavon	Lake Edge Periodically Flooded	0.40
Outfall	Outfall Channel to Lake Lavon	Open Field, Grassland	2.35

SURFACE WATER

As all of the pipeline routes considered involve excavation in and near streams, surface water quality may be temporarily at risk due to the potential for sedimentation and siltation. The construction contractor(s) would be required to prepare and implement Stormwater Pollution Prevention Plans (SWPPP) to protect against loss of soil due to erosion during rainfall events. A general Texas Pollution Discharge Elimination System (TPDES) permit exists for construction activities. The SWPPP is a requirement of the general permit. The NTMWD would review the SWPPP to determine that potential threats to water quality are addressed, and would inspect the implementation and maintenance of measures during the construction process. Approved engineering and construction best management practices (BMP's) would be used to minimize erosion during construction. Practices which can be used to control erosion and sedimentation are as follows:

- Vegetative cover would be re-established as soon as practicable to any areas of exposed soil within the construction area. Erosion control mats or comparable protection would be required for stream banks to provide protection until vegetation is reestablished.
- Exposed soil in traffic areas would be sprinkled with water at appropriate intervals to minimize wind erosion.
- Temporary sediment control measures would be used on slopes with exposed soils. These measures may include silt fencing, rock-check dams, and/or hay bales.
- Stockpiles formed from excavations would be managed near streams, gullies or steep slopes by silt fences, rock berms, or geotextiles at the contractors discretion to prevent direct discharge of sediments to streams
- Construction areas would be graded and left in a smooth condition at the conclusion of construction to discourage the formation of gullies and to facilitate reestablishment of vegetative cover.

Implementation of the above measures would limit adverse effects due to siltation and sedimentation during construction. Although trenching would temporarily disrupt the areas adjacent to and including stream crossings, the disturbance would be short-termed and the impacted areas are expected to return to their natural states within a short period of time.

GROUNDWATER

There are no significant groundwater sources in the immediate project area as well as no major or minor aquifer outcrops existing along the pipeline routes. However, it is possible that surface water infiltration into the Wolfe City Sand formation may occur along some streams along the east side of Lake Lavon. In that regard, the pipeline terminus and outfall may cross the Wolfe City Sand formation. The pipe material, embedment material and backfill are relatively inert, thus there are no impacts to groundwater envisioned from trenching and installing a water pipeline across the Wolfe City Sand. If the trench is open during periods of rainfall, the infiltration into the Wolfe City Sand may increase above the natural infiltration.

Due to the above and the design of the proposed pipeline, none of the proposed project features are expected to have an impact on ground water quality within the project area.

WETLANDS

Alan Plummer Associates, Inc. conducted onsite investigations in January and February 2005 for the proposed project to identify potential jurisdictional waters of the U.S. and adjacent wetlands. Based on these investigations, the proposed project would incur 69 jurisdictional stream crossings, 7 wetland crossings, and 23 jurisdictional open water crossings plus the outfall flume to Lake Lavon. Table 7 identifies the jurisdictional areas and quantifies the impacts at each location.

Necessary measures and BMP's would be incorporated into the engineering design and construction to minimize impacts where the pipelines cross jurisdictional areas. Minimization of impacts at all of the stream crossings may be achieved by limiting construction activities to the permanent easement at the crossings and impacts to three of the streams would be avoided completely with this scenario. After construction, any impacted areas would be returned to pre-construction contours. Table 7 provides a summary of impacts to jurisdictional waters resulting from the preferred pipeline route. Mitigation of these impacts is addressed in the Mitigation Plan prepared by APAI in connection with the East Fork Reuse Project and included in Appendix E to this document.

From information in Table 7 and aerial photographs, it appears that the other conveyance pipeline alignments that were considered would have a similar or greater impact on wetlands and waters of the U.S. as compared to the preferred route. Narrow easements may be required at creek crossings to minimize impacts to stream channels and associated riparian areas. These issues would be incorporated into the final design to minimize the impacts to the maximum extent practicable.

Lake Outfall Alternative A would have a greater impact on jurisdictional waters of the U.S. than Alternatives B or C because the length of pipeline to Location A would require crossing more jurisdictional areas than for Locations B or C.

FLOODPLAINS

The proposed pipeline route would be within the 100-year floodplain associated with Lake Lavon and several streams flowing into Lake Lavon; however, the proposed construction methods would not impact valley storage within the project area. All disturbed areas would be returned to pre-construction contours and grades; therefore, flood storage loss would not occur. Copies of the FEMA flood insurance rate maps for the project area are provided in Appendix F.

Detailed investigations were not performed for other route alternatives considered. However, construction along the other pipeline routes would have been treated comparably as described for the preferred route with preconstruction contours restored following construction. Therefore, no loss of flood storage would have been anticipated with any of the alternative routes. Likewise, none of the Lake Outfall Alternatives considered would affect valley storage, as all disturbed areas would be returned to pre-construction contours and grades; therefore, flood storage loss would not occur.

AIR QUALITY

Air quality in the immediate project area may be temporarily affected by dust and vehicle exhaust from construction activities associated with all components of the proposed project; however, BMP's, such as periodic watering of loose soil in traffic areas to minimize its release into the air, would be employed to minimize these impacts.

NOISE

Noise effects resulting from activities associated with the proposed project would be temporary and limited to project component areas. Additionally, the construction specifications would require the contractor to be familiar with, observe, and comply with federal, state, and local laws, ordinances, and regulations that apply to the conduct of work including the Occupational Safety and Health Administration regulations with respect to noise. Therefore, noise levels, which would be unacceptable from a health and safety standpoint, should not occur.

WILDLIFE

It is anticipated that impacts to wildlife resulting from all route alternatives would be temporary, occurring only during the construction of the proposed pipeline. Wildlife would be expected to leave the general area, but return once construction is complete. Impacts to aquatic organisms would be minimized due to utilizing BMP's during construction. The proposed project minimizes fragmentation of wildlife habitat by following roadways and utility easements to the extent practicable.

THREATENED AND ENDANGERED SPECIES

As mentioned in Chapter 3, the USFWS lists the following threatened or endangered species as occurring or potentially occurring in Kaufman, Rockwell, and Collin Counties include: Interior Least Tern (*endangered*), Whooping Crane (*endangered*), and Bald Eagle (*threatened*).

The interior least tern traditionally nests along sand and gravel bars within wide, shallow rivers. With the decrease in availability of traditionally preferred habitat, the tern has begun utilizing non-traditional habitats such as sand and gravel pits, dredge islands, dirt roads, and gravel rooftops typically within approximately two miles of the Trinity River. Typical nesting sites are usually absent of vegetation; however, terns are known to utilize sites that have up to 30 percent vegetative cover. Traditional habitats such as sand or gravel bars are not present within the project area. Therefore, the interior least tern is not expected to nest within or adjacent to the project area.

The whooping crane is known to migrate through, but not nest in the area. Typical preferred roosting habitat by a migrating crane includes marshy wetlands and riverine habitat while croplands and marshy wetlands are typically used by migrating whooping cranes for feeding. The preferred habitat for the whooping crane is not encountered along the proposed pipeline route. Therefore, the whooping crane is not expected to occur within or adjacent to the project area.

The bald eagle typically nests within trees that are taller than the existing canopy along or within two miles of large water bodies where the forest, marsh, and water meet. Furthermore, open water and wetland areas are important for feeding. The eagles can tolerate some human activity; however, they do not seem to be able to tolerate activity within a minimum of 750 to 1,000 feet from nest or perching sites. While a portion of the pipeline route lies adjacent to Lake Lavon, the riparian area within and adjacent to the project area is relatively young and quite uniform in nature. Therefore, it is unlikely that a bald eagle would occur within the project area.

Designated critical habitat is not present for any of the federally listed threatened or endangered species within the project area and none of the species were observed during the on-site investigation. Based on observations during the on-site investigation and evaluation of preferred habitat for the federally and state listed protected species, the proposed project would not adversely impact any of the federally or state listed species.

CULTURAL RESOURCES

APAI subcontracted with AR Consultants, Inc. to conduct a cultural resources investigation of the East Fork Reuse Project pipeline. The scope of the archaeological survey included a records review, a field survey, the recording of sites, if present, and the preparation of a summary report. The cultural resources survey report prepared by AR Consultants, Inc. to document the investigation is submitted as a separate document designated Appendix C to this report. The findings of the cultural resources survey and summary report were provided to the State Historical Commission (THC) on November 11, 2005. The THC responded on December 2, 2005 indicating that the submission of the final report demonstrated completion of the permit requirements under Permit number 3646. The THC letter is provided in Appendix C. Based upon the results of the survey and THC response letter, AR Consultants, Inc. recommended that the proposed project area has low archaeological potential and that further cultural investigations are unwarranted. However, if unidentified cultural resources are encountered during project construction, the THC would be contacted and the required avoidance and/or mitigation requirements would be followed.

SOCIOECONOMIC EFFECTS

The proposed project construction components would have similar socioeconomic effects including temporary minor disruption of traffic flow for local residents and businesses during construction along the pipeline route through this sparsely populated rural area and restrictions on use of land within the pipeline easement (for which each landowner is compensated by purchase of the easement). No socioeconomic impacts are anticipated to boaters or anglers where the pipeline route crosses the lake edge or at the outfall location since work in these areas would be conducted when lake levels are at conservation pool. However, as stated in Chapter 2, failure to construct the project would not permit NTMWD to meet near-term and long-term demands for water. Without ample water supply, negative socioeconomic impacts to one of the fastest growing regions in the U.S. would occur. The preferred pipeline route was one of two routes considered that had the least impact on urban/congested areas of the six routes evaluated.

OTHER IMPACTS OF THE EAST FORK REUSE PROJECT

In projects such as the East Fork Reuse Project where river flow is diverted for beneficial use, questions are often raised concerning the impact of the diversion on downstream water quality and stream flow. For this reason, APAI and Freese and Nichols, Inc. investigated the impacts of diversions on water quality and flow variability in the East Fork Trinity River. The following is a summary of the results of this investigation.

Downstream Water Quality

Results of the QUAL-TX water quality modeling for conditions reflecting proposed diversion quantities indicate that the diversion of water from the East Fork Trinity River would cause dissolved oxygen concentrations to increase downstream of the withdrawal point, compared to what these concentrations would be without the proposed diversions. As water is withdrawn for this project, the decreasing depth downstream of the withdrawal point would cause the rate of reaeration to increase sufficiently to increase the dissolved oxygen concentration in the stream. Corollary model results for the main stem of the Trinity River downstream of the East Fork Trinity River confluence demonstrate that the DO levels of the river would also increase when water is withdrawn from the East Fork Trinity River. These water quality improvements are caused by the removal of oxygen-demanding pollutant loads from the East Fork Trinity River before they enter the main stem of the Trinity River.

Downstream Hydrology

The NTMWD intends to divert a significant portion of the wastewater flows that are collected in the East Fork. In order to address downstream water interests, the NTMWD proposed that 30 percent of wastewater plant discharges attributed to waters originating in the Trinity River Basin remain in the East Fork Trinity River. On an annual basis approximately 60 percent of water that is provided to water supply customers is returned to the wastewater treatment plants. The firm yield of Lake Lavon is 104,000 acre-feet/year (ac-ft/yr) for flows originating in the Trinity River Basin. When the maximum firm yield is diverted from the lake for water supply it can be estimated that over 62,000 acre-feet/year (60 percent) would return to area-wide wastewater treatment plants. Based on retaining 30 percent of the effluent for in-stream needs would yield 18,720 ac-ft/yr or an average of 16.7 million gallons per day (MGD) (25.8 cfs).

Analysis of the impact of East Fork Diversion Project diversions on stream flow variability below Lake Ray Hubbard shows that the Project would provide adequate flow to maintain habitat in the East Fork Trinity River under dry weather conditions. Since the requested water rights to divert WWTP flows would not allow the diversion of natural runoff or spills from Lake Ray Hubbard, flows in the East Fork below the proposed diversion would exceed 30 cfs 65 percent of the time; 40 cfs 53 percent of the time; 50 cfs 43 percent of the time; 100 cfs 34 percent of the time; 500 cfs 17 percent of the time; and 10,000 cfs 11 percent of the time.

Constructed Wetland Hydrology

The diverted flows from the East Fork will flow across the Seagoville Ranch through sedimentation basins, constructed wetland cells, conveyance and distribution channels into a final collection pool of the constructed wetland system where a conveyance pump station will pump the collected treated flows through the conveyance pipeline back to Lake Lavon. Storm runoff from the hillsides west of the constructed wetland areas will be routed around the constructed wetland cells through the existing channels and ponds as well as installed piping and discharged to the East Fork at the three existing outfalls. The diverted flows from the East Fork will be based on the daily discharges of treated effluent from the WWTPs upstream of the diversion point. Therefore, these flows will be variable but will be within the range of 48 MGD to 165 MGD. The normal continuous diversion rate to the wetland (i.e., inflow) will be about 107 MGD. For operational flexibility, the wetland will be designed to treat up to 1.5 times the normal diversion rate for short periods of time.

The constructed wetland has a nominal area of 2,000 acres that will include about 1,840 acres of wetted surface. The balance of the wetland is berms, flow distribution and control structures, and access ways. With normal design inflow of 107 MGD diverted and treated, the hydraulic loading rate for the wetland area will be about 5.44 cm/day. The design inflow range of 48 to 165 MGD provides a hydraulic loading rate ranging between 2.44 to 8.39 cm/day.

The wetland system is designed as a flow-through system with nominal detention times of 7 to 10 days for the diverted design flows to reach the final collection pool. Precipitation falling upon the surface of the constructed wetland area will contribute to the diverted flows. Water losses from the wetland system including evaporation, evapotranspiration, and seepage may account for up to 15 MGD during summer months.

Except for infrequent periods when a wetland cell or train may be taken “off-line” to address maintenance or operational issues, the constructed wetland would be perennially flooded with design depths facilitating the establishment of dense emergent wetland vegetation interspersed with areas of open water.

CHAPTER 5

CUMULATIVE IMPACTS

Cumulative effects are the summation of both direct and indirect effects of a proposed project's incremental impacts when they are added to other past, present, and reasonably foreseeable actions, regardless of who carries out the action (40 CFR Part 1508.7). Guidance for implementing NEPA (CEQ, 1997) recommends that Federal agencies identify the temporal and geographic boundaries of the potential cumulative effects of a proposed action. For the purposes of this EA, the temporal boundary of analysis is from approximately 2000 to 2010. This boundary encompasses a range within which data are reasonably available and forecasts can be reasonably made. The geographic boundaries of analysis vary depending on the resource and potential effects. As such, they correspond to the analysis areas described under each resource.

Specific projects that are similar in size or scope or have the potential to cumulatively affect the resources evaluated for the project are identified in Table 9 below. These projects are further described in the narrative following the table. Some resources would be affected by several or all of the described activities, while others could be affected very little or not at all.

Table 9. Past, Present, and Reasonably Foreseeable Activities

Cumulative Action	Project Description	Past	Present	Future
SH 78 Expansion	Roadway Expansion per Regional Thoroughfare Plan			x
Potential Bridge Crossing	Roadway Construction per Regional Thoroughfare Plan			x
Master Plan for USACE Property at Lake Lavon	Update of existing master plan			x
FM 3286 Bridge Replacement	Urban Expansion in Kaufman, Rockwall, and Collin Counties		x	x

Terminology

Terms referring to impact intensity, context, and duration are used in the effects analysis. Unless otherwise stated, the standard definitions for these terms are as follows:

- *Negligible:* The impact is at the lower level of detection, and there would be no measurable change.
- *Minor:* The impact is slight but detectable, and there would be a small change.
- *Moderate:* The impact is readily apparent, and there would be a measurable change that could result in a small but permanent change.

- *Major:* The impact is severe, and there would be a highly noticeable, permanent, measurable change.
- *Localized Impact:* The impact occurs in a specific site or area. When comparing changes to existing conditions, the impacts are detectable only in the localized area.
- *Short-Term Effect:* The effect occurs only during or immediately after implementation of the project.
- *Long-Term Effect:* The effect could occur for an extended period after implementation of the project. The effect could last several years or more and could be beneficial or adverse.

Thresholds of Significance

Significance thresholds are listed in Table 10. These thresholds are provided to help the reader and decision-makers understand the magnitude and intensity of impacts. Some thresholds are determined using quantitative data, while others rely on qualitative data.

Table 10. Thresholds of Significance

Resource	Thresholds of Significance
Soils and Geology	Significance threshold would be reached if a project were to expose people to an increased level of geologic hazards, such as slope instability, or if it were to result in a change in or loss of a unique geologic resource. Significance threshold would be reached if a project were to result in a substantial soil loss because of increased erosion, decreased slope stability, or increased impermeable surfaces, such that there is a measurable decrease in water infiltration into soils. Significance threshold would be reached if a project were to convert Federal prime farmland soils or soils of statewide importance to incompatible uses, or if it were to contaminate the soil.
Water Resources	Significance threshold would be reached if an action were to cause substantial flooding or erosion, if it were to substantially impair any significant water body, watershed health, or the functionality of major rivers, wetlands, or floodplains or if it were to decrease surface or groundwater quality or quantity.
Wetlands and Floodplains	Significance threshold would be reached if an action were to dredge, fill or substantially impair the health or the functionality of wetlands or floodplains.
Air Quality	Significance threshold would be reached if a project were to lead to an exceedance of the NAAQS or the State of Texas Ambient Air Quality Area Standards.

Table 10. Thresholds of Significance

Resource	Thresholds of Significance
Vegetation	Significance threshold would be reached if: An action introduced or substantially encouraged the spread of noxious weeds or other undesirable invasive species; There were a substantial loss of riparian, wetland, or marsh habitats; There were harm or destruction of a species, natural community, or habitat that is specifically recognized as biologically significant in local, state, or Federal policies, statutes, or regulations; or There was an alteration or destruction of habitat that would prevent the reestablishment of native biological communities that inhabited the area prior to the disturbance.
Fish, Wildlife	Significance threshold would be reached if there were: A loss of a number of individuals of any native animal species that could affect abundance or diversity of that species beyond normal variability; A substantial interference with movement of any resident or migratory fish or wildlife species; An adverse effect on a species, natural community, or habitat that is specifically recognized as biologically significant in local, state, or Federal policies, statutes, or regulations; Harm, harassment, or destruction of a species, natural community, or habitat that is recognized for scientific, recreational, ecological, or commercial importance; An alteration or destruction of habitat that would prevent the reestablishment of native biological communities that inhabited the area prior to the disturbance; An extensive loss of biological communities in high quality habitat for longer than one year; or A violation of the Migratory Bird Treaty Act.
Special Status Species	Significance threshold would be reached if there were to result in harm, harassment, or destruction of any Federally listed endangered, threatened, or candidate species, its habitat, migration corridors, or breeding areas. Significance threshold would be reached if there were harm, harassment, or destruction of any birds of conservation concern.
Cultural Resources	Significance threshold would be reached if a project were to directly or indirectly alter the integrity and characteristics of a resource that would qualify it for inclusion in the National Registry of Historic Places (NRHP) (36 CFR 800.5a). Significance threshold would be reached if it were determined, in consultation with Federally recognized tribes or other tradition-based communities, that a project were to inhibit access to or use of culturally important locations or would interfere with cultural or religious practices.
Hazardous Materials	Significance threshold would be reached if a project were to directly or indirectly create a hazard by exposing the public to hazardous materials at levels exceeding the range of risk generally considered acceptable by EPA. Significance threshold would be reached if a project were to create a hazard to the public through transport, use, or disposal of hazardous materials or were to increase the likelihood of a hazardous materials release to the environment. Significance threshold would be reached if a project were to lead to a major increase in hazardous material used or wastes generated.

Table 10. Thresholds of Significance

Resource	Thresholds of Significance
Socioeconomic Resources and Environmental Justice	Significance threshold would be reached if a project would create an increase in population growth or the demand for housing, schools, or community facilities that is beyond the capacity of the region to accommodate. Significant effects also would result from the displacement of a large number of people, especially from affordable housing, a decrease in local employment, or a decrease in the accessibility of community facilities. Significant environmental justice effects would occur if a project would disproportionately negatively affect low-income and minority populations.
Recreation	Significance threshold would be reached if a project were to result in a substantial decline in the quality or quantity of existing recreational facilities. Impacts on recreational activities would be considered significant if they were to result in a substantial decline in the quality or quantity of opportunities to participate in these recreation activities.
Aesthetic Concerns	Significance threshold would be reached if a project were to noticeably increase visual contrast and reduce the scenic quality, as seen from any high sensitivity foreground or middle ground viewpoint; if it were to block or disrupt existing views or reduce public opportunities to view scenic resources; or if visual impacts resulting from a project were to conflict with local regulations.
Noise	There are no universally applicable regulatory thresholds for assessing significance of noise impacts, but environmental noise regulations and guidelines are defined by various Federal and state agencies that provide a general context for assessing noise issues. The EPA calls out a maximum annual day/night noise level of 55 decibels (dBA) to protect public health and welfare for outdoor areas where noise interferes with normal speech or is found to be extremely annoying to those who frequent the area. Significance threshold would be reached if a project were to: violate EPA noise standards at the boundaries of the project area over an extended period of time; or create impulse or other short-term event noise levels that are likely to cause significant annoyance to more than 15% of exposed individuals at locations frequented by the general public.

The proposed project includes mitigation to offset direct impacts and reduce cumulative impacts. The proposed project's mitigation requirements would be necessary to comply with state and federal regulations, agreements, and/or policies; therefore, analysis of the proposed project without mitigation was not analyzed, as the proposed project would not be built without appropriate mitigation. The cumulative impacts of the proposed project are discussed as follows.

LAND USE

The Lake Lavon area is expected to see continued urbanization as growth is projected to continue, guided by local land use plans and policies. All of the projects listed in Table 9 would result in increased urbanization and development with Kaufman, Rockwall, and Collin Counties. The cumulative effects of continuing development within the study area and beyond are speculative due to market forces and individual decisions. Study area transportation projects have been designed to accommodate growth that is projected in the region by NCTCOG, consistent with the general plans of affected jurisdictions.

The Upper East Fork Reservoirs Watershed contains 408,511 acres and includes twenty-eight incorporated cities that lie fully or partially within this watershed. Those cities are: Allen, Celina, Dallas, Fairview, Farmersville, Fate, Frisco, Garland, Heath, Lavon, Lowry Crossing, Lucas, McKinney, Melissa, Murphy, Nevada, New Hope, Parker, Plano, Princeton, Prosper, Richardson, Rockwall, Rowlett, Sachse, Saint Paul, Weston, and Wylie. Only 27 percent of the area, about 110,298 acres in this watershed, is classified as urban, while 60 percent may be classified as rural. There are 34 State permitted wastewater discharging facilities within this watershed with a total discharge of 751.68 MGD. In addition, there is 1 agricultural non-discharge permit in this watershed. There are 24 public domestic dischargers (66.01 MGD), 4 private domestic dischargers (0.208 MGD) and 6 industrial dischargers (685.45 MGD). The proposed project could cause a significant adverse cumulative impact to open space and rural areas as development continues and these resources become scarcer.

GEOLOGY AND SOILS

The project listed in Table 9 and associated urbanization in the area would include minor short-term impacts and long-term disturbances of soils and surface geology. Minor short-term impacts would include the disturbance of soils during construction activities, increased dust emissions, and the potential for increased erosion and subsequent sedimentation of adjacent water resources during heavy rainfall events. Long-term impacts would include the replacement of bare soils and native vegetation with hardpan surfaces and the potential for increased erosion due to increased storm water runoff from residential, commercial, and industrial areas. Impacts to these resources would be minimized by adherence to erosion control and storm water pollution prevention practices mandated by federal and state regulations, and local policies. The proposed project would result in minor impacts to soils and surface geology; however, it would not cause a significant adverse cumulative impact to geology and soils within the study area.

VEGETATION

Urban development in the DFW region would result in cumulative effects upon the region's remaining natural resources (i.e., wetlands, water resources, and biological resources). These effects would be minimized by applicable federal, state, and local regulations, requiring mitigation for impacts from other projects for residential, commercial, and industrial development as well as the supporting infrastructure including

roadways, pipelines, and utility lines. As a result, the proposed project would not cause a significant adverse cumulative impact to vegetation.

SURFACE WATER

Water quality can be altered by changes made to the natural state of a watershed. Various factors generated by human activity such as urbanization and agricultural use can have adverse effects unless appropriate abatement programs are put into place. Impacts from urbanization have included physical modifications and heavy management of stream and river channels for flood control; construction of reservoirs; storm water runoff from residential, commercial, and industrial areas; and discharges from municipal wastewater treatment plants. Urban runoff has resulted in other types of use impairments as evidenced by the multiple 303(d) listings for legacy pollutants (pesticides and PCBs) in fish tissue in the Dallas-Fort Worth (DFW) area. Numerous studies examining storm water runoff have documented that this is the predominant source for these water quality constituents. Additional impacts from agricultural runoff include pesticides such as the herbicide atrazine, a herbicide used on agricultural crops such as corn. The East Fork arm was identified as threatened in the 2000 303(d) list based on levels of atrazine identified in finished drinking water. Because an insufficient number of atrazine samples in surface water were available in 2002 to demonstrate that the standard is no longer threatened, Segment 0821 (from Lavon Dam in Collin County, up to normal pool elevation of 492 feet) was still identified as threatened for atrazine. Other concerns listed in the Draft 2002 Texas Water Quality Inventory Report included nutrient enrichment in the East Fork arm for nitrate+nitrite nitrogen, aquatic life uses in the lowermost portion of the reservoir due to depressed dissolved oxygen, and also nutrient enrichment in the lowermost portion of the reservoir due to nitrate+nitrite nitrogen. A number of water quality activities are underway in segment 0821 to address threats to water quality.

In the future, additional urbanization would likely occur in and around the Lake Lavon area, as well as in other areas of the DFW region. This would result in additional storm water and treated wastewater to the East Fork Trinity River watershed. However, it is expected that future storm water and treated wastewater discharges would be regulated by TPDES permits with specific restrictions on the loading of water quality constituents of concern. The loading of such constituents may also be governed by future Total Maximum Daily Loads (TMDL) limitations prescribed by the TCEQ. The effects of additional urbanization would also result in less acreage of agricultural cropland, which may also result in less potential for agricultural herbicides such as atrazine in storm runoff.

Individually, any of the projects listed in Table 9 would have minimal short-term impacts on water quality. The proposed action's contribution to cumulative construction impacts on water quality would be mitigated to insignificance with implementation of a storm water pollution prevention plan (SW3P) that are mandated by TCEQ in its TPDES rules; therefore, the construction activities associated with the proposed action would not be a significant adverse cumulative impact to water quality within the project study area.

GROUNDWATER

Urbanization in the area would lead to a more rapid and higher rainfall runoff pattern, alteration of hydrologic regimes for streams, reduction in ground water recharge areas, potential overdraught of groundwater, and pollution loading that could infiltrate to shallow groundwater. The proposed project and those listed in Table 9 would not directly impact groundwater. Implementation of the requisite SW3P would minimize the potential for contaminated surface water runoff which would minimize impacts involving recharge of groundwater. The proposed project would not cause a significant adverse cumulative impact to groundwater.

WETLANDS

Wetlands cover about 7.6 million acres of Texas or 4.4 percent of the State's area. The most extensive wetlands are the bottomland hardwood forests and swamps of East Texas; the marshes, swamps, and tidal flats of the Gulf coast; and the playa lakes of the High Plains. Although wetlands in Texas comprise less than 5 percent of the state's total land area, Texas is one of nineteen states that have exhibited the most significant losses of wetland ecosystems. A variety of human induced actions, natural events, and secondary non-point source pollution problems have contributed to the decline of about one-half of Texas's original wetlands. Within the project study area, the most notable sources of wetland decline include conversion of land to agricultural uses, inundation of floodplains from reservoir construction, sedimentation from storm water erosion, infilling for urban development, and chemical contamination from excessive nutrients, fertilizers, and pesticides.

The destruction and loss of wetlands has created a potential for secondary impacts such as increased flood damages, increased drought damages, and the decline of bird populations. The proposed project avoids wetlands and waters of the U.S. to the greatest extent practicable; however, mitigation is included to compensate unavoidable impacts caused by the project. The proposed mitigation plan, included in Appendix E, describes the mitigation activities that would be applied during and following construction activities to minimize impacts to waters of the U.S. An individual Section 404 permit (USACE Project No. 200500002) application is currently being processed. Due to the sequencing requirements for avoidance, minimization of potential impacts to the extent practicable, and compensatory mitigation that would be provided for unavoidable impacts to wetland areas, it is concluded that the project would not cause a significant adverse cumulative impact to wetlands.

FLOODPLAINS

The protection of floodplains and floodways is required by EO 11988 Floodplain Management and is implemented through 23 CFR 650, Subpart A Location and Hydraulic Design of Encroachments on Floodplains. Urban development, flood damage reduction projects, placement of fill material, and transportation projects could have cumulative impacts to floodplains within the project area. Secondary impacts associated

with floodplain encroachment include increases in base flood elevations, changes in natural stream flow dynamics, and alternations to life process requirements of aquatic species. The proposed construction methods for the conveyance pipeline and outfall would not impact valley storage within the project area. All disturbed areas would be returned to pre-construction contours and grades; therefore, flood storage loss would not occur. As a result, the proposed project would not cause a significant adverse cumulative impact to floodplains.

AIR QUALITY

Construction of the pipeline would involve the use of diesel powered construction equipment. During daytime work hours there would be exhaust (and particulate) emissions associated with the construction activities. However, this is considered a minor or temporary event affecting air quality; especially since the construction area is linear and as such would preclude high density of construction machinery.

Regional thoroughfare planning conducted for the study area and project listed in Table 9 address future improvements for transportation that would serve to minimize traffic congestion to protect air quality as urbanization of the area progresses. The minimal short-term air quality impacts during construction of the proposed conveyance pipeline and outfall would be mitigated by use of BMPs such as periodic watering of loose soil in traffic areas to minimize its release into the air. Vegetation would be reestablished on all areas disturbed during construction following completion; therefore, the proposed project would not cause a significant adverse cumulative impact to air quality.

WILDLIFE

The projects listed in Table 9 and other urban pressures within the project area would likely displace wildlife. Accordingly, it is anticipated the land within the Lake Lavon USACE limits would see an increase in density and diversity of wildlife species. A part of the mitigation proposed for this project is to enhance the habitat available on the USACE lands at Lake Lavon. The probable future involving increases in wildlife populations within Lake Lavon would indicate the lands be dedicated for wildlife habitat enhancement and not contemplated for high human land use such as parks.

THREATENED AND ENDANGERED SPECIES

There would be no threatened and endangered species impacts related to the proposed project. However, if threatened and endangered species are discovered during construction, activities would cease and the USFWS would be contacted.

CULTURAL RESOURCES

Under the requirements of the Antiquities Code of Texas in 1969, the THC works to preserve and protect the state's archaeological and historical resources. However, not all historic buildings and archaeological sites affected by a project require protection. State

and federal guidelines exist to determine which are important, and consequently, which need protection. In this regard, the THC partners with project sponsors to ensure the tangible remains of our state's heritage are not needlessly destroyed during development.

Growth and development in the DFW area is projected to continue in the future at a rate similar to that experienced in recent years. The proposed action would not contribute to the localized disturbance of known archaeological resources. However, urban development at other locations in DFW could represent a contribution to the disturbance of archaeological resources as a result of associated construction. The degree of disturbance would depend on the type and nature of preservation or mitigation efforts and location of these resources.

SOCIOECONOMIC RESOURCES

Census data show that areas served by NTMWD have been among the fastest population growth areas in the US between 1990 and 2000 (e.g., Collin County and Rockwall County grew approximately 86 percent and 68 percent, respectively). The development of surrounding land would provide homes and employment in the immediate vicinity and proposed expansion of transportation facilities in the area would provide means that are more efficient for residents to commute. Most of the development in the area would be on undeveloped land currently under agricultural activity or pasture. Therefore, it is not anticipated that local development, in accordance with local planning efforts, would have a significant adverse cumulative impact to socioeconomic resources.

HAZARDOUS MATERIALS

There would be no impacts related to hazardous materials related to the proposed project. Hazardous waste conditions with the project would remain the same as current conditions if there were no project. Therefore, there would be no cumulative impacts related to hazardous materials.

AESTHETIC CONCERNS

The visual landscape near the project area is characterized by Lake Lavon, undeveloped land, and low density residential. Since the majority of the proposed project would be buried below the ground surface and the diversion pump and outfall structures are situated within remote areas, no impacts to the local aesthetics are anticipated. As a result, the proposed project would not cause a significant adverse cumulative impact to aesthetics. The constructed wetland could be considered as an aesthetic benefit to an area that is currently old-field, pasture, and row-crop farming land.

CHAPTER 6

PERMITS AND OTHER REGULATORY REQUIREMENTS

TEXAS POLLUTANT DISCHARGE ELIMINATION SYSTEM (TPDES) STORM WATER PERMIT

The proposed project would require a TPDES Storm Water Permit for construction since the total number of acres disturbed would be greater than one acre. The contractor would also be required to post all pertinent TPDES documents on-site during construction. Since the proposed project would disturb more than five acres, the contractor would be required to file a Notice of Intent (NOI) with TCEQ for storm water discharges associated with construction activity under the TPDES Construction General Permit and would be required to abide by the provisions of the permit.

SECTION 404 PERMIT

The East Fork Reuse Project would impact wetlands and waters of the U.S. associated with the Diversion Pump Station, Constructed Wetland, Conveyance Pump Station, Conveyance Pipeline, and Outfall Structure. Because of the complexity of this project, NTMWD has applied for a Standard Individual 404 Permit (ENG FORM 4345) covering all elements of the project.

RAILROAD BORING PERMIT

Since the Recommended Route would require multiple crossings of railroads, a railroad boring permit would be required for each crossing from the railroad company owning the affected railroad at each crossing.

OTHER FEDERAL, STATE, OR LOCAL AUTHORIZATIONS

Reference is made to Table 11 for a list of other federal, state, or local authorizations required for this project.

Table 11. List of Other Certifications or Approval/Denials Received from Other Federal, State, or Local Agencies for Work Described in this Application

AGENCY	TYPE APPROVAL	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
USACE[1]	Levee modification		Pending	Pending	
USACE[2]	Outfall in Lake Lavon	USACE Project No.: 200400002	Pending		
USACE[3]	Jurisdictional areas on Lake Lavon property	USACE Project No.: 200400002	Pending		
Texas Historical Commission[4]	Texas Antiquities Permit Application	3646	Jan 05	Dec 2	
TCEQ[5]	Water Rights			Pending	
Kaufman Co.[6]	Floodplain		Pending	Pending	
TxDOT[7]	Road Crossings		Pending	Pending	
Kaufman Co[8]	Road Crossings		Pending	Pending	
Rockwall Co[8]	Road Crossings		Pending	Pending	
Collin Co[8]	Road Crossings		Pending	Pending	

Notes:

1. Pipeline crossings are necessary at the location of a federal levee in Kaufman County. USACE permission is required for the crossing and manner of planned construction. Design documents are being prepared for submittal to the Operations Division Fort Worth District, USACE.

2. An outfall structure is required for discharge into Lake Lavon. Design documents are being prepared for submittal to the Operations Division Fort Worth District, USACE and within this EA document.

3. Pipeline route crosses jurisdictional waters and other lands on Lake Lavon property. Design documents are being prepared for submittal to the Operations Division Fort Worth District, USACE and within this EA document.

4. Archeological Survey has been conducted for the project site following notification of the Texas Historical Society.

5. Water Rights application to divert water from the East Fork of the Trinity River has been submitted. The permit application proposes to divert an amount of water equal to the treated effluent from the NTMWD-operated treatment plants discharging to the East Fork except 30 percent of all Trinity Basin-based water resources authorized pursuant to Certificate of Adjudication No. 08-2410, as amended. NTMWD proposes to leave the above referenced 30 percent in the East Fork of the Trinity River to address the downstream water rights and the needs of the environment. The permit, when issued, would address diversion points, amounts and in-stream flow requirements.

6. Kaufman County administers the FEMA program in an area where the constructed wetland is located. Freese and Nichols, Inc. conducted hydraulic analyses. This information would be transmitted to the Floodplain Administrator along with design drawings of the wetland for review and approval.

7. State and interstate highways require authorization from the Texas Department of Highways to tunnel under them Authorization would be sought during the design phase of the project.

8. County roads that would be crossed by the pipeline would require county approval to cross the roadway. This approval would be sought during the design phase of the project.

CHAPTER 7

MITIGATION PLAN

The East Fork Reuse Project would be constructed to meet public need and designed to minimize adverse environmental impacts. Compensatory mitigation would be undertaken to offset unavoidable environmental impacts resulting from construction.

Planning, design and site selection was governed by the sequencing efforts to avoid and minimize impacts to jurisdictional waters of the U.S. as well as the aquatic and vegetative habitats within Project construction areas. As an example, the pipeline alignment was chosen to coincide or abut existing utility corridors, to the extent possible, thus limiting environmental impacts. Furthermore, areas disturbed as a result of construction of the pipeline would be returned to original grade and replanted with native vegetation.

Some impacts to jurisdictional areas as well as loss of vegetation/habitat would be unavoidable. As shown in the following Table 7, impacts to jurisdictional waters of the U.S. are associated with various components of the overall project. The project components that have impacts to waters of the U.S. include the diversion pump station intake channel, emergent wetland and black willow swamp within the constructed wetland footprint, segments of the conveyance pipeline route, and outfall structure.

A federally authorized and constructed levee and floodway are associated with the constructed wetland and conveyance pipeline portions of the project. The pipeline would go under the levee (bored) and along the floodway. Additionally, a section of the northernmost section of the federally authorized levee would be temporarily cut open to allow installation of a flow control structure to move water from one section of the constructed wetlands to another. No environmental impacts are considered associated with the work on the levees. The impacts involved to waters of the U.S. for installation of the pipeline along the floodway section are part of the total project impacts that would be addressed in the 404 application and mitigation plan.

Reference is made to Appendix E for a copy of the Mitigation Plan for this project. Table 8 of Chapter 4 provided a good summary of impacts for the various components of the project.

SUMMARY OF COMPENSATORY MITIGATION ACTIVITIES

Mitigation activities are proposed at each of the project component areas to the extent practicable and a collective mitigation plan is proposed to enhance the USACE property at Lake Lavon to provide compensatory mitigation for impacts that cannot be mitigated at the project component locations. Mitigation activities would include reestablishment of vegetative cover for all areas disturbed during construction. Vegetation to be planted at each of the project component locations are listed in Tables 7 through 12 of the proposed mitigation plan included in Appendix E. The location of the various components of the collective mitigation plan is shown in conjunction with the pipeline route on Figures 12 through 16 of the proposed mitigation plan included in Appendix E.

Diversion Pump Station

Proposed mitigation activities at the diversion pump station location include planting herbaceous species to promote slope stabilization on the East Fork bank at the intake channel location and enhancement of the vegetative diversity of the oxbow slough. Tables 7 and 8 of the proposed mitigation plan included in Appendix E lists the species for seeding along the intake channel. Planting of canopy trees and shrubs in the collective mitigation area on the USACE property at Lake Lavon would provide compensation for impacts to the riparian forest in the area of the diversion pump station intake channel.

Constructed Wetland

The emergent wetland areas (EW1, EW2, and EW3) and black willow swamp delineated by AEI as jurisdictional areas lie within the footprint of the central section of the constructed wetland. Impacts to these areas would be from removal of the constructed levees and the willow growth that has overtaken these areas as well as the water level control structures previously installed during management of these areas for waterfowl habitat. Further impact to these areas would result from grading of the areas as needed to facilitate collection of the design flows from the wetland trains in the central section and conveyance to the treatment trains in the south section. Emergent wetland area EW4 lies within the footprint of the south section of the constructed wetland. Impacts to this area would be similar to those in the central section in that construction of perimeter berms, collection channels, and some grading of the topography within the cells would be necessary to facilitate even distribution of flows across the treatment wetland area. The topography to be developed in the constructed wetland cells would include a mixture of deep water areas (>4 feet deep) and marsh areas varying in water depths from about 6 inches to about 20 inches. The marsh areas would be planted with a variety of emergent and submergent wetland plant species, as listed in Table 9 of the proposed mitigation plan included in Appendix E, as well as dressed with topsoil from the existing emergent wetland areas. The upper six inches of topsoil from the existing emergent wetland areas would be stripped and stockpiled separately prior to grading of the areas for the proposed constructed wetland cells. This topsoil would be used for final grading of the marsh areas within the constructed wetland cells to encourage development of a varied and dense emergent vegetative cover within the marsh areas.

Approximately 25 acres of nursery area for propagation of wetland plants was established on the Seagoville Ranch in Fall 2004. About 20 acres of the Phase I nursery lie outside the constructed wetland footprint and the other 5 acres lie within the footprint at the southeast end of the central section. About 200 acres would be established as a Phase II nursery in two cells of train 6 within the central section of the constructed wetland. These two cells would be constructed first and wetland plants propagated in the Phase I nursery as well as several species harvested from the existing sources on the site would be transplanted to the Phase II nursery prior to any regrading of the existing areas.

The water source for the Phase I nursery consists of pumped flows from the existing stormwater collection/conveyance system on the ranch. Water would be pumped from the ranch's stormwater collection/conveyance system and/or the East Fork to supply the Phase II nursery

using temporary pumps at first then the diversion pump station would be used when it becomes available.

The long term hydrology for the constructed wetland would be provided by the pumped flows diverted from the East Fork of the Trinity River at the diversion pump station. These diverted flows would range from 48 mgd to 165 mgd based on the volume of discharged effluent flows from several wastewater treatment plants upstream of the diversion point. The design life for the constructed wetland is 50 years, similar to the design life used for reservoirs, and the easement purchased by the NTMWD from Caroline Hunt Trust Estates (CHTE) for the Seagoville Ranch reflects this term. However, the terms of the Memorandum of Agreement (MOA) signed by NTMWD and CHTE provides for continuing the East Fork Reuse Project beyond the initial 50-year design term. Based on the projected increases in population in the NTMWD's service area and resulting continuing demand for water supply, the difficulty and expense of developing alternative water supplies for this area, the East Fork Reuse Project is projected to be in service for much longer than the original design life. In the event that the East Fork Reuse Project is ever abandoned as a water supply project, Paragraph 5.3 of Article 5 (Post-Closing Obligations) of the MOA between NTMWD and CHTE includes a provision for NTMWD to "provide an annual average flow of 4.5 million gallons of water per day in perpetuity to the Diversion Easement Tract described in the Easement Agreement" to sustain the created marsh areas on Seagoville Ranch. A copy of the MOA between NTMWD and CHTE is included in the proposed mitigation plan included in Appendix E.

Based on the development of more diverse topography and a vegetative community with enhanced diversity within the constructed wetland cells that would overlie the existing emergent wetland areas and black willow swamp, the creation of edge effects adjacent to the existing on-channel ponds, preserved high-quality hard-mast-producing trees, and increased aquatic functions of these areas, it is proposed that the impacts resulting from the construction of the wetland cells will be self-mitigating.

Conveyance Pipeline and Lake Lavon Outfall

The initial leg of the pipeline route across Seagoville Ranch would be seeded with a mixture of native grasses, legumes, and wildflowers to reestablish herbaceous vegetative cover in keeping with the requirements for maintenance of the floodway between the USACE flood protection levees. Table 10 of the proposed mitigation plan included in Appendix E lists the species to be included in the seeding mixture for the section of the route between the USACE flood protection levees. This same seeding mixture will be used to reestablish vegetative cover over the pipeline easement across the USACE property at Lake Lavon.

Where the pipeline route crosses the three small wetland areas, the topsoil excavated from these areas would be used for the backfilling for final grading to restore the original contours. The seedbank within this topsoil should be sufficient to restore aquatic vegetation for these small areas.

Along the pipeline route off of the Seagoville Ranch continuing up to the USACE property at Lake Lavon, the area disturbed during construction would be seeded with grasses matching the

adjacent properties along the route. With 90 percent of the route being classified as Rural-Open Field, the majority of this area would probably be seeded with Bermuda grass (*Cynodon dactylon*). Where the pipeline route crosses stream channels, the disturbed banks would be seeded with the same mixture specified in Table 7 for the slopes of the East Fork at the intake channel for the diversion pump station.

When the pipeline route crosses onto USACE property, the pipeline easement area up to the Lake Lavon outfall would be seeded with the mixture specified in Table 10 of the proposed mitigation plan included in Appendix E. The area within the permanent pipeline easement across USACE property is approximately 12.8 acres. Additionally, approximately 9.7 acres of the temporary construction easement would be seeded with the same native herbaceous species shown in Table 10 resulting in a total of about 22.5 acres of native prairie. Adjacent to the permanent pipeline easement and in nearby tracts as shown on Figures 12, 13, and 14 approximately 31 acres would be planted with woody vegetation at a density of 50 canopy trees per acre (planted as 5-gallon container grown material) and 35 small trees and shrubs per acre (planted as 1 to 3-gallon container grown material). This represents a 2:1 ratio for the impacted wooded area on USACE property (13.5 acres) plus impacts to approximately 2 acres of wooded riparian area off the USACE property totaling 15.5 acres. The plantings of woody vegetation would be used to create a mosaic of vegetative cover intermingling native prairie and enhanced riparian forest. A listing of canopy tree, small tree, and shrub species is included in Table 11 of the proposed mitigation plan included in Appendix E.

In addition to the native prairie and forested area, where the pipeline route crosses the intermittently flooded edge of Lake Lavon, a mixture of wetland plant species would be established across the approximate 0.36 acre plus an additional 1.0 acre. This represents roughly a 2:1 ratio of mitigation to acreage of periodically flooded lake edge along the pipeline route and at the lake outfall. Table 12 of the proposed mitigation plan included in Appendix E lists the wetland plants that will be seeded or planted as plugs within this area.

As shown on Figure 15 of the proposed mitigation plan included in Appendix E, switchgrass would be seeded to restore vegetative cover and provide erosion control along the outfall channel to the lake conservation pool level.

An area of approximately 87 acres located on the north shoreline of the cove at the inflow of Elm and Tom Bean Creeks was selected for a native prairie restoration to provide additional mitigation. This area was previously leased from the USACE for livestock pasture. Overgrazing has resulted in reduction of the native grass community and substantial invasion of eastern red cedar. The USACE would prepare and conduct a burn management program for the area and reseeding with a mixture of native grasses, legumes, and wildflowers, as listed in Table 13 of the proposed mitigation plan included in Appendix E, would be conducted in conjunction with the other mitigation plantings.

A summary of the mitigation to be provided on USACE property is presented in Table 12 below. The resulting overall ratio of mitigation to be provided is 4:1.

Table 12 . Summary of Mitigation for Impacts on USACE Property

Category	Impacted Area (acres)	Mitigation Area (acres)	Mitigation Ratio
Open Field/Existing Easement	21.3	109	5.1:1
Wooded	13.5 (+2.0 acres off USACE property)	31.0	2.3:1 2:1 overall for wooded areas)
Wetland/Lake Edge	0.76	1.36	1.8:1
Overall	35.6	141.36	4:1

The collective mitigation area associated with the pipeline easement on USACE property at Lake Lavon is intended to be self-sustaining with no routine maintenance required. The native prairie established within the pipeline easement and planted trees and shrubs are intended to establish natural habitat areas that would enhance the existing natural areas on the USACE property. Occasional mowing may be used to control the invasion of undesirable woody vegetation within the prairie areas, or if needed to control weedy herbaceous species during the establishment of the native grasses, legumes, and wildflowers within the planting mix. Any maintenance efforts needed would be coordinated with the USACE Operations staff prior to implementation.

The progress of the mitigation areas towards achieving the goals stated in the mitigation plan would be monitored by measuring the development of hydrology, vegetation, soils, and habitat for aquatic and terrestrial wildlife. The NTMWD, acting through its agent Alan Plummer Associates, Inc. (APAI), would report to the USACE monitoring results, mitigation success, and general compliance with the terms and conditions of the 404 permit.