Record of Decision
Department of the Army Permit Application SWG-2009-00188
Luce Bayou Interbasin Transfer Project

Name and Address of Applicant

Coastal Water Authority
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Project Introduction and Background

The Coastal Water Authority (CWA or Applicant) submitted an application for a Department of the Army (DA) permit in 2009. CWA submitted an application to the U.S. Army Corps of Engineers, Galveston District (Corps) requesting authorization to construct a 26.5 mile conveyance structure that includes a raw water pump station located in the Trinity River, subsurface pipeline and surface canal, sedimentation basin, and associated berms, access roads, drainage ditches, perimeter fencing, and an outfall structure into Luce Bayou just above its confluence with Lake Houston. The proposed project was assigned DA permit application number SWG-2009-00188 and is commonly referred to as the Luce Bayou Interbasin Transfer Project (LBITP).

The project proposes work in Waters of the U.S., including wetlands (WOUS). This work requires a DA permit pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899 prior to construction. Because the project requires a federal decision/action to be made it is subject to the National Environmental Policy Act (NEPA). A draft and final Environmental Impact Statement (DEIS/FEIS) was prepared in accordance with NEPA, and Council on Environmental Quality regulations (CEQ: 40 CFR 1500 to end) and Corps regulations implementing NEPA. The DEIS/FEIS prepared for this project addressed NEPA, environmental and cultural resource laws, Corps Regulatory Program procedures (33 CFR 320-332) including Corps regulations implementing NEPA at 33 CFR 325 Appendix B, and requirements of the Section 404 (b)(1) Guidelines (40 CFR 230). The EIS documents provide the information needed for the Corps permit decision-making process.

Preparation of Environmental Impact Statement

Determining if the proposed action would have a significant effect on the human environment is central to deciding whether an EIS would be required. To make this decision, the Corps reviewed factors regarding intensity for short-term and long-term effects in the context of the region affected by the proposed project, specifically the Trinity River and Lake Houston. In accordance with NEPA, the significance of Federal actions must be evaluated in terms of both context and intensity, 40 CFR Section 1508.27. The significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting and must be considered in conjunction with the intensity of the proposed action. Intensity must also be considered with the identification of a major Federal action requiring the development of an EIS. The

intensity of the effect on the social and human environment refers to the severity of impact and is evaluated with respect to 10 factors related to the intensity of the effect on the natural and human environment including public health and safety. 40 C.F.R 1508.27(b). During review of the significance of the proposed action, the Corps determined that three of 10 factors regarding intensity seemed to be relevant to the identification of a major Federal action based on the information provided by the Applicant. These factors are provided as follows:

Factor 2: The degree to which the proposed action affects public health or safety. A major concern identified by the Texas Parks and Wildlife Department (TPWD) Inland Fisheries Regional Director, Trinity National Wildlife Refuge (TRNWR) Refuge Manager, and during the public notice process was the project's potential to introduce non-native, invasive species into Lake Houston, which is Houston's primary drinking water supply source. Based on information provided by the TPWD and the U.S. Geological Survey (USGS), Lake Houston is currently free from zebra mussels (*Dreissena polymorpha*), an invasive species. According to a TPWD Inland Fisheries article released in January 2010, zebra mussels have been found in Lake Texoma and the upper Trinity River basin. Zebra mussel infestations have been known to significantly impact water quality and have caused large declines in fish, birds, and native mussel populations nationwide. Successful measures to control zebra mussels are limited to physical and chemical treatments many of which are prohibited for use in drinking water supplies such as Lake Houston.

Factor 4: The degree to which the effects on the quality of the human environment are likely to be highly controversial. The U.S. Congress included the zebra mussel in the Non-indigenous Aquatic Nuisance Prevention and Control Act (NAPCA) of 1990 as amended through Public Law (PL) 106-580, December 29, 2000. A Congressional study reported zebra mussels have resulted in U.S. economic impacts estimated at $5 billion between 1998 and 2000 by fouling infrastructure. Another concern identified during the public notice process was related to another invasive species, giant salvinia (*Salvinia molesta*). Giant salvinia, as with many non-native aquatic plant species, forms dense mats that eliminate all other aquatic vegetation in the area including phytoplankton and zooplankton, which are vital to water quality for healthy fish populations. Giant salvinia can also create anoxic zones in the water column impacting overall water quality. Controlling giant salvinia is generally accomplished by using herbicides, many of which are prohibited for use in drinking water supplies.

Factor 5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks. By a letter dated September 8, 2010, the Applicant indicated physical treatment for zebra mussels and giant salvinia are often difficult to implement and/or are unproven for large-scale operations. The Applicant also indicated chemical treatment for zebra mussels and giant salvinia are limited due to their prohibition for use in drinking water. The Applicant needs to thoroughly address the methods for potential treatment to prevent these non-native, invasive species from being introduced into Lake Houston. The Applicant has stated

they will consider control options and treatment for these non-native invasive species during the project's design phase.

Based on the review and after evaluating all factors from interested parties, the Corps determined that the proposed project may have a significant effect on the human environment and, as such, in accordance with 33 CFR 325 Appendix B, Paragraph 7, the Corps determined that an EIS must be prepared. Additional investigation into those areas with potential significant impacts on the human environment would be necessary to allow the Corps to evaluate the DA permit application and make the appropriate decision.

The Notice of Intent (NOI) to prepare an EIS for the LBITP was published in the Federal Register (FR) on May 25, 2011. The Notice of Availability of the Draft EIS was published in the FR on October 26, 2012. The Notice of Availability for the Final EIS was published in the Federal register on October 4, 2013. This Record of Decision incorporates by reference the *Luce Bayou Interbasin Transfer Project (LBITP) Environmental Impact Statement (EIS) Prepared For Department Of The Army (DA) Permit Application No. SWG-2009-00188.*

Authorities Applicable to the Proposed Project

Corps Authorities

Rivers and Harbors Act of 1899 (RHA) (33 U.S.C. §403): Under Section 10 of the RHA, a permit is required for any structure and/or work in navigable waters of the United States.

Clean Water Act (CWA) (33 U.S.C. §1344): Under Section 404 of the CWA, a permit is required for the discharge of dredged or fill material into waters of the United States.

Other Authorities

National Environmental Policy Act (NEPA)

Clean Air Act

Coastal Zone Management Act

National Historic Preservation Act

Fish and Wildlife Coordination Act

Endangered Species Act

Non-indigenous Aquatic Nuisance Prevention and Control Act

Executive Orders

EO 13175, Consultation with Indian Tribes, Alaska Natives, and Native Hawaiians.

EO 11988, Floodplain Management.

EO 12898, Environmental Justice.

EO 13112, Invasive Species.

EO 13212 and 13302, Energy Supply and Availability.

Project Description

The CWA proposes to construct water conveyance pipelines and a surface canal structure with associated maintenance roadway, perimeter security fencing, and drainage structures from the Capers Ridge proposed raw water pump station to Lake Houston 26.5 miles from the Trinity River. A typical cross section indicates a 300-ft. right of way would be required to accommodate all elements necessary for the operation and maintenance of the canal and pipelines. All excavated material for the pipeline, canal, and sedimentation basin would be utilized within the right of way or placed in upland placement areas. Drainage structures including siphons would not adversely affect drainage and sheet flow in the vicinity of the project, but would be designed to maintain pre-project drainage conditions as much as practicable. These structures are described in Appendix B of the FEIS entitled Preliminary Engineering Report.

Scope of Analysis

The determination of what is the appropriate Scope of Analysis governing the Corps' permit review and decision is guided by the Corps' NEPA regulations for the regulatory program: 33 CFR Part 325, Appendix B. The Scope of Analysis should be limited to the specific activity requiring a DA permit and any additional portions of the entire project over which there is sufficient Federal control and responsibility to warrant NEPA review. Appendix B states that factors to consider in determining whether sufficient "control and responsibility" exist include: 1) whether or not the regulated activity comprises "merely a link" in a corridor type project; 2) whether there are aspects of the upland facility in the immediate vicinity of the regulated activity that affect the location and configuration of the regulated activity; 3) the extent to which the entire project will be within Corps jurisdiction; and 4) the extent of cumulative Federal control and responsibility. Generally, the Corps' area of responsibility includes all waters of the U.S. as well as any additional areas of non-jurisdictional waters or uplands where the District determines there is adequate Federal control and responsibility to justify including those areas within the Corps' NEPA scope of analysis. This normally includes upland areas in the immediate vicinity of the waters of the U.S. where the regulated activity occurs (Standard Operating Procedures for the U.S. Army Corps of Engineers Regulatory Program – July 2009).

Factors.

(i) With regard to the first factor that must be considered in the determination of sufficient Federal control and responsibility, the regulated activities associated with this interbasin transfer proposal do not comprise a link in a corridor type of project.

(ii) With regard to the second factor, the design of upland portions of the interbasin transfer occurring in the immediate vicinity of the regulated activities does affect the location and configuration of the regulated activities. The project will involve placement of excavated materials from the construction onto waters of the United

States and uplands immediately adjacent to the waters of the United States to meet required implementation of security and safety measures; management of sediment; pipeline, utility, stream, wildlife and roadway crossings; provision of electrical power; acquisition of property; construction of drainage crossings, outfall and ancillary structures. Therefore, this project does meet the second factor.

(iii) With regard to the third factor, the extent to which the entire project will be within Corps jurisdiction, the proposed interbasin transfer project has environmental consequences that are essentially products of the Corps' permit action. The jurisdictional waters are scattered throughout the footprint of the project, and will be affected by the excavation and fill activities. The project will also involve placement of excavated materials from the construction onto waters of the U. S. and uplands to meet required implementation of security and safety measures; management of sediment; pipeline, utility, stream, wildlife and roadway crossings; provision of electrical power; acquisition of property; construction of drainage crossings, outfall and ancillary structures. While impacts to upland areas on the project site will be considered under our Scope of Analysis since the work on uplands cannot be made independent of the fill of wetlands, upland areas are not jurisdictional under the authorities of Section 404 of the CWA, or Section 10 of the RHA of 1899. Although there are areas within the footprint of the project wherein the Corps does not have jurisdiction, the entire project is within the Corps' Scope of Analysis; thus this project does meet the third factor.

(iv) With regard to the fourth factor that must be considered in the determination of sufficient Federal control and responsibility, during our consideration of the extent of cumulative Federal control and responsibility for this project, we appropriately relied on, and fully considered, information and reports from Federal agencies pursuant to their responsibilities under the Fish and Wildlife Coordination Act, the Endangered Species Act (ESA), the Magnuson-Stevens fishery Conservation and Management Act for Essential Fish Habitat (EFH), and other relevant authorities. The Corps' staff archeologist reviewed the project site and determined that there are properties listed in the National Register of Historic Places for the permit area that will be affected, but no sites outside of the permit area may be affected. The U.S. Fish and Wildlife Service (USFWS) and TPWD provided comments regarding impacts to mussel species and the introduction of noxious and non-native species, particularly the zebra mussel, to Lake Houston. In addition, the Corps analysed the proposed project's affects on the Wallisville Lake Project saltwater barrier operations. While the analysis of the proposed project concluded that the withdrawal of water from the Trinity River will not affect operations of the Wallisville Lake Project saltwater barrier, the Corps did conclude that the transfer of water from the Trinity River to Lake Houston did pose a risk of introduction of zebra mussels to a primary source of water for the City of Houston. Therefore, the Corps's Scope of Analysis will include the Trinity River Basin and Lake Houston as they pertain to zebra mussels.

Determined Scope. This project does not meet factor 1, but does meet factors 2 and 3 as well as factor 4 as it pertains to zebra mussels. Therefore, sufficient Federal control and responsibility does exist to warrant expanding our review to areas outside our jurisdiction, inclusive of those areas adjacent to project features that require DA permit authorization. Our Scope of Analysis for uplands will include the direct impacts to uplands resulting from canal excavation as well as impacts to uplands areas that will result from the placement of fill material obtained from the excavation activities**.** The analysis will also include the Trinity River Basin and Lake Houston as they pertain to zebra mussels.

Environmental Assessment

Purpose and Need for the Work

Under NEPA guidelines and implementing regulations in 40 CFR 1502.13, the lead Federal agency must state the purpose and need for the proposed action when preparing an EIS. Defining the project purpose is also critical to the evaluation of any project's compliance with the Section 404(b)(1) guidelines. In accordance with Section 404(b)(1) *Guidelines for Specification of Disposal Sites for Dredged or Fill Material*, Subpart B, Compliance with the Guidelines, [40 CFR 230.10(a)(3)], where the activity associated with a discharge that is proposed for a special aquatic site (as defined in Subpart E) does not require access or proximity to or siting within the special aquatic site in question to fulfill its basic purpose (i.e., is not "water dependent''), practicable alternatives that do not involve special aquatic sites are presumed to be available, unless clearly demonstrated otherwise. In addition, where a discharge is proposed for a special aquatic site, all practicable alternatives to the proposed discharge which do not involve a discharge into a special aquatic site are presumed to have less adverse impacts on the aquatic ecosystem, unless clearly demonstrated otherwise. The 404(b)(1) guidelines (40 CFR 230) distinguish between the basic purpose and overall project purpose, and specifies that the basic purpose determines whether the proposed action is water dependent. This distinction ensures that the range of alternatives analyzed are sufficiently broad to fully inform the public and agency decision maker.

The EIS was prepared based upon Corps' defined purpose and need, and also considered the proposed water supply delivery system benefits compared to the expected detriments. The Applicant has stated that the proposed inter-basin transfer of water would be a significant measure allowing Harris County, Texas to comply with a State mandate to reduce reliance on groundwater, provide enough new surface water supply to meet future population demand as projected by the Texas Water Development Board, fulfill water contract commitments to major water customers, and also meet criteria for being a reliable supply of water. The perpetual water surface rights already secured in Lake Livingston by the City of Houston would allow water to be legally transferred to Lake Houston, the City's primary water supply reservoir.

Applicant's Stated Purpose

The Applicant intends for the LBITP to achieve the following:

- Comply with a regulatory mandate from the Harris-Galveston Subsidence District (HGSD) to control subsidence by significantly reducing and eventually eliminating the current heavy reliance on groundwater supplies to meet water demand. The Applicant sees the LBITP as a major part of the surface water development strategy that enables water use reduction according to the subsidence district timeline.
- Transfer enough surface water to the Northeast Water Purification Plant (NEWPP) at Lake Houston to provide a long-term and reliable municipal water supply that will meet the future population growth forecast by the Texas Water Development Board's (TWDB 2011) Region H Regional Water Plan (RWP) and water contract commitments to major customers.
- Provide the required surface water supply by exercising previously secured perpetual surface water rights in Lake Livingston, and construct water conveyance facilities using previously acquired property to convey water to Lake Houston, the City of Houston's primary water supply reservoir.

Basic Project Purpose

The basic purpose for the proposed action is to provide municipal water supply for the City of Houston and surrounding area. As such, the project does not require access or proximity to or siting within a special aquatic site, such as a wetland, to fulfill its basic purpose.

Overall Project Purpose

The overall project purpose is to provide municipal water supply to the City of Houston and its customers by exercising the City of Houston's perpetual surface water rights in Lake Livingston.

Alternatives Analysis

Rationale for Determining Practicability of Alternatives

The Corps regulatory permit review process requires an analysis of water supply sources and alternative project designs to demonstrate the avoidance and minimization of impacts on aquatic resources to the greatest extent possible.

NEPA requires that a No Action Alternative be analyzed to determine the environmental consequences of not undertaking the proposed project, and thereby provide a framework for measuring the benefits and adverse effects of other alternatives.

Pursuant to Clean Water Act Section 404(b), the Corps defines practicable alternatives as those that are, "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes." (40 CFR 230.10 (a)). On the basis of the information developed through the screening analysis,

and preliminary evaluation, the following alternatives were selected by the Corps for a more detailed impacts analysis: No Action, Alternative 3A, Alternative 4, and Alternative 6.

Alternatives Considered but Not Included in the Detailed Analysis

Of the original 14 alternatives identified during scoping, four were determined not to meet the project's overall purpose and need and were eliminated from further analysis. The remaining 11 alternatives, the No Action and ten build alternatives, were screened to determine which would be carried forward into detailed analysis. This screening process, after consideration of cost, existing technology, and logistics in light of overall project purposes, resulted in 7 additional alternatives being determined not to be practicable and were eliminated from detailed analysis. Chapter 2 of the FEIS presents the reasons for eliminating alternatives and discusses why the three build alternatives were determined to be practicable and were carried forward along with No Action Alternative.

Alternatives Considered

The Corps has three options relative to the Least Environmentally Damaging Practicable Alternative (LEDPA). The three options available to the Corps are: 1) issue the permit; 2) issue the permit with special conditions; or 3) deny the permit. Alternatives are evaluated and discussed in Chapters 2 and 4 in the EIS. An analysis of alternative site plans for avoiding and minimizing project specific impacts to WOUS including wetlands is discussed in Chapter s 4 and 5 of the EIS.

Permit denial is identified and described as the No Action Alternative in Chapter 4 of the EIS. In accordance with 33 CFR Part 320.4(b)(4) and 40 CFR 230.10, the Corps performed an evaluation of alternatives, as described below.

No-Action Alternative

Under the No Action Alternative, the Corps would not issue any permits for construction of a raw water pump station and conveyance facility between the Trinity River and Lake Houston. As a result, the City of Houston's water supply system would remain in its current condition and continue to serve its customers. An existing water conveyance (Trinity River Pump Station) would have to be expanded and additional pump station(s) would have to be implemented to convey water supply up-gradient to customers located in north and northwest Harris County. Build Alternatives 5, 5A, 6, and 6A were developed to evaluate this approach in more detail in the EIS. Some, but not all, of the Applicant's project purposes would be met under this alternative.

Action Alternatives

All proposed action alternatives are located in Liberty and Harris Counties, Texas within an area bounded by Luce Bayou on the north, the Trinity River on the east, an existing CWA raw water canal on the south and Lake Houston on the west. Major north/south roadways in this large study area include FM 2100 near Lake Houston, and State Highway 321 just west of the Trinity River, which connects the towns of Cleveland,

Dayton, and Mont Belvieu. The major east/west roadway in the study area is U.S. 90, which connects the towns of Crosby, Dayton, and Liberty. Most of the study area is rural and dominated by agricultural land uses. North of U.S. 90 from west to east, are the towns of Atascocita, Huffman, and Kenefick.

Depending on the alignment, the project would directly affect from 364.76 acres to 59 acres of jurisdictional wetlands, affect varying lengths of intermittent and perennial streams, and varying areas of non-wetland floodplain and riparian areas. Most wetlands affected by the alternatives constitute a productive and valuable public resource. The wetlands, streams, and associated vegetation communities provide surface water storage, stream flow maintenance, groundwater recharge, sediment removal and nutrient re-cycling, aquatic productivity which generates opportunities for fishing and waterfowl hunting, and plant and wildlife habitat important for hunting, trapping, and other recreational activities.

Alternative 4

This alternative would convey water from the Trinity River to Lake Houston via a pipeline to Lake Houston. The diversion point for Alternative 4 is the Trinity River near Capers Ridge. A river intake and pump station would be constructed along the river's west embankment. Ancillary facilities would include an administration and control building, a maintenance facility, chemical storage and feed facilities, a fuel facility, resident operator housing, a potable water supply, onsite waste disposal, a power supply, communications, access roadways and related facilities. A pipeline would convey the raw water approximately 24 miles directly into Lake Houston. Most of the pipeline would be constructed adjacent to an existing Houston Natural Gas Company (HNG) pipeline easement south of Capers Ridge extending southwesterly to a point south of FM 1960. The pipeline could be located adjacent to an existing Sunoco pipeline easement from FM1960 to Lake Houston. About 126,300 linear feet of constructed improvements would be needed to develop this alternative into a conveyance facility. The pipeline ROW would traverse multiple land uses and natural areas as follows.

- From Capers Ridge to SH 321, the approximate 8-mile-long ROW would mostly traverse the heavily wooded Trinity River floodplain.
- From SH 321 to FM 1960, the approximate 10-mile long ROW traverses farmland and scattered wetlands and wooded areas as the ROW enters the upper Cedar Bayou watershed.
- From FM 1960 to FM 2100, the approximate 3-mile ROW crosses the Cedar Bayou watershed. It is carried under Cedar Bayou itself in a deep tunnel and is then tunneled under a number of Cedar Bayou's western tributary streams.
- As the ROW continues west of FM 2100, it must either be tunneled under existing housing development or located to avoid these land uses. However, the proposed pipeline would not be able to avoid heavily wooded areas and wetlands west of FM 2100 and east of Lake Houston south of the FM 1960 East Bridge across Lake Houston. Development along Lake Houston's eastern shore allows almost no opportunity to locate the ROW without being immediately adjacent to existing subdivisions.

Alternative 6

This alternative would convey water from the Trinity River at the existing Trinity River Pump Station (TRPS) facility to Lake Houston via a pipeline. The existing river intake and pump station would be modified and/or expanded along the river's west embankment. The existing ancillary facilities would require some improvements; however, extensive new facilities would not be required.

The pipeline would convey raw water in a pipeline extending approximately 21.6 miles adjacent to an existing ExxonMobil pipeline easement to FM 2100 and then northward to Foley Road and west directly to Lake Houston. About 114,200 feet of constructed improvements would be needed to develop this alternative into a conveyance facility Limited development exists along the proposed conveyance route; however, development is occurring along FM 2100. Alternative 6 would traverse a variety of land uses as described below.

- From TRPS, the pipeline would be aligned in a 300-foot wide Right-of-Way (ROW) and traverse farmland and patches of wooded areas and tunneled under multiple streams. Between Hatchfield Road and Cedar Bayou's main stem, residential areas would have to be traversed and ROW identified for the pipelines.
- Cedar Bayou would be crossed in a tunnel section and then aligned to cross US 90 and then across farmland and residential areas to a canal just south of the dam at Lake Houston.

For Alternative 6, the pipeline ROW would be located through residential subdivisions and transition to an existing canal west of FM 2100. The fenced ROW and other security measures for the pipeline would be visible to adjacent residents.

Applicant's Preferred Alternative (Alternative 3a)

The Applicant's preferred alternative is to withdraw water from the lower Trinity River near Caper's Ridge, pump the water through an approximate 3.1-mile long segment of pipe (two 108-inch diameter pipes), into a sedimentation basin, and then into an earthen, open channel canal that would transport water using gravity to Luce Bayou at the confluence with Lake Houston. The average depth of water in the open canal constructed within the 300-ft wide project easement is anticipated to be 7 ft and the flow and depth would be controlled by water control equipment/facilities installed along the route. Water intake and discharge structures and construction/maintenance areas and easements would also be part of the alternative. The Sam Houston Electrical Cooperative would supply electric power to the Capers Ridge Pump Station (CRPS). The pumping capacity of the project would be sufficient to supplement the Lake Houston water supplies so that water demands would be satisfied until at least planning year 2040. As specified by the City of Houston's Certificate of Adjudication No. 08-4261, the total amount of permitted water that can be diverted at the Capers Ridge diversion point is 550.86 MGD. The design of the project and the canal portion of the interbasin transfer system would be developed to convey water at the maximum permitted diversion rate.

The applicant's preferred alternative would require the construction of new facilities within approximately 1,050 acres (ac) of land owned by the Applicant. The project would also require implementation of security and safety measures; management of sediment; pipeline, utility, stream, wildlife and roadway crossings; provision of electrical power; acquisition of property; construction of drainage crossings, outfall and ancillary structures; mitigation of unavoidable project effects, including shoreline and river bank erosion protection; and management of public project funds.

Operations of the project would include canal maintenance such as repair, nuisance and exotic aquatic species removal from the canal, mowing of the canal berms, and sediment management. The proposed compensatory mitigation plan includes transfer of property ownership for an approximate 3,000-ac parcel of property located within the floodplain of the lower Trinity River from the Applicant to the Trinity River National Wildlife Refuge (TRNWR).

Zebra mussels (*Dreissena polymorpha*), a non-native freshwater bivalve, is a prolific aquatic nuisance species, which the Secretary of the Interior has designated as "injurious wildlife." It was introduced into the Great Lakes in the mid-1980s and has since spread throughout the Great Lakes Basin and the Mississippi River drainage system. It may be introduced into the San Jacinto or Trinity River watersheds prior to constructing the LBITP through natural dispersion and incidental transfer from human activities.

If the zebra mussel has not already been introduced into the San Jacinto River watershed prior to constructing this alternative, the proposed water conveyance canal could potentially be a conduit for transferring zebra mussels from the Trinity River to Lake Houston. Therefore, as directed by the Corps, the Applicant has developed zebra mussel control options to be incorporated into this alternative's design that would provide for specific control and treatment methods implemented according to identified triggers during the operation and maintenance of this alternative. Appendix P of the FEIS includes the Luce Bayou Interbasin Transfer Project Zebra Mussel Control Plan, which outlines methods for the reduction of potential impacts if and when zebra mussels become a problem. The Applicant determined that a three-tiered response plan is appropriate for monitoring and responding to the zebra mussel risk for the facilities. The Applicant's Response Plan provides the following:

- Actual locations of the three reaches or zones of the Trinity River and the zebra mussel risk levels assigned to each zone;
- Response actions assigned to each zone or zebra mussel risk level;
- Threshold or triggers monitored and evaluated by the Applicant to "trigger" actions under the next, higher level of zebra mussel risk; and,
- Description of the response actions that the Applicant will undertake as the level of risk increases.

Appendix P, Figure 3-1 presents the Applicant's Response Plan in summary; Appendix P, Figure 3-2 shows all three reaches or zones of the Trinity River basin that correspond to the three levels of zebra mussel risk.

Environmental Setting

The Applicant's proposed project and the build alternatives are located within the Western Gulf Coastal Plain/Gulf Coast Prairies and Marshes Ecoregion as designated under the EPA's Level III Ecoregion classification. The principal distinguishing characteristics of the Western Gulf Coastal Plain are its relatively flat coastal plain topography and grassland vegetation. Inland from this region the plains are older, more irregular, and have mostly forest or savannah vegetation. There is a higher percentage of cropland in this area than in bordering ecological regions and urban and industrial land uses have expanded greatly over the past fifty years with oil and gas production being common. Dominating the area between the Trinity and San Jacinto basins is the approximately 200 square mile area of the Cedar Bayou watershed which is the dominating hydrologic feature between the two river basins. The climate for the watershed is humid subtropical with average rainfall between 40" to 54" with increasing levels toward the coast. Temperatures can exceed 100 degrees Fahrenheit in the summer and remain moderate during the winter with frequent cold fronts followed by strong southerly return winds. The watershed is vulnerable to extreme weather events originating in the Gulf of Mexico and is seasonally prone to tropical events including hurricanes.

Jurisdictional wetlands that would be affected by the Applicant's preferred alternative include 125.07 ac of forested wetlands, 31.68 ac of scrub shrub wetlands, 206.78 ac of emergent wetlands, 3.57 ac of surface drainage features, and 2.11 ac of open water where portions of the proposed pump station would be located in the Trinity River. Some 75% or 277 ac of the total jurisdictional areas identified are characterized as wetlands or waters having reduced or impaired function due to a variety of human activities including farming, silviculture or related activities,

Environmental Impacts and Public Interest Review

The possible consequences of this Applicant's preferred alternative were studied for environmental concerns, social well-being, and the public interest, in accordance with regulations published in 33 C.F.R. 320-332. All factors, that may be relevant to the proposal, must be considered. The following factors were evaluated appropriately, as they relate to the Applicant's preferred alternative described in the alternative analysis section.

Historical and Cultural Resources

No direct or indirect effects are anticipated on historic resources. The LBITP right of way follows property lines of residential properties, and identified historical properties or sites were avoided during project planning and no mitigation is needed for historical resources.

Pre-historic areas eligible for the Natural Register were identified on Capers Ridge, an upland portion of the LBITP. Consultation has been conducted with the State Historic Preservation Officer (SHPO) and relevant Indian nations. A Memorandum of Agreement (MOA) is being developed that will establish how these resources will be managed. In addition, the permit will be conditioned to prohibit work on Capers Ridge until all terms of the MOA are satisfied.

Water Quality

Effects from the LBITP to water quality would be minimal such that direct or indirect effects are not anticipated. There would be a potential minor long-term beneficial effect on the water quality of Lake Houston as a result of implementation of the LBITP. Lake Houston is currently classified as impaired per Clean Water Act Section 303(d).

Rare, Threatened or Endangered Species

The proposed LBITP project area was selected in consultation with the U.S. Fish and Wildlife Service to avoid impacts to rare threatened or endangered species.

Fish and Wildlife Values

No direct, indirect, long-term, or adverse effects to fishes would occur related to implementation of the LBITP. Appropriate mitigation in the form of intake screen slot size would be used at the river pump intake location. Pumping could impinge larger fish on intake screens, and entrain fish eggs and mussel larvae through the transfer system. The proposed project would utilize a trash rack and bar screen that would otherwise minimize impacts to aquatic species that could potentially become caught and trapped in the pumps.

Temporary effects to wildlife habitat that would result from the proposed action include the decreased attractiveness of habitat adjacent to the project corridor, as well as possible disturbances to normal behavior patterns of wildlife as a result of increased noise levels from construction activities. Alternative 3A would result in direct, short-term impacts on wildlife habitat, including habitat loss through its conversion to surface water conveyance infrastructure and maintained ROW.

Shoreline Erosion and Accretion

No impacts to shoreline areas adjacent to the pump station are anticipated as a result of the LBITP. The proposed intake structures along the Trinity River were studied to assess their potential to affect the stability of the Trinity Rivers geomorphology. The studies concluded that the reach of the Trinity River is very stable and that the

placement of the intake structure and associated fill material will not affect stability of the Caper's ridge shoreline or the opposite bank.

Essential fish habitat

The LBITP is not located within an area mapped as Essential Fish habitat by the national Marine Fisheries and will not have an adverse affect on the bay or estuaries located downstream of the project site.

Wetlands and special aquatic sites

Wetlands affected by the LBITP are estimated at 364.76 ac. with over 75% of this total located in agricultural fields and those previously affected by farming activities. Stream impacts amount to 65 linear feet.

Recreation

A limited, local effect in the area of intake pump construction would occur to recreation and non-commercial navigation, including boating, on the Trinity River section of the LBITP. It is anticipated that Lake Houston water levels would remain consistent with baseline conditions in accordance with operating procedures. No direct, indirect, long-term, or adverse effects to navigation and boating would occur related to implementation of the LBITP.

Aesthetics

Direct impacts from the LBITP include the aesthetics of the riparian tree line along the Trinity River; the viewshed where project elements such as the maintenance facility and any elevated structures are implemented; and the removal of vegetation along the project right of way. Most of the right of way would be located on agricultural lands or farmed fields. The proposed, fenced conveyance canal with access road and associated facilities would traverse agricultural fields and undeveloped areas for much of the length of the alignment. Near the Lake Houston discharge, in the vicinity of FM 2100 and Wolff Road, several residential subdivisions or planned residential areas would be located near the discharge location.

Land use

All elements of LBITP would be located in sparsely populated areas of Liberty County and northeast Harris County. Approximately 1,005 ac would be converted from private to public use. Land uses adjacent to the proposed water conveyance are presently in agricultural use, or wooded natural area. Few residential or commercial uses are located near the proposed right of way. Primary activities occurring in the area of the right of way include farming, sand, gravel, oil and gas mining (drilling), and recreational (hunting)

Navigation

The intake structures of the LBITP are located on the Trinity River, a navigable water, but will not impede navigation or littoral access to private land owners once constructed.

Federal Projects

No effect is anticipated on Federal projects by the LBITP. The proposed action was studied to evaluate the potential impacts to the Wallisville Lake Project salt water barrier operations. Both the Corps and the CWA's independent reviews concluded that the release of water from Lake Livingston and intake of water at Capers Ridge would have no affect on the daily operations of the salt water barrier.

Water Supply and Conservation

Potential direct and indirect, long-term benefit to water supply and conservation would occur for these resources.

The LBITP would provide a public benefit with respect to water supply. The LBITP is a long-planned project identified by the state of Texas as critical to providing water to meet projected population growth of Houston. The need for the LBITP is to meet projected water requirements as exemplified by Water Supply Contracts held between Houston and North Harris County Regional Water Authority (NHCRWA), Central Harris County Regional Water Authority (CHCRWA), West Harris County Regional Water Authority (WHCRWA), and North Fort Bend Water Authority (NFBWA) for future water. A secondary objective is to assist with the conversion from groundwater to surface water sources to meet mandated goals developed to control area subsidence. Without the LBITP, Houston would not be able to meet its contracted demand allocations, projected long-term water supply requirements identified by the 2011 Region H (Houston) Regional Water Plan (RHRWP) and the TWDB 2012 State Water Plan (SWP); and would not be able to meet mandated conversion of groundwater to surface water supply sources to control area subsidence by the mandated conversion dates imposed by Harris-Galveston Subsidence District (HGSD) and the Fort Bend Subsidence District.

Texas state law requires retail and wholesale water providers to prepare and submit plans to the Texas Commission on Environmental Quality; these plans must specify demand management measures for use during drought including curtailment of "non-essential water uses" i.e., landscape irrigation and water for swimming pools or fountains (Texas Environmental Quality Code §288.20). The purpose of the LBITP is to provide water to the Houston area thus providing additional water supply to the region that can be combined with conservation measures developed and implemented by the City of Houston when needed.

Floodplain values

The LBITP would be located within approximately 54 acres of an existing floodplain. No adverse effects to the floodplain are anticipated and no increased risk of flooding of constructed or agricultural assets are expected.

Safety

The LBITP would be designed, operated, and maintained consistent with Department of Homeland Security standards for public infrastructure.

Energy Needs

No direct, indirect, long-term, or adverse effects to minerals and mineral resources would occur in relation to the implementation of the LBITP. One Natural Gas Pipeline (NGPL) Interconnect Meter Site Crossing was identified near the Stoesser property. No electrical power corridors were identified within the ROW of the proposed Alternative 3A and no oil wells are located in the proposed Alternative 3A footprint, although there is a dry hole present in the vicinity of the sedimentation basin. No other energy or mineral resources were identified within the proposed project ROW.

Flood Hazards

Flood hazards and flood hazard values are critical components integral to project development and design/mitigation considered for the action alternatives. Flood hazards and flood hazard values are directly affected and design features to minimize the affect have been developed during project evaluations/studies. Additional design features include a series of siphons in conjunction with collector ditches and culverts along the canal alignment that will assure overland flow/floodplain values will be maintained reducing the potential for flood hazards.

Economics

Both positive and negative economic impacts are anticipated as result of the LBITP. The loss of income and tax revenue from change of land use from agricultural and timber production to public use would consist of $8,782 or 5.8% of the total economic value of the properties within the ROW. There are 34 properties that provide economic value through agricultural and timber production within the ROW. Tax revenue is assessed at 8% per $1,000 per acre property.

Socioeconomics and Environmental Justice

No direct and indirect, long-term and adverse effects to environmental justice populations would occur for the implementation of Alternative 3A.

Air Pollution

The proposed project has been analyzed for conformity applicability pursuant to regulations implementing Section 176(c) of the Clean Air Act. It has been determined the activities proposed under this permit will not exceed *de minimis* levels of direct emissions of a criteria pollutant or its precursors and are exempted by 40 CFR PART 93.153. For these reasons, a conformity determination is not required for this individual permit.

Food and Fiber production

Direct and indirect effects to food and fiber production would occur and the health of these sources is declining in the area of the LBITP (Chapter 5, Section 5.3.4 of the FEIS). Farmland areas within the vicinity of the proposed Alternative 3A have been identified. Alternative 3A traverses through approximately 9.5 miles of farmland resources that would be permanently converted to public use from agriculture. However,

none of the proposed project alternatives, including the No Action alternative, exceeded thresholds for identifying that adverse impacts to prime farmland may occur as a result of project-related construction, operation, and maintenance activities.

Mineral Needs

No direct, indirect, long-term, or adverse effects to minerals and mineral resources would occur in relation to the implementation of the LBITP. One Natural Gas Pipeline (NGPL) Interconnect Meter Site Crossing was identified near the Stoesser property. No electrical power corridors were identified within the ROW of the proposed Alternative 3A and no oil wells are located in the proposed Alternative 3A footprint, although there is a dry hole present in the vicinity of the sedimentation basin. No other energy or mineral resources were identified within the proposed project ROW.

Other Federal State or Local Requirements

A Section 401 Water Quality Certification (WQC, 33 USC 1342) has not been issued for the proposed project and must be obtained from the Texas Commission on Environmental Quality (TCEQ). The TCEQ has not yet acted on the Applicant's request for water quality certification under Section 401 of the CWA. The Corps will provide the TCEQ with a copy of this permit decision document when finalized. The final permit decision document will contain the environmental assessment and mitigation and Section 404(b)(1) analysis. The TCEQ will then make its determination whether the project will comply with state surface water quality standards in accordance with Section 401 of the CWA. The Corps will provide a permit decision to the applicant when the following procedures have been completed. The TCEQ will either provide its certification decision to the Corps or request an extension from the Corps within 10 working days from receipt of the Corps decision document. If the TCEQ does not provide a certification decision or request an extension within the 10 day period, the Corps will presume waiver of certification in accordance with 33 CFR 325.2(b) and proceed with the issuance or denial of the permit. If TCEQ requests an extension of time, the Corps will determine the merit of the time extension request and the length of the extension based on 33 CFR 325.2(b) and notify TCEQ of its intended decision. If the Corps decides to deny or modify a request for extension, TCEQ will have 10 working days from the date it is notified of the intended action of the Corps on the request for extension in which to either certify or deny certification. The TCEQ will be solely responsible for determining the project’s consistency with the goals and policies of the Coastal Management Plan. This determination will accompany TCEQ’s Section 401 certification.

Cumulative Impact Assessment

An assessment of cumulative impacts takes into consideration the consequences that past, present, and reasonably foreseeable future projects had, have, or will have on an ecosystem. Every permit application must be considered on its own merits. Its impacts on the environment must be assessed in light of historical permitting activity, along with anticipated future activities in the area. Although a particular project may constitute a minor impact in itself, the cumulative impacts that result from a large number of such

projects could cause a significant impairment of resources and interfere with the productivity and quality of existing ecosystems.

Direct, indirect, and cumulative environmental, cultural, and socioeconomic effects were analyzed that would likely occur upon implementation of the three alternatives, plus the no build alternative. The physical, natural, and social impacts for each alternative are discussed in Chapter 4.0 of the FEIS. The impacts to each resource area are summarized below. Cumulative effects were analyzed taking into account past, present, and reasonably foreseeable future actions in the project area and are discussed in Chapter 5.0 of the FEIS. Table 1 (below) summarizes the sum of the potential direct, indirect and cumulative effects of the build alternatives based on identified resource area.

Table 1. Summary of Potential Direct, Indirect and Cumulative Environmental Consequences on Resource Areas Affected by the Build Alternatives.

Resource Area	Alternative 3A	Alternative 4	Alternative 6
Topography and Bathymetry	No effect	No effect	No effect
Soils	No effect	No effect	No effect
Prime Farmland Soils	Minor effect	Minor effect	Minor effect
Geology	Minor effect	Minor effect	Minor effect
Groundwater	Positive effect	Positive effect	Positive effect
Subsidence	Minor effect	Minor effect	Minor effect
Sedimentation and erosion	Minor effect	Minor effect	Minor effect
Surface water and drainage	No effect	No effect	No effect
Water quality	Minor effect	Adverse effect	Adverse effect
Climate change	No effect	No effect	No effect
Regional air quality	Minor effect	Adverse effect	Adverse effect
Hazardous air pollutants	Minor effect	Minor effect	Minor effect
Air quality (NAAQS)	No effect	No effect	No effect
Greenhouse gas emissions	Minor effect	Minor effect	Minor effect
Wetlands	Minor/Mitigated	Adverse effect	Adverse effect
Streams	Minor effect	Adverse effect	Adverse effect
Bottomlands	Minor/Mitigated	Adverse effect	Adverse effect
Floodplain	Minor effect	Adverse effect	Adverse effect
Avifauana	Minor effect	Adverse effect	Adverse effect
Aquatic species	Minor effect	Adverse effect	Adverse effect
Habitat fragmentation	Minor/Mitigated	Adverse effect unknown	Adverse effect unknown

Resource Area	Alternative 3A	Alternative 4	Alternative 6
T&E species	No effect	Neutral/Mitigated	Neutral/Mitigated
Invasive species	Minor/Mitigated	Minor effect	Minor effect
Recreation/Boating	Minor effect	Adverse effect	Adverse effect
Agriculture	Minor effect	Adverse effect	Adverse effect
Residential land use	Minor effect	Adverse effect	Adverse effect
Oil and gas storage	Minor effect	Adverse effect	Adverse effect
Energy/Mineral resources	Minor effect	Adverse effect	Adverse effect
Roads/Infrastructure	Minor effect	Adverse effect	Adverse effect
Relocations/Displacements	Minor effect	Adverse effect	Adverse effect
Incompatible land use	Minor effect	Adverse effect	Adverse effect
Visual/Aesthetic effects	Minor effect	Adverse effect	Adverse effect
Noise effects	Minor effect	Minor effect	Minor effect
Hazardous materials	Minor effect	No effect	No effect
Safety/Security of water supply	No effect	Minor effect	Minor effect
Environmental justice issues	Beneficial effect	Adverse effect	Adverse effect
Cultural Resources	Minor/Mitigated	Adverse effect unknown	Adverse effect unknown
Descriptors: 'No effect' = no adverse or beneficial effect 'Minor effect' = minor adverse impact			

The identification and assessment of cumulative impacts for each alternative and resource category are summarized by resource category in Chapter 5 of the EIS. An assessment of the need for mitigation is described for each alternative and resource category and is summarized in Chapter 5, Table 5-1 of the FEIS. No adverse effects on resources were identified for Alternative 3A. The need for mitigation was identified for five resources: 1) cultural resources; 2) invasive species; 3) habitat fragmentation;, 4) bottomlands; and 5) wetlands.

When considering the overall impacts that will result from Alternative 3A, in relation to the overall impacts from similar past, present, and reasonably foreseeable future projects, the cumulative impacts resulting from the Alternative 3A are not considered to be significantly adverse. Overall, the project will result in minimal environmental impacts.

Public Interest Review

Coordination

DA Permit Application Public Notice and Scoping

The Luce Bayou Inter-basin Transfer Project public notice was published on April 19, 2010. After a joint agency evaluation meeting was held, which included federal and state resource agencies (February 10, 2010), the Applicant began to develop alternative routes and initiated the process of avoiding and minimizing effects to aquatic resources through the development of an environmental assessment. After reviewing the environmental assessment, considering the comments of resource agencies and other stakeholders, and developing information concerning potential effects of inter-basin water transfers from invasive species, the Corps decided to initiate the EIS process to better evaluate the Applicant's proposal.

An EIS Scoping Meeting was held on July 21, 2011 at the Dayton, Texas Community Center after a Notice of Intent to prepare an EIS was published in the Federal Register (May 25, 2011). Some 224 substantive comments were provided during the Scoping Comment period with the majority of comments focused on NEPA compliance, wetlands and aquatic environment effects of the project, facility construction and operation, and freshwater inflow to Galveston Bay (Luce Bayou Inter-basin Transfer FEIS, Chapter 7.0).

Draft Environmental Impact Statement (DEIS)

The Corps made the DEIS available for public review and comment online through the Corps website, through U.S. EPA's NEPA Net site, and provided copies of the DEIS to the Dayton, Texas library The DEIS was available for comment for 52 days beginning October 26, 2012 through December 17, 2012. The DEIS public hearing was held in Dayton, Texas on November 28, 2012.

Substantive Issues - Summary

Some 1,122 substantive comments were received on the DEIS (Luce Bayou Inter-basin Transfer Project FEIS, Appendices A and T).

Most comments were in the form of letters with a large number of form letters received in support of the project but without substantive comment on the DEIS.

A substantial number of comments received from the Sierra Club focused on the impact of providing for municipal water demand. In various ways, the commenter indicated that population growth and urban development in the Houston area would increase while the size and quality of natural areas would decrease if municipal water was provided to meet demand. This circumstance was thought to be objectionable and was presented as a reason to not build the project.

Related to the comments mentioned in the preceding item, the Sierra Club also noted that transportation and other infrastructure growth impacts from the future population served by adequate water supplies are not evaluated in the EIS.

Multiple comments requested various re-evaluations of specific build alternatives to better understand how these could be feasible.

The Applicant and the City of Houston expressed hope the Corps would provide a favorable permit decision at an early date.

Multiple comments expressed concern that by removing the proposed volumes of water from the Trinity River that wetland habitat along the river and its tributaries would begin to dry up and lose wetland functions and values, and that upper Galveston Bay would not receive freshwater needed to maintain productive estuarine values.

Multiple comments expressed concern over the impact of invasive zebra mussels should they be transferred from the Trinity River watershed to the San Jacinto watershed.

The City of Houston provided a number of comments clarifying and better explaining the type and nature of its water rights ownership in the Livingston Reservoir.

Several comments concerned the mitigation proposal and whether it adequately compensated for resource losses.

Agency Comments on the DEIS

Chapter 8, Section 8.6 of the FEIS provides detailed, point-by-point discussion of how the FEIS responded to Federal/State agency comments on the DEIS. The following is a summary:

U.S. EPA Region 6 (EPA) requested another look at dredging Lake Houston to increase water supply capacity and to also consider providing for fringe wetlands along the lake's shoreline with the dredged material excavated to deepen the lake. This re-look was made and additional discussion is provided in the FEIS.

EPA also requested additional information concerning Indian Trust assets and Tribal Consultation. The FEIS provides the requested information in Chapter 8, Section 8.5.

EPA requested specific air emission impacts from construction be minimized through an emissions mitigation program. The FEIS includes mitigation measures to be used to reduce emission effects during construction periods.

EPA requested a specific section of the FEIS include all City, State, Federal and public coordination/correspondence, including tribal government co-ordination/consultation. Such a section has been provided in the FEIS at Appendix A and Chapter 8.0.

The Natural Resources Conservation Service presented a letter that presented how the Service defines wetlands. The Corps responded by stating that farmed wetlands and

possible prior converted croplands have been considered in the jurisdictional determinations for the right of way proposed by the Applicant.

The National Marine Fisheries Service stated that with respect to areas under their jurisdiction, including essential fish habitat, that the Service proposed to ‘take no action at this time.’

The U.S. Department of Interior, Office of Environmental Policy and Compliance commented that Alternative 3A is ‘one of the most environmentally damaging alternatives because of the extensive alterations to wildlife habitats along the proposed canal.’ The DEIS does not adequately evaluate impacts downstream of the proposed pump station nor does the DEIS assess secondary impacts caused by removing water from the Trinity River. It (the DEIS) does not include adequate compensation/mitigation for direct and indirect impacts that may occur from project construction. Interior also provided a hydrological analysis intended to show that the water needed for the proposed water supply is not available due to drought or to maintain the constant levels required at Livingston Dam. The FEIS provides responses to these comments in Appendix A of the FEIS.

The USFWS, Ecological Services Field Office, Houston, Texas was consulted during the development of environmental documentation. Impacts to a bald eagle nest and migratory bird rookery were avoided through this consultation. The FEIS includes details of this consultation and coordination and provides detailed information concerning wildlife and habitat learned as a result of the Service’s communications.

The USFWS, Trinity River National Wildlife Refuge System, by letter dated July 25, 2013, has indicated their willingness to accept the donation of the approximately 3,000-acre mitigation tract (Harrison tract) into the refuge system. Specific details for this transaction are being resolved by the Applicant and the USFWS.

The TCEQ, who is responsible for providing water quality certification under the Clean Water Act Section 401, expressed no comment on the project.

The TPWD’s Coastal Fisheries Division acknowledged the extensive coordination that occurred during the project planning period and stated that avoidance and minimization of impacts to aquatic resources and mitigation have been adequate. The Coastal Services Division would still want to resolve issues relating to the restoration of 200 acres of logged areas. Additionally, the Division requests further analyses of river low flows and water withdrawals. The Division also requests that the conveyance right of way provide for wildlife crossings along the 26-mile route.

The GLO commented that the “impacts would occur to critical habitat and waterways, including the Cedar Bayou watershed, which feeds into Galveston Bay.” The Land Office will review the FEIS pursuant to the Coastal Coordination Act, 31 Texas Administrative Code Section 506.30.

The Texas Historical Commission indicated that the project would not affect historic properties, though Tribal Nation coordination continues. Resources important to Tribal

Nations have been discovered within Alternative 3A, and a MOA has been developed (to be completed).

Final Environmental Impact Statement (FEIS)

The Corps made the FEIS available for public review on their website and through U.S. EPA's NEPA Net site, as well as published a notice of availability of the FEIS in the *Federal Register* on October 4, 2013 and a subsequent Special Public Notice through its standard public notice process. The FEIS review period began October 3, 2013 and ended November 18, 2013. In response to the FEIS review period, only one comment letter was received.

Comments on the FEIS

The U.S. EPA Region 6 letter, dated November 17, 2013, raised eight sets of concerns under specific categories as follows:

1. Water Use Calculations

EPA asked for an explanation of forecasted water use per person. Based on the forecasted Harris County population change from 4 million to 6 million people between 2010 and 2040, and a change in water use from 450 million gallons per day (MGD) to 1,350 MGD the EPA calculates that the water use per person doubles during the time period from 112.5 gallons per day (gpd) to 225 gpd. The EPA requested an explanation for the doubling in per person use in the face of aggressive conservation measures.

The Applicant provided water demand information, which was presented in the EIS as follows: Between 2030 and 2050 (water) demand is forecast to be between 1,300 and 1,400 MGD. The source of this information was attributed to the City of Houston. Elsewhere in the EIS, population forecasts were presented, also provided by the Applicant, and reviewed and verified as to source.

In all the data reviewed concerning water demand, no information was presented that specifically identified 'per capita' water use. What was presented was water demand information relevant to establishing the need for the proposed Luce Bayou Interbasin Transfer project. This information includes the following:

1. Information relating to the historical reliance on groundwater resources and how this major water source must, by regulation, be replaced with surface water.
2. Total surface water supply and demand forecast (Chapter 1, Figure 1-6 in the FEIS) for the City of Houston.
3. A discussion of Water Authorities and other water customers of the City of Houston that expands the population served by water sold by the City of Houston, which is included in the City of Houston's water demand estimates.
4. Water Authorities demand projections (Chapter 1, Figure 1-8 in the FEIS).

5. Information (Chapter 1, Figure 1-7 in the FEIS) that identifies the City of Houston's treated and untreated water customers, which includes the customers mentioned in item 3 above, and also includes municipal utility districts, commercial/industrial, large industrial, local (incorporated) cities and villages, and other customers, including residential.
6. Population forecasts for multiple counties, including Harris County, from the Texas Water Development Board.

The demand projections by the City of Houston and the Water Authorities, while being supported by population forecasts, also include diverse water users and populations/businesses located outside the City of Houston, such as those located in Fort Bend County, Galveston County, and others. Chapter 1, Figure 1-6 of the FEIS estimates a 1,300 MGD demand by the year 2050. This forecast includes both the City of Houston forecast demand plus the pending contracted water the City must provide, primarily to Water Authorities. How this demand estimate translates to 'per capita use' was not a focus of the EIS evaluation, primarily because 'demand' is understood more broadly.

EPA limits the population projection in its per capita calculation to Harris County. The information provided by the Applicant indicates that populations beyond Harris County are part of the Applicant's/City of Houston's 2060 demand estimate, and this may be as many as 8 to 9 million versus the almost 7 million estimated for Harris County alone.

2. Historical and Archaeological Resources

The EPA's November 17, 2013 letter included the following comment on Historic and Archeological Resources*:* In the DEIS comment letter, EPA asked what process was used to determine Indian Trust Assets (ITA's) that were not in the project vicinity, and why National Historic Preservation Act (NHPA) and Archeological and Historical Protection Act (AHPA) consultation was not completed. The response to EPA comments was that the CORPS has, and will continue, to coordinate with tribes, and that consultation documentation is provided in Appendix H. Appendix H contains consultation documents with the Texas State Historic Preservation Officer (SHPO) and an unsigned Memorandum of Agreement (MOA) between several parties, including tribes. EPA was unable to locate any letters to, or from, tribes indicating specific tribes were contacted for this project. This is not adequate consultation for NHPA, AHPA, or Executive Order (EO) 13175. The ROD should include letters to/from tribes, and a signed copy of the MOA.

Appendix C of 33 CFR 325 establishes the procedures to be followed by the U.S. Army Corps of Engineers (Corps) to fulfill the requirements set forth in the National Historic Preservation Act (NHPA), other applicable historic preservation laws, and Presidential directives as they relate to the regulatory program of the Corps (33 CFR parts 320–334). Appendix C, Paragraph 2.d states that if a permit application requires the preparation of an Environmental Impact Statement (EIS) pursuant to the National Environmental Policy Act, the SHPO and the ACHP will be given the opportunity to participate in the scoping process and to comment on the Draft and Final EIS

In developing the cultural resource information necessary for the Draft and Final EIS, the district engineer coordinated with the applicant and the SHPO throughout the permit evaluation process. Consultation was initiated on April 19, 2010 when the initial public notice was published notifying all interested parties and has been a continuing process thought the development of the EIS to accommodate new information resulting from continuing investigations and changing interests in those resources. As a result of continuing field investigations and archeological testing conducted by the applicant under the direction of the district engineer and SHPO, cultural resources of religious and traditional importance to the Indian Tribes were located and direct coordination with the appropriate Indian Tribes was initiated within days of discovery. Until this point in the investigation, Indian Tribes had been notified of project through standard coordination procedures and the Tribes had not provided any comment or objection.

The district engineer has considered all comments provided by the SHPO, ACHP, applicant, and appropriate Indian Tribes during consultation in the development of NEPA documentation. The process followed by the Corps is in compliance with Appendix C and has provided for the maximum consideration of historic properties within the jurisdictional constraints of the Corps regulatory program.

Locational and sensitive information related to archeological sites is excluded from the Freedom of Information Act (Section 304 of the NHPA and Section 9 of ARPA). The disclosure to the public of information pertaining to coordination of cultural resources included the location and character of sensitive historic resources and release of correspondences would create a substantial risk of harm, theft, or destruction to the resources or to the area or place where such resources are located. Based on this conclusion, the district engineer did not include afore mentioned information in the Draft or Final EIS and will not otherwise make it available to the public. The table below (**Table 2**) catalogs the various correspondences between the SHPO, ACHP, Tribes and Applicant demonstrating that adequate consultation was conducted in a timely and effective manner in regards to Indian Tribe resources.

When conclusion of the consultation process results in an agreement, Appendix C, Paragraph 8 authorizes the district engineer to formalize this agreement with either a permit condition or by signing a Memorandum of Agreement (MOA) with the parties. Completion of a Memorandum of Agreement for inclusion in the Final EIS is not a requirement and should not delay the district engineer's decision. The district engineer will formalize the agreement for the proposed LBITP project with both an MOA signed by the interested parties and by permit special condition referencing the MOA and attachments that also prohibits construction of the portion of the project located within the cultural resource areas until the Section 106 process is completed.

Indian Trust Assets (ITAs) are legal interests in property held in trust by the U.S. for federally recognized Indian tribes or individual Indians. An Indian trust has three components: (1) the trustee, (2) the beneficiary, and (3) the trust asset. ITAs can include land, minerals, federally-reserved hunting and fishing rights, federally-reserved water rights, and in-stream flows associated with trust land. Beneficiaries of the Indian trust relationship are federally-recognized Indian tribes with trust land; the U.S. is the

trustee. A review of the Proposed Action was conducted to determine whether the Proposed Action has potential to affect ITAs. The Proposed Action is an interbasin transfer of water rights from the Trinity River to Lake Houston for use by the City of Houston. The Corps published several notices to solicit comments from the public, state and federal agencies as well as Indian Tribes. Subsequent to these notices, ongoing cultural resource investigations identified relics of religious and traditional importance to the Indian Tribes. Upon this discovery, the Corps began direct consultation with the appropriate tribes. At no time when soliciting comments from or coordinating and consulting with Indian Tribes did any of the Indian Tribes assert or declare Indian Trust Assets on the project site. Based on the information provided it is determined that neither the Applicant's Preferred Action nor the alternatives carried through the EIS for analysis have a potential to affect Indian Trust Assets.

Table 2: Summary of Coordination with Indian Tribes. The following table outlines the date, type of coordination, method of communication and Indian Tribes participating in coordination pursuant to DA Permit Application SWG-2009-00188.

Date	Action	Communication Method	Tribes Participating
19-Apr-10	Public Notice Identifying need for Cultural Resource Investigation	Website Publishing/ Email Notification	Alabama-Coushatta, Coushatta of Louisiana, Kiowa, Tonkawa Tribe of Oklahoma
29-Oct-12	Special Public Notice - Draft Environmental Impact Statement	Website Publishing/ Email Notification	Alabama-Coushatta, Coushatta of Louisiana, Kiowa, Tonkawa Tribe of Oklahoma
8-Jan-13	Notice of Inadvertent Discovery of Human Remains	Electronic Mail	Alabama-Coushatta, Coushatta of Louisiana, Kiowa, Tonkawa Tribe of Oklahoma
11-Jan-13	Re-coordination of Draft Environmental Statement and Cultural Resource report	Electronic Mail	Alabama-Coushatta, Coushatta of Louisiana, Kiowa, Tonkawa Tribe of Oklahoma
14-Feb-13	Consultation Regarding Inadvertent Discovery	Teleconference	Coushatta of Louisiana, Alabama-Coushatta
28-Feb-13	Site Visit	Electronic Mail	Coushatta of Louisiana, Alabama-Coushatta
5-Mar-13	Coordination of Record of Field Trip to Site	Electronic Mail	Alabama-Coushatta, Coushatta of Louisiana, Kiowa, Tonkawa Tribe of Oklahoma

Date	Action	Communication Method	Tribes Participating
6-Mar-13	Coordination - Reburial of Grave at Site	Electronic Mail	Kiowa
6-Mar-13	Coordination - Reburial of Grave Site	Electronic Mail	Tonkawa Tribe of Oklahoma
8-Mar-13	Concurrence of Reburial of Grave Site	Electronic Mail	Tonkawa Tribe of Oklahoma
22-Mar-13	Coordination of Proposed Ground Penetrating Radar Assessment	Electronic Mail	Alabama-Coushatta, Coushatta of Louisiana, Kiowa, Tonkawa Tribe of Oklahoma
22-Mar-13	Coordination of Proposed Ground Penetrating Radar Assessment	Electronic Mail	Alabama-Coushatta, Coushatta of Louisiana, Kiowa, Tonkawa Tribe of Oklahoma
11-Apr-13	Kiowa withdrew themselves from Reburial of Grave Site Consultation	Teleconference	Kiowa
2-May-13	Confirmed Reburial of Grave Site	Electronic Mail	Alabama-Coushatta
2-Jul-13	Coordination of Draft Data Recovery Plan, Draft Reburial Plan and draft Testing Report	Electronic Mail	Alabama-Coushatta, Coushatta of Louisiana, Kiowa, Tonkawa Tribe of Oklahoma
15-Jul-13	Consultation Regarding Draft data Recovery Plan, Draft Reburial Plan and Draft testing Plan	Teleconference	Coushatta of Louisiana, Alabama-Coushatta
23-Sep-13	Coordination of Summary of Additional testing, Geoarch testing and Draft MOU	Electronic Mail	Alabama-Coushatta, Coushatta of Louisiana, Kiowa, Tonkawa Tribe of Oklahoma
9-Oct-13	Special Public Notice -Final Environmental Impact Statement	Website Publishing/ Email Notification	Alabama-Coushatta, Coushatta of Louisiana, Kiowa, Tonkawa Tribe of Oklahoma
5-Nov-13	Consultation Regarding Summary	Teleconference	Coushatta of Louisiana, Alabama-Coushatta

Date	Action	Communication Method	Tribes Participating
	of Additional testing, Geoarch testing and Draft MOU		
3-Dec-13	Coordination of Revised Draft MOU, Revised Data Recovery Plan	Electronic Mail	Alabama-Coushatta, Coushatta of Louisiana, Kiowa, Tonkawa Tribe of Oklahoma
6-Dec-13	Consultation Regarding Revised Draft MOU, Revised Data Recovery Plan	Teleconference	Coushatta of Louisiana, Alabama-Coushatta

3. Environmental Justice

EPA requested that EO 12898 be complied with by assessing potential effects to low income populations, the elderly, children and other vulnerable populations as specified by the EO 12898. The following discussion supplements EIS discussions of these populations.

Low-income Population

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, was issued on February 11, 1994, and mandates that federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of programs on minority and low income populations. Environmental Justice Impacts are discussed in the FEIS in Chapter 3, Section 3.10.3, Chapter 4, Section 4.9.1, and in Chapter 5, Table 5-1, which summarizes existing resource conditions and potential impacts included in FEIS. Chapter 3, Section 3.9.4 Housing and Residential Development in the FEIS also discusses housing costs and occupancy for existing residents. Additional data on low-income populations are discussed further in the text below.

A low income population is defined as a group of people and/or a community that, as a whole, lives below the national poverty level. The average poverty level threshold for a family of four people in 2013, as defined by the U.S. Department of Health and Human Services (HHS) thresholds, was a total annual household income of $23,550. For purposes of determining low-income populations, median household income was examined, using the U.S. Census poverty thresholds for 2007 to 2011 (a 5-year average), as reported in the American Community Survey (ACS). The geographic areas evaluated include the United States, Texas, counties in the project area, and Census tracts within the three proposed LBITP alternative alignments.

As shown in Tables 3, 4, and 5 (below) developed for each alternative using data compiled by the 2007-2011 American Community Survey, none of the Census tracts have median household incomes below the 2013 poverty threshold. It is important to

note that Median Household income is the average of households within a Census tract. Individual households could have incomes below the 2013 HHS poverty threshold.

Table 3: Median Household Income for Census Tracts within Alternative 3A

Geographic Area	Median Household Income
United States	$52,762
Texas	$50,920
Harris County	$52,675
Liberty County	$47,460
Census Tract 7003	$39,912
Census Tract 7004	$53,571
Census Tract 7007	$59,970
Census Tract 7008	$50,476
Census Tract 7009	$66,250
Census Tract 7010	$51,473
Census Tract 2504.01	$88,731
Census Tract 2504.02	$87,034
Census Tract 2508	$109,947
Census Tract 2509	$131,563
Census Tract 2516	$74,821
Census Tract 2517	$59,766

Source: U.S. Census Bureau (2007-2011) American Community Survey 5-Year estimates

Table 4: Median House Income for Census Tracts within Alternative 4

Geographic Area	Median Household Income
United States	$52,762
Texas	$50,920
Harris County	$52,675
Liberty County	$47,460
Census Tract 7004	$53,571
Census Tract 7008	$50,476
Census Tract 7009	$66,250
Census Tract 7010	$51,473
Census Tract 2517	$59,766

Table 5: Median House Income for Census Tracts within Alternative 6

Geographic Area	Median Household Income
United States	$52,762
Texas	$50,920
Harris County	$52,675
Liberty County	$47,460
Census Tract 7010	$51,473
Census Tract 7011	$55,792
Census Tract 2518	$77,936
Census Tract 2519.01	$62,286
Census Tract 2519.02	$94,016
Census Tract 2527	$56,884

Source: U.S. Census Bureau (2007-2011) American Community Survey 5-Year estimates

Based on the low-income Census data presented in Tables 3, 4, and 5, it is expected that the proposed project would not result in disproportionately high and adverse effects on low-income populations, for any of the LBITP alternatives. However, tract level data does not identify the specific locations of low-income households or individuals that could be impacted by residential displacements for Alternatives 4 and 6. Individual low-income households could be adversely impacted by the proposed project, if the residences are within the areas of potential displacements.

Age Vulnerable Populations

In order to examine vulnerable populations that could be affected by the proposed project, children defined as 18 years old and younger and elderly population defined as 65 years or older were identified by Census tract within each of the LBITP alternative alignments. Group quarter populations such as group homes for children or elder care facilities are not included in the percentages shown below in Tables 6, 7, and 8.

Table 6: Age Sensitive Populations for Alternative 3A

Geographic Area	Children (Under 18 years Old)	Elderly (65 years or older)
United States	17.6%	12.9%
Texas	19.6%	10.3%
Harris County	19.8%	8.1%
Liberty County	19.0%	11.0%
Liberty County		
Census Tract 7003	**19.3%**	**12.6%**
Census Tract 7004	17.4%	11.0%
Census Tract 7007	14.1%	**11.4%**
Census Tract 7008	**22.4%**	10.3%
Census Tract 7009	6.2%	3.7%
Census Tract 7010	**26.6%**	6.3%
Harris County		
Census Tract 2504.01	**29.9%**	3.2%
Census Tract 2504.02	**22.4%**	5.2%
Census Tract 2508	**20.2%**	**10.3%**
Census Tract 2509	**22.5%**	**12.3%**
Census Tract 2516	**21.1%**	**10.5%**
Census Tract 2517	**23.9%**	**8.6%**

Source: U.S. Census Bureau (2007-2011) American Community Survey 5-Year estimates

Table 7: Age Sensitive Populations for Alternative 4

Geographic Area	Children (Under 18 years Old)	Elderly (65 years or older)
United States	17.6%	12.9%
Texas	19.6%	10.3%
Harris County	19.8%	8.1%
Liberty County	19.0%	11.0%
Liberty County		
Census Tract 7004	17.4%	**11.0%**
Census Tract 7008	**22.4%**	**10.3%**
Census Tract 7009	6.2%	3.7%
Census Tract 7010	**26.6%**	6.3%
Harris County		
Census Tract 2517	**23.9%**	**8.6%**

Source: U.S. Census Bureau (2007-2011) American Community Survey 5-Year estimates

Table 8: Age Sensitive Populations for Alternative 6

Geographic Area	Children (Under 18 years Old)	Elderly (65 years or older)
United States	17.6%	12.9%
Texas	19.6%	10.3%
Harris County	19.8%	8.1%
Liberty County	19.0%	11.0%
Liberty County		
Census Tract 7010	**26.6%**	6.3%
Census Tract 7011	16.7%	6.9%
Harris County		
Census Tract 2518	18.5%	**13.5%**
Census Tract 2519.01	19.3%	**8.3%**
Census Tract 2519.02	16.1%	**11.5%**
Census Tract 2527	15.5%	**10.1%**

Source: U.S. Census Bureau (2007-2011) American Community Survey 5-Year estimates

As shown in Table 6, 7 and 8, in order to examine potential Census tracts with a high population of children or elderly, the percentages of these populations was compared to the county averages in which they reside. The bolded cells identify Census tracts with populations of children or elderly that are higher than the county comparison group. Although these percentages are higher than the comparison no Census tract is above 50 percent of these vulnerable populations.

Based on the age distribution census data presented in Tables 6, 7, and 8, it is expected that the proposed project would not result in disproportionately high and adverse effects on children or elderly populations, for any of the LBITP alternatives. However, tract level data does not identify the specific numbers of children or elderly in each household. It is expected that children or elderly individuals could be impacted by residential displacements for Alternatives 4 and 6.

4. Indirect Impacts to Adjacent Aquatic Resources

EPA expressed concern regarding construction of a channel through large wetland complexes and tributaries, possibly resulting in subsurface drainage of adjacent wetlands and diversion of tributaries, the indirect and cumulative effects of which could alter the chemical, biological, or physical integrity of these aquatic resources.

Wetlands within the areas of Alternatives 3A, 4, and 6 are typically shallow depressions on the landscape hydrologically driven by episaturation (direct precipitation and possibly some minor contribution from surface runoff in the immediately adjacent area) rather than endosaturation (ground water inflows that saturate the wetlands). Construction of a water conveyance channel would permanently remove wetlands within the project

footprint; however, wetlands situated adjacent to the project footprint would not be directly affected by construction. Precipitation events would continue to provide hydrology to support these wetlands, similar to conditions prior to construction of the channel. Large storm events or periods of excessive rainfall could result in the shallow depressional wetlands filling with water and excess surface runoff moving across the relatively level landscape. Although the elevated berms lining the conveyance channel could impede the movement of surface runoff, siphons located in slightly lower elevations where surface runoff would naturally move across the landscape would be constructed along the channel to allow for the continued movement of surface flows. Where the conveyance channel intersects with a natural stream or watercourse, siphons would be constructed such that water in the channel would be conveyed below the stream or watercourse, thereby not affecting stream flows.

Indirect adverse impacts to wetlands adjacent to the conveyance channel would not be expected to occur. Because wetlands in the project area are not dependent on ground water inflows for hydrology, construction of the conveyance channel would not interrupt or deplete the source of hydrology for the wetlands. For wetlands directly abutting the project footprint, a small berm would be constructed along the project boundary to allow for the retention of surface water within the adjacent wetland. Flows within area streams and watercourses are generally confined to the surface expression of the stream/watercourse. Crossings of the conveyance channel at these streams/watercourses would incorporate a siphon structure, whereby water in the channel would be enclosed within concrete box culverts and conveyed under the stream/watercourse. Therefore, any subsurface flows that may be associated with these streams/watercourses would not enter into the conveyance system to reduce or divert flows from the streams/watercourses. Other than a change in the physical configuration of wetlands adjacent to the conveyance channel footprint (i.e., a reduction in the size of the wetland due to construction within the project footprint), the chemical, biological, or physical integrity of wetlands outside the project footprint would not be indirectly impacted by the proposed project.

5. Discrepancies in Wetland Acreages Impacted

EPA’s review of the EIS found a number of discrepancies in the acres of wetlands listed (for the various build alternatives), wetland acres by type, and linear feet of streams. There is a difference between the wetland acreages associated with Alternative 3A in Chapter 2.0 of the EIS and in subsequent EIS chapters. There also is a difference in linear feet of streams affected by Alternative 3A in Chapter 2.0 and subsequent chapters. The reasons for the differences are as follows:

Chapter 2.0 included an evaluation of all build alternatives according to a common base of information, the National Wetlands Inventory (NWI). The purpose of using these data was to compare each of the alternatives for the purpose of screening out those that would cause the greatest impact to aquatic resources. The screening process also identified those alternatives that should be analyzed in greater detail in the EIS. Once those alternatives that should be analyzed in more detail were identified, more rigorous analysis of them occurred.

Alternative 3A was identified as the Applicant's preferred alternative and was analyzed in greater details as a result of a preliminary jurisdictional determination, which resulted in the expansion of the areas considered jurisdiction wetlands in comparison to the NWI-mapped data used in the screening process. However, it was also determined in this detailed analysis that most of the linear feet of streams potentially affected by Alternative 3A were non-jurisdictional drainage ditches constructed through uplands. Consequently, the linear feet of streams potentially affected by Alternative 3A were significantly reduced.

An approved jurisdictional determination of the 2,979-acre mitigation site identified 1,131.76 acres of aquatic resources (wetlands, streams, ponds, various drainage features) and 1,847.24 acres of upland resources. Chapter 3, Section 3.6.2.2 of the FEIS references the entire 3,135-acre mitigation property, which includes approximately 156 acres of the LBITP footprint occurring within the mitigation property. Excluding the LBITP footprint, the mitigation site encompasses approximately 2,979 acres. Chapter 3, Section 3.6.2.2 Proposed Compensatory Mitigation Property states that 796.52 acres of jurisdictional waters were verified on the mitigation property. The remaining aquatic resources include 332.99 acres of non-jurisdictional wetlands and 4,493 linear feet of non-regulated tributaries. The collective acreage of aquatic resources presented in this section totals 1,129.51 acres, but does not include the acreage associated with the 4,493 linear feet of non-regulated tributaries. Chapter 5, Section 5.3.2.7 Mitigation Opportunities includes text that explains the exclusion of the 156 acres of the LBITP footprint from the 3,135-acre mitigation property. In this section, all aquatic resources identified on the 2,979-acre mitigation site total 1,131.8 acres. This total includes both jurisdictional and non-jurisdictional waters, and includes the acreage for all surface drainage features. The difference between the aquatic resource acreages presented in Chapter 3, Section 3.6.2.2 (1,129.51 acres) and Chapter 5, Section 5.3.2.7 (1,131.8 acres) is the area of the non-regulated tributaries that was not quantified in Chapter 3, Section 3.6.2.2.

6. Effects to Coastal Estuarine Systems

EPA observed that according to Chapter 5, Table 5-1 of the FEIS, Alternative 3A would indirectly affect the Galveston Bay (Trinity Bay) estuarine environment and mud flats/bay bottom as environmental flows are altered during project implementation. EPA requested that ROD should quantify all indirect or cumulative impacts to the affected bay systems, and identify the appropriate compensatory mitigation for any adversely affected aquatic resource.

The Trinity River Authority operations staff at Lake Livingston coordinates with the Applicant TRPS to maintain river inflow to meet downstream water demands. Releases from Lake Livingston occur to allow the TRPS to remove the amount of water permitted under existing water rights. A similar operational scheme will be implemented for the LBITP to meet demands at the CRPS diversion point.

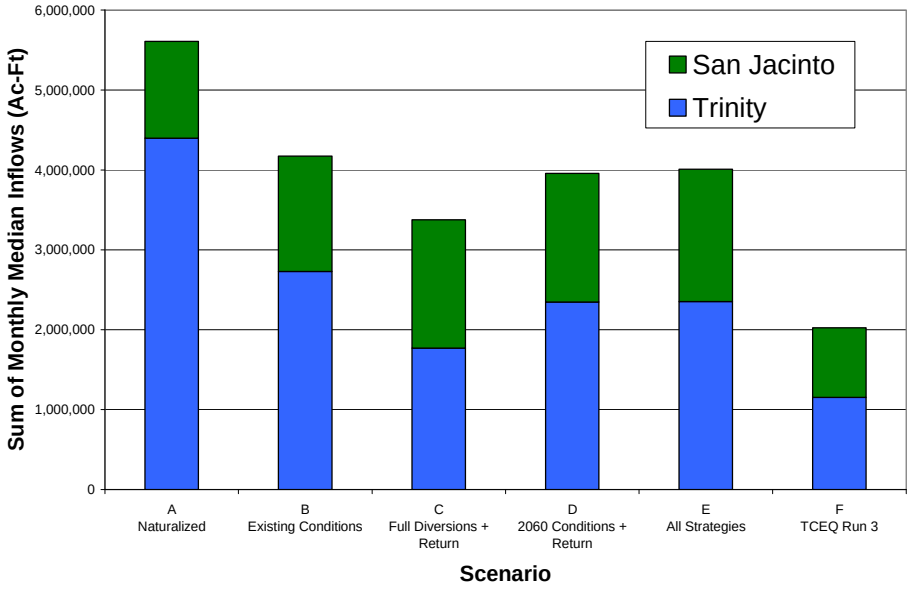
Flows downstream of the CRPS will be maintained to match or exceed the minimum levels currently experienced in the Trinity River, controlled by the demand at the existing

TRPS. Low flows upstream of the CRPS will be slightly increased to allow for the withdrawal of water at both the CRPS and the existing TRPS.

The pattern of bay and estuary (B&E) flows to the Galveston Bay system from the Trinity River and San Jacinto River results from the combined effects of Region H water management strategies (WMS), including upstream implementation of Region C conservation strategies (reuse and return flows). Evaluation of Region C return flows and Trinity Bay inflows indicate that upstream reuse will have an effect on Galveston Bay inflows. Based on modeling studies, the net effect of the Region H WMS after 2010, including the LBITP diversion, on B&E flows into Galveston Bay meet the Galveston Bay Freshwater Inflows Group (GBFIG) identified environmental flow targets, although there would be year-to-year variability based on variability in weather conditions.

Implementation of the LBITP and other WMS identified by the 2012 State Water Plan will impact not only the Frequency of Target Attainment (FTA), but also the proportion of inflow to Galveston Bay supplied by the San Jacinto River and Trinity River Basins. Inflows for the San Jacinto River and Trinity River Basins for various flow scenarios involving WMS outlined by the Region H Water Plan are shown below in Table 9.

Table 9. B&E Contributions to Galveston Bay of the San Jacinto River and Trinity River Basins



As shown in the graph above, for “naturalized” flow conditions (Model Scenario A), as well as the existing conditions scenario (Model Scenario B), Galveston Bay B&E inflows are dominated by contributions from the Trinity River Basin. Trinity River Basin inflow contributions to Galveston Bay decrease by comparison for Model Scenario C (fully authorized diversions + expected return flows). As for the Future Year 2060 conditions, (Model Scenario D, incorporating future flow conditions + expected return flows) and Model Scenario E (assuming all upstream WMS are implemented), these measures cause an increase in the relative contribution of Trinity River Basin inflows to Galveston Bay. Model Scenario E (TCEQ Run 3 fully authorized diversions + no return flows)

provides the least amount of median inflows to Galveston Bay of all water management scenarios modeled.

The environmental flow investigations conducted through the Region H water planning process evaluated alternatives to identify water diversion and management strategies that would meet Galveston Bay B&E inflow targets at the desired frequency for Future Year 2060 conditions. The models were developed to evaluate alternatives to reservoir operations that would minimize the effects of water supply diversions on Galveston Bay B&E target inflows. The goal was to assess whether water management strategies could be successful in meeting Galveston Bay B&E inflow targets (at the desired frequency of attainment) while also maintaining current and future water supplies needed from Lake Houston and Lake Livingston, and without reducing the firm yields of these reservoirs. A major assumption in development of water management strategies was that Galveston Bay B&E inflow targets would be achieved by any flow that equaled or exceeded the targeted inflow volume identified by GBFIG as sufficient. Another model constraint was that the inflow scenarios modeled would comply with the existing water rights diversion priority system. The net result of the investigations documented by the *Environmental Flows Study* (2009) was that wastewater return flows were critical to supplying water to Region H, and will not impact the firm yield of either Lake Houston or Lake Livingston.

The function of the Galveston Bay B&E system is influenced by a number of factors. The Trinity River Basin currently dominates inflows into the Galveston Bay B&E system, followed by the San Jacinto River Basin, with the other rivers making relatively minor contributions. Viewed over the entire period of record, the change from the naturalized condition (Model Scenario A) to current or existing conditions (Model Scenario B) describes a change to Galveston Bay inflows, with a greater proportion of inflows coming from the San Jacinto River Basin, while the Future Year 2060 model conditions with strategies (Model Scenario E) shows Galveston Bay inflow contributions of similar proportion to current conditions (Model Scenario B).

However, there are two factors that indicate that Galveston Bay B&E inflow change caused by WMS implementation would not be directly responsible for impacts to the Galveston Bay B&E system. The first factor is that the most significant change to the inflow contributions to Galveston Bay from the San Jacinto River Basin and the Trinity River Basin occurs through the comparison between the naturalized condition (Model Scenario A) and the current conditions model (Model Scenario B) and a healthy Galveston Bay B&E system. The second factor is that the change in the proportion of inflows to Galveston Bay from the San Jacinto River Basin would not be a function of WMS implementation (i.e., the LBITP), but rather is the result of the full authorized diversion model (Model Scenario C). In addition, the fact that the Model Scenario D (Future Year 2060) and Model Scenario E (TCEQ Run 3 fully authorized diversions + no return flows) exhibit identical median discharges during the period of concern suggests that the identified shift of Galveston Bay inflows away from the Trinity River Basin could be largely a result of the implementation of upstream Trinity River WMS.

Upper basin return flows are an important consideration in this study due to their inclusion in the base model and, in particular, the substantial contributions made by Region C (upper Trinity River Basin) return flows to Region H illustrated by the Trinity River Basin model. Water imports into the upper Trinity River Basin account for additional return flows that may be an important source for maintaining lower Trinity River Basin water rights and Galveston Bay B&E inflows. Upper basin return flows are also important in providing water for the proposed LBITP diversion and supplying major demands for water in Region H. The importance of return flows to the WMS models presented is highlighted by a comparison of Model Scenario C and Model Scenario F. For every month of the full period of simulation, the addition of return flows in the Model Scenario C resulted in increased Galveston Bay B&E inflows compared with the Model Scenario F; the minimum monthly increase is represented by 27,897 acre-feet and the median monthly increase is modeled at 80,878 acre-feet. Additional modeling conducted during the development of water management strategies for Region H indicated that loss of Region C return flows over the period of record would result in a 20 percent reduction in Galveston Bay B&E inflows generated by the Trinity River Basin. For seven major water rights evaluated, six experienced a reduction in firm yield due to removal of upper basin return flows. These reductions in firm yield ranged from 34 to 54 percent. As such, any Region C WMS that would reduce the return flows to Region H would have the potential to substantially alter Galveston Bay B&E inflow regimes as well as the firm yield of water rights in the Trinity River and San Jacinto River Basins.

The potential hydrological effects related to construction and implementation of the LBITP are not, by themselves, considered to result in regional, large-scale, permanent long-term effects to hydrologic systems. The LBITP would not cause substantial change to stream flow of the Trinity River or Lake Houston compared to existing conditions because, in general, average flow rates within the lower Trinity River would substantially change during high or median flow regimes. During low flow conditions, hydrological effects of the proposed LBITP diversion of up to 450 MGD from the lower Trinity River are not anticipated to be significant. The LBITP would cause water from the Trinity River Basin, stored in Lake Livingston, to be transferred to the San Jacinto River Basin for temporary storage in Lake Houston prior to use as a water supply source. The subsequent diversion, treatment and beneficial use of this water has been authorized by Certificate of Adjudication 08-4261 for storage and release to the meet the City of Houston’s anticipated municipal and industrial demands within the downstream region. The flows diverted from the lower Trinity River would only be in the river for use when released from storage from Lake Livingston to meet the City of Houston’s demands for water. Lake Wallisville already limits flows from the lower Trinity River to Galveston Bay; in addition, the LBITP would result in an indirect benefit to Galveston Bay B&E inflows since water released to the lower Trinity River would not otherwise be present if not for the LBITP diversion.

Mitigation

The City of Houston, City of Dallas, Trinity River Authority (TRA), Tarrant Regional Water District (TRWD), and North Texas Regional Water District (NTRWD) have agreed to allow the reuse of treated effluent in the upper Trinity River Basin to flow downstream and be allocated for the protection of inflows to Lake Livingston and downstream Galveston Bay B&E flows. As reflected in water rights and water right amendments to existing permits obtained by TRA, TRWD, the City of Dallas, and the NTRWD since 2002, a wastewater discharger may recover and beneficially reuse on a one-time basis up to 70 percent of its treated effluent. The remainder of the treated effluent (30 percent) must be allowed to flow downstream for the protection of existing water rights, including Lake Livingston, at all times. The original 70 percent of treated effluent after the one-time beneficial reuse must thereafter be available for downstream flows. Additionally, since 2005 when the City of Houston started to pursue the LBITP WMS, the City has obtained five new water rights permits in the Trinity River and San Jacinto River with the goal to mitigate downstream impacts, particularly to downstream bay and estuary systems. These permits include Certification of Adjudication No. 08-4277, Permit Nos. 5807 and 5808 (which are jointly owned by the San Jacinto River Authority), and Permit Nos. 5826 and 5827. The City of Houston has also acquired Permit No. 08-4277 from the American Rice Growers Association to keep more water in the lower Trinity River Basin for discharges to the Galveston Bay B&E system. Permit Nos. 5826 and 5827 provide for the beneficial reuse of treated return flows (approximately 600,000 acre-feet/annum) and also require the City of Houston to return 50 percent of return flows generated (up to 300,000 acre-feet/annum) to flow downstream to the receiving Galveston Bay B&E system.

7. Wetland Compensatory Mitigation

EPA requested documentation that the Harrison mitigation tract ‘is under imminent threat of destruction or adverse modification. Further, EPA requested that preservation be implemented in conjunction with aquatic resource restoration, establishment and/or enhancement activities. Additionally, and based on jurisdictional acreages, EPA states the compensation ratio is approximately 2:1 of acres preserved vs. impacted acres. Because preservation is proposed for compensation, EPA requests the compensation ratio to be ‘much higher than 2:1.’

The Applicant reports that the former owner of the tract (Harrison family) had specific plans to subdivide the tract and market large-tract home sites in addition to the continuation of selected logging of the tract and offering of cattle grazing leases. Preservation is defined in 33 CFR 332.2 as the removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. On the mitigation site in question, the activities that may be removed to prevent the decline of the existing aquatic resources include; 1) silviculture, 2) ranching, and 3) sand mining. Of these three activities, silviculture and ranching are specifically exempted from regulation by Section 404(f) of the Clean Water Act. In contrast, sand mining that results in a deposition of fill material within a water of the United States is a regulated activity; however, sand mining is frequently conducted in the region in a manner that does not

result in the deposition of fill material and may be conducted in wetlands without a permit. All three of these activities have occurred on the mitigation tract and the resulting decline in the function of the wetlands was commented on by state and federal agencies during the evaluation of this project and included in both the Draft and Final EIS. The threat to the aquatic resources on the mitigation site property is clear, measurable, unregulated, and removable.

The Corps has calculated that the proposed compensatory mitigation property has approximately 1,132 acres of aquatic resources versus approximately 365 impacted acres, or a 3:1 compensation ratio, not the 2:1 ratio reported by the EPA. However, when functional or condition assessment methods or other suitable metrics are available, these methods should be used where practicable to determine how much compensatory mitigation is required. The Corps reviewed several wetland assessments for the proposed impact site and compensatory mitigation site to evaluate their function. These assessments are included in the appendices of both the Draft and Final EIS and include: 1) Wetland Evaluation Technique Version 2 (WET 2); 2) Interim Hydrogeomorphic Model for Herbaceous Riverine Wetlands; 3) Interim Hydrogeomorphic Model for Forested Riverine Wetlands**;** 4) Modified Charleston Method; 5) Galveston District Stream Condition Assessment; and 6) Habitat Evaluation Procedures (HEP). The analysis of the aquatic resource functions by a single assessment procedure is limited by procedures that are designed to compare a specific classification of aquatic resources which prohibits direct comparisons between resources. Of these assessments, two will be used to further clarify the conclusion that the proposed compensatory mitigation plan sufficiently offsets loss of function in impacted wetlands. For a detailed review of these assessments, see Appendix D and O of the FEIS.

WET 2, a wetland assessment procedure historically used by the Corps calculates a Quality Point Score (QPS) to quantify the functional value of the wetlands based on their social significance, effectiveness, and opportunity to perform function. Analysis of the 365-acre wetland impact site concluded a QPS score of 0.645 and the 1,132 acre mitigation site concluded a QPS score of 0.674. When calculating compensatory mitigation using WET 2, the QPS score is multiplied by the wetland acreage to calculate the lost function and values and compare them to the a mitigation plan. In the case of the LBITP Compensatory Mitigation Plan, the mitigation to impact ratio using WET 2 is 3:1 due to the lower function and value of the impact site compared the Compensatory mitigation site.

Although not specific to aquatic resources, HEP is used to document the quantity and quality of available habitat for selected wildlife species. Results of the HEP analysis indicate that the Applicant's preferred alternative contains 384 Annual Average Habitat Units **(**AAHU**)** s for the no action alternative and 191 AAHUs for the with-project alternative over the 50-year period of analysis. Therefore, a net loss of 193 AAHUs would be expected to result from construction of the preferred alternative. The net loss exhibited by the analysis largely results from alteration of habitat from vegetated areas to a conveyance canal and adjacent access berms. The mitigation site contains 1,414 AAHUs for the no-action alternative and 1,467 AAHUs for the with-project alternative

over the 50-year period of analysis. Therefore, a net gain of 53 AAHUs would be realized as a result of construction of the preferred alternative. The HEP analysis indicates that the mitigation site contains 3.6 times the amount of baseline AAHUs over the 50-year period of analysis.

The results of this study clearly indicate that the quality of the habitat on the mitigation site to be preserved provides important physical, chemical, or biological functions and is measurably more ecologically sustainable than the resources located within the preferred alignment. While the EPA did not state how much higher they felt the compensation ratio should be, the ratio for both aquatic function and aquatic acreage already exceeds 3:1.

8. Stream Compensatory Mitigation

EPA requested the Record of Decision include discussion of compensatory mitigation for impacts to the Trinity River and adjacent wetlands at the intake structure from mechanized clearing and bank hardening. Further, EPA stated that if no work is performed to enhance the proposed preservation areas and most of the water and stream impacts for the project are unaccounted for, the EPA recommends permit denial.

While some work will occur below the line of ordinary high water in the Trinty River relevant to constructing the pump station, there is no riverine functional loss in the Trinity River and, therefore, no need to require compensatory mitigation. As is made clear in the discussion (see item 5. above), other than the 65 linear feet of impact to Luce Bayou, all other impacts are to non-jurisdictional agricultural drainage ditches. Compensatory mitigation of impacts to Luce Bayou is included with the compensatory mitigation site. The mitigation site itself is part of the riparian corridor of the Trinity River and contains a tributary, Gillen Bayou. The bayou is located in one of the areas deeply impacted by the demonstrable threat discussed in the wetland compensatory mitigation section above. The riparian corridor and stream channel have begun stabilizing and are of sufficient quality to qualify as a stream preservation site in accordance with the Galveston District Stream Condition Assessment Procedure. Approximately 65-linear feet of Luce Bayou will be impacted by the LBITP which will be compensated by the preservation of 12,100 linear feet of Gillen Bayou and its riparian buffer zone.

Findings

The Corps concludes that the on-site and off-site build alternatives, including the no-action alternative, for the project were properly considered and that the alternatives carried through the impact evaluation process in the EIS were reasonable and sufficient to meet the need for alternatives evaluation. Impacts to waters of the United States proposed for the LBITP project were quantified in the EIS. In addition, the EIS included an estimate of waters present at each off-site alternative. Furthermore, the Corps evaluated in the EIS the nature and degree of the effect that the discharge into waters at the proposed off-site alternatives will have, both individually and cumulatively, on the structure and function of: 1) the aquatic ecosystem and organisms; 2) the water quality, current patterns, circulation, including downstream flows, and normal water fluctuation;

and 3) the introduction, relocation, or increase in contaminants within those waters. The Applicant, in identifying their preferred alternative, minimized environmental impacts to those necessary to meet the stated purpose and need for the project.

The Applicant's preferred alternative will affect 365 acres of wetlands and 65 linear feet of Luce Bayou, more than the other two build alternatives. However, through analysis using functional assessments, the Corps concluded that 75%, or 277 acres, of waters affected in Alternative 3 are of low function. Waters of the United States that would be affected by the Applicant's preferred alternative include 125.07 acres of forested wetlands, 31.68 acres of scrub shrub wetlands, 206.78 ac of emergent wetlands, 3.57 ac of surface drainage features, and 2.11 acres of open water where portions of the proposed pump station would be located in the Trinity River. The low quality 277 acres are characterized as wetlands or waters having reduced or impaired function due to a variety of human activities including farming, silviculture or related activities, Additionally, Alternative 3A affects fewer streams as compared to the other build alternatives. Many of the streams within the rights of way of Alternatives 4 and 6 will have to be enclosed in culverts or otherwise routed over or under the water supply pipelines as a consequence of how the water supply conveyance must be constructed. Right of way design would necessarily alter natural streams so as to remove riparian vegetation and modify the stream course within the right of way. By contrast, Alternative 3A affects a short length of a natural stream and only affects man made drainages and ditches along the route to Lake Houston.

The applicant has proposed to compensate for unavoidable impacts to 365 acres of wetlands and 65 linear feet of Luce Bayou by preserving a 2,979-acre tract along the Trinity River. The mitigation tract is comprised of 1,132 acres of high functioning wetlands and12,100 linear feet of Gillen Bayou, a tributary of the Trinity River. The compensatory mitigation tract will be conveyed to the Trinity National Wildlife Refuge who will manage and protect the site in perpetuity. The Corps concludes that the proposed compensatory mitigation plan will offset the loss of functions and values of the proposed project impacts. A special condition will be added to the permit to require the compensatory mitigation plan be implemented prior to work in Waters of the United States.

In response to the potential significant affect on the human environment resulting from the transmission of zebra mussels from the Trinity River to Lake Houston, the primary drinking water source for the City of Houston, the applicant developed a control and treatment plan, titled *Coastal Water Authority Zebra Mussel Response Plan: Luce Bayou Interbasin Transfer Project*. The Corps concludes that the response plan sufficiently mitigates the risk of transfer of zebra mussels and will add a special condition to the permit to require implementation of the plan upon issuance of the permit.

Biological surveys of Alternative 3A have verified that there would be no effect on Federally listed threatened or endangered species or species that may be of concern to the TPWD. On-site archaeological and historical structure surveys have been conducted that demonstrate these resources have been avoided to the maximum extent

practicable, and potential impacts to affected resources will be mitigated according to formal agreement with the State Historic Preservation Officer and Indian Tribes, and special permit conditions.

40 CFR 230.10(a)(2) charges the Corps with taking cost (in addition to existing technology and logistics) into account in light of overall project purposes when evaluating the practicability of alternatives. Alternative 3A is estimated to cost $228 million to construct. Alternative 4 is estimated to cost $595.3 million, with Alternative 6 estimated at $494 million to construct (Chapter 2, Section 2.7.23 of the FIES). The primary difference in the cost of these alternatives is the 200,000 linear feet of 108" pipe necessary for Alternatives 4 and 6 versus the 10,000 linear feet of 108" pipeline necessary for Alternative 3A. The use of 108" pipeline is further complicated by the need to specifically manufacture 108" pipeline for the project and the uncertainty of the availability of the materials necessary for manufacture. While the project purpose cannot eliminate the need for the pipeline altogether, Alternative 3A was designed to minimize the need for the pipeline thus reducing the cost and uncertainty of the project.

While cost is not the sole factor determining practicability of an alternative, it is reasonable to conclude that alternatives that would cost twice or more than the preferred alternative would be considered significant additional cost alternatives. The Applicant is a public entity who is not in the business of making a profit from the water conveyance. It is concerned with providing necessary infrastructure to residents and businesses that pay for such facilities through their taxes and water bills. Consequently, implementation costs of such facilities must be considered as part of the public interest review.

The Corps' analysis of both the on-site and off-site alternatives did not identify a practicable alternative to the proposed discharge that would have less adverse effect on the aquatic ecosystem. Therefore, the Corps concludes that the applicant's preferred alternative, Alternative 3A, is the least environmentally damaging practicable alternative.

<u>The following Special Conditions will be Added to the Authorization:</u>

1. The Applicant understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.
2. When structures or work authorized by this permit are determined by the District Engineer to have become abandoned, obstructive to navigation or cease to be used for the purpose for which they were permitted, such

structures or other work must be removed, the area cleared of all obstructions, and written notice given to the Chief of Compliance, Galveston/District Regulatory Branch, within 30 days of completion.

3. Prior to construction or the commencement of work within the boundary of site 41LB42, the permittee shall: (1) sign and adhere to the terms and conditions of the Memorandum of Agreement Regarding the Resolution of Adverse Effects to Site 41LB42 and Tribal and Archeological Monitoring of Project Work on Capers Ridge, Liberty County, Texas (MOA), including all attachments to the MOA; (2) shall conduct data recovery on site 41LB42 as described in the statement of work titled “Data Recovery Plan for Investigations at 41LB42, Liberty County, Texas” dated December 6, 2013, and prepared by Moore Archeological Consulting, Inc. (Attachment 1 of the MOA); (3) the data recovery effort shall be considered complete upon written confirmation from the Corps; and (4) have a Tribal Monitor present during all data recovery efforts and adhere to the terms and conditions of the Monitoring Plan (Attachment 2 of the MOA).
4. During construction and preconstruction activities on the landform referred to as Capers Ridge, the permittee shall have a Tribal Monitor and an Archeological Monitor present and shall adhere to the terms and conditions of the Monitoring Plan (Attachment 2 of the MOA).
5. Should burials or human remains be encountered during data recovery, preconstruction activities, or construction, the permittee shall adhere to the terms and conditions of the Reburial Plan (Attachment 4 of the MOA).
6. Prior to start of work in waters of the United States, including wetlands, the permittee will transfer ownership of the 2,979-acre tract identified in the attached *Luce Bayou Interbasin Transfer Project Final Mitigation Plan Permit Application No. SWG-2009-00188* to the U.S. Fish and Wildlife Service’s Trinity River National Wildlife Refuge with receipt of transfer of ownership provided to the Chief of the Compliance, U.S. Army Corps of Engineers, Galveston District.
7. The permittee agrees to immediately implement the commitments in the attached *Coastal Water Authority Zebra Mussel Response Plan: Luce Bayou Interbasin Transfer Project*. The permittee will provide copies of the plan’s monitoring reports annually to the Chief of the Compliance, U.S. Army Corps of Engineers, Galveston District. The permittee will provide notification of a confirmed occurrence of zebra mussels in any location that triggers a change in risk level to the Chief of the Compliance, U.S. Army Corps of Engineers, Galveston District within 1 month of encountering.

Conclusion

I have reviewed and evaluated, in light of the overall public interest, the documents and factors concerning this permit application, as well as the stated views of other interested Federal and non-Federal agencies and the concerned public, relative to the proposed work in waters of the United States. This evaluation is in accordance with the guidelines contained in 40 CFR 230 pursuant to Section 404(b)(1) of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. The Corps has required the Applicant to avoid, minimize, and mitigate for impacts and believes that the project, with conditions, represents the least environmentally damaging practicable alternative based on the Applicant's purpose and need for the project. After weighing favorable and unfavorable effects as discussed in this document, I find that issuance of a Department of the Army permit, with conditions, is not contrary to the public interest.

16 JAN 14
(Date)

Richard P. Pannell
Colonel, Corps of Engineers
District Engineer