UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

East Texas Electric Cooperative, Inc., Texas Project No. 12632-002

NOTICE OF AVAILABILITY OF ENVIRONMENTAL ASSESSMENT

(February 2, 2011)

In accordance with the National Environmental Policy Act of 1969 and the Federal Energy Regulatory Commission's (Commission or FERC's) regulations, 18 Code of Federal Regulations (CFR) Part 380 (Order No. 486, 52 Federal Register [FR] 47897), the Office of Energy Projects has reviewed East Texas Electric Cooperative, Inc.'s (the Cooperative's) application for license for the Lake Livingston Hydroelectric Project (FERC Project No. 12632-002), located on the Trinity River near the city of Livingston, in San Jacinto, Polk, Trinity, and Walker counties. The project would not occupy any federal lands.

Staff prepared an environmental assessment (EA) that analyzes the potential environmental effects of licensing the project, and concludes that licensing the project, with appropriate environmental protective measures, would not constitute a major federal action that would significantly affect the quality of the human environment.

A copy of the EA is available for review at the Commission in the Public Reference Room or may be viewed on the Commission's web site at www.ferc.gov using the "eLibrary" link. Enter the docket number excluding the last three digits in the docket number field to access the document. For assistance, contact FERC Online Support at FERCOnlineSupport@ferc.gov, or toll-free at 1-866-208-3676, or for TTY, 202-502-8659. You may also register online at www.ferc.gov/docs-filing/esubscription.asp to be notified via email of new filings and issuances related to this or other pending projects. For assistance, contact FERC Online Support.

For further information, contact Sarah Florentino at (202) 502-6863, or by email at sarah.florentino@ferc.gov.

Kimberly D. Bose,
Secretary.

ENVIRONMENTAL ASSESSMENT

FOR HYDROPOWER LICENSE

Lake Livingston Hydroelectric Project—FERC Project No. 12632-002

Texas

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, D.C. 20426

January 2011

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ACRONYMS AND ABBREVIATIONS

APE	area of potential effects
applicant	East Texas Electric Cooperative, Inc.
BMP	best management practice
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
Cooperative	East Texas Electric Cooperative, Inc.
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DIDSON	high-definition sonar
DO	dissolved oxygen
EA	environmental assessment
EFH	Essential Fish Habitat
EPAct	Energy Policy Act of 2005
EPRI	Electric Power Research Institute
ERCOT	Electric Reliability Council of Texas
ESA	Endangered Species Act
ºF	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
FM	Farm-to-Market Road
FPA	Federal Power Act
FWS	U.S. Fish and Wildlife Service
HPMP	Historic Properties Management Plan
L&WCF	Land & Water Conservation Fund
mg/L	milligrams per liter
MOA	Memorandum of Agreement
msl	mean sea level
MW	megawatt
MWh	megawatt-hour
National Register	National Register of Historic Places
NERC	North American Electric Reliability Corporation
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
PA	Programmatic Agreement
ROW	right-of-way
RV	recreational vehicle
SCORP	State Comprehensive Outdoor Recreation Plan
SHPO	State Historic Preservation Officer
SWPPP	Storm Water Pollution Prevention Plan
TCP	traditional cultural properties

Texas CEQ	Texas Commission on Environmental Quality
Texas PWD	Texas Parks and Wildlife Department
TRA	Trinity River Authority of Texas
USGS	U.S. Geological Survey
WQC	water quality certification

EXECUTIVE SUMMARY

Proposed Action

East Texas Electric Cooperative, Inc. (applicant or the Cooperative) proposes to construct, operate, and maintain the 24-megawatt (MW) Lake Livingston Hydroelectric Project that would be located on the Trinity River Authority of Texas' (TRA) existing 14,400-foot-long (approximate) Lake Livingston dam on the Trinity River near the city of Livingston, in San Jacinto, Polk, Trinity, and Walker counties, Texas. The project would not occupy any federal lands.

Project Description

In addition to Lake Livingston dam, the proposed project would consist of the following new facilities: (1) an intake structure and headrace channel; (2) three steel penstocks; (3) a powerhouse; (4) a tailrace channel; (5) an approximate 3.2-mile-long, 138-kilovolt transmission line interconnecting the project with Entergy's existing Rich substation near Goodrich; and (6) appurtenant facilities.

The Cooperative proposes to finalize the draft Memorandum of Agreement (MOA) with TRA governing project operations. Under the MOA, the project would operate using TRA's current scheduled releases from Lake Livingston dam.

Proposed Environmental Measures

The Cooperative proposes the following measures for the protection and enhancement of environmental resources: (1) an erosion and sediment control plan; (2) provide a minimum flow of 200 cubic feet per second (cfs) over the dam spillway during generating periods, with all flows to be spilled and generation stopped at releases of about 750 cfs or lower, to maintain water quality and aquatic habitat in the stilling basin and in the Trinity River downstream from the dam; (3) provide air injection equipment in the project powerhouse to improve dissolved oxygen (DO) in project discharges; (4) install trashracks to exclude larger debris and fish from the powerhouse intake; (5) conduct post-operational monitoring in accordance with a Post-Startup Monitoring Plan to determine whether downstream water quality and fishery resources are adequately protected during project operation; (6) conduct pre-construction surveys for listed plants on the proposed transmission line route, and consult with the U.S. Fish and Wildlife Service to minimize potential effects for any populations encountered during the surveys; (7) prepare a recreation management plan and implement recreational enhancements downstream of Lake Livingston dam, to include a new barrier-free gazebo/observation platform, a parking area, a trail, benches, interpretive signs, new lighting, a new access road, and restoration of Southland Park lands to their natural state by removal of abandoned structures; and (8) implement a Historic Properties Management Plan (HPMP).

Alternatives Considered

This environmental assessment (EA) analyzes the effects of the proposed construction and operation of the project and recommends conditions for an original license for the project. In addition to the Cooperative's proposal, we consider two alternatives: (1) the Cooperative's proposal with staff modifications; and (2) no action—the project would not be constructed.

Under the staff alternative, the project would be constructed and operated as proposed by the Cooperative, but with the following additional measures: (1) monitor the downstream river banks and around other project facilities during project operations for signs of scour and erosion, as part of the erosion and sediment control plan; (2) prepare a final Post-Startup Monitoring Plan including a schedule for longer term fisheries monitoring; (3) institute unit shutdowns in order to meet DO criteria, if DO standards cannot be met by the air injection system, as part of the final Post-Startup Monitoring Plan; (4) construct the project in accordance with the National Bald Eagle Management Guidelines; (5) file, prior to ground-disturbing activities, the results of the Cooperative's proposed survey of the transmission line route for the presence of federally or state-listed rare plants, and if any are found, propose mitigation measures to protect these species during both project construction and maintenance activities; (6) file a recreation monitoring report with the Commission every 6 years in conjunction with the Licensed Hydropower Development Recreation Report (Form 80) filing that would summarize monitoring activities and any recommendations for future recreation management; and (7) revise and implement the Cooperative's January 2010 HPMP. The recommended staff modifications include, or are based in part on, recommendations made by the federal and state resource agencies that have an interest in the resources that may be affected by the proposed project construction and operation.

Public Involvement and Areas of Concern

Before filing its license application, the Cooperative conducted a prefiling consultation process under the alternative licensing process. The intent of the Commission's prefiling process is to initiate public involvement early in the project planning process and to encourage citizens, governmental entities, tribes, and other interested parties to identify and resolve issues prior to an application being formally filed with the Commission. After the application was filed, we conducted scoping to determine what issues and alternatives should be addressed. A scoping document was distributed to interested parties on February 27, 2008. Scoping meetings were held in Livingston, Texas, on March 26, 2008. On May 27, 2010, we requested conditions and recommendations in response to the ready for environmental analysis notice.

The primary issues associated with licensing the project are the effects of project operations on water quality and fishery resources downstream from Lake Livingston dam, as well as access to public recreation.

Staff Alternative

Geology and Soils

Ground disturbance would occur at several locations in the project area during project construction, which could also mobilize reservoir sediments and bank material. The proposed erosion and sediment control plan would minimize erosion and sedimentation.

Aquatic Resources

The proposed project would use flows that TRA currently directs through the dam, and the applicant would not regulate or alter the amount of flow that TRA releases from Lake Livingston. However, project operation would result in a small increase in water temperature and some reduction in DO downstream from Lake Livingston dam, compared to current conditions, because the project would withdraw water from a higher elevation in the reservoir and would reduce the amount of aeration that now occurs over the spillway. The proposed minimum flows, the air injection equipment, and project shutdowns (if needed) would maintain DO levels and water temperatures close to existing conditions during summer critical water quality periods, and would maintain state water quality standards downstream from the dam.

Project operation would result in a minor change in aquatic habitat downstream from Lake Livingston dam as a result of changes in flow patterns, but this would have minimal effects on fishery resources in the Trinity River. The flow pattern changes would not result in major changes in habitat suitability or in fish distribution because the changes in the flow patterns would be limited to the area immediately downstream from the dam.

Project operation would entrain some fish that now pass downstream through the spillway gates, and are a major source of recruitment for fish populations downstream from the dam, particularly striped bass. Some of these fish would be exposed to injury and mortality in the project turbines, but with the proposed large, "fish friendly" Kaplan units, survival of fish passing through the turbine generators would be expected to be higher than it would be with other turbine designs. The proposed trashracks would also physically exclude larger fish from the turbine intake and prevent passage through the turbine generators. A Post-Startup Monitoring Plan would include monitoring of fish populations downstream to ensure that project operation is not adversely affecting these populations.

Terrestrial Resources

Construction of the transmission line would remove trees in upland woodland areas, cause disturbance to grassland or pasture areas, and increase temporary disturbance for wildlife on about 39 acres. Proposed measures to protect terrestrial resources, wetlands, and federally or state-listed rare plants include: (1) design and construct the transmission line to take into account soil stability, the protection of natural vegetation, sensitive habitats, and adjacent natural habitat for plants and wildlife, and the prevention of silt deposition in watercourses; (2) maximize the preservation of natural habitat and the conservation of natural resources during the clearing of the transmission line right-of-way; (3) survey the transmission line route during the appropriate seasons and prior to ground-disturbing activities to determine the presence of federally or state-listed rare plants, and if such plants are found, consult with state and federal agencies and propose mitigation measures to protect these species during project construction, operation and maintenance activities, with survey results to be filed with the Commission; (4) if endangered or threatened wildlife habitat is encountered during construction, obtain guidance from the U.S. Fish and Wildlife Service prior to any further clearing or construction activities; (5) construct the transmission facilities in accordance with current standards to reduce the risk of avian injury or mortality; and (6) conduct field investigations to determine whether any existing structures to be removed are occupied by rare bat species, and if such species are encountered, consult with state and federal agencies prior to modification of the structure. The project also would be constructed in accordance with the National Bald Eagle Management Guidelines to avoid disturbance of bald eagles.

Threatened and Endangered Species

No federally listed aquatic or terrestrial species are known to occur within the vicinity of the proposed project, but two federally listed endangered plants, Texas trailing phlox and Texas prairie dawn, could occur along the transmission line route. The proposed survey of the route prior to ground-disturbing activities would confirm whether construction would affect these plant species. If these species are found, the U.S. Fish and Wildlife Service would be consulted to determine appropriate measures to protect these species. Such measures should include re-design of the transmission line route or construction plans to avoid populations of these endangered plants and their habitat.

Recreation and Land Use

Project construction would have minimal effect on existing recreation facilities. The proposed renovation and reopening of recreation facilities at Southland Park downstream from the dam would increase recreational opportunities by restoring public access to the area downstream from the dam and allowing activities such as sight-seeing, wildlife observation, and enjoyment of the natural area of Southland Park. Land use in

the area would be minimally affected, because most of the area to be occupied by project facilities is already part of the existing Lake Livingston dam. The project transmission line would traverse primarily pasture land and scattered woodland. These land uses could continue in most of the proposed transmission line corridor.

Cultural Resources

Project construction and operation could affect properties that are eligible for listing on the National Register of Historic Places (National Register), including prehistoric sites within the proposed transmission line corridor, which was identified by the Texas State Historic Preservation Officer (SHPO) as having a high potential for significant cultural resources. Historic properties would be protected under the provisions of the HPMP filed with the Commission on January 25, 2010. Under the staff alternative, the Cooperative would consult with the Texas SHPO, participating tribes, and the Commission to revise the January 2010 HPMP to: depict the area of potential effects as encompassing the entirety of Lake Livingston reservoir and areas to be affected by the project; clarify that section 106 applies to this federal undertaking, and not the Texas Historical Commission's "Rules of Practice and Procedure for the Antiquities Code of Texas"; evaluate the Lake Livingston dam for listing on the National Register upon reaching 50 years of age, and assess potential effects on this structure; and identify and evaluate traditional cultural properties of importance to the Alabama-Coushatta Tribe, Caddo Nation, and Kickapoo Tribe, prior to ground-disturbing activities associated with project construction.

Conclusions

Based on our analysis, we recommend licensing the project as proposed by the Cooperative, with some staff modifications and additional measures, as described above under *Alternatives Considered*.

In section 4.2 of the EA, we compare the total project cost to the cost of obtaining power from a likely alternative source of power in the region, for each of the alternatives identified above. Our analysis shows that, during the first year of operation, under the Cooperative's proposal, the project would produce 124,000 MWh of power at a cost that is $4,168,930, or $33.62/MWh, more than the cost of alternative power. Under the staff-recommended alternative, the project would produce 120,160 MWh of power at a cost that is $4,327,810, or $36.02/MWh, more than the cost of alternative power. The 3,840-MWh reduction in power production under the staff-recommended alternative reflects our estimate of foregone generation if project shutdowns are required to maintain state water quality standards for DO during the summer months.

On the basis of our independent analysis, we conclude that issuing an original license for the project, with the environmental measures that we recommend, would not be a major federal action significantly affecting the quality of the human environment.

We chose the staff alternative as the preferred alternative because: (1) the project would provide a dependable source of electrical energy for the region (120,160 MWh annually); (2) the 24 MW of electrical energy generated from a renewable resource may offset the use of fossil-fueled, steam-electric generating plants, thereby conserving nonrenewable resources and reducing atmospheric pollution; and (3) the recommended environmental measures proposed by the Cooperative, as modified by staff, would adequately protect and enhance environmental resources affected by the project. The overall benefits of the staff alternative would be worth the cost of the proposed and recommended environmental measures.

ENVIRONMENTAL ASSESSMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, D.C.

Lake Livingston Hydroelectric Project
FERC Project No. 12632-002--Texas

1.0 INTRODUCTION

1.1 Application

On March 31, 2009, East Texas Electric Cooperative, Inc. (applicant or the Cooperative) filed an application for an original license with the Federal Energy Regulatory Commission (Commission or FERC) for the Lake Livingston Project (project). The 24-megawatt (MW) project would be located on the Trinity River Authority of Texas'(TRA) existing 14,400-foot-long (approximate) Lake Livingston dam on the Trinity River near the city of Livingston, in San Jacinto, Polk, Trinity, and Walker counties, Texas (figure 1). The project does not occupy any federal lands. As proposed, the project would generate an average of about 124,000 megawatt-hours (MWh) of energy annually.

1.2 Purpose of Action and Need for Power

The purpose of the proposed project is to provide a new source of hydroelectric power. Therefore, under the provisions of the Federal Power Act (FPA), the Commission must decide whether to issue a license to the Cooperative for the Lake Livingston Project and what conditions should be placed in any license issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (e.g., flood control, irrigation, and water supply), the Commission must give equal consideration to the purposes of: energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife (including related spawning grounds and habitat); the protection of recreational opportunities; and the preservation of other aspects of environmental quality.

Issuing an original license for the Lake Livingston Project would allow the Cooperative to generate electricity at the project for the term of a license, making electrical power from a renewable resource available to its customers.

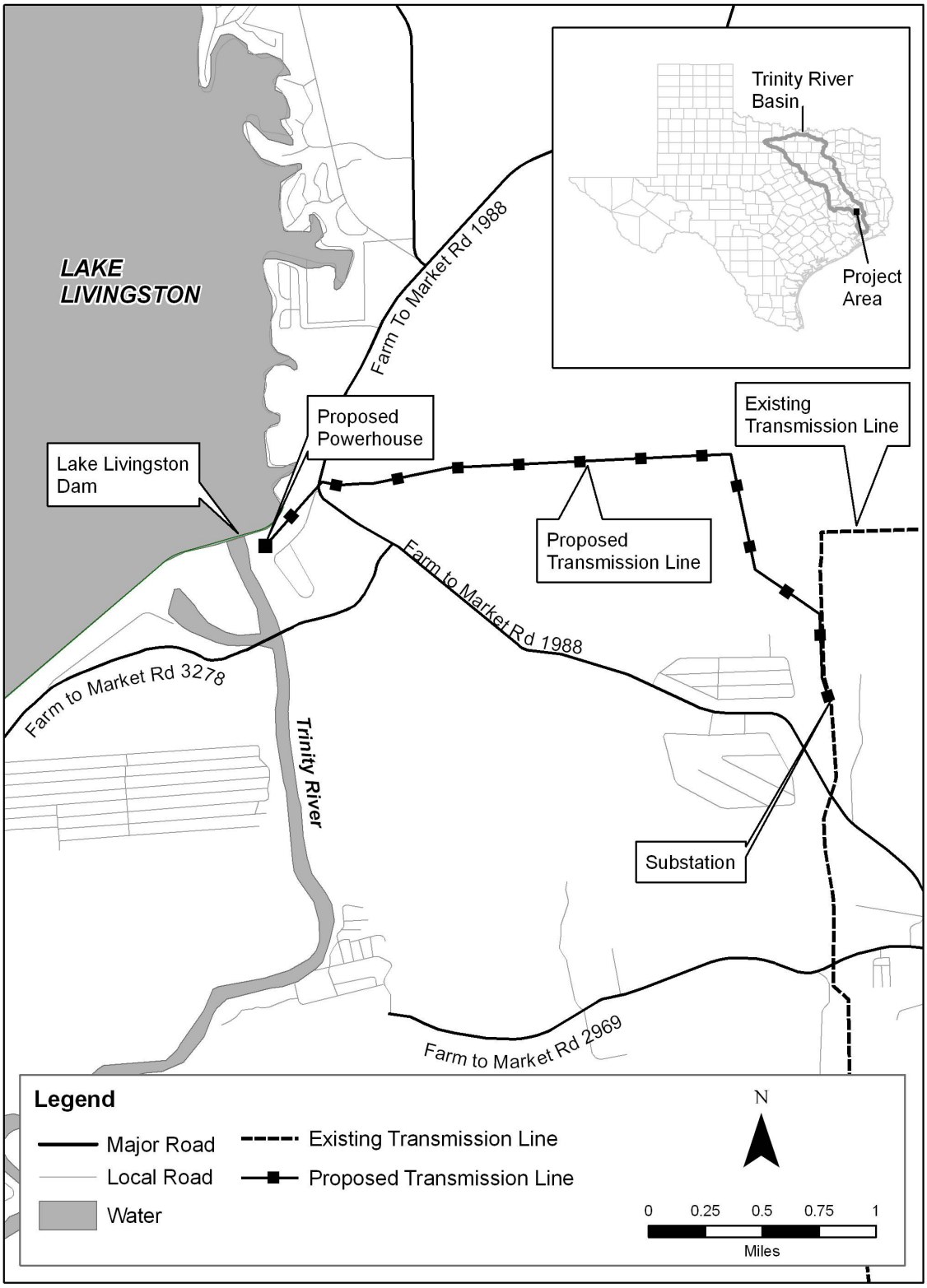

Figure 1. Location of proposed Lake Livingston Hydroelectric Project (Source: staff).

This environmental assessment (EA) assesses the effects associated with construction and operation of the project, alternatives to the proposed project, and makes recommendations to the Commission on whether to issue a license, and if so, recommends terms and conditions to become a part of any license issued.

In this EA, we assess the environmental and economic effects of constructing and operating the project: (1) as proposed by the applicant; and (2) with our recommended measures. We also consider the effects of the no-action alternative. Important issues that are addressed include streamflows, water quality, and aquatic habitat downstream from the dam; vegetation, wetlands, riparian habitat, and wildlife resources; federally listed threatened and endangered species; recreational access; historic properties; and project economics, associated with implementation of the proposed and recommended environmental measures.

The Lake Livingston Project would provide hydroelectric generation to meet part of Texas' power requirements, resource diversity, and capacity needs. The project would have an installed capacity of 24 MW and, as recommended by staff, would generate approximately 120,160 MWh per year.

The North American Electric Reliability Corporation (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period. The Lake Livingston Project would be located in the Electric Reliability Council of Texas (ERCOT) region of NERC. According to NERC's 2009 forecast, annual energy requirements for the ERCOT region are projected to grow at annual rates of 2.04 percent, from 2009 through 2018 (NERC, 2009). NERC projects resource capacity margins (generating capacity in excess of demand) will drop below the minimum target of 12.5 percent by 2016.

We conclude that power from the Lake Livingston Project would help meet a need for power in the ERCOT region in both the short- and long-term. The project would provide low-cost power that displaces non-renewable, fossil-fired generation and contributes to a diversified generation mix. Displacing the operation of fossil-fueled facilities may avoid some power plant emissions and create an environmental benefit.

1.3 Statutory and Regulatory Requirements

Any license issued for the Lake Livingston Project is subject to numerous requirements under the FPA and other applicable statutes. We summarize the major regulatory requirements in table 1 and describe them below.

Table 1. Major statutory and regulatory requirements for the Lake Livingston Hydroelectric Project (Source: staff).

Requirement	Agency	Status
Section 18 of the FPA (fishway prescriptions)	U.S. Fish and Wildlife Service (FWS)	FWS filed preliminary prescriptions on July 23, 2010. The applicant filed an alternative prescription and request for trial-type hearing on August 25, 2010. On October 6, 2010, FWS withdrew its prescription and requested reservation of authority to prescribe fishways in the future. On October 7, 2010, the applicant withdrew its request for trial-type hearing and alternative prescription.
Section 10(j) of the FPA	FWS, Texas Parks and Wildlife Department (Texas PWD)	FWS and Texas PWD timely filed, on July 23, 2010, and August 2, 2010, respectively, recommendations.
Clean Water Act (CWA)—water quality certification (WQC)	Texas Commission on Environmental Quality (Texas CEQ)	On April 3, 2009, the Cooperative submitted an application for WQC. It withdrew this application on March 29, 2010, and resubmitted application for WQC on April 1, 2010. The application remains pending before the Texas CEQ, with the due date for agency action by April 1, 2011.
Endangered Species Act Consultation (ESA)	FWS, National Marine Fisheries Service (NMFS)	No federally listed aquatic or terrestrial species occur within the vicinity of the project.

Requirement	Agency	Status
Coastal Zone Management Act Consistency (CZMA)	Texas Coastal Coordination Council (staffed by Texas General Land Office)	The project is not subject to the Texas Coastal Management Program review, and no consistency certification is required, as confirmed by letter from the Texas Coastal Coordination Council, filed with the Commission on May 21, 2010.
National Historic Preservation Act (NHPA)	Texas Historical Commission (State Historic Preservation Office)	The applicant plans to finalize the existing draft Historic Properties Management Plan (HPMP).
Magnuson-Stevens Fishery Conservation and Management Act	NMFS	We conclude that licensing the project, as proposed by the applicant with staff-recommended measures, would not adversely affect Essential Fish Habitat. As such, no consultation is required with NMFS.

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretary of Commerce or the Secretary of the Interior. On July 23, 2010, the U.S. Fish and Wildlife Service (FWS) timely filed a fishway prescription that would require the Cooperative to install upstream passage facilities for the American eel (*Anguilla rostrata*), and would require studies beginning in the year 2025 to determine whether downstream eel passage measures are needed at the project. These measures are discussed under section 3.3.2, *Diadromous Fish Passage*.

The Energy Policy Act of 2005 (EPAct) provides parties to this licensing proceeding the opportunity to request a trial-type hearing regarding issues of material fact that support the prescriptions developed under FPA section 18. EPAct also provides parties the opportunity to propose an alternative to the prescriptions. In accordance with

section 241 of EPAct, the Cooperative, in an August 25, 2010, filing, requested a hearing regarding issues of material fact pertaining to FWS' fishway prescription. The primary issue raised by the Cooperative is that the prescription is not supported by the Commission's public record for the licensing proceeding, nor by available scientific studies and literature. The Cooperative also filed an alternative fishway prescription under which the Cooperative would contribute $20,000 per year for 15 years (for a total of $300,000) to a grant program supporting the creation of eel passage projects, removal of barriers to eel movement, and/or beneficial stocking of eels primarily at locations along the Atlantic coast. On October 6, 2010, FWS withdrew its prescription and requested a reservation of authority to prescribe fishways under section 18 be included in any license issued for the project. On October 7, 2010, the Cooperative then withdrew its request for trial-type hearing and alternative fishway prescription.

1.3.1.2 Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

FWS and the Texas PWD timely filed, on July 23, 2010, and August 2, 2010, respectively, recommendations under section 10(j), as summarized in table 8, in section 5.4, *Fish and Wildlife Agency Recommendations*. In section 5.4, we also discuss how we address the agency recommendations and comply with section 10(j).

1.3.1.3 Section 21 Eminent Domain Restrictions

Section 21 of the FPA provides that no licensee may use the right of eminent domain provided for under that section's provisions to acquire any lands or other property that, prior to the date of enactment of the Energy Policy Act of 1992, were owned by a state or political subdivision thereof and were part of or included within any public park, recreation area, or wildlife refuge established under state or local law. Section 21 provides further that, in the case of lands or other property that are owned by a state or political subdivision and are part of or included within a public park, recreation area, or wildlife refuge established under state or local law on or after the date of enactment of the Energy Policy Act of 1992, no licensee may use the right of eminent domain under section 21 to acquire such lands or property unless there has been a public hearing held in the affected community and a finding by the Commission, after due

consideration of expressed public views and the recommendations of the state or political subdivision that owns the lands or property, that the license will not interfere or be inconsistent with the purposes for which such lands or property are owned.

The Cooperative is seeking to lease about 20 acres of Polk County's Southland Park for inclusion within the project. Southland Park appears to have been established prior to the enactment of the Energy Policy Act of 1992. If so, the Cooperative would be barred from using the right of eminent domain under section 21 to acquire any Southland Park lands.

1.3.2 Clean Water Act

Under section 401 of the Clean Water Act (CWA), a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the CWA. On April 3, 2009, the Cooperative applied to the Texas Commission on Environmental Quality (Texas CEQ) for 401 water quality certification (WQC) for the Lake Livingston Project. It withdrew this application on March 29, 2010, and resubmitted an application for WQC on April 1, 2010. Texas CEQ received this request on April 1, 2010. Texas CEQ has not yet acted on the request. The WQC is due by April 1, 2011.

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species. There are six federally listed species that may occur in one or more of the four counties occupied by the proposed project. These species include the endangered red-cockaded woodpecker (*Picoides borealis*), Texas prairie dawn (*Hymenoxys texana*), and Texas trailing phlox (*Phlox nivalis* ssp *texensis*); and the threatened piping plover (*Charadrius melodus*), Louisiana black bear (*Ursus americanus luteolus*), and black bear (*Ursus americanus*, treated as threatened in East Texas by similarity of appearance to Louisiana black bear).

None of the listed species has been specifically identified as being present within the proposed project boundary or in the area of impact downstream from the proposed hydropower facilities, nor has any critical habitat been designated within those areas. There is the potential for Texas prairie dawn and Texas trailing phlox to occur within the transmission line right-of-way (ROW). Our analyses of project impacts on threatened and endangered species are presented in section 3.3.4, *Threatened and Endangered Species*, and our recommendations in section 5.2, *Comprehensive Development and Recommended Alternative*. Based on our analysis, we conclude that licensing the Lake Livingston Project, as proposed with staff-recommended measures, is not likely to

adversely affect the Texas prairie dawn and Texas trailing phlox, and would not affect the red-cockaded woodpecker, piping plover, Louisiana black bear, and black bear.

1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 U.S.C. § 1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

On the Trinity River, the upper boundary of the Texas Coastal Management Program is the border between Chambers and Liberty counties, approximately 7.5 miles upstream from the northern extent of Trinity Bay and more than 120 river miles downstream from the Lake Livingston dam. During prefiling consultation, a state representative informed the applicant's consultant that, because of the proposed project's lack of proximity to the coastal zone boundary and its proposal to operate using TRA's scheduled water releases, the project is not subject to the coastal management program. This determination was confirmed by letter from the Texas Coastal Coordination Council, filed with the Commission on May 21, 2010 (letter from Tammy S. Brooks, Consistency Review Coordinator, Texas General Land Office, to Nelson H. Nease, Brickfield, Burchette, Ritts & Stone, PC, May 18, 2010). Therefore, the project is not subject to the Texas Coastal Management Program review and no consistency certification is needed for the action.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties (TCPs), and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

To meet the requirements of section 106, the Commission intends to execute a Programmatic Agreement (PA) for the protection of historic properties from the effects of the construction and operation of the Lake Livingston Project. The terms of the PA would ensure that the Cooperative addresses and treats all historic properties identified within the project's area of potential effects (APE) through the finalization of the existing draft HPMP.

1.3.6 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act requires federal agencies to consult with National Marine Fisheries Service (NMFS) on all actions that may adversely affect Essential Fish Habitat (EFH). NMFS, in coordination with the Gulf of Mexico Fishery Management Council, has designated EFH in the Gulf of Mexico and its estuaries for red drum, reef fish, coastal migratory pelagics, shrimp, stone crab, spiny lobster, and coral. None of the EFH designations extends into the Trinity River above the estuarine area at the top of Trinity Bay, near Wallisville, Texas. Given the proposed project's substantial distance from any EFH and the Cooperative's proposal to operate using TRA's scheduled water releases, we conclude that licensing the project, as proposed by the applicant with staff-recommended measures, would not adversely affect EFH. As such, no consultation is required with NMFS.

1.3.7 Land & Water Conservation Fund Act

Section 6(f)(3) of the Land & Water Conservation Fund (L&WCF) Act (Public Law 88-578) prohibits lands developed under the L&WCF Act from being converted to uses other than public outdoor recreation uses, without the approval of the Secretary of the Interior. Polk County's Southland Park was developed with funds provided for under the L&WCF Act. The Cooperative is seeking to lease about 20 acres of Southland Park from the County, which has indicated a willingness to consider negotiating a lease. About 1.97 acres of the proposed leased parkland would be required inside the project boundary for project power facilities. The remainder of the 20 acres would be designated for recreation use within the project. The Cooperative has indicated that it will consult with Polk County, the Texas PWD, and the National Park Service regarding project use of Southland Park lands with respect to L&WCF Act requirements.

1.4 Public Review and Comment

The Commission's regulations (18 CFR §4.38) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the ESA, NHPA, and other federal statutes. Prefiling consultation must be complete and documented according to the Commission's regulations.

1.4.1 Scoping

As part of the prefiling process under the Commission's alternative licensing process, the Commission staff conducted scoping to determine what issues and alternatives should be addressed. A scoping document was distributed to interested agencies and others on February 27, 2008. It was noticed in the Federal Register on

March 5, 2008. Two scoping meetings, both advertised in several local newspapers of general circulation,[1] were held on March 26, 2008, in Livingston, Texas, to request oral comments on the project. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission's public record for the project. In addition to comments provided at the scoping meetings, the following entities provided written comments:

Commenting Entity	Date Filed
Federal Emergency Management Agency	April 7, 2008
U.S. Fish & Wildlife Service	April 24, 2008
Universal Ethician Church	April 24, 2008
Texas Parks and Wildlife Department	April 25, 2008

1.4.2 Interventions

On April 20, 2010, the Commission issued a notice that the Cooperative's license application was accepted for filing and soliciting motions to intervene and protests and other agency authorizations. This notice set July 28, 2010, as the deadline for filing protests and motions to intervene. The following entities filed motions to intervene:

Intervenor	Date Filed
City of Houston Legal Department	June 11 and 17, 2010
Trinity River Authority of Texas	June 18, 2010

1.4.3 Comments on the Application

A notice requesting conditions and recommendations was issued on May 27, 2010. The following entities commented:

Commenting Agencies and Other Entities	Date Filed
National Park Service	June 21, 2010
U.S. Department of the Interior	July 23, 2010
Texas Parks & Wildlife Department	July 23, 2010

The applicant filed reply comments on September 9, 2010.

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[1] The notice of the scoping meetings was published in *The Polk County Enterprise; The San Jacinto News-Times*; *The Trinity Standard*; and *The Corrigan Times*.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 No-action Alternative

The no-action alternative is license denial. Under the no-action alternative, the project would not be built, and the environmental resources in the project area would not be affected.

2.2 Applicant's Proposal

2.2.1 Proposed Project Facilities

The proposed project would use the following existing facilities: (1) TRA's existing 14,400-foot-long (approximate) Lake Livingston dam, which has a crest elevation of 145.0 feet mean sea level (msl) and consists of (a) a basic earth embankment section, (b) outlet works, and (c) a spillway; and (2) the 83,000-acre Lake Livingston, which has a normal water surface elevation of 131.0 feet msl and gross storage capacity of 1,750,000 acre-feet.

The proposed project would consist of the following new facilities: (1) an intake structure and headrace channel approximately 350 feet long; (2) three steel penstocks, about 12 feet in diameter and 1,925 feet in length; (3) a powerhouse containing three generating units, having a total installed capacity of 24 MW; (4) an approximate 250-foot-long tailrace channel; (5) an approximate 3.2-mile-long, 138-kilovolt transmission line interconnecting the project with Entergy's existing Rich substation near Goodrich; and (6) an electric switchyard and other appurtenant facilities. The project would have an estimated annual generation of 124 gigawatt-hours, which the Cooperative would sell at wholesale to its constituent electric cooperatives.

The proposed project boundary would enclose the entire Lake Livingston dam and reservoir and about 45 acres of land that would be occupied by the proposed new generating facilities, ancillary structures and 3.2-mile-long transmission line corridor.

2.2.2 Project Safety

Under an original hydropower license, the proposed project would be subject to the Commission's project safety requirements. As part of the licensing process, the Commission staff would evaluate the adequacy of the proposed project facilities. Special articles would be included in any license issued, as appropriate. Before the project is constructed, engineers from the Commission's Atlanta Regional Office would review the designs, plans, and specifications of the proposed intake structure, penstock, powerhouse, and other structures. During construction, engineers from the Commission would frequently inspect the project to assure adherence to approved plans and specifications, special license articles relating to construction, operation, and maintenance, and accepted

engineering practices and procedures. Once construction is complete and the project enters the operation phase, Commission engineers would inspect it on a regular basis.

2.2.3 Proposed Project Operation

The proposed project would operate using water releases that TRA would otherwise make through the spillway gates to maintain the reservoir surface elevation at approximately 131 feet msl and to satisfy demands by downstream water right holders. When scheduled releases are less than 750 cfs, the powerhouse would not be operated, and any releases would be made through the spillway gates. For scheduled releases between 750 and 4,900 cfs, a minimum-flow release of 200 cfs (described in section 2.2.4) would be discharged through one of the spillway gates to maintain dissolved oxygen (DO) and aquatic habitat in the spillway stilling basin, and the powerhouse would generate with the remainder of the flow. When scheduled releases exceed 4,900 cfs, the combined powerhouse hydraulic capacity and minimum flow release, any excess flows would be released through the spillway gates.

Because the proposed project would operate within the constraints of TRA's existing reservoir operations, the quantity and timing of flows in the Trinity River downstream from the project tailrace would be unaffected by the proposed hydropower operations. Further, the hydropower project is not expected to modify existing water surface elevations in the impoundment.

2.2.4 Proposed Environmental Measures

The Cooperative proposes the following protection, mitigation, and enhancement measures:

Construction

- Develop an erosion and sediment control plan during the detailed project design phase and before project construction begins that is consistent with applicable state and local soil conservation standards, including any Storm Water Pollution Prevention Plan (SWPPP) required by Texas CEQ.

Operation

- Develop, execute, and submit, for Commission approval, a final Memorandum of Agreement (MOA) with TRA governing project operations, with the objective of maintaining net reservoir releases and surface elevations in accordance with existing operational protocols.

- When scheduled releases are between 1,000 and 4,700 cubic feet per second (cfs), release a minimum flow of 200 cfs through the spillway gates, for

maintenance of water quality and aquatic habitat within and downstream from the stilling basin, with the remaining flow to be released through the powerhouse. When scheduled flow releases reach as low as about 750 cfs, shut down the powerhouse and all flows would be passed through the spillway gates.[2]

- Modify the notch in the downstream weir wall to maintain a relatively constant water level and in turn aquatic habitat in the stilling basin at the proposed minimum spillway discharge of 200 cfs during hydropower operations.

Aquatic Resources

- Conduct, in consultation with Texas CEQ, Texas PWD, and FWS, post-operational monitoring in accordance with the Post-Startup Monitoring Plan filed March 15, 2010. This plan would provide for monitoring of DO and water temperature and the forage fish and striped bass populations downstream from the dam. The goal would be to determine the adequacy of minimum flows to protect aquatic life in the stilling basin and river downstream, followed by the preparation of a mitigation program after monitoring and testing. The mitigation program would specify how reservoir releases and hydropower operations would be managed when DO and temperature triggers provided in the plan are reached.

- Install equipment to inject air or oxygen into water diverted for power generation and operate such equipment when DO reaches critical levels as determined in consultation with Texas PWD and Texas CEQ.

- Install bar racks with a clear spacing of 5.5 inches to exclude larger debris and fish from the powerhouse intake.

Terrestrial Resources

- Design and construct the transmission line to take into account soil stability, the protection of natural vegetation, sensitive habitats, the protection of adjacent resources such as natural habitat for plants and wildlife, and the prevention of silt deposition in watercourses. Clearing for the transmission

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[2] This is the applicant's revised minimum flow proposal made in the Post-Startup Monitoring Plan filed March 15, 2010. In the license application, the applicant proposed that when total reservoir releases are less than the hydraulic capacity of the powerhouse (approximately 4,500 cfs), minimum flows of 50 to 200 cfs would be released through the spillway gates to maintain water quality in the stilling basin above the weir wall.

line ROW would be performed in a manner that would maximize the preservation of natural habitat and the conservation of natural resources.

- Survey the transmission line route during the appropriate seasons (i.e., when plants are conspicuous) and prior to ground-disturbing activities to determine the presence of federally or state-listed rare plants, and consult with Texas PWD and FWS if such plants are found.

- If endangered or threatened wildlife habitat is encountered during construction, obtain guidance from FWS prior to any further clearing or construction activities.

- Construct the transmission facilities in accordance with current standards to reduce the risk of avian injury or mortality, including "Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006" (APLIC et al., 2006).

- If it is necessary to modify or remove existing service buildings or other structures during project construction, conduct a field investigation to determine whether such structures are occupied by Rafinesque's big-eared bats or Southeastern myotis. If either species of bat is encountered, consult with FWS and Texas PWD prior to modification of the structure.

Recreation

- Develop and implement a recreation management plan. Install a new barrier-free gazebo/observation platform at a location directly downstream from the tailwater canal, along with road closure gates for after hours, a parking area, a trail, benches, interpretive signs, and lighting. Perform site remediation to remove abandoned structures and to restore the Southland Park lands to their natural state.

- Construct a new access road connecting the existing Recreation Road 5 with the new parking area at the gazebo/observation platform.

- After the project's tailrace channel location and design have been finalized, consult with TRA, FWS, Polk County, and Texas PWD, and study the demand for, and feasibility of, providing barrier-free public fishing access on the east bank of the Trinity River below the project tailwater discharge and within the project boundary.

Cultural Resources

- Implement the HPMP filed with the Commission on January 25, 2010. Among other provisions, the HPMP requires the Cooperative to conduct within 6 months of license issuance, an archeological survey of the approved transmission line route that meets or exceeds the minimum standards for such surveys prescribed by the Texas State Historic Preservation Officer (SHPO). The Cooperative would complete section 106 consultation with the Texas SHPO and tribes with regard to the mitigation of potential effects to identified properties that are eligible for the National Register prior to ground-disturbing activity associated with the transmission line construction.

2.2.5 Modifications to Applicant's Proposal—Mandatory Conditions

Section 18 Prescription

FWS' requested section 18 reservation of authority, as filed on October 6, 2010, is evaluated as part of the applicant's proposal.

2.3 Staff Alternative

Under the staff alternative, the project would include these additional measures:

- Prepare and file an erosion and sediment control plan with the Commission prior to ground-disturbing activities, that would include: (1) the Cooperative's proposed sediment and erosion control plan for construction of the project; and (2) a plan for visual monitoring of the downstream river banks and around other project facilities during project operations for signs of scour and erosion, and repair and stabilize the slopes if erosion and scour is identified during monitoring.

- Prepare a final Post-Startup Monitoring Plan for Commission approval after issuance of any license for the project so that final details of the plan for monitoring water quality and fisheries, including a schedule for longer-term fisheries monitoring, would be developed in consultation with FWS and Texas PWD.

- If state DO standards cannot be met by the applicant's proposed air injection system, institute unit shutdowns in order to meet DO criteria, as a provision of the final Post-Startup Monitoring Plan.

- Construct the project in accordance with the National Bald Eagle Management Guidelines to avoid disturbance of bald eagles by maintaining appropriate construction buffer zones in the vicinity of any active eagle

nests, and scheduling ground-disturbing construction activities to avoid active nesting periods.

- Prior to initiating ground-disturbing activities, file with the Commission, the results of the Cooperative's proposed survey of the transmission line route for the presence of federally or state-listed rare plants, documentation of consultation with Texas PWD and FWS, and if any are found, proposed mitigation measures to protect these species during project construction, operation, and maintenance activities.

- As part of the recreation management plan proposed by the Cooperative, file a recreation monitoring report with the Commission every 6 years in conjunction with the Form 80 filing that would summarize ongoing monitoring activities, and any recommendations for future recreation management.

- Revise the Cooperative's January 2010 HPMP to include: (1) a map or maps depicting the APE as encompassing the entirety of Lake Livingston reservoir, with clarification that the portion of the APE addressed in the HPMP is limited to project affected areas; (2) clarification that section 106 of the NHPA and its implementing regulations found at 36 CFR 800 apply to this federal undertaking, and not the Texas Historical Commission's "Rules of Practice and Procedure for the Antiquities Code of Texas;" (3) provisions for evaluation of the Lake Livingston dam for listing on the National Register upon reaching 50 years of age, and assessment of potential effects of project construction and maintenance on this potential historic structure; and (4) provisions for the identification and evaluation of TCPs of importance to the Alabama-Coushatta Tribe, Caddo Nation, and Kickapoo Tribe, prior to implementation of ground-disturbing activities associated with project construction.

2.4 Alternatives Considered But Eliminated From Detailed Study

No reasonable action alternatives have been identified other than the Cooperative's proposal, the staff alternative recommended in this EA, and no action.

Before submitting its license application, the Cooperative considered several alternative power plant configurations, as well as a number of alternative transmission line routes. Alternative locations for the project intake and discharge facilities were considered but were eliminated based on logistical and dam safety concerns raised by the dam's owner, TRA. Several smaller and larger installed generating capacities were evaluated, ranging from 16 to 32 MW, but the three-unit, 24-MW plant configuration was selected as the most efficient and economically feasible alternative.

The Cooperative studied a total of seven discrete transmission line routes, but selected the preferred route based on a combination of environmental factors and landowner preferences. The proposed route completely avoids bottomland/riparian forests, with the large majority of the route located in open grassland or pasture areas. The route may cross some wetland areas; however these areas would likely be spanned by the transmission line. The applicant proposes to survey the final transmission line route and design final pole placements to avoid any wetland areas. The proposed route also contains the least amount of high-probability area for locating historic properties.

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3.0 ENVIRONMENTAL ANALYSIS

In this section, we present: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area. Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed mitigation, protection, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Staff conclusions and recommended measures are discussed in section 5.2, *Comprehensive Development and Recommended Alternative*.[3]

3.1 General Description of the River Basin

The Trinity River crosses east Texas, flowing in a generally southeasterly direction from the headwaters near Gainesville, to Trinity Bay at the Gulf of Mexico in the vicinity of Galveston. The main stem of the river begins at the junction of the Elm and West Forks at Dallas and meanders some 500 river miles before reaching Trinity Bay. The overall length of the Trinity River Basin is approximately 360 miles, making it the longest river having its entire course within Texas. The total drainage area of the basin is 17,969 square miles, and encompasses all or part of 34 counties in Texas. The river is an integral part of, and a critical resource for maintaining, the state's water supply, via a system of more than 40 reservoirs on the river main stem and on the tributaries, and also provides many opportunities for recreation. Most of the other dams and reservoirs are located upstream of Lake Livingston or on tributaries to the Trinity River, and the only downstream barrier is the Wallisville Salt Barrier (operated by the U.S. Army Corps of Engineers), located about 125 miles downstream from Lake Livingston dam. The Wallisville Salt Barrier is a low-head gate and lock structure that prevents the upstream movement of saline waters under certain river flow and tidal conditions, but allows for boat navigation through the site. The Trinity River provides water to over half of the population of Texas and serves two major population centers: Dallas/Fort Worth in the north and Houston to the south.

The topography of the area surrounding Lake Livingston is characterized by rolling and hilly terrain consisting of alternating sands and shales of Eocene and Miocene age. The immediate area around Lake Livingston can be characterized as predominantly rural. The project area is in the south temperate region of Texas, with long warm and

[3] Unless otherwise indicated, our information is taken from the application for license for this project (Cooperative, 2009) and additional information filed by the Cooperative on September 22, October 22, and November 20, 2009, and February 16, March 15, May 20, and May 21, 2010.

humid summers and short, mild winters. Summer temperatures are moderated by prevailing southeast winds from the Gulf of Mexico. Rainfall in the watershed varies from 30 to 40 inches in the upper basin to 40 to 50 inches in the lower basin. The highest monthly rainfall normally occurs in May and June, and the highest average river flow typically occurs from March through May.

3.2 Scope of Cumulative Effects Analysis

According to the Council on Environmental Quality's regulations for implementing National Environmental Policy Act (40 CFR §1508.7), a cumulative effect is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions taking place over time, including hydropower and other land and water development activities.

Based on our review of the license application and agency and public comments, we identified water quality and fishery resources as having the potential to be cumulatively affected by the proposed project, in combination with other past, present, and foreseeable future activities. Water quality could be cumulatively affected because project operations may affect DO levels and water temperatures in the Trinity River downstream from the Lake Livingston dam. As we describe above, other large reservoirs in the basin are located primarily well upstream of Lake Livingston on the four major forks of the Trinity River upstream of the Dallas/Fort Worth area. Major reservoirs in the upper basin include Lake Bridgeport, Eagle Mountain Lake, and Lake Worth on the West Fork; Lake Weatherford and Benbrook Lake on the Clear Fork; Ray Roberts Lake and Lewisville Lake on the Elm Fork; and Lavon Lake and Lake Ray Hubbard on the East Fork. In addition, 11 major reservoirs exist on smaller tributaries, mostly in the Dallas/Fort Worth area. These reservoirs have some effect on downstream flows in the Trinity River and affect river flows entering Lake Livingston. The Dallas/Fort Worth and other upstream developed areas also affect the quality of water entering Lake Livingston, associated with runoff from urban, residential, and agricultural areas, and discharges from industrial and recreational activities. Any water quality effects associated with the operation of Lake Livingston dam and the project may indirectly contribute to impacts on water quality and fishery resources in the reach of the lower Trinity River downstream of Lake Livingston dam.

3.2.1 Geographic Scope

The geographic scope of analysis for cumulatively affected resources defines the physical limits or boundaries of the effects of the proposed action on the resources. Because the proposed action can affect resources differently, the geographic scope for each resource may vary. For water quality and fishery resources, the geographic scope is defined as the Trinity River reach from the head of Lake Livingston to a point in the

Trinity River 30 miles downstream from Lake Livingston dam in the vicinity of Romayor, Texas. Any project effects on water quality and fisheries would not extend upstream of Lake Livingston, and any downstream effects would not be discernable after reaching Romayor. These effects would not be evident downstream from Romayor because of the distance downstream and the influence of other tributaries, and the limited effects that the project would have on these resources, because of the proposed operations that would be essentially the same as current operations.

3.2.2 Temporal Scope

The temporal scope of analysis includes a discussion of the past, present, and future actions and their effects on water quality and fisheries resources. Based on the potential term of a license, the temporal scope looked 30 to 50 years into the future, concentrating on the effect on water quality and fisheries from reasonably foreseeable future actions. The historical discussion is limited, by necessity, to the amount of available information for each resource. We identified the present resource conditions based on the license application, agency comments, and comprehensive plans.

3.3 Proposed Action and Action Alternatives

In this section, we discuss the effect of the project alternatives on environmental resources. For each resource, we first describe the affected environment, which is the existing condition and baseline against which we measure effects. We then discuss and analyze the specific site-specific and cumulative environmental issues.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EA. We have not identified any substantive issues related to socioeconomics associated with the proposed action, and, therefore, socioeconomics is not assessed in this EA. We present our recommendations in section 5.2, *Comprehensive Development and Recommended Alternative.*

3.3.1 Geologic and Soil Resources

Affected Environment

The upper Trinity River Basin is characterized by rolling topography. Soils in the region are predominantly deep to shallow clay, clay loam, and sandy loam. Ground cover includes deciduous forests, shrubs, and grasses. The maximum elevation in the upper Trinity River Basin is 1,522 feet msl in an area northwest of Fort Worth. From this area, which averages more than 1,000 feet msl, the land gradually slopes down to sea level. The Trinity River follows this slope to the southeast, emptying into the Gulf of Mexico.

The middle and lower Trinity River Basin areas are characterized by gently rolling to flat terrain. Stream and river channels tend to be wide and shallow with a broad floodplain. Soils in the region are predominantly clay and sandy loams and tend to be somewhat acidic and poorly drained. Around Lake Livingston, soils are classified as Alfisols. They are generally light in color, thinly layered, loamy, and somewhat leached near the surface. Deeper soils tend to become more clayey, basic, and less permeable. Land cover includes deciduous hardwoods, conifers, and grasses.

The Deweyville (Holocene) Formation is the dominant geologic formation mapped throughout the study area, with alluvial deposits mapped along the Trinity River. The Deweyville Formation and alluvium deposits are made up of sand, silt, clay, and some gravel, and include point bars, natural levees, stream channel, and backswamp deposits. In alluvium, organic matter may be locally abundant in addition to sand, silt, and clay. Sand in the Deweyville Formation is coarser than that in alluvium, and gravel is found mostly along the Trinity River. The ground surface adjacent to the river is characterized by relict meanders of much larger radius of curvature than those of streams, with some scattered pimple mounds.[4] Thickness is locally more than 50 feet (BEG, 1992).

The earthquake hazard in the proposed project area is low. According to the U.S. Geological Survey (USGS) Earthquake Hazards Program, the peak horizontal ground acceleration for the project area with a 2 percent probability of exceedance in 50 years is between 4 and 6 percent of the acceleration due to gravity (32.2 feet per second per second). The probability for occurrence of a magnitude 5.0 or greater earthquake within 50 miles of the project area over 50 years is about 0.01 (Frankel et al., 2002).

Environmental Effects

Ground disturbance associated with the construction of the project could release sediment into Lake Livingston, the Trinity River downstream of the dam, and drainage channels along the proposed transmission line route. Construction activities such as clearing, grading, and excavation can expose soils, talus, alluvium, and weathered bedrock to wind and water erosion. Once mobilized, these materials could enter Lake Livingston and the Trinity River, increasing sedimentation and turbidity.

Under the proposed action, ground disturbance would occur at several locations in the project area. Construction of the headrace channel, intake, and tailrace could

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[4] Pimple mounds are low, flattened, circular to oval, domelike, mounds composed of loose, sandy loam or loamy sand, occurring on the slopes, summits and crests of hills created by the deep erosion and dissection of unconsolidated and unlithified (non-compacted) early Pleistocene and middle Pleistocene, Pliocene, and older coastal plain sediments.

mobilize reservoir sediments and bank material. Construction of the penstocks, powerhouse, switchyard, access roads, and the relocation of existing TRA buildings would cause ground disturbance near Lake Livingston dam. Construction of the transmission line and associated access roads would cause ground disturbance along the length of the transmission corridor. Construction effects could be most pronounced where the construction activities occur nearest to, or in, Lake Livingston and the Trinity River.

The proposed headrace channel would involve the dredging and excavation of lakebed sediments and shoreline material in Lake Livingston. It would be about 350 foot long, 100 feet wide, and located adjacent to the east abutment of the dam. The channel would be trapezoidal in cross-section and lined with riprap. The proposed intake structure would be located at the end of the headrace channel, just downstream of the existing dam crest at the east abutment. Construction of the intake would involve excavation within Lake Livingston dam.

The proposed tailrace would involve dredging and excavating a 250-foot-long open channel, extending from the downstream side of the powerhouse to the point where the tailrace merges with the river approximately 1,000 feet downstream of the spillway. The majority of the tailrace construction would take place on dry land that is now mostly a grassy area; however, construction would extend approximately 250 feet into the Trinity River, requiring some excavation in the wetted river channel. The tailrace channel would be about 50 feet wide.

The Cooperative proposes to develop an erosion and sediment control plan during the detailed project design phase and prior to implementing any ground-disturbing activities. The plan would be consistent with applicable state and local soil conservation standards, including any SWPPP required by Texas CEQ. The plan would employ best management practices (BMPs) for project-specific construction issues to minimize erosion and sedimentation.

Several generalized BMPs are proposed for construction activities at the Lake Livingston dam and along the transmission line route. Spoil material from excavation would be used for construction of the earth embankment, the switchyard, and access roads. Excess spoil would be disposed of on the downstream slope of the existing dam or at approved disposal areas in accordance with applicable Texas environmental requirements. The amount of disturbed area exposed to rainfall would be minimized. Areas that are disturbed and exposed would, to the extent possible, be kept stabilized and/or seeded during and upon completion of construction activities. Measures to contain sediment would also be implemented. Any construction work in the river bed would likewise be conducted in a manner to minimize and control sedimentation.

Clearing and grading of the ROW, staging areas, storage areas, setup sites, etc., would be minimized. These areas would be graded in a manner that would minimize erosion; conform to the natural topography; and, if necessary, have erosion controls installed. Soil that has been excavated during construction and not used would be evenly backfilled onto a cleared area or removed from the site. The backfilled soil would be sloped gradually to conform to the terrain and the adjacent land. If natural seeding would not provide ground cover in a reasonable length of time, appropriate reseeding would be performed as needed after construction is complete. Monitoring would continue until vegetation was established and stable. Erosion-control devices (such as silt fences, hay bales, settling ponds) would be constructed where necessary to reduce soil erosion in the ROW. Any necessary new access roads would not be constructed on unstable slopes. Where feasible, existing ranch or pasture roads would be used for service and/or access, and any new access roads would be temporary. Clearing and construction activities near streams would be performed in a manner to minimize damage to the natural condition of the area, and stream banks would be restored as necessary to minimize erosion. Following completion of construction, vegetation in the transmission line ROW would be maintained to ensure that vegetation has adequate clearance from the conductors. Effects of maintenance activities are described in section 3.3.3, *Terrestrial Resources*.

Our Analysis

Project construction would mobilize sediments due to disturbance of soil and sediment in the vicinity of Lake Livingston dam and along the proposed transmission line route. Without properly designed and constructed sediment controls, ground disturbance could represent a substantial source of sedimentation to the Trinity River and Lake Livingston, causing increased turbidity and elevated sediment loading. The area of greatest disturbance would be in the vicinity of Lake Livingston dam, where major excavations would occur (about 1,000,000 cubic yards and dredging of about 50,000 cubic yards of earthen material). Effects of construction along the transmission line ROW would be minimal, because less land disturbance would occur and any access roads would be temporary, given the current land use. The Cooperative's proposed erosion and sediment control plan would apply appropriate BMPs and appropriate soil erosion and sediment control prevention measures to construction activities and would effectively minimize any erosion, sedimentation, and slope stability effects in the project area. The BMPs currently proposed by the Cooperative are not site-specific, but rather they are based on conceptual project plans. By preparing and implementing a site-specific erosion and sediment control plan based on the generic BMPs, the Cooperative would be able to identify potential areas of sediment disturbance and address them with the goal of minimizing erosion and restricting the transport of sediment using BMPs.

Elevated turbidity and increased sedimentation could occur in Lake Livingston and the Trinity River downstream of the Livingston dam, despite properly functioning control measures. During construction of the headrace and tailrace channels, reservoir

and streambed sediments would be disturbed and transported downstream. All ground-disturbing activities associated with project construction would increase erosion and transport of sediment laden runoff. However, these effects would be temporary. Any erosion, sedimentation, or slope stability effects would be minor and on the same level as common infrastructure projects such as road and building construction projects when proper controls are in place.

Because TRA would continue to control the reservoir levels and flow passage through the project under current operational protocols, the project would trigger no major long-term effects on shoreline erosion on Lake Livingston or in the river downstream from the tailrace. However, there could be effects in the area local to the new tailrace discharge. The powerhouse discharge would enter the river channel at an angle roughly perpendicular to the flow below the dam. The velocity patterns resulting from this orientation could cause erosion of the river bank on the opposite, or west, side of the river from the powerhouse. Also, the reconfigured east bank area adjacent to the new tailrace discharge could be vulnerable to erosion associated with high flows from either the spillway gates or the tailrace. Visual monitoring of the river banks in these two areas during project operation would help to proactively identify any erosion that does occur and the need for any mitigative action to prevent erosion and protect the river banks from further damage. Visual monitoring of other project facilities during operations could also be part of this program so that any erosion identified anywhere in the project area, such as rutting along transmission line access roads or erosion around project recreation facilities, could be readily repaired to avoid significant surface erosion.

3.3.2 Aquatic Resources

Affected Environment

Water Quantity

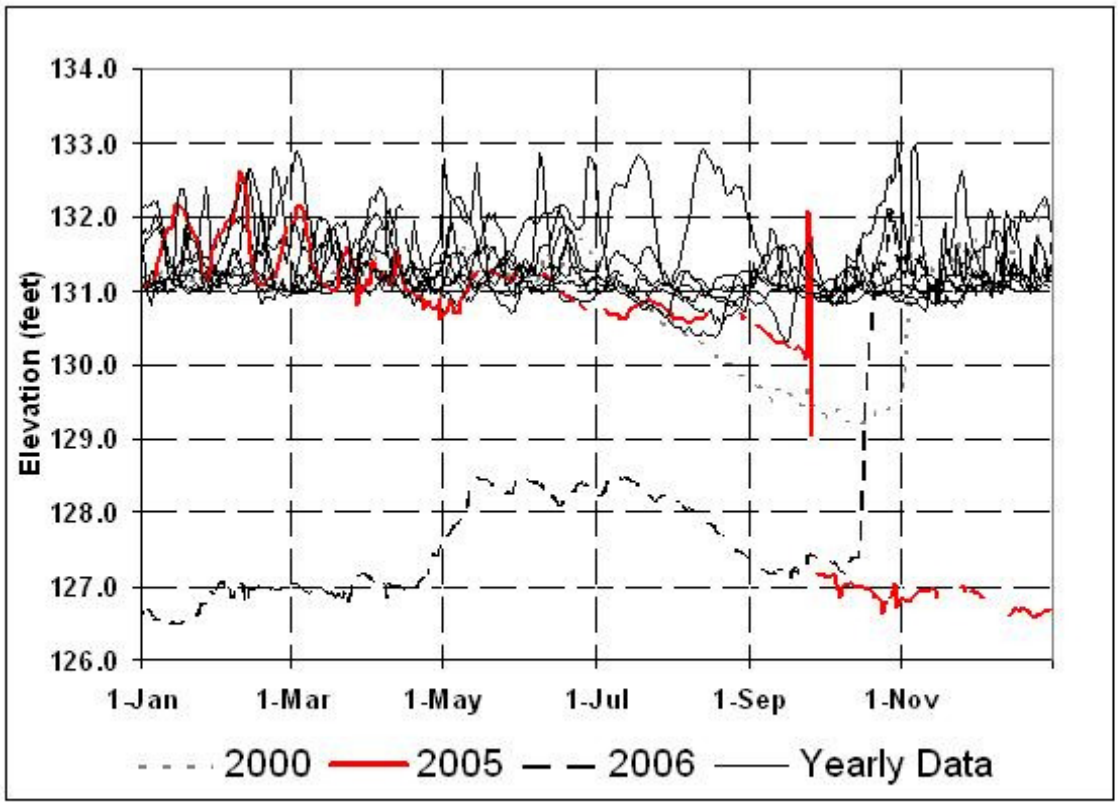
Lake Livingston has a surface area of 83,000 acres and was formed by the dam which was constructed in 1969 at river mile 129.2 on the Trinity River. Lake Livingston is the largest reservoir in the Trinity River Basin and was created by TRA for water supply, including domestic, municipal, industrial, and irrigation. The lake has a drainage area of 16,583 square miles, is about 53 miles long, an average depth of 23 feet, a maximum depth of 90 feet, and a storage capacity of about 1.75 million acre-feet. TRA operates Lake Livingston to maintain a water level near elevation 131.0 feet msl plus or minus 1 or 2 feet depending on the season and weather conditions. Natural inflow to Lake Livingston determines release rates at the spillway, except during low flow periods when downstream water demands govern the release rate.

To limit the salt water advance on the lower Trinity River, TRA was historically required to release at least 1,000 cfs, regardless of inflow, during the rice irrigation season: May 15 through September 15. These releases are no longer required to ensure

that irrigation water remains free of salinity. In 1999, the Corps constructed the Wallisville Salt Barrier Project, located about 125 miles downstream on the Trinity River near the estuary associated with Galveston Bay.

Since 1999, the lake level has been maintained by operation of the spillway gates at generally above elevation 131 (figure 2). However in 2000, the lake level fell to almost elevation 129 feet due to drought conditions. After Hurricane Rita in September 2005, lake levels were quickly lowered because waves caused erosion damage on the upstream face of the dam. The lake level remained low, generally below elevation 128.5 feet as shown in figure 2, until the damage was repaired. The water level of the lake was raised in October 2006.

Figure 2. Lake Livingston historical water surface elevation for January 2000 to June 2010 (Source: USGS, 2010).



The maximum discharge from Lake Livingston occurred in October 1994 at 110,600 cfs, and the minimum was about 230 cfs in 1972. Table 2 provides information on the monthly flows recorded at USGS gage no. 08066250 Trinity River near Goodrich, which is located a few miles downstream from Lake Livingston dam. This table shows that the highest flows normally occur in the spring, and the lowest flows occur in the summer or early fall.

Table 2. Monthly outflow from Lake Livingston (Source: USGS, 2010).

	Exceedance					
Month	**90%**	**75%**	**50%**	**25%**	**10%**	**Mean**
January	1,230	1,720	3,880	14,500	24,000	10,036
February	1,180	2,100	5,915	15,100	18,650	10,302
March	1,210	3,020	6,580	17,900	27,100	12,258
April	1,515	2,250	5,635	17,600	24,150	10,511
May	1,610	3,140	7,930	17,000	22,200	12,087
June	1,005	2,285	5,725	16,200	24,350	11,392
July	998	1,590	2,330	3,610	8,980	5,419
August	1,010	1,140	1,440	2,220	6,240	2,594
September	661	941	1,310	1,880	4,270	2,559
October	470	688	964	1,930	4,430	3,661
November	682	912	1,735	6,610	17,850	6,822
December	572	990	6,700	16,500	22,000	9,238

Note: Data are from USGS gage no. 08066250 Trinity River near Goodrich for October 1, 1970, to September 30, 2009.

TRA constructed Lake Livingston for water supply purposes. TRA has an obligation to supply about 1.344 million acre-feet per year to the city of Houston and other users. Houston's water supply and the majority of other water are transported to Houston after it is discharged from the dam and is pumped to Houston via the Coastal Industrial Water Authority's pump station in Liberty County. In addition, there are other water rights from areas downstream from the dam including the Dayton and Davers Canal Systems and other withdrawal points.

Water Quality

Section 303(d) of the CWA, as amended in 1985 and 1992, requires that states develop a list of water bodies that do not meet water quality standards, establish priority rankings for waters on the list, and develop action plans, called total maximum daily loads, to improve water quality. The lists of impaired water bodies are revised periodically (typically every 2 years).

The state has established criteria to determine if a water body meets the state's goal of maintaining its beneficial uses, such as drinking, fishing, and contact recreation. If it is determined that the designated uses of a water body are threatened or impaired, the affected water body is then placed on a list of impaired waters (commonly referred to as the 303(d) list), and the state develops action plans to achieve compliance. Portions of Lake Livingston are currently listed as not meeting water quality criteria for sulfate and pH.

Nutrients

Point and nonpoint source pollution loads impact Lake Livingston and the greater region. Excess nutrients from urban runoff, development, agriculture, and wastewater treatment plant effluents result in depressed DO levels, algal blooms, high bacteria levels, and eutrophic conditions. Analysis of available information on nutrients reveals that, in the Trinity River Basin, the lowest nutrient concentrations occur immediately downstream from reservoirs, which act as sinks for nutrients. Furthermore, nutrient loads increase substantially in the Dallas-Fort Worth area with the addition of nutrients from point sources. Loads decrease substantially as flow passes through Lake Livingston reservoir.

Eutrophication can occur when water bodies receive an excess of nutrients, primarily phosphorus and nitrogen, leading to excessive primary production. Eutrophication may result in low DO concentrations and algal blooms. Texas CEQ has identified Lake Livingston as eutrophic. Available data show high levels of nutrients in all portions of Lake Livingston, with generally higher concentrations near the headwaters. Although water quality has improved since the 1970s when the lake water was first impounded, nutrients in runoff and DO levels remain a concern. A comprehensive water quality assessment of Lake Livingston, conducted for TRA from 1988 to 1997, revealed substantial nutrient loading (mainly nitrates and phosphorus) and DO levels. The most recent Basin Highlights Reports prepared for the Trinity River Basin also described high nutrient levels throughout the Main Stem Trinity River subwatershed. These water quality issues are widespread within the Trinity River Basin and not limited to Lake Livingston.

In 2001, evaluation of the water quality data collected near the dam showed an increasing trend in sulfate concentrations. Elevated sulfate levels were also noted during recent water quality surveys, and sulfate levels were listed as a concern on the 2008 303(d) list of impaired water bodies.

Temperature and Dissolved Oxygen

The DO criteria for both the Trinity River and Lake Livingston set by Texas CEQ are 5 milligrams per liter (mg/L) (24-hour mean) and 3 mg/L (minimum). During the spring (defined by Texas CEQ as that portion of the first half of the year when water temperatures are between 63 and 73 degrees Fahrenheit [ºF]), DO criteria are 5.5 mg/L (24-hour mean) and 4.5 mg/L (minimum). The higher spring criteria protect fish spawning. The maximum temperature criteria for Lake Livingston and the Trinity River are both 93ºF.

Differences in water density due to temperature result in the formation of three water layers (stratification) within a lake or reservoir: an epilimnion (warm surface water readily affected by atmospheric conditions); a thermocline (a middle layer showing a

rapid temperature differential with elevation); and a hypolimnion (a relatively cold and stagnant bottom layer not directly influenced by atmospheric conditions).

Historical data collected by TRA reveal that thermal stratification in Lake Livingston typically occurs only in the deep portions of the lake. The fall overturn generally occurs in September or October and the reservoir is isothermal (uniform temperature through the water column) from November through April. During the months of July through August, a thermocline is present from approximately 30 to 60 feet of depth. Because the depth throughout more than 90 percent of the reservoir is less than 40 feet, with an average depth of approximately 22 feet, it was concluded that a large percentage of the stored water is not stratified and may be characterized as part of the epilimnion during the critical summer months.

DO monitoring performed by TRA in Lake Livingston from November 2007 through October 2008 showed DO distribution in the reservoir. DO concentrations in the reservoir in front of the spillway gates (figure 3) were mostly stable and above 5 mg/L at all depths in the months of October through April. From May through September, when thermal stratification was observed, DO levels started to decrease substantially with depth (generally at depths greater than 10 to 15 feet). From June through August, concentrations dropped below 1 mg/L at about 35 feet.

DO is generally stable downstream from the dam because of high physical reaeration as the water is discharged from the reservoir and cascades in a relatively thin, turbulent, sheet flow into the stilling basin. Although the reservoir release is periodically hypoxic (minimum DO at 29 feet was 0.1 mg/L), passage of water over the dam appears to aerate the water to near saturation.

TRA assessed the historical distribution of DO in the reservoir and impacts of the thermal stratification. During cooler months (November through April) the water is circulated from top to bottom and substantial aeration and mixing occurs, permitting replenishment of DO used in the decomposition of organic matter. Figure 4 presents a monthly average of daytime DO measurements over depth as recorded by TRA during 10 years of monitoring between 1973 and 1983. DO levels below the state criterion (5.0 mg/L) generally occurred from May through October at depths greater than 20 to 25 feet. Concentrations below 3.0 mg/L, which could adversely affect many fish species, generally occurred at depths greater than 30 feet for a shorter period of time.

Figure 3. Monthly DO measurements through the Lake Livingston water column in front of spillway gates (Source: Cooperative, 2009a).

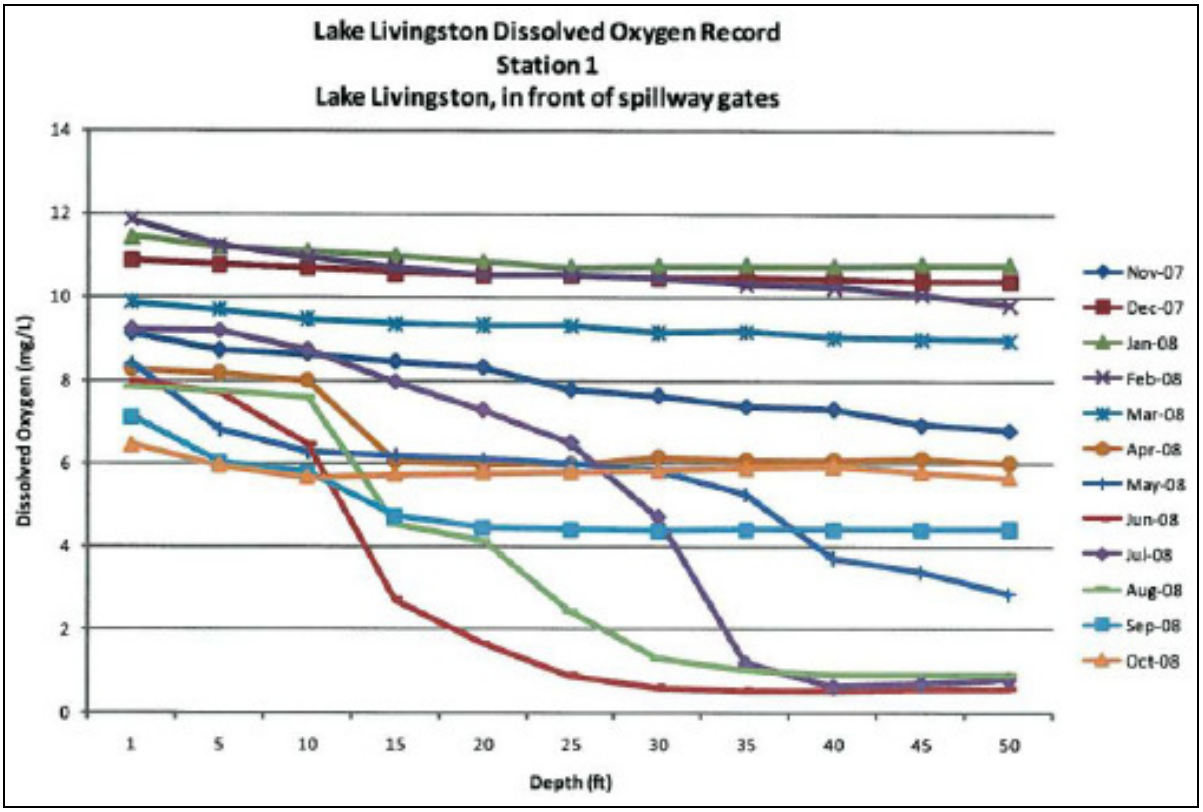
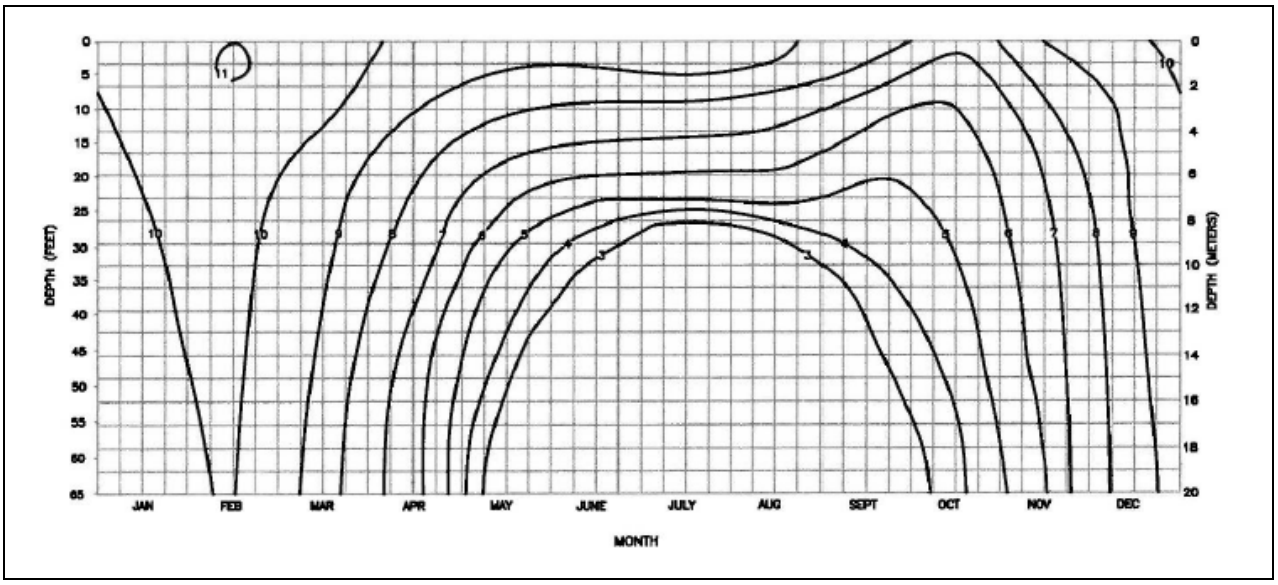


Figure 4. Reservoir average DO history with depth. Averages based on 288 sampling days from October 1973 to May 1983 (Source: Cooperative, 2009a).



At monitoring stations on tributaries above the dam, DO concentrations below 1 mg/L have been observed. These low concentrations are primarily caused by oxygen-demanding wastewaters discharged into the tributaries. According to an assessment by the Cooperative, as tributary inflows reach Lake Livingston, velocity decreases and residence time increases such that the oxygen-demanding materials in the treated wastewaters have become partially stabilized before reaching the lower half of the reservoir. This process results in an increase in the surface DO concentrations as water approaches the dam.

Other Water Quality Parameters

Inorganic constituents in Lake Livingston reflect the moderate water quality status. Lake Livingston water is usually moderately hard to hard, with 61 to 180 milligrams calcium carbonate per liter. An evaluation of Lake Livingston water quality data from 1988 to 1997 reported average dissolved solids, chloride, and sulfate concentrations of 214, 25, and 38 mg/L, respectively, in the main pool near the dam. The study also indicated that at every station all values reported for these inorganic constituents were less than the secondary maximum concentration drinking water standard.

A Trinity River Basin water quality study conducted between 1992 and 1995 indicated decreased lead, DDT, and polychlorinated biphenyl concentrations, and increased chlordane, polycyclic aromatic hydrocarbon, and zinc concentrations in sediments from urban streams since the mid-1960s. The reason for elevated chlordane levels was explained as urban growth, while increased polycyclic aromatic hydrocarbon and zinc concentrations were reported as largely due to automobile use in the watershed.

Fishery Resources

Lake Livingston and the Trinity River support an important warmwater fishery of regional significance. The applicant conducted baseline fishery surveys using a range of sampling techniques in both the lake and river in 2007 and 2008. These surveys found 26 species in Lake Livingston. The species of greatest interest to the sport fishery included striped bass; largemouth bass; bluegill; blue, channel, and flathead catfish; white bass; and crappie. The primary forage species in the lake are threadfin shad, gizzard shad, bluegill, longear sunfish, and inland silverside. The lake's sport fishery is partially supported by stocking, particularly for striped bass, with about 20 million striped bass stocked in the lake from 1977 through 2008. Other species stocked have included largemouth bass, blue and channel catfish, and paddlefish.

The applicant's surveys included investigation of fish passage through the existing spill gates using high-definition sonar (DIDSON), which recorded fish moving through a spillway gate from the reservoir into the river. Results of the study indicated that large numbers of fish exhibit volitional movement from the reservoir, using the spillway gates

as the path of movement from the lake. Most of the fish passing the gates were small (less than 8 inches long) and were forage species (threadfin and gizzard shad). Striped bass, however, do migrate from the lake, primarily as age I or age II fish during the spring, high-flow period. These fish substantially contribute to the sport fishery in the Trinity River downstream from the dam. The DIDSON study estimated that about 457,000 fish more than 8 inches long passed through the gates from December 2007 to August 2008. A substantial portion of those fish were believed to be striped bass, based on the physical profiles recorded by DIDSON. Other findings of the applicant's studies were that fish density and diversity is higher (although primarily forage species) in the vicinity of the proposed headrace canal in the reservoir than in open water at the depth at which water is released through the spillway gates. No juvenile (young-of-the-year) striped bass were collected in the reservoir, indicating no or limited natural reproduction in the reservoir. Striped bass were present in the vicinity of the dam (in the reservoir) only during the winter and spring months. Other sport fish commonly occurring in the vicinity of the dam included white crappie, blue catfish, white bass, and channel catfish.

The Trinity River downstream from Lake Livingston is relatively undeveloped. It is a free-flowing, low-gradient, meandering river, flowing for 129 miles into Trinity Bay, Galveston Bay, and then into the Gulf of Mexico. Texas PWD has designated a lower portion of the Trinity River as an "Ecologically Significant Stream Segment" (Texas PWD, 2007). The Texas legislature may designate a river or stream segment of unique ecological value following the recommendations of a regional water planning group. The ecologically significant segment below Lake Livingston is from the confluence with Trinity Bay in Chambers County upstream to Farm-to-Market Road (FM) 787 in Liberty County, which is about 25 miles downstream from Lake Livingston dam. This reach is within Texas CEQ stream segments 0801 and 0802 and contains abundant fish and wildlife habitat.

The applicant's baseline fishery surveys found a total of 54 species downstream from the dam, with the sample reach closest to the dam showing the highest number of species (45). Threadfin shad was the most common species collected downstream from the dam, but other species of interest included striped bass, blue catfish, white bass, crappie, smallmouth buffalo, and low numbers of paddlefish. Estuarine species were also found in this reach, including striped mullet, blue crab, and skipjack herring. American eel were also collected in limited numbers (see later in this section). The species of greatest importance to the sport fishery is the striped bass, with downstream passage from Lake Livingston being the primary source of recruitment for this fishery. Striped bass are present downstream from the dam year-round, because of the cooler and well-oxygenated water discharged through the spill gates on Lake Livingston dam, and the abundance of prey species (threadfin shad) during much of the year. Texas PWD collects brood stock for its striped bass hatchery program from the Trinity River immediately downstream from the dam. Approximately one-third of the striped bass fingerlings produced in the

state's hatchery system are stocked in Lake Livingston for the primary purpose of maintaining the tailrace fishery.

American eel

The American eel is the only diadromous species occurring in the Trinity River downstream from Lake Livingston dam, but is found in only limited numbers. The applicant conducted surveys for American eel from December 2007 through August 2008 by setting temporary traps and by electrofishing downstream from the dam. The traps did not collect any eels, but a total of 13 eels were captured and 4 observed during electrofishing in the 11-mile reach downstream from the dam. The eels ranged in length from 200 to 367 millimeters (about 8 to 14 inches), indicating that these were subadults, but not recent in-migrants (elvers) from the Gulf of Mexico. Juvenile eel remains were also found in the stomachs of two striped bass and one blue catfish in February during an investigation of sport fish food habits downstream from the dam.

The applicant also conducted eel surveys using electrofishing at 11 locations in the upper Trinity River Basin well upstream of Lake Livingston and immediately downstream from all of the major impoundments in the Dallas-Fort Worth area. Other sampling locations included two sites in the West Fork of the Trinity River and one site on the mainstem Trinity River at State Highway 287. No eels were collected.

Paddlefish

Paddlefish is a state-listed threatened species in Texas, with its native range in Texas limited to rivers in east Texas. Prior to the 1990s, the species was believed extirpated from most of its range in Texas due to construction of dams. Texas PWD initiated a program to reintroduce paddlefish to selected river segments through stocking, beginning in the 1990s. The Trinity River upstream of Lake Livingston was one of the river reaches that was identified as possible paddlefish spawning habitat. A total of 110,000 juvenile paddlefish was released into Lake Livingston from 1990 through 1992. There has been no indication that successful paddlefish reproduction has occurred in the Trinity River, and any paddlefish remaining in the river are believed to be from the stocking in the 1990s. The applicant's fishery surveys collected three paddlefish downstream from Lake Livingston dam, with at least two additional paddlefish observed, but not collected in the same reach. No paddlefish were collected or observed in Lake Livingston.

Environmental Effects

Water Quantity

The applicant proposes to construct a powerhouse with 3 hydroelectric turbines and a combined maximum capacity of 4,500 cfs. Flow would be diverted from the lake

by a 350-foot-long, riprap-lined headrace channel to an intake structure and three 1,925-foot-long penstocks to the powerhouse location below the dam. The applicant does not propose to regulate or alter the amount of flow that TRA releases from Lake Livingston. Rather, the project would pass flows that TRA directs through the dam under the existing operation scheme. The applicant proposes to develop a final MOA with TRA to define project operations for both water levels and flow releases. Therefore, TRA, not the applicant, would control flow releases and ramping rates. The applicant does not propose to change any discharge parameters to optimize hydroelectric generation or for any other reason. The applicant does propose that TRA would release a minimum flow of 200 cfs from the existing spillway Taintor gates to maintain water quality in the stilling basin whenever the powerhouse is in operation. The applicant also proposes to modify the notch at the downstream weir wall to help maintain a relatively constant water level in the stilling basin at a flow of 200 cfs. At flows less than the minimum capacity of one generating unit (about 750 cfs), all flow releases would be through the spillway gates. Scheduled releases in excess of the powerhouse capacity would also be released through the spillway gates.

Limited comments or other recommendation were received about the proposed operations or water quantity in general. Both TRA and the city of Houston noted that the primacy of the reservoir's water supply operations should be respected under any FERC license.

Our Analysis

The applicant proposes flow releases that would maintain the lake levels established by TRA. The presence and operation of the proposed project would result in the same flow releases and lake levels maintained under existing conditions. Operation of the project would not alter the quantity or timing of dam releases and would not affect water surface elevations in Lake Livingston or the Trinity River. Table 3 provides estimates of the monthly flow exceedances that the proposed hydraulic capacity of 4,500 cfs would represent. For example, for the months of February through June, the powerhouse would be able to operate at full capacity nearly 60 percent of the time.

The location of outflow from the powerhouse would be just downstream from the stilling basin and about 1,000 feet downstream from the spillway. There would be no changes in discharge volume or periodicity to affect the primary use of the lake, water supply, because the water withdrawals are below the dam and downstream from the location of the proposed tailrace. In addition, operations of the lake during flood conditions would not be affected because the spillway capacity would not be affected by the proposed project configuration.

Table 3. Monthly exceedance values for 4,500 cfs (Source: USGS, 2010, as modified by staff).

Month	4,500 cfs Exceedance Value (%)
January	49
February	58
March	59
April	57
May	61
June	55
July	25
August	15
September	12
October	15
November	35
December	50

Water Quality

The only water quality parameters potentially affected by operation of the project are water temperature and DO. While high nutrient levels and eutrophication are an issue in the Trinity River and in Lake Livingston, those water quality impairments are related to current conditions within the basin, and the proposed project would have no effect on nutrient levels.

The bottom of the proposed headrace channel would be at elevation 115 feet, about 16 feet below normal pool elevation of 131 feet msl. The majority of the water that would enter the intake and be released downstream would come from the top 16 feet of the reservoir, although some mixing of lower reservoir elevation layers could occur. Therefore, the water entering the project would have similar quality as the water that currently occurs in the epilimnion. Under current conditions, water is released from the bottom of the Taintor gates at about elevation 99 feet msl.

Temperature was monitored at three locations from spring through summer 2008: at the existing spillway gates (at a depth of 4, 29, and 50 feet), the proposed headrace (at a depth of 5 feet), and in the stilling basin between the dam and the weir wall (near the surface). The study showed the water temperature at a depth of 5 feet at the proposed headrace had an average temperature about 1°F higher and a maximum temperature about 3.8°F higher than the temperature downstream of the dam. Temperatures downstream of the dam reflect the current location of the withdrawal from the reservoir (the spillway gates near the depth of 29 feet).

DO concentrations were monitored from May through September 2008, and averaged 7.3 mg/L at the proposed headrace location and 7.6 mg/L in the stilling basin. The minimum DO at the proposed headrace location was 0.4 mg/L compared to 5.7 mg/L in the stilling basin. Low DO in reservoir surface waters has not been commonly reported other than during periods of fall overturn. Lowest DO was usually reported during the early morning and was observed on multiple dates at each of the surface stations.

The applicant conducted water quality modeling to help predict how temperature and DO in Lake Livingston, the stilling basin, and the proposed tailrace area would be affected by different hydroelectric and reservoir release scenarios (Cooperative, 2009a). The model calibration, data development, and model results along with various figures comparing the observed and modeled parameters are presented in "Trinity River and Lake Livingston Biological Characterization for the Proposed Lake Livingston Hydroelectric Project" (Cooperative, 2009a). Modeling was conducted in two phases. The first phase calibrated the model using historical reservoir and river water quality and bathymetric data. At the end of data collection in September 2008, model calibration was reviewed, and the more detailed intensively collected data were incorporated into the model. The revised, updated model was used to develop the most accurate predictions possible at a range of operational scenarios.

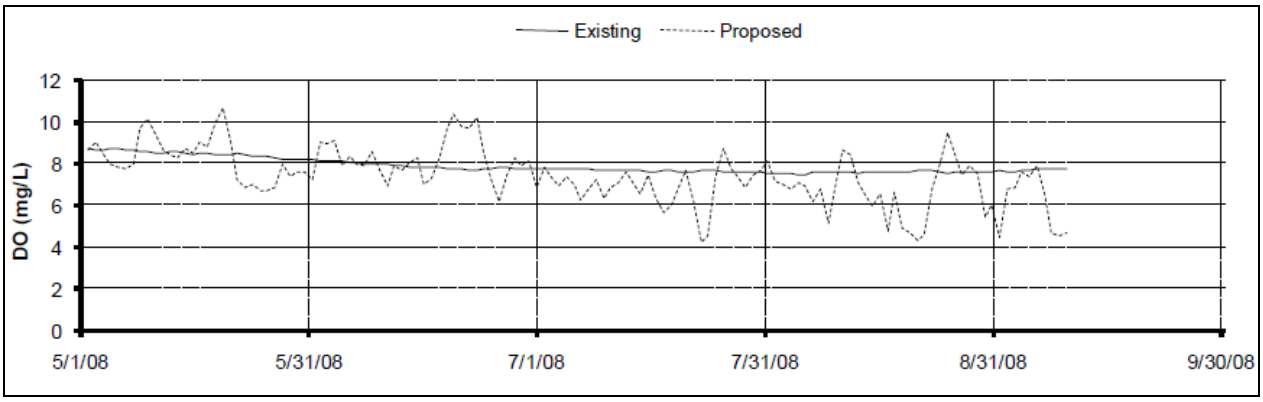
Model results showed that the water temperatures in the Trinity River downstream from the project would increase under proposed project operations. This was attributable to the passage of warmer surface waters from a headrace channel instead of releasing water through the spillway from a depth of 29 feet. Model results showed a typical temperature increase of less than 5ºF, and increased fluctuations due to diurnal changes in surface water temperature. The model results indicated, however, that the maximum temperature criteria of 93ºF would not be exceeded.

Model results also showed that DO in the Trinity River downstream of the project generally would decrease and fluctuate more under proposed operations than they do at present. Currently, water released through the spillway gates is subject to a high degree of physical aeration as it cascades in a relatively thin and turbulent flow into the stilling basin. Under proposed project operations, water from the epilimnion would flow through the headrace channel and through the project turbines and would not be subject to such a high degree of aeration, except for the minimum flow of 200 cfs that would continue to be released through the spillway gates. The applicant states that the predicted DO fluctuations in the project discharge would likely reflect diurnal DO fluctuations that occur in the reservoir epilimnion, associated with photosynthesis and higher DO levels during daylight hours, and respiration and reduced DO levels during darkness hours.

Under low flow conditions in the Trinity River, the model predicted that DO would fluctuate between about 4.1 and 10.3 mg/L just downstream of the dam (figure 5).

Modeling was extended up to 10 miles downstream of the dam, and showed that at greater distances downstream, DO fluctuations were dampened and the differences between current conditions and predicted conditions were less. Modeling of higher flow releases (full powerhouse releases with 200-cfs minimum flow over the spillway) showed a similar pattern for DO, although DO levels dipped to slightly below 4 mg/L on a few occasions. According to model results, the daily average DO criteria of 5 mg/L would not be met in some scenarios, but the minimum DO criteria of 3 mg/L would be met at all times.

Figure 5. Model results for existing and proposed conditions in the Trinity River just downstream from the dam for May-September 2008, low-flow conditions. Model assumptions were existing conditions: spillway gate release = 950 cfs; and proposed conditions: powerhouse flow = 750 cfs, spillway gate release = 200 cfs (Source: Cooperative, 2009a).



To mitigate for any effects on water quality, the Cooperative proposes to install equipment to inject air or oxygen into water diverted for power generation and would operate such equipment when DO reaches critical levels as determined in consultation with Texas PWD and Texas CEQ. The applicant also proposes to monitor DO and water temperature as part of its Post-Startup Monitoring Plan, and to prepare a draft mitigation plan after monitoring and further testing, to specify how reservoir releases and hydropower operations would be managed when DO and temperature triggers provided in the plan are reached. This mitigation plan would specify when the air injection system would be operated and when the proportion of flow releases through the spillway gates should increase or decrease.

Our Analysis

The Cooperative's proposals to mitigate for effects on water quality are reasonable and would provide a logical mechanism for mitigating any effects that are detected during project operations. The proposed air injection system would help to ensure that DO levels would be maintained at or above state standards downstream from Lake

Livingston dam under most operating conditions. Air injection systems are often successful in maintaining DO levels downstream from dams, but under extreme meteorological conditions DO standards may still not be maintained. Under those conditions, additional flow releases may be required over the spillway, which has shown to provide good aeration downstream from Lake Livingston dam under current operations. The Post-Startup Monitoring Plan and its associated mitigation plan would address periods when the air injection system would not be sufficient to maintain state standards, by providing for additional spillage at the dam to enhance DO levels. The Post-Startup Monitoring Plan would function as an adaptive management measure that would provide additional DO enhancement, should ongoing monitoring indicate that state standards are not being met under various levels of powerhouse operations.

Proposed project operation would also release warmer reservoir surface water into the Trinity River during the months when the reservoir is subject to thermal stratification (July through September). Project shutdowns or increasing the proportion of flow releases through the deeper spillway gates would act to reduce water temperatures downstream from the dam, and ensure that state water temperature standards are not exceeded. These operational changes for water temperature may only be required during July through September, because during months with uniform temperatures in the reservoir (October through June), the temperature regime in the Trinity River downstream from Lake Livingston dam would be similar to the temperatures occurring under existing conditions. Again, the Post-Startup Monitoring Plan would function as an adaptive management measure that would provide for operational adjustments, should monitoring indicate that state water temperature standards are exceeded.

Fishery Resources

Construction Effects

Runoff from active construction sites and disturbed areas could result in an increase in turbidity and sedimentation in the Trinity River, which would adversely affect fisheries habitat by modifying substrate or result in smothering of fish eggs and larvae if sedimentation occurred during spawning periods. As described in section 3.3.1, *Geologic and Soil Resources*, the applicant proposes to develop an erosion and sediment control plan during the detailed project design phase and to implement the plan during the construction period. The plan would be consistent with Texas CEQ regulations for stormwater permitting to prevent erosion and sediment discharge to the river during construction.

Our Analysis

Project construction would involve substantial excavation and ground-disturbing activities associated with proposed project facilities in proximity to Lake Livingston dam and the Trinity River, including the 350-foot-long headrace channel and intake structure,

the three 1,925-foot-long steel penstocks, the three-unit powerhouse, and the 250-foot-long tailrace channel. These major construction activities in proximity to the Trinity River, which would involve excavation of about 1,000,000 cubic yards and dredging of about 50,000 cubic yards of earthen material, would have the potential to release sediment and fines to the river and adversely affect aquatic habitat, if appropriate erosion control measures and BMPs are not followed. The Cooperative's proposed erosion and sediment control plan and other proposed BMPs would act to ensure that the appropriate measures would be taken to protect aquatic habitat during project construction. Further, filing this plan with the Commission, prior to commencement of ground-disturbing activities, would ensure that appropriate measures are implemented during construction.

Minimum Flows/Downstream Habitat

The applicant is proposing to generate power using the flow releases made by TRA. The applicant initially proposed that when total reservoir releases are less than the hydraulic capacity of the powerhouse (approximately 4,500 cfs), minimum flows of 50 to 200 cfs would be released through the spillway Taintor gates to maintain water quality in the stilling basin above the weir wall. In its Post-Startup Monitoring Plan, filed March 15, 2010, however, the applicant states that when scheduled releases are between 1,000 cfs and 4,700 cfs, approximately 200 cfs would be released through the spillway gates, and the remaining flow would continue to be released through the powerhouse. When scheduled flow releases reach as low as about 750 cfs, the powerhouse would be shut down and all flows would be passed through the spillway gates. The applicant would implement its Post-Startup Monitoring Plan to monitor DO and water temperature, and the forage fish and striped bass populations downstream from the dam. The objective of this monitoring would be to determine the adequacy of minimum flows to protect aquatic life in the stilling basin and downstream river, which would be based on whether DO and water temperature standards are met. The Cooperative would also prepare a draft mitigation plan after monitoring and further testing, to outline how reservoir releases and hydropower operations would be managed when DO and water temperature triggers provided in the plan are reached.

Both FWS and Texas PWD are in agreement with the applicant's Post-Startup Monitoring Plan, although Texas PWD indicates that a minimum flow of 200 cfs would be required at all times in the spillway during initial hydropower operations, and that the minimum flow may need to be adjusted after empirical data from the monitoring program become available. FWS recommends that all conditions contained within the Post-Startup Monitoring Plan should be implemented throughout the project's life.

Our Analysis

As we previously described, the spillway stilling basin and the Trinity River immediately downstream from the weir wall are important habitat for fishery resources,

particularly for striped bass, blue catfish, other sport and forage species. The cooler, well-oxygenated water released from the existing spillway provides an important thermal refuge for striped bass during the summer months, when water temperatures in the Trinity River may approach sub-lethal or lethal levels for striped bass. The striped bass that occur downstream from Lake Livingston dam provide a major part of the brood stock for the Texas PWD striped bass hatchery operations, so the aquatic habitat downstream from the dam is of high importance to Texas PWD.

The applicant, Texas PWD, and FWS all agree that a minimum flow (200 cfs) be discharged from the spillway for the protection of aquatic habitat downstream from the dam. The parties also agree with the provision for additional monitoring and possible future adjustment of the proportion of flow through the spillway gates, or air injection into the generating units, depending on the results of the monitoring studies. The project would operate using whatever flows are scheduled for release from Lake Livingston by TRA.

Under the applicant's proposal, a minimum flow of 200 cfs would be released whenever the scheduled releases from the dam range from 1,000 to 4,700 cfs. Based on the flow record, the flow duration curve included in Exhibit B of the license application, a flow release of 1,000 cfs would be expected to occur 85 percent of the time, while a flow of 4,700 cfs or higher would occur about 42 percent of the time. Thus, the 200-cfs minimum flow would be expected to occur at least 85 percent of the time, while additional spillage (because the generating units' hydraulic capacity would be exceeded) would occur about 42 percent of the time. A 200-cfs release approximates the lowest flow ever released by Lake Livingston dam. Higher spillway discharges would occur whenever scheduled releases fall below 750 cfs, the minimum hydraulic capacity of one generating unit. If that occurred, the generating units would be shut down and all discharges would be made over the spillway. A flow release of 750 cfs is at the 95 percent exceedance level, which means that flow scenario would occur 5 percent of the time. Under normal project operations (releases between 1,000 and 4,700 cfs), spillway flows would comprise from 4 to 20 percent of the releases from the dam, while the powerhouse releases most of the flows.

Effects on downstream aquatic habitat from a minimum flow ranging from 200 cfs most of the time to higher levels (750 cfs) about 5 percent of the time may not be measurable, although the differences would be mostly observable in the stilling basin. Any flow that passes over the spillway gates first enters the spillway stilling basin, which is impounded by the weir wall. The wetted area and elevation of the stilling basin would not likely change appreciably by the range of minimum flows to be discharged (typically between 200 and 750 cfs), because the applicant is proposing to modify the notch in the downstream weir wall to maintain a relatively constant water level in the stilling basin. The retention time and flow velocities in the basin, however, would change. We estimate that the stilling basin has a storage volume of 1.63 acre-feet. A flow of 200 cfs for 24

hours is 396 acre-feet, so at that flow the retention time would be about 6 minutes. A flow of 750 cfs would result in a retention time of less than 2 minutes, and at that flow the stilling basin would exhibit higher velocities than at a flow of 200 cfs. Any fish residing in the stilling basin would be exposed to these higher velocities, but these higher velocities would be infrequent and much lower than the velocities and turbulence levels associated with higher spillage events that often occur under existing Lake Livingston operations. At flows greater than 200 cfs, velocity refugia may still be available within the stilling basin, or fish could simply move downstream to the river below the weir to more suitable habitat.

Minimum flows from the stilling basin would spill over the weir wall into the Trinity River, which would also receive discharges from the proposed powerhouse, so the total releases to the river would equal existing discharges from the dam. Because the overall discharge from the dam would remain the same, there would be minimal effects on aquatic habitat in the Trinity River, except for a change in flow patterns immediately downstream from the weir wall. Therefore, a minimum flow of 200 cfs from the Lake Livingston dam spillway is appropriate when combined with the proposed operational approach, water quality measures, and adaptive management measures.

The applicant explains that there is a coolwater refuge for fish (striped bass) immediately downstream from the weir wall, due to a groundwater inflow of about 1 cfs. The proposed tailrace would discharge about 300 feet downstream from the weir wall, so the small coolwater refuge area would remain available as a fish refuge during the summer months.

Discharge from the powerhouse would result in a relatively high flow (up to 4,500 cfs) entering the river at an angle. This flow may reach the opposite (west) shoreline, potentially resulting in some erosion along the Trinity River shoreline (this is also discussed in section 3.3.1, *Geologic and Soil Resources*). The powerhouse discharge may also tend to concentrate flows along the east side of the Trinity River downstream from the weir wall for an unknown distance, although this effect would unlikely be evident more than a mile or two downstream. Changes in downstream flow patterns may affect the distribution of fish in the river, but these flow pattern changes would not result in any dewatering of habitat or substantial changes in habitat availability.

Effects on water quality associated with project flow releases and the proposed minimum flow were discussed in *Water Resources*. We found that the proposed project would release water that would be slightly warmer than current spillway releases, with slightly lower DO levels. However, state standards would continue to be met, particularly if the applicant activates its proposed air injection system in the generating units, or implements project shutdowns. With these measures, the proposed project would have minimal effects on water quality and in turn fishery resources downstream from Lake Livingston dam.

As we previously described, the applicant would implement a Post-Startup Monitoring Plan to determine the adequacy of minimum flows to protect aquatic life in the stilling basin and the river downstream, and to prepare a mitigation plan to alleviate any adverse conditions found by the monitoring program. Implementing this plan would help ensure that water quality and fisheries habitat is protected downstream from Lake Livingston dam. Although our analysis indicates that this high-value habitat would not be adversely affected by proposed project operations, the Post-Startup Monitoring Plan would provide for real-time monitoring of water quality and fish populations during the first several years of project operation. The plan would also include a provision to adjust minimum flows or the proportion of flows to be passed by the spillway gates, if warranted.

FWS recommends that the provisions of the Post-Startup Monitoring Plan continue for the life of the project, and that the Cooperative continue to work with Texas PWD to resolve any unforeseen impacts that the project may have on the striped bass fishery downstream from the Lake Livingston dam that were not considered in the development of the Post-Startup Monitoring Plan. The applicant is proposing to monitor water temperature and DO for the life of the project, but is proposing to monitor fish populations for only the first 3 to 5 years of project operation. Continuing to monitor water temperature and DO for the license term is reasonable, because those parameters would provide a good indication of the continued suitability of aquatic habitat downstream from Lake Livingston dam over the long term. However, it may be appropriate to adjust the sampling interval after the initial years of operation to focus on periods when impacts are likely to occur. Any such adjustments could be made based on consultations among the parties after the first few years of data collection.

Monitoring fish populations for the life of the project would be unnecessary to determine the health of the downstream fishery. However, periodic monitoring (every 5 to 10 years) for the first several years of the license would be appropriate to ensure that the striped bass and other fisheries downstream from the dam are not being adversely affected by project operation, including any unforeseen impacts. Once project operations and associated mitigative measures have been in place for a number of years, and if fish population monitoring has demonstrated that populations are stable and minimally affected by project operations, there would be no need to continue fisheries monitoring for the life of the project.

The applicant filed its Post-Startup Monitoring Plan as a draft plan on March 15, 2010. In its filing, the applicant states that it anticipates preparing a final plan, as a requirement of any license issued. Requiring the applicant to prepare and file a final Post-Startup Monitoring Plan for Commission approval, after issuance of any license for the project, would allow the Cooperative, in consultation with the agencies, to finalize details of the plan, including developing a schedule for long-term fisheries monitoring.

Downstream Fish Passage

The applicant's pre-application fisheries studies using DIDSON found that large numbers of sport and forage species pass through the spillway gates, and are a major source of recruitment for fish populations downstream from the dam, particularly for striped bass. With operation of the proposed powerhouse, up to 96 percent of the flow scheduled for release from Lake Livingston dam would pass through the generating units, likely entraining a large portion of the fish currently passing downstream through the spillway gates. These fish would be subjected to injury and mortality associated with physical trauma (blade strike) or pressure changes during passage.

The applicant is proposing to install trashracks on the project intakes to exclude trash and larger fish, and is proposing large Kaplan units, which are considered to be more "fish friendly" than other turbine designs. Texas PWD recommends installation of "fish friendly" turbines, and both Texas PWD and FWS recommend implementing the Post-Startup Monitoring Plan to ensure that fish populations downstream from the dam (including striped bass) maintain adequate numbers and condition to support the current level of recreational fishing and the Texas PWD striped bass stocking program.

Our Analysis

Fish entrainment can be a major source of fish mortality at hydroelectric projects where downstream passage of large numbers of outmigrants occurs, and is often associated with anadromous species but sometimes involves resident fish populations. We reviewed the Electric Power Research Institute (EPRI) (1997) summary of fish entrainment studies, which is a database of the results of 43 fish entrainment studies conducted at hydroelectric projects located primarily in the northeast, southeast, and midwest United States in the early to mid 1990s. Our review indicates that many of the warmwater species occurring in Lake Livingston have been studied at other hydroelectric projects, although the extent of entrainment varied among species and from project to project. Most of the fish entrained were typically less than 100 millimeters (4 inches) long and were often juvenile fish or forage species such as minnows that never exceed a length of 3 or 4 inches.[5] This finding is in general agreement with the applicant's DIDSON study that found most of the fish passing the Lake Livingston spillway gates (98 percent) were less than 8 inches long, with the majority less than 5 inches long (probably threadfin shad). The DIDSON monitoring, however, also found that substantial numbers of fish greater than 8 inches long (probably striped bass) passed through the spillway gates, although the total proportion of larger fish was only about 2 percent of the total estimated passage of about 8 million fish from December 2007 through August 2008.

[5] EPRI found that overall, 90 percent of the fish entrained in the 43 studies were less than 4 inches long.

Assuming that fish passed through the spillway gates are indicative of fish that would be entrained through the proposed powerhouse, most of the fish subjected to passage through the turbines would be young-of-the-year or juvenile life stages, as well as forage species such as threadfin shad. Based on the data in EPRI (1997), it is reasonable to assume that a portion of the fish passing through the turbines would be killed. However, the loss of individual fish of these species and life stages, which typically experience high natural mortality rates in river systems unaffected by hydro operations, would be unlikely to affect the overall fish populations in the Trinity River.

We previously described that the striped bass fishery downstream of Lake Livingston dam depends on the successful downstream passage of mostly age I and II striped bass from Lake Livingston, which now occurs through the spillway gates. Under proposed project operations, up to 96 percent of the flow releases from the dam would be diverted from the spillway gates to pass through the powerhouse, likely attracting out-migrating striped bass to the powerhouse flows, where they could be entrained. Although the Cooperative is proposing trashracks on the intake structure to exclude trash and larger fish, the proposed trashrack spacing would be 5.5 inches and would be capable of physically excluding only the largest fish. The mean length of striped bass in Lake Livingston is 9.3 inches for age I and 18 inches for age II. Fish of this size range would be capable of passing through the trashracks proposed at the Lake Livingston Project, so would likely be entrained and experience some mortality during turbine passage.[6]

Not all striped bass, however, would pass downstream through the turbines. Because striped bass are known to pass downstream primarily during the months of February through April, there would be greater amounts of spillage during those months, offering fish an alternative route downstream, similar to current operations. Table 2 shows that the median discharge from Lake Livingston dam ranges from 5,635 to 6,580 cfs in February through April, indicating that substantial spillage could occur during that period (the powerhouse maximum hydraulic capacity would be 4,500 cfs).

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[6] Using a freshwater fish weight calculator (http://www.csgnetwork.com/fishfreshwtcalc.html, accessed December 3, 2010), a striped bass 9.3 inches in length would have a girth of 5.4 inches and weight of 0.4 pounds, while an 18-inch striped bass would have a girth of 10.4 inches and weight of 2.8 pounds. The girth of a fish is the circumference of the fish at its widest point, and although the circumference of a striped bass is not a perfect circle (the body is more laterally compressed), a conservative approximation of the fish width can be made by calculating the diameter, using the girth (circumference divided by π or 3.14). Thus, a 9.3-inch striped bass would have an estimated width of about 1.7 inches, and an 18-inch striped bass would have an estimated width of about 3.3 inches.

The percentage of entrained fish that would experience mortality cannot be predicted with certainty, although review of the EPRI (1997) database does allow a general estimate of likely mortality. Fish mortality through hydroelectric turbine generators depends on a number of factors, including: type of unit, head, hydraulic capacity, runner speed, runner diameter, peripheral runner velocity, number of runner blades, number of wicket gates, number of stay vanes, and clearances inside the unit. In general, large Kaplan units, which are proposed for Lake Livingston, are considered to be more "fish friendly" than high-head Francis units that run at higher runner speeds and may have smaller clearances within the unit.

Our review of the survival data in EPRI (1997) indicates that, while there is a wide range in survival rates among studies and species (and whether survival is measured immediately or after 24 or 48 hours), survival rates of 90 to 98 percent (mortality rates of 2 to 10 percent) are common, with the highest survival associated with large Kaplan units of moderate head. The proposed units at Lake Livingston would have a head ranging from 50 to 79 feet, which is considered moderate. Thus, it is reasonable to assume that the survival rate of fish passing through the proposed units would be at least 90 percent. Achieving survival of 95 percent and greater, which was documented from some projects, may not be achievable at Lake Livingston, because the proposed units would have a relatively high runner speed of 240 revolutions per minute, which is higher than any of the Kaplan units included in the EPRI data. Survival of an estimated 90 percent of the fish passing through the proposed powerhouse would suggest that specific measures for fish passage or protection at the project are likely not necessary, and none have been recommended by the resource agencies.

The Post-Startup Monitoring Plan includes a provision to monitor fish populations downstream from the dam, including striped bass, to ensure that project operations are not adversely affecting these populations. If adverse effects are detected, appropriate measures, such as reductions in powerhouse flows and an increase in spillway flows (particularly during the spring months for striped bass passage), could be taken to ensure that sufficient numbers of fish are successfully passing downstream from Lake Livingston to support the fishery downstream from the dam.

Paddlefish

Paddlefish were not collected or observed in Lake Livingston during the applicant's surveys, and only three were collected downstream from the dam. Based on this known distribution, it is unlikely that paddlefish would be exposed to potential entrainment at the proposed hydropower intake on Lake Livingston. Paddlefish are planktivorous and those residing in the Trinity River downstream from the dam may feed on zooplankton passing from Lake Livingston into the river. The proposed hydroelectric facility is unlikely to affect passage of zooplankton from the reservoir to the river, because zooplankton would likely experience good survival during passage through the

turbines. Other potential effects on paddlefish inhabiting the river downstream from the dam would be associated with the previously described water quality and flow pattern changes downstream from the weir wall, but these effects are not expected to be adverse. State water quality standards would continue to be maintained downstream from the dam as a result of the Cooperative's proposed environmental measures.

Diadromous Fish Passage

The only diadromous species collected in the project vicinity by the applicant's fishery studies was the American eel, a catadromous species that spawns in the Atlantic Ocean but spends most of its life rearing in freshwater lakes and streams, or in estuarine coastal waters. FWS states that the American eel has experienced population declines along the Atlantic coast and in the Gulf of Mexico, and has requested reservation of authority to prescribe fishways at the project in the future.

Our Analysis

As previously described, only small numbers of American eel were collected during the applicant's baseline fisheries surveys. In addition, data presented by the applicant indicate that only small numbers of American eel likely occur in the lower Trinity River, as well as many other Texas coastal rivers. FWS states that little is known about the distribution of eel in the Gulf of Mexico and its tributaries, but that there is speculation that the current abundance of eels is lower than in the past. Nonetheless, the preponderance of information filed by the applicant in its request to Interior for a trial-type hearing and its alternative fishway prescription shows that there is a lack of substantial evidence to support fish passage at the project at this time.

The applicant's fishery survey data did show that American eel occur in the Trinity River, but in very low numbers (only 17 of the 13,900 fish collected by all gear types were eel). All of these eel were collected downstream from Lake Livingston dam, and none were collected upstream of the dam. This may indicate that the dam is an impediment to the upstream movement of eel in the river, or may be the result of differences in sampling effort or efficiency. Because Lake Livingston dam is located at river mile 129, there is a substantial amount of eel habitat downstream from the dam in the Trinity River and its tributaries that can be used by eel before there is a need to provide upstream eel passage at the dam. If the population of American eel in the Gulf of Mexico and in Texas waters were to increase to a point that most of the available habitat in the lower Trinity River is used, upstream passage at the dam may be warranted in the future.

For now, periodic monitoring of American eel downstream from Lake Livingston dam would be an appropriate measure to detect any future increases in the eel population. The Post-Startup Monitoring Plan provides for monitoring of fish populations below the dam for the first 3 to 5 years of project operation. This level of monitoring would likely

detect any short-term increases in the eel population. Longer term fisheries monitoring, as we discuss above, that would include sampling for American eel, would provide the means for detecting any longer-term increases in the eel population.

Cumulative Effects

Water Quality

Our analysis indicates that operation of the proposed project would affect water quality downstream from Lake Livingston dam by slightly increasing water temperatures and potentially reducing DO levels, compared to existing conditions. Any effects on water quality immediately downstream from Lake Livingston dam could have cumulative effects on water quality in the lower Trinity River, because the river is already an impaired system with high nutrient levels and impairment of other water quality parameters due to urban, agricultural, and industrial development. Any potential project effects, however, would be mitigated by long-term monitoring of water temperature and DO, and implementation of appropriate measures to ensure that releases from Lake Livingston dam meet state water quality standards.

Water quality modeling indicates that any effects of the proposed project on water temperature and DO (without any mitigation) would be moderated and minimally detectable within 10 miles downstream from the dam. Thus, any effects associated with the project on water quality would not contribute to adverse cumulative effects in the lower Trinity River downstream from Lake Livingston dam.

Fishery Resources

Construction and operation of the project at Lake Livingston dam has the potential to affect fishery resources by interrupting the current passage of fish from the lake to the Trinity River downstream from the dam. This effect could occur as a result of the reduction in successful downstream fish passage due to entrainment through the powerhouse and the mortality of some fish during turbine passage. Striped bass and forage species from the lake are the major source of recruitment for these species downstream from the dam, and potentially for a large portion of the lower Trinity River. These striped bass are also the major source of brood stock for the Texas PWD striped bass hatchery program in the state. Therefore, any significant adverse effect on the Lake Livingston striped bass population could have cumulative effects on the striped bass fishery in the lower Trinity River, or in other water bodies in Texas that depend on hatchery striped bass.

The proposed project's potential effects on striped bass and other species that pass the Lake Livingston dam to the lower Trinity River would be minimized because: (1) this passage would continue through the powerhouse trashracks, as smaller fish less than 8 inches long (which compose the majority of fish passing the dam and include yearling

striped bass) would be able to pass through the trashracks; (2) survival of entrained fish would likely be 90 percent or higher; (3) water quality downstream from the dam would still meet state standards and would not adversely affect fish populations; and (4) the Post-Startup Monitoring Plan would provide for monitoring of the fish populations downstream from the dam, with provisions for making changes in project operations to mitigate any effects that are observed.

3.3.3 Terrestrial Resources

Affected Environment

Vegetation

Human activities including logging, and clearing for agriculture and pasture, have modified the majority of lands within and surrounding the project. Around Lake Livingston dam, vegetation consists predominantly of manicured lawn with some shrub growth. Some riparian forest stands are present downstream from the dam along the banks of the Trinity River. Dominant tree species in these forests include swamp red maple, river birch, American hornbeam, American beech, water oak, willow oak, American elm, and green ash. Along the proposed route for the transmission line, vegetation is dominantly grassland and pasture with occasional trees and upland woodland areas. Dominant trees in these upland areas include eastern red cedar, short-leaf pine, long leaf pine, loblolly pine, white oak, southern red oak, black walnut, and black hickory. Dominant grass and forb species include splitbeard bluestem, three-awn, brome, Bermudagrass, lovegrass, little bluestem, johnsongrass, Texas thistle, goldenrod, croton, Texan bluebonnet, and clover.

The dam site is located within the Pineywoods Vegetation Region, in an area also known as the Big Thicket. The majority of historical wetland and riparian areas upstream of the dam are currently inundated by the lake. As is evident from National Wetland Inventory maps, there are numerous forested and unforested wetlands in the area near and downstream from the dam. Most are located within the 100-year floodplain of the Trinity River and its tributaries. In 1983, field surveys of the proposed project area downstream of the dam did not identify any wetland areas. However, photos included in the applicant's October 22, 2009, additional information filing (figures 21, 22, 24, and 25) show vegetation along the east bank of the Trinity River that appears consistent with wetland vegetation in an area with wetland hydrology. Wetland delineations would be required to confirm or update the findings of the 1983 surveys.

Sensitive plant species potentially occurring in the project area include Texas prairie dawn (*Hymenoxys texana*); and Texas trailing phlox (*Phlox nivalis ssp texensis*), both of which are discussed in section 3.3.4, *Threatened and Endangered Species*.

Wildlife

Wildlife habitats surrounding the project area include bottomland forests and wetlands, open field/pasture, and upland woodlands. This diversity of available habitat, and the project's location along a major migratory pathway for North American birds, results in a highly diverse wildlife community in the project area. This diversity includes 76 species of reptiles and amphibians, 97 birds, and 38 mammals. Species of particular note for their recreational or commercial value include white-tailed deer, northern bobwhite, mourning dove, rabbits, American woodcock, waterfowl, squirrels, raccoon, beaver, nutria, gray fox, red fox, Virginia opossum, striped skunk, coyote, and mink.

There are nine wildlife taxa that are state-listed as threatened or endangered with potential occurrence in Polk or San Jacinto counties. The red-cockaded woodpecker (*Picoides borealis*) and red wolf (*Canis rufus*)[7] are state-listed as endangered, while the following species are state-listed as threatened: three reptiles, alligator snapping turtle (*Macrochelys temminckii*), Louisiana pine snake (*Pituophis ruthveni*), and timber/canebrake rattlesnake (*Crotalus horridus*); five birds, peregrine falcon (*Falco peregrinus americanus*), Bachman's sparrow (*Aimophila aestivalis*), bald eagle (*Haliaeetus leucocephalus*), piping plover (*Charadrius melodus*), swallow-tailed kite (*Elanoides forficatus*), and wood stork (*Mycteria americana*)[8]; and three mammals, black bear (*Ursus americanus*), Louisiana black bear (*Ursus americanus luteolus*), and Rafinesque's big-eared bat (*Corynorhinus rafinesquii*).

In addition to the state listings, the red-cockaded woodpecker, piping plover, black bear, and Louisiana black bear are federally listed species, and they are discussed in section 3.3.4, *Threatened and Endangered Species*.

Both the American peregrine falcon and Arctic peregrine falcon are statewide migrants in Texas. The coast provides important migratory habitat for both subspecies. Arctic peregrines are known to overwinter on the Texas coast. No nesting records of peregrines exist for the study area counties, and no occurrence records exist for the study area or immediate vicinity. These falcons are unlikely to occur in the study area except passing through during migration.

The recently delisted bald eagle is a rare and local summer resident in the eastern third of Texas, where it breeds along the Gulf Coast and on major inland lakes and reservoirs. During migration and winter, the species is more widely distributed,

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[7] Red wolf is also federally listed as endangered but is only known to occur in Florida, North Carolina, and South Carolina.

[8] Wood stork is also federally listed as endangered but its federal status is limited to populations in Alabama, Florida, Georgia, and South Carolina.

occurring primarily in the northern two-thirds of the state. Bald eagles prefer large bodies of water surrounded by tall trees or cliffs, which they use as nesting and roosting sites. Active nests are known to occur in Polk and San Jacinto counties, and a territory exists on Lake Livingston. The applicant encountered a bald eagle nest near the Trinity River south of the dam and south of FM 3278 during a field visit in March 2008. Surveyors also observed adult eagles foraging along the Trinity River south of FM 3278. According to locals, the nest produced young.

The swallow-tailed kite is a casual to rare migrant in all parts of the state except the Panhandle and western half of the Edwards Plateau. Habitat includes freshwater and brackish marshes, bottomland forests, and swamps. Historically, it was a very common to uncommon breeding species in the eastern half of Texas, but was almost completely extirpated from the state by 1910. Although the species was not known to nest in the state from 1914 to 1993, in 1994, surveyors recorded a swallow-tailed kite nest near the Neches River in Tyler County, Texas. Additionally, bird watchers have reported swallow-tailed kites exhibiting breeding behavior during the breeding season since 1990, and nest sites were confirmed in Orange County, Texas. Within Texas, this species most often occurs in Chambers, southern Harris, Liberty, Hardin, Jefferson, Orange, eastern Tyler, Jasper, and Newton counties. Although it has not been reported from either Polk County or San Jacinto County, this species could occur in the study area as a rare migrant.

The wood stork is an uncommon to locally common post-breeding visitor to the Texas coast and inland to the eastern third of the state. Suitable habitat for this species occurs in the study area. Thus, wood storks may visit the study area during migration/postbreeding dispersal.

Bachman's sparrow, an inhabitant of open pine or oak woods, brushy, overgrown fields, and scrub palmetto thickets, is an uncommon local resident of the Pineywoods region. This species has been recorded from both Polk and San Jacinto counties so it has potential to occur in the study area.

The alligator snapping turtle is an inhabitant of deep rivers, lakes, and large streams with muddy bottoms. It is known to occur in Polk County and has potential to occur in the study area.

The Louisiana pine snake occurs in mixed deciduous-longleaf pine woodlands and breeds from April to September. This species is known to occur in both Polk and San Jacinto counties and has potential to occur in the study area.

The timber/canebrake rattlesnake typically inhabits dense thickets and brushy areas along the floodplains of major creeks and rivers throughout the eastern third of Texas. It occurs within a variety of habitats including floodplains and riparian areas, swamps, upland pine and deciduous woodlands, abandoned farmland, and limestone

bluffs. This rattlesnake is most active during the summer and fall, with some activity noted in spring and as late as December. It is known to occur within both Polk and San Jacinto counties, and has potential to occur in the study area.

Rafinesque's big-eared bat occurs throughout the southeastern United States, with the western limit of its range in east Texas. Rafinesque's big-eared bat roosts in tree cavities, crevices under bark, under dry leaves, in buildings, and in abandoned wells. This species is known to occur in Polk County and has potential to occur in the study area. The applicant consulted with TRA regarding presence of bats roosting in out buildings near the Lake Livingston dam, which are used for storing lawn mowing equipment. There is no evidence that bats use these buildings. Other structures associated with Southland Park may also provide roosting habitat for bats; however, bat presence in these areas is unknown.

The red wolf is considered extirpated in the state of Texas and is excluded from further analysis.

Environmental Effects

Effects of Construction of Project Hydroelectric Facilities

Construction of the project powerhouse, intake facilities, and tailrace channel would require some excavation within upland areas. However, the project would only disturb areas that were previously cleared of native vegetation during construction and maintenance of the Lake Livingston dam. Vegetation in these areas is dominantly manicured lawn and scrub; however, as noted above, some wetlands may be present along the river margins. Construction of the project hydroelectric facilities would remove approximately 12 acres of vegetation. Following construction, as part of proposed measures to reduce the potential for erosion, the applicant would reseed or stabilize disturbed areas.

Loud noises and increased human activity associated with construction activities could affect bald eagles nesting nearby. Such effects could result in nest abandonment or reduced reproductive success and constitute a violation of the Bald and Golden Eagle Protection Act. FWS recommends, by letter dated July 23, 2010, that the applicant adhere to the National Bald Eagle Management Guidelines to avoid disturbance of bald eagles. FWS also notes that eagles are particularly vulnerable to disturbance throughout the nesting season, which in Texas is October 1 through May 30.

Construction of project facilities could also require the modification or removal of existing structures such as the out buildings near Lake Livingston dam and other structures associated with Southland Park. Such activities could affect sensitive bat species if they are found to roost in these areas. To reduce potential effects on sensitive bats, the applicant proposes to conduct a field investigation to determine whether any of

the structures are occupied by Rafinesque's big-eared bats or Southeastern myotis. If either species of bat is encountered, the Cooperative would consult with FWS and Texas PWD prior to modification or removal of the structure.

Our Analysis

Construction of the project hydroelectric facilities would temporarily disturb lawn and scrub vegetation. Approximately 12 acres of this habitat would be permanently removed. Because much of this area consists of manicured vegetation, there is little potential for long-term effects on terrestrial resources. The applicant proposes to survey the transmission line route for wetlands, but does not indicate whether such surveys would also occur in the proposed tailrace location. If the applicant conducts surveys for wetlands in this area prior to ground-disturbing activities, and consults with the Corps to mitigate any loss of wetlands due to construction, long term effects would be minimized.

During construction, increased noise and human activity would discourage wildlife from occupying the construction zone. Species most likely to be displaced are those that occur in open areas or edges between forest and grassland and are tolerant of human development. The affected area is not expected to support any state-listed species. Similar habitat is abundant in the project area, and the temporary displacement associated with construction of the hydroelectric facilities would not affect local wildlife. Following construction, land use around the dam is expected to return to manicured lawn. However, reseeding disturbed areas with native vegetation would help to stabilize soils and limit erosion that could reduce the success of revegetation efforts and affect water quality. Additionally, the Cooperative proposes to restore the Southland Park recreational area with native vegetation plantings, display interpretative signs about vegetation in the area, and work with community volunteers to maintain native vegetation resources in the area. These measures would help offset effects of the project construction on native vegetation.

As FWS notes in its comments, the National Bald Eagle Management Guidelines provide guidelines for scheduling construction activities in proximity to active eagle nests. Specifically, the guidelines include providing protection buffers that range in size from 330 feet to 0.5 mile, depending on the intensity of the construction activities proposed and the surrounding landscape. These guidelines are meant to protect eagles from disturbance, which could result in nest abandonment or lower reproductive success, thereby violating the Bald and Golden Eagle Protection Act.

The closest eagle nest identified in the project area is on the Trinity River, south of FM 3278, which places the nest greater than 0.5 mile from the proposed construction activities. Typically, eagles will return to existing nests from one year to the next. However, there is always the potential for pairs to construct new nests. If the Cooperative consults with FWS prior to commencing construction activities that could

disturb eagles during the October 1 through May 30 nesting period, to ensure compliance with the National Bald Eagle Management Guidelines, effects of construction on eagles would be minimal.

The Cooperative's proposal to conduct bat surveys prior to ground-disturbing activities and consult with FWS and Texas PWD, should any structures with bat activity require modification or removal, would help identify and avoid potential risk of injury to bats. In addition, suitable roosting habitat is present in nearby woodland areas. As such, any effects of permanent removal of the limited roosting habitat associated with these structures would be minimal. The Cooperative's proposed measure would minimize potential effects of the construction of hydroelectric facilities on sensitive bats.

Effects of Operation of Project Hydroelectric Facilities

The project would operate using water releases that TRA would otherwise make through the spillway gates to maintain the reservoir surface elevation at approximately 131 feet msl, and to satisfy demands by downstream water right holders. There would be no changes in lake water levels impacting upstream or downstream wetlands, littoral, or riparian zones. There would, however, be a change in the location of the majority of the flow releases from Lake Livingston dam, which could result in some shoreline erosion.

Our Analysis

As discussed in section 3.3.1, the orientation of the tailrace at an angle roughly perpendicular to the existing Trinity River channel could create potential for erosion. These effects would be most likely to occur during low flow periods when the discharge from the powerhouse is the major component of flow entering the channel and would not be attenuated by flows discharging from the spillway. Erosion potential is expected to be greatest in the immediate vicinity of the tailrace and along the river bank opposite the tailrace. Based on aerial photography, existing vegetation in this area appears to be limited to grasses and potentially small patches of emergent wetlands. Some riparian forest is present, but is set back from the flood scour area associated with the main channel. As such, erosion is this area would have a small effect on terrestrial resources. The applicant's proposed erosion and sediment control plan, as modified by staff, would provide a mechanism for the Cooperative to monitor this area for erosion during project operations and implement control measures if necessary.

Effects of Construction of Project Transmission Line

The applicant conducted an in-depth siting study that evaluated seven potential routes for the project transmission line. Attachment A of the applicant's applicant-prepared EA provides in-depth analysis comparing these seven routes. In the original application, the applicant identified Route 3 as its preferred route. In November 2010, following discussions with the affected land owner, the applicant modified its exhibit G

drawings filed with the Commission and identified a new preferred route which it named the Baker Requested Route. By e-mail dated September 17, 2010, Texas PWD indicated it does not object to the revised route.

Within the project study area, primary sensitive areas for terrestrial resources include wetlands, bottomland/riparian forests, and upland woodlands. The proposed route completely avoids wetlands identified in the National Wetland Inventory database and bottomland/riparian forests, with the large majority of the route located in open grassland or pasture areas. The proposed route would cross approximately 2.3 acres (1,000 linear feet with a 100-foot-wide ROW) of upland woodland areas, consisting of isolated trees and small woodland patches. This constitutes about 6 percent of the 38.8 acres of total ROW. The route avoids large patches of woodlands and interior woodland habitat areas.

Construction of the transmission line would require some tree removal, grading of open grassland or pasture vegetation, and use of heavy machinery. These activities have the potential to temporarily displace wildlife and could result in injury or mortality. To reduce potential effects, the applicant proposes to perform transmission line clearing in a manner that would maximize the preservation of natural habitat and the conservation of natural resources. The applicant's proposed design of the line would take into account soil stability, sensitive habitats, the protection of adjacent resources such as natural habitat for plants and wildlife, and the prevention of silt deposition in watercourses. Prior to commencing ground-disturbing activities, the Cooperative also proposes to conduct surveys of the transmission line ROW for state-listed plant species and consult with Texas PWD to minimize effects on any observed populations.

Our Analysis

Construction of the project transmission line would result in the removal of trees in upland woodland areas, disturbance to grassland or pasture areas, and temporary disturbance to wildlife. While most of this disturbance would likely be limited to access roads and pole sites, clearing of vegetation could increase erosion rates and create suitable sites for establishment of invasive species, potentially altering vegetation composition. The Cooperative proposes to develop and implement an erosion and sediment control plan, as well as identify and avoid effects on wetlands. Including provisions for post-construction maintenance and monitoring in the Cooperative's proposed plan would help ensure successful establishment of native vegetation at reseeded areas. We assume that larger, more mobile species, such as white-tailed deer and birds, would be displaced to the surrounding areas. Less mobile species, such as rodents and reptiles, would also be displaced and could be lost. Some habitat would be restored in areas reseeded for erosion control. Implementation of the applicant's proposed measures would minimize effects of transmission line construction on terrestrial resources, including sensitive species and their habitats.

Effects of Operation and Maintenance of Project Transmission Line

Operation of the project transmission line poses risks to avian species including collisions with support wires or conductors and potential electrocution of birds large enough to span multiple conductors. The Cooperative proposes to construct the transmission facilities in accordance with current standards to reduce the risk of avian injury or mortality, including "Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006" (APLIC et al., 2006).

The transmission line ROW would also require vegetation maintenance to ensure vegetation does not grow too close to the conductors, creating a fire or electrical reliability hazard. In areas where treatment of vegetation within the ROW is required, the applicant proposes mowing, pruning and/or application of U.S. Environmental Protection Agency-approved herbicides as required (i.e., normally once every 3 to 5 years), to ensure proper clearance between the conductors and nearby vegetation. While maintenance patrols would vary, aerial patrols and foot patrols would be performed periodically. Cropland areas and properly managed grazing lands would require little or no vegetation control, due to existing land-use practices. The trimming of trees that pose a potential danger to the conductors or structure in order to provide a safe and reliable powerline would constitute the major maintenance activity.

Our Analysis

Although transmission lines pose a threat of electrocution for large bird species, such as raptors, following APLIC's guidelines is considered industry standard for designing transmission lines with avian protection in mind. As such, designing the project transmission line following these standards would help minimize the potential for avian mortality and injury due to collision or electrocution.

Existing vegetation in the proposed ROW is dominated by pasture lands, comprising grasses, forbs, and short shrubs. These areas would require little to no maintenance because there is little risk of plants interfering with the conductors. Vegetation management would be required within woodland patches. Implementing pruning and mowing activities to ensure vegetation does not grow too close to the conductors is necessary for the safe and reliable operation of the transmission line. The applicant's proposed methods are appropriate, provided they are implemented in a manner that would preserve native species composition and suitable vegetation cover for local wildlife. Vegetation management that maintains understory vegetation would provide cover habitat for wildlife crossing the corridor and provide edge habitat preferred by many wildlife species. The use of pruning techniques to the greatest extent practical and limiting mowing would maintain a healthy understory and limit potential for invasive species establishment.

3.3.4 Threatened and Endangered Species

Affected Environment

While preparing the license application and EA for the transmission line route, the applicant reviewed FWS and Texas PWD lists of threatened and endangered species known to occur in San Jacinto, Polk, Trinity, and Walker counties. Species with potential to occur in the project area include the endangered red-cockaded woodpecker (*Picoides borealis*) and the threatened piping plover (*Charadrius melodus*); Louisiana black bear (*Ursus americanus luteolus*); black bear (*Ursus americanus*, treated as Threatened in East Texas by similarity of appearance to Louisiana black bear); Texas prairie dawn (*Hymenoxys texana*); and Texas trailing phlox (*Phlox nivalis ssp texensis*). There are no federally listed fish or aquatic species in Lake Livingston or in the Trinity River downstream of the project.

Red-Cockaded Woodpecker

The red-cockaded woodpecker, which has been listed as endangered under the ESA since 1970, prefers open, mature, and old growth pine habitats that formerly covered the southeastern United States (FWS, 2003). Due to the clearing of such habitats (logging, agriculture, fire suppression, etc.), over 97 percent of the red-cockaded woodpecker population has been lost, leaving only 14,000 red-cockaded woodpeckers living in 5,600 colonies scattered across eleven states, including Texas. Currently, the largest Texas populations are within the Sam Houston, Angelina, Sabine, and Davy Crockett national forests, Jones and Fairchild state forests, and several private tracts. In 2003, FWS issued the Red-Cockaded Woodpecker Recovery Plan.

Suitable nesting habitat for the red-cockaded woodpecker generally consists of open pine forests and savannahs with large, older pines and minimal hardwood trees. The red-cockaded woodpecker prefers nesting cavities excavated from living trees, especially older trees that are susceptible to red-heart disease. Suitable foraging habitat is found in open-canopy mature pine forests having low densities of small pines, mid-story vegetation, or hardwood over-story (FWS, 2003). The red-cockaded woodpecker requires large continuous tracts of suitable habitat, with a typical family group occupying a home range of 100 to 400 acres (FWS, 2003; Jackson, 1994). No suitable habitat for this species is present in areas of potential project effects.

Piping Plover

The piping plover is a small shorebird that inhabits coastal beaches and tidal flats. Approximately 35 percent of the known global population of piping plovers winters along the Texas Gulf Coast, where they spend 60 to 70 percent of the year. The piping plover population that winters in Texas breeds on the northern Great Plains and around the Great Lakes. Within their wintering range, which includes the Texas Gulf Coast,

piping plovers inhabit beaches and bay margins, particularly tidal mudflats and sandflats, algal flats, sandy beaches, and spoil islands. The piping plover is a very rare migrant in east Texas and no species occurrences are recorded with 5 miles of the project area. No suitable habitat for this species is present in areas of potential project effects.

Louisiana Black Bear

The Louisiana black bear historically inhabited east Texas, Louisiana, and southern Mississippi, but is now confined to small numbers in Mississippi, along the Mississippi River, and to core populations in the Tensas and Atchafalaya River basins in Louisiana. The last Texas Pineywoods record of the native black bear is from the late 1950s, near the town of Livingston in Polk County. Periodic reports of black bears exist from various counties of east Texas; however, these bears most likely represent individuals dispersing from neighboring areas in Louisiana. Louisiana black bears require large areas of remote, undisturbed bottomland hardwood forest habitat, although other forest types may be used. Of particular importance is high quality cover for bedding, denning, and escape, particularly where areas of suitable habitat have become smaller and more fragmented. No suitable habitat for this species is present in areas of potential project effects.

Black Bear

Black bears are extremely rare in east Texas and it is unlikely that they would be present in the study area. Formerly widespread throughout the state, the American black bear is now restricted to mountainous areas of the Trans-Pecos region and the far southwestern edge of the Edwards Plateau. FWS designates the American black bear as threatened because of its similarity in appearance to the Louisiana black bear, but this status applies only within the historic range of the Louisiana black bear. Because of the similarity of appearance between the two taxa, FWS treats all east Texas black bears as threatened.

Texas Trailing Phlox

Texas trailing phlox is a short, evergreen, perennial subshrub that is endemic to deep sandy soils of fire maintained openings in upland longleaf pine savannas or post oak-bluejack oak woodlands in southeast Texas. Canopy closure due to fire suppression is a major threat to Texas trailing phlox, which depends on fire to maintain an open forest canopy. The species occurs in fewer than 20 populations in Hardin, Polk, and Tyler, counties. No previously recorded occurrences of the Texas trailing phlox have been documented in the study area or vicinity. There is limited potential for this species to occur in the project area. No surveys have been completed.

Texas Prairie Dawn

Texas prairie dawn is a small sunflower that grows in sparsely vegetated areas at the base of mima mounds (small mounds that form in thickened loamy and sandy soils) or other nearly barren areas on slightly saline soils in coastal prairie grasslands. The species is known to occur in Trinity County but suitable habitat is not known to occur in the project area.

Environmental Effects

Effects of Construction

Construction of the project hydroelectric facilities would occur in previously disturbed areas that do not provide habitat for threatened or endangered species. Construction of the transmission line could cross potential habitat for Texas trailing phlox or Texas prairie dawn. Occurrence of these species in the proposed transmission line ROW is unlikely; but, if present, vegetation clearing activities associated with construction could affect these species. To minimize potential risks the Cooperative proposes to conduct surveys prior to ground-disturbing activities and during flowering periods to identify any existing populations of these species. If surveys do identify threatened plants in areas of proposed construction activity, the Cooperative proposes to consult with FWS to identify measures to minimize any effects. In addition, if any threatened or endangered wildlife habitat is encountered during construction, the Cooperative proposes to cease vegetation clearing activities and consult with FWS.

Our Analysis

Based on existing land use practices within areas of proposed construction activity, it is unlikely any threatened or endangered species are present. The Cooperative's proposal to conduct surveys for listed plants prior to ground-disturbing activities, and consult with FWS to minimize potential effects for any populations encountered during the surveys, would ensure construction effects are minimized. Filing the survey results with the Commission, would keep the Commission informed about the potential presence of these species. If listed plant species are found, the report could also include the specific avoidance and mitigation measures, developed through consultation with FWS, to ensure project construction and maintenance would not adversely affect these species. This report would also provide the Commission with the information needed should formal consultation with FWS be required in the future. Implementation of this measure would ensure the project is not likely to adversely affect listed plants.

Effects of Operation

The proposed project would be operated using water releases that TRA would otherwise make through the spillway gates, and there would be no changes in lake water

levels. As discussed in sections 3.3.2 and 3.3.3, the location of the tailrace relative to the existing channel could increase erosion potential along the banks of the Trinity River downstream from the dam. If these effects were to remove habitat for listed species, there could be potential effects to these resources. Vegetation management within the transmission line ROW could also affect listed species if there were no measures in place that consider the potential occurrence of listed plants.

The Cooperative proposes to develop an erosion and sediment control plan, which, with staff recommended measures, would include monitoring for erosion resulting from project operations and implementing control measures if necessary. In addition, the Cooperative proposes to conduct surveys for sensitive plant species within the transmission line ROW prior to ground-disturbing activities. If these surveys identify populations of Texas trailing phlox or Texas prairie dawn, the Cooperative proposes to consult with FWS to develop appropriate protection and mitigation measures for these species.

Our Analysis

Potential for erosion related to tailrace discharges are expected to be limited to areas in the immediate vicinity of the proposed tailrace and the channel bank opposite the tailrace. Existing vegetation in this area does not provide habitat for threatened or endangered species. In addition, the Cooperative would monitor erosion and implement corrective measures if needed. As such, operation of the powerhouse is not expected to affect threatened or endangered species.

Vegetation management within the transmission line ROW could affect Texas trailing phlox or Texas prairie dawn if these species are present and no protection measures are implemented. The Cooperative's proposed surveys prior to ground-disturbing activities and consultation with FWS to identify any necessary protection measures would help reduce potential effects for these species, provided that the identified measures are successfully implemented. The project, therefore, would not be likely to adversely affect Texas trailing phlox or Texas prairie dawn.

The project would also not affect the red-cockaded woodpecker, piping plover, Louisiana black bear, or black bear, because none of these species or suitable habitat for the species occurs within the areas potentially affected by project construction, operation, and maintenance.

3.3.5 Recreation and Land Use

Affected Environment

Regional Recreation Resources

There are two national forests administered by the U.S. Forest Service, a national grassland area, and other public recreation sites within the Trinity River Basin. The Davy Crockett National Forest, located in Houston County, is 20 miles north of Lake Livingston. This 64,000-acre national forest contains Ratcliff Lake, which is a 45-acre lake that offers fishing, swimming, about 80 campsites, and a concession stand. There are hiking trails, and hunting is permitted. The Sam Houston National Forest, southwest and adjacent to Lake Livingston, covers about 163,000 acres. There are four recreation areas within the forest, including Stubblefield, Double Lake, Kelley Pond, and Cagle, as well as four hunting camps. Recreational opportunities at or near these sites include camping, hiking, wildlife observation, fishing, and hunting. The Caddo-Lyndon B. Johnson national grassland is located northwest of Dallas-Fort Worth, within the Trinity River Basin, and includes grazing land for cattle, habitat for wildlife, and recreation activities such as hiking, camping, fishing, hunting, horseback riding, mountain biking, wildlife viewing, and photography.

The Texas State Comprehensive Outdoor Recreation Plan (SCORP) (Texas PWD, 2005) guides Texas PWD in conserving the state's natural and historic heritage and in providing public access to the outdoors. The plan addresses conservation of land and water resources and recreation. The Texas SCORP establishes eight goals to meet numerous conservation and recreation needs identified for the state. These goals include improving access, increasing participation, enhancing the quality of an activity, improving water quality, managing and promoting recreation, biodiversity, and cultural resources in the state, and improving data collection and dissemination methods to make management decisions. The Texas SCORP identifies picnicking, visiting historic sites, fishing, and camping as popular recreation activities. Fifty-two percent of respondents indicated a need for additional public access to water-based recreation, such as swimming, boating, and fishing.

The Trinity River Basin Master Plan (TRA, 2010) identifies similar goals as those identified in the Texas SCORP. These goals include providing public access and facilities for recreation and supporting programs designed to conserve environmental resources.

Lake Livingston

Lake Livingston has approximately 450 miles of shoreline, extending into San Jacinto, Polk, Walker, and Trinity counties, and encompasses 83,200 acres at a maximum pool level of 131 feet msl. The proposed project facilities would be located entirely in

Polk County, which comprises 1,061 square miles and ranges in elevation from 100 to 300 feet msl. In 2009, the estimated population for the county was 46,530, reflecting a 13.19 percent increase from 2000 (41,139 persons) (U.S. Census Bureau, 2009). Pine and hardwood forests cover much of the area surrounding Lake Livingston. Baseline fishery surveys at Lake Livingston, as described in section 3.3.2, *Aquatic Resources*, identified striped bass; largemouth bass; bluegill; blue, channel, and flathead catfish; white bass; and crappie as species of greatest interest to the recreational fishery. Invasive aquatic vegetation has had an adverse effect on sport fishing and reduced boating, hunting, and swimming access to Lake Livingston. To control the spread of invasive aquatic vegetation (e.g., *Hydrilla*, Water Hyacinth, and Water Lettuce) in Lake Livingston, TRA's efforts have focused on the removal of these plant species from boat lanes, areas of the lake with high recreational use, and around the shoreline facilities. Due to TRA's efforts and a 2009-2010 over-winter kill, the invasive aquatic vegetation has been reduced significantly (letter from Michael N. McCarty, Counsel to East Texas Electric Cooperative, Inc. to Kimberly Bose, Secretary, FERC, Washington, D.C., May 5, 2010).

Project Boundary

The proposed project boundary would include Lake Livingston up to elevation 131 feet msl, which is the normal maximum reservoir level, Lake Livingston dam and land downstream of the dam, and the proposed transmission line corridor. Thus, at elevation 131 feet msl, the project boundary would include those docks and piers that extend into the reservoir. Boat ramps and swimming beaches on Lake Livingston would also be partially within the project boundary and partially outside of it. The proposed project boundary would encompass a 13.35-acre parcel owned by TRA and a 20-acre parcel owned by Polk County, which comprise Southland Park which is located on the eastern bank of the Trinity River downstream from the dam. The project boundary would also include the approximate 39-acre (3.2-mile long, 100-foot wide) transmission line corridor, extending from the project switchyard to the existing Rich substation owned by Sam Houston Electric Cooperative, Inc., near Goodrich, Texas.

The land within the proposed transmission line corridor consists of pasture and grazing with scattered trees and is divided among nine property owners. The transmission line would cross FM 1988, a state secondary two-lane highway, and it may cross and/or follow Recreation Road 5, a two-lane road that provides access to Southland Park, between the generation substation and FM 1988, but it would not cross any other public roadway.

Recreation on Lake Livingston

Lake Livingston State Park, which is located north of Swartout in Polk County, contains 635.5 acres along Lake Livingston. Pine-oak woodlands, dominated by loblolly

pine and water oak, occur at the park. The park offers 161 camp sites, 10 screened shelters, a group picnic pavilion, a 50-person campground, restrooms, six boat ramps, a barrier-free fishing pier, and fish-cleaning shelters. An approximate 6.9 miles of trails provide hiking and mountain biking. Equestrian riding is available for visitors who use the horses provided by Lake Livingston stables. In 2009, Lake Livingston State Park received 139,307 total visits, including 69,966 overnight visits. The weekend (Saturday and Sunday) average was 240 day use visits per day.

Wolf Creek Park, located north of the town of Coldspring in San Jacinto County, includes 137 acres and 1 mile of shoreline, and is operated by TRA. The park accommodates overnight visitors on a 9-month basis and provides camping, wilderness areas, a miniature golf course, a marina, a fishing pier and boat ramp, a picnic area, a playground, and a shelter for group activities. In 2009, Wolf Creek Park received 19,326 total visits, including 9,413 visits for tent and recreational vehicle (RV) camping.

Tigerville Park, also operated by TRA, consists of an estimated 14 acres of non-fee day-use facilities and is located on the eastern shore of Lake Livingston 1.5 miles southwest of Blanchard, Polk County. The lake forms the northwestern boundary and the entire southwest and southern park boundaries. This wooded area contains a secluded deep water cove and has scenic views. The park has approximately 2,100 feet of shoreline and includes a free public boat ramp (open all year) and day-use facilities. The park also includes picnic sites, restrooms, a fishing pier, and a nature area. Recreational use data for the site are unavailable.

Swimming beaches on Lake Livingston are located at Texas PWD's Lake Livingston State Park, TRA's Wolf Creek Park, and two private marina/resorts: the Bethy Creek Resort and the Northshore RV Resort & Marina. There are approximately 50 commercial marina/resorts on Lake Livingston that are open to the public or available for rental. These facilities serve the needs of recreationists and other visitors. Two privately owned, residential summer camps for children –Camp Olympia and YMCA Camp Cullen – are operated near Trinity.

Recreation Downstream from the Dam

Until recently, Polk County operated Southland Park on the eastern bank of the Trinity River just below the dam. After TRA's construction of the Lake Livingston dam, Southland Park was developed by Polk County with funds under the L&WCF. The park site encompasses 33.35 acres, of which TRA owns and leases 13.35 acres to Polk County, which owns the remaining acreage. Until its closure in 2008, the park consisted of a gazebo/observation pavilion, a convenience store and cafe, picnic tables, and trailer sites. In recent years, recreational use at Southland Park declined, and its amenities had not been maintained by the private concessionaire who operated those facilities under an arrangement with the county. Consequently, the park was closed to the public. A chain

link fence was installed after park closure and currently blocks public access to the park, however an access road from FM 1988 to the site (known as Recreation Road 5), still exists, and provides public access to a portion of the park including the gazebo/observation pavilion.

TRA owns the San Jacinto County Park, which consists of 8.83 acres of undeveloped land below the dam on the western bank of the Trinity River. The access road (FM Road 3278) is south of, and parallel to, the parcel and is a continuation of an existing county road. The road terminates at the park where users may park their vehicles and gain access for fishing on the river. No formal facilities are provided because the site is subject to periodic flooding.

Two boat ramps maintained by a private concessionaire (Browder's Marina), one on either side of the river, are located 0.4 mile downstream from the dam, and are readily accessible from a county road. These ramps provide access to the tailwater fishery below the dam. Because of public safety concerns, the public is restricted from the tailwater area for 1,000 feet downstream from the dam. The Cooperative stated that angling usage below the dam has decreased significantly over the past 15 years, because of strict creel limits[9] on striped bass and blue catfish instituted by Texas PWD for angling above the FM 3278 bridge. As further described in section 3.3.2, *Aquatic Resources*, the striped bass population downstream from Lake Livingston dam is a critical source of brood stock for the Texas PWD's striped bass hatchery and stocking program, requiring increased protection of that population. Angling usage downstream from the dam also decreased because of TRA's enactment of an ordinance extending the no-access zone from 500 to 1,000 feet below the center-line of the dam (TRA Ordinance No. O-9AAA, adopted October 27, 1993, http://www.trinityra.org/default.asp?contentID=131).

Land Use

The Trinity River Basin transects eight distinct topographic and ecological regions, including the North Central Prairie, the Grand Prairie, the Blackland Prairie, the Eastern Timberlands, the Western and Eastern Cross Timbers, the Bottomlands, the Coastal Prairie and Marsh, and the Texas Claypan. The region consists of the floodplain areas adjacent to the tributaries and the Trinity River, and primarily consists of alluvial soil washed from the Blackland Prairie upstream. Land on higher river terraces is farmed

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[9] Special "bag limits" for this area are: (1) from the Lake Livingston dam downstream to the FM Road 3278 bridge, striped bass minimum length limit=18 inches and daily bag=2; and (2) from the Lake Livingston dam downstream to the FM Road 3278 bridge, blue and channel catfish minimum length limit=12 inches and daily bag=10, of which only 2 fish can be 24 inches or larger (Texas PWD website, http://www.tpwd.state.tx.us/publications/annual/fish/limits_freshwater/exceptions.phtml#T.)

and produces corn, peaches, blueberries, feed crops, livestock and commercial hardwoods. The primary use of the river bottom area is grazing. The timber industry and agricultural production contribute to the economy of Polk County (McCaslin, 2010).

Lake Livingston is located in the Bottomlands region, which lies along the Trinity River and the lower reaches of major tributaries. The topography in the proposed project area is characterized by rolling and hilly terrain consisting of alternating sands and shales of Eocene and Miocene age. For further discussion see section 3.3.1, *Geologic and Soil Resources*.

TRA owns in fee the land underlying Lake Livingston, all islands within the lake, and the shoreline up to the normal maximum operating pool level of 131 feet msl. Most of the shoreline surrounding Lake Livingston is privately owned above the 131-foot msl contour. However, TRA has a flowage easement on thousands of parcels of land surrounding the lake (letter from Michael N. McCarty, Counsel, Brickfield Burchette Ritts & Stone, PC, Washington, D.C., to Kimberly Bose, Secretary, FERC, Washington, D.C., May 5, 2010). Residential development occurs along the lower end of Lake Livingston. Development around Lake Livingston is controlled by local land use ordinances of the four bordering counties and is also limited by TRA ordinances governing septic discharges and construction activities in proximity to the reservoir, such as shoreline structures.

TRA's ordinances regulate uses of lands and waters in and around Lake Livingston in which TRA has either a fee or an easement interest. TRA requires each property owner who wishes to install a structure or engage in other regulated activity within the flowage easement to execute a Joint Use Agreement between the property owner and TRA (letter from Michael N. McCarty, Counsel, Brickfield Burchette Ritts & Stone, PC, Washington, D.C., to Kimberly Bose, Secretary, FERC, Washington, D.C., May 5, 2010). Further, property owners adjacent to the lake are responsible for the construction and maintenance of any shoreline erosion control measures to protect their property from soil erosion. TRA comments it inspects and licenses shoreline control measures installed by private land owners adjacent to the lake.

Environmental Effects

Recreation Resources and Land Use

To improve recreation resources, the Cooperative proposes to develop and implement a recreation management plan that would include the following provisions at the former Southland Park: (1) developing a lighted parking lot at the entrance to the new gazebo/observation platform, containing approximately 10 parking spaces; (2) relocating a portion of the existing Recreation Road 5 to provide access to and parking for the new gazebo/observation platform; (3) replacing the existing gazebo with a covered barrier-free 16-foot diameter gazebo/observation platform equipped with lights;

and (4) developing paved, barrier-free trails that would extend from the new gazebo/observation platform in an irregular loop for a total distance of about 1,500 feet. Benches would be installed along the proposed trails and native grasses and wildflowers would be planted. In addition, interpretive signs would be installed along the trail to provide information about the local terrestrial resources. The Cooperative would also perform site remediation at Southland Park to remove abandoned structures and to restore the Southland Park lands.

The proposed recreation facilities would be located within the project boundary, within the area currently known as Southland Park, and would occupy portions of both the county-owned parcel and TRA property. The Cooperative proposes to acquire a long-term (99-year) lease from the county for the 20-acre parcel, and a long-term easement from TRA for that portion of TRA's river frontage parcel needed for the proposed recreation measures.

Although the Cooperative states it would remain responsible for operating and maintaining the improvements at the former Southland Park, it anticipates that it would enter into an agreement with other entities, such as Polk County, Texas PWD, Trails and Nature Tourism Committees of the Livingston-Polk County Chamber of Commerce, and the National Park Service, to provide for the operation and maintenance of the trail and facilities.

Texas PWD concurs with the proposed recreation measures; however, should the private recreation facility (Browder's Marina) cease to provide public access to the river downstream of Lake Livingston, Texas PWD recommends that the Cooperative develop and maintain reasonable public access to the river at a feasible location.

Texas PWD also recommends that the final placement of a safety cable spanning the Trinity River delineating no public access should be determined only after the project has been constructed and operational for a sufficient time to allow the stabilization of hydraulic conditions downstream of the project, and to determine the location of fish congregations.

Our Analysis

The Cooperative's proposed recreation measures are a culmination of a consultation process with numerous multi-interest stakeholders. The Trinity River downstream from Lake Livingston dam is known for its concentration of migratory and resident bird species. The Cooperative's proposal to replace the existing gazebo with a covered barrier-free gazebo/observation platform would enhance wildlife observation at the project.

Improvements to the Southland Park area, including new or improved amenities, would benefit recreation users by providing public access to lands that had been closed

and unavailable to the public since 2008. Implementation of these enhancements would further the Texas SCORP goals to meet the numerous conservation and recreation needs identified by the state. The Cooperative's proposed recreation measures at the former Southland Park site would improve access to the outdoors and the quality of the recreational experience, and could increase the participation rate for outdoor activities, thereby addressing projected population growth in the bordering four counties and associated recreation needs and demand. Barrier-free amenities could also attract additional users that previously were unable to use certain recreation facilities at the site. Interpretive displays would inform the public about terrestrial resources, and could also include information about aquatic invasive vegetation.

A recreation management plan would provide a framework for consulting with pertinent agencies and other stakeholders and developing the proposed recreation measures at the project. The Cooperative states that the proposed amenities are subject to revision based on agency consultations; therefore, a recreation management plan describing the agreed-upon recreation measures would be filed with the Commission for approval. Developing such a plan would have a direct beneficial effect on the recreational experiences of residents and visitors.

This recreation management plan as currently proposed by the Cooperative, however, would not provide for monitoring of recreational use at the proposed recreation facilities. Recreational use monitoring would provide a means for determining whether the proposed facilities would meet future recreational demand, including for future downstream river access as recommended by Texas PWD. This monitoring would provide the justification for future improvements and upgrades to existing recreation facilities, if the monitoring indicated an increasing demand for additional improvements in the project area. A provision to include a recreation monitoring report, as part of the final recreation management plan and filed in conjunction with the Licensed Hydropower Development Recreation Report (Form 80 – filed every 6 years), would provide additional details about recreational use levels, and help the Cooperative and other stakeholders[10] identify and provide for future public access to project lands and waters to accommodate population growth, increased development, and changing patterns of recreational use for the term of the new license. This report would summarize monitoring activities and data, and provide recommendations to address future recreation measures.

We considered Texas PWD's recommendation to develop and maintain reasonable public access to the Trinity River at a feasible location downstream from Lake Livingston

[10] Other stakeholders could include the National Park Service, Texas PWD, Texas SHPO, Polk County, and the Trails and Nature Tourism Committees of the Livingston-Polk County Chamber of Commerce.

dam. At this time, Browder's Marina provides safe public access to the Trinity River; therefore, additional public access below the dam is not currently needed. However, as part of the proposed recreation monitoring, the potential need for an alternative facility can be monitored and assessed throughout the term of the license, which would meet the intent of the Texas PWD's recommendation.

Project Boundary

The project boundary would include the 83,200 acre Lake Livingston, a 13.35-acre parcel owned by TRA, a 20-acre parcel owned by Polk County, a 3.77-acre private parcel, and 3.2-mile long 100-foot wide transmission line corridor.

The Cooperative proposes to acquire 3.77 acres of land (either in fee or by perpetual easement) from the Sasparilla Barton Estate. The Sasparilla Barton Estate parcel is privately owned land that the Cooperative would need for relocating Recreation Road 5 and for the proposed powerhouse access road, in addition to the private lands within the 3.2-mile transmission line corridor. At Southland Park, the Cooperative proposes to use 1.97 acres of the 20-acre Polk County owned parcel for the proposed substation and a section of the proposed powerhouse access road. The Cooperative proposes to manage the remaining 18.03 acres for recreation and public access. The Cooperative also proposes to acquire easements from TRA necessary for project purposes. Those easements would be acquired upon the issuance of an acceptable license order. Additionally, the Cooperative proposes to acquire easements from individual property owners along the proposed transmission line ROW.

The Cooperative does not propose to acquire any lands in fee around the reservoir as a buffer zone, as it states that doing so would render the project economically infeasible and could interfere with TRA's effective regulation of uses surrounding the reservoir. Instead, the Cooperative intends to acquire from TRA the minimum easement rights necessary to satisfy its obligations as a licensee. The February 28, 2007, memorandum of understanding among the Cooperative, TRA, and the City of Houston grants the Cooperative an easement sufficient to construct, operate, and maintain the hydroelectric project consistent with the term of a Commission license and the memorandum of understanding (Cooperative, 2009b). TRA has agreed to grant the Cooperative an easement for its lands deemed necessary for project purposes, as stipulated in its memorandum of understanding (letter from Michael N. McCarty, Counsel, Brickfield Burchette Ritts & Stone, PC, Washington, D.C., to Kimberly Bose, Secretary, FERC, Washington, D.C., May 20, 2010).

Our Analysis

The Cooperative appears to have included within the proposed project boundary lands sufficient to construct, operate, and maintain the project. The proposed project boundary, revised by the Cooperative and filed with the Commission on November 20,

2009, also includes the lands necessary for the development of the proposed project recreation improvements. A project boundary that would include the project facilities and proposed recreation improvements would clearly delineate the project features and the Cooperative's responsibility. Regarding the 20-acre Southland Park parcel, section 21 of the FPA provides that no licensee may use the right of eminent domain provided for under that section's provisions to acquire any lands or other property that, prior to the date of enactment of the Energy Policy Act of 1992, were owned by a state or political subdivision thereof and were part of or included within any public park, recreation area, or wildlife refuge established under state or local law. Southland Park appears to have been established prior to the enactment of the Energy Policy Act of 1992. If so, the Cooperative would be barred from using the right of eminent domain under section 21 to acquire any Southland Park lands (see section 1.3.1.3).

3.3.6 Cultural Resources

Affected Environment

Section 106 of the National Historic Preservation Act

Section 106 of the NHPA, as amended, requires the Commission to take into account the effects of licensing a hydropower project on any historic properties and allow the Advisory Council on Historic Preservation a reasonable opportunity to comment if any adverse effects on historic properties are identified within the hydropower project's APE.

Historic properties are defined as any district, site, building, structure, or object that is included in, or eligible for inclusion in, the National Register. In this EA, we also use the term "cultural resources" to include properties that have not been evaluated for eligibility for listing in the National Register. In most cases, cultural resources less than 50 years old are not considered eligible for the National Register.

Section 106 also requires that the Commission seek concurrence with the Texas SHPO on any finding involving effects or no effects on historic properties. If Native American (i.e., aboriginal) properties have been identified, section 106 also requires that the Commission consult with interested Native American tribes that might attach religious or cultural significance to such properties.

Area of Potential Effects

Pursuant to section 106, the Commission must take into account whether any historic property could be affected by the issuance of a proposed original license within a project's APE. The APE is determined in consultation with the SHPO and is defined as "the geographic area or areas within which an undertaking may directly or indirectly

cause alterations in the character or use of historic properties, if any such properties exist" (36 C.F.R. 800.16[3]).

The project APE was not fully defined in the Cooperative's March 2009 license application. In its June 2009 Additional Information Request, Commission staff asked the Cooperative to consult with the Texas SHPO to determine the boundaries of the APE. In August 2009, the Cooperative stated that although the entire Lake Livingston dam and reservoir must be included within the proposed project boundary, cultural resources located along the reservoir's shoreline would not be affected by project construction, operation, and maintenance activities. The Cooperative stated that the APE as proposed in the draft HPMP encompassed all areas that would be affected by the project, which did not include the reservoir. In January 2010, the Texas SHPO stated that it would defer to the Commission with regard to the boundaries of the APE (letter from M. Wolfe, Texas SHPO, Texas Historical Commission, Austin, TX, to Michael N. McCarty, Counsel, Brickfield Burchette Ritts & Stone, PC, Washington, D.C., January 12, 2010). In the HPMP filed on January 25, 2010, the Cooperative excluded the Lake Livingston reservoir from the boundaries of the APE.

Cultural History Overview

The following text is adapted from the cultural overview provided in the January 2010 HPMP (Cooperative, 2010).

The Paleoindian period is the earliest generally accepted cultural period in the New World and includes populations that inhabited most, if not all, of North America by the end of the Pleistocene epoch. With the close of the Pleistocene came a period of climatic warming and a subsequent rise in sea level as surface water was released from glaciers and polar ice. Paleoindian occupation of the region during the terminal Pleistocene is evidenced by projectile point types such as Scottsbluff, Clovis, Plainview, Angostura, and possibly San Patrice, which are all considered characteristic of the Paleoindian culture. Archaeological evidence synthesized by Story et al. (1990; as cited in Cooperative, 2010) from numerous counties comprising the Greater Gulf Coastal Plain in Texas, Louisiana, Arkansas, and Oklahoma support the suggestion that the early cultures of the Paleoindian period probably existed in small nuclear families or bands that migrated widely in pursuit of seasonal resources.

The next period of cultural development, generally termed the Archaic, has been subdivided into Early, Middle, and Late stages based on changes observed in the archeological record that appear to coincide with episodic shifts in the Holocene climate and environment. The lifeways and subsistence strategies of the prior Paleoindian period appear to have extended into the Archaic. However, the Archaic may be characterized as a period of increasing population and changing lithic technologies. Although Early and Middle Archaic sites are not abundant in southeast Texas, they appear to show an

increased diversity of functional tool types and styles over those associated with the Paleoindian period. The San Patrice projectile point typifies the Early Archaic assemblage. This tool exhibits a triangular or leaf-shaped blade, and is nearly always thinned at the base. The Middle Archaic is characterized by expanding and parallel-stemmed dart point.

Sites dating to the Late Archaic period tend to be more abundant and are usually located on sandy knolls and other high terraces along perennial streams. Many have been found within the confines of the various reservoir projects of east and southeast Texas and as a consequence have been subjected to a considerable amount of excavation and analysis. Typically, Late Archaic sites tend to be relatively small and only rarely contain specialized tools or specific indicators of subsistence technology.

The advent of the Early Ceramic period actually heralds few changes. It has been argued that patterns developed during the Archaic effectively remain in place with the only alteration being the addition of ceramics to the technological repertoire.

The Late Prehistoric period in portions of the upper Texas coast spans the time between approximately A.D. 800 or 900 and A.D. 1700. The period is marked technologically by the appearance of arrow points, notably of the types Scallorn and Perdiz. With the exception of the use of the bow-and-arrow, little evidence exists for cultural change.

The first Europeans to encounter native groups in east Texas were Cabeza de Vaca in 1528 and the survivors of the De Soto expedition in 1542. According to Newcomb (1961, as cited in Cooperative, 2010), the main indigenous Indian groups in southeast Texas at the time were the Bidais, Deadose, Patiri, and Akokisa. By the end of the nineteenth century these indigenous groups were gone from the scene. A small immigrant Native American population composed of Alabama and Koasati (Coushatta) managed to maintain a presence in east Texas. Today they represent one of only a few resident native groups in the state.

During prefiling consultation for the license application, three federally recognized tribes were identified as having ancestral ties to the area of the proposed project: the Alabama-Coushatta Tribe of Texas (Alabama-Coushatta Tribe), the Caddo Nation of Oklahoma (Caddo Nation), and the Kickapoo Traditional Tribe of Texas (Kickapoo Tribe).

The pineywoods of east Texas were capable of supporting resident indigenous populations. To a large extent, however, the arriving Euro-Americans had a more difficult time. The rolling, forested landscape was not particularly suited to large-scale agriculture. Some members of Stephen F. Austin's First Colony settled along the San Jacinto River in 1824, and cattle ranching and timbering became the principal economic mainstays. Later, oil and gas exploration, beginning near Beaumont in the early part of

this century, significantly altered the economic picture of the area, but not necessarily its settlement pattern.

The region of present day Polk and San Jacinto counties was included in a vast royal land grant to Panfilode Narvaez, although the area was largely ignored by the Spanish. As early as 1529, a few roads following Indian trails were completed through the district, but no settlers came. Between 1831 and 1834, about 100 families received land grants, but few actually settled the land. Based on the 1834 census records, only seven families lived in the Trinity River settlement of Smithfield.

Present day Polk County became officially organized in August 1846 with Livingston as the county seat. The first permanent settlers in the county were the Alabama-Coushatta Tribe who continued to live in the Big Thicket area. During the early 1830s, European settlers began moving into the area. While many of them settled near the Trinity River, many more settled near major creeks. Cotton was the biggest industry leading up to the Civil War and then declined along with corn crops through the 1850s and 1860s. Plantations dominated the economy prior to the Civil War.

The population of the county grew slowly in the late nineteenth century as did industries such as cotton and corn production. In addition, cattle and other livestock made up a larger part of the economy. Polk County has also been influenced by the wood-products industry. Most of the lumber-related industries began operating during the 1870s and 1880s after the construction of the railroads. The first two railroads in the area were the Houston East & West Texas (now Southern Pacific) and the Trinity & Sabine (now defunct).

San Jacinto County was established out of portions of Walker County in 1870 with Coldspring as the county seat. A post office was established in Coldspring (formerly known as Coonskin) in 1847. In 1881, the Houston East &West Texas Railroad was constructed along the southeastern corner of the county. The timber industry figured importantly in the development of the county and Coldspring. Between the 1880s and 1920s, almost six million acres of timber were cut. The Delta Land and Timber Company built a commissary there in 1926. The Civilian Conservation Corps established a camp for youth in 1930 and operated it until 1937. The Coldspring Oil Field was discovered in 1945.

Archaeological and Historic-Era Properties and Structures

A review of records and files housed at the Texas Archaeological Research Laboratory was conducted to determine the location of previously identified archaeological sites within the proposed project boundary, the location of properties listed or eligible for listing on the National Register, State Archaeological Landmarks, and Texas Historic Markers. The Texas Department of Transportation's Master List of

National Register Eligible Bridges and Texas Historic Cemeteries database was reviewed.

The record search resulted in the identification of only two properties listed on the National Register within the proposed project boundary. Both are historic bridges crossing the Trinity River: the State Highway 19 Bridge (circa 1940) and the Riverside Swinging Bridge (circa 1904), a swinging railroad bridge. These structures are listed on the National Register because of their architectural/engineering significance. Both are located well upstream of the Lake Livingston dam.

In its license application, the Cooperative stated that construction of the proposed hydroelectric generation facilities would occur in areas previously excavated and disturbed by construction of the Lake Livingston dam. In a January 2008 letter, the Texas SHPO agreed that the areas near the dam where the proposed power facilities, laydown, and staging areas would be constructed would not require archaeological survey (letter from F. Lawrence Oaks, Texas SHPO, Texas Historical Commission, Austin, Texas, to Kimberly D. Bose, Secretary, FERC, Washington, D.C., January 28, 2008).

Although it has not yet been subject to archeological study, the proposed transmission line corridor was identified by the Texas SHPO as having a high potential for significant cultural resources, and that several prehistoric sites have been recorded within the project area (letter from F.L. Oaks, Texas SHPO, Austin, Texas. to R. Reid, PBS&J, March 4, 2009 [as cited in Cooperative, 2009a]).

Traditional Cultural Properties

To date, no potential TCPs of importance to Native American tribes have been identified within the project APE.

Environmental Effects

In this section, we discuss the boundaries of the APE and evaluate the effects of the Cooperative's proposed project construction, operation, and maintenance on the following cultural resources: (1) archaeological; (2) TCPs; and (3) historic buildings and structures.

Project Construction, Operation and Maintenance

As mentioned above, in its license application, the Cooperative stated that construction of the proposed hydroelectric generation facilities adjacent to the Lake Livingston dam would occur in areas previously excavated and disturbed by construction of the dam and would not affect any previously identified historic properties. However, the Cooperative acknowledged that direct impacts to known or unknown cultural resources may occur during construction of the proposed transmission line. Additionally,

impacts associated with vehicular traffic could damage surficial or buried cultural resources and pedestrian traffic could result in site vandalism. The Cooperative implied that because most of its transmission lines are located on private lands that are restricted from public access, vandalism as a result of public access would be limited. The Cooperative stated that the construction of the transmission line could affect the visual integrity of any unrecorded historic structures. In a March 2009 letter (as cited in Cooperative, 2009a), the Texas SHPO stated that an archaeological survey of the transmission line corridor that would meet or exceed the minimum standards set forth in Archeological Survey Standards for Texas would be required prior to ground-disturbing activity associated with the transmission line construction.

Historic Properties Management

In August 2009, the Cooperative consulted with the Texas SHPO, the Alabama-Coushatta Tribe, the Caddo Nation; and the Kickapoo Tribe regarding a draft HPMP designed to address historic properties within the project APE. Comments were received from the Texas SHPO, the Caddo Nation, and the Alabama-Coushatta Tribe. The Alabama-Coushatta Tribe commented that the HPMP neglected to address TCPs that might be present within the project APE (letter from Bryant Celestine, Tribal Historic Preservation Officer, Alabama-Coushatta Tribe of Texas, Livingston, Texas, to Michael N. McCarty, Counsel, Brickfield, Burchette, Ritts & Stone, PC, Washington, D.C., September 18, 2009). A second draft HPMP was prepared in October, 2009 based on comments received. Comments on the second draft were received from the Alabama-Coushatta Tribe (December 22, 2009) and the Texas SHPO (January 12, 2010). The Alabama-Coushatta Tribe reiterated that the revised HPMP still did not adequately address TCPs (letter from Bryant Celestine, Tribal Historic Preservation Officer, Alabama-Coushatta Tribe of Texas, Livingston, Texas, to Michael N. McCarty, Counsel, Brickfield, Burchette, Ritts & Stone, PC, Washington, D.C., December 22, 2009). In its comments, the Texas SHPO concurred that the revised HPMP addressed all of its comments, except for its comments on the APE (see discussion of the APE above). The Cooperative addressed the comments of the Alabama-Coushatta Tribe in a further revised January 2010 HPMP (Cooperative, 2010).

The Cooperative proposes to implement its January 2010 HPMP. The HPMP includes: (1) designation of a HPMP Coordinator; (2) provisions for annual monitoring of historic properties; (3) procedures for the treatment of human remains that may be encountered during project activities; (4) provisions for public interpretation; (5) procedures to address unanticipated discoveries; (6) requirements for periodic reporting and meetings; (7) procedures for dispute resolution; and (8) a process for HPMP review and revision. Further, in accordance with the Texas SHPO's March 2009 comment, the HPMP stipulates that a professional archaeological survey of the proposed transmission line corridor be undertaken prior to any ground-disturbing activity associated with transmission line construction. Any identified resources would be documented and

evaluated in accordance with the Texas Historical Commission's Rules of Practice and Procedure for the Antiquities Code of Texas, and impacts on any resources would be avoided. As mentioned above, the State Highway 19 Bridge and the Riverside Swinging Bridge that cross the Trinity River are located within the proposed project boundary but upstream of the Lake Livingston dam. The Cooperative has, therefore, not provided measures for these structures because they would not be affected by the proposed project.

Additionally, in its HPMP, the Cooperative states that periodic maintenance clearing of the transmission line ROW would have little or no chance of affecting historic properties because archaeological surveys conducted prior to ground-disturbing activities would identify sites along the transmission line corridor and enable them to be evaluated and avoided. The Cooperative concluded that project construction and operation is not anticipated to have impacts on historic properties and cultural resources within the APE, including TCPs.

Our Analysis

With regard to the project APE, the Cooperative consulted with the Texas SHPO, and the Texas SHPO subsequently deferred to the Commission to determine the APE. Because the entire Lake Livingston reservoir is necessary for the operation of the proposed project, the project boundary must encompass the entire reservoir. A project's APE must minimally align with the project's boundary but it is not necessarily limited by it if project effects extend beyond the boundary. Therefore, the project APE must include Lake Livingston reservoir, but only because the reservoir is needed for project operations. However, the reservoir was previously constructed for other purposes and TRA is solely responsible for its operation. Reservoir fluctuation, reservoir-related erosion, and recreation effects to cultural resources on its shorelines would be a result of TRA activities and not the Cooperative's activities, because the Cooperative does not control reservoir levels and project activities would not occur on the reservoir. For this reason, no additional survey of the reservoir would be necessary because any identified effects on cultural sites present on the shoreline of the reservoir, including the State Highway 19 Bridge and the Riverside Swinging Bridge, would not be attributed to project operations. The reservoir would be included in both the project boundary and the APE, but the portion of the APE to be addressed in the HPMP includes only those lands affected by the Cooperative's construction, operation, and maintenance activities. Should project activities extend to the reservoir shorelines, or should operation of the reservoir ultimately be modified for project purposes resulting in potential effects on shoreline resources, such effects could be addressed in a revision of the HPMP.

The Cooperative's January 2010 HPMP includes provisions for the monitoring of historic properties, the treatment of human remains, public interpretation, procedures to address unanticipated discoveries, requirements for periodic reporting and meetings, procedures for dispute resolution, and a process for HPMP review and revision. Further,

the HPMP includes a stipulation for a professional archaeological survey of the proposed transmission line corridor to be undertaken prior to any ground-disturbing activities. Identified resources would be evaluated for eligibility to the National Register.

The January 2010 HPMP states that the Texas Historical Commission's "Rules of Practice and Procedure for the Antiquities Code of Texas" would be followed with regard to the evaluation of historic structures and archaeological sites. Because the project is a federal undertaking, resources must be evaluated in accordance with section 106 of the NHPA, not State statutes. Section 106 and its implementing regulations found at 36 C.F.R. 800.4(c) must be followed for the evaluation of resources to the National Register. Requirements for the assessment of effects and resolution of effects found to be adverse are found at 36 C.F.R. 800.5 and 36 C.F.R. 800.6, respectively. Revision of the HPMP to include a requirement to follow these federal regulations instead of the Texas Historical Commission's "Rules of Practice and Procedure for the Antiquities Code of Texas" would ensure compliance with the requirements of NHPA.

In general, resources must be more than 50 years old to be considered eligible for listing on the National Register. The Lake Livingston dam was constructed by TRA between 1966 and 1969. Currently, it does not meet the age requirement for eligibility to the National Register. However, within 7 to 10 years, the dam may become eligible for listing. Including a provision for evaluation of the Livingston dam when it reaches 50 years of age would ensure that this potential historic structure is not adversely affected by the installation of the proposed hydroelectric facilities.

At the request of the Alabama-Coushatta Tribe, the January 2010 HPMP provides for consideration of TCPs during project construction and other activities. The HPMP states that TCPs would be preserved through avoidance, and a goal of the plan is to develop an "appropriate process to be followed in the event that previously unidentified historic properties and TCP are discovered." Unlike archaeological materials which may be identified by the Cooperative during construction and other project-related activities, TCPs are not inadvertently "discovered;" they are identified in consultation with the participating tribes (and other communities as appropriate) and the SHPO as part of the section 106 process, and prior to implementing any ground-disturbing activities. As requested by the Alabama-Coushatta Tribe, the HPMP does not include a process by which TCPs would be identified prior to ground-disturbing activities associated with the construction of the project. Revision of the HPMP to include a process and schedule to identify and evaluate potential TCPs for listing on the National Register located within the APE in consultation with the Alabama-Coushatta Tribe, the Caddo Nation, the Kickapoo Tribe, and the Texas SHPO, prior to project-related land-disturbing activities, would ensure that any identified resources can be avoided during construction as proposed by the Cooperative.

Revising and implementing the HPMP to include these additional measures, in consultation with the Texas SHPO, participating tribes, and the Commission, would ensure that potential adverse effects of the proposed Lake Livingston Project construction, operation, maintenance, recreation or other activities on cultural resources, including TCPs, would be addressed over the term of the license. We intend to execute a PA among the Commission, the Texas SHPO, and the Advisory Council. The Cooperative, participating tribes, and others, as appropriate, would be invited to sign the Programmatic Agreement (PA) as concurring parties. The PA would include a measure to implement the HPMP.

3.4 No-action Alternative

Under the no-action alternative, the Lake Livingston Project would not be constructed. There would be no changes to the physical, biological, or cultural resources of the area and electrical generation from the project would not occur. The power that would have been developed from a renewable resource would have to be replaced from nonrenewable fuels. The noise and air quality impacts of any existing fossil fuel-fired generation system would continue unabated or at increased levels as the local electrical demand increases. The risk of spills of fossil fuels would likewise continue at current or increasing levels. The financial benefits to the local economy associated with construction spending, and to the Cooperative in terms of project operating revenues would not be realized.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the Lake Livingston Project's use of the Trinity River for hydropower purposes to see what effect various environmental measures would have on the project's costs and power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp*.,[11] the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using a likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead Corp*, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.

For each of the licensing alternatives, our analysis includes an estimate of: (1) the cost of individual measures considered in the EA for the protection, mitigation and enhancement of environmental resources affected by the project; (2) the cost of alternative power; (3) the total project cost (i.e., for construction, operation, maintenance, and environmental measures); and (4) the difference between the cost of alternative power and total project cost. If the difference between the cost of alternative power and total project cost is positive, the project produces power for less than the cost of alternative power. If the difference between the cost of alternative power and total project cost is negative, the project produces power for more than the cost of alternative power. This estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

4.1 Power and Economic Benefits of the Project

Table 4 summarizes the assumptions and economic information we use in our analysis. This information was provided by the Cooperative in its license application, or estimated by staff. We find that the values provided by the applicant are reasonable for the purposes of our analysis. Cost items common to all alternatives include: taxes and insurance costs; net investment (the total investment in power plant facilities remaining to be depreciated); estimated future capital investment required to maintain and extend the life of plant equipment and facilities; licensing costs; normal operation and maintenance cost; and Commission fees.

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[11] See *Mead Corporation, Publishing Paper Division*, 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

Table 4. Parameters for the economic analysis of the Lake Livingston Hydroelectric Project (Source: Cooperative, 2009a; staff).

Parameter	Value	Source
Period of analysis (years)	30	Staff
Term of financing (years)	20	Staff
Insurance	0.25%	Staff
Net investment, $	$0	License application[a]
Construction cost, $	$67,744,000	License application[b]
Cost to prepare license application	$3,500,000	License application
Operation and maintenance, $/year	$4,253,800	License application[c]
Renewable energy credits, $/year	$248,000	License application[d]
Energy rate, $/MWh	$40.48	Staff[e]
Capacity rate, $/kilowatt-year	$157	Staff[f]
Short-term interest rate	6%	License application
Long-term interest rate	5%	License application
Discount rate	5%	License application
Authorized installed capacity (MW)	24.0	License application
Annual generation (MWh)	124,000	License application

[a] Net investment is the depreciated project investment allocated to power purposes. The only capital investment that incurred to date is for development of the project license, which is included in the cost of the project as proposed.

[b] The cost shown includes the base construction cost and permits, but does not include the cost of the license application presented below.

[c] The cost shown includes the base operation and maintenance costs, administrative and general costs, FERC fees, property taxes, and annual payments to the city of Houston and TRA.

[d] Although the Cooperative expects to receive these credits, they have not yet been approved for the project and therefore we have not included them in our analysis.

[e] The energy rate used is based on the Energy Information Administration's Annual Energy Outlook for 2010. The Cooperative provided an energy rate of $61.10/MWh based on average energy market prices for the Entergy area. The Cooperative does not yet have an energy purchase contract for the project. The energy rate negotiated may be somewhat higher than we have estimated in our analysis.

[f] The Cooperative states that the project would have no dependable capacity. If the project is deemed to be eligible for capacity value, this would provide additional revenue for the project.

4.2 Comparison of Alternatives

Table 5 summarizes the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power and total project cost for each of the action alternatives considered in this EA, including the applicant's proposal and the staff alternative.

Table 5. Summary of the annual cost of alternative power and annual project cost for the alternatives for the Lake Livingston Hydroelectric Project (Source: staff).

	Applicant's Proposal	Staff Alternative
Installed capacity (MW)	24.0	24.0
Annual generation (MWh)	124,000	120,160
Annual cost of alternative power	$5,019,520	$4,864,080
($/MWh)	40.48	40.48
Annual project cost	$9,188,450	$9,191,890
($/MWh)	74.10	76.50
Difference between the cost of alternative power and project cost	($4,168,930)	($4,327,810)
($/MWh)	(33.62)	(36.02)

Note: A number in parentheses denotes that the difference between the cost of alternative power and project cost is negative, thus the total project cost is greater than the cost of alternative power.

4.2.1 No-action Alternative

Under the no-action alternative, the project would not be constructed as proposed and would not produce any electricity.

4.2.2 Applicant's Proposal

The Cooperative proposes to develop the Lake Livingston Project at the Lake Livingston dam. As proposed by the Cooperative, the project would have an installed capacity of 24 MW, and generate an average of 124,000 MWh of electricity annually. The average annual cost of alternative power would be $5,019,520, or about $40.48/MWh. The average annual project cost would be $9,188,450, or about $74.10/MWh. Overall, the project would produce power at a cost that is $4,168,930, or about $33.62/MWh, more than the cost of alternative power.

4.2.3 Staff Alternative

The staff alternative involves developing the project as proposed by the Cooperative, but would include a provision for project shutdown if the state DO standards cannot be met by the proposed air injection system. Thus, capacity and energy attributes vary accordingly. The staff alternative also includes: (a) the applicant's proposed environmental measures; (b) certain additional measures recommended by resource agencies that would have no additional cost; and (c) revisions to the January 2010 HPMP. Table 6 shows the staff-recommended additions, deletions, and modifications to the Cooperative's proposed environmental protection and enhancement measures, and the estimated cost of each measure.

Based on a total installed capacity of 24 MW and an average annual generation of 120,160 MWh, the cost of alternative power would be $4,864,080, or about $40.48/MWh. The average annual project cost would be $9,191,890, or about $76.50/MWh. Overall, the project would produce power at a cost that is $4,327,810, or about $36.02/MWh, more than the cost of alternative power.

4.3 Cost of Environmental Measures

Table 6 gives the cost of each of the environmental enhancement measures considered in our analysis. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 6. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of the proposed operation of the Lake Livingston Hydroelectric Project (Source: Cooperative, 2009a, and staff).

Enhancement/Mitigation Measures	Entities	Capital[a] (2010$)	Annual[a] (2010$)	Levelized Annual Cost (2010$)	Notes
1. Develop and implement a Storm Water Pollution Prevention Plan.	Cooperative, Staff	$15,000	$0	$1,010	
2. Develop and implement an erosion and sediment control plan for construction, and file with the Commission prior to the start of ground-disturbing activities, which includes provisions for visual monitoring of the downstream river banks for signs of erosion and scour during project operations, and if erosion and/or scour is identified, take appropriate measures to repair and stabilize the embankment against further damage.	Cooperative, Staff	$20,000	$0	$1,350	
3. Use whatever flow is released by TRA, so reservoir levels remain the same as current operations.	Cooperative, Staff	$0	$0	$0	**b**
4. Develop and implement a final MOA with TRA for the maintenance of net reservoir releases and surface elevations.	Cooperative, Staff	$15,000	$0	$1,010	

Enhancement/Mitigation Measures	Entities	Capital[a] (2010$)	Annual[a] (2010$)	Levelized Annual Cost (2010$)	Notes
5. When TRA releases are less than about 750 cfs, all of the inflow would pass through the spillway gates, and the powerhouse units would not operate. When TRA releases are between 1,000 and 4,700 cfs, a minimum flow of 200 cfs would be released through the spillway gates and the remainder would pass through the powerhouse units. When TRA releases exceed 4,700 cfs, the powerhouse units would operate at 4,500 cfs and all excess flows would pass through the spillway gates. In the event of a powerhouse shutdown, all flows would be directed through the spillway gates.	Cooperative, Staff	$0	$242,880	$242,880	**c**
6. Modify the notch in the downstream weir to maintain a relatively constant water level in the stilling basin at the proposed minimum spillway discharge of 200 cfs during hydropower operations.	Cooperative, Staff	$22,500	$0	$1,520	

Enhancement/Mitigation Measures	Entities	Capital[a] (2010$)	Annual[a] (2010$)	Levelized Annual Cost (2010$)	Notes
7. Revise the draft Post-Startup Monitoring Plan for water temperature, DO, striped bass, and forage fish monitoring to include a schedule for longer-term fisheries monitoring as developed in consultation with the Cooperative, FWS, and Texas PWD, and file the final plan with the Commission for approval; implement the plan upon approval by the Commission.	Cooperative, Texas PWD, FWS, Staff	$126,980	$15,720	$24,300	

Enhancement/Mitigation Measures	Entities	Capital[a] (2010$)	Annual[a] (2010$)	Levelized Annual Cost (2010$)	Notes
8. During project operations, alter the proportion of flow discharged through the existing Taintor gates and spillway, to maintain: (a) adequate water temperature, DO, and hydraulic conditions for aquatic life survival in the stilling basin and the Trinity River downstream from Lake Livingston; and (b) adequate instream habitat and depth to allow adult striped bass access to downstream thermal refugia. At initial start-up and whenever hydropower is generated, pass a minimum flow of 200 cfs to maintain water quality and aquatic habitat. However, upon collection of empirical data from monitoring, this value may need to be adjusted accordingly to maintain adequate water quality, physical habitat, and connectivity in the stilling basin and the Trinity River downstream from Lake Livingston.	Texas PWD, Staff	$0	$0	$0	**d**
9. Install, operate, and maintain an air injection system.	Cooperative, Staff	$142,860	$30,000	$39,650	
10. If state DO standards cannot be met by air injection system, institute unit shutdowns in order to meet DO criteria.	Staff	$0	$155,440	$155,440	**e**

Enhancement/Mitigation Measures	Entities	Capital[a] (2010$)	Annual[a] (2010$)	Levelized Annual Cost (2010$)	Notes
11. Install bar racks to exclude larger debris and fish from the powerhouse intake.	Cooperative, Staff	$0	$0	$0	**b**
12. Use appropriate fish-friendly turbines to minimize fish mortality.	Texas PWD, Staff	$0	$0	$0	**f**
13. Construct project in accordance with the National Bald Eagle Management Guidelines to avoid disturbance of bald eagles.	FWS, Staff	$0	$0	$0	**b**
14. Ensure that the transmission line is constructed in accordance with current standards to reduce the risk of avian injury or mortality, including "Standard procedures for Avian Protection on Power Lines: The State of the Art in 2006."	Cooperative, Staff	$0	$0	$0	**b**
15. If endangered species or threatened wildlife habitat is encountered during construction, obtain guidance from FWS prior to any further clearing or ground-disturbing activities.	Cooperative, Staff	$5,000	$0	$340	**g**

Enhancement/Mitigation Measures	Entities	Capital[a] (2010$)	Annual[a] (2010$)	Levelized Annual Cost (2010$)	Notes
16. Survey the transmission line route during appropriate seasons (i.e., when plants are conspicuous) and prior to ground-disturbing activities to determine the presence of federally or state-listed rare plants, and consult with Texas PWD and FWS if such plants are found.	Cooperative, Staff	$20,000	$0	$1,350	**g**
17. Survey project area, including the transmission line ROW, for wetlands, and if found, execute appropriate wetlands permitting and mitigation.	Cooperative, Staff	$20,000	$0	$1,350	**g**
18. Clear the transmission ROW in a manner that would maximize the preservation of natural habitat and resources and would take into account soil stabilization, the protection of natural vegetation, sensitive habitats, the protection of adjacent resources such as natural habitat for plants and wildlife, and the prevention of silt deposits in water courses.	Cooperative, Staff	$0	$0	$0	**b**

Enhancement/Mitigation Measures	Entities	Capital[a] (2010$)	Annual[a] (2010$)	Levelized Annual Cost (2010$)	Notes
19. If it is necessary to modify or remove existing service buildings or other structures during project construction, first conduct a field survey investigation to determine whether such structures are occupied by Rafinesque's big-eared bats or Southeastern myotis. If either species is encountered, consult with FWS and Texas PWD prior to modification of the structure.	Cooperative, Staff	$10,000	$0	$680	**g**
20. Develop and implement a recreation management plan for project recreation facilities.	Cooperative, Staff	$50,000	$0	$3,380	**g**
21. File a recreation monitoring report with the Commission every 6 years in conjunction with the Form 80 filing that would summarize ongoing monitoring activities, and any recommendations for future recreation management.	Staff	$0	$740	$740	**h**
22. Install a new barrier-free gazebo/observation platform and other general site improvements downstream from the tailrace channel.	Cooperative, Staff	$250,000	$0	$16,890	

Enhancement/Mitigation Measures	Entities	Capital[a] (2010$)	Annual[a] (2010$)	Levelized Annual Cost (2010$)	Notes
23. Obtain a lease from Polk County for use of county lands and an easement from TRA for use of TRA lands for the proposed recreation improvements.	Cooperative, Staff	$0	$20,000	$20,000	**i**
24. Perform site remediation to remove abandoned structures and to restore the Southland Park lands to their natural state.	Cooperative, Staff	$150,000	$0	$10,130	**j**
25. Construct a new access road connecting the existing Recreation Road with the new parking area at the gazebo/observation platform.	Cooperative, Staff	$250,000	$0	$16,890	
26. Should the existing public features cease to provide safe public access to the Trinity River downstream from the hydropower project, construct and maintain reasonable public river access features at a location to be determined feasible.	Texas PWD	$0	$0	$0	**k**

Enhancement/Mitigation Measures	Entities	Capital[a] (2010$)	Annual[a] (2010$)	Levelized Annual Cost (2010$)	Notes
27. Final placement of the safety cables spanning the Trinity River that would delineate the areas of no public access should be determined only after the hydroelectric facility has been constructed and fully operational for a sufficient time to allow the stabilization of hydraulic conditions downstream from the hydropower facilities and to determine the location of fish congregations.	Texas PWD	$0	$0	$0	l
28. Develop and conduct a cultural resources survey along the transmission line corridor, provide a survey summary report, and implement the January 2010 HPMP for the project.	Cooperative, Staff	$40,000	$0	$2,700	

Enhancement/Mitigation Measures	Entities	Capital[a] (2010$)	Annual[a] (2010$)	Levelized Annual Cost (2010$)	Notes
29. Revise the January 2010 HPMP to include: (1) a map or maps depicting the APE as encompassing the entirety of Lake Livingston reservoir, with clarification that the portion of the APE addressed in the HPMP is limited to project-affected areas; (2) clarification that section 106 of the NHPA and its implementing regulations found at 36 C.F.R. 800 apply to this federal undertaking, and not to the Texas Historical Commission's "Rules of Practice and Procedure for the Antiquities Code of Texas"; (3) provisions for evaluation of the Lake Livingston dam for listing on the National Register upon reaching 50 years of age, and assessment of potential effects of project construction and maintenance on this potential historic structure; and (4) provisions for the identification and evaluation of TCPs of importance to the Alabama Coushatta Tribe, the Caddo Nation, and the Kickapoo Tribe, prior to implementation of ground-disturbing activities associated with project construction.	Staff	$40,000	$0	$2,700	**m**

[a] All costs provided by the Cooperative unless otherwise noted.

[b] The implementation of this measure is not expected to require any additional cost beyond the estimated normal project operation cost.

[c] The Cooperative estimated that providing a minimum flow of 200 cfs would result in the loss of approximately 6,000 MWh per year, on average, over the license term.

[d] We view the requirements of this measure to be essentially the same as what is proposed by the Cooperative and would therefore not cost any additional cost to implement.

[e] Based on hydrologic records for the period 1974-2004, which the Cooperative used for its analyses, we estimate that, if shutdowns are required in order to meet DO requirements, the annual loss of energy would be approximately 3,840 MWh per year (20 days per year times 8 hours per day times 24 MW).

[f] We assume that the Texas PWD recommendation is largely met by the proposed installation of the Kaplan turbines.

[g] The Cooperative did not provide an estimate for this measure, so the cost shown was estimated by staff.

[h] The Cooperative did not provide a cost for this measure so staff estimated a cost of $5,000 every 6 years to implement this measure.

[i] A cost for this measure was not provided by the Cooperative, so a cost was roughly approximated by staff, for signing a lease with Polk County ($10,000) and negotiation of easements from TRA ($10,000). The Cooperative has stated that if the County land was acquired in fee, instead of leasing it, the cost would be approximately $2,500 per acre ($50,000).

[j] The cost to implement this measure was not provided by the Cooperative so it was estimated by staff pending final plans for the removal of structures and restoration of the area to natural conditions.

[k] A cost for this measure cannot be estimated at this time.

[l] A cost for this measure cannot be estimated at this time.

[m] Costs were estimated by staff to be $5,000 for item 1, no cost for item 2, $15,000 for item 3, and $20,000 for item 4.

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5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Comparison of Alternatives

In this section we compare the development and non-developmental effects of the Cooperative's proposal, the Cooperative's proposal as modified by staff, and the no-action alternative, as shown in table 7.

Table 7. Comparison of alternatives for the proposed Lake Livingston Project (Source: staff).

Resource	No Action Alternative	Proposed Action	Staff Recommended Alternative
Generation	None	124,000 MWh	120,160 MWh
Geology and Soils	No effect	Ground disturbance during construction; potential downstream shoreline erosion during operation	Same as proposed action, with finalization of erosion and sediment control plan, and erosion monitoring during operation
Aquatic Resources	No effect	Small increase in water temperatures and some reduction in DO levels below dam; change in flow pattern below dam; potential for fish entrainment mortality in project turbines	Same as proposed action, with finalization of Post-Startup Monitoring Plan and other measures to maintain state water quality standards, to include project shutdowns
Terrestrial Resources	No effect	Some vegetation removal and disturbance to wildlife during transmission line construction	Same as proposed action, with construction in accordance with the National Bald Eagle Management Guidelines to avoid disturbance of bald eagles

Resource	No Action Alternative	Proposed Action	Staff Recommended Alternative
Threatened and Endangered Species	No effect	Potential for listed plants (Texas trailing phlox or Texas prairie dawn) to occur along the transmission line route; plant surveys prior to ground-disturbing activities	Same as proposed action
Recreation and Land Use	No effect	Construction would occur in area now closed to recreation just below dam; applicant would provide recreational enhancements	Same as proposed action, with requirement of a recreation monitoring report every 6 years
Cultural Resources	No effect	Minimal effects that would be mitigated by implementation of January 2010 HPMP	Same as proposed action, but HPMP would be revised to ensure long-term protection of historic properties

5.2 Comprehensive Development and Recommended Alternative

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of fish and wildlife, the protection of recreational opportunities, and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for licensing the Lake Livingston Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review of agency and public comments filed on this project and our review of the environmental and economic effects of the proposed project and its alternatives, we selected the staff alternative as the preferred option. We recommend this option because: (1) issuance of an original license by the Commission would allow the Cooperative to construct, operate, and maintain the project as an

economically beneficial and dependable source of electrical energy for its customers; (2) the 24 MW of electric energy generated from a renewable resource may offset the use of fossil-fueled, steam-electric generating plants, thereby conserving nonrenewable resources and reducing atmospheric pollution; (3) the public benefits of this alternative would exceed those of the no-action alternative; and (4) the recommended measures would protect and enhance fish and wildlife resources and would provide improved recreation opportunities at the project.

In the following section, we make recommendations as to which environmental measures proposed by the Cooperative or recommended by agencies and other entities should be included in any license issued for the project. In addition to the Cooperative's proposed environmental measures, we recommend additional measures to be included in any license issued for the project. We also discuss which measures we do not recommend including in a license.

Measures Proposed by the Cooperative

Based on our environmental analysis of the Cooperative's proposal discussed in section 3 and the costs discussed in section 4, we recommend including the following environmental measures proposed by the Cooperative in any license issued for the project. Our recommended modifications to the Cooperative's proposed measures are shown in *italics*.

Construction

- Develop an erosion and sediment control plan during the detailed project design phase and before project construction begins that is consistent with applicable state and local soil conservation standards, including any SWPPP required by Texas CEQ. *The plan should be filed with the Commission prior to ground-disturbing activities and include a provision for visual monitoring of the river banks downstream from the powerhouse tailrace during project operation for signs of scour and erosion, and around other project facilities for signs of erosion.*

Operations

- Develop, execute, and submit a final MOA with TRA governing project operations, with the objective of maintaining net reservoir releases and surface elevations in accordance with existing operational protocols.

- When scheduled releases are between 1,000 and 4,700 cfs, release a minimum flow of 200 cfs through the spillway gates, for maintenance of water quality and aquatic habitat within and downstream from the stilling basin, with the remaining flow to be released through the powerhouse. When scheduled flow

releases reach as low as about 750 cfs, shut down the powerhouse and all flows would be passed through the spillway gates.

- Modify the notch in the downstream weir wall to maintain a relatively constant water level and in turn aquatic habitat in the stilling basin at the proposed minimum spillway discharge of 200 cfs during hydropower operations.

Aquatic Resources

- Conduct, in consultation with Texas CEQ, Texas PWD, and FWS, post-operational monitoring in accordance with the Post-Startup Monitoring Plan filed on March 15, 2010. This plan provides for (a) monitoring of DO, water temperature, as well as the forage fish and striped bass populations downstream from the dam, to determine the adequacy of minimum flows to protect aquatic life in the stilling basin and the river downstream, and (b) preparing a draft mitigation plan after monitoring and testing to outline how reservoir releases and hydropower operations would be managed when DO and temperature triggers provided in the plan are reached. *Prepare a final Post-Startup Monitoring Plan for Commission approval after issuance of any license so that the Cooperative can develop the final details of the plan, including a schedule for longer-term fisheries monitoring, and unit shutdowns to maintain DO, after consultation with FWS and Texas PWD.*

- Install equipment to inject air or oxygen into water diverted for power generation and operate such equipment when DO reaches critical levels, as determined in consultation with Texas PWD and Texas CEQ. *If state DO standards cannot be met by the proposed air injection system, institute unit shutdowns in order to meet DO criteria.*

- Install bar racks with a clear spacing of 5.5 inches to exclude larger debris and fish from the powerhouse intake.

Terrestrial Resources/Threatened and Endangered Species

- Design and construct the transmission line to take into account soil stability, the protection of natural vegetation, sensitive habitats, the protection of adjacent resources such as natural habitat for plants and wildlife, and the prevention of silt deposition in watercourses. Clearing for the transmission line ROW is to be performed in a manner that would maximize the preservation of natural habitat and the conservation of natural resources.

- Survey the transmission line route during the appropriate seasons (i.e., when plants are conspicuous) and prior to ground-disturbing activities to determine the presence of federally or state-listed rare plants, and consult with Texas

PWD and FWS if such plants are found. *Prior to initiating ground-disturbing activities, file with the Commission the survey results, documentation of consultation with Texas PWD and FWS, and if any are found, proposed mitigation measures to protect these species during construction and maintenance activities.*

- If endangered or threatened wildlife habitat is encountered during construction, obtain guidance from FWS prior to any further clearing or ground-disturbing activities.

- Construct the transmission facilities in accordance with current standards to reduce the risk of avian injury or mortality, including "Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006" (APLIC et al., 2006).

- If it is necessary to modify or remove existing service buildings or other structures during project construction, conduct a field investigation to determine whether such structures are occupied by Rafinesque's big-eared bats or Southeastern myotis. If either species of bat is encountered, consult with FWS and Texas PWD prior to modification of the structure.

Recreation

- Develop and implement a recreation management plan, *and include a provision to file a recreation monitoring report with the Commission every 6 years in conjunction with the Form 80 filing that would summarize the ongoing monitoring activities and any recommendations for future recreation management.*

- After the project's tailrace channel location and design have been finalized, consult with TRA, FWS, Polk County, and Texas PWD, and study the demand for, and feasibility of, providing barrier-free public fishing access on the east bank of the Trinity River below the project tailwater discharge.

- Install a new barrier-free gazebo/observation platform at a location immediately downstream from the tailwater canal, along with road closure gates for after hours, a parking area, a trail, benches, interpretive signs, and lighting.

- Perform site remediation to remove abandoned structures and restore the Southland Park lands to their natural state.

- Construct a new access road connecting the existing Recreation Road with the new parking area at the gazebo/observation platform.

Cultural Resources

- Implement the HPMP filed with the Commission on January 25, 2010. Among other provisions, the HPMP requires the Cooperative to conduct, within 6 months of license issuance, an archeological survey of the approved transmission line route that meets or exceeds the minimum standards for such surveys prescribed by the Texas SHPO. The Cooperative would complete section 106 consultation with the Texas SHPO and tribes with regard to the mitigation of potential effects to identified properties that are eligible for the National Register prior to ground-disturbing activity associated with the transmission line construction. *Revise the Cooperative's January 2010 HPMP to include: (1) a map or maps depicting the APE as encompassing the entirety of Lake Livingston reservoir, with clarification that the portion of the APE addressed in the HPMP is limited to project-affected areas; (2) clarification that section 106 of the NHPA and its implementing regulations found at 36 C.F.R. 800 apply to this federal undertaking, and not the Texas Historical Commission's "Rules of Practice and Procedure for the Antiquities Code of Texas"; (3) provisions for evaluation of Lake Livingston dam for listing on the National Register upon reaching 50 years of age, and assessment of potential effects of project construction and maintenance on this potential historic structure; and (4) provisions for the identification and evaluation of TCPs of importance to the Alabama Coushatta Tribe, Caddo Nation, and Kickapoo Tribe, prior to implementation of ground-disturbing activities associated with project construction.*

Additional Measures Recommended by Staff

In addition to the Cooperative's proposed measures listed above, we recommend including the following staff-recommended measure in any license issued for the Lake Livingston Project:

- Construct the project in accordance with the National Bald Eagle Management Guidelines to avoid disturbance of bald eagles by maintaining appropriate construction buffer zones in the vicinity of any active eagle nests, and scheduling ground-disturbing construction activities to avoid active nesting periods.

We discuss our rationale for the measures we recommend as part of the staff alternative below, and measures we do not recommend are discussed in the following section.

Final Post-Startup Monitoring Plan

The Cooperative has proposed, and both Texas PWD and FWS have agreed to, a Post-Startup Monitoring Plan, for monitoring of downstream water temperature, DO and fish populations once the project begins operation. Based on our analysis, we also agree that this plan is an appropriate measure to monitor project effects once in operation.

FWS, however, also recommends that the provisions of the Post-Startup Monitoring Plan continue for the life of the project, and that the licensee continue to work cooperatively with Texas PWD to resolve any unforeseen impacts that the project may have on the striped bass fishery downstream from the Lake Livingston dam that were not considered in the development of the Post-Startup Monitoring Plan. The applicant is proposing to continue the water temperature and DO monitoring for the life of the project, but is proposing to monitor fish populations for only the first 3 to 5 years of project operation. Monitoring water temperature and DO over the term of the license is reasonable, because those parameters would provide a good indication of the continued suitability of aquatic habitat downstream from Lake Livingston dam over the long term. Monitoring of fish populations for the term of the license, however, is likely excessive and unnecessary to determine the health of the downstream fishery. Rather, periodic monitoring (every 5 to 10 years) for the first several years of the license would be sufficient to ensure that the striped bass and other fisheries downstream from the dam are not being adversely affected by project operation, including any unforeseen impacts. If, at any point during the license term, the fish population monitoring demonstrates that fish populations are stable and show no signs of being affected by project operations (such signs could include poor recruitment from Lake Livingston, or low game fish growth rates because of the low abundance of forage species), there may be no need to continue fisheries monitoring for the remainder of the license. Under such circumstance, the Cooperative could seek relief from the Commission, after opportunity for public review and comment, to end the monitoring.

The applicant filed its proposed Post-Startup Monitoring Plan as a draft plan. In its filing, the Cooperative states that it anticipates preparing a final plan as a requirement of any license issued for the project. Requiring the Cooperative to file such a plan for Commission approval would afford them the time and opportunity to develop the final details of the plan, including a schedule for longer-term fisheries monitoring, with FWS and Texas PWD. The benefits of this plan outweigh the minimal cost to finalize the plan.

Final Erosion and Sediment Control Plan

Project construction would mobilize sediments because of disturbance of soil and sediment in the vicinity of and downstream of Lake Livingston dam and along the proposed transmission line route. Without properly designed and constructed sediment controls, ground disturbance could represent a substantial source of sedimentation to the

Trinity River and Lake Livingston, causing increased turbidity and elevated sediment loading. The Cooperative's proposed erosion and sediment control plan would apply BMPs, as well as soil erosion and sediment control prevention measures to construction activities, and would effectively minimize any erosion, sedimentation, and slope stability effects in the project area. However, the BMPs currently proposed by the Cooperative are not site-specific, but rather are based on conceptual project plans. By preparing and implementing a site-specific erosion and sediment control plan based on BMPs, the Cooperative would be able to identify potential areas of sediment disturbance and address them with the goal of minimizing erosion and restricting the transport of sediment.

Because TRA would continue to control the reservoir levels and flow passage through the project, the project would trigger no major effects on long-term erosion on the Lake Livingston shoreline. However, the powerhouse discharge would enter the river channel at an angle roughly perpendicular to the flow below the dam. The velocity patterns resulting from this orientation could cause erosion of the river bank on the opposite, or west, side of the river from the powerhouse. Also, the reconfigured east bank area adjacent to the new tailrace discharge could be vulnerable to erosion associated with high flows from either the spillway gates or the tailrace. Visual monitoring of the river banks in these two areas during project operation would help to identify any erosion that may occur and the need for any mitigative action to prevent erosion and protect the river banks from further damage.

Operations and maintenance activities along the transmission line, near the powerhouse and other project facilities, and in Southland Park may involve the use of heavy equipment that could cause ground disturbances such as rutting and erosion. In addition, the Trinity River could overflow its banks during high flow events, temporarily flooding a portion of Southland Park. Sediment could be deposited on the proposed recreation road, paved trail system, benches, native vegetation beds, and interpretive signs. If identified early during routine project operation or maintenance inspections, erosion anywhere in the project area could be readily repaired to avoid significant erosion and costly repairs to project access roads and the recreation facilities in Southland Park.

To address the potential for erosion and sedimentation, we recommend that any license issued require the preparation and filing of a site-specific erosion and sediment control plan with the Commission prior to the start of ground-disturbing activities, that includes: (1) the provisions and elements proposed by the Cooperative; (2) a provision for visual monitoring of the river banks especially opposite the powerhouse tailrace and near the tailrace outlet for signs of scour and erosion; (3) a provision for visual monitoring along the transmission line, near the powerhouse and other project facilities, and the facilities in Southland Park for signs of erosion; and (4) a commitment to repair and stabilize erosion and scour that is identified during monitoring. We estimate that preparing a final erosion and sediment control plan would have an annual cost of $1,350,

which would be a reasonable cost for addressing erosion during both the construction and operational periods of the project.

Unit Shutdowns to Maintain DO

The Cooperative is proposing several measures to ensure that DO levels downstream from Lake Livingston dam continue to meet state standards. These include: (1) passing a minimum flow of 200 cfs through the spillway gates to provide highly aerated flows to the stilling basin downstream from the dam; (2) installing and operating an air injection system on the project turbines; (3) monitoring water temperature and DO levels for the term of the project license; and (4) implementing other measures as part of the Post-Startup Monitoring Plan (e.g., reducing generation and increasing flow through the spillway gates, if monitoring indicates that additional DO enhancement is required). These measures may be adequate to maintain DO levels most of the time. However, meteorological conditions may still result in DO levels that do not meet state standards, or high concentrations of fish may result in DO depletion in areas downstream from the dam. Thus, should the measures proposed by the applicant prove incapable of maintaining DO, project shutdown and passing scheduled flow releases through the spillway may be required.

The Trinity River downstream from the dam is high-value aquatic habitat for striped bass and other sport fishes, and maintenance of this habitat is important from a regional and statewide perspective. Based on our review of the Post-Startup Monitoring Plan, the applicant appears to contemplate the operational changes described above (reducing generation and increasing spillage) as an option for increasing DO levels downstream from the dam. Therefore, we recommend the Cooperative revise its draft Post-Startup Monitoring Plan to formalize such a provision, should it be necessary. We estimate that if such a shutdown was required 20 days per year for 8 hours per day, it would have an annual cost of $155,440. This would be a reasonable cost for maintaining aquatic habitat and the fishery downstream from Lake Livingston dam.

National Bald Eagle Management Guidelines

The National Bald Eagle Management Guidelines provide guidelines for scheduling construction activities in proximity to active eagle nests. Specifically, the guidelines state that protection buffers that range in size from 330 feet to 0.5 mile should be provided, depending on the intensity of the construction activities proposed and the surrounding landscape. These guidelines are meant to protect eagles from disturbance, which could result in nest abandonment or lower reproductive success, thereby violating the Bald and Golden Eagle Protection Act.

The closest eagle nest identified in the project area is on the Trinity River, south of FM 3278, which places the nest greater than 0.5 mile from the proposed construction activities. Typically, eagles will return to existing nests from one year to the next.

However, there is always the potential for pairs to construct new nests. Given its proximity to the project area, we recommend that the Cooperative consult with FWS prior to commencing construction activities that could disturb eagles during the October 1 through May 30 nesting period, to ensure compliance with the National Bald Eagle Management Guidelines. Compliance with these guidelines would minimize any effects of construction on eagles. There would be minimal cost for this measure, as the Cooperative would likely consult with FWS on a number of matters prior to commencing ground-disturbing activities associated with project construction.

Recreation Monitoring Report

The Cooperative proposes to develop and implement a recreation management plan to provide a framework for consulting with pertinent agencies and other stakeholders and developing final plans for the proposed recreation measures at the project. These measures would include: (1) a lighted parking lot at the entrance to the proposed gazebo/observation platform with 10 parking spaces; (2) relocating a portion of the existing Recreation Road 5 to provide access to and parking for the new gazebo/observation platform; (3) replacing the existing gazebo with a covered barrier-free 16-foot diameter gazebo/observation platform equipped with lights; and (4) developing paved, barrier-free trails that would extend from the new gazebo/observation platform in an irregular loop for a total distance of about 1,500 feet. The Cooperative states that the proposed amenities are subject to revision based on further agency consultations; therefore, a recreation management plan describing the agreed-upon recreation measures would be filed with the Commission for approval.

The Cooperative's proposed recreation management plan, however, does not provide for monitoring of recreational use at the recreation facilities. Recreational use monitoring would provide the information needed for justifying future improvements and upgrades to existing recreation facilities. A provision to include a recreation monitoring report, as part of the final recreation management plan, would provide additional details about recreational use levels and help the Cooperative and other stakeholders[12] identify and provide for future public access to project lands and waters to accommodate population growth, increased development, and changing patterns of recreational use for the term of the new license.

We recommend that the Cooperative be required to file every 6 years, in coordination with its filing of the Form 80, a recreation monitoring report that (a) summarizes ongoing monitoring activities and data compiled during the recreation monitoring and (b) identifies and recommends future recreation measures to account for

[12] Other stakeholders could include the National Park Service, Texas PWD, Texas SHPO, Polk County, and the Trails and Nature Tourism Committees of the Livingston-Polk County Chamber of Commerce.

future changes in recreational demand. We estimate the annual cost of this measure, as a part of the recreation management plan, would be $740. We find the potential benefit of including a recreation monitoring report as part of the recreation management plan, to identify future recreation needs, would be worth the cost.

Historic Properties Management Plan

The Cooperative's January 2010 Historic Properties Management Plan (HPMP) contains many appropriate measures for the management and treatment of historic properties. However, the HPMP does not contain accurate maps of the entire project APE as defined by the Commission, does not correctly cite the federal section 106 regulations that govern this undertaking, does not adequately address potential project effects on Lake Livingston dam, which may become eligible for listing in the National Register in the near future, and does not adequately address potential TCPs. Revising and implementing the HPMP to include the following additional measures would ensure that cultural resources are protected during construction and operation of the project over the license term: (1) revision of the HPMP to include a map or maps depicting the APE as encompassing the entirety of Lake Livingston reservoir, with clarification that the portion of the APE addressed in the HPMP is limited to project-affected areas; (2) clarification that section 106 of the NHPA and its implementing regulations found at 36 CFR 800 apply to this federal undertaking, and not the Texas Historical Commission's "Rules of Practice and Procedure for the Antiquities Code of Texas;" (3) provisions for evaluating the Lake Livingston dam for listing on the National Register upon reaching 50 years of age; (4) assessment of potential effects of project construction and maintenance on this potential historic structure; and (5) provisions for the identification and evaluation of TCPs of importance to the Alabama Coushatta Tribe, the Caddo Nation, and the Kickapoo Tribe prior to implementation of project construction activities.

The Cooperative is also proposing to conduct a cultural resources survey of the proposed transmission line corridor prior to any ground-disturbing activities, because of the potential for impact unknown cultural resources that may occur within the corridor. We agree that this survey should be conducted. We estimate the annual cost of developing and conducting a cultural resources survey, providing a survey summary report, and developing and implementing the January 2010 HPMP for the project, as proposed by the Cooperative, would be $2,700. The annual cost of additional staff-recommended changes to the HPMP, as previously discussed, would add $2,700. We conclude that these additional measures warrant the additional cost.

Measures Not Recommended by Staff

Placement of Safety Cable

Texas PWD recommends (see section 5.4, *Fish and Wildlife Agency Recommendations*) the final (post-project) placement of the safety cable spanning the

Trinity River that delineates the area of no public access downstream from Lake Livingston dam should be determined only after the proposed project has been constructed and is operational. Texas PWD states this would allow the stabilization of hydraulic conditions downstream from the project and the determination of the locations of fish congregations downstream of the dam. We do not recommend adopting this specific recommendation regarding the placement of the safety cable as a condition of the license, because the Commission's Division of Dam Safety and Inspections would determine the need for and placement of any safety measures post licensing as part of its review of final project design. Under any license issued, the Cooperative would have a responsibility for public safety and to ensure public access under parts 12 and 2.7 of the Commission's regulations.

5.3 Unavoidable Adverse Effects

Project construction would result in disturbance of about 12 acres of lawn and scrub on the downstream side of Lake Livingston dam, and the removal of small areas of trees in upland woodland areas, disturbance to grassland or pasture areas, and increased temporary disturbance to wildlife associated with constructing the project transmission line. Project construction would also involve excavation of about 1,000,000 cubic yards and dredging of about 50,000 cubic yards of earthen material, which would likely result in the release of small amounts of sediment and fines to the Trinity River, even with implementation of an erosion and sediment control plan and BMPs. Project operation would release waters from Lake Livingston dam that would be slightly warmer and have slightly lower DO than existing flow releases, although measures would be implemented to ensure that state water quality standards would continue to be met. Project operation would also result in some fish entrainment mortality, although that mortality is not expected to result in any long-term adverse effects on the fishery. There is the potential for some scouring and bank erosion associated with tailrace discharges, but monitoring during project operations would allow the Cooperative to identify and repair damaged areas.

5.4 Fish and Wildlife Agency Recommendations

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. Section 10(j) of the FPA states that whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

In response to our ready for environmental analysis notice, FWS and Texas PWD on July 23, 2010, and August 2, 2010, respectively, filed recommendations under section 10(j). Table 8 lists FWS' and Texas PWD's recommendations filed pursuant to section 10(j), and identifies whether the recommendations are adopted under the staff alternative. Environmental recommendations that we consider outside the scope of section 10(j) have been considered under section 10(a) of the FPA and are addressed in the specific resource sections of this document.

We recommend adopting measures consistent with the five recommendations that we consider to be within the scope of section 10(j). We discuss the reasons for either adopting or not adopting specific recommendations considered under section 10(a) in section 5.2, *Comprehensive Development and Recommended Alternative*.

Table 8. Fish and wildlife agency recommendations for the Lake Livingston Hydroelectric Project (Source: staff).

Recommendation	Agency	Within the Scope of Section 10(j)	Annual Cost	Adopted
1. Implement the draft Post-Startup Monitoring Plan, which includes temperature and DO monitoring and striped bass and forage fish monitoring, with provisions for mitigative measures.	Texas PWD, FWS	Yes	$24,300	Adopted
2. Provisions of the Post-Startup Monitoring Plan should continue for the life of the project, and the licensee should continue to work cooperatively with Texas PWD to resolve any unforeseen impacts.	FWS	Yes	$0	Adopted by recommending preparation of final plan

Recommendation	Agency	Within the Scope of Section 10(j)	Annual Cost	Adopted
3. Implement specific operational responses to maintain adequate aquatic habitat for fishes downstream from the dam, and a minimum flow of 200 cfs	Texas PWD	Yes	$0	Adopted as part of Post-Startup Monitoring Plan
4. Use appropriate fish-friendly turbines to minimize fish mortality	Texas PWD	Yes	$0	Adopted, as is part of proposed project design
5. Construct project in accordance with the National Bald Eagle Management Guidelines to avoid disturbance of bald eagles	FWS	Yes	$0	Adopted
6. Should the existing public features cease to provide safe public access to the Trinity River downstream from the project, construct and maintain reasonable public river access features at a location to be determined feasible.	Texas PWD	No, not a specific measure to protect, mitigate, or enhance fish and wildlife resources	$0	Not adopted, although future recreational needs will be assessed for the life of the project

Recommendation	Agency	Within the Scope of Section 10(j)	Annual Cost	Adopted
7. Final placement of the safety cables spanning the Trinity River that would delineate the areas of no public access should be determined only after the project has been constructed and is operational	Texas PWD	No, not a specific measure to protect, mitigate, or enhance fish and wildlife resources	$0	Not adopted; the Commission's Division of Dam Safety and Inspections would determine the need for and placement of any safety measures post licensing as part of its review of final project design
8. Commission should provide documentation regarding no effect conclusion for Threatened and Endangered species	FWS	No, not a specific measure to protect, mitigate, or enhance fish and wildlife resources	$0	Adopted, in that we provide documentation of no effect in the EA

5.5 Consistency with Comprehensive Plans

Section 10(a)(2)(A) of the FPA, 16 U.S.C.§803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed 13 qualifying comprehensive plans that are applicable to the Lake Livingston Project, located in Texas.[13] No inconsistencies were found.

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6.0 FINDING OF NO SIGNIFICANT IMPACT

On the basis of our independent analysis, we find that the issuance of a license for the Lake Livingston Project, with our recommended environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

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