THE PERMANENT SALTWATER BARRIER IN THE NECHES RIVER

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INTRODUCTION

The lower Neches River and Neches-Trinity Coastal Basins (Exhibit I) are characterized by moderately dense population; a heavy petroleum and petrochemical industry; a hub of highway, rail and deep-water transportation facilities; and a major rice-producing agricultural industry. The well-being and prosperity of all of these interests are incontrovertibly dependent on an abundant supply of freshwater.

While less populated and less industrialized areas north of the lower Neches area are largely consumers of groundwater, the lower basin's groundwater supply has neither the volume nor the quality to meet the local freshwater requirements. Thus, the lower basin must depend on its surface water supply in the Neches River and its tributaries.

The area's fresh surface water supply is continually in danger of the threat of saltwater contamination. Saltwater may threaten the freshwater intakes of lower Neches cities, industries and farms by moving upstream from the Gulf of Mexico through the deepwater channel to Beaumont.

The effects of saltwater on those dependent on freshwater may be catastrophic. Humans and domestic animals cannot consume freshwater significantly contaminated by saltwater because of detrimental effects on their health. Industries are even less tolerant of saltwater because of its adverse effects on their products and damages to their processes and equipment. Farmers may not use water degraded by saltwater because it may be fatal to crops and damaging to the soil.

The extent of upstream intrusion of saltwater varies inversely with the downstream flow of freshwater. That is, if freshwater flows are abundant, their downstream pressure will prevent the saltwater from moving upriver to the freshwater intakes at and above Beaumont. If freshwater flows are insufficient, saltwater may move upriver and the Lower Neches Valley Authority (LNVA) must take measures to protect the intakes.

The measures taken by the LNVA consist of the installation of temporary saltwater barriers in the Neches River and Pine Island Bayou. These structures effectively block the upstream intrusion of saltwater when freshwater streamflows are insufficient to hold the saltwater in abeyance.

Relatively economical to construct and effective controls, the temporary barriers are, unfortunately, controversial. They block boat traffic and are perceived to be the cause of flooding. They undoubtedly are a boating inconvenience, but they have been proven to have insignificant backwater (flooding) effects.

Despite these facts, the public unpopularity of the temporary barriers has caused the U.S. Army Corps of Engineers to cancel LNVA's permit, originally issued in 1945, to install the barriers. Although a new permit was reissued with imposition of very expensive conditions on any

subsequent installations, the new permit will terminate on December 31, 1999. After that point LNVA must have either built or be well underway on constructing an alternative saltwater control device meeting more stringent requirements.

The LNVA has been considering the building of such a device since the 1960's. It is a permanent saltwater barrier, designed by the Corps of Engineers, with gates capable of being opened when streamflows are capable of controlling saltwater intrusion and closed when the flows are inadequate. The structure would also contain a gated navigation channel, which would allow free access to the river by boats and the migration of fish. Its backwater effects have been designed to be insignificant and it is an enormously efficient freshwater conservation device.

Why is this so? As was noted earlier, saltwater intrusion may be controlled by freshwater flows, if sufficient in volume. If dry weather flows are not supplemented by freshwater releases from reservoir storage, the battle may be lost. When water stored in Sam Rayburn Reservoir is plentiful, river flows are supplemented with releases from the reservoir. These releases are made solely for the purpose of saltwater control and have little benefits other than that.

Enormous quantities of freshwater may be released from Rayburn for saltwater control during the dry season. The volume may be more than double the one billion gallons a day being delivered to LNVA customers for useful purposes. If drought conditions persist, measures must be taken to protect water remaining in Rayburn, and that is when temporary barriers are installed as discussed above. See Section 3 for information on drought effects.

A permanent saltwater barrier would enable the encroachment of saltwater to be controlled by simply closing the gates rather than by the nonconservative practice of flushing away the saltwater. The gates could be used to minimize freshwater drawdown in Rayburn, creating a more constant level reservoir, and even more importantly, extend the amount of surface water held in reserve to support the future demands of the area's growth and development.

The permanent saltwater barrier offers that prospect. It offers not only the customers of LNVA an additional source of water for their future, it holds the same promise for those residents, businesses and farms not presently served by the LNVA.

This latter point, in large measure, is the reason for assembling this information. The Congress of the United States authorizes Federal projects and provides a certain level of funding. Local beneficiaries, in this case the local users of the water, will provide the balance of the project costs.

As a non-profit agency of the State of Texas without powers of taxation, the LNVA has no authority to appropriate any part of project costs from those benefitting from the project other than its customers. Therefore, a relatively small segment of the population will pay for a project which benefits a larger group of residents and businesses.

The following information was excerpted from the 1981 permanent saltwater barrier design report by the Galveston District, Corps of Engineers, and various reports by the LNVA. Some of the LNVA reports were written several years ago for various purposes, and redundancies will be

found in their content. However, each represents a chapter in the history of the project, and are included for reference.

The readers of the information contained in this report are asked to consider the long-term benefits of the permanent saltwater barrier and to recognize the importance of a fair and equitable arrangement for Federal/Local sharing of project costs.

SECTION 1

Excerpts from the Phase I Report, General Design Memorandum - Main Report and Supplement to Final Environmental Statement

Neches River and Tributaries
Saltwater Barrier at Beaumont, Texas

Galveston District, Corps of Engineers
Galveston, Texas
1981

NECHES RIVER AND TRIBUTARIES, SALTWATER BARRIER AT BEAUMONT, TEXAS

INTRODUCTION

Plan to control saltwater intrusion on the Neches River as described in House Document 94-629, 94th Congress, 2nd Session, titled Neches River and Tributaries, Saltwater Barrier at Beaumont, Texas.

The primary purpose of the project is to prevent saltwater contamination of municipal, industrial, and agricultural surface water supplies while maintaining free and reasonable unobstructed use of the river by existing and future navigation.

STUDY AUTHORITY

Authority for construction of a permanent saltwater barrier in the Neches River as described in the Interim Review of Reports on Neches River and Tributaries Covering Saltwater Barrier at Beaumont, Texas (reprinted as House Document 94-629) is contained in Section 102 of the Water Resources Development Act of 1976 (Public Law 94-587). The pertinent part of the act is quoted as follows:

Local Cooperation

The previously described plan has been authorized with the provision that, prior to construction, local interests agree to the following items of local cooperation:

"a. Provide without cost to the United States all lands, easements, and rights-of-way necessary for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of excavated materials, and including necessary retaining dikes, bulkheads, and embankments therefor, or the costs of such retaining works;

"b. Contribute 25 percent of the first cost of the barrier located at the environmental quality site the sum of the non-Federal contributions currently being estimated at $3,485,000[1/], including the value of lands, easements, and right-of-way and alterations and relocations, to be paid either in a lump sum prior to commencement of construction, or in installments prior to commencement of pertinent work items, in accordance with construction schedules as required by the Chief of Engineers, the final apportionment of costs to be made after actual costs have been determined;

"c. Accomplish, without cost to the United States, all alterations and relocations of structures, pipelines, powerlines, cables, utility facilities, sewers, and highway facilities made necessary by the construction of the project;

"d. Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army and bear 25 percent of the incurred cost;

"e. Arrange, without cost to the United States, for construction and maintenance of a suitable connecting road from the project to the city street system;

"f. Hold and save the United States free from damages that may result from construction, maintenance, and operation of the project; and

"g. Obtain, without cost to the United states, all water rights needed for operation of the project in the interest of navigation and prevention of salinity intrusion, and resolve any conflicts in water rights necessary for effective operation of the project."

Section 102 of the Water Resources Development Act of 1976 (P.L. 94-587) amended the conditions recommended by the Chief of Engineers to state that ". . . the non-Federal share for such project shall not exceed $2,100,000." Section 9 of the Water Resources Development Act of 1974 (P.L. 93-251) amended the "hold and save" clause (item f) to read "Hold and save the United states free from damages due to the construction, operation, and maintenance of the project except where such damages are due to the fault or negligence of the United States or its contractors."

PROBLEM IDENTIFICATION

A feasibility report identified and considered problems relating to saltwater contamination of existing surface water supplies; seasonal interruptions to use of the river by navigation as a result of procedures employed by the Lower Neches Valley Authority (LNVA) to halt saltwater contamination; and preservation and enhancement of natural environmental resources.

The report briefly described the resources of the study area and discussed the problems, needs, opportunities, and concerns of the public relative to permanently controlling salinity intrusion on the Neches River.

1/ Limited to $2,100,000 by the Water Resources Development Act of 1976, Section 102 (P.L. 94-587), the authorizing legislation for this project.

NATIONAL OBJECTIVES

Planning efforts have focused on achieving National Economic Development (NED) and Environmental Quality (EQ) as co-equal National objectives, as required by the "Principles and Standards for Planning Water and Related Land Resources" developed by the Water Resources Council. National Economic Development is defined as increasing the value of the Nation's output of goods and services and improving National economic efficiency. Environmental Quality is defined as the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems.

Plans presented have been evaluated for their contributions toward these objectives. All of the plans displayed reflect an overall improvement in the quality and/or quantity of economic and environmental resources when compared to existing conditions.

EXISTING CONDITIONS

Location

The Neches River Basin is located in East Texas and encompasses an area of about 10,000 square miles, including all or portions of 20 counties. The watershed is about 210 miles long, with a maximum width of about 70 miles. Figure 2-1 shows the basin and its pertinent water resource development features. Elevations within the watershed range from sea level at Sabine Lake to about 550 feet at its headwaters near Colfax, in Van Zandt County.

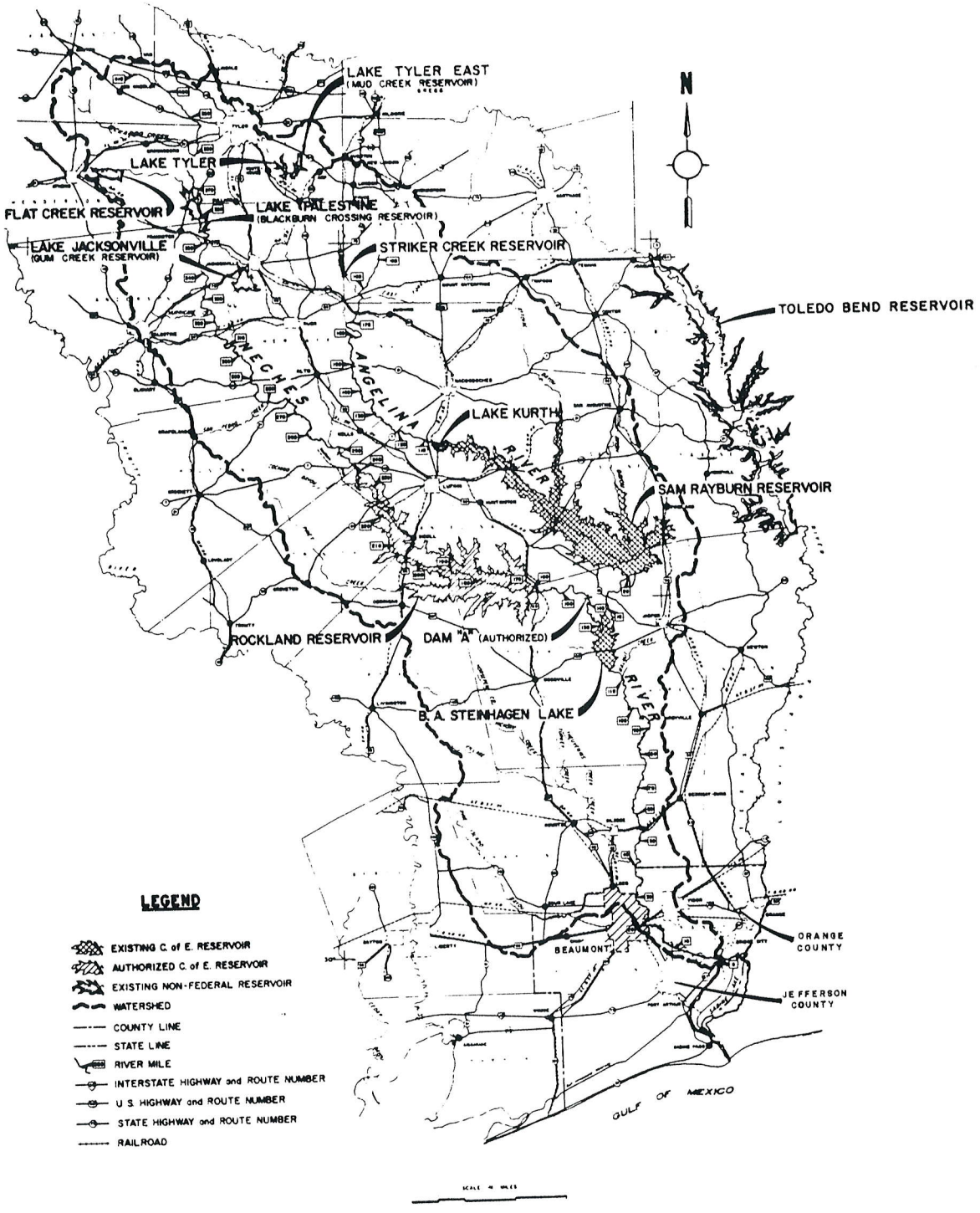
The portion of the Neches River Basin affected by construction of a saltwater barrier, the study area for this report, is encompassed by Orange and Jefferson Counties.

Climate

The climate of the study area is generally mild, although it is distinctive in the relative large range in annual and daily temperatures. Snowfall and subfreezing temperatures are rarely experienced. The average annual precipitation in the study area is about 60 inches, although periods of extreme flooding or drought have occurred.

Population

The population of the study area is centered in the Beaumont-Port Arthur-Orange metropolitan area, containing approximately 63 percent of the two-county total. Most of the 1960-1970 population growth experienced by the study area was located in suburban industrial communities such as Groves, Nederland, Port Neches, and Vidor.



NECHES RIVER BASIN

FIGURE 2-1

Land Use

Land use within the study area includes agriculture; rangeland; industry; urban-business; timber; recreation; and undeveloped wetlands, forests, and forested wetlands. Much of the prairies and high marsh areas are used for agriculture or as rangeland. Industrial land use is mostly comprised of petroleum-related industries concentrated along specific reaches of the Sabine-Neches Waterway.

Salinity

Prior to 1900, salinity intrusion was not a serious problem in the Neches River and its tributaries. Natural salinity barriers at the mouth of the river effectively prevented salinity intrusion upstream except during periods of extremely low river flows. Federal construction and progressive maintenance of the Sabine-Neches Waterway to the City of Beaumont removed natural salinity barriers and increased the cross-sectional area of the river, thus largely creating the present problem. Increasing freshwater withdrawals upstream for irrigation and water supply has aggravated the problem. In a study conducted by the U.S. Army Corps of Engineers, Waterways Experiment Station, it was estimated that the adverse effects caused by works of man are assignable to the navigation project and to upstream withdrawals in the relative proportions of about 75- and 25-percent, respectively.

NO FEDERAL ACTION CONDITIONS

If no Federal action is taken to protect the freshwater supplies of the area from saltwater intrusion, the area will continue to undergo modifications as a result of man's activities. These modifications form a base by which impacts created by implementation of each of the alternative plans may be measured. For purposes of this analysis, it is assumed that LNVA will continue its present practice of installing temporary saltwater barriers in Pine Island Bayou and the Neches River annually, as needed to protect freshwater supplies.

The parameters which were analyzed in determining effects of no Federal action include economic indicators as well as expected environmental and social conditions.

Future Water Supply Requirements

A study of the Lower Neches River Basin to determine future water supply requirements was conducted by the Corps' Southwestern Division Office (SWD). A copy of the report on the study is available in either the District or Division Office. Based on this study, future water supply needs for the study area are expected to be generally for the same types of uses now served. Petroleum refining and chemical production are projected as the heaviest industrial freshwater users in Jefferson County, with a paperboard mill in Jasper County adding significantly to the overall industrial water use. Municipal per capita water use rates are projected to increase at a decreasing rate. The municipal and industrial water requirements are projected to increase from

265.98 million gallons per day (MGD) in 1976 to 622.58 MGD by the year 2040.

Although the study did not analyze irrigation and other agricultural water requirements, it recognizes the fact that these requirements are expected to continue to represent a significant share of the total water requirements of the study area. Projections of irrigation water requirements developed by the Texas Water Development Board (TWDB), in its draft report Continuing Water Resources Planning and Development for Texas, indicate that the amount of water required for this purpose is expected to remain relatively stable.

General Economic Conditions

Without the project to control saltwater intrusion, LNVA is expected to continue to bear the full cost of seasonal installation of the temporary saltwater barriers. Vessel movement above the temporary barriers is halted during the time they are in place, causing a compromised operation of a commercial sand-dredging firm.

Environmental Conditions

From an environmental standpoint, if no Federal action is taken, irreversible commitments of environmental resources associated with project construction would be avoided, such as permanent coverage of some wildlife habitat, conversion of wetlands to channel bottom, and coverage of channel-bottom dwelling organisms. However, this condition would forgo several environmental enhancement features inherent in implementation of any alternative plan such as maintaining or restoring freshwater conditions in the Neches River and Pine Island Bayou and the associated swamps.

Failure to control salinity intrusion would contribute to the continuing degradation of up to 16.7 miles of the Neches River and Pine Island Bayou and the adjacent swamp areas located downstream of the temporary barriers presently installed by LNVA. Water quality problems below the temporary barriers, related to saltwater intrusion and industrial pollution, are expected to continue. The natural balance of this segment of the river may be seasonably disturbed, adversely affecting fish and invertebrates.

Socioeconomic Conditions

The direct effects of no Federal action on the socioeconomic factors in the study area constitute acceptance and continuation of the existing conditions. Water quality in the Neches River and Pine Island Bayou below the temporary barriers will continue to be seasonally degraded by saltwater intrusion. This seasonal degradation of water quality will continue to impact unfavorably on aesthetics and recreational opportunities in the study area. Access to points upstream of the temporary barriers by recreational and commercial navigation will continue to be impeded.

Water Conservation

Renewed National emphasis on water conservation makes it essential that conservation measures be fully considered in any water supply study. The study of water needs in the basin incorporated water conservation in two ways. The per capita use rates were projected to increase at a decreasing rate during the period of analysis. Also, the needs for the industrial segment were adjusted to reflect expected increased recycling by industrial users.

Water Supply

Several studies have been undertaken which deal with water supply problems and needs for the Lower Neches Basin and the State of Texas. The most comprehensive of these studies was an overall appraisal of water problems of the state, with possible solutions, which was undertaken by the Texas Water Development Board (TWDB) in the mid-1960's. The data gathered and conclusions of the study were published in November 1968 as the Texas Water Plan (TWP), which is intended to serve as a flexible guide for future water planning in the State of Texas. A draft revision and update, titled Continuing Water Resources Planning and Development for Texas, was completed in May 1977.

One important conclusion of these studies is that Texas is rapidly becoming a water-short region. The TWP report indicates that there are areas with surplus water resources in the eastern portion of the state and areas of critical future water shortages in the western portion of the state. The report concludes that development of all of the state's surface and underground water resources will not satisfy the anticipated water needs of the foreseeable future.

The Lower Neches River Basin is located in the easternmost portion of the State of Texas, in the area designated as containing surplus water resources. The average flow at the mouth of the Neches River from 1922 through water year 1977 is approximately 5,600,000 acre-feet per year.

Dependable surface water supplies in the study area include Sam Rayburn Reservoir (annual yield 915,000 acre-feet) and B.A. Steinhagen Reservoir (annual yield 133,000 acre-feet), providing a dependable annual yield of 1,048,000 acre-feet of surface water. LNVA is authorized to appropriate up to 820,000 acre-feet of water from Sam Rayburn Reservoir for municipal, industrial, and irrigation uses, such water to be impounded and re-regulated in B. A. Steinhagen Reservoir.

LNVA provides water to 26 industrial customers, including oil refineries and petrochemical companies. Municipal customers consist of three water districts and the Cities of Groves, Nederland, Nome, Port Arthur, and Port Neches in Jefferson County. In 1979, LNVA provided 15,555 acre-feet of water for municipal uses; 141,938 acre-feet for industrial uses; and 229,172 acre-feet for irrigation; or a total surface water use of 386,665 acre-feet.

The City of Beaumont is also authorized to withdraw 56,467 acre-feet of Neches River water for municipal use. The estimated actual surface water use by the city in 1979 was 18,517 acre-feet.

Groundwater resources in the study area have been estimated at approximately 169,000 acre-feet annually through the year 2030 by the Texas Water Development Board. Groundwater usage for the area in the year 2000 is estimated to be 62,000 acre-feet, increasing to approximately 78,000 acre-feet by 2030.

A comparison of safe annual groundwater withdrawal rates currently used and projected groundwater withdrawals indicates that projected demands can be met without creating extreme water-level declines, significant land-surface subsidence, or saltwater encroachment.

Projections by TWDB indicate that the study area will remain water self-sufficient through the year 2030. These projections are based on the assumption that measures will be continued to prevent contamination of the freshwater supply by salt water and that the authorized but deferred Rockland Reservoir will be constructed by the year 2030.

Water Quality

Except for localized conditions of stream degradation, inorganic water quality of the Neches River Basin is excellent, with low dissolved solids and low hardness. The Neches River near Evadale contains dissolved-solids concentrations less than 150 milligrams per liter (mg/l) about 50 percent of the time. This concentration has equalled or exceeded 200 mg/l only about one percent of the time.

Most of the Neches River Basin receives moderately low organic loadings and maintains dissolved-oxygen concentrations in excess of 5 mg/l. Effluent streams from industries and cities along the lower Neches have been improved since the study was performed, and that reach of the River has experienced a dramatic recovery.

The tidal reach of the river is frequently contaminated by salt water in addition to municipal and industrial wastes, creating serious water quality problems in this segment of the river. During periods of low flow and high water use, salt water from the Gulf of Mexico moves up the Neches River in concentrations sufficient to contaminate the freshwater supplies of the City of Beaumont and LNVA, endangering the suitability of the water for irrigation, municipal, and industrial uses. Although rice, the primary irrigated crop in the area, is tolerant of small amounts of salt at any stage of growth, higher concentration can affect the existing crop. Long-term effects may also develop through salt build-up in the soil, adversely affecting future crops. Industries in the area require water with salinities less than 10 grains per gallon.

The City of Beaumont normally withdraws water from the Neches River at a gravity intake at Bunns Bluff, mile 30.3, but activates its Weiss Bluff Pumping Station at mile 41.7 when salt water is present at Bunns Bluff. This condition has occurred on the average of 111 days per year since 1929. The city also has the capability to withdraw water through a gravity intake at its Lawson's Raw Water Pump Station, located adjacent to its Lawson's Crossing siphon under the Neches River.

LNVA withdraws water from Pine Island Bayou at Voth and from the Neches River at Lakeview, mile 38. Both intakes are subject to saltwater intrusion and are protected by temporary steel sheet pile barriers installed almost annually by LNVA downstream of its water supply intakes to prevent contamination of its water supply. The locations of the water intakes and the temporary barriers are shown on Figure 2-3.

Navigation

The only commercial navigation on the Neches River upstream from Interstate Highway 10 is involved with the transport of river sand. One firm in Beaumont presently dredges sand from the Neches River and transports it to its supply yard just downstream from Interstate Highway 10 in 30- by 200-foot barges with loaded drafts of 5 feet. Recent communications with this firm indicate that the sand is delivered on an as-needed basis, resulting in less than one trip per week.

The firm obtains its sand from the reach of the river from 500 feet above IH 10 to 1-½ miles above the mouth of Village Creek. During the time the LNVA temporary saltwater barriers are in place, the company is restricted to that reach of the river below Lakeview.

Extensive recreational boating on this portion of the Neches River is discussed in the following section on recreation.

Recreation

Numerous recreational craft frequent this reach of the river for such purposes as pleasure boating, sightseeing, water skiing, and fishing. Some of these recreational crafts are large vessels moored at boat clubs along the river while others are smaller craft which are trailered to launch sites.

Several facilities are located along the Neches River which provide limited access to recreational opportunities. Free public boat ramps provided by the Texas Parks and Wildlife Department are located in Beaumont at river mile 26.5 and just under the Interstate Highway 10 bridge. The Beaumont Boat Club, located at river mile 22.5, allows public use of its facilities on a fee basis. This facility is reputedly the most highly utilized access to the Neches River during the peak recreational season, with over 400 boats launched per weekend.

The Neches Boat Club (river mile 25.9) and the Beaumont Country Club (river mile 26.5) are privately owned access points to the Neches River. Use of these facilities are limited to their members.

The temporary saltwater barriers installed by LNVA each year block access by recreational craft to those portions of the Neches River above Lakeview and Pine Island Bayou above Voth. Included in these areas are a portion of the Beaumont Unit and the Little Pine Island-Pine Island Bayou Corridor of the nearby Big Thicket National Preserve, shown on Figure 2-3, as well as many miles of scenic streams and bayous. Recreational boating originating in Beaumont is,

therefore, limited to the reach of the Neches River and Pine Island Bayou below LNVA's temporary barriers.

Environment

Environmental problems, needs, and opportunities are mainly related to water quality in the reaches of the Neches River and Pine Island Bayou downstream from LNVA's temporary barriers. Prior to Federal construction of the Neches River Navigation Channel, the waters of the Neches River were, for the most part, fresh year-round. Extensive freshwater swamps and numerous cypress and tupelo gum trees covered the natural floodplain of the river.

Since construction and continued enlargement of the Federal project, saltwater intrusion has become more and more of a problem. With construction of the temporary saltwater barriers by LNVA, the reach of the Neches River and Pine Island Bayou below the barriers become very saline and polluted with municipal and industrial wastes, threatening the existence of the freshwater habitat provided by the freshwater swamps and slowly destroying the cypress trees. Protection of this area from contamination by salt water and industrial and municipal pollutants would constitute a significant environmental gain.

Improvements Desired

Several workshop meetings have been conducted in the study area during post authorization planning efforts. The purpose of these meetings was to afford local interests and the public an opportunity to express their desires, views, and concerns regarding the authorized Neches River Saltwater Barrier Project. At these meetings, the City of Beaumont and LNVA reaffirmed their desire for construction of a permanent saltwater barrier and navigation by-pass channel at the authorized site 1 location. A desire to protect and enhance as much of the natural freshwater environment of the Neches River and Pine Island Bayou as possible was also expressed at these meetings.

Public Concerns

Subsequent to Congressional authorization of the Neches River Saltwater Barrier at site 1, the Orange County Drainage District (OCDD) expressed concern that construction of the barrier at this location would have a serious detrimental effect on drainage in portions of western Orange County. In a letter dated 18 April 1977, OCDD formally stated its opposition to construction of the barrier at site 1. OCDD did not oppose construction of a saltwater barrier at any of the other sites, and especially favored site 4. This issued has since been resolved.

PLAN FORMULATION RATIONALE

Formulation of a plan of improvement to prevent saltwater contamination of freshwater supplies in the study area has involved consideration of the various measures available to protect the freshwater supplies of the study area. Each alternative investigated was considered on the basis of engineering feasibility, sociological compatibility, and its contribution to the National economic and environmental objectives or goals. Those alternatives which least satisfied the formulation and evaluation criteria and were obviously lacking justification were deleted from further study early in the formulation process. The alternatives which survived the development and evaluation of preliminary plans were then subjected to a more extensive screening to select a plan which best meets the needs of the area.

Guidelines used during plan formulation studies for this design memorandum are in accordance with the Water Resources Council's "Principles and Standards for Planning Water and Related Land Resources" and the Engineer Regulation 1105-2-200 Multiobjective Planning series dated 13 July 1978, as well as other applicable laws and guidelines.

PLANS OF OTHERS

During the post authorization planning process, consideration has been given to the plans of other governmental agencies, Federal, state, and local; together with other public and private groups or individuals. At present, there are no known plans, other than those proposed in this report, for improvements or modifications to the Neches River in the interest of salinity control.

ANALYSIS OF PLANS CONSIDERED

Preliminary evaluations were made of potential alternative solutions to determine their suitability to satisfy evaluation criteria. Some of the alternatives described in the following paragraphs were eliminated from further consideration without benefit of detailed analysis. The reasons for dropping these alternatives are indicated. Other alternatives were found to be desirable and were carried through the iterative process to the detailed planning stage.

Possible Solutions

Alternative measures which would prevent saltwater contamination of the freshwater supplies in the Neches River include continuation of the present practice of installing temporary saltwater barriers in the Neches River and Pine Island Bayou each year; flushing the saltwater wedge downstream with fresh water; extension of the freshwater intake canals to points above the possible limits of salinity intrusion; increased use of groundwater as a substitute for surface water from the river; and construction of a permanent saltwater barrier with facilities to meet the needs of the region.

Temporary Saltwater Barriers. Periodic installation of temporary steel sheetpile saltwater barriers across Pine Island Bayou and the Neches River downstream from freshwater intakes is one method of protecting the freshwater supplies of the study area from salinity intrusion. This solution is currently undertaken by LNVA whenever salinity levels at their water intakes reach unacceptable levels, at an estimated average annual cost of approximately $250,000.

Although relatively inexpensive, installation of these temporary barriers constitutes a less than desirable solution to the water quality and other problems and needs of the study area for several reasons. While in place, these barriers prevent passage of commercial and recreational vessels, impeding the public right of free and reasonable unobstructed use of the naturally navigable river. The river is the primary access to the Little Pine Island-Pine Island Bayou Corridor and the only access to the Beaumont Unit of the Big Thicket National Preserve. These barriers also create minor backwater effects while in place and are not responsive to sudden changes in river flow. No environmental enhancement or preservation is inherent in this solution.

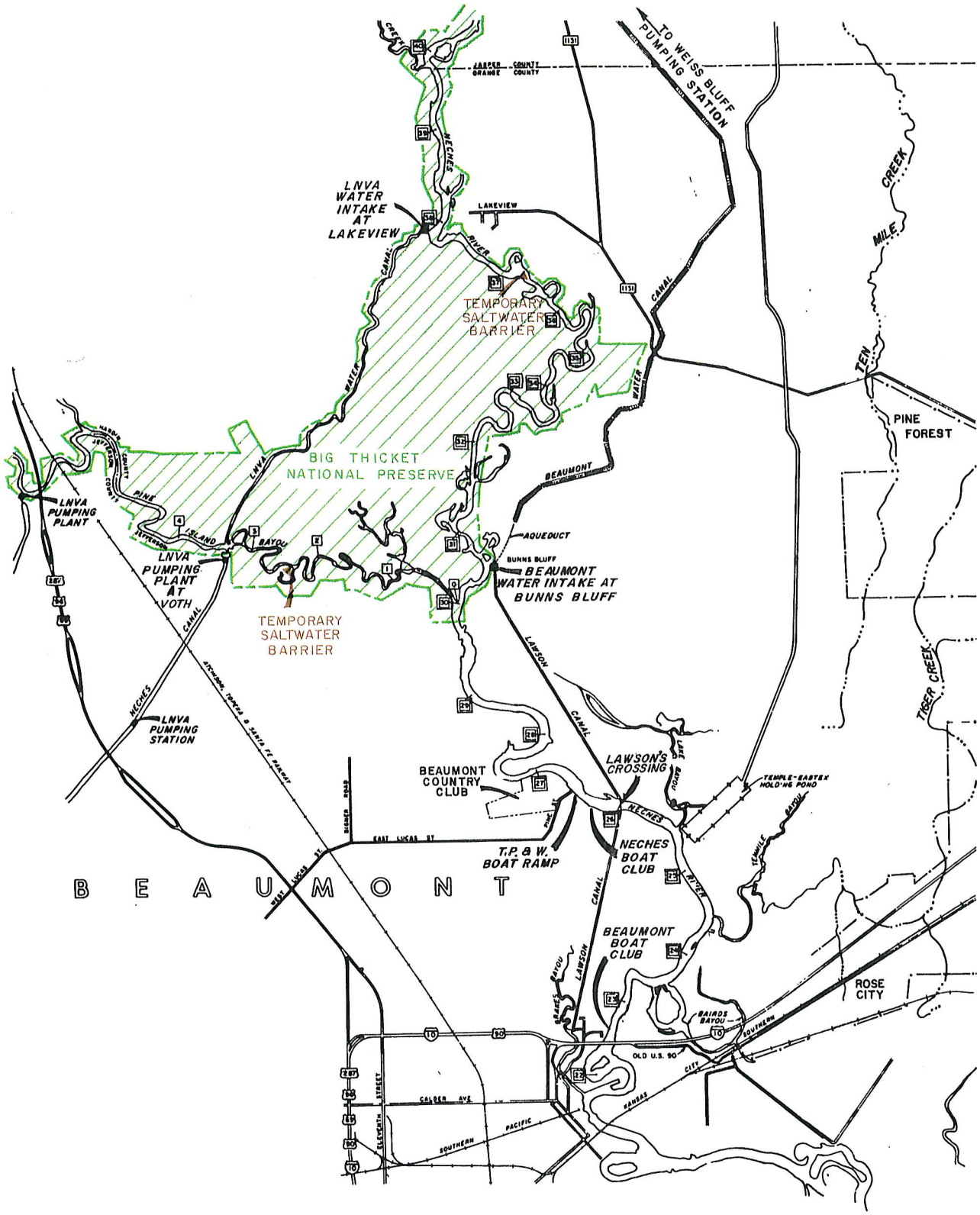
In order to protect the freshwater supplies of the study area, LNVA will have to continue its practice of installing this type of barrier until a more acceptable solution is provided.

Flushing. The salinity levels at freshwater intakes could be controlled by flushing the salt water downstream from Bunns Bluff with fresh water released from upstream reservoirs. With the present project dimensions of the Neches River Channel at 40 by 400 feet, an estimated net flow of approximately 1,900 cubic feet per second would be required to depress the saltwater wedge below the freshwater intakes at Bunns Bluff. This flow would be required for an average of 111 days per year, requiring approximately 407,000 acre-feet of water per year in addition to the water required for withdrawal for municipal, industrial, and agricultural uses. Proposed enlargements to portions of the Sabine-Neches Waterway would increase the quantity of water required to maintain an acceptable degree of water quality at Bunns Bluff.

Rather than alter the authorized functions of Sam Rayburn Reservoir, to the detriment of its extensive recreational development, it was assumed for evaluation purposes that the additional water would be supplied by the authorized but deferred Rockland Reservoir. Approximately 40 percent of the annual yield of this reservoir would be required to provide flows of the magnitude required under existing conditions.

This solution was deemed unacceptable for a number of reasons. The water required for flushing would be provided by Rockland Reservoir. This project is currently deferred and is being restudied by the Fort Worth District during 1981 and 1982 for reclassification. According to the Texas Water Development Board, Texas is rapidly becoming a water-short region. Future demands for water for municipal, industrial, and agricultural uses, therefore, preclude consideration of such water use as a realistic long-range solution.

Extension of Intake Canals. It is technically feasible to extend the water intake canals of LNVA and the City of Beaumont above the influence of the tides and any possible saltwater intrusion. The canals would have to be constructed to a point above river mile 50, which is the point at which the thalweg of the river rises to an elevation of one foot above mean sea level.



TEMPORARY SALTWATER BARRIER LOCATIONS

FIGURE 2-3

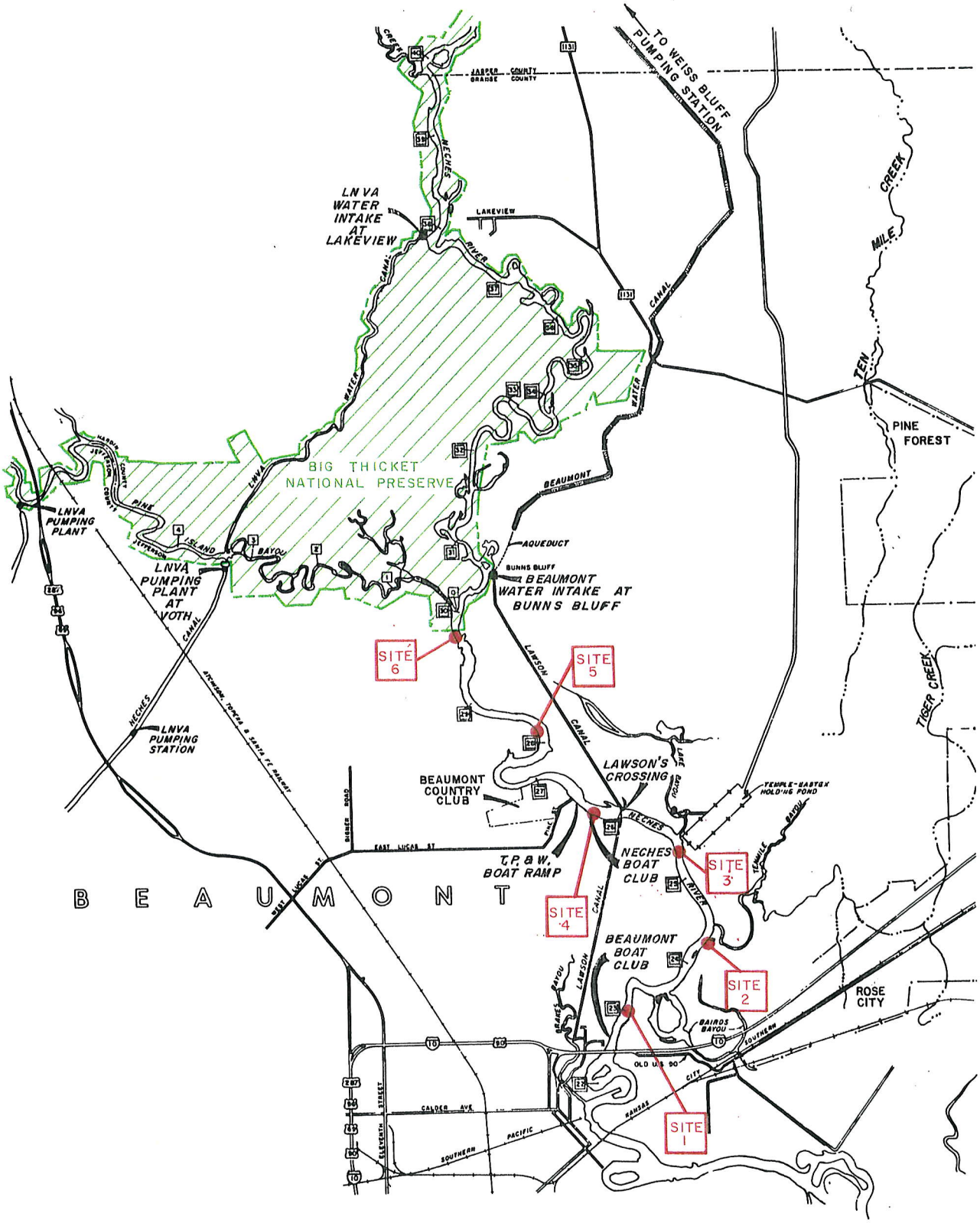
This plan would do nothing to preserve or enhance the environment in the area. Extension of these canals would cause extensive disruption of the natural environment of the river's flood plain. Flow patterns in adjacent wetlands would be disturbed. Relocations of roads and utilities bisected by the canals would also be required. Water quality in the lower reaches of the Neches River would remain poor, impacting unfavorably on the associated swamps and cypress trees as well as other flora and fauna in the area. Therefore, extension of the intake canals above the reach of salt water was considered an unacceptable solution.

Use of Groundwater. Prevention of saltwater intrusion in the Neches River would not be necessary from a water supply standpoint if the municipal, industrial, and agricultural water demands in the study area could be supplied entirely from groundwater. The Texas Water Development Board has estimated the safe annual yield of groundwater from aquifers in and near the study area at about 170,000 acre-feet per year. TDWR has also determined that approximately 530,000 acre-feet of water are used annually by this area, 307,000 acre-feet of which are for municipal and industrial users. Groundwater may be used to augment surface water supplies in the study area, but the entire safe yield would be inadequate to meet the entire water needs of the study area. Withdrawals in excess of the safe annual yields would induce land subsidence and eventually lead to depletion of the aquifers. Use of groundwater in place of surface water was, therefore, determined to be technically infeasible.

Permanent Saltwater Barrier. Construction of a permanent structure and related works in the Neches River downstream from the water intakes of LNVA and the City of Beaumont to control salinity intrusion and accommodate navigation is a technically feasible solution. This alternative would satisfy the majority of the planning objectives in that it would prevent salinity intrusion, allow free and reasonable unobstructed use of the river, contribute to the preservation or enhancement of the environment, and enhance recreational opportunities. The degree to which these objectives are satisfied, as well as satisfying the archeological and cultural resources objective, is partially determined by the location and design of the barrier structure.

Location of the Barrier. Seven sites were investigated in the feasibility report, six of which are shown on Figure 3-1. The seventh site was at or below the Interstate Highway 10 bridge. Examination of this site indicated alterations to the bridge would be necessary. These alterations were deemed uneconomical, and this site was dropped from further consideration.

Each of the other six sites was found to be technically and environmentally suitable for construction of a saltwater barrier and navigation gate. Since the design of the barrier structures and navigation gates would be similar at any of the six sites, major differences in project costs would be associated with related works such as lengths of channels, levees, access roads, and appursenant works. Each of the six sites also provide varying amounts of environmental and recreational enhancement.



INVESTIGATED SITE LOCATIONS

FIGURE 3-1

ALTERNATE SITE DESCRIPTIONS

SITE 1

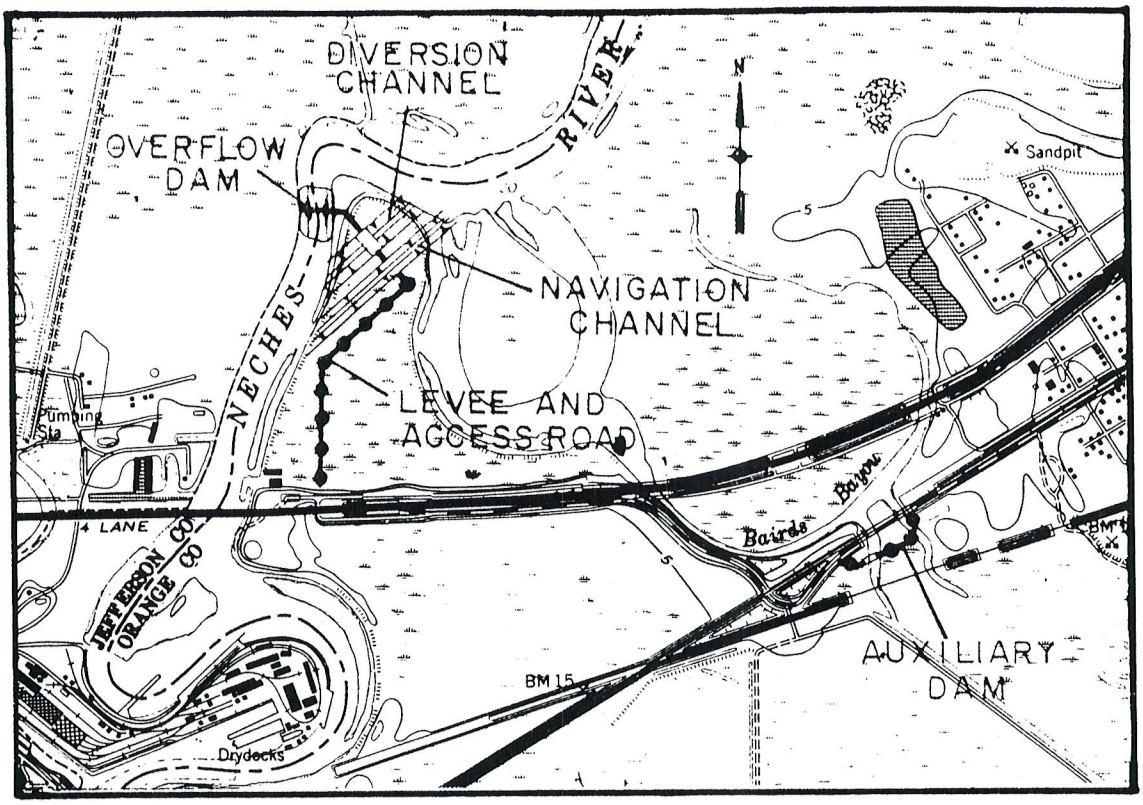


FIGURE 3-2

Site 1 (authorized location), shown on Figure 3-2, is located at river mile 23.0 on the Neches River. A project at site 1 is the second most costly site investigated. An auxiliary dam and appurtenant works required to prevent saltwater intrusion via a canal that drains the southern end of Bairds Bayou contribute substantially to its cost. A barrier at site 1 would require relocation of the effluent outfall from the Temple-Eastex, Inc., paper mill at Evadale, Texas, to a new location downstream from Interstate Highway 10. However, a barrier at site 1 would assure the reliability of the freshwater supplies of LNVA and the City of Beaumont for municipal, industrial, and agricultural uses. It also provides the greatest environmental and recreational enhancement features of any of the sites, restoring a dependable freshwater environment in all of the river and swamp areas above Interstate Highway 10 except for 600 acres of swamp drained by Brakes Bayou, located on the west side of Lawson Canal (See Figure 3-1). Approximately 16.7 miles of the Neches River and Pine Island Bayou between the permanent barrier location and the existing temporary barrier locations would be improved for freshwater fishing. This site would also enhance the environment by barring the upstream movement of polluted water. Site 1 is the site preferred by local interests and environmental groups.

SITE 2

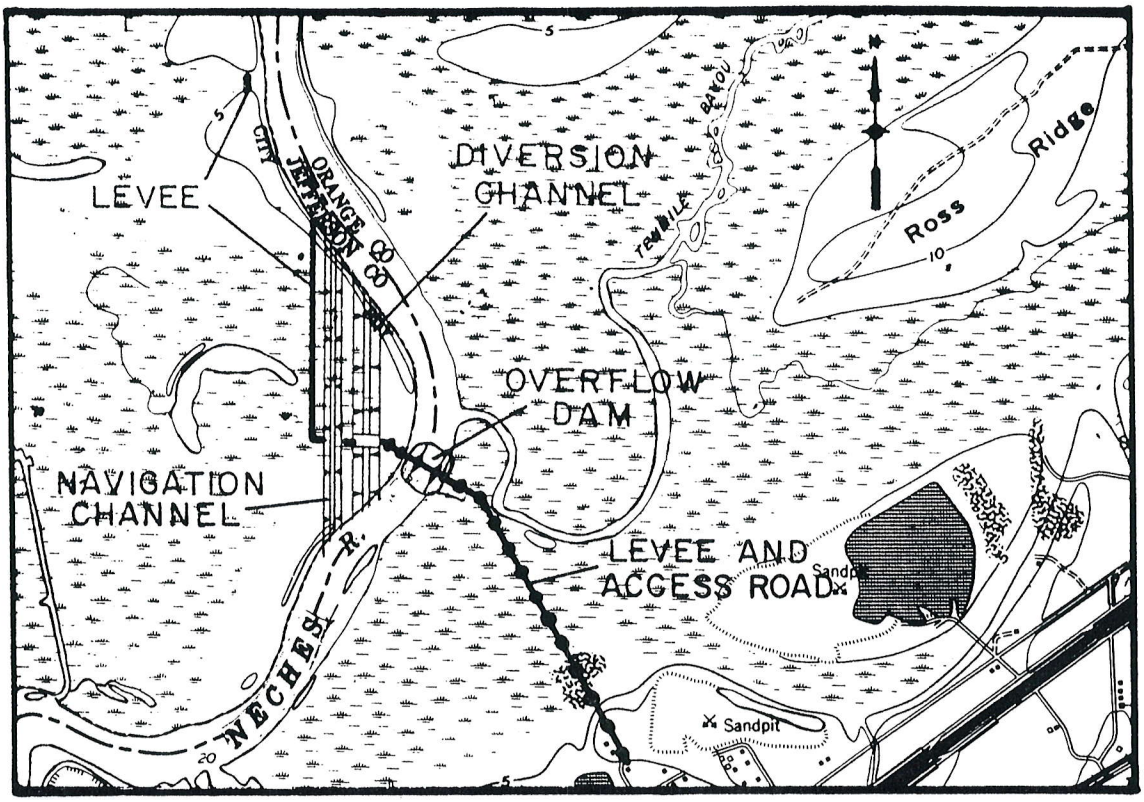


FIGURE 3-3

Site 2, shown on Figure 3-3, is located at river mile 24.3, just downstream from Tenmile Bayou. A project at this site would require a much longer navigation by-pass channel, diversion channel, access road and more levees than site 1 but would not require construction of auxiliary works at Bairds Bayou. It would also require relocation of Temple-Eastex's effluent outfall to a point downstream from Interstate Highway 10. Based on preliminary cost estimates, site 2 was found to be slightly more costly than site 1, making it the most costly site investigated. Location of a barrier at site 2 would protect the water supplies of LNVA and the City of Beaumont. It would also provide environmental and recreational enhancement features, but to a lesser degree than site 1. Site 2 would restore a dependable freshwater environment to approximately 15.4 miles of the Neches River and Pine Island Bayou by barring the upstream movement of polluted water, but would divide one of the most heavily used recreational segments of the river. The configuration of the river at site 2 does not lend itself to diversion techniques as readily as other sites, requiring lengthy channels and levees. The long navigation and diversion channels require destruction of much more

wetland habitat than those at site 1. The length and location of the access road and levees could alter flow regimes in the wetland areas. Because of more potential adverse environmental effects, lessened environmental benefits, less desirable river configuration, and desires of local interests as well as recreation and environmental groups, site 2 was removed from further consideration.

SITE 3

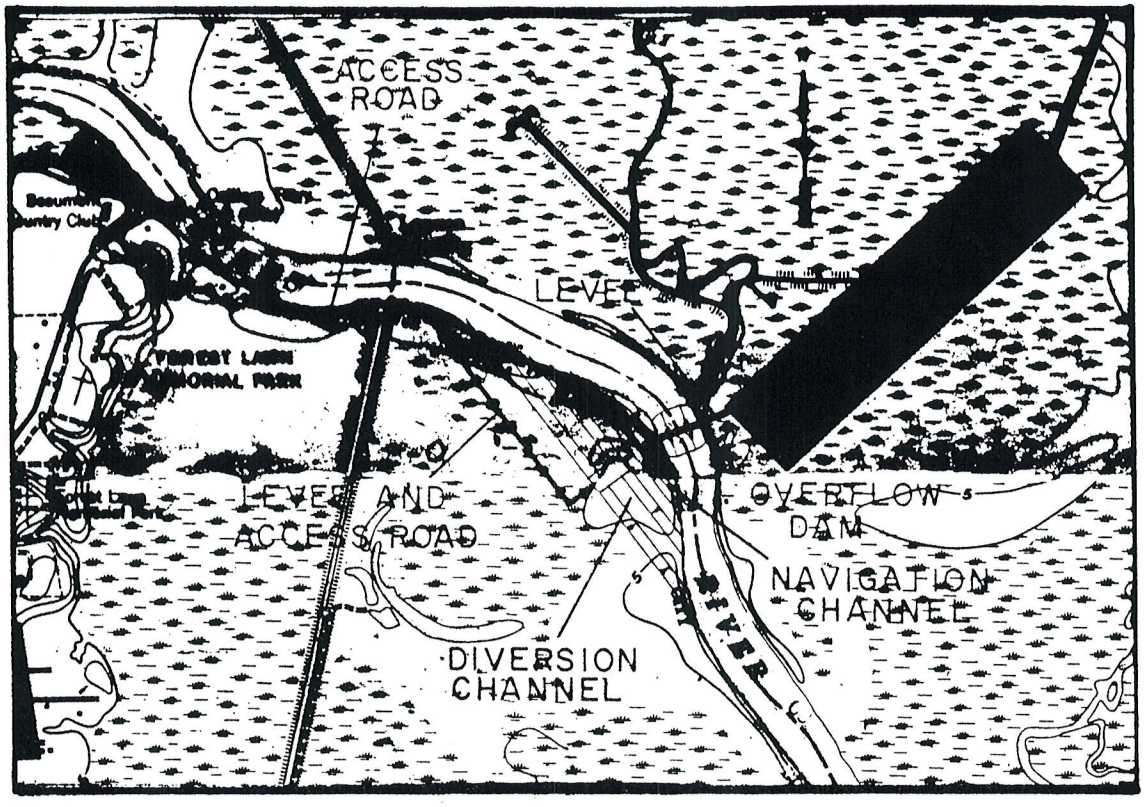


FIGURE 3-4

Site 3, shown on Figure 3-4, is located at river mile 25.4, just downstream from the mouth of Lake Bayou and adjacent to the Temple-Eastex, Inc., effluent outfall. A project at this site would require a long navigation channel and access road. Several structures would be affected by construction activities at this site. Relocation of the Temple-Eastex, Inc., effluent outfall below the barrier structure would be relatively simple, requiring only minor construction to locate the outfall below the barrier. However, the U.S. Fish and Wildlie Service indicated that relocation of the Temple-Eastex effluent outfall below Inter-State Highway 10 would have the most favorable impact on fish and wildlife resources in the project area. Based on preliminary cost estimates, site 3 was found to be less costly than site 1 or site 2. Location of a barrier at site 3 would protect the water supplies of LNVA and the City of Beaumont. It would provide a lesser degree of environmental and recreational enhancement than the aforementioned sites, restoring a dependable freshwater environment to approximately 14.3 miles of the Neches River and Pine Island Bayou by barring the upstream movement of polluted water. Site 3 would be less favorable with recreational boaters than sites 1 or 2, since it would divide a heavily used recreational segment of the

river almost at its midpoint. The river configuration at site 3 is not as favorable as at other sites, requiring lengthy navigation and diversion channels. More wetlands would be affected by construction of a saltwater barrier at site 3 than at sites 1 or 2. Because of potential adverse environmental effects, lessened environmental benefits, less desirable river configuration, and the desires of local interests as well as recreational and environmental groups, site 3 was not carried into detailed planning.

SITE 4

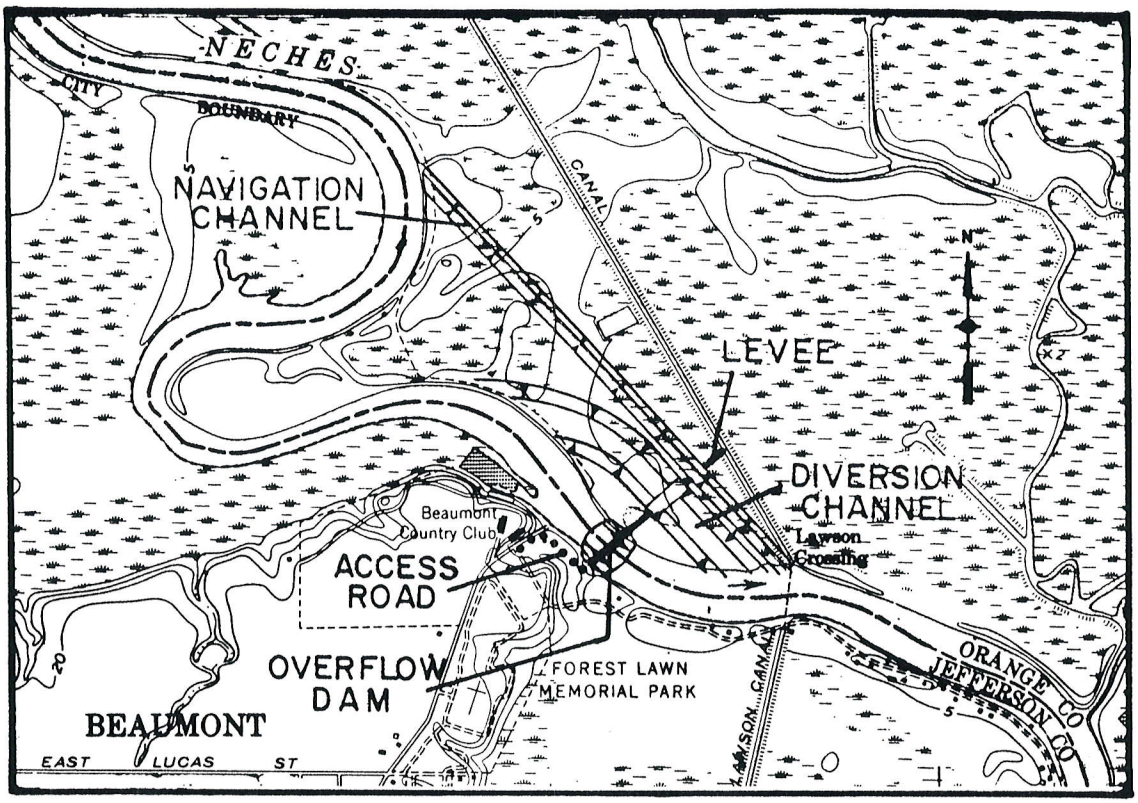


FIGURE 3-5

Site 4, shown on Figure 3-5, is located at river mile 26.3, downstream from the Beaumont Country Club. Lawson's Crossing, the City of Beaumont's water supply siphon under the Neches River, and the Neches Boat Club are located just downstream of the site. Based on preliminary cost estimates, site 4 was found to be the most economical of any of the sites. Location of a barrier at site 4 would protect the water supplies of LNVA and the City of Beaumont, although Beaumont would not be able to use its gravity intake structure at the Lawson's Raw Water Pump Station when salinities are at unacceptable levels. It would also provide environmental and recreational enhancement features, but to a lesser degree than sites 1, 2, or 3. However, the City of Beaumont does not support any site upstream of site 3 because none of these sites allow use of the gravity intake structure located at Lawson's Raw Water Pump Station. Approximately 13.4 miles of the Neches River and Pine Island Bayou would be restored to a freshwater environment by barring the upstream movement of saline and polluted water.

SITE 5

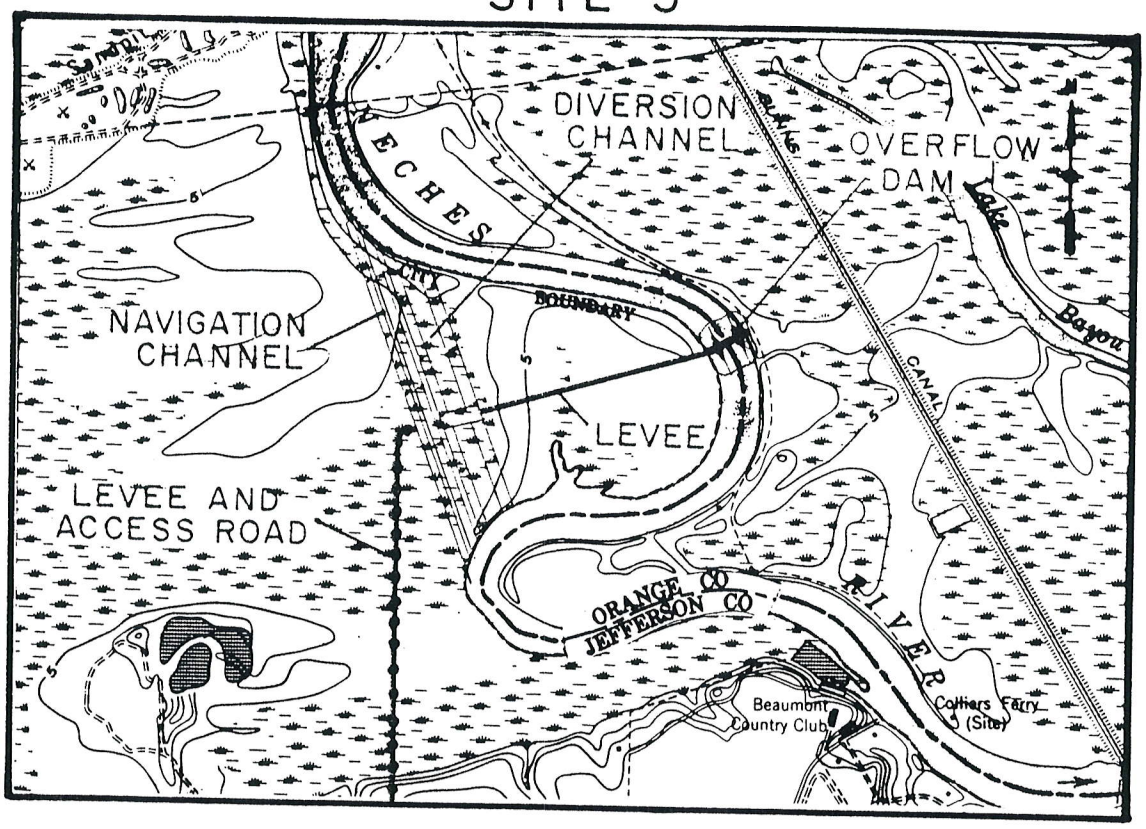


FIGURE 3-6

Site 5, shown on Figure 3-6, is located at river mile 28.1. This location is upstream from all three existing boat clubs. A project at site 5 would require the largest area for construction of the diversion and navigation channels and a long access road. Access to the overflow dam for maintenance purposes would be very difficult. Based on preliminary cost estimates, construction of a barrier at site 5 would be more costly than at site 4. The water supplies of LNVA and the City of Beaumont at Bunns Bluff would be protected by construction of a barrier at this location. However, the City of Beaumont does not favor this site since it is upstream from the Lawson Crossing. It ranks fifth overall in environmental and recreational enhancement. When in use, minor backwater effects of a barrier at site 5 may extend into the lower reaches of the Big Thicket National Preserve, with possible adverse effects on flora and fauna along the banks of the Neches River and Pine Island Bayou. This site would restore a dependable freshwater environment to approximately 11.4 miles of the Neches River and Pine Island Bayou by barring upstream movement of saline and polluted water. Unfavorable backwater effects, lessened environmental benefits, and the opposition of

local interests and environmental groups caused site 5 to be deleted from more detailed analyses.

SITE 6

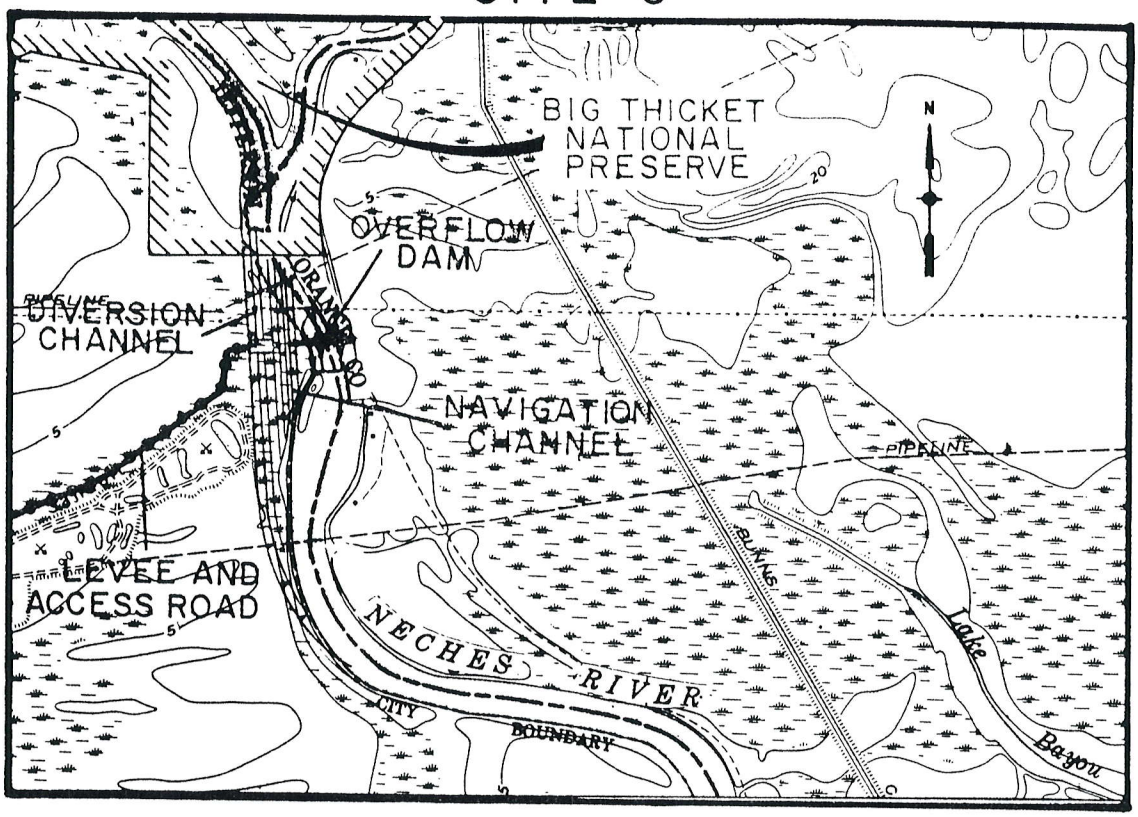


FIGURE 3-7

Site 6, shown on Figure 3-7, is located at river mile 29.7, just downstream from the confluence of the Neches River and Pine Island Bayou. A project at this site would require the shortest navigation channel but a long diversion channel and the longest access road. Based on preliminary cost estimates, site 6 was found to be only slightly more expensive than site 4. This location would also protect the water supplies of LNVA and the City of Beaumont at Bunns Bluff. A project at site 6, however, has significant environmental disadvantages. A project at this location would improve freshwater conditions to only 10.0 miles of the river and Pine Island Bayou, would improve the least amount of swamp area, and would extend minor backwater effects, when operational, into the Big Thicket National Preserve. The river configuration at this site is the least favorable for construction of a diversion channel. Site 6 is also located upstream from the three existing boat clubs and is not favored by the local interests and environmental groups. For these reasons, site 6 was not considered during detailed analyses.

Design of the Barrier. Five designs for a permanent saltwater barrier were analyzed during preliminary planning efforts: a fixed-wier dam, a dam with flap-gated outlets, a dam utilizing a number of chanoine wickets, an inflatable fabric dam, and a tainter-gated dam. A fixed-wier dam would be the most economical design. However, severe sedimentation problems and increased backwater effects inherent in such a design removed it from further consideration.

Flap gates are an effective method of maintaining one-way flow in a hydraulic system. They have been used effectively in small systems such as drainage ditches, pump stations, and small streams and bayous. However, flap gates of the size and magnitude required to prevent salinity intrusion on the Neches River without increasing backwater effects are an untried design. Maintenance and replacement costs of such a design are also unknown. Extensive design and model studies would be required before such a structure could be compared with other, more thoroughly tested designs.

Chanoine wickets are a type of collapsible flashboard used across the navigation pass of a dam. They may also be used as the entire control structure. These structures are used in water depths up to about 13 feet. The raising of the wickets is a slow operation, requiring the use of a service boat, with the cost of crew and other operating expenses making them very expensive to operate and maintain. There is considerable leakage between wickets unless special sealing materials are used. An improved two-position Chanoine-Pascoud wicket was developed by the Corps of Engineers which can be raised quicker with less risk to operating employees. Tests indicate that wicket heights up to 25 feet may be feasible. However, because of the uncertainty of this new design, the inadequate size of the proven design, the high operation and maintenance cost, and the other undesirable facets of these wickets, utilization of chanoine wickets for the barrier structure was removed from further consideration.

Inflatable fabric dams were investigated as an alternative barrier structure design. These dams consist of an inflatable fabric bag installed on a concrete sill. Inflation of the bag creates a dam. These dams have been used effectively in shallow-water situations for water conservation, levee

control, raising spillways, saltwater barriers, and recreation areas. However, their design is untested in deep-water situations as are present on the Neches River. An inflatable fabric dam was installed on the Colorado River at Bay City by the Lower Colorado River Authority (LCRA) in 1963. This dam was 13 feet high and 227 feet long. From the time of installation, LCRA experienced problems. Shearing and tearing of the fabric have been the largest problems although logs moving downstream have torn the fabric several times, even with the dam deflated and lying flat on the river bottom. Damage to the fabric by vandals was also a recurring problem. LCRA decided that maintenance of the fabric dam was too costly and removed it in the early 1970's. Because of the numerous problems experienced by LCRA and the fact that an inflatible fabric dam of the size required for the Neches River has never been constructed, use of this type of structure was not given further consideration.

Tainter gates are simple gates usually employed as the control elements on non-navigable dams on channelized rivers. They hold the water surface at a predetermined elevation by passing varying amounts of water. Backwater effects are minimized because they can be fully opened during major floods. Their design and operation costs; as well as operation, maintenance, and replacement costs; can be estimated with reasonable accuracy, since many such gates have been built by the Corps of Engineers.

Navigation Features. All of the structures described above would require construction of a navigation by-pass structure except for the Chanoine wickets. This navigation structure would be required to meet the needs of the existing and potential commerical and recreational vessels utilizing this section of the river. It should also be adaptable to conversion to a navigation lock should future needs justify it.

Comparative Assessment and Evaluation

The six sites investigated for location of the saltwater barrier were all technically and environmentally feasible, but to varying degrees. The differences in the estimated first costs of projects at all six sites are small, the main differences being costs incurred as a result of varying

lengths of channels, levees, and access roads. Site 1 includes the cost of appurtenant works at Bairds Bayou and relocation of the Temple-Eastex effluent outfall, making it one of the most costly sites. Sites 2 and 3 also require relocation of this outfall.

Environmentally, the sites generally provide decreasing environmental and recreational enhancement benefits as the location of the barrier progresses upstream. Construction activities at some of the sites damage more of the environment than at others, based on conditions at the site and the area required for construction. All of the projects, however, protect the water supplies of LNVA and the City of Beaumont at its Bunns Bluff intake structure, therefore providing the same economic benefits relating to prevention of agricultural damages.

Table 3-2 shows the sites ranked in order of increasing estimated first cost and environmental and recreational enhancement values.

TABLE 3-2

RANKING OF BARRIER LOCATIONS
(Increasing)

Estimated Project First Cost Ranking		Environmental and Recreational Enhancement Values Ranking
	Least	
4		6
6		5
3		4
5		3
1		2
2		1
	Most	

The five barrier structure designs investigated effectively halted intrusion by salt water. Some of the designs caused undesirable backwater effects while other have never been tested in the sizes required by this project. Only the tainter-gated structure, or a modification thereof, in

conjunction with a navigation by-pass channel and gate, was of a proven design in the dimensions required without creating unacceptable backwater effects.

Conclusions

Of the six sites investigated for construction of a saltwater barrier structure, site 4 protects the municipal, industrial, and agricultural water supply of LNVA and the City of Beaumont from salinity intrusion at the lowest project first cost. Since it provides the same benefits with regard to agricultural water supply as any of the other sites, it therefore, contributes the most to the National Economic Development objective. Site 1 contributes the most environmental enhancement features and fulfills the objectives of the Environmental Quality objective. Therefore, these two sites were selected for consideration during detailed planning. Desires of local interests, environmental impacts, and undesirable backwater effects resulted in the other four sites being removed from further consideration. Undesirable backwater effects; uncertain or untested designs; and operation, maintenance, and replacement problems resulted in all of the barrier structure designs except for the tainter gate design being deleted from detailed analysis.

TABLE 5-1

COMPARISON OF ESTIMATED FIRST COSTS: PROJECT DOCUMENT ESTIMATE, PB-3 ESTIMATE AND CURRENT ESTIMATE

Item	Project Document Estimate	Approved[1] PB-3 Estimate	Current Estimate	Difference
Lands & Damages (Rights-of-way, & disposal easements, levees, & spillways)	$ 46,450	$ 89,000	$ 86,000	-$ 3,000
Dams				
Tainter Gate Structure	5,077,000	9,595,000	15,340,000	+ 5,745,000
Auxiliary Dam	592,000	1,105,000	990,000	- 115,000
Overflow Dam	0	0	1,067,000	+ 1,067,000
Locks (Navigation Gate)	3,977,000	7,510,000	6,073,000	- 1,437,000
Channels				
Navigation	87,000	164,000	590,000	+ 426,000
Diversion	0	0	1,049,000	+ 1,049,000
Bairds Bayou	0	0	130,000	+ 130,000
Levees (Includes Access Roads)	221,400	424,000	917,000	+ 493,000
Buildings, Grounds, & Utilities	244,000	464,000	236,000	- 228,000
Permanent Operating Equipment	65,000	122,000	0	- 122,000
U.S. Coast Guard-Navigation Aids	4,000	7,000	8,000	+ 1,000
Relocations	0	0	5,698,000	+ 5,698,000
Engineering & Design	821,000	1,600,000	2,111,000	+ 511,000
Supervision & Administration	718,150	1,327,000	1,847,000	+ 520,000
Total	$11,853,000	$22,407,000	$36,142,000	+ 13,735,000

[1] PB-3 dated 1 October 1980, approved 7 May 1980

THE IMPACT OF DROUGHT CONDITIONS ON FRESHWATER SUPPLY IN THE LOWER NECHES AREA

THE IMPACT OF DROUGHT CONDITIONS ON FRESHWATER SUPPLY IN THE LOWER NECHES AREA

The drought of 1995-1996 brought into perfect focus the absolute need for a permanent saltwater barrier in the Neches River. As discussed in the Introduction section of this report, during periods of normal rainfall in the watershed of Sam Rayburn Reservoir, sufficient water is stored to make releases of freshwater from the reservoir to force saltwater away from the lower Neches River freshwater intakes. When freshwater stored in the reservoir is in short supply, typical of drought periods, releases may not be made for this purpose, and the LNVA must install temporary saltwater barriers to hold the saltwater downstream of the freshwater intakes.

The operator of Rayburn Reservoir, the Corps of Engineers, makes releases from the reservoir determined on the basis of demand for water by LNVA and hydroelectric production of power. By a formula based on current water elevation in the reservoir, the Corps makes releases for saltwater control only when the elevation of the reservoir lies above Zone 3 as illustrated on the two enclosed reservoir level charts. Conditions which control reservoir levels and operations are described below.

In typical years, those in which rainfall throughout the Sam Rayburn watershed occurs in normal amounts, the reservoir begins the year reasonably full. Winter and Spring rains frequently cause water stored in the reservoir to rise into the flood storage zone, above the elevation of 164.4 feet above mean sea level (msl.)

As Spring rains subside and water demands in the lower Neches Basin rise to meet the needs of area rice farms, industries and cities, the water level in the reservoir falls. Normal water use during Summer and Fall, combined with high evaporation losses, may cause the reservoir to fall six to eight feet by late Fall.

By that time, frequent rains and low evaporation rates combine to elevate the water level in the reservoir to near full by the end of the year.

This annual fluctuation in reservoir levels is illustrated on the enclosed chart entitled Sam Rayburn Reservoir 1995 Elevation Data. It will be noted, however, that the reservoir failed to refill in late 1995, as earlier described.

This is reflective of the drought conditions beginning in early 1995. The second enclosed chart, Sam Rayburn Reservoir 1996 Elevation Data clearly illustrates that the reservoir continued to fall most of the year, because streamflows in Rayburn's watershed produced only 30% of normal reservoir inflows. Compounding the problem of low inflows was a hot summer producing extremely high reservoir evaporation losses.

When Rayburn's elevation falls into Zone 3, the temporary saltwater barriers are installed in the lower Neches River and Pine Island Bayou. Following their installation, the large amounts of freshwater customarily released from Rayburn for saltwater control are withheld. This permits conservation of approximately 5,000 acre feet of water a day in Rayburn Reservoir.

The LNVA is not permitted to begin installation of the temporary saltwater barriers until Rayburn's elevation has been within Zone 3 for a period of 30 days. It may be easily seen that the release of freshwater for saltwater control may result in a drawdown of several feet from Rayburn's storage pool during the course of typical dry periods.

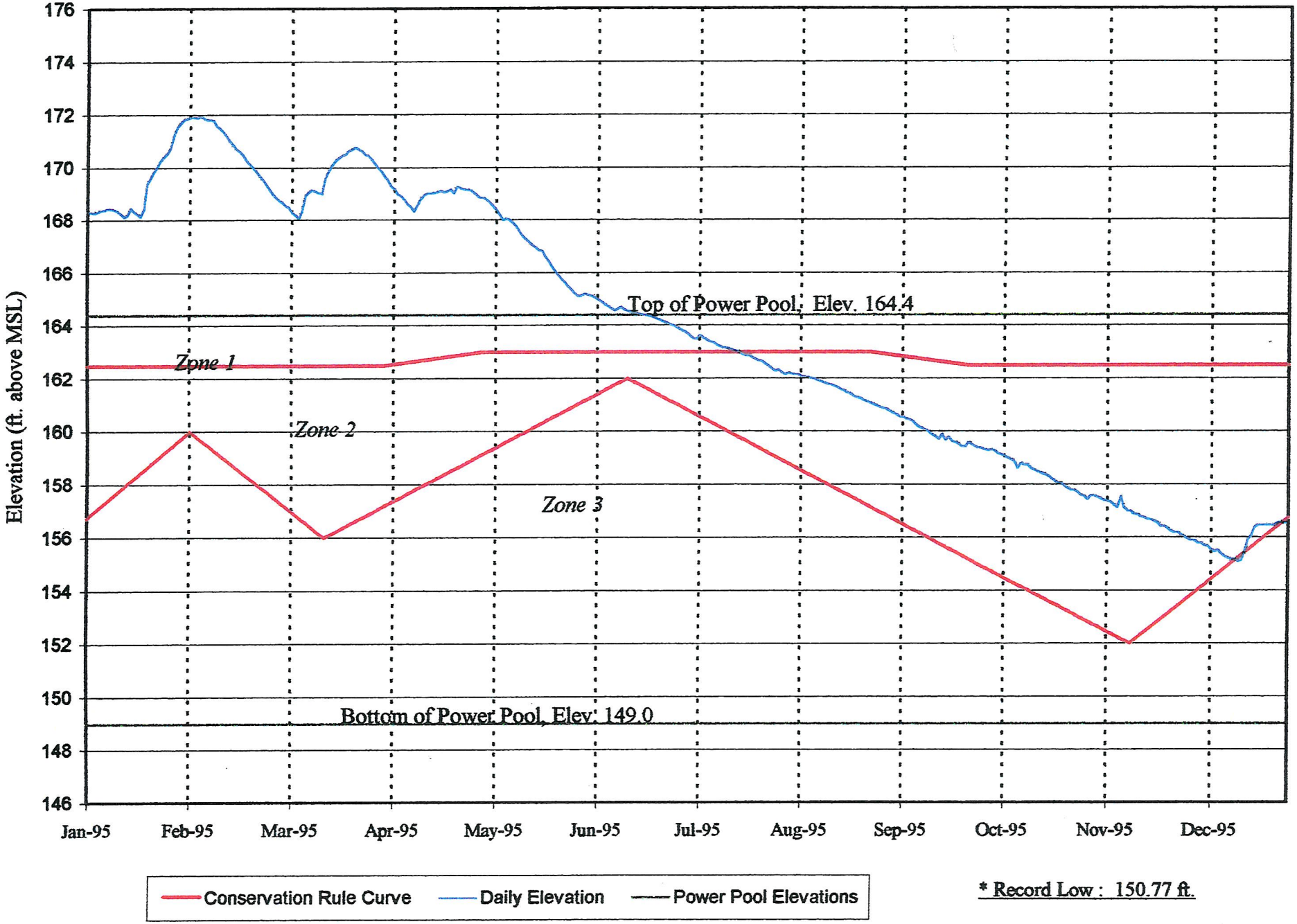
The Permanent Saltwater Barrier in the Neches River would permit retention of those saltwater control releases from the reservoir. The permanent barrier would be a gated structure. In periods of abundant streamflows, the gates would remain open and saltwater would be held in abeyance by the large freshwater flows.

When streamflows are low, the gates would be partially or completely closed to prevent the upstream movement of saltwater and the conservation of unnecessary releases in Sam Rayburn Reservoir.

Studies have confirmed that, when considered as a conservation device, the Permanent Saltwater Barrier has the effect of a reservoir with a dependable yield of approximately 150,000 acre feet of freshwater a year.

LOWER NECHES VALLEY AUTHORITY

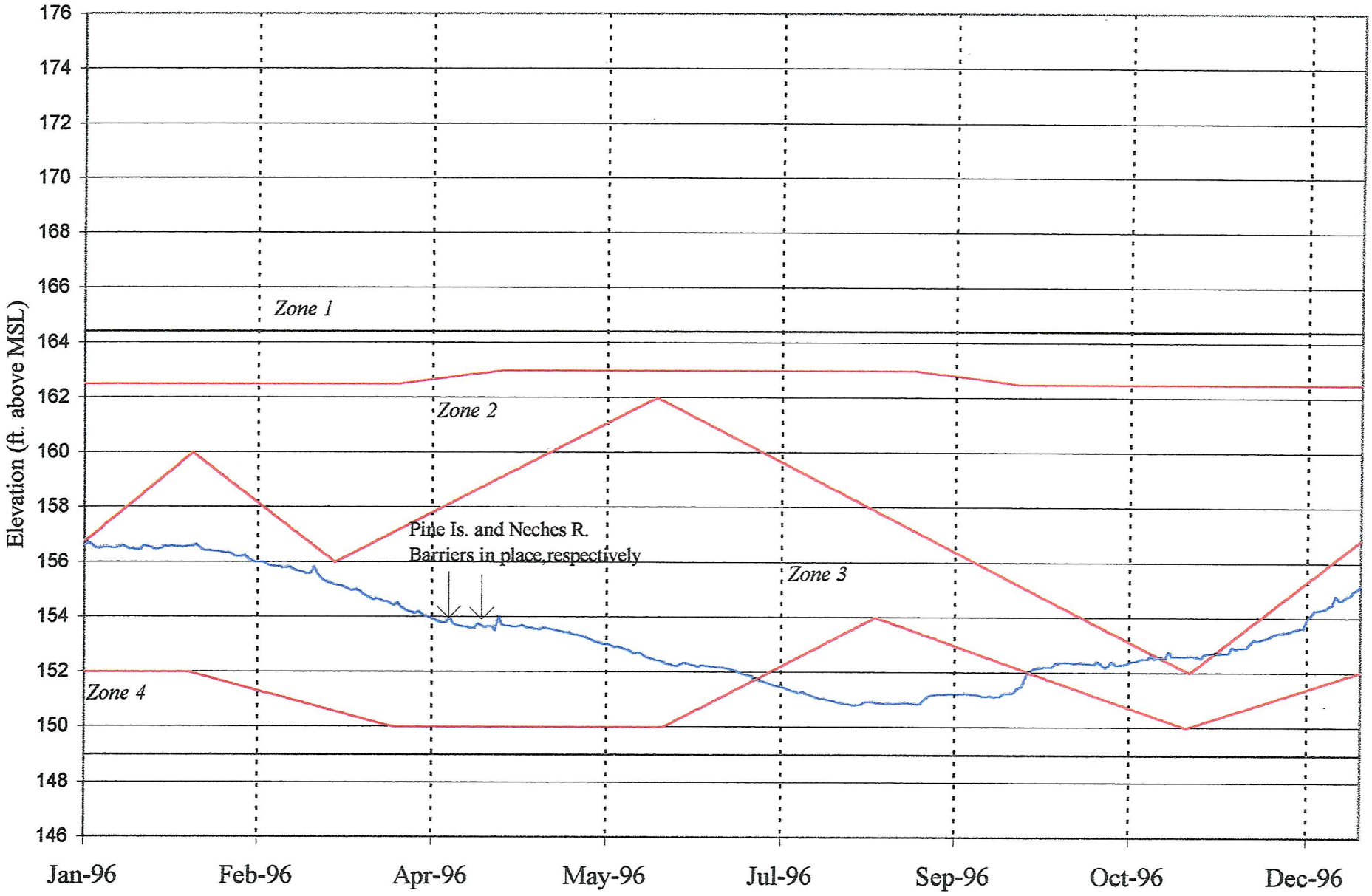
SAM RAYBURN RESERVOIR 1995 ELEVATION DATA



* Record Low : 150.77 ft.

LOWER NECHES VALLEY AUYHORITY

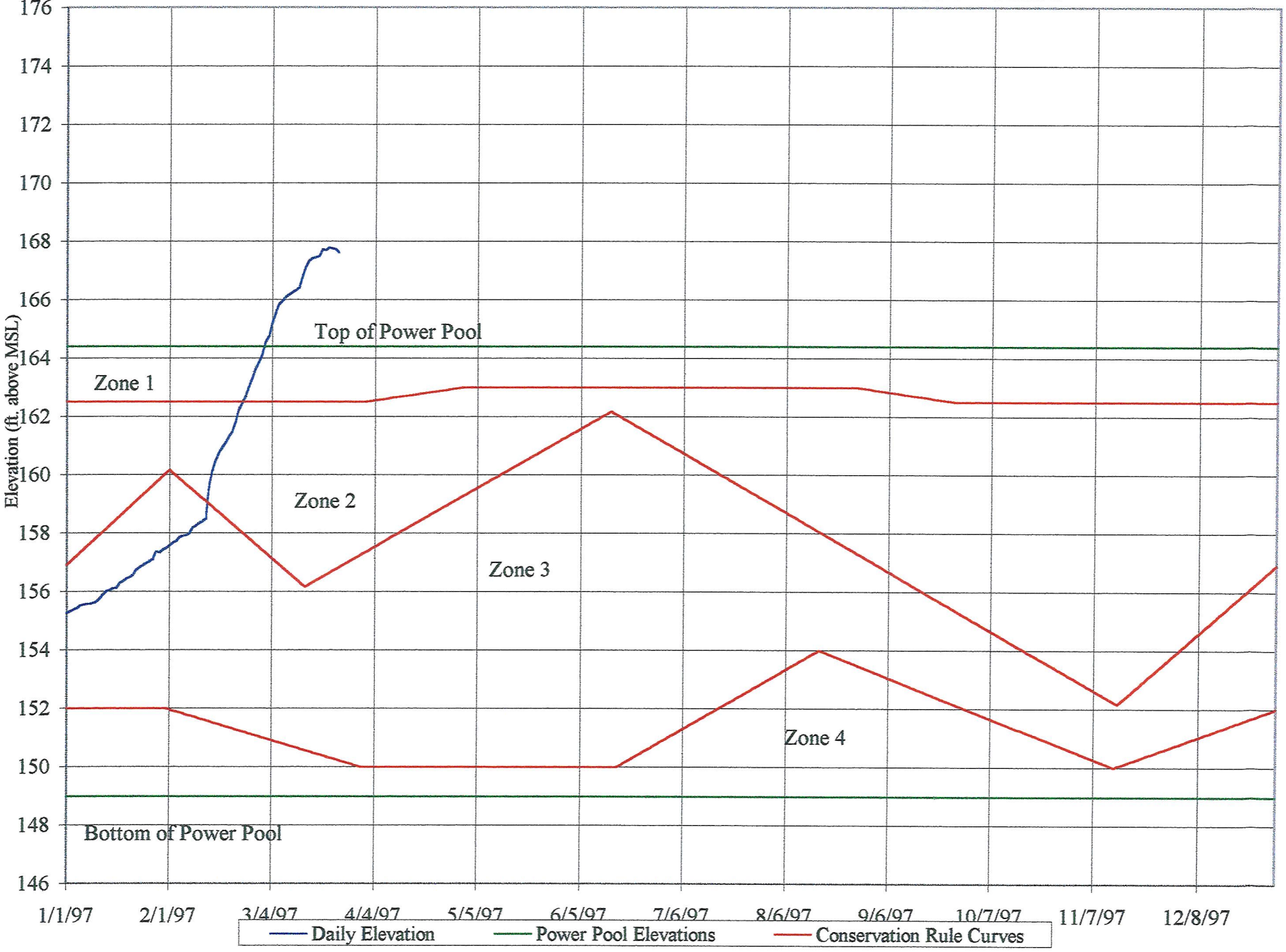
SAM RAYBURN RESERVOIR 1996 ELEVATION DATA



* Record Low : 150.77

LOWER NECHES VALLEY AUTHORITY

SAM RAYBURN RESERVOIR 1997 ELEVATION DATA



CHRONOLOGY OF EVENTS
PROPOSED SALTWATER BARRIER

CHRONOLOGY OF EVENTS
PROPOSED SALT WATER BARRIER
ON THE NECHES RIVER AT BEAUMONT, TEXAS

July 1960

Freese & Nichols, Consulting Engineers, recommended to the LNVA Board of Directors that a permanent salt water barrier be considered for the lower reaches of the Neches River.

September 1960

Division Engineer agrees to study feasibility of a permanent salt water barrier and lock on the Neches River.

December 1960

District Engineer reports that he is not authorized to do a specific study on barrier without authorization from Chief of Engineers.

August 1961

LNVA asked Congress for funds to study salt water barrier and also met with General Fleming, Division Engineer, to consider barrier site.

November 14, 1961

Public hearing at Beaumont, Texas with reference to SWB on Neches River below mouth of Pine Island Bayou.

December 9, 1970

Second Public Hearing, Beaumont.

September 30, 1970

LNVA met with City and Eastex to discuss site location.

October 8, 1970

Beaumont City officials met with Representative of LNVA and Eastex, Inc.

December 13, 1971

Chas. Hill, City Manager, responded and agreed to a distribution of responsibilities and cost of barrier at site 1.

March 8, 1972

Letter to LNVA from Eastex concerning the stipulation by the Corps of Engineers that site 1 would be considered only if Eastex effluent point is located downstream of the barrier. Eastex pledges full cooperation.

March 24, 1972

Third Public Hearing, Beaumont.

December 20, 1972

Preliminary draft of environmental statement issued.

December 28, 1972

Interim Review of SWB in Neches River issued by Galveston Corps of Engineers recommending 95% - 5% cost sharing.

April 30, 1973

Review of Interim Review completed by Division Engineer and forward to B.E.R.H. (Board of Engineers for Rivers and Harbors)

September 26, 1973

B.E.R.H. asks Waterways Experiment Station at Vicksburg to study salinity intrusion in Neches River.

June 17, 1974

Waterways Experiment Station report completed and sent back to B.E.R.H. under signature of Carl J. Hubal.

July 16, 1974

Approval of B.E.R.H. of SWB for Neches River at 75% Federal- 25% Local cost sharing.

August 1974

Revised draft Environmental Statement sent to B.E.R.H.

December 18, 1974

B.E.R.H. sent report to Governor Briscoe for comments.

February 24, 1975

Public Hearing before Texas Water Rights Commission.

March 17, 1975

Governor Briscoe sends comments to B.E.R.H. recommending change of cost sharing to 95% - 5%.

July 17, 1975

B.E.R.H. replies to Gov. Briscoe's recommendation by saying W.E.S. is sound and cost sharing to remain at 75% - 25%.

October 21, 1974

Governor Briscoe filed a letter with Gen. Gribble, Chief of Engineers, in support of a more reasonable cost sharing.

April 20, 1974

Application sent to Secretary of Army from Chief of Engineers with 75% - 25% cost sharing.

May 26, 1976

From Secretary of Army to OMB.

July 16, 1976

City of Beaumont agrees to contribute $400,000 toward construction of project.

August 27, 1976

Senator Bentsen presented our application to Senate Subcommittee on Public Works.

September 2, 1976

Congressman Brooks presented our application to House Subcommittee on Public Works, based on LNVA's action to support maximum contribution of $2.1 million and etc.

September 2, 1976

Still in OMB.

September 9, 1976

Out of OMB, back to Secretary of Army.

September 28, 1976

Approved by Senate.

September 29, 1976

Approved by House.

September 30, 1976

Conference Report Approval -- Local Share not to exceed $2,100,000 of construction cost.

October 22, 1976

Omnibus Bill signed by President Ford.

January 17, 1977

Letter from Mr. Hammack, Eastex, relative to relocation of the Eastex effluent line.

February 23, 1977

General McGinnis testified, Corps capable of starting advanced planning and design in FY'78 provided $100,000 is provided to Corps Budget.

April 5, 1977

Congressman Jack Brooks presented request for $100,000 to House Subcommittee on Appropriations.

April 19, 1977

Orange County Drainage District wrote 50 letters protesting site 1.

June 14, 1977

House approves funding $100,000 in Appropriations Bill.

July 25, 1977

House approves conference committee recommendations on water resource projects, including $100,000 for SWB, and sends bill to Senate for action.

September, 1977

LNVA hosts meeting, District Corps of Engineers and Orange County Drainage District directors, also City of Beaumont.

February 16, 1978

Announcement of pre-construction planning for the Neches River salt water barrier at Beaumont, Texas by District Corps of Engineers.

March 15, 1978

TWC approved LNVA as local sponsor.

April 5, 1978

Congressman Brooks requests $240,000 in Federal budget for FY'79.

May 1-2, 1978

District C.O.E. personnel conducted public workshops in Vidor and Beaumont to gain public comments on site 1 location of the SWB.

August 1, 1978

District Corps of Engineers mailed Plan of Study to Southwest Division outlining time -- job projections from now to construction.

August, 1978

Corps decided to do hydraulic survey in house.

November 1, 1978

Corps decided to analyze hydraulic survey data with Corps staff.

February 20, 1979

Hydraulic analysis forwarded to the Division office.

March 23, 1979

J. D. Nixon and A. T. Hebert, Jr. discuss salt water barrier and LNVA legislative items with Gary Smith, Corps of Engineers, Orange County Drainage District.

March 26, 1979

Division returns hydraulic analysis with comments.

March 27, 1979

Colonel Vanden Bosch says District is on schedule, next public hearing due July or August, 1979.

April 4, 1979

Jack Brooks presented our request to Congress for 1980 funds in amount of $500,000.

August 17, 1979

Joe Trahan and District Corps of Engineers staff met to give us the results of the hydraulic study started August 1978.

November 16, 1979

Corps of Engineers met with LNVA to explain modifications to barrier.

December 4, 1979

Corps of Engineers met with Orange Drainage District to explain modifications to barriers.

January 9, 1980

Orange County Drainage District voted to drop protest against barrier as modified.

February 19, 1980

Corps of Engineers testified capability of $350,000 in 1981.

April 1, 1980

Congressman Jack Brooks presented request for 1981 funds to Subcommittee on Appropriations.

April 10, 1980

District Engineer to give LNVA revised time table: (18 months delay) construction contract possible in May, 1983.

November 21, 1980

General Design Memo I sent to Division.

January 21, 1981

General Design Memo I returned to District office.

May 12, 1981

Public hearing at LNVA office to discuss modified site 1 plan as contained in:

1. Phase I G.D.M.
2. Phase I G.D.M. appendices
3. Fish & Wildlife Report

May 12, 1981

Colonel Sigler stated the District would work to complete other segments so that he could express a construction capability to Congress in February, 1982.

December 1, 1982

Final Design of levee and access road to barrier site completed by COE.

May 1, 1982

Construction plans and specifications for levee and access road completed.

November 11, 1983

COE forwarded to LNVA a local cooperation (Section 221) agreement between COE and LNVA which would signify agreement on cost sharing.

November 22, 1983

LNVA Board authorized and approved a Resolution of Cooperation between the U.S. Government and LNVA agreeing to share costs specified in the Water Resources Development Act of 1976. This was the Act which set LNVA's share at $2,100,000. COE failed to execute the agreement, apparently because it did not meet current Federal financing policy guidelines.

July 10, 1985

New Federal policy on local cost sharing of Federal projects was instituted, requiring that LNVA's local cost share be set at 35% of project costs.

August 6, 1985

Galveston COE advised LNVA that the project would be scheduled for construction in 1987 if agreement could be reached on new financing policy requirements.

August 22, 1985

LNVA Finance Committee met with representatives of Galveston COE to discuss details of financing project under terms of new Federal financing policy. Project costs were estimated at $40,800,000, with LNVA's share set at $14,273,000 and Temple-Eastex relocation costs were $5,700,000.

August 27, 1985

Letter from LNVA to Galveston COE agreed that LNVA would provide necessary water rights; lands for construction site; relocating of pipelines, powerlines, highways; and provide cash contributions as agreed during construction. However, LNVA expressed doubt that they could meet requirements to provide 35% of project costs. COE placed project on inactive list.

June 11, 1987

A report entitled "The Impact of the Proposed Neches River Permanent Saltwater Barrier of Water Supply Yield" was completed by LNVA. It confirmed that the barrier would be the equivalent of a reservoir with an annual dependable yield of 155,700 acre feet of fresh water.

September 20, 1991

In a letter to Galveston COE, LNVA attempted to restart the project and initiate construction.

October 11, 1991

Galveston COE replied that, in order to reactivate the project, cost sharing must be consistent with financing policies of the Water Resources Act of 1986, which set LNVA's project cost share at 35%.

March 30, 1993

At the request of LNVA and their assurances that they will accept local project sponsorship under existing Federal financing policies, a request for the appropriation of $200,000 of Federal funds was made and approved to reevaluate the project.

November 30, 1993

A letter was received from Galveston COE requesting a strong letter of commitment from LNVA and a resolution and plan to provide funds to pay its 35% share of project costs.

January 5, 1994

LNVA adopted a letter of commitment and a Resolution of Agreement for local sponsorship of the project.

September 1, 1994

COE submitted a draft report to LNVA and COE Division Headquarters on "Preconstruction Engineering and Design Reevaluation" of the project.

January 5, 1995

LNVA was notified by Galveston COE that project benefits were further considered based on their municipal and industrial benefits, a procedure that would result in a higher local cost allocation. Cost shares were as follows:

Federal Government	$17,955,000
LNVA & City of Beaumont	$30,936,000
Temple-Inland	$25,888,000

March, 1995

House and Senate Appropriations Committees approved an additional $100,000 appropriation to be utilized by the Corps to perform a Limited Resource Reevaluation of the Barrier Project.

November 9, 1995

The City of Beaumont requested that the construction site of the Permanent barrier be moved to a location between Lawson's Crossing and the Temple-Inland discharge point.

March 1996

House and Senate Appropriations Committees approved a budget of $520,000 for completion of the Limited Resource Reevaluation Study of the permanent barrier.

April 19, 1996

Meeting with staffs of Senators Hutchison and Gramm and Deputy Assistant Secretary of the Army regarding progress and local cost share of the saltwater barrier project.

June 17, 1996

Galveston District Corps of Engineers advised that LRR study funds had been exhausted and work would be suspended until '97 funds were received. LNVA offered to provide $100,000 to enable the study to remain active. Galveston District prepared Memorandum of Agreement, approved by LNVA, and forwarded to the office of the Secretary of the Army. The offer was declined.

January 28, 1997

Texas A & M submitted draft of the Limited Resource Re-evaluation report. The findings were interpreted by Corps personnel to indicate that agricultural benefits of the project had declined further, and a new breakdown of project cost shares was developed. As a result LNVA's share was recommended to be approximately 90% of project costs. Concurrently, the Galveston District concluded that project costs could be reduced to approximately $43.3 million by siting the project upstream of the Temple-Inland discharge point. Resultant cost shares were recommended as follows:

Federal Government	$ 4,200,000
LNVA & City of Beaumont	$39,100,000

FINANCING THE PROJECT

FINANCING THE PROJECT

Since the early 1970's various proposals have been made to allocate the permanent saltwater barrier costs among Federal and local sponsors. The U.S. Congress has supplied planning funds since inception of the project, and have offered to provide a share of project capital costs. But final allocation of cost-shares for construction and operating costs have not yet been authorized.

The first attempt to set the amount of cost allocations was established in the Water Resources Development Act of 1976 (WRDA 76.) That document fixed the amount of local cost allocations at $2,100,000. By agreement, the LNVA proposed to provide $1,700,000 of this amount and the City of Beaumont agreed to a $400,000 share.

Between 1976 and 1982, the Corps of Engineers continued planning functions with Federal sponsorship. In November, 1983, LNVA approved a Resolution of Cooperation agreeing to share project costs as specified in WRDA 76. The Corps, however, failed to execute the agreement and the financing agreement authorized in WRDA 76 was later voided.

In 1985, the Corps advised LNVA that the Permanent Barrier could be built with Federal sponsorship of 65% of project costs. LNVA was assigned a cost share of $14,273,000 and Temple-Eastex (now Temple-Inland) was asked to supply $5,700,000 to relocate its outfall canal downstream of the barrier. When LNVA attempts failed to obtain reinstatement of the financing agreement authorized in 1976, LNVA advised the Corps that the new proposal exceeded its financial capabilities.

In 1991, it became clear that escalating environmental concerns relative to the temporary saltwater barriers made these structures questionable for the future. LNVA requested that the Corps restart the Permanent Barrier project. The Corps advised that WRDA 86 cost sharing policies set LNVA's share at 35% of project costs. LNVA agreed to those terms and final project design work resumed.

In January, 1994 LNVA adopted a Resolution of Agreement and issued a strong letter of commitment to finance the project. The Corps initiated a Design Reevaluation Report, finalized in late 1994.

In January, 1995 the Corps advised the Congress that the reevaluation study revealed that the project's principal beneficiaries were municipalities and industries, and Federal policies required that LNVA's cost allocation would be reestimated at $31,000,000. Temple-Inland's relocation costs were estimated at $26,000,000. In reaching this assignment of costs, the Corps ruled that a decline in agricultural freshwater demands was the reason for the reallocations.

In January, 1997, the Corps reported that a further decline in agricultural water demands required that LNVA's cost allocation should be set at $39,100,000.

It is LNVA's opinion that the Corps has misinterpreted the reason for the agricultural use declines. These declines were reached principally by cost cutting measures taken by area farmers to reduce water uses by 40%. The farmers have been the largest users of freshwater in the lower Neches area and remain the largest users today.

The impact of the Corps' recommendation on cost assignments on the consumers of LNVA water is severe. In order for LNVA to finance projects it must be generated through increases in its water rates. Although LNVA is a public agency, it does not have the power to tax nor receive appropriations.

Approximately half of the lower Neches area residents consume LNVA water. The other half of those residents live in the City of Beaumont and other more rural areas. The residents and businesses in the Counties surrounding Rayburn Reservoir receive large economic benefits from the reservoir. The Permanent Saltwater Barrier would further benefit that area by making Rayburn a more constant level reservoir, adding to its recreational and wildlife benefits.

Obviously, LNVA has no authority to appropriate funds from any person or business which does not consume its water. Thus, only a portion of the residents of the area would pay for a project with a much larger list of beneficiaries. It appears that a more logical funding formula would be based on the recognition that many tax-payers will benefit from the project without incurring costs. It seems that their equitable share should be provided in the form of a share of their tax contributions returned to the area by way of the Federal cost share.

LNVA feels strongly that the U.S. Congress should acknowledge that the permanent barrier is critically important to the future of not only the lower Neches area, but has great benefit to the economy of much of East Texas.

FACTS SUPPORTING 35% LOCAL COST SHARING OF THE PERMANENT SALTWATER BARRIER

NECHES RIVER SALTWATER BARRIER PROJECT
Facts Supporting 35% Local Cost Sharing

1. The water Resources Development Act of 1976 (Public Law 94-587) authorized the project and concluded that the local cost share of the Neches River Saltwater Barrier project should be approximately 15% of total project costs. The principal basis for fixing the local share at that amount followed precedent established by the Federal Calcasieu River Saltwater Barrier project, in which a Federal deepwater channel to Lake Charles, LA, permitted saltwater to threaten private freshwater intakes. Congress agreed that local interests should bear costs only of lands, relocations and construction liability.

2. From its inception, the Neches Barrier project has been justified and the local cost share has been allocated on the basis of its agricultural benefits. Only in most recent correspondence and studies by the Corps of Engineers (COE) have the municipal and industrial benefits been considered in calculations of local cost share allocations. If agricultural benefits continue to be the basis for cost share allocations, the local, public cost share of the presently estimated project cost would be approximately $18,000,000.

3. Because of concerns expressed by the Orange County Drainage District in September, 1977, the COE authorized a hydraulic evaluation to assess the potential backwater effects of the proposed Permanent Saltwater Barrier. The one-year study resulted in a modification in the project design, and Orange County interests withdrew their opposition to the Barrier. Partly because of this delay, the project fell victim to changes in the Federal financing policy, which superseded the authorization of the project granted by the Water Resource Development Act of 1976. When reauthorized, LNVA's project cost share increased from the previously agreed $2,100,000 to $14,300,000. LNVA felt that this cost was above its financial capability at that time and the project was placed on hold by COE. Because of present conditions, partly described in item 5, below, LNVA has revised its position and is firmly committed to local sponsorship of the project.

4. LNVA is a public non-profit, non-taxing agency which receives no public appropriations and which exists solely on revenues generated from the sale of its fresh water and services. It serves 26 industries, 8 municipal users and approximately 100 farmers, all of whom are recovering from several years of economic stress. Over fifty percent (50%) of LNVA's annual freshwater deliveries are consumed by its agricultural users, and local industries consume 35%-40% of LNVA's deliveries. Less than 30% of the residents within LNVA's jurisdiction are customers of the Authority. Reduced to simple terms, 30% of the area's residents will bear costs of a project of tremendous economic benefits to a much larger area. Continuing economic recovery could suffer a severe setback if LNVA's customers are required to bear a disproportionate share of total project costs through a large increase in the cost of its most essential resource - its fresh water.

5. By terms of a Permit recently issued by COE, LNVA is prohibited from continued installations of temporary saltwater barriers, the devices previously utilized to protect the area's freshwater resource, beyond December 31, 1999. LNVA is therefore required to abandon a more affordable means to control saltwater intrusion, primarily because of environmental concerns, and move very rapidly toward the more acceptable alternative, the proposed Neches River Saltwater Barrier project.

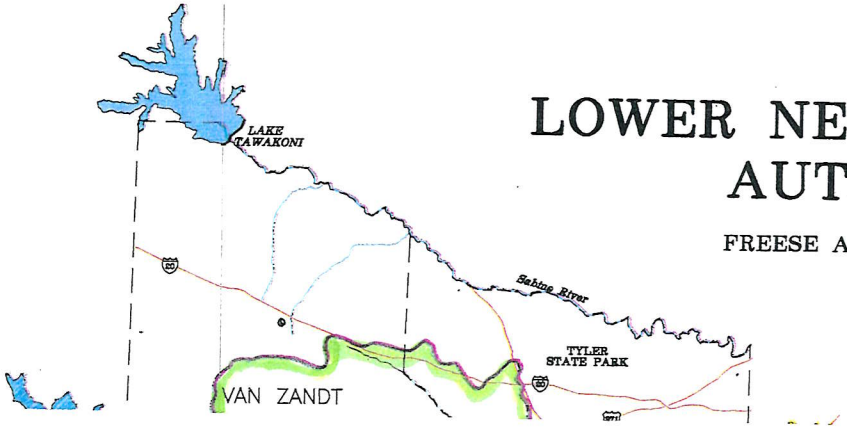
6. The project will enhance the aquatic environment by restoring over seventeen (17) miles of the River and thousands of acres of associated wetlands to their original fresh water state. Additionally, the barrier will protect the Big Thicket National Preserve against damages of saltwater intrusion. It has the benefit of offering greater environmental advantages than damages, features not normally associated with projects located in wetland environments.

7. The project offers the additional benefit of an extremely efficient water conservation device. That benefit is realized through conservation of many billions of gallons annually of fresh water, which are presently being released for no purpose other than to flush saltwater away from local freshwater intakes. Conservation of this resource will not only assure an abundant supply of fresh water for the area well into the next century, it may also delay the need for new fresh water storage facilities.

8. The period of construction of the project is estimated at four years. Projects of this magnitude will create many new construction jobs. Additionally, operating and maintenance of the facilities will require permanent employees as well.

EXHIBIT I

THE NECHES RIVER AND NECHES-TRINITY COASTAL BASINS



LOWER NECHES VALLEY AUTHORITY

FREESE AND NICHOLS, INC.
1994

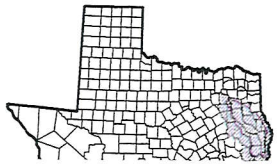
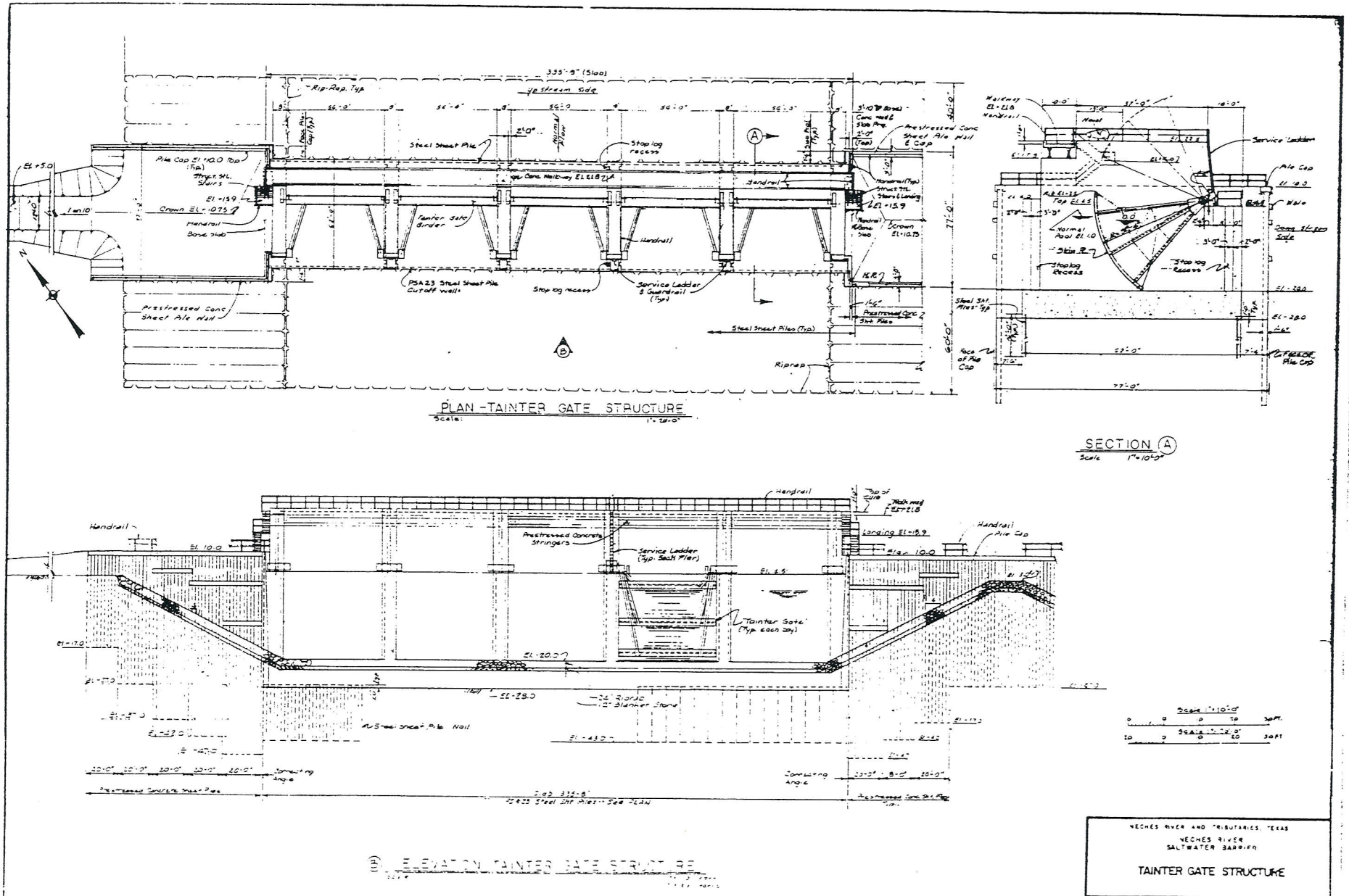


EXHIBIT II

DESIGN OF THE NECHES RIVER PERMANENT SALTWATER BARRIER AND NAVIGATION CHANNEL

DESIGN OF NECHES RIVER
PERMANENT SALTWATER BARRIER

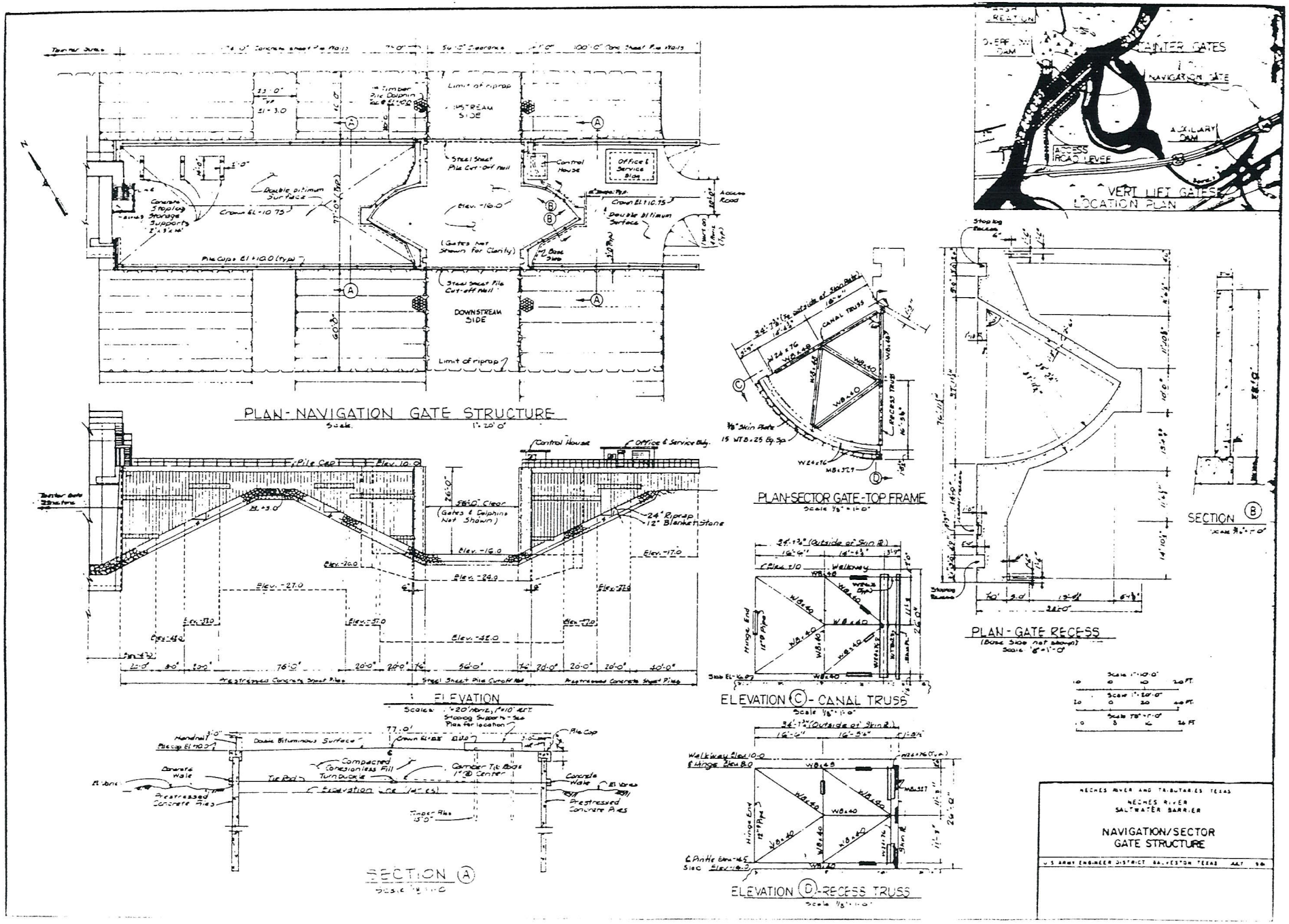


NECHES RIVER AND TRIBUTARIES, TEXAS
NECHES RIVER
SALTWATER BARRIER

TAINTER GATE STRUCTURE

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS JULY 19[illegible]

SALTWATER BARRIER
NAVIGATION CHANNEL



NECHES RIVER AND TRIBUTARIES TEXAS

NECHES RIVER
SALTWATER BARRIER

NAVIGATION/SECTOR
GATE STRUCTURE

U.S. ARMY ENGINEER DISTRICT, GALVESTON TEXAS

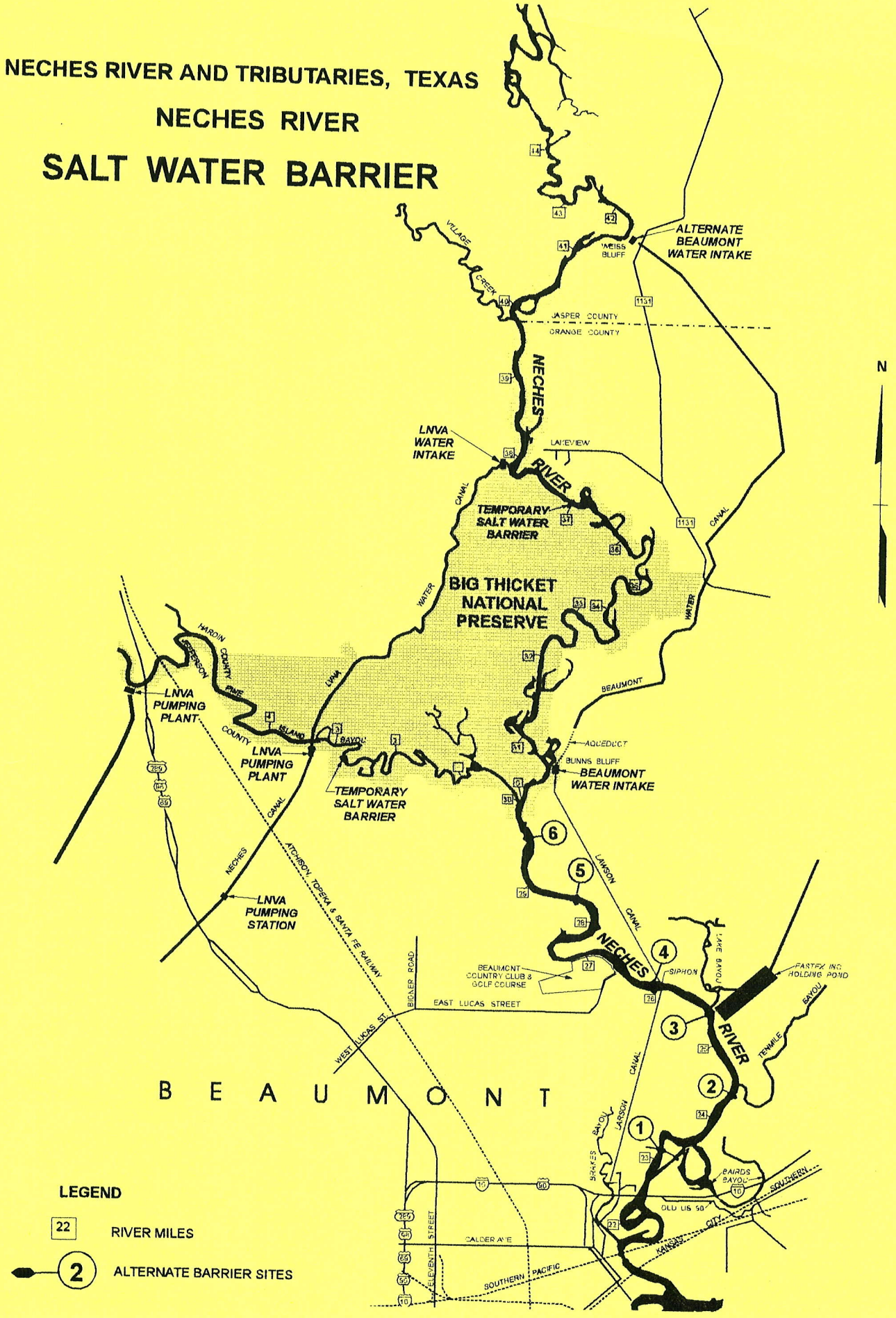

NECHES RIVER AND TRIBUTARIES, TEXAS
NECHES RIVER
SALT WATER BARRIER
ALTERNATE BEAUMONT WATER INTAKE
WEISS BLUFF
VILLAGE CREEK
JASPER COUNTY
ORANGE COUNTY
NECHES RIVER
LNVA WATER INTAKE
LAKEVIEW
CANAL
TEMPORARY SALT WATER BARRIER
BIG THICKET NATIONAL PRESERVE
WATER
BEAUMONT
HARDIN
JEFFERSON
COUNTY
PINE ISLAND
BAYOU
LNVA PUMPING PLANT
LNVA PUMPING PLANT
TEMPORARY SALT WATER BARRIER
AQUEDUCT
BUNNS BLUFF
BEAUMONT WATER INTAKE
LNVA PUMPING STATION
ATCHISON, TOPEKA & SANTA FE RAILWAY
LAWSON
BEAUMONT COUNTRY CLUB & GOLF COURSE
BIGNER ROAD
EAST LUCAS STREET
WEST LUCAS ST
SIPHON
LAKE BAYOU
FASTEX INC. HOLDING POND
TENMILE BAYOU
BRAKES BAYOU
BAIRDS BAYOU
OLD US 90
SOUTHERN PACIFIC
CALDER AVE
ELEVENTH STREET
KANSAS CITY SOUTHERN
B E A U M O N T
N
LEGEND
22 RIVER MILES
2 ALTERNATE BARRIER SITES

NECHES RIVER AND TRIBUTARIES, TEXAS

NECHES RIVER

SALT WATER BARRIER




NECHES RIVER AND TRIBUTARIES, TEXAS
NECHES RIVER
SALT WATER BARRIER
ALTERNATE BEAUMONT WATER INTAKE
WEISS BLUFF
VILLAGE CREEK
JASPER COUNTY
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