TRINITY RIVER AUTHORITY
OF TEXAS

LIVINGSTON DAM AND RESERVOIR

Trinity River, Texas

REPORT ON

MASTER PLAN FOR
RECREATIONAL DEVELOPMENT

PREPARED BY

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AUGUST 1965

Report on
MASTER PLAN FOR RECREATIONAL DEVELOPMENT

LIVINGSTON RESERVOIR
Trinity River, Texas

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PERTINENT DATA

Location:

The Livingston Dam site is located in Polk and San Jacinto Counties, Texas, at about River Mile 128 on the Trinity River. The reservoir will be within Polk, San Jacinto, Trinity and Walker Counties, Texas.

Purpose:

Water conservation.

Drainage Areas in square miles:

Total at the dam site	= 16,604*
Uncontrolled at the dam site	= 10,693
Between the dam site and Riverside	= 1,097
Between the dam site and Oakwood	= 3,804
Area of Lake Surface	= 129

*Value from TRA Master Plan

Reservoir:

Feature	Elev.	Surface Area (Acres)	Pool Capacity (Ac.-Ft.)	Total Capacity (Ac.-Ft.)
Top of Dam	145.0	-	-	-
Normal Water Level	131.0	82,250	1,635,000	1,795,000
Spillway Crest	99.0	17,750	160,000	160,000
Stream Bed	40.0+	0	0	0

Spillway:

12-40' x 32' Tainter Gates
Ogee crest elevation 99.0
Capacity at normal pool level 319,000 c.f.s.

Report on
MASTER PLAN FOR RECREATIONAL DEVELOPMENT

LIVINGSTON RESERVOIR
Trinity River, Texas

I - INTRODUCTION

1-01. General. A dramatic growth in outdoor recreation has taken place in Texas in the last ten years, particularly in water-oriented recreation. This growth has been brought about primarily by the construction of numerous new dams and lakes, and has been accelerated by population growth, improved standards of living, and the improvement of roads and highways which has made outdoor areas easily accessible. Present outdoor recreation demands are tremendous, and are expected to increase steadily at rates even faster than anticipated increases in population. This fact has been recognized at local, State and National levels resulting in recreational planning at all levels to meet future requirements.

1-02. The Livingston Dam and Reservoir Project will be constructed by the Trinity River Authority of Texas to supplement the water supplies of the lower Trinity River basin and the industrial complex at Houston, Harris County, and adjacent areas. The Project will be maintained and operated by the Trinity River Authority of Texas.

1-03. Authority and Purpose. This report was authorized by the Executive Committee, Trinity River Authority of Texas, on December 28, 1964 to plan the recreational aspects of Livingston Reservoir. This report presents the results of that study and a Master Plan for the construction of

recreational facilities. The purpose of the Master Plan is to present a comprehensive plan for the progressive, orderly development of the recreational and scenic resources of the Livingston Reservoir area. The report presents data that influence the use of these resources and outlines a program for development consistent with anticipated usage.

1-04. Status of the Project. The Texas Water Commission, successor to the Board of Water Engineers, issued Permit No. 1970, dated October 11, 1960, granting jointly to the City of Houston and Trinity River Authority of Texas impoundment and diversion rights in the Livingston Reservoir. In accordance with the Permit, impoundment for water supply purposes may not exceed 1,750,000 acre-feet and diversion may not exceed 1,254,400 acre-feet per annum. The Permit divides the diversion rights between the two permittees, 70 percent to Houston and 30 percent to Trinity River Authority.

1-05. A permit for the construction of the Livingston Dam and Reservoir on the Trinity River, a navigable stream, was granted by the U. S. Army, Corps of Engineers, in October 1960.

1-06. Contractual agreements have been executed by the City of Houston and the Trinity River Authority making possible the sale of bonds by the Trinity River Authority in June 1965 for financing the project. Detailed design of the dam and spillway has been completed by Brown and Root, Inc., consultants for the City of Houston. Appraisal and acquisition of reservoir lands is in progress, and construction of the dam is scheduled to begin in the autumn of this year. Completion of the project is tentatively scheduled for 1969.

II - DESCRIPTION OF THE PROJECT

2-01. Purpose of the Project. The Livingston Dam and Reservoir will be owned and operated by the Trinity River Authority of Texas. Its primary purpose will be to supply municipal, industrial, and agricultural water needs in the lower Trinity River basin and the Houston industrial area. Water for diversion by the City of Houston and other downstream users will be released from the reservoir to flow down the natural channel to the points of intake. Wallisville Reservoir, an authorized project of the Corps of Engineers near the mouth of the Trinity River, will have a normal pool level of 4.0 feet, m. s. l. It will effectively prevent pollution by salt water intrusion at the diversion points of appropriators in the extreme lower end of the basin.

2-02. The Livingston Reservoir will become an integral part of the Trinity River barge canal recommended in the Corps of Engineers "Comprehensive Survey Report on the Trinity River and Tributaries, Texas," dated June 1962. The Corps plan provides for navigation locks to be constructed near the west end of the dam for barge movement up to, and down from, the lake level. A set of locks will also be constructed in the upper end of the reservoir about ten miles upstream from Riverside. A navigation channel would be excavated where necessary through the reservoir so that traffic would not be interrupted by low reservoir stages during extreme drought periods.

2-03. Location. The Livingston Dam site is located in Polk and San Jacinto Counties, Texas, at about River Mile 128 on the Trinity River.

The site is approximately 7 miles southwest of Livingston, Polk County, Texas, and about 11 river miles upstream from the crossing of U. S. Highway 59, between Cleveland and Livingston. The reservoir will lie in Polk, San Jacinto, Trinity and Walker Counties, Texas.

2-04. Project Structures. The principal project structures will consist of an earthfill embankment, a concrete spillway, and an outlet works. The total length of the dam will be approximately 13,500 feet. The embankment will have a top width of 24 feet and an average height of 55 feet above the valley floor. The upstream slope of the embankment will be protected with dumped riprap, and the downstream slope will be sodded and seeded. The spillway will consist of an ogee section, with crest at elevation 99.0 controlled by twelve 40-foot by 32-foot tainter gates. The outlet works will consist of a 10-foot diameter conduit under the dam, a multi-gated inlet tower with operating equipment and an access bridge, a stilling basin for energy dissipation of releases, and a measuring weir.

2-05. Project Buildings. Tentative plans for project buildings include an office building, a maintenance building, a caretaker's residence, and a boat dock and shelter for the project operational crafts. The office building will be located near the east end of the dam. The maintenance shop and caretaker's residence will be located near the office building and the boating facilities will be constructed at a nearby cove.

2-06. Public Observation Areas. An observation area is proposed at each end of the dam. From these sites, visitors can observe the work area during construction, and the dam and a large expanse of open water upon completion. The two areas will be similar, each consisting of a 100-foot by 200-foot parking area with a protective guard rail.

2-07. Reservoir Area. The reservoir created by the Livingston Dam will have a total storage capacity of 1,795,000 acre-feet and an area of 82,250 acres at normal water surface level, elevation 131.0. The reservoir will be approximately 49 miles in length. The head of the reservoir will be about 15 miles upstream from the State Highway 19 crossing near Riverside, although most of the storage capacity will be below this point. Numerous tributaries will be inundated at normal lake level for several miles upstream from the river bottoms, producing a long, irregular shoreline about 460 miles in length. The lake shore will generally be a sandy loam with slopes varying from gentle to moderately steep. Project lands lie within the East Texas Timberlands, and although considerable clearing has been accomplished in the bottom lands, the major portion of the shoreline will be wooded, primarily with pines, and some hardwoods. A map of the reservoir area is shown on Plate 1.

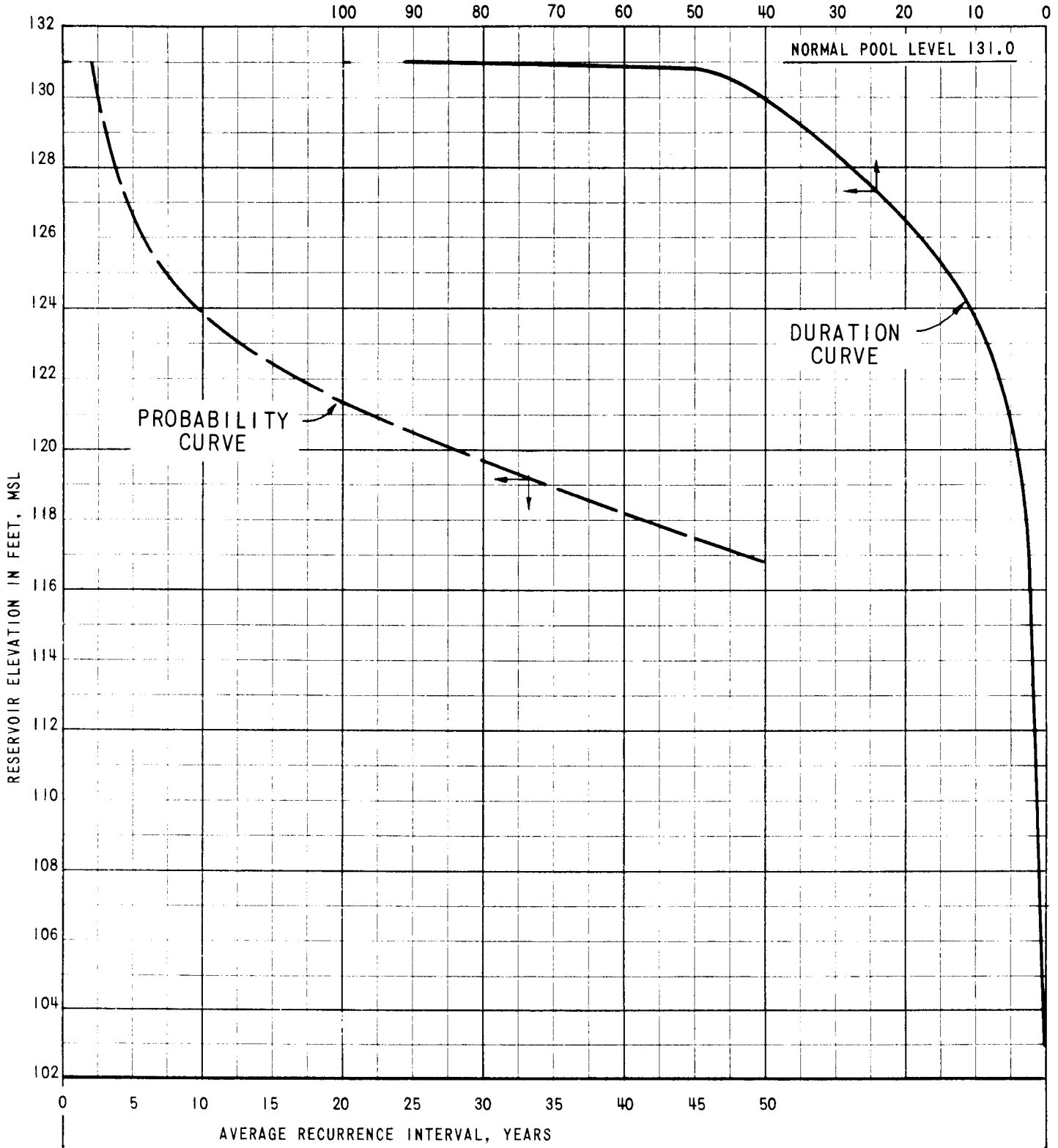
2-08. Fluctuations of Reservoir Levels. Since Livingston Reservoir will not contain storage capacity allocated to flood control, the reservoir level will rarely be higher than one foot above the normal pool elevation of 131.0. On the other hand, during a period of extreme drought, such as experienced in the period from 1953 to 1956, the reservoir could be drawn

down as much as 28 feet below normal pool level. Such low stages would occur, however, only during extreme drought periods after withdrawals from the lake reached rates approaching the project yield, about 1,120 million gallons per day. The likelihood of this extreme drawdown is remote, however, since maximum use of reservoir storage is not expected to occur until some date in the distant future. Hypothetical reservoir routings, using monthly data of historical stream flow for a 39-year study period, indicate that the reservoir will maintain a fairly constant level at elevation 131.0. Reservoir pool elevation probabilities are shown in Table 1. The pool elevation probability and duration curves are shown on Figure 1.

TABLE 1

RESERVOIR POOL ELEVATION PROBABILITIES

Recurrence Interval Years	Minimum Reservoir Elevation, Feet, msl
2	130.7
5	126.5
10	124.0
25	120.6
50	117.0



LIVINGSTON RESERVOIR
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REPORT ON MASTER PLAN FOR
RESERVOIR RECREATIONAL DEVELOPMENT

POOL ELEVATION
PROBABILITY AND DURATION

FIGURE 1

2-09. Clearing. A policy for reservoir clearing has not been adopted. The definite need for clearing has been recognized, however, especially in consideration of the enhancement of the scenic aspects of the reservoir, removal of navigational and boating hazards, control of mosquitoes, and general improvement for recreational use of the reservoir. In the absence of a definite plan, it is proposed that clearing criteria used at Corps of Engineers Reservoirs be adopted as a minimum, and that additional clearing be done to a practical limit of available funds. The Corps of Engineers criteria are outlined in EM 415-2-301, change 1, dated 3 April 1961. Generally, the reservoir clearing plan would consist of clearing in selected areas between a minimum upper limit of elevation of 131.0 (normal pool level) and a maximum lower limit of elevation of 119.0 (5 feet below the 10-year frequency drawdown). Particular areas selected for reservoir clearing would include boating lanes, areas within one mile of the dam site, each primary public-use area, each existing and anticipated future populated area, and areas within one-half mile of all highway crossings of the reservoir. Sizable portions of the reservoir area have been cleared for farming, and it is anticipated that accelerated cutting of saw timbers and pulp wood in advance of inundation will be accomplished by commercial interests in some of the wooded areas, thus leaving a large portion of the reservoir area below the town of Carlisle relatively free of timber standing above elevation 119.0. In selected portions of this area where timbers extending above elevation 119.0 may be standing, selective cutting would be undertaken to provide clear expanses of open water above elevation 119.0. Additional clearing around the periphery of the reservoir would be accomplished where practical in order to extend open water areas to the shoreline.

III - RESOURCES OF THE PROJECT

3-01. General and Scenic Values. Livingston Reservoir is located in the "Pine Belt" portion of Eastern Texas. The terrain is heavily wooded with rolling hills and deep valleys. The over-all scenic effect is pleasing and with the irregular shoreline of the initial impoundment, the scenic values of the reservoir are considered to be attractive for a varied and interesting recreational use. The dam and spillway will provide an impressive attraction for many people who will visit the project primarily for this interest.

3-02. Area Available for Public Use. Livingston Reservoir will have a shoreline length of about 460 miles and will inundate some 82,250 acres of land. The waters of the lake will be available for public use, and will be accessible to the public by way of nineteen recreational public-use sites planned for development by the Trinity River Authority or local governments. The planned recreation sites, spaced strategically around the reservoir, will contain a total area in excess of 3,000 acres. In addition to these nineteen sites, the long shoreline will offer numerous sites for the construction of concession facilities, quasi-public group camps, and private boat docks that will serve development on lands adjacent to the project boundary. The narrow strip of land being acquired along the periphery of the reservoir between the acquisition guide contour and the shoreline is not expected, in general, to be available for public access in view of the adopted land acquisition policy. This policy is outlined in Section 5.

3-03. Fish and Wildlife. Fish and wildlife are important to the region in which Livingston Reservoir will be located. Hunting and fishing are major recreational activities throughout the region because of the natural cover provided by the heavy vegetation, and the numerous water holes, sloughs and oxbows existing in the river bottoms. These areas are usually subject to flooding during high water stages of the major streams. The fertility gained by waters during overbank flooding and the interchange of fish populations during high water periods have been beneficial in maintaining moderate sport fishing conditions. Principal species harvested by sport fishermen are largemouth bass, white bass, crappies, bluegills and other sunfishes. Other species found in these areas, as well as in the streams proper, include flathead catfish, channel catfish, blue catfish, carp, buffalo, gar and freshwater drum. Fishing in the streams is not as popular, however, as in the river-bottom lakes, due primarily to stream pollution. There is a good population of wildlife in the area, including white-tailed deer, bobwhites, mourning doves, squirrels, raccoons, foxes and waterfowl. The area supports considerable hunting.

3-03a. Effects of the Impoundment. The reservoir will replace a stream and river-bottom lake fishery of poor to average quality with a much improved reservoir-type fishery. Fish species will be primarily the same as those named in Paragraph 3-03 although their number will be increased and they will enjoy an improved habitat. The downstream fishery should be improved as a result of water releases for downstream usage and by reduction of extremely high flows during floods. Some losses of wildlife habitat and a possible reduction in hunting are recognized in

the reservoir area. However, the reservoir will provide a greater diversification of fish and wild life habitat and should result in considerable net benefits in fish and wildlife resources.

3-04. Boating. Boating on rivers and streams within the lake area is practically nonexistent. The formation of the lake will offer boating opportunities in this area similar to those now enjoyed at other large lakes in the general vicinity, such as Lake Texoma and Lake Tawakoni. Boating on Livingston Reservoir is expected to become a major recreational activity.

3-05. Archeological and Historical Data. Exploration of the reservoir area for historical and archeological data is expected to begin in September 1965 under the direction of the Texas Archeological Salvage Project, Balcones Research Center, Austin, Texas.

3-06. Other Resources. With numerous areas of the Reservoir being easily accessible and uniquely attractive, it will be a major attraction for picnickers, campers and associated day-use activities. Week-end use of these types of facilities should remain high indefinitely.

IV - FACTORS INFLUENCING DEVELOPMENT FOR PUBLIC USE

4-01. Region Served. Livingston Reservoir will be of recreational importance to a large portion of south and east Texas. Fluctuations in reservoir levels will generally be small, and for this reason, recreational potential will be great over almost its entire length. For purposes of estimating the future recreational usage of Livingston Reservoir, the zone of influence that its recreational opportunity will have on the surrounding population is estimated to extend 75 miles in all directions. The zone of influence is shown on Plate 2 along with related recreation areas. Included in the zone of influence are the population centers of Houston and Beaumont; the smaller cities of Pasadena, Baytown, Bryan, College Station, Palestine, Nacogdoches, Galena Park, Lufkin and Huntsville; numerous smaller towns and communities; and the broad expanse of the Big Thicket Country.

4-02. Population Data. The 1965 population within the 75-mile zone of influence of Livingston Reservoir has been estimated at 1,948,000, a large part of which is urban. The population within a 50-mile radius of the reservoir is chiefly rural, amounting to approximately 200,000 persons. Population projections indicate that by the year 1979, 10 years after completion of the project, the number of people within 75 miles will increase to 2,740,000, and within 50 miles, to 220,000. The 1960 population of cities over 10,000 persons within the 75-mile radius is given on Table 2.

TABLE 2

CITY POPULATION DATA, 75-MILE RADIUS
(Cities over 10,000 Population)

City	Population (1960 Census)	Distance and Direction from Livingston Reservoir
Within 50 Miles:		
Huntsville	11,999	30 W
Lufkin	17,641	50 NNE
Within 50 to 75 Miles:		
Houston	938,219	70 S
Pasadena	58,737	75 S
Beaumont	119,175	74 SE
Baytown	28,159	72 S
Bryan	27,542	75 W
College Station	11,396	74 W
Palestine	13,974	75 NNW
Nacogdoches	12,674	75 NNE
Galena Park	10,852	67 S

4-03. Economic Status of the Zone of Influence. The broad expanse of forest lands which cover a large portion of the area in the vicinity of the reservoir provide a major industry. Many citizens are dependent upon the forest for a livelihood. Numerous oil and gas wells dot the countryside, particularly in southern portion of the zone of influence. Agricultural endeavors are directed primarily toward raising beef cattle, dairy cattle and poultry, although rice and cotton are grown in quantity in some areas. Manufacturing is carried on to some extent in the smaller cities of the area, but it reaches major proportions in the highly industrialized cities of Houston and Beaumont. The economy of the area has a rather wide range of variance, it being more sound in the populous areas. According to 1960 census data, wage earners in Harris and Jefferson

counties have a median annual income of slightly over $6,000, while the median income for the remainder of the zone of influence is approximately $3,600.

4-04. Related Recreational Areas. The major recreational areas of the region are shown on Plate 2. Known data relative to existing major lakes and parks within a 75-mile radius of Livingston Reservoir are given in Table 3. The most recently completed reservoir in the area is Sam Rayburn Reservoir, a large Corps of Engineers multipurpose project on the Angelina River about 65 miles northeast of the Livingston project. The Corps of Engineers provides basic facilities at its reservoirs for camping, picnicking and boat launching. Concession sites supplement these facilities to make available various types of services for a visit of one day or longer.

TABLE 3

RELATED RECREATIONAL DATA

Recreational Area	Distance (Air Miles)	Administrating Agency	Primary Purpose	Lake Surface Area (acres)	1964 Attendance
Lakes					
Dam "B" Reservoir	55	Corps of Engrs. & LNVA	Mun., Ind., Irr.	13,700	816,200
Lake Jacksonville	70	City of Jacksonville	Mun. & Rec.	1,320	
Lake Kurth	60	Southland Paper Mills, Inc.	Industrial	800	
Lake Houston	45	City of Houston	M., I., Ir., Mi., R.	12,500	
Camp Creek Lake	55	Camp Creek Water Co.	Rec.	750	
Sheldon Res.	55	Texas Parks & Wildlife Dept.	Fish & Wildlife	1,200	
Anahuac Lake	65	Chambers-Liberty Co. Navig. Dist.	Irr.	5,300	
**Honea	35	San Jacinto Riv. Auth.	Mun., Ind., Mi.	17,600	
Sam Rayburn Res.	60	Corps of Engrs. & LNVA	Mun., Ind., Irr., Power, F. C.	114,550	
**Active Preconstruction Planning					
State Parks					
Huntsville	25	Texas Parks & Wildlife Comm.	Recreation	2,122	476,000
Jim Hogg	65	Texas Parks & Wildlife Comm.	Historical Park	177	6,300
Mission San Francisco De Los Tejas	45	Texas Parks & Wildlife Comm.	Historical Park	118	8,200
San Jacinto	60		Historic & Recreation	445	unknown
Washington	70	Texas Parks & Wildlife Comm.	Historic & Recreation	71	36,600

TABLE 3 (CONT'D)

RELATED RECREATIONAL DATA

Recreational Area	Distance (Air Miles)	Administrating Agency	Primary Purpose	Lake Surface Area (acres)	1964 Attendance
Recreation Areas					
Bouton Lake Campground	55	U. S. Forest Service	Recreation		
Ratcliff Park	35	U. S. Forest Service	Recreation		
Double Lake Park	10	U. S. Forest Service	Recreation		
Stubblefield Lake Campground	25	U. S. Forest Service	Recreation		
Boykin Springs Park	55	U. S. Forest Service	Recreation		
Pine Springs Rec. Area	40	U. S. Forest Service	Recreation		
Holly Bluff Campground	30	U. S. Forest Service	Recreation		
Walker Lake Campground	25	U. S. Forest Service	Recreation		

4-05. Regional Interest in Recreation. Attendance information is not available on most of the lakes and recreation parks in the area; however, the fact that approximately 816,000 persons visited Dam "B" Reservoir in 1964 and another 476,000 visited Huntsville State Park, indicates a definite interest in recreation by the people of the region. Locally, an organization named the Four County Lake Development Association, composed of members from the reservoir-bordering counties of Polk, Trinity, San Jacinto and Walker, was formed for the purpose of promoting recreational development of the area. Trinity County voters, on November 6, 1962, approved a bond issue in the amount of $100,000 for the purpose of establishing public parks on the shores of the Lake Livingston in Trinity County. A group in San Jacinto County has organized under the Area Redevelopment Program for purposes of recreational development in their county. Local interest in recreation is outstanding.

4-06. Access. Existing roads into the reservoir area are numerous but, in most cases, are not highly developed roads. U. S. Highway 190 which crosses the reservoir area slightly below its midpoint will be rebuilt to provide a permanent reservoir crossing, thereby affording arterial access from both east and west. Interstate Highway 45 and U. S. Highway 59, both excellent highways, intersect U. S. 190 west and east of the reservoir, respectively, and both will serve as arteries from the Houston area, as well as areas north of the reservoir. In the upper end of the reservoir near Trinity, State Highways 19 and 94 make crossings. State Highway 156 generally parallels the lower half of the reservoir on its southwesterly

side, and will serve as a major access artery. FM 356 will function in a similar manner on the northeast side of the reservoir in its upper portion. Many points on the reservoir's perimeter can be reached by existing roads; however, a number of these roads will require improvement before carrying heavy traffic loads. Plate 1 shows the principal roads in the general vicinity of the reservoir.

4-07. Climate. Long periods of mild weather are favorable to the recreational use of the reservoir. From March to November, temperatures will permit the use of the lake for aquatic sports, sightseeing, picnicking and camping. Winter months generally are sufficiently mild to permit fishing from boats. Normal annual temperature is 67 degrees F. with a normal of 83 degrees in July and 50 degrees in January. Rainfall for the region averages approximately 45 inches annually.

4-08. Principal Types of Recreational Use. Considering that the majority of the visitors expected to visit the Livingston Reservoir live within less than a two-hour's drive from the reservoir, the need for recreational opportunity is expected to be greatest in the category of a one-day outing, followed by needs for overnight accommodations, and then by vacation use.

4-08a. Day use. The principal use of the reservoir will be by individuals or groups who go for a one-day outing. This group includes sightseers, picnickers, boaters, skiers, fishermen, and swimmers. The demand on facilities by this class of recreationists will vary with the

season, but probably 60 percent of the total visitation will be on Saturdays and Sundays. The development in public-use areas will be designed to serve this group.

4-08b. Week-end use. Since access to the reservoir is available by State and Federal highways from all directions, visitors for the overnight stay will provide another class of user requiring facilities. Development for the one-day user also will provide minimum facilities for the overnight camper. Additional developments by concessionaires on or near the project will supplement those furnished in public-use areas to attract this type of user.

4-08c. Vacation use. It is anticipated that vacations at the lake will have minor attraction, and the extent to which this use is developed will depend upon the facilities and services that are made available by commercial operators who cater to this type of trade.

4-09. Estimated Attendance. Attendance at a reservoir for recreational purposes depends primarily upon the facilites provided and upon population resident within a reasonable distance of the reservoir. A distance of 75 miles has been used in this analysis. Various methods have been devised for estimating attendance, one of the more reliable being based on past attendance records at reservoirs with similar facilites.

4-09a. Government projects in Texas. The Corps of Engineers has published information on attendance at its major reservoirs throughout the United States, which, as noted in paragraph 4-04, are equipped with basic

recreational facilities. Table 4 gives attendance information for 10 Corps of Engineers reservoirs in Texas for the period 1954 to 1964.

TABLE 4

PUBLIC USE ATTENDANCE AT CORPS OF ENGINEERS RESERVOIRS IN TEXAS

Reservoir Project	Area at Max. Conservation Level in Acres	Visitor - days Attendance in Thousands									
		1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
TEXAS												
Belton	7,400	774	1190	1685	2198		2407	1607	2214	1788	1748	1729
Benbrook	3,770	965	808	1004	1416		1373	1181	1268	1249	1378	1527
Dam B	13,700	295	311	355	511		1242	1268	1658	1191	811	816
Garza-Little Elm	23,470	1155	1550	1776	2014		2248	2283	2328	2387	2530	2516
Grapevine	7,380	1242	1170	1174	2420		1889	1674	1990	2144	2457	2011
Hords Cr.	510	161	144	163	163		283	253	288	208	220	233
Lavon	11,080	568	974	1225	1248		1911	2077	2596	4203	3498	3365
San Angelo	5,440	744	675	955	1323		1591	1379	1595	1548	1693	1692
Texoma*	95,400	5108	6599	7472	8038		6736	6625	6449	6743	7333	8197
Whitney	15,800	2479	2980	2900	3020		3180	3197	4321	3583	4048	4225
Totals	183,950	13,491	16,421	18,709	22,351		22,860	21,544	24,707	25,044	25,716	26,311

*Partly in Oklahoma

As indicated in Table 4, the total attendance at the ten reservoirs in 1964 was 26,311,000 visitor-days. The total population resident within 75 miles of these reservoirs was approximately 4,800,000. Hence, the number of visitor-days attendance was 5.48 per capita of the population.

4-09b. The Corps of Engineers has also made surveys in recent years to determine the distance that people travel to visit recreational areas. Data from these surveys for the years 1961, 1963 and 1964 for nine reservoirs in the Fort Worth District, are given in Table 5.

TABLE 5

PERCENTAGE OF VEHICLES FROM THE ZONES OF INFLUENCE
CORPS OF ENGINEERS RESERVOIRS, FORT WORTH DISTRICT

Reservoir Project	Year	0-50Mi.		50-100Mi.		Over 100Mi.
		0-25Mi.	25-50Mi.	50-75Mi.	75-100Mi.	
Belton	1961	94		2		4
	1963	71	19	2	2	6
	1964	79	10	1	3	7
Benbrook	1961	99		-		1
	1963	94	5	-	-	1
	1964	92	5	1	-	2
Dam B	1961	49		45		6
	1963	64	6	12	6	12
	1964	18	12	35	16	19
Grapevine	1961	99		1		-
	1963	96	3	-	-	1
	1964	94	5	-	-	1
Hords Cr.	1961	84		6		10
	1963	61	20	7	6	6
	1964	72	17	5	1	5
Lavon	1961	98		1		1
	1963	76	22	1	1	-
	1964	79	20	1	-	-
Lewisville	1961	98		1		1
	1963	81	16	1	-	2
	1964	73	23	-	-	4
San Angelo	1961	81		12		7
	1963	76	6	4	7	7
	1964	82	5	2	1	10
Whitney	1961	47		48		5
	1963	30	22	22	21	5
	1964	42	15	28	11	4

The information in Table 5, when related to centers of population, indicates that where reservoirs are near a populous area, practically all of the attendance is from within a 50-mile radius. Where reservoirs are remote from populous areas, people will travel in quantity for distances of 75 miles, and even as much as 100 miles, for recreational visits.

4-09c. Tennessee Valley Authority. Taking another group of reservoirs for a comparison, the Tennessee Valley Authority reservoirs in the year 1963 had a visitor-day attendance of 7.0 per capita of the 8,000,000 people residing within 75 miles of the reservoirs. Attendance at these reservoirs increased from 25,545,000 in 1952 to 56,438,000 in 1963, or an average annual increase of 2,810,000 which is far in excess of the increase in population.

4-09d. Livingston Reservoir estimated attendance. An estimate of attendance at Livingston Reservoir was made from an evaluation of the historical attendance records compiled by the Corps of Engineers and the population within the apparent zones of influence of the different reservoirs. The estimate was based primarily on per capita visitor-day attendance figures experienced at Whitney Reservoir and Dam B Reservoir, because of similarities in population location around these two reservoirs and Livingston Reservoir. Whitney serves a population of 285,000 within a 50-mile radius, and 1,900,000 within a 50- to 75-mile radius, which approximates the population around Livingston Reservoir. Approximately 50% of the recorded attendance at Whitney comes from the Dallas-Fort Worth

area, which is about 75 miles distant. A large part of the attendance at Dam B comes from the populous Beaumont vicinity which is about 60 miles away. Similarly, a large percentage of the attendance at Livingston Reservoir is expected to come from Metropolitan Houston, which is about 70 miles distant. From a correlation of population, attendance and distance-traveled data for the three years of record at Whitney and Dam B Reservoirs, it was concluded that the average number of visitor-days attendance was 5.88 per capita of the population residing within 50 miles of the reservoirs, and 0.73 per capita of the population within a 50 to 75 mile radius. These values were applied to the estimated 1979 population in the vicinity of Livingston Reservoir, as indicated below, to give an estimated annual attendance in that year of 3,133,000 persons.

Zone	1979 Estimated Population	Visitor-days per capita	Estimated 1979 Annual Attendance 1/
Within 0-50 Miles	220,000	5.88	1,293,600
Within 50-75 Miles	2,520,000	0.73	1,839,600
Totals	2,740,000		3,133,200
		Use	3,133,000

1/ The reservoir is expected to have been in operation approximately 10 years by 1979.

4-10. Peak-day Attendance. The Corps of Engineers has published data on peak-day attendance experienced at its reservoirs throughout the Unite States. The over-all average for these reservoirs indicates that peak-day attendance is about 8.5 times the average-day attendance. For

comparison, a study was made of attendance figures at the ten Corps of Engineers reservoirs listed in Table 4. The 1963 total annual attendance was 25,716,000, or an average of 70,500 per day. At the same time, total peak-day attendance was 586,500, or 8.3 times the average-day. A similar comparison of data at Whitney and Dam B Reservoirs produced a value of 7.3. Based on an evaluation of these values, 8.0 was adopted as the ratio, peak-day/average-day attendance, at Livingston Reservoir, and peak-day attendance was computed to be 68,700, as follows.

$$\frac{3{,}133{,}000 \text{ Annual visitors}}{365 \text{ days per year}} \times 8.0 = \underline{68{,}700} \text{ peak-day visitors.}$$

4-11. Estimated Attendance by Recreational Category. Surveys have been conducted by the Corps of Engineers to determine the number of people who participate in the various categories of recreation during visits to their reservoirs. These surveys were made at various times of the year, and were made primarily at areas of heavy public use. The results of the surveys during the past six years at nine reservoirs in the Fort Worth District are given in Table 6. An average annual percentage of the total for each recreational category was computed for the data in Table 6. Only the data for the last three years were used, since the preceeding years do not give complete breakdown information. Average annual percentages were also computed using only Whitney and Dam B Reservoirs and from these data, values were estimated for Livingston Reservoir. The computed averages for the nine reservoirs, for Whitney and Dam B, and as adopted for Livingston Reservoir, are given in Table 6a.

TABLE 6

ATTENDANCE AT FORT WORTH DISTRICT, C. OF E. RESERVOIRS

BY CATEGORIES OF RECREATIONAL ACTIVITY

YEAR	TOTAL	CAMP	PICNIC	BOAT	FISH	HUNT	SIGHTSEE	SKI	SWIM	OTHER
					BELTON RESERVOIR					
1959	2,407.0	90.9	144.0	-	666.3	18.9	-	-	-	1,486.9
1960	1,607.4	82.8	132.0	-	446.1	14.7	-	-	-	931.7
1961	2,213.8	48.2	304.0	217.9	278.2	-	1,122.4	-	-	389.5
1962	1,788.4	51.5	205.6	161.9	429.6	4.8	831.5	25.6	177.2	159.1
1963	1,747.5	55.7	209.9	87.0	562.5	31.8	856.8	86.8	159.9	172.0
1964	1,728.6	76.0	276.4	180.3	524.7	37.5	609.4	44.9	276.5	101.3
					BENBROOK RESERVOIR					
1959	1,372.9	17.5	78.0	-	727.8	14.6	-	-	-	535.0
1960	1,180.7	17.6	96.6	-	649.6	6.1	-	-	-	410.7
1961	1,267.8	45.8	178.2	272.2	422.5	5.2	610.5	-	-	117.5
1962	1,249.4	61.7	180.9	106.1	708.0	5.4	339.1	49.8	122.8	37.4
1963	1,378.4	40.8	152.1	67.0	587.0	10.2	531.6	50.0	160.4	43.8
1964	1,526.8	14.3	176.2	136.7	704.6	16.8	476.2	57.3	148.7	194.0
					DAM B RESERVOIR					
1959	1,242.0	122.1	64.8	-	667.5	24.9	-	-	-	362.7
1960	1,268.3	126.2	64.8	-	743.6	25.6	-	-	-	308.0
1961	1,657.8	220.0	215.4	314.3	630.7	5.4	613.5	-	-	154.4
1962	1,190.7	265.0	99.4	232.6	617.4	3.5	330.2	35.9	102.0	97.4
1963	811.1	189.4	89.2	102.0	438.8	4.7	223.9	14.2	74.7	2.8
1964	816.2	196.7	92.8	99.5	419.5	3.7	227.5	11.7	86.2	0.6
					GRAPEVINE RESERVOIR					
1959	1,889.0	12.2	31.6	-	1,326.5	9.2	-	-	-	509.5
1960	1,673.7	12.9	35.8	-	1,165.5	10.2	-	-	-	449.3
1961	1,989.8	117.7	372.0	459.7	841.8	9.9	616.5	-	-	261.3
1962	2,143.9	207.7	492.8	318.5	1,199.4	5.6	306.0	133.6	489.3	15.6
1963	2,457.5	370.8	632.8	335.1	988.0	36.0	285.5	228.4	536.7	110.7
1964	2,011.1	191.2	448.0	289.8	946.9	18.2	338.5	119.0	415.3	65.1
					HORDS CREEK RESERVOIR					
1959	282.8	9.4	28.6	-	201.4	4.2	-	-	-	39.2
1960	253.2	10.8	26.1	-	184.7	5.2	-	-	-	26.4
1961	288.5	20.5	47.6	65.4	182.6	9.0	21.9	-	-	11.5
1962	208.4	19.1	36.2	38.1	85.8	3.7	51.0	9.0	16.3	12.8
1963	220.4	31.0	52.9	57.1	73.3	5.2	10.9	24.5	24.3	5.2
1964	232.5	36.7	58.7	42.3	71.9	16.0	15.3	28.0	18.8	7.7
					LAVON RESERVOIR					
1959	1,910.8	18.2	206.7	-	664.2	21.2	-	-	-	1,000.7
1960	2,076.6	22.2	218.4	-	693.4	21.4	-	-	-	1,121.2
1961	2,596.0	181.8	271.6	534.4	728.7	41.2	900.5	-	-	134.9
1962	4,203.3	381.5	722.5	663.9	1,435.3	108.5	1,247.7	195.2	679.4	133.8
1963	3,498.4	242.4	764.5	511.8	1,524.8	93.2	673.8	180.1	653.5	214.0
1964	3,364.7	166.9	655.0	429.1	1,377.0	116.0	645.4	167.8	402.5	167.1
					GARZA LITTLE ELM RESERVOIR					
1959	2,248.0	109.2	373.2	-	375.8	2.0	-	-	-	1,387.0
1960	2,282.6	93.8	370.0	-	424.3	4.6	-	-	-	1,389.9
1961	2,327.6	181.3	543.0	1,010.5	744.7	5.0	407.4	-	-	49.7
1962	2,386.9	170.6	409.9	909.4	686.9	44.5	445.2	41.5	31.7	20.5
1963	2,529.5	197.4	424.3	632.4	505.1	20.6	588.4	154.7	414.8	105.7
1964	2,515.9	103.0	416.3	475.4	611.1	23.7	783.8	186.3	336.0	88.8
					SAN ANGELO RESERVOIR					
1959	1,591.1	46.1	92.8	-	716.8	13.2	-	-	-	722.2
1960	1,379.0	72.3	156.0	-	648.3	18.5	-	-	-	483.9
1961	1,594.9	92.1	202.1	236.4	557.5	12.5	498.0	-	-	292.9
1962	1,548.0	170.8	263.2	292.0	645.7	28.5	434.5	77.2	210.4	56.9
1963	1,692.6	122.9	232.5	196.9	661.1	30.7	394.2	115.9	266.2	41.6
1964	1,691.7	145.5	228.7	206.0	734.0	48.5	431.6	68.9	161.9	27.7
					WHITNEY RESERVOIR					
1959	3,180.0	127.2	505.8	-	823.0	142.2	-	-	-	1,581.3
1960	3,197.0	80.2	183.9	-	1,360.2	71.5	-	-	-	1,501.4
1961	4,321.3	803.5	705.8	988.9	1,739.5	60.5	887.4	-	-	1,436.2
1962	3,583.1	754.3	596.7	672.1	1,567.3	35.9	649.6	109.5	894.7	225.7
1963	4,048.3	645.4	675.3	387.9	1,446.5	27.9	1,041.9	71.2	325.4	431.8
1964	4,224.7	756.4	560.3	503.9	1,950.4	90.4	740.9	113.2	496.1	204.3

TABLE 6a

Recreation Category	Average Annual Percentage of Total Visitations 1/		
	9 C. of E. Reservoirs	Whitney and Dam B Reservoirs (Avg.)	Adopted for Livingston Res.
Camping	10.5	20.8	18.0
Picnicking	16.5	13.0	15.0
Boating	15.0	14.1	15.0
Fishing	40.0	47.2	40.0
Hunting	1.7	0.9	1.0
Sightseeing	24.7	24.0	24.0
Water-skiing	4.9	2.8	4.0
Swimming	12.9	12.2	12.0
Other	4.6	5.1	5.0
Totals	130.8	140.1	134.0

1/ The total percentages are in excess of 100% due to participation by visitors in more than one type of recreation.

4-12. Estimated Attendance by Years of Reservoir Operation. The estimated annual attendance of 3,133,000 persons at Livingston Reservoir is expected to obtain by 1979, the probable 10th year of operation of the reservoir which is the design period adopted for this Master Plan. In order to estimate the attendance during the first nine years of operation, a study was made of growth in attendance patterns at Corps of Engineers reservoirs. The general pattern of the larger reservoirs indicates a rather rapid ascent in attendance for the first three to five years of operation, with subsequent increases being slower and at a rate approaching the rate of population increase. A curve showing the relationship between the combined Garza-Little Elm and Whitney Reservoir attendance and year of operation, is shown in Figure 2 for the first ten years of operation of the two projects. This relationship was used as the basis for estimating the

annual increase in attendance at Livingston. The relationship adopted for Livingston Reservoir is also shown on Figure 2. The slope of this curve from the fifth through tenth years of operation closely parallels an estimated 2.5 percent annual increase in population within the 75-mile zone of influence. Estimated annual attendance during the first ten years of operation of Livingston Reservoir is given in Table 7.

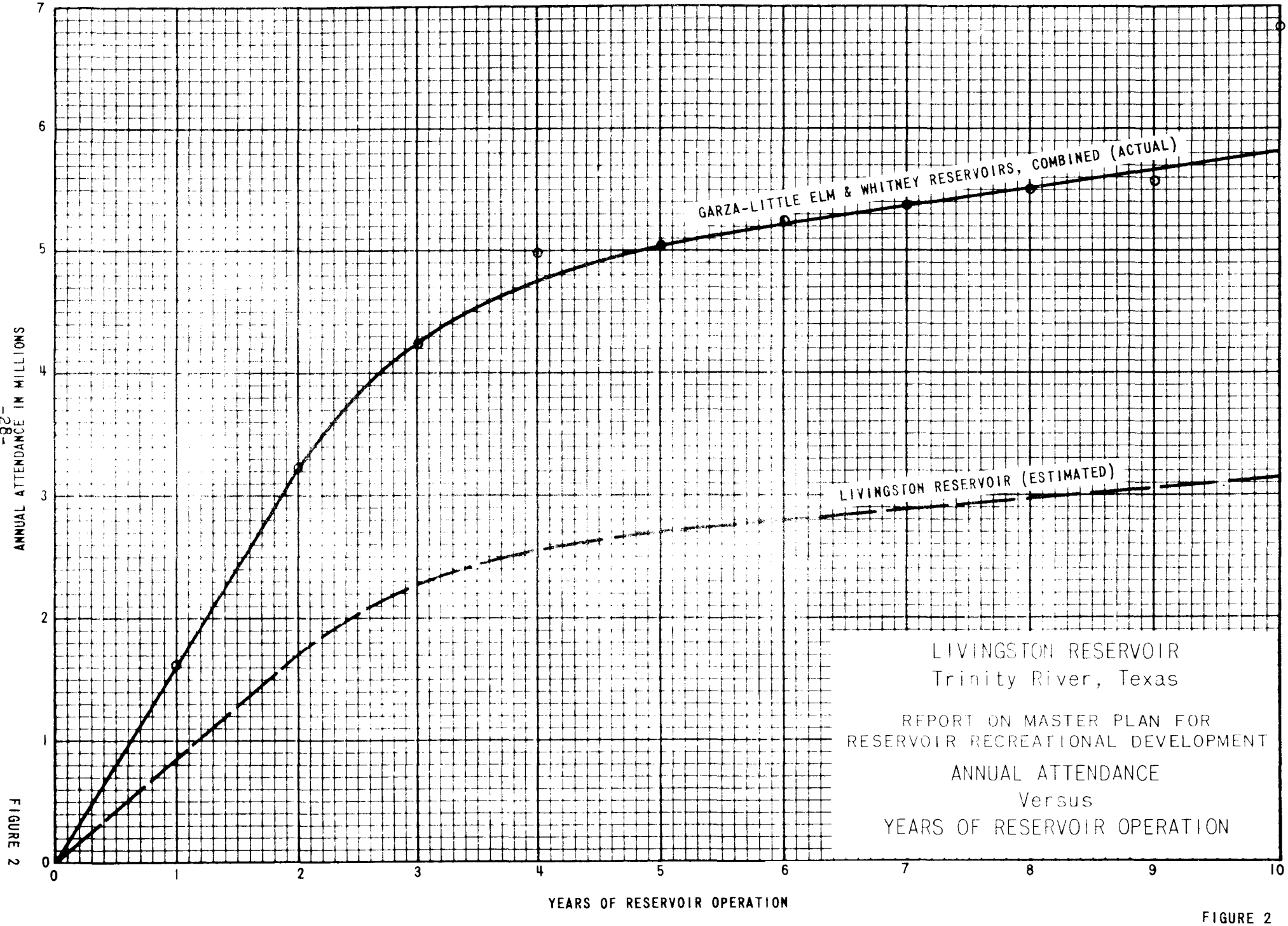

GARZA-LITTLE ELM & WHITNEY RESERVOIRS, COMBINED (ACTUAL)
LIVINGSTON RESERVOIR (ESTIMATED)
LIVINGSTON RESERVOIR
Trinity River, Texas
REPORT ON MASTER PLAN FOR
RESERVOIR RECREATIONAL DEVELOPMENT
ANNUAL ATTENDANCE
Versus
YEARS OF RESERVOIR OPERATION
ANNUAL ATTENDANCE IN MILLIONS
YEARS OF RESERVOIR OPERATION
0
1
2
3
4
5
6
7
8
9
10

FIGURE 2

TABLE 7

Livingston Reservoir
Estimated Attendance by Recreational Categories
and by Years of Reservoir Operation

Year of Operation	Total Attendance	Camping 18%	Picnicking 15%	Boating 15%	Fishing 40%	Hunting 1%	Sightseeing 24%	Skiing 4%	Swimming 12%	Other 5%
1	865,000	155,700	129,750	129,750	346,000	8,650	207,600	34,600	103,800	43,250
2	1,715,000	308,700	257,250	257,250	686,000	17,150	411,600	68,600	205,800	85,750
3	2,280,000	410,400	342,000	342,000	912,000	22,800	547,200	91,200	273,600	114,000
4	2,550,000	459,000	382,500	382,500	1,020,000	25,500	612,000	102,000	306,000	127,500
5	2,710,000	487,800	406,500	406,500	1,084,000	27,100	650,400	108,400	325,200	135,500
6	2,800,000	504,000	420,000	420,000	1,120,000	28,000	672,000	112,000	336,000	140,000
7	2,885,000	519,300	432,750	432,750	1,154,000	28,850	692,400	115,400	346,200	144,250
8	2,960,000	532,800	444,000	444,000	1,184,000	29,600	710,400	118,400	355,200	148,000
9	3,050,000	549,000	457,500	457,500	1,220,000	30,500	732,000	122,000	366,000	152,500
10	3,133,000	563,940	469,950	469,950	1,253,200	31,330	751,920	125,320	375,960	156,650

Total percentage is in excess of 100 because of some visitors' participating in more than one type of activity.

4-13. Recreational Acreage Requirements. In the interest of preserving the natural beauty and scenic aspects of the reservoir and its shoreline, sufficient acreage, insofar as practicable, should be provided at recreational areas to avoid overcrowding and the subsequent deterioration of natural assets. The U. S. Forest Service has adopted quantitative recreational development acreage criteria which is believed will accomplish this purpose. The Forest Service practice is to convert estimated annual visits to visitor-days by assigning a value of 3 visitor-days to each camping visit, and a value of 1/2 visitor-day to each visit for other recreational purposes. The resultant total number of visitor-days is then multiplied by a factor of .001 to arrive at the number of acres needed for development. Application of these factors to the estimated tenth year attendance at Livingston Reservoir indicates a needed development area of 2,977 acres. Approximately 10 percent additional acreage would be needed for buffer zones and to offset acreage not suitable for development, giving a total of 3,275 acres needed. It is estimated that acquisition of 3,000 acres above the guide taking line for recreational purposes will be adequate, in that a portion of the acreage lying between the guide taking line and the normal water surface will be developed.

4-14. Spacing and Size of Recreation Areas. Guide lines for spacing and size of recreation areas are provided in Corps of Engineers Manual 405-2-150, change 11, dated May 31, 1963. For ease of reference, the pertinent paragraph from the referenced manual is quoted as follows:

> "For the economic protection of the concessionair and to minimize maintenance by centralization of activity, the spacing (of sites)

can be expected in the typical case to average every five or ten miles along each side of the reservoir and major tributaries. While the size of these areas will vary greatly, depending on anticipated use, each should be at least 50-acres in size above the guide taking line. Every third or fourth access area should be planned for a more general development with an area in excess of 500 acres above the guide taking line. It is recognized, however, that variations from these criteria may be warranted due to such considerations, among others, as population density, availability of alternate facilities, and adaptability of the project to public requirements."

4-15. Recreational Facility Requirements.

4-15a. Design Criteria. Criteria, useful as a guide in determining the type and number of recreational facilities to provide at sites on the shores of reservoirs, are given in Corps of Engineers Manual, No. EM 1130-2-312, dated May 1, 1960. Recommended criteria for the basic facilities are as follows:

(1) Boat Launching. At least one boat launching ramp for each 40,000 annual visitors, or at any one area with 40 boat launchings per peak day or the number of ramps required to prevent not more than one-hour delay in launching or haul-out. In addition, car and trailer parking space for ten units per camp.

(2) Picnic Facilities. At least one picnic area at or near the dam and all public-use areas, either as a separate activity or combined with other types of public recreation activities where appropriate. Each picnic area will consist of 5 to 50 tables,

with fireplaces and trash receptacles. A minimum of one picnic table for each 4,000 annual visitors, or one picnic table for each 100 to 200 peak-day visitors, or one table for each ten to fifteen picnickers. Parking space for one automobile will be constructed for each picnic table. One group-type shelter for each 225 picnickers per peak-day.

(3) Camping Facilities. There will be either a tent or trailer camp site for each 7,500 to 10,000 annual visitors, or a camp site per 10 peak-day campers. Each tent and trailer camp area will contain a minimum of seven sites. Trailer spaces should be segregated from tent camper sites if feasible. No utility connections will be provided for trailers. Camping facilities located near picnic areas should provide for joint use of water supply system and sanitary system where feasible.

(4) Swimming and Bathing Facilities. One swimming and bathing facility for each public-use area planned for supervision by public agencies. There will be at least one bath-change house for each permissible swimming area attracting 50 or more peak-day swimmers.

4-15b. Design Requirements. On the basis of estimated annual visitations of 3,133,000 and the above listed criteria, public-use areas at Livingston Reservoir should contain about 78 boat launching lanes,

850 picnic tables and 1,200 tent or trailer camp sites. Table 8 illustrates how these quantities of facilities were determined, showing estimated attendance figures, design criteria and the number of facilities to be provided.

TABLE 8

DETERMINATION OF QUANTITIES
OF BASIC RECREATIONAL FACILITIES
(Tenth Year)

	Item	: Quantity
(1)	Annual Attendance	3,133,000
(2)	Peak-Day Attendance	68,700
	I - Boat Launching Facilities.	
(a)	Annual Boaters	469,950
(b)	Peak-day Boaters	10,300
	Boat launching lanes @ 1 per 40,000 annual attendance	78
	Boat launching lanes to be provided	78
	Car-Trailer parking spaces @ 10 per launching lane	780
	II - Picnicking Facilities.	
(a)	Annual Picnickers	469,950
(b)	Peak-day Picnickers	10,300
	Tables @ 1 per 4,000 annual attendance	783
	Tables @ 1 per 100 peak-day attendance	687
	Tables @ 1 per each 10 to 15 peak-day picnickers	687 to 1,030
	Tables to be provided	850
	Parking spaces @ 1 per table (minimum)	850
	Group Type Shelters @ 1 per 225 peak-day picnickers	45
	Group Type Shelters to be provided	45
	III - Camping Facilities.	
(a)	Annual Campers	563,940
(b)	Peak-day Campers	12,370
	Tent & Trailer Camp spaces @ 1 per 10 peak-day campers	1,237
	Tent & Trailer Camp spaces @ 1 per 7,500 annual attendance	417
	Tent & Trailer Camp spaces to be provided	1,200

V - LAND ACQUISITION

5-01. General Policy. The guide contour for right-of-way acquisition for the reservoir is elevation 135.0 feet at the dam and in the lower portion of the reservoir. The guide contour will rise in steps up to elevation 140.0 feet at a point about 6 miles downstream from the Riverside Gage, and will continue upstream at this elevation until within the natural banks of the Trinity River. The taking line will maintain a minimum horizontal distance of 50 feet from the normal water surface, elevation 131.0 feet. The guide contour elevations were determined by backwater computations and reservoir operating criteria. Guide contours adopted for land acquisition are as follows:

Channel Miles Above Dam Site From	To	Guide Contour Elev.	Remarks
Zero	25.0	135.0	Mile 24.0 is about 4.0 miles below mouth of White Rock Creek.
25.0	28.3	136.5	Mile 28.3 is about 0.7 miles below mouth of White Rock Creek.
28.3	32.0	138.0	Mile 32.0 is about 1.5 miles below mouth of Carolina Creek.
32.0	Upstr.	140.0	Area below elevation 140 will be acquired upstream to point where contour lies below top bank of river.

5-02. The general policy adopted by the Trinity River Authority for acquisition of Livingston Reservoir lands is to purchase all the lands lying below the guide contours in fee, and return to the original owners

a perpetual right of joint use of the land lying above the normal lake level, elevation 131.0 feet. The right of joint use will be subject to certain fundamental restrictions to control the use of these marginal lands. It is anticipated that approximately 95,000 acres will be acquired for the reservoir area, of which approximately 90% had been surveyed prior to June 1965. Mineral rights (oil and gas) in general will be left with the original owner.

VI - COMMERCIAL RECREATION

6-01. General. To provide the public with supplies and services that are usually needed for a visit to a water-oriented recreation area, commercial concessions will be developed at strategic locations on the reservoir. These sites will be provided by private capital at or near public-use areas. They may be on project land or on privately owned property. Commercial sites will augment and further stimulate the recreational use of the entire lake; and, where located on project lands, will provide income for operation and maintenance of recreation areas through lease agreements with concessionaires.

6-02. Facilities to be Provided by Concessionaires. It is proposed that commercial services and facilities at or near each major public-use area include the following: rental service for boats and motors; sale of gasoline, fuels and oil, bait, fishing tackle, supplies and equipment, refreshments and ready-to-serve foods; fishing docks for year-round use; and guide service. Additional concessions, including overnight accomodations, restaurants, lodges, recreation halls, rental and dockage for large boats, repair service for boats and motors, riding stables, archery ranges and a golf course, are proposed at strategic locations around the lake. In addition to facilities provided as a direct service or supply to the public, the concessionaire will provide water supply, sanitation, refuse disposal, utilities, additional roads, trails and other constructions necessary for the convenience and safety of the using public.

6-03. Concession Location. Concession sites will be available at each project recreation area; however, it is contemplated that the business opportunity will suggest to the private investor the location that he chooses for his concession. If the concession occupies project lands, the Project Authority will execute reasonable lease agreements and will exercise approval authority for the facilities and modes of operation.

VII - PLAN OF DEVELOPMENT

7-01. General. The plan of development includes seventeen general-use recreation areas located to provide convenient access to the reservoir area, and two small boat-launching sites specifically selected to provide access for fishermen and hunters to the upper reaches of the reservoir. The sites included in this Plan were designed to meet the recreational demands expected to obtain ten years after the reservoir is in operation. It is proposed that the sites be constructed at a rate commensurate with the demands of visiting recreationists. Facilities to be constructed in these areas are those which are necessary for access, health, safety and the most appropriate recreation-type usage.

7-02. Facilities Proposed at Recreation Sites. The development of the recreation areas includes the non-revenue producing facilities commonly found in public parks to provide access, sanitation, water supply, swimming beaches, information or guidance, and to prolong or retain the scenic features for the useful life of the development area. The following features, supplemented by commercial concessions discussed in Section 6, are proposed for construction:

a. Roads with parking. Access road systems will either be a part of the existing primary and secondary road systems, new roads constructed by the State or Counties, or new roads constructed by the Authority.

(1) Primary access and circulatory roads, when constructed by the Authority, are proposed for construction with double bituminous surfacing where traffic volumes justify this type of surfacing. Where dust will be a detriment to the use of camping or picnic areas, roads and parking areas will receive a double bituminous surface treatment.

(2) Secondary roads and low traffic volume roads when constructed by the Authority are proposed to be graded and drained, but not surfaced until warranted by traffic volume.

b. Boat-launching ramps. Boat launching ramps will be constructed with one or more lanes 12 feet wide and 120 to 150 feet long with an optimum twelve percent grade. Adequate turn-arounds and parking will be provided.

c. Sanitation. Sanitation facilities are proposed for tent and trailer camping areas, picnic areas and group camps. In the major public-use areas, vault-type toilet facilities are proposed. At camp sites, outside shower heads will be provided as well. Pit-type toilets are proposed for remote locations where use of the area will not justify vault-type toilet building.

d. Water supply. Potable drinking water will be obtained from drilled wells where feasible, and will be supplied to camping areas, picnic areas, group camps and beach areas. Electric pumps, operated by pressure tanks, and supply lines to toilets, drinking fountains and spigots are proposed.

e. Picnic areas. Picnic areas are designated to provide space and facilities for visitors who come for a one-day outing. Facilities proposed for these areas consist of concrete tables and fireplaces on concrete slabs to facilitate cleaning and maintenance. Refuse cans for disposal of garbage, and cans for other refuse will be placed in picnic areas at locations for the convenience of the picnickers. Group-type shelters are proposed for areas having as many as 225 peak-day picnickers.

f. Camp grounds for tents and mobile trailers. Camp grounds are designated to provide space for visitors who will stay overnight or longer. Such visitors desire separation from each other and from picnickers. Facilities proposed for the camping areas consist of a secondary-type road with individual turnouts for car or car and mobile trailer, a graded tent site, and one table, fireplace and refuse can per site. Water supply and sanitation facilities are to be as designated in subparagraph (c) and (d) above.

g. Group camps. Group camps have been designated at six of the major areas. There is always a need for a day facility to serve groups of Boy Scouts, Girl Scouts, or other groups who tour in caravans. The sites can also be used by small groups from nearby towns. The need is for tent sites apart from general public use. The sites can be further from the lake shore than other types of activities since use of boats is usually not involved. The proposed development consists of a road and a turn-around loop with parking to serve the camping units. A central campfire with tent spaces cleared of brush comprises a unit. Pit-type toilets and a water well complete the needed development of the group camp.

h. Swimming beaches. Swimming beaches are proposed to be operated by others in the major public-use areas. Where possible, sites will be in open fields having sandy soils with moderate slopes both below and above the normal water surface. Proposed improvements consist of grading, clearing, removal of any stumps, roots or vegetation that would be objectionable in the beach area, and, where necessary, the hauling and spreading of sandy material. Sanitation can be provided by a central change house built by a concessionaire, with toilets and a shower. Prior to construction of beach facilities, local agencies will be given the opportunity to assume responsibility for the area and planned development.

i. Other facilities. Signs, markers, buoys, and navigation aids are proposed to give adequate information, directions and guidance to visitors who will use the development areas and the lake area. Signs consist of entrance signs located at the principal roads leading into the development area. Information signs identify the location of facilities, describe the use of the site, such as camp grounds, or list project rules and regulations. Buoys are placed at hazard areas such as obstacles or shallow water. Navigation aids identify deep-water channels, designate slow-speed areas or may identify certain points of land for guidance in navigation.

7-03. Selected Recreation Areas. Selection of sites for recreational development was made with due consideration of the influencing factors discussed in Section 4, and in conformity, as nearly as practicable, with the criteria outlined therein regarding site size, spacing and overall development acreage. Consideration was also given to such factors as road access, slope of the terrain, effect of excessive draw-down of the water level during drought years, attractiveness and suitability for development, property boundaries and land acquisition. Some areas around the reservoir are presently being developed as real estate subdivisions, and active subdivision planning is being carried on in numerous other areas. It was not possible in some instances to find suitable sites on appropriate sections of the lake shore that were not adjacent to lands known to be planned for residential development. Of the numerous sites considered in the study of the reservoir area, seventeen sites were selected for general-use recreational development, and

two small boat-launching areas were selected for access of fishermen and hunters to the upper reaches of the reservoir. The locations of the selected sites are shown on Plate 1. Site acreages, tentatively selected site names, and a summary of the basic recreational facilities planned for each site are shown in Table 9.

Site No.	Park Name	2/ Site Area (ac.)	Group Camp	Picnic Tables	Group Ty Shelter	bins	Other Related Facilities
1	Camilla	115	-	32	2	-	Concession Stand
2	Cold Spring	45	-	13	1	-	Concession Stand
3	Wolf Creek	370	1	103	5	15	Lodge, Marina, Golf Course, Restaurant
4	Paul Horton Memorial	117	-	33	2	12	Concession Stand
5	Point Blank	140	-	39	2	-	Concession Stand
6	Patricks Ferry	300	1	84	3	21	Lodge, Restaurant, Marina, Recreation Hall
7	Staley	115	-	32	2	-	Concession Stand
8	Riverside	390	1	110	6	15	Ball Park, Marina, Restaurant, Lodge, Recreation Hall
9	Trinity	80	-	22	1	-	Concession Stand
10	County Line	1/ 3	-	-	-	-	
11	Glendale	1/ 3	-	-	-	-	
12	White Rock	140	-	39	2	10	Lodge, Restaurant, Marina
13	Caney Creek	300	1	84	5	-	Horseback Riding, Archery, Recreation Hall
14	Carlisle	140	-	39	2	-	Concession Stand
15	Onalaska	50	-	14	1	-	Concession Stand
16	Kickapoo	135	-	38	2	10	Lodge, Restaurant, Marina
17	Blanchard	260	1	72	4	12	Marina, Restaurant, Lodge
18	Tigerville	143	-	32	2	-	Concession Stand
19	Livingston	220	1	64	3	12	Lodge, Restaurant, Marina, Archery, Horseback Riding
		3060	6	850	45	107	

1/ Boat-Launching Site. Acreage lies below g
2/ Site acreage includes only the area above ctual field surveys.

7-04. Description of Recreation Sites. A brief description of each of the selected sites, giving present ownership, acreage, access and other pertinent information, follows. The general location of the proposed sites is shown on Plate 1.

Site No. 1 - Camilla Recreation Park. Camilla Recreation Park site is located on the west shore of the lake about one mile upstream from the dam and one mile north of Camilla. The site is composed of portions of two adjacent tracts of land owned separately by Alma Harrison, et al, and Mrs. John F. Garrott. About 115 acres above the guide taking contour will be included in the park, plus an additional 12.14 acres which lies between the taking contour and the normal water edge. The site is possibly nearer to Houston than any of the other selected recreation areas. It is enhanced further by its proximity to the dam site. Scattered groves of trees and an elevated terrain will provide a pleasing scenic aspect. Access will require either improvement of an existing dirt road to the west or construction of about one-half mile of new road to the south over private property. The proposed plan of development of this recreation site is shown on Plate 3.

Site No. 2 - Cold Spring Recreation Park. Cold Spring Recreation Park site is located on the west shore of the lake about four miles from the dam and three miles northeast of Cold Spring on FM 1514. It consists of about 45 acres of the Hutchings Trust property remaining above the guide taking contour, and an additional 3.76 acres extending to the normal water edge. The site is generally wooded, easily accessible, and provides a variable off-shore slope which is suitable for both swimming and boat-launching.

Site No. 3 - Wolf Creek Recreation Park. Wolf Creek Recreation Park site is located on the west shore of the lake about seven miles from the dam and about five miles north of Cold Spring on the north side of Wolf Creek. Access from near-by FM 224 will be cut off by the Wolf Creek arm of the reservoir, and future access is indefinite pending planning of road relocations in the area. Possibly, construction of about one-quarter mile of new road connecting to FM 224 on the south would be required. The tract is presently owned by Moss Tie Company. It includes about 372 acres above the guide taking contour and 38.22 acres between this contour and the normal water edge. The site is desirable for general recreational development, having a long shoreline, a protected cove on Wolf Creek, a generally elevated terrain and wooded slopes which present a naturalistic affect.

Site No. 4 - Paul Horton Memorial Recreation Park. The Paul Horton Memorial Park site is located on the west shore of the lake about eleven miles from the dam and about two miles southeast of Point Blank on State Highway 156. It will be just north of the Paul Horton Memorial Church. The site is on land owned by Binz J. Settergast and Mary Porta Bodet, amounting to a total of about 117 acres above the guide taking contour. An additional 8.70 acres lie between the guide taking contour and the normal water edge. Wooded slopes, easy access, and a long shoreline, which will not be affected appreciably by lake drawdown, make this a very desirable site for recreational development.

Site No. 5 - Point Blank Recreation Park. The Point Blank Recreation Park site is located on the west shore of the lake about thirteen miles from the dam and one mile northeast of Point Blank on FM 1909. The existing highway will be inundated by the reservoir and access to the Park will depend upon relocation of highways in the area. The site includes parts of two tracts of land, one owned by W. W. Butler and the other by A. B. Moorehead. Above the guide taking contour are approximately 140 acres of land, and about 16 acres lie between this contour and normal lake level. This peninsular-shaped area is about 70 percent wooded. It will have an unusually long shoreline with two protected coves and good water depth, and command a view of almost the entire main body of the reservoir.

Site No. 6 - Patricks Ferry Recreation Park. The Patricks Ferry Recreation Park site is located on the west side of the lake about fourteen miles from the dam and about five miles northeast of Point Blank. A long section of the shoreline is adjacent to the natural bank of the Trinity River, offering an opportunity for mooring the deeper draft boats and pleasure crafts which should frequent the lake after completion of the Trinity Barge Canal. Present access is over a light duty road leading from FM 1909. This location was selected on the assumption that U. S. Highway 190 will be relocated in this immediate vicinity and that the site would attract numerous visitors by virtue of its accessibility. If U. S. 190 should cross the reservoir at another location, then this site, reduced somewhat in size, would be served

from some relocation of FM 1909. It would then be desirable to acquire a large acreage at the terminus of the highway crossing. The site contains about 300 acres belonging to Southland Paper Mills, Inc.. It is almost entirely wooded and has a long irregular shoreline which will not be appreciably affected by lake drawdown. The plan of development of this park site is shown on Plate 4.

Site No. 7 - Staley Recreation Park. The Staley Recreation Park site is located on the west side of the lake about twenty miles above the dam and ten miles east of Riverside. This site is located on the Gibbs Brothers and Company property. Although remote from main traveled roads, the site was selected to fill a need for a public access point in the long reach of shoreline between Patricks Ferry and Riverside. Extension of either FM 980 or FM 946 will be necessary to provide permanent access to the site. The 115-acre peninsular area selected is beautifully wooded with a long irregular shoreline and good water depth. It should be excellent for camping, picnicking and boating.

Site No. 8 - Riverside Recreation Park. The Riverside Recreation Park site is located on the west side of the lake and on the western outskirts of Riverside. This site fronts on the north side of FM 980 and on the west side of State Highway 19. It comprises about 15 acres of the Missouri Pacific Railroad property and about 375 acres of uplands which will be severed from the State Prison Farm lands by reservoir inundation. It is hoped that the State will relinquish this area for recreational development. Its size, accessibility and topography are most desirable for a general-use recreation area.

Site No. 9 - Trinity Recreation Park. The Trinity Recreation Park site is located on the east side of the lake about four miles south of Trinity and adjacent to State Highway 19. This site contains approximately 80 acres out of the C. A. Boaz property. It is heavily wooded and will provide deep water along much of its shoreline.

Site No. 10 - County Line Boat-Launching Area. The County Line Boat-Launching site is located near the upper end of the lake about four miles west of Trinity. It is on the north bank of the Trinity River and just east of the Walker County-Trinity County line. Land access to the upper reaches of the reservoir will be somewhat limited. The proposed navigation canal along the Trinity River will provide deep water up to Lock and Dam No. 6, to be located about three miles upstream from this site. It was selected primarily as a boat-launching area for access to these deep waters by fishermen and boaters. The site is approximately three acres in size, and would be located on project lands between the normal water level and the guide taking contour. One launching ramp and a few camping facilities would comprise the development. Road access would be over an existing dirt road which connects with FM 230.

Site No. 11 - Glendale Boat-Launching Area. The Glendale Boat-Launching Site is located about three miles northeast of Trinity on State Highway 94 at White Rock Creek. The site will provide access for sportsmen to the upper reaches of the White Rock Creek arm of the reservoir. A boat-launching ramp and a few picnic facilities will comprise the improvements. The site will be about three acres in size located on project lands between normal water level and the taking line. The land is now owned by Southland Paper Mills, Inc..

Site No. 12 - White Rock Recreation Park. The White Rock Recreation Park site is located on the White Rock Creek arm of the lake and adjacent to FM 356. It is about six miles east of the town of Trinity. About 140 acres are included in this heavily wooded park site. It includes parts of two ownerships, Southland Paper Mills, Inc., and the S. E. Barnes Estate. This scenic site will provide public access to the White Rock Creek Arm of the lake which is one of the more beautiful areas on Livingston Reservoir. Good water depth and remoteness from the main body of the reservoir should make this an excellent water sports area. The plan of development is shown on Plate 5.

Site No. 13 - Caney Creek Recreation Park. Caney Creek Recreation Park site is located on the Caney Creek arm of the lake about one mile northwest of Sebastopol. This site occupies about 300 acres of the Southland Paper Mills property. Its long irregular shoreline provides good water depth and its wooded confines will afford a scenic park site. The site is planned for a major camping development. It will be necessary to construct an access road to FM 355. A suggested location for the access road is along the West Texas Gulf Pipeline right-of-way.

Site No. 14 - Carlisle Recreation Park. Carlisle Recreation Park site is located on the east side of the lake and on the Harts Creek arm. It is about one mile southwest of Carlisle and about twenty miles above the dam. The area contains about 140 acres, now owned by Southland Paper Mills and Herbert C. Ogden, and is accessible by way of a light duty road off FM 356. Gentle to moderately sloping terrain with excellent water frontage and a protected cove, make this area desirable for recreational development.

Site No. 15 - Onalaska Recreation Park. Onalaska Recreation Park site is located on the east side of the lake about seventeen miles above the dam. It is located about one mile northwest of Onalaska. The site was selected on the assumption that U. S. Highway 190 will be relocated to cross the lake in this immediate vicinity, thereby making the site easily accessible to tourists as well as local visitors. Groves of large trees on moderately sloping terrain further enhance the recreational value of this 50-acre site. It is now owned by Harold B. Andrews.

Site No. 16 - Kickapoo Recreation Park. Kickapoo Recreation Park site is located on the east side of the Kickapoo arm of the lake about three miles east of Onalaska. Access is presently over a light duty road, but it is anticipated that either U. S. Highway 190 or FM 356 will be relocated in this immediate vicinity. The site contains about 100 acres, most of which is owned by Southland Paper Mills, Inc.. The remaining portion is made up of small acreages from adjacent properties which will be severed by the reservoir. The selected park area is peninsular in shape, with a long irregular shoreline, good water depth, protected coves, and a wooded, moderately sloping terrain which is desirable for recreational development. The plan of development is shown on Plate 6.

Site No. 17 - Blanchard Recreation Park. Blanchard Recreation Park site is located on the east side of the lake about eight miles above the dam. It is on existing U. S. Highway 190 about one mile west of Blanchard. This site will provide a long shore line with both deep and shallow water. It will consist of about 260 acres of the Southland Paper Mills property. The park land is in two segments adjacent to, and connected by, existing U. S. Highway 190, providing excellent access. The terrain

south of the highway is gently sloping, while the area on the north side has steeper slopes and is more rugged in appearance.

Site No. 18 - Tigerville Recreation Park. Tigerville Recreation Park site is located on the east side of the lake about six miles above the dam. It is located about one mile south of Blanchard on a light duty road. This wooded site contains about 143 acres, which is presently under two ownerships, John W. Luker and A. A. Klein. The uplands are relatively flat with moderate slopes to an irregular shoreline. Good water depth and a protected cove provide a desirable boating area.

Site No. 19 - Livingston Recreation Park. Livingston Recreation Park site is located on the east shore about one mile above the dam. It is located adjacent to FM 1968 and about six miles southwest of Livingston. This 220-acre tract will attract numerous visitors because of its accessibility and its heavily wooded cover. The tract covers land owned by Southland Paper Mills and small severed acreages out of an adjacent ownership on the west. The plan of development of this site is shown on Plate 7.

7-05. Additional Areas. At the date of this report (August 1965), no lands for recreational purposes have been acquired. There will undoubtedly be areas adjacent to the land acquired for reservoir right-of-way that will be purchased to reduce severance damages. Any land purchased that is excess to reservoir right-of-way requirements should be examined, and if found suitable, it should be reserved for future recreational development.

7-06. Schedule of Development. Records of visitors to lakes in the general vicinity of Livingston Reservoir, and Corps of Engineer criteria for estimating recreational requirements indicate that the nineteen sites described in paragraph 7-04 will be required during the first ten years of reservoir operation. Five sites are recommended to be constructed during the first year. The construction of the remaining sites will be governed by the time when actual attendance indicates that additional sites are needed and when construction funds become available. A schedule showing a sequence of site development designed to meet anticipated requirements is given on Table 10.

TABLE 10

SCHEDULE OF DEVELOPMENT

	Site No.	Site Name	Site Acreage
Stage I (1st Year of Operation):	1	Camilla	115
	6	Patricks Ferry	300
	12	White Rock	140
	16	Kickapoo	135
	19	Livingston	220
		Sub-total	910
Stage II (Estimated 2nd to 3rd Year of Operation):	2	Cold Spring	45
	3	Wolf Creek	370
	4	Paul Horton Memorial	117
	8	Riverside	390
	11	Glendale	3 *
	14	Carlisle	140
	17	Blanchard	260
		Sub-total	1,322
Stage III (Estimated 3rd to 10th Year of Operation):	5	Point Blank	140
	7	Staley	115
	9	Trinity	80
	10	County Line	3 *
	13	Caney Creek	300
	15	Onalaska	50
	18	Tigerville	143
		Sub-total	828
		Total Area	3,060

* Boat-Launching Site. Acreage lies below guide taking contour, and is not included in totals.

7-07. Functional Plans for Recreation Parks. General plans have been prepared for the five recreation sites scheduled for first-year development. These plans are shown on Plates 3 through 7. The plans were prepared with the aid of U. S. Geological Survey maps and aerial photographs. In addition to the recreation facilities shown on the plans, all necessary supporting facilities will be included, i.e., water system, sewage system, maintenance and operation facilities, etc.. The sites will be fenced, and where necessary, perimeter firebreaks will be constructed adjacent to high-value timberland.

7-08. The layout of facilities for these five sites is typical of current plans for development of the other recreation sites at the reservoir although the layout of each individual site will depend upon the actual acreage acquired, field surveys of the terrain, and the trend of public interest toward particular types of recreational activities at the time of construction.

VIII - FINANCIAL

8-01. General. Plans for financing the construction and operation of the recreational facilities proposed in this report can only be classed as tentative at this time. It is presently planned that the land for the sites be acquired as a part of the general land acquisition program with project funds. Clearing of the reservoir within one mile of the seventeen general-use recreation areas, and clearing of boating lanes is considered a part of the overall cost of the reservoir. The cost of clearing these areas is included in general construction costs. Any additional clearing will be accomplished with separate funds. In view of the recreational interest expressed locally, it is hoped that the responsibility for development and operation of some of the planned recreation sites will be accepted by local governments. The course the Authority must take in arranging permanent financing for the recreational program will depend a great deal upon the availability of Federal funds through the "Land and Water Conservation Fund Act of 1965" (Public Law 88-578). This act creates a fund from which Congress can make appropriations to provide urgently needed public outdoor recreation areas and facilities. States and certain Federal agencies are eligible to receive money from this fund, although grants to States may not exceed 50 percent of the cost of planning, acquisition or development projects. The States may allocate portions of the money they receive to their political subdivisions. In Texas, this will be on a "matching fund" basis.

8-02. An Act passed by the last session of the Texas Legislature (S. B. 165) designates the Parks and Wildlife Department of the State of Texas as the State Agency to cooperate with the Federal Government in the administration of the provisions of any federal assistance program oriented toward outdoor recreation, and specifically to cooperate with the Federal Government in the administration of the provisions of the "Land and Water Conservation Fund Act of 1965", (Public Law 88-578). Also, among other things, it adds to the purposes and functions of river authorities and certain other political subdivisions, the acquisition of lands for recreation purposes, construction, operation, maintenance, etc. of recreation areas, and the right to enter into agreements with Federal Agencies and others on subjects pertaining to Outdoor Recreation. For ease of reference, a portion of Section 1, S. B. 165, is quoted as follows:

> "Section 1. The Parks and Wildlife Department of the State of Texas is hereby designated as the State Agency to cooperate with the Federal Government in the administration of the provisions of any federal assistance programs for the planning, acquisition, operation, and development of the outdoor recreation resources of the state, including the acquisition of lands and waters and interests therein, and specifically to cooperate with the Federal Government in the administration of the provisions of the "Land and Water Conservation Fund Act of 1965" (Public Law 88-578) effective January 1, 1965, and any amendments which may be added thereto from time to time, in the event no other State Agency is by law designated to cooperate with the Federal Government in the administration of the provisions of such Act or other Acts which may be hereafter enacted by the Congress.
>
> The Parks and Wildlife Department is directed to enact and promulgate such rules and regulations as may be necessary to effect the cooperation as herein outlined and designated. The parks and Wildlife Department is hereby authorized and directed to cooperate with the proper departments of the Federal Government and with all other departments of the state and local governments

including as a part of a state plan water districts, river authorities, and special districts in outdoor recreation in the enforcement and administration of the provisions of the Federal Acts and any Amendments thereto and in compliance with the rules and regulations issued thereunder in the manner prescribed in this Act or as otherwise provided by law. It is the intent of the Legislature to add to the purposes, functions and duties of river authorities and water districts or other political subdivisions organized under Article III, Section 52, or Article XVI, Section 59, of the Constitution of Texas, and counties, to acquire lands for public recreation purposes, to construct thereon facilities for public use, to provide for the operation, maintenance and supervision of such public recreation areas, and to enter into agreements with other local, state or Federal Agencies for planning, construction, maintenance, and operation of such facilities, together with necessary access roads thereto, and to maintain adequate sanitary standards on the land and water areas as a part of and adjacent to such recreation areas."

8-03. Estimated Cost of Recreational Facilities. It is estimated that the development of the nineteen recreation sites discussed in Section 7 will cost $4,456,100, exclusive of land cost. General details of this estimate are given in Table 11. Included in the estimate are costs of park roads and facilities, vehicles and maintenance equipment and access roads, together with provisions for contingencies, engineering, legal and fiscal costs and interest during construction. Not included in the estimate are the costs of facilities expected to be constructed by concessionaires, including lodges, cabins, restaurants, recreation halls, bath change houses, marinas, golf course, riding stables, archery ranges and other concessions. Nor is the cost of land included in the estimate. As stated previously, land for the recreation sites will be acquired with project funds.

8-04. Development of the project would be spread out over approximately 10 years in accordance with the schedule of development shown in Table 10. The initial investment includes the cost of construction of site numbers 1, 6, 12, 16 and 19 with access roads, and most of the project vehicles and maintenance equipment. Investments required through pertinent years of reservoir operation, together with annual debt service, based on financing by 30-year bonds at 4% interest, is tabulated below:

ESTIMATE OF TOTAL AND ANNUAL COSTS
FOR RECREATION SITE DEVELOPMENT

Year of Operation	No. of Parks	Accumulated Total Investment	Annual Debt Service
1	5	$1,169,700	$ 67,700
3	12	2,784,700	161,100
10	19	3,885,800	224,600

TABLE 11

COST ESTIMATE - RECREATION FACILITIES
(10th Year)

Site No.	Area in Acres	Park Construction	Vehicles & Equipment	Access Roads	Total
1	115	$ 119,700	-	-	$ 119,700
2	45	59,000	-	-	59,000
3	370	337,000	-	-	337,000
4	117	128,900	-	-	128,900
5	140	138,500	-	-	138,500
6	300	294,400	-	-	294,400
7	115	119,000	-	-	119,000
8	390	346,500	-	-	346,500
9	80	77,400	-	-	77,400
10	3	4,300	-	-	4,300
11	3	4,300	-	-	4,300
12	140	136,800	-	-	136,800
13	300	286,500	-	-	286,500
14	140	138,000	-	-	138,000
15	50	61,600	-	-	61,600
16	135	131,300	-	-	131,300
17	260	244,700	-	-	244,700
18	143	124,400	-	-	124,400
19	220	210,100	-	-	210,100
General	-	-	$ 88,800	$ 131,500	220,300
Sub-totals	3,066	$2,962,400	$ 88,800	$ 131,500	$3,182,700
Contingencies		296,200	8,900	13,200	318,300
Sub-totals		$3,258,600	$ 97,700	$ 144,700	$3,501,000
Engineering, Legal, Fiscal		228,000	1,000	10,100	239,100
Sub-totals		3,486,600	98,700	154,800	3,740,100
Interest During Construction		139,500	-	6,200	145,700
TOTALS		$3,626,100	$ 98,700	$ 161,000	$3,885,800

Note: Cost of land is not included in estimate.

8-05. Operation and Maintenance Cost. Estimated costs of operation and maintenance of recreational facilities was developed by establishing a proposed schedule of personnel and salary rates, and a schedule of vehicles and maintenance equipment together with their annual costs of operation and maintenance. Annual costs are based on the proposal that supervision and maintenance of park roads, signs and public-use facilities be accomplished by scheduled personnel, and that mowing and clean-up be done on a contractural basis. Costs of administration of the parks and facilities are also included in the estimate. By the tenth year of reservoir operation, annual operation and maintenance of nineteen recreation sites is estimated to cost $141,700. Details of the operation and maintenance estimates are given in the following table.

RECREATION FACILITIES - OPERATION AND MAINTENANCE COSTS

Salary Costs		
1	Superintendent	$ 12,000
1	Clerk-typist	4,000
2	Ranger	10,000
1	Mechanic	5,200
2	Foreman	10,400
2	Truck and Bulldozer Operators	7,800
8	Laborers	22,800
	Sub-total, Salaries	$ 72,200
Non-Salary Costs		
	Transportation	17,000
	Boat and Equipment Operation	23,000
	Utilities and Office Supplies	7,500
	Mowing and Cleanup (Contracted)	22,000
	Sub-total, Non-Salary Costs	$ 69,500
	TOTAL	$ 141,700

Estimated operation and maintenance costs for pertinent years of reservoir operation appear below.

Year of Operation	No. of Sites	Annual Operating and Maintenance Expense
1	5	$ 84,000
3	12	120,000
10	19	141,700

HOUSTON CO.

WALKER CO.

TRINITY CO.

SAN JACINTO CO.

POLK CO.

GLENDALE

TRINITY

CHITA

SEBASTOPOL

CARLISLE

ONALASKA

KICKAPOO

POINT BLANK

OAKHURST

STEPHEN CREEK

RIVERSIDE

COUNTRY CAMPUS

DODGE

HUNTSVILLE

BLANCHARD

LIVINGSTON

COLD SPRING

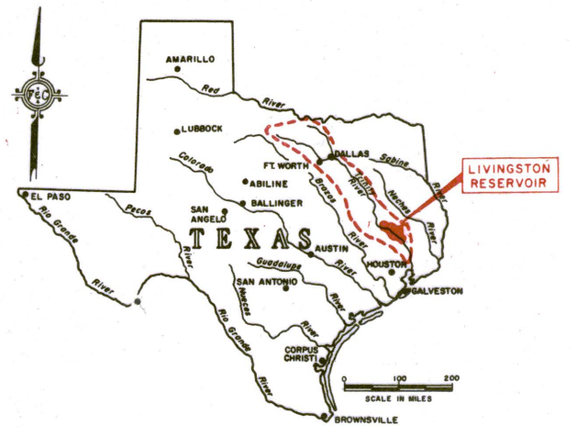
LIVINGSTON DAM

CAMILLA

Corps of Engineers
Lock & Dam Site No.6

MISSOURI PACIFIC

LOCATION MAP



LIVINGSTON RESERVOIR

Storage Capacity - 1,795,000 Ac.Ft.
Surface Area ----- 82,250 Acres
------- 129 Sq. Mi.
Length ---------- 52 Miles
Maximum Depth ------- 90 Feet

LEGEND

- RESERVOIR AT ELEVATION 131.0
- RESERVOIR CLEARING FOR RECREATIONAL PURPOSES
- CLEARING MAIN CHANNEL
- CLEARING ACCESS CHANNELS
- (7) RECREATION SITE
- U.S. & STATE HIGHWAY (PAVED)
- COUNTY ROAD (GRAVEL OR GRADED DIRT)
- UNIMPROVED ROAD OR TRAIL
- RAILROAD
- PIPE LINE
- POWER LINE

0 1/2 1 2 3 4 5
SCALE IN MILES

TRINITY RIVER AUTHORITY OF TEXAS

LIVINGSTON DAM AND RESERVOIR

MASTER PLAN
FOR RESERVOIR RECREATIONAL DEVELOPMENT

RESERVOIR AREA RECREATION PLAN

FORREST AND COTTON, INC.
CONSULTING ENGINEERS
DALLAS, TEXAS

FILE: 538-19-01

DATE: AUGUST, 1965

PLATE NO. 1

PROPOSED ACCESS ROAD.
IMPROVE EXISTING ROAD.

Park Entrance

BEACH

CHANGE HOUSE

SHELTER

CONSESSION STAND

PICNIC AREA

BOAT LAUNCHING RAMP (2 LANES)

BOAT DOCK

25 TENT SITES

12 TRAILER SITES

8 TRAILER SITES

SHELTER

PICNIC AREA

FISHING PIER

115 ACRES

Livingston Reservoir

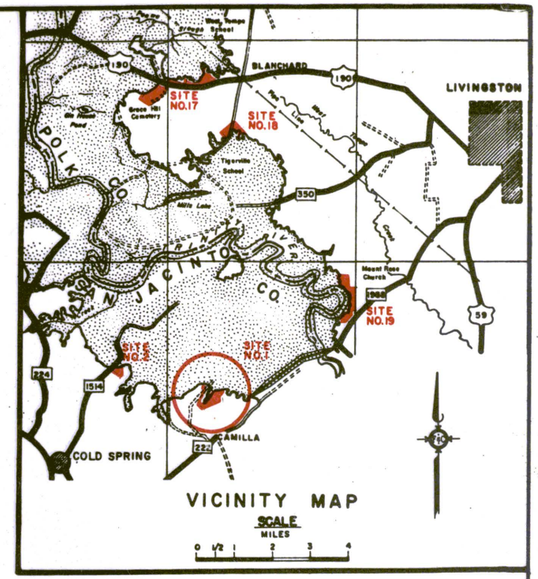
W. B. Mitchell

Mrs. John F. Garrett

Alma Harrison, et al

W. A. McElhannon, et al

205



VICINITY MAP

SCALE
MILES
0 1/2 1 2 3 4

LEGEND

131 — NORMAL WATER SURFACE
UPPER BOUNDARY OF PARK
PROPERTY LINE
John Doe — PRESENT LAND OWNER
COMFORT STATION - PIT TYPE
COMFORT STATION - VAULT TYPE

200 0 200 400 600 800
SCALE IN FEET

TRINITY RIVER AUTHORITY OF TEXAS

LIVINGSTON DAM AND RESERVOIR

MASTER PLAN
FOR RESERVOIR RECREATIONAL DEVELOPMENT

CAMILLA RECREATION PARK SITE NO. 1

PLAN OF DEVELOPMENT

FORREST AND COTTON, INC.
CONSULTING ENGINEERS
DALLAS, TEXAS

FILE: 538-19-03

DATE: AUGUST, 1965

PLATE NO 3

Livingston Reservoir

Trinity River

FISHING PIER

FISHING PIER

LODGE AND RESTAURANT

PARKING (100 CARS)

RECREATION HALL

21 CABINS

BOAT LAUNCHING RAMP (3 LANES)

PICNIC AREA

SHELTER

40 TRAILER SITES

MARINA

32 TRAILER SITES

PICNIC AREA

PARKING

300 ACRES

GROUP CAMP

PRESUMED RELOCATION OF U.S. HIGHWAY 190

Park Entrance

WILDERNESS AREA

Southland Paper Mill, Inc.

Southland Paper Mill, Inc.

Earnest Liggins, et ux

Will Hill

VICINITY MAP

SCALE MILES

0 1/2 1 2 3 4

SITE NO.14 CARLISLE

TRINITY CO.

POLK CO.

SITE NO.15

SITE NO.6

ONALASKA

SITE NO.16

KICKAPOO

SITE NO.5

POINT BLANK

BLANCHARD

SITE NO.17

SITE NO.4

SITE NO.18

LEGEND

- 131 NORMAL WATER SURFACE
- UPPER BOUNDARY OF PARK
- PROPERTY LINE
- John Doe PRESENT LAND OWNER
- p COMFORT STATION - PIT TYPE
- v COMFORT STATION - VAULT TYPE

200 0 200 400 600 800

SCALE IN FEET

TRINITY RIVER AUTHORITY OF TEXAS

LIVINGSTON DAM AND RESERVOIR

MASTER PLAN
FOR RESERVOIR RECREATIONAL DEVELOPMENT

PATRICKS FERRY RECREATION PARK SITE NO. 6

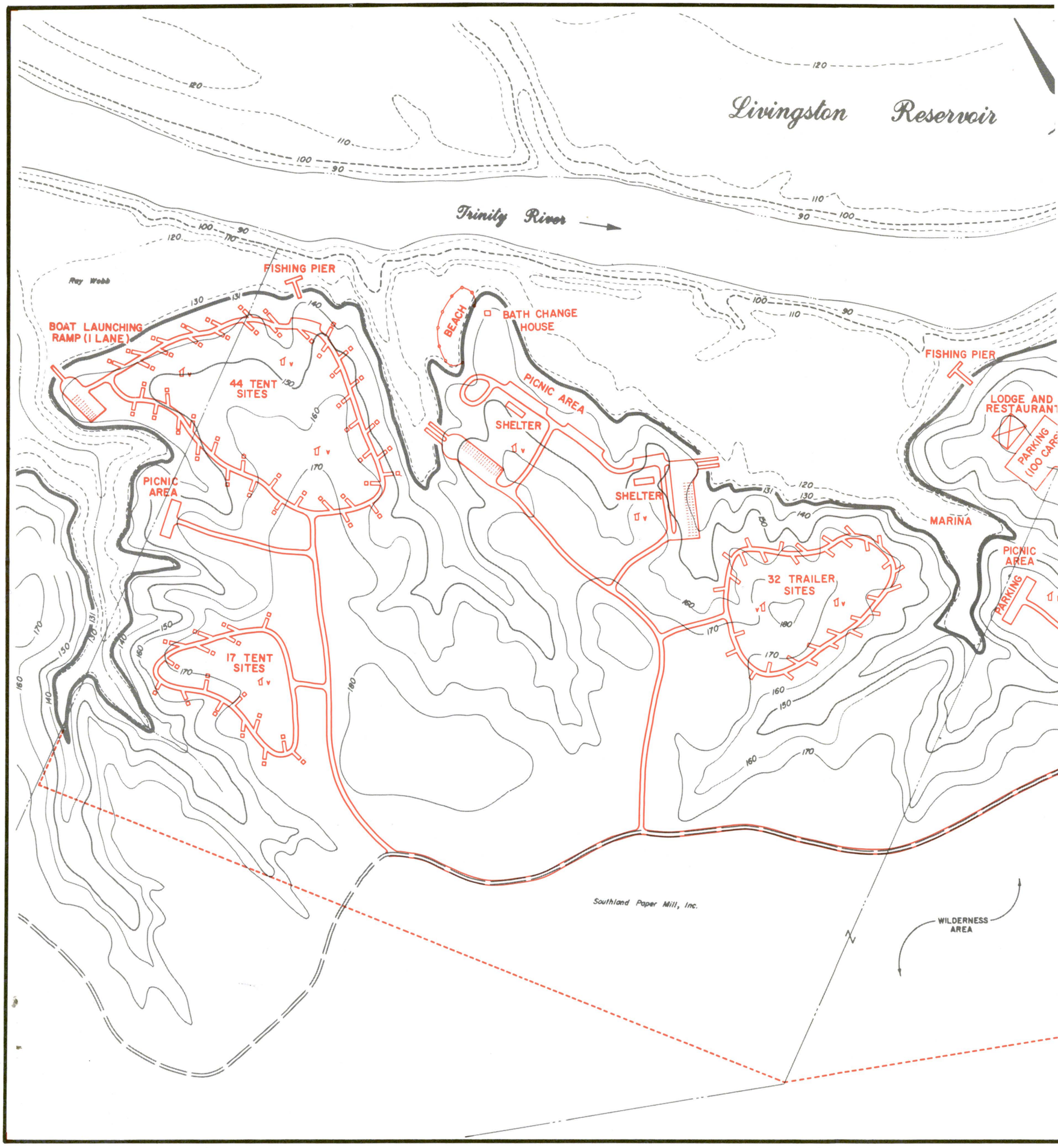
PLAN OF DEVELOPMENT

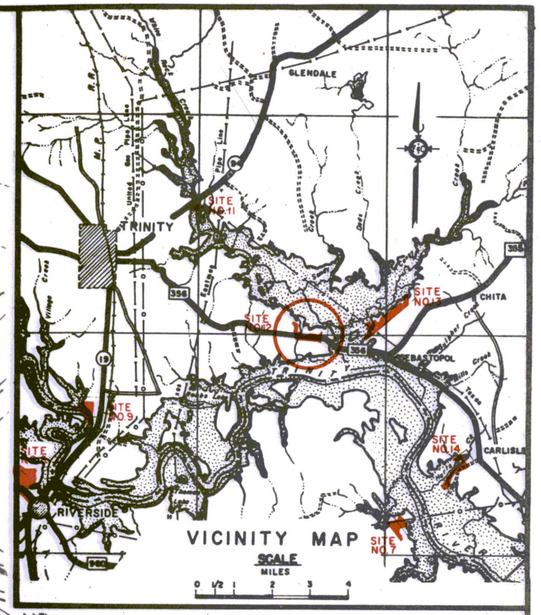
FORREST AND COTTON, INC.
CONSULTING ENGINEERS
DALLAS, TEXAS

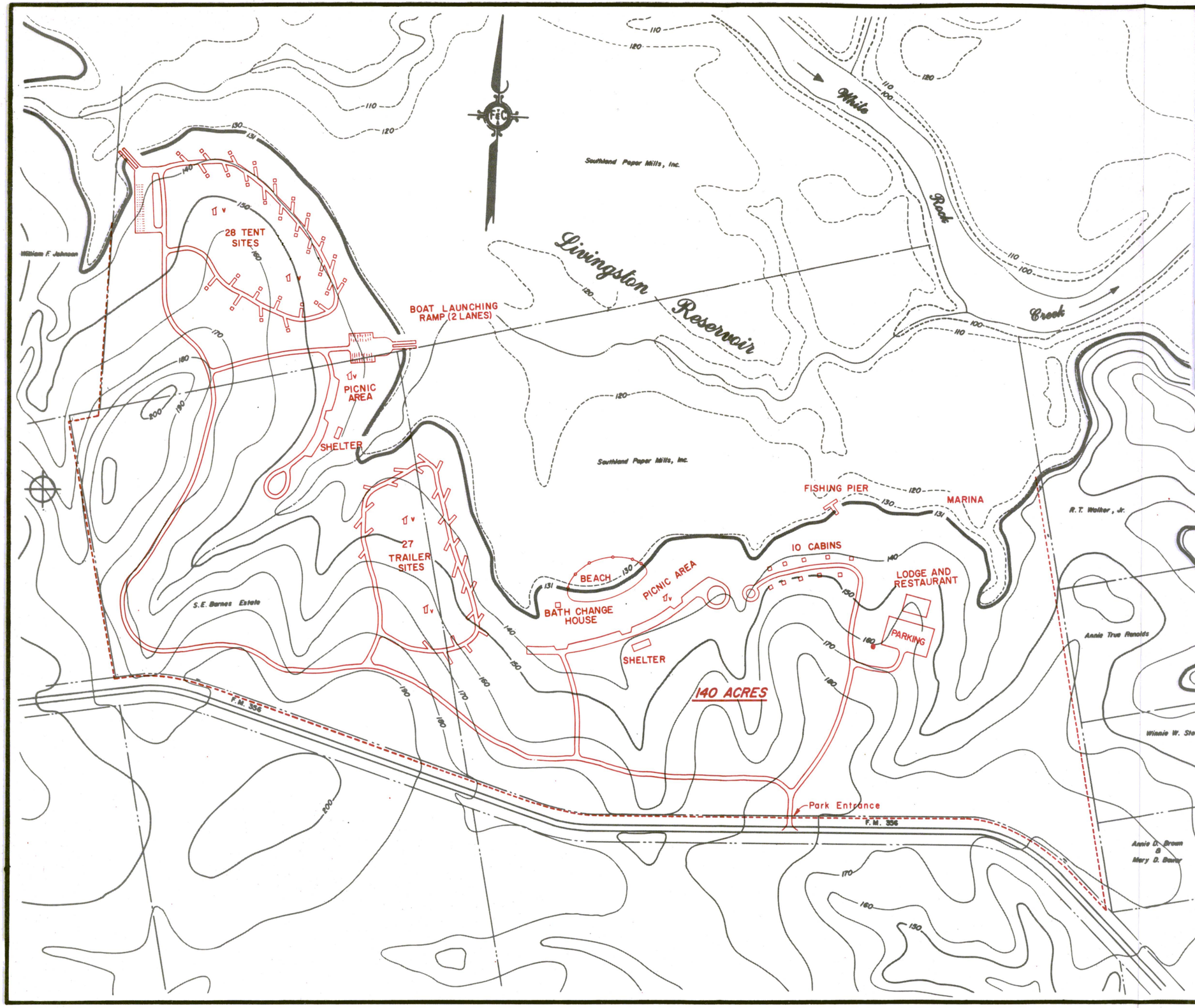
FILE 538-19-04

DATE AUGUST, 1965

PLATE NO 4


Livingston Reservoir
Trinity River
Ray Webb
FISHING PIER
BOAT LAUNCHING RAMP (1 LANE)
44 TENT SITES
PICNIC AREA
BEACH
BATH CHANGE HOUSE
PICNIC AREA
SHELTER
SHELTER
FISHING PIER
LODGE AND RESTAURANT
PARKING (100 CARS)
MARINA
PICNIC AREA
PARKING
32 TRAILER SITES
17 TENT SITES
Southland Paper Mill, Inc.
WILDERNESS AREA





LEGEND

- 131 — NORMAL WATER SURFACE
- ---------- UPPER BOUNDARY OF PARK
- —————— PROPERTY LINE
- John Doe — PRESENT LAND OWNER
- COMFORT STATION - PIT TYPE
- COMFORT STATION - VAULT TYPE

200 0 200 400 600 800
SCALE IN FEET

TRINITY RIVER AUTHORITY OF TEXAS

LIVINGSTON DAM AND RESERVOIR

MASTER PLAN
FOR RESERVOIR RECREATIONAL DEVELOPMENT

WHITE ROCK RECREATION PARK
SITE NO. 12

PLAN OF DEVELOPMENT

FORREST AND COTTON, INC.
CONSULTING ENGINEERS
DALLAS, TEXAS

FILE: 538-19-05

DATE: AUGUST, 1965

PLATE NO. 5

Livingston Reservoir

Tom P. Wright Estate

Sandy Creek

Brodie Jones

J. A. Hensley

COUNTY RD.

21 TRAILER SITES

18 TENT SITES

BEACH

SHELTER

CHANGE HOUSE

PICNIC AREA

BOAT LAUNCHING RAMP (2 LANES)

Park Entrance

PRESUMED RELOCATION OF EITHER U.S. 190 OR F.M. 356

10 CABINS

135 ACRES

LODGE & RESTAURANT

FISHING PIER

PARKING AREA

Kickapoo Creek

FISHING PIER

MARINA

BOAT LAUNCHING RAMP (2 LANES)

SHELTER

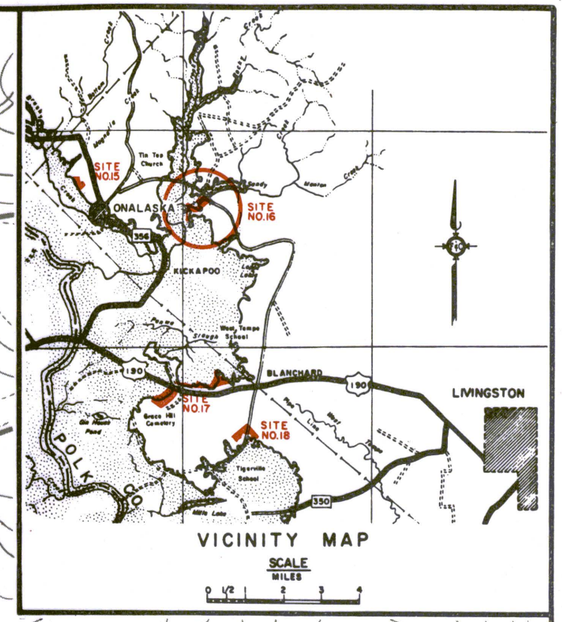
PICNIC AREA

Southland Paper Mills, Inc.

Guy Stewart

J. J. Burriss

Ernest Router, Jr. & R. C. Thomas



VICINITY MAP

SCALE MILES

0 1/2 1 2 3 4

LEGEND

- 131 — NORMAL WATER SURFACE
- UPPER BOUNDARY OF PARK
- PROPERTY LINE
- John Doe — PRESENT LAND OWNER
- p — COMFORT STATION - PIT TYPE
- v — COMFORT STATION - VAULT TYPE

200 0 200 400 600 800

SCALE IN FEET

TRINITY RIVER AUTHORITY OF TEXAS

LIVINGSTON DAM AND RESERVOIR

MASTER PLAN
FOR RESERVOIR RECREATIONAL DEVELOPMENT

KICKAPOO RECREATION PARK SITE NO. 16

PLAN OF DEVELOPMENT

FORREST AND COTTON, INC.
CONSULTING ENGINEERS
DALLAS, TEXAS

FILE 538-19-06

DATE AUGUST, 1965

PLATE NO. 6

Livingston Reservoir

Trinity River

M.T. Potts & J.S. Holleman

Southland Paper Mills, Inc.

FISHING PIER

PICNIC AREA

SHELTER

BEACH

CHANGE HOUSE

32 TENT SITES

BOAT LAUNCHING RAMP (2 LANES)

PICNIC AREA

SHELTER

13 TENT SITES

17 TRAILER SITES

15 TRAILER SITES

FISHING PIER

PICNIC AREA

SHELTER

13 TRAILER SITES

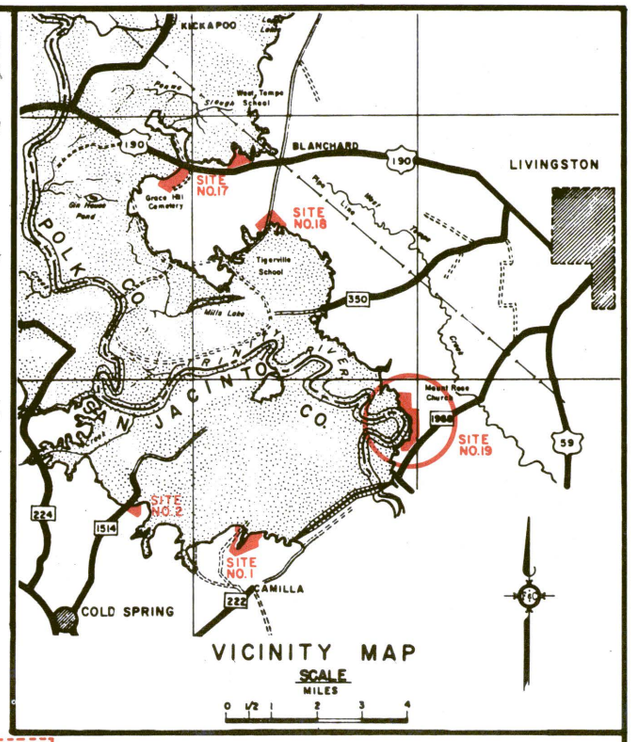
LODGE AND RESTAURANT

12 CABINS

ARCHERY

HORSEBACH RIDING STABLES

220 ACRES



VICINITY MAP

SCALE MILES

0 1/2 1 2 3 4

LEGEND

- 131 — NORMAL WATER SURFACE
- UPPER BOUNDARY OF PARK
- PROPERTY LINE
- John Doe — PRESENT LAND OWNER
- p — COMFORT STATION - PIT TYPE
- v — COMFORT STATION - VAULT TYPE

200 0 200 400 600 800

SCALE IN FEET

TRINITY RIVER AUTHORITY OF TEXAS

LIVINGSTON DAM AND RESERVOIR

MASTER PLAN
FOR RESERVOIR RECREATIONAL DEVELOPMENT

LIVINGSTON RECREATION PARK
SITE NO. 19

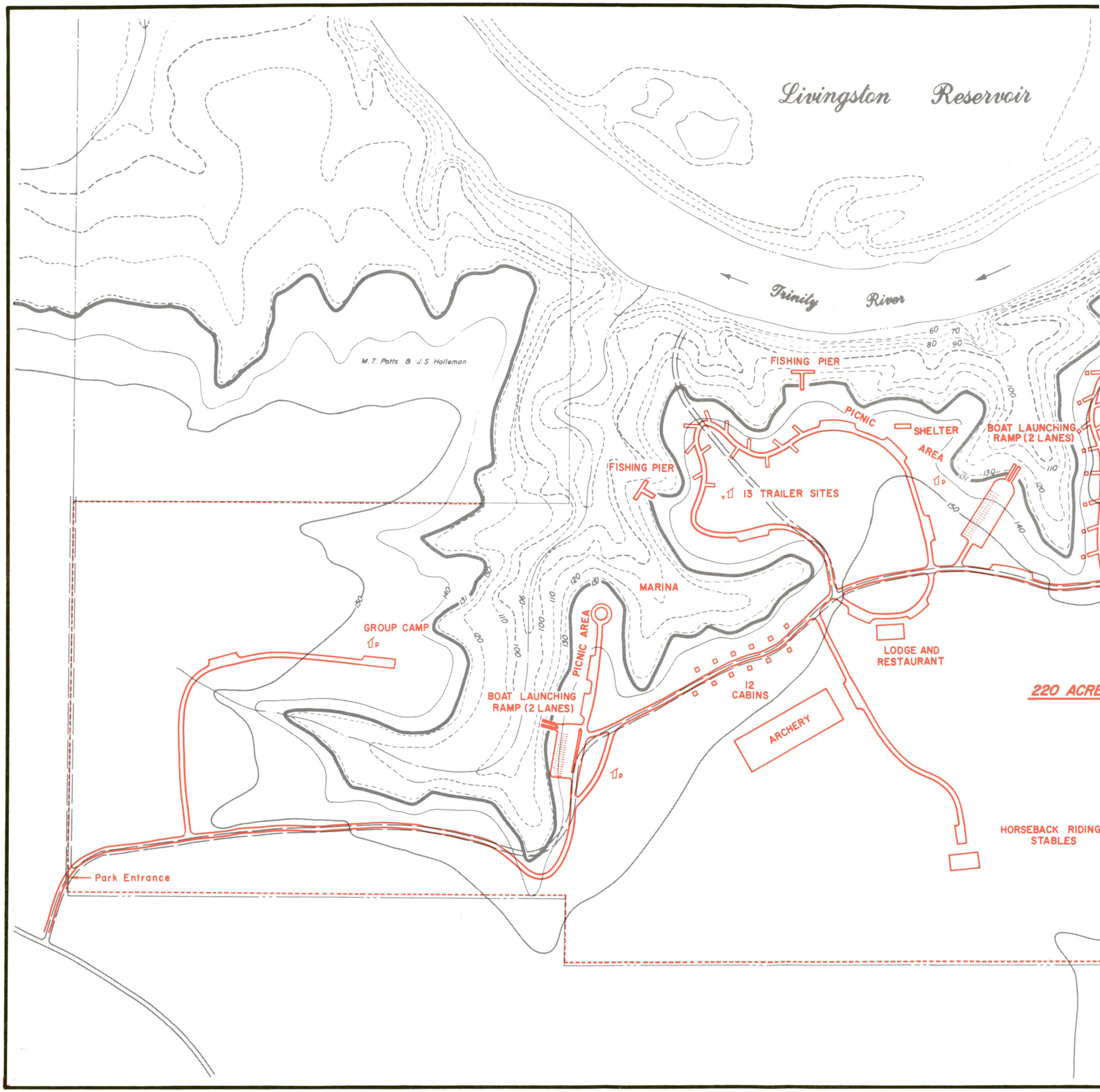
PLAN OF DEVELOPMENT

FORREST AND COTTON, INC.
CONSULTING ENGINEERS
DALLAS, TEXAS

FILE: 538-19-07

DATE AUGUST, 1965

PLATE NO 7


Livingston Reservoir
Trinity River
M.T. Potts & J.S. Holleman
FISHING PIER
PICNIC AREA
SHELTER
BOAT LAUNCHING RAMP (2 LANES)
FISHING PIER
13 TRAILER SITES
MARINA
GROUP CAMP
PICNIC AREA
BOAT LAUNCHING RAMP (2 LANES)
LODGE AND RESTAURANT
12 CABINS
ARCHERY
HORSEBACK RIDING STABLES
Park Entrance
220 ACRE