Form No. 10-306 (Rev. 10-74)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES INVENTORY -- NOMINATION FORM

FOR FEDERAL PROPERTIES

FOR NPS USE ONLY
RECEIVED JUL 26 1979
DATE ENTERED OCT 31 1979

SEE INSTRUCTIONS IN *HOW TO COMPLETE NATIONAL REGISTER FORMS*
TYPE ALL ENTRIES -- COMPLETE APPLICABLE SECTIONS

1 NAME

HISTORIC: Ocoee Hydroelectric Plant Number Two

AND/OR COMMON: Ocoee Number Two or Number Two

2 LOCATION

STREET & NUMBER: U. S. Highway Number 64 — __NOT FOR PUBLICATION

CITY, TOWN: Ocoee — __ VICINITY OF — CONGRESSIONAL DISTRICT: 3

STATE: Tennessee — CODE: 47 — COUNTY: Polk County — CODE: 139

3 CLASSIFICATION

CATEGORY	OWNERSHIP	STATUS	PRESENT USE	
__DISTRICT	X PUBLIC	X OCCUPIED	__AGRICULTURE	__MUSEUM
X BUILDING(S)	__PRIVATE	__UNOCCUPIED	__COMMERCIAL	__PARK
X STRUCTURE	__BOTH	__WORK IN PROGRESS	X EDUCATIONAL	__PRIVATE RESIDENCE
__SITE	**PUBLIC ACQUISITION**	**ACCESSIBLE**	__ENTERTAINMENT	__RELIGIOUS
__OBJECT	__IN PROCESS	X YES: RESTRICTED	X GOVERNMENT	__SCIENTIFIC
	__BEING CONSIDERED	__YES: UNRESTRICTED	X INDUSTRIAL	__TRANSPORTATION
		__NO	__MILITARY	__OTHER:

4 AGENCY

REGIONAL HEADQUARTERS: *(If applicable)* Tennessee Valley Authority

STREET & NUMBER:

CITY, TOWN: Knoxville — __ VICINITY OF — STATE: Tennessee

5 LOCATION OF LEGAL DESCRIPTION

COURTHOUSE, REGISTRY OF DEEDS, ETC.: Registry of Deeds, Polk County Courthouse

STREET & NUMBER: Highway 411

CITY, TOWN: Benton — STATE: Tennessee

6 REPRESENTATION IN EXISTING SURVEYS

TITLE

DATE — __FEDERAL __STATE __COUNTY __LOCAL

DEPOSITORY FOR SURVEY RECORDS

CITY, TOWN — STATE

7 DESCRIPTION

CONDITION		CHECK ONE	CHECK ONE
__EXCELLENT	__DETERIORATED	X UNALTERED	X ORIGINAL SITE
X GOOD	__RUINS	__ALTERED	__MOVED DATE______
__FAIR	__UNEXPOSED		

DESCRIBE THE PRESENT AND ORIGINAL (IF KNOWN) PHYSICAL APPEARANCE

The Ocoee No. 2 Hydroelectric Plant is located on the Ocoee River in the Unicoi Mountains of southeast Tennessee, upstream from Parksville Lake (Ocoee No. 1). Construction of the project was started in 1912 by the Eastern Tennessee Power Company, and the plant began operation in October, 1913. In 1939, both Ocoee No. 2 and Ocoee No. 1 were acquired by the Tennessee Valley Authority and supplemented, in 1943, by Ocoee No. 3.

Ocoee No. 2 was considered to be an engineering marvel in its time because of the manner in which the hydraulic head was obtained. The term "head" is used in hydroelectric technology to quantify potential power. It is the measure of distance that water is allowed to drop in free fall, or near free fall, before striking the turbine or waterwheel. The greater the distance of drop, the greater the momentum of the water as it passes through the turbine and, hence, the greater the power transferred to the generator. The water is collected at a diversion dam and is channelled through a wooden flume set upon a shelf carved along the side of the mountain to a point 4.7 miles downstream. Across its length, the flume drops a mere 19 feet (in order to maintain the flow of water) while the natural bed of the river drops 270 feet. The result is an operating head at the outlet of the flume above the power plant of over 250 feet.

Toward the end of the flume, the water enters a holding area, or forebay. Eight siphons augment the ability of the 90-foot ogee spillway to get rid of the water in case of a sudden shutdown of the turbines. They also furnish better control of the water surface than would otherwise be possible. When built, this spillway was considered the largest of its type in the world. From the forebay, the water is funnelled through a flume extension to the penstocks and then to the turbines in the power plant at the river basin some 250 feet below.

The various features of the project are described below.

Diversion Dam

The diversion dam is a rock filled crib structure 396 feet long at its crest. At the maximum section, it is 30-feet high and 40-feet wide at the base. The entire dam rests on a rock formation. The crib is constructed of 10-inch square sawn oak timbers. The upstream face is sheathed with a double lap of 3-inch pine planking. The crest is sheeted with a single layer of 6-inch oak planking. The dam contains five 4-foot by 4-foot sluiceways with hydraulically operated gates (now out of service) for overflow of surplus water. A swinging footbridge traverses the river over the top of the dam.

The flume intake is a 16-foot high, 30-foot wide reinforced concrete structure located on the southernmost edge of the diversion dam. The top is 1 foot 4 inches below the crest of the crib dam and the opening is provided with iron racks to prevent floating trash from entering the flume. The water admitted to the flume is controlled by a steel taintor gate that is 14 feet ½ inch wide and 10 feet, 9 3/4 inches high. This gate was operated solely by means of a hand wheel until 1956, when it was motorized by TVA to permit remote operation from the Ocoee No. 2 Powerhouse. Operation of the gate by the hand wheel is still possible.

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The Flume

The flume itself is a partially covered wooden trough designed for a waterway 14 feet 2 inches wide and 9 feet 9 inches deep when carrying the maximum required capacity. The original design capacity was 1200 cubic feet per second, or 540,000 gallons per minute. However, the addition of new lining timbers on the interior of the flume has reduced this capacity to approximately 1100 cubic feet per second. The average slope of the main flume is 0.64 feet per thousand, but this slope is increased on the curves and reduced on the tangents. The water travels at a velocity of 8.7 feet per second. The flume is 4.7 miles long and the drop in the flume for its entire length is 18.94 feet. Eight million board feet of long leaf yellow pine lumber was used in its construction.

The flume box was originally constructed of horizontal planking with vertical posts. Each post, or "bent," consisted of one 8 inch by 12 inch column on either side of the box, joined by two 3 inch by 10 inch collar beams across the top and two 4-inch by 10-inch sills across the bottom. Galvanized steel yokes were added in 1927 to replace the original timber columns and sill beams. The interior of the flume is lined with 3-inch by 12-inch long leaf yellow pine timber. The lower section of the flume was relined around 1930 with 1-inch boards nailed over the old lumber. Between 1934 and 1944, the entire exterior of the flume was reinforced with vertical planking and horizontal struts together sandwiching a layer of heavy burlap. In 1941, the top four feet of the interior lining was replaced with creosoted lumber. The present flume has only been patched and repaired since 1944. While much of the original material remains within the composite cross section of the present flume, there is a constant need for replacement of deteriorating wooden members along the flume line. This replacement is being carried on, even to this day, despite the suspension of service almost three years ago. The present flume still exhibits significant leakage and is in need of major rehabilitation.

The flume was originally supported by 42 timber trestles as it crossed the various small ravines. The wooden trestles were replaced with concrete structures around 1927. Five of the ravines, however, were too large for this kind of support and steel trestles were used. The trestles vary in height of steel from 70 to 150 feet and in length from 132 to 288 feet, the largest having a height above the valley floor of 150 feet and in length of 288 feet. Today, major deterioration has occured through rusting including several structural members in each of the five trestles that have rusted away entirely. The extremely poor condition of the steel trestles and the resultant safety hazard were the primary reasons for the suspension of power production at Ocoee No. 2 by TVA.

A standard gauge railway was constructed on top of the flume with 30 pound rails. It is used to patrol the flume and to carry construction and maintenance materials. Initially, the main vehicle was a handcar. This was replaced by an electric storage battery-operated car, and it in turn by the present gasoline motor powered car.

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Forebay/Siphon Spillway Dam

At a point 300 feet from the penstocks, the flume empties into the forebay. The forebay serves as a settling basin and was built at a point where a natural ravine existed. The ravine is blocked with a concrete dam. The dam creates a reservoir which joins the main flume outlet on one end with the flume extension intake on the other. In case of an emergency, if the turbine gates were closed, water could be diverted out of the forebay down the mountainside. However, as the area of the forebay was quite small, it could not provide sufficient area to discharge 1200 cubic feet of water per second without excessive changes in level. To solve this problem, eight siphon spillway units were installed in the concrete of the dam. In a siphon spillway, the water flows through a closed conduit, producing a suction head that greatly increases the velocity and, consequently, the discharge per unit area. When the water surface reaches an elevation slightly above the top of the air vents (which are located above the main spillway openings), the air thus confined in the top of the siphons is quickly ejected by the pressure of the flowing water and the siphons are primed. With the increased velocity produced by the suction, the complete discharge of the battery of eight siphons is greater than the maximum discharge of the flume. Hence, as soon as the siphons are primed, the water level in the forebay begins to fall, preventing overflow of the spillway.

In order to prevent erosion of the ravine by the water discharged through the spillway, a 6 foot by 8 foot covered wooden waste flume approximately 300 feet long was constructed to carry the water to a point where the rock outcrop extends completely across the ravine. This wooden structure was replaced with a concrete discharge flume in 1927.

A trench about 10 feet deep and extending upstream from the spillway dam intercepts trash, sand, and gravel carried along the bottom of the flume. This trench is cleaned through a 48-inch sluiceway through the dam. The water discharged from the flume is directed toward a sand sluice by means of a submerged wooden partition supported at intervals by rock-filled cribs. A timber boom across the forebay deflects floating material to a 4-foot trash chute through the dam.

The forebay outlet is through the flume extension. Connecting the forebay with the penstock intake, the flume extension is similar to the main flume with the exception that the box height is increased to over 15 feet, giving an elevation of 6 feet above the ordinary water surface in order to accommodate the surge created by the sudden closing of the turbine gates. The original timber bents of the extension were replaced in concrete at the time that steel bents were installed on the main flume line. The extension is 303 feet long, 14 feet 8 inches wide and 15 feet 9 inches high, with a total drop of 0.81 feet.

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Although provisions were made originally for three penstocks, only two were installed. The riveted steel pipes are 492.3 feet long and 8 feet in diameter between the intake and the powerhouse. They vary in thickness from 5/8 inch to 9/16 inch to 7/16 inch to 3/8 inch. Immediately below the intake and installed within each penstock is an 8 foot butterfly valve which is both motor and hand operated. The motors are controlled from the switchboard in the powerhouse and are capable of closing the valves in 15.3 seconds. Each penstock is secured in position by two large concrete anchorages, one just below the butterfly valves and the other midway down the hill. Each penstock leads to a separate turbine within the powerhouse, discharging the water directly into the turbine spiral casing.

The Powerhouse

The powerhouse is 125 feet 6 inches long, 80 feet 5½ inches wide and 55 feet high, and is constructed of brick and steel on a concrete foundation. The roof is 50 feet above the generator floor and is formed of reinforced concrete slabs.

The original power equipment consisted of two 10,000 horsepower turbines running at 360 revolutions per minute, built in 1912 and furnished by the I. P. Morris Company of Philadelphia, Pennsylvania. The turbines were guaranteed to deliver 10,000 horsepower at 94% efficiency. The turbines are inward flow, double discharge, reaction type, commonly known as "high head Francis." The turbine shafts are horizontal. In 1924, new draft tubes were installed on Unit 2, increasing the horsepower rating to 15,000. Unit 1 was never altered and remains at its original rating of 10,000 horsepower.

Each turbine is provided with a friction brake designed to bring the unit from full speed to dead stop in five minutes when the turbine "wicket" gates are closed. The gates are closed automatically by an overspeed trip device if the speed of the turbine runners exceeds a preset value. Each turbine was originally controlled by an I. P. Morris oil pressure governor. Four-inch by six-inch triplex governor oil pumps were belt driven from the generator shaft. In 1925, the original governors were replaced with Allis-Chalmers governors and new oil pumps were installed. The speed of the unit can be further controlled by a hand-operated mechanism used in conjunction with the oil pressure from the governor accumulator tanks. For starting the unit, a hand oil pump was provided to supply the necessary pressure for opening the wicket gates by hand.

Provisions were made for a third turbine (and a third generating unit) to accompany the planned third penstock. This assembly was never installed, however, and it is doubtful that construction was ever seriously intended. Since the installation of the "planned" assembly was always pending and therefore still theoretically under construction, the development qualified for a lower tax status.

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Each turbine is directly connected to one of the two main generating units. Each of these units consisted of a 9375 kilovolt-amperes (kVA), 6600 volt, three phase, 60 cycle alternator, running at 360 rpm. (At a later date, the generator ratings were increased by the manufacturers to 11,750 kVA. The Unit 2 generator was replaced in January 1951 at a new rating of 13,125 kVA and, in May, 1953, Unit 1 was rewound to this higher rating.) A 120 kilowatt direct current exciter is connected to each generator shaft. A 9000 kVA, three phase, 60 cycle transformer accompanies each generator. These transformers originally raised the potential from 6600 volts to either 66,000 or 110,000 volts. All power is now conducted at 69,000 volts. A third 8500 kVA transformer was added and all three connected in parallel to operate from the two generating units. All three transformers are used in normal operation, but the system is capable of running on any two if one is removed for servicing. In 1951, the three transformer units were modified for outdoor use and moved to the switchyard adjacent to the powerhouse.

Behind the transformers were five oil-break switches for controlling the power lines of the various machinery and transformers. A separate 300 amp oil-break switch controlled service within the station, and nine 120,000 volt capacity switches, delta connected in three banks were used for the tie line control. Existing oil circuit breakers are located in the switchyard. All oil-break switches are remotely controlled from a sixteen panel slate switchboard inside the powerhouse.

A 50 kw motor generator set is included to serve as a spare exciter. It is otherwise used to operate a 30 ton overhead service crane in the powerhouse. (It was also used to charge the batteries of the flume car when the car was operated by electric storage battery motor.) The crane travels longitudinally within the powerhouse on a track suspended from the roof and is used to remove the turbines and generators for servicing. The station transformers, now located in the switchyard, transform the power from 6600 to 240 and 480 volts for use within the powerhouse. Two 10 horsepower, 900 rpm motor driven vertical sump pumps remove water which accumulates in the sump.

The switchboard consists of 16 panels providing space for a variety of relays, complete indicating meters on all lines and generators, ammeters on each transformer, and a frequency meter, voltmeter and synchroscope for bus with plug connections. The switchboard also contains control switches, battery meters, generator watt-hour meters, a Tirrell regulator for each generator and miscellaneous minor items. The regulators have been modified for wide range control. All switchboard equipment was of the highest grade available.

Operating Problems

Difficulties have been experienced at Ocoee No. 2 with short wheel life, the result of high acid and silt content in the water. Although much of this area is now heavily

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wooded, in 1912 there were 28 square miles of denuded landscape caused by fumes from copper smelting plants in that vicinity, causing heavy erosion. Apparently, these problems were anticipated by the designer of the plant because the original waterwheels were made of bronze. The bronze waterwheels had to be replaced in less than 2½ years, however, and since that time various other metals such as cast iron, white iron, welded steel, chrome nickel and rewelded steel have been used, with no better results. Recently improved water conditions and the use of stainless steel have greatly extended the life of the wheels.

On April 14, 1949, a field engineer and a trainee were testing relays at the plant. As the test blocks were being replaced, one of the units was tripped from the line, precipitating a series of events that resulted in its destruction through overspeed. A huge hole was blown through the middle of the powerhouse; the Unit 2 generator disintegrated. The powerhouse was repaired and Unit 2 replaced and returned to service on January 2, 1951. The turbine work was done by the I. P. Morris Company, and a new generator was supplied by the Elliott Company.

Other Features

Other buildings necessary for the construction, maintenance and operation of the flume and the plant still exist today. Among these are the Lumber House, the Saw Mill House, the Derrick House, the Rack House, the Head Gate House, the Store House, the Machine Shop, the Battery Car Garage, the Flume Head Gate House, the Flume Car Garage, the Dry Lumber House, the Planing Mill, the Tool House, and the Incline House.

Major equipment includes a stiff leg derrick and an incline from the plant elevation to the top of the flume at a point 220 feet before the flume outlet. The incline was constructed for hoisting material 400 feet 6 inches from the original railroad line at the river edge up to the line of the flume. It has a balance cable system with an Otis elevator and a counter balance car. The main car is 6 feet wide and 15 feet 6 inches long and travels on broad gauge tracks. The balance car travels only half the distance (212 feet) along the narrow gauge tracks.

The village of Caney Creek was built in 1918 by the Eastern Tennessee Power Company for occupancy by the employees at the plant and their families. It was approximately three quarters of a mile downstream from the powerhouse, and the fifteen families who lived in the village could cross the river only by boat or by means of a 150 foot suspended footbridge. The village had sixteen homes, fifteen garages, a small hotel, and an elementary school that doubled as a church. In 1939 the Tennessee Valley Authority bought the Ocoee No. 2 plant and in 1941 removed the village. All that remains today are "two empty fish ponds and an abandoned tennis court" (Cleveland Daily Banner, August 1, 1973).

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The Ocoee No. 2 Hydroelectric Plant is capable of producing 25,000 horsepower (135 million kwh per year). A duplicate transmission line originally connected No. 2 with the Parksville plant. From this station, electrical energy was transmitted on high tension lines at 66,000 and 120,000 volts via the switchhouse at Cleveland, Tennessee, to Chattanooga, Knoxville, and Nashville, Tennessee, and Rome, Georgia. This transmission line was removed in June, 1943, for the State of Tennessee to relocate U. S. Highway No. 64. Since the line was removed, Ocoee No. 2 power is transmitted from the system to the Ocoee No. 3 hydroelectric plant switchyard via a 69,000 volt line. At this point, it joins the rest of the TVA transmission grid.

The plant was in operation from October 23, 1913, until September 1, 1976. The flume was shut down because of deteriorating and rusting trestles, condemned by the TVA Office of Power upon the recommendation of the Division of Engineering Design. Since the shutdown, water has been kept in the flume to prevent further damage, and a small maintenance crew has continued with minor repairs.

SELECTION OF BOUNDARIES

The land surrounding Ocoee No. 2 is located within the Cherokee National Forest under the supervision of the U. S. Forest Service. This land was purchased from the Tennessee Electric Power Company by the Tennessee Valley Authority in 1939 and transferred to the Forest Service by Presidential Proclamation on August 12, 1940, with rights to access for maintainence reserved by TVA. Land reservations on either end of the flume line remain the property of TVA and are occupied by the diversion dam on the east end of the flume and the powerhouse, shop and forebay area on the west end. The exact boundaries of the diversion dam and powerhouse reservations are delineated on USGS Ducktown and Caney Creek Quads, respectively.

These reservations have been the limits of TVA jurisdiction since 1940 and have been selected without alteration as the boundaries of portions of the land included in this nomination. A 100 foot wide strip of land centered on the flume line was selected to connect the two non-contiguous reservations. This selection was based on the prior existence of a similar 100 foot right of way held by the Tennessee Electric Power Company in the 1920's and documented in TEPCo drawing number 15714B dated August 3, 1926. There is no mention of reserved lands along the flume line in either the deed or the Presidential Proclamation of 1940, which outlines only general rights to maintain and operate the flume without reference to specific boundaries or rights of way. Use of the historical precedent of a 100 foot right of way centered on the flume line was felt to be sufficient to prevent adverse impact on the facility.

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OCOEE DEVELOPMENT NUMBER TWO TECHNICAL DATA SHEET, EXISTING FACILITIES

Present owner: Tennessee Valley Authority
Owner at construction: Eastern Tennessee Power Company
Engineer: J. G. White Engineering Corporation
in charge: William P. Creager, Assistant Hydraulic Engineer
Construction began: May, 1912
Plant in operation: October 23, 1913
Service suspended: September 1, 1976
Capacity at full load (original facility): 20,000 horsepower
18,750 kilovolt-amperes
14,600 kilowatts
Capacity at full load (at suspension of service):
25,000 horsepower
26,250 kilovolt-amperes
21,000 kilowatts
Flume length: 4.7 miles
Main flume: 24,410 feet
Forebay and transitions: 154 feet
Flume extension: 303 feet
Elevation at bottom of flume at intake: 1103.17 feet
Elevation at bottom of flume at forebay: 1087.25 feet
Drop, diversion dam to forebay: 15.85 feet
Drop overall: 18.94 feet
Head developed at turbines: 255 feet
Diversion dam - area of lake: 21 acres
Elevation at crest: 1115.2 feet
Taintor gate: 150.9 square feet
Automatic remote controlled switching gate installed, 1956, James G. Biddle Co., catalog no. 3304-14
Flume railroad: - standard gauge, 30 lb. rails
Viaducts - steel trestle:
No. 1: 216 feet span, 61.5 feet height above lowest pier
No. 2: 132 feet span, 36.44 feet height
No. 3: 288 feet span, 108.7 feet height
No. 4: 240 feet span, 71.27 feet height
No. 5: 168 feet span, 42.66 feet height
Forebay - elevation at top of spillway dam: 1099.4 feet, area at normal water surface: 10,000 square feet
Penstocks (2) - each equipped with 8 foot diameter butterfly valves, vertical shaft type, operated by hand by worm and gear, and by 5 horsepower motor controlled from powerhouse, time required for motor operated closing: 15.3 seconds,

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motors: General Electric 125 volt dc, 12 A., 120 feet lbs. torque, 900 rpm, serial no. 402183 (unit 1), 397857 (unit 2)

Turbines (2) - horizontal shaft, single runner, double discharge, Francis type runners with cast iron volute casings (each provided with friction brake), 10,000 horsepower, I. P. Morris Co., 250 foot head, 360 rpm, 55 inch wheel, serial number 191 (unit 1), 15,000 horsepower, I. P. Morris Co., 250 foot head, 360 rpm, 54 inch wheel, serial no. 9339 (unit 2)

Turbine governors (2) - Allis-Chalmers, size 3, oil pressure floating level type, adapted for heavy duty service in connection with fluctuating loads, serial no. 678 (unit 1), 747 (unit 2)

Turbine governor oil pumps (2) - Allis-Chalmers type A. R. 217C, 10 horsepower, 3 phase, 60 cycle, 36.4 A., 220 volt, 575 rpm, serial no. 3397 MK-217C-1-1 (unit 1), 3397 MK-217C-1-2 (unit 2)

Generators (2) - General Electric, A.T.B., 20 pole, 13,125 kVA., (rewound May, 1953, previous capacity: 11,750 kVA., increased from original capacity of 9375 kVA. by manufacturer), 0.8 power factor, 360 rpm, 6600 volts, 3 phase, 60 cycle, serial no. 559535 (unit 1); Elliot Company, 13,125 kVA., 0.8 power factor, 360 rpm, 6600 volts, 3 phase, 60 cycle, design D416, installed 1950, serial no. 1S-8350 (unit 2)

Exciters (2) - General Electric, 6 pole compound wound inter-pole, 120 kw, 125 volts dc, 960 A., 360 rpm, form L, type M.P.C., serial no. 387319 (unit 1); Elliot Company, 120 kw, 125 volts dc, 960 A., design 59MV1, installed 1950, serial no. 1S-8351 (unit 2)

Auxiliary exciter - General Electric, 50 kw, 125 volts, 400 A., 1200/1165 rpm, serial no. 388720

Exciter motor - for auxiliary exciter - General Electric 75 horsepower, 220 volts 186 A., 1200/1165 rpm, serial no. 576260

Transformers (3) - bus connected in parallel to both generating units - located in switchyard, moved outside powerhouse following generator unit 2 runaway; 1 each General Electric, 8500 kVA., indoor type, modified for outdoor use, 6600 volts - 69,000 volts, type WCT, 3 phase, 60 cycle, serial no. 1197746; 2 each General Electric, 9000 kVA., indoor type, modified for outdoor use, 6600 volts - 69,000 volts, type WCT, 3 phase, 60 cycle, serial no. 990144, 990145

Station service transformers (2) - Moloney, 150, kVA., 7200 volts - 240/280 volts, type TCL, 3 phase, 60 cycle, serial no. 895735 (unit 1), 895736 (unit 2)

Oil circuit breakers (2) - for service on main generators - Pacific Electric Manufacturing Corporation, 2000 A., 125 volts dc, type MH-3, installed 1950, serial no. MH-2015 (unit 1), MH-2016 (unit 2)

Traveling crane - for servicing machinery, 30 ton case crane, serial no. 214943, 36 feet, 2-3/4 inches span, one 60 ton hook with 3 part block, 1 inch wire rope, maximum lift: 40 feet, maximum wheel load: 45,000 lb.

Incline - from plant elevation to top of flume, 400 feet 6 inches long, Otis elevator, serial no. 68236, drum 55 inches long by 3 feet in diameter - 2 cables ½ inch by

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491 feet long, balance car travels 212 feet with 3/4 inch cable, balance car travels on narrow gauge track, main car on broad gauge track

Derrick - at top of incline - stiff leg type, American Hoist and Derrick Company, boom 75 feet, original operating mechanism replaced recently with similar mechanism found in switchyard (date and origin of manufacture of this mechanism unknown), present steel boom installed August 1976.

Drums for turning derrick (2) - 21 inches in diameter by 9 inches long with 7/8 inch cable, revolving wheel 16 feet in diameter

Motor - General Electric type I. P. C., 5011, Form M, 1155 rpm, 37 horsepower - 47.5 A., serial no. 1649727

May 18, 1979

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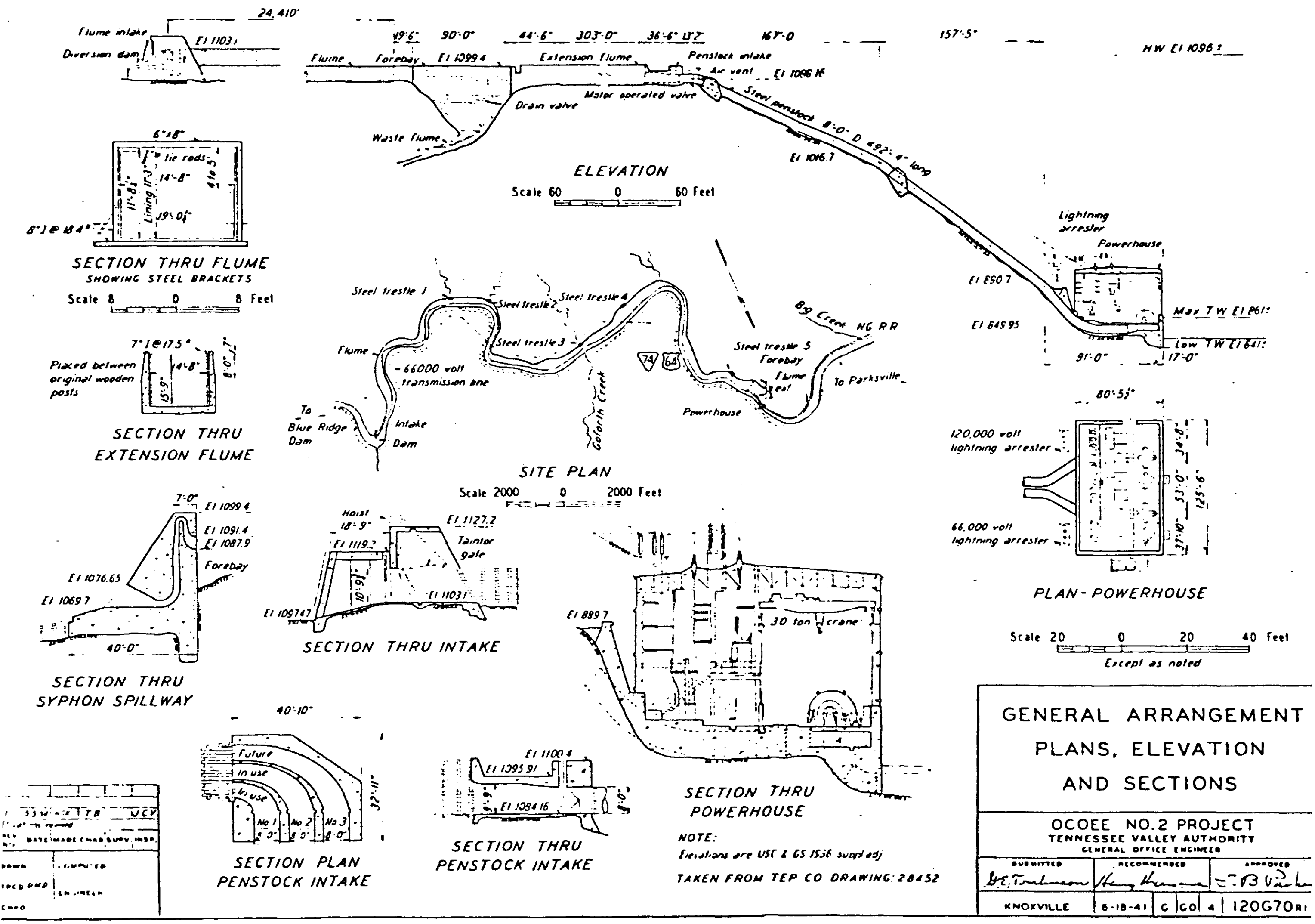
General Arrangement, Plans, Elevation and Sections, Ocoee No. 2, Tennessee Valley Authority drawing, dated June 18, 1941.



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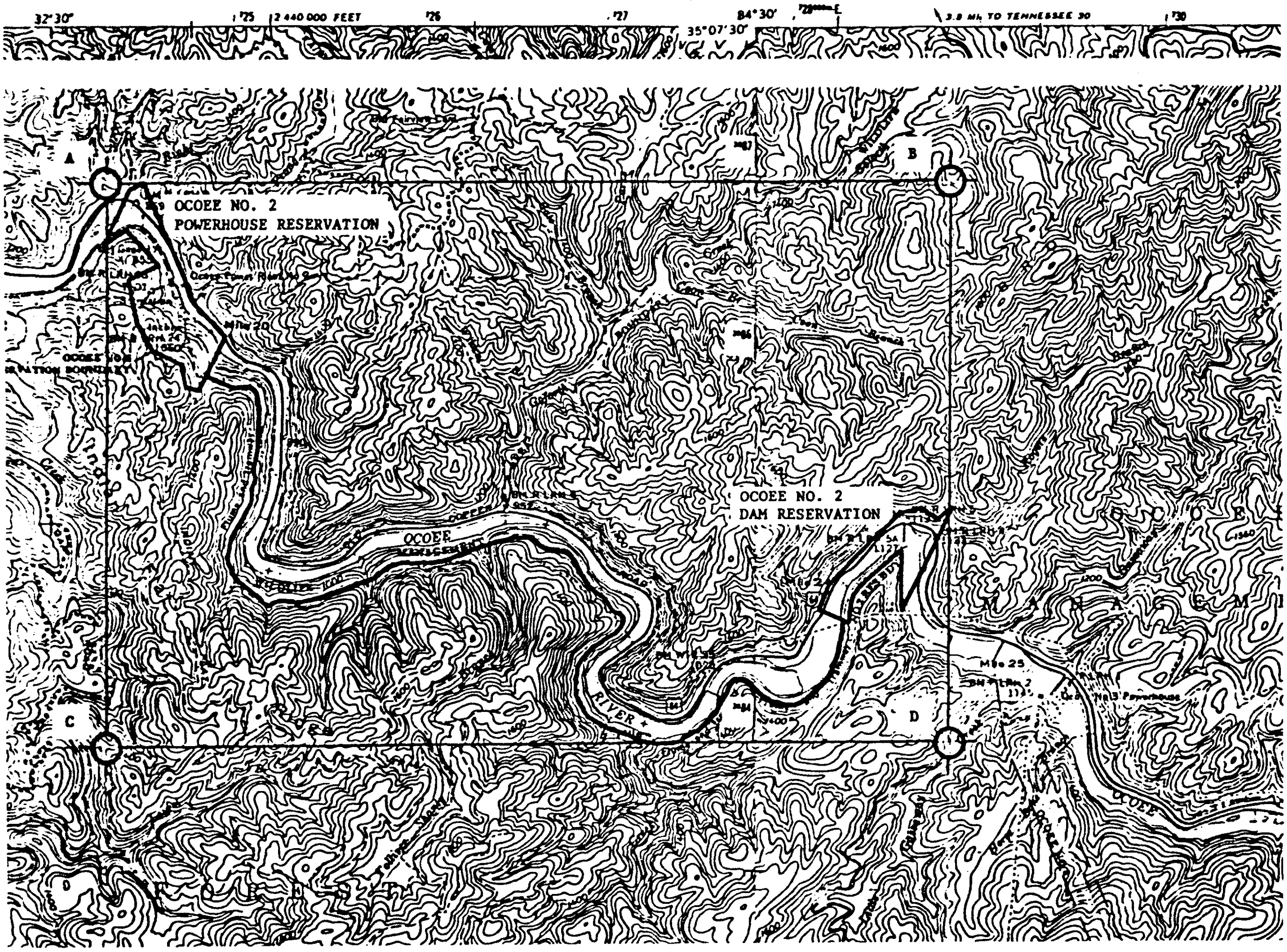
Site Map, composite of USGS Ducktown Quadrangle and USGS Caney Creek Quadrangle. Diversion dam reservation is outlined at right, powerhouse reservation at left.

CANEY CREEK QUADRANGLE
TENNESSEE-POLK CO.
7.5 MINUTE SERIES (TOPOGRAPHIC) 126-SE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



UTM references: A - 16 724383 3886670 B - 16 728939 3886786
C - 16 724462 3883671 D - 16 729008 3883785

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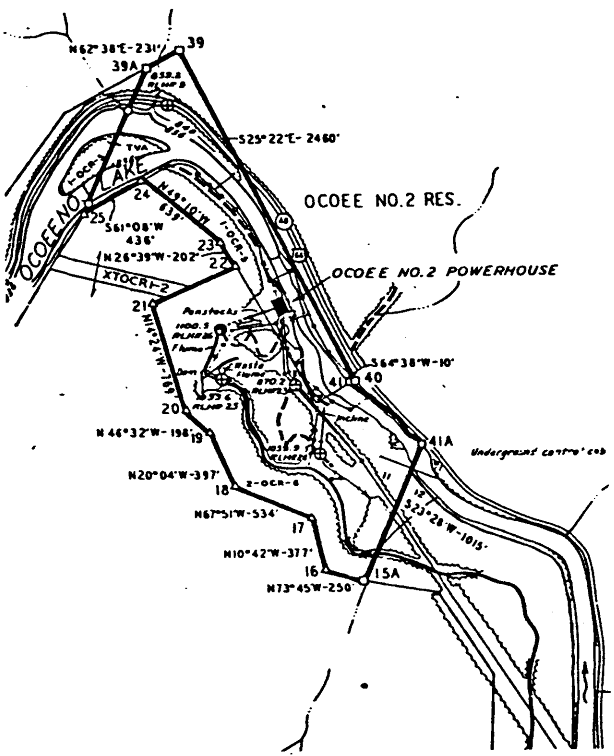
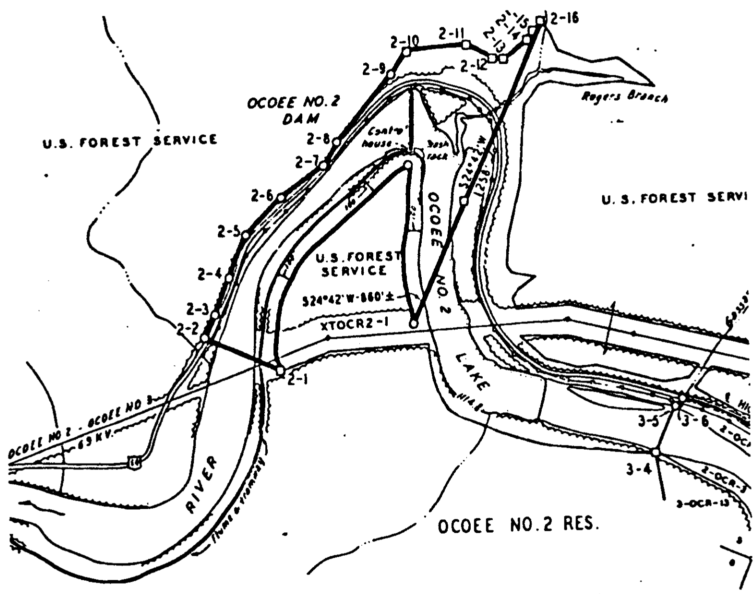
Detail Site Maps, Ocoee No. 2 Reservation.
Taken from TVA drawings 26-MS-421501-D-1 and 26-MS-421501-D-2 dated April, 1965.



Powerhouse Reservation



Diversion Dam Reservation

8 SIGNIFICANCE

PERIOD	AREAS OF SIGNIFICANCE -- CHECK AND JUSTIFY BELOW			
_PREHISTORIC	_ARCHEOLOGY-PREHISTORIC	_COMMUNITY PLANNING	_LANDSCAPE ARCHITECTURE	_RELIGION
_1400-1499	_ARCHEOLOGY-HISTORIC	_CONSERVATION	_LAW	_SCIENCE
_1500-1599	_AGRICULTURE	_ECONOMICS	_LITERATURE	_SCULPTURE
_1600-1699	_ARCHITECTURE	_EDUCATION	_MILITARY	_SOCIAL/HUMANITARIAN
_1700-1799	_ART	X ENGINEERING	_MUSIC	_THEATER
_1800-1899	_COMMERCE	_EXPLORATION/SETTLEMENT	_PHILOSOPHY	_TRANSPORTATION
X 1900-	_COMMUNICATIONS	X INDUSTRY	_POLITICS/GOVERNMENT	_OTHER (SPECIFY)
		_INVENTION		

SPECIFIC DATES Mar. 1, 1912 - Oct. 23,1913 BUILDER/ARCHITECT J. G. White Engineering Corporation

STATEMENT OF SIGNIFICANCE

The Ocoee River offers exceptional opportunities for water power development. Flowing in the Unicoi Mountains from an elevation of 2,024 feet above sea level, its watershed has an average annual rainfall of 55 inches, exceeding that of any part of the United States with the exception of the coastal and mountainous areas of Oregon and Washington. Two miles below Ducktown, the river enters a narrow gorge which it follows for ten miles, then through a wide valley to a narrow gateway between the abrupt slopes of Sugar Loaf and Bean Mountain falling a total of 710 feet in the 26 miles between Ducktown and Parksville.

In 1910, J. W. Adams of Chattanooga deeded riparian rights on the Ocoee River to C. M. Clark and Associates of Philadelphia. The Clark interests organized the Eastern Tennessee Power Company and in August 1910, began the construction of Ocoee No. 1 dam and powerhouse at Parksville, Tennessee, on the Ocoee River some 18 miles east of the town of Cleveland.

Construction was started on the Ocoee No. 2 plant March 1, 1912, and production started on October 23, 1913. Two hundred eighty-nine thousand pounds of rock was blasted from the side of the mountain and eight million feet of long leaf yellow pine was used. It was designed and constructed by the J. G. White Engineering Corporation of New York, under the hydroelectric power and dam design. His Hydroelectric Handbook (1927; 1950, John Wiley and Sons, 2nd ed., 1152 pp.) is still a definitive compendium on all phases of hydro-electric power.

On April 25, 1912, the Eastern Tennessee Power Company became the Tennessee Power Company. Ocoee No. 1 was completed in January of that year several months before the opening of the hydroelectric plant at Hales Bar near Chattanooga. The contract for servicing the city of Chattanooga was subsequently awarded to the Tennessee Power Company and Ocoee No. 1 began delivery of power over newly constructed transmission lines.

Following successful experimentation in alternating current production at Niagara Falls, New York, the potential of remote rural hydro plants, such as Ocoee, began to be realized. Previous direct current production did not offer the capacity for long distance distribution possible with alternating current power.

The result was that direct current plants could only provide power to single, isolated locations in close proximity to the production facility. At Ocoee No. 2, one of the first alternating current production facilities in the region, this limitation did not exist. When Ocoee No. 2 joined Ocoee No. 1, followed by a linking with the Hales Bar hydro plant and steam plants in Nashville, Chattanooga, and Knoxville, an integrated transmission system was developed that could provide power over great distances. Power from this system was sold to Chattanooga, Nashville, Knoxville, Cleveland, Tennessee, the

9 MAJOR BIBLIOGRAPHICAL REFERENCES

Cleveland Daily Banner, Cleveland, Tennessee, July 31, 1977.

"Developing Electric Power Under 250-Foot Head in Tennessee," Engineering Record, April 18, 1914, Vol. 69, No. 16, pp. 454-456.

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10 GEOGRAPHICAL DATA

ACREAGE OF NOMINATED PROPERTY 150 acres

UTM REFERENCES

	ZONE	EASTING	NORTHING
A	1 6	7 2 4 3 8 3	3 8 8 6 6 7 0
B	1 6	7 2 8 9 3 9	3 8 8 6 7 8 6
C	1 6	7 2 4 4 6 2	3 8 8 3 6 7 1
D	1 6	7 2 9 0 0 8	3 8 8 3 7 8 5

VERBAL BOUNDARY DESCRIPTION

The area specified for this nomination includes all of the land encompassed in the Ocoee No. 2 dam reservation as noted on the USGS Ducktown Quadrangle, all of the alnd encompassed in the Ocoee No. 2 powerhouse reservation as noted on the (con't.)

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES

STATE	CODE	COUNTY	CODE
STATE	CODE	COUNTY	CODE

11 FORM PREPARED BY

NAME / TITLE Mary Jane Schad Wells, Architectural Historian
Douglas A. Yorke, Jr., Historical Architect

ORGANIZATION Building Conservation Technology, Inc. DATE May 18, 1979

STREET & NUMBER 1217 Fifth Avenue North TELEPHONE 615-254-0556

CITY OR TOWN Nashville STATE Tennessee 37208

12 CERTIFICATION OF NOMINATION

STATE HISTORIC PRESERVATION OFFICER RECOMMENDATION

YES ✓ NO___ NONE___ Herbert L. Harper

STATE HISTORIC PRESERVATION OFFICER SIGNATURE

In compliance with Executive Order 11593, I hereby nominate this property to the National Register, certifying that the State Historic Preservation Officer has been allowed 90 days in which to present the nomination to the State Review Board and to evaluate its significance. The evaluated level of significance is X National ___State ___Local.

FEDERAL REPRESENTATIVE SIGNATURE Richard C. Morgan for T. H. Ripley

TITLE Manager of Natural Resources DATE July 16, 1979

FOR NPS USE ONLY

I HEREBY CERTIFY THAT THIS PROPERTY IS INCLUDED IN THE NATIONAL REGISTER

Carol Shull DATE 10-3-79

~~DIRECTOR, OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION~~ KEEPER OF THE NATIONAL REGISTER

ATTEST: Beth Grosvenor DATE 10/30/79

~~KEEPER OF THE NATIONAL REGISTER~~

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Aluminum Company of America (Alcoa) and others including the Georgia Power Company.

In an incredibly brief period, production of power in the region jumped from relying on small single operations to being one of the nation's first interconnected networks of hydro and steam facilities. The development at Ocoee No. 2 of broad distribution through the integrated system tie line was one of the earliest examples of what today is a minimum standard for electrical power sharing.

As the second hydroelectric plant on the Ocoee, Ocoee No. 2 marked an important step in the industrial development of that part of the South, carrying relatively inexpensive electricity to metropolitan as well as rural areas. A considerable part of the electrical energy was used in the lighting of cities along the line, the rest for industry and trolly car service. An article in the Chattanooga News on October 30, 1911 (Vol. XXIII, No. 249) reads:

> "All of East Tennessee and North Georgia is expectantly awaiting the completion of the water power on the Ocoee River in Polk County, by the Eastern Tennessee Power Company. The value of this enterprise to the whole community can hardly be estimated.
>
> Within a few months, cheap power will be available in Chattanooga, Knoxville, and all the intermediate towns. With the modern electrical power transmission methods, it is possible to carry this energy for hundreds of miles without appreciable losses, a thing almost unknown fifteen years ago..."

The Ocoee No. 2 Hydroelectric Plant was as unique among hydroelectric stations in 1912 as it is today. Its use of an extremely long wooden flume to obtain the hydraulic head for operating the turbine of the two generating units is not common. Although the use of flumes dates back to Roman times, today the only known flumes of significant length are remnants from the early logging days of the western United States. Restored grist-mills still exist with short lengths of wooden flumes for carrying water to their overshot or breast water wheels or small turbines, but there are none known of such a great length or which are able to carry as much water as Ocoee No. 2. Is is very possible that Ocoee No. 2 is the sole surviving large scale example of such a development.

The flume is served by an industrial railroad, which today is another unique feature. Running along the top of the flume, the railroad serves to carry men and maintenance materials to all parts of the flume for repair, inspection and servicing. The incline is of additional interest as it contains both broad and narrow gauge tracks and cars, and its balance cable system is unusual.

The powerhouse equipment remains from the era of early electrical production and is becoming of increasing interest as other plants and their equipment are modernized.

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The horizontal-shaft double-discharge scroll-case turbines are quite rare, as are the slate gauge boards, old heavy case meters, open heavy copper switch-gear and the surviving insulators on the powerhouse roof.

Ocoee No. 2 was the site of one of the first siphon spillways used in this country, consisting of a battery of eight siphons for discharging excess water from the forebay. Introduced by the J. G. White Engineering Corporation, the spillway was written up in great detail in Engineering Record (May 16, 1914, Vol. 69, p. 567) by William P. Creager. An editorial in the same issue describes tests made on the siphon spillway at Ocoee No. 2 stating that "these tests are interesting because they are among the first performed with accuracy in order to obtain the efficiency of siphons designed and built in this country. Considering that the design of siphonic spillways is still in its infancy in this country, the efficiency obtained is gratifying" (p. 545).

The Ocoee No. 2 Hydroelectric Plant is an historic site development which incorporates a variety of virtually vanished technologies of multi-faceted appeal and historic value. Scenically nestled in the mountains of the Cherokee National Forest, Ocoee No. 2 is significant not only because of the wooden flume, the railway running along the top, the incline and the fully equipped powerhouse, but because it combines all of these features, and others, into a single development that clearly exemplifies the importance of early hydroelectric technology.

Travelling along U. S. Highway No. 64, Ocoee No. 2 is an impressive and easily identifiable landmark. From across the river, the highway affords clear views of the flume and steel trestles, including several points where the illusion is such that the water appears to be flowing uphill.

Ocoee No. 2 has escaped alteration, modernization, and demolition in the past years, and today remains almost an anachronism in comparision with recent 1000 megawatt-size plants. But TVA's temporary removal of Ocoee No. 2 from service was due to deteriorating trestle condition, not outmoded equipment; the plant retains all the necessary equipment to return to full production. Since Ocoee No. 2 is capable of beginning operation by hand (without electrical assistance), it could be an important factor in the event of a system-wide outage because it could serve to produce the power necessary to restart other production facilities.

Ocoee No. 2 is a landmark of hydroelectric production; the development on the Ocoee River set the standards for both experimental technology and the widespread distribution of inexpensive electrical power that was to demonstrate and support the national potential of the Tennessee Valley Authority. Today,

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power production at Number Two has been suspended due to the deteriorated condition of all five of the main steel trestles. While water has been kept in the flume line since shutdown in an effort to preserve the existing timbers, significant levels of deterioration have occured. While regular replacement of wooden members and routine maintenance have been a normal portion of the operation of the flume historically, recent requirements of upkeep have become extremely demanding despite the facility's being off-the-line for nearly three years.

<u>Summary</u>

Ocoee Development No. 2 has significance in the social, industrial, and engineering heritage of the southern United States. It is a completely equipped and operable hydroelectric plant dating from the first decade of broad electrical production in this country. Ocoee No. 2 is a symbol of the close and delicate link between engineering and social progress, and, as one of the first hydroelectric facilities in the region, of great importance to the history of both rural and urban development in the South. It is impressive as a facility, yet simple, ordered, and comprehensible in its function. With its commanding setting in the Cherokee National Forest, Ocoee No. 2 is an important element of the regional landscape and its accessibility provides a useful, instructional tool to the interested and curious observer.

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"Siphonic Spillway for a Hydroelectric Plant," Engineering Record, May 16, 1914, Vol. 69, No. 20, pp. 545, 567-570.

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USGS Caney Creek Quadrangle and a strip of land connecting the two reservations that extends for 50 feet on either side of the centerline of the existing flume. These boundaries have been outlined on a series of maps included herein.