

BAGNELL DAM AND OSAGE POWER PLANT
GATED SPILLWAY
Spanning Osage River on Business Route 54
Lake Ozark
Miller County
Missouri

HAER No. MO-117-C

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Midwest Regional Office
601 Riverfront Drive
Omaha, Nebraska 68102-4226

HISTORIC AMERICAN ENGINEERING RECORD

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UTM References:

	East End:		West End:	
Zone	Easting	Northing	Easting	Northing
15	532947	4228318	532816	4228210

Quad: Bagnell Quadrangle - Missouri 7.5 Minute Series, 1983

Construction: 1929-31

Designer: Stone and Webster Engineers

Present Owner: AmerenUE, Lake Ozark, Missouri

Present Occupant: AmerenUE, Lake Ozark, Missouri

Present Use: Dam and Power Plant

Significance: This property is listed on the National Register of Historic Places for significance related to social history and engineering. The construction of the dam and power plant in 1930-31 began the production of hydroelectric power in mid-Missouri and created the Lake of the Ozarks, a regional tourist attraction that dramatically changed social and economic aspects of central Missouri.

Project Information: Bagnell Dam was recorded in 2009 by R. Gail White, White and Borgognoni Architects, Carbondale, Illinois, and by Benjamin Halpern, Halpern Photography, Champaign, Illinois. As a result of relicensing requirements, the historic structure will be altered for required technological upgrades and enhanced safety.

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I. Physical Description of the Bagnell Dam Gated Spillway:

The gated spillway section of the dam 520' long and is equipped with twelve radial tainter gates, each 34' x 22', which are used to control the reservoir water level during flood periods. Each tainter gate is supported by a trunnion bearing anchored in a concrete pier on each downstream side and normally rests on the seal at the upstream end. By use of the gantry crane and chains attached to the bottom of the gates, each one may be opened to the desired position and latched by chain dogs. The gates are provided with rubber side seals and a timber bottom seal. All bear on metal seal surfaces imbedded in the concrete. Two 70-ton capacity traveling electric gantry cranes mounted on rails on the operating level at elevation 669' mean seal level (MSL) above the spillway and power station are used to operate the tainter gates and head gates that open or shut the flow of water through the dam, and also to handle the stop logs and trash racks. One of these cranes has been equipped with an auxiliary gasoline electric drive for emergency service in the event of an electrical failure. The cranes were manufactured by the Whiting Corporation.

The upper portion of the spillway has a parabolic curve profile. This upper portion, in addition to a straight intermediate portion, is designed for streamline flow so as to minimize erosion of the concrete by the flowing water. The foot of the of the spillway is provided with a stepped apron made up of four ascending steps at the toe of the spillway section to dissipate energy from the discharged water and reduce erosion of the riverbed below the dam. Each step is 6' wide starting at the horizontal tangent of the bucket and rising 36", 15", 15", and 24" respectively. The apron dissipates to a large degree the energy in the lower portion of the overflowing jet within the limits of the apron and deflects the turbulent water to the surface of the tailwater, thus eliminating jet action on the riverbed and reducing scour due to turbulence and eddies. A concrete retaining wall extending 50' downstream beyond the end of the stepped apron along the west side of the spillway protects the riverbank from erosion due to the flow of water over the spillway.

The structure is in good condition, but will be altered for required technological upgrades and enhanced safety.

II. History of the Bagnell Dam Gated Spillway:

Union Electric began construction of the Osage hydro-electric development on August 6, 1929. Clearing of timber for the reservoir began at that time, although a few men had already begun work to prepare housing and administration offices.¹ The layout for the cofferdam for the

¹Carole Tellman Pilkington, "The Story of Bagnell Dam," *Lake Area Chamber of Commerce*, 1989, 8-9.

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spillway and west abutment areas located on the flood plain of the Osage River on the west side of the valley was begun on September 30, 1929.² The spillway cofferdam was unwatered on March 1, 1930.³

The construction sequence was to cofferdam the spillway and west abutment areas, and then to complete the excavation for that part of the work. Although earth excavation was started before the spillway cofferdam was completed and unwatered, the major portion of the work, except for the diversion channel, was done in the dry. The west abutment and spillway were then completely concreted except for notches and sluiceways, the bottoms of which were located at the normal river level to provide for later river diversion. The excavation for the diversion channel was carried on simultaneously with the work on the west abutment and spillway portions of the dam. The river was diverted through the temporary notches and sluiceways in the spillway when the concrete in these parts of the structure was completed to a sufficient height. The main power station cofferdam, which extended across the original channel of the river, was then closed and unwatered, after which the erection of the permanent power station structure begun.

Because of the depth and permeable nature of the layer of gravel in the valley bottom a cofferdam with watertight cutoff down to rock was built on the west portion of the dam site and in the river channel. Single lines of steel sheetpiling were driven across the floodplain, while a self-supporting cellular type construction cofferdam was used in the river channel. During the first step of the construction program when the flood plain on the west side of the river was closed by the spillway and west abutment cofferdam, a sluiceway capable of flooding the entire excavated area within twenty four hours was installed in the river end of the cofferdam. This precaution was taken to prevent erosion of the slopes of the earth prism supporting the steel sheeting if the cofferdam were overtopped. As soon as the critical flood period of the year was passed in May 1930, work was started on the power station cofferdam, restricting the river channel to a clear width of 200'. As soon as the concrete in the west abutment and spillway section had been completed to Elevation 585' MSL, the ordinary high stage of the river, the spillway cofferdam was removed, the diversion channel opened and the river returned through the slots and sluiceways in the spillway section of the dam.⁴

²Pilkington, 15.

³Cally Lence and Gail White, "Bagnell Dam and Osage Power Plant," National Register of Historic Places Nomination, U.S. Department of the Interior, National Park Service, Washington, D.C., listed August 27, 2008, 16.

⁴A.W. Clark, "Construction Features of Osage Hydro-Electric Development," In *Engineering News-Record*, March 26, 1931, 525-526.

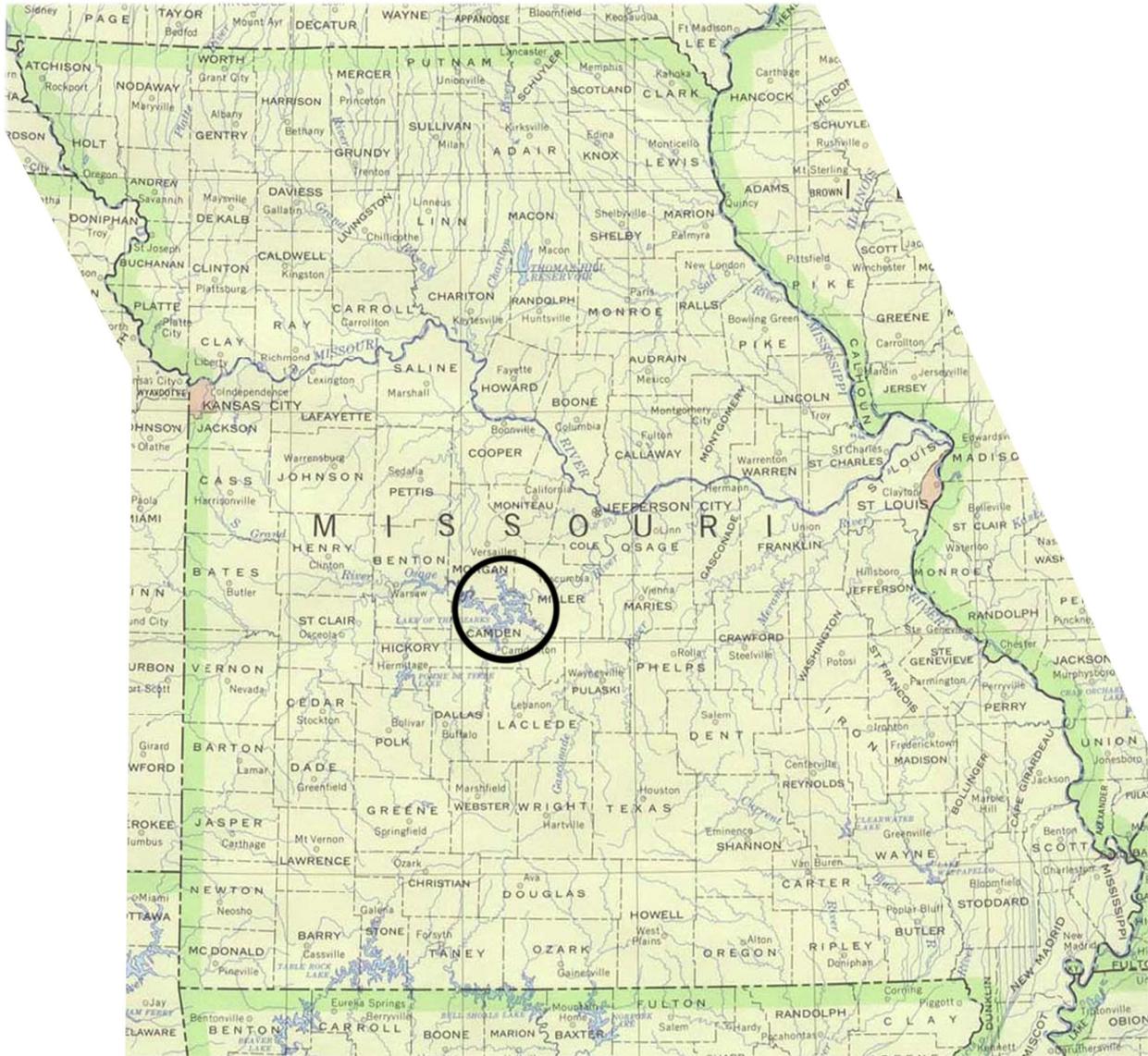
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Erection of the Power House steel structure began on December 10, 1930. Less than one year later, on August 6, 1931, the generator tests started, and on September 3, 1931, the water wheel tests started. By October 16, 1931, the first commercial operation of the Osage Power Plant began.⁵ At this time, the Osage Plant was connected to the St. Louis system, the expansion of which allowed Union Electric to sell power to St. Louis and Rivermines customers at less cost. Soon thereafter, electrification came to the lake area. The first distribution pole was set on the south side of the Osage River. The first power line extended from the spillway structure to an H-frame structure on the south bank. The line was energized on December 24, 1931, and served twenty-four customers.⁶

⁵Pilkington, 15.

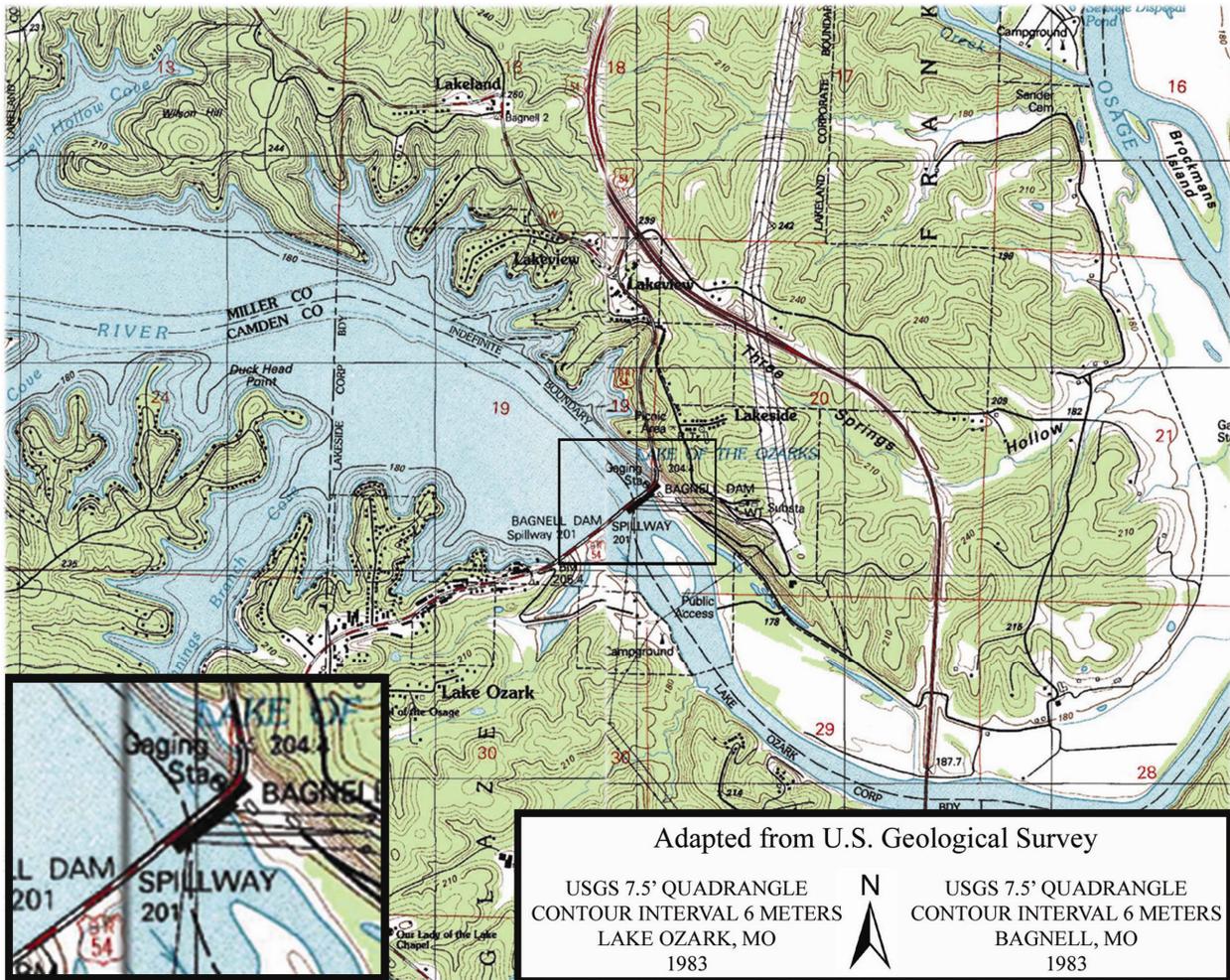
⁶Lorraine Burke, *50th Anniversary Bagnell Dam 1931-1981*, Lake of the Ozarks Area Council of the Arts, 1981, 36.

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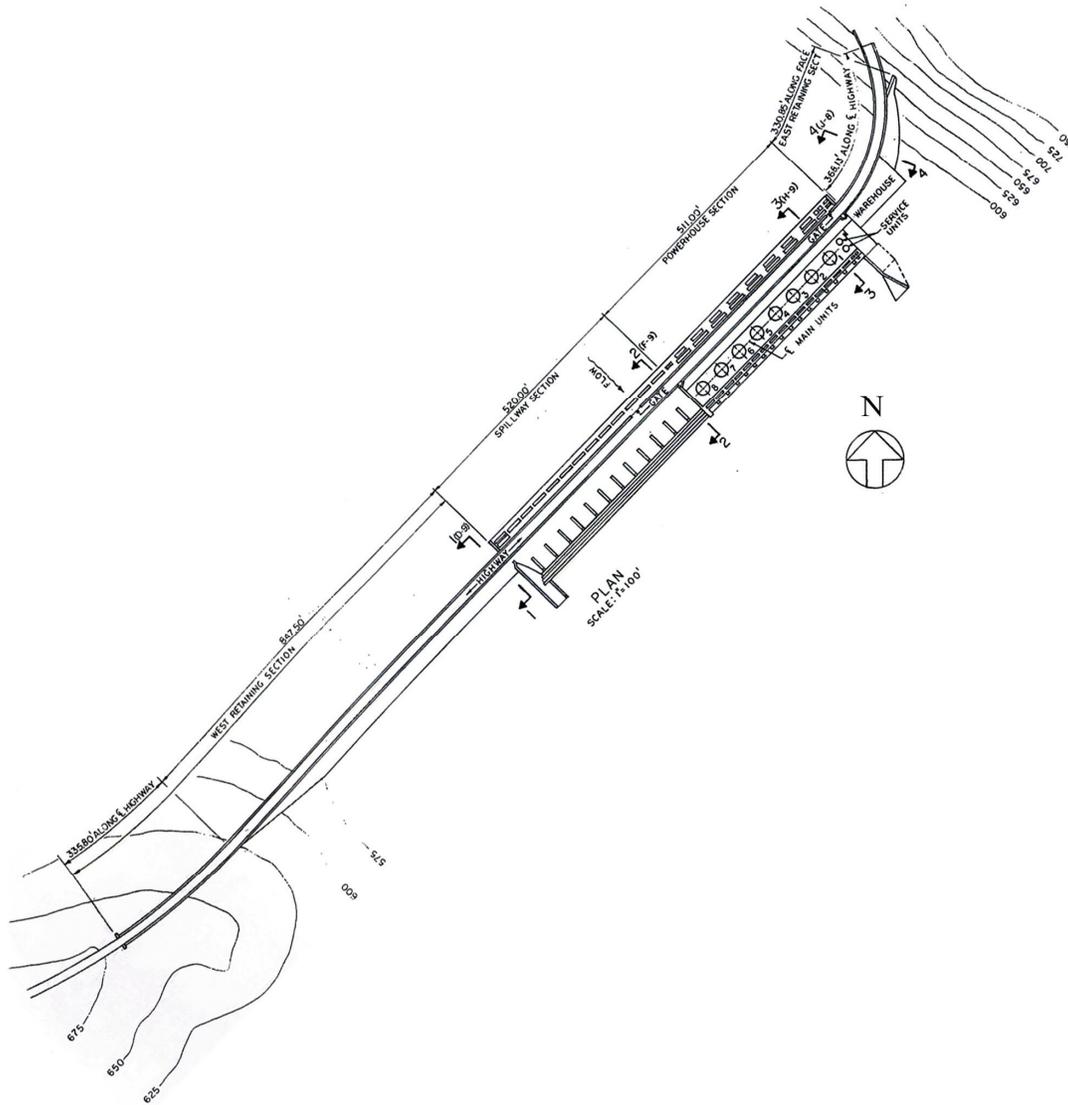
Map of Location within the State of Missouri
Bagnell Dam and Osage Power Plant
Adapted from http://www.lib.utexas.edu/maps/United_states/missouri_90.jpg

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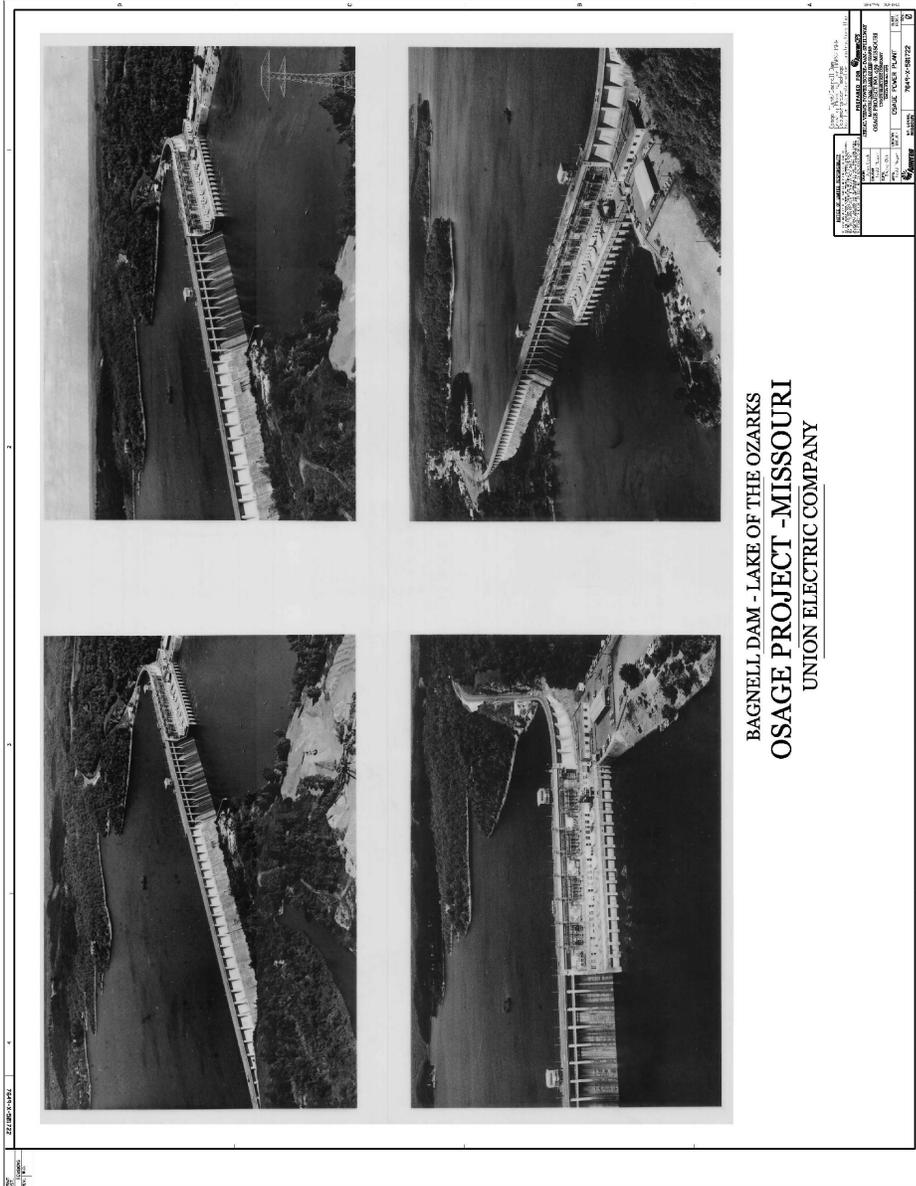
Map of Vicinity of Lake Ozark
 Bagnell Dam and Osage Power Plant
 Adapted from U.S. Geological Survey, Lake Ozark and Bagnell Quads,
http://store.usgs.gov/b2c_usgs/usgs/maplocator

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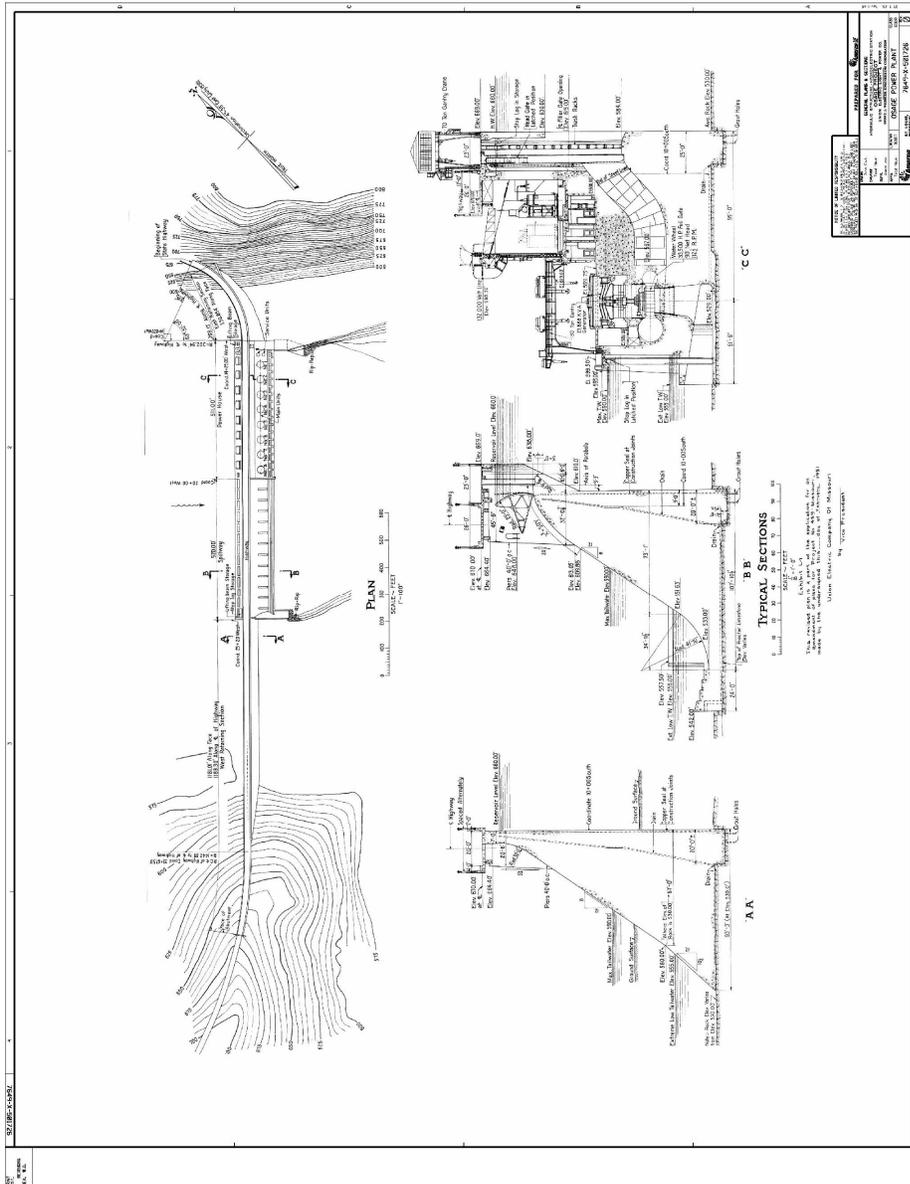
Sketch Map
Bagnell Dam and Osage Power Plant
Adapted from Construction Drawing 7649-X-501752
Original on file at AmerenUE, St. Louis, Missouri

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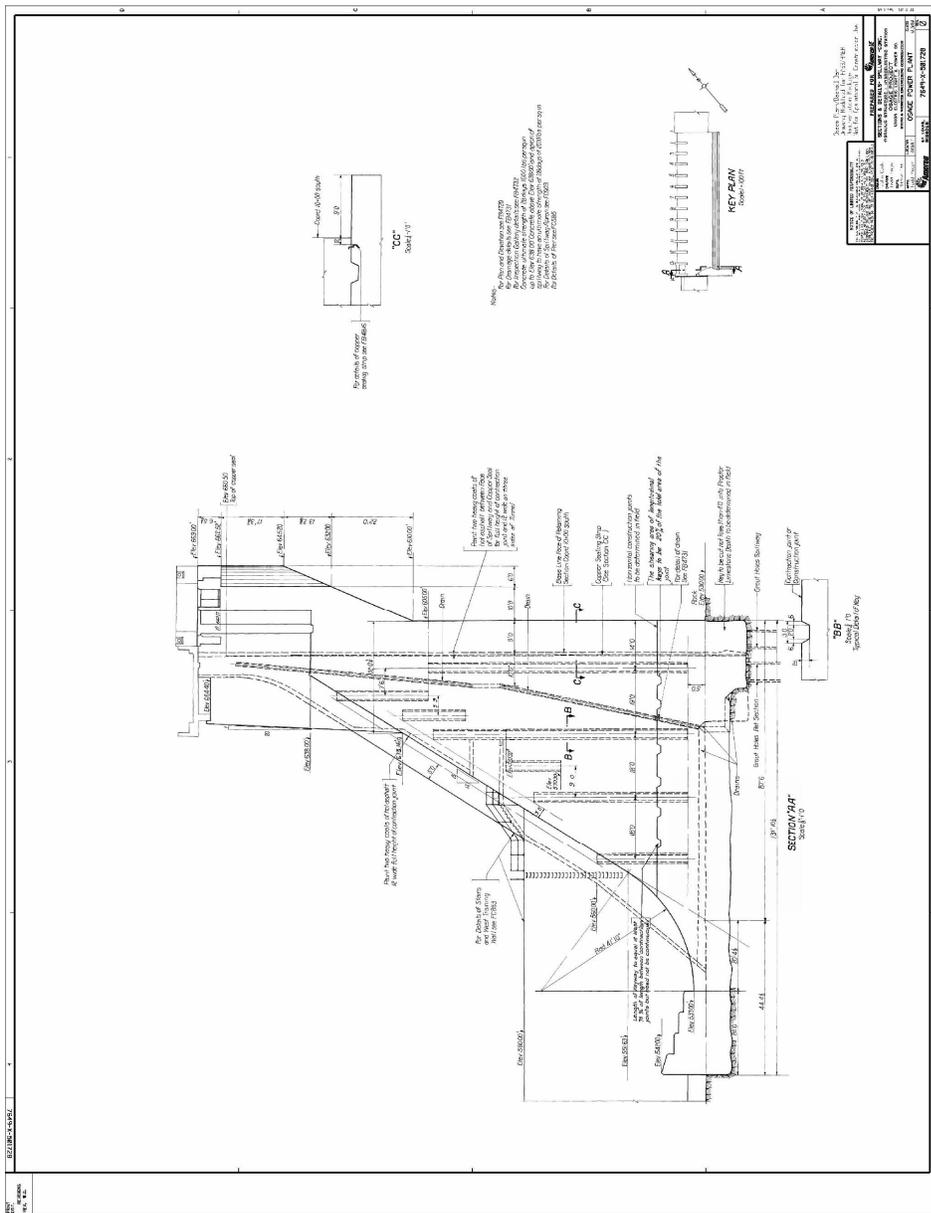
Reduced copy of historic aerial photographs, dated February 20, 1973
 Modified by AmerenUE for HAER documentation on January 6, 2010
 Original on file at AmerenUE, St. Louis, Missouri

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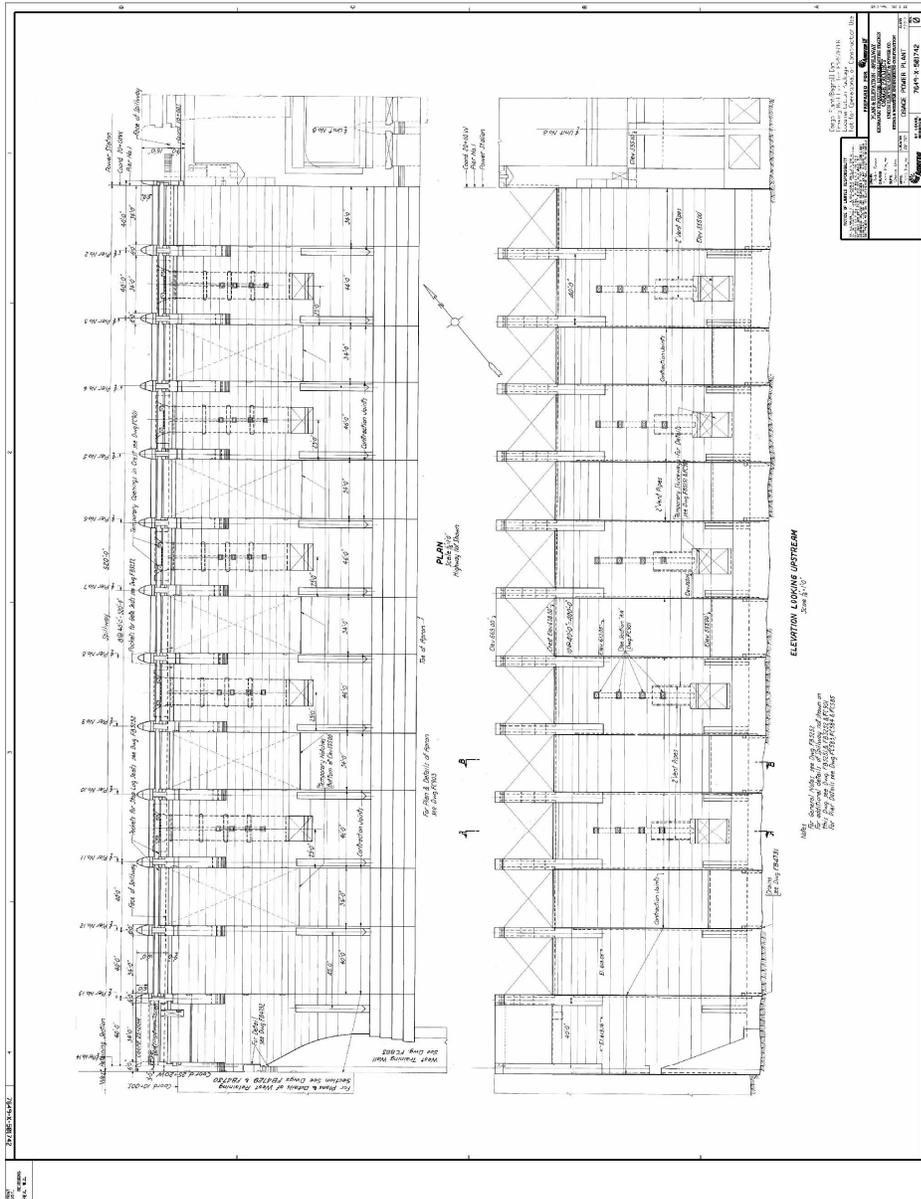
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 Modified by AmerenUE for HAER documentation on January 6, 2010
 Original on file at AmerenUE, St. Louis, Missouri

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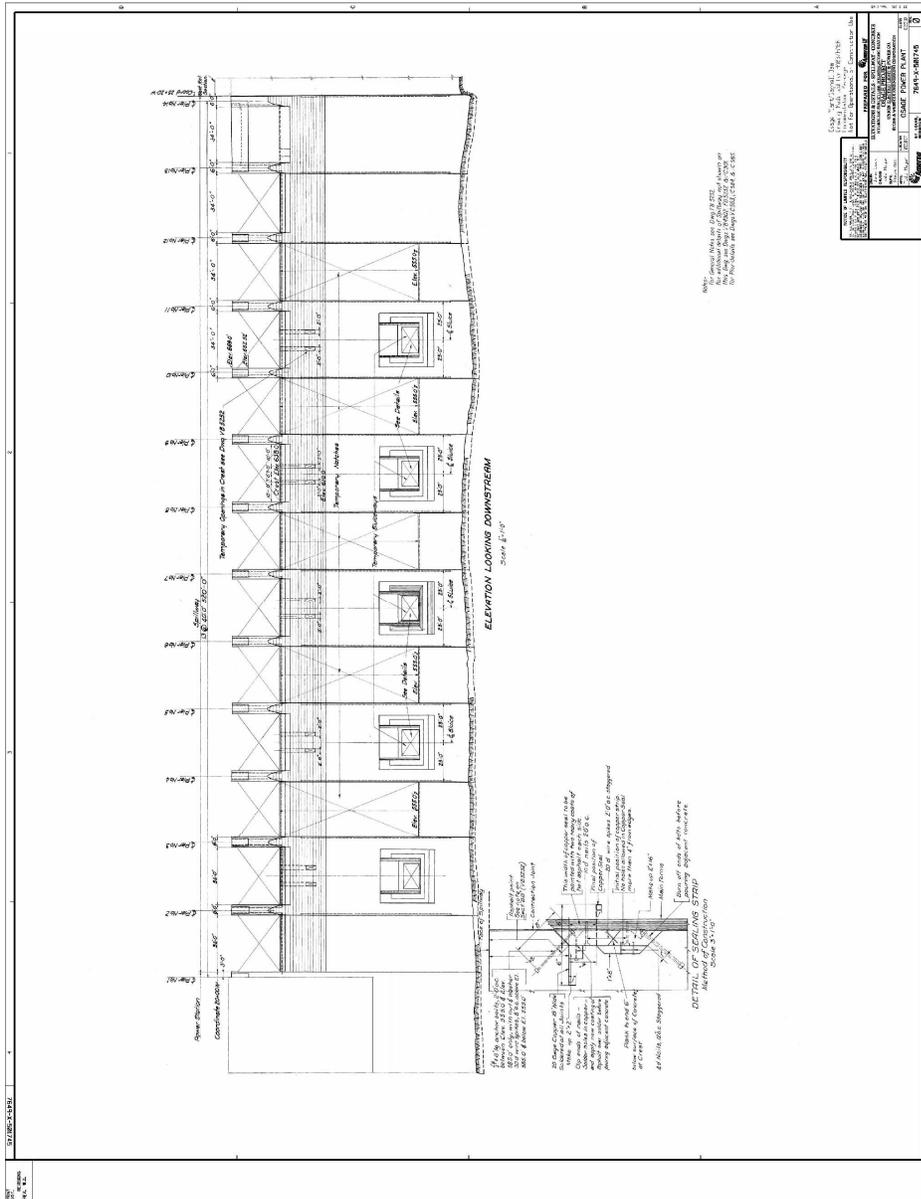
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 Modified by AmerenUE for HAER documentation on January 6, 2010
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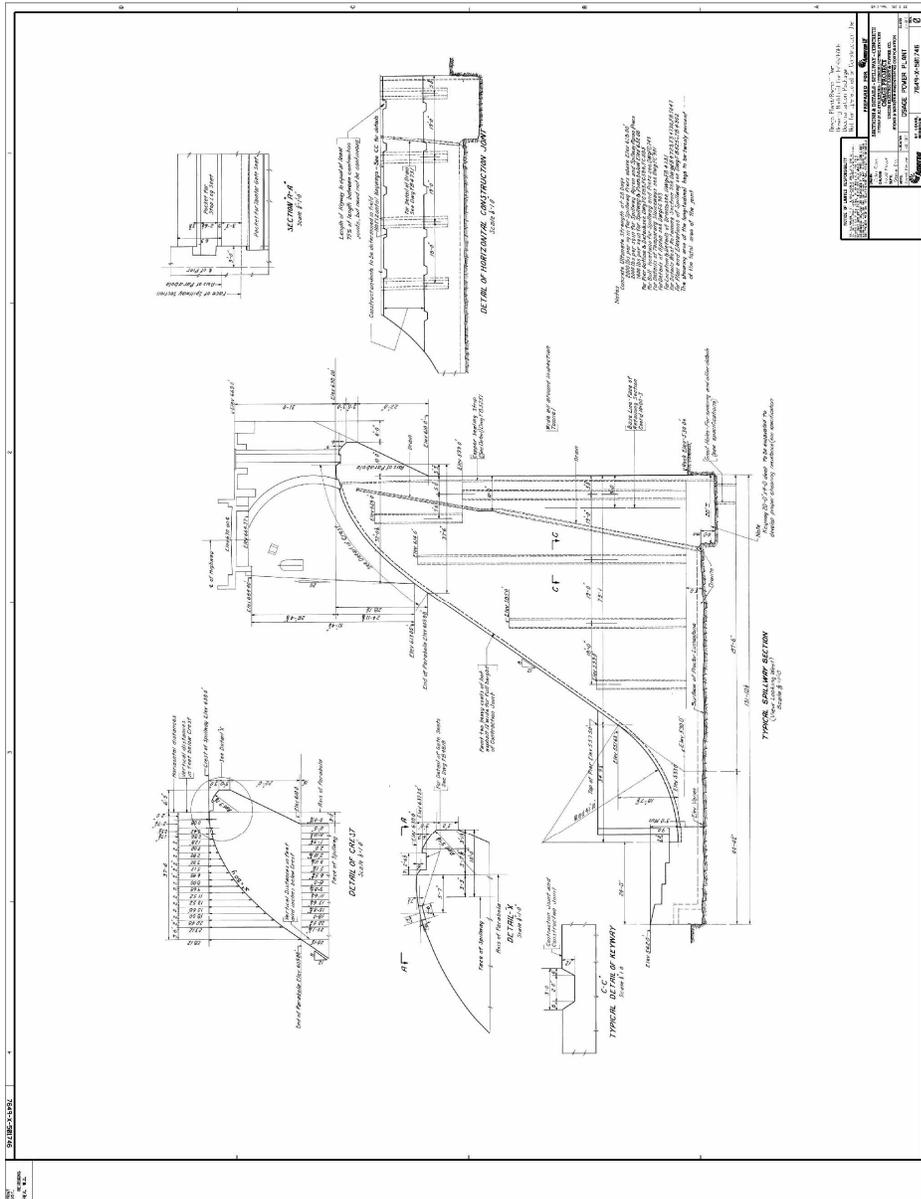
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 Modified by AmerenUE for HAER documentation on January 6, 2010
 Original on file at AmerenUE, St. Louis, Missouri

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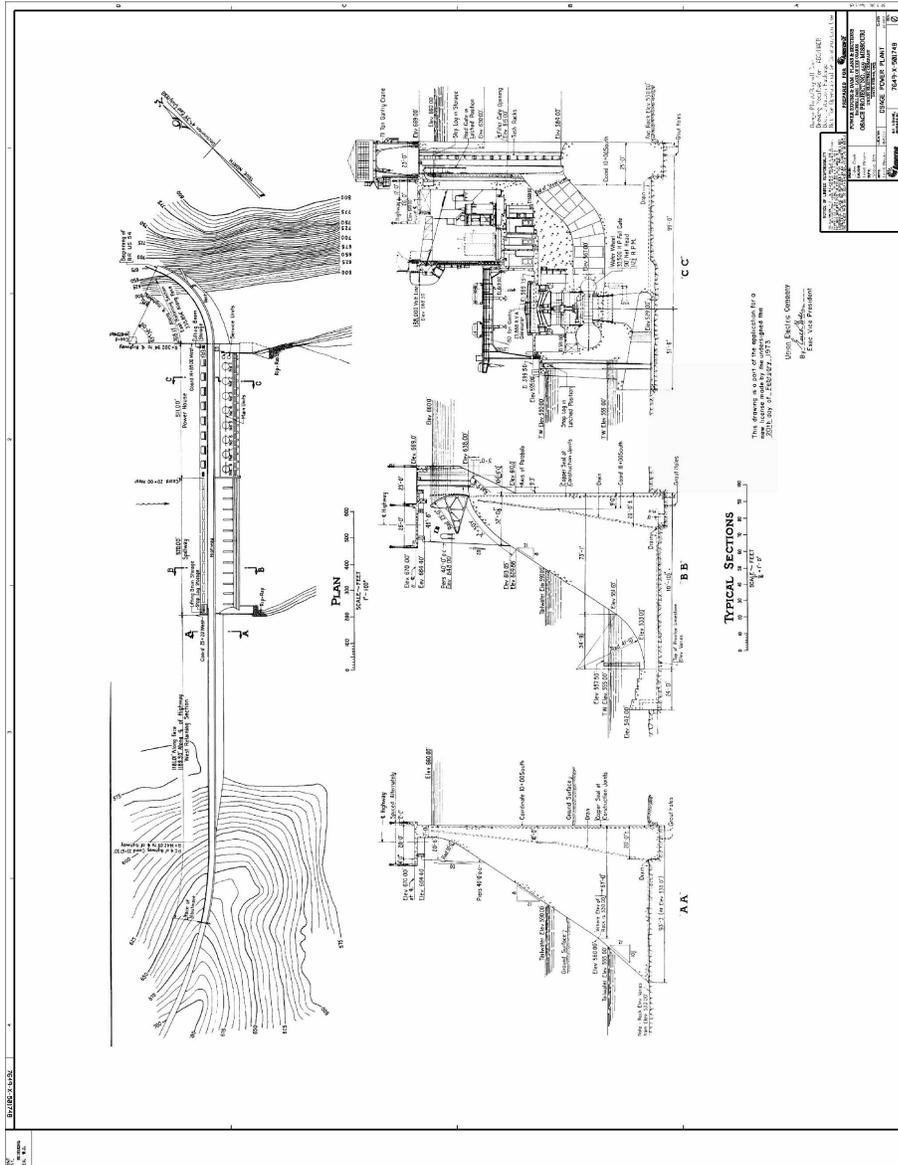
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 Modified by AmerenUE for HAER documentation on January 6, 2010
 Original on file at AmerenUE, St. Louis, Missouri

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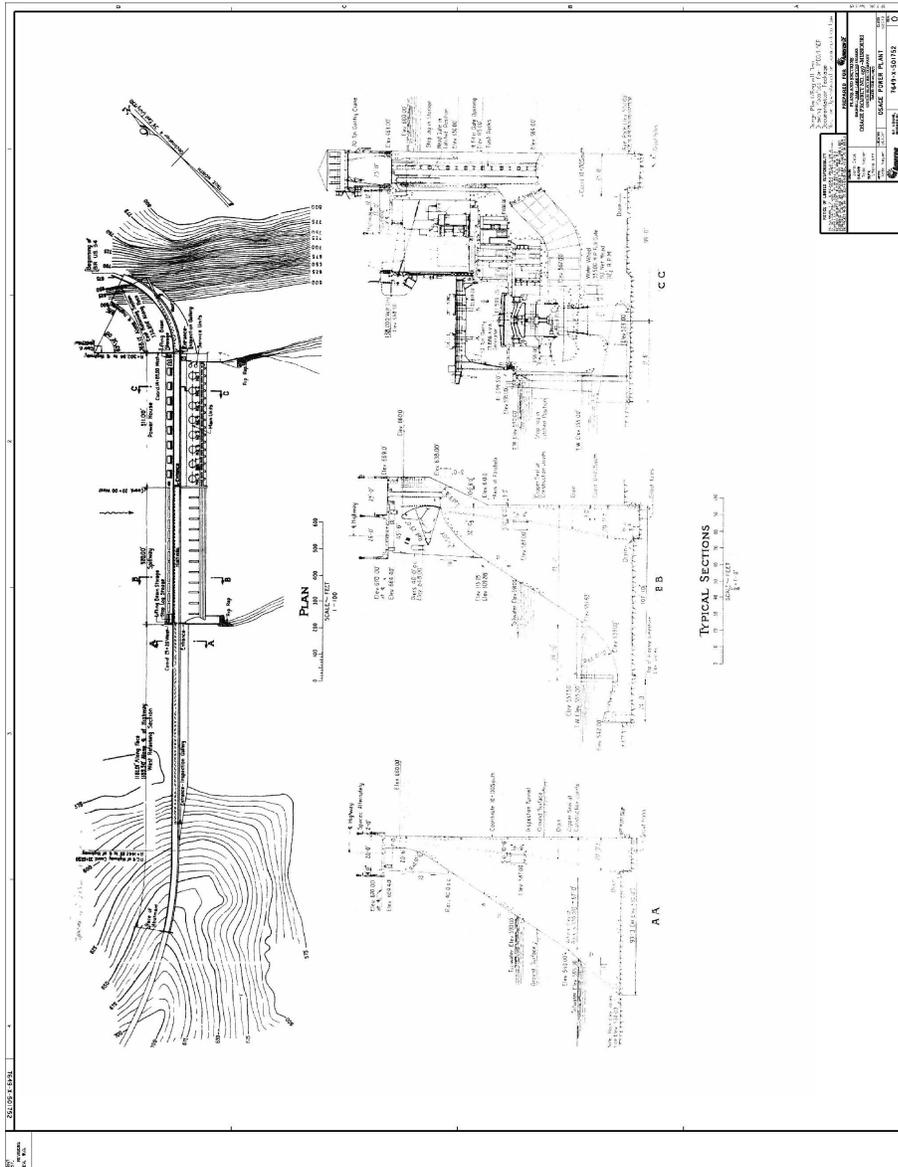
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 Modified by AmerenUE for HAER documentation on January 6, 2010
 Original on file at AmerenUE, St. Louis, Missouri

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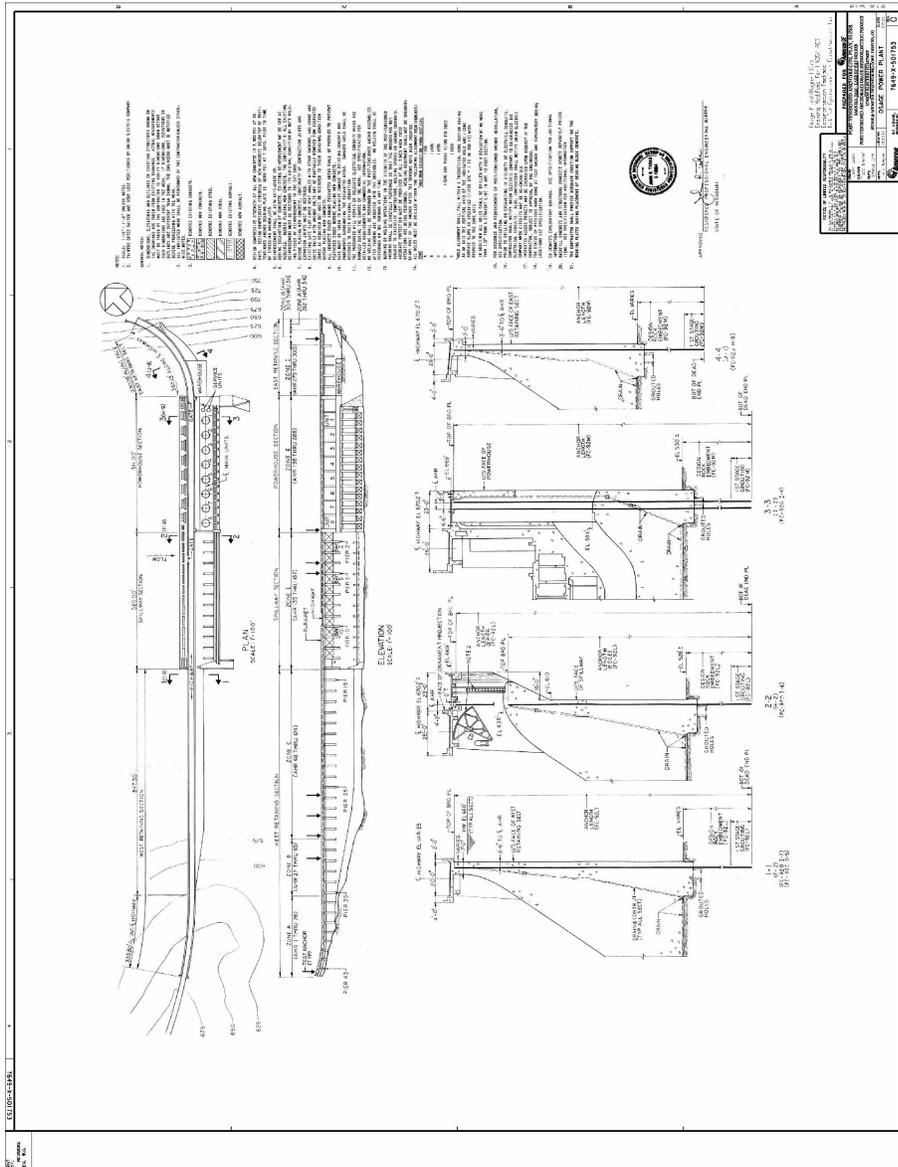
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 Original on file at AmerenUE, St. Louis, Missouri

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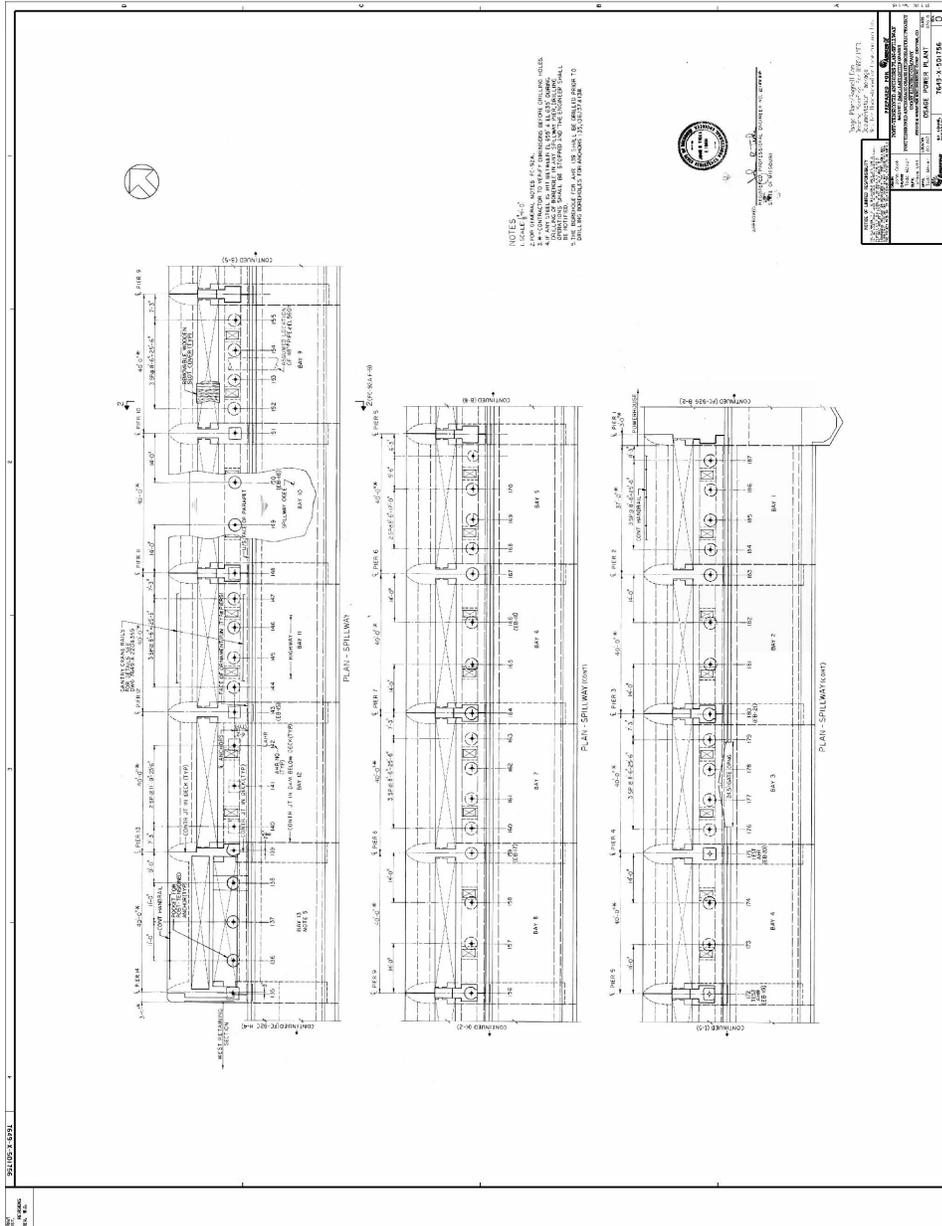
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 Modified by AmerenUE for HAER documentation on January 6, 2010
 Original on file at AmerenUE, St. Louis, Missouri

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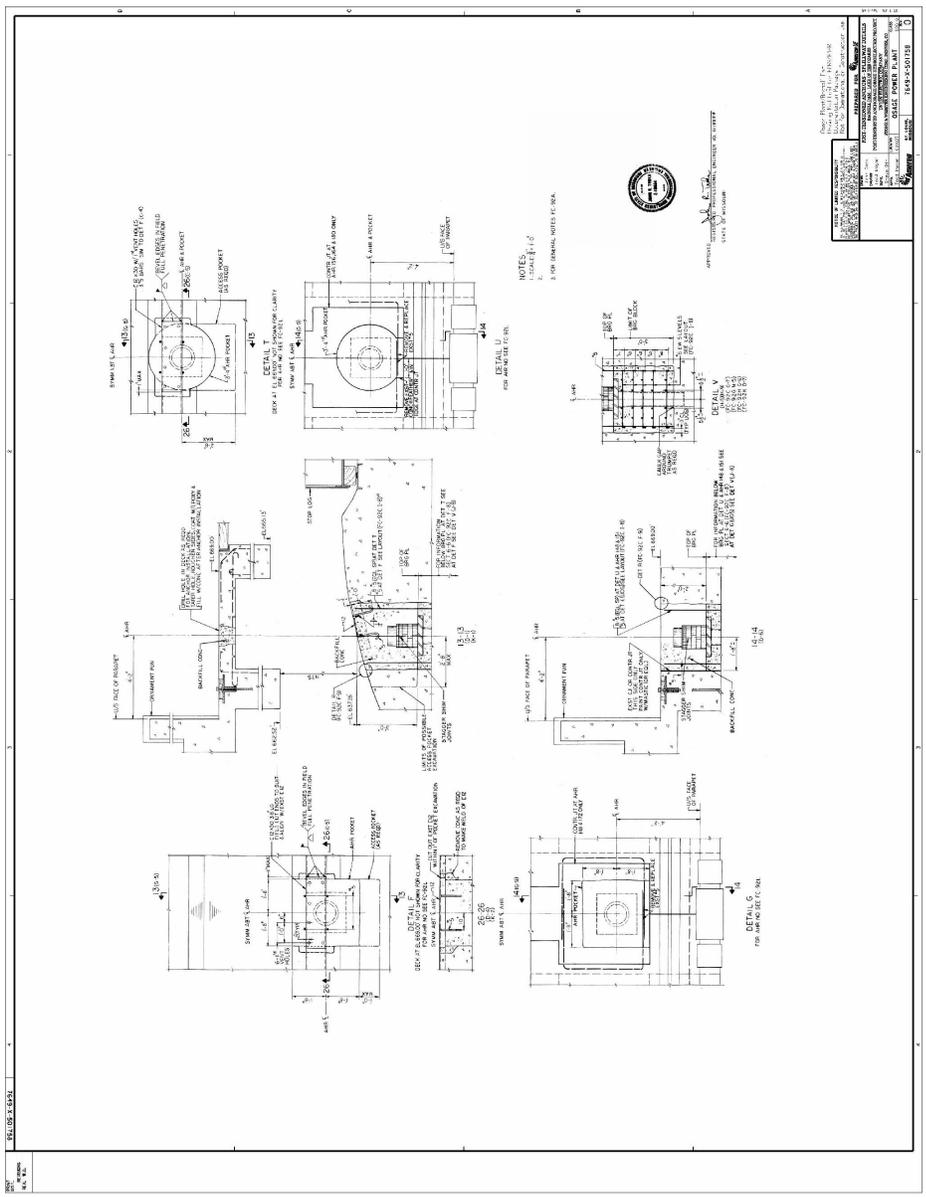
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 Modified by AmerenUE for HAER documentation on January 6, 2010
 Original on file at AmerenUE, St. Louis, Missouri

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Reduced copy of historic plan, dated March 17, 1982
 Modified by AmerenUE for HAER documentation on January 6, 2010
 Original on file at AmerenUE, St. Louis, Missouri

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Reduced copy of historic details, dated March 17, 1982
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UNION ELECTRIC LIGHT AND POWER CO.-HYDROELECTRIC STATION-OSAGE DEVELOPMENT
J.O. 5461 #447, 1-2-31.
STONE & WEBSTER ENGINEERING CORPORATION, Builders
General View from East Hillside N 2285

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UNION ELECTRIC LIGHT AND POWER CO. HYDROELECTRIC STATION-OSAGE DEVELOPMENT
STONE & WEBSTER ENGINEERING CORPORATION, BUILDERS
General View from East Hillside N 2354
J.O. 5461 No 516, 4-29-51

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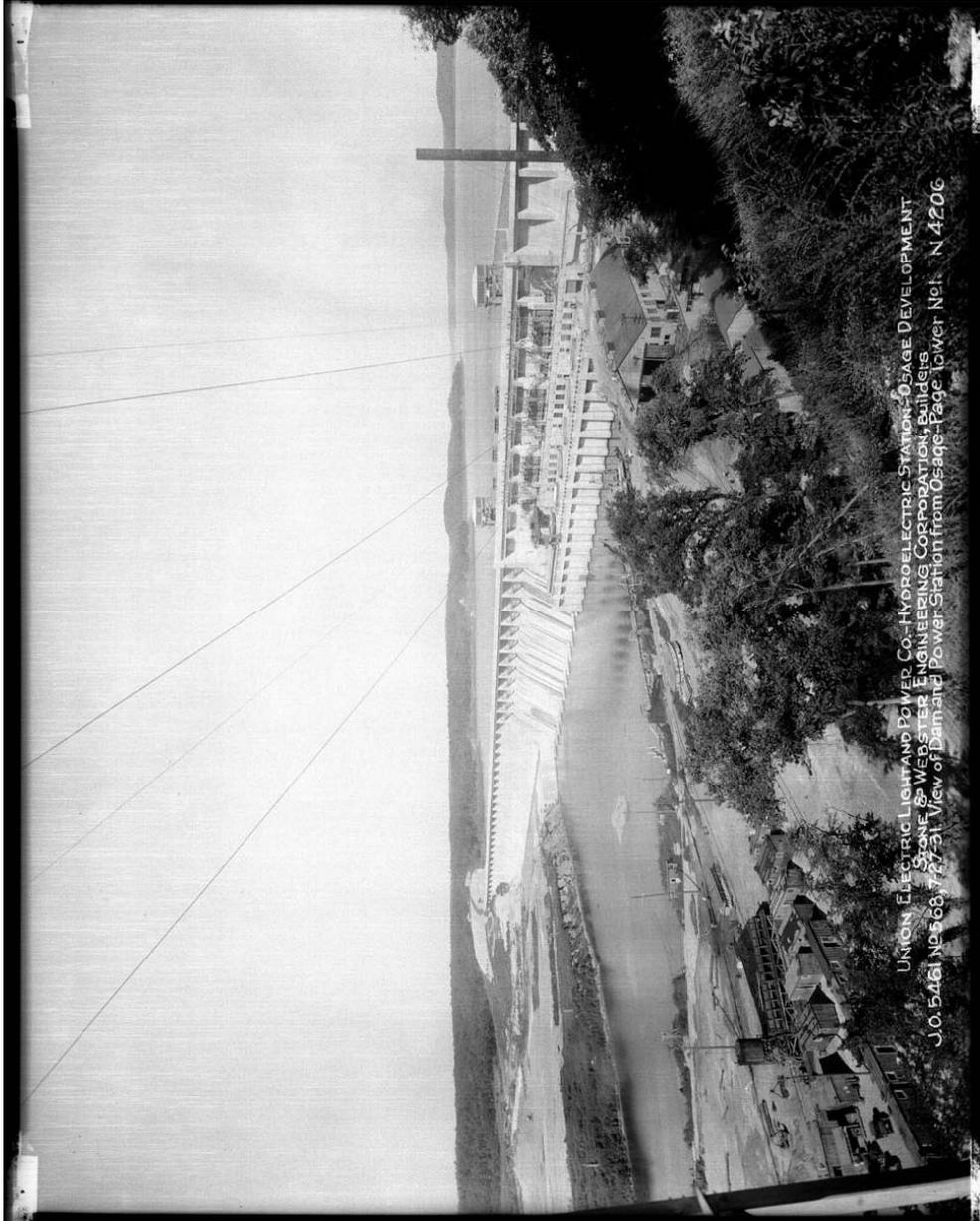


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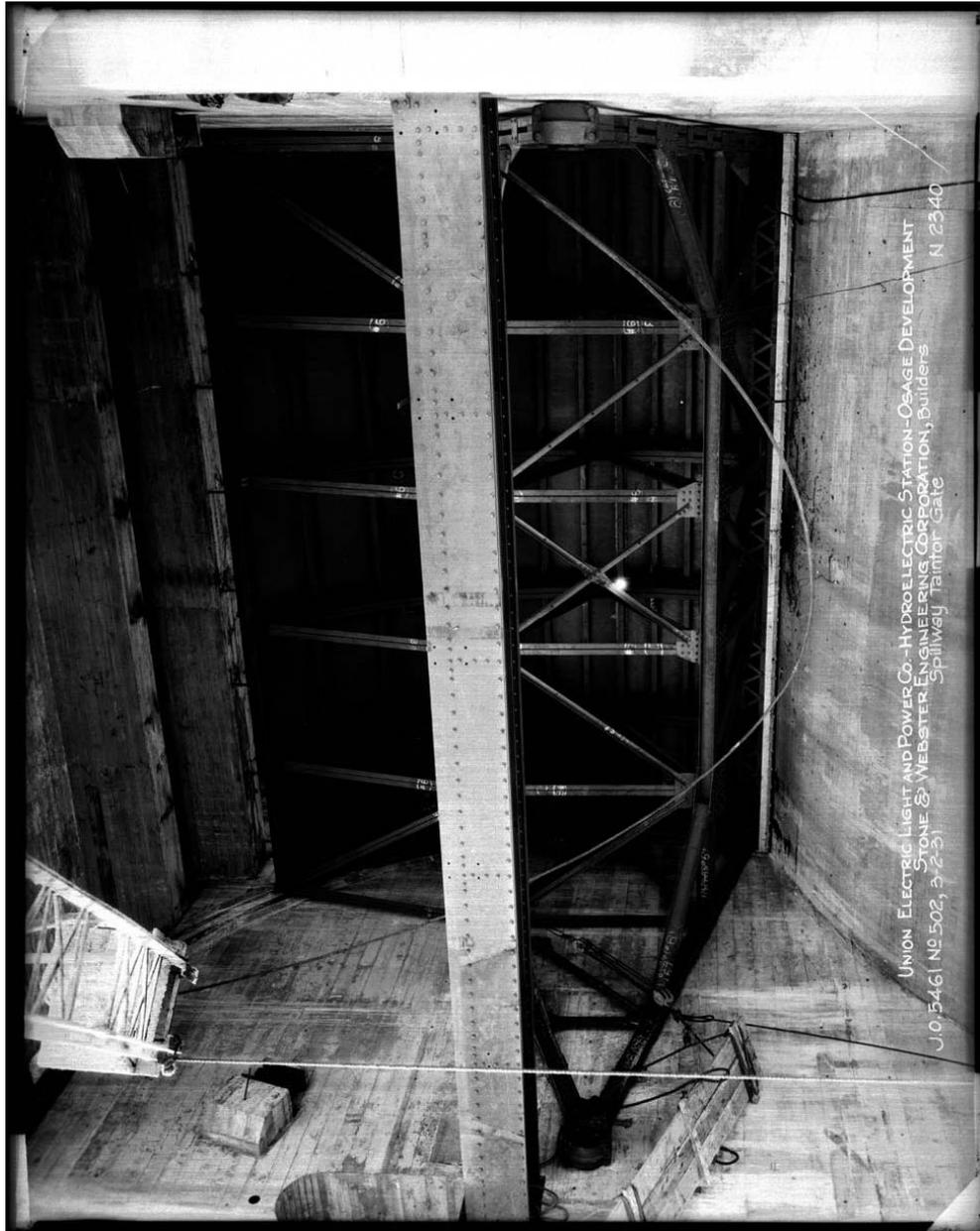
UNION ELECTRIC LIGHT AND POWER CO.-HYDROELECTRIC STATION-OSAGE DEVELOPMENT
STONE & WEBSTER ENGINEERING CORPORATION BUILDERS N 2372
J.O. 5461 N 554, 5-27-31. Downstream Elevation of Dam and Lower Station

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UNION ELECTRIC LIGHT AND POWER CO. HYDROELECTRIC STATION, OSAGE DEVELOPMENT.
J.O. 5461, NO. 568, 7-23-31. View of Dam and Power Station from Osage. Page Power No. N 4206

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