

SECTION II
PROJECT DESCRIPTION

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2-01 LOCATION

Carlyle Lake is located on the Kaskaskia River at river mile 94.2 upstream from its confluence with the Mississippi River and about one-half mile upstream of the town of Carlyle, Illinois. Carlyle is located in Clinton County, approximately 50 miles east of St. Louis, Missouri, on U. S. Highway 50. The project area is bounded by Interstate Highway 70 on the north, U. S. Highway 50 and Interstate 64 on the south, U. S. Highway 51 and Interstate 57 on the east, and Illinois State Route 127 on the west. The location of the project and reservoir is shown on PLATE 3. State parks, Corps projects and population density information within the zone of influence (100-mile radius of Carlyle Lake) are shown on PLATE 3.

2-02 LAKE DATA

a. Basin Hydrologic And Climatic Summary. The plan of lake operation provides for flood control, water supply, navigation, water quality enhancement, recreation, and fish and wildlife conservation.

(1) A table of pertinent data related to project features and information related thereto is as follows.

TABLE 1
CARLYLE LAKE
PERTINENT DATA

General

Purpose of project	Flood control, lower Kaskaskia River navigation, water supply, outdoor recreation, fish and wildlife conservation, and water quality enhancement.
Location of dam	
Stream	Kaskaskia River, Illinois
River mile, above mouth	94.2
County	Clinton
Nearest Town	Carlyle, Illinois
Location of reservoir	
River mile above mouth	94.2
Counties	Clinton, Bond, Fayette, and Marion
Drainage area	
Upstream from dam site(sq. mi.)	2,717
Upstream from mouth(sq. mi.)	5,840

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Reservoir

Inactive pool (minimum pool)

Elevation, feet	429.5
Area, acres	7,100
Shoreline (excluding arms), miles	25
Depth of water, feet	25 feet maximum

Joint-use pool

Elevation, feet, National Geodetic Vertical Datum (NGVD)	429.5-445.0 (summer pool 445.0)
Pool area, acres at elev. 445.0 ft.	26,000
Shoreline (excluding arms), miles	55
Depth of water, feet	40 feet maximum

Public land area at 445.0, acres 12,833

Flood control pool

Elevation, feet, NGVD	445.0-462.5
Pool area, acres at elev. 462.5 ft.	58,447
Shoreline (excluding arms), miles	135
Depth of water, feet	58 feet maximum

Main dam

Type	Earth-fill dam with gated spillway section
Elevation of crest, feet, NGVD	4 7 2 . 5
Height above streambed, feet	67.5
Length of crest, feet	6,610

Spillway

Width, gross, feet	179
Width, net, feet	152
Elevation of crest, feet, NGVD	425.0
Crest gates	425.0
Number	4
Size, feet	38W x 39H
Type	
Tainter	
Elevation, top of gates (closed), feet, NGVD	463.5
Tailwater elevation for discharge	
Minimum release, 50 cfs	412.0
Maximum release, 10,000 cfs	427.0

Outlet sluices

Location	East abutment, Monolith 7D
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Number	1
Size intake and intake invert elevation	30" at 417 feet NGVD
Size outlet and outlet invert elevation	24" at 404 Feet NGVD
Control	Venturi tube and regulating valve

Saddle dams

Elevation of crests, feet NGVD	472.5
Saddle Dam No. 2	
Maximum height, feet	44
Length of crest, feet	8,100
Saddle Dam No. 3	
Maximum height, feet	34
Length of crest, feet	23,400

Keyesport Levee

Elevation of crests, feet NGVD	469
Maximum height, feet	472.5
Length of crest, feet	9,945
Fee line contour, feet	450
Easement line contour, feet	465.5
Flowage Easement Lands, Acres	24,972
Total Fee Lands and Water, Acres	37,543

(2) The climate in this area is relatively moderate.

(a) Temperature. Occasional temperatures of 100° F. or higher have been experienced. The winters are usually short and moderate, although temperatures below zero are occasionally experienced. The average annual temperature in this area is about 55° F., and the average monthly temperature ranges from a maximum of 78° F. during July to a minimum of 30° F. in January. An extreme low of minus 34° F. was recorded in Lincoln, Illinois, in January 1927, and minus 28° F. was recorded in Morrisonville, Illinois, just outside the basin boundary. The maximum observed temperature of 115° F. occurred at Centralia, Illinois, on 22 July 1901, and again at Greenville, Illinois, on 12 July 1936.

(b) Wind. The maximum wind movement occurs in March, and the minimum average occurs in August. The average annual wind velocity is about 10.3 miles per hour. The prevailing winds over the basin are from the south, southwest.

(c) Humidity. The mean relative humidity varies from about 59 to 86 percent in the winter and from 51 to 89 percent during the other seasons of the year.

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(d) Precipitation. The average annual precipitation over the drainage area is 40.2 inches of which about 22 percent falls in May and June. Although rainstorms are frequent in the spring, local cellular storms also occur in July and August. Snowfall is usually limited to the period from October through April and seldom covers the ground for more than a few days at a time. The average annual snowfall amounts to about 17 inches.

b. Lake Shoreline, Length, And General Character. The topography of the reservoir area consists of gently rolling land, with alluvial valleys and terraces developed along the Kaskaskia River. The reservoir area is one of moderately low relief. The highest point is some 4 miles southwest of the town of Carlyle and is approximately 580 feet in elevation, while the lower portions of the Kaskaskia River Valley have elevations near 400 feet. The uplands are generally flat, except where interrupted by occasional drift hills. Elevations of these uplands range between 450 and 550 feet, with the drift hills standing 30 to 50 feet higher. The reservoir, at joint use pool elevation 445.0, has a water surface area of approximately 25,000 acres and 87 miles of shoreline. The pool at this elevation extends upstream from the dam approximately 13 miles, intersected about 8 miles upstream by the Burlington and Northern Railroad crossing between Keyesport and Boulder, and varies in width at this elevation from 1 to 3 miles. The average water depth throughout the reservoir at joint use pool elevation is approximately 25 feet. Depths along the western shore are greater, due to the old riverbed, than along the eastern shore and in the upper reaches. Maximum depths of 40 feet are along the old riverbed and at several of the bottomland lake sites which existed prior to inundation. The shoreline of the reservoir at the joint use pool elevation is rather regular, except where several major tributary streams enter the main pool. By far, the major portions of deep water are along the bluff-like areas of the west and south shore of the reservoir. This condition exists even at inactive or minimum pool elevations.

c. Project Structures.

(1) Main Dam. The main dam consists of a compacted earth-fill embankment and a concrete spillway section with tainter gates and sluices located about midway along the dam embankment. The crest of the dam embankment is at elevation 472.5 feet, and the crest of the spillway is at elevation 425 feet. The total length of the structure, including the spillway section, is about 6,610 feet. The main dam has a dam safety data collection system consisting of instruments installed both during and after construction. The purpose of these instruments is to monitor the performance safety of the earthfill embankment and the concrete structure.

(2) Saddle Dams and Pump Stations. Because of the topography, it was necessary to construct two earth-fill saddle dams on the lake rim, east of Carlyle, in order to contain the maximum pool level proposed for the reservoir. The total length of these embankments is about 31,560 feet, and the elevation of the crest of each dam is 472.5 feet, the same as that of the main dam. Drainage facilities for handling natural impoundment landside of the saddle dams consists of a system of drainage structures, collection ditches, and a pump station for each saddle dam.

(3) Keyesport Levee and Pump Station. The reservoir necessitates separate protection, consisting of an earthen levee and drainage and pumping facilities for handling interior drainage for the Village of Keyesport, opposite river mile 125. The net grade elevation of this levee is 469 feet, and it is 9,945 feet in length.

(4) Railroad Crossing. The Burlington and Northern Railroad, crossing the pool between Keyesport and Boulder was raised a maximum of

approximately 23 feet. The railroad levee is riprapped and has several flood openings. This structure separates the open water pool to the south from the flooded dead timber (now mostly stumps) and shallow water to the north.

(5) Relocations and Remedial Works. At the time of construction, existing local roads, oil lines, power lines and transmission lines, two water supply facilities, and several cemeteries required relocation or remedial measures.

2-03. LAKE REGULATION

Appendix B of the Kaskaskia River Basin, Illinois, Master Reservoir Regulation Manual contains the plan for reservoir regulation. The plan provides for flood control, water supply, water quality, navigation, recreation, and fish and wildlife conservation.

a. Reservoir Regulation And Pool Fluctuation. Water level management for water quality, water supply, and fish and wildlife has a minimal effect on regulation of the reservoir for flood control. The relationships of outflows with time of the year and reservoir elevations is illustrated on PLATE 12.

b. Water Quality Regulation. A minimum release rate of 50 cfs will be maintained to provide guaranteed downstream flows for pollution abatement and maintained stream flow. This volume of flow is in excess of the minimum flows experienced during the period of minimum stream flow record. Consequently, a minimum 50 cfs downstream release rate improves the stream flow characteristics that have been experienced during the period of minimum stream flow.

c. Inactive Storage Pool. The inactive storage pool of 50,000 acre-feet below elevation 429.5 feet is reserved for sediment retention.

d. Joint Use Pool. The joint use pool contains 230,227 acre-feet of storage between elevation 429.5 and 445.0 feet. Thirty two thousand, six hundred ninety two acre-feet (32,692 ac. ft.) of this storage is allocated to the State of Illinois for water supply. The State of Illinois is participating as a local interest by contributing the cost (payable when utilized) allocated to this storage for domestic and future industrial water supply needs. The remaining 197,535 acre-feet is allocated to the Federal Government. Stored water is regulated for Kaskaskia River navigation, fish and wildlife management, recreation, and to assure minimum flows downstream.

e. Flood Control Pool. The portion of the reservoir above elevation 445 feet and below elevation 462.5 feet has an authorized storage of 700,000 acre-feet for flood control. This storage is based on requirements determined from more recent criteria and hydraulic data subsequent to the authorization act. The rule curve, pool frequency, and duration curve is presented on PLATE 12.

2-04. VISITATION DATA

a. General. Visitation has increased steadily at Carlyle Lake since becoming operational in 1967. Visitation has fluctuated between 2.5 and 4.5 million recreation days over the past ten years. A recreation day is a visit by one individual for recreational purposes during any reasonable portion or all of a 24-hr period. Year to year variations in actual lake visitation can be attributed to the changes in weather conditions, fluctuations in lake levels, cost and supply of gasoline, general economic conditions, and the level of development of facilities occurring on the lake. Recreational opportunities will be continually reevaluated to insure maximum use by the public. In 1992,

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visitation began to be recorded as visitor hours and visits instead of recreation days. Actual visitation data in Table 2 reflect this change.

b. Past And Current Visitation. Carlyle Lake's zone of influence is shown on PLATE 3. The most recent visitor use survey provided data which showed that 54% of lake visitors travel a distance of less than 26 miles to reach the lake, 25% of lake users come from within a 26-50 mile radius, 9% from within a 51-75 mile radius, and 4% from beyond 100 mile distance of the lake. TABLE 2 presents a summary of actual and estimated visitation from 1967 through 1996. Recreation use days are estimated from 1992 on because of the switchover to Visitor Estimation Reporting System (VERS). Estimated visitation for the years 1992 to 1996 were developed by linear regression analysis of data from 1984 to 1991 to provide a more accurate trend in visitation. Marina patron visitation reflects a market area skewed toward St. Louis and is discussed in Section 4-03e.

c. Projected Visitation. A discussion of projected visitation at Carlyle Lake, is presented in paragraph 4-14.

TABLE 2
CARLYLE LAKE
VISITATION, 1967-1996
RECREATION DAYS

1967	929,008
1968	1,563,877
1969	2,397,411
1970	2,022,246
1971	2,330,468
1972	2,262,449
1973	2,534,267
1974	2,658,564
1975	2,360,561
1976	2,310,186
1977	2,815,527
1978	3,103,273
1979	2,750,100
1980	2,763,499
1981	2,575,763
1982	3,424,750
1983	3,776,272
1984	3,559,551
1985	3,606,900
1986	3,931,039
1987	4,045,611
1988	3,530,773
1989	3,546,272
1990	3,880,531
1991	4,198,436
1992	4,345,954
1993	4,511,261
1994	4,394,159
1995	4,480,439
1996	4,566,719
	<u>VISITOR HOURS</u>
1992	23,730,673
1993	24,780,357
1994	21,811,481
1995	25,705,118
1996	23,760,870