

Glen Canyon Dam and Powerplant



SELF-GUIDED TOUR

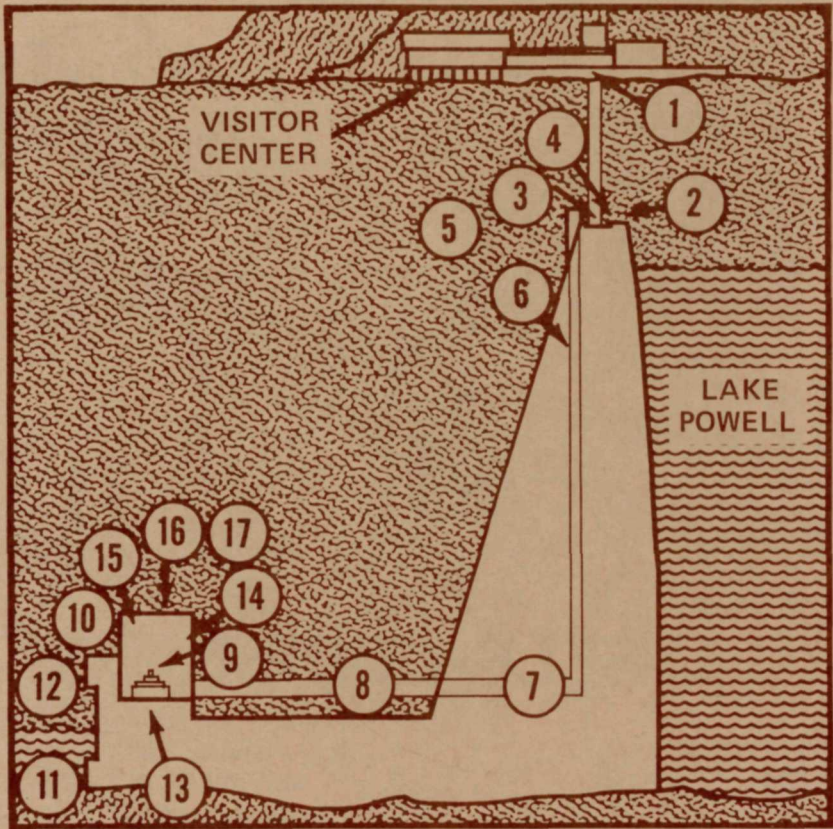
DEPARTMENT OF THE INTERIOR

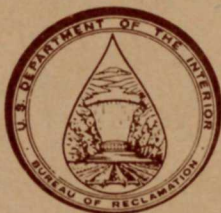
Walter J. Hickel, Secretary

BUREAU OF RECLAMATION

Ellis L. Armstrong, Commissioner

CROSS SECTION OF GLEN CANYON DAM
SHOWING TOUR STATIONS





**CONVENIENT MARKERS SIMILAR TO
INSIGNIA APPEAR ON TOUR ROUTE.
CORRESPONDING TEXT NUMBER
DESCRIBES FEATURES**

On this self-guided tour you will ride on 3 different elevators, walk through a tunnel, and cross a bridge. Total walking distance, round trip, is only about 1/3 mile.

You may proceed at your own pace, but an average visit takes around 30 minutes. The areas you will visit are safe, but please observe the "No Admittance" and "Restricted Area" signs. These are for your protection. Benches are provided for those who wish to rest along the way.



ELEVATOR FROM VISITOR CENTER TO CREST OF DAM ACCESS TUNNEL

The tour begins on this elevator which will convey you 110 feet down to the level of the crest of the dam.



TUNNEL TO CREST OF THE DAM

Upon your exit from the Visitor Center elevator you will enter a short tunnel, through which you will walk to the crest of the dam.



THE CREST OF THE DAM

The crest length of Glen Canyon Dam is 1560 feet, the width of the roadway and sidewalks totals 35 feet. Embedded in the concrete are rails for the 190-ton gantry crane, the high steel structure on the top of the dam. The gantry crane is used (infrequently) to install stop logs and remove penstock gates for maintenance. A penstock is a 15-foot diameter steel tube, 500 feet long, through which water passes from the lake to the turbine.



PENSTOCK GATE CHAMBER

The small buildings on the upstream side contain machinery to operate gates on the penstock intakes. The top of the structure can be removed to permit the gantry crane to remove and replace for inspection and maintenance the tremendously heavy penstock gates.

You may be interested in noting lake elevations which are posted at various intervals down the edge of the wall.

Upstream from the dam about 2,500 feet, you will see a cable boom all the way across the canyon. This is to keep trash and boats from drifting near the dam.

On either side of the canyon, you can see the channel cut into the canyon wall, creating a "by-pass" or spillway intake for the water. These channels can be used when elevation of the lake exceeds 3680 feet.

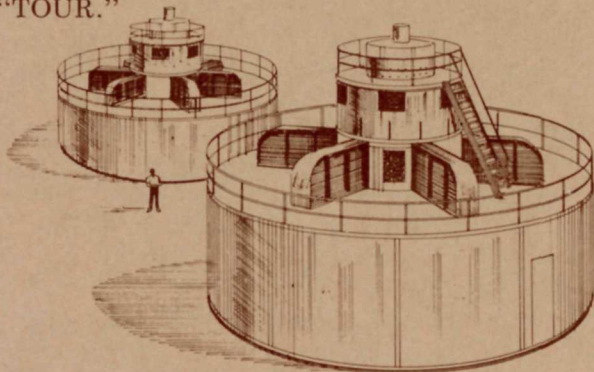
GEOLOGY OF GLEN CANYON

The portion of Glen Canyon you can observe downstream from the dam is typical Navajo sandstone, a thick formation that extends downward about 500 feet below the riverbed. Navajo sandstone is actually solidified sand dunes that are perhaps 150 million years old. Although in this section of canyon the walls are sheer and high, the cliffs along most of Lake Powell are dissected into many picturesque formations. This site was chosen for the dam because the canyon is narrow, the rocks are stable with no nearby faults, and the cost of the dam was much less here than elsewhere.

In the bed of Wahweap Creek, 6 miles from the dam, was located an ample supply of hard rock aggregate that was mixed with cement and water to make concrete for the dam.

ELEVATOR INTO DAM

The west side elevator (right side looking downstream) will descend 528 feet. The trip will take just over one minute. Push the button marked: "TOUR."





GALLERY FROM ELEVATOR TO POWERPLANT

Upon exit from the elevator, you will enter one of the dam's many galleries. The 50-degree temperature remains constant year-round.

Galleries are necessary in concrete dams for inspection purposes. In this gallery, over 100 feet of concrete lie between you and Lake Powell.

FOLLOW THE SIGNS TO THE POWERPLANT



BRIDGE FROM DAM TO POWERPLANT

86,000 sq. ft. of grassed area lie between dam and powerplant, almost 2 full acres. The big manholes are used to periodically inspect expansion joints in the penstocks which are 20 feet below the surface. Water trough at base of the dam returns drainage water to the river.



POWER GENERATOR ROOM

The 8 generators have a combined rating of 950,000 kilowatts. This is enough electricity for a city of about 1 1/2 million people. Generators turn at 150 revolutions per minute, generating power at 13,800 volts. The generators are driven by Francis type reaction turbines, which are connected to the generators by large, vertical steel shafts. The flow of water through the penstocks turns the turbines.

When a rise in the demand for electricity occurs, the magnetic load against the generator increases, causing a slight decrease in the speed of the turbines. To keep the turbine and generator rotating at a constant speed, the governor automatically opens the gates, increasing the flow of water enough to bring the speed back to normal and supply the additional power required. The reverse occurs when power demands drop off.

POWERPLANT TRANSFORMER DECK

From this outside platform you can view the massive transformers that raise the energy from the generating voltage of 13,800 volts to 230,000 and 345,000 volts for transmission to distant markets. The higher voltage decreases transmission line losses.



Each pair of generators feeds power into a bank of 3 single-phase transformers. Each of the transformers weighs about 90 tons and includes a heavy metal core and windings surrounded by special insulating oil.

THE COLORADO RIVER

Below the powerplant, the river resumes its journey to the sea. Here you see the canyon much the same as Major John Wesley Powell viewed it when he named Glen Canyon in 1869.



Glen Canyon Dam has cleared sediment from the river, the water is crystal clear, and rainbow trout thrive in the channel below the dam.

For 15 miles below here, the river winds through lower reaches of Glen Canyon, passes Lee's Ferry, and continues through Marble and Grand Canyons for a distance of 270 miles to reach Hoover Dam, where this same water is again used to generate electricity.

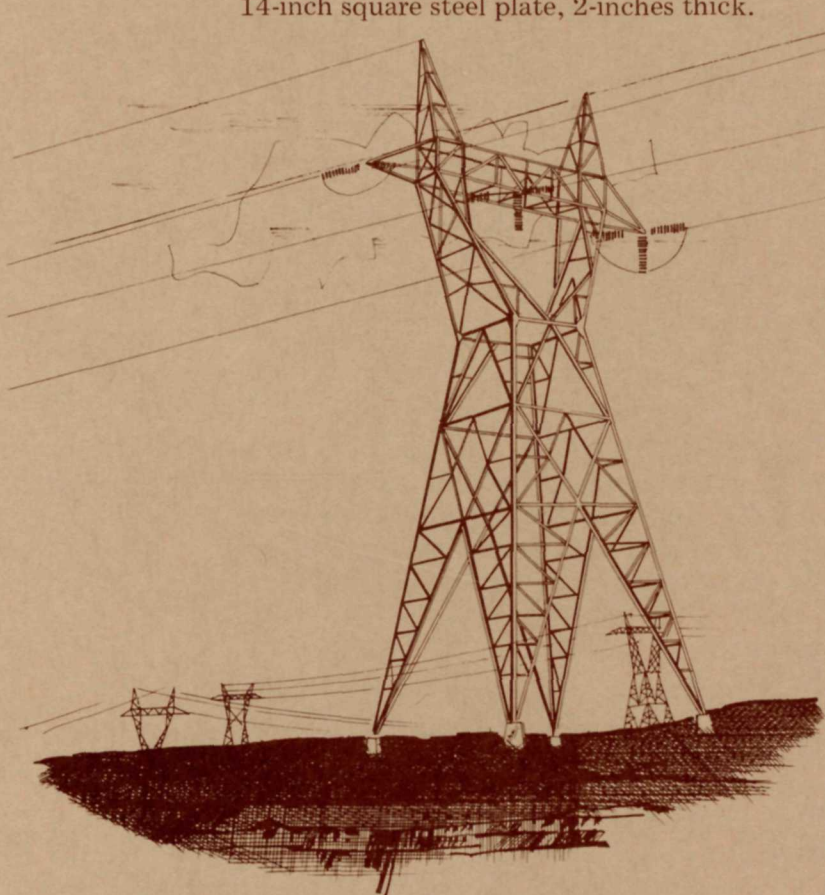
Beyond Hoover Dam lie a series of Reclamation reservoirs which furnish water for irrigation between Arizona and California.



ROCK BOLTS

To your right, on the canyon wall, are many "rock bolts" which prevent rock slabs from falling. These bolts are 2-inches in diameter, extend 45 to 75 feet in the canyon wall, and are cement grouted.

Mounted on the parapet wall is a sample "rock bolt" with the standard type anchor and the 14-inch square steel plate, 2-inches thick.



**IF YOU DO NOT WISH TO TAKE THE
"HALE & HEARTY" OPTIONAL TOUR,
STATION 13, PROCEED TO STATION 14.**

OPTIONAL TOUR FOR THE "HALE & HEARTY"

WALK DOWN 56 STEPS — RIDE ELEVATOR UP. This optional tour will permit you to view the rotating shaft, turbine gate control, governor gallery, and other operating media.

TURBINE PIT AND SHAFT (OPTIONAL TOUR)

The steel shaft is 40 inches in diameter, weighs 79,500 pounds and turns at 150 revolutions per minute. It is connected to the generator above and the turbine wheel below. Water passing through the turbine wheel spins the shaft and generator to which it is connected. About 1,300,000 gallons of water per minute are passing under your feet at this moment. The many metal arms at the bottom of the pit are hydraulically operated, and open and close the wicket gate which controls the water flow through the turbine. Sudden load changes detected by a computer in the Power Operations Center in Montrose, Colorado, sending impulses by microwave to the gate controls, may cause rapid operation of the wicket gate.



GOVERNOR GALLERY (OPTIONAL TOUR)

From this point to the far end of the gallery, or hallway, it is 550 feet. There are 8 identical units, 1 for each turbine, spread out down the hallway. The governor units control the speed of the turbines through a high-pressure oil system.



Proceed to the elevators. Enter one of the elevators and push button marked "TOUR for Floor 8 Control Room and Observation Deck." Stay on elevator until you reach floor 8. The elevator may stop at floor 3 where you started down the 56 steps; however REMAIN ON ELEVATOR until you reach floor 8 control room.



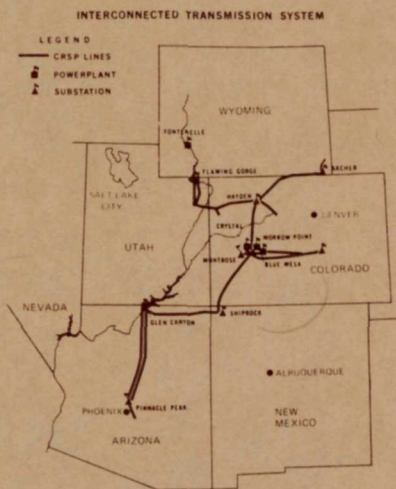
ELEVATOR TO CONTROL ROOM

Either one of these elevators will take you to:
**FLOOR 8 — CONTROL ROOM
AND OBSERVATION DECK**



POWERPLANT CONTROL ROOM

The entire plant is controlled by an operator in the control room. He can observe on the various meters whether or not all mechanisms are operating correctly. This control room is closely linked by a microwave radio system to the power operations office in Montrose, Colorado, which dispatches power to the various markers. Reading of the generators is controlled by a digital computer in the Montrose office which coordinates power needs, water needs, and power capabilities throughout the Colorado River Storage Project.



OBSERVATION DECK

From this outside observation level you can obtain some idea of the massiveness of 5-million cubic yard of concrete that stand between you and Lake Powell.

Glen Canyon Dam was constructed in 26-separate vertical blocks by placing successive 7 1/2 foot layers known as "lifts" on top of each other. You can still see the faint horizontal lines between each 7 1/2 feet layer. The first concrete was placed in June 1960; the dam was topped out in September 1963.

From this point looking downstream, notice the service access tunnel at the bottom of the left canyon wall. This tunnel is 21-ft. high and 22-ft. wide with a two lane drive running a length of 2 miles from the canyon rim. The tunnel is used to bring heavy equipment into the powerplant.

Also on the left side, you will observe the outlet valves which are 8-ft. penstocks designed to discharge water around the powerplant, should the necessity arise.

Total cost of the Glen Canyon Project, including the dam, powerplant, access roads, bridge, and facilities at Page, is about \$272 million. Most of this money will be repaid the Treasury of the United States by the sale of electricity, amortized over a period of years. Recreation facilities will cost another \$28 million.

COMPLETION OF TOUR

The self-guided tour ends on the observation deck of the 8th floor of the powerplant. Please return to the Visitor Center by proceeding to Floor No. 3 of the powerplant and by following signs marked "Return." We hope that you have enjoyed your visit.



The self-guided tour has been made available through the combined efforts of the Bureau of Reclamation and the National Park Service. Both are agencies of the Department of the Interior.



In its assigned function as the Nation's principal natural resource agency, the Department of the Interior bears a special obligation to assure that our expending resources are conserved, that renewable resources are managed to produce optimum yields, and that all resources contribute their full measure to the progress, prosperity, and security of America, now and in the future.