

WATER RESOURCES

Reservoir Project Will Boost Storage, Increase Environmental Flows in Northern California

AFTER RECEIVING more than \$1.2 billion in state and federal funding in 2018 for what is slated to become the seventh-largest reservoir in California, the Sites Project Authority, of Maxwell, California, recently began awarding design contracts for the next phase of its planned 1.8 million acre-ft reservoir. Known as the Sites Project, the off-stream reservoir and its associated conveyance infrastructure will be designed to divert and store water from the Sacramento River during storm events and release it when water is scarce and in greater demand. The Sites Reservoir, which is the main component of the project to be constructed, will provide significantly more water during drier periods, complementing other drought-management tools used to address California's water-management challenges. In this way, the

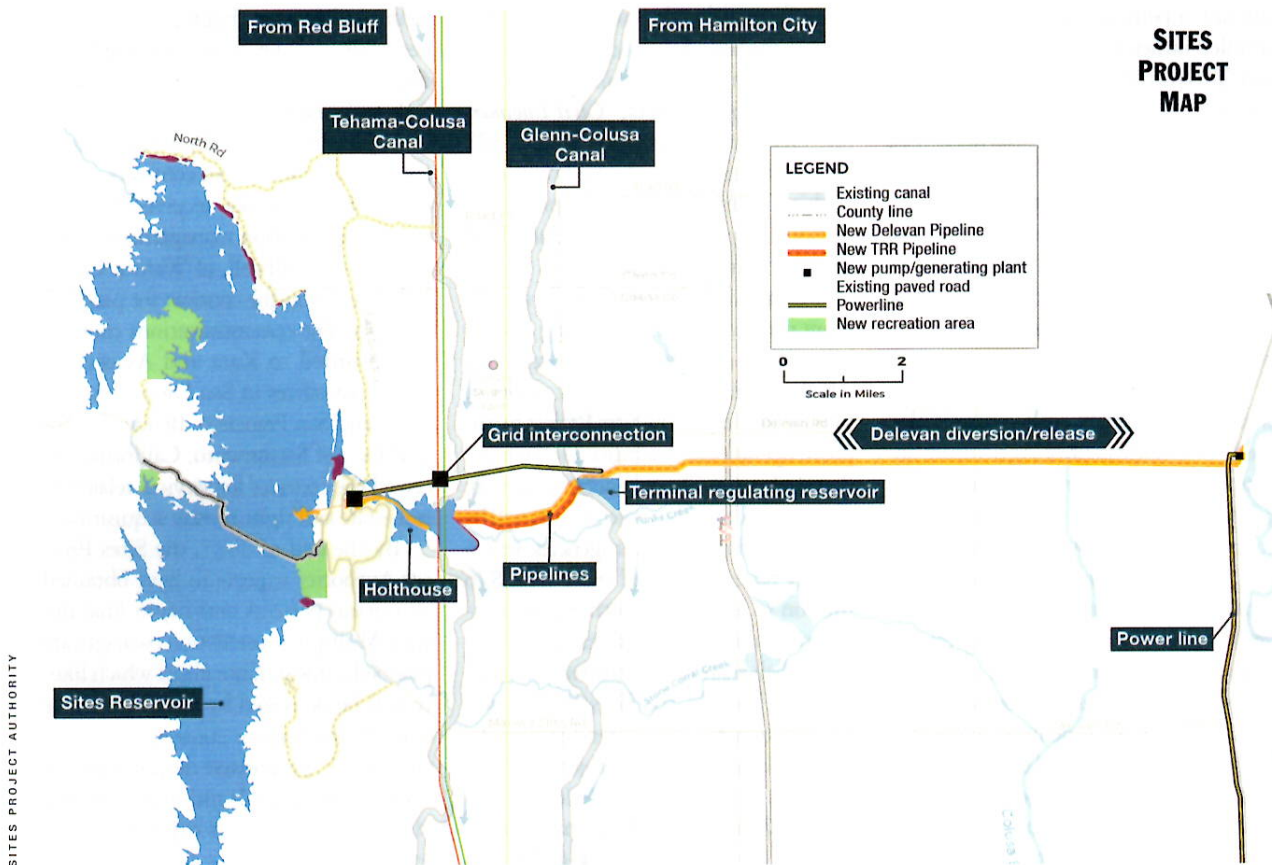
Sites Project will improve the sustainability and reliability of water supplies needed for environmental, agricultural, and urban uses within the Sacramento Valley and throughout the Golden State.

To be situated in Colusa and Glenn Counties about 10 mi west of Maxwell, the new reservoir, along with its related components, has an overall estimated cost of \$6.4 billion, including financing costs, says Jim Watson, P.E., the general manager of the Sites Project Authority. Comprising 29 California water agencies, the authority is the lead sponsor of the project, in partnership with state and federal agencies.

The Sites Project is expected to help California adapt to the deleterious changes that many foresee for the state's water resources. For example, climate change is expected to decrease snowpack levels in Northern California's mountain ranges, altering the timing and reducing the volume of snowmelt that flows into the region's streams and rivers. Meanwhile, the changing climatic conditions already have begun to increase rainfall levels, Watson says, resulting in shorter, more intense episodes of runoff.

By virtue of being an off-stream facility, the Sites Project will be well positioned to accommodate these changing conditions, Watson says. "[With] more volatile hydrologic conditions, the Sites Reservoir actually will become more valuable because we'll be taking the excess flows when they're available [and releasing] the water back into the system when it's drier," he says. "The project can actually help dampen out the impacts that future hydrology may create to the state's water system. It's a different way of operating than a traditional, on-stream reservoir."

The project's signature element, the massive reservoir, will be held in check by two main dams and nine saddle dams. Flows to the reservoir will come from the Sacramento River by way of two existing regional canal systems, the Tehama-Colusa Canal and the Glenn-Colusa Canal (see map). Currently, the two canals, separately and by means of intakes that include state-of-the-art fish screens, divert water from the river during periods of peak agricultural demand and send it southward to farmers in the Sacramento Valley. When excess flows are available in the Sacramento



SITES PROJECT AUTHORITY

Civil Engineering NEWS

River during winter, when agricultural demand is lowest, the Sites Project will accept water from the canals. In this way, Sacramento River water will flow almost entirely by gravity to the project.

Where the Glenn–Colusa Canal enters the project area, the canal will connect to the new 1,200 acre-ft Terminal Regulating Reservoir. From there, water will be pumped to the west through a 3.5 mi long, 12 ft diameter pipeline to the existing Funks Reservoir on the Tehama–Colusa Canal. To provide additional operational flexibility and accommodate incidental pumped-storage hydropower, Funks Reservoir will be expanded; it will also be renamed the Holthouse Reservoir. When flows are to be reversed between the two regulating reservoirs, the pipeline will convey water by gravity in the opposite direction through turbines. These new facilities are referred to as the Maxwell Water Intertie.

To send water from Holthouse Reservoir to Sites Reservoir, another new pumping station will convey flows through a penstock and lined tunnel to an inlet–outlet tower in the larger reservoir. To return water from the Sites Reservoir to the Sacramento River, the new Delevan Pipeline, which consists of twin 12 ft diameter pipelines, will convey flows 14 mi to the east to an outfall on the river. This release point potentially could also serve as another intake on the Sacramento River, diverting water through state-of-the-art fish screens and pumping flows up into the Holthouse Reservoir.

Because the Maxwell Water Intertie is expected to benefit rural communities, the U.S. Department of Agriculture announced in November 2018 that it would provide \$449 million in funding for this component of the overall Sites Project. “By interconnecting these two regional canal systems, we improve the ability to get water to where the need is greatest,” Watson says. Improving the efficiency and reliability of local water deliveries will boost prospects for agriculture in the area, indirectly benefiting local communities.

All told, the Sites Project is expected to increase the surface-water storage capacity in the Sacramento Valley by 15

percent. Annually, the project could produce as much as 500,000 acre-ft for environmental and water supply benefits. Essentially, the water will be divided on the basis of the “beneficiary-pays principle,” Watson says, meaning that project partners, which include local water agencies from across the state, the state of California, and the Bureau of Reclamation, would decide how they want to use their share of the water stored in the reservoir. Currently, about one-third would be dedicated to environmental purposes, while the remaining two-thirds would be used for agricultural and drinking-water purposes. However, under existing statutes, up to 75 percent of the available water in the reservoir could be used to provide environmental benefits.

Because it offers benefits to people and the environment, the Sites Project enjoys broad support. In July 2018, the California Water Commission awarded \$816 million to the project, with the understanding that a commensurate portion of the water procured by the project would be used to benefit wildlife refuges and the Delta smelt fish (*Hypomesus transpacificus*) in Northern California, especially those in the delta formed by the confluence of the Sacramento and San Joaquin Rivers (see “Commission Awards Billions for California Storage Projects,” *Civil Engineering*, October 2018, pages 30 and 32). The commission also decreed that some of this funding be used to improve recreational opportunities and reduce flood risks in Northern California.

Meanwhile, Reclamation is a cost-share partner and is completing a feasibility study to determine the extent to which the federal government wants to provide funding to the Sites Project to improve operational flexibility in a manner that confers significant benefits to salmon. The remainder of the project’s costs will be paid for by the local water agencies, which already have committed more than \$26 million to advance the other planning-related studies. The agencies also will finance their share of the construction costs.

More broadly, the Sites Project will provide benefits that extend statewide. Once in operation, the project will enable the larger state and federal reservoirs in California to detain more water into the summer, improving the reli-

ability of those supplies. In addition, the Sites Project will be able to provide flows to water agencies located as far south as the Coachella Valley in Southern California. Because these agencies currently obtain some of their water from the Colorado River, the new supplies from the Sites Project will afford them “more diversity and can help them reduce their need to divert water off the Colorado when there are shortages or droughts in the Colorado River basin,” Watson notes. “This project really moves the needle when you think about statewide water management.”

Currently, the design of the Sites Project is about 15 percent complete. AECOM, of Los Angeles, has provided engineering services for the project since late 2015 and remains under contract for this purpose. As for more recent design contracts, the Sites Project Authority awarded four in March. Jacobs, which has its headquarters in Dallas, was awarded the reservoir operations contract, which entails determining the project yield and modeling the project in terms of its relation to the broader state water system. ICF International Inc., of Fairfax, Virginia, received two contracts, one for permitting and the other for environmental support. Fugro, which has its headquarters in Leidschendam, the Netherlands, was awarded a contract for geotechnical services.

In January, the Sites Project Authority awarded four additional contracts. HDR, of Omaha, Nebraska, received the contract for integration management, while Brown and Caldwell, of Walnut Creek, California, won the contract for program controls. The communications contract was awarded to Katz and Associates, which has offices in San Diego, Los Angeles, and San Francisco. Bender Rosenthal Inc., of Sacramento, California, received the contract for services related to real estate and right-of-way acquisition.

By the end of 2021, the Sites Project Authority expects to have obtained all critical permits and begin final design. Multiple construction packages are planned—most, if not all, of which likely will be delivered by such alternative delivery methods as construction manager-at-risk, progressive design/build, or traditional design/build. Construction of the entire project is expected to last seven years. —JAY LANDERS