SUBMIT OPTION SUBMITTAL FORM BY:
1. EMAIL TO: COLORADORIVERBASINSTUDY@USBR.GOV
2. U.S. MAIL TO: BUREAU OF RECLAMATION, ATTENTION MS. PAM ADAMS, LC-2721, P.O. BOX 61470, BOULDER CITY, NV 89006-1470
3. FACSIMILE TO: 702-293-8418

Option Submittal Form

Contact Information (optional): ☐ **Keep my contact information private.**

Contact Name: ______________ Title: ______________

Affiliation: ______________

Address: ______________

Telephone: E-mail Address:

Date Option Submitted: ______________

Option Name:

Import from Columbia River via a submarine pipeline.

Description of Option:

The idea of using an undersea pipeline to augment water supplies in southern California has been considered since the early 1970s when the U.S. Bureau of Reclamation (USBR) began reconnaissance studies (USBR 1971). USBR conducted a significant amount of study and evaluation although the planned feasibility studies were not completed. The undersea aqueduct idea was resurrected during the early 1990s when the governor of Alaska proposed constructing a pipeline from southeastern Alaska to northern California. This concept was evaluated by the Office of Technology Assessment (OTA 1992). The potential of using an undersea aqueduct to transport water from the Columbia River to S. California, discussed in this option, was evaluated based on the USBR and Alaska aqueducts previously proposed.

Location: Describe location(s) where option could be implemented and other areas that the option would affect, if applicable. Attach a map, if applicable.

The source of supply for the undersea aqueduct is the Columbia River. The intake facility would be located near the mouth of the river, but far enough upstream to avoid salt water intrusion. Deliveries could be to Castaic Lake for MWD usage and the All-American Canal to off-set diversion from the Colorado River.

Quantity and Timing: Roughly quantify the range of the potential amount of water that the option could provide over the next 50 years and in what timeframe that amount could be available. If option could be implemented in phases, include quantity estimates associated with each phase. If known, specify any important seasonal (e.g., more water could be available in winter) and/or frequency (e.g., more water could likely be available during above-average hydrologic years) considerations. If known, describe any key assumptions made in order to quantify the potential amount.

It was estimated that a subsea aqueduct proposed by the USBR could supply up to 14 million acre-feet per year (AFY) from six rivers in northern California and Oregon (McCammon 1966). That amount was equivalent to about half of the annual flow of these rivers, and storage reservoirs were required to capture winter flows. Since the 1960s, there has been a steady trend away from building additional storage reservoirs for these types of purposes and 14 MAFY is not expected to be a reasonable quantity. But, 1 MAFY may be worth studying.

The annual amount available would depend on the surplus available at the river mouth after other uses were satisfied including currently permitted withdrawals and that needed for fisheries, navigation and other designated uses. The National Research Council (NRC) (2004) was asked by the Washington State Department of Ecology (WDOE) to evaluate the effects of additional water withdrawals because WDOE had many pending water withdrawal permits which at that time exceeded 250,000 AFY. The NRC study did not identify an exact amount of water available for withdrawal, but identified several potential problems with increased withdrawals.

SUBMIT OPTION SUBMITTAL FORM BY:
1. EMAIL TO: COLORADORIVERBASINSTUDY@USBR.GOV
2. U.S. MAIL TO: BUREAU OF RECLAMATION, ATTENTION MS. PAM ADAMS, LC-2721, P.O. BOX 61470, BOULDER CITY, NV 89006-1470
3. FACSIMILE TO: 702-293-8418

Additional Information

Technical Feasibility: Describe the maturity and feasibility of the concept/technology being proposed, and what research and/or technological development might first be needed.

Extensive engineering, geotechnical, and oceanographic feasibility studies would be required prior to implementation. It has been estimated that the oceanographic studies alone could take 10 years to complete. However, the OTA study concluded that the aqueduct could be built if enough time and money were invested (OTA 1992). Some of the major technical issues to be resolved include methods to lay the pipeline, crossing major fault zones and submarine canyons, selection of pipe materials, and design of pumping facilities and storage facilities. Previous proposals for an undersea aqueduct have included pipelines located several miles from shore at depths of 250 to 300 feet. There are several large submarine canyons that cut the shelf along the potential pipeline route and would have crossing lengths of 1 to 2 miles (McCammon and Lee 1966).

USBR proposed using high strength fiberglass material that together with the fresh water would produce a buoyant pipeline that would be anchored to the bottom. It was estimated that pumping stations would be required about every 150 miles along the route. Many other design issues for the offshore and land-based facilities would need to be resolved.

Costs: Provide cost and funding information, if available, including capital, operations, maintenance, repair, replacement, and any other costs and sources of funds (e.g., public, private, or both public and private). Identify what is and is not included in the provided cost numbers and provide references used for cost justification. Methodologies for calculating unit costs (e.g., $/acre-foot or $/million gallons) vary widely; therefore, do not provide unit costs without also providing the assumed capital and annual costs for the option, and the methodology used to calculate unit costs.

All costs available on this option are both dated and are presented in $/AF basis without sufficient explanation on how the unit cost was calculated to be useful. If a rough cost estimate is desired, detailed review of the appendix items for the USBR reports is required and then the cost estimates would need to be updated to modern day values.

Permitting: List the permits and/or approvals required and status of any permits and/or approvals received.

The specific permits required have not been identified. However, a water withdrawal permit would be required. In addition, the routing of the pipeline and location of shore facilities will be a concern to States and coastal counties as well as the California Coastal Commission, U.S. Department of the Interior, Navy, Army Corps of Engineers, and USBR. In addition, the US Fish and Wildlife Service and the US Environmental Protection Agency would have significant input to the permitting process. All of these agencies will want to review and regulate the project. Among the major concerns would be impacts to estuarine habitats at the mouth of the Columbia River.

Legal / Public Policy Considerations: Describe legal/public policy considerations associated with the option. Describe any agreements necessary for implementation and any potential water rights issues, if known.

Considerable opposition from the States of Washington and Oregon and from environmental groups should be expected if this option were proposed.

Implementation Risk / Uncertainty: Describe any aspects of the option that involves risk or uncertainty related to implementing the option.

Permitting, financing, public acceptance, construction feasibility, etc

SUBMIT OPTION SUBMITTAL FORM BY:
1. EMAIL TO: COLORADORIVERBASINSTUDY@USBR.GOV
2. U.S. MAIL TO: BUREAU OF RECLAMATION, ATTENTION MS. PAM ADAMS, LC-2721, P.O. BOX 61470, BOULDER CITY, NV 89006-1470
3. FACSIMILE TO: 702-293-8418

Reliability: Describe the anticipated reliability of the option and any known risks to supply or demand, such as: drought risk, water contamination risk, risk of infrastructure failure, etc.

Large pipelines have been constructed and operated successfully in ocean environments for many years including oil pipelines in the North Sea. Although oceanographic and geotechnical characteristics of the route would be addressed in the aqueduct design, it is possible that the pipeline could be damaged by a number of natural phenomenon including earthquakes, landslides, and tsunamis.

Water Quality: Identify key water quality implications (salinity and other constituents) associated with the option in all of the locations the option may affect.

The water quality of the Columbia is generally good and the water quality should not pose any special problems for treatment at existing facilities.

Energy Needs: Describe, and quantify if known, the energy needs associated with the option. Include any energy required to obtain, treat, and deliver the water to the defined location at the defined quality.

Energy Required	Source(s) of Energy
Pump stations are expected every 150 miles, but the exact energy needs are not estimated.	Could be from a large number of potential sources.

Hydroelectric Energy Generation: Describe, and quantify if known, any anticipated increases or decreases in hydroelectric energy generation as a result of the option.

Location of Generation	Impact to Generation
	Not considered in past evaluations.

Recreation: Describe any anticipated positive or negative effects on recreation.

Location(s)	Anticipate Benefits or Impacts
	Not considered in past evaluations.

Environment: Describe any anticipated positive or negative effects on ecosystems within or outside of the Colorado River Basin.

Location(s)	Anticipated Benefits or Impacts
Columbia River Mouth	Could have some degree of impact the fresh water / salt water mixture at the mouth of the Columbia River.
Pipeline alignment	Could have some degree of impact to submarine environment during installation.

SUBMIT OPTION SUBMITTAL FORM BY:
1. EMAIL TO: COLORADORIVERBASINSTUDY@USBR.GOV
2. U.S. MAIL TO: BUREAU OF RECLAMATION, ATTENTION MS. PAM ADAMS, LC-2721, P.O. BOX 61470, BOULDER CITY, NV 89006-1470
3. FACSIMILE TO: 702-293-8418

Socioeconomics: Describe anticipated positive or negative socioeconomic (social and economic factors) effects.

Not considered in past evaluations.

Other Information: Provide other information as appropriate, including potential secondary benefits or considerations. Attach supporting documentation or references, if applicable.

This concept has been studied before.

References:

Lee, Fred C. (August 1965). Feasibility Study of Mainland Shelf Undersea Aqueducts (Coastal Delivery of Waters of the Eel, Klamath and Rogue Rivers to Central and Southern California). NESCO Proposal P 682, National Engineering Science Company, Pasadena California.

McCammon, Lewis A. (May-June 1966). Proposed Undersea Aqueduct. The Military Engineer, pp 186 – 188.

McCammon, Lewis A. and Fred C. Lee (July 1966). Undersea Aqueduct System. Jour. AWWA, Vol 58, pp 885 – 892.

National Research Council (2004). Managing the Columbia River, Instream Flows, Water Withdrawals, and Salmon Survival. Committee on Water Resources Management, Instream Flows and Salmon Survival in the Columbia River Basin.

Office of Technology Assessment, U.S. Congress (January 1992). Alaskan Water for California? The Subsea Pipeline Option Background Paper, OTA-BP-O-92. Washington, DC: U.S. Government Printing Office.

USBR, U.S. Department of the Interior (January 1975). California Undersea Aqueduct, Reconnaissance Investigation, Special Report.

USBR, U.S. Department of the Interior (September 1971). Study Work Plan for California Undersea Aqueduct, Reconnaissance Investigation, Working Document.

USBR, U.S. Department of the Interior (December 1969). California Undersea Aqueduct, Prereconnaissance Study.