

Date: October 26, 2020

To: Mayor and Members of the City Council

From: Thomas B. Modica, City Manager 

Subject: **ALAMITOS BAY WATER QUALITY ENHANCEMENT PROJECT UPDATE**

This memorandum provides information on recent actions undertaken as part of an engineering feasibility study to identify alternative solutions for anticipated water quality impacts in Alamitos Bay due to State regulatory requirements to phase out Once-Through Cooling (OTC) systems at energy plants. Information is also provided on anticipated next steps in formulating an implementation plan based on the findings of the study.

BACKGROUND

The State Water Resources Control Board (SWRCB) enacted a OTC Policy in 2010, requiring power plants to phase out the practice of using marine water to cool turbines used for the generation of electricity. The policy on the Use of Coastal and Estuarine Water for Power Plant Cooling (Policy), aims to reduce the harmful effects associated with OTC, such as entrainment (fish and larvae drawn through the cooling system and subjected to hot water) and impingement (fish trapped at the screens). Both the Alamitos Energy Center (AES) and the Haynes Generating Station (HGS) currently draw ocean water from Alamitos Bay (Bay) and discharge the water to the San Gabriel River (SGR) as part of their OTC pumping systems. AES is a natural gas power plant that provides electricity to Long Beach and the region. This power generator has used ocean water to cool power plant turbines. Such pumping activities create currents, pulling ocean water into the Bay, mixing ocean and bay water, which, in turn, improves circulation and water quality. Through 2019, the average pump rate from the Bay into the SGR through AES was 326 million gallons of seawater per day. The average pump rate for HGS was 581 million gallons of seawater per day. AES has recently decreased pump rates and plans to phase out OTC entirely by 2023. HGS will cease OTC operations by 2029.

Through OTC pumping operations, AES and HGS have assisted circulation throughout the Bay for the last 55 years. This consistent water movement has established habitat and water quality conditions that are now dependent on a regular supply of new seawater pulled from the open ocean into the Bay and re-circulated back to the ocean from the SGR. It is anticipated that cessation of power plant pumps in 2023 will have an immediate effect on circulation and is expected to precipitate secondary adverse effects on water quality and aquatic life. The Bay is a major recreational and commercial waterway that supports a variety of year-round activities. It is also home to protected marine life and habitats. Over the years, the City has made significant investments to maintain and improve water quality in the Bay, including various watershed source control measures, such as storm water diversion, capture and treatment of runoff, and implementation of clean marina programs to reduce bacteria, toxic pollutants, and trash. Additionally, investments have been made to protect endangered species and their habitats through the restoration of wetlands and eel grass habitats.

For the last year, the City Project Team (Project Team), including staff from the City Manager, City Attorney, Development Services, Health and Human Services, Parks, Recreation and Marine, and Public Works Departments, has been engaged in an engineering feasibility study to evaluate the effectiveness of new, environmentally friendly pumps at different locations within the Bay. The Project Team has determined that installation of fish-friendly pumps at the AES site is a viable option for maintaining current water circulation patterns and meeting biological, environmental, and regulatory requirements. Work has begun to formalize a partnership with AES to implement a pumping solution prior to the full cessation of OTC operations in 2023.

STUDY OF POTENTIAL WATER QUALITY IMPACTS

Since the adoption of the OTC Policy in 2010, City staff have worked to understand and prevent water quality impacts, and plan long-term, sustainable measures to maintain and improve water quality in the Bay and surrounding water bodies. Moffatt & Nichol (M & N) was commissioned to investigate potential water quality improvement measures within the Bay and adjacent water bodies and/or tributaries, including Los Cerritos Channel and SGR. M & N studied water circulation throughout the Bay and identified potential causes of stagnation and other conditions that could lead to poor flushing and water quality. The initial study indicated pumping provides a circulation benefit, which, in turn, contributes positively to water quality. An expanded study included water quality modeling to predict the impact of decreased circulation and tidal flushing that would result when AES and HGS cease OTC pumping operations. Findings indicate the current, positive water quality condition of the Bay is a result of forced circulation from tidal exchange and pumping associated with OTC. Modeling studies show with the shutdown of OTC at the AES site, tidal flushing will decrease and seawater residence time will increase in some areas. Concentrations of bacteria will increase as a result, producing degraded water quality in portions of the Bay. For example, currently Mother's Beach water exchange occurs every 3.4 days, but after pumping stops, water exchange is anticipated to occur to every 9.5 days.

AES OTC pumping appears to impact residence times more significantly than HGS due to its upstream location. Residence time is commonly used as an indirect indicator of water quality. Increased residence time corresponds with degraded water quality and vice-versa. Currently, the greatest quantity of trash collected is from the Los Cerritos Channel before it enters the Bay at the AES inlet channel where currents from pumping pull floatable trash into capture devices adjacent to the AES power plant. Without the pumps, trash will flow into the Bay and be moved around with the tidal currents. Study findings indicate the following anticipated impacts from cessation of pumping and forced circulation in the Bay:

- A need for new trash management approaches to capture and retrieve trash from environmentally sensitive areas and public access areas;
- Prolonged periods of elevated bacteria concentrations near source areas; and,
- Increased temperatures in areas that are shallow and stagnant within the Bay that will lead to further water quality impacts like blooms and anoxic conditions in localized areas.

FEASIBILITY STUDY OF FISH-FRIENDLY PUMPING OPTIONS

The City employed M & N to identify alternative pumping systems that would minimize potential water quality impacts within the Bay due to pump cessation. M & N was charged with conducting an engineering study to identify pumping options that could be feasibly constructed on the AES site and to develop design concepts illustrating those options.

Additionally, M & N was asked to identify related permit and regulatory requirements, design and construction schedules, and construction cost estimates for each of the feasible options developed. This effort began with engagement of the Regional Water Quality Control Board (RWQCB) to determine whether pumping and transfer of water from the Bay into the SGR could continue without OTC operations under prescribed conditions, through either modification of the existing AES permit or a new permit held by the City. After several months of discussion and study, the RWQCB identified an approach that would require a new City permit to install fish-friendly pumps on the AES property and continue the transfer of water from the Bay to the SGR. Concurrent with these efforts, the Project Team and M & N began collaborating with AES to identify the most suitable location for the new pumps among the six existing pump intake wells associated with the six AES power plant units.

After achieving consensus with AES on a feasible location on their site, M & N and the Project Team finalized a project description and began evaluating the infrastructure to support installation of the fish-friendly pumps. The project proposes to replace two existing non-fish friendly vertical-axial-flow pumps at the AES Unit 6 intake well used for cooling during power generation with two fish-friendly vertical-axial-flow pumps that will be used to circulate water without the effects of cooling. The new pumps will have similar pumping capacity as the AES Unit 6 intake well. Installation of fish-friendly pumps will maintain the current water circulation pattern. Studies on the mechanics and implementation of these pumps indicate their use can promote safe fish transport from the Bay to the SGR. Fish-friendly pumps have impeller blades with rounded edges and wider spacing between the blades, substantially reducing the impact risk to fish. According to the research, their effectiveness in preventing harm to fish is between 93 and 99 percent.

Existing infrastructure was preliminarily assessed, and it was determined that the AES Unit 6 intake well could support the fish-friendly pumps. However, contrary to assumptions of several years ago, it was found that some new infrastructure would be required to convey water from the existing pump well to the SGR. Currently, water flows from the pump well through a steam condenser attached to the power plant unit into the SGR. Demolition of the power plant unit will commence upon cessation of OTC operations in 2023, as part of the AES OTC mitigation plan. This condition necessitates the installation of new piping infrastructure to an extent guided by the chosen construction scenario. A more in-depth assessment of the existing infrastructure to confirm its condition will be required and occur as part of the 30 percent engineering design.

In the spring of 2020, the Project Team and AES identified four conceptual design alternatives for the installation of new, fish-friendly pumps. Each alternative varies in level of interaction with AES operations, risks, costs, and schedule. Schedules for the four alternatives range from completion by 2023 to 2026. Construction cost estimates also vary based on the extent of new infrastructure required for each alternative. In general, construction schedules extending

beyond 2023 have lower costs and the least impact on AES operations. But the lower costs of these options come at the expense of protracted interruption of pumping to accommodate demolition of the existing AES Units 5 and 6 intake wells upon cessation of OTC operations in December 2023. Operations and maintenance activities and expenses will include maintenance and repair of pumps, cleaning of intake and outfall structures, trash capture and removal, and powering of the pumps with new, metered electrical service from Southern California Edison (SCE). The City exclusively, or as part of a partnership, would be responsible for operations and maintenance of the new pumping system. The Project Team has been informed that AES could not legally operate a pumping system unrelated with its primary purpose of generating energy.

The Project Team and AES have preliminarily selected a preferred design alternative, which is identified in the attachment. This design alternative proposes to start and complete construction by 2023 while the plant is operational and prior to demolition of the AES Units 5 and 6 intake wells. It requires the least amount of new piping infrastructure. The preliminary cost estimate for construction of the preferred design alternative is \$35 million and operating and maintenance costs are estimated to be \$2 million, annually. These costs are rough estimates until the condition of the site infrastructure can be fully assessed through 30 percent engineering design.

Developing a Memorandum of Understanding (MOU) agreement with AES is necessary to advance the preferred design alternative. Design, permitting, operating, and financial planning expectations need to be included in a MOU to guide the City and AES through this project. Preliminary engineering design and the permitting process will begin in the winter of 2020 to keep the project on schedule. To advance planning discussions and proceed with formalizing a business relationship with the City, AES is requesting a Non-Disclosure Agreement (NDA) to safeguard confidential proprietary information that may be disclosed during related discussions. AES is also requesting an Access License Agreement with the City to cover the investigative work performed on the site by the City's contractor.

MOU AGREEMENTS WITH AES

In October 2015, the City and AES entered a five-year MOU, effectively memorializing a voluntary commitment from AES to demolish all six existing power generating units after they ceased operating and construction of the new power plant was complete. Since the new AES power plant began operating in 2020, three of the six original power generating units remain operational and are expected to continue through December 2023. The other three units have ceased operations in accordance with the State Water Board's OTC policy, but will remain in place until the other three are shut down in 2023. As a result of this delay in the expected demolition of the original power plant units, there is a need to amend the current MOU to reflect the new schedule for demolition contemplated by AES. Additionally, the City and AES will agree to a second MOU to address continued operation of the AES pump stations once they ceased being needed for OTC operations. Completion of the Engineering Feasibility Study and identification of a preferred design solution has provided the basis for this second MOU. The Project Team anticipates working with AES to update the demolition MOU and finalize the second MOU to define shared commitments on the design, construction, and operation of the new pumping system over the next several months.

NEXT STEPS

The next phase of work includes developing and entering a MOU with AES and initiating 30 percent engineering design. However, to proceed with these efforts, the City must first execute the AES-requested NDA and Access License Agreement. Staff will seek City Council approval of these agreements in November 2020.

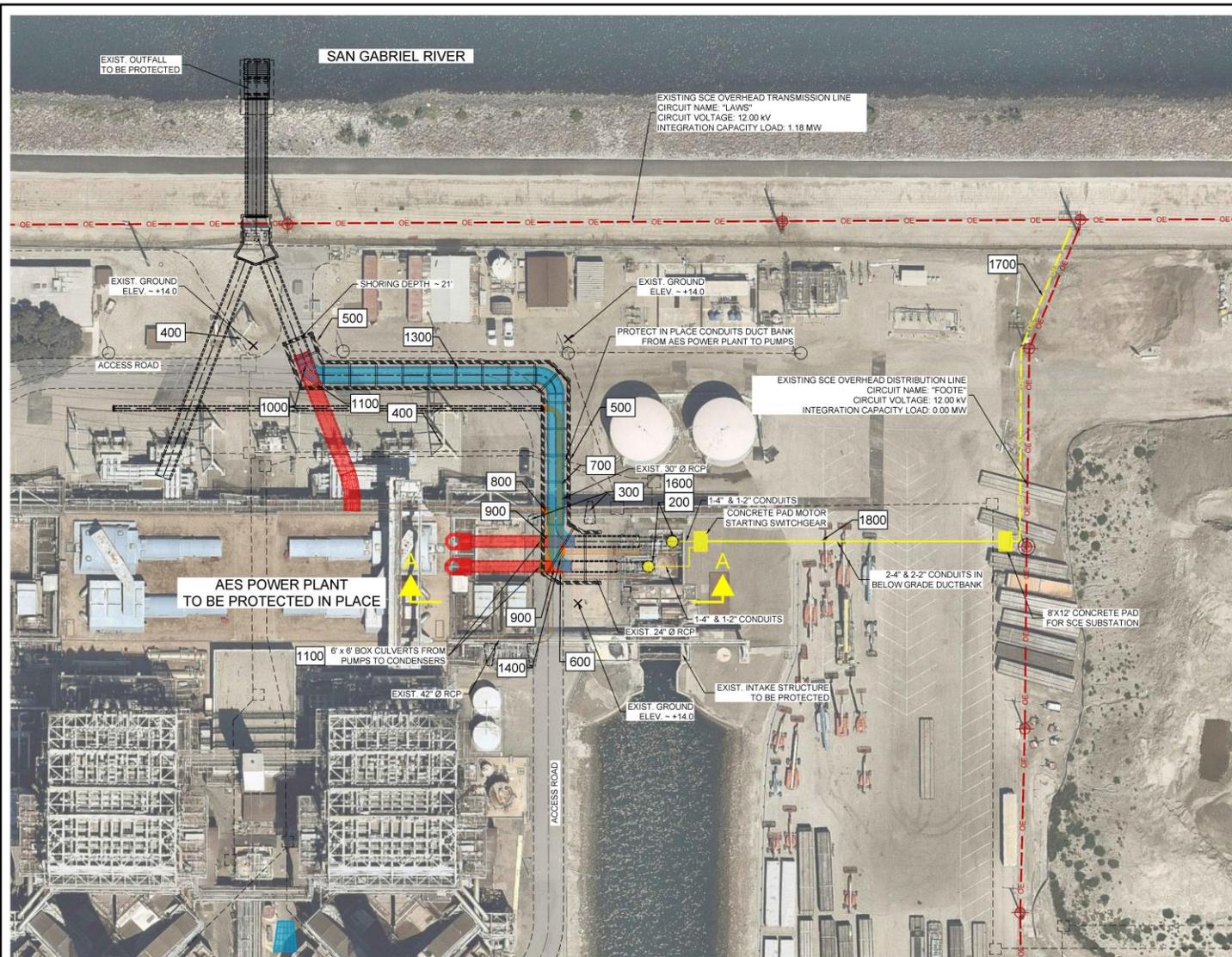
FISCAL IMPACT

As noted above, only a conceptual understanding of the capital and operating costs are known for the preferred design alternative. Overall, capital costs are estimated at \$35 million and annual operating costs are estimated at \$2 million. A more precise cost estimate can be achieved upon completion of an in-depth assessment of the current infrastructure conditions. There is \$500,000 currently budgeted in the Tidelands Capital Improvement Program to support completion of 30 percent engineering plans.

If you have any questions, please contact Kevin Jackson, Deputy City Manager, at (562) 570-5028, or via email at Kevin.Jackson@longbeach.gov.

ATTACHMENT

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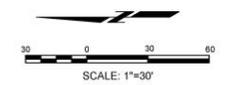
CONSTRUCTION COST ESTIMATE SUMMARY				
BID ITEM	LEGEND	DESCRIPTION	UNIT	QTY
100		MOBILIZATION/DEMOLITION	LS	1,000
200	●	REMOVAL OF EXISTING PUMPS	EA	2,000
300		PROTECT OVERHEAD GANTRY CRANE STRUCTURE	LS	1,000
400		PROTECT EXISTING POWER TOWERS	EA	2,000
500	▨	TEMPORARY SHORING	LF	640,000
600	▨	REMOVAL OF EXISTING 24" RCP	LF	96,000
700	▨	REMOVAL OF EXISTING 30" RCP	LF	45,000
800	▨	REMOVAL OF EXISTING 42" RCP	LF	77,000
900	▨	PARTIAL REMOVAL OF 6X6 RCB	LF	66,000
1000	▨	PARTIAL REMOVAL OF 8X8 RCB	LF	38,000
1100	■	PLUG AND ABANDON EXISTING RCB AND RCP	EA	6,000
1300	■	INSTALL 8X8 RCB	LF	247,000
1400	▨	INSTALL TRANSITION STRUCTURE 6X6 RCB TO 8X8	LF	48,000
1600	●	INSTALL NEW PUMPS	EA	2,000
1700	—	SCE SERVICE LINE	LS	1,000
1800	—	POWER DISTRIBUTION	LS	1,000
			CONSTRUCTION SUB TOTAL	27,094,000
			CONTINGENCY @ 30%	8,128,000
			CONSTRUCTION TOTAL COST	35,222,000

CONSTRUCTION SCHEDULE	
	FROM MID 2021 TO MID 2022

ASSUMPTIONS	
1	EXISTING 24", 30" AND 42" RCP CAN BE PARTIALLY REMOVED
2	EXISTING 6' X 6' AND 8' X 8' RCB CAN BE PARTIALLY REMOVED
3	EXISTING ROAD FROM INTAKE STRUCTURE TO OUTFALL CAN BE TEMPORARILY CLOSED
4	PROPOSED PUMPS CAN BE POWERED FROM ADJACENT SCE CIRCUITS
5	SHORING AND INSTALLING 8' X 8' RCB WILL NOT CONFLICT WITH UNKNOWN UNDERGROUND STRUCTURES OR UTILITIES OTHER THAN THE CONDUITS DUCT BANK CROSSING FROM THE AES POWER PLANT TO THE PUMPS
6	NO CONSTRAINTS FOR ACCESSING THE SITE AND AVAILABILITY OF LAYDOWN AREAS FOR CONSTRUCTION

ADVANTAGES AND DISADVANTAGES	
BENEFITS	CONS
REDUCED COST BY USING EXISTING "WELL" INTAKE STRUCTURE	EXISTING STRUCTURE MAY LIMIT THE SIZE OF PUMPS
REDUCED COST BY USING EXISTING OUTFALL STRUCTURE	CONSTRUCTION ACTIVITIES HAVE THE MOST INTERACTION WITH AES OPERATIONS
REDUCED PERMITTING CONSTRAINTS BY USING EXISTING INTAKE AND OUTFALL STRUCTURES	

ALTERNATIVE No. 1-A "PRIOR DEMO - SHORT" - LAYOUT
SCALE: 1" = 30'

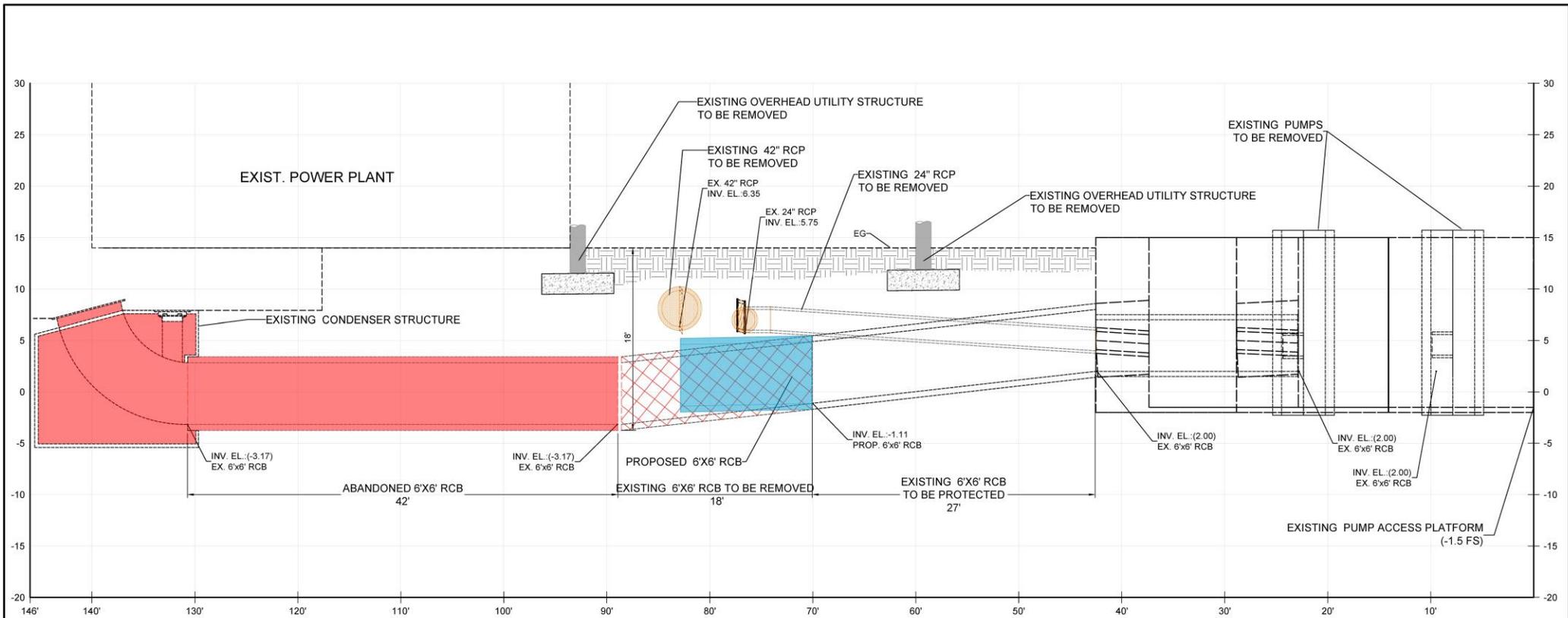


PLAN PREPARED FOR:
CITY OF LONG BEACH

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ALAMITOS BAY PUMPING SYSTEM
AT AES PLANT

Conceptual Engineering Design
Preferred Alternative



ALAMITOS BAY PUMPING SYSTEM
AT AES PLANT

PLAN PREPARED FOR:
CITY OF
LONG BEACH

PLAN PREPARED BY:
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Conceptual Engineering Design
Preferred Alternative
SECTION A-A
(2020-03-17)