CHAPTER 5
ALTERNATIVES

5.1 INTRODUCTION

According to State CEQA Guidelines (section 15126.6), an EIR shall describe a range of reasonable alternatives to the project or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives. The guidelines further require that the discussion focus on alternatives capable of eliminating significant adverse impacts of the project or reducing them to a level of insignificance even if these alternatives would impede to some degree the attainment of the project objectives or would be more costly. The alternatives analysis also should identify any significant effects that may result from a given alternative.

The lead agency is responsible for selecting a range of potentially feasible project alternatives for examination, and must publicly disclose its reasoning for selecting those alternatives. The range of alternatives is governed by a “rule of reason” that requires the EIR to set forth only those potentially feasible alternatives necessary to permit a reasoned choice. The alternatives shall be limited to those that would avoid or substantially lessen any of the significant effects of the project. Of those alternatives, the EIR need examine in detail only those that the lead agency determines could feasibly attain most of the basic objectives of the project. An EIR need not consider every conceivable alternative to a project. Rather, it must consider a reasonable range of potentially feasible alternatives that will foster informed decision-making and public participation.

An EIR is not required to consider alternatives which are infeasible. “Feasible” means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors (State CEQA Guidelines, section 15364). Among the factors that may be taken into account when addressing the feasibility of alternatives are site suitability, economic viability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries (projects with a regionally significant impact should consider the regional context), and whether the proponent can reasonably acquire, control, or otherwise have access to the alternative site (or already owns the alternative site). None of these factors establishes a fixed limit on the scope of reasonable alternatives.

5.2 SUMMARY OF SIGNIFICANT IMPACTS AND PROJECT OBJECTIVES

5.2.1 Significant Project Impacts

The following potentially significant Project impacts have been identified, all of which can be mitigated to a less-than-significant level.

BIO-1A **Special-status Species – Federally-listed Species.** The Project could result in direct impacts to federally-listed steelhead, if any individuals are present, and indirect impacts to habitat for the steelhead and federally- and state-listed coho salmon.

BIO-1B **Special-Status Species – State-Listed Species.** The Project could result in impacts to foothill yellow-legged frog, a candidate for state listing, if any individuals are present at the construction sites.

BIO-1C **Special-status Species – State Species of Special Concern.** The Project could result in impacts to animals that are identified as state Species of Special Concern that could be present at the sites during construction. These potential species include Western pond turtle, Santa Cruz black salamander, California giant salamander, San Francisco dusky-footed woodrat, pallid bat and Townsend's big-eared bat.

BIO-1D **Special-status Plant Species.** Project construction and ground disturbance in proposed staging and work areas could result in impacts to special-status plant species if any plants are present.

BIO-2 **Sensitive Habitats.** Project construction and ground disturbing activities in proposed staging and work areas could result in impacts to and loss of sensitive vegetation communities that are present in these areas.

BIO-3 **Jurisdictional Aquatic Resources.** The Project could result in impacts to jurisdictional aquatic resources, including wetlands and non-wetland waters of the United States.

BIO-4 **Nesting Birds.** The Project could result in impacts to nesting birds if vegetation removal and/or construction activities occur during the nesting season.

BIO-8 **In-Reservoir Fish and Water Quality.** The Project could result in impacts to existing non-native game fish due to adverse effects on water quality from in-reservoir construction activities.

CUL-5 **Paleontological Resources.** Ground-disturbing activities during construction could result in damage to previously undiscovered, intact paleontological resources below the ground surface.

FOR-2 **Loss of forest land or conversion of forest land to non-forest use.** The proposed Project would result in conversion of forest land.

HAZ-1B **Disposal of Hazardous Waste.** Project construction would potentially generate bedrock/soil spoils with metals concentrations in excess of disposal standards for a Class III landfill.

HAZ-2A: **Upset and Release of Hazardous Materials.** Project construction would potentially result in incidental spills of petroleum products and hazardous materials.

HAZ-2B: **Upset and Release of Hazardous Materials.** Project construction would potentially result in health hazards to construction workers, due to exposure to metals in submerged Reservoir sediments, upland bedrock excavations, and upland excavation spoils.

HYDRO-4: **Water Quality.** Proposed dredging, tunneling, excavations, and grading would potentially violate water quality standards or waste discharge requirements or otherwise substantially degrade surface water quality due to potential erosion or inadvertent transport of construction debris or materials into Newell Creek or the Reservoir.

5.2.2 Summary of Project Objectives

1. Protect the City's water supply system by addressing deficiencies in the NCD inlet/outlet works to maintain full system functionality and reliability, including the ability to collect water from different elevations in the Reservoir for treatment at the Graham Hill Water Treatment Plant.
2. Address deficiencies in the NCD inlet/outlet works to meet DSOD requirements to lower the maximum reservoir storage by 10 percent of the hydraulic head within seven days and to fully drain the reservoir to the deadpool in 90 days.
3. Improve overall operational efficiency and system performance of the NCD inlet/outlet works to provide flexibility to efficiently meet water demands and reservoir maintenance.
4. Improve access and ability to inspect and maintain the inlet/outlet system.

5. Implement an inlet/outlet replacement project that is relatively cost-effective in terms of both capital and operation/maintenance costs.
6. Complete the first segment replacement of the existing aging Newell Creek Pipeline to prevent damage during construction of the NCD inlet/outlet replacement project.
7. Maintain uninterrupted beneficial flow releases during construction of a new inlet/outlets works project.

5.3 ALTERNATIVES CONSIDERED BUT ELIMINATED

Section 15126.6(c) of State CEQA Guidelines indicates that the range of potential alternatives shall include those that could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects. The EIR should briefly describe the rationale for selecting the alternatives to be discussed.

The EIR also should identify any alternatives that were considered by the lead agency but were rejected as infeasible, and briefly explain the reasons underlying the lead agency's determination. Among the factors that may be used to eliminate alternatives from detailed consideration in an EIR are:

(1) failure to meet most of the basic project objectives,

(2) infeasibility, or

(3) inability to avoid significant environmental impacts.

The City considered the following Project alternatives, which were eliminated from further consideration as explained in the following sections:

- Rehabilitation of Existing Inlet/Outlet Facilities
- Alternative Conduit Tunnel Alignment, Design and Construction Techniques
- Reservoir Intake Design Alternatives and Reduced Dredging

5.3.1 Rehabilitation of Existing Inlet/Outlet Facilities

The existing Newell Creek Dam (NCD) inlet/outlet works is approaching the end of its useful design life as illustrated by three primary identified deficiencies: inlet/outlet conduit deterioration, an inoperable and partially closed plug valve at the toe of the dam, and an inoperable fifth inlet/outlet gate in the Loch Lomond Reservoir (Reservoir) as explained in Chapter 3, Project Description. In 2016, City staff began evaluating alternatives to address deficiencies, which were a result of age and subsequent deterioration, and which were rendering the water supply from the Reservoir less reliable and were not able to meet the California

Division of Safety of Dam's (DSOD) emergency drawdown requirements. The City has been operating the dam under a temporary agreement with DSOD that is contingent on the City expeditiously working on a long-term solution of the system's deficiencies.

Rehabilitation was considered and eliminated from further consideration by the City for a number of reasons outlined below, which include issues with engineering feasibility, as well as costs, risks during construction, and regulatory requirements. The City assessed the feasibility of rehabilitating or replacing the existing inlet/outlet works in an engineering review summarized in the Project Alternatives Memorandum (AECOM, 2016) and based on the facility inspections over the past six years.

- **Feasibility:** A portion of the pipe cannot be rehabilitated; therefore, the same deficiencies would exist after rehabilitation. The Inlet-Outlet conduit pipe consists of three sections, telescoping from a 24-inch section at the upstream face of the dam, through a 30-inch section, to the 36-inch section that extends beneath the dam to the downstream toe. The engineering evaluation concluded that the 30-inch section is too remote and inaccessible, and has too many bends for successful rehabilitation. Therefore, even with successful rehabilitation of the 24- and 36-inch pipeline segments, a portion of the existing infrastructure would remain in its current deteriorated condition. Corrosion and encrustations observed in the conduit pipes during past remotely operated vehicle (ROV) inspections would worsen over time and could result in constricted flow and increased risk of debris or encrustations dislodging and inhibiting flow through the conduit (AECOM, 2016), which could threaten reliability of water deliveries to the GHWTP and Reservoir.
- **Infrastructure and Life Cycle Costs:** Although rehabilitation would cost less initially, replacement would be required within 20 or less years after rehabilitation; therefore, rehabilitation only buys time and replacement is inevitable. A new system would be expected to have 50-year minimum asset life; a rehabilitated system would have an expected 20-year life after which additional rehabilitation would be required, or more likely, construction of a new system. Furthermore, the new system is being designed to provide easier rehabilitation in the future.
- **Risk of Failure during Construction:** There is a risk that portions of the badly deteriorated steel liner (which was used as a concrete form for the outlet conduit during construction) would be damaged during rehabilitation. This might result in sections pulling away from the concrete and make rehabilitation more unpredictable and challenging. Potential leakage during dewatering could affect the dam structure.
- **Regulatory (DSOD) Requirements:** Rehabilitation would not allow the dam to meet current DSOD emergency drawdown requirements; while replacement would. Based on assumptions about the ability to rehabilitate the existing pipe and the flow characteristics of the rehabilitated pipe, engineering calculations indicate that a rehabilitated system would not be able to meet DSOD emergency drawdown requirements of 10 percent in 7days. Furthermore, meeting current DSOD requirements

is contingent upon the successful opening of the fifth-lowest intake gate, which was not achievable during a prior gate-replacement project due in part to the landslide debris covering the gate.

- **Supply Reliability:** Rehabilitation would require the pipeline to be out of service for at least four months. During this time, DSOD would require a system of pumps capable of meeting drawdown, which would be a costly undertaking with large, diesel fueled pumps. In addition, the water supply provided by the Reservoir would be unavailable, thereby reducing overall water supply reliability.

Based on the feasibility-related challenges, risks of pipe failure and reduced supply reliability during construction of the rehabilitation option, the improved infrastructure and ability to meet DSOD requirements with replacement, and the overall comparative costs, rehabilitation of the Newell Creek Dam Inlet-Outlet pipeline was determined to be an infeasible alternative.

5.3.1 5.3.2 Inlet/Outlet Facility Alternatives

Outlet / Tunnel Design Alternatives

Tunnel Alignment/Location

Alternative locations for the new conduit-tunnel alignment were considered by the City. Based on a review of data from previous studies and investigations, it was determined that the left abutment of the Reservoir is less preferable than the right because steeper terrain on the left abutment makes construction access more difficult and may require a deeper shaft. The left abutment is also less preferable because (1) there is a large active landslide located on that side of the Reservoir and (2) sloughing and sediment accumulation on the left side closer to the dam that has buried the lowest intake (AECOM, June 2017). It was also determined that constructing a new inlet/outlet conduit through the existing dam embankment was not feasible because a flow path could be created through the dam that could potentially lead to a catastrophic failure. For these reasons, the City eliminated these design alternatives from further consideration.

Portal Alternate Location

The 10% engineering design review also considered alternate locations for the new tunnel portal. Moving the portal closer to the toe of the dam would potentially reduce the grading for the construction platform at the toe of the dam by decreasing the tunnel portal size and eliminating excavation along the old logging road. However, it was determined that positioning the tunnel portal closer to the toe of the dam was not feasible due to an inability to provide minimum clearance between the tunnel crown and the dam embankment when passing under the dam. The minimum clearance requirement is dependent on the site’s geotechnical characteristics. In order to lower the alignment enough to provide sufficient clearance beneath the dam, the portal would need to be lower than what would be practical/possible with the existing topography at the base of the dam (AECOM, June 2017). In a subsequent review, the City reviewed a partial fill at the toe of the dam would found that there would not be adequate space for construction vehicles with a reduced fill area, and this was eliminated from further consideration.

Portal Construction Platform Size Reduction

Reduction of the portal construction platform area was also considered and eliminated from consideration. It was estimated that the launch portal area and the receiving shaft will require a minimum of approximately 5,000 and 2,000 square feet of useable staging area, respectively. The current proposed size of about 0.5 acre was deemed necessary to provide adequate access for large equipment, and given the constrained area, no further reduction was deemed feasible.

Tunnel Construction Alternatives

Four replacement tunnel alignments were assessed in an engineering review (AECOM, September 2016) conducted for the City. All four alignments were through the right (west) abutment. Two alignments were selected for further evaluation: (1) a straight alignment tunneled with a microtunnel boring machine (MTBM) and (2) a curved alignment tunneled by conventional methods (AECOM, July 2018a). Based on this evaluation and results of a preliminary geotechnical investigation conducted in late 2016, the City moved forward with a 10% engineering design for both the MTBM and conventional tunnel alignments.

Microtunneling is a trenchless construction method that involves installing a pipe by pushing pipe segments through the ground with hydraulic jacks assembled in a jacking frame located in a launch pit. As the MTBM is pushed forward, spoils (excavated material) are simultaneously transported back to the launch portal by a conveyance system or a slurry pumping system. This process is repeated until the leading pipe segment reaches a receiving shaft. These machines, when applied correctly, are capable of crossing under sensitive structures while minimizing ground settlement (AECOM, June 2017). The main requirements for the straight microtunnel alignment are three-fold: to keep the tunnel run as short as possible to avoid/reduce the number of intermediate jacking stations, to ensure that the alignment has sufficient clearance between the crown of the tunnel and the dam embankment, and to make sure there is a sufficient depth of rock above the tunnel in general. If a slurry MTBM process is used for excavation, the resulting spoils would likely be unsuitable for reuse as fill material and would need to be disposed of in accordance with local, state, and federal regulations (AECOM, June 2017).

Following a review of the 10% design report the City decided to eliminate the microtunneling alternative due to concern that the MTBM could become stuck due to overburden caused by the required tunneling depth, because of concern that the tunnel length would be too long between available shaft locations, and because it would require challenging horizontal “wet taps” into the reservoir. Therefore, the microtunneling alternative was eliminated from further review.

5.3.3 Reservoir Intake Design Alternatives and Reduced Dredging

Intake Structure Alternatives

The 10% engineering design report evaluated alternative intake structures. Several inlet structure options were explored during the conceptual design phase of this project. The structures listed below are options that have been removed from further consideration.

Free Standing Tower

A free standing intake tower within the Reservoir would be connected to the new inlet/outlet tunnel. It would have to be approximately 100 feet tall to include a low level inlet (480 feet) and be above the Reservoir surface when the reservoir is full (Elevation 577.5 feet). A bridge would provide land access to the tower. It was eliminated from further consideration because of the large amount of underwater construction and the difficulty of making a tower of this height seismically stable (AECOM, June 2017).

Connecting to the Existing Sloping Intake

Connection to the existing sloping intake configuration was removed from consideration for multiple reasons. Constructing a new inlet/outlet conduit on the right abutment and providing a connection across the deepest portion of the Reservoir to the left abutment, where the existing sloping intake is located, would require challenging and expensive underwater construction. The existing sloping intake itself is nearly 60 years old and a sloughing and sediment accumulation in the left abutment has covered the lowest intake. Uncovering this lower gate to achieve operational flexibility would also be challenging and expensive. However, as discussed in Section 5.3.1, rehabilitation was not deemed feasible. Therefore, this alternative was eliminated from further consideration.

Vertical Intakes Connecting to Microtunnel

For this option a single adit would be microtunneled below the rock line into the Reservoir. Inlets would then be drilled down vertically from the Reservoir. There are two major issues with vertical inlets for the microtunnel alternative. It was determined that it would be extremely difficult if not impossible to construct a connection between the 24 or 30-inch inlet and the 48 inch inlet/outlet pipe within a 6-foot diameter tunnel. To provide a portal for the microtunnel, a shaft would need to be constructed through an ancient landslide on the right abutment of the dam. This could create issues with drainage of seepage, and lowering the downstream portal excavation would add significantly to the cost of the project because of additional excavation and shoring (AECOM, June 2017). Therefore, this alternative was eliminated from further consideration.

Sloping Intake

A sloping intake configuration, similar to the existing inlet structure, is commonly used at reservoirs in California due to favorable seismic performance. Allowable slopes for the underwater excavations were evaluated based on slope models with consideration of soil/rock stratigraphy and soils conditions identified from soils borings. After several engineering reviews, it was decided that the inlet structures needed to be founded on bedrock for stability during a seismic event. Once that decision was made it became unclear whether the best arrangement would consist of three inlets each with a vertical shaft or a sloped concrete encased intake conduit with three inlets and a single vertical shaft. After considerable review, the three shaft arrangement was chosen because it was judged to likely have better seismic performance and because it would reduce overall project risk by reducing the amount of underwater work (AECOM, July 2018a). Therefore, the sloping intake design was eliminated from further consideration due to seismic design considerations and the potential for increased construction activity in the Reservoir.

Reservoir Dredge Alternatives

Another alternative considered moving the dredged Reservoir materials from the dredged site by barge to another location in the Reservoir for placement rather than moving the dredged materials directly into the thalweg downslope of the proposed inlets. Other locations for disposal were considered and eliminated from further consideration for the following reasons:

- Disposal elsewhere in the Reservoir would require two separate areas with silt screens, which would increase the square footage of required silt screens.
- The construction schedule would lengthen as barges would need to enter and exit each of the silt screen cells between trips.
- It would be impractical to compact the dredged material, and placing the unconsolidated spoils higher in the reservoir would require placing it at very shallow slopes to keep it stable. Even at shallow slopes, the material could move during seismic events.

5.4 ALTERNATIVES CONSIDERED

Based on the above discussion and the City’s consideration of other alternatives, the following section evaluates the following alternatives:

- ❒ No Project – Required by CEQA
- ❒ Alternative 1 – Reduced Project
- ❒ Alternative 2 – Reduced Construction Area

Each alternative is described and analyzed below, and the ability to meet project objectives is addressed. Table 5-1 summarizes key components of the alternatives.

5.4.1 No Project Alternative

Section 15126.6(e) of the State CEQA Guidelines requires that the impacts of a “no project” alternative be evaluated in comparison to the proposed project. Section 15126(e) also requires that the No Project Alternative discuss the existing conditions that were in effect at the time the Notice of Preparation was published, as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services.

Description

Under the No Project Alternative, the proposed Project would not be constructed. The City is currently operating under an “Interim Drawdown Plan” approved by the California Division of Safety of Dam (DSOD). The objective of the interim drawdown plan is to meet DSOD’s emergency reservoir drawdown criteria using existing functional infrastructure until NCD outlet system rehabilitation or replacement is completed. The existing NCD outlet infrastructure with a partially open 24-inch plug valve at the toe of the dam is inadequate to meet DSOD emergency drawdown requirements for the 10 percent in 10-day drawdown requirement, but the 90-day drawdown requirement can be met by using the a combination of downstream pipes. Therefore, it is not expected that the City would be able to operate under the interim plan indefinitely.

Impacts

None of the impacts identified in this EIR would occur with the No Project Alternative. However, under this alternative, it is likely that replacement of the inlet/outlet works would be required at some point in the near future due to continued deterioration of the existing inlet/outlet works and the need to meet DSOD requirements. Thus, the proposed Project would be deferred to an unknown time in the future, and impacts identified in this EIR would likely result at that time.

Ability to Meet Project Objectives

The No Project Alternative would not meet the basic Project objectives (#1-6), but beneficial flow releases would not be affected as no construction would occur (#7).

5.4.2 Alternative 1 – Reduced Project

Description

Under this alternative, the size of two project components would be reduced: the intake and the conduit tunnel. For the intake component, one of the three proposed intake inlets would be eliminated. Three inlets are proposed to provide operational flexibility in drawing water from the Reservoir to achieve optimum water quality. Under this alternative, the lowest inlet would remain in order to meet drawdown requirements, but one of the other two inlets would be eliminated. This would result in a potentially reduced foundation area with slightly reduced Reservoir dredging. However, it is not expected that there would a substantial reduction in disturbed area because an adequate area would continue to be needed for the air vent, debris walls protecting the two inlets, and creation of stable side slopes. It is estimated that the proposed Project inlets and air vent would cover a submerged Reservoir area of approximately 13,000 square feet (0.3 acres). Under this alternative, inlet and air vent coverage might be reduced by 2,000-3,000 square feet; however, this would only reduce the overall potential submerged dredge area (approximately 1.1 acres) by approximately 5-6 percent.

The second component would be reduction of the conduit tunnel to a 10-foot diameter size rather than the proposed 14-foot diameter size. While this would result in some reduction of the volume of excavated spoils and the need for disposal, which in turn could reduce the needed onsite disposal areas, it may make the project more difficult and extend the tunnel construction schedule because of construction limitations and the difficulty of working within a more confined space. It is estimated that a 10-foot diameter tunnel would reduce excavated spoils by about 40 percent from approximately 13,600 cubic yards (cy) to 8,000 cy (total bulked amount). The total spoils from the tunnel and construction platform would be reduced from 22,600 to 17,000 cy, of which approximately 14,450 cy could be disposed on site. However, the reduced tunnel size may create limitations/constraints as to the type of construction equipment that can be used.

Impacts

Biological and Forest Resources

This alternative would not reduce or eliminate direct or indirect impacts to fish and special status amphibian species or sensitive wetland habitats (BIO-1A, BIO-1B, BIO-3) as there would be no change to the Project components that include work in or adjacent to Newell Creek. The slightly reduced Reservoir inlet footprint and dredging would result in some reduction of impacts to fish and water quality in the Reservoir (BIO-8), but use of silt screens as proposed would be required under this alternative. All Project Best Management Practices (BMPs) and mitigation measures identified for the proposed Project would continue to be required with this alternative. With reduced tunnel size and resulting excavated spoils, a slight reduction in on-site staging areas may be possible. To the extent that disturbance to create areas for placement of spoils are reduced or eliminated, there would also be an overall reduction in the level of impact related to some special status species-woodrats and bats (BIO-1C), special status plant species (BIO-1D), sensitive habitat (BIO-2), and nesting birds (BIO-4). However, mitigation would still be required.

This alternative could potentially reduce, but not eliminate, impacts related to conversion of forest lands (FOR-2) as a result of potential reduction of staging area disturbance with reduced spoils disposal from a reduced tunnel size. However, mitigation would still be required as with the proposed Project.

Cultural Resources

This alternative would reduce the amount and size of tunnel excavation, which would result in a reduction of potential impacts to paleontological resources (CUL-5). Mitigation would continue to be required.

Hazards and Hazardous Materials

With a reduction in Reservoir dredging and the tunnel size, there would be a reduction in disturbed soils with a potential reduction in exposure to elevated metals in soils (HAZ-1B and HAZ-2B), that may be present in both dredged and excavated soils. Other impacts related to transport of hazardous fuels (HAZ-1A) and potential for accidental spills (HAZ-2A) would remain unchanged as the overall construction schedule and equipment would not be altered.

Hydrology and Water Quality

This alternative would result in impacts to stormwater drainage, emergency releases, and water quality or flood hazards similar to the proposed Project. Best Management Practices and mitigation measures would continue to be required for water quality protection in the Reservoir and Newell Creek.

Other Impacts

The reduced sizes of two of the Project components – inlets and tunnel size – would not substantially alter construction schedules or equipment use, and thus, air quality impacts related to criteria pollutant (AIR-2, AIR-3) and GHG emissions (AIR-6) would not be substantially altered. These impacts would remain less than significant as with the proposed Project. Similarly, impacts related to construction noise (NOISE-3) would not be substantially changed, and impacts would remain less than significant as with the proposed Project. Less-than-significant impacts related to historical (CUL-1) and archaeological resources (CUL-2/3) and geology and soils (GEO-1, GEO-2, GEO-3-1) would not change from the proposed Project.

Ability to Meet Project Objectives

The Reduced Project Alternative would fully meet five Project objectives. These include meeting DSOD requirements (#2), improving access and maintenance capabilities (#4), implementing a cost-effective project (#5), completing the first segment of the NCP replacement (#6), and maintaining beneficial flow releases during construction (#7). The elimination of one inlet would not provide as much operational flexibility as the three proposed with the Project. The proposed three inlets provide redundancy for emergency drawdowns; two inlets would still provide redundancy, but not as much as with the proposed design. Thus, this alternative would not fully meet two objectives (#1 and #3) related to improvements that would enhance system operational functionality and flexibility.

5.4.3 Alternative 2 – Reduced Construction Area

Description

Under this alternative construction staging areas would be eliminated and/or reduced in size. Staging area sizes would need to consider storage of materials and products, treatment and temporary storage of spoils, tunnel equipment laydown, and potentially a concrete batch plant. Staging area requirements for tunnel, shaft, and inlet construction would vary depending on the contractor's selected method of construction. For this alternative, the elimination of Staging Areas 6 and 7 or a reduction in the area of disturbance would result in reduction of potentially disturbed construction areas by about 3 acres, as well as potentially result in reduced road improvements on the east side of the Reservoir that would otherwise be needed for construction equipment access.

Impacts

Biological and Forest Resources

This alternative would not reduce or eliminate direct or indirect impacts to fish and special status amphibian species or sensitive wetland habitats (BIO-1A, BIO-1B, BIO-3) as there would be no change to the Project components that include work in or adjacent to Newell Creek. Similarly there would be no change to potential impacts in the Reservoir (BIO-8), and all BMPs and mitigation measures identified for the proposed Project would continue to be required with this alternative. With a reduction in on-site staging areas, less acreage would be temporarily disturbed during construction, and there would also be an overall reduction in the level of impact related to some special status species-woodrats and bats (BIO-1C), special status plant species (BIO-1D), sensitive habitat areas (BIO-2), and nesting birds (BIO-4). However, mitigation would still be required.

This alternative could potentially reduce, but not eliminate, impacts related to conversion of forest lands (FOR-2) as a result of a reduction in on-site construction staging areas. Mitigation would continue to be required.

Cultural Resources

This alternative would not reduce the amount of tunnel excavation or potential impacts to sensitive paleontological resources (CUL-5) that may be discovered during construction. Mitigation would continue to be required.

Hazards and Hazardous Materials

This alternative would not reduce the amount of excavated or dredged materials, and there would be no change to identified impacts related to potential exposure to elevated metals (HAZ-1B and HAZ-2B), that may be present in both excavated and dredged materials. Other impacts related to transport of hazardous fuels (HAZ-1A) and potential for accidental spills (HAZ-2A) would remain unchanged as the overall construction schedule and equipment would not be altered.

Hydrology and Water Quality

This alternative would not result in changes to stormwater drainage, emergency releases, water quality or flood hazards. Best Management Practices and mitigation measures would continue to re required for water quality protection in the Reservoir and Newell Creek. However, the elimination of construction staging areas could reduce potential erosion associated with improvement and use of the onsite informal road on the east side of the Reservoir.

Other Impacts

Reduction and/or elimination of staging/disposal areas on the Project site would result in some loss of construction efficiency from the reduction in available construction areas, but this would not substantially alter construction schedules or equipment use. Therefore, air quality impacts related to criteria pollutant (AIR-2, AIR-3) and GHG emissions (AIR-6) would not be expected to be substantially change, and impacts would remain less than significant as with the proposed Project. Impacts related to construction noise (NOISE-3) would also not be substantially changed, and impacts would remain less than significant as with the proposed Project. Less-than-significant impacts related to historical (CUL-1) and archaeological resources (CUL-2/3) and geology and soils (GEO-1, GEO-2, GEO-3-1) would not substantially change, although less area would be disturbed with elimination of construction staging areas, which could slightly reduce impacts. To the extent that the reduction in available staging areas for disposal of excavated spoils would require additional off-site hauling to dispose of these materials, there could be slight increase in daily trips or extended duration of trips over the period in which haul trips would occur. However, this would not be substantial, and traffic and associated vehicular air emissions would remain less-than-significant.

Ability to Meet Project Objectives

The Reduced Construction Area Alternative would meet all Project objectives.

5.4.4 Environmentally Superior Alternative

According to CEQA Guidelines section 15126.6(e), if the environmentally superior alternative is the “no project” alternative, the EIR shall also identify an environmentally superior alternative among the other alternatives. Furthermore, Sections 21002 and 21081 of CEQA require lead agencies to adopt feasible mitigation measures or feasible alternatives in order to substantially lessen or avoid otherwise significant adverse environmental effects, unless specific social or other conditions make such mitigation measures or alternatives infeasible. Where the environmentally superior alternative also is the no project alternative, CEQA Guidelines in Section 15126(d)(4) requires the EIR to identify an environmentally superior alternative from among the other alternatives.

In the present case, none of the alternatives, including the No Project Alternative, would eliminate significant Project impacts, although Alternatives 1 and 2 would reduce the level of impact, but not to a less-than-significant level. Table 5-1 presents a comparison of project impacts between the proposed Project and the alternatives. Both Alternatives 1 and 2 would reduce impacts, but would not substantially lessen significant impacts. Excluding the No Project Alternative, Alternative 2 – Reduced Construction Area Alternative – is considered the environmentally superior alternative of the CEQA alternatives considered. Although it would not reduce significant impacts to less-than-significant levels, it would reduce some of the identified significant impacts and would best meet project objectives. However, it would not substantially lessen the identified significant environmental impacts.

Table 5-1 is on the next page.

Table 5-1: Comparison of Impacts of Project Alternatives

Environmental Issue	Proposed Project	No Project	ALT 1 – Reduced Project	ALT 2 – Reduced Project Area
AIR-2/3: Criteria Pollutant Emissions	LS	NI	LS -	LS
AIR-4/5: Sensitive Receptors / Odors	LS	NI	LS -	LS
AIR-6: Greenhouse Gas Emissions	LS	NI	LS -	LS
BIO-1A: Special Status Species Federally-Listed Fish	LSM	NI	LSM	LSM
BIO-1B: Special Status Species State-Listed -Foothill yellow-leg frog	LSM	NI	LSM -	LSM
BIO-1C: Special Status Species – Calif. Species of Special Concern	LSM	NI	LSM -	LSM -
BIO-1D: Special Status Plant Species	LSM	NI	LSM	LSM-
BIO-2: Sensitive Habitat	LSM	NI	LSM-	LSM
BIO-3: Jurisdictional Aquatic Resources	LSM	NI	LSM	LSM
BIO-4: Nesting Birds	LSM	NI	LSM-	LSM-
BIO-8: In-Reservoir Fish and Water Quality	LSM	NI	LSM-	LSM
CUL-1: Historical Resources	LS	NI	LS	LS
CUL-2/3: Archaeological Resources	LS	NI	LS	LS-
CUL-4: Tribal Cultural Resources	LS	NI	LS	LS-
CUL-5: Paleontological Resources	LSM	NI	LSM-	LSM
FOR-2: Loss or Conversion of Forest Land	LSM	NI	LSM-	LSM-
GEO-1: Exposure to Seismic Hazards	LS	NI	LS	LS
GEO-2: Slope Stability	LS	NI	LS-	LS-
GEO-3: Expansive Soil	LS	NI	LS	LS
HAZ-1A: Use and Transport of Hazardous Materials	LS	NI	LS-	LS-
HAZ-1B: Disposal of Hazardous Waste	LSM	NI	LSM-	LSM
HAZ-2A: Upset and Release of Hazardous Materials-Accidental Spills	LSM	NI	LSM	LSM
HAZ-2B: Upset and Release of Hazardous Materials-Exposure to Hazards	LSM	NI	LSM	LSM
HYDRO-2: Alteration of Drainage Patterns	LS	NI	LS	LS
HYDRO-3: Increased Surface Flows – Emergency Releases	LS	NI	LS	LS
HYDRO-4: Water Quality	LSM	NI	LSM-	LSM-
HYDRO-5: Flood Hazards	LS	NI	LS	LS
HYDRO-7: Seiches, Tsunamis, Mudflows	LS	NI	LS	LS
NOISE-2: Permanent Noise Increases	LS	NI	LS	LS
NOISE-3: Temporary Noise Increases	LS	NI	LS	LS
TRAF-1: Traffic-Circulation System Impacts	LS	NI	LS-	LS-
New Significant Impacts		None	None	None

LEGEND	
NI No Impact LS Less than significant impact LSM Less than significant impact with mitigation	+ Greater adverse impact than proposed project - Lesser adverse impact than proposed project

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CHAPTER 6
OTHER CEQA CONSIDERATIONS

Section 15126 of the California Environmental Quality Act (CEQA) Guidelines requires that all aspects of a project must be considered when evaluating its impact on the environment, including planning, acquisition, development, and operation. The EIR must also discuss (1) significant environmental effects of the proposed project, (2) significant environmental effects that cannot be avoided if the proposed project is implemented, (3) significant irreversible environmental changes that would result from implementation of the proposed project, and (4) growth-inducing impacts of the proposed project. Chapter 1, Summary, and Chapter 4, Environmental Setting, Impacts, and Mitigation Measures, of this EIR provide a comprehensive identification and evaluation of the proposed project's environmental effects, mitigation measures, and the level of impact significance both before and after mitigation. This section addresses the other required topics identified above. Cumulative impacts are discussed in each section of Chapter 4, and project alternatives are discussed in Chapter 5, Project Alternatives.

6.1 SIGNIFICANT UNAVOIDABLE IMPACTS

The CEQA Guidelines require a description of any significant impacts, including those that can be mitigated but not reduced to a level of insignificance (Section 15126.2(b)). Where there are impacts that cannot be alleviated without imposing an alternative design, their implications and the reasons why the project is being proposed, notwithstanding their effect, should be described. This EIR identified no significant unavoidable project impacts or cumulative impacts.

6.2 SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES

The CEQA Guidelines require a discussion of significant irreversible environmental changes with project implementation, including uses of nonrenewable resources during the initial and continued phases of the project (Section 15126.2(c)). As described in Section 15126.2(c), use of nonrenewable resources during the initial and continued phases of the project may be irreversible since a large commitment of such resources makes removal or nonuse thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as highway improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses. Irreversible damage can also result from environmental accidents associated with the project.

According to Section 15126.2(c), a project would generally result in a significant irreversible impact if:

- The project would involve a large commitment of nonrenewable resources during initial and continued phase of the project;

- Primary and secondary impacts would generally commit future generations to similar uses;
- The project would involve uses in which irreversible damage could result from environmental accidents; or
- The proposed consumption of resources is not justified (e.g., the project involves the wasteful use of energy).

Implementation of the project would involve the use of some nonrenewable resources. Project construction would require consumption of fossil fuels, labor, and construction materials. These expenditures would be, for the most part, irrecoverable. However, such resources are not considered to be in short supply, and their use would not impede the continued availability of these resources for other projects. Project operation would continue the existing land use on the project site; therefore, the project would not commit future generations to land uses that do not already exist. Energy use is addressed is section 6.4.

Irreversible changes to the physical environment could occur from accidental release of hazardous materials associated with construction activities. However, environmental accidents would be minimized through adherence to federal, state and local regulations. Additionally, the Project includes Best Management Practices (BMPs) that include measures to prevent accidental release of hazardous materials with development of emergency plans that outline procedures to follow in the event of an accidental release. Compliance with State and federal hazardous materials regulations would reduce the potential for accidental release of hazardous materials to a less-than-significant level.

No other irreversible changes are expected to result from the construction of the proposed Project.

6.3 GROWTH-INDUCING IMPACTS

CEQA requires that any growth-inducing aspect of a project be discussed in an EIR. This discussion should include consideration of ways in which the project could directly or indirectly foster economic or population growth in adjacent and/or surrounding areas. Projects that could remove obstacles to population growth (such as major public service expansion) must also be considered in this discussion. According to CEQA, it must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.

According to the CEQA Guidelines, a project would have the potential to induce growth if it would:

- Remove obstacles to population growth (e.g., through the expansion of public services into an area that does not currently receive these services), or through the provision of new access to an area, or a change in restrictive zoning or land use designation; or

- Result in economic expansion and population growth through employment opportunities and/or construction of new housing.

As discussed in Section 4.1.5 of this EIR, the project would not include housing or generate new employment opportunities. The project would consist of replacement of existing infrastructure and associated improvements at the existing Newell Creek Dam to enhance operational efficiency, improve system performance, provide for long-term reliable storage for the City's drinking water supply, and enable the City to meet the California Department of Water Resources Division of Safety of Dams (DSOD) reservoir drawdown requirements in case of an emergency. The Project would not involve procurement of additional water supplies or expansion of public services into areas that do not currently receive these services. Thus, the Project would not remove obstacles to population growth. As an improvement to a water supply facility, the project would not result in uses that would directly or indirectly induce substantial economic growth.

It is noted that the Santa Cruz Water Department is in the process of implementing a Capital Improvement Program (CIP) that includes plans and funding for numerous capital improvements projects, including rehabilitation or replacement projects, upgrades and improvements projects, water supply reliability studies, and water main replacements as discussed in Section 4.0.3.2. The City has submitted applications for changes to its existing water rights would change the manner of diversion and location of use and also has embarked on a pilot water-sharing agreement with Soquel Creek Water District. These future projects could result in a change and/or increase in inflows to and seasonal withdrawals from Loch Lomond Reservoir. However, the proposed Project is independent of these other planned projects and would not result in population growth inducement.

6.4 ENERGY CONSERVATION

To assure that energy implications are considered in project decisions, Appendix F of the CEQA Guidelines requires that an EIR disclose and discuss the potential impacts of a project on energy resources and conservation, with particular emphasis on avoiding or reducing inefficient, wasteful, and unnecessary consumption of energy resources.

6.4.1 Methodology

Energy demand for the proposed project is based on the California Emissions Estimator Model (CalEEMod), Version 2016.3.2, as well as the Sacramento Metropolitan Air Quality Management District (SMAQMD) Harborcraft, Dredge, and Barge Emission Factor Calculator (July 2017), which were used to estimate potential project-generated greenhouse gas (GHG) emissions associated with off-road equipment and on-road vehicles, and GHGs from the flat-bottom crew boat and the push boat, respectively. The estimated GHGs were then back-calculated based on carbon content (i.e., kilograms of carbon dioxide [CO_2] per gallon) to estimate fuel usage during project construction. Energy use calculations are provided in Appendix D.

Regarding operations and maintenance (O & M), activities would include routine inspection and maintenance and would be expected to be on the same order of magnitude as the existing facility. As such, any potential increase in operational energy demand would be negligible and was not quantified for the project.

6.4.2 Impacts and Mitigation Measures

Energy Consumption

Construction would involve several phases over an approximate 24-month period. Construction equipment estimates, including daily use during each project phase/sequence, were provided by the City's consulting engineer. The type and amount of equipment used in each construction phase, as well as other construction assumptions, are summarized in Appendix B.

Electricity

Construction Use. Temporary electric power for as-necessary lighting and electronic equipment (such as computers inside temporary construction trailers and heating, ventilation, and air conditioning) would be provided by Pacific Gas and Electric Company (PG&E). Electrically powered hand tools would also be used during construction. The vast majority of the energy used during construction would be from petroleum. The electricity used for such activities would be temporary and negligible; therefore, impacts would be *less than significant*.

Operational Use. As part of the project, several additional components would require monitoring that would result in a negligible increase in electricity use. However, overall, operational electricity requirements would not be expected to change in comparison to the existing facility. As such, the project would not have an impact on the local utility and would not result in a wasteful use of energy. Impacts related to operational electricity use would be *less than significant*.

Natural Gas

Construction Use. Natural gas is not anticipated to be required during construction of the project. Fuels used for construction would primarily consist of diesel and gasoline, which are discussed below. Any minor amounts of natural gas that may be consumed as a result of Project construction would be temporary and negligible and would not have an adverse effect; therefore, impacts would be *less than significant*.

Operational Use. Long-term project operations would not result in natural gas usage. Therefore, the project would not have an impact on the local utility and would not result in a wasteful use of energy. Therefore, natural-gas-consumption impacts would be *less than significant*.

Petroleum

Construction Use. Petroleum would be consumed throughout construction of the project. Fuel consumed by construction equipment and boats would be the primary energy resource expended over the course of construction, and vehicle miles traveled (VMT) associated with the transportation of construction materials and construction-worker commutes would also result in petroleum consumption. Heavy-duty construction equipment, boats, and on-road haul trucks associated with construction activities would rely on diesel fuel. Construction workers would travel to and from the project site throughout the duration of construction. It is assumed in this analysis that construction workers' vehicles would be gasoline-powered.

There are no unusual project characteristics or construction processes that would require the use of equipment that would be more energy intensive than that used for comparable activities, or equipment that would not conform to current emissions standards (and related fuel efficiencies).

Heavy-duty construction equipment of various types would be used during each phase of construction. Equipment anticipated for project construction is summarized in Table 6.4-1: Hours of Operation for Construction Equipment. In summary, over all phases of construction, diesel-fueled construction equipment would run for an estimated 63,224 hours.

Fuel consumption from construction equipment and boats was estimated by converting the total CO_2 emissions from each construction phase to gallons using the conversion factors for CO_2 to gallons of gasoline or diesel. Construction is estimated to occur in phases based on the anticipated project construction schedule. The conversion factor for gasoline is 9.13 kilograms of CO_2 per gallon (kg CO_2/gallon) and the conversion factor for diesel is 10.21 kg CO_2/gallon (The Climate Registry 2017). The estimated diesel fuel usage from construction equipment and boats are shown in Table 6.4-2and Table 6.4-3, respectively.

Fuel consumption from worker and vendor trips were estimated by converting the total CO2 emissions from each construction phase to gallons using the conversion factors for CO2 to gallons of gasoline or diesel. Worker vehicles are assumed to be gasoline-fueled, and vendor/hauling vehicles are assumed to be diesel-fueled. Calculations for total worker, vendor, and haul truck fuel consumption are provided in Table 6.4-4, Table 6.4-5, and Table 6.4-6 respectively.

As shown in Table 6.4-2 through Table 6.4-6, the project is estimated to consume 275,273 gallons of petroleum during overall project construction. By comparison, California's consumption of petroleum is approximately 52.9 million gallons per day (CEC 2018). Therefore, because petroleum use during construction would be temporary and would not be wasteful or inefficient, impacts would be *less than significant*.

Operational Use. During operations, the majority of fuel consumption resulting from the project would involve the use of motor vehicles traveling to and from the project site for routine inspection and maintenance activities, which would be on the same order of magnitude as for the existing facility. Given these considerations, the petroleum consumption associated with the project would not be considered inefficient or wasteful and therefore would result in a *less than significant* impact.

Table 6.4-1: Hours of Operation for Construction Equipment

Construction Phase	Equipment Types	Hours of Equipment Use
Mobilization	Articulated haul truck, forklift, loader	150
Develop Staging Areas	Articulated haul trucks, excavator, dozers, loaders, water trucks, crane/boom truck	420
Construct NCP Bypass	Articulated haul trucks, excavator, dozer, motor grader, loader, roller, water truck, forklift, crane/boom truck	3,432
Install Boat Launch/Silt Curtain	Diesel generator, articulated haul trucks, excavator, motor grader, roller, water truck, forklift, crane/boom truck, loader	1,880
Dredge and Drill Shafts	Crane/boom truck, clamshell dredger, drill rig, generator set, breathing compressors, hot water suit heaters	3,300
Access Road Improvement	Articulated haul trucks, excavator, dozer, motor grader, loader, roller, water truck, forklift	204
Grade Portal Platform	Articulated haul trucks, dozers, loaders, water trucks, concrete mixers, crane/boom truck	2,968
Install Culvert Bridge	Articulated haul truck, excavator, dozer, roller, forklifts, crane/boom truck, loader	2,660
Construct Intake/Air Vent	Concrete mixers, forklift, crane/boom truck, generator set, breathing compressors, hot water suit heaters	10,890
Tunnel Excavation	Diesel generator, articulated haul trucks, concrete mixer, tunneling roadheader, air compressors, ventilator fan, water treatment plant	19,800
Inlet Control House	Articulated haul truck, excavator, motor grader, concrete mixers, forklift, crane/boom truck, loader	2,400
Inlet/Outlet Conduit/Backfill Tunnel	Diesel generator, concrete mixers, forklifts, air compressors, loader	7,500
Start Outlet Yard Construction	Diesel generator, articulated haul truck, excavator, motor grader, roller, concrete mixers, forklifts, crane/boom truck, loader	3,200
Complete Outlet Yard Construction	Diesel generator, articulated haul truck, excavator, motor grader, roller, concrete mixer, forklifts, crane/boom truck, loader	1,880
Electrical Controls Installation	Diesel generators, excavator, loader, forklifts, crane/boom truck	690
Perform Start-Up Testing	Crane/boom truck	250
Decommission Existing Outlet	Articulated haul truck, concrete mixer, crane/boom truck, loader	1,600
	Total	**63,224**

Source: See Appendix D.

Table 6.4-2. Construction Equipment Diesel Demand

Phase	Pieces of Equipment	Equipment CO_2 (MT)	kg CO_2/Gallon	Gallons
Mobilization	3	5.68	10.21	556.65
Develop Staging Areas	11	22.72	10.21	2,225.05
Construct NCP Bypass	10	170.62	10.21	16,710.81
Install Boat Launch/Silt Curtain	10	85.91	10.21	8,414.07
Dredge and Drill Shafts	6	151.98	10.21	14,885.87
Access Road Improvement	9	10.48	10.21	1,025.97
Grade Portal Platform	14	114.28	10.21	11,192.77
Install Culvert Bridge	8	101.48	10.21	9,939.17
Construct Intake/Air Vent	7	360.88	10.21	35,345.67
Tunnel Excavation	9	923.00	10.21	90,401.24
Inlet Control House	8	62.30	10.21	6,102.26
Inlet/Outlet Conduit/Backfill Tunnel	10	102.99	10.21	10,086.73
Start Outlet Yard Construction	11	94.68	10.21	9,273.71
Complete Outlet Yard Construction	10	66.27	10.21	6,490.44
Electrical Controls Installation	7	22.31	10.21	2,184.93
Perform Start-Up Testing	1	7.99	10.21	782.11
Decommission Existing Outlet	4	22.10	10.21	2,164.87
			Total	**227,782.33**

Sources: Appendix D (pieces of equipment and equipment CO_2);The Climate Registry 2017 (kg CO_2/gallon)
Notes: CO_2 = carbon dioxide; MT = metric ton; kg = kilogram

Table 6.4-3. Construction Boat Diesel Demand

Phase	Number of Boats	Boat CO2 (MT)	kg CO_2/Gallon	Gallons
Dredge and Drill Shafts	2	60	10.21	5,896.55
Construct Intake/Air Vent	2	181	10.21	17,689.64
			Total	**23,586.19**

Sources: Appendix D (construction boat CO_2); The Climate Registry 2017 (kg CO_2/gallon)
Notes: CO_2 = carbon dioxide; MT = metric ton; kg = kilogram

Energy Consumption with Accelerated Construction Schedule

There may be an "accelerated" construction schedule in which some work activities/sequences are scheduled during consecutive evening/nighttime periods to complete a particular phase in a shorter amount of time. Under this scenario, a 16-hour work day is anticipated with two work shifts. The tunnel excavation construction may include 24-hour construction with three 8-hour shifts. If an accelerated construction schedule were to be implemented, there could be a brief overlap of construction workers arriving to and leaving the site. However, the amount of equipment would remain the same, although the duration of use would be extended. Construction assumptions with an accelerated schedule are included in Appendix B.

Energy calculations with an accelerated are included in Appendix D. Total hours of construction equipment use and construction equipment diesel demand would slightly decrease, while construction boat diesel demand would the nearly the same as under a two-year schedule. Construction worker, vendor, and haul trip fuel demand also would be similar or slightly reduced with the accelerated schedule. Therefore, petroleum consumption associated with an accelerated construction schedule would not be considered inefficient or wasteful and therefore would result in a *less than significant* impact.

Mitigation Measures

No mitigation measures are required as a significant impact has not been identified.

Table 6.4-4. Construction Worker Vehicle Gasoline Demand

Phase	Trips	Vehicle CO_2 (MT)	kg CO_2/Gallon	Gallons
Mobilization	170	1.38	9.13	150.65
Develop Staging Areas	0	0.00	9.13	0.00
Construct NCP Bypass	1,496	12.10	9.13	1,325.72
Install Boat Launch/Silt Curtain	680	5.50	9.13	602.61
Dredge and Drill Shafts	1,870	15.13	9.13	1,657.15
Access Road Improvement	102	0.83	9.13	90.39
Grade Portal Platform	0	0.00	9.13	0.00
Install Culvert Bridge	1,292	10.45	9.13	1,144.94
Construct Intake/Air Vent	0	0.00	9.13	0.00
Tunnel Excavation	5,100	40.75	9.13	4,463.03
Inlet Control House	0	0.00	9.13	0.00
Inlet/Outlet Conduit/Backfill Tunnel	2,550	19.92	9.13	2,181.31
Start Outlet Yard Construction	1,360	10.62	9.13	1,163.37
Complete Outlet Yard Construction	680	5.31	9.13	581.69
Electrical Controls Installation	510	3.98	9.13	436.27
Perform Start-Up Testing	850	6.64	9.13	727.11
Decommission Existing Outlet	1,360	4.51	9.13	494.44
			Total	**15,018.67**

Sources: Appendix D (construction worker CO_2); The Climate Registry 2017 (kg CO_2/gallon)
Notes: CO_2 = carbon dioxide; MT = metric ton; kg = kilogram

Table 6.4-5. Construction Vendor Truck Diesel Demand

Phase	Trips	Vehicle CO_2 (MT)	kg CO_2/Gallon	Gallons
Mobilization	20	0.37	10.21	36.09
Develop Staging Areas	0	0.00	10.21	0.00
Construct NCP Bypass	176	3.24	10.21	317.61
Install Boat Launch/Silt Curtain	80	1.47	10.21	144.37
Dredge and Drill Shafts	220	4.05	10.21	397.01
Access Road Improvement	12	0.22	10.21	21.66
Grade Portal Platform	56	1.03	10.21	101.06
Install Culvert Bridge	152	2.80	10.21	274.30
Construct Intake/Air Vent	330	6.07	10.21	594.62
Tunnel Excavation	900	16.53	10.21	1,619.28
Inlet Control House	120	2.19	10.21	214.75
Inlet/Outlet Conduit/Backfill Tunnel	450	8.22	10.21	805.32
Start Outlet Yard Construction	240	4.39	10.21	429.50
Complete Outlet Yard Construction	120	2.19	10.21	214.75
Electrical Controls Installation	60	1.10	10.21	107.38
Perform Start-Up Testing	100	1.83	10.21	178.96
Decommission Existing Outlet	240	1.86	10.21	182.54
			Total	**5,639.19**

Sources: Appendix D (construction vendor CO_2); The Climate Registry 2017 (kg CO_2/gallon)
Notes: CO_2 = carbon dioxide; MT = metric ton; kg = kilogram

Table 6.4-6. Construction Haul Truck Diesel Demand

Phase	Trips	Vehicle CO_2 (MT)	kg CO_2/Gallon	Gallons
Mobilization	0	0.00	10.21	0.00
Develop Staging Areas	200	8.48	10.21	830.36
Construct NCP Bypass	176	7.46	10.21	730.72
Install Boat Launch/Silt Curtain	24	1.35	10.21	132.51
Dredge and Drill Shafts	0	0.00	10.21	0.00
Access Road Improvement	20	0.85	10.21	83.04
Grade Portal Platform	346	14.67	10.21	1,436.53
Install Culvert Bridge	6	0.34	10.21	33.12
Construct Intake/Air Vent	0	0.00	10.21	0.00
Tunnel Excavation	0	0.00	10.21	0.00
Inlet Control House	0	0.00	10.21	0.00
Inlet/Outlet Conduit/Backfill Tunnel	0	0.00	10.21	0.00
Start Outlet Yard Construction	0	0.00	10.21	0.00
Complete Outlet Yard Construction	0	0.00	10.21	0.00
Electrical Controls Installation	0	0.00	10.21	0.00
Perform Start-Up Testing	0	0.00	10.21	0.00
Decommission Existing Outlet	0	0.00	10.21	0.00
			Total	**3,246.29**

Sources: Appendix D (construction haul truck CO_2); The Climate Registry 2017 (kg CO_2/gallon)
Notes: CO_2 = carbon dioxide; MT = metric ton; kg = kilogram

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CHAPTER 7
REFERENCES AND LIST OF PREPARERS

7.1 AGENCIES AND PERSONS CONTACTED

City of Santa Cruz

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County of Santa Cruz

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7.3 EIR TEAM

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