

Operations and Maintenance Technical Memorandum



To: Sites Project Authority
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Appendix A. Estimated O&M Costs

Acronyms and Abbreviations

ABME	Area Bridge Maintenance Engineers
ADAS	automated data acquisition system
Authority	Sites Project Authority
Caltrans	California Department of Transportation
cfs	cubic feet per second
DSOD	State of California Department of Water Resources, Division of Safety of Dams
DWR	California Department of Water Resources
ft	feet
I/O	Inlet/Outlet Works
MAF	million-acre-foot
MUTCD	Manual on Uniform Traffic Control Devices
O&M	operations and maintenance
ROV	remotely operated vehicle
SM&I	Caltrans Structures and Bridge Maintenance
TM	technical memorandum

1.0 Introduction

1.1 Project Overview and Reservoir Alternatives

The Sites Project Authority (Authority) is preparing a feasibility-level evaluation for a 1.5-million-acre-foot (MAF) reservoir as a preferred alternative ("Alternative 1") for the Sites Reservoir Project. Figure 1-1 shows the location of Sites Reservoir, and the various dams, roads, and other features to be constructed to form the reservoir. Sites Reservoir would have a nominal total storage capacity of 1.5 MAF. Table 1-1 outlines key aspects of the reservoir.

Table 1-1. Sites Reservoir

Total Storage Capacity	1.5 MAF
Active Storage Capacity	1.4 MAF
Approximate Inundation Area	13,200 acres
Dam/Saddle Dam Crest Elevation (Without Camber)	517 feet
Normal Maximum Reservoir Water Surface Elevation	498 feet
Minimum Operating Water Elevation	340 feet
Top of Dead Pool Elevation	300 feet
Inlet/Outlet Facilities Conveyance Capacity:	
Tehama-Colusa Canal	2,100 cfs
Glenn-Colusa Irrigation District Canal	1,800 cfs

cfs = cubic feet per second

MAF = million acre feet

The reservoir boundaries and water surface elevations provided in Table 1-1 are based on topographic information provided by the California Department of Water Resources (DWR) for their use on the project. New topographic information will be obtained for the reservoir site in future phases of the project. The information provided in Table 1-1 should be verified when the new surveys are completed.

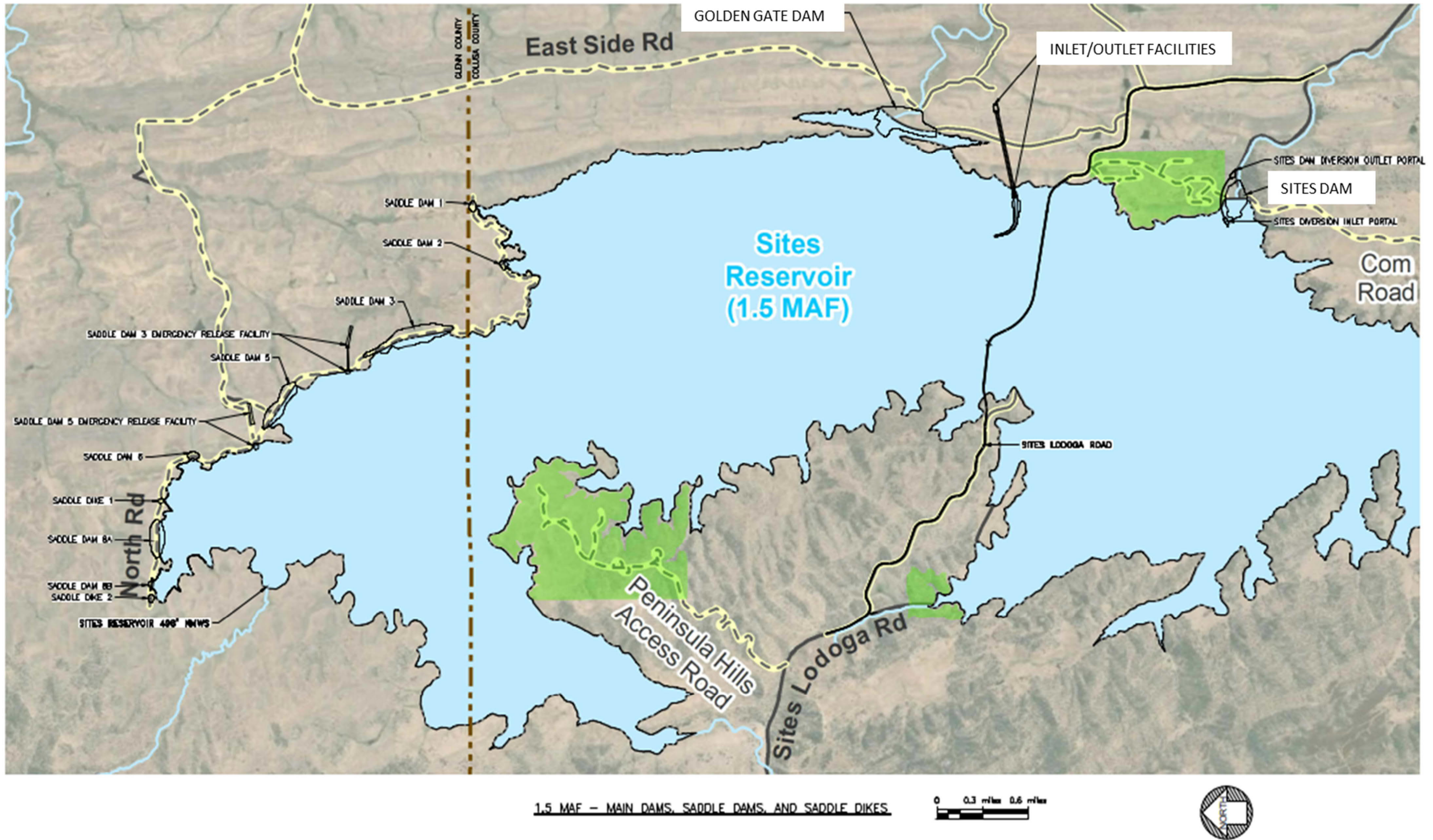


Figure 1-1. Alternative 1 Reservoir

The key dimensions of the facilities are included in Table 1-2.

- Main Dams, Saddle Dams and Dikes, and Reservoir Rim: The Sites Reservoir dams include two main dams, Golden Gate Dam on Funks Creek and Sites Dam on Stone Corral Creek, and saddle dams and dikes on the reservoir rim on tributaries to the Hunters Creek drainage.
- Spillway: This structure is a concrete overflow spillway located at Saddle Dam 8B that would discharge into Hunters Creek to the north.
- Inlet/Outlet (I/O) Works: These facilities include a vertical tower with multiple intake levels connected to two inlet/outlet tunnels. These provide for normal reservoir operation and for making the major portion of emergency reservoir releases that will be required by DSOD as part of dam permitting. The tunnels connect to reservoir conveyance pipelines (HC) at the downstream tunnel portal.
- Sites Dam Outlet Works: This outlet works tunnel would be located in the north abutment of Sites Dam; it would be used initially for construction diversion for both main dams and subsequently for stream maintenance and a portion of the emergency reservoir releases to Stone Corral Creek after construction.
- Emergency Release Structures: These structures provide emergency release capacity to supplement the release capacities at the I/O Works and Sites Dam tunnel. They include intakes and tunnels located at Saddle Dams 3 and 5 for Alternative 1 only; they would discharge to Hunter’s Creek tributaries on the north side of the reservoir.
- Roads: Roads include local roads (recreational use and public access), maintenance roads, and construction access roads.
- Bridges: Two bridges crossing the reservoir (lengths of 1,400 feet and 1,633 feet for the west bridge and east bridge, respectively) with fill prisms, providing an east-west connection from rural communities of Maxwell, Lodoga, and Stonyford for Alternative 1 only. For Alternative 2, there will be a southern road alignment around the south end of reservoir, providing an east-west connection from Maxwell to the rural communities of Lodoga and Stonyford.

Table 1-2. Reservoir Facility Descriptions

Reservoir Elevation at full pool (feet)	498.0
Reservoir Area at full pool (acres)	13,200
Dam / Dike Crest Elevation (feet) (without camber)	517.0
Main Dams	2 main dams – see below
Saddle Dams	7 saddle dams and 2 saddle dikes – see below
Dam / Dike:	<u>Max. Ht. Above Streambed / Crest Length (ft)</u>
Golden Gate Dam	287 / 2,221
Sites Dam	267 / 781
Saddle Dam 1	27 / 318
Saddle Dam 2	57 / 250
Saddle Dam 3	107 / 3,422
Saddle Dam 5	77 / 1,894
Saddle Dam 6	47 / 362
Saddle Dam 8A	82 / 1,300

Saddle Dam 8B	37 / 475
Saddle Dike 1	12 / 122
Saddle Dike 2	12 / 198
Saddle Dike 3	Not required
I/O Tower	Top elev. 558 ft. 258 ft high / 7 elevations to draw water from reservoir
I/O Tunnels	Approx. 3,110 ft long/Dual 23 ft Internal diameter tunnels
Sites Diversion/Outlet Tunnels	Approx. 1,590 ft long/12 ft internal diameter tunnel
Emergency Release System (on north rim)	Two emergency release systems located at Saddle Dams 3 and 5
Spillway	Weir crest length = 85.5 feet, crest elevation = 504 feet

ft = feet
I/O = Inlet/outlet works
MAF = million acre feet

1.2 Purpose and Scope

The purpose of this task is to prepare a description of the inspection and O&M activities associated with each of the HR project facilities. This TM also includes a general description of the dam safety monitoring program, including instrumentation, monitoring seismic activity and maintenance. This task supports the Sites Project Feasibility Report, but does not purport to be a detailed inspection and O&M manual that would be used for the constructed facilities.

1.3 Limitations

The scope of work for this TM was restricted to the development of the inspection and O&M activities for the Sites Reservoir under the Reservoir (HR) contract. O&M for the conveyance facilities are separately considered in a companion TM for the HC contract.

AECOM represents that our services were conducted in a manner consistent with the standard of care ordinarily applied as the state of practice in the profession, within the limits prescribed by our client.

2.0 Inspection and O&M for HR Facilities.

Table 2-1 presents a simplified summary of inspection and O&M for the HR facilities for the dams, spillway, inlet/outlet works (I/O), high-level emergency release structures, roads, and bridges. This table shows the estimated frequency that may be needed for inspection and O&M activities.

Table 2-1. Summary of Inspection and O&M for HR Facilities¹

Feature	Inspection or O&M Est. Frequency / Duration (Approx.)
Dams and Abutments	Inspection: First 5 years, daily / 1 day Years 6-10, weekly / 1 day Years 11 – onward, -monthly / 1 day O&M: Annually / 4 days
Monument surveys (by subcontractor)	Inspection (Surveys): Semi-annually / 2 days
Replace instrumentation (by subcontractor)	O&M: 25 years / 25 days each time
Reservoir Rim and Spillway	Inspection: First 5 years, weekly / 2 days Years 6-10, quarterly/2 days > 10 years, monthly / 2 days O&M: Annually / 4 days
Inlet/Outlet Works, Sites Dam Outlet and Emergency Release Structures	Inspection: First 5 years, weekly / 2 days Years 6-10, monthly/2 days >10 years, quarterly / 2 days O&M: Annually / 4 days
Mechanical equipment/gates/valves (by subcontractor)	Inspection: Semi-annually / 1 day >6 years, annually/2 days 5 years for tunnel ROV / 8 days O&M: 25 years / 8 days each time
4. Roads – Sites Lodoga Road Causeway	Inspection: Years 1-5: Weekly first 6 mo., Monthly next 54 mo. / 1 day > 5 years: Every 3 months / 1 day O&M: Annually / 1 day
Local Roads	Inspection: Years 1-5: Monthly first 6 mo; Every 3 mo. next 54 mo. / 1 day >5 years: Every 3 months / 2 days O&M: Annually / 2 day
Main Roads	Inspection: Years 1-5: Every 3 months / 2 days >5 years: Every 6 months / 2 days O&M: Every 3 years / 4 days (see note below)
Bridges	Inspection:

Feature	Inspection or O&M Est. Frequency / Duration (Approx.)
	Years 1-5, semi-annually / 2 days >5 years, annually / 1 day O&M: Annually / 2 days
Monument surveys (by subcontractor)	Inspection (Surveys) – (timed with surveys for dams and abutments): Semi-annually / 2 days

1. Routine O&M (Maintenance, Management, Repair, and Operation) for feasibility study O&M

3.0 Dams, Abutments, Rim and Spillway

3.1 Inspection

3.1.1 Visual Inspections

Visual inspections are an integral part of evaluating the performance of the dams. Systematic visual inspections of the dams will be required once filling has commenced. The visual inspections will be carried out by walking a prescribed route at the dams. Visual observations include, but are not limited to, the following:

- Deformation and Cracking: Cracks, bulges, alignment deviations in the crest, depressions, sinkholes, slides.
- Seepage: Seepage at the downstream face or abutments, turbid or cloudy seepage, evidence of piping (internal erosion of embankment or foundation materials) or transport of materials.
- Surface Conditions: Erosion gullies, excessive vegetation that can obscure observation, rodent burrows, debris, and condition of the riprap on the upstream face of the dams
- Rim observations would include erosion or slumps on the reservoir side and seeps or slumps on the outboard side of the rim.

If unusual conditions are observed, more frequent visual inspections (such as daily) and further investigation of that condition would be undertaken. Also, more frequent visual inspections would be performed after earthquakes that are felt in the site or after major rain storm events. Instrumentation data would also be monitored and recorded more frequently after earthquakes. Monitoring would include more frequent data recording for seepage to check for increased flow, and the piezometers would be read more frequently. Action items, such as needed repairs or follow-up on specific inspections, will be identified and brought to the attention of engineers.

Dams and abutments inspection frequencies are presented in Table 2-1.

3.1.2 Instrumentation Data and Monitoring

Instrumentation will be installed in the dam embankment and foundation, downstream of the dam, and in the abutments. The primary objective of the instrumentation is to provide data to evaluate whether the dam is performing as expected and to warn of changes that could impair dam safety.

Instrumentation data will initially be used to evaluate the behavior of the dam during the first filling of the reservoir and whether conditions are consistent with the design assumptions. During long-term operation of the project, instrumentation data will also be used to monitor the performance of the dam. As data are compiled, trends under normal operation will be established, and the significance of variations under unusual events or loads, such as earthquakes, can be evaluated.

Instrumentation will be installed to enable monitoring of the following performance parameters:

- Piezometer Water Levels: Water levels within the downstream shell zone, will be monitored to check for potential saturation of the shell zone. Water levels for foundation piezometers will be monitored to check piezometric pressures in the foundation.
- Seepage (Seepage weirs): Seepage rates will be measured at the dam toe to check for potential internal problems in the dam. In addition, clarity or turbidity of the seepage will be monitored; turbid seepage could indicate piping. Turbidity indicates that material is migrating from the foundation and/or from the dam embankment.
- Embankment Movement (Inclinometer and survey monuments): Horizontal and vertical surface movements of the embankments will be monitored by surveys to check for settlement and deformation. Horizontal movements of the embankment will also be monitored with an inclinometer.
- Earthquake Accelerations (Accelerographs): Accelerations at the dam crest and left abutment will be measured by accelerographs.
- Reservoir Level: Reservoir levels will be monitored to correlate with seepage and piezometric data.

The data recording frequencies are indicated in Table 2-1 and would be increased if any of the following is observed:

- Unusual conditions are observed during visual inspections.
- Rapidly changing instrumentation data are recorded.
- Established trends in data change.
- Piezometer readings exceed pre-established levels.
- After earthquakes that trigger at least one of the accelerographs or are felt at the dam site.
- After major rainstorms.

3.2 Maintenance

Maintenance of the dams will include:

- Standard maintenance:
 - Trim vegetative growth on the downstream face of the dam, abutments, and the toe on a regular basis.
 - Clear the spillway channels of trees and shrubs.
 - Clean out and fill rodent holes with hand-tamped sandy gravel materials.
 - Repair erosion rills.
 - Clean out any debris on the downstream face, abutments, access road ditches, approach channel to the Saddle Dam 8B spillway structure.
- Following any major rain storm event:
 - Observe the downstream face of the dam for signs of erosion, and repair any erosional features.
 - Observe culverts for blockage, and clear as necessary.

4.0 Inlet/Outlet Works and Sites Dam Outlet

4.1 Inspection

Trained operators will conduct periodic inspections of the Inlet/Outlet Works at Golden Gate Dam and the Outlet Works at Sites Dam. Inspections of the intake/outlet works would include the following:

- Checking gates, valves, screens and operators for leaks, corrosion, rust, or unusually large vibrations.
- Actuating gates and valves periodically to confirm functionality without unnecessary discharges.
- Inspecting concrete structures and lining for significant cracks, areas of spalling, voids, and joints.
- Inspecting Stone Corral creek channel for erosion.

Inundated infrastructure, such as the inlets and tunnels, will likely be inspected with remotely operated vehicles (ROVs). Above-ground infrastructure, such as the Sites Dam outlet structure, can be inspected by crews and operators.

4.2 Maintenance

Regular maintenance of the screens at the I/O tower or Sites inlet is not anticipated. However, at the I/O tower they should have any accumulated debris scraped off of them once they are hoisted above the water surface. For all instrumentation and electrical components, routine maintenance such as calibration or testing, should be performed as stated in the manufacturer's O&M manuals.

Refurbishment or replacement of gates and valves, both at the I/O tower and Sites inlet and outlet structures, would need to occur periodically as noted in Table 2-1.

If inspections of concrete structure and linings reveals significant defects, maintenance will be required to repair or replace concrete as needed.

4.3 Operation

During typical operations the I/O ports at the tower will be opened based on inflow/outflow demands, port submergence considerations, and desired water quality characteristics (e.g., temperature, dissolved oxygen, etc.). The Sites Dam outlet will typically have a valve open to convey instream beneficial releases to Stone Corral Creek, in accordance with environmental requirements.

In an emergency situation both the I/O works and the Sites Dam Outlet will be operated to drawdown the reservoir according to DSOD emergency drawdown requirements.

5.0 High Level Emergency Release Structures

5.1 Inspection

Trained operators will conduct periodic inspections of the high-level emergency release structures. Inspections would include the following:

- Checking gates, valves, and operators for leaks, corrosion, rust, or unusually large vibrations.
- Actuating gates and valves periodically to confirm functionality without discharging flows.
- Inspecting concrete structures and lining for significant cracks, areas of spalling, voids, and joints.
- Inspecting Stone Corral creek channel for erosion (following emergency releases).

Inundated infrastructure, such as the inlets and tunnels, will likely be inspected with ROVs. Above-ground infrastructure, such as the outlet structures, can be inspected by crews and operators.

5.2 Maintenance

Trashracks should periodically have any accumulated debris scraped off of them. For all instrumentation and electrical components, routine maintenance such as calibration or testing should be performed as stated in the manufacturer's O&M manuals. Refurbishment or replacement of gates and valves would need to occur periodically as noted in Table 2-1.

If inspections of concrete structure and linings reveals significant defects, maintenance will be required to repair or replace concrete as needed.

5.3 Emergency Operation

In an emergency situation the high level emergency release structures will be operated to drawdown the reservoir according to DSOD emergency drawdown requirements.

6.0 Roads

6.1 Functional Classification

The maintenance level assigned to a road considers the road functional classification, traffic volume, road condition, surface type, travel speed, user comfort and convenience, user safety, budget constraints, and environmental concerns.

Three types of roads have been defined for this Sites Reservoir project to provide for three functions: Local Access, Construction Access, and Maintenance Access. Local Access roads are Colusa County and Glenn County roads used for conveyance of the general traveling public. These roads will be maintained by the agency having jurisdiction of the roadway. Construction Access roads are specific to construction equipment/material transport and utilize Local Access roads in part.

6.2 Operations

6.2.1 Local Access Roads

The Local Access Road classification is assigned to roads that provide a high degree of user comfort and convenience. These roads are two lanes with shoulders, paved facilities and have the following attributes:

- Provides a high degree of user comfort and convenience for drivers in a standard passenger car (daily and during temporary construction operations)
- Provides smooth road surface, free of obstructions and debris
- Inspires confidence in the driver's expectations that hazards will be few and identified well in advance with clear visibility.
- Provides a visually pleasing roadway.
- Provides driver guidance and follows the requirements of the "Manual on Uniform Traffic Control Devices" (MUTCD) for signs and markings.
- Operates with higher traffic volume and speeds.
- Provides drainage via culverts.
- Functions as an arterial or collector.
- Provides a smooth paved road surface with lane striping and defined shoulders
- Operates as an access controlled facility
- Maintained by the local agency having jurisdiction – Glenn or Colusa Counties

6.2.2 Maintenance Access Roads

Maintenance Access Roads The Maintenance Access Road classification is assigned to roads open and maintained for travel by a driver in a standard passenger car. User comfort and convenience are not considered priorities. These roads have restricted access (maintenance personnel and adjacent landowners) are often unpaved gravel roads and have the following attributes:

- Are passable to drivers in passenger cars.
- Usually do not consider user comfort and convenience priorities.
- Are subject to the requirements MUTCD for signs.
- Provides a single lane with turnouts visible from either direction.
- Operates typically at low speeds.
- Functions as a local or collector.
- Operates with low- to moderate-traffic volume.
- Provides drainage via a combination of dips and culverts.
- Typically, may have wash-boarding.

6.3 Inspection and Maintenance

6.3.1 Local Access Roads Maintenance

Maintenance of Local Access roadways will be the responsibility of the local agency having jurisdiction of the roadway – Glenn or Colusa Counties.

Traveled way and shoulders. Maintain to provide for the protection of investment and resource values, and for a high degree of user comfort and convenience for all motor vehicles including standard passenger cars.

Drainage. Drain as necessary to keep drainage facilities functional and prevent unacceptable environmental damage while maintaining a high degree of user comfort and convenience.

Roadway. Control vegetation to provide sight distance. Repair and/or remove slides, slumps and debris to provide passage by the traveling public and to control resource damage. Surface repair includes pothole patching, crack sealing, chip sealing and removal of unsuitable material.

Roadside. Clean up litter in accordance with road management objectives. Remove trees that threaten safety to the general public and maintain vegetation as required. Cut and remove fallen trees for appropriate horizontal clearance. Remove debris and maintain fencing. Remove graffiti from roadside signs and barrier rails.

Structures. Maintain all structures (e.g., culverts) to provide for passage of traffic and to preserve structures for future use. Remove graffiti from columns, barrier rails, etc..

Traffic service. Install and maintain appropriate route markers, warning, regulatory, and guide signs, and other traffic control devices as warranted in a sign plan. Maintain centerlines, edge stripes, and other pavement and curb markings as needed.

Maintenance Cycle. Typically, annually.

6.3.2 Maintenance Access Roads Maintenance

Maintenance Access roads are specific for the use to maintain facilities. Maintenance of Maintenance Access roadways would be the responsibility of the Sites Authority, unless used by the contractor; then maintenance responsibility would be that of the contractor until the Authority takes ownership.

Traveled way and shoulders. Maintain to provide travel by drivers in standard passenger cars. Some surface roughness is acceptable. Maintain a traveled way crown or cross slope to provide adequate drainage. Replace the base course and surfacing as needed to protect the resources.

Drainage. Drain as necessary to keep drainage facilities functional and prevent unacceptable environmental damage while maintaining passage for drivers in standard passenger cars.

Roadway. Control vegetation to provide sight distance. Repair and/or remove slides, slumps and debris to provide passage by the traveling public and to control resource damage. Blade surface to maintain template and drainage. Surface is compact, crowned or sloped to drain without segregation of surface materials – no ruts or rills. Suitable material is recovered and incorporated. Unsuitable material is removed. Surface repair may include pothole patching, crack sealing, chip sealing and removal of unsuitable material.

Roadside. Clean up litter in accordance with road management objectives. Remove trees that threaten safety and maintain vegetation as required. Remove logs and debris when interfering with drainage or operation of maintenance equipment. Remove debris and maintain fencing. Remove debris and maintain fencing. Remove graffiti from roadside signs and barrier rails.

Structures. Maintain all structures (e.g., culverts) to provide for passage of traffic and to preserve structures for future use. Remove graffiti from columns, barrier rails, etc.

Traffic service. Install and maintain appropriate route markers, warning, regulatory, and guide signs and other traffic control devices as warranted in a sign plan.

Maintenance Cycle. Typically, 3 years.

7.0 Bridges

7.1 Inspection and Maintenance

It is assumed that County would be providing maintenance services generally in response to a problem on a bridge that affects public safety or the structural integrity of the structure. However, for periodic engineering Inspections, County would have arrangements with Caltrans to perform Inspection and Maintenance services. Caltrans "Maintenance Manual, Chapter H" is therefore used primarily in listing the below information. It is anticipated that the County will periodically re-surface and re-stripe the bridge. Signage may also be replaced and guardrails may be painted.

7.2 Inspections by Caltrans Area Bridge Maintenance Engineers

To comply with federal regulations, bridge structures would be periodically inspected by Caltrans Structures and Bridge Maintenance (SM&I) Area Bridge Maintenance Engineers (ABME), and more frequently when the need is determined by the ABME. Work recommendations are made for any corrective actions required.

When work recommendations are made, the recommendations will suggest the work be done either by contract or by maintenance crews. These recommendations are for guidance and the County has the

flexibility to accomplish the work by any means available. However, it should be noted that many of the repair recommendations affect structural components and are engineered solutions. Therefore, the repair recommendations, methods, and procedures would need to be followed. Often, the ABME will require assistance from the County crews to perform the bridge Inspections. Each work recommendation is identified by action type, target completion time, and accompanied by an estimated cost to do the work. SM&I staff would be contacted if assistance is needed in marking work complete.

7.3 Inspections by County Maintenance

Periodic walk through inspections would be made by County to detect obvious defects, hazards or potential problems and also to monitor known problems. The purpose of these inspections is to supplement the more detailed, but less frequent inspections by the ABME. Special attention should be given to any condition that affects the safety and/or structural capacity. If there is a question as to the relevance of a structural condition, the ABME would be notified.

When major defects or hazards are found, they would be immediately reported to SM&I. If an emergency condition exists, appropriate action would be taken as soon as possible to provide for public safety and to prevent further structural damage from occurring. This includes, but is not limited to, restricting traffic on the bridge or closing it completely, installing temporary support systems, or making temporary repairs. After a major storm, earthquake, or other natural event that may cause damage to bridges, the County would inspect all bridges in the affected area for signs of damage. Any damage found should be reported to SM&I.

7.4 Post-earthquake Inspections

Post bridge earthquake inspections will be conducted under the direction of SM&I ABME's, and Structure Construction Engineers depending on the level of intensity and extent of damage. SM&I would be notified of any earthquake-related damage.

An earthquake of less than 5.5 magnitude is considered too low to cause bridge damage. Although unexpected, any earthquake related damage found by County Maintenance personnel would be reported to SM&I in Sacramento. For earthquake magnitudes higher than 5.5 magnitude, ABME's team would carry out inspections.

7.5 Minor Defects

Minor defects are those that can be corrected with little or no risk of structure collapse or rendering of damage to adjacent or related members while making repairs or replacements and include the following:

- Damaged or misplaced clearance markers.
- Damaged or missing advisory and warning signs
- Damaged or deteriorated railings
- Uneven or cracked approach and deck surfacing.
- Joint Seals
- Accumulated drift adjacent to bents and piers.
- Minor erosion.
- Accumulated dirt or debris on decks
- Plugged drains.
- Settlement or roughness of approach.

- Fire hazards.
- Faulty electrical contacts

7.6 Major Defects

Some defects are considered major because they involve individual members that affect the structural stability of an entire span, thus requiring underpinning of the span or supplementing of the member before removal and include:

- Bent or damaged girders
- Cracked or spalled concrete members
- Defective bearings
- Joint Seal Assemblies
- Settled bents or piers
- Major erosion or scour
- Extensive fire damage

8.0 Annualized Cost of Operations and Maintenance

The estimated frequency and the level of labor and equipment that may be needed for inspection and O&M are indicated in Appendix A. The O&M tables in this appendix were used for estimating the approximate annualized costs for inspection and O&M. The cost tables pertain to routine O&M (maintenance, management, repair, and operation) for feasibility evaluation for the HR facilities. The inspection costs assume that the dam instrumentation is connected to an automated data acquisition system (ADAS), which would allow for remote data collection. An allowance is also included for the annual DSOD fee and providing support for the annual required DSOD inspection.

The O&M tables do not include costs for security, water quality monitoring, environmental protection, recreation, warehousing, office space, or HC facilities. Also, no allowance is made for any possible overlap in staff or equipment for O&M between the HR and HC contracts.

Dams: The tables include allowances for Engineer inspection report preparation as follows:

- Initial filling: first 5 years (can vary greatly): 40 hours/month for 5 years
- Long-term: 80 hours/year after end of year 5

Roads: The annualized costs assumed the following responsibilities for inspecting and maintaining the roads post-construction (to be confirmed with the Counties):

- Local Access Roads – Inspection and maintenance of Local Access roadways would be the responsibility of the agency having jurisdiction of the roadway: Colusa County or Glenn County.
- Maintenance Access Roads – Inspection and maintenance of Maintenance Access roadways would be the responsibility of the Sites Authority.
- Colusa County would continue to inspect and maintain the realigned Sites Lodoga Road and Huffmaster Road as the County is currently doing.

The estimated annualized O&M costs for the HR facilities are summarized in Table 8-1, from Appendix A:

Table 8-1. Summary of Estimated Annualized O&M Costs for HR Facilities

Years or Period	Activity	Estimated Annualized Costs
Years 1-5	Inspection and O&M	\$2,323,000
Years 6-10	Inspection and O&M	\$1,045,000
Years 11 onward	Inspection and O&M	\$856,000
Periodic (5 years)	Periodic maintenance and repairs	\$5,133,000
Periodic (25 years)	Periodic maintenance and repairs	\$34,186,000

The total average annual operating cost for the HR facilities is about \$2,944,000 over 40 years.

Appendix A

Estimated O&M Costs

Cost Summary

Annual Costs

Years 1 - 5

Dams	\$1,139,816
Reservoir Rim and Spillway	\$190,376
Inlet/Outlet Works, Sites Dam Outlet and Emergency Release Structures	\$158,980
Roads	\$96,225
Bridges	\$44,200
General	\$390,800
Unlisted items allowance	\$303,060

Total: Years 1 - 5	\$2,323,457
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Years 6 - 10

Dams	\$284,936
Reservoir Rim and Spillway	\$58,856
Inlet/Outlet Works, Sites Dam Outlet and Emergency Release Structures	\$49,380
Roads	\$84,580
Bridges	\$40,090
General	\$390,800
Unlisted items allowance	\$136,296

Total: Years 6 - 10	\$1,044,938
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Cost Summary

Years 11 on

Dams	\$120,536
Reservoir Rim and Spillway	\$80,776
Inlet/Outlet Works, Sites Dam Outlet and Emergency Release Structures	\$27,460
Roads	\$84,580
Bridges	\$40,090
General	\$390,800
Unlisted items allowance	\$111,636

Total: Years 11 on	\$855,878
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Average Annual Cost over 40 years (Rounded)	\$1,063,000
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Periodic Costs

Every 3 Years	\$0
Every 5 Years	\$5,133,100
Every 25 Years	\$34,186,135

Average Periodic Cost over 40 years (Rounded)	\$1,881,000
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Total Average Annual Operating Cost	\$2,944,000
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Excludes costs related to:

- Security and protective services
- Water quality
- Recreation facilities

Years 1 - 5: Reservoir Filling

1. Dams and Abutments

Dams

Inspection:

Daily / 1 day

Inspectors	6 EA	2,600 Hr/Yr	15,600 Hr	\$55.00	\$858,000
Pick-up trucks	6 EA	260 Day/Yr	1,560 Day	\$95.00	\$148,200
Misc equipment	6 EA	260 Day/Yr	1,560 Day	\$40.00	\$62,400
					<u>\$1,068,600</u>

O&M:

Annually / 4 days

Inspectors	2 EA	40 Hr/Yr	80 Hr	\$55.00	\$4,400
Laborers	2 EA	40 Hr/Yr	80 Hr	\$65.00	\$5,200
Operators	2 EA	40 Hr/Yr	80 Hr	\$100.00	\$8,000
Truck drivers	2 EA	40 Hr/Yr	80 Hr	\$70.00	\$5,600
Materials allowance	1 LS		1 LS	\$5,000.00	\$5,000
Pick-up trucks	4 EA	4 Day/Yr	16 Day	\$95.00	\$1,520
Dump truck	2 EA	4 Day/Yr	8 Day	\$720.00	\$5,760
Backhoe	2 EA	4 Day/Yr	8 Day	\$600.00	\$4,800
Compactor	2 EA	4 Day/Yr	8 Day	\$792.00	\$6,336
Misc equipment	8 EA	4 Day/Yr	32 Day	\$40.00	\$1,280
					<u>\$47,896</u>

Monument surveys

Inspection (Surveys): Subcontractor

Semi-annually / 2 days

Survey Crew Chief	1 EA	40 Hr/Yr	40 Hr	\$115.00	\$4,600
Survey Technician	5 EA	40 Hr/Yr	200 Hr	\$75.00	\$15,000
Pick-up trucks	6 EA	2 Day/Yr	12 Day	\$130.00	\$1,560
Survey/GPS instruments	6 EA	2 Day/Yr	12 Day	\$125.00	\$1,500
Misc equipment	6 EA	2 Day/Yr	12 Day	\$55.00	\$660
					<u>\$23,320</u>

Subtotal Dams

\$1,139,816

2. Reservoir Rim and Spillway

Inspection:

Weekly / 2 days

Inspectors	2 EA	1,040 Hr/Yr	2,080 Hr	\$55.00	\$114,400
ATV	2 EA	104 Day/Yr	208 Day	\$95.00	\$19,760
Misc equipment	2 EA	104 Day/Yr	208 Day	\$40.00	\$8,320
					<u>\$142,480</u>

O&M:

Annually / 4 days

Inspectors	2 EA	40 Hr/Yr	80 Hr	\$55.00	\$4,400
Laborers	2 EA	40 Hr/Yr	80 Hr	\$65.00	\$5,200
Operators	2 EA	40 Hr/Yr	80 Hr	\$100.00	\$8,000
Truck drivers	2 EA	40 Hr/Yr	80 Hr	\$70.00	\$5,600
Materials allowance	1 LS		1 LS	\$5,000.00	\$5,000
Pick-up trucks	4 EA	4 Day/Yr	16 Day	\$95.00	\$1,520
Dump truck	2 EA	4 Day/Yr	8 Day	\$720.00	\$5,760
Backhoe	2 EA	4 Day/Yr	8 Day	\$600.00	\$4,800
Compactor	2 EA	4 Day/Yr	8 Day	\$792.00	\$6,336
Misc equipment	8 EA	4 Day/Yr	32 Day	\$40.00	\$1,280
					<u>\$47,896</u>

Subtotal Reservoir Rim and Spillway

\$190,376

3. Inlet/Outlet Works, Sites Dam Outlet and Emergency Release Structures

I/O Works

Inspection:

Weekly / 2 days

Inspectors	2 EA	1,040 Hr/Yr	2,080 Hr	\$55.00	\$114,400
Pick-up trucks	2 EA	104 Day/Yr	208 Day	\$95.00	\$19,760
Misc equipment	2 EA	104 Day/Yr	208 Day	\$40.00	\$8,320
					<u>\$142,480</u>

O&M:

Annually / 4 days

Inspectors	2 EA	40 Hr/Yr	80 Hr	\$55.00	\$4,400
Laborers	2 EA	40 Hr/Yr	80 Hr	\$65.00	\$5,200
Materials allowance	1 LS		1 LS	\$1,000.00	\$1,000
Pick-up trucks	4 EA	4 Day/Yr	16 Day	\$95.00	\$1,520
Misc equipment	4 EA	4 Day/Yr	16 Day	\$40.00	\$640
					<u>\$12,760</u>

Mechanical equipment/gates/valves (by subcontractor)

Inspection:

Semi-annually / 1 day

Inspectors	2 EA	20 Hr/Yr	40 Hr	\$75.00	\$3,000
Pick-up trucks	2 EA	2 Day/Yr	4 Day	\$130.00	\$520
Misc equipment	2 EA	2 Day/Yr	4 Day	\$55.00	\$220
					<u>\$3,740</u>

Subtotal Inlet/Outlet Works, Sites Dam Outlet and Emergency Release Structures

\$158,980

4. Roads – Sites Ladoga Road Causeway, Local Roads, Main. Roads

Inspection:

Sites Ladoga Causeway: 1 day/week for 6 mo, then 1 day/month, average 20 days per year

Local Roads: 1 day/month for 6 mo, then 1 day/3 months, average 5 days per year

Main Roads: 2 days/3 months, average 8 days per year

TOTAL Inspection

33 Days

Inspectors	1 EA	330 Hr/Yr	330 Hr	\$55.00	\$18,150
Pick-up trucks	1 EA	33 Day/Yr	33 Day	\$95.00	\$3,135
Misc equipment	1 EA	33 Day/Yr	33 Day	\$40.00	\$1,320
					<u>\$22,605</u>

O&M:

Sites Ladoga Causeway: 1 day/year
 Local Roads: 2 days/year
 Main Roads: 4 days/3 years, average 1.33 days/year
 TOTAL O&M

5 Days

Inspectors	2 EA	50 Hr/Yr	100 Hr	\$55.00	\$5,500
Laborers	2 EA	50 Hr/Yr	100 Hr	\$65.00	\$6,500
Operators	2 EA	50 Hr/Yr	100 Hr	\$100.00	\$10,000
Truck drivers	2 EA	50 Hr/Yr	100 Hr	\$70.00	\$7,000
Materials allowance	1 LS		1 LS	\$20,000.00	\$20,000
Pick-up trucks	4 EA	5 Day/Yr	20 Day	\$95.00	\$1,900
Dump truck	2 EA	5 Day/Yr	10 Day	\$720.00	\$7,200
Backhoe	2 EA	5 Day/Yr	10 Day	\$600.00	\$6,000
Compactor	2 EA	5 Day/Yr	10 Day	\$792.00	\$7,920
Misc equipment	8 EA	5 Day/Yr	40 Day	\$40.00	\$1,600
					<u>\$73,620</u>

Subtotal Roads

\$96,225

5. Bridges

Inspection:

Semi-annually / 2 day

Inspectors	2 EA	40 Hr/Yr	80 Hr	\$55.00	\$4,400
Pick-up trucks	2 EA	4 Day/Yr	8 Day	\$95.00	\$760
Misc equipment	2 EA	4 Day/Yr	8 Day	\$40.00	\$320
					<u>\$5,480</u>

O&M:

Annually / 2 days

Inspectors	1 EA	20 Hr/Yr	20 Hr	\$55.00	\$1,100
Laborers	3 EA	20 Hr/Yr	60 Hr	\$65.00	\$3,900
Operators	1 EA	20 Hr/Yr	20 Hr	\$100.00	\$2,000
Materials					\$5,000
Pick-up trucks	4 EA	2 Day/Yr	8 Day	\$95.00	\$760
Crane	1 EA	2 Day/Yr	2 Day	\$1,120.00	\$2,240
Misc equipment	5 EA	2 Day/Yr	10 Day	\$40.00	\$400
					<u>\$15,400</u>

Monument surveys

Inspection (Surveys): Subcontractor

Semi-annually / 2 days

Survey Crew Chief	1 EA	40 Hr/Yr	40 Hr	\$115.00	\$4,600
Survey Technician	5 EA	40 Hr/Yr	200 Hr	\$75.00	\$15,000
Pick-up trucks	6 EA	2 Day/Yr	12 Day	\$130.00	\$1,560
Survey/GPS instruments	6 EA	2 Day/Yr	12 Day	\$125.00	\$1,500
Misc equipment	6 EA	2 Day/Yr	12 Day	\$55.00	\$660
					<u>\$23,320</u>

Subtotal Bridges \$44,200

General

General Management

Senior Inspector	Report writing/filings	1 LS	480 Hr/Yr	480 Hr	\$85.00	\$40,800
DSOD fees				1 LS	\$350,000.00	\$350,000
						<u>\$390,800</u>

Office and related Expenses

Office provided by HC Facilities						<u>\$0</u>
						\$0

Subtotal General \$390,800

Unlisted items allowance

Unlisted Items Allowance

Senior Inspector	Report writing/filings			15%	\$2,020,397	\$303,060
						<u>\$303,060</u>

Subtotal General \$303,060

Total: Years 1 - 5 \$2,323,457

Years 6 - 10

1. Dams and Abutments

Dams

Inspection:

Weekly / 1 day

Inspectors	6 EA	520 Hr/Yr	3,120 Hr	\$55.00	\$171,600
Pick-up trucks	6 EA	52 Day/Yr	312 Day	\$95.00	\$29,640
Misc equipment	6 EA	52 Day/Yr	312 Day	\$40.00	\$12,480
					<u>\$213,720</u>

O&M:

Annually / 4 days

Inspectors	2 EA	40 Hr/Yr	80 Hr	\$55.00	\$4,400
Laborers	2 EA	40 Hr/Yr	80 Hr	\$65.00	\$5,200
Operators	2 EA	40 Hr/Yr	80 Hr	\$100.00	\$8,000
Truck drivers	2 EA	40 Hr/Yr	80 Hr	\$70.00	\$5,600
Materials allowance	1 LS		1 LS	\$5,000.00	\$5,000
Pick-up trucks	4 EA	4 Day/Yr	16 Day	\$95.00	\$1,520
Dump truck	2 EA	4 Day/Yr	8 Day	\$720.00	\$5,760
Backhoe	2 EA	4 Day/Yr	8 Day	\$600.00	\$4,800
Compactor	2 EA	4 Day/Yr	8 Day	\$792.00	\$6,336
Misc equipment	8 EA	4 Day/Yr	32 Day	\$40.00	\$1,280
					<u>\$47,896</u>

Monument surveys

Inspection (Surveys): Subcontractor

Semi-annually / 2 days

Survey Crew Chief	1 EA	40 Hr/Yr	40 Hr	\$115.00	\$4,600
Survey Technician	5 EA	40 Hr/Yr	200 Hr	\$75.00	\$15,000
Pick-up trucks	6 EA	2 Day/Yr	12 Day	\$130.00	\$1,560
Survey/GPS instruments	6 EA	2 Day/Yr	12 Day	\$125.00	\$1,500
Misc equipment	6 EA	2 Day/Yr	12 Day	\$55.00	\$660
					<u>\$23,320</u>

Subtotal Dams \$284,936

Years 6 - 10

2. Reservoir Rim and Spillway

Inspection:

Quarterly/2 days

Inspectors	2 EA	80 Hr/Yr	160 Hr	\$55.00	\$8,800
ATV	2 EA	8 Day/Yr	16 Day	\$95.00	\$1,520
Misc equipment	2 EA	8 Day/Yr	16 Day	\$40.00	\$640
					<u>\$10,960</u>

O&M:

Annually / 4 days

Inspectors	2 EA	40 Hr/Yr	80 Hr	\$55.00	\$4,400
Laborers	2 EA	40 Hr/Yr	80 Hr	\$65.00	\$5,200
Operators	2 EA	40 Hr/Yr	80 Hr	\$100.00	\$8,000
Truck drivers	2 EA	40 Hr/Yr	80 Hr	\$70.00	\$5,600
Materials allowance	1 LS		1 LS	\$5,000.00	\$5,000
Pick-up trucks	4 EA	4 Day/Yr	16 Day	\$95.00	\$1,520
Dump truck	2 EA	4 Day/Yr	8 Day	\$720.00	\$5,760
Backhoe	2 EA	4 Day/Yr	8 Day	\$600.00	\$4,800
Compactor	2 EA	4 Day/Yr	8 Day	\$792.00	\$6,336
Misc equipment	8 EA	4 Day/Yr	32 Day	\$40.00	\$1,280
					<u>\$47,896</u>

Subtotal Reservoir Rim and Spillway \$58,856

3. Inlet/Outlet Works, Sites Dam Outlet and Emergency Release Structures

I/O Works

Inspection:

Monthly/2 days

Inspectors	2 EA	240 Hr/Yr	480 Hr	\$55.00	\$26,400
Pick-up trucks	2 EA	24 Day/Yr	48 Day	\$95.00	\$4,560
Misc equipment	2 EA	24 Day/Yr	48 Day	\$40.00	\$1,920
					<u>\$32,880</u>

Years 6 - 10

O&M:

Annually / 4 days

Inspectors	2 EA	40 Hr/Yr	80 Hr	\$55.00	\$4,400
Laborers	2 EA	40 Hr/Yr	80 Hr	\$65.00	\$5,200
Materials allowance	1 LS		1 LS	\$1,000.00	\$1,000
Pick-up trucks	4 EA	4 Day/Yr	16 Day	\$95.00	\$1,520
Misc equipment	4 EA	4 Day/Yr	16 Day	\$40.00	\$640
					<u>\$12,760</u>

Mechanical equipment/gates/valves (by subcontractor)

Inspection:

Annually/2 days

Inspectors	2 EA	20 Hr/Yr	40 Hr	\$75.00	\$3,000
Pick-up trucks	2 EA	2 Day/Yr	4 Day	\$130.00	\$520
Misc equipment	2 EA	2 Day/Yr	4 Day	\$55.00	\$220
					<u>\$3,740</u>

Subtotal Inlet/Outlet Works, Sites Dam Outlet and Emergency Release Structures \$49,380

4. Roads – Sites Ladoga Road Causeway, Local Roads, Main. Roads

Inspection:

Sites Ladoga Causeway: 1 day/3 months, average 4 days per year

Local Roads: 2 days/3 months, average 8 days per year

Main Roads: 2 days/6 months, average 4 days per year

TOTAL Inspection

16 Days

Inspectors	1 EA	160 Hr/Yr	160 Hr	\$55.00	\$8,800
Pick-up trucks	1 EA	16 Day/Yr	16 Day	\$95.00	\$1,520
Misc equipment	1 EA	16 Day/Yr	16 Day	\$40.00	\$640
					<u>\$10,960</u>

Years 6 - 10

O&M:

Sites Ladoga Causeway: 1 day/year
 Local Roads: 2 days/year
 Main Roads: 4 days/3 years, average 1.33 days/year
 TOTAL O&M

5 Days

Inspectors	2 EA	50 Hr/Yr	100 Hr	\$55.00	\$5,500
Laborers	2 EA	50 Hr/Yr	100 Hr	\$65.00	\$6,500
Operators	2 EA	50 Hr/Yr	100 Hr	\$100.00	\$10,000
Truck drivers	2 EA	50 Hr/Yr	100 Hr	\$70.00	\$7,000
Materials allowance	1 LS		1 LS	\$20,000.00	\$20,000
Pick-up trucks	4 EA	5 Day/Yr	20 Day	\$95.00	\$1,900
Dump truck	2 EA	5 Day/Yr	10 Day	\$720.00	\$7,200
Backhoe	2 EA	5 Day/Yr	10 Day	\$600.00	\$6,000
Compactor	2 EA	5 Day/Yr	10 Day	\$792.00	\$7,920
Misc equipment	8 EA	5 Day/Yr	40 Day	\$40.00	\$1,600
					<u>\$73,620</u>

Subtotal Roads \$84,580

5. Bridges

Inspection:

Annually / 1 day

Inspectors	2 EA	10 Hr/Yr	20 Hr	\$55.00	\$1,100
Pick-up trucks	2 EA	1 Day/Yr	2 Day	\$95.00	\$190
Misc equipment	2 EA	1 Day/Yr	2 Day	\$40.00	\$80
					<u>\$1,370</u>

O&M:

Annually / 2 days

Inspectors	1 EA	20 Hr/Yr	20 Hr	\$55.00	\$1,100
Laborers	3 EA	20 Hr/Yr	60 Hr	\$65.00	\$3,900
Operators	1 EA	20 Hr/Yr	20 Hr	\$100.00	\$2,000
Materials					\$5,000
Pick-up trucks	4 EA	2 Day/Yr	8 Day	\$95.00	\$760
Crane	1 EA	2 Day/Yr	2 Day	\$1,120.00	\$2,240
Misc equipment	5 EA	2 Day/Yr	10 Day	\$40.00	\$400
					<u>\$15,400</u>

Years 6 - 10

Monument surveys

Inspection (Surveys): Subcontractor						
Semi-annually / 2 days						
Survey Crew Chief	1 EA	40 Hr/Yr	40 Hr	\$115.00	\$4,600	
Survey Technician	5 EA	40 Hr/Yr	200 Hr	\$75.00	\$15,000	
Pick-up trucks	6 EA	2 Day/Yr	12 Day	\$130.00	\$1,560	
Survey/GPS instruments	6 EA	2 Day/Yr	12 Day	\$125.00	\$1,500	
Misc equipment	6 EA	2 Day/Yr	12 Day	\$55.00	\$660	
						<u>\$23,320</u>

Subtotal Bridges \$40,090

General

General Management						
Senior Inspector	Report writing/filings	1 LS	480 Hr/Yr	480 Hr	\$85.00	\$40,800
DSOD fees				1 LS	\$350,000.00	\$350,000
						<u>\$390,800</u>

Office and related Expenses						
Office provided by HC Facilities						<u>\$0</u>
						<u>\$0</u>

Subtotal General \$390,800

Unlisted items allowance

Unlisted Items Allowance						
Senior Inspector	Report writing/filings			15%	\$908,642	\$136,296
						<u>\$136,296</u>

Subtotal General \$136,296

Total: Years 6 - 10 **\$1,044,938**

Years 11 onwards

1. Dams and Abutments

Dams

Inspection:

Monthly / 1 day

Inspectors	6 EA	120 Hr/Yr	720 Hr	\$55.00	\$39,600
Pick-up trucks	6 EA	12 Day/Yr	72 Day	\$95.00	\$6,840
Misc equipment	6 EA	12 Day/Yr	72 Day	\$40.00	\$2,880
					<u>\$49,320</u>

O&M:

Annually / 4 days

Inspectors	2 EA	40 Hr/Yr	80 Hr	\$55.00	\$4,400
Laborers	2 EA	40 Hr/Yr	80 Hr	\$65.00	\$5,200
Operators	2 EA	40 Hr/Yr	80 Hr	\$100.00	\$8,000
Truck drivers	2 EA	40 Hr/Yr	80 Hr	\$70.00	\$5,600
Materials allowance	1 LS		1 LS	\$5,000.00	\$5,000
Pick-up trucks	4 EA	4 Day/Yr	16 Day	\$95.00	\$1,520
Dump truck	2 EA	4 Day/Yr	8 Day	\$720.00	\$5,760
Backhoe	2 EA	4 Day/Yr	8 Day	\$600.00	\$4,800
Compactor	2 EA	4 Day/Yr	8 Day	\$792.00	\$6,336
Misc equipment	8 EA	4 Day/Yr	32 Day	\$40.00	\$1,280
					<u>\$47,896</u>

Monument surveys

Inspection (Surveys): Subcontractor

Semi-annually / 2 days

Survey Crew Chief	1 EA	40 Hr/Yr	40 Hr	\$115.00	\$4,600
Survey Technician	5 EA	40 Hr/Yr	200 Hr	\$75.00	\$15,000
Pick-up trucks	6 EA	2 Day/Yr	12 Day	\$130.00	\$1,560
Survey/GPS instruments	6 EA	2 Day/Yr	12 Day	\$125.00	\$1,500
Misc equipment	6 EA	2 Day/Yr	12 Day	\$55.00	\$660
					<u>\$23,320</u>

Subtotal Dams

\$120,536

Years 11 onwards

2. Reservoir Rim and Spillway

Inspection:

Monthly/2 days

Inspectors	2 EA	240 Hr/Yr	480 Hr	\$55.00	\$26,400
ATV	2 EA	24 Day/Yr	48 Day	\$95.00	\$4,560
Misc equipment	2 EA	24 Day/Yr	48 Day	\$40.00	\$1,920
					<u>\$32,880</u>

O&M:

Annually / 4 days

Inspectors	2 EA	40 Hr/Yr	80 Hr	\$55.00	\$4,400
Laborers	2 EA	40 Hr/Yr	80 Hr	\$65.00	\$5,200
Operators	2 EA	40 Hr/Yr	80 Hr	\$100.00	\$8,000
Truck drivers	2 EA	40 Hr/Yr	80 Hr	\$70.00	\$5,600
Materials allowance	1 LS		1 LS	\$5,000.00	\$5,000
Pick-up trucks	4 EA	4 Day/Yr	16 Day	\$95.00	\$1,520
Dump truck	2 EA	4 Day/Yr	8 Day	\$720.00	\$5,760
Backhoe	2 EA	4 Day/Yr	8 Day	\$600.00	\$4,800
Compactor	2 EA	4 Day/Yr	8 Day	\$792.00	\$6,336
Misc equipment	8 EA	4 Day/Yr	32 Day	\$40.00	\$1,280
					<u>\$47,896</u>

Subtotal Reservoir Rim and Spillway

\$80,776

3. Inlet/Outlet Works, Sites Dam Outlet and Emergency Release Structures

I/O Works

Inspection:

Quarterly/2 days

Inspectors	2 EA	80 Hr/Yr	160 Hr	\$55.00	\$8,800
Pick-up trucks	2 EA	8 Day/Yr	16 Day	\$95.00	\$1,520
Misc equipment	2 EA	8 Day/Yr	16 Day	\$40.00	\$640
					<u>\$10,960</u>

Years 11 onwards

O&M:

Annually / 4 days

Inspectors	2 EA	40 Hr/Yr	80 Hr	\$55.00	\$4,400
Laborers	2 EA	40 Hr/Yr	80 Hr	\$65.00	\$5,200
Materials allowance	1 LS		1 LS	\$1,000.00	\$1,000
Pick-up trucks	4 EA	4 Day/Yr	16 Day	\$95.00	\$1,520
Misc equipment	4 EA	4 Day/Yr	16 Day	\$40.00	\$640
					<u>\$12,760</u>

Mechanical equipment/gates/valves (by subcontractor)

Inspection:

Annually/2 days

Inspectors	2 EA	20 Hr/Yr	40 Hr	\$75.00	\$3,000
Pick-up trucks	2 EA	2 Day/Yr	4 Day	\$130.00	\$520
Misc equipment	2 EA	2 Day/Yr	4 Day	\$55.00	\$220
					<u>\$3,740</u>

Subtotal Inlet/Outlet Works, Sites Dam Outlet and Emergency Release Structures \$27,460

4. Roads – Sites Lodoga Road Causeway, Local Roads, Main. Roads

Inspection:

Sites Lodoga Causeway: 1 day/3 months, average 4 days per year

Local Roads: 2 days/3 months, average 8 days per year

Main Roads: 2 days/6 months, average 4 days per year

TOTAL Inspection

16 Days

Inspectors	1 EA	160 Hr/Yr	160 Hr	\$55.00	\$8,800
Pick-up trucks	1 EA	16 Day/Yr	16 Day	\$95.00	\$1,520
Misc equipment	1 EA	16 Day/Yr	16 Day	\$40.00	\$640
					<u>\$10,960</u>

Years 11 onwards

O&M:

Sites Ladoga Causeway: 1 day/year
 Local Roads: 2 days/year
 Main Roads: 4 days/3 years, average 1.33 days/year
 TOTAL O&M

5 Days

Inspectors	2 EA	50 Hr/Yr	100 Hr	\$55.00	\$5,500
Laborers	2 EA	50 Hr/Yr	100 Hr	\$65.00	\$6,500
Operators	2 EA	50 Hr/Yr	100 Hr	\$100.00	\$10,000
Truck drivers	2 EA	50 Hr/Yr	100 Hr	\$70.00	\$7,000
Materials allowance	1 LS		1 LS	\$20,000.00	\$20,000
Pick-up trucks	4 EA	5 Day/Yr	20 Day	\$95.00	\$1,900
Dump truck	2 EA	5 Day/Yr	10 Day	\$720.00	\$7,200
Backhoe	2 EA	5 Day/Yr	10 Day	\$600.00	\$6,000
Compactor	2 EA	5 Day/Yr	10 Day	\$792.00	\$7,920
Misc equipment	8 EA	5 Day/Yr	40 Day	\$40.00	\$1,600
					\$73,620

Subtotal Roads **\$84,580**

5. Bridges

Inspection:

Annually / 1 day

Inspectors	2 EA	10 Hr/Yr	20 Hr	\$55.00	\$1,100
Pick-up trucks	2 EA	1 Day/Yr	2 Day	\$95.00	\$190
Misc equipment	2 EA	1 Day/Yr	2 Day	\$40.00	\$80
					\$1,370

Years 11 onwards

O&M:

Annually / 2 days

Inspectors	1 EA	20 Hr/Yr	20 Hr	\$55.00	\$1,100
Laborers	3 EA	20 Hr/Yr	60 Hr	\$65.00	\$3,900
Operators	1 EA	20 Hr/Yr	20 Hr	\$100.00	\$2,000
Materials					\$5,000
Pick-up trucks	4 EA	2 Day/Yr	8 Day	\$95.00	\$760
Crane	1 EA	2 Day/Yr	2 Day	\$1,120.00	\$2,240
Misc equipment	5 EA	2 Day/Yr	10 Day	\$40.00	\$400
					<u>\$15,400</u>

Monument surveys

Inspection (Surveys): Subcontractor

Semi-annually / 2 days

Survey Crew Chief	1 EA	40 Hr/Yr	40 Hr	\$115.00	\$4,600
Survey Technician	5 EA	40 Hr/Yr	200 Hr	\$75.00	\$15,000
Pick-up trucks	6 EA	2 Day/Yr	12 Day	\$130.00	\$1,560
Survey/GPS instruments	6 EA	2 Day/Yr	12 Day	\$125.00	\$1,500
Misc equipment	6 EA	2 Day/Yr	12 Day	\$55.00	\$660
					<u>\$23,320</u>

Subtotal Bridges \$40,090

General

General Management

Senior Inspector	Report writing/filings	1 LS	480 Hr/Yr	480 Hr	\$85.00	\$40,800
DSOD fees				1 LS	\$350,000.00	\$350,000
						<u>\$390,800</u>

Office and related Expenses

Office provided by HC Facilities						<u>\$0</u>
						<u>\$0</u>

Subtotal General \$390,800

Years 11 onwards

Unlisted items allowance

Unlisted Items Allowance					
Senior Inspector	Report writing/filings	15%	\$744,242	<u>\$111,636</u>	\$111,636

Subtotal General \$111,636

Total: Years 6 - 10 \$855,878

Periodic Costs

Every 3 Years

Roads: Included under Annual O&M					
Maintenance					
None					\$0
					<u>\$0</u>
Subtotal - 3 Years					<u>\$0</u>

Every 5 Years

I/O Works					
Maintenance: ROV Inspection					
Inspectors	2 EA	40 Hr	80 Hr	\$55.00	\$4,400
Laborers	2 EA	40 Hr	80 Hr	\$65.00	\$5,200
Materials allowance	1 LS		1 LS	\$1,000	\$1,000
Pick-up trucks	4 EA	4 Day/Yr	16 Day	\$95.00	\$1,520
ROV Inspection equipment	2 EA	4 Day/Yr	8 Day	\$2,400.00	\$19,200
Misc equipment	4 EA	4 Day/Yr	16 Day	\$40.00	\$640
					<u>\$31,960</u>

Roads

Periodic Resurfacing and repair					
Allowance for resurfacing, repairs					
Gravel paving	2,550,570 SF		2,550,570 SF	\$2.00	\$5,101,140
					<u>\$5,101,140</u>
Subtotal - 5 Years					<u>\$5,133,100</u>

Periodic Costs

Every 25 Years

Dams

Maintenance: Instrumentation

Inspectors	2 EA	40 Hr/Yr	80 Hr	\$55.00	\$4,400
Drill Rig operators	2 EA	40 Hr/Yr	80 Hr	\$105.00	\$8,400
Drill Rig helpers	2 EA	40 Hr/Yr	80 Hr	\$95.00	\$7,600
Laborers	2 EA	20 Hr	40 Hr	\$65.00	\$2,600
Materials allowance	1 LS		1 LS	\$25,000	\$25,000
Pick-up trucks	4 EA	4 Day/Yr	16 Day	\$95.00	\$1,520
Drill Rig	2 EA	4 Day/Yr	8 Day	\$1,440.00	\$11,520
Backhoe	2 EA	4 Day/Yr	8 Day	\$600.00	\$4,800
Dump truck	2 EA	4 Day/Yr	8 Day	\$720.00	\$5,760
Misc equipment	8 EA	4 Day/Yr	32 Day	\$40.00	\$1,280
					<u>\$72,880</u>

I/O Works: Mechanical equipment/gates/valves (by subcontractor)

Maintenance

Inspectors	1 EA	80 Hr/Yr	80 Hr	\$75.00	\$6,000
Operators	3 EA	80 Hr/Yr	240 Hr	\$135.00	\$32,400
Laborers	2 EA	80 Hr	160 Hr	\$90.00	\$14,400
Materials allowance	1 LS		1 LS	\$25,000	\$25,000
Pick-up trucks	4 EA	8 Day/Yr	32 Day	\$95.00	\$3,040
Crane	2 EA	8 Day/Yr	16 Day	\$1,120.00	\$17,920
Dump truck	2 EA	8 Day/Yr	16 Day	\$720.00	\$11,520
Misc equipment	6 EA	8 Day/Yr	48 Day	\$40.00	\$1,920
Vendor Cost for valve refurbishment	1 LS		1 LS	\$10,000,000	\$10,000,000
					<u>\$10,112,200</u>

Roads

Periodic Resurfacing and repair

Allowance for resurfacing, repairs

AC paving	4,800,211 SF		4,800,211 SF	\$5.00	\$24,001,055
					<u>\$24,001,055</u>

Subtotal - 25 Years					<u><u>\$34,186,135</u></u>
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Cost Data

Labor

Senior Inspector	\$85.00 per hr	Agency Employee	Based on \$125,000 per year, plus 45% Burden(PRTI/Benefits)
Inspectors	\$55.00 per hr	Agency Employee	Based on \$80,000 per year, plus 45% Burden(PRTI/Benefits)
Laborers	\$65.00 per hr	Agency Employee	Based on \$32 (Prev Wage) plus 110% Fringe & Burden
Operators	\$100.00 per hr	Agency Employee	Based on \$52 (Prev Wage) plus 90% Fringe & Burden
Drill Rig operators	\$105.00 per hr	Agency Employee	Based on \$55 (Prev Wage) plus 90% Fringe & Burden
Drill Rig helpers	\$95.00 per hr	Agency Employee	Based on \$50 (Prev Wage) plus 90% Fringe & Burden
Truck drivers	\$70.00 per hr	Agency Employee	Based on \$33 (Prev Wage) plus 115% Fringe & Burden
Survey Crew Chief	\$85.00 per hr	Agency Employee	Based on \$125,000 per year, plus 45% Burden(PRTI/Benefits)
Survey Technician	\$55.00 per hr	Agency Employee	Based on \$80,000 per year, plus 45% Burden(PRTI/Benefits)

Equipment

Pick-up trucks	\$95.00 per day	Agency Owned	Based on \$45k per truck, per 3 years, plus annual \$2k maint, \$2k ins, \$8k fuel = \$25k/yr
ATV	\$95.00 per day	Agency Owned	Based on \$30k per ATV, per 2 years, plus annual \$2k maint, \$2k ins, \$8k fuel = \$25k/yr
ROV Inspection eq	\$2,400.00 per day	Agency Owned	Allow \$2400 per day
Dump truck	\$720.00 per day	Agency Owned	Based on caltrans ownership rates, \$90/hr
Backhoe	\$600.00 per day	Agency Owned	Based on caltrans ownership rates, \$75/hr
Compactor	\$792.00 per day	Agency Owned	Based on caltrans ownership rates, \$99/hr
Misc equipment	\$40.00 per day	Agency Owned	Allow \$5 per hour
Crane	\$1,120.00 per day	Agency Owned	Based on caltrans ownership rates, \$140/hr
Drill Rig	\$1,440.00 per day	Agency Owned	Based on caltrans ownership rates, \$180/hr

Sub Costs

1.35

Direct cost above + 35% mark-up

