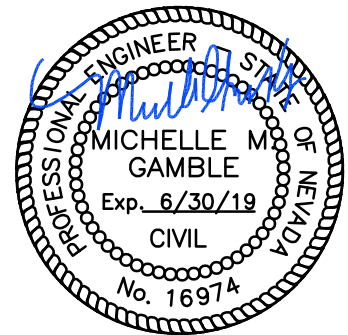


Marlette Lake Dam Resilient Infrastructure Project

BCA 10 –After Mitigation Estimation of Loss of Water Days

The purpose of the mitigation project is to structurally retrofit the Marlette Dam to protect it from failure during a seismic event. Upon completion of the proposed mitigation efforts, the potential for a dam failure will be reduced. If a seismic event occurs, the response activities outlined in the Emergency Action Plan will be implemented. Due to potential weather and access considerations, it is assumed that all pumping activities may be required to be stopped while an assessment of the facility is completed. For the BCA, it is assumed this happens during a period of pumping and that an assessment could be completed within one week. Attached are pages from the EAP that describes the response activities.

Although there should be no impact to SR 28, to be conservative, this BCA assumes that SR 28 is closed to traffic during the time period in which the structural assessment of the dam is conducted after a large seismic event.



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is popular with beach goers and fishermen.

Analyses of calculated probable maximum precipitation and clear day dam break models indicate that the expected run off will not top the dam. Refer to Report B - Probable Maximum Flood Analysis and Emergency Action Plan Marlette Lake Washoe County, Nevada, AMEC Infrastructure, Donald L. Damotte, P.E. Feb. 8, 2002. A dam failure due to other than overtopping does present a potential for substantial damage downstream due to the steep terrain and resulting high flow velocities. A large earthquake in the area would be the most likely cause of such a dam failure.

Section V. EAP Response Process

Step 1: Incident Detection, Evaluation and Emergency Level Determination

There is a pump station located on the north-east shore approximately 3,500 feet from the dam. Pumping operations typically occur during summer peaking, usually early July to mid-October. The dam is visible from the flume trail and the hiking path on the west shore of Marlette Lake. The dam and lake are currently unattended. A USGS level monitoring station exists on the west shore approximately 1,000 feet south of the dam. The USGS gage currently records lake level every 15 minutes and the data is displayed on their website at

http://waterwatch.usgs.gov/index.php?id=real&sid=w_table_flow&r=nv

The USGS site number for these readings is 10336710.

Incident detection is included as part of the standard operating procedures that include:

- A. The condition of the dam, spillway, outlet valves, and log boom are evaluated by Marlette Water System Operations personnel once snow has melted enough to obtain access to the dam. Spillway flow depth is measured and logged. Debris and any obstructions of the flow are removed from the channel to allow free flow past the dam.

- B. The general condition of the dam and related features are observed whenever Marlette Water System and/or Buildings and Grounds personnel are at the dam site. Depth of flow in the spillway is measured and logged. The outlet valves are to be exercised at least once every summer and logged. The outlet valves are opened and regulated to prevent the out flow depth in the spillway from exceeding 12 inches in depth.
- C. Unusual, conditions and problems with the dam that are observed by or reported to the State Park Rangers, Forestry Personnel, State Wildlife Personnel, Marlette Water System Operators, or Buildings and Grounds by members of general public using the area are investigated by Marlette Water System operators on a priority basis.

In the event of a strong earthquake within the vicinity, inspection of the condition of the dam's structure within one hour will be a high priority of the available Marlette Water System and Buildings and Grounds operators. The method of transportation to the dam will be selected based on seismic severity and weather conditions. Snowmobiles or a helicopter may be necessary to access the dam site. The condition of the dam will be observed and logged. Visible cracks, slides, leaks, wave damage, or topping by water are cause to start the emergency notification process. It is **critical that the dam levels be closely monitored** during these circumstances. The water level or condition of the ice in the lake will be observed and anything unusual noted. The condition of snow and rocks on the north side of the dam will be evaluated for possible avalanche and rock slides into the lake or spillway. The condition and flow in the spillway will be measured, if accessible.

In the event of overtopping or uncontrolled flows, there will be a good potential for flooding and high amounts of debris at the State Route 28 crossing. Road undermining and road washouts can occur. With these events, there is also the potential for an existing 16-inch effluent pipeline located 42-inches below the roadway shoulder (western-most shoulder) to be exposed. Uncontrolled flows and the force of waters on this exposed pipeline can cause pipe failure and effluent flows into Lake Tahoe. The

16-inch pipeline is owned and maintained by Incline Village General Improvement District (IVGID). This pipe carries treated effluent from Incline Village's wastewater treatment plant and is gravity-fed southerly along SR 28. At approximately 1,500 feet south of Sand Harbor, a pump station is needed to pump the effluent southerly, then the pipe heads easterly on Route 50 where the effluent is used for irrigating golf and ranch properties, and finally dumps into the evergreen wetlands off of Vicki Lane in southeast Carson City.

In the event of imminent failure, it is highly advised that IVGID be contacted so that the effluent pumps located south of Sand Harbor can be shut off and emergency spill mitigation can be initiated.

In the event of specifically observed events, as shown in Appendix A, the emergency level will need to be determined and classified as follows:

Classification of Emergency

Emergencies at Marlette Dam fall into two Classifications:

- A. **POTENTIAL FAILURE** - requires a change in operation of the dam, as well as notification to appropriate entities and mitigation measures to prevent escalation of the emergency. Thresholds warranted for potential failure are rising flow depths at the spillway, embankment overtopping, cracking or movement, noticeable seepage, noticeable sinkholes, flooding and/or the undermining of SR 28, noticeable damage due to an earthquake event, threats to security and sabotage or vandalism occurring in noticeable seepage and flows.

- B. **IMMINENT FAILURE** - requires notification of downstream property owners and appropriate entities to protect adjacent properties and lives. Thresholds warranted for imminent failure are flow depths at or greater than 24-inches in depth at the spillway, water levels near or at the top of the dam, uncontrolled flows or seepage, rapidly enlarging sinkholes, severe road undermining and erosion, effluent pipe breaks, earthquake events which result in uncontrolled release of waters, security,

sabotage or vandalism events which impact the function of the dam allowing uncontrolled release of water.

Refer to Appendix A, the Marlette Lake Dam Emergency Level Descriptions. The chart identifies and classifies specific events, and the levels of failure associated with each noticeable event. Notification Flowcharts (Figures C-1 (Imminent) and C-2 (Potential)) will accompany the Marlette Lake Dam Emergency Level Descriptions (Appendix A).

Each flowchart identifies the personnel and entities to contact in the events of imminent or potential failure.

Once the level of emergency has been determined, emergency actions must be followed as described below:

Step 2: Notification and Communication

1. Washoe County Dispatch is responsible for initiating the Notification Flowcharts (Figures C-1 and C-2) based on information received and urgency communicated with the report of an emergency condition and for the security at the dam during the emergency;
2. The Washoe County Emergency Management Coordinator is responsible for contacting all primary local authorities to instigate safety measures. It is Washoe County's Emergency Management Coordinator's responsibility to contact and coordinate all emergency notification tiers on the Notification Flow Charts (Figures C-1 and C-2);
3. The Washoe County Sheriff (Incline Substation) should contact all downstream residents regarding the emergency. The Sheriff will route alerting to advise residents living within their jurisdiction of the alerts. The Sheriff will assist evacuation/traffic flow and establish traffic control points at pre-designated locations and prevent unauthorized entry into emergency areas;
4. The Washoe County Sheriff is responsible to call on resources it deems necessary as initial call to response to possible inundation of State Route 28 and the area to the west of the road to Lake Tahoe;

5. The Nevada Highway Patrol is responsible for calling up resources it deems necessary for traffic control on State Route 28 and the decision where and when to block the road if necessary;
6. The Nevada Department of Transportation is responsible for assisting the Washoe and Carson Sheriffs and control and calling for any protective actions or repairs to SR 28 as result of the dam emergency;
7. In the event of an imminent emergency to the effluent pipeline in SR 28, Washoe County Dispatch will contact the Incline Village GID's Emergency and Safety Manager to ensure the shut-down of its effluent pumps;
8. Nevada State Parks Division is responsible for posting and/or closing access to the recreation areas adjacent to the dam and Marlette Creek area and Marlette Lake and notifying concessionaires in the area during the emergency;
9. The United States Forest Service is responsible for posting and/or closing access to the Marlette Creek Area to the shore of Lake Tahoe west of SR 28;
10. Washoe County Emergency Management will communicate with the Nevada Department of Emergency Management (DEM). The DEM is responsible for notifying appropriate federal and state recovery agencies. DEM will make all relevant notifications to appropriate state and federal authorities. DEM will locate and coordinate the movement of emergency requested resources, assist with the declaration process, if necessary, and activate State Emergency Operations, if necessary;
11. The National Weather Service (NWS) is responsible for weather and storm alerts which can affect the dam. The NWS will issue warnings for public safety and to trigger agency response. The NWS will work with the Nevada and California River Forecast Center to develop inundation information.

Downstream Property Owners

Properties which could be impacted in the event of a dam break are located on the George Whittel Estate Property (owned by the United States of America) parcel APN-130-360-17. This property is located directly downstream of the Marlette Lake Dam spillway. There are five structures built on this property ranging from 580 to 8,912

square feet. All the structures were built in 1934. A few of the structures were renovated in 1971.

It is critical that the people staying in these structures be notified under the events of either potential or imminent emergency. Washoe County's 911 Dispatch will contact Washoe County's Sheriff/Police Incline Substation to evacuate the premises.

Emergency Evacuation

The Washoe County Sheriff and Police are responsible for warning and evacuation planning. The Dam Owner, or an Observer, is responsible for notifying Washoe County Emergency Dispatch/Management if a failure is impending or has already occurred. The Dam Owner is responsible for updating Washoe County Emergency Management on a continual basis when flooding is anticipated.

1. Washoe County 911 Dispatch is responsible for contacting local authorities for action;
2. The Washoe County Sheriff and Police are responsible for evacuation of the area from the dam to the east shore of Lake Tahoe;
3. The State Parks Division is responsible for the evacuation of the back country areas along the Flume Trail and Trails into Marlette Lake;
4. The Nevada Highway Patrol is responsible for evacuating and blocking State Route 28.

Step 3: Emergency Actions

Mitigation Measures

Appendix A, the Marlette Lake Dam Emergency Level Chart, identifies "Actions to be Taken" for both potential and imminent failure mitigation measures which include clearing the spillway of debris. In either the potential or imminent failure events, notifying specific personnel and local authorities is a must.

In addition, specific problems should be mitigated and addressed as follows:

Failure of Appurtenant Structures such as Spillways or Outlets

- In almost all events, the spillway must be inspected to determine if the spillway is damaged or blocked. If the spillway cannot be cleaned, pumping, siphoning or a controlled breach may be required, depending upon the event.
- Implement temporary measures to protect the damaged structure, such as closing a spillway or providing temporary protection for the damaged spillway.
- Employ experienced professional divers if necessary to assess the problem and possibly implement repair.
- Lower the water level to a safe elevation. If the spillway is inoperable, pumping, siphoning or controlled breach may be required.

Embankment Cracking, Movement and Erosion

- Place additional rip rap or sandbags in damaged areas to prevent further embankment erosion.
- Lower the water level, if possible, to an elevation below the damaged area.
- Restore freeboard with sandbags or earth and rock fill. Continue close inspection of the damaged area until permanent repairs can be made.

Excessive Settlement of the Embankment

- Lower the water level by releasing it through the spillway or by pumping, siphoning or a controlled breach.
- If necessary, restore freeboard, preferably by placing sandbags.
- Lower water to a safe level.
- Continue operating at a reduced level until repairs can be made.

Excessive Seepage and High Level Saturation of the Embankment

- Lower the water level, if at all possible, to a safe level.
- Continue frequent monitoring for signs of slides, cracking or concentrated seepage.
- Continue operation at a reduced level until repairs can be made.

Slides on the Upstream or Downstream Slope of the Embankment

- Lower the water level, if at all possible, at a rate and to an elevation considered safe given the situation.
- If the spillway is damaged or blocked, pumping, siphoning or a controlled breach may be required.
- Stabilize slides on the downstream slope by weighing the toe area with additional soil, rock or gravel.

Erosional Flows through the Embankment

- Plug the reservoir side of the flow with materials which are available (hay bales, bentonite or plastic sheeting if the entrance to the leak is in the reservoir basin).
- Lower the water level until the flow decreases to a non-erosive velocity or until it stops.
- Place a protective sand and gravel filter over the exit area to hold materials in place.
- Continue lowering the water level until a safe elevation is reached.
- Continue operating at a reduced level until repairs can be made.

Additional Mitigation Measures which can be Implemented as Future Capital Improvement Projects

Seismic Monitoring:

Seismic-type monitors placed on, and either side of, the dam sense movement in the dam and its abutments. Telemetry installed to transmit data from the sensors to monitoring units located in the offices of the State of Nevada Buildings and Grounds. Monitoring equipment should be set up to signal an alarm if movements greater than a preset amount are indicated. The alarm should be set up to automatically notify the proper emergency authorities if such an event appears imminent, or has occurred. Additional uses could be designed to activate warning lights and barricade arms across Highway 28.

Step 4: Responsibility for Duration, Termination, Security and Follow-Up

1. The Owner is responsible for the evaluation of the situation at Marlette Dam.
2. The Owner will coordinate with emergency management authorities and inform authorities that the condition of the dam has been stabilized.
3. The Owner is responsible for providing necessary information on the conditions at the dam to other agencies involved as needed to restore operations of the highway and trails.
4. The Owner is responsible for arranging to provide security at the dam site during and after the emergency.
5. The Owner will work with Washoe County Emergency Management, Washoe County Sheriff's Incline Substation, the North Lake Tahoe Fire Protection District and the Division of Emergency Management in declaring an end to the emergency.
6. Washoe County Emergency Management will provide for a post-incident debriefing.
7. The Owner is responsible for submitting follow up documentation as required by Washoe County Emergency Management, Department of Emergency Management, Division of Risk Management, the Federal Emergency Management (FEMA), and others to abate any damages and secure repair and restoration funding following the emergency.

Termination of EAP Operations

Upon completion of all EAP activities and conclusion to the emergency situation, the EAP operations must be terminated and follow-up procedures completed; including evaluating whether structures that may be re-occupied and completing a Dam Emergency Situation Report. Note that EAP actions cannot be terminated if still classified as either a potential or an imminent emergency situation. The situation must be downgraded to a non-failure emergency condition.

Prior to the termination of an event that has not resulted in failure, a detailed inspection of the

dam must be conducted. It must be determined whether the potential exists for loss of life, injury or property damage. If State Buildings and Grounds, with DWR concurrence, determines that no threat exists, the Owner will notify the Sheriff's office and will terminate the EAP.

A Dam Safety Emergency Situation Report shall be completed by the Owner to record the event type and all actions taken. This report shall be provided to both the DWR Dam Safety Section and the Sheriff's office.

The Dam Owner will terminate 24-hour surveillance of the dam site when either heavy rains have ended and/or the water level in the lake is no longer rising significantly, or after personal inspection and authorization by the Dam Owner or from the Division of Water Resources Engineer.