Anderson Dam Seismic Retrofit Project Update

Public Meeting – City of Morgan Hill | March 22, 2017
Santa Clara Valley Water District serves...

- **2 million** people
- **15 cities**
- **4,700** well owners
- **13** water retailers
Water Supply from Imported Sources and Local Reservoirs Intricately Connected in County

- **10 reservoirs**
- **3 pump stations**
- **142 miles of pipelines**
- **3 water treatment plants**
- **1 advanced purification plant**
- **393 acres of recharge ponds**
- **275 miles of jurisdictional streams**
Anderson Dam: Key to County Water Supply

Anderson: 90,000 Acre-Feet

Total Countywide Storage: 169,000 Acre-Feet

Guadalupe

Lexington

Chesbro

Almaden

Coyote

Calero

Stevens Creek

Uvas

Vasona
Map of Gauge Locations in Coyote Watershed

Coyote Creek Streamflow Gauge
Anderson Dam Storage Gauge
Anderson Reservoir
Coyote Reservoir Rainfall Gauge
Coyote Reservoir

Santa Clara Valley Water District
Coyote Reservoir Precipitation Gauge (ALERT gauge 6021)

Rainfall (inches)

Date

11/1/16

11/3/16

11/5/16

11/7/16

11/9/16

11/11/16

11/13/16

11/15/16

11/17/16

11/19/16

11/21/16

11/23/16

11/25/16

11/27/16

11/29/16

12/1/16

12/3/16

12/5/16

12/7/16

12/9/16

12/11/16

12/13/16

12/15/16

12/17/16

12/19/16

12/21/16

12/23/16

12/25/16

12/27/16

12/29/16

12/31/16

Rainfall (inches)
Anderson Reservoir Storage: Nov. 1 – Dec. 30, 2016

Note: Anderson Reservoir Actual Storage Level is **solid blue line**
Coyote Creek Flows: November 1 – December 30, 2016

Coyote Creek at Madrone Streamflow Gauge (ALERT gauge 5082)

Anderson Reservoir outlet release to Coyote Creek: 40 cfs – 50 cfs
Coyote Reservoir Precipitation Gauge (ALERT gauge 6021)

Rainfall

Andersson Reservoir Storage (ALERT gauge 1480)

Reservoir Capacity (625.0 ft elev. / 91,373 af)

Interim DSOD Restriction (599.5 ft elev. / 61,810 af)

Anderson Dam Storage Levels (blue line)

Coyote Creek Flows Downstream of Anderson Dam

Santa Clara Valley Water District
Coyote Reservoir Rainfall: January 1 – February 28, 2017

Coyote Reservoir Precipitation Gauge (ALERT gauge 6021)

Preliminary – subject to revision
Anderson Reservoir Storage: Jan. 1 – Feb. 28, 2017

Note: Anderson Reservoir Actual Storage Level is solid blue line

Anderson Reservoir Storage (ALERT gauge 1480)

- Reservoir Capacity (625.0 ft elev. / 91,373 af)
- Interim DSOD Restriction (599.5 ft elev. / 61,810 af)
- Emergency Storage (20,000 af)

Preliminary – subject to revision
Coyote Creek Flows: January 1 – February 28, 2017

Preliminary – subject to revision

Anderson Reservoir spillway flows peak at above 7,000 cfs
Anderson Reservoir outlet is closed on 2/20 as spillway flows exceed 2,000 cfs
Anderson Reservoir outlet reopened on 2/24
Anderson Reservoir stops spilling on 2/28

Anderson Reservoir outlet opened 100% on 1/9 (~425 cfs)
Anderson Reservoir begins to spill on 2/18

Coyote Creek at Madrone Streamflow Gauge (ALERT gauge 5082)
Jan 1 to Feb 28, 2017

Rainfall

Coyote Reservoir Precipitation Gauge (ALERT gauge 6021)

Anderson Reservoir Storage (ALERT gauge 1480)

Reservoir Capacity (625.0 ft elev. / 91,373 af)
Interim DSOD Restriction (599.5 ft elev. / 61,810 af)
Emergency Storage (20,000 af)

Coyote Creek at Madrone Streamflow Gauge (ALERT gauge 5082)
**Anderson Dam Operations – Spring 2017**

Estimate of timelines to draw down Anderson Reservoir to restricted level (presented to Morgan Hill City Council on March 15, 2017):

<table>
<thead>
<tr>
<th>Weather Outlook</th>
<th>Approx. No. of days Anderson storage is projected to remain above DSOD restriction</th>
<th>Approximate date storage falls below DSOD restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetter Spring</td>
<td>55 - 65</td>
<td>Early May 2017</td>
</tr>
<tr>
<td>Average Spring</td>
<td>35 – 45</td>
<td>Mid-April 2017</td>
</tr>
<tr>
<td>Drier Spring</td>
<td>30 – 40</td>
<td>Early April 2017</td>
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Summary

• Water District fully opened Anderson outlet valve on January 9, 2017.
• Water District continued releasing maximum discharge from Anderson Reservoir until February 20, 2017.
• Outlet valve was fully re-opened on February 24.
• As of March 15th, Anderson Reservoir is 90% full. It may take an estimated 30 – 65 days to return to restricted level.
Meeting Purpose

► Objectives
  ► Provide the latest information on the seismic findings and a modified project approach, an update on project status and schedule, and topics related to dam safety performance
  ► Address community questions and concerns
  ► Reinforce our commitment to public safety and keeping the community informed as the project progresses

► Questions & Answers
► Informational Booths
Background and Project Overview

Anderson Dam Existing Configuration

Spillway  Outlet pipe  Dam embankment  Crest of dam

Santa Clara Valley Water District
Seismic Activity in the Vicinity of Anderson Dam

Seismic environment

- 1911 Calaveras (6.5)
- 1984 Morgan Hill (6.1)
- 1979 Coyote Lake (5.7)
- 1989 Loma Prieta (6.9)

LEGENDS:
- Historical earthquake epicenters
- Water district dams and reservoirs
Anderson Dam Historical Earthquake Impacts

Embankments - Minor longitudinal cracking on dam crest

1984 Morgan Hill Earthquake magnitude 6.1

1989 Loma Prieta Earthquake magnitude 6.9
Problem Definition

- **Magnitude 7.2 Earthquake on the Calaveras Fault or M6.6 on the Coyote Creek Fault**
  - Embankment slumps up to 25 feet due to liquefaction of lower fine fill and alluvium
  - Outlet conduit buckles up to 4 feet due to fault rupture on the Range Front Fault

- **Changes in Regulatory Requirements (DSOD and FERC)**
  - Outlet works does not meet current emergency drawdown criteria
  - Spillway undersized for Probable Maximum Flood
Existing Embankment Cross-section

Lower finer fill and alluvium predicted to liquefy during the maximum credible earthquake

Cross Section Not to Scale
Initial Project: Address Liquefaction

- 10 feet high cofferdam (drained reservoir)
- Upstream embankment buttress
- Downstream embankment buttress
- Existing outlet pipe
Original Project: Liquefaction, New Intake and Outlets, Spillway / Crest Modifications

- New sloping intake
- New High Level Outlet conduit
- 10 feet high cofferdam (drained reservoir)
- Upstream embankment buttress
- Downstream embankment buttress
- New lower level conduit in tunnel
- Abandon existing outlet pipe
- Spillway modifications
New Findings

Shown: Mapped traces of Coyote Creek Fault

[Diagrams showing mapped traces and zones]
**Key Findings**

- Downstream transition zone not functional
- Impermeable core of the dam may crack
- Seepage (piping) may occur
2016 Modified Project

- More Extensive Embankment Retrofit and Additional Elements
  - Retrofitted embankment similar footprint to existing dam.
  - Remove all liquefiable material (compared to previous buttress approach)

- Other project elements remain unchanged
  - New high level and low level outlet
  - Spillway wall raise
  - Temporary cofferdam
  - New sloping intake
  - Crest raise for additional freeboard
2016 Modified Project Footprint

Existing dam footprint

Remnant dam clay core to remain

Post Project dam footprint

Existing dam clay core
2016 Modified Project Construction Sequence

Year 1: Dewatering, Outlet Tunnel Construction

Dry Season*: Lower Dam to Interim Height (El 570 ft)

Year 2: Lower Dam to Interim Height (El 570 ft)

Interim EL (570 ft) Winter 1

Interim EL (570 ft) Winter 2

Dry Season Year 3: Lower Dam to remnant core; re-build to Interim Height (El 570 ft)

Dry Season Year 4: Build Dam to Full Elevation (El 656 ft)

Winter Year 4: Reservoir begins to re-fill

Full Height Over Winter (El 647 ft)

Complete Construction (El 656 ft)

* Dry Season = April to October
Project Cost:

- Modified Project Cost ~ $400M

Project Schedule:

We are here


NEPA / CEQA / Permitting

Design

Construction 2020→2024
Next Steps and Public Meetings

- 30% Design – June 2017
- 60% Design – December 2017
  - Public meeting in early 2018
- Draft Environmental Impact Report (EIR) for Public Review – Summer 2018
  - A public meeting for Draft EIR in late summer 2018
- 90% Design – September 2018
  - Pre-construction meetings in 2019-2020
- Start of Construction - 2020
http://www.valleywater.org/Services/AndersonDamAndReservoir.aspx

- Sign up to receive project updates via email.
- View project reports, maps, history and other information.
- Coming later in 2017: project blog

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Special Status Plants

- Coyote Ceanothus
- Tiburon Paintbrush
- Mt. Hamilton Thistle
- S. Clara Valley Dudleya
- Smooth Lessingia
- Metcalf Canyon Jewel-flower
Special Status Animals

California Red-Legged Frog

Dusky Footed Woodrat

Western Pond Turtle

California Tiger Salamander
Anderson Geotechnical Investigations