Annual Surveillance Report January 2024 to December 2024 for Sand Canyon Dam

DSOD Dam No. 1029-002

Irvine, California

Submitted to:
Irvine Ranch Water District
Dams & Storage
15600 Sand Canyon Avenue
Irvine, CA 92618

Prepared by:
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May 19, 2025
GEI Project No. 2305575

GEI Consultants

Consulting Engineers and Scientists

May 19, 2025
GEI Project No. 2305575

Mr. Jacob Moeder,
Assistant Engineer – Dams & Storage
Irvine Ranch Water District
15600 Sand Canyon Avenue
Irvine, CA 92618

Re: Sand Canyon Dam, DSOD Dam No. 1029-002,
Annual Surveillance Report from January 2024 to December 2024

Dear Mr. Moeder:

GEI Consultants, Inc. (GEI) is pleased to submit this Annual Surveillance Report for Sand Canyon Dam covering January 2024 to December 2024. This report is part of the scope of work described under our Professional Service Agreement between Irvine Ranch Water District (District) and GEI Consultants Inc. (GEI) dated October 25, 2023.

We appreciate this opportunity to provide the District with our services. Please contact Emerson Revolorio at erevolorio@geiconsultants.com or Rich Sanchez at rsanchez@geiconsultants.com with any questions.

Sincerely,

GEI CONSULTANTS, INC.

Richard Sanchez, P.E.
Principal Engineer

Emerson Revolorio, P.E.
Project Engineer

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Acronyms and Abbreviations

AC	asphalt concrete
AF	acre-feet
CCTV	closed-circuit television
CML&C	cement-mortar-lined and coated
CMP	corrugated Metal Pipe
District	Irvine Ranch Water District
DSOD	State of California, Department of Water Resources, Division of Safety of Dams
D/S	Downstream
El, EL, Elev	elevation
ft	feet
GEI	GEI Consultants, Inc.
gpm	gallons per minute
gal/min	gallons per minute
H:V	Horizontal to Vertical
ID	identification
in.	inches
liter/min	liters per min
mm	Millimeter
MW	monitoring well
NAVD 88	North American Vertical Datum of 1988
NGVD 29	National Geodetic Vertical Datum of 1929
No.	number
NOAA	National Oceanic and Atmospheric Administration
P.E.	Professional Engineer
P or Piez	piezometer
RCP	reinforced concrete pipe
RIDM	Risk Informed Decision Making

Res.	Reservoir
U/S	Upstream
VW, VWP, VB	vibrating wire piezometer
W.S.	water surface
YR	year

1.0 Introduction and Background

1.1 General

This report presents the results of the dam safety monitoring and surveillance for Sand Canyon Dam conducted by the Irvine Ranch Water District (District) and GEI Consultants, Inc. (GEI) covering the period between January 2024 through December 2024. It includes a review of previous surveillance reports, a compilation of the field measurements, maintenance reports, observations, and conclusions related to the general condition and safety of the dam. In addition, recommendations are provided for continued operation, surveillance, and monitoring of the dam. This report is submitted as part of the jurisdictional requirements of the State of California, Department of Water Resources, Division of Safety of Dams (DSOD).

Piezometer water levels, reservoir water surface elevations, and seepage flow rates covered in Table 5 are from 2007 to 2024 with representative plots in Figures 4 through 15. Tables 6 through 9 provide annual and cumulative horizontal and vertical movement based on survey data collected at Sand Canyon Dam. Annual (short term) and cumulative (long term) representations of the data help to identify any adverse trends or significant deviations in the data. Survey data tables and figures are presented to show the results of horizontal and vertical movement surveys from 1995 through 2024. Survey data tables also include limited data for years between 1968 and 1995. No surveys were conducted in calendar years 2017 and 2021. A survey was performed in June 2024 and included in this report.

The vertical datum indicated on the as-built plans and project documents for Sand Canyon Dam is National Geodetic Vertical Datum of 1929 (NGVD 29). The reservoir water surface elevation, piezometer instrumentation data and vertical survey data are currently based on NGVD 29.

In July 2023, IRWD developed a Dam Safety Program (IRWD, 2023) that includes principles and guidelines for Risk Informed Decision Making (RIDM) for its portfolio of dams. This report has been updated to follow the guidelines in the Dam Safety Program.

1.2 Dam and Reservoir

Sand Canyon Dam is a 59-foot-high compacted embankment dam located on Sand Canyon Wash in Irvine, California. The dam was completed in 1943. The District took over operation of the Sand Canyon Dam and Reservoir in 1967 from The Irvine Company.

The dam crest is at Elevation 202 ft (NGVD 29). There is a one-foot-high concrete parapet wall (Top of Wall at Elevation 203 ft) along the upstream edge of the crest of the dam (Figures 1 through 3). The watershed drainage area is 6.8 square miles, and the spillway crest is at Elevation 193.5 ft, providing 8.5 ft of freeboard. The reservoir area is 51 acres and

the reservoir capacity at the spillway crest elevation is 960 acre-feet upon original construction. The maximum capacity has been reduced from 960 acre-feet to 740 acre-feet due to sedimentation in the reservoir (Draft Data Summary Report, Sand Canyon Dam, HDR 2021). The dam is 861 ft long with a 10-foot-wide crest. The crest is paved with Asphalt Concrete (AC).

The upstream face of the dam is lined with 3-inch-thick AC extending approximately 19 ft down from the crest of the dam and has a slope of 2.5H:1V. The downstream face of the dam is covered with grass and has a slope of 2H:1V.

The dam is a zoned embankment with an upstream shell zone consisting of "selected impervious" material, a central core zone of "random" material, and a downstream shell zone of "unselected pervious" material. During construction of the dam, test results indicated that the embankment is homogeneous and consists, for the most part, of medium dense sandy clay and clayey sand (DSOD, 1984). The dam was founded on alluvium across the original broad stream channel, and on sandstone of the Santiago Formation at the abutments. A cutoff trench was constructed under portions of the upstream and central zones of embankment material (see Figure 2). The trench typically penetrates 2 to 4 ft into the sandstone bedrock but does not extend across the full width of the broad alluvial channel.

1.3 Spillway

The spillway is located about 250 ft to the East from the right end of the dam. There is a rock knob that separates the dam and the spillway. The spillway consists of an approach section, an ungated concrete ogee weir, and a rectangular channel. The channel has 18-foot-high reinforced concrete retaining walls on both sides. The bottom of the channel is mostly unlined and consists of sandstone bedrock with filled-in areas of dental concrete. The channel conveys the water to an energy dissipation reinforced concrete structure that outlets to Sand Canyon Wash. The spillway crest is at Elevation 193.5 ft, which provides 8.5 ft of freeboard.

1.4 Outlet Works

The outlet works consist of a 36-inch-diameter corrugated metal pipe (CMP) with pipe water flow controlled by four upstream and three downstream gates. The upstream controls consist of three 24-inch-diameter inlet slide gates at Elevations 169.9, 177.1, and 185.0 ft, and one 20-inch-diameter main gate located near the upstream toe. The inlet gates are manually operated from the hand wheel controls located at the upstream edge of the crest of the dam.

The 36-inch CMP connects to a 20-inch steel outlet pipe under the dam, 260 ft in length and transitions to a 24-inch-diameter distribution line near the downstream toe of the dam. The 24-inch-diameter distribution line splits into a 24-inch-diameter and 20-inch-diameter

emergency outlet pipe, and a 12-inch-diameter main outlet pipe. At approximately 330 ft downstream of the toe of the dam, there are 3 emergency valves that control flow into Sand Canyon Wash (Figure 1). IRWD updated their non-potable system details during the review period and provided updated pipe layouts and valve sizes related to outlet flow from the dam. The updated details are provided in the appendix and have been incorporated in Figure 1. Based on the updated details, the emergency valve sizes are 24-inch-diameter (Valve 7 and 19) and 20-inch-diameter (Valve 20). Water is released through a 24-inch-diameter outfall located in the creek. A vault box was installed in 2023 near the emergency valves.

The District provided a Dam Outlet Valve Exercising Log which states that the valves were exercised between November 12 to December 3, 2024, and December 16 to 31, 2024. During our annual inspection, the District stated that the stem of gate valve #2 (Figure 1) was damaged during the 2023 exercise and still requires repair. The valve exercise table is provided in the Appendix of this report.

1.5 Subdrains

There was no internal drainage system installed within the embankment during the construction of the dam. However, two seepage subdrains referred to as the Left Subdrain and Right Subdrain, were installed at the downstream toe near the left groin (Figure 1). The Left Subdrain consists of a 6-inch pipe with two 4-inch branches, while the Right Subdrain is a 6-inch pipe extending approximately 100 ft parallel to the toe (DSOD, 1984). The two subdrains discharge into a Drain Junction Vault located at the downstream toe of the dam near the left abutment. The flow from the two subdrains is measured at a small Drain Junction Vault by the District staff monthly.

As part of the District's 2-year maintenance program, a condition assessment of the Left, Right, and Vault subdrains was performed by V&A Consulting Engineers, Inc. (V&A) on June 4, 2024. The two subdrain pipes are 6 inches in diameter and are made of PVC material. A push camera with a maximum length of 200 ft was advanced through the subdrains to record CCTV (closed-circuit television) footage. V&A encountered a root ball in the Left subdrain at approximately 83 ft. V&A encountered debris and three bends in the Right pipe. The push camera was not able to travel further than 59 ft due to a 90-degree bend. V&A also reported that the Right subdrain pipe changed from PVC to metal at 56 ft and noticed perforation holes in the pipe at 59 feet. V&A reported that the Vault subdrain had rocks accumulating on the bottom of the pipe at approximately 53 ft. V&A concluded by saying the subdrains are in good condition. V&A recommended using a Vactor truck to remove any debris and root balls and to continue performing CCTV inspections every 2 years to maintain the integrity of the subdrain system. A copy of the subdrain condition assessment report is provided in the appendix of this report.

2.0 Instrumentation Measurements

2.1 General

Instrumentation at Sand Canyon Dam includes 18 piezometers, two seepage subdrains, and six survey monuments. District staff measure the water levels in the reservoir, levels in the piezometers, and measure the seepage flow rates monthly and immediately following significant seismic events. The survey monuments are surveyed annually by a licensed surveyor under contract with the District. Precipitation is measured on-site.

Figure 1 is a Site and Instrumentation Plan showing the layout of the dam and appurtenances, as well as the locations of the piezometers, seepage collection subdrains, and survey monuments. The left and right designations are as viewed looking downstream.

IRWD contracted Genterra Consultants to establish thresholds and action levels for piezometer readings, seepage flow, and movement monitoring (Genterra, 2023). These thresholds and action levels were based on a review of historical performance data, previous reports, and statistical analysis of piezometer readings in relation to reservoir water levels. Genterra developed four alarm levels based on an expected instrument reading range set by an upper and lower band. Each alarm level has a defined upper and lower limit. If an instrument reading falls outside its expected range, it moves into the next alarm level. Alarm Levels are designated as Alarm Level I (Green Alarm), II (Yellow Alarm), III (Orange Alarm), and IV (Red Alarm). The lower and upper bands for each alarm level and the required response for each alarm level are shown in Table 2 of Guideline No. 4 (Seepage & Piezometer Monitoring) and Table 2 of Guideline No. 6 (Movement Monitoring) in IRWD's Dam Safety Program. The piezometers, seepage, and movement surveys were assessed using these alarm levels. Tables 1 through 4 summarize the readings for the 2024 review period.

Throughout this report, instrumentation measurements and readings remained within historical limits and followed historical trends will be classified as normal. Historical limit is classified as the range between maximum and minimum water levels within the past ten years.

Based on the ten-year historical data from January 2014 through December 2024, the reservoir water surface elevation varied from a minimum Elevation of 163.6 ft to a maximum Elevation of 194.1 ft. During the 2024 review period, the reservoir water surface elevation varied from a minimum Elevation of 175.7 ft to a maximum Elevation of 194.0 ft, see Table 5. During the review period, the reservoir spilled, and water flowed through the spillway intermittently from January to May. The exact start and end date of spilling was not provided by the District. The

reservoir water surface elevations during the 2024 review period remained within historical limits and considered normal. Rainfall data is included in Table 5 and Figures 4 through 15.

2.2 Piezometers

Originally, the dam had 18 open-well piezometers. An open-well piezometer is a small-diameter well, used mainly to measure the pressure or depth to water. It is typically installed as a casing in a vertical borehole and has a discrete perforated zone near its bottom to enable monitoring of changes in water levels within that zone. More than one piezometer can be installed within a single, larger-diameter outer well casing. These groups of piezometers are often referred to as multi-stage or nested piezometers. Piezometers 1 through 8 remain as open-well piezometers with A and B designations for nested piezometers (1A & 1B, 2A & 2B, and 8A & 8B). Both A & B are placed in the same hole but at different elevations.

In 2015, the District converted Piezometers 9 through 13 to vibrating wire piezometers (VWP). All the VWPs were recording erroneous digital readings from February 2019 until December 2020 (Table 5). The erroneous readings are marked in red as shown in Table 5. The District reported they were having problems with the digital data logger. The District was able to fix the data logger unit with the help of the manufacturer (Geokon) and started providing readings in 2021. The readings appear to be given as depths and in units of feet and follow the historical trends seen before the data logger malfunction. VWPs contain a high tensile steel wire attached at one end to a diaphragm. The frequency of vibration in the wire induces an alternating electrical current in a coil. The magnitude of the current is detected, and the reading is then converted to a pressure. The pressure fluctuates with changes in water levels in the immediate vicinity of the piezometer tip. The VWPs at the dam are designated with a V to identify them as such and with an A or B for nested piezometers (VBW9A & 9B and VBW/10A & 10B). Again, both A and B are placed in the same hole.

The location of each piezometer is shown on Figure 1. Thirteen of the 18 piezometers are located either at or near the maximum section of the dam. Three of the remaining five piezometers are in the right portion of the dam and two are in the left portion.

Table 5 lists the reservoir water surface elevations and piezometer water levels from January 2007. Figures 4 through 8 are 2-year graphical plots (January 2023 through December 2024) of the piezometer data and reservoir water levels. Figures 9 through 13 are historical 10-year graphical plots (since 2014) of the piezometer data and reservoir water levels.

The following is a discussion of the piezometers including the water level measurements during the 2024 review period as well as comparisons with historical trends. As noted above, the vibrating wire piezometers were producing erroneous digital readings from February 2019 to December 2020. The District provided readings for the vibrating wire piezometers for the 2024 review period, and they follow historical trend.

Table 1 provides a summary of the piezometer level evaluations during the review period. Readings with isolated spikes or drops were not considered reliable and were not included in the maximum and minimum water level range.

Table 1. Piezometers – Maximum and Minimum Water Level Ranges

Piezometer	Tip Elevation (ft)	2014-2024 10-Year Range (ft)	2024 Range (ft)	2024 Maximum Alarm Level	Comment
P-1A	159.3	159.0 – 160.5	159.3 – 159.7	Level I	
P-1B	132.9	140.4 – 149.1	143.5 – 149.1	Level III	The alarm status was downgraded to Level I after the reservoir level was lowered and precipitation decreased. Continue to monitor changes. Perform Alarm Level III response per Table 2 of Dam Safety Program Guideline No. 4 (Seepage & Piezometer Monitoring).
P-2A	153.9	165.1 – 176.1	172.8 – 176.1	Level IV	Slight increasing trend since January 2023. Slow response to lowering of reservoir level. Continue to monitor changes. Perform Alarm Level IV response per Table 2 of Dam Safety Program Guideline No. 4 (Seepage & Piezometer Monitoring).
P-2B	123.8	137.3 – 143.6	140.6 – 143.6	Level I	
P-3	155.8	159.8 – 182.0	169.9 – 180.8	Level I	
P-4	129.1	136.2 – 150.7	139.4 – 150.7	Level IV	Alarm level I since lowering reservoir in July 2024. Continue to monitor changes. Perform Alarm Level IV response per Table 2 of Dam Safety Program Guideline No. 4 (Seepage & Piezometer Monitoring).
P-5	129.6	139.8 – 146.5	141.9 – 145.5	Level I	
P-6	127.7	140.1 – 147.8	142.8 – 147.8	Level IV	Has historically been at Alarm Level IV. Continue to monitor changes. Perform Alarm Level III response per Table 2 of Dam Safety Program Guideline No. 4 (Seepage & Piezometer Monitoring).
P-7	152.7	154.7 – 166.9	163.0 – 166.9	Level I	
P-8A	164.3	162.4 – 173.8	167.5 – 173.8	Level I	
P-8B	144.5	152.5 – 164.5	157.0 – 164.3	Level II	Alarm level I since lowering of reservoir. Continue to monitor changes. Perform Alarm Level II response per Table 2 of Dam Safety Program Guideline No. 4 (Seepage & Piezometer Monitoring).
VBW9A	160.4	160.1 – 168.0	160.8 – 168.0	Level III	Alarm level I since lowering of reservoir. Continue to monitor changes. Perform Alarm Level III response per Table 2 of Dam Safety Program Guideline No. 4 (Seepage & Piezometer Monitoring).
VBW9B	151.7	151.7 – 159.1	155.4 – 158.6	Level I	
VBW/10A	148.0	157.6 – 164.3	160.6 – 164.0	Level I	
VBW/10B	136.1	136.1 – 143.2	138.0 – 141.4	Level I	
VBW/11	155.4	155.4 – 156.9	156.2 – 156.9	Level I	
VBW/12	151.5	151.0 – 156.7	151.8 – 154.8	Level I	
VBW/13	150.6	150.1 – 155.9	150.6 – 155.9	Level III	Returned to Alarm Level I for the rest of the review period. Continue to monitor changes. Perform Alarm Level III response per Table 2 of Dam Safety Program Guideline No. 4 (Seepage & Piezometer Monitoring).

Piezometers P-1A, P-1B, and P-6 are located near the right end of the dam along a similar cross section of the dam. Piezometers P-lA and P-1B are located on the crest of the dam, while Piezometer P-6 is near its downstream toe. The tip of Piezometer P- lA (Elevation 159.3 ft) is located within the embankment, while Piezometers P-1B and P-6 have tips within the foundation alluvium (Elevations 132.9 ft and 127.7 ft, respectively). Piezometer P-lA had minor changes during 2024 (Figure 4) and has historically shown slight to no response to the reservoir water level changes (Figure 9). Piezometers P-lB and P-6 tracked the reservoir level indicating groundwater levels within the alluvium foundation are responsive to reservoir water levels changes. P-1B returned to Alarm Level I once the reservoir level was lowered. The District stated to GEI that it has been having issues with obtaining readings from piezometer P-1B due to debris build up within the standpipe. The District is planning to clean out the piezometer. Based on the Alarm Levels developed, piezometer P-6 has historically been at Alarm Level IV. P-6 continues to follow historical trends.

Piezometers P-2A and P-2B are located on the crest of the dam, Piezometer P-5 is located near the toe of the dam, while Piezometers VBW/10A and VBW/10B are located at the downstream face of the dam. All five piezometers are near the maximum section of the dam. The tips of Piezometer P-2A, P-2B, P-5, VBW/10A, and VBW/10B are at Elevations 153.9 ft, 123.8 ft, 129.6 ft, 148 ft, and 136.1 ft, respectively. Piezometers P-2A installed within the dam embankment, generally tracked the reservoir levels during 2024 (Figure 5). On July 7, 2023, the District informed GEI that a stone was encountered inside piezometer P-2A. Despite cleaning efforts, the District has not been able to remove the stone. Piezometer P-2A may be providing erroneous data due to the presence of the stone. The water level observed in VBW/10A appears to follow the historical trend and reacts to the change in reservoir level due to the increase in rainfall. The water levels observed in piezometers P-2A and VBW/10A remained within historical levels with the exceptions identified in Table 1 (Figures 5 and 10).

Piezometers P-2B, P-5, and VBW/10B are installed within the foundation alluvium. Piezometer P-2B tracked the reservoir levels slightly during the 2024 review period, see Figure 5. Piezometer VBW/10B and P-5 had slight fluctuations during the review period. The water levels observed in VBW/10B, P-2B, and P-5 piezometers remained within historical levels (Figure 10) during the 2024 review period, with the exceptions stated above and in Table 1.

Piezometers P-4, P-8A, P-8B, VBW9A, VBW9B and VBW/11 are located along another plane near the maximum cross section of the dam. Piezometers P-8A & P-8B are located on the crest of the dam, Piezometer P-4 is located near the toe of the dam, and Piezometers VBW9A & VBW9B are located along the downstream face of the dam along with Piezometer VBW/11. Graphs of the water levels during the two-year period from January 2023 through December 2024 are shown on Figure 6, and graphs for the historical period

from January 2014 through December 2024 are shown on Figure 11. Piezometers P-8A, VBW9A, and VBW/11 are installed within the dam embankment. Piezometers P-8A continues to respond to reservoir water surface fluctuations. For the 2024 review period, VBW9A had a slight response to reservoir water surface fluctuations. VBW9A also reached Alarm Level III two times during the review period but returned to Alarm Level I when the reservoir water level was lowered toward the end of the year, see Figure 6 and Table 1. The water level observed in the piezometers during the 2024 review period was consistent with historical levels (Figure 11). Piezometers P-4 and P-8B are installed in foundation bedrock, and VBW9B was installed in foundation alluvium. Piezometers P-8B and P-4 generally responded to reservoir water surface fluctuations. The phreatic surface in Piezometer P-4 increased and was near the top of the piezometer casing elevation during 2023 and 2024 when the reservoir level was at its highest and consistently above Elevation 190 ft. Based on the last two years it appears that P-4 is sensitive to changes in reservoir water level and precipitation. The phreatic surface increase occurred during the peak rainy season and began trending downwards as the reservoir level decreased. P-4 has returned to Alarm Level I since the reservoir water level started lowering in July 2024. During the review period, VBW9B and VBW/11 had minor fluctuations. The water levels observed in these piezometers during this 2024 review period were consistent with historical levels (Figures 6 and 11).

Piezometers P-3 and P-7 are located in the left portion of the dam. Piezometer P-3 is located on the crest of the dam, while Piezometer P-7 is on the downstream face near the left groin. Graphs of the water levels during the two-year period from January 2023 through December 2024 are shown on Figure 7, and those for the historical period from January 2014 through December 2024 are shown on Figure 12. The tips of these piezometers are set below the base of the embankment, and possibly into bedrock. During the 2024 review period and historically, both piezometers tracked the reservoir levels closely. The water levels observed in these piezometers during this 2024 review period were consistent with historical levels (Figures 7 and 12).

Vibrating wire piezometers VBW/12 and VBW/13 are located in the maximum section area of the dam at the downstream toe area. Graphs of the water levels during the two-year period from January 2023 through December 2024 are shown on Figure 8, and those for the historical period from January 2014 through December 2024 are shown on Figure 13. The tip elevation of these two piezometers is within the dam embankment. During the 2024 review period, both piezometers had slight responses to reservoir water surface fluctuations, see Figure 13. VBW/13 reached Alarm Level III in February 2024 during the highest level of precipitation and highest reservoir level of the review period. VBW/13 returned to Alarm Level I after lower levels of precipitation and the reservoir level began to lower.

Based on GEI's review, the piezometers responded to the increase in reservoir water surface level based on the 2023 and 2024 increase rainfall. Though many piezometers had slight increases in alarm levels, the water levels remained normal and consistent with historical levels. The piezometer levels had also begun to decrease in response to the lowering of the reservoir level. It

is also recommended that IRWD follows the appropriate response for alarm level changes per Table 2 of Dam Safety Program Guideline No. 4 (Seepage & Piezometer Monitoring). GEI will continue to assist the District and closely monitor the water levels in each piezometer.

2.3 Seepage Flows

There are no internal drains that were installed during construction of the dam but because of seepage appearing at the downstream toe soon after filling, the Left Subdrain was installed near the downstream toe at the left groin. In 1976, the Right Subdrain was added.

Figure 14 represents the seepage flow rates from the Left and Right Subdrains versus the reservoir water surface elevations for the two-year period from January 2023 through December 2024. Figure 15 covers the historical period from January 2014 through December 2024. Tabulated data for the seepage flow rates is presented in Table 2.

Table 2. Seepage Flows – Maximum and Minimum Water Flow Rates

Seepage Flow Point	2014-2024 10-Year Range (gpm)	2024 Range (gpm)	2024 Maximum Alarm Level	Comment
Left Subdrain	0.00 – 4.38	0.52 – 4.38	Level III	Alarm level I since lowering of reservoir. Continue to monitor changes. Perform Alarm Level III response per Table 2 of Dam Safety Program Guideline No. 4 (Seepage & Piezometer Monitoring).
Right Subdrain	0.00 – 0.04	0.00 – 0.01	N/A	Not included in reservoir alarm level analysis by GENTERRA.

During 2024, the Right Subdrain remained dry, while the Left Subdrain flow rate tracked the reservoir levels. Historically, the left subdrain seepage tracks the reservoir level (Figure 15).

Based on GEI's review of the seepage data, the flow rates continue to be consistent with historical flow rates and there are no indications of unusual conditions or trends. The flows should continue to be observed for clarity to check for the presence of any suspended solids that might indicate a potential piping condition. It is also recommended that IRWD follows the appropriate response for alarm level changes per Table 2 of Dam Safety Program Guideline No. 4 (Seepage & Piezometer Monitoring).

2.4 Movement Surveys

There are six survey monuments (S-1 through S-6) located on the crest of Sand Canyon Dam spanning from the left abutment to the right abutment (Figure 1). Survey Monuments S-1 through S-5 were initially read on September 15, 1969, while S-6 was initially read on October

20, 1987. Starting in 1995 the monuments are normally surveyed annually by a licensed surveyor under contract with the District.

Table 6 presents the horizontal movement of the survey monuments compared to the baseline measurements, while Table 7 presents the cumulative horizontal displacement of the survey monuments since 1975. Table 8 presents the survey monument elevations from 1968 through 2024, while Table 9 presents the cumulative vertical movement of the survey monuments since 1969. Figures 16 and 17 are graphical presentations of the cumulative horizontal displacement and cumulative vertical movement of the survey monuments since 1995, respectively. Table 3 provides the Cumulative Horizontal Displacement compared to the Alarm Level for each survey monument. Table 4 provides the Cumulative Vertical Displacement compared to the Alarm Level for each survey monument.

Table 3. Horizontal Movement Survey – Cumulative Horizontal Displacement

Monument ID	Historical Cumulative Horizontal Displacement Range (in)	2024 Cumulative Horizontal Displacement (in)	2024 Alarm Level	Comment
S-1	0.12 to 0.54	-0.30	Level II	Continue to monitor changes. Perform Alarm Level II response per Table 2 of Dam Safety Program Guideline No. 6 (Movement Monitoring).
S-2	0.00 to 0.48	0.18	Level I	
S-3	0.54 to 0.96	0.76	Level I	
S-4	0.60 to 0.96	0.76	Level I	
S-5	0.12 to 0.60	0.29	Level I	
S-6	-0.54 to 0.00	-0.32	Level I	

Notes:
1. Negative displacements are in the upstream direction and positive displacements are in the downstream direction.
2. Historical range is based on surveys from 1995 to 2023.

Table 4. Vertical Movement Survey – Cumulative Vertical Displacement

Monument ID	Historical Cumulative Vertical Displacement Range (in)	2024 Cumulative Vertical Displacement (in)	2024 Alarm Level	Comment
S-1	-1.56 to -1.36	-1.46	Level I	
S-2	-1.37 to -1.09	-1.15	Level I	
S-3	-0.91 to -0.48	-0.59	Level I	
S-4	-3.24 to -2.76	-2.89	Level I	
S-5	-1.34 to -1.04	-1.20	Level I	
S-6	-0.96 to -0.05	-0.19	Level I	

Notes:
1. Historical range is based on surveys from 1995 to 2023.

No survey was performed in 2017 and 2021. A survey was performed on June 5, 2024, and is provided in the Appendix of this report. The data for 2024 has been reviewed and found within historical limits and trends. The cumulative horizontal and vertical movements show relatively minor changes (Tables 6 through 9) during the review period and most likely related to temperature and reservoir level changes. Based on GEI's review of the historical data, the horizontal and vertical movements are judged to be minimal with no unusual movements. It is

also recommended that IRWD follows the appropriate response for alarm level changes per Table 2 of Dam Safety Program Guideline No. 6 (Movement Monitoring).

3.0 Field Evaluations

3.1 Field Evaluation of March 25, 2024

A field evaluation and inspection were performed by Emerson Revolorio and Rich Sanchez of GEI, Danielle Drake, and Casey King of the District, and Cameron Lancaster and Brandon Cruz of DSOD on March 25, 2024. The reservoir level was reported to be at Elevation 193.9 ft. Weather conditions were sunny with temperature in the mid-60s. Photos taken by GEI are included in the Appendix of this report.

3.1.1 Dam

The crest of the dam was walked, and the asphalt concrete surface was observed to be in good condition with no signs of movement and significant cracking, see Photo 1. Minor temperature related AC cracking was observed near the left abutment, see Photo 1. The exposed upstream AC-lined slope face above the reservoir water level had some long-standing transverse and longitudinal shrinkage-expansion cracking with vegetation growing within the cracks, see Photo 2. The dam crest and upstream face looked similar to what was observed during the July 2023 inspection.

The downstream toe area, downstream embankment slope, and both groin areas were inspected. The downstream slope of the dam had recently been mowed, see Photos 6 and 7. GEI noticed minor rodent activity at the downstream toe near the left abutment, see Photo 8. During the inspection, GEI discovered little to no poison in the rodent control feeder boxes throughout the dam. IRWD reported that they are limited to the amount of poison they can add to the environment. Currently, IRWD is utilizing carbon monoxide as an effective treatment for ground squirrel control. IRWD still has black feeder control stations for rats and mice near the dam caretake houses and other IRWD facilities. No signs of live seepage were seen on the downstream slope face.

Overall, the condition of the dam remains largely unchanged from the conditions observed during the July 2023 inspection. Overall, the dam was well maintained with no signs of instability or distress.

3.1.2 Spillway

The reservoir was not spilling during the inspection, but reservoir water levels were near the ogee weir crest, see Photo 9. GEI was not able to access the spillway due to the high-water level. Vegetation and debris have accumulated along the spillway channel due to the recent spilling, see Photos 9 and 10. Minor brush/tule growth was observed at the end of the stilling basin, see Photo 11. The District is aware this vegetation growth has to be monitored continuously and cut

as required. GEI observed concrete spalling at one of the baffle blocks in the stilling basin which has exposed some rebar, see Photo 12. GEI was not able to take measurements at the crack gauges and inspect the undermining at the concrete repair work on the spillway channel floor due to restricted access. A more detailed inspection was conducted during the annual spillway inspections as follows.

A spillway inspection was performed by Emerson Revolorio and Matt Corrado of GEI, and Michael Brungardt of IRWD on October 23, 2024. The entire spillway was walked, and each wall panel was inspected within the spillway. The inspection was supplemented by taking aerial images using a DJI Phantom 4 Pro V2 drone. An exhibit was prepared using Ortho mosaic imagery created from the drone photos, and from the notes taken from the inspection. The inspection documented significant deficiencies with the spillway. Cracks, joint openings, and joint offsets greater than or equal to ¼-inch were classified as significant. The spillway inspection exhibit as requested by IRWD was created to document the inspection findings and is provided in the appendix of this report. A photo log of the inspection is also provided in the appendix of this report. As shown in the exhibit, there are various deficiencies, and a Spillway Condition Assessment along with any needed engineering analysis should be performed to determine a detailed condition of the spillway.

3.1.3 Outlet Works

The four upstream outlet gates and three downstream blowoff/control valves were not exercised during this inspection. GEI observed that gate valve #2 stem was still damaged from the last time it was exercised during the 2023 DSOD inspection, see Photo 13. The vegetation in Sand Canyon creek near the 24-inch outfall has started to grow back, see Photo 14. The District has still not been able to locate the 24-inch outfall after clearing the vegetation due to the high-water level in the creek. The District plans to locate the outfall once the water level in the creek lowers. Access to emergency valve 7 is currently obstructed with large diameter angular rocks and vegetation, see Photo 15. The rocks and vegetation make it difficult to access and operate the valve during an emergency.

Based on the District's report, and observations of the control equipment, the outlet works for the dam appeared fully operational except for the gate 2 outlet valve. Figure 1 shows the locations of the inlet gate structure which consists of three upstream 24-inch outlet gates (Nos. 1, 2, and 3), and one 20-inch diameter main lower outlet slide gate. Downstream of the dam adjacent to the Sand Canyon Creek, there are two 24-inch-diameter emergency valves (Valve 7 and 19), and a 20-inch-diameter emergency valve (Valve 20) for lowering the reservoir level in an emergency. The outfall is located within the creek area.

3.1.4 Seepage

Seepage flow rates continue to be monitored and measured monthly by District staff. A small seepage flow, estimated as 2 to 3 gpm, was observed in the Left Subdrain. The Right Subdrain was dry during this inspection. The observed seepage conditions were within past levels and based on past records and observations. Seepage water did not appear to have turbidity and appeared to be clear, see Photo 16.

GEI inspected the abandoned irrigation weir box which has previously shown signs of seepage, see Photos 3-5. GEI observed water seeping around the weir box and accumulated water within the box. Minor seepage was also observed trickling from the crack in the weir box, see Photo 4. The water in the weir box appears to be a combination of seepage and surface runoff from the surrounding area that has migrated through the cracks of the abandoned irrigation weir box. It is possible that the source of the seepage around the weir box and inadvertently collected in the weir box is from the reservoir. This possibility is further supported with observation that the seepage in the area is most noticeable during periods of elevated water levels in the reservoir.

IRWD should continue monitoring this area throughout the year to observe any changes during drier seasons and lower reservoir water levels.

4.0 Conclusions and Recommendations

4.1 Conclusions

1) Based on the review of available instrumentation data and the field inspection, the dam did not have signs of structural deficiencies, seepage, and instability.
2) Based on GEI's review, the piezometers responded to the increase in reservoir water surface level based on the increase rainfall in 2023 and 2024. Though many piezometers had slight increases, the water levels remained normal and consistent with historical levels, except for piezometers P-1B and P-2A.
3) The District stated to GEI that it has been having issues obtaining readings from Piezometer P-1B due to debris build up within the standpipe.
4) On July 7, 2023, the District informed GEI that a stone was encountered inside piezometer P-2A. Despite cleaning efforts, the District has not been able to remove the stone. Piezometer P-2A may be providing erroneous data due to the presence of the stone.
5) The phreatic surface in Piezometer P-4 increased and was near the top of the piezometer casing elevation during 2023 and 2024 when the reservoir level was at its highest and consistently above Elevation 190 ft. Based on the last two years it appears that P-4 is sensitive to changes in reservoir water level and precipitation. The phreatic surface increase occurred during the peak rainy season and began trending downwards as the reservoir level decreased. P-4 has returned to Alarm Level I since the reservoir water level started lowering in July 2024.
6) According to recently developed Alarm Levels, the readings at piezometer P-6 have historically been at Alarm Level IV. GEI does not consider this an issue since readings continued to follow historical trends and continue to respond to reservoir water level changes.
7) GEI inspected the abandoned irrigation weir box which has previously shown signs of seepage. GEI observed water seeping around the weir box and accumulated water within the box. Minor seepage was also observed trickling from the crack in the weir box. The water in the weir box appears to be a combination of seepage and surface runoff from the surrounding area that has migrated through the cracks of the abandoned irrigation weir box. This possibility is further supported with observation that the seepage in the area is most noticeable during periods of elevated water levels in the reservoir. The District is moving forward with an improvement project to remove the existing irrigation weir box and design a collection system to monitor and measure the seepage and runoff in the area.
8) Seepage flow rates during this review period are within historical values and trends.

9) Horizontal and vertical movement are within historical values and trends. Survey monument S-1 was in Alarm Level II during the annual survey. The rest of the survey monuments remained in Alarm Level I.

10) GEI saw minor rodent activity along the downstream slope of the dam near the left abutment. IRWD is continuing with rodent control measures. IRWD is currently utilizing carbon monoxide as an effective treatment for ground squirrel control. IRWD still has black feeder control stations for rats and mice near the dam caretake houses and other IRWD facilities.

11) The long-standing transverse and longitudinal shrinkage-expansion cracking along the upstream face of the AC liner appeared similar to what was observed during the July 2023 inspection.

12) The AC pavement on the dam crest has minor temperature expansion cracking.

13) Outlet works gate valve #2 stem was still damaged when it was exercised during the April 2023 DSOD inspection.

14) Outlet valves were not exercised during the inspection. The District provided a Dam Outlet Valve Exercising Log which states that the valves were exercised between November 12 to December 3, 2024, and December 16 to 31, 2024. Based on visual observations of exposed control equipment, the outlet facilities remain fully functional except for outlet works gate valve #2.

15) The area surrounding the 24-inch blowoff outfall has been cleared of overgrown vegetation. The 24-inch outfall has not been located due to the high-water level in the creek.

16) Access to emergency valve 7 is currently obstructed with large diameter angular rocks and vegetation. The rocks and vegetation make it difficult to access and operate the valves during an emergency.

17) Vegetation and debris have accumulated along the spillway channel due to the recent spilling.

18) Brush/tule growth was sprouting at the end of the spillway stilling basin.

19) GEI conducted an inspection of the spillway and created an exhibit documenting the significant deficiencies with the spillway.

4.2 Recommendations

1) The District should continue collaborating with pest management companies to determine most effective treatment options in controlling rodent activity. In addition, the District should continue collapsing, backfilling, and compacting rodent holes with surrounding material as an ongoing maintenance item throughout the dam.

2) The District needs to clean out piezometer P-1B to remove the possible debris build up.

3) The District needs to prevent any water surface runoff from entering the casing in piezometer P-4 by sealing the casing cover with a rubber gasket. The District should continue to monitor the piezometer, and nearby area for any wet spots.

4) Continue to monitor trends at piezometer P-6. Report to Dam Safety Engineer if trends start to change.

5) GEI recommends continuously monitoring the desiccation cracks near piezometer P-7.

6) GEI recommends continuing performing a visual inspection of the area surrounding survey monument S-1 to inspect any signs of movement.

7) Continue to perform appropriate instrument alarm level response per Table 2 of Dam Safety Program Guideline No. 4 (Seepage & Piezometer Monitoring) and Table 2 Guideline No. 6 (Movement Monitoring).

8) IRWD should continue monitoring abandoned irrigation weir box throughout the year to observe any changes during drier seasons and lower reservoir water levels. GEI recommends that IRWD establish a method to capture and measure flows at this location if determined to be coming from the reservoir. IRWD should provide monitoring data to include in annual surveillance reports. GEI recommends that IRWD establish a method to capture and measure flows at this location if determined to be coming from the reservoir.

9) Repair AC at localized crack areas on the upstream slope and crest of the dam. These cracks should be repaired with a Sika AC repair product. Vegetation and brush at the upstream slope need to be removed.

10) The outlet controls and the 24-inch blowoff outfall should continue to be fully exercised annually.

11) The outlet works gate valve #2 stem needs to be repaired and fully exercised to confirm it is still operable.

12) GEI recommends clearing the rocks and vegetation restricting access to the emergency valves.

13) The District needs to continue monitoring brush/tule growth at the spillway stilling basin and cut when appropriate to avoid any damage to spillway concrete or impacts to spillway operability.

14) GEI recommends sealing the wall joint on the left-wing wall with a Sika sealant. GEI also recommends installing a crack gauge at the wall joint to monitor future movement. The crack gauge should be measured annually and after each spilling event.

15) GEI recommends measuring the crack gauge at the R1/R2 wall panel joint annually and during other spillway inspections if conducted.

16) The District needs to remove vegetation and debris that accumulates in the spillway channel after a spilling event.

17) GEI recommends clearing the shrub and tree vegetation directly above the spillway channel walls.

18) GEI recommends performing a detailed Spillway Condition Assessment.

19) Continued careful monitoring by the District staff of the condition of the dam, appurtenances and instrumentation. Staff needs to be inspecting for signs of distress or movement, increased seepage, or any other unusual conditions including instrumentation readings. Any unusual observations need to be reported immediately to the Dam Safety Engineer.

20) GEI recommends continuing following IRWD's Dam Safety Program Guidelines after a 4.0 earthquake.

Sand Canyon Dam Action Item Summary

Item	Location	Maintenance	Measures
Rodent activity	Throughout dam	Active rodent holes and lack of poison in rodent control feeder boxes	The District should continue collaborating with pest management companies to determine most effective treatment options in controlling rodent activity. In addition, the District should continue collapsing, backfilling, and compacting rodent holes with surrounding material as an ongoing maintenance item throughout the dam.
Piezometer P-1B	Dam crest	Possible obstruction in piezometer	Clean out piezometer.
Piezometer P-2B	Dam crest	Possible obstruction in piezometer	Clean out piezometer.
Piezometer P-2A	Dam crest	Possible obstruction in piezometer	Clean out piezometer. Extend the top of standpipe to prevent water from entering. Resurvey top of piezometer.
Piezometer P-4	Dam crest	Increase piezometer water level readings	Prevent water surface runoff from entering piezometer. Continue monitoring piezometer, and nearby area for wet spots.
Piezometer P-6	Right toe of dam	Piezometer at Alarm Level IV	Continue to monitor trends at piezometer P-6. Report to Dam Safety Engineer if trends start to change.
Survey Monument S-1	Left abutment	Alarm Level II	Continue performing visual inspections of the area surrounding the survey monument to inspect any signs of movement.
AC pavement	Dam crest	Shrinkage-expansion temperature cracking	Repair AC pavement by filling in cracks and creating a smooth surface with a Sika AC repair product.
AC Liner	Upstream face	Shrinkage-expansion temperature cracking and vegetation growth in cracks	Repair areas with large cracks by filling in and creating a smooth surface with a Sika AC repair product. Remove vegetation.
AC Liner	Upstream face near water line	Overgrown brush within the reservoir near the water line	Remove brush.
Gate valve #2 stem	Upstream face	Buckled outlet works stem	Repair stem and fully exercise to confirm if it is still operable.
Downstream emergency outfall valves	Downstream of dam	Vegetation and angular rocks obstructing area	Clear area of rocks and vegetation to provide access to the emergency outfall valves.
Irrigation weir box	Downstream left groin	Seepage through and around structure	IRWD should continue monitoring abandoned irrigation weir box throughout the year to observe any changes during drier seasons and lower reservoir water levels. GEI recommends that IRWD establish a method to capture and measure flows at this location if determined to be coming from the reservoir. IRWD should provide monitoring data to include in annual surveillance reports.
Wing wall joint	Left wing wall	Wall joint offset	Repair joint with a Sika sealant per manufactures instructions. Install crack gauge to measure joint movement. Monitor crack gauge annually and after each spilling event.
Spillway	Right Abutment	Assessment	Perform Spillway Condition Assessment.
Stilling basin	Spillway stilling basin	Brush/tule growth	Cut and maintain.
Spillway channel wall	Right spillway concrete wall vertical joint	Vertical wall joint with approximately a 1-mm offset between concrete wall sections	Continue to monitor and measure crack meter annually and after a spilling event. Report to Dam Safety

Item	Location	Maintenance	Measures
			Engineer if the wall continues to deflect.
Spillway channel walls	Spillway	Overgrown vegetation above spillway channel walls	Remove vegetation directly above the spillway channel walls.
Spillway channel	Spillway	Vegetation and debris throughout channel	Remove vegetation and debris that accumulated in the channel after every spilling event.

5.0 Limitations

This report presents observations made, conclusions drawn, and opinions formed from (1) a visual inspection of the Sand Canyon Dam and its appurtenant structures, and (2) a review of instrumentation data, including piezometer levels and seepage, collected by the District and reported since 1975. The purpose of the inspection and review is to assess the safety of the structure for continuing operation. Reuse of this report for any other purposes, in part or in whole, is at the sole risk of the user.

In the context intended above, the term "safety" is interpreted to be restricted specifically to major structural and control features of the project in regard to their adequacy against possible catastrophic failure due to natural or operational events. No consideration is given herein to those public safety aspects related to voluntary occupancy or use of project features in such manner as to result in personal mishaps.

The undersigned who performed the inspection and reviewed the instrumentation data and prepared this report, desire that it be clearly understood that the conclusions regarding the condition and safety of the dam and related facilities are not guaranteed but do represent our best judgment. Inevitably, such judgment must be recognized to be affected to an uncertain degree by the practical limitations that affect all dam evaluations, relative principally to approximate knowledge of the existing properties of the structures and their foundations, the potential for storm or seismic damage, and the uncertainties that are known to exist in estimating margins of safety.

The conclusions and professional opinions presented herein were developed by GEI Consultants, Inc. for the Irvine Ranch Water District in accordance with generally accepted engineering principles and practices. We make no other warranty, either expressed or implied.

6.0 References

California Department of Water Resources, Division of Safety of Dams (DSOD), 1984, Sand Canyon Dam, 1029-2, Safety Review Report; safety Review Report; by DSOD; date April 1984.

California Department of Water Resources, DSOD, 2020, Inspection of Dam and Reservoir in Certified Status report; October 19, 2020.

Genterra, 2023, Technical Memorandum Identification of Instrumentation Thresholds and Action Levels at Sand Canyon, March 24, 2023.

HDR, 2021, Draft Data Summary Report, Sand Canyon Dam, July 2021

IRWD, 2023, Dam Safety Program Guidelines & Governance, July 2023.

Tables

TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			1A		1B		2A		2B	
Top of Well Elevation --->			201.9		201.8		201.9		202	
Bottom of Well Elevation --->			159.3		132.9		153.9		123.8	
Depth of Well --->			42.6		68.9		48		78.2	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
1/31/2007	176.80		41.6	160.3	59.1	142.70	35.2	166.70	62.7	139.3
2/28/2007	177.60		42.5	159.4	59.2	142.60	35.5	166.40	62.6	139.4
3/29/2007	177.10		42.3	159.6	59.2	142.60	35.6	166.30	62.6	139.4
4/27/2007	176.60		42.3	159.6	59.3	142.50	35.3	166.60	62.8	139.2
5/24/2007	176.80		42.3	159.6	59.7	142.10	35.9	166.00	63.1	138.9
6/27/2007	179.90		42.5	159.4	59.6	142.20	35.3	166.60	63.4	138.6
7/27/2007	177.80		42.4	159.5	60.0	141.80	35.8	166.10	64.0	138.0
8/28/2007	177.20		42.4	159.5	60.1	141.70	35.5	166.40	64.1	137.9
9/26/2007	177.00		42.5	159.4	59.7	142.10	35.7	166.20	63.8	138.2
10/30/2007	175.50		42.5	159.4	59.6	142.20	36.0	165.90	63.9	138.1
11/27/2007	175.90		42.5	159.4	59.9	141.90	36.3	165.60	63.9	138.1
12/27/2007	178.20		42.6	159.3	59.5	142.30	36.4	165.50	63.0	139.0
1/30/2008	184.40		42.4	159.5	57.7	144.10	35.8	166.10	61.0	141.1
2/26/2008	186.10		42.4	159.5	57.0	144.80	34.9	167.00	60.7	141.3
3/26/2008	188.00		42.6	159.3	56.6	145.20	33.8	168.10	60.8	141.2
4/25/2008	191.00		42.4	159.5	56.5	145.30	32.7	169.20	61.0	141.0
5/28/2008	190.93		41.4	160.6	55.9	145.90	31.3	170.60	60.3	141.7
6/25/2008	189.50		42.3	159.6	56.1	145.70	30.7	171.20	60.5	141.5
7/29/2008	185.10		41.4	160.5	56.6	145.20	30.9	171.00	61.0	141.0
7/30/2008	185.10	0.00	41.5	160.4	56.5	145.30	30.7	171.20	60.9	141.1
8/27/2008	178.00	0.00	41.7	160.2	57.6	144.20	32.1	169.80	61.7	140.3
9/25/2008	176.80	0.00	42.5	159.4	58.4	143.40	33.1	168.80	62.4	139.6
10/28/2008	175.20	0.00	44.4	157.5	58.8	143.00	34.3	167.60	62.9	139.1
11/25/2008	175.80	1.82	42.4	159.5	58.9	142.90	35.2	166.70	63.0	139.0
12/30/2008	181.70	2.91	42.6	159.3	57.7	144.10	35.2	166.70	61.4	140.6
1/29/2009	182.20	0.39	42.4	159.5	57.5	144.30	34.8	167.10	61.3	140.7
2/25/2009	185.70	3.10	42.0	159.9	57.0	144.80	34.1	167.80	59.9	142.1

Notes:
1. Readings in red are classified as erroneous
2. Elevation calculations between 2/27/2019 and 12/29/2020 were not included due to issues with data logger.
3. Piezometer data based on NGVD 29 datum.

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JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			1A		1B		2A		2B	
Top of Well Elevation --->			201.9		201.8		201.9		202	
Bottom of Well Elevation --->			159.3		132.9		153.9		123.8	
Depth of Well --->			42.6		68.9		48		78.2	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
3/26/2009	188.40	0.10	42.4	159.5	56.9	144.90	33.2	168.70	61.0	141.0
4/28/2009	189.30	0.00	42.4	159.5	56.7	145.10	32.0	169.90	61.3	140.7
5/18/2009	188.50	0.00	41.3	160.6	56.6	145.20	31.4	170.50	61.0	141.0
5/27/2009	188.10	0.00	42.2	159.7	56.7	145.10	31.2	170.70	61.0	141.0
6/30/2009	188.60	0.10	42.4	159.5	56.7	145.10	31.2	170.70	61.3	140.7
7/30/2009	184.80	0.00	42.3	159.6	56.9	144.90	30.9	171.00	61.3	140.7
8/26/2009	176.60	0.00	41.5	160.4	57.8	144.00	31.6	170.30	61.8	140.2
9/30/2009	174.50	0.00	42.2	159.7	59.0	142.80	33.3	168.60	62.8	139.2
10/28/2009	175.30	0.29	42.6	159.3	59.2	142.60	34.2	167.70	63.0	139.0
12/1/2009	176.40	0.00	42.0	159.9	59.4	142.40	35.2	166.70	63.3	138.7
12/28/2009	178.80	2.75	42.5	159.5	58.6	143.30	35.5	166.50	62.2	139.8
1/26/2010	191.30	4.15	42.4	159.5	57.3	144.50	34.9	167.00	60.6	141.4
2/24/2010	193.60	2.29	42.4	159.5	55.4	146.40	32.5	169.40	59.8	142.2
3/29/2010	193.50	1.18	42.2	159.7	55.4	146.40	29.9	172.00	60.0	142.0
4/4/2010	193.50		41.5	160.4	55.5	146.30	25.5	176.40	60.0	142.0
4/27/2010	193.90	1.66	42.3	159.6	55.4	146.40	29.2	172.70	59.9	142.1
5/27/2010	192.90	0.03	41.4	160.5	55.4	146.40	28.7	173.20	59.9	142.1
6/29/2010	191.60	0.00	41.4	160.5	55.4	146.40	28.7	173.20	59.7	142.3
7/28/2010	187.50	0.00	42.3	159.6	55.9	145.90	29.1	172.80	60.4	141.6
8/31/2010	179.20	0.00	41.5	160.4	57.3	144.50	30.8	171.10	61.4	140.6
9/29/2010	175.60	0.00	41.2	160.7	58.5	143.30	31.7	170.20	62.0	140.0
10/26/2010	178.20	2.93	41.4	160.5	58.6	143.20	33.0	168.90	61.9	140.1
11/30/2010	178.80	1.14	42.6	159.3	58.8	143.00	34.4	167.50	62.4	139.6
12/30/2010	193.90	9.95	42.4	159.5	55.4	146.40	33.8	168.10	59.5	142.5
1/27/2011	194.00	0.86	41.5	160.4	55.4	146.40	30.4	171.50	60.0	142.0
2/23/2011	193.80	1.02	42.4	159.5	55.5	146.40	28.9	173.00	59.7	142.3
3/29/2011	193.90	2.38	41.3	160.6	54.9	146.90	28.1	173.80	59.5	142.5
4/27/2011	193.60	0.56	42.3	159.6	55.3	146.50	27.6	174.30	59.8	142.2

Notes:
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Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
5/25/2011	193.10	0.51	41.4	160.5	55.2	146.60	27.9	174.00	59.8	142.2
6/28/2011	192.00	0.00	42.3	159.6	55.3	146.50	28.2	173.70	59.7	142.3
7/27/2011	186.75	0.00	41.5	160.5	55.8	146.00	28.9	173.10	60.0	142.0
8/25/2011	176.30	0.00	42.4	159.5	57.2	144.60	30.3	171.60	61.0	141.0
9/28/2011	176.00	0.06	42.4	159.5	58.6	143.30	32.5	169.50	62.1	139.9
10/25/2011	176.50	0.89	42.2	159.7	59.1	142.70	33.5	168.40	62.3	139.7
11/22/2011	177.20	1.31	42.4	159.5	58.9	143.00	34.4	167.50	62.2	139.8
12/22/2011	176.70	0.20	41.6	160.3	59.0	142.80	34.5	167.40	62.5	139.5
1/25/2012	178.60	0.84	41.4	160.5	58.6	143.20	35.0	166.90	61.9	140.1
2/28/2012	179.20	0.68	41.5	160.4	58.6	143.20	35.5	166.40	61.1	140.9
3/27/2012	180.60	1.73	41.5	160.4	58.4	143.50	35.1	166.80	61.6	140.4
6/27/2012	180.70	0.00	42.5	159.4	58.6	143.20	33.8	168.10	61.9	140.1
7/26/2012	179.20	0.10	42.3	159.6	58.7	143.10	34.3	167.60	62.1	139.9
8/8/2012	178.50	0.10	42.2	159.7	58.9	142.90	34.3	167.60	62.7	139.3
8/28/2012	177.10	0.00	42.4	159.5	59.3	142.50	34.6	167.30	62.9	139.1
8/29/2012	177.10	0.00	42.0	159.9	59.1	142.70	34.3	167.60	62.7	139.3
9/25/2012	175.30	0.00	42.3	159.6	59.8	142.00	35.0	166.90	63.5	138.5
10/30/2012	176.00	0.19	42.3	159.6	60.0	141.80	35.6	166.30	63.8	138.2
11/27/2012	175.80	0.69	42.4	159.5	59.7	142.10	35.8	166.20	63.4	138.6
12/12/2012	176.10	1.40	42.5	159.4	59.7	142.10	35.7	166.20	62.9	139.1
1/22/2013	177.20	1.20	42.4	159.5	58.8	143.00	36.0	165.90	62.1	139.9
2/27/2013	178.20	0.31	42.3	159.6	58.4	143.40	35.8	166.10	61.8	140.2
3/28/2013	178.20	0.71	42.4	159.5	58.4	143.40	35.8	166.10	61.7	140.3
4/25/2013	177.30	0.03	42.5	159.4	58.4	143.40	35.9	166.00	62.4	139.7
5/22/2013	177.60	0.00	42.5	159.4	59.0	142.80	35.9	166.00	62.3	139.7
6/25/2013	177.50	0.00	42.3	159.6	59.2	142.70	36.0	165.90	62.5	139.5
7/23/2013	175.70	0.00	42.5	159.4	59.6	142.20	36.0	165.90	63.1	138.9
8/21/2013	174.50	0.00	42.5	159.4	59.9	141.90	36.2	165.70	63.7	138.3

Notes:
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TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			1A		1B		2A		2B	
Top of Well Elevation --->			201.9		201.8		201.9		202	
Bottom of Well Elevation --->			159.3		132.9		153.9		123.8	
Depth of Well --->			42.6		68.9		48		78.2	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
9/25/2013	175.70	0.00	42.6	159.3	60.2	141.60	36.3	165.60	63.8	138.2
10/29/2013	176.00	0.00	42.6	159.3	59.9	141.90	36.5	165.40	63.6	138.4
11/27/2013	176.50	0.44	42.3	159.6	59.5	142.30	36.4	165.50	63.3	138.7
12/19/2013	176.80	0.53	42.5	159.4	59.5	142.30	36.4	165.50	63.1	138.9
1/28/2014	176.80	0.00	42.5	159.4	59.1	142.70	36.5	165.40	62.7	139.3
2/25/2014	176.70	0.72	42.3	159.6	59.0	142.80	36.6	165.30	62.5	139.5
3/25/2014	178.50		42.5	159.4	58.5	143.30	36.5	165.40	62.0	140.0
3/29/2014	178.40	1.44	42.5	159.4	58.6	143.20	36.6	165.30	62.0	140.0
4/25/2014	177.40	0.74	42.4	159.5	58.8	143.00	36.3	165.60	62.2	139.8
5/28/2014	176.40	0.00	42.5	159.4	59.4	142.40	36.3	165.60	62.9	139.1
6/25/2014	176.10	0.00	42.5	159.4	60.0	141.80	36.5	165.40	63.6	138.4
7/30/2014	177.30	0.00	42.5	159.4	60.1	141.70	36.4	165.50	63.7	138.4
8/26/2014	176.10	0.03	42.5	159.4	60.2	141.60	36.3	165.60	63.8	138.2
9/23/2014	175.90	0.00	42.3	159.6	60.3	141.50	36.5	165.40	64.2	137.9
10/30/2014	176.30	0.00	42.2	159.7	60.1	141.70	36.6	165.30	64.0	138.0
11/21/2014	176.20	0.25	42.2	159.7	59.9	141.90	36.7	165.20	63.9	138.1
12/30/2014	178.90	3.37	42.3	159.6	58.8	143.00	36.7	165.20	62.5	139.5
1/27/2015	179.60	0.89	42.3	159.6	58.3	143.50	36.2	165.70	62.2	139.9
2/27/2015	180.00	0.46	42.3	159.6	58.3	143.50	35.8	166.10	62.0	140.0
3/26/2015	179.60	0.45	42.3	159.6	58.2	143.60	35.7	166.20	62.1	139.9
4/29/2015	178.20	0.24	42.2	159.7	58.7	143.10	35.5	166.40	62.7	139.3
5/27/2015	179.00	1.04	42.2	159.7	58.6	143.20	35.8	166.10	62.6	139.4
6/25/2015	179.60	0.00	42.2	159.7	58.5	143.30	35.6	166.30	62.3	139.7
7/29/2015	178.10	0.00	42.3	159.6	58.9	142.90	35.5	166.40	63.1	138.9
8/26/2015	176.20	0.00	42.2	159.7	59.2	142.60	35.4	166.50	63.3	138.7
9/22/2015	178.20	1.64	42.2	159.7	58.9	142.90	35.8	166.10	62.8	139.2
10/27/2015	176.90	0.10	42.3	159.6	59.0	142.80	35.8	166.10	63.0	139.0
11/24/2015	176.30	0.17	42.2	159.7	59.2	142.60	36.0	165.90	63.1	138.9

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JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			1A		1B		2A		2B	
Top of Well Elevation --->			201.9		201.8		201.9		202	
Bottom of Well Elevation --->			159.3		132.9		153.9		123.8	
Depth of Well --->			42.6		68.9		48		78.2	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
12/22/2015	177.60	0.72	42.3	159.7	58.9	143.00	36.1	165.80	62.9	139.1
1/27/2016	180.10	2.86	42.6	159.3	58.2	143.60	36.5	165.40	61.9	140.1
2/25/2016	181.60	0.20	42.2	159.7	57.8	144.00	35.6	166.30	61.8	140.2
3/24/2016	184.80		42.3	159.6	57.7	144.10	34.1	167.80	61.3	140.7
3/31/2016	184.50	1.51	42.2	159.7	57.7	144.10	35.0	166.90	61.8	140.2
4/28/2016	183.60	0.04	42.2	159.7	57.8	144.00	34.3	167.70	62.1	139.9
5/25/2016	182.50	0.13	42.2	159.7	58.0	143.80	34.2	167.70	62.2	139.8
6/28/2016	180.70	0.00	42.9	159.0	59.2	142.60	33.3	168.60	63.3	138.7
7/27/2016	178.40	0.00	42.4	159.5	59.1	142.70	34.2	167.70	63.1	138.9
8/24/2016	176.40	0.00	42.3	159.6	59.6	142.30	34.8	167.10	63.5	138.5
9/27/2016	175.80	0.00	42.3	159.6	60.0	141.80	35.3	166.60	63.9	138.1
10/26/2016	178.60	0.64	42.3	159.6	59.8	142.00	35.6	166.30	63.7	138.3
11/22/2016	178.30	1.11	42.4	159.5	59.7	142.10	35.5	166.40	63.5	138.5
12/28/2016	184.80	4.01	42.3	159.6	59.0	142.80	35.6	166.30	62.6	139.4
1/25/2017	193.30	6.33	42.4	159.5	56.1	145.70	34.6	167.30	59.0	143.0
2/28/2017	193.90	3.27	42.3	159.6	54.5	147.30	31.2	170.70	58.8	143.2
3/29/2017	193.70	0.08	42.4	159.5	54.7	147.10	29.6	172.30	59.2	142.8
4/27/2017	192.90	0.04	42.2	159.7	54.7	147.10	28.8	173.10	59.5	142.5
5/23/2017	187.90	0.33	42.2	159.7	55.2	146.60	29.1	172.80	59.5	142.5
6/21/2017	182.50	0.00	42.2	159.7	56.1	145.70	29.9	172.00	60.1	141.9
7/26/2017	163.60	0.00	42.2	159.7	58.2	143.60	32.0	169.90	61.6	140.4
8/30/2017	163.60	0.00	42.2	159.7	59.7	142.10	34.1	167.80	62.9	139.1
9/28/2017	163.60	0.00	42.3	159.6	60.8	141.00	35.5	166.40	63.7	138.3
10/26/2017	171.80	0.00	42.1	159.8	61.4	140.40	36.2	165.70	64.2	137.8
11/29/2017	177.20	0.08	42.2	159.7	60.7	141.10	36.8	165.10	64.4	137.6
12/27/2017	176.70	0.00	42.3	159.6	60.9	140.90	36.4	165.50	64.5	137.5
1/24/2018	178.10	1.67	42.3	159.6	60.3	141.50	36.0	165.90	63.9	138.1
2/21/2018	177.80	0.27	42.2	159.7	60.2	141.60	35.9	166.00	63.9	138.1

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JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			1A		1B		2A		2B	
Top of Well Elevation --->			201.9		201.8		201.9		202	
Bottom of Well Elevation --->			159.3		132.9		153.9		123.8	
Depth of Well --->			42.6		68.9		48		78.2	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
3/28/2018	183.50	1.23	42.3	159.6	59.7	142.10	35.6	166.30	63.5	138.5
4/27/2018	184.30	0.05	42.2	159.7	59.5	142.30	35.0	166.90	63.5	138.5
5/30/2018	183.10	0.13	42.2	159.7	59.1	142.70	34.0	167.90	63.4	138.6
6/28/2018	181.70	0.00	42.4	159.5	59.3	142.50	33.8	168.10	63.6	138.4
7/26/2018	180.00	0.00	42.4	159.5	59.8	142.00	34.2	167.70	63.6	138.4
8/28/2018	177.30	0.00	42.3	159.6	60.2	141.60	34.3	167.60	64.2	137.8
9/27/2018	178.10	0.00	42.3	159.6	60.3	141.50	64.4	137.50	64.7	137.3
10/24/2018	178.00	0.66	42.4	159.5	60.3	141.50	64.4	137.50	64.3	137.7
11/29/2018	177.50	1.60	42.3	159.6	60.3	141.50	35.0	166.90	64.3	137.7
12/20/2018	181.40	2.39	42.2	159.7	59.1	142.70	35.0	166.90	62.9	139.1
1/30/2019	189.40	4.56	42.2	159.7	57.4	144.40	34.6	167.30	61.2	140.8
2/27/2019	194.10	7.48	42.3	159.6	54.8	147.00	30.9	171.00	59.4	142.6
3/27/2019	194.00	1.27	42.4	159.5	54.9	146.90	29.1	172.80	59.4	142.6
4/24/2019	193.60	0.07	42.30	159.6	55.00	146.80	28.20	173.70	59.55	142.5
5/30/2019	191.40	0.73	42.20	159.7	55.30	146.50	28.00	173.90	59.80	142.2
6/26/2019	190.80	0.02	42.40	159.5	55.40	146.40	28.10	173.80	59.80	142.2
7/5/2015	190.40	0.00	42.30	159.6	55.40	146.40	28.00	173.90	60.00	142.0
7/30/2019	188.95	0.00	42.30	159.6	55.70	146.10	28.30	173.60	60.30	141.7
8/27/2019	187.40	0.00	42.10	159.8	60.50	141.30	28.10	173.80	60.70	141.3
9/26/2019	186.20	0.00	42.30	159.6	60.40	141.40	28.00	173.90	59.90	142.1
10/22/2019	185.20	0.00	42.20	159.7	56.50	145.30	29.80	172.10	61.20	140.8
11/26/2019	183.50	2.66	42.20	159.7	56.90	144.90	30.80	171.10	61.30	140.7
12/18/2019	186.80	4.44	42.40	159.5	56.40	145.40	31.10	170.80	60.40	141.6
1/28/2020	192.00	0.24	42.20	159.7	55.00	146.80	28.30	173.60	59.50	142.5
2/25/2020	192.10	0.49	42.25	159.7	54.90	146.90	28.20	173.70	59.40	142.6
3/24/2020	194.00	3.89	42.20	159.7	54.80	147.00	28.00	173.90	59.10	142.9
4/29/2020	193.50	4.59	42.20	159.7	53.80	148.00	27.40	174.50	59.20	142.8
5/27/2020	193.10	0.03	42.20	159.7	54.00	147.80	27.40	174.50	59.50	142.5
6/24/2020	190.00	0.00	41.90	160.0	54.10	147.70	27.70	174.20	59.70	142.3

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JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			1A		1B		2A		2B	
Top of Well Elevation --->			201.9		201.8		201.9		202	
Bottom of Well Elevation --->			159.3		132.9		153.9		123.8	
Depth of Well --->			42.6		68.9		48		78.2	
Date	Spillway 378'		Reading	Elev.	Reading	Elev.	Reading	Elev.	Reading	Elev.
	Elevation	Rainfall (in)								
7/29/2020	188.90	0.00	42.20	159.7	54.50	147.30	28.50	173.40	59.60	142.4
8/27/2020	185.90	0.00	42.10	159.8	55.10	146.70	29.10	172.80	59.80	142.2
9/29/2020	183.10	0.00	42.30	159.6	55.70	146.10	30.25	171.65	60.00	142.0
10/29/2020	180.30	0.00	42.10	159.8	56.60	145.20	31.40	170.50	60.80	141.2
11/24/2020	179.00	0.65	42.20	159.7	57.40	144.40	32.10	169.80	61.20	140.8
12/29/2020	179.00	1.03	42.20	159.7	57.80	144.00	33.10	168.80	61.20	140.8
1/26/2021	180.50	2.39	42.20	159.7	57.60	144.20	33.50	168.40	60.90	141.1
2/25/2021	182.10	0.03	42.30	159.6	57.40	144.40	33.30	168.60	60.90	141.1
3/23/2021	182.90	1.15	41.40	160.5	57.30	144.50	33.50	168.40	61.30	140.7
4/27/2021	182.00	0.04	42.30	159.6	57.60	144.20	33.20	168.70	61.30	140.7
5/26/2021	181.00	0.11	42.20	159.7	57.80	144.00	33.40	168.50	61.60	140.4
6/30/2021	179.00	0.00	42.30	159.6	58.10	143.70	33.50	168.40	61.90	140.1
7/27/2021	177.10	0.08	42.30	159.6	58.50	143.30	34.00	167.90	62.30	139.7
8/24/2021	175.40	0.00	42.20	159.7	58.90	142.90	34.30	167.60	52.40	149.6
9/28/2021	175.20	0.06	42.20	159.7	59.10	142.70	35.00	166.90	52.80	149.2
10/27/2021	177.20	0.80	42.30	159.6	59.20	142.60	35.40	166.50	63.00	139.0
11/23/2021	177.80	0.00	42.30	159.6	59.10	142.70	35.20	166.70	63.10	138.9
12/21/2021	180.50	5.86	42.20	159.7	58.60	143.20	35.20	166.70	62.10	139.9
1/25/2022	187.00	0.08	42.20	159.7	54.20	147.60	29.30	172.60	59.70	142.3
2/22/2022	186.60	0.18	42.30	159.6	57.30	144.50	33.30	168.60	60.90	141.1
3/28/2022	186.60	1.38	42.30	159.6	56.70	145.10	30.90	171.00	60.10	141.9
4/26/2022	186.60	0.01	42.20	159.7	57.20	144.60	32.00	169.90	61.10	140.9
5/25/2022	185.30	0.05	42.30	159.6	57.70	144.10	31.90	170.00	61.30	140.7
6/28/2022	182.70	0.00	42.30	159.6	58.00	143.80	32.20	169.70	61.70	140.3
7/26/2022	179.70	0.00	42.30	159.6	58.50	143.30	32.60	169.30	62.30	139.7
8/30/2022	178.30	0.13	42.20	159.7	59.10	142.70	33.30	168.60	62.70	139.3
9/29/2022	175.80	0.24	42.20	159.7	59.40	142.40	34.10	167.80	52.70	149.3
10/26/2022	175.30	0.26	42.20	159.7	59.40	142.40	34.70	167.20	63.00	139.0
11/22/2022	179.40	1.46	42.30	159.6	59.10	142.70	35.10	166.80	62.60	139.4

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JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			1A		1B		2A		2B	
Top of Well Elevation --->			201.9		201.8		201.9		202	
Bottom of Well Elevation --->			159.3		132.9		153.9		123.8	
Depth of Well --->			42.6		68.9		48		78.2	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
12/29/2022	185.70	2.21	42.30	159.6	58.00	143.80	34.20	167.70	51.40	150.6
1/11/2023	191.70	3.90	42.20	159.70	57.30	144.50	33.90	168.00	50.20	151.8
1/25/2023	194.00	7.17	42.20	159.70	55.90	145.90	32.70	169.20	59.80	142.20
2/28/2023	194.00	3.98	42.30	159.60	55.30	146.50	29.70	172.20	58.90	143.10
3/29/2023	194.00	5.92	42.20	159.70	54.00	147.80	28.20	173.70	58.60	143.40
4/25/2023	194.00	0.19	42.20	159.70	55.10	146.70	27.70	174.20	59.60	142.40
5/24/2023	193.40	0.89	42.20	159.70	55.00	146.80	27.84	174.07	59.64	142.36
6/28/2023	192.70	0.07	42.30	159.60	55.30	146.50	27.40	174.50	59.80	142.20
7/26/2023	191.60	0.00	42.20	159.70	55.00	146.80	27.50	174.40	59.70	142.30
8/29/2023	190.50	1.84	42.18	159.72	54.90	146.90	27.60	174.30	59.60	142.40
9/26/2023	189.80	0.00	42.25	159.65	54.90	146.90	27.65	174.25	59.35	142.65
10/25/2023	189.70	0.19	42.20	159.70	54.90	146.90	27.70	174.20	60.10	141.90
11/30/2023	189.20	0.65	42.20	159.70	54.90	146.90	27.70	174.20	60.00	142.00
12/27/2023	190.00	1.15	42.20	159.70	54.90	146.90	27.80	174.10	59.90	142.10
1/29/2024	191.90	2.00	42.20	159.70	54.00	147.80	29.10	172.80	59.60	142.40
2/27/2024	194.00	8.89	42.20	159.70	52.90	148.90	27.50	174.40	58.40	143.60
3/27/2024	193.80	2.51	42.20	159.70	53.10	148.70	27.35	174.55	58.75	143.25
4/23/2024	194.00	1.51	42.60	159.30	52.70	149.10	26.70	175.20	58.95	143.05
5/1/2024	193.90	0.00	42.20	159.70	53.20	148.60	26.80	175.10	59.00	143.00
5/23/2024	193.10	0.08	42.20	159.70	53.20	148.60	26.70	175.20	59.30	142.70
6/20/2024	191.50	0.00	42.20	159.70	53.30	148.50	25.90	176.00	59.40	142.60
7/25/2024	188.70	0.00	42.20	159.70	52.90	148.90	26.30	175.60	59.70	142.30
8/28/2024	185.90	0.00	42.30	159.60	53.40	148.40	26.20	175.70	60.10	141.90
9/18/2024	183.95	0.00	42.20	159.70	53.40	148.40	26.00	175.90	60.40	141.60
10/30/2024	182.00	0.00	42.20	159.70	56.90	144.90	25.80	176.10	60.70	141.30
11/26/2024	177.30	0.06	42.20	159.70	57.90	143.90	26.17	175.73	60.95	141.05
12/17/2024	175.70	0.04	42.30	159.60	58.30	143.50	25.90	176.00	61.40	140.60

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JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			3		4		5		6	
Top of Well Elevation --->			201.2		150.7		151.5		167.4	
Bottom of Well Elevation --->			155.8		129.1		129.6		127.7	
Depth of Well --->			45.4		21.6		21.9		39.7	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
1/31/2007	176.80		31.9	169.3	9.4	141.30	9.2	142.3	25.6	141.80
2/28/2007	177.60		31.7	169.5	9.6	141.10	9.3	142.2	25.4	142.00
3/29/2007	177.10		31.9	169.3	10.4	140.30	9.6	141.9	25.6	141.80
4/27/2007	176.60		32.1	169.1	10.5	140.20	9.5	142.0	25.7	141.70
5/24/2007	176.80		32.7	168.5	10.7	140.00	9.8	141.7	26.0	141.40
6/27/2007	179.90		30.0	171.2	11.0	139.70	9.6	141.9	26.0	141.40
7/27/2007	177.80		30.8	170.4	11.5	139.20	9.8	141.7	26.4	141.00
8/28/2007	177.20		31.5	169.7	11.8	138.90	10.2	141.3	26.4	141.00
9/26/2007	177.00		30.5	170.7	11.9	138.80	10.2	141.3	26.1	141.30
10/30/2007	175.50		31.9	169.3	12.3	138.40	10.3	141.2	26.0	141.40
11/27/2007	175.90		31.8	169.4	12.6	138.10	10.3	141.2	25.5	141.90
12/27/2007	178.20		30.3	170.9	12.6	138.10	10.6	140.9	25.4	142.00
1/30/2008	184.40		27.2	174	10.8	139.90	10.3	141.2	24.2	143.23
2/26/2008	186.10		25.6	175.6	9.7	141.00	9.2	142.3	23.6	143.80
3/26/2008	188.00		24.4	176.8	10.0	140.70	9.0	142.5	23.4	144.00
4/25/2008	191.00		22.2	179.0	10.2	140.50	8.9	142.6	23.1	144.30
5/28/2008	190.93		21.9	179.3	10.2	140.60	8.9	142.6	22.6	144.81
6/25/2008	189.50		22.2	179.0	10.2	140.50	8.9	142.6	22.8	144.60
7/29/2008	185.10		24.5	176.7	10.3	140.40	9.0	142.5	23.1	144.30
7/30/2008	185.10	0.00	24.4	176.8	10.3	140.40	8.9	142.6	23.0	144.40
8/27/2008	178.00	0.00	29.3	171.9	10.5	140.20	9.2	142.3	24.0	143.40
9/25/2008	176.80	0.00	30.3	170.9	10.7	140.00	8.9	142.6	24.6	142.80
10/28/2008	175.20	0.00	36.6	164.6	11.0	139.70	9.1	142.4	25.2	142.20
11/25/2008	175.80	1.82	31.5	169.7	11.3	139.40	9.2	142.3	25.3	142.10
12/30/2008	181.70	2.91	27.5	173.7	10.9	139.80	9.2	142.3	24.1	143.30
1/29/2009	182.20	0.39	27.1	174.1	10.9	139.80	9.1	142.4	24.0	143.40
2/25/2009	185.70	3.10	25.1	176.1	10.8	139.90	9.1	142.4	23.5	143.90

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Monitoring Well --->			3		4		5		6	
Top of Well Elevation --->			201.2		150.7		151.5		167.4	
Bottom of Well Elevation --->			155.8		129.1		129.6		127.7	
Depth of Well --->			45.4		21.6		21.9		39.7	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
3/26/2009	188.40	0.10	23.3	177.9	10.8	139.90	9.2	142.3	23.4	144.00
4/28/2009	189.30	0.00	22.4	178.8	10.9	139.80	9.1	142.4	23.1	144.30
5/18/2009	188.50	0.00	22.8	178.4	10.9	139.80	9.2	142.3	23.2	144.20
5/27/2009	188.10	0.00	23.0	178.2	10.9	139.80	9.2	142.3	23.2	144.20
6/30/2009	188.60	0.10	22.8	178.4	11.0	139.70	9.0	142.5	23.7	143.70
7/30/2009	184.80	0.00	24.7	176.5	11.0	139.70	9.1	142.4	23.4	144.00
8/26/2009	176.60	0.00	29.2	172.0	11.1	139.60	9.1	142.4	24.2	143.20
9/30/2009	174.50	0.00	32.1	169.1	11.3	139.40	9.2	142.3	25.3	142.10
10/28/2009	175.30	0.29	31.8	169.4	11.5	139.20	8.3	143.2	25.6	141.80
12/1/2009	176.40	0.00	31.5	169.7	11.9	138.80	9.5	142.0	25.7	141.70
12/28/2009	178.80	2.75	29.9	171.3	11.3	139.40	9.5	142.0	24.9	142.50
1/26/2010	191.30	4.15	22.8	178.4	9.9	140.80	9.2	142.3	23.8	143.60
2/24/2010	193.60	2.29	20.3	180.9	9.8	140.90	7.9	143.6	22.0	145.40
3/29/2010	193.50	1.18	19.7	181.5	8.5	142.20	8.2	143.3	22.0	145.40
4/4/2010	193.50		19.8	181.4	8.7	142.00	8.2	143.3	22.1	145.30
4/27/2010	193.90	1.66	19.5	181.7	8.9	141.80	7.8	143.7	22.0	145.40
5/27/2010	192.90	0.03	19.9	181.3	9.2	141.50	7.8	143.7	22.0	145.40
6/29/2010	191.60	0.00	20.6	180.6	9.5	141.20	7.7	143.8	22.0	145.40
7/28/2010	187.50	0.00	22.6	178.6	9.8	140.90	7.8	143.7	22.4	145.00
8/31/2010	179.20	0.00	27.9	173.3	10.2	140.50	8.0	143.5	23.6	143.80
9/29/2010	175.60	0.00	31.2	170.0	10.6	140.10	8.1	143.4	24.9	142.50
10/26/2010	178.20	2.93	30.5	170.7	10.8	139.90	9.7	141.8	24.9	142.50
11/30/2010	178.80	1.14	30.2	171.0	11.6	139.10	8.3	143.2	25.0	142.40
12/30/2010	193.90	9.95	20.4	180.8	8.6	142.10	5.9	145.6	22.0	145.40
1/27/2011	194.00	0.86	20.0	181.2	9.3	141.40	6.2	145.4	22.0	145.40
2/23/2011	193.80	1.02	20.0	181.3	9.5	141.20	5.9	145.6	22.0	145.39
3/29/2011	193.90	2.38	19.6	181.6	8.9	141.80	6.7	144.8	21.7	145.70
4/27/2011	193.60	0.56	19.7	181.5	9.0	141.70	7.0	144.5	22.0	145.40

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Bottom of Well Elevation --->			155.8		129.1		129.6		127.7	
Depth of Well --->			45.4		21.6		21.9		39.7	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
5/25/2011	193.10	0.51	20.2	181.0	9.2	141.50	7.0	144.5	21.9	145.50
6/28/2011	192.00	0.00	20.7	180.5	9.3	141.40	7.2	144.3	22.0	145.40
7/27/2011	186.75	0.00	23.5	177.8	9.4	141.40	7.1	144.4	22.4	145.00
8/25/2011	176.30	0.00	29.7	171.5	9.7	141.00	7.2	144.3	23.6	143.80
9/28/2011	176.00	0.06	24.7	176.5	10.5	140.30	7.6	143.9	24.9	142.50
10/25/2011	176.50	0.89	31.7	169.5	11.0	139.70	8.1	143.4	25.2	142.20
11/22/2011	177.20	1.31	31.7	169.6	11.1	139.70	8.2	143.4	25.2	142.20
12/22/2011	176.70	0.20	31.7	169.5	11.5	139.20	8.2	143.3	25.4	142.00
1/25/2012	178.60	0.84	30.8	170.4	11.7	139.00	8.3	143.2	25.0	142.40
2/28/2012	179.20	0.68	30.5	170.7	11.7	139.00	8.5	143.0	25.0	142.40
3/27/2012	180.60	1.73	29.7	171.5	11.5	139.20	8.4	143.1	24.8	142.65
6/27/2012	180.70	0.00	28.0	173.2	10.3	140.40	8.8	142.7	24.9	142.50
7/26/2012	179.20	0.10	29.8	171.5	10.9	139.80	8.8	142.7	25.1	142.30
8/8/2012	178.50	0.10	30.1	171.1	10.8	139.90	8.6	142.9	25.3	142.10
8/28/2012	177.10	0.00	31.0	170.2	11.2	139.50	8.7	142.8	25.6	141.80
8/29/2012	177.10	0.00	30.8	170.4	11.0	139.70	8.5	143.0	25.5	141.90
9/25/2012	175.30	0.00	32.2	169.0	11.6	139.10	8.8	142.7	26.1	141.30
10/30/2012	176.00	0.19	32.0	169.2	12.1	138.60	8.9	142.6	26.3	141.10
11/27/2012	175.80	0.69	32.2	169.0	12.4	138.30	9.4	142.1	26.0	141.40
12/12/2012	176.10	1.40	31.9	169.3	12.5	138.20	9.5	142.0	25.8	141.60
1/22/2013	177.20	1.20	31.3	169.9	12.5	138.20	9.6	141.9	25.1	142.30
2/27/2013	178.20	0.31	30.7	170.5	12.2	138.50	9.3	142.2	24.7	142.70
3/28/2013	178.20	0.71	31.0	170.2	12.1	138.60	9.5	142.0	24.7	142.70
4/25/2013	177.30	0.03	31.6	169.6	12.2	138.60	9.6	141.9	25.1	142.30
5/22/2013	177.60	0.00	31.4	169.8	12.1	138.60	9.6	141.9	25.3	142.10
6/25/2013	177.50	0.00	31.4	169.9	12.2	138.60	9.6	141.9	25.5	141.95
7/23/2013	175.70	0.00	32.4	168.8	12.3	138.40	9.7	141.8	25.9	141.50
8/21/2013	174.50	0.00	32.8	168.4	12.5	138.20	9.7	141.8	26.3	141.10

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Bottom of Well Elevation --->			155.8		129.1		129.6		127.7	
Depth of Well --->			45.4		21.6		21.9		39.7	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
9/25/2013	175.70	0.00	32.4	168.8	12.9	137.80	10.2	141.3	26.5	140.90
10/29/2013	176.00	0.00	32.2	169.0	13.0	137.70	10.2	141.3	26.3	141.15
11/27/2013	176.50	0.44	31.8	169.4	12.9	137.80	10.0	141.5	25.9	141.50
12/19/2013	176.80	0.53	31.7	169.5	13.1	137.60	10.2	141.3	25.8	141.60
1/28/2014	176.80	0.00	32.0	169.2	13.0	137.70	10.3	141.2	25.5	141.90
2/25/2014	176.70	0.72	32.2	169.0	12.8	137.90	10.3	141.2	25.4	142.05
3/25/2014	178.50		30.9	170.3	8.1	142.60	10.2	141.3	24.9	142.50
3/29/2014	178.40	1.44	31.1	170.1	8.2	142.50	10.3	141.2	24.9	142.50
4/25/2014	177.40	0.74	31.5	169.7	8.9	141.80	10.2	141.3	25.0	142.40
5/28/2014	176.40	0.00	32.4	168.8	9.7	141.00	10.3	141.3	25.7	141.70
6/25/2014	176.10	0.00	32.2	169.0	10.3	140.40	10.2	141.3	26.3	141.10
7/30/2014	177.30	0.00	31.6	169.6	10.7	140.10	10.2	141.3	26.4	141.00
8/26/2014	176.10	0.03	32.1	169.1	11.0	139.70	10.2	141.3	26.4	141.00
9/23/2014	175.90	0.00	32.0	169.2	11.4	139.30	10.3	141.2	26.7	140.75
10/30/2014	176.30	0.00	32.1	169.1	11.9	138.80	10.5	141.0	26.5	140.90
11/21/2014	176.20	0.25	31.8	169.4	12.1	138.60	10.5	141.0	26.2	141.20
12/30/2014	178.90	3.37	30.3	170.9	11.9	138.80	10.5	141.0	25.2	142.20
1/27/2015	179.60	0.89	29.9	171.3	11.9	138.80	10.5	141.1	24.8	142.60
2/27/2015	180.00	0.46	29.7	171.5	11.9	138.80	10.5	141.0	24.6	142.80
3/26/2015	179.60	0.45	30.0	171.2	11.9	138.80	10.4	141.1	24.5	142.90
4/29/2015	178.20	0.24	30.8	170.4	11.9	138.80	10.6	140.9	24.9	142.50
5/27/2015	179.00	1.04	30.8	170.4	12.0	138.70	10.4	141.1	24.9	142.50
6/25/2015	179.60	0.00	29.8	171.4	12.0	138.70	10.3	141.2	25.0	142.40
7/29/2015	178.10	0.00	30.8	170.4	12.3	138.40	10.4	141.1	25.3	142.10
8/26/2015	176.20	0.00	31.9	169.3	12.3	138.40	10.4	141.1	25.6	141.80
9/22/2015	178.20	1.64	31.0	170.2	9.3	141.40	10.5	141.0	25.3	142.10
10/27/2015	176.90	0.10	31.4	169.8	9.9	140.80	10.5	141.0	25.3	142.10
11/24/2015	176.30	0.17	32.5	168.7	10.4	140.30	10.6	140.9	25.7	141.70

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Depth of Well --->			45.4		21.6		21.9		39.7	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
12/22/2015	177.60	0.72	31.2	170.0	10.7	140.00	10.5	141.0	25.2	142.20
1/27/2016	180.10	2.86	30.2	171.0	10.2	140.50	10.5	141.0	24.5	142.90
2/25/2016	181.60	0.20	29.2	172.0	10.6	140.10	9.9	141.6	24.2	143.20
3/24/2016	184.80		27.6	173.6	10.1	140.60	9.8	141.7	24.0	143.40
3/31/2016	184.50	1.51	27.6	173.6	10.2	140.50	9.8	141.7	24.1	143.30
4/28/2016	183.60	0.04	27.8	173.4	10.4	140.30	9.8	141.7	24.3	143.10
5/25/2016	182.50	0.13	28.4	172.8	10.6	140.10	9.8	141.7	24.4	143.00
6/28/2016	180.70	0.00	29.3	171.9	11.0	139.70	9.9	141.6	24.9	142.50
7/27/2016	178.40	0.00	30.7	170.5	11.1	139.60	9.9	141.6	25.5	141.90
8/24/2016	176.40	0.00	32.1	169.2	11.4	139.30	10.0	141.5	25.6	141.80
9/27/2016	175.80	0.00	32.7	168.5	11.8	138.90	10.1	141.4	26.4	141.00
10/26/2016	178.60	0.64	31.0	170.2	11.2	139.50	10.2	141.3	25.4	142.00
11/22/2016	178.30	1.11	31.2	170.0	12.2	138.50	10.3	141.3	26.1	141.30
12/28/2016	184.80	4.01	29.3	172.0	12.3	138.40	10.3	141.2	25.5	141.95
1/25/2017	193.30	6.33	22.5	178.7	11.0	139.70	7.1	144.4	22.6	144.80
2/28/2017	193.90	3.27	21.4	179.8	9.3	141.40	6.7	144.8	21.1	146.30
3/29/2017	193.70	0.08	21.2	180.0	9.1	141.60	7.2	144.3	21.4	146.00
4/27/2017	192.90	0.04	21.5	179.7	9.0	141.70	7.2	144.3	21.4	146.00
5/23/2017	187.90	0.33	23.8	177.4	9.1	141.60	7.3	144.2	21.9	145.50
6/21/2017	182.50	0.00	27.0	174.2	9.3	141.40	7.3	144.2	22.6	144.80
7/26/2017	163.60	0.00	34.6	166.6	9.7	141.00	8.3	143.3	24.4	143.00
8/30/2017	163.60	0.00	37.8	163.4	10.5	140.20	7.2	144.3	25.9	141.50
9/28/2017	163.60	0.00	40.2	161.0	11.4	139.30	10.5	141.0	26.9	140.50
10/26/2017	171.80	0.00	41.4	159.8	11.7	139.00	10.6	140.9	27.3	140.10
11/29/2017	177.20	0.08	33.1	168.1	12.3	138.40	10.9	140.6	27.1	140.30
12/27/2017	176.70	0.00	32.6	168.6	12.7	138.00	11.1	140.4	27.1	140.30
1/24/2018	178.10	1.67	31.8	169.4	13.0	137.70	11.1	140.4	27.1	140.30
2/21/2018	177.80	0.27	31.8	169.4	13.2	137.50	11.1	140.4	26.6	140.80

Notes:
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TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			3		4		5		6	
Top of Well Elevation --->			201.2		150.7		151.5		167.4	
Bottom of Well Elevation --->			155.8		129.1		129.6		127.7	
Depth of Well --->			45.4		21.6		21.9		39.7	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
3/28/2018	183.50	1.23	28.8	172.4	13.3	137.40	11.2	140.3	26.1	141.30
4/27/2018	184.30	0.05	27.9	173.3	13.4	137.30	11.3	140.2	25.9	141.50
5/30/2018	183.10	0.13	28.2	173.0	13.5	137.20	11.7	139.8	25.7	141.70
6/28/2018	181.70	0.00	29.2	172.0	13.4	137.30	11.2	140.3	25.7	141.70
7/26/2018	180.00	0.00	30.4	170.8	13.4	137.30	11.2	140.3	24.7	142.70
8/28/2018	177.30	0.00	31.8	169.4	13.7	137.00	11.2	140.3	26.6	140.80
9/27/2018	178.10	0.00	32.0	169.2	13.8	136.90	11.3	140.2	26.7	140.70
10/24/2018	178.00	0.66	31.7	169.5	14.0	136.70	11.3	140.2	26.6	140.80
11/29/2018	177.50	1.60	31.8	169.4	14.5	136.20	11.4	140.1	26.6	140.80
12/20/2018	181.40	2.39	29.3	171.9	13.7	137.00	11.4	140.1	25.5	141.90
1/30/2019	189.40	4.56	24.4	176.8	11.4	139.30	9.3	142.2	24.0	143.40
2/27/2019	194.10	7.48	21.5	179.7	10.3	140.40	7.0	144.5	21.4	146.00
3/27/2019	194.00	1.27	21.2	180.0	9.9	140.80	7.4	144.1	21.5	145.90
4/24/2019	193.60	0.07	21.05	180.2	9.80	140.90	7.50	144.0	21.70	145.70
5/30/2019	191.40	0.73	22.20	179.0	9.70	141.00	5.00	146.5	21.90	145.50
6/26/2019	190.80	0.02	22.30	178.9	9.70	141.00	7.60	143.9	22.00	145.40
7/5/2015	190.40	0.00	22.60	178.6	9.70	141.00	7.60	143.9	22.10	145.30
7/30/2019	188.95	0.00	22.90	178.3	9.90	140.80	7.60	143.9	22.40	145.00
8/27/2019	187.40	0.00	24.10	177.1	10.50	140.20	8.10	143.4	22.70	144.70
9/26/2019	186.20	0.00	23.80	177.4	10.10	140.60	7.30	144.2	21.90	145.50
10/22/2019	185.20	0.00	25.50	175.7	10.80	139.90	8.00	143.5	23.50	143.90
11/26/2019	183.50	2.66	26.20	175.0	10.80	139.90	8.15	143.4	23.50	143.90
12/18/2019	186.80	4.44	24.50	176.7	10.70	140.00	8.20	143.3	22.85	144.55
1/28/2020	192.00	0.24	20.10	181.1	9.90	140.80	7.70	143.8	21.70	145.70
2/25/2020	192.10	0.49	21.00	180.2	9.20	141.50	7.60	143.9	21.60	145.80
3/24/2020	194.00	3.89	20.70	180.5	9.80	140.90	7.40	144.1	21.20	146.20
4/29/2020	193.50	4.59	19.25	182.0	8.15	142.55	6.75	144.8	20.60	146.80
5/27/2020	193.10	0.03	19.80	181.4	8.50	142.20	7.00	144.5	20.70	146.70
6/24/2020	190.00	0.00	20.70	180.5	8.70	142.00	7.30	144.2	20.60	146.80

Notes:
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TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			3		4		5		6	
Top of Well Elevation --->			201.2		150.7		151.5		167.4	
Bottom of Well Elevation --->			155.8		129.1		129.6		127.7	
Depth of Well --->			45.4		21.6		21.9		39.7	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
7/29/2020	188.90	0.00	22.30	178.9	9.10	141.60	7.20	144.3	21.30	146.10
8/27/2020	185.90	0.00	24.00	177.2	9.10	141.60	7.20	144.3	21.60	145.80
9/29/2020	183.10	0.00	26.10	175.1	9.35	141.35	7.30	144.2	22.25	145.15
10/29/2020	180.30	0.00	27.80	173.4	9.60	141.10	7.40	144.1	23.00	144.40
11/24/2020	179.00	0.65	27.00	174.2	9.80	140.90	7.60	143.9	23.70	143.70
12/29/2020	179.00	1.03	29.10	172.1	10.10	140.60	7.90	143.6	24.10	143.30
1/26/2021	180.50	2.39	28.60	172.6	10.30	140.40	8.00	143.5	24.00	143.40
2/25/2021	182.10	0.03	27.50	173.7	10.40	140.30	8.90	142.6	23.70	143.70
3/23/2021	182.90	1.15	27.20	174.0	10.50	140.20	8.10	143.4	23.60	143.80
4/27/2021	182.00	0.04	27.70	173.5	10.70	140.00	8.20	143.3	24.00	143.40
5/26/2021	181.00	0.11	28.20	173.0	10.80	139.90	8.30	143.2	24.10	143.30
6/30/2021	179.00	0.00	29.40	171.8	11.00	139.70	8.40	143.1	24.40	143.00
7/27/2021	177.10	0.08	30.50	170.7	11.20	139.50	8.70	142.8	24.80	142.60
8/24/2021	175.40	0.00	31.80	169.4	11.40	139.30	8.90	142.6	25.20	142.20
9/28/2021	175.20	0.06	32.40	168.8	11.70	139.00	9.50	142.0	25.30	142.10
10/27/2021	177.20	0.80	31.40	169.8	12.00	138.70	9.60	141.9	25.50	141.90
11/23/2021	177.80	0.00	30.40	170.8	12.20	138.50	9.60	141.9	25.40	142.00
12/21/2021	180.50	5.86	29.20	172.0	12.30	138.40	9.70	141.8	24.90	142.50
1/25/2022	187.00	0.08	22.50	178.7	9.70	141.00	7.20	144.3	21.60	145.80
2/22/2022	186.60	0.18	25.60	175.6	11.40	139.30	9.30	142.2	23.60	143.80
3/28/2022	186.60	1.38	23.90	177.3	10.70	140.00	8.20	143.3	22.40	145.00
4/26/2022	186.60	0.01	25.70	175.5	11.20	139.50	9.10	142.4	23.70	143.70
5/25/2022	185.30	0.05	26.20	175.0	11.10	139.60	9.10	142.4	23.90	143.50
6/28/2022	182.70	0.00	27.40	173.8	11.30	139.40	9.20	142.3	24.30	143.10
7/26/2022	179.70	0.00	29.20	172.0	11.40	139.30	9.30	142.2	24.80	142.60
8/30/2022	178.30	0.13	30.70	170.5	11.70	139.00	9.50	142.0	25.40	142.00
9/29/2022	175.80	0.24	31.60	169.6	12.10	138.60	9.70	141.8	25.70	141.70
10/26/2022	175.30	0.26	32.30	168.9	12.20	138.50	9.70	141.8	25.70	141.70
11/22/2022	179.40	1.46	30.20	171.0	12.30	138.40	9.90	141.6	25.40	142.00

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JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			3		4		5		6	
Top of Well Elevation --->			201.2		150.7		151.5		167.4	
Bottom of Well Elevation --->			155.8		129.1		129.6		127.7	
Depth of Well --->			45.4		21.6		21.9		39.7	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
12/29/2022	185.70	2.21	26.00	175.2	12.00	138.70	9.90	141.6	24.30	143.10
1/11/2023	191.70	3.90	23.60	177.60	9.10	141.60	9.40	142.10	23.70	143.70
1/25/2023	194.00	7.17	21.40	179.80	0.04	150.66	7.80	143.70	22.40	145.00
2/28/2023	194.00	3.98	21.10	180.10	0.00	150.70	7.00	144.50	21.80	145.60
3/29/2023	194.00	5.92	20.30	180.90	0.00	150.70	6.40	145.10	20.40	147.00
4/25/2023	194.00	0.19	21.20	180.00	0.90	149.80	7.50	144.00	21.60	145.80
5/24/2023	193.40	0.89	20.87	180.33	1.61	149.09	7.70	143.80	21.77	145.63
6/28/2023	192.70	0.07	21.40	179.80	2.40	148.30	7.70	143.80	21.90	145.50
7/26/2023	191.60	0.00	21.60	179.60	3.00	147.70	7.80	143.70	22.00	145.40
8/29/2023	190.50	1.84	22.20	179.00	3.64	147.06	7.76	143.74	21.94	145.46
9/26/2023	189.80	0.00	22.60	178.60	4.10	146.60	7.60	143.90	21.80	145.60
10/25/2023	189.70	0.19	23.20	178.00	4.60	146.10	7.70	143.80	22.10	145.30
11/30/2023	189.20	0.65	23.40	177.80	5.10	145.60	7.80	143.70	21.90	145.50
12/27/2023	190.00	1.15	23.40	177.80	5.60	145.10	7.80	143.70	21.90	145.50
1/29/2024	191.90	2.00	22.40	178.80	6.40	144.30	7.90	143.60	21.90	145.50
2/27/2024	194.00	8.89	20.40	180.80	0.05	150.65	6.00	145.50	19.60	147.80
3/27/2024	193.80	2.51	20.75	180.45	0.50	150.20	6.80	144.70	20.40	147.00
4/23/2024	194.00	1.51	20.70	180.50	1.10	149.60	6.90	144.60	20.20	147.20
5/1/2024	193.90	0.00	20.65	180.55	1.30	149.40	6.95	144.55	20.35	147.05
5/23/2024	193.10	0.08	21.15	180.05	1.65	149.05	7.20	144.30	20.50	146.90
6/20/2024	191.50	0.00	22.10	179.10	2.10	148.60	7.30	144.20	20.80	146.60
7/25/2024	188.70	0.00	23.80	177.40	2.70	148.00	7.30	144.20	21.30	146.10
8/28/2024	185.90	0.00	24.30	176.90	3.30	147.40	7.60	143.90	22.00	145.40
9/18/2024	183.95	0.00	26.50	174.70	3.70	147.00	7.70	143.80	22.50	144.90
10/30/2024	182.00	0.00	27.50	173.70	10.70	140.00	8.80	142.70	23.30	144.10
11/26/2024	177.30	0.06	30.37	170.83	10.83	139.87	8.84	142.66	23.87	143.53
12/17/2024	175.70	0.04	31.30	169.90	11.30	139.40	9.60	141.90	24.60	142.80

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TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			7		8A		8B		VBW9A	
Top of Well Elevation --->			169.2		202.3		202.2		184	
Bottom of Well Elevation --->			152.7		164.3		144.5		160.4	
Depth of Well --->			16.5		38		57.7		23.6	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
1/31/2007	176.80		8.4	160.8	35.8	166.5	46.9	155.30	22.5	161.50
2/28/2007	177.60		8.1	161.1	36.3	166.0	47.0	155.20	23.1	160.90
3/29/2007	177.10		8.3	160.9	36.3	166.0	47.2	155.00	23.3	160.70
4/27/2007	176.60		8.7	160.5	36.2	166.1	47.0	155.20	23.2	160.80
5/24/2007	176.80		9.4	159.8	36.6	165.7	47.3	154.90	23.4	160.60
6/27/2007	179.90		8.2	161.0	36.0	166.3	46.1	156.10	23.2	160.80
7/27/2007	177.80		7.8	161.4	35.9	166.4	46.5	155.70	23.1	160.90
8/28/2007	177.20		8.6	160.6	36.0	166.3	46.7	155.50	23.0	161.00
9/26/2007	177.00		7.5	161.7	36.0	166.3	46.5	155.70	23.1	160.90
10/30/2007	175.50		8.0	161.2	36.3	166.0	47.2	155.00	23.3	160.70
11/27/2007	175.90		7.9	161.3	36.6	165.7	47.2	155.00	23.5	160.50
12/27/2007	178.20		7.4	161.8	36.4	165.9	46.6	155.60	23.4	160.60
1/30/2008	184.40		6.7	162.5	35.6	166.8	45.0	157.30	23.3	160.70
2/26/2008	186.10		5.8	163.4	34.5	167.8	44.1	158.10	22.7	161.30
3/26/2008	188.00		5.4	163.8	33.5	168.8	43.7	158.50	22.3	161.70
4/25/2008	191.00		4.5	164.7	32.2	170.1	42.6	159.60	21.7	162.30
5/28/2008	190.93		4.5	164.7	31.4	170.9	42.3	159.90	21.2	162.80
6/25/2008	189.50		5.0	164.2	31.9	170.4	42.6	159.60	20.8	163.20
7/29/2008	185.10		6.9	162.3	32.0	170.3	43.3	158.90	20.9	163.10
7/30/2008	185.10	0.00	4.9	164.3	31.9	170.4	43.3	158.90	20.8	163.20
8/27/2008	178.00	0.00	6.3	162.9	33.6	168.7	45.6	156.60	21.4	162.60
9/25/2008	176.80	0.00	6.9	162.3	34.8	167.5	46.0	156.20	22.1	161.90
10/28/2008	175.20	0.00	7.4	161.8	35.6	166.7	46.8	155.40	22.5	161.50
11/25/2008	175.80	1.82	7.7	161.5	36.1	166.2	47.0	155.20	22.8	161.20
12/30/2008	181.70	2.91	6.5	162.7	35.6	166.7	45.1	157.10	22.8	161.20
1/29/2009	182.20	0.39	6.0	163.2	34.9	167.4	44.7	157.50	22.7	161.30
2/25/2009	185.70	3.10	5.8	163.4	34.6	167.7	43.9	158.30	22.4	161.60

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JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			7		8A		8B		VBW9A	
Top of Well Elevation --->			169.2		202.3		202.2		184	
Bottom of Well Elevation --->			152.7		164.3		144.5		160.4	
Depth of Well --->			16.5		38		57.7		23.6	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
3/26/2009	188.40	0.10	5.0	164.2	33.0	169.3	43.1	159.10	21.9	162.10
4/28/2009	189.30	0.00	3.7	165.5	31.9	170.4	42.7	159.50	21.4	162.60
5/18/2009	188.50	0.00	4.5	164.7	31.9	170.4	42.7	159.50	21.0	163.00
5/27/2009	188.10	0.00	4.6	164.6	31.9	170.4	42.9	159.30	21.0	163.00
6/30/2009	188.60	0.10	4.3	164.9	31.7	170.6	42.6	159.60	21.0	163.00
7/30/2009	184.80	0.00	4.5	164.7	32.0	170.3	43.2	159.00	20.9	163.10
8/26/2009	176.60	0.00	5.8	163.4	33.3	169.0	45.1	157.10	21.4	162.60
9/30/2009	174.50	0.00	7.7	161.5	35.1	167.2	46.6	155.60	22.2	161.80
10/28/2009	175.30	0.29	7.8	161.4	35.6	166.7	46.7	155.50	22.5	161.50
12/1/2009	176.40	0.00	7.7	161.5	36.1	166.2	46.9	155.30	22.8	161.20
12/28/2009	178.80	2.75	6.8	162.4	36.0	166.3	46.0	156.20	23.0	161.10
1/26/2010	191.30	4.15	5.5	163.7	35.4	166.9	43.2	159.00	22.9	161.10
2/24/2010	193.60	2.29	3.2	166.0	31.8	170.5	41.5	160.70	21.6	162.40
3/29/2010	193.50	1.18	3.4	165.8	31.3	171.0	41.2	161.00	20.2	163.80
4/4/2010	193.50		3.6	165.6	30.2	172.1	41.1	161.10	20.3	163.70
4/27/2010	193.90	1.66	3.4	165.8	29.8	172.5	41.0	161.20	19.5	164.50
5/27/2010	192.90	0.03	3.4	165.8	29.8	172.5	41.0	161.20	19.4	164.60
6/29/2010	191.60	0.00	3.1	166.1	29.9	172.4	41.2	161.00	19.4	164.60
7/28/2010	187.50	0.00	3.3	165.9	30.6	171.7	42.6	159.60	19.8	164.20
8/31/2010	179.20	0.00	4.6	164.6	32.6	169.7	44.4	157.80	21.0	163.00
9/29/2010	175.60	0.00	6.3	162.9	34.2	168.1	45.8	156.40	21.5	162.50
10/26/2010	178.20	2.93	6.8	162.4	35.2	167.1	45.8	156.40	22.3	161.70
11/30/2010	178.80	1.14	6.4	162.8	35.7	166.6	45.8	156.40	22.8	161.20
12/30/2010	193.90	9.95	4.1	165.1	33.8	168.5	41.3	160.90	19.6	164.40
1/27/2011	194.00	0.86	2.9	166.3	30.3	172.0	41.0	161.20	19.2	164.80
2/23/2011	193.80	1.02	2.8	166.4	29.5	172.9	40.7	161.50	18.7	165.40
3/29/2011	193.90	2.38	2.7	166.5	28.8	173.5	40.4	161.80	16.3	167.70
4/27/2011	193.60	0.56	2.8	166.5	29.0	173.3	40.5	161.70	18.2	165.90

Notes:
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TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			7		8A		8B		VBW9A	
Top of Well Elevation --->			169.2		202.3		202.2		184	
Bottom of Well Elevation --->			152.7		164.3		144.5		160.4	
Depth of Well --->			16.5		38		57.7		23.6	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
5/25/2011	193.10	0.51	2.5	166.7	29.4	172.9	40.6	161.60	18.8	165.20
6/28/2011	192.00	0.00	2.5	166.7	29.6	172.7	40.9	161.30	19.2	164.80
7/27/2011	186.75	0.00	2.9	166.3	30.7	171.6	42.1	160.10	19.7	164.30
8/25/2011	176.30	0.00	4.7	164.5	32.7	169.6	44.8	157.40	20.9	163.10
9/28/2011	176.00	0.06	6.6	162.6	34.9	167.4	46.0	156.20	22.1	161.90
10/25/2011	176.50	0.89	6.7	162.5	35.8	166.5	46.1	156.10	22.5	161.50
11/22/2011	177.20	1.31	6.7	162.6	36.0	166.4	46.2	156.00	22.8	161.20
12/22/2011	176.70	0.20	6.3	162.9	35.9	166.4	45.9	156.30	22.9	161.10
1/25/2012	178.60	0.84	6.5	162.7	35.7	166.6	45.5	156.70	22.8	161.20
2/28/2012	179.20	0.68	6.4	162.8	35.9	166.4	45.6	156.60	22.8	161.20
3/27/2012	180.60	1.73	6.3	162.9	35.6	166.7	45.0	157.20	23.0	161.10
6/27/2012	180.70	0.00	5.9	163.3	34.4	167.9	44.6	157.60	22.4	161.60
7/26/2012	179.20	0.10	6.3	162.9	35.0	167.3	45.1	157.10	22.5	161.50
8/8/2012	178.50	0.10	6.2	163.0	34.8	167.5	45.2	157.00	22.4	161.60
8/28/2012	177.10	0.00	6.5	162.7	35.3	167.0	45.6	156.60	22.6	161.40
8/29/2012	177.10	0.00	6.4	162.8	35.0	167.3	45.5	156.70	22.3	161.70
9/25/2012	175.30	0.00	7.0	162.2	35.7	166.6	46.3	155.90	22.8	161.20
10/30/2012	176.00	0.19	7.0	162.2	36.3	166.0	46.4	155.80	23.2	160.80
11/27/2012	175.80	0.69	7.0	162.2	36.4	165.9	46.5	155.70	23.3	160.70
12/12/2012	176.10	1.40	6.9	162.3	36.3	166.0	46.3	155.90	23.1	160.90
1/22/2013	177.20	1.20	6.4	162.8	36.4	165.9	45.8	156.40	23.3	160.70
2/27/2013	178.20	0.31	6.1	163.1	36.0	166.3	45.4	156.80	23.1	160.90
3/28/2013	178.20	0.71	6.4	162.8	36.0	166.3	45.5	156.70	23.3	160.70
4/25/2013	177.30	0.03	6.6	162.6	36.1	166.2	45.8	156.40	23.3	160.80
5/22/2013	177.60	0.00	6.6	162.6	36.1	166.2	45.7	156.50	23.2	160.80
6/25/2013	177.50	0.00	6.5	162.7	36.2	166.1	45.7	156.50	23.3	160.70
7/23/2013	175.70	0.00	6.8	162.4	36.3	166.0	46.3	156.00	23.3	160.70
8/21/2013	174.50	0.00	7.0	162.2	38.0	164.3	46.5	155.70	23.3	160.70

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TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			7		8A		8B		VBW9A	
Top of Well Elevation --->			169.2		202.3		202.2		184	
Bottom of Well Elevation --->			152.7		164.3		144.5		160.4	
Depth of Well --->			16.5		38		57.7		23.6	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
9/25/2013	175.70	0.00	6.8	162.4	36.2	166.1	46.3	155.90	23.4	160.60
10/29/2013	176.00	0.00	6.5	162.7	36.6	165.7	46.2	156.00	23.5	160.60
11/27/2013	176.50	0.44	6.1	163.1	36.4	165.9	45.9	156.30	23.3	160.70
12/19/2013	176.80	0.53	6.2	163.0	36.3	166.0	45.8	156.40	23.2	160.80
1/28/2014	176.80	0.00	6.2	163.0	36.5	165.8	45.9	156.30	23.5	160.50
2/25/2014	176.70	0.72	6.3	163.0	36.5	165.8	45.9	156.30	23.5	160.50
3/25/2014	178.50		6.0	163.3	36.2	166.1	45.4	156.90	23.4	160.60
3/29/2014	178.40	1.44	5.9	163.3	36.4	165.9	45.5	156.70	23.5	160.50
4/25/2014	177.40	0.74	6.1	163.1	36.1	166.2	45.5	156.70	23.3	160.70
5/28/2014	176.40	0.00	6.6	162.6	36.3	166.0	46.0	156.20	23.3	160.70
6/25/2014	176.10	0.00	6.4	162.8	36.4	165.9	44.9	157.30	23.3	160.70
7/30/2014	177.30	0.00	6.2	163.0	36.3	166.0	45.6	156.70	23.2	160.90
8/26/2014	176.10	0.03	6.1	163.1	36.2	166.1	45.6	156.60	23.6	160.40
9/23/2014	175.90	0.00	6.0	163.2	36.4	166.0	45.7	156.50	23.3	160.80
10/30/2014	176.30	0.00	5.9	163.3	36.3	166.0	45.8	156.40	23.3	160.70
11/21/2014	176.20	0.25	5.8	163.4	36.3	166.0	45.5	156.70	23.2	160.80
12/30/2014	178.90	3.37	5.3	163.9	36.0	166.3	44.9	157.30	23.1	160.90
1/27/2015	179.60	0.89	5.2	164.0	35.8	166.5	44.6	157.60	23.2	160.90
2/27/2015	180.00	0.46	5.2	164.0	35.2	167.1	44.3	157.90	22.8	161.20
3/26/2015	179.60	0.45	5.3	163.9	35.3	167.0	44.4	157.80	22.8	161.20
4/29/2015	178.20	0.24	5.6	163.6	35.3	167.0	44.8	157.40	22.6	161.40
5/27/2015	179.00	1.04	5.8	163.4	35.7	166.6	45.0	157.20	22.9	161.10
6/25/2015	179.60	0.00	5.2	164.0	35.2	167.1	44.5	157.70	23.0	161.00
7/29/2015	178.10	0.00	5.4	163.8	35.3	167.0	44.8	157.40	22.6	161.40
8/26/2015	176.20	0.00	5.6	163.6	35.6	166.7	45.2	157.00	22.7	161.30
9/22/2015	178.20	1.64	5.6	163.6	35.8	166.5	44.9	157.30	22.9	161.10
10/27/2015	176.90	0.10	5.4	163.8	35.8	166.5	45.0	157.20	22.5	161.50
11/24/2015	176.30	0.17	5.6	163.6	35.8	166.5	45.3	156.90	23.2	160.80

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SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			7		8A		8B		VBW9A	
Top of Well Elevation --->			169.2		202.3		202.2		184	
Bottom of Well Elevation --->			152.7		164.3		144.5		160.4	
Depth of Well --->			16.5		38		57.7		23.6	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
12/22/2015	177.60	0.72	5.5	163.7	35.8	166.5	44.9	157.30	22.9	161.10
1/27/2016	180.10	2.86	5.3	163.9	36.0	166.3	44.7	157.50	23.5	160.50
2/25/2016	181.60	0.20	5.0	164.2	34.9	167.4	43.8	158.40	23.5	160.50
3/24/2016	184.80		4.8	164.4	34.5	167.8	43.3	158.90	23.4	160.60
3/31/2016	184.50	1.51	4.7	164.5	34.4	167.9	43.1	159.10	23.3	160.70
4/28/2016	183.60	0.04	4.8	164.4	33.8	168.5	43.2	159.00	23.2	160.80
5/25/2016	182.50	0.13	4.7	164.5	34.1	168.2	43.6	158.60	22.9	161.10
6/28/2016	180.70	0.00	4.8	164.4	34.3	168.0	43.9	158.30	23.1	160.90
7/27/2016	178.40	0.00	5.1	164.1	34.6	167.7	44.6	157.60	23.2	160.80
8/24/2016	176.40	0.00	5.7	163.5	35.3	167.0	45.1	157.10	23.4	160.60
9/27/2016	175.80	0.00	6.1	163.1	35.8	166.5	45.5	156.70	23.5	160.50
10/26/2016	178.60	0.64	5.3	163.9	35.8	166.5	44.8	157.40	23.6	160.40
11/22/2016	178.30	1.11	5.6	163.7	35.7	166.6	44.8	157.40		
12/28/2016	184.80	4.01	5.2	164.0	35.5	166.8	44.0	158.20	23.4	160.60
1/25/2017	193.30	6.33	3.9	165.3	33.9	168.4	41.1	161.10	22.3	161.70
2/28/2017	193.90	3.27	3.2	166.0	30.7	171.6	40.5	161.70	21.2	162.80
3/29/2017	193.70	0.08	3.0	166.2	30.0	172.3	40.3	161.90	20.5	163.50
4/27/2017	192.90	0.04	2.7	166.5	29.7	172.6	40.0	162.20	20.4	163.60
5/23/2017	187.90	0.33	3.0	166.2	30.5	171.8	41.2	161.00	23.4	160.60
6/21/2017	182.50	0.00	3.5	165.7	31.9	170.4	42.6	159.60	21.3	162.70
7/26/2017	163.60	0.00	5.8	163.4	34.5	167.8	46.7	155.50	22.8	161.30
8/30/2017	163.60	0.00	8.7	160.5	36.4	165.9	48.6	153.60	23.5	160.50
9/28/2017	163.60	0.00	12.6	156.6	37.5	164.8	49.7	152.50	23.6	160.40
10/26/2017	171.80	0.00	14.5	154.7	37.7	164.6	48.8	153.40	23.6	160.40
11/29/2017	177.20	0.08	9.7	159.5	37.2	165.1	46.3	155.90	23.6	160.40
12/27/2017	176.70	0.00	7.6	161.6	36.7	165.6	46.1	156.10	23.6	160.40
1/24/2018	178.10	1.67	7.7	161.5	36.3	166.0	45.4	156.80	23.6	160.40
2/21/2018	177.80	0.27	6.8	162.4	36.1	166.2	45.3	156.90	23.6	160.40

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SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			7		8A		8B		VBW9A	
Top of Well Elevation --->			169.2		202.3		202.2		184	
Bottom of Well Elevation --->			152.7		164.3		144.5		160.4	
Depth of Well --->			16.5		38		57.7		23.6	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
3/28/2018	183.50	1.23	5.9	163.3	35.6	166.7	44.0	158.20	23.3	160.74
4/27/2018	184.30	0.05	5.2	164.0	34.8	167.5	43.5	158.70	23.6	160.40
5/30/2018	183.10	0.13	5.3	163.9	34.2	168.1	43.6	158.60	23.3	160.75
6/28/2018	181.70	0.00	5.7	163.5	34.2	168.1	44.0	158.20	23.3	160.70
7/26/2018	180.00	0.00	6.0	163.2	34.5	167.8	44.4	157.80	23.9	160.10
8/28/2018	177.30	0.00	6.7	162.5	35.2	167.2	45.3	156.90	23.4	160.60
9/27/2018	178.10	0.00	7.0	162.2	35.5	166.8	45.5	156.70	23.6	160.40
10/24/2018	178.00	0.66	6.2	163.0	35.6	166.7	45.3	156.90	23.6	160.40
11/29/2018	177.50	1.60	6.9	162.3	35.5	166.8	45.5	156.70	23.6	160.40
12/20/2018	181.40	2.39	6.6	162.6	35.3	167.0	44.4	157.80	23.6	160.40
1/30/2019	189.40	4.56	5.0	164.2	33.6	168.7	41.8	160.40	23.4	160.60
2/27/2019	194.10	7.48	3.5	165.7	30.8	171.5	39.7	162.50	20.1	
3/27/2019	194.00	1.27	3.9	165.3	29.6	172.7	34.3	167.90	20.9	
4/24/2019	193.60	0.07	4.25	165.0	29.40	172.9	39.30	162.90	20.10	
5/30/2019	191.40	0.73	4.60	164.6	29.90	172.4	39.90	162.30	20.50	
6/26/2019	190.80	0.02	4.50	164.7	30.30	172.0	40.20	162.00	20.70	
7/5/2015	190.40	0.00	4.40	164.8	30.50	171.8	40.30	161.90	20.80	
7/30/2019	188.95	0.00	4.70	164.5	30.70	171.6	40.50	161.70	21.00	
8/27/2019	187.40	0.00	4.70	164.5	31.10	171.2	41.20	161.00	2.31	
9/26/2019	186.20	0.00	4.70	164.5	31.50	170.8	41.20	161.00	21.70	
10/22/2019	185.20	0.00	5.00	164.2	32.40	169.9	42.00	160.20	22.00	
11/26/2019	183.50	2.66	5.10	164.1	32.70	169.6	42.50	159.70	8804.00	
12/18/2019	186.80	4.44	4.80	164.4	32.60	169.7	41.65	160.55	8803.00	
1/28/2020	192.00	0.24	4.00	165.2	30.50	171.8	39.40	162.80	23.30	
2/25/2020	192.10	0.49	4.00	165.2	30.30	172.0	39.10	163.10	87.67	
3/24/2020	194.00	3.89	4.00	165.2	3.20	199.1	39.10	163.10	8760.00	
4/29/2020	193.50	4.59	3.30	165.9	28.70	173.6	37.90	164.30	8719.457	
5/27/2020	193.10	0.03	3.00	166.2	29.00	173.3	38.10	164.10	8736.785	
6/24/2020	190.00	0.00	2.80	166.4	29.70	172.6	38.40	163.80	8749.643	

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JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			7		8A		8B		VBW9A	
Top of Well Elevation --->			169.2		202.3		202.2		184	
Bottom of Well Elevation --->			152.7		164.3		144.5		160.4	
Depth of Well --->			16.5		38		57.7		23.6	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
7/29/2020	188.90	0.00	2.90	166.3	30.30	172.0	39.40	162.80	8763.9	
8/27/2020	185.90	0.00	3.30	165.9	31.10	171.2	40.30	161.90	8779.345	
9/29/2020	183.10	0.00	4.20	165.0	32.40	169.9	41.55	160.65	8796.117	
10/29/2020	180.30	0.00	5.00	164.2	33.40	168.9	42.60	159.60	8808.922	
11/24/2020	179.00	0.65	5.70	163.5	34.00	168.3	43.30	158.90	8817.643	
12/29/2020	179.00	1.03	5.90	163.3	34.50	167.8	43.30	158.90	8824.287	
1/26/2021	180.50	2.39	4.80	164.4	34.70	167.6	43.00	159.20	23.3	160.70
2/25/2021	182.10	0.03	5.60	163.6	34.10	168.2	41.90	160.30	23.10	160.90
3/23/2021	182.90	1.15	5.40	163.8	33.80	168.5	41.40	160.80	23.20	160.80
4/27/2021	182.00	0.04	5.60	163.6	34.00	168.3	42.10	160.10	23.20	160.80
5/26/2021	181.00	0.11	5.70	163.5	34.20	168.1	42.40	159.80	23.60	160.40
6/30/2021	179.00	0.00	6.00	163.2	34.60	167.7	43.20	159.00	23.40	160.60
7/27/2021	177.10	0.08	6.50	162.7	35.00	167.3	43.90	158.30	23.50	160.50
8/24/2021	175.40	0.00	6.80	162.4	35.40	166.9	44.60	157.60	23.50	160.50
9/28/2021	175.20	0.06	6.90	162.3	35.90	166.4	45.10	157.10	23.60	160.40
10/27/2021	177.20	0.80	6.60	162.6	36.10	166.2	44.80	157.40	23.60	160.40
11/23/2021	177.80	0.00	6.20	163.0	35.70	166.6	44.20	158.00	23.60	160.40
12/21/2021	180.50	5.86	5.90	163.3	35.60	166.7	43.50	158.70	23.60	160.40
1/25/2022	187.00	0.08	3.20	166.0	39.90	162.4	39.60	162.60	23.60	160.40
2/22/2022	186.60	0.18	4.70	164.5	33.00	169.3	40.50	161.70	23.10	160.90
3/28/2022	186.60	1.38	4.60	164.6	32.30	170.0	41.50	160.70	22.80	161.20
4/26/2022	186.60	0.01	4.50	164.7	33.20	169.1	40.50	161.70	22.73	161.27
5/25/2022	185.30	0.05	4.60	164.6	32.60	169.7	41.00	161.20	22.70	161.30
6/28/2022	182.70	0.00	5.00	164.2	33.20	169.1	41.90	160.30	22.80	161.20
7/26/2022	179.70	0.00	5.40	163.8	33.90	168.4	43.00	159.20	23.00	161.00
8/30/2022	178.30	0.13	6.10	163.1	34.60	167.7	43.90	158.30	23.40	160.60
9/29/2022	175.80	0.24	6.40	162.8	35.30	167.0	44.70	157.50	23.70	160.30
10/26/2022	175.30	0.26	6.60	162.6	35.80	166.5	45.20	157.00	23.60	160.40
11/22/2022	179.40	1.46	6.00	163.2	35.90	166.4	44.30	157.90	23.60	160.40

Notes:
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TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			7		8A		8B		VBW9A	
Top of Well Elevation --->			169.2		202.3		202.2		184	
Bottom of Well Elevation --->			152.7		164.3		144.5		160.4	
Depth of Well --->			16.5		38		57.7		23.6	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
12/29/2022	185.70	2.21	45.00	124.2	34.00	168.3	41.90	160.30	23.60	160.40
1/11/2023	191.70	3.90	4.20	165.00	33.50	168.80	40.60	161.60	23.10	160.90
1/25/2023	194.00	7.17	3.40	165.80	31.90	170.40	38.80	163.40	22.50	161.50
2/28/2023	194.00	3.98	3.40	165.80	30.10	172.20	38.10	164.10	20.50	163.50
3/29/2023	194.00	5.92	3.20	166.00	28.50	173.80	37.70	164.50	17.00	167.00
4/25/2023	194.00	0.19	3.60	165.60	28.80	173.50	37.90	164.30	19.30	164.70
5/24/2023	193.40	0.89	3.79	165.41	28.83	173.48	38.55	163.65	19.80	164.20
6/28/2023	192.70	0.07	3.00	166.20	29.40	172.90	38.80	163.40	20.08	163.92
7/26/2023	191.60	0.00	2.80	166.40	29.70	172.60	38.80	163.40	20.45	163.55
8/29/2023	190.50	1.84	2.60	166.60	30.19	172.11	39.15	163.05	20.77	163.23
9/26/2023	189.80	0.00	2.50	166.70	30.55	171.75	39.60	162.60	20.90	163.10
10/25/2023	189.70	0.19	2.70	166.50	30.80	171.50	39.80	162.40	21.20	162.80
11/30/2023	189.20	0.65	3.00	166.20	30.80	171.50	39.80	162.40	21.40	162.60
12/27/2023	190.00	1.15	3.20	166.00	31.20	171.10	39.80	162.40	21.50	162.50
1/29/2024	191.90	2.00	3.50	165.70	30.50	171.80	39.00	163.20	21.29	162.71
2/27/2024	194.00	8.89	2.60	166.60	28.50	173.80	38.00	164.20	16.01	167.99
3/27/2024	193.80	2.51	2.60	166.60	28.90	173.40	38.10	164.10	18.78	165.22
4/23/2024	194.00	1.51	2.50	166.70	28.80	173.50	37.90	164.30	18.98	165.02
5/1/2024	193.90	0.00	3.10	166.10	28.60	173.70	37.90	164.30	19.02	164.98
5/23/2024	193.10	0.08	2.30	166.90	29.05	173.25	38.40	163.80	18.97	165.03
6/20/2024	191.50	0.00	2.60	166.60	29.60	172.70	38.90	163.30	20.30	163.70
7/25/2024	188.70	0.00	3.30	165.90	30.70	171.60	39.90	162.30	21.14	162.86
8/28/2024	185.90	0.00	3.80	165.40	31.60	170.70	40.75	161.45	21.72	162.28
9/18/2024	183.95	0.00	4.10	165.10	32.20	170.10	41.40	160.80	18.97	165.03
10/30/2024	182.00	0.00	4.50	164.70	33.20	169.10	43.40	158.80	22.68	161.32
11/26/2024	177.30	0.06	5.20	164.00	33.94	168.36	44.48	157.72	22.92	161.08
12/17/2024	175.70	0.04	6.20	163.00	34.80	167.50	45.20	157.00	23.17	160.83

Notes:
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TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			VBW9B		VBW/10A		VBW/10B		VBW/11	
Top of Well Elevation --->			184.2		183.4		183.7		165.6	
Bottom of Well Elevation --->			151.7		148.0		136.1		155.4	
Depth of Well --->			32.5		35.4		47.6		10.2	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
1/31/2007	176.80		28.9	155.3	19.4	164.0	45.0	138.7	8.4	157.2
2/28/2007	177.60		28.5	155.7	19.3	164.1	45.2	138.5	9.2	156.4
3/29/2007	177.10		28.6	155.6	19.3	164.1	45.6	138.1	8.4	157.2
4/27/2007	176.60		28.5	155.7	19.3	164.1	45.4	138.3	9.3	156.3
5/24/2007	176.80		28.6	155.6	19.3	164.1	45.9	137.8	9.2	156.4
6/27/2007	179.90		28.4	155.8	19.2	164.2	45.4	138.3	8.2	157.4
7/27/2007	177.80		28.5	155.7	19.3	164.1	46.5	137.2	9.2	156.4
8/28/2007	177.20		28.3	155.9	19.4	164.0	46.4	137.3	8.0	157.6
9/26/2007	177.00		28.4	155.8	19.4	164.0	46.5	137.2	9.3	156.3
10/30/2007	175.50		28.7	155.5	19.4	164.0	46.6	137.1	9.3	156.3
11/27/2007	175.90		28.8	155.4	19.5	163.9	46.6	137.1	9.3	156.3
12/27/2007	178.20		28.9	155.3	19.5	163.9	45.5	138.2	9.5	156.1
1/30/2008	184.40		28.6	155.6	19.4	164.1	43.6	140.3	9.4	156.2
2/26/2008	186.10		28.2	156.0	19.4	164.0	43.2	140.6	9.3	156.3
3/26/2008	188.00		27.7	156.5	19.3	164.1	43.4	140.4	9.1	156.5
4/25/2008	191.00		27.1	157.1	19.5	163.9	42.8	141.0	8.9	156.7
5/28/2008	190.93		26.7	157.5	19.6	163.8	42.9	141.0	8.3	157.3
6/25/2008	189.50		26.5	157.7	19.8	163.6	42.8	141.0	8.3	157.3
7/29/2008	185.10		26.5	157.7	19.2	164.2	42.8	141.0	8.2	157.4
7/30/2008	185.10	0.00	26.5	157.7	19.3	164.1	42.7	141.1	7.8	157.8
8/27/2008	178.00	0.00	26.9	157.3	19.4	164.0	44.2	139.6	8.3	157.3
9/25/2008	176.80	0.00	27.6	156.6	19.3	164.1	45.0	138.8	8.1	157.5
10/28/2008	175.20	0.00	28.1	156.1	21.0	162.4	45.3	138.5	8.0	157.6
11/25/2008	175.80	1.82	28.4	155.8	21.4	162.0	45.4	138.4	9.0	156.6
12/30/2008	181.70	2.91	28.2	156.0	21.7	161.7	43.9	139.9	9.0	156.6
1/29/2009	182.20	0.39	28.2	156.0	21.5	161.9	43.9	139.9	9.1	156.5
2/25/2009	185.70	3.10	28.0	156.2	21.4	162.0	43.0	140.8	8.9	156.7

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TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			VBW9B		VBW/10A		VBW/10B		VBW/11	
Top of Well Elevation --->			184.2		183.4		183.7		165.6	
Bottom of Well Elevation --->			151.7		148.0		136.1		155.4	
Depth of Well --->			32.5		35.4		47.6		10.2	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
3/26/2009	188.40	0.10	27.5	156.7	20.9	162.5	43.6	140.2	8.8	156.8
4/28/2009	189.30	0.00	27.1	157.1	20.2	163.2	43.7	140.1	8.5	157.1
5/18/2009	188.50	0.00	26.8	157.4	19.6	163.8	43.4	140.4	8.4	157.2
5/27/2009	188.10	0.00	26.8	157.4	19.4	164.0	43.6	140.2	8.4	157.2
6/30/2009	188.60	0.10	26.7	157.5	19.2	164.2	43.7	140.1	8.4	157.2
7/30/2009	184.80	0.00	26.7	157.5	19.2	164.2	43.9	139.9	8.3	157.3
8/26/2009	176.60	0.00	27.0	157.2	19.5	163.9	44.1	139.7	8.3	157.3
9/30/2009	174.50	0.00	27.7	156.5	20.4	163.0	45.1	138.7	8.7	156.9
10/28/2009	175.30	0.29	28.0	156.2	20.8	162.6	44.4	139.4	8.9	156.7
12/1/2009	176.40	0.00	28.4	155.8	21.0	162.4	45.0	138.8	9.0	156.6
12/28/2009	178.80	2.75	28.5	155.8	21.8	161.6	44.5	139.3	9.2	156.5
1/26/2010	191.30	4.15	28.3	155.9	21.5	161.9	43.0	140.8	8.1	157.5
2/24/2010	193.60	2.29	27.2	157.0	20.5	162.9	42.4	141.4	8.3	157.3
3/29/2010	193.50	1.18	26.1	158.1	19.1	164.3	42.4	141.4	8.1	157.5
4/4/2010	193.50		26.0	158.2	18.7	164.7	42.6	141.2	8.2	157.4
4/27/2010	193.90	1.66	25.8	158.4	18.4	165.0	42.5	141.3	8.0	157.6
5/27/2010	192.90	0.03	25.7	158.5	18.2	165.2	42.4	141.4	7.8	157.8
6/29/2010	191.60	0.00	25.8	158.4	18.1	165.3	42.2	141.6	7.9	157.7
7/28/2010	187.50	0.00	26.1	158.1	18.3	165.1	42.9	140.9	8.0	157.6
8/31/2010	179.20	0.00	26.8	157.4	18.9	164.5	42.9	140.9	7.9	157.7
9/29/2010	175.60	0.00	27.2	157.0	19.3	164.1	44.0	139.8	8.0	157.6
10/26/2010	178.20	2.93	27.8	156.4	20.3	163.1	44.3	139.5	8.6	157.0
11/30/2010	178.80	1.14	28.4	155.8	21.3	162.1	44.6	139.2	8.9	156.7
12/30/2010	193.90	9.95	27.0	157.2	19.5	163.9	42.1	141.7	7.5	158.1
1/27/2011	194.00	0.86	26.0	158.2	18.8	164.6	42.7	141.2	7.8	157.8
2/23/2011	193.80	1.02	25.6	158.7	18.2	165.2	42.4	141.4	7.9	157.8
3/29/2011	193.90	2.38	24.6	159.6	16.8	166.6	41.9	141.9	7.6	158.0
4/27/2011	193.60	0.56	25.0	159.2	17.0	166.4	42.4	141.4	7.8	157.8

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TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			VBW9B		VBW/10A		VBW/10B		VBW/11	
Top of Well Elevation --->			184.2		183.4		183.7		165.6	
Bottom of Well Elevation --->			151.7		148.0		136.1		155.4	
Depth of Well --->			32.5		35.4		47.6		10.2	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
5/25/2011	193.10	0.51	25.5	158.7	17.6	165.8	42.3	141.5	7.9	157.7
6/28/2011	192.00	0.00	25.8	158.4	18.3	165.1	42.4	141.4	8.0	157.6
7/27/2011	186.75	0.00	26.1	158.1	18.4	165.1	42.6	141.2	8.2	157.4
8/25/2011	176.30	0.00	26.9	157.3	18.5	164.9	43.4	140.4	8.5	157.1
9/28/2011	176.00	0.06	27.7	156.5	20.0	163.5	44.5	139.3	8.7	156.9
10/25/2011	176.50	0.89	28.1	156.1	20.6	162.8	44.8	139.0	8.9	156.7
11/22/2011	177.20	1.31	28.4	155.8	21.2	162.2	44.7	139.1	9.0	156.6
12/22/2011	176.70	0.20	28.5	155.7	21.6	161.8	45.2	138.6	8.9	156.7
1/25/2012	178.60	0.84	28.3	155.9	21.4	162.0	44.2	139.6	9.2	156.4
2/28/2012	179.20	0.68	28.6	155.6	21.7	161.7	44.2	139.6	9.4	156.2
3/27/2012	180.60	1.73	28.4	155.8	21.8	161.7	43.8	140.0	9.2	156.4
6/27/2012	180.70	0.00	27.9	156.3	20.2	163.2	44.1	139.7	9.6	156.0
7/26/2012	179.20	0.10	28.2	156.0	21.5	161.9	44.4	139.4	9.2	156.4
8/8/2012	178.50	0.10	28.0	156.2	21.1	162.3	44.9	138.9	9.0	156.6
8/28/2012	177.10	0.00	28.2	156.0	21.3	162.1	45.3	138.5	9.1	156.5
8/29/2012	177.10	0.00	27.8	156.4	20.9	162.5	45.7	138.1	8.9	156.7
9/25/2012	175.30	0.00	28.3	155.9	21.4	162.0	46.2	137.6	9.1	156.5
10/30/2012	176.00	0.19	28.6	155.6	21.8	161.6	46.3	137.5	9.2	156.4
11/27/2012	175.80	0.69	28.8	155.4	22.1	161.3	46.1	137.7	9.3	156.3
12/12/2012	176.10	1.40	28.6	155.6	22.0	161.5	45.6	138.2	9.3	156.3
1/22/2013	177.20	1.20	28.8	155.4	22.3	161.1	44.6	139.2	9.2	156.4
2/27/2013	178.20	0.31	28.6	155.6	22.2	161.2	44.4	139.4	9.4	156.2
3/28/2013	178.20	0.71	28.7	155.5	22.3	161.1	44.1	139.7	9.5	156.1
4/25/2013	177.30	0.03	28.7	155.5	22.3	161.1	45.0	138.8	9.5	156.1
5/22/2013	177.60	0.00	28.5	155.7	22.3	161.1	44.9	138.9	9.5	156.1
6/25/2013	177.50	0.00	28.7	155.5	22.4	161.1	45.0	138.8	9.6	156.1
7/23/2013	175.70	0.00	28.7	155.5	22.3	161.1	45.7	138.1	9.5	156.2
8/21/2013	174.50	0.00	28.6	155.6	22.3	161.1	46.1	137.7	9.4	156.2

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TABLE 5
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PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			VBW9B		VBW/10A		VBW/10B		VBW/11	
Top of Well Elevation --->			184.2		183.4		183.7		165.6	
Bottom of Well Elevation --->			151.7		148.0		136.1		155.4	
Depth of Well --->			32.5		35.4		47.6		10.2	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
9/25/2013	175.70	0.00	28.7	155.5	22.0	161.4	46.4	137.4	9.4	156.2
10/29/2013	176.00	0.00	28.8	155.4	22.5	160.9	42.3	141.6	9.4	156.2
11/27/2013	176.50	0.44	28.6	155.6	22.5	160.9	46.2	137.6	9.3	156.3
12/19/2013	176.80	0.53	28.6	155.6	22.5	160.9	45.6	138.2	9.5	156.1
1/28/2014	176.80	0.00	28.9	155.3	22.9	160.5	45.4	138.4	9.6	156.0
2/25/2014	176.70	0.72	28.9	155.3	22.9	160.5	45.2	138.6	9.6	156.0
3/25/2014	178.50		28.8	155.5	22.9	160.6	44.6	139.2	9.6	156.0
3/29/2014	178.40	1.44	28.9	155.3	22.9	160.5	44.7	139.1	9.3	156.3
4/25/2014	177.40	0.74	28.7	155.5	22.7	160.7	44.8	139.0	9.5	156.1
5/28/2014	176.40	0.00	28.8	155.4	22.7	160.7	43.3	140.5	9.6	156.0
6/25/2014	176.10	0.00	28.8	155.4	22.7	160.7	46.3	137.5	8.9	156.7
7/30/2014	177.30	0.00	28.6	155.7	22.6	160.9	46.9	136.9	9.3	156.3
8/26/2014	176.10	0.03	32.5	151.7	22.5	160.9	42.5	141.3	9.5	156.1
9/23/2014	175.90	0.00	28.7	155.5	22.7	160.7	46.6	137.3	9.4	156.3
10/30/2014	176.30	0.00	28.7	155.5	22.7	160.7	46.6	137.2	9.3	156.3
11/21/2014	176.20	0.25	28.6	155.6	22.7	160.7	45.0	138.8	9.1	156.5
12/30/2014	178.90	3.37	28.5	155.7	22.8	160.6	45.1	138.7	9.4	156.2
1/27/2015	179.60	0.89	28.6	155.6	22.8	160.6	44.8	139.0	9.3	156.3
2/27/2015	180.00	0.46	28.2	156.0	22.4	161.0	44.3	139.5	9.1	156.5
3/26/2015	179.60	0.45	28.2	156.0	22.3	161.1	42.5	141.3	9.1	156.5
4/29/2015	178.20	0.24	28.1	156.1	22.1	161.3	42.4	141.4	9.0	156.6
5/27/2015	179.00	1.04	28.5	155.7	22.2	161.2	44.0	139.8	9.3	156.3
6/25/2015	179.60	0.00	28.3	155.9	22.1	161.3	46.9	136.9	9.0	156.6
7/29/2015	178.10	0.00	28.0	156.2	22.0	161.4	45.0	138.8	8.9	156.7
8/26/2015	176.20	0.00	28.0	156.2	21.2	162.2	40.6	143.2	8.9	156.7
9/22/2015	178.20	1.64	28.2	156.0	22.1	161.3	45.4	138.4	9.0	156.6
10/27/2015	176.90	0.10	28.3	155.9	22.2	161.2	45.8	138.0	9.2	156.4
11/24/2015	176.30	0.17	28.5	155.7	22.3	161.1	42.7	141.1	9.3	156.3

Notes:
1. Readings in red are classified as erroneous
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3. Piezometer data based on NGVD 29 datum.

TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			VBW9B		VBW/10A		VBW/10B		VBW/11	
Top of Well Elevation --->			184.2		183.4		183.7		165.6	
Bottom of Well Elevation --->			151.7		148.0		136.1		155.4	
Depth of Well --->			32.5		35.4		47.6		10.2	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
12/22/2015	177.60	0.72	28.7	155.5	22.7	160.7	45.7	138.1	9.3	156.3
1/27/2016	180.10	2.86	29.4	154.8	24.7	158.7	45.7	138.1	10.1	155.5
2/25/2016	181.60	0.20	29.3	154.9	24.6	158.9	46.5	137.3	10.1	155.5
3/24/2016	184.80		29.1	155.1	24.3	159.1	46.3	137.5	10.1	155.5
3/31/2016	184.50	1.51	29.1	155.1	24.3	159.1	46.5	137.3	10.1	155.5
4/28/2016	183.60	0.04	28.9	155.3	24.0	159.4	46.9	136.9	10.2	155.4
5/25/2016	182.50	0.13	28.8	155.4	23.7	159.7	46.8	137.0	9.8	155.8
6/28/2016	180.70	0.00	28.9	155.3	23.6	159.8	47.1	136.7	9.9	155.7
7/27/2016	178.40	0.00	29.0	155.2	23.6	159.8	47.5	136.3	9.9	155.7
8/24/2016	176.40	0.00	29.1	155.1	23.6	159.8	47.6	136.2	9.8	155.8
9/27/2016	175.80	0.00	29.4	154.8	23.9	159.5	47.6	136.2	10.0	155.6
10/26/2016	178.60	0.64	29.5	154.7	24.1	159.3	47.6	136.2	10.0	155.6
11/22/2016	178.30	1.11								
12/28/2016	184.80	4.01	29.3	154.9	24.2	159.2	45.5	138.4	10.1	155.5
1/25/2017	193.30	6.33	28.2	156.0	23.0	160.4	42.9	140.9	9.5	156.1
2/28/2017	193.90	3.27	27.4	156.8	21.3	162.1	43.1	140.7	9.0	156.6
3/29/2017	193.70	0.08	27.0	157.2	20.5	162.9	43.7	140.1	9.0	156.6
4/27/2017	192.90	0.04	27.0	157.2	20.6	162.8	43.9	139.9	9.2	156.4
5/23/2017	187.90	0.33	27.3	156.9	23.0	160.4	44.0	139.8	9.7	155.9
6/21/2017	182.50	0.00	27.7	156.5	21.1	162.3	44.8	139.0	9.3	156.3
7/26/2017	163.60	0.00	28.6	155.6	22.0	161.4	46.6	137.2	9.5	156.1
8/30/2017	163.60	0.00	29.4	154.8	23.1	160.3	47.6	136.2	9.8	155.8
9/28/2017	163.60	0.00	29.8	154.4	23.8	159.6	47.6	136.2	9.9	155.7
10/26/2017	171.80	0.00	29.9	154.3	24.3	159.1	47.6	136.2	37.3	155.7
11/29/2017	177.20	0.08	30.0	154.2	24.7	158.7	47.6	136.2	10.2	155.7
12/27/2017	176.70	0.00	29.8	154.4	24.7	158.7	47.6	136.2	10.2	155.7
1/24/2018	178.10	1.67	29.8	154.4	24.7	158.7	47.6	136.1	10.2	155.7
2/21/2018	177.80	0.27	29.8	154.4	24.7	158.7	47.6	136.1	10.2	155.7

Notes:
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3. Piezometer data based on NGVD 29 datum.

TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			VBW9B		VBW/10A		VBW/10B		VBW/11	
Top of Well Elevation --->			184.2		183.4		183.7		165.6	
Bottom of Well Elevation --->			151.7		148.0		136.1		155.4	
Depth of Well --->			32.5		35.4		47.6		10.2	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
3/28/2018	183.50	1.23	29.7	154.5	24.6	158.8	47.6	136.1	10.2	155.7
4/27/2018	184.30	0.05	29.4	154.8	24.4	159.0	47.6	136.1	10.2	155.7
5/30/2018	183.10	0.13	29.2	155.0	24.4	159.0	47.6	136.1	10.2	155.7
6/28/2018	181.70	0.00	29.0	155.2	23.6	159.8	47.6	136.1	28.2	155.7
7/26/2018	180.00	0.00	29.1	155.1	23.5	159.9	47.6	136.1	10.0	155.6
8/28/2018	177.30	0.00	29.2	155.0	23.5	159.9	47.6	136.1	9.9	155.7
9/27/2018	178.10	0.00	29.4	154.8	23.7	159.7	47.6	136.1	10.0	155.6
10/24/2018	178.00	0.66	29.4	154.8	23.9	159.5	47.6	136.1	10.1	155.5
11/29/2018	177.50	1.60	29.6	154.6	24.2	159.2	47.6	136.1	10.2	155.4
12/20/2018	181.40	2.39	29.5	154.7	24.1	159.3	46.8	136.9	10.1	155.5
1/30/2019	189.40	4.56	28.9	155.3	25.8	157.6	45.6	138.1	9.9	155.7
2/27/2019	194.10	7.48	17.8		33.9		41.8		6.1	
3/27/2019	194.00	1.27	26		20.5		43.7		9.1	
4/24/2019	193.60	0.07	29.40		20.30		43.80		9.20	
5/30/2019	191.40	0.73	26.90		20.50		44.10		9.30	
6/26/2019	190.80	0.02	27.00		20.60		44.00		9.40	
7/5/2015	190.40	0.00	27.10		20.60		44.20		10.20	
7/30/2019	188.95	0.00	17.80		34.90		42.40		7.30	
8/27/2019	187.40	0.00	18.03		35.11		42.62		7.73	
9/26/2019	186.20	0.00	18.20		34.90		42.80		8.06	
10/22/2019	185.20	0.00	27.90		21.30		45.80		9.70	
11/26/2019	183.50	2.66	8743.00		8514.00		8702.00		8316.00	
12/18/2019	186.80	4.44	8741.00		8511.00		8665.00		8308.00	
1/28/2020	192.00	0.24	29.14		23.80		45.60		9.80	
2/25/2020	192.10	0.49	87.16		8488.50		8635.60		8296.30	
3/24/2020	194.00	3.89	8712.80		8481.00		8636.60		8300.80	
4/29/2020	193.50	4.59	8678.46		8455.261		8641.121		8286.36	
5/27/2020	193.10	0.03	8695.179		8468.494		8646.494		8295.486	
6/24/2020	190.00	0.00	8704.683		8475.23		8651.577		8304.142	

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TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			VBW9B		VBW/10A		VBW/10B		VBW/11	
Top of Well Elevation --->			184.2		183.4		183.7		165.6	
Bottom of Well Elevation --->			151.7		148.0		136.1		155.4	
Depth of Well --->			32.5		35.4		47.6		10.2	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
7/29/2020	188.90	0.00	8718.148		8484.906		8654.388		8309.247	
8/27/2020	185.90	0.00	8726.589		8495.277		8663.389		8316.309	
9/29/2020	183.10	0.00	8737.937		8507.042		8659.805		8314.927	
10/29/2020	180.30	0.00	8747.634		8518.862		8682.145		8317.247	
11/24/2020	179.00	0.65	8753.042		8531.034		8686.862		8318.992	
12/29/2020	179.00	1.03	8757.986		8545.635		8683.545		8319.8	
1/26/2021	180.50	2.39	29.10	155.1	23.20	160.2	45.50	138.20	10.10	155.50
2/25/2021	182.10	0.03	28.90	155.3	23.30	160.1	45.30	138.40	9.80	155.80
3/23/2021	182.90	1.15	28.90	155.3	23.30	160.1	45.40	138.30	10.00	155.60
4/27/2021	182.00	0.04	28.90	155.3	23.20	160.2	45.80	137.90	10.00	155.60
5/26/2021	181.00	0.11	28.90	155.3	23.28	160.1	46.58	137.12	9.90	155.70
6/30/2021	179.00	0.00	29.10	155.1	23.40	160.0	46.80	136.90	10.00	155.60
7/27/2021	177.10	0.08	29.20	155.0	23.50	159.9	46.80	136.90	9.90	155.70
8/24/2021	175.40	0.00	29.20	155.0	23.50	159.9	46.80	136.90	9.90	155.70
9/28/2021	175.20	0.06	29.50	154.7	23.80	159.6	47.40	136.30	10.08	155.52
10/27/2021	177.20	0.80	29.50	154.7	24.00	159.4	47.40	136.30	10.10	155.50
11/23/2021	177.80	0.00	29.60	154.6	24.30	159.1	47.60	136.10	10.20	155.40
12/21/2021	180.50	5.86	29.40	154.8	24.30	159.1	46.80	136.90	10.10	155.50
1/25/2022	187.00	0.08	28.80	155.4	23.60	159.8	45.40	138.30	10.10	155.50
2/22/2022	186.60	0.18	28.80	155.4	23.60	159.8	45.40	138.30	10.10	155.50
3/28/2022	186.60	1.38	28.50	155.7	22.70	160.7	45.70	138.00	10.20	155.40
4/26/2022	186.60	0.01	28.40	155.8	22.70	160.7	45.50	138.20	9.80	155.80
5/25/2022	185.30	0.05	28.40	155.8	22.50	160.9	46.10	137.60	9.80	155.80
6/28/2022	182.70	0.00	28.60	155.6	22.60	160.8	46.50	137.20	9.60	156.00
7/26/2022	179.70	0.00	28.80	155.4	22.70	160.7	46.80	136.90	9.60	156.00
8/30/2022	178.30	0.13	29.10	155.1	23.20	160.2	47.10	136.60	9.80	155.80
9/29/2022	175.80	0.24	29.30	154.9	23.60	159.8	47.50	136.20	9.90	155.70
10/26/2022	175.30	0.26	29.40	154.8	23.80	159.6	47.60	136.10	9.90	155.70
11/22/2022	179.40	1.46	29.50	154.7	24.09	159.3	46.95	136.75	10.03	155.57

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TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			VBW9B		VBW/10A		VBW/10B		VBW/11	
Top of Well Elevation --->			184.2		183.4		183.7		165.6	
Bottom of Well Elevation --->			151.7		148.0		136.1		155.4	
Depth of Well --->			32.5		35.4		47.6		10.2	
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**	**Reading**	**Elev.**
	Elevation	**Rainfall (in)**								
12/29/2022	185.70	2.21	29.30	154.9	24.10	159.3	45.80	137.90	9.90	155.70
1/11/2023	191.70	3.90	28.80	155.40	23.60	159.80	44.40	139.30	9.70	155.90
1/25/2023	194.00	7.17	28.10	156.10	22.80	160.60	44.00	139.70	8.80	156.80
2/28/2023	194.00	3.98	27.30	156.90	21.20	162.20	43.20	140.50	8.70	156.90
3/29/2023	194.00	5.92	25.10	159.10	19.10	164.30	43.40	140.30	8.70	156.90
4/25/2023	194.00	0.19	26.10	158.10	19.80	163.60	44.20	139.50	8.90	156.70
5/24/2023	193.40	0.89	26.50	157.70	19.90	163.50	44.30	139.40	8.90	156.70
6/28/2023	192.70	0.07	26.75	157.45	20.23	163.17	44.44	139.26	9.05	156.55
7/26/2023	191.60	0.00	27.10	157.10	20.60	162.80	44.20	139.50	9.00	156.60
8/29/2023	190.50	1.84	27.31	156.89	20.83	162.57	44.47	139.23	9.15	156.45
9/26/2023	189.80	0.00	27.40	156.80	21.00	162.40	43.90	139.80	8.90	156.70
10/25/2023	189.70	0.19	27.60	156.60	21.20	162.20	44.70	139.00	9.00	156.60
11/30/2023	189.20	0.65	27.70	156.50	21.30	162.10	44.60	139.10	9.10	156.50
12/27/2023	190.00	1.15	27.70	156.50	21.40	162.00	44.30	139.40	9.00	156.60
1/29/2024	191.90	2.00	27.53	156.67	21.20	162.20	44.10	139.60	9.08	156.52
2/27/2024	194.00	8.89	25.64	158.56	19.41	163.99	42.26	141.44	8.82	156.78
3/27/2024	193.80	2.51	26.14	158.06	19.70	163.70	43.23	140.47	8.71	156.89
4/23/2024	194.00	1.51	26.40	157.80	19.60	163.80	43.80	139.90	9.03	156.57
5/1/2024	193.90	0.00	26.34	157.86	19.63	163.77	43.89	139.81	9.08	156.52
5/23/2024	193.10	0.08	26.26	157.94	19.60	163.80	43.80	139.90	9.03	156.57
6/20/2024	191.50	0.00	27.20	157.00	20.60	162.80	44.40	139.30	9.40	156.20
7/25/2024	188.70	0.00	27.58	156.62	20.16	163.24	44.44	139.26	9.23	156.37
8/28/2024	185.90	0.00	27.87	156.33	21.46	161.94	44.91	138.79	9.22	156.38
9/18/2024	183.95	0.00	26.26	157.94	19.58	163.82	43.78	139.92	9.03	156.57
10/30/2024	182.00	0.00	28.26	155.94	22.19	161.21	44.99	138.71	9.30	156.30
11/26/2024	177.30	0.06	28.47	155.73	22.55	160.85	45.24	138.46	9.32	156.28
12/17/2024	175.70	0.04	28.77	155.43	22.83	160.57	45.71	137.99	9.44	156.16

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TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			VBW/12		VBW/13		Seepage Flow Point	
Top of Well Elevation --->			160.5		160.1		Drain ID	
Bottom of Well Elevation --->			151.5		150.6			
Depth of Well --->			9		9.5			
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Seepage Flow Point (Gal / Min)**	
	Elevation	**Rainfall (in)**					**Left Subdrain**	**Right Subdrain**
1/31/2007	176.80		8.2	152.3	8.6	151.50	0.00	0.0
2/28/2007	177.60		8.4	152.1	5.7	154.40	0.00	0.0
3/29/2007	177.10		8.7	151.8	9.2	150.90	0.00	0.0
4/27/2007	176.60		8.8	151.7	8.9	151.20	0.00	0.0
5/24/2007	176.80		8.9	151.6	9.3	150.80	0.00	0.0
6/27/2007	179.90		8.7	151.8	9.1	151.00	0.00	0.0
7/27/2007	177.80		8.8	151.7	9.4	150.70	0.00	0.0
8/28/2007	177.20		8.9	151.6	9.2	150.90	0.00	0.0
9/26/2007	177.00		8.9	151.6	9.2	150.92	0.00	0.0
10/30/2007	175.50		8.9	151.6	9.2	150.90	0.00	0.0
11/27/2007	175.90		9.0	151.5	9.3	150.80	0.00	0.0
12/27/2007	178.20		9.0	151.5	9.4	150.70	0.00	0.0
1/30/2008	184.40		6.5	154.0	6.3	153.80	0.16	0.0
2/26/2008	186.10		7.6	152.9	7.7	152.40	0.36	0.0
3/26/2008	188.00		8.0	152.5	8.6	151.50	0.84	0.0
4/25/2008	191.00		8.9	151.6	9.0	151.10	1.59	0.0
5/28/2008	190.93		8.6	151.9	9.0	151.10	1.98	0.0
6/25/2008	189.50		8.3	152.2	8.7	151.40	1.59	0.0
7/29/2008	185.10		7.9	152.6	8.4	151.70	1.74	0.0
7/30/2008	185.10	0.00	7.6	152.9	8.6	151.50	2.06	0.0
8/27/2008	178.00	0.00	8.2	152.3	8.3	151.80	0.79	0.0
9/25/2008	176.80	0.00	8.2	152.3	8.1	152.00	0.29	0.0
10/28/2008	175.20	0.00	8.4	152.1	8.6	151.50	0.03	0.0
11/25/2008	175.80	1.82	8.6	151.9	8.7	151.40	0.04	0.0
12/30/2008	181.70	2.91	8.0	152.5	7.8	152.30	0.63	0.0
1/29/2009	182.20	0.39	8.6	151.9	8.5	151.60	0.68	0.0
2/25/2009	185.70	3.10	7.7	152.8	7.5	152.60	1.06	0.0

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PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			VBW/12		VBW/13		Seepage Flow Point	
Top of Well Elevation --->			160.5		160.1		Drain ID	
Bottom of Well Elevation --->			151.5		150.6			
Depth of Well --->			9		9.5			
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Seepage Flow Point (Gal / Min)**	
	Elevation	**Rainfall (in)**					**Left Subdrain**	**Right Subdrain**
3/26/2009	188.40	0.10	8.5	152.0	8.5	151.60	1.59	0.0
4/28/2009	189.30	0.00	8.6	151.9	8.9	151.20	2.26	0.0
5/18/2009	188.50	0.00	7.8	152.7	9.0	151.10	2.18	0.0
5/27/2009	188.10	0.00	8.7	151.8	9.1	151.00	1.98	0.0
6/30/2009	188.60	0.10	7.8	152.7	8.6	151.50	2.98	0.0
7/30/2009	184.80	0.00	8.1	152.4	8.4	151.70	2.26	0.0
8/26/2009	176.60	0.00	8.0	152.5	8.1	152.00	0.63	0.0
9/30/2009	174.50	0.00	7.9	152.6	8.4	151.70	0.01	0.0
10/28/2009	175.30	0.29	8.0	152.5	8.5	151.60	0.00	0.0
12/1/2009	176.40	0.00	8.0	152.5	8.7	151.40	0.00	0.0
12/28/2009	178.80	2.75	8.2	152.3	8.6	151.50	0.21	0.0
1/26/2010	191.30	4.15	5.6	154.9	4.9	155.20	1.06	0.0
2/24/2010	193.60	2.29	7.1	153.4	6.7	153.40	2.88	0.0
3/29/2010	193.50	1.18	7.3	153.2	6.8	153.30	1.82	0.0
4/4/2010	193.50		7.5	153.0	7.0	153.10	2.54	0.0
4/27/2010	193.90	1.66	7.3	153.2	6.8	153.30	0.75	0.0
5/27/2010	192.90	0.03	7.4	153.1	7.5	152.60	3.17	0.0
6/29/2010	191.60	0.00	7.7	152.8	8.6	151.50	2.38	0.0
7/28/2010	187.50	0.00	7.5	153.0	7.1	153.00	1.59	0.0
8/31/2010	179.20	0.00	7.4	153.1	7.7	152.40	0.98	0.0
9/29/2010	175.60	0.00	7.3	153.2	7.3	152.80	0.13	0.0
10/26/2010	178.20	2.93	7.5	153.0	7.6	152.50	0.20	0.0
11/30/2010	178.80	1.14	8.0	152.5	8.6	151.50	0.32	0.0
12/30/2010	193.90	9.95	4.6	155.9	3.7	156.40	2.51	0.0
1/27/2011	194.00	0.86	6.4	154.2	5.9	154.20	2.25	0.0
2/23/2011	193.80	1.02	6.5	154.0	6.1	154.00	1.46	0.0
3/29/2011	193.90	2.38	4.8	155.7	3.8	156.30	0.87	0.0
4/27/2011	193.60	0.56	6.0	154.6	5.2	154.90	0.79	0.0

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TABLE 5
SAND CANYON DAM
PIEZOMETER AND SUBDRAIN MEASUREMENTS
JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			VBW/12		VBW/13		Seepage Flow Point	
Top of Well Elevation --->			160.5		160.1		Drain ID	
Bottom of Well Elevation --->			151.5		150.6			
Depth of Well --->			9		9.5			
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Seepage Flow Point (Gal / Min)**	
	Elevation	**Rainfall (in)**					**Left Subdrain**	**Right Subdrain**
5/25/2011	193.10	0.51	6.8	153.7	6.2	153.90	0.79	0.0
6/28/2011	192.00	0.00	7.8	152.7	7.3	152.80	1.59	0.0
7/27/2011	186.75	0.00	7.7	152.9	7.0	153.10	0.98	0.0
8/25/2011	176.30	0.00	7.7	152.8	7.8	152.30	0.69	0.0
9/28/2011	176.00	0.06	7.8	152.7	7.9	152.30	0.13	0.0
10/25/2011	176.50	0.89	7.9	152.6	8.3	151.80	0.26	0.0
11/22/2011	177.20	1.31	8.4	152.1	8.4	151.80	0.24	0.0
12/22/2011	176.70	0.20	8.7	151.8	8.5	151.60	0.30	0.0
1/25/2012	178.60	0.84	7.8	152.7	8.6	151.50	0.32	0.0
2/28/2012	179.20	0.68	8.0	152.5	8.6	151.50	0.40	0.0
3/27/2012	180.60	1.73	7.9	152.6	8.6	151.50	0.43	0.0
6/27/2012	180.70	0.00	8.9	151.6	9.4	150.70	0.13	0.0
7/26/2012	179.20	0.10	8.8	151.7	9.5	150.60	0.12	0.0
8/8/2012	178.50	0.10	8.9	151.6	8.6	151.50	0.32	0.0
8/28/2012	177.10	0.00	8.9	151.6	9.4	150.70	0.24	0.0
8/29/2012	177.10	0.00	9.2	151.3	8.6	151.50	0.18	0.0
9/25/2012	175.30	0.00	8.9	151.6	9.4	150.70	0.07	0.0
10/30/2012	176.00	0.19	8.9	151.6	9.3	150.80	0.12	0.0
11/27/2012	175.80	0.69	9.0	151.5	9.2	150.90	0.13	0.0
12/12/2012	176.10	1.40	9.0	151.6	9.0	151.10	0.13	0.0
1/22/2013	177.20	1.20	9.0	151.5	9.3	150.80	0.24	0.0
2/27/2013	178.20	0.31	8.9	151.6	9.2	150.90	0.14	0.0
3/28/2013	178.20	0.71	9.0	151.5	9.4	150.70	0.32	0.0
4/25/2013	177.30	0.03	9.0	151.5	9.4	150.70	0.34	0.0
5/22/2013	177.60	0.00	9.0	151.5	9.4	150.70	0.16	0.0
6/25/2013	177.50	0.00	8.9	151.6	9.2	150.90	0.23	0.0
7/23/2013	175.70	0.00	8.9	151.6	9.3	150.80	0.12	0.0
8/21/2013	174.50	0.00	9.0	151.5	9.5	150.60	0.10	0.0

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JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			VBW/12		VBW/13		Seepage Flow Point	
Top of Well Elevation --->			160.5		160.1		Drain ID	
Bottom of Well Elevation --->			151.5		150.6			
Depth of Well --->			9		9.5			
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Seepage Flow Point (Gal / Min)**	
	Elevation	**Rainfall (in)**					**Left Subdrain**	**Right Subdrain**
9/25/2013	175.70	0.00	9.0	151.5	9.4	150.70	0.16	0.0
10/29/2013	176.00	0.00	9.0	151.5	9.4	150.70	0.22	0.0
11/27/2013	176.50	0.44	8.9	151.6	9.2	150.90	0.25	0.0
12/19/2013	176.80	0.53	9.0	151.5	9.4	150.70	0.40	0.0
1/28/2014	176.80	0.00	9.0	151.5	9.4	150.70	0.37	0.0
2/25/2014	176.70	0.72	9.0	151.5	9.4	150.70	0.22	0.0
3/25/2014	178.50		9.0	151.5	9.4	150.70	0.25	0.0
3/29/2014	178.40	1.44	9.0	151.5	9.4	150.70	0.47	0.0
4/25/2014	177.40	0.74	9.0	151.5	9.5	150.60	0.32	0.0
5/28/2014	176.40	0.00	9.0	151.5	9.3	150.80	0.04	0.0
6/25/2014	176.10	0.00	9.0	151.5	9.5	150.60	0.21	0.0
7/30/2014	177.30	0.00	9.0	151.5	9.4	150.70	0.28	0.0
8/26/2014	176.10	0.03	9.0	151.5	9.4	150.70	0.29	0.0
9/23/2014	175.90	0.00	8.9	151.7	9.2	150.90	0.26	0.0
10/30/2014	176.30	0.00	8.0	152.5	8.5	151.60	0.29	0.0
11/21/2014	176.20	0.25	8.9	151.6	9.2	150.90	0.32	0.0
12/30/2014	178.90	3.37	8.8	151.7	9.2	150.90	0.42	0.0
1/27/2015	179.60	0.89	8.9	151.6	9.1	151.00	0.40	0.0
2/27/2015	180.00	0.46	8.9	151.6	9.1	151.00	0.52	0.0
3/26/2015	179.60	0.45	9.0	151.5	8.9	151.20	0.61	0.0
4/29/2015	178.20	0.24	8.9	151.6	9.2	150.90	0.55	0.0
5/27/2015	179.00	1.04	8.9	151.6	9.3	150.80	0.48	0.0
6/25/2015	179.60	0.00	8.9	151.6	9.3	150.80	0.44	0.0
7/29/2015	178.10	0.00	8.9	151.6	9.3	150.80	0.55	0.0
8/26/2015	176.20	0.00	8.9	151.6	9.3	150.80	0.13	0.0
9/22/2015	178.20	1.64	8.9	151.6	9.3	150.80	0.61	0.0
10/27/2015	176.90	0.10	8.9	151.6	9.3	150.80	0.42	0.0
11/24/2015	176.30	0.17	9.0	151.5	9.3	150.80	0.40	0.0

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Monitoring Well --->			VBW/12		VBW/13		Seepage Flow Point	
Top of Well Elevation --->			160.5		160.1		Drain ID	
Bottom of Well Elevation --->			151.5		150.6			
Depth of Well --->			9		9.5			
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Seepage Flow Point (Gal / Min)**	
	Elevation	**Rainfall (in)**					**Left Subdrain**	**Right Subdrain**
12/22/2015	177.60	0.72	9.0	151.5	8.4	151.70	0.41	0.0
1/27/2016	180.10	2.86	8.9	151.6	9.4	150.70	0.37	0.0
2/25/2016	181.60	0.20	9.0	151.5	9.5	150.60	0.57	0.0
3/24/2016	184.80		8.9	151.6	9.5	150.60	0.60	0.0
3/31/2016	184.50	1.51	8.9	151.6	9.5	150.60	2.03	0.0
4/28/2016	183.60	0.04	9.0	151.5	9.5	150.60	1.76	0.0
5/25/2016	182.50	0.13	9.0	151.5	9.5	150.60	1.61	0.0
6/28/2016	180.70	0.00	9.0	151.5	9.5	150.60	1.11	0.0
7/27/2016	178.40	0.00	9.0	151.5	9.5	150.60	1.02	0.0
8/24/2016	176.40	0.00	9.0	151.5	9.5	150.60	0.61	0.0
9/27/2016	175.80	0.00	9.0	151.5	9.5	150.60	0.40	0.0
10/26/2016	178.60	0.64	9.0	151.5	9.5	150.60	0.88	0.0
11/22/2016	178.30	1.11					0.92	0.0
12/28/2016	184.80	4.01	9.0	151.5	9.5	150.60	1.36	0.0
1/25/2017	193.30	6.33	4.7	155.8	7.7	152.40	2.01	0.0
2/28/2017	193.90	3.27	3.8	156.7	6.5	153.60	1.72	0.0
3/29/2017	193.70	0.08	4.9	155.6	7.7	152.40	1.66	0.0
4/27/2017	192.90	0.04	5.5	155.0	8.2	151.90	2.77	0.0
5/23/2017	187.90	0.33	9.0	151.5	9.0	151.10	3.29	0.0
6/21/2017	182.50	0.00	8.9	151.6	8.6	151.50	2.06	0.0
7/26/2017	163.60	0.00	8.8	151.7	8.5	151.60	0.26	0.0
8/30/2017	163.60	0.00	8.4	152.1	9.2	150.90	0.00	0.0
9/28/2017	163.60	0.00	9.0	151.5	9.5	150.60	0.00	0.0
10/26/2017	171.80	0.00	9.0	151.5	9.5	150.60	0.00	0.0
11/29/2017	177.20	0.08	9.0	151.5	9.5	150.60	0.00	0.0
12/27/2017	176.70	0.00	9.0	151.5	9.5	150.60	0.00	0.0
1/24/2018	178.10	1.67	9.0	151.5	9.5	150.60	0.02	0.0
2/21/2018	177.80	0.27	9.0	151.5	9.5	150.60	0.00	0.0

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JANUARY 2007 THROUGH DECEMBER 2024

Monitoring Well --->			VBW/12		VBW/13		Seepage Flow Point	
Top of Well Elevation --->			160.5		160.1		Drain ID	
Bottom of Well Elevation --->			151.5		150.6			
Depth of Well --->			9		9.5			
Date	Spillway 378'		Reading	Elev.	Reading	Elev.	Seepage Flow Point (Gal / Min)	
	Elevation	Rainfall (in)					Left Subdrain	Right Subdrain
3/28/2018	183.50	1.23	9.0	151.5	9.5	150.60	0.14	0.0
4/27/2018	184.30	0.05	9.0	151.5	9.5	150.60	0.29	0.0
5/30/2018	183.10	0.13	9.0	151.5	9.5	150.60	0.22	0.0
6/28/2018	181.70	0.00	9.0	151.5	9.5	150.60	0.15	0.0
7/26/2018	180.00	0.00	9.0	151.5	9.5	150.60	0.03	0.0
8/28/2018	177.30	0.00	9.0	151.5	9.5	150.60	0.00	0.0
9/27/2018	178.10	0.00	9.0	151.5	9.5	150.60	0.00	0.0
10/24/2018	178.00	0.66	9.0	151.5	9.5	150.60	0.00	0.0
11/29/2018	177.50	1.60	9.0	151.5	9.5	150.60	0.00	0.0
12/20/2018	181.40	2.39	9.0	151.5	9.5	150.60	0.08	0.0
1/30/2019	189.40	4.56	8.4	152.1	8.4	151.70	0.76	0.0
2/27/2019	194.10	7.48	6.5		5.8		1.82	0.0
3/27/2019	194.00	1.27	7.1		7		1.66	0.0
4/24/2019	193.60	0.07	7.60		7.60		1.66	0.0
5/30/2019	191.40	0.73	8.40		8.20		1.35	0.0
6/26/2019	190.80	0.02	7.90		7.90		1.53	0.0
7/5/2015	190.40	0.00	9.00		9.50		1.59	0.0
7/30/2019	188.95	0.00	9.00		9.50		1.37	0.0
8/27/2019	187.40	0.00	9.00		0.00		1.06	0.0
9/26/2019	186.20	0.00	9.00		9.50		1.03	0.0
10/22/2019	185.20	0.00	9.00		9.50		1.05	0.0
11/26/2019	183.50	2.66	8081.00		8358.00		1.13	0.0
12/18/2019	186.80	4.44	8070.00		8344.00		1.65	0.0
1/28/2020	192.00	0.24	8.39		8.40		2.06	0.0
2/25/2020	192.10	0.49	8052.60		8325.60		2.57	0.0
3/24/2020	194.00	3.89	8014.40		8288.70		2.44	0.0
4/29/2020	193.50	4.59	8005.488		8269.357		3.70	0.0
5/27/2020	193.10	0.03	8038.796		8312.104		4.12	0.0
6/24/2020	190.00	0.00	8073.167		8344.973		4.23	0.0

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Top of Well Elevation --->			160.5		160.1		Drain ID	
Bottom of Well Elevation --->			151.5		150.6			
Depth of Well --->			9		9.5			
Date	**Spillway 378'**		**Reading**	**Elev.**	**Reading**	**Elev.**	**Seepage Flow Point (Gal / Min)**	
	Elevation	**Rainfall (in)**					**Left Subdrain**	**Right Subdrain**
7/29/2020	188.90	0.00	8066.977		8341.389		3.54	0.0
8/27/2020	185.90	0.00	8080.359		8356.421		3.49	0.0
9/29/2020	183.10	0.00	8077.749		8356.66		2.43	0.0
10/29/2020	180.30	0.00	8084.328		8366.622		1.51	0.0
11/24/2020	179.00	0.65	8089.965		8379.636		1.05	0.0
12/29/2020	179.00	1.03	8086.061		8380.184		0.89	0.0
1/26/2021	180.50	2.39	9.00	151.50	9.50	150.60	0.98	0.00
2/25/2021	182.10	0.03	9.00	151.50	9.50	150.60	1.00	0.00
3/23/2021	182.90	1.15	9.00	151.50	9.50	150.60	1.36	0.00
4/27/2021	182.00	0.04	9.00	151.50	9.50	150.60	1.17	0.00
5/26/2021	181.00	0.11	9.00	151.50	9.50	150.60	0.87	0.00
6/30/2021	179.00	0.00	9.00	151.50	9.50	150.60	0.69	0.00
7/27/2021	177.10	0.08	9.00	151.50	9.50	150.60	0.43	0.00
8/24/2021	175.40	0.00	9.00	151.50	9.50	150.60	0.24	0.00
9/28/2021	175.20	0.06	8.79	151.71	9.50	150.60	0.19	0.00
10/27/2021	177.20	0.80	9.00	151.50	9.50	150.60	0.32	0.00
11/23/2021	177.80	0.00	9.00	151.50	9.50	150.60	0.51	0.00
12/21/2021	180.50	5.86	9.00	151.50	9.50	150.60	0.63	0.00
1/25/2022	187.00	0.08	9.00	151.50	9.50	150.60	1.59	0.00
2/22/2022	186.60	0.18	9.00	151.50	9.50	150.60	1.59	0.00
3/28/2022	186.60	1.38	9.00	151.50	9.50	150.60	1.33	0.00
4/26/2022	186.60	0.01	9.00	151.50	9.50	150.60	1.35	0.00
5/25/2022	185.30	0.05	9.20	151.30	9.90	150.20	1.30	0.00
6/28/2022	182.70	0.00	9.00	151.50	9.50	150.60	1.19	0.00
7/26/2022	179.70	0.00	9.00	151.50	9.50	150.60	0.76	0.00
8/30/2022	178.30	0.13	9.00	151.50	9.50	150.60	0.57	0.00
9/29/2022	175.80	0.24	9.50	151.00	10.00	150.10	0.32	0.00
10/26/2022	175.30	0.26	9.00	151.50	9.50	150.60	0.27	0.00
11/22/2022	179.40	1.46	9.00	151.50	9.50	150.60	0.49	0.00

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Top of Well Elevation --->			160.5		160.1		Drain ID	
Bottom of Well Elevation --->			151.5		150.6			
Depth of Well --->			9		9.5			
Date	Spillway 378'		Reading	Elev.	Reading	Elev.	Seepage Flow Point (Gal / Min)	
	Elevation	Rainfall (in)					Left Subdrain	Right Subdrain
12/29/2022	185.70	2.21	8.90	151.60	9.80	150.30	1.37	0.00
1/11/2023	191.70	3.90	6.70	153.80	6.10	154.00	1.97	0.00
1/25/2023	194.00	7.17	7.20	153.30	7.30	152.80	2.12	0.00
2/28/2023	194.00	3.98	6.50	154.00	5.90	154.20	2.69	0.00
3/29/2023	194.00	5.92	5.90	154.60	4.60	155.50	3.17	0.04
4/25/2023	194.00	0.19	6.70	153.80	6.30	153.80	3.04	0.00
5/24/2023	193.40	0.89	7.00	153.50	6.80	153.30	2.64	0.00
6/28/2023	192.70	0.07	7.60	152.90	7.40	152.70	3.17	0.00
7/26/2023	191.60	0.00	8.10	152.40	7.90	152.20	3.59	0.00
8/29/2023	190.50	1.84	8.24	152.26	8.06	152.04	3.43	0.00
9/26/2023	189.80	0.00	8.50	152.00	8.30	151.80	4.04	0.00
10/25/2023	189.70	0.19	8.40	152.10	8.40	151.70	3.70	0.00
11/30/2023	189.20	0.65	8.40	152.10	8.40	151.70	2.43	0.00
12/27/2023	190.00	1.15	8.30	152.20	8.30	151.80	3.80	0.00
1/29/2024	191.90	2.00	7.99	152.51	8.14	151.96	3.71	0.00
2/27/2024	194.00	8.89	5.71	154.79	4.20	155.90	3.17	0.01
3/27/2024	193.80	2.51	6.78	153.72	6.41	153.69	4.36	0.00
4/23/2024	194.00	1.51	6.97	153.53	6.82	153.28	4.02	0.00
5/1/2024	193.90	0.00	7.31	153.19	7.00	153.10	4.28	0.00
5/23/2024	193.10	0.08	7.00	153.50	6.80	153.30	4.38	0.00
6/20/2024	191.50	0.00	8.40	152.10	8.50	151.60	3.33	0.00
7/25/2024	188.70	0.00	8.75	151.75	8.85	151.25	4.28	0.00
8/28/2024	185.90	0.00	8.73	151.77	8.96	151.14	3.01	0.00
9/18/2024	183.95	0.00	6.96	153.54	6.81	153.29	3.17	0.00
10/30/2024	182.00	0.00	7.60	152.90	9.25	150.85	1.85	0.00
11/26/2024	177.30	0.06	7.80	152.70	9.48	150.62	1.59	0.00
12/17/2024	175.70	0.04	#N/A	#N/A	9.50	150.60	0.52	0.00

Notes:
1. Readings in red are classified as erroneous
2. Elevation calculations between 2/27/2019 and 12/29/2020 were not included due to issues with data logger.
3. Piezometer data based on NGVD 29 datum.

TABLE 6
SAND CANYON DAM
HORIZONTAL MOVEMENT OF SURVEY MONUMENTS
1975 THROUGH 2024

Monument ID		Reservoir Elevation (feet)	Temperature (°C)	S-1		S-2		S-3		S-4		S-5		S-6	
Approx . Station				8+00.234		6+00.212		4+00.125		2+00.191		0+00.079		0+61.430	
Year	Date			(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)
1968															
1969															
1975	9/15/1975			0.050	0.600	0.060	0.720	0.050	0.600	0.040	0.480	0.000	0.000		
1976															
1977															
1978															
1979															
1980															
1981	12/15/1981			0.070	0.840	0.080	0.960	0.080	0.960	0.040	0.480	0.100	1.200		
1982	6/15/1982			0.030	0.360	0.070	0.840	0.100	1.200	0.080	0.960	0.050	0.600		
1983															
1984															
1985	10/20/1985			0.070	0.840	0.090	1.080	0.120	1.440	0.130	1.560	0.060	0.720		
1986															
1987	10/20/1987			0.080	0.960	0.120	1.440	0.110	1.320	0.110	1.320	0.060	0.720	0.150	1.800
1988															
1989															
1990															
1991															
1992															
1993															
1994															
1995	5/8/1995			0.060	0.720	0.080	0.960	0.130	1.560	0.120	1.440	0.040	0.480	0.120	1.440
1996	5/1/1996			0.080	0.960	0.100	1.200	0.120	1.440	0.120	1.440	0.050	0.600	0.150	1.800
1997	5/28/1997			0.070	0.840	0.080	0.960	0.100	1.200	0.100	1.200	0.005	0.600	0.130	1.560
1998	5/11/1998			0.070	0.840	0.080	0.960	0.100	1.200	0.100	1.200	0.010	0.120	0.120	1.440

Note:
1. Vertical data is referenced in NGVD 29 datum.

TABLE 6
SAND CANYON DAM
HORIZONTAL MOVEMENT OF SURVEY MONUMENTS
1975 THROUGH 2024

Monument ID		Reservoir Elevation (feet)	Temperature (°C)	S-1		S-2		S-3		S-4		S-5		S-6	
Approx . Station				8+00.234		6+00.212		4+00.125		2+00.191		0+00.079		0+61.430	
Year	Date			(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)
1999	4/26/1999			0.070	0.840	0.090	1.080	0.100	1.200	0.095	1.140	0.015	0.180	0.115	1.380
2000	6/29/2000			0.075	0.900	0.090	1.080	0.105	1.260	0.095	1.140	0.015	0.180	0.120	1.440
2001	5/2/2001			0.075	0.900	0.090	1.080	0.100	1.200	0.095	1.140	0.020	0.240	0.110	1.320
2002	5/21/2002			0.070	0.840	0.090	1.080	0.120	1.440	0.100	1.200	0.020	0.240	0.105	1.260
2003	5/21/2003			0.075	0.900	0.095	1.140	0.115	1.380	0.100	1.200	0.015	0.180	0.110	1.320
2004	5/18/2004			0.070	0.840	0.100	1.200	0.120	1.440	0.100	1.200	0.020	0.240	0.115	0.138
2005	5/31/2005			0.070	0.840	0.100	1.200	0.105	1.260	0.100	1.200	0.020	0.240	0.115	1.380
2006	5/31/2006			0.070	0.840	0.095	1.140	0.110	1.320	0.100	1.200	0.010	0.120	0.115	1.380
2007	5/15/2007	176.8		0.080	0.960	0.085	1.020	0.105	1.260	0.090	1.080	0.020	0.240	0.105	1.260
2008	5/27/2008	190.9		0.080	0.960	0.085	1.020	0.105	1.260	0.100	1.200	0.020	0.240	0.120	1.440
2009	6/9/2009	188.1		0.065	0.780	0.085	1.020	0.095	1.140	0.100	1.200	0.020	0.240	0.120	1.440
2010	5/24/2010	190.9		0.060	0.720	0.080	0.960	0.110	1.320	0.090	1.080	0.020	0.240	0.105	1.260
2011	5/18/2011	193.1		0.065	0.780	0.080	0.960	0.110	1.320	0.110	1.320	0.020	0.240	0.120	1.440
2012	5/18/2012	180.7		0.065	0.780	0.085	1.020	0.110	1.320	0.105	1.260	0.020	0.240	0.120	1.440
2013	6/6/2013	177.6		0.065	0.780	0.105	1.260	0.100	1.200	0.100	1.200	0.015	0.180	0.115	1.380
2014	4/25/2014	177.4		0.095	1.140	0.100	1.200	0.130	1.560	0.100	1.200	0.015	0.180	0.120	1.440
2015	6/4/2015	179.0		0.080	0.960	0.080	0.960	0.115	1.380	0.105	1.260	0.020	0.240	0.115	1.380
2016	7/25/2016	178.4		0.080	0.960	0.085	1.020	0.115	1.380	0.110	1.320	0.015	0.180	0.125	1.500
2017	6/15/2017	182.5													
2018	5/31/2018	183.1		0.080	0.960	0.090	1.080	0.115	1.380	0.105	1.260	0.025	0.300	0.125	1.500
2019	6/13/2019	190.8		0.080	0.960	0.095	1.140	0.120	1.440	0.115	1.380	0.020	0.240	0.125	1.500
2020	10/16/2020	180.3		0.060	0.720	0.060	0.720	0.110	1.320	0.110	1.320	0.035	0.420	0.130	1.560
2021															
2022	4/26/2022	186.2		0.060	0.720	0.070	0.840	0.110	1.320	0.110	1.320	0.025	0.300	0.120	1.440
2022	10/27/2022	175.3	27.2	0.070	0.840	0.095	1.140	0.115	1.380	0.095	1.140	0.020	0.240	0.115	1.380
2023	12/6/2023	189.3	12.8	0.070	0.840	0.085	1.020	0.120	1.440	0.100	1.200	0.020	0.240	0.120	1.440
2024	6/5/2024	192.1	16.7	0.025	0.300	0.075	0.900	0.113	1.356	0.103	1.236	0.024	0.288	0.123	1.476

Note:
1. Vertical data is referenced in NGVD 29 datum.

TABLE 7
SAND CANYON DAM
CUMULATIVE HORIZONTAL DISPLACEMENT OF SURVEY MONUMENTS
1975 THROUGH 2024

Monument ID		Reservoir Elevation (feet)	Temperature (°C)	S-1		S-2		S-3		S-4		S-5		S-6	
Approx . Station				8+00.234		6+00.212		4+00.125		2+00.191		0+00.079		0+61.430	
Year	Date			(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)
1968															
1969															
1975	9/15/1975			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
1976															
1977															
1978															
1979															
1980															
1981	12/15/1981			0.020	0.240	0.020	0.240	0.030	0.360	0.000	0.000	0.100	1.200		
1982	6/15/1982			-0.020	-0.240	0.010	0.120	0.050	0.600	0.040	0.480	0.050	0.600		
1983															
1984															
1985	10/20/1985			0.020	0.240	0.030	0.360	0.070	0.840	0.090	1.080	0.006	0.720		
1986															
1987	10/20/1987			0.030	0.360	0.060	0.720	0.060	0.720	0.070	0.840	0.060	0.720	0.000	0.000
1988															
1989															
1990															
1991															
1992															
1993															
1994															
1995	5/8/1995			0.010	0.120	0.020	0.240	0.080	0.960	0.080	0.960	0.040	0.480	-0.030	-0.360
1996	5/1/1996			0.030	0.360	0.040	0.480	0.070	0.840	0.080	0.960	0.050	0.600	0.000	0.000
1997	5/28/1997			0.020	0.240	0.020	0.240	0.050	0.600	0.060	0.720	0.050	0.600	-0.020	-0.240
1998	5/11/1998			0.020	0.240	0.020	0.240	0.050	0.600	0.060	0.720	0.010	0.120	-0.030	-0.360

Note:
1. Vertical data is referenced in NGVD 29 datum.

TABLE 7
SAND CANYON DAM
CUMULATIVE HORIZONTAL DISPLACEMENT OF SURVEY MONUMENTS
1975 THROUGH 2024

Monument ID		Reservoir Elevation (feet)	Temperature (°C)	S-1		S-2		S-3		S-4		S-5		S-6	
Approx . Station				8+00.234		6+00.212		4+00.125		2+00.191		0+00.079		0+61.430	
Year	Date			(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)
1999	4/26/1999			0.020	0.240	0.030	0.360	0.050	0.600	0.055	0.660	0.015	0.180	-0.035	-0.420
2000	6/29/2000			0.025	0.300	0.030	0.360	0.055	0.660	0.055	0.660	0.015	0.180	-0.030	-0.360
2001	5/2/2001			0.025	0.300	0.030	0.360	0.050	0.600	0.055	0.660	0.020	0.240	-0.040	-0.480
2002	5/21/2002			0.020	0.240	0.030	0.360	0.070	0.840	0.060	0.720	0.020	0.240	-0.045	-0.540
2003	5/21/2003			0.025	0.300	0.035	0.420	0.065	0.780	0.060	0.720	0.015	0.180	-0.040	-0.480
2004	5/18/2004			0.020	0.240	0.040	0.480	0.070	0.840	0.060	0.720	0.020	0.240	-0.035	-0.420
2005	5/31/2005			0.020	0.240	0.040	0.480	0.055	0.660	0.060	0.720	0.020	0.240	-0.035	-0.420
2006	5/31/2006			0.020	0.240	0.035	0.420	0.060	0.720	0.060	0.720	0.010	0.120	-0.035	-0.420
2007	5/15/2007	176.8		0.030	0.360	0.025	0.300	0.055	0.660	0.050	0.600	0.020	0.240	-0.045	-0.540
2008	5/27/2008	190.9		0.030	0.360	0.025	0.300	0.055	0.660	0.060	0.720	0.020	0.240	-0.030	-0.360
2009	6/9/2009	188.1		0.015	0.180	0.025	0.300	0.045	0.540	0.060	0.720	0.020	0.240	-0.030	-0.360
2010	5/24/2010	190.9		0.010	0.120	0.020	0.240	0.060	0.720	0.050	0.600	0.020	0.240	-0.045	-0.540
2011	5/18/2011	193.1		0.015	0.180	0.020	0.240	0.060	0.720	0.070	0.840	0.020	0.240	-0.030	-0.360
2012	5/18/2012	180.7		0.015	0.180	0.025	0.300	0.060	0.720	0.065	0.780	0.020	0.240	-0.030	-0.360
2013	6/6/2013	177.6		0.015	0.180	0.015	0.180	0.055	0.660	0.060	0.720	0.015	0.180	-0.035	-0.420
2014	4/25/2014	177.4		0.045	0.540	0.040	0.480	0.080	0.960	0.060	0.720	0.015	0.180	-0.030	-0.360
2015	6/4/2015	179.0		0.030	0.360	0.020	0.240	0.065	0.780	0.065	0.780	0.020	0.240	-0.035	-0.420
2016	7/25/2016	178.4		0.030	0.360	0.025	0.300	0.065	0.780	0.070	0.840	0.015	0.180	-0.025	-0.300
2017	6/15/2017	182.5													
2018	5/31/2018	183.1		0.030	0.360	0.030	0.360	0.065	0.780	0.065	0.780	0.025	0.300	-0.025	-0.300
2019	6/13/2019	190.8		0.030	0.360	0.035	0.420	0.070	0.840	0.075	0.900	0.020	0.240	-0.025	-0.300
2020	10/16/2020	180.3		0.010	0.120	0.000	0.000	0.060	0.720	0.070	0.840	0.035	0.420	-0.020	-0.240
2021															
2022	4/26/2022	186.2		0.010	0.120	0.010	0.120	0.060	0.720	0.070	0.840	0.025	0.300	-0.030	-0.360
2022	10/27/2022	175.3	27.2	0.020	0.240	0.035	0.420	0.065	0.780	0.055	0.660	0.020	0.240	-0.035	-0.420
2023	12/6/2023	189.3	12.8	0.020	0.240	0.025	0.300	0.070	0.840	0.060	0.720	0.020	0.240	-0.030	-0.360
2024	6/5/2024	192.1	16.7	-0.025	-0.300	0.015	0.180	0.063	0.756	0.063	0.756	0.024	0.288	-0.027	-0.324

Note:
1. Vertical data is referenced in NGVD 29 datum.

TABLE 8
SAND CANYON DAM
ELEVATIONS OF SURVEY MONUMENTS
1968 THROUGH 2024

Monument ID		Reservoir Elevation (feet)	Temperature (°C)	S-1	S-2	S-3	S-4	S-5	S-6
Approx . Station				8+00.234	6+00.212	4+00.125	2+00.191	0+00.079	0+61.430
Year	Date			(feet)	(feet)	(feet)	(feet)	(feet)	(feet)
1968				200.75	200.33	200.4	200.57		
1969				200.6	200.24	200.29	200.41		
1975	9/15/1975			200.727	200.956	200.534	200.430	200.570	
1976									
1977									
1978									
1979									
1980									
1981	12/15/1981			200.750	201.970	200.540	200.630	200.570	
1982	6/15/1982			200.800	201.010	200.570	200.660	200.610	
1983									
1984									
1985	10/20/1985			200.740	200.960	200.540	200.600	200.550	
1986									
1987	10/20/1987			200.790		200.550	200.630	200.550	200.760
1988									
1989									
1990									
1991									
1992									
1993									
1994									
1995	5/8/1995			200.840	201.060	200.610	200.680	200.660	200.830
1996	5/1/1996			200.840	201.060	200.610	200.690	200.670	200.840
1997	5/28/1997			200.850	201.070	200.610	200.700	200.680	200.810
1998	5/11/1998			200.850	201.060	200.600	200.680	200.660	200.780

Note:
1. Vertical data is referenced in NGVD 29 datum.

TABLE 8
SAND CANYON DAM
ELEVATIONS OF SURVEY MONUMENTS
1968 THROUGH 2024

Monument ID		Reservoir Elevation (feet)	Temperature (°C)	S-1	S-2	S-3	S-4	S-5	S-6
Approx . Station				8+00.234	6+00.212	4+00.125	2+00.191	0+00.079	0+61.430
Year	Date			(feet)	(feet)	(feet)	(feet)	(feet)	(feet)
1999	4/26/1999			200.847	201.057	200.592	200.677	200.657	200.772
2000	6/29/2000			200.847	201.057	200.597	200.682	200.667	200.777
2001	5/2/2001			200.847	201.057	200.602	200.692	200.672	200.787
2002	5/21/2002			200.852	201.057	200.597	200.682	200.672	200.782
2003	5/21/2003			200.852	201.062	200.602	200.687	200.677	200.787
2004	5/18/2004			200.852	201.062	200.602	200.687	200.677	200.787
2005	5/31/2005			200.852	201.062	200.602	200.682	200.672	200.782
2006	5/31/2006			200.857	201.062	200.597	200.682	200.672	200.782
2007	5/15/2007	176.8		200.847	201.060	200.597	200.680	200.671	200.778
2008	5/27/2008	190.9		200.850	201.054	200.591	200.673	200.668	200.774
2009	6/9/2009	188.1		200.847	201.067	200.607	200.687	200.682	200.787
2010	5/24/2010	190.9		200.847	201.052	200.587	200.672	200.667	200.772
2011	5/18/2011	193.1		200.847	201.052	200.592	200.677	200.672	200.777
2012	5/18/2012	180.7		200.847	201.057	200.592	200.677	200.672	200.777
2013	6/6/2013	177.6		200.847	201.057	200.587	200.672	200.672	200.777
2014	4/25/2014	177.4		200.847	201.062	200.597	200.682	200.682	200.787
2015	6/4/2015	179.0		200.847	201.057	200.587	200.677	200.672	200.777
2016	7/25/2016	178.4		200.842	201.047	200.582	200.672	200.667	200.772
2017	6/15/2017	182.5							
2018	5/31/2018	183.1		200.842	201.057	200.592	200.682	200.682	200.787
2019	6/13/2019	190.8		200.852	201.052	200.582	200.667	200.662	200.767
2020	10/16/2020	180.3		200.843	201.052	200.574	200.660	200.658	200.764
2021									
2022	4/26/2022	186.2		200.845	201.054	200.581	200.668	200.667	200.771
2022	10/27/2022	175.3	27.2	200.842	201.057	200.581	200.669	200.665	200.767
2023	12/6/2023	189.3	12.8	200.845	201.048	200.578	200.665	200.663	200.769
2024	6/5/2024	192.1	16.7	200.849	201.052	200.583	200.671	200.670	200.776

Note:
1. Vertical data is referenced in NGVD 29 datum.

TABLE 9
SAND CANYON DAM
CUMULATIVE VERTICAL MOVEMENT OF SURVEY MONUMENTS
1969 THROUGH 2024

Monument ID		Reservoir Elevation (feet)	Temperature (°C)	S-1		S-2		S-3		S-4		S-5		S-6	
Approx . Station				8+00.234		6+00.212		4+00.125		2+00.191		0+00.079		0+61.430	
Year	Date			(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)
1968															
1969				-0.15	-1.800	-0.09	-1.080	-0.11	-1.32	-0.16	-1.92				
1975	9/15/1975			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
1976															
1977															
1978															
1979															
1980															
1981	12/15/1981			-0.023	-0.276	-1.014	-12.168	-0.006	-0.072	-0.200	-2.400	0.000	0.000		
1982	6/15/1982			-0.073	-0.876	-0.054	-0.648	-0.036	-0.432	-0.230	-2.760	-0.040	-0.480		
1983															
1984															
1985	10/20/1985			-0.013	-0.156	-0.004	-0.048	-0.006	-0.072	-0.170	-2.040	0.020	0.240		
1986															
1987	10/20/1987			-0.063	-0.756		0.000	-0.016	-0.192	-0.200	-2.400	0.020	0.240	0.000	0.000
1988															
1989															
1990															
1991															
1992															
1993															
1994															
1995	5/8/1995			-0.113	-1.356	-0.104	-1.248	-0.076	-0.912	-0.250	-3.000	-0.090	-1.080	-0.070	-0.840
1996	5/1/1996			-0.113	-1.356	-0.104	-1.248	-0.076	-0.912	-0.260	-3.120	-0.100	-1.200	-0.080	-0.960
1997	5/28/1997			-0.123	-1.476	-0.114	-1.368	-0.076	-0.912	-0.270	-3.240	-0.110	-1.320	-0.050	-0.600
1998	5/11/1998			-0.123	-1.476	-0.104	-1.248	-0.066	-0.792	-0.250	-3.000	-0.090	-1.080	-0.020	-0.240

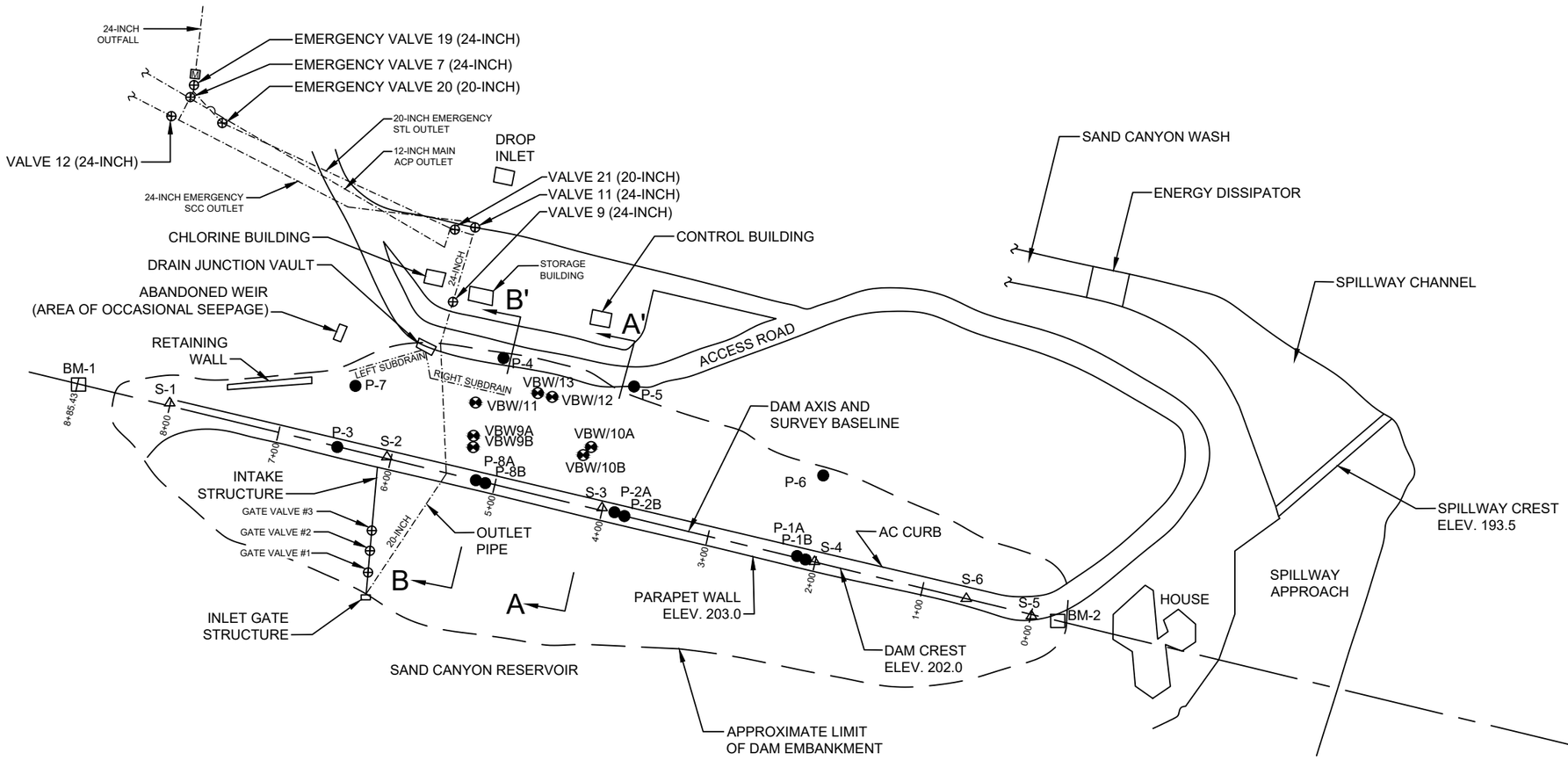
Note:
1. Vertical data is referenced in NGVD 29 datum.

TABLE 9
SAND CANYON DAM
CUMULATIVE VERTICAL MOVEMENT OF SURVEY MONUMENTS
1969 THROUGH 2024

Monument ID		Reservoir Elevation (feet)	Temperature (°C)	S-1		S-2		S-3		S-4		S-5		S-6	
Approx . Station				8+00.234		6+00.212		4+00.125		2+00.191		0+00.079		0+61.430	
Year	Date			(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)	(feet)	(inches)
1999	4/26/1999			-0.120	-1.440	-0.101	-1.212	-0.058	-0.696	-0.247	-2.964	-0.087	-1.044	-0.012	-0.144
2000	6/29/2000			-0.120	-1.440	-0.101	-1.212	-0.063	-0.756	-0.252	-3.024	-0.097	-1.164	-0.017	-0.204
2001	5/2/2001			-0.120	-1.440	-0.101	-1.212	-0.068	-0.816	-0.262	-3.144	-0.102	-1.224	-0.027	-0.324
2002	5/21/2002			-0.125	-1.500	-0.101	-1.212	-0.063	-0.756	-0.252	-3.024	-0.102	-1.224	-0.022	-0.264
2003	5/21/2003			-0.125	-1.500	-0.106	-1.272	-0.068	-0.816	-0.257	-3.084	-0.107	-1.284	-0.027	-0.324
2004	5/18/2004			-0.125	-1.500	-0.106	-1.272	-0.068	-0.816	-0.257	-3.084	-0.107	-1.284	-0.027	-0.324
2005	5/31/2005			-0.125	-1.500	-0.106	-1.272	-0.068	-0.816	-0.252	-3.024	-0.102	-1.224	-0.022	-0.264
2006	5/31/2006			-0.130	-1.560	-0.106	-1.272	-0.063	-0.756	-0.252	-3.024	-0.102	-1.224	-0.022	-0.264
2007	5/15/2007	176.8		-0.120	-1.440	-0.104	-1.248	-0.063	-0.756	-0.250	-3.000	-0.101	-1.212	-0.018	-0.216
2008	5/27/2008	190.9		-0.123	-1.476	-0.098	-1.176	-0.057	-0.684	-0.243	-2.916	-0.098	-1.176	-0.014	-0.168
2009	6/9/2009	188.1		-0.120	-1.440	-0.111	-1.332	-0.073	-0.876	-0.257	-3.084	-0.112	-1.344	-0.027	-0.324
2010	5/24/2010	190.9		-0.120	-1.440	-0.096	-1.152	-0.053	-0.636	-0.242	-2.904	-0.097	-1.164	-0.012	-0.144
2011	5/18/2011	193.1		-0.120	-1.440	-0.096	-1.152	-0.058	-0.696	-0.247	-2.964	-0.102	-1.224	-0.017	-0.204
2012	5/18/2012	180.7		-0.120	-1.440	-0.101	-1.212	-0.058	-0.696	-0.247	-2.964	-0.102	-1.224	-0.017	-0.204
2013	6/6/2013	177.6		-0.120	-1.440	-0.101	-1.212	-0.053	-0.636	-0.242	-2.904	-0.102	-1.224	-0.017	-0.204
2014	4/25/2014	177.4		-0.120	-1.440	-0.106	-1.272	-0.063	-0.756	-0.252	-3.024	-0.112	-1.344	-0.027	-0.324
2015	6/4/2015	179.0		-0.120	-1.440	-0.101	-1.212	-0.053	-0.636	-0.247	-2.964	-0.102	-1.224	-0.017	-0.204
2016	7/25/2016	178.4		-0.115	-1.380	-0.091	-1.092	-0.048	-0.576	-0.242	-2.904	-0.097	-1.164	-0.012	-0.144
2017	6/15/2017	182.5													
2018	5/31/2018	183.1		-0.115	-1.380	-0.101	-1.212	-0.058	-0.696	-0.252	-3.024	-0.112	-1.344	-0.027	-0.324
2019	6/13/2019	190.8		-0.125	-1.500	-0.096	-1.152	-0.048	-0.576	-0.237	-2.844	-0.092	-1.104	-0.007	-0.084
2020	10/16/2020	180.3		-0.116	-1.392	-0.096	-1.152	-0.040	-0.480	-0.230	-2.760	-0.088	-1.056	-0.004	-0.048
2021															
2022	4/26/2022	186.2		-0.118	-1.416	-0.098	-1.176	-0.047	-0.564	-0.238	-2.856	-0.097	-1.164	-0.011	-0.132
2022	10/27/2022	175.3	27.2	-0.115	-1.38	-0.101	-1.212	-0.047	-0.564	-0.239	-2.868	-0.095	-1.140	-0.007	-0.084
2023	12/6/2023	189.3	12.8	-0.118	-1.416	-0.092	-1.104	-0.044	-0.528	-0.235	-2.82	-0.093	-1.116	-0.009	-0.108
2024	6/5/2024	192.1	16.7	-0.122	-1.464	-0.096	-1.152	-0.049	-0.588	-0.241	-2.892	-0.100	-1.200	-0.016	-0.192

Note:
1. Vertical data is referenced in NGVD 29 datum.

Figures



LEGEND

VBW/13	VIBRATING WIRE PIEZOMETER
P-2A	OPEN WELL PIEZOMETER
S-3	SURVEY MONUMENT
BM-1	BENCH MARK
M	METER
A A'	LINE OF SECTION
	OUTLET PIPE
	SEEPAGE SUBDRAIN
0+00	STATION NUMBER

NOTES:

(1) SECTION A-A' IS SHOWN ON FIGURE 2

(2) SECTION B-B' IS SHOWN ON FIGURE 3

(3) ELEVATIONS ARE IN FEET RELATIVE TO NGVD29 DATUM

(4) LOCATIONS OF OUTLET PIPES AND VALVES ARE ESTIMATED

(5) ONLY DSOD JURISDICTIONAL VALVES ARE SHOWN

NOT TO SCALE

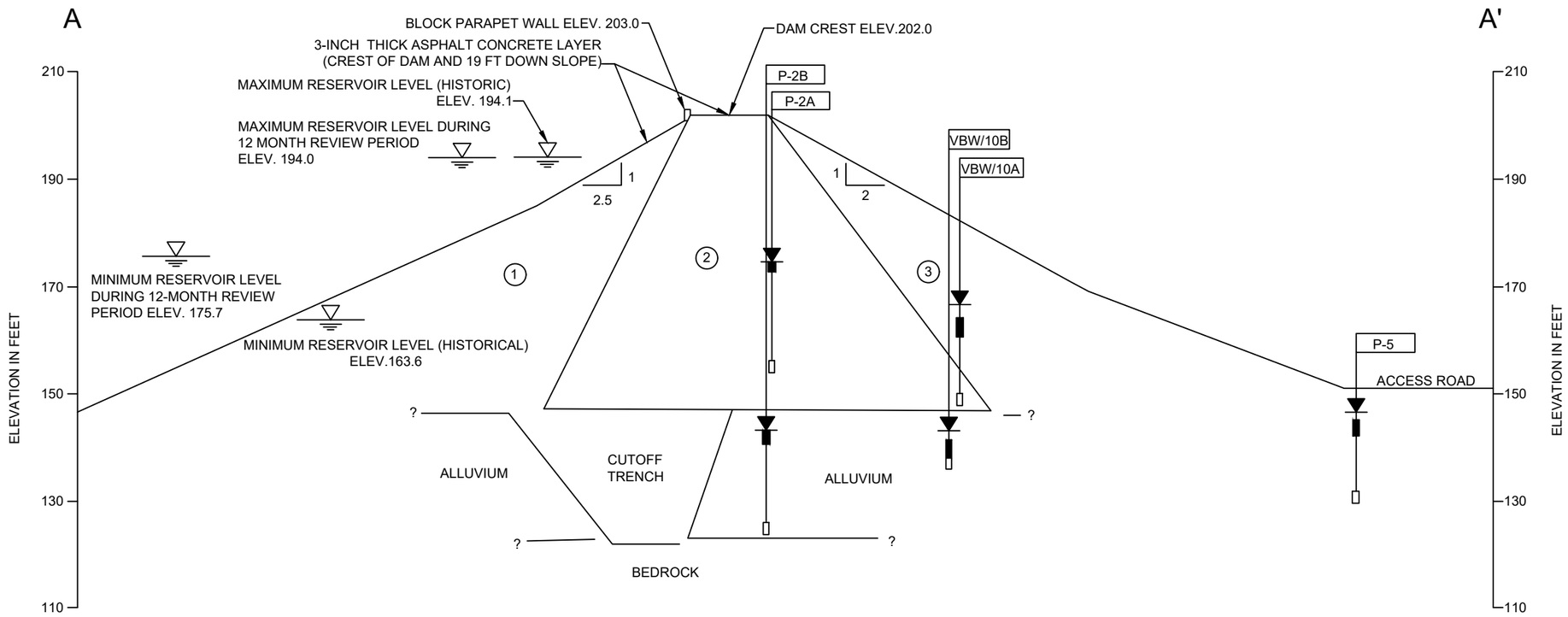
Annual Surveillance Report from Jan. 2024 to Dec. 2024
Sand Canyon Dam
Irvine, CA

Irvine Ranch Water District
Irvine, CA

GEI Consultants

SITE AND INSTRUMENTATION PLAN

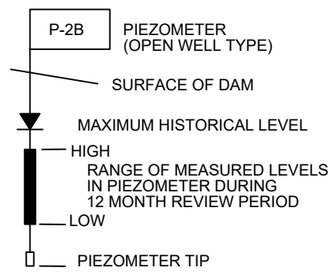
Project 2305575 | May 2025 | Fig. 1



MATERIALS

1. SELECTED IMPERVIOUS
2. RANDOM
3. UNSELECTED PERVIOUS

LEGEND



NOTE: QUESTIONABLE READINGS
ARE NOT SHOWN

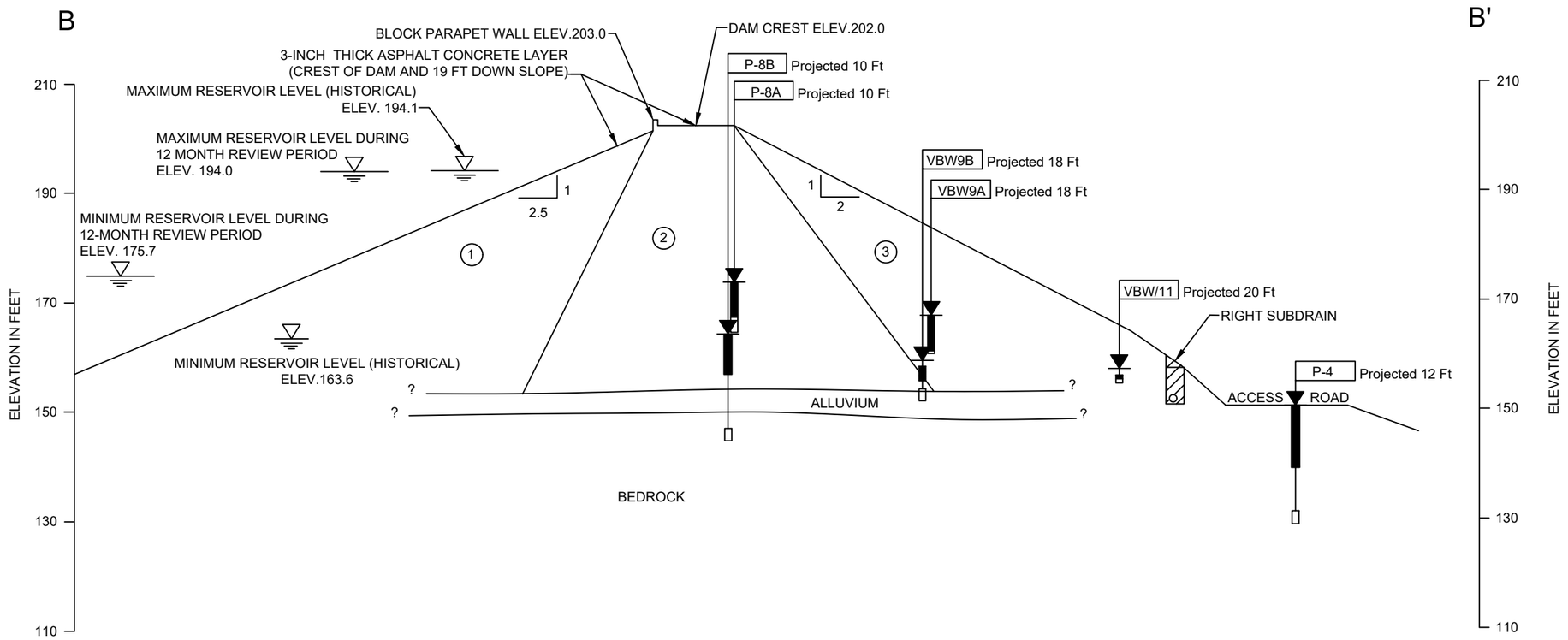
NOTES:

(1) SEE FIGURE 1 FOR LOCATION OF SECTION

(2) ELEVATIONS ARE IN FEET RELATIVE TO NGVD29

NOT TO SCALE

Annual Surveillance Report from Jan. 2024 to Dec. 2024 Sand Canyon Dam Irvine, CA	GEI Consultants	SECTION A-A'
Irvine Ranch Water District Irvine, CA	Project 2305575	May 2025 Fig. 2



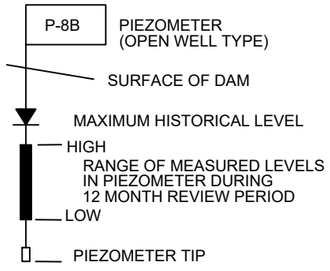
MATERIALS

(1) SELECTED IMPERVIOUS

(2) RANDOM

(3) UNSELECTED PERVIOUS

LEGEND



NOTE: QUESTIONABLE READINGS ARE NOT SHOWN

NOTES:

(1) SEE FIGURE 1 FOR LOCATION OF SECTION

(2) ELEVATIONS ARE IN FEET RELATIVE TO NGVD29

NOT TO SCALE

Annual Surveillance Report from Jan. 2024 to Dec. 2024
Sand Canyon Dam
Irvine, CA

Irvine Ranch Water District
Irvine, CA

GEI Consultants

SECTION B-B'

Project 2305575 | May 2025 | Fig. 3

Figure 4

SAND CANYON DAM

2-YR OPEN WELL PIEZOMETER AND RESERVOIR WATER SURFACE ELEVATIONS

OPEN WELL PIEZOMETERS P-1A, P-1B, AND P-6

JANUARY 2023 THROUGH DECEMBER 2024

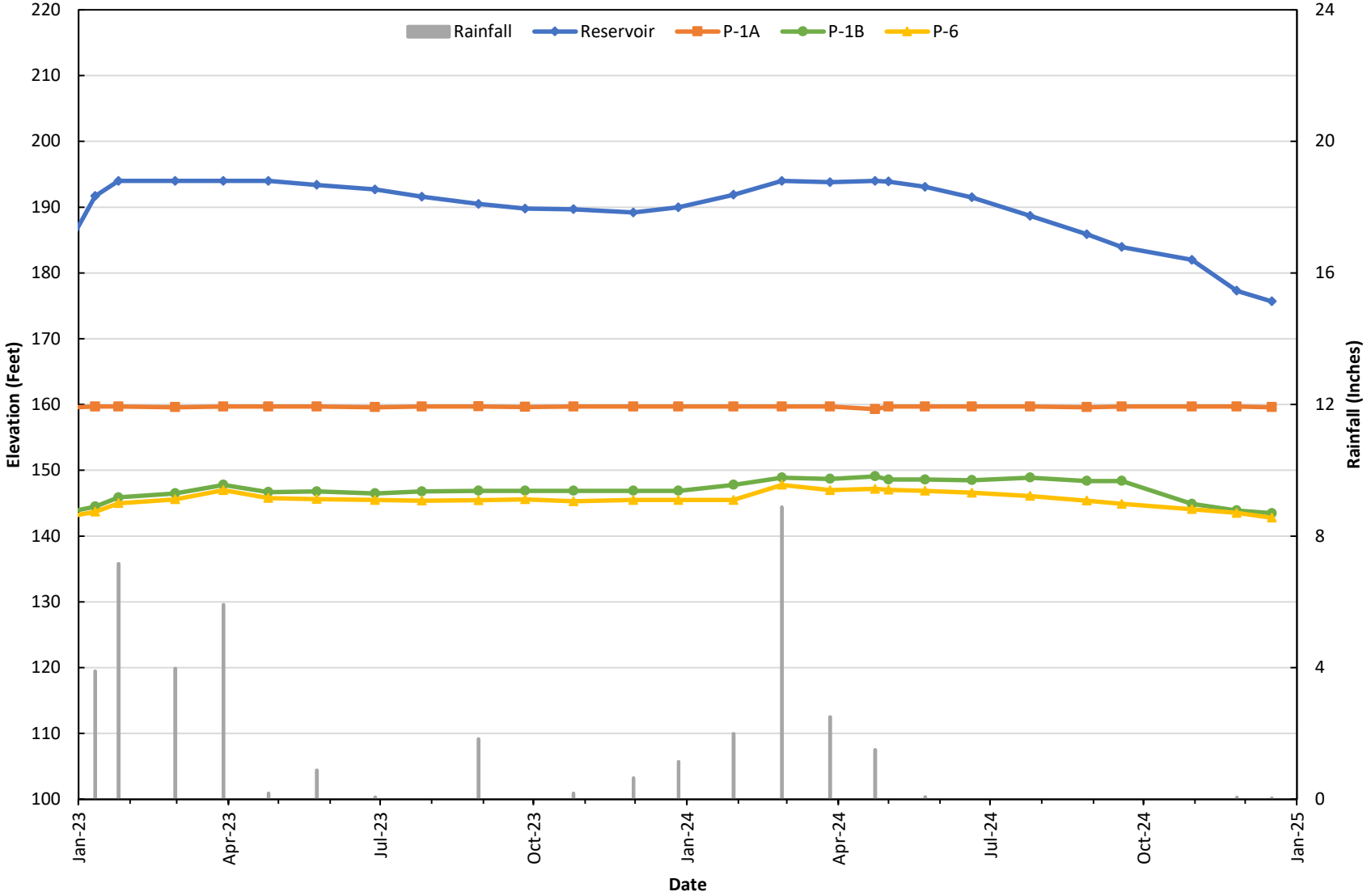


Figure 5

SAND CANYON DAM

2-YR PIEZOMETER AND RESERVOIR WATER SURFACE ELEVATIONS

PIEZOMETERS P-2A, P-2B, P-5, VBW/10A, AND VBW/10B

JANUARY 2023 THROUGH DECEMBER 2024

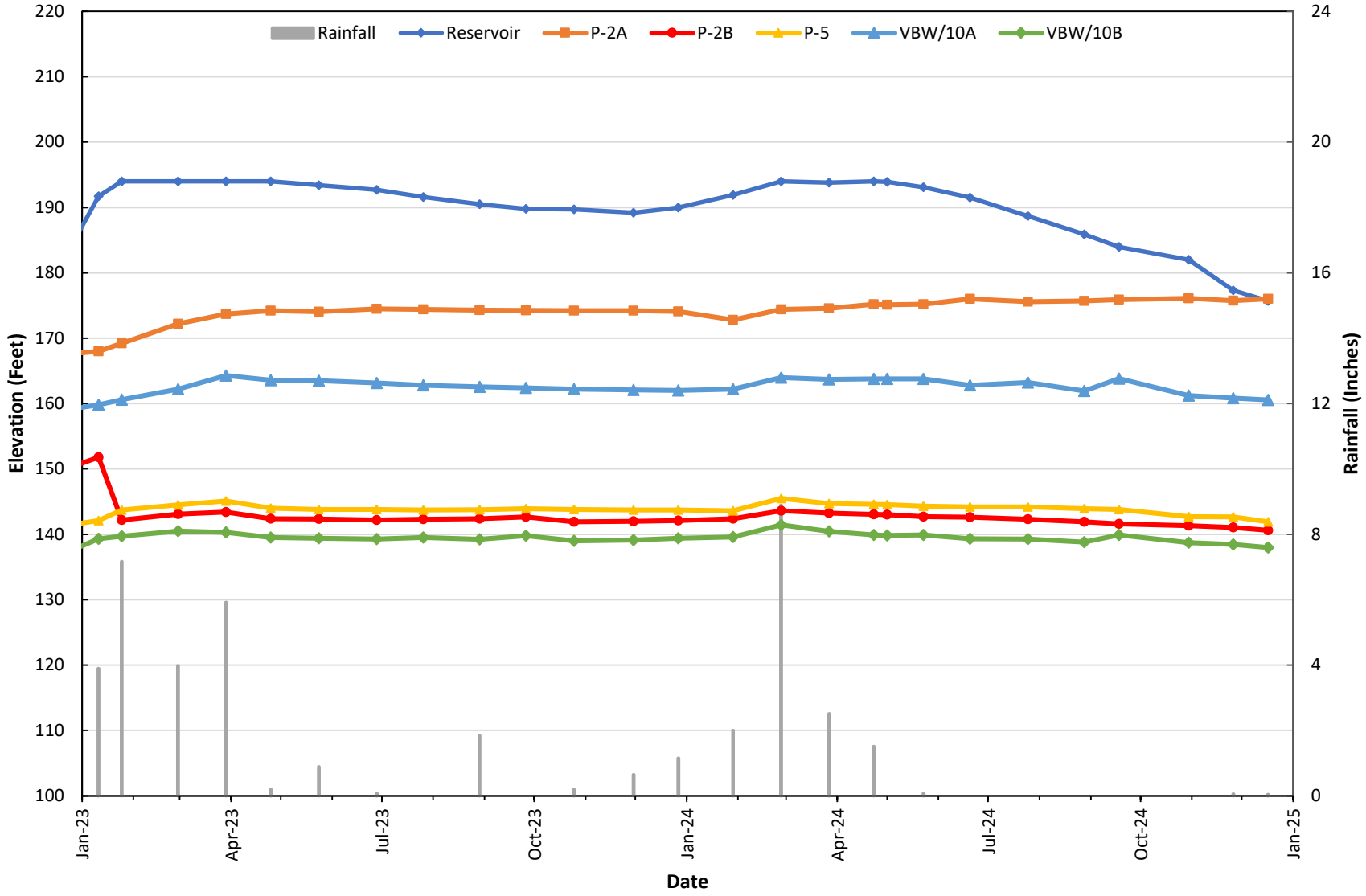


Figure 6

SAND CANYON DAM

2-YR PIEZOMETER AND RESERVOIR WATER SURFACE ELEVATIONS

PIEZOMETERS P-4, P-8A, P-8B, VBW9A, VBW9B, AND VBW/11

JANUARY 2023 THROUGH DECEMBER 2024

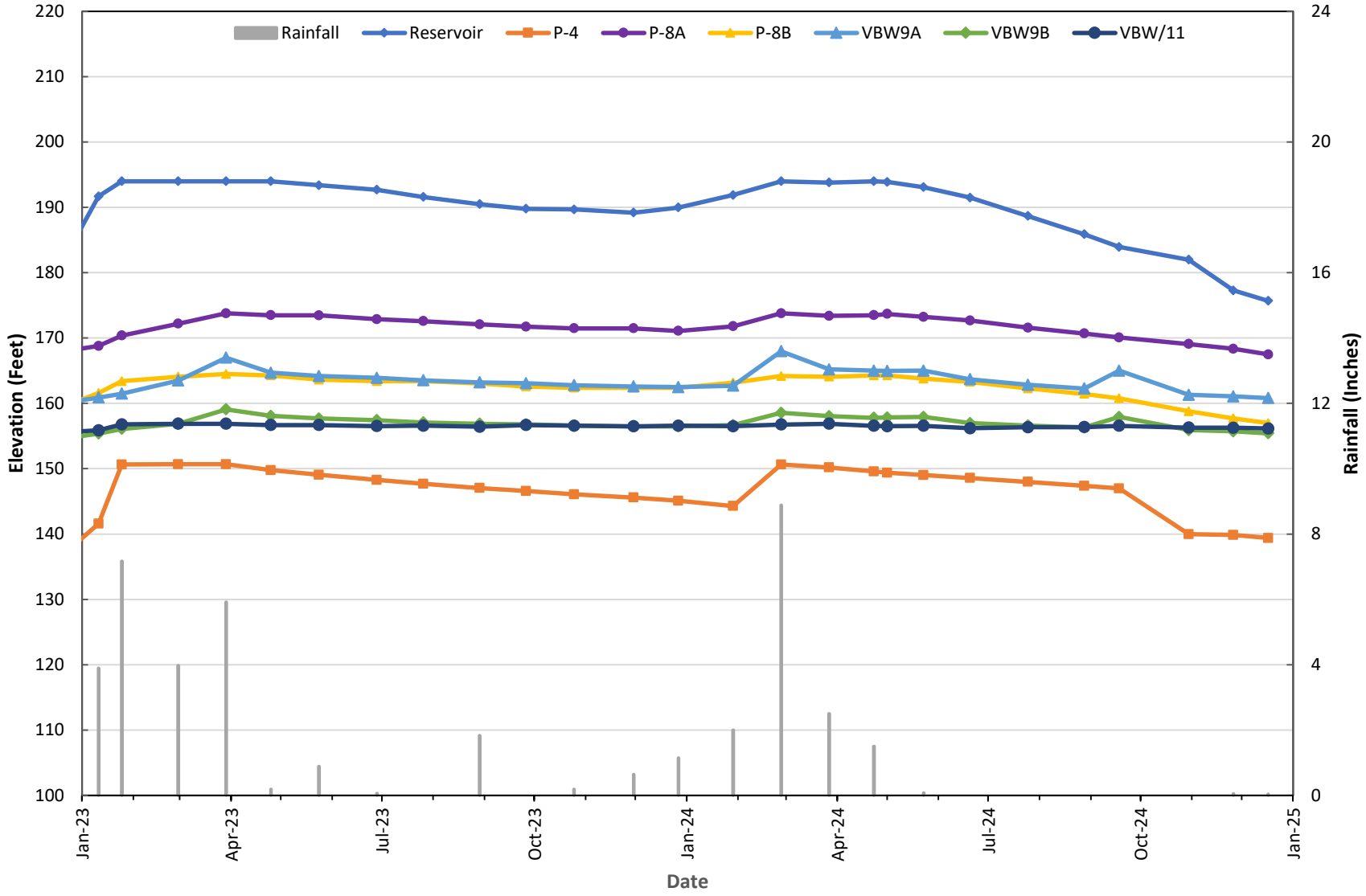


Figure 7
SAND CANYON DAM
2-YR OPEN WELL PIEZOMETER AND RESERVOIR WATER SURFACE ELEVATIONS
OPEN WELL PIEZOMETERS P-3, AND P-7
JANUARY 2023 THROUGH DECEMBER 2024

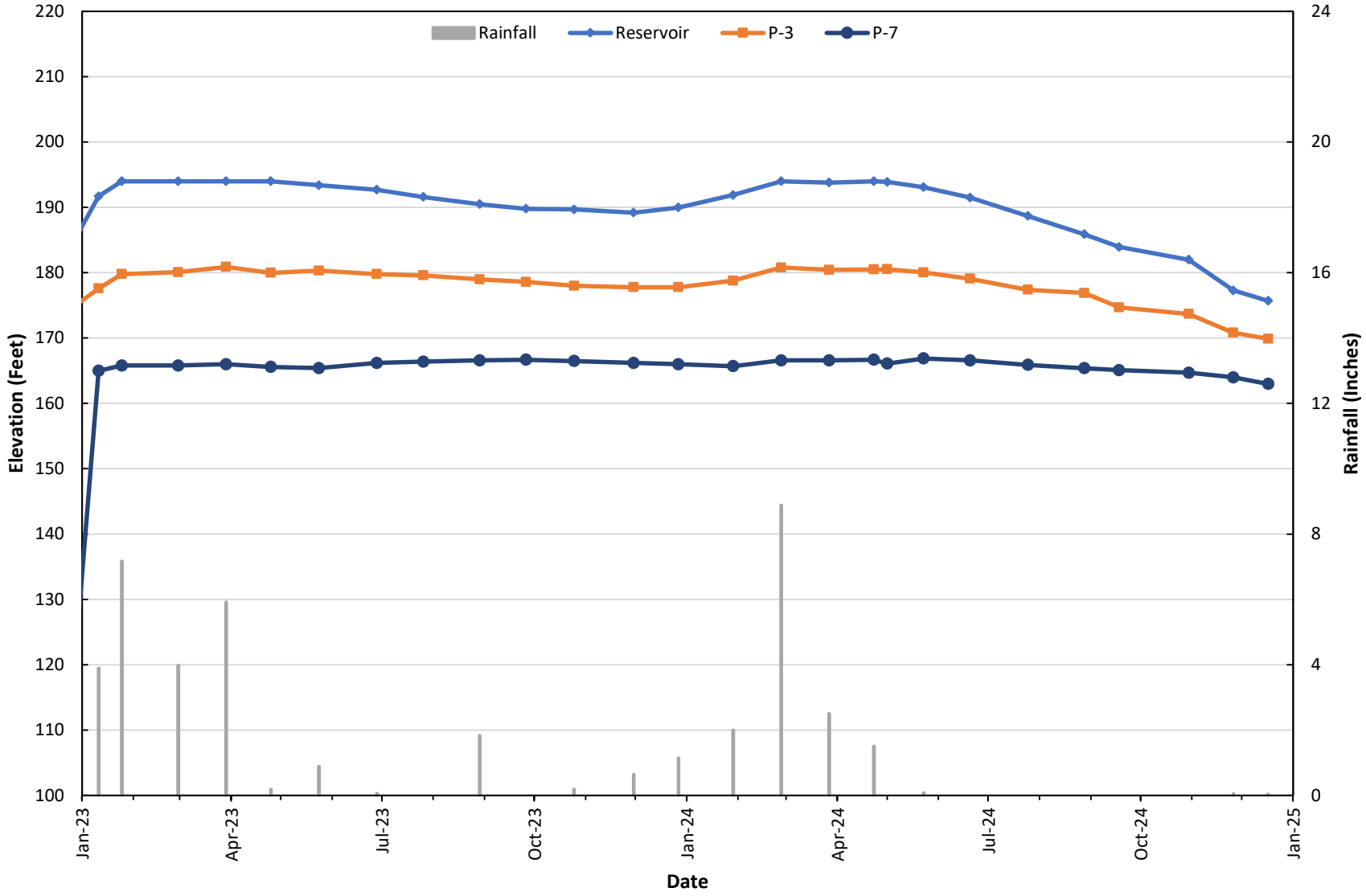


Figure 8
SAND CANYON DAM
2-YR VIBRATING WIRE PIEZOMETER AND RESERVOIR WATER SURFACE ELEVATIONS
VIBRATING WIRE PIEZOMETERS VBW/12, AND VBW/13
JANUARY 2023 THROUGH DECEMBER 2024

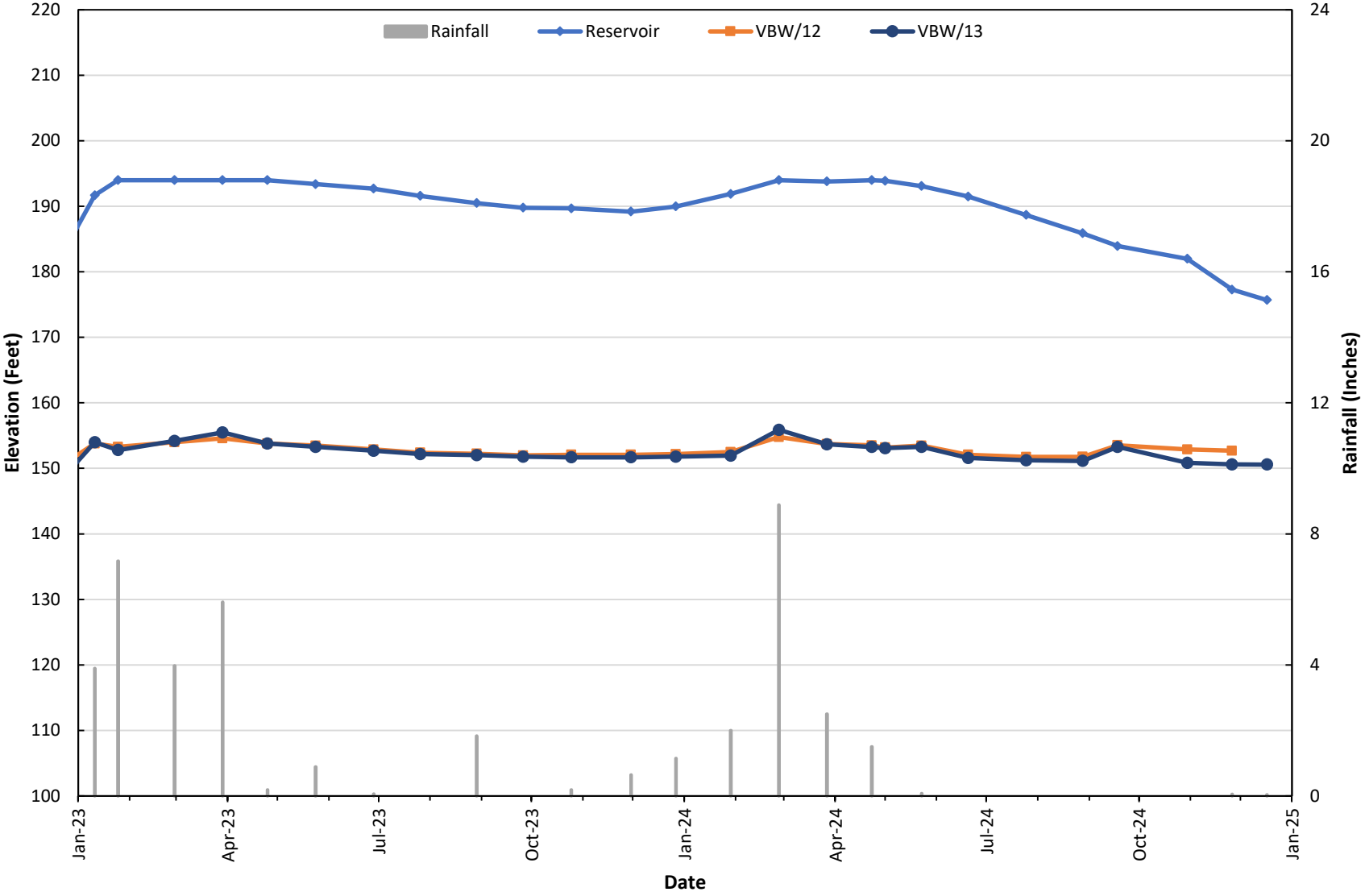


Figure 9

SAND CANYON DAM

HISTORICAL OPEN WELL PIEZOMETER AND RESERVOIR WATER SURFACE ELEVATIONS

OPEN WELL PIEZOMETERS P-1A, P-1B, AND P-6

JANUARY 2014 THROUGH DECEMBER 2024

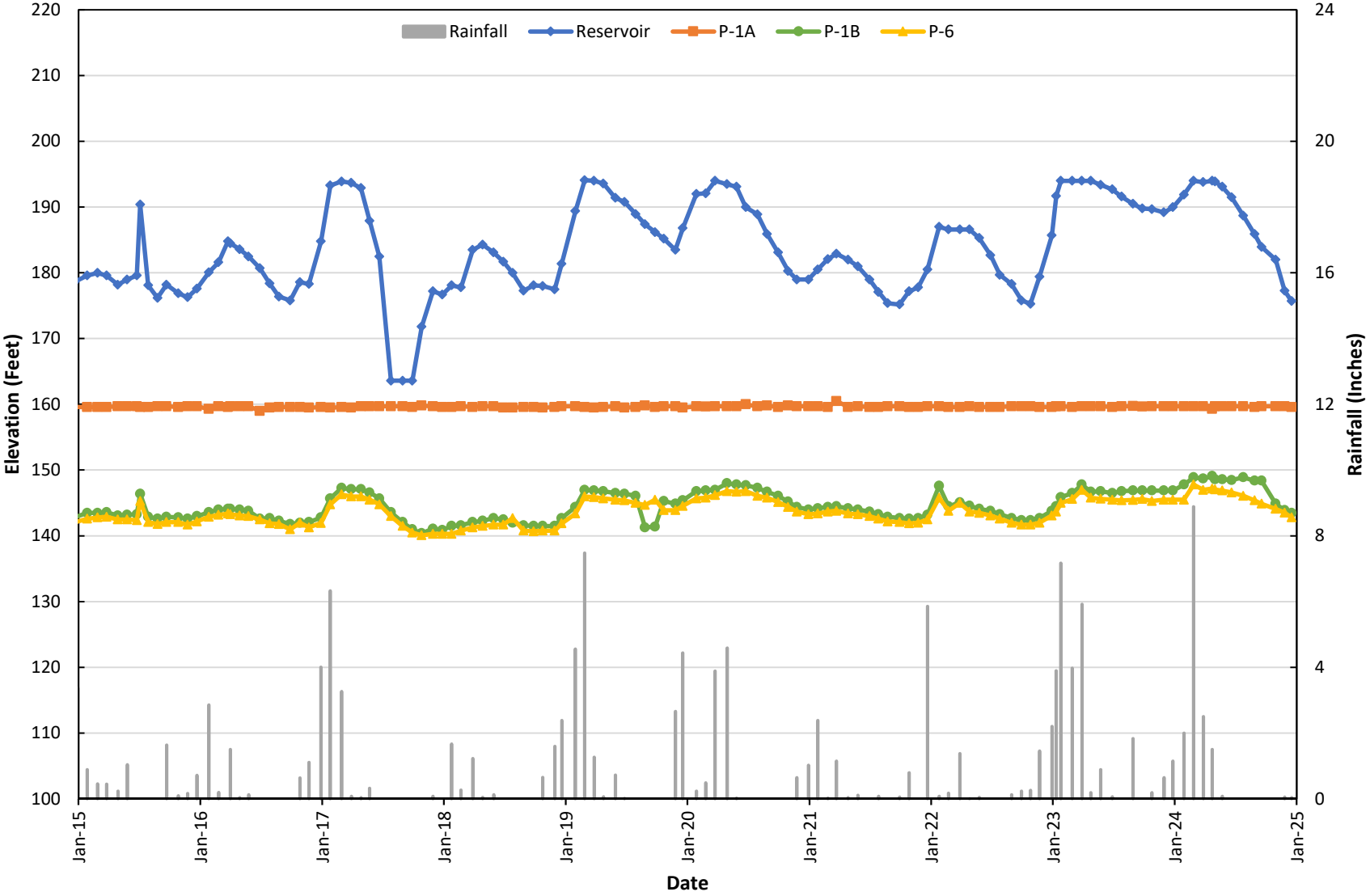


Figure 10

SAND CANYON DAM

HISTORICAL PIEZOMETER AND RESERVOIR WATER SURFACE ELEVATIONS

PIEZOMETERS P-2A, P-2B, P-5, VBW/10A, AND VBW/10B

JANUARY 2014 THROUGH DECEMBER 2024

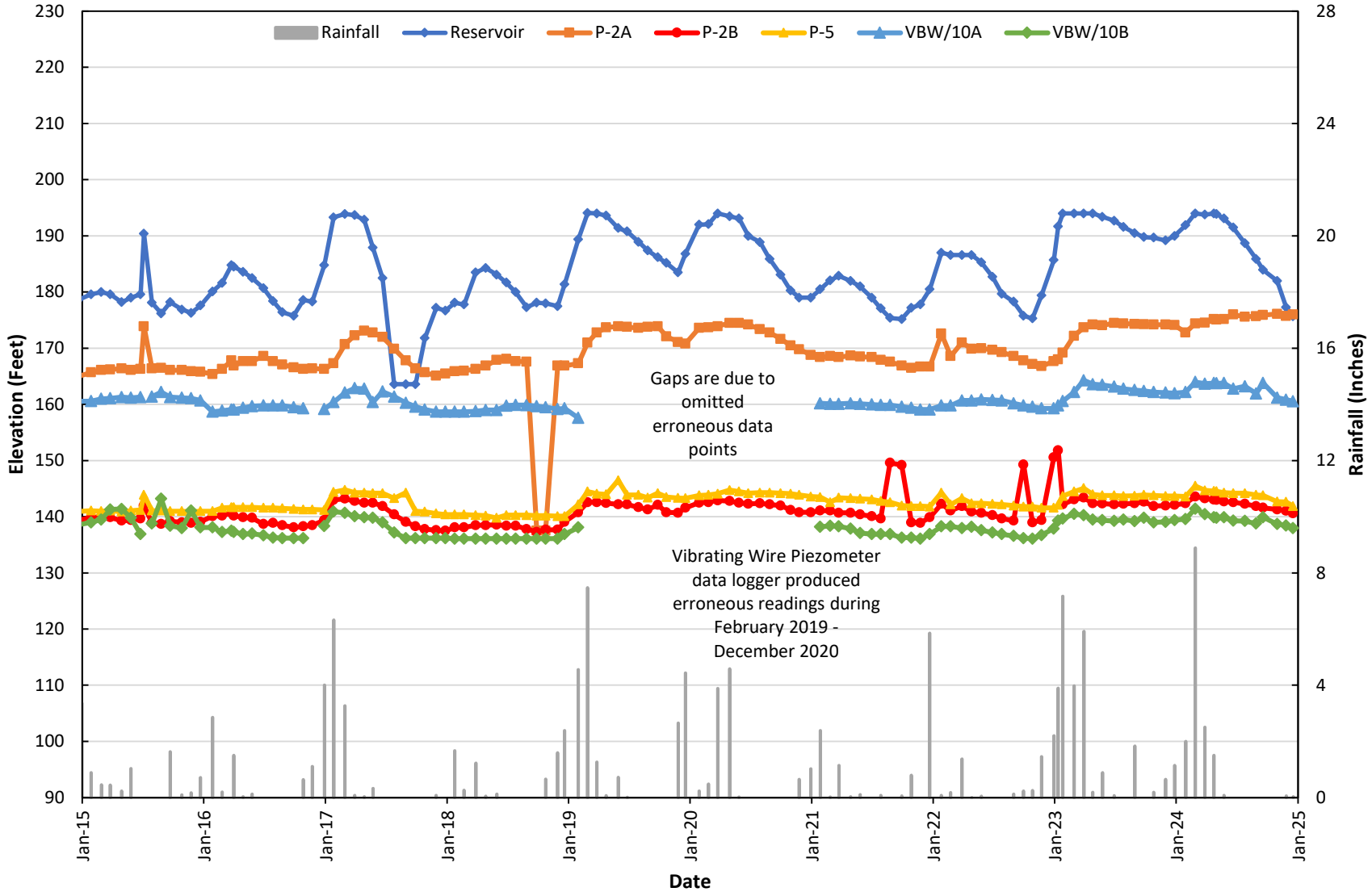


Figure 11
SAND CANYON DAM
HISTORICAL PIEZOMETER AND RESERVOIR WATER SURFACE ELEVATIONS
PIEZOMETERS P-4, P-8A, P-8B, VBW9A, VBW9B, AND VBW/11
JANUARY 2014 THROUGH DECEMBER 2024

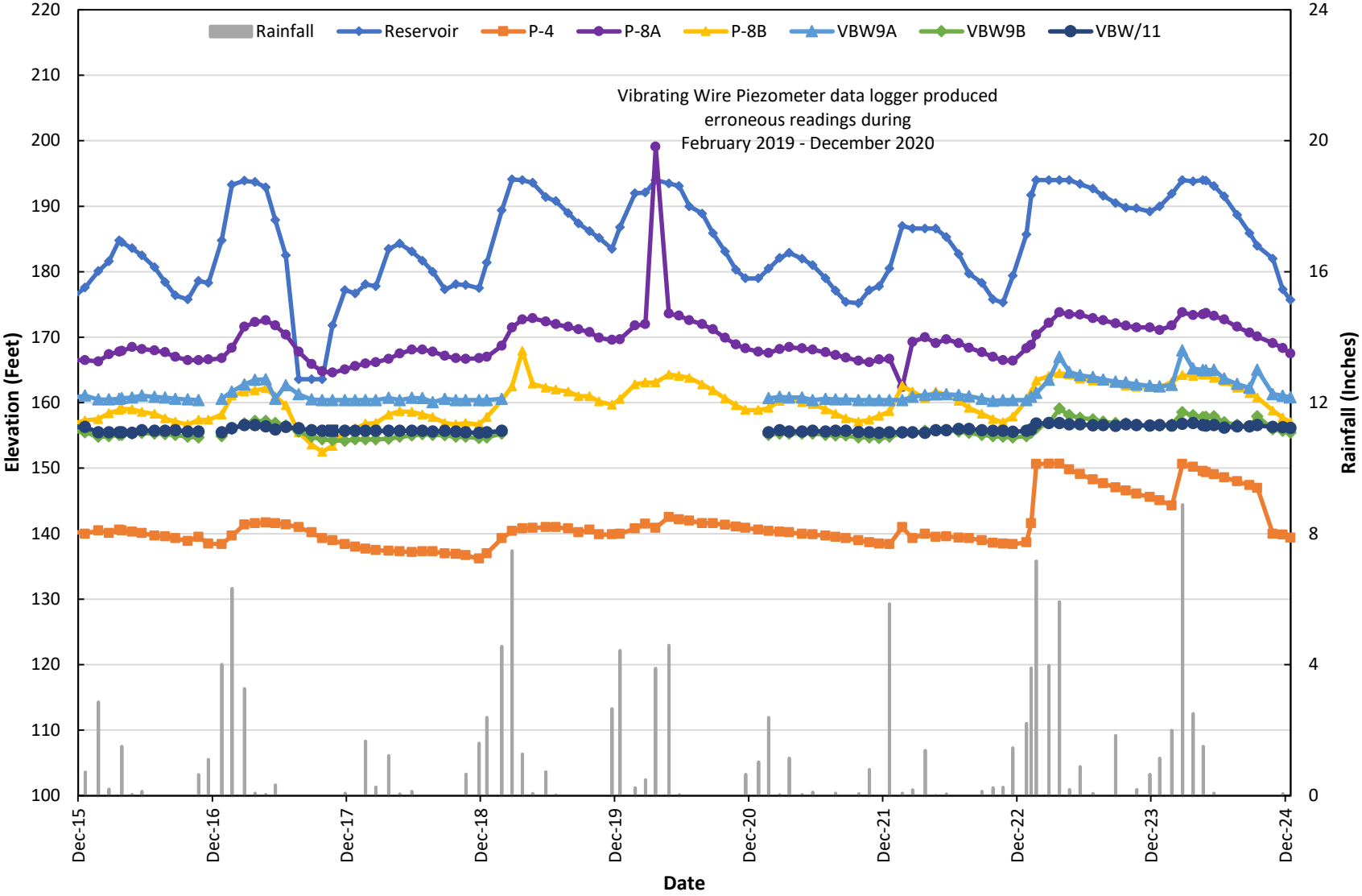


Figure 12
SAND CANYON DAM
HISTORICAL OPEN WELL PIEZOMETER AND RESERVOIR WATER SURFACE ELEVATIONS
OPEN WELL PIEZOMETERS P-3, AND P-7
JANUARY 2014 THROUGH DECEMBER 2024

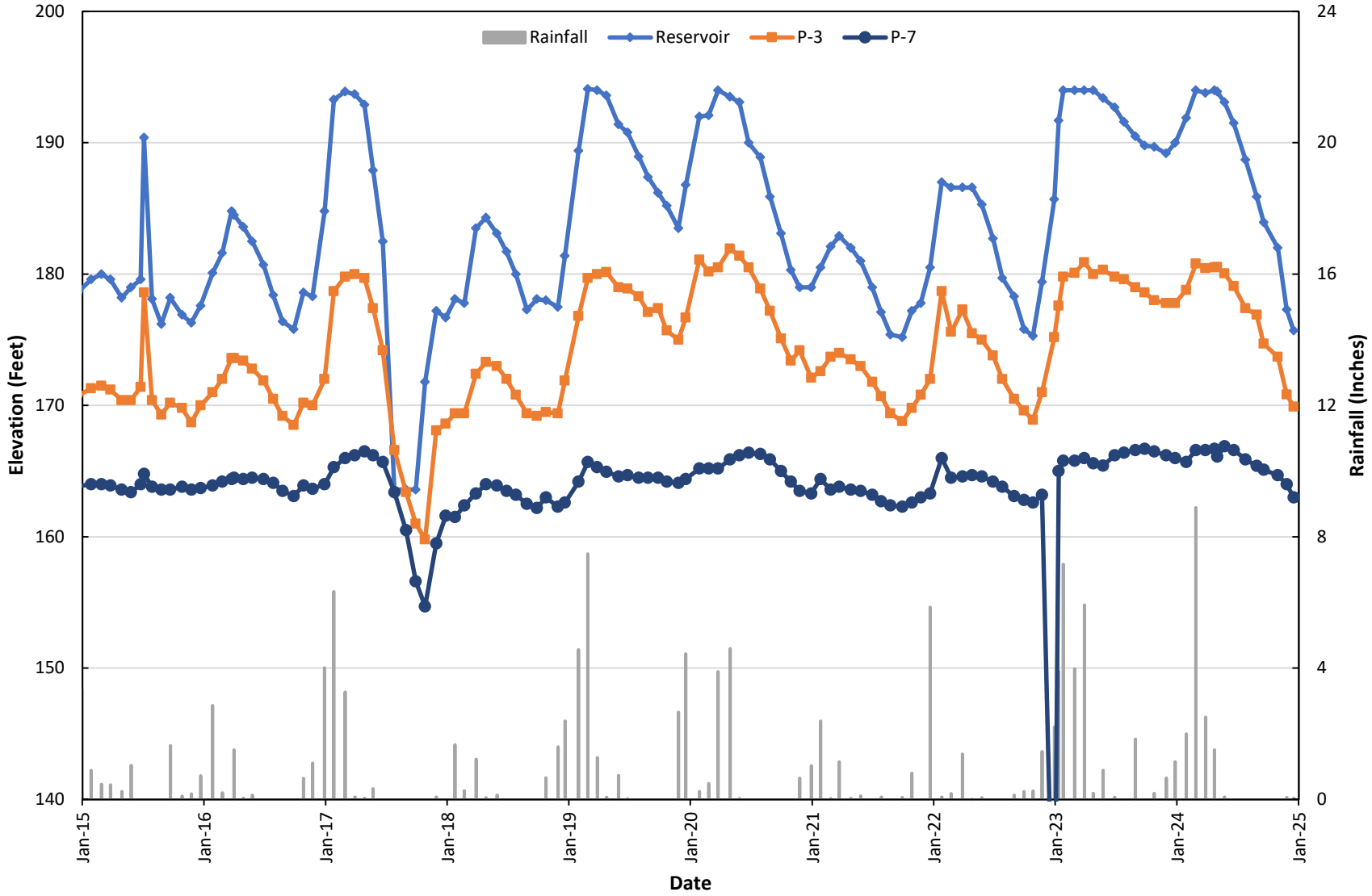


Figure 13

SAND CANYON DAM

HISTORICAL VIBRATING WIRE PIEZOMETER AND RESERVOIR WATER SURFACE ELEVATIONS

VIBRATING WIRE PIEZOMETERS VBW/12, AND VBW/13

JANUARY 2014 THROUGH DECEMBER 2024

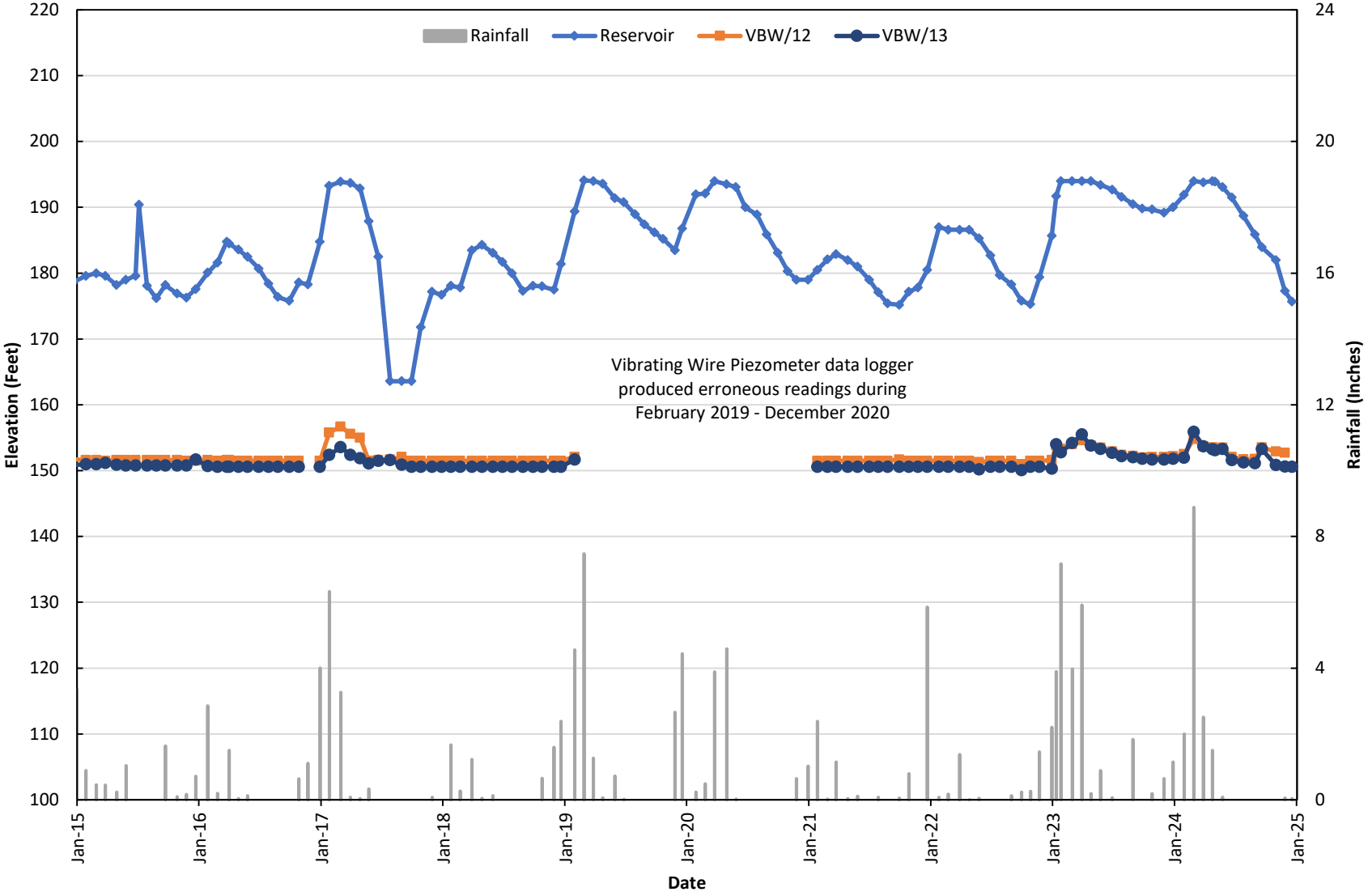


Figure 14
SAND CANYON DAM
2-YR SEEPAGE, RESERVOIR WATER SURFACE ELEVATIONS AND RAINFALL
JANUARY 2023 THROUGH DECEMBER 2024

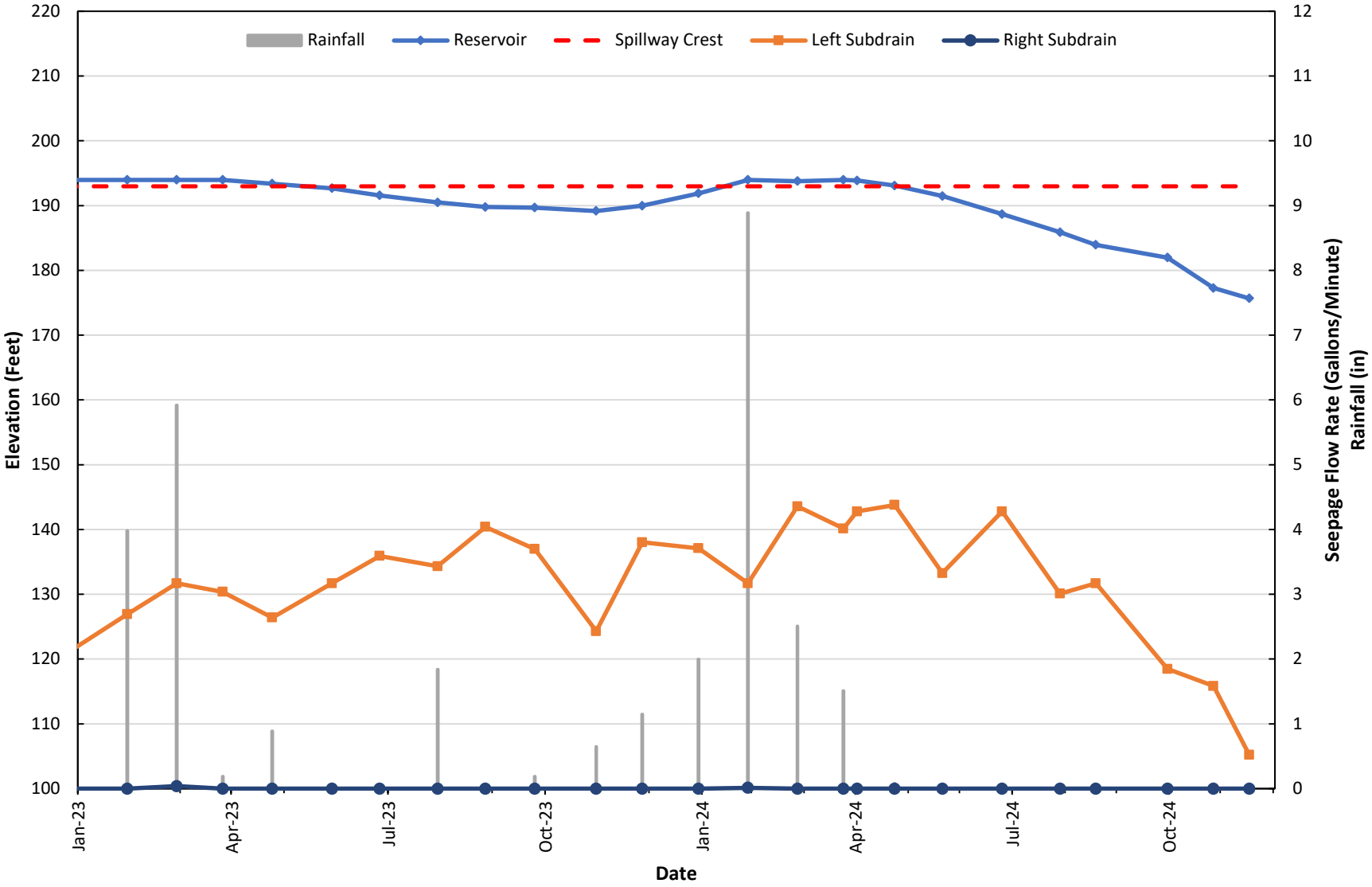


Figure 15
SAND CANYON DAM
HISTORICAL SEEPAGE FLOW RATES AND RESERVOIR WATER SURFACE ELEVATIONS
JANUARY 2014 THROUGH DECEMBER 2024

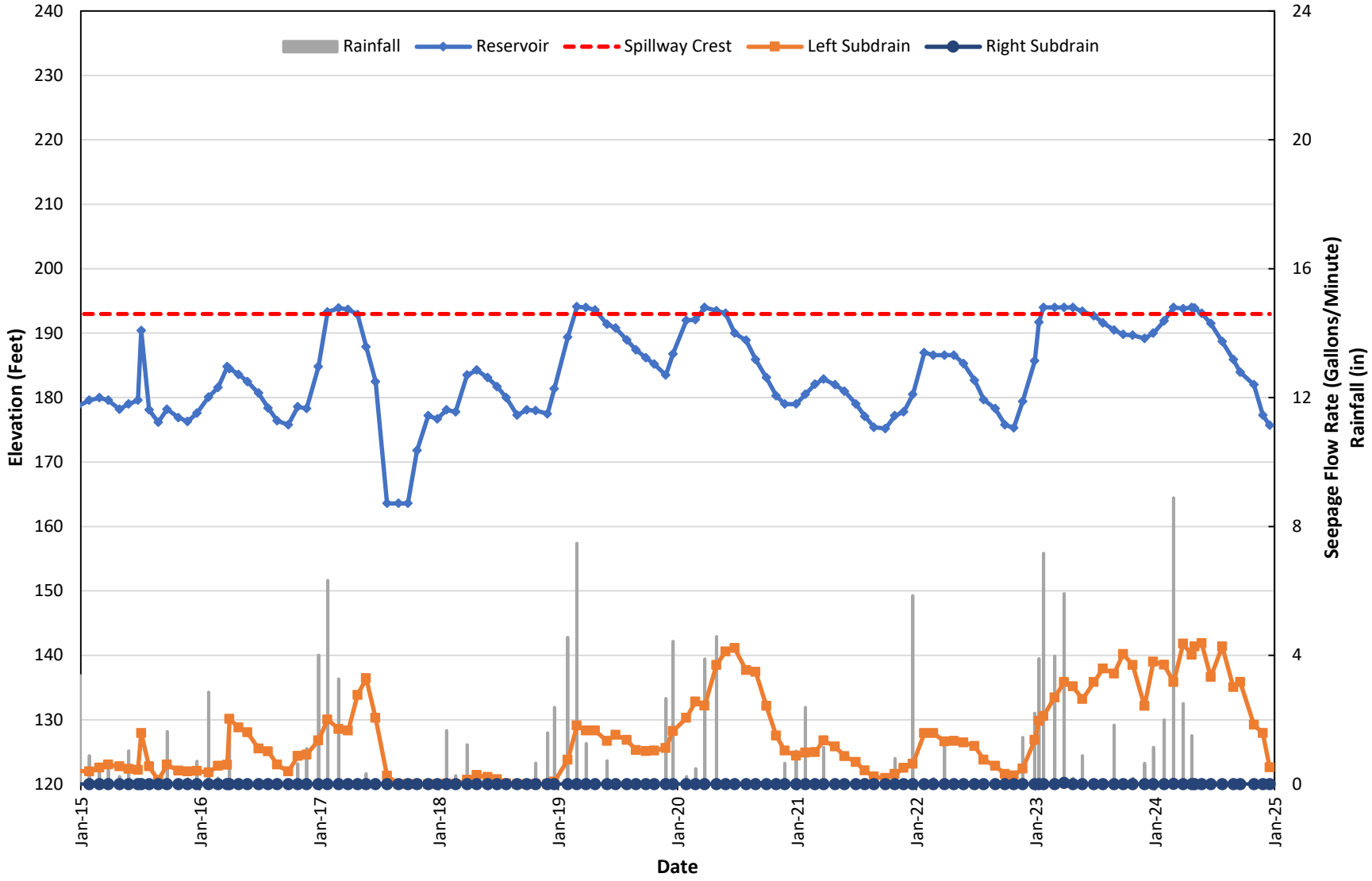


Figure 16
SAND CANYON DAM
HISTORICAL CUMULATIVE HORIZONTAL DISPLACEMENT
SURVEY MONUMENTS S-1, S-2, S-3, S-4, S-5, S-6
JANUARY 1995 THROUGH DECEMBERr 2024

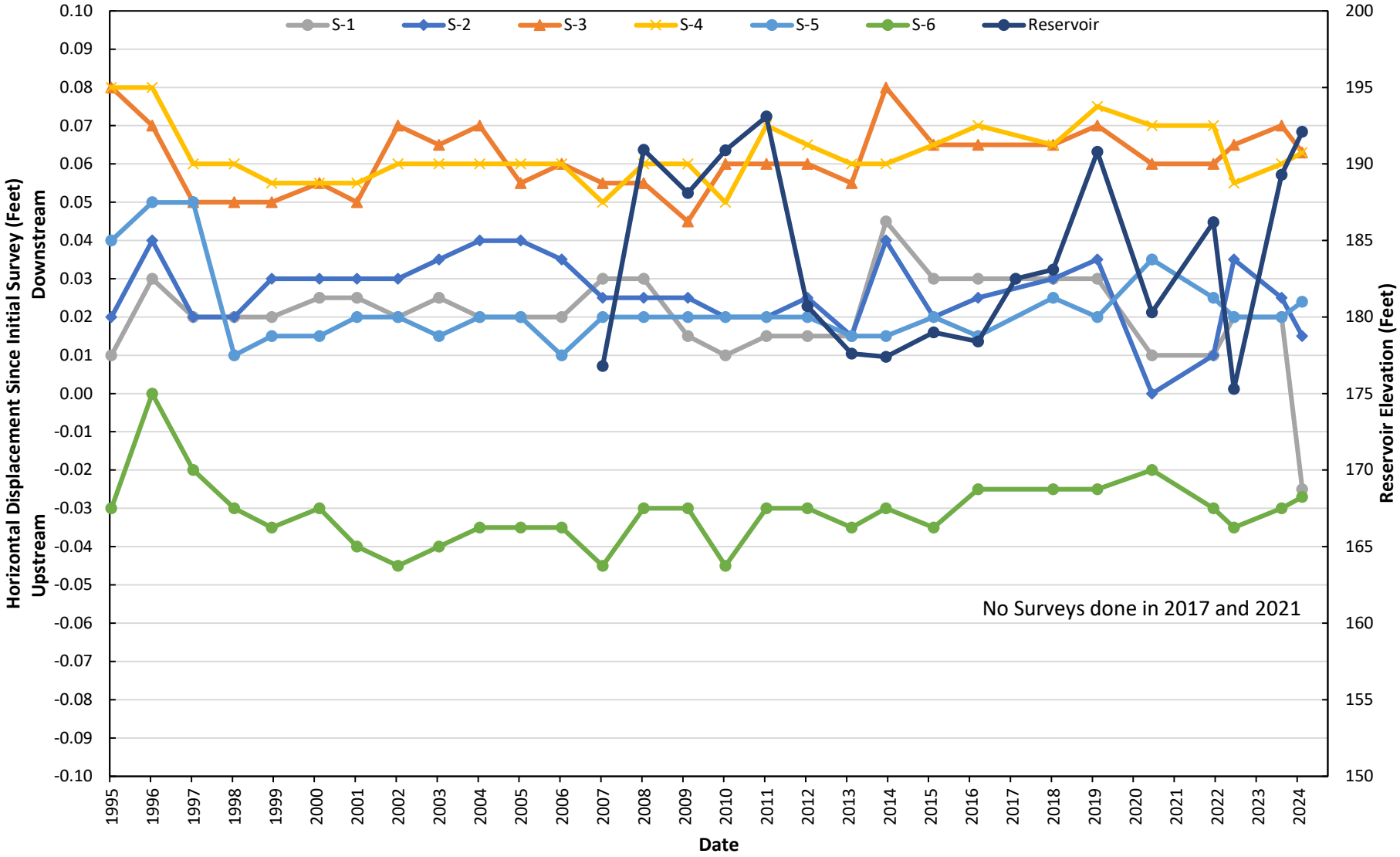


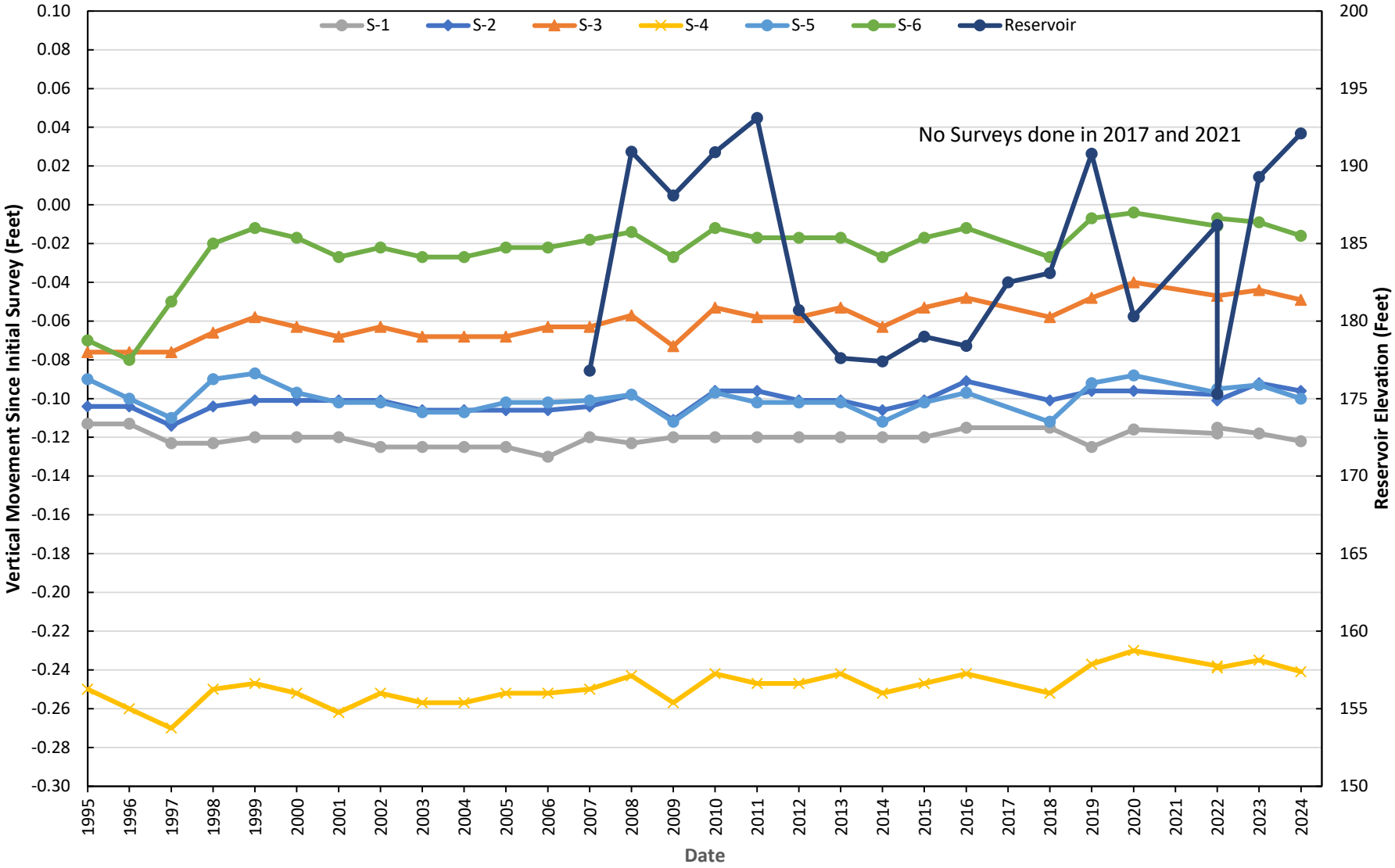
Figure 17

SAND CANYON DAM

HISTORICAL CUMULATIVE VERTICAL MOVEMENT

SURVEY MONUMENTS S-1, S-2, S-3, S-4, S-5, S-6

JANUARY 1995 THROUGH DECEMBER 2024



Appendix

Inspection Photographs of Sand Canyon Dam – March 25, 2024

IRWD Dam Outlet Valve Exercising Log

GUIDA Survey Report

Valves Exhibit for Emergency Release

Subdrain Condition Assessment

Spillway Inspection Exhibit

Spillway Inspection Photographs – October 24, 2024

Inspection Photographs of Sand Canyon Dam

March 25, 2024

Photo 1) AC paved crest looking towards the right abutment, including 1-foot-high curb wall.

Photo 2) AC-lined upstream face looking towards right abutment. Note cracks along face.

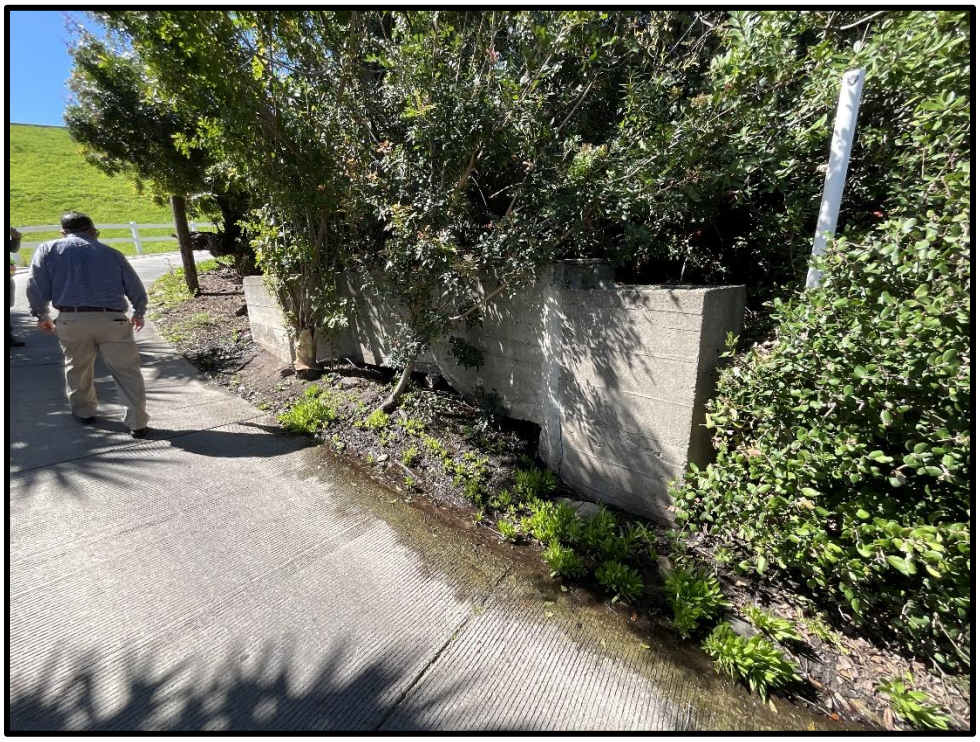


Photo 3) Abandoned irrigation weir box. Note seepage surrounding the box.

Photo 4) Abandoned irrigation weir box. Note pooled water.

Photo 5) Downstream face of dam near left abutment. Note abandoned irrigation weir box.

Photo 6) Downstream face of dam. Looking towards right abutment.

Photo 7) Downstream face of dam. Looking towards left abutment.

Photo 8) Minor rodent activity on the downstream toe near the left abutment.

Photo 9) Spillway control ogee section and approach. Note debris and water level.

Photo 10) Spillway channel looking downstream. Note vegetation and debris.

Photo 11) Close up view of spillway stilling basin. Note brush/tule growth downstream.

Photo 12) Close up view of spillway stilling basin. Note brush/tule growth downstream.

Photo 13) Close up view of the buckled gate valve #2 stem.

Photo 14) Sand Canyon creek. Note minor vegetation growth.

Photo 15) Close up of large diameter angular rocks and vegetation limiting access to emergency valves #23 and #24.

Photo 16) Seepage at left subdrain. Right subdrain was dry.

IRWD Dam Outlet Valve Exercising Log

IRWD DAM OUTLET VALVE EXERCISING LOG

SAND CANYON DAM VALVE EXERCISING

DATE	INITIALS	24" TOP # OF TURNS 185'	24" MIDDLE # OF TURNS 177'	24" BOTTOM # OF TURNS 170'	24" MAIN # OF TURNS	24" BLOW-OFF VALVE #2	24" BLOW-OFF VALVE #1	20" BLOW-OFF VALVE #3	24" EMERGENCY VALVE FLOW (CFS)	TIME (MIN)	TOTAL GALLONS	REASON	COMMENT
5/6/2013		58	21	48	102		Not Turned				0		
4/22/2014		58	21	48	102		Not Turned				0		
4/20/2015		58	21	48	102/50%		Not Turned				0	DSOD	
5/26/2016		58	21	48	30%		Not Turned				0	DSOD	
7/20/2016		58	21	48	30%	Installed 2016	100%	Replaced 2016			0		
4/5/2017		58	21	48	30%	100%	100%	100%			0	DSOD	
Reservoir empty from 7/24/2017 to 10/19/2017 for outlet stucture and main valve repairs.											0		
5/2/2018		58	21	48	102	100%	100%	100%			0	DSOD	
3/28/2019		58	21	48	102	100%	100%	100%			0	DSOD	
1/14/2020		58	21	48	102	100%	100%	100%			0	DSOD	
4/27/2021		58	21	48	102	100%	100%	100%			0		
4/14/2022		58	21	48	102	100%	100%	100%			0		
10/18/2022						100%	100%				0		
04/18-19/23		58	21	N/A*	102	100%	100%	100%			0	DSOD	*Valve broken
11/12-12/3/24	SH, NK, JV					100%	100%	100%	3.34		0	Discharge	Emergency
12/16-31/2024	SH, AZ, JV					15%	100%	100%	3.5		0	Discharge	Emergency
1/20/2025	SH, NK					100%	100%	100%	0		0	Repair	Emergency
											0		
											0		
											0		
											0		
											0		
											0		
											0		
											0		

GUIDA Survey Report

GUIDA GEOSPATIAL SOLUTIONS

CREW: J.GROEN/J.PINTAVALLE

DATE: 2024-06-05

GUIDA JOB NUMBER: 0123-02577

JOB DESCRIPTIONS: IRWD SAND CANYON RESERVOIR

RESERVOIR MONITORING LAND SURVEYING NOTES

NAME	STATION	OFFSET
BM-1	8+85.336	
S-1	8+00.236	0.025'
S-2	6+00.224	0.075'
S-3	4+00.123	0.113'
S-4	2+00.186	0.103'
S-6	0+61.413	0.123'
S-5	0+00.056	0.024'
BM-2	-0+15.38	

HOLD STATION

HOLD FOR LINE

HOLD FOR LINE

BM1- BRASS DISC WITH PUNCH MARK IN WELL AT WEST SIDE OF VAULT.

NOTES:

S-1 THRU S-6 ARE "+" ON BRASS DISC IN WELL

INSTRUMENT SETUP

N.T.S.

WEATHER CONDITIONS:
TEMP 62°
OVERCAST SKIES
HUMIDITY 80%
BAROMETRIC PRESSURE (INHG) 29.88
RESERVIOR WATER ELEVATION=192.1 +/-

JOSHUA R. GROEN PLS 9753

BM2- BRASS DISC WITH PUNCH MARK IN WELL MONUMENT AT EDGE OF CONCRETE WALK.

GUIDA LEVEL NOTES

PAGE 2 OF 2

DATE: 2024-06-05

GUIDA JOB

CREW: J. GROEN/ J. PINTAVALLE

NUMBER: 0123-02577

CLIENT NAME: IRWD

PROJECT NAME: IRWD ANNUAL DAM MONITORING

PROJECT LOCATION: SAND CANYON RESERVOIR

INSTRUMENT S/N:

WEATHER	PRESSURE	TEMP
OVERCAST	29.88	65°F

STATION	BS	HI	FS	ELEV	ADJUSTED ELEVATION	DESCRIPTION/NOTES
BM1					204.167	BRASS DISK IN WELL
	3.347	207.514				
S-1			6.666	200.849	200.849	BRASS DISK IN WELL
	6.379	207.227				
S-2			6.174	201.053	201.052	BRASS DISK IN WELL
	6.582	207.634				
S-3			7.051	200.584	200.583	BRASS DISK IN WELL
	7.003	207.587				
S-4			6.915	200.672	200.671	BRASS DISK IN WELL
	6.754	207.426				
S-6			6.648	200.778	200.776	BRASS DISK IN WELL
	6.584	207.362				
S-5			6.690	200.672	200.670	BRASS DISK IN WELL
	6.764	207.436				
BM2			6.737	201.700	201.698	BRASS DISK IN WELL
	5.673	207.373				
E			5.158	203.216	203.214	NAIL AND SQUARE WASHER IN TOP OF WALL
	4.152	207.367				
E-1			4.139	203.228	203.225	NAIL AND SQUARE WASHER IN TOP OF WALL
	4.137	207.545				
E-2			4.279	203.266	203.263	NAIL AND SQUARE WASHER IN TOP OF WALL
	4.393	207.659				
E-3			4.262	203.397	203.394	NAIL AND SQUARE WASHER IN TOP OF WALL
	3.826	207.223				
E-4			3.698	203.525	203.521	NAIL AND SQUARE WASHER IN TOP OF WALL
	3.728	207.253				
BM1			3.081	204.171	204.167	

GUIDA GEOSPATIAL SOLUTIONS

LEVEL NOTES

PAGE 1 OF _____

DATE: 2024-06-05

CREW: J. GROEN / J. PINTAUALLE

GUIDA JOB NUMBER: 0123-02577

PROJECT NAME: IRWD ANNUAL DAM MONITORING

CLIENT NAME: IRWD

PROJECT LOCATION: SAND CANYON RESERVOIR

INSTRUMENT S/N: _____ WEATHER: OVERCAST PRESSURE: 29.88 TEMP: 65°F

STATION	BS	HI	FS	ELEV	ADJUSTED ELEVATION	DESCRIPTION/NOTES
Bm1					204.167	BRASS DISC IN WELL
	3.347	207.514				
S1			6.666	200.849	200.849	BRASS DISK IN WELL
	6.379	207.227				
S-2			6.174	201.053	201.052	BRASS DISK IN WELL
	6.582	207.634				
S-3			7.051	200.584	200.583	BRASS DISK IN WELL
	7.003	207.587				
S-4			6.915	200.672	200.671	BRASS DISK IN WELL
	6.754	207.426				
S-6			6.648	200.778	200.776	BRASS DISK IN WELL
	6.584	207.362				
S-5			6.690	200.672	200.670	BRASS DISK IN WELL
	6.764	207.436				
Bm2			5.737	201.700	201.698	BRASS DISK IN WELL
	5.673	207.373				
E			4.158	203.216	203.214	NAIL AND SQUARE WASHER IN TOP OF WALL
	4.152	207.367				
E-1			4.139	203.228	203.225	NAIL/SQ WASHER TOP OF WALL
	4.317	207.545				
E-2			4.279	203.266	203.263	NAIL/SQ WASHER TOP OF WALL
	4.393	207.659				
E-3			4.262	203.397	203.394	NAIL/SQ WASHER TOP OF WALL
	3.826	207.223				
E-4			3.698	203.525	203.521	NAIL/SQ WASHER TOP OF WALL
	3.728	207.253				
Bm1			3.081	204.171	204.167	

Prepared by:

CNC ENGINEERING

26 Executive Park | Ste 270
Irvine | CA | 92614
P | 949.863.0588
www.cnc-eng.com

JOB NAME IRWD
SAND CANYON RESERVOIR
JOB NO. 22-006 SRN
CREW A. MORENO
R. STEWART
DATE 12-6-2023 SHEET 1 OF 2

RESERVOIR MONITORING LAND SURVEYING NOTES

NAME	STA.	OFFSET
BM1	8+85.338	
S-1	8+00.214	0.070'
S-2	6+00.185	0.085'
S-3	4+00.100	0.120'
S-4	2+00.172	0.100'
S-6	0+61.411	0.120'
S-5	0+00.060	0.020'
BM2	-0+15.380	
HOLD STATION		

HOLD FOR LINE

HOLD FOR LINE.
BM1-BRASS DISC W/PUNCH MARK IN WELL MONUMENT AT WEST SIDE OF VAULT.

N.T.S.

NOTES:

- S-1 THRU S-6 ARE "+" ON BRASS DISC IN WELL MONUMENT.

INSTRUMENT SETUP

WEATHER CONDITIONS:
TEMP - 55°
CLEAR SKIES
HUMIDITY - 42%
BAROMETRIC PRESSURE (INHG) - 30.35
RESERVOIR WATER LEVEL ELEVATION - 189.3±

LICENSED LAND SURVEYOR
TEDDY Y. OHANA
No. 8583
STATE OF CALIFORNIA

TEDDY Y. OHANA PLS 8583

BM2-BRASS DISC W/PUNCH MARK IN WELL MONUMENT AT EDGE OF CONC. WALK

Prepared by:

CNC ENGINEERING
26 Executive Park | Ste 270
Irvine | CA | 92614
P | 949.863.0588
www.cnc-eng.com

Date: 12/6/2023

SURVEY LEVELING NOTES

PROJECT: IRWD / Sand Canyon Reservoir – Level Report

STATION	B.S.	HI	F.S.	ADJ ELEVATION	SURVEY LEVELING NOTES
BM1				204.167	Brass CAP w/punch in well
	3.863	208.030			
S-1			7.185	200.845	"S" points are "+ "on Brass Disc in Well Monument
	6.552	207.397			
S-2			6.349	201.048	
	6.817	207.865			
S-3			7.286	200.578	
	7.221	207.800			
S-4			7.134	200.665	
	6.995	207.661			
S-6			6.890	200.769	
	6.918	207.689			
S-5			7.024	200.663	
	6.505	207.170			
BM2			5.474	201.694	Brass Disc w/punch in well Monument
	5.900	207.595			
E			4.386	203.208	"E" points are Nail and Square Washer on Top of Wall
	4.423	207.632			
E-1			4.408	203.222	
	4.573	207.797			
E-2			4.532	203.262	
	4.730	207.995			
E-3			4.600	203.392	
	4.042	207.437			
E-4			3.913	203.521	
	4.592	208.116			
BM1			3.946	204.167	Brass Disc w/punch in well Monument

Valves Exhibit for Emergency Release

LEGEND

- Emergency Outlet
- Main Outlet
- Main Inlet
- Emergency Valve, Normally Closed
- Valve Normally Open
- Valve Normally Closed
- #* DSOD Valve

NOTES

1. 20" STL LINE PREVIOUSLY ABANDONED. REVIVED BY CONSTRUCTION SERVICES AND CONNECTED TO 30" EMERGENCY DUMP IN APPROX. 2008 (REF. BILL WESSON, 2023)

NO.	DATE	REVISIONS	APPROVED
2	4/11/2024	VALVE SIZES REVISED, METER BOX ADDED	DD

DSOD Valves: 7*, 9*, 11*, 12*, 19*, 20*, 21*

0 25' 50'

BILL WESSON	WATER OPERATIONS SUPERVISOR	
NAME		DATE
DANIELLE DRAKE	ASSISTANT ENGINEER	
NAME		DATE
JACOB MOEDER	IRWD ENGINEERING MANAGER	
NAME		DATE

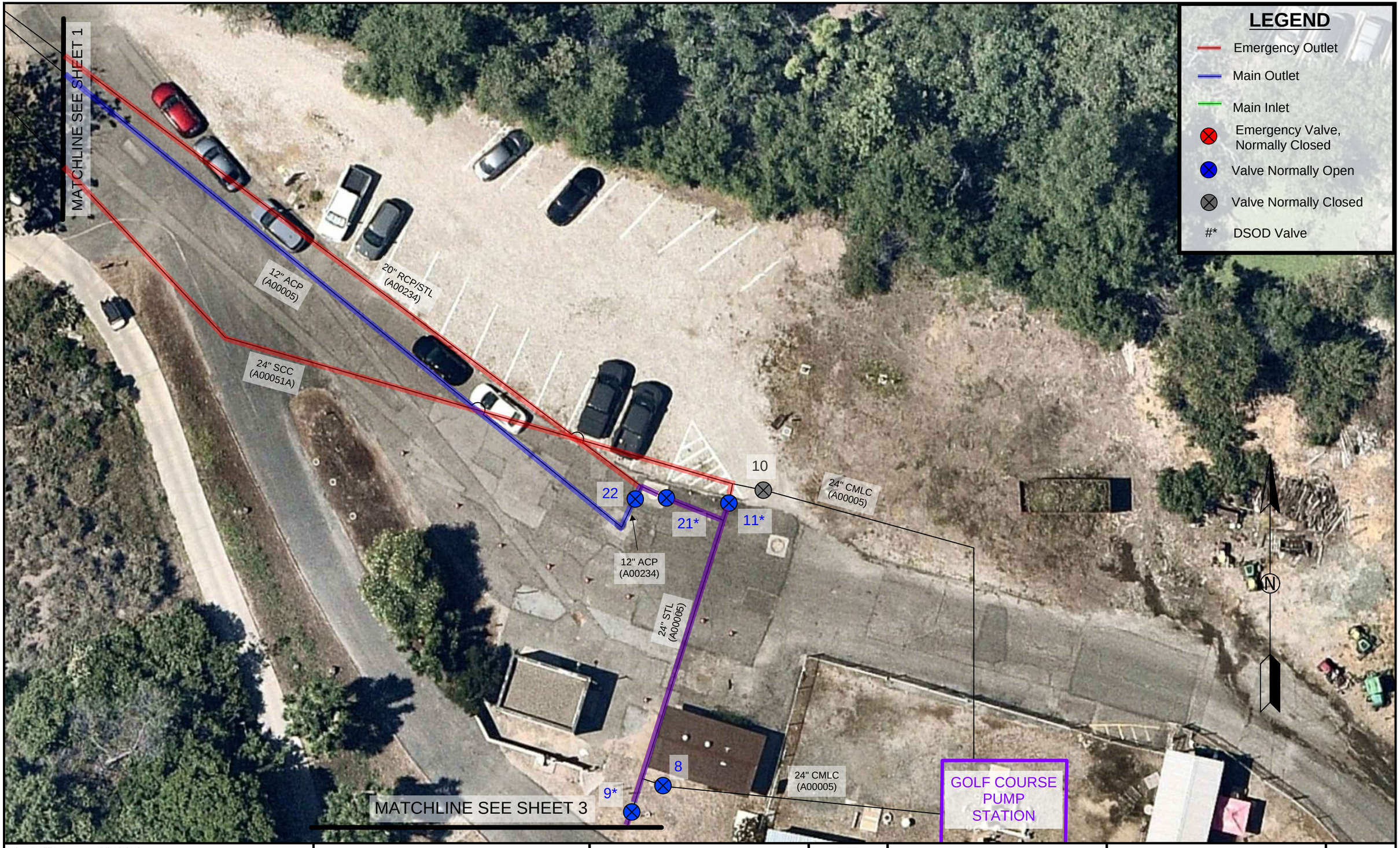
Irvine Ranch Water District

DEVELOPED BY ENGINEERING INTERNS:
TINH NGUYEN
RYAN TRAN

SAND CANYON DAM
PIPELINE SCHEMATIC

SHEET 01
01 OF 05 SHEETS

AUGUST 2023



NO.	DATE	REVISIONS	APPROVED

DSOD Valves: 7*, 9*, 11*, 12*, 19*, 20*, 21*

0 25' 50'

BILL WESSON	WATER OPERATIONS SUPERVISOR	
NAME		DATE
DANIELLE DRAKE	ASSISTANT ENGINEER	
NAME		DATE
JACOB MOEDER	IRWD ENGINEERING MANAGER	
NAME		DATE

Irvine Ranch Water District

DEVELOPED BY ENGINEERING INTERNS:
TINH NGUYEN
RYAN TRAN

SAND CANYON DAM
PIPELINE SCHEMATIC

SHEET 02
02 OF 05 SHEETS

AUGUST 2023

NO.	DATE	REVISIONS	APPROVED

0 50' 100'

BILL WESSON NAME — WATER OPERATIONS SUPERVISOR — DATE

DANIELLE DRAKE NAME — ASSISTANT ENGINEER — DATE

JACOB MOEDER NAME — IRWD ENGINEERING MANAGER — DATE

Irvine Ranch Water District

DEVELOPED BY ENGINEERING INTERNS:
TINH NGUYEN
RYAN TRAN

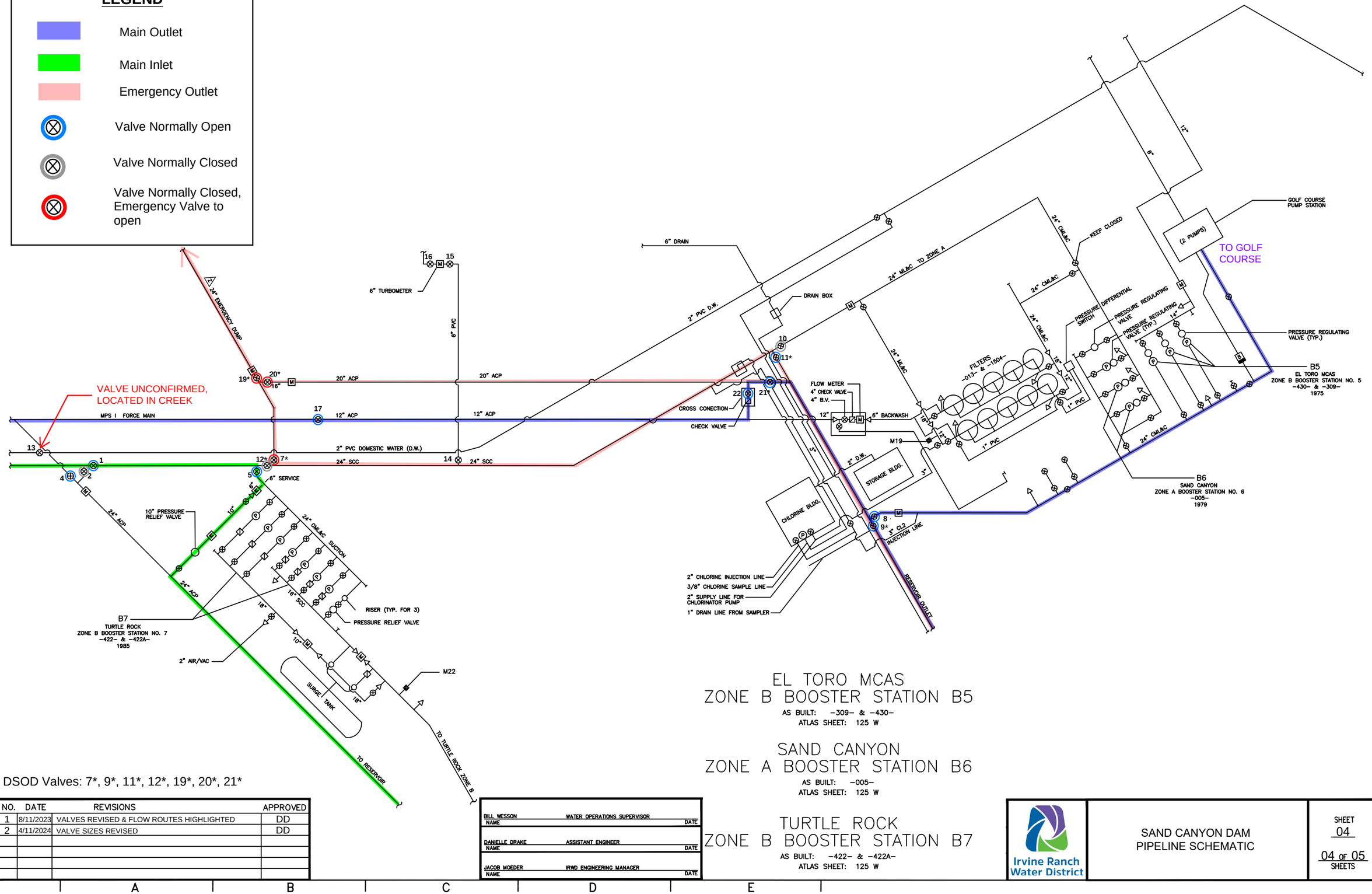
SAND CANYON DAM PIPELINE SCHEMATIC

SHEET 03
03 OF 05 SHEETS

AUGUST 2023

LEGEND

- Main Outlet
- Main Inlet
- Emergency Outlet
- Valve Normally Open
- Valve Normally Closed
- Valve Normally Closed, Emergency Valve to open



DSOD Valves: 7*, 9*, 11*, 12*, 19*, 20*, 21*

NO.	DATE	REVISIONS	APPROVED
1	8/11/2023	VALVES REVISED & FLOW ROUTES HIGHLIGHTED	DD
2	4/11/2024	VALVE SIZES REVISED	DD

BILL WESSON	WATER OPERATIONS SUPERVISOR	
NAME		DATE
DANIELLE DRAKE	ASSISTANT ENGINEER	
NAME		DATE
JACOB MOEDER	IRWD ENGINEERING MANAGER	
NAME		DATE

EL TORO MCAS
ZONE B BOOSTER STATION B5

AS BUILT: -309- & -430-
ATLAS SHEET: 125 W

SAND CANYON
ZONE A BOOSTER STATION B6

AS BUILT: -005-
ATLAS SHEET: 125 W

TURTLE ROCK
ZONE B BOOSTER STATION B7

AS BUILT: -422- & -422A-
ATLAS SHEET: 125 W

Irvine Ranch Water District

SAND CANYON DAM
PIPELINE SCHEMATIC

SHEET 04
04 OF 05 SHEETS

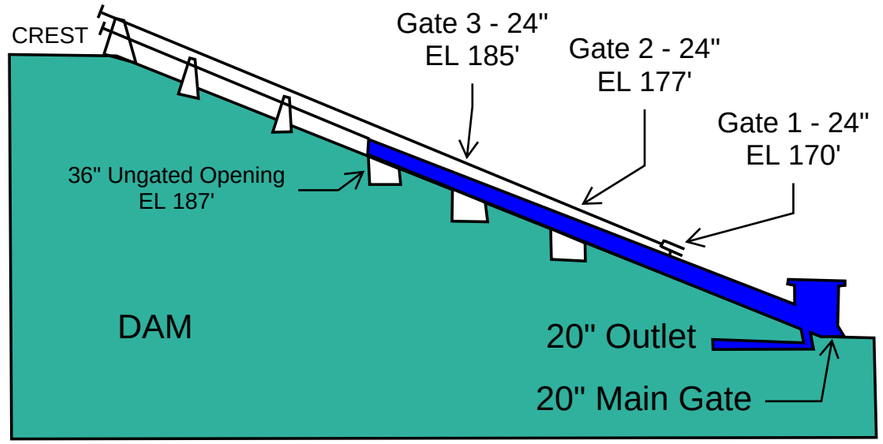
AUGUST 2023

Sand Canyon Dam Valve Summary

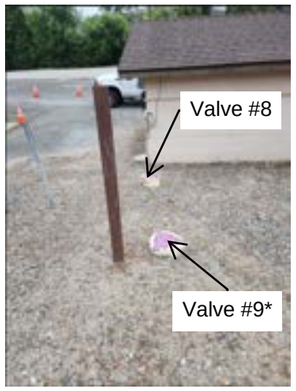
Valve Number	Size	Turns	Normally:	Emergency Valve
1	24"		Open	
2	24"		Closed	
4	24"		Open	
5	24"		Open	
7*	24"	41	Closed	Yes
8	24"		Open	
9*	24"	38	Open	
10	24"	45	Closed	
11*	24"	42	Open	
12*	24"		Closed	
17	12"	37	Open	
19*	24" (2)	57	Closed	Yes
20*	20"	32	Closed	Yes
21*	20"		Open	
22	12"		Open	

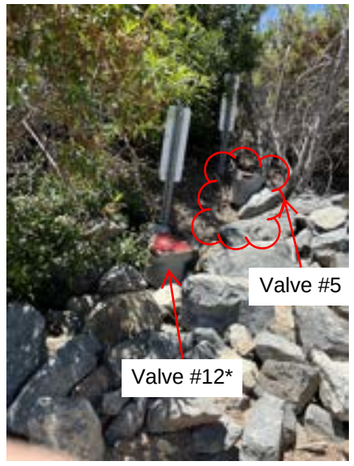
Sand Canyon Dam Gate Valve Summary

Valve	Turns	Size	Elevation
Main	102	20"	-
Gate 1	48	24"	170'
Gate 2	21	24"	177'
Gate 3	58	24"	185'



1 / - SAND CANYON DAM SECTION OF MULTILEVEL OUTLET





NO.	DATE	REVISIONS	APPROVED
2	4/11/2024	VALVE SIZES REVISED	DD

DSOD Valves: 7*, 9*, 11*, 12*, 19*, 20*, 21*

BILL WESSON	WATER OPERATIONS SUPERVISOR	
NAME		DATE
DANIELLE DRAKE	ASSISTANT ENGINEER	
NAME		DATE
JACOB MOEDER	IRWD ENGINEERING MANAGER	
NAME		DATE

Irvine Ranch Water District

DEVELOPED BY ENGINEERING INTERNS:
TINH NGUYEN
RYAN TRAN

SAND CANYON DAM
PIPELINE SCHEMATIC

SHEET 05
05 OF 05 SHEETS

AUGUST 2023

Subdrain Condition Assessment

11011 Via Frontera
Suite C
San Diego, CA 92127

510.903.6600
vaengineering.com

V&A Project No. 24-0164

July 11, 2024

Brandon Joseph
Assistant Engineer
Irvine Ranch Water District
3512 Michelson Drive
Irvine, CA 92612

Subject: Irvine Ranch Sand Canyon Subdrain Condition Assessment – Vactor Cleaning and CCTV

Dear Brandon Joseph:

Irvine Ranch Water District (IRWD) owns and operates the Sand Canyon Reservoir in Irvine, California. IRWD requested a condition assessment of the subdrain system to start a two-year maintenance program. The condition assessment included three (3) separate subdrain pipes:

1. 6-inch Left drain
2. 6-inch Right drain
3. 6-inch Vault drain

The three (3) subdrain pipes are 6-inch in diameter and are made of PVC material. It was found that the right drain is connected to a metal pipe. IRWD contracted V&A Consulting Engineers, Inc. (V&A) to perform a condition assessment of the subdrain pipes by obtaining and evaluating closed-circuit television (CCTV) video. Based on the review of site conditions, V&A prepared to perform a condition assessment of the subdrains, which involved interior video documentation using a push camera with CCTV recording capability. IRWD was responsible for preparing the access points for entry, which included removing the vault lid.

On June 4, 2024, V&A arrived on site, accompanied by IRWD and Performance Pipeline Technologies Inc., who were subcontracted by V&A to assist in capturing CCTV video. The pipes were assessed with a push camera. During the assessment, the left and right drains were staked with flags to locate the pipes underground.

Figure 1 presents the pipe alignments for this condition assessment report.

Figure 1 – Irvine Ranch Water District Sand Canyon Left, Right, and Vault Drains.

Assessment

Three (3) sections of drains were assessed, which included the following:

1. 6-inch left drain
    a. Vault box to the end of the push camera's capabilities
2. 6-inch right drain
    a. Vault box to the end of the push camera's capabilities
3. 6-inch vault drain
    a. Vault box to the end of the push camera's capabilities

The push camera can reach a maximum length of 200 feet but cannot safely navigate obstructions like tight turns. Based on site conditions, the left and right drains were assessed upstream and surveyed to the end of the push camera's capabilities. The vault drain was assessed in the downstream direction.

A summary of observations from V&A's review of the CCTV footage is provided in the following sections below.

Left Drain

The 6-inch left drain was assessed from the vault box to 83.5 feet when the push camera could not travel further because of a root ball in the pipe. Significant water flow throughout the pipe made it difficult to consistently capture clear footage. The following is a summary of the observations:

- STA 00+07 – Pipe is in good condition with 75% staining on its walls
- STA 00+43 – Possible blockage in the pipe—due to the water level, there was no clear footage or picture, but the push camera operator felt a blockage
- STA 00+83 – Root ball in the pipe and end of the survey

Refer to Photo 1 through Photo 4 below for general observations.

Photo 1 – STA 00+07: Pipe is in good condition with 75% staining on its walls (typical).

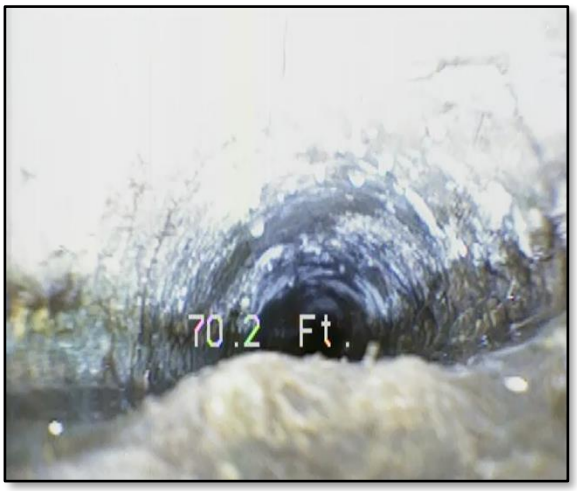


Photo 2 – STA 00+70: Pipe is in good condition.

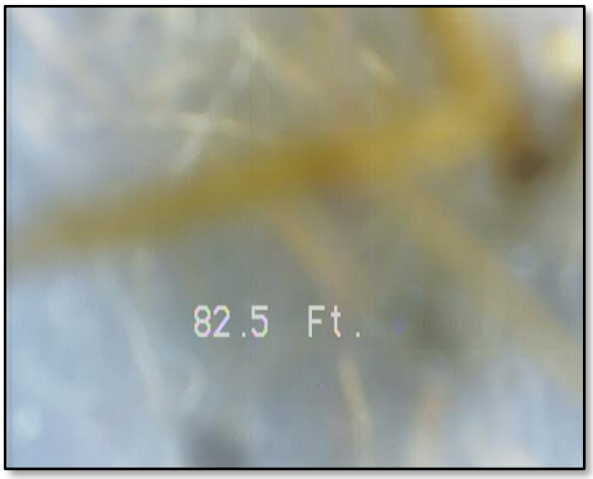


Photo 3 – STA 00+82: Root ball inside pipe.

Photo 4 – STA 00+82: Root ball inside pipe.

Right Drain

The 6-inch right drain was assessed from the vault box to 112.2 feet, after which the push camera could not travel further because of a 90° bend in the pipe. The pipe material changed at 56.2 feet to what appeared to be perforated metal. The following is a summary of the observations:

- STA 00+04 – Debris in the pipe
- STA 00+09 – Bend in the pipe
- STA 00+11 – Bend in the pipe with debris buildup
- STA 00+55 – 90° bend in the pipe
- STA 00+56 – Change in pipe material to metal
- STA 00+59 – Possible perforation hole in the metal pipe

Refer to Photo 5 through Photo 10 below for general observations.

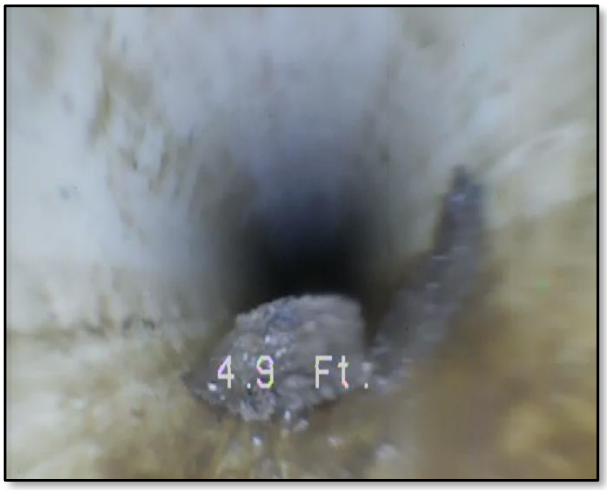


Photo 5 – STA 00+04: Debris in the pipe.

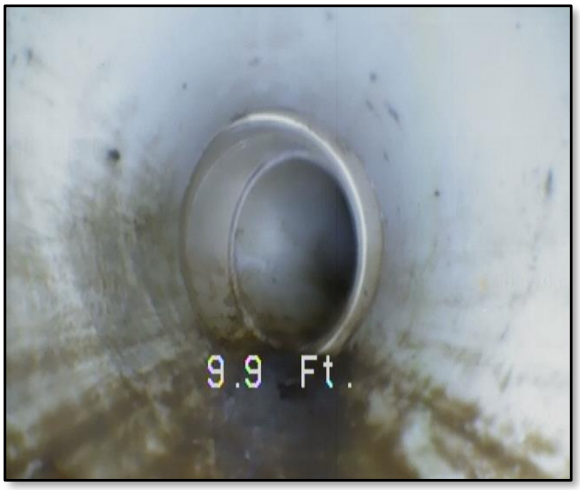


Photo 6 – STA 00+09: Bend in the pipe.

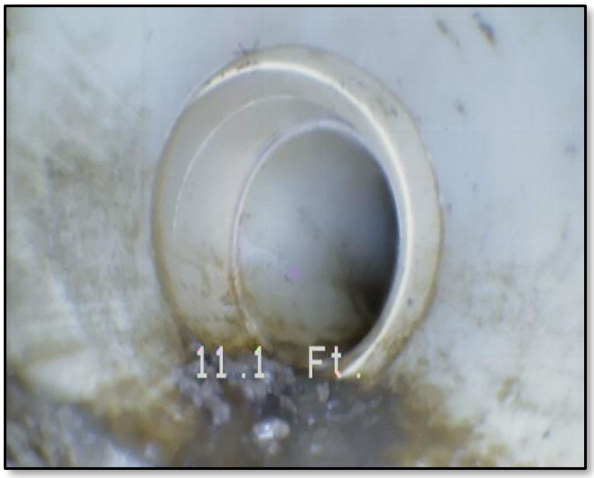


Photo 7 – STA 00+11: Bend in the pipe with debris buildup.

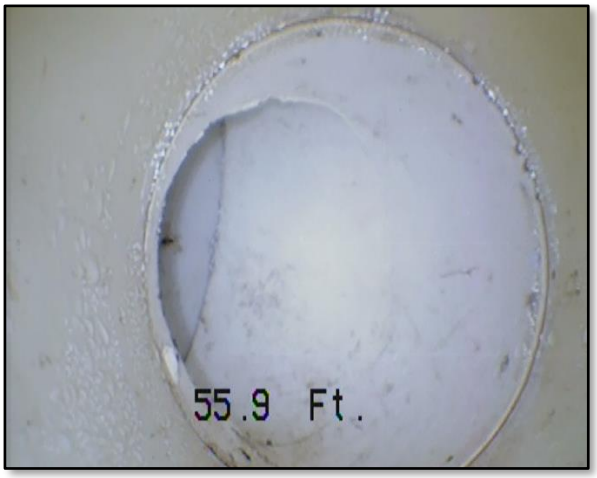


Photo 8 – STA 00+55: 90° bend in the pipe.

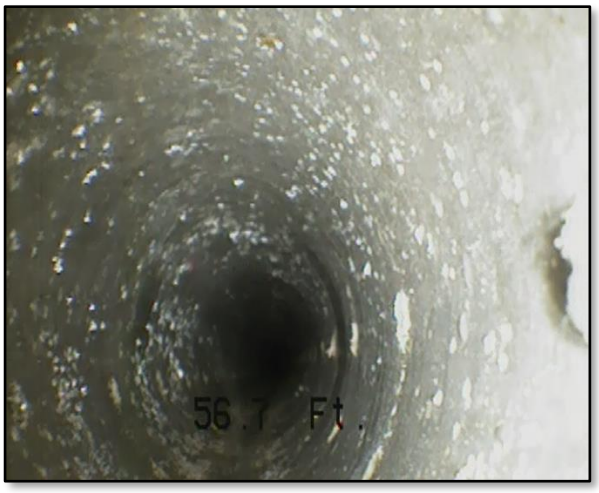


Photo 9 – STA 00+56: Change in pipe material to metal.

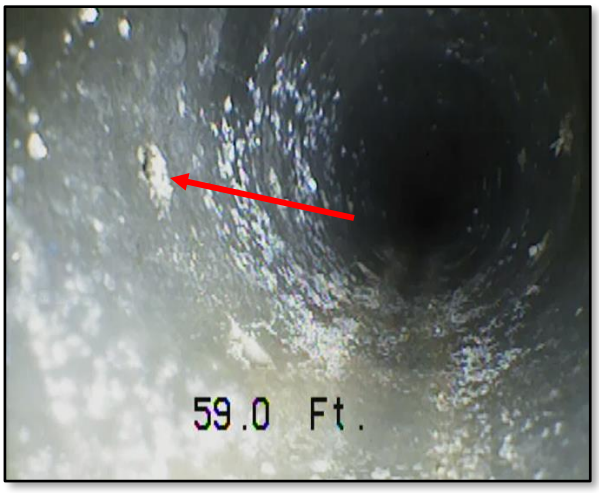


Photo 10 – STA 00+59: Possible perforation hole in the metal pipe.

Vault Drain

The 6-inch vault drain was assessed in the downstream direction to 112.2 feet, after which a change in pipe diameter prevented the push camera from traveling any further. The following is a summary of the observations:

- STA 00+02 – Pipe is in good condition with 100% staining on its walls
- STA 00+39 – Lateral tap connection at 9 o'clock
- STA 00+52 – 50% water level
- STA 00+53 – Rocks on the bottom of the pipe
- STA 00+56 – Change in pipe diameter
- STA 01+12 – End of survey

Refer to Photo 11 through Photo 17 below for general observations.

Photo 11 – STA 00+02: Pipe is in good condition with 100% staining on pipe walls.

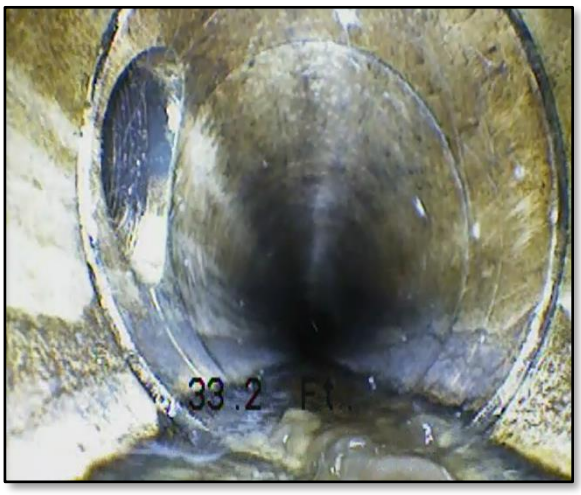


Photo 12 – STA 00+39: Lateral tap connection at 9 o'clock.

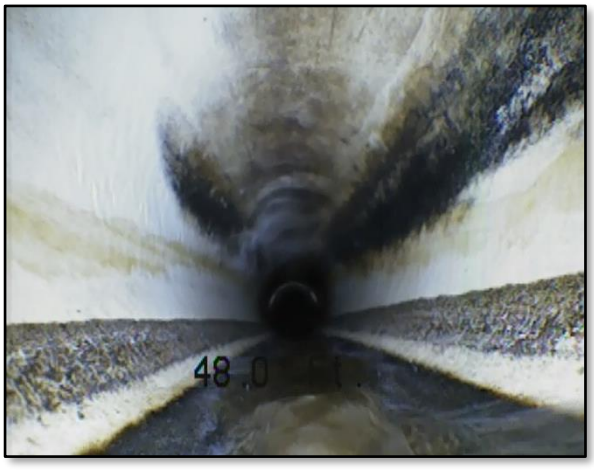


Photo 13 – STA 00+48: Pipe is in good condition with 65% staining on pipe walls.

Photo 14 – STA 00+52: 50% water level and change in pipe diameter.

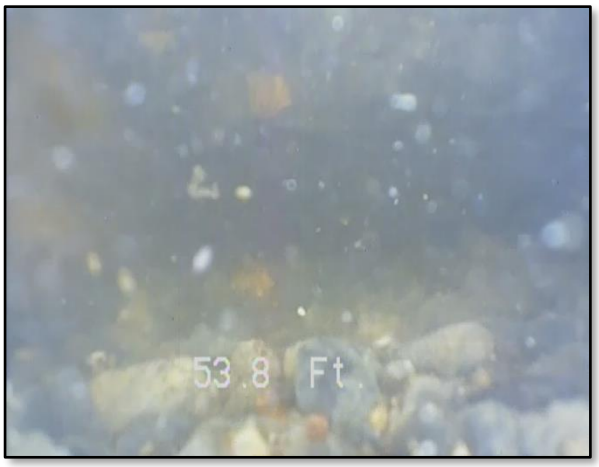


Photo 15 – STA 00+53: Rocks on the bottom of the pipe.

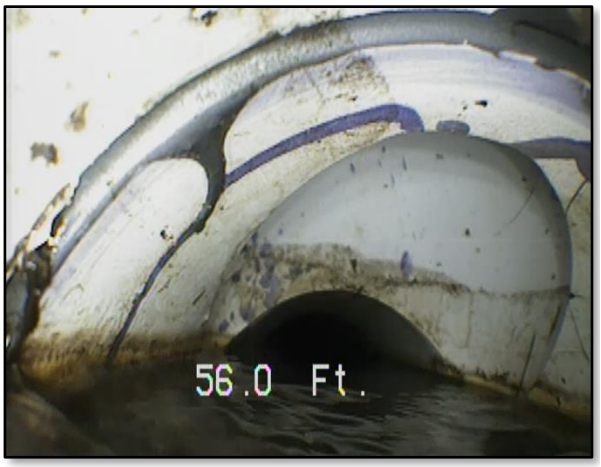


Photo 16 – STA 00+56: Change in the pipe diameter.

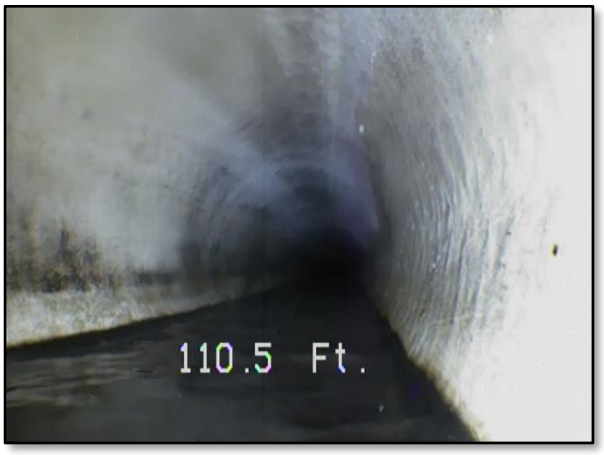


Photo 17 – STA 01+10: Pipe is in good condition.

Only left drain had a root ball

Conclusions and Recommendations

The left, right, and vault drains at the Sand Canyon reservoir are in good condition, and no major defects were found. The left and right drains had root ball obstructions, and the vault drain had rocks accumulating on the bottom of the pipe, where the pipe changed diameters.

Based on the review of the CCTV footage, V&A finds it feasible to keep the subdrains in operation for the foreseeable future. V&A provided the following recommendations to be considered for the subdrains:

1. Vactor clean the pipelines to ensure debris and root balls are removed.
2. Perform CCTV every two years to ensure the integrity of the subdrain system.

On behalf of our staff and myself, I would like to thank you for the opportunity to be of service to you and the Irvine Ranch Water District.

Sincerely,
V&A Consulting Engineers, Inc.

Brian Briones, P.E.
Southwest Regional Manager

Spillway Inspection Exhibit

NOTES:

1. ALIGNMENT BEGINS AT BOTTOM OF OGEE CREST.
2. ORTHOMOSAIC COMPILED FROM IMAGERY CAPTURED ON 10/23/2024 AT APPROXIMATELY 1:00 PM TO 4:00 PM.

0 30 60

SCALE, FEET

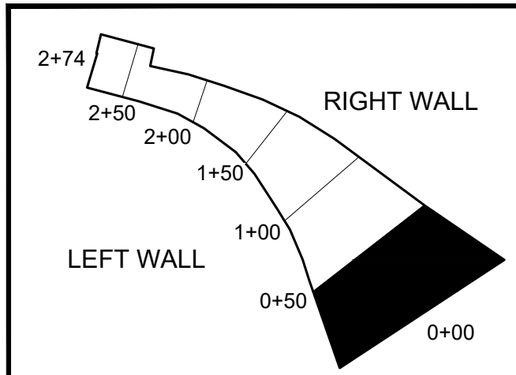
SPILLWAY INSPECTION
SAND CANYON DAM
IRVINE, CALIFORNIA

IRVINE RANCH WATER DISTRICT
IRVINE, CALIFORNIA

GEI Consultants

PLAN OVERVIEW

Project 2305575 | May 2025 | Fig. 1



LEGEND:

- CONCRETE SPALL
- PREVIOUS REPAIR
- DELAMINATED PREV. REPAIR
- CONCRETE POPOUT
- DEBRIS / VEGETATION
- CRACKING
- DRAIN
- PHOTO 2 PHOTO REFERENCE
- L1, R1, C1 WALL PANEL NUMBER

NOTES:

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0 10 20
SCALE, FEET

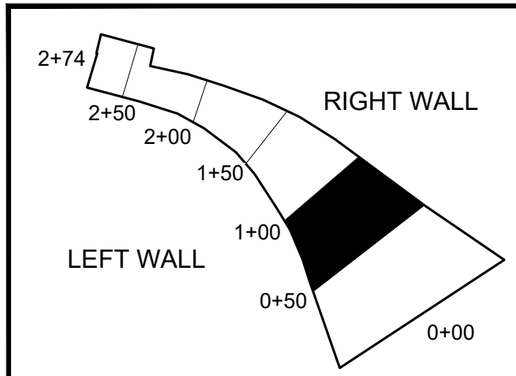
SPILLWAY INSPECTION
SAND CANYON DAM
IRVINE, CALIFORNIA

IRVINE RANCH WATER DISTRICT
IRVINE, CALIFORNIA

GEI Consultants

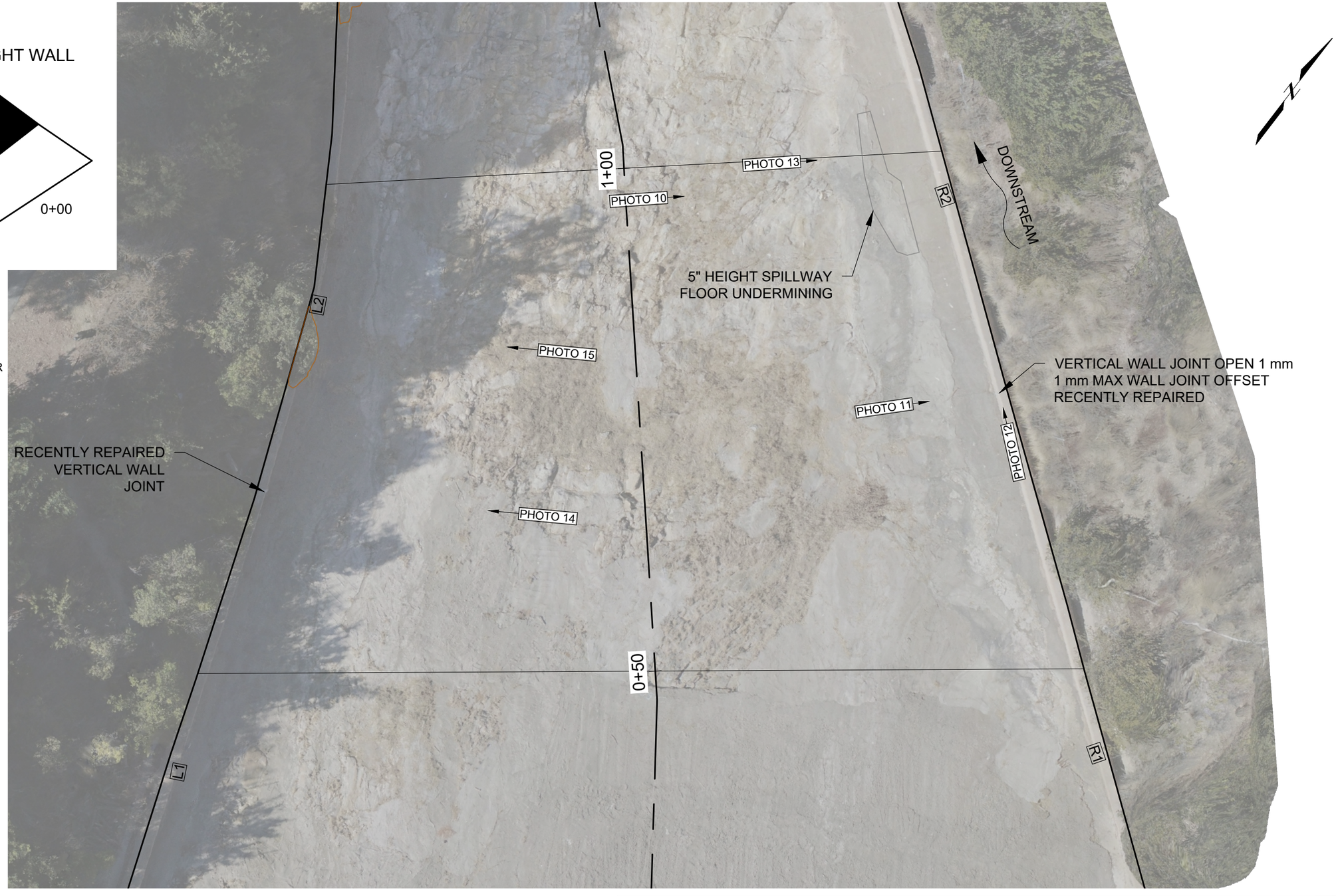
SPILLWAY FLOOR
STA 0+00 TO STA 0+50

Project 2305575 | May 2025 | Fig. 2



LEGEND:

- CONCRETE SPALL
- PREVIOUS REPAIR
- DELAMINATED PREV. REPAIR
- CONCRETE POPOUT
- DEBRIS / VEGETATION
- CRACKING
- DRAIN
- PHOTO 2 — PHOTO REFERENCE
- L1, R1, C1 — WALL PANEL NUMBER



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0 10 20

SCALE, FEET

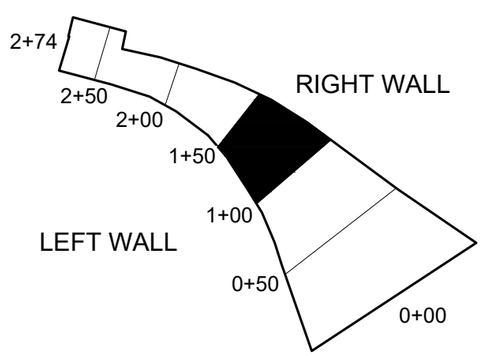
SPILLWAY INSPECTION
SAND CANYON DAM
IRVINE, CALIFORNIA

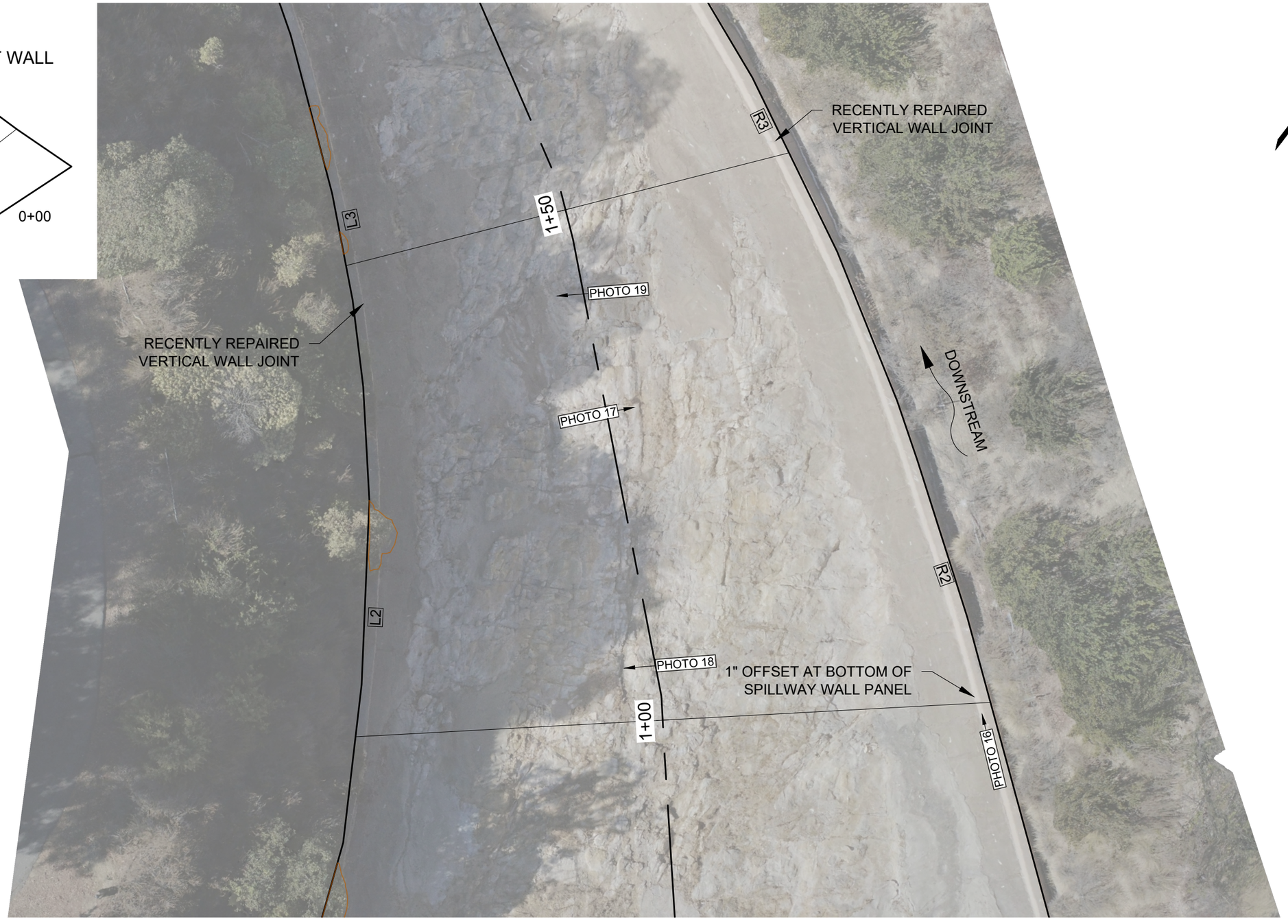
IRVINE RANCH WATER DISTRICT
IRVINE, CALIFORNIA

GEI Consultants

SPILLWAY FLOOR
STA 0+50 TO STA 1+00

Project 2305575 | May 2025 | Fig. 3





LEGEND:

- CONCRETE SPALL
- PREVIOUS REPAIR
- DELAMINATED PREV. REPAIR
- CONCRETE POPOUT
- DEBRIS / VEGETATION
- CRACKING
- DRAIN
- PHOTO 2 PHOTO REFERENCE
- L1, R1, C1 WALL PANEL NUMBER

NOTES:

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0 10 20

SCALE, FEET

SPILLWAY INSPECTION
SAND CANYON DAM
IRVINE, CALIFORNIA

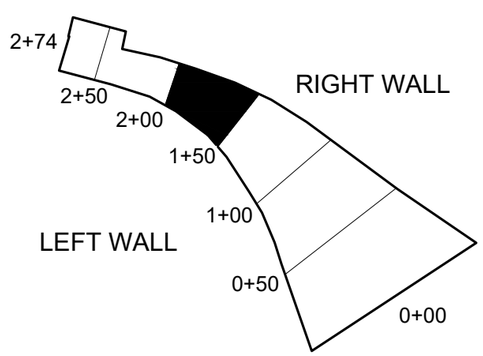
IRVINE RANCH WATER DISTRICT
IRVINE, CALIFORNIA

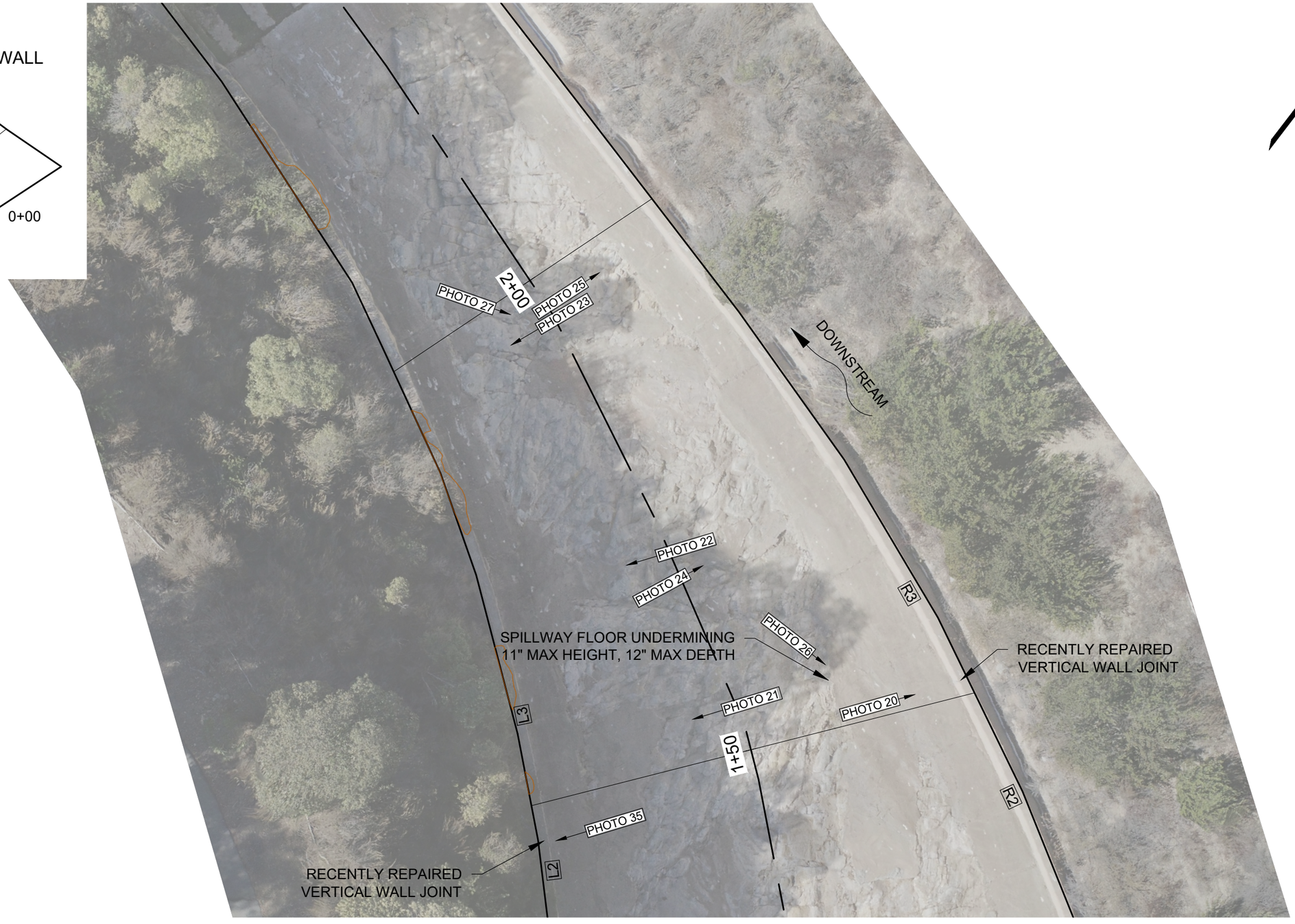
GEI Consultants

Project 2305575

SPILLWAY FLOOR
STA 1+00 TO STA 1+50

May 2025 Fig. 4





LEGEND:

- CONCRETE SPALL
- PREVIOUS REPAIR
- DELAMINATED PREV. REPAIR
- CONCRETE POPOUT
- DEBRIS / VEGETATION
- CRACKING
- DRAIN
- PHOTO 2 PHOTO REFERENCE
- L1, R1, C1 WALL PANEL NUMBER

NOTES:

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0 10 20
SCALE, FEET

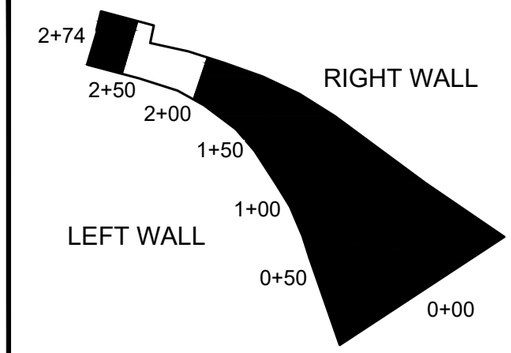
SPILLWAY INSPECTION
SAND CANYON DAM
IRVINE, CALIFORNIA

IRVINE RANCH WATER DISTRICT
IRVINE, CALIFORNIA

GEI Consultants

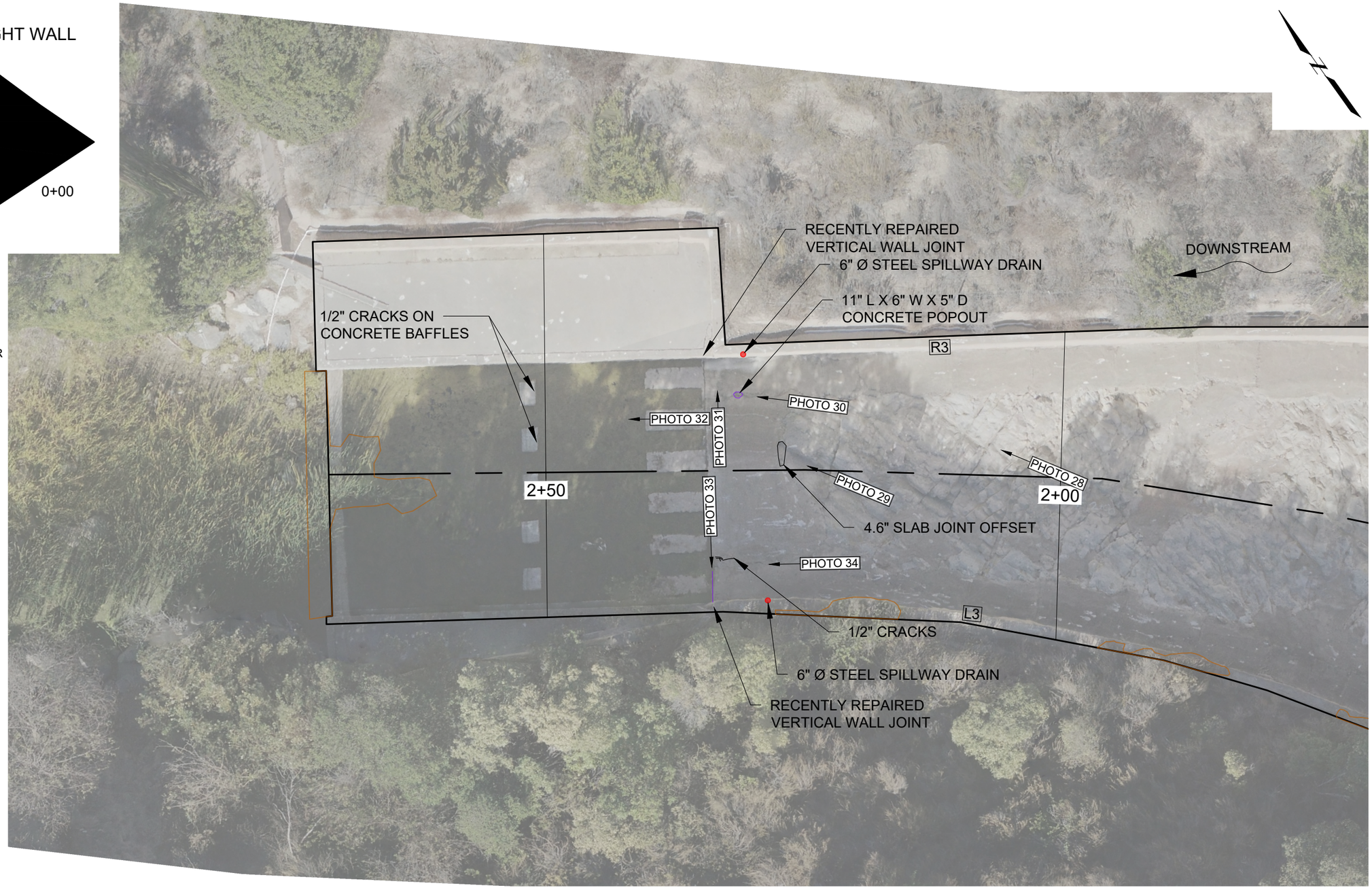
SPILLWAY FLOOR
STA 1+50 TO STA 2+00

Project 2305575 | May 2025 | Fig. 5



LEGEND:

- CONCRETE SPALL
- PREVIOUS REPAIR
- DELAMINATED PREV. REPAIR
- CONCRETE POPOUT
- DEBRIS / VEGETATION
- CRACKING
- DRAIN
- PHOTO 2 PHOTO REFERENCE
- L1, R1, C1 WALL PANEL NUMBER



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0 10 20

SCALE, FEET

SPILLWAY INSPECTION
SAND CANYON DAM
IRVINE, CALIFORNIA

IRVINE RANCH WATER DISTRICT
IRVINE, CALIFORNIA

GEI Consultants

Project 2305575

SPILLWAY FLOOR
STA 2+00 TO STA 2+71

May 2025 Fig. 6

Spillway Inspection Photographs

10/23/2024: Spillway Inspection

Photo 1) ½" slab joint offset near toe of spillway ogee weir.

Photo 2) View of spillway ogee weir and unlined spillway channel transition looking northeast.

Photo 3) 1” slab joint offset at spillway ogee weir and unlined spillway channel transition.

Photo 4) View of spillway ogee weir and unlined spillway channel transition looking northeast. Note 2’ diameter corrugated metal pipe.

Photo 5) 5” depth void at previous spillway repair.

Photo 6) View of spillway wall panel R1.

Photo 7) View of spillway ogee weir looking northeast.

Photo 8) View of spillway wall panel L1.

Photo 9) View of spillway wall panel L1.

Photo 10) View of spillway wall panel R1 and R2. Note recent vertical joint repair.

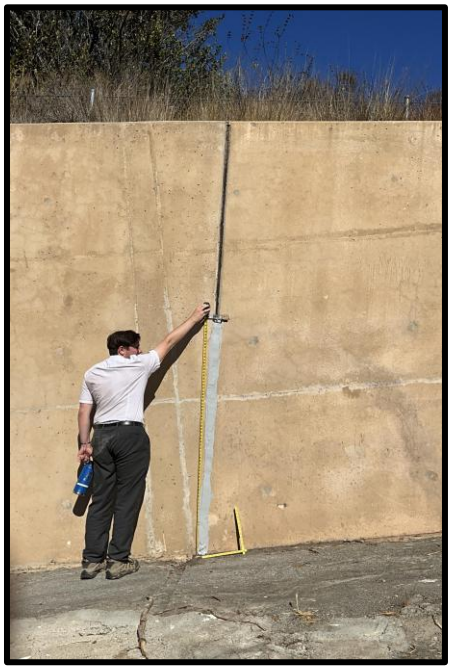

Photo 11) Vertical wall joint open ½" max between wall panels R1 and R2. Note recent repair of bottom half of joint.

Photo 12) Crack gauge at wall panels R1 and R2 joint. Note recent repair.

Photo 13) 5" height undermining of spillway floor.

Photo 14) View of spillway wall panels L1 and L2. Note recently repaired wall joint.

Photo 15) View of spillway wall panels L1 and L2. Note recently repaired wall joint.

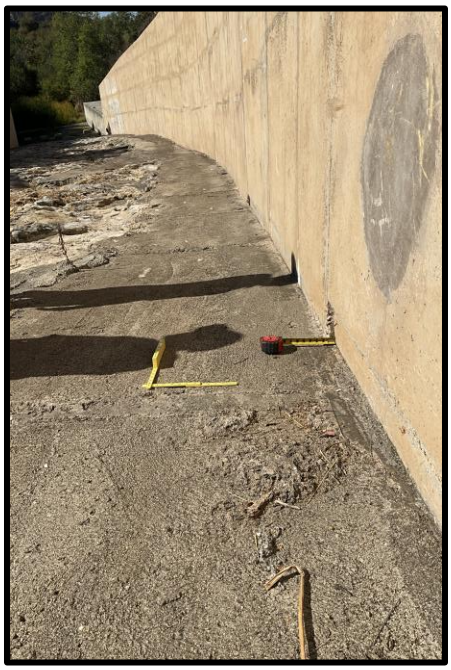

Photo 16) 1” offset at bottom of spillway wall panel R2.

Photo 17) View of spillway wall panels R2 and R3. Note recently repaired wall joint.

Photo 18) View of spillway wall panel L2.

Photo 19) View of spillway wall panels L2 and L3. Note recently repaired wall joint.

Photo 20) Vertical wall joint open ½" max between wall panels R2 and R3. Note recent repair of bottom half of joint.

Photo 21) View of spillway wall panels L2 and L3. Note recently repaired wall joint.

Photo 22) View of spillway wall panel L3.

Photo 23) View of spillway wall panel L3.

Photo 24) View of spillway wall panel R3.

Photo 25) View of spillway wall panel R3.

Photo 26) Spillway floor undermining. 11” max height, 12” max depth.

Photo 27) View of spillway wall panel R3 looking upstream.

Photo 28) View of spillway wall panel R3 looking downstream. Note spillway drain.

Photo 29) 4.6” downstream slab joint offset at unlined spillway channel and stilling basin transition.

Photo 30) 11” Length (L) x 6” Width (W) x 5” Depth (D) concrete popout at unlined spillway channel and stilling basin transition.

Photo 31) Recently repaired spillway vertical wall joint. Note spillway drain.

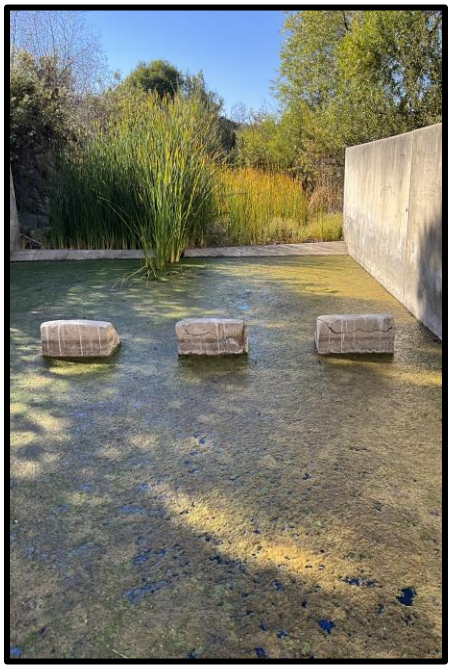

Photo 32) Spillway stilling basin. Note cracks on concrete baffles.

Photo 33) Recently repaired spillway vertical wall joint. Note spillway drain.

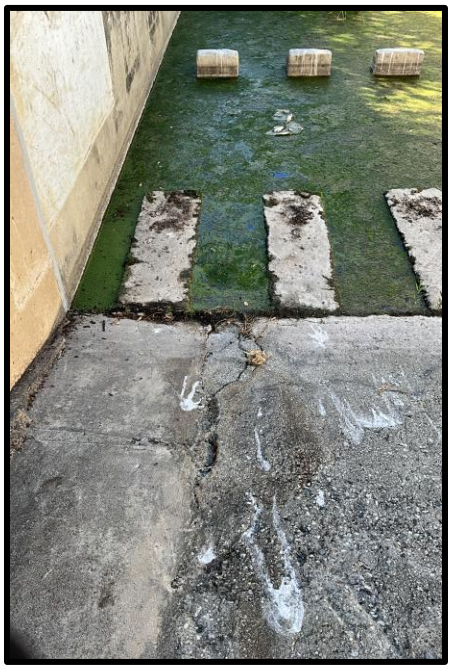

Photo 34) ½" cracks along spillway floor.

Photo 35) Vertical wall joint open ½" max between wall panels L2 and L3. Note recent repair of bottom half of joint.

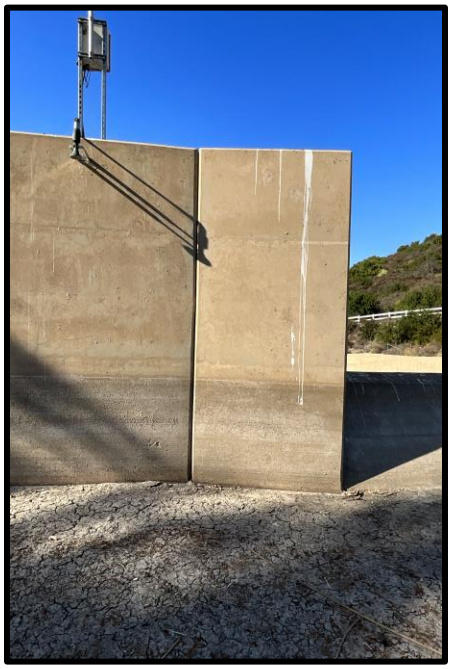

Photo 36) Vertical wall joint ½" open max with 1 ½" max wall joint offset.

Photo 37) Vertical wall joint ½" open max with 1 ½" max wall joint offset. 1" void in joint.