Amador Regional Sanitation Authority

Amador Regional Sanitation Authority Meeting Agenda

Wednesday, March 19, 2025 at 2:30 PM

33 Church Street, Sutter Creek, CA 95685

The Agenda can be found on the City's Website: www.cityofsuttercreek.org

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1. **Call to Order and Establish a Quorum for Regular Meeting**
2. **Pledge of Allegiance to the Flag**
3. **Public Forum**

   Discussion items only, no action to be taken. Any person may address the Board at this time upon any subject within the jurisdiction of the Amador Regional Sanitation Authority; however, any matter that requires action may be referred to staff and/or Committee for a report and recommendation for possible action at a subsequent Board meeting. Please note – there is a five (5) minute limit per topic.

4. **Consent Agenda**

   A. Minutes of January 16, 2025 Meeting

   Motion to approve minutes

   B. ARSA Operations Report - Jan 2025

   Information

   C. Budget v Actual February 2025

   D. Balance Sheet February 2025

   E. Warrant List February 2025

   F. ARSA Individual Water Balance Final Reports

   Information item - final submitals to regional water board

5. **Administrative Agenda**

   A. Henderson Dam Under Drain Project

   Information Report / Discussion on RFP Process

6. **General Manager's Report - informational**
7. **Adjournment**

Amador Regional Sanitation Authority

Amador Regional Sanitation Authority Meeting Minutes

Thursday, January 16, 2025 at 2:30 PM

33 Church Street, Sutter Creek, CA 95685

The Agenda can be found on the City's Website: www.cityofsuttercreek.org

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1. Call to Order and Establish a Quorum for Regular Meeting

PRESENT: Board Members Swift, Gunselman, Carnell, and Epperson

ABSENT: Sherril at start, arrived at 3 PM

STAFF: DuBois, LaFontaine

2. Pledge of Allegiance to the Flag

Led by Chair Swift

3. Public Forum - None

4. Consent Agenda

A. Budget v Actual January 2025

B. Warrant List January 2025

C. Balance Sheet January 2025

D. Reservoir report - for information only

Motion to approve by Gunselman, Seconded by Epperson

Passed 4 - 0 with Sherril absent.

Board Member Sherril arrived at 3 PM

5. General Manager's Report - informational

General Manager DuBois provided an update on ARSA overall.

6. Administrative Agenda

A. Water Balance Responses to Water Board

Information presentation with consultant Hydrosciences, on ARSA, Ione and CDCR responses to Water Board Order

Steven Whittlesley from Hydroscience presented an update on the Regional Water Board letters with Commentary from GM DuBois

Board member Epperson has a lot of background in ARSA and CDCR. He commented that he believed CRCR was looking to expand their sprayfields at one point in time. He also believed the golf course could handle more water.

Board Member Carnell asked about Q Ranch as a possibility. Chair Swift said that it wasn't that close and would require investment in a pipeline to get water there.

7. Adjournment

Amador Regional Sanitation Authority

"Servicing Amador City, Martell, & Sutter Creek"

MONITORING REPORT SUBMITTAL TRANSMITTAL FORM

Attn: Kenny Croyle (916) 464-4676
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, #200
Rancho Cordova, CA 95670-6114

Discharger:	Amador Regional Sanitation Authority
Name of Facility:	Amador County Regional Outfall
WDRs Order Number:	R5-1993-0240
WDID:	5B030109001
County:	Amador

I am hereby submitting to the Central Valley Water Board the following information:

CHECK ALL THAT APPLY:

Monthly Monitoring Report for the month of: **January 2025**

1st / 2nd / 3rd / 4th (**circle one**) Quarterly Monitoring Report for the year of: _____

1st / 2nd (**circle one**) Semi-annual Monitoring Report for the year of: _____

Annual Monitoring Report for the year of: _____.

VIOLATION NOTIFICATION

During the monitoring period, **there were** / were not (circle one) any violations of the WDRs.

1. The violations were: There was no collection of data on weekends due to management decision to not have ARSA staff work on weekends, starting November 1, 2024 and continuing indefinitely.

2. Have the violations been corrected? Yes / No (circle one). If no, what will be done to correct the violations:

CERTIFICATION STATEMENT

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Signature: Steven C Stone (209) 267-5647 (Phone) 2/26/2025 (Date)

cc: Tom DuBois, ARSA Manager and CofSC City Manager (email), Grant Reynolds, Sanitary Engineer (email), Gary Ghio, ARSA Engineer (email), City of Ione, (email), File

Henderson Reservoir

Month: Jan-25

Operator: Steven Stone

Date	Sutter Creek Treatment Plant Effluent Total Gallons Per Day	Sutter Creek Diversion Gallons Per Day	Free Board # of Feet Down from top of Spillway	OUT FLOW GALLONS PER DAY	Dissolved Oxygen MG/L (weekly)	P.H. (monthly)	Total Coliform MPN/100mL (monthly)	Total Arsenic MG/L (monthly)	Electrical Conductivity umhos/cm (monthly)	Bowers Irrigation	Hoskins Irrigation	Water Trough Sections A,B,C	Dist Sys Sections A,B,C
1	772,225	OFF	18 ' 5 "	-						OFF	OFF	ABC/OK	ABC/OK
2	912,432	OFF	18 ' 3 "	-						OFF	OFF	ABC/OK	ABC/OK
3		OFF	18 ' 1 "	-						OFF	OFF	ABC/OK	ABC/OK
4		OFF	' "							OFF	OFF		
5		OFF	' "	-						OFF	OFF		
6	828,025	OFF	17 ' 9 "	1,152,830						OFF	OFF	ABC/OK	ABC/OK
7	770,675	OFF	17 ' 8 "	116,880						OFF	OFF	ABC/OK	ABC/OK
8	495,069	OFF	17 ' 8 "	114,040	5.40					OFF	OFF	ABC/OK	ABC/OK
9	614,650	OFF	17 ' 7 "	128,830						OFF	OFF	ABC/OK	ABC/OK
10		OFF	17 ' 6 "	136,110						OFF	OFF	ABC/OK	ABC/OK
11		OFF	' "							OFF	OFF		
12		OFF	' "	-						OFF	OFF		
13	405,447	OFF	17 ' 4 "	340,260						OFF	OFF	ABC/OK	ABC/OK
14	445,388	OFF	17 ' 3 "	142,200						OFF	OFF	ABC/OK	ABC/OK
15	406,439	OFF	17 ' 1 "	242,390	5.26					OFF	OFF	ABC/OK	ABC/OK
16	426,240	OFF	17 ' 1 "	201,630						OFF	OFF	ABC/OK	ABC/OK
17		OFF	17 ' 1 "	117,890						OFF	OFF	ABC/OK	ABC/OK
18		OFF	' "							OFF	OFF		
19		OFF	' "	-						OFF	OFF		
20	454,009	OFF	16 ' 11 "	326,800						OFF	OFF	ABC/OK	ABC/OK
21	415,019	OFF	16 ' 11 "	117,270						OFF	OFF	ABC/OK	ABC/OK
22	401,948	OFF	16 ' 10 "	98,440	5.12	8.21	920	0.02	810	OFF	OFF	ABC/OK	ABC/OK
23	381,120	OFF	16 ' 10 "	108,170						OFF	OFF	ABC/OK	ABC/OK
24		OFF	16 ' 9 "	95,520						OFF	OFF	ABC/OK	ABC/OK
25		OFF	' "							OFF	OFF		
26		OFF	' "	-						OFF	OFF		
27	398,190	OFF	16 ' 7 "	330,910						OFF	OFF	ABC/OK	ABC/OK
28	359,697	OFF	16 ' 6 "	129,250						OFF	OFF	ABC/OK	ABC/OK
29	310,367	OFF	16 ' 6 "	98,920	5.02					OFF	OFF	ABC/OK	ABC/OK
30	341,958	OFF	16 ' 5 "	121,290						OFF	OFF	ABC/OK	ABC/OK
31	329,000	OFF	16 ' 5 "	102,150						OFF	OFF	ABC/OK	ABC/OK
Total	9,467,898			4,221,780									

Preston Reservoir

Month Jan-25 Operator: Steven Stone

Date	Free Board Ft Dn	D.O. MG/L weekly	P.H. monthly	Distrib. System	Preston School of Industry Backwash Gals In	Mule Cr. Prison In Flow Gals	Flow Out to Ione Tertiary Gallons Per Day
1	17 ' 8 "			OK	-	OFF	OFF
2	17 ' 8 "			OK	-	OFF	OFF
3	17 ' 7 "			OK	-	OFF	OFF
4	' "				-	OFF	OFF
5	' "				-	OFF	OFF
6	17 ' 6 "			OK	-	OFF	OFF
7	17 ' 6 "			OK	-	OFF	OFF
8	17 ' 6 "	6.44		OK	-	OFF	OFF
9	17 ' 5 "			OK	-	OFF	OFF
10	17 ' 5 "			OK	-	OFF	OFF
11	' "				-	OFF	OFF
12	' "				-	OFF	OFF
13	17 ' 4 "			OK	-	OFF	OFF
14	17 ' 4 "			OK	-	OFF	OFF
15	17 ' 4 "	6.20		OK	-	OFF	OFF
16	17 ' 4 "			OK	-	OFF	OFF
17	17 ' 4 "			OK	-	OFF	OFF
18	' "				-	OFF	OFF
19	' "				-	OFF	OFF
20	17 ' 3 "			OK	-	OFF	OFF
21	17 ' 2 "			OK	-	OFF	OFF
22	17 ' 2 "	6.10	8.35	OK	-	OFF	OFF
23	17 ' 2 "			OK	-	OFF	OFF
24	17 ' 2 "			OK	-	OFF	OFF
25	' "				-	OFF	OFF
26	' "				-	OFF	OFF
27	17 ' 1 "			OK	-	OFF	OFF
28	17 ' 0 "			OK	-	OFF	OFF
29	16 ' 11 "	6.12		OK	-	OFF	OFF
30	16 ' 11 "			OK	-	OFF	OFF
31	16 ' 11 "			OK	-	OFF	OFF
TOTAL					-	-	-

Comments:

Preston Forebay

Month Jan-25 Operator: Steven Stone

Date	Free Board Ft Dn	Est. Flow Gallons Per Minute Out	Est. Flow Gallons Per Day Out	D.O. MG/L weekly	P.H. monthly	Distrib. System
1	11 ' 11 "	100	144,000			OK
2	11 ' 11 "	100	144,000			OK
3	11 ' 8 "	100	144,000			OK
4	' "					
5	' "					
6	11 ' 8 "	100	144,000			OK
7	11 ' 8 "	100	144,000			OK
8	11 ' 10 "	100	144,000	3.20		OK
9	12 ' 0 "	100	144,000			OK
10	12 ' 0 "	100	144,000			OK
11	' "					
12	' "					
13	12 ' 4 "	100	144,000			OK
14	12 ' 6 "	100	144,000			OK
15	12 ' 7 "	100	144,000	3.40		OK
16	12 ' 8 "	100	144,000			OK
17	12 ' 9 "	100	144,000			OK
18	' "					
19	' "					
20	13 ' 0 "	75	108,000			OK
21	13 ' 4 "	100	144,000			OK
22	13 ' 6 "	100	144,000	3.26	8.30	OK
23	13 ' 8 "	100	144,000			OK
24	13 ' 8 "	100	144,000			OK
25	' "					
26	' "					
27	14 ' 0 "	100	144,000			OK
28	14 ' 0 "	100	144,000			OK
29	14 ' 2 "	100	144,000	3.46		OK
30	14 ' 6 "	100	144,000			OK
31	14 ' 8 "	100	144,000			OK
TOTALS						
		AVG / DAY	142,434.78			

Comments:

January-25

Operator: Steven Stone

ARSA Bowers Irrigation

Date	Sections A Thru E	Odor	Rainfall (in.) (daily)	Acreage Applied (daily)	Total Nitrogen (mg/l) (monthly)	Water Application Rate (in/day)	Average Total Gallons per Day
1	OFF	NONE				0	0
2	OFF	NONE				0	0
3	OFF	NONE				0	0
4	OFF	NONE				0	0
5	OFF	NONE				0	0
6	OFF	NONE				0	0
7	OFF	NONE				0	0
8	OFF	NONE				0	0
9	OFF	NONE				0	0
10	OFF	NONE				0	0
11	OFF	NONE				0	0
12	OFF	NONE				0	0
13	OFF	NONE				0	0
14	OFF	NONE				0	0
15	OFF	NONE				0	0
16	OFF	NONE				0	0
17	OFF	NONE				0	0
18	OFF	NONE				0	0
19	OFF	NONE				0	0
20	OFF	NONE				0	0
21	OFF	NONE				0	0
22	OFF	NONE				0	0
23	OFF	NONE				0	0
24	OFF	NONE				0	0
25	OFF	NONE				0	0
26	OFF	NONE				0	0
27	OFF	NONE				0	0
28	OFF	NONE				0	0
29	OFF	NONE				0	0
30	OFF	NONE				0	0
31	OFF	NONE				0	0
				#DIV/0! Average	#DIV/0!		

Total Gallons Used: -

Total Nitrogen Loading Rate (lbs/ac/mo): **#DIV/0!**

Comments:

January-25

Operator: Steven Stone

ARSA Hoskins Irrigation

Date	GRAVITY SECTION	PRESSURE SECTION	Odor	Run Off	Rainfall (in.) (daily)	Acreage Applied (daily)	Total Nitrogen (mg/l) (monthly)	Water Application Rate (in/day)	Avg. Total Gallons per Day (gal)
1	OFF	OFF	OFF	OFF		0		0	0
2	OFF	OFF	OFF	OFF		0		0	0
3	OFF	OFF	OFF	OFF		0		0	0
4	OFF	OFF	OFF	OFF		0		0	0
5	OFF	OFF	OFF	OFF		0		0	0
6	OFF	OFF	OFF	OFF		0		0	0
7	OFF	OFF	OFF	OFF		0		0	0
8	OFF	OFF	OFF	OFF		0		0	0
9	OFF	OFF	OFF	OFF		0		0	0
10	OFF	OFF	OFF	OFF		0		0	0
11	OFF	OFF	OFF	OFF		0		0	0
12	OFF	OFF	OFF	OFF		0		0	0
13	OFF	OFF	OFF	OFF		0		0	0
14	OFF	OFF	OFF	OFF		0		0	0
15	OFF	OFF	OFF	OFF		0		0	0
16	OFF	OFF	OFF	OFF		0		0	0
17	OFF	OFF	OFF	OFF		0		0	0
18	OFF	OFF	OFF	OFF		0		0	0
19	OFF	OFF	OFF	OFF		0		0	0
20	OFF	OFF	OFF	OFF		0		0	0
21	OFF	OFF	OFF	OFF		0		0	0
22	OFF	OFF	OFF	OFF		0		0	0
23	OFF	OFF	OFF	OFF		0		0	0
24	OFF	OFF	OFF	OFF		0		0	0
25	OFF	OFF	OFF	OFF		0		0	0
26	OFF	OFF	OFF	OFF		0		0	0
27	OFF	OFF	OFF	OFF		0		0	0
28	OFF	OFF	OFF	OFF		0		0	0
29	OFF	OFF	OFF	OFF		0		0	0
30	OFF	OFF	OFF	OFF		0		0	0
31	OFF	OFF	OFF	OFF		0		0	0
						#DIV/0! Average	#DIV/0!		

Total Gallons Used: **-**

Total Nitrogen Loading Rate (lbs/ac/mo): **#DIV/0!**

Comments:

Daily Report

California Irrigation Management Information System (CIMIS)

Rendered in ENGLISH Units.

Wednesday, January 1, 2025 - Friday, January 31, 2025

Printed on Wednesday, February 26, 2025

Plymouth - Sierra Foothill - Station 227

Date	ETo (in)	Precip (in)	Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Max Air Temp (°F)	Min Air Temp (°F)	Avg Air Temp (°F)	Max Rel Hum (%)	Min Rel Hum (%)	Avg Rel Hum (%)	Dew Point (°F)	Avg Wind Speed (mph)	Wind Run (miles)	Avg Soil Temp (°F)
1/1/2025	0.01	0.00	73	8.7	51.7	36.3	46.3	92	70	82	41.0	2.1	49.8	50.2
1/2/2025	0.04	0.00	198	9.8	58.6	42.8	49.0	96	67	82	43.9	2.4	56.6	50.8
1/3/2025	0.01	0.87	28	9.9	56.9	43.4	49.0	97	51	84	44.3	3.4	81.3	50.7
1/4/2025	0.05	0.00	218	8.2	53.2	36.7	44.0	97	64	83	39.3	2.8	66.1	49.9
1/5/2025	0.05	0.00	225	8.1	56.6	36.6	44.5	95	56	81	39.1	2.9	68.8	49.5
1/6/2025	0.05	0.00	235	9.0	57.5	36.9	46.9	96	60	83	41.9	3.0	71.4	49.5
1/7/2025	0.08	0.00	248	5.1	64.8	40.4	52.5	53	25	38	27.5	3.9	92.7	49.3
1/8/2025	0.06	0.00	241	7.0	58.0	35.9	45.9	91	36	66	35.4	2.9	70.3	49.0
1/9/2025	0.06	0.00	247	7.4	61.9	38.0	47.5	83	48	66	36.8	3.0	71.0	48.9
1/10/2025	0.06	0.00	234	6.3	64.9	36.9	48.7	77	27	54	32.6	2.9	70.7	49.0
1/11/2025	0.07	0.00	207	5.1	62.2	35.1	48.1	76	26	44	27.5	3.8	92.0	48.7
1/12/2025	0.05	0.00	206	5.6	54.2	32.9	42.9	81	38	60	29.9	3.0	73.1	47.7
1/13/2025	0.06	0.00	223	5.1	56.8	33.5	44.3	79	30	51	27.3	3.2	76.2	47.5
1/14/2025	0.06	0.00	231	5.4	57.7	34.7	44.2	71	32	54	28.8	3.0	72.4	47.4
1/15/2025	0.06	0.00	235	6.1	61.4	37.2	47.2	72	34	55	31.9	3.2	76.5	47.6
1/16/2025	0.07	0.00	238	5.5	62.2	36.3	48.1	75	27	48	29.3	3.0	72.2	47.8
1/17/2025	0.07	0.00	240	5.1	57.5	33.6	44.7	76	33	50	27.4	3.3	78.3	47.8
1/18/2025	0.06	0.00	250	6.4	56.2	34.3	43.4	84	48	67	33.2	3.2	77.2	47.3
1/19/2025	0.06	0.00	253	6.6	55.1	34.0	43.1	85	48	70	33.9	3.0	71.0	47.2
1/20/2025	0.07	0.00	267	4.8	61.0	31.8	44.8	85	23	47	25.9	3.3	78.2	46.9
1/21/2025	0.06	0.00	264	5.6	59.0	33.4	44.0	77	33	57	29.8	2.8	67.6	46.7
1/22/2025	0.06	0.00	262	6.2	59.5	34.1	45.1	78	41	60	32.3	3.3	79.0	46.7

Daily Report

1/23/2025	0.08	0.00	268	5.7	67.0	39.6	50.8	65	30	45	30.3	2.9	68.6	47.3
1/24/2025	0.07	0.00	230	5.5	62.9	36.3	49.1	76	27	47	29.6	3.1	73.8	47.8
1/25/2025	0.06	0.02	215	6.1	53.3	33.0	43.1	84	47	65	32.0	3.7	88.1	47.6
1/26/2025	0.06	0.00	257	5.7	51.1	33.2	41.0	82	40	65	30.2	3.2	76.8	47.5
1/27/2025	0.07	0.00	279	5.2	54.4	34.3	41.9	76	39	57	27.9	3.3	78.5	46.7
1/28/2025	0.06	0.00	285	5.5	53.9	31.8	41.5	75	43	62	29.5	3.2	75.9	46.5
1/29/2025	0.07	0.00	283	6.5	54.3	33.3	42.1	85	53	71	33.5	3.4	81.1	46.5
1/30/2025	0.06	0.00	287	7.0	53.0	31.7	41.6	93	57	79	35.5	3.0	70.9	46.7
1/31/2025	0.00	0.39	38	8.9	50.0	36.1	45.2	92	71	87	41.5	3.6	87.0	46.9
Tots/Avgs	1.75	1.28	225	6.6	57.6	35.6	45.5	82	43	63	33.2	3.1	74.6	48.1

Flag Legend		
A - Historical Average	I - Ignore	R - Far out of normal range
C or N - Not Collected	M - Missing Data	S - Not in service
H - Hourly Missing or Flagged Data	Q - Related Sensor Missing	Y - Moderately out of range
Conversion Factors		
Ly/day/2.065=W/sq.m	inches * 25.4 = mm	(F-32) * 5/9 = c
mph * 0.447 = m/s	mBars * 0.1 = kPa	miles * 1.60934 = km

Amador Regional Sanitation Authority (ARSA)
Budget vs. Actual
July 2024 through February 2025

	Jul '24 - Feb 25	Budget	$ Over Budget	% of Budget
Ordinary Income/Expense				
Income				
Interest Income	80.29	150.00	-69.71	53.5%
Reimbursed Expenses	0.00	27,800.00	-27,800.00	0.0%
Use Fee Revenue				
Amador City	11,215.50	22,431.00	-11,215.50	50.0%
Amador Water Agency	60,429.00	120,858.00	-60,429.00	50.0%
City of Sutter Creek	160,249.25	640,997.00	-480,747.75	25.0%
Total Use Fee Revenue	231,893.75	784,286.00	-552,392.25	29.6%
Total Income	231,974.04	812,236.00	-580,261.96	28.6%
Expense				
Employee Services				
Contract with COSC	104,935.71	223,000.00	-118,064.29	47.1%
Overtime	13,302.31	20,000.00	-6,697.69	66.5%
Total Employee Services	118,238.02	243,000.00	-124,761.98	48.7%
Operations				
Audit & Accounting	20.00	6,000.00	-5,980.00	0.3%
Contingency	0.00	65,000.00	-65,000.00	0.0%
Engineering				
Inundation mapping	0.00	7,000.00	-7,000.00	0.0%
Engineering - Other	39,528.18	40,000.00	-471.82	98.8%
Total Engineering	39,528.18	47,000.00	-7,471.82	84.1%
Flood Control	0.00	1,000.00	-1,000.00	0.0%
Fuel	3,951.26	19,000.00	-15,048.74	20.8%
General Supplies	0.00	600.00	-600.00	0.0%
Legal	3,335.23	60,000.00	-56,664.77	5.6%
Membership Dues	0.00	3,000.00	-3,000.00	0.0%
O&M Building/Structures	1,600.00	1,500.00	100.00	106.7%
O&M Equipment	11.05	35,000.00	-34,988.95	0.0%
Professional Services	1,778.25			
Repairs & Maintenance	32,768.61	15,000.00	17,768.61	218.5%
Taxes/Fees/Licenses	33,048.44	73,500.00	-40,451.56	45.0%
Tertiary Treatment Fees	107,622.66	136,500.00	-28,877.34	78.8%
Vehicle Maintenance	1,988.79	5,000.00	-3,011.21	39.8%
Total Operations	225,652.47	468,100.00	-242,447.53	48.2%
Total Expense	343,890.49	711,100.00	-367,209.51	48.4%
Net Ordinary Income	-111,916.45	101,136.00	-213,052.45	-110.7%
Other Income/Expense				
Other Expense				
Capital	21,700.00	450,000.00	-428,300.00	4.8%
Total Other Expense	21,700.00	450,000.00	-428,300.00	4.8%
Net Other Income	-21,700.00	-450,000.00	428,300.00	4.8%
Net Income	**-133,616.45**	**-348,864.00**	**215,247.55**	**38.3%**

9:29 AM
03/07/25
Accrual Basis

Amador Regional Sanitation Authority (ARSA)
Balance Sheet
As of February 28, 2025

	Feb 28, 25
ASSETS	
Current Assets	
Checking/Savings	
10000 · Checking - Umpqua	6.23
10001 · Checking - Bank of Marin	181,371.40
10011 · Savings - Bank of Marin	349,133.65
Total Checking/Savings	530,511.28
Accounts Receivable	
11000 · Accounts Receivable	552,392.25
Total Accounts Receivable	552,392.25
Total Current Assets	1,082,903.53
Fixed Assets	
150620 · Long Term Assets Structures	1,884,800.13
150621 · Long Term Assets Structures Dep	-1,884,800.15
150630 · Long Term Assets Equipment	151.00
150631 · Long Term Assets Equipment Depr	-151.00
35000 · Investment in Capital Assets	841,648.00
Total Fixed Assets	841,647.98
TOTAL ASSETS	**1,924,551.51**
LIABILITIES & EQUITY	
Equity	
30000 · Opening Balance Equity	2,031,569.74
32000 · Retained Earnings	-628,925.20
Net Income	521,906.97
Total Equity	1,924,551.51
TOTAL LIABILITIES & EQUITY	**1,924,551.51**

Amador Regional Sanitation Authority (ARSA)
Warrant List
February 2025

Type	Num	Date	Name	Account	Paid Amount
Bill Pmt -Check	**1112**	**02/10/2025**	**Campbell Construction**	**10001 · Checking - Bank of Marin**	
Bill	1042	10/31/2024		Capital	-21,700.00
TOTAL					-21,700.00
Bill Pmt -Check	**1113**	**02/10/2025**	**City of Sutter Creek**	**10001 · Checking - Bank of Marin**	
Bill	2025-02	02/10/2025		Contract with COSC	-9,122.73
				Overtime	-517.98
TOTAL					-9,640.71
Bill Pmt -Check	**1114**	**02/10/2025**	**EDCO Enterprises, Inc.**	**10001 · Checking - Bank of Marin**	
Bill	22143	10/22/2024		O&M Building/Structures	-1,600.00
TOTAL					-1,600.00
Bill Pmt -Check	**1115**	**02/10/2025**	**Hunt & Sons, Inc.**	**10001 · Checking - Bank of Marin**	
Bill	345832	01/15/2025		Fuel	-105.64
Bill	358363	01/31/2025		Fuel	-212.03
TOTAL					-317.67
Bill Pmt -Check	**1116**	**02/10/2025**	**Ione ACE Hardware**	**10001 · Checking - Bank of Marin**	
Bill	21263	02/01/2025		Repairs & Maintenance	-51.40
TOTAL					-51.40
Bill Pmt -Check	**1117**	**02/10/2025**	**Weber, Ghio & Associates, Inc.**	**10001 · Checking - Bank of Marin**	
Bill	14356	01/10/2025		Engineering	-500.00
Bill	14357	01/10/2025		Engineering	-81.25
Bill	14358	01/10/2025		Engineering	-4,315.00
TOTAL					-4,896.25

SUMMARY OF FINAL INDIVIDUAL WATER BALANCE LETTERS

- MCSP:
    - Under current 0.54 MGD ADWF they need about 17 Ac-ft of additional storage/disposal capacity. Under the 0.67 MGD scenario they need 239 Ac-ft of storage/disposal.
    - They proposed either expanding their LAAs by 163 net acres or utilizing the tri-party agreement to discharge to COWRF the maximum of 350 Ac-ft per year.
- City of Ione
    - At current flows of 0.41 MGD, the City requires 594 Ac-ft of additional storage/disposal capacity. Under the future 2030 flow of 0.51 MGD, the City requires 697 Ac-ft of additional storage/disposal capacity. No projects were identified for increasing storage/disposal capacity.
- ARSA:
    - At 0.313 MGD current ADWF ARSA would have 24-25 Ac-ft of available disposal capacity and 64-70 Ac-ft of storage capacity.
    - At 0.319 MGD future ADWF ARSA would have 12.5-13 Ac-ft of available disposal capacity and 60-65 Ac-ft of storage capacity

Technical Memorandum

HydroScience
Strategic Water Solutions

Sacramento • Berkeley • San Jose

To: Tom DuBois, ARSA General Manager

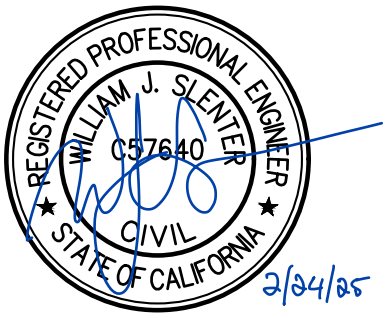
From: Hydroscience Engineers, Inc.

Prepared By: Steven Whittlesey, PE

Reviewed By: Bill Slenter, PE

Subject: Revised ARSA Water Balance Update

Date: February 24, 2025



This Technical Memorandum (TM) provides the water balance that has been updated in response to the February 3, 2025, Central Valley Regional Water Quality Control Board (Water Board) Review of the Site-Specific Water Balance for the Amador Regional Sanitation Agency (ARSA) disposal system in joint operation with the Castle Oaks Water Reclamation Facility (COWRF) and the Castle Oaks Golf Course (COGC) which receive secondary disinfected effluent from the Sutter Creek Wastewater Treatment Plant (WWTP). This TM is organized into the following sections:

- Background Information
- WWTP Flow & Population Data
- Climatological Data
- Storage Facilities Characterization
- Disposal Facilities Characterization
- Water Balance Results

Background Information

The ARSA, City of Ione (City), and Portlock International Ltd. (Portlock) are all permittees under the State Water Resources Control Board (SWRCB) Water Reclamation Requirement Order 93-240 (WRRs). The WRRs permit the ARSA system, the COWRF, and the COGC land application areas (LAAs). ARSA operates the storage and disposal facilities downstream of the Sutter Creek WWTP, however the City operates the COWRF and Portlock operates the COGC.

ARSA's system includes conveyance infrastructure, three storage reservoirs and two LAAs. The system receives secondary disinfected effluent from the Sutter Creek WWTP and disposes of it on the Bower's Ranch and Hoskin's Ranch LAAs. Storage is provided in the ARSA system by the Henderson Reservoir, Preston Forebay and Preston Reservoir. Remaining effluent that is not disposed in the ARSA system is conveyed to the COWRF to receive tertiary treatment before it is disposed at the COGC. ARSA also owns a diversion from Sutter Creek that may divert surface water to meet irrigation demands when inadequate volume of Sutter Creek WWTP effluent is available. The Sutter Creek diversion is in need of repair and ARSA continues to seek cost effective bids for the work expected to occur in 2025 at the earliest.

Under a 2007 contractual agreement with the City, the California Department of Corrections and Rehabilitation (CDCR) Mule Creek State Prison (MCSP) has sent effluent to the COWRF either through Preston Reservoir or directly via an interconnection pipe. The discharge from MCSP to the COWRF is not described in the WRRs and is an agreement between ARSA, the City, and the CDCR. This agreement is the Parties' effort to manage the system to the maximum benefit possible. The flow diagram of the interconnected system is illustrated in Figure 1.

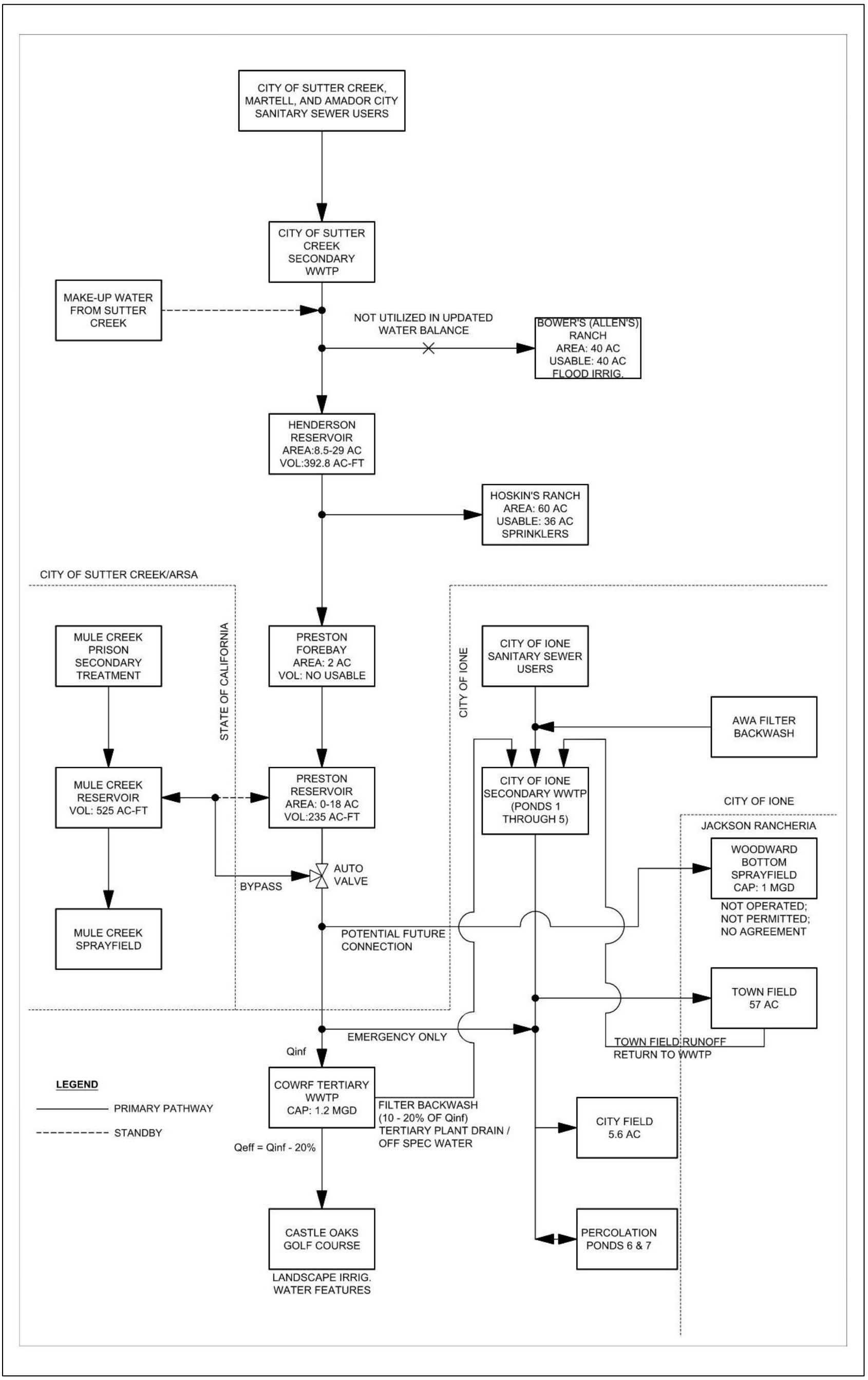


Figure 1: ARSA Storage and Disposal System Flow Diagram

On August 14, 2024, the SWRCB issued a Water Code Section 13267 Order to requiring ARSA, MCSP, and the City to verify their abilities and capacities to adequately convey, treat, and dispose of the wastewater generated by their own respective collection systems without impacting beneficial uses. ARSA, the City, and Portlock submitted the water balance by December 13, 2024, in accordance with the Water Code Section 13267 Order.

On February 3, 2025, the SWRCB issued a comment letter to ARSA, the City, and Portlock International requiring revisions to the water balance. This updated TM incorporates updates made in response to the February 3, 2025 review letter. The comments and their corresponding updated sections of this TM are summarized in Table 1 below.

Table 1: Summary of Revisions Pursuant to SWRCB Review Letter from February 3, 2025

Required Action Items	Revised TM Section
A. Rainfall Data – Redistribute to reflect average-year rainfall patterns.	Current Flow Conditions Climatological Data
B. City of Sutter Creek Inflow & Infiltration – Provide additional supporting information or exclude	Future Projected Flows & Population
C. City of Ione Title 22 Engineering Report – Provide additional supporting information	Attachment D
D. Castle Oaks Golf Course Overflow of Lake I – Cease overflow discharge and update water balance accordingly	Attachment D
E. Operational Decisions not in WDRs – Exclude assumptions such as unpermitted discharge to surface water	Disposal Facilities Characterization – Bower's Ranch
F. Submit Spreadsheets and Data	Attachment F & Excel Spreadsheet

WWTP Flow & Population Data

This section documents the existing wastewater flows to the Sutter Creek WWTP, and wastewater flows over the next 5 years based on population growth as required by the Water Code Section 13267 Order item 1.A. Daily flow data from January 2017 through September 2024 for the Sutter Creek WWTP and monthly status reports from January 2016 through July 2024 for ARSA facilities were provided by Sutter Creek and ARSA Staff. Population data was sourced from the California Department of Finance. Population and flow data is included as Attachment A for reference.

Current Flow Conditions

An analysis of the daily flow data indicates the Average Dry Weather Flow (ADWF) (average of flows from July through September) from 2017 through 2024 was typically 0.31 MGD.

Table 2: Sutter Creek WWTP ADWFs from 2017 Through 2024

Year	ADWF (MGD
2017	0.291
2018	0.305
2019	0.342
2020	0.269
2021	0.326
2022	0.327
2023	0.328
2024	0.318
Average	**0.313**

Throughout the months of December through April, Sutter Creek WWTP effluent flows can increase from infiltration and inflow (I/I) due to significant rainfall events. Precipitation data from the National Oceanic and Atmospheric Administration Sutter Hill CDF station was collected and compared to the Sutter Creek WWTP flow data. Data shown in Figure 2 indicates that once surface soils become saturated from initial rainfall, I/I increases significantly during subsequent rainfall events further into the periods of December through April.

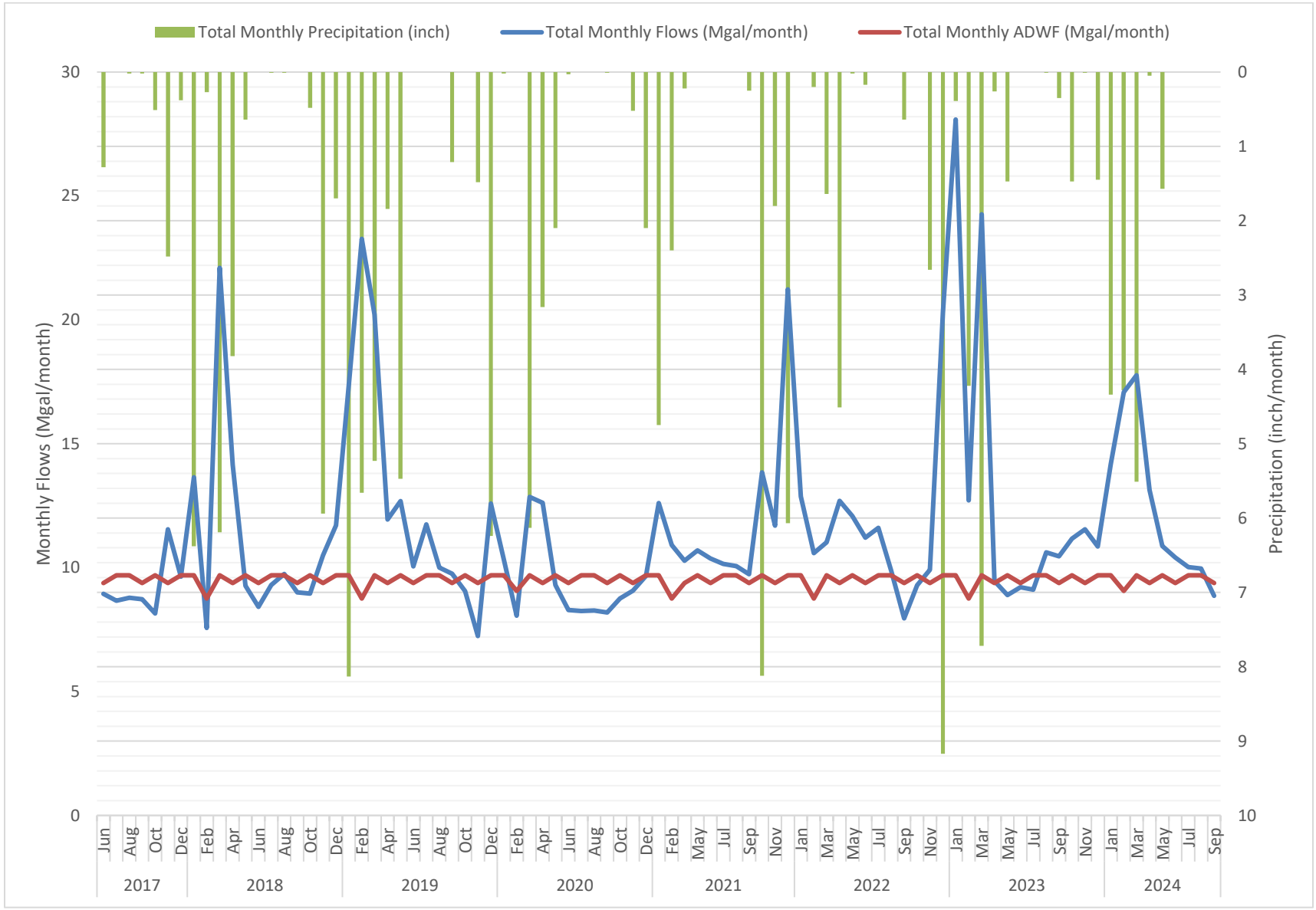


Figure 2: Sutter Creek WWTP Effluent Flows and Rainfall

To benchmark the Sutter Creek WWTP I/I, the historical wet years of 2016/17 and 2022/23 were compared to the estimated 1-in-100 Return Period (RP100) total wastewater flows. In 2016/17 water year (WY) there were 14.2 inches of precipitation from October through December before 15.1 inches of precipitation occurred in January when the peak flow of 94.8 Ac-ft also occurred. In the 2022/23 WY, there were 11.8 inches of precipitation in October through December and only 0.39" in Jan and the peak flow for the month of Jan resulted in 86.2 Ac-ft/month.

Due to the estimation of the I/I being a function of monthly precipitation, the first calibration step is adjustment of the monthly distribution of RP100 precipitation to match the 2016/17 WY rainfall patterns as described in the Climatological Data section. The climatological adjustment results in the I/I decreasing for November, March and May because the rainfall distribution for 2016/17 WY was much lower for those months. The calibrated I/I is also higher in October, December, January and April than compared to the average year because of their higher adjusted rainfall distribution.

Next, to bring the modeled RP100 flows within range of the 2016/17 and 2022/23 flows, a 25% increase in I/I from December through April was applied. This results in a January modeled peak flow of 87.4 Ac-ft which is within 8% of the 2016/17 WY peak flow. Due to the high variance and potential errors in estimating the precipitation vs I/I data, this 25% multiplier during the wet months can be considered a calibration of the modeled RP100 flows to be consistent with historical data.

As mentioned by Action Item A of the February 3, 2025, SWRCB review letter, the rainfall for January/February 2017 was much heavier than typical distribution and it may be more representative to distribute the rainfall and flow more evenly over the wet season. To evaluate the effects of rainfall distribution, RP100 rainfall and effluent flows will also be distributed based on average-year distribution and include the 25% I/I increase factor for December through April. The uncalibrated and calibrated RP100 flows and their comparative 2016/17 and 2022/23 Sutter Creek WWTP effluent flows are illustrated in Figure 3 for reference.

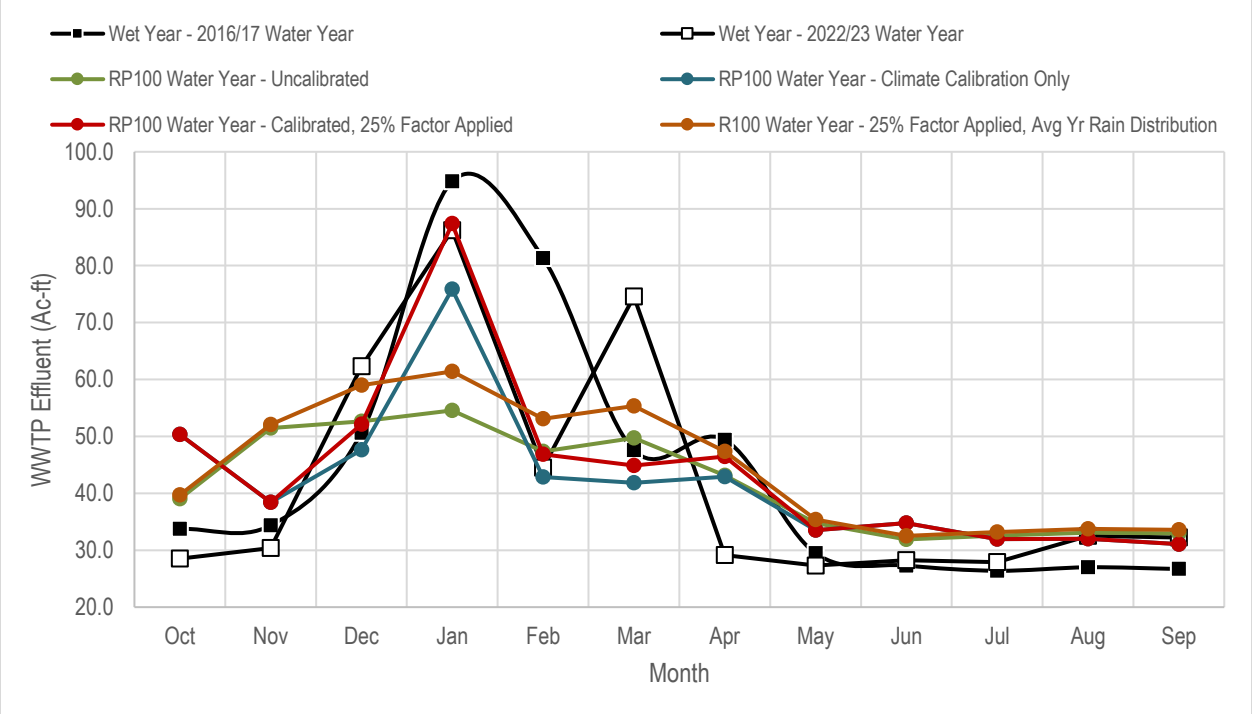


Figure 3: Calibration of Sutter Creek WWTP I/I for RP100 Conditions

Future Projected Flows & Population

In recent years the City of Sutter Creek has taken steps to reduce the I/I from the Sutter Creek WWTP collection system which included sealing of manholes within and adjacent to creek beds. Future I/I reduction efforts are expected to continue to be taken by the City of Sutter Creek, as documented in the Draft 2023 Sutter Creek WWTP I/I Analysis Update Technical Memorandum from Carollo Engineers provided as Attachment B for reference. This analysis involved flow monitoring of the collection system and modeling of the effects of I/I mitigation efforts on peak hour influent flows to the WWTP.

I/I mitigation efforts considered included manhole rehabilitation, sewer main rehabilitation or replacement and lateral rehabilitation that were recommended for sewer shed areas that have the highest I/I rates per foot of sewer pipe, which are 18% of the collection system by length. The Carollo Draft Technical Memorandum estimated the I/I reduction projects in the targeted 18% of the collection system may result in the peak hour influent flow to be reduced between 30% to 65%. However, the results of I/I reduction projects may have a more modest effect upon the peak month flows because, unlike during a peak hour event, over a peak month there may be enough time for infiltration to occur at a low rate that may still result an increased monthly influent volume.

In the prior water balance evaluation a peak month flow reduction of 5.4% was estimated for future flows, however the flow reduction has been removed due to the uncertainty of the effectiveness of the I/I reduction projects. To justify reducing the anticipated future flows (in future technical reports/analyses), the City may provide additional supporting information for the I/I reduction projects. The City may also complete additional flow monitoring after implementing the I/I reduction projects to substantiate effects on WWTP flows.

Population data provided by ARSA is sourced from the California Department of Finance population projections, which estimates in the next five years, by 2029, the population of Amador County will increase 2.17 percent.[1] The population of Sutter Creek, Martell, and Amador City are expected to increase proportionally to the projected Amador County population growth rate. The projected increases in population and flow are summarized in Table 3. ADWFs in 2029 are anticipated to reach 0.319 MGD, which is the basis of ADWF for Future Water Balance Results.

Table 3: Future Sutter Creek WWTP Flow Projections Based on Population Growth and I/I Reduction Projects

Year	ADWF (MGD)	Model Peak Month Flow (MGD)
2024	0.313	2.819
2029	0.319	2.687
Total Change	**+2.17%**	**-4.7%**

[1] CA Department of Finance Population Projections P-2A, November 2024: Projections | Department of Finance

Climatological Data

This section discusses the climatological data sources and their characteristics that were used for uncalibrated and calibrated water balance calculations. Statistical depth-duration-frequency data for the RP100 frequency at 1-Year duration are referenced from the California Department of Water Resources, Ione station (station number B00 4283 00).[2] Precipitation for the RP100 WY totals 41.11 inches based on the Ione station. Monthly precipitation patterns and totals are based on the Western Regional Climate Center Comparative Tables for Ione.[3] Average-year precipitation totals approximately 21.41 inches annually, resulting in a RP100 to average-year ratio of 1.92.

During initial water balance calculations, it became apparent that precipitation patterns during RP100 WYs did not follow the same trend as the monthly precipitation distribution during average years. The most recent historical data of a WY similar to the RP100 is the 2016/17 WY which saw 105% of the RP100 total precipitation (43.37 inches) with 15.1 inches occurring in January 2017 alone. To better fit the historically significant 2016/17 data, the RP100 precipitation pattern was adjusted to fit the monthly pattern of the 2016/17 WY, but with reduced amounts to match the statistical RP100 precipitation of 41.11 inches. The adjusted data is illustrated in Figure 4. The adjustment of the distribution of monthly precipitation for the RP100 WY is a calibration element, as mentioned in the Water Balance Results section.

A water balance using RP100 total precipitation distributed based on the average year ("Uncalibrated RP100") has also been included in the discussion of the Water Balance Results to address Required Action Item A from the SWRCB review letter.

[2] Ione Rainfall Depth Duration Frequency Table, California Department of Water Resources, November 2024: DDF Ione CA
[3] Western Regional Climate Center Precipitation Comparative Tables, November 2024: WRCC: Precipitation Comparative Table (dri.edu)

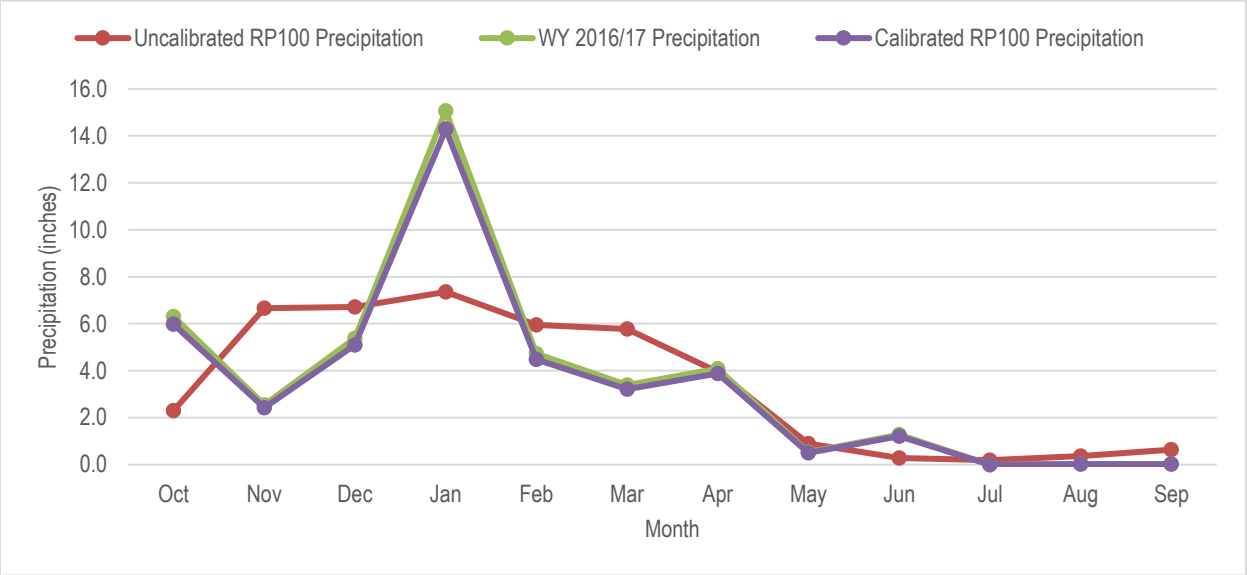


Figure 4: Calibration of RP100 Monthly Precipitation Patterns to Match 2016/17 Water Year

Pan evaporation data stations within the project vicinity are limited, therefore the Camp Pardee station was the closest selected station from the Western Regional Climate Center Pan Evaporation Comparative Tables (located within approximately 9 miles from Ione and 10 miles from Sutter Creek).[4] Pan evaporation from the Camp Pardee station totaled 57.88 inches per year, and a typical pan coefficient of 0.75 was applied to the monthly pan evaporation data to estimate the effective lake evaporation from Henderson and Preston Reservoirs and the Preston Forebay. Additionally, a weather correction factor reduction of 25% was applied to the months of November through March during the RP100 WY to account for reduction in evaporation during a wet year wet season.

Reference evapotranspiration (Eto) data were acquired from the California Irrigation Management Information System (CIMIS) for the Shenandoah station 81, which is within 6.5 miles of Sutter Creek, and 9.5 miles of Ione and located within the Sierra Foothills, CIMIS Zone 13. The Shenandoah station reported an annual Eto total of 49.4 inches. Crop coefficients (Kc) consistent with pasture grasses for CIMIS Zone 13 were applied to the reference Eto of CIMIS station 81 to calculate crop evapotranspiration (Etc) rates at the LAAs.[5] Wet year Kc values were used to calculate the RP100 WY Etc, and typical year Kc values were used to calculate average year Etc values. The difference between the monthly rainfall depth and the Etc resulted in the agronomic crop irrigation demand values. Rainfall efficiency is conservatively estimated at 100%, meaning all precipitation over the LAAs reaches the ground surface and is not evaporated to atmosphere. Finally, the irrigation efficiency is estimated at 85% which approximates a highly efficient irrigation system minimizing potential for overestimation of irrigation demands.

[4] Western Regional Climate Center Pan Evaporation Comparative Tables, November 2024: WRCC: Pan Evap Comparative Table (dri.edu)
[5] California Crop and Soil Evapotranspiration, ITRC Report 03-001, January 2003, www.itrc.org/reports/pdf/californiacrop.pdf

A summary of the climatological data used for the uncalibrated and calibrated water balance calculations is provided in Table 4: Estimated Climatological Parameters for Water Balance Calculations.

Table 4: Estimated Climatological Parameters for Water Balance Calculations

Climatological Parameters	Units	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Precipitation – Avg. Year	Inch	1.20	3.47	3.50	3.83	3.10	3.01	2.06	0.47	0.15	0.10	0.19	0.33	21.41
Precipitation – Uncalibrated RP100	Inch	2.30	6.66	6.72	7.35	5.95	5.78	3.96	0.90	0.29	0.19	0.36	0.63	41.11
Precipitation - Calibrated RP100	Inch	5.98	2.42	5.10	14.28	4.48	3.21	3.88	0.50	1.21	0.00	0.02	0.02	41.11
Effective Lake Evap. – Avg. Year	Inch	2.83	1.05	0.54	0.54	0.84	1.74	3.14	5.28	7.07	8.38	7.13	4.88	43.41
Effective Lake Evap. – RP100	Inch	2.83	0.79	0.41	0.41	0.63	1.31	3.14	5.28	7.07	8.38	7.13	4.88	42.23
Reverence Evapotranspiration – CIMIS Station 81	Inch	3.60	1.75	1.21	1.19	1.83	3.10	4.42	5.67	6.88	7.56	7.02	5.17	49.40
Pasture Grass Agronomic Application – Avg. Year	Ft/Ac	0.05	0.00	0.00	0.00	0.00	0.00	0.09	0.46	0.63	0.69	0.64	0.41	2.96
Pasture Grass Agronomic Application – Uncalibrated RP100	Ft/Ac	0.09	0.00	0.00	0.00	0.00	0.00	0.06	0.54	0.69	0.72	0.65	0.45	3.21
Pasture Grass Agronomic Application – Calibrated RP100	Ft/Ac	0.00	0.00	0.00	0.00	0.00	0.17	0.07	0.58	0.60	0.74	0.69	0.51	3.36

Storage Facilities Characterization

This section describes the Henderson Reservoir, Preston Forebay and the Preston Reservoir, which are the ARSA system's effluent storage facilities as illustrated in the Figure 1 flow diagram. Detailed information including topographical survey data from November 7, 2008, for Henderson Reservoir, the stage-storage curve data (for Henderson and Preston Reservoirs) and dam embankment data sheets for the reservoirs are provided in Attachment C.

Henderson Reservoir

Henderson Reservoir is reported to have a variable usable storage volume with a minimum 2 feet of freeboard from spillway ranging from 27.5 ac-ft to 392.8 ac-ft, and surface area (8.5 ac to 29 ac) based on the reservoir being at a minimum pool (approximately 5 ft stage) at the end of the dry season and at a maximum at the end of the wet season. The reservoir is described as providing seasonal storage but never to be empty. Therefore, an initial volume in any scenario was assumed to be 27.5 ac-ft and the goal of the water balance is to reach 27.5 ac-ft at the end of the dry season.

Percolation and evaporation rates are functions of the water surface area of the reservoirs; however the percolation rates are uncertain and have not been recently studied. Reservoir surface area was back-calculated from the month-to-month accumulated storage volume in the reservoir and then multiplied by the evaporation or percolation rate. The reservoir also accumulates precipitation throughout the entire acreage of 29 acres. Sutter Creek is diverted around the reservoir but a catchment area of 4.3 acres is assumed to add runoff to the reservoir with a very conservative runoff coefficient of 1.

Since Henderson Reservoir is the first reservoir in the system, the operational strategy taken in the water balance is to retain as much effluent and precipitation runoff in the reservoir throughout the wet season until full, at which point effluent would be sent from Henderson to Preston Reservoir.

Preston Forebay

The disposal capacity of the Preston Forebay is calculated as if it were only a pass-through system as the water flows through the reservoir and it maintains a constant water surface elevation and surface area. The percolation rate is reportedly zero leaving only evaporation as a means of disposal. The surface area is 2 acres with no discernible runoff catchment area.

Preston Reservoir

Preston Reservoir is reported to have a variable usable storage volume with a minimum 2 feet of freeboard from spillway ranging from 0 ac-ft to 235 ac-ft, and surface area (0 ac to 18 ac) based on the reservoir often being empty at the end of the dry season. Therefore, the initial volume in water balance scenarios was assumed to be 0 ac-ft and the goal of the water balance is to reach 0 ac-ft storage at the end of the dry season.

Similar to the Henderson Reservoir calculations, percolation and evaporation rates are a function of the water surface area of the reservoir, however the percolation rates are assumed to be negligible due to a lack of percolation studies. Reservoir surface area was back-calculated from the month-to-month accumulated storage volume in the reservoir and then multiplied by the evaporation rate. The reservoir also accumulates precipitation throughout the entire acreage of 18 acres. Preston Reservoir also has a catchment area of 14 acres that adds runoff to the reservoir with a very conservative runoff coefficient of 1.

Since Preston Reservoir is the final reservoir in the system, the operational strategy taken in the water balance is to receive any excess effluent and precipitation runoff from upstream components when Henderson Reservoir does not have available storage capacity. As a result, Preston Reservoir quickly receives large effluent volumes later in the wet season but does not reach its maximum capacity in any evaluated scenario.

Disposal Facilities Characterization

This section describes the Bower's Ranch, Hoskin's Ranch and the COGC, which are the ARSA system's effluent disposal facilities as illustrated in the Figure 1 flow diagram. Disposal capacity of each site is evaluated based on the Climatological Data section. Although Noble Ranch is described, it is not currently in use as a LAA.

Bower's Ranch

ARSA has a 40 acre land application (flood irrigation) disposal easement upon Bower's Ranch. The disposal facility was recently expanded from 60% constructed (24 acres) to fully utilizing the 40 acre site. As Bower's Ranch is the first LAA in the ARSA system, it is often fully utilized to take almost all of the Sutter Creek WWTP effluent for the months of June through October. Due to the site topography, any tailwater from the site is received by Henderson Reservoir and there is little to no risk of tailwater migrating to other properties. The site primarily consists of pasture grass that is used for cattle grazing.

As identified by Required Action Item E from the SWRCB review letter dated February 3, 2025, the water balance must include only facilities operated in compliance with WDRs and applicable regulations. Due to various compliance issues that the SWRCB asserts to exist with the current operation of Bower's Ranch, it has been removed from utilization in the water balance.

Hoskin's Ranch

ARSA has a 60 ac LAA at Hoskin's Ranch that is used for spray land application. The disposal facility was recently expanded from only 40% constructed (24 acres) to 60% constructed (36 acres). This LAA is primarily used for pasture grasses and for grazing cattle. Application rates are carefully monitored by ARSA Staff to prevent any overspray and to maintain but not exceed agronomic application rates.

Noble Ranch

Sutter Creek has an existing land application disposal easement for this site for 1,300 ac-ft/yr. This facility is not yet constructed nor is the site in use. Therefore, this site was not characterized or evaluated for water balance calculations.

Castle Oaks Golf Course

Disinfected secondary effluent from the ARSA system is exported from Preston Reservoir to the COWRF for tertiary treatment and subsequent water recycling at the COGC. The COGC includes a total irrigable acreage of 130 acres and contains nine lakes with only one lake (Lake I) totaling 3.1 acres that is typically filled with recycled water during the irrigation season. Demands to be met by ARSA's effluent include both the COGC irrigation demands and backwash flows at the COWRF which are necessary to maintain the COWRF system operation. The operation of the COWRF is detailed in Attachment D. COWRF influent flows total approximately 423.4 Ac-ft during

the RP100 WY and 481.7 Ac-ft during the average year. The capacity evaluation of the COWRF and COGC was completed by West Yost Engineers, and their 2024 COGC Recycled Water Demands Technical Memorandum is included as Attachment E for further reference. Additionally, a cover letter has been prepared by West Yost in response to the SWRCB's February 3, 2025, review letter and is included in Attachment D.

Water Balance Results

This section discusses water balance calculations that were completed for uncalibrated current flow conditions, calibrated current flow conditions, and calibrated future flow conditions. All water balance calculations consist of evaluation of system operations during a RP100 WY followed by an average year WY.

As discussed in the WWTP Flow & Population Data section, calibration of the flow data included increasing the I/I volume by 25% from December through April to be consistent with 2016/17 and 2022/23 WY flow data. Calibration of precipitation in the Climatological Data involved adjusting the monthly distribution of RP100 annual precipitation based on 2016/17 WY precipitation data. Another set of scenarios were also evaluated with RP100 annual precipitation distributed over more average-year conditions rather than the 2016/17 WY. The calibrations result in increased effluent reservoir storage volumes and increased flow I/I flow volumes. Calibrated future flow conditions account for the same I/I and climate calibrations and 2.17% population growth. As discussed in the Future Projected Flows & Population section, no I/I flow reduction has been included although the City of Sutter Creek will continue to pursue the I/I reduction projects and may provide additional information in the future to more precisely evaluate the flow effects.

The strategy of the water balance calculations incorporates the following logic:

1) Fully meet all irrigation demands at the LAAs (Hoskin's Ranch, and COGC) utilizing Sutter Creek WWTP effluent to the maximum agronomic rate for each given month.

2) Any shortfall of irrigation demands (which is also an excess of LAA disposal capacity) would be made up by water supplies other than the Sutter Creek WWTP effluent. It is assumed water supplying unmet irrigation demands are conveyed through the ARSA system, and are accounted for in monthly inflows and storage volumes. These are figurative estimates for water balance calculation purposes, and no specific water supply is identified to meet these demands.

3) Henderson Reservoir is assumed to maintain a minimum dead pool of 27.5 Ac-ft at 5 ft stage, whereas Preston Reservoir is allowed to reach 0 Ac-ft storage (empty).

4) Any excess of Sutter Creek WWTP effluent or precipitation / runoff not used to meet irrigation demands is stored in Henderson Reservoir first and then, once it reaches full capacity of 392.8 Ac-ft at 2 ft freeboard, any excess volume is sent to Preston Reservoir. Runoff and precipitation within Henderson Reservoir or its catchment area is retained in it. All other runoff and precipitation in the system in excess of monthly irrigation demand is retained in Preston Reservoir. The resulting final storage volumes for the month are then carried over as the beginning storage volume for the following month.

Water balance calculations completed for all scenarios indicate the ARSA system in combination with the COWRF and COGC can adequately contain and dispose of all Sutter Creek WWTP effluent, precipitation, and runoff for the RP100 WY without violation of storage capacity or agronomic application rates. When RP100 WY rainfall occurs on an average year distribution, the disposal capacity is decreased by approximately 0.4 Ac-ft during the irrigation season due to higher precipitation during the irrigation season which decreases the agronomic irrigation demands. However, the maximum storage required during the WY is decreased by 5.9 Ac-ft if the RP100 rainfall is distributed like an average WY.

Unlike the previous December 2024 water balance calculation, these results indicate there is only 12.5 to 13.0 Ac-ft of surplus disposal capacity (unmet irrigation demands) in the disposal system. Capacity for additional flows from other dischargers appears to be limited based on these results.

These water balance calculations do not include discharges from MCSP nor any future flows from City of Ione arising from approved housing developments exceeding existing secondary plant capacity. The remaining capacity of the COGC to accommodate flows from either of these sources is limited. The MCSP would need to utilize their sprayfields as a component of their disposal strategy, and City of Ione would need to develop additional disposal areas to address city growth. The COWRF accepting discharges from both MCSP and the City of Ione in the future is likely infeasible without large-scale expansion of the COWRF, and expansion of the COGC or development of additional LAAs.

The overall water balance results for each scenario are summarized in Table 5. Detailed water balance calculations are provided in Attachment F for further reference.

Table 5: Summary of Water Balance Calculation Results

Row Number	Row Calculations	Parameters	Water Balance Scenario Results									
			Scenario 1		Scenario 2a		Scenario 2b		Scenario 3a		Scenario 3b	
			Uncalibrated Current Flows		Calibrated Current Flows Avg-WY Rain Distribution		Calibrated Current Flows 2016/17-WY Rain Distribution		Calibrated Future Flows Avg-WY Rain Distribution		Calibrated Future Flows 2016/17-WY Rain Distribution	
		Climate Conditions	RP100 (Year 1)	Avg Year (Year 2)	RP100 (Year 1)	Avg Year (Year 2)	RP100 (Year 1)	Avg Year (Year 2)	RP100 (Year 1)	Avg Year (Year 2)	RP100 (Year 1)	Avg Year (Year 2)
Inflow Results												
A	--	WWTP Effluent (Ac-ft)	503.2	442.7	528.9	457.4	529.8	457.4	536.5	465.0	537.4	465.0
B	--	Precipitation and Runoff (Ac-ft)	230.6	120.1	230.6	120.1	230.6	120.1	230.6	120.1	230.6	120.1
Storage Facilities Results												
C	--	Henderson Reservoir Max Storage Volume (Ac-ft)	392.8	283.6	392.8	296.1	392.8	296.1	392.8	300.4	392.8	300.4
D	--	Preston Reservoir Max Storage Volume (Ac-ft)	139.9	135.1	165.0	141.0	170.9	140.5	169.3	147.3	175.2	154.4
E	--	Henderson Reservoir Evaporation (Ac-ft)	73.1	57.4	73.2	59.3	73.6	59.3	73.5	60.2	73.8	60.2
F	--	Preston Forebay Evaporation (Ac-ft)	6.6	6.4	6.6	7.2	6.6	7.2	6.6	7.2	6.6	7.2
G	--	Preston Reservoir Evaporation (Ac-ft)	40.2	36.8	44.3	43.3	45.4	43.2	45.0	45.0	46.1	46.9
Disposal Results												
H	--	Bower's Ranch Irrigation Demands (Ac-ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I	--	Hoskin's Ranch Irrigation Demands (Ac-ft)	115.5	106.7	115.5	106.7	115.5	106.7	115.5	106.7	115.5	106.7
J	--	COWRF & COGC Irrigation Demands (Ac-ft)	423.4	481.7	423.4	481.7	423.4	481.7	423.4	481.7	423.4	481.7
K	--	Unmet Irrigation Demands (Ac-ft)	0.0	51.1	0.0	24.2	0.0	24.7	0.0	12.5	0.0	13.0
Overall Calculation Results												
L	(A+B)	Total Inflows Excluding Unmet Irrigation Demands (Ac-ft)	733.9	562.8	759.5	577.5	760.4	577.5	767.1	585.1	768.0	585.1
M	(A+B+K)	Total Inflows Including Unmet Irrigation Demands (Ac-ft)	733.9	613.9	759.5	601.8	760.4	602.2	767.1	597.7	768.0	598.1
N	(E+F+G+ I+J)	Total Outflows (Ac-ft)	658.8	689.0	663.1	698.2	664.5	698.1	664.0	700.8	665.4	700.7
O	(N – L), or K	Unmet Irrigation Demands (Ac-ft)	0.0	51.1	0.0	24.2	0.0	24.7	0.0	12.5	0.0	13.0
P	(C+D), or as shown (1)	Maximum Storage Volume Required (Ac-ft)	532.7	402.6	557.8	437.1	563.7	436.6	562.1	447.7	568.0	447.2
Q	(627.8 Ac-ft – P)	Unutilized Storage Capacity at Peak Storage (Ac-ft)	95.1	223.2	70.0	190.7	64.1	191.2	65.7	180.1	59.8	180.6

(1) The peak month storage volumes for Henderson and Preston Reservoirs may be in different months than the overall system's peak storage month, resulting in minor discrepancies of 2.4 to 2.9 Ac-ft between Row N values and (D+E) calculations. Where discrepancies occur, Row N displays overall peak storage month volumes from water balance calculations.

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ATTACHMENT A

Amador Regional Sanitation Agency
2024 Individual Water Balance Update

Sutter Creek WWTP Population and Flow Data

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CA Department of Finance
Population Projection by County

Report P-2A: Total Estimated and Projected Population for California and Counties: July 1, 2020 to 2070

		Estimates				Projections						
FIPS	**Geography**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
6000	CALIFORNIA	39,541,722	39,246,702	39,146,273	39,109,070	39,119,734	39,155,670	39,243,572	39,340,965	39,451,269	39,568,558	39,694,960
6001	ALAMEDA	1,680,487	1,657,465	1,649,975	1,656,037	1,654,334	1,654,555	1,660,187	1,666,430	1,673,310	1,680,926	1,689,225
6003	ALPINE	1,202	1,180	1,175	1,165	1,163	1,163	1,165	1,170	1,174	1,172	1,176
6005	AMADOR	40,440	40,262	40,105	40,122	**40,198**	40,298	40,429	40,615	40,828	**41,070**	41,327

ARSA Facilities Monthly Status Reports - Provided by ARSA Staff

Date	Month	Sutter Creek WWTP (mg)	Sutter Creek WWTP (ac ft)	Bowers Irrigation (mg)	Bowers Volume irrigated (ac ft)	Henderson Freeboard	Volume in Henderson (af)	Capacity Remaining in Henderson (af)	Henderson Outflow (mg)	Henderson outflow (ac ft)	Hoskins Irrigation (mg)	Hoskins Volume irrigated (ac ft)	Mule Creek Inflow (mg)	Mule Creek Inflow (ac ft)	Preston Freeboard	Volume in Preston (af)	Capacity Remaining in Preston (ac ft)	Outflow to Ione (mg)	Outflow to Ione (ac ft)	TOTAL Ac Ft of Effluent in the system	TOTAL Remaining Capacity for Winter (ac ft)	TOTAL USED FOR IRRIGATION (ac ft)
2016																						
1/31/2016	Jan	19.0	58.3	0.0	0.0	12'1"	155.8	237.2	12.4	38.1	0.0	0.0	0.0	0.0	11'4"	94.7	140.3	3.9	12.0	250.47	377.5	12.0
2/29/2016	Feb	10.7	32.8	0.0	0.0	10'9"	180.9	212.1	17.8	54.6	0.0	0.0	0.0	0.0	8'7"	128.4	106.6	4.0	12.3	309.27	318.7	12.3
3/31/2016	Mar	17.7	54.3	0.0	0.0	8'7"	225.7	167.3	15.1	46.3	0.0	0.0	0.0	0.0	5'7"	171.0	64.0	3.4	10.4	396.64	231.4	10.4
4/30/2016	Apr	10.7	32.8	0.0	0.0	8'5"	229.3	163.7	13.7	42.0	0.0	0.0	0.0	0.0	5'7"	171.0	64.0	9.1	27.9	400.29	227.7	27.9
5/31/2016	May	9.3	28.5	0.0	0.0	9'9"	201.0	192.0	23.0	70.6	0.0	0.0	0.0	0.0	7'7"	141.9	93.1	27.3	83.8	342.85	285.2	83.8
6/30/2016	Jun	8.3	25.5	2.9	8.9	14'4"	117.6	275.4	32.2	98.8	2.2	6.8	0.0	0.0	9'8"	114.5	120.5	36.0	110.5	232.06	395.9	126.1
7/31/2016	Jul	9.0	27.6	9.0	27.6	20'1"	43.8	349.2	25.4	77.9	5.3	16.3	35.9	110.2	7'6"	143.1	91.9	40.9	125.5	186.84	441.2	169.4
8/31/2016	Aug	9.2	28.2	9.2	28.2	22'3"	24.9	368.1	8.7	26.7	3.2	9.8	32.9	101.0	8'3"	132.8	102.2	44.1	135.3	157.68	470.3	173.4
9/30/2016	Sep	8.3	25.5	6.3	19.3	25'8"	5.0	388.0	10.8	33.1	2.2	6.8	10.3	31.6	13'2"	75.1	159.9	37.5	115.1	80.06	547.9	141.2
10/31/2016	Oct	11.0	33.8	2.5	7.7	23'2"	18.4	374.6	5.9	18.1	0.0	0.0	4.0	12.3	14'4"	63.8	171.2	6.4	19.6	82.18	545.8	27.3
11/30/2016	Nov	11.2	34.4	0.0	0.0	20'8"	38.2	354.8	5.3	16.3	0	0.0	0.0	0.0	14'2"	65.4	169.6	0.0	0.0	103.6	524.4	0.0
12/31/2016	Dec	16.5	50.6	0.0	0.0	16'8"	83.5	309.5	10.4	31.9	0.0	0.0	0.0	0.0	11'6"	92.8	142.2	0.0	0.0	176.32	451.7	0.0
Total:		**140.9**	**432.4**	**29.9**	**91.8**				**180.7**	**554.5**	**12.9**	**39.6**	**83.1**	**255.0**				**212.6**	**652.4**			**783.8**
2017																						
1/31/2017	Jan	30.9	94.8	0.0	0.0	9'3"	211.4	181.6	10.7	32.8	0.0	0.0	0.0	0.0	6'8"	154.9	80.1	245.8	0.0	366.25	261.8	0.0
2/28/2017	Feb	26.5	81.3	0.0	0.0	4'1"	334.2	58.8	10.2	31.3	0.0	0.0	0.0	0.0	4'4"	190.6	44.4	136.3	0.0	524.72	103.3	0.0
3/31/2017	Mar	15.5	47.6	0.0	0.0	1'5"	408.4	43.6	14.1	43.3	0.0	0.0	0.0	0.0	1'5"	240.4	29.6	90.8	4.7	648.74	73.3	4.7
4/30/2017	Apr	16.1	49.4	0.0	0.0	1'6"	405.9	46.1	34.9	107.1	0.0	0.0	0.0	0.0	1'8"	235.9	34.1	104.6	18.2	641.82	80.2	18.2
5/31/2017	May	9.6	29.5	0.0	0.0	3'7"	347.5	45.5	38.0	116.6	2.7	8.3	0.0	0.0	1'2"	244.9	25.1	77.0	83.9	592.42	70.6	92.2
6/30/2017	Jun	8.9	27.3	8.0	24.6	6'7"	271.3	121.7	36.0	110.5	8.8	27.0	0.0	0.0	3'2"	209.8	25.2	77.3	111.2	481.07	146.9	162.8
7/31/2017	Jul	8.6	26.4	8.7	26.7	11'	176.1	216.9	35.0	107.4	10.7	32.8	0.0	0.0	6'11"	151.3	83.7	256.9	128.3	327.34	300.7	187.8
8/31/2017	Aug	8.8	27.0	8.7	26.7	13'9"	127.0	266.0	20.6	63.2	8.6	26.4	0.0	0.0	7'6"	143.1	91.9	282.0	37.3	270.02	358.0	90.4
9/30/2017	Sep	8.7	26.7	8.7	26.7	16'2"	90.3	302.7	18.3	56.2	11.9	36.5	0.0	0.0	6'10	152.5	82.5	253.2	0.0	242.81	385.2	63.2
10/31/2017	Oct	8.0	24.6	8.1	24.9	17'4"	74.8	318.2	13.8	42.4	9.4	28.8	0.0	0.0	9'7"	115.5	119.5	366.7	52.6	190.33	437.7	106.3
11/30/2017	Nov	11.5	35.3	0.9	2.8	14'10"	121.6	271.4	9.7	29.8	7.4	22.7	0.0	0.0	11'1"	97.5	137.5	422.0	83.5	219.1	408.9	109.0
12/31/2017	Dec	9.5	29.2	0.0	0.0	12'9"	143.9	249.1		0.0	6.3	19.3	0.0	0.0	10'6"	104.4	130.6	400.8	0.0	248.26	379.7	19.3
Total:		**162.6**	**499.0**	**43.1**	**132.3**				**241.3**	**740.5**	**65.8**	**201.9**	**0.0**	**0.0**				**2713.5**	**519.7**			**853.9**
2018																						
1/31/2018	Jan	13.6	41.7	0	0.0	9'7"	206.1	186.9	8.4	25.8	0	0.0	0	0.0	8'8"	128.4	106.6	0.0	0.0	334.5	293.5	0.0
2/28/2018	Feb	8.7	26.7	0	0.0	7'10"	240.4	152.6	5.1	15.7	0	0.0	0	0.0	8'3"	133.9	101.1	0.0	0.0	374.3	253.7	0.0
3/31/2018	Mar	22.1	67.8	0	0.0	4'1"	332.9	60.1	8.00	24.6	0	0.0	0	0.0	5'11"	164.1	70.9	0.0	0.0	497	131.0	0.0
4/30/2018	Apr	14.1	43.3	0	0.0	3'9"	342.6	50.4	23.8	73.0	6.0	18.4	0	0.0	3'3"	200.9	34.1	1.2	3.7	543.5	84.5	22.1
5/31/2018	May	9.3	28.5	0	0.0	3'10"	340.6	52.4	16.9	51.9	9.9	30.4	0	0.0	8'2"	133.9	101.1	27.7	85.0	474.5	153.5	115.4
6/30/2018	Jun	8.4	25.8	5.3	16.3	5'8"	295.1	97.9	21.2	65.1	9.6	29.5	0	0.0	15'1"	59.6	175.4	37.7	115.7	354.7	273.3	161.4
7/31/2018	Jul	9.3	28.5	9.2	28.2	10'0"	193.7	199.3	35.4	108.6	9.5	29.2	0	0.0	22'0"	17.0	218.0	42.9	131.7	210.7	417.3	189.0
8/31/2018	Aug	9.7	29.8	9.7	29.8	11'7"	163.6	229.4	12	36.8	5.8	17.8	0	0.0	20'9"	22.0	213.0	0.0	0.0	185.6	442.4	47.6
9/30/2018	Sep	9	27.6	9	27.6	13'11"	123.9	269.1	16	49.1	10.7	32.8	0	0.0	19'3"	36.2	198.8	0.0	0.0	160.1	467.9	60.5
10/31/2018	Oct	8.9	27.3	8.9	27.3	15'2"	106.0	287.0	16.2	49.7	10.0	30.7	0	0.0	11'	45.6	189.4	0.0	0.0	151.6	476.4	58.0
11/30/2018	Nov	10.5	32.2	5.8	17.8	15'1"	107.2	285.8	14.9	45.7	5.6	17.2	0	0.0	14'10"	60.9	174.1	0.0	0.0	168.1	459.9	35.0
12/31/2018	Dec	11.7	35.9	0	0.0	13'6"	131.2	261.8	15.2	46.6	0	0.0	0	0.0	11'2"	94.9	140.1	0.0	0.0	226.1	401.9	0.0
Total:		**135.3**	**415.2**	**47.9**	**147.0**				**193.1**	**592.6**	**67.1**	**205.9**	**0.0**	**0.0**				**109.5**	**336.0**			**689.0**
2019																						
1/31/2019	Jan	17.4	53.4	0	0.0	10'5"	185.4	207.6	36.7	112.6	0	0.0	0	0.0	8'3"	132.8	102.2	0	0.0	318.2	309.8	0.0
2/28/2019	Feb	23.3	71.5	0	0.0	6'6"	271.9	121.1	4.8	14.7	0	0.0	0	0.0	6'6"	157.3	77.7	0	0.0	429.22	198.8	0.0
3/31/2019	Mar	20.2	62.0	0	0.0	3'6"	350.4	42.6	7.6	23.3	0	0.0	0	0.0	4'8"	185.2	49.8	0	0.0	535.64	92.4	0.0
4/30/2019	Apr	11.9	36.5	0	0.0	2'9"	271.4	121.6	15.8	48.5	4.2	12.9	0	0.0	3'2"	209.8	25.2	2	6.1	481.19	146.8	19.0
5/31/2019	May	12.7	39.0	0	0.0	3'6"	350.4	42.6	24.0	73.7	5.8	17.8	0	0.0	4'8"	185.2	49.8	20.9	64.1	535.64	92.4	81.9
6/30/2019	Jun	10	30.7	5.2	16.0	5'10"	288.5	104.5	26.5	81.3	12.3	37.7	0	0.0	7'3"	146.6	88.4	29	89.0	435.06	192.9	142.7
7/31/2019	Jul	7.6	23.3	9.9	30.4	8'11"	217.9	175.1	22.9	70.3	13.8	42.4	0	0.0	14'7"	61.5	173.5	40.6	124.6	279.44	348.6	197.3
8/31/2019	Aug	10	30.7	10	30.7	10'7"	184.2	208.8	13.4	41.1	11.8	36.2	0	0.0	17'2"	40.3	194.7	6.2	19.0	224.52	403.5	85.9
9/30/2019	Sep	9.6	29.5	9.4	28.8	12'6"	148.3	244.7	13.7	42.0	10.4	31.9	0	0.0	17'1"	40.9	194.1	0	0.0	189.23	438.8	60.8
10/31/2019	Oct	9	27.6	9	27.6	14'3"	119.6	273.4		0.0	12.2	37.4	0	0.0	16'5"	46.0	189.0	0	0.0	165.61	462.4	65.1
11/30/2019	Nov	7.2	22.1	5.1	15.7	14'1"	121.6	271.4	9.3	28.5	5.7	17.5	0	0.0	14'11"	58.5	176.5	0	0.0	180.14	447.9	33.1
12/31/2019	Dec	12.6	38.7	0	0.0	12'3"	152.2	240.8	0	0.0	0	0.0	0	0.0	13'2"	75.1	159.9	0	0.0	227.3	400.7	0.0
Total:		**151.5**	**464.9**	**48.6**	**149.1**				**174.7**	**536.1**	**76.2**	**233.8**	**0.0**	**0.0**				**98.7**	**302.9**			**685.9**

ARSA Facilities Monthly Status Reports - Provided by ARSA Staff

Date		Sutter Creek WWTP Flow (mg)	Sutter Creek WWTP (ac ft)	Bowers Irrigation (mg)	Bowers Volume irrigated (ac ft)	Henderson Freeboard	Volume in Henderson (af)	Capacity Remaining in Henderson	Henderson Outflow (mg)	Henderson outflow (ac ft)	Hoskins Irrigation (mg)	Hoskins Volume irrigated (ac ft)	Mule Creek Inflow (mg)	Mule Creek Inflow (ac ft)	Preston Freeboard	Volume in Preston (af)	Capacity Remaining in Preston (ac ft)	Outflow to Ione (mg)	Volume sent to Ione (ac ft)	TOTAL Ac Ft of Effluent in the system	TOTAL Remaining Capacity for Winter (ac ft)	TOTAL USED FOR IRRIGATIO N (ac ft)
2020																						
1/31/2020	Jan	10.3	31.6	0	0.0	11'2"	172.9	220.1	8.5	26.1	0	0.0	0	0.0	12'2"	85.5	149.5	0	0.0	258.4	369.6	0.0
2/29/2020.	Feb	8	24.6	0	0.0	10'7"	184.2	208.8	3.5	10.7	0	0.0	0	0.0	11'7"	91.9	143.1	0	0.0	276.08	351.9	0.0
3/31/2020	Mar	12.85	39.4	0	0.0	8'11"	214.9	178.1	7.4	22.7	0	0.0	0	0.0	10'1"	109.4	125.6	0	0.0	324.26	303.7	0.0
4/30/2020	Apr	12.61	38.7	0	0.0	7'8"	246.1	146.9	6.3	19.3	0	0.0	0	0.0	10'8"	102.4	132.6	8.84	27.1	348.5	279.5	27.1
5/31/2020	May	8.2	25.2	1.4	4.3	8'6"	227.5	165.5	4.2	12.9	7.5	23.0	0	0.0	13'11"	67.8	167.2	23.9	73.3	295.3	332.7	100.7
6/30/2020	Jun	8.3	25.5	8.3	25.5	11'6"	166.5	226.5	6.3	19.3	5.7	17.5	0	0.0	19'6"	25.1	209.9	28.9	88.7	191.6	436.4	131.7
7/31/2020	Jul	8.3	25.5	8.3	25.5	14'11"	108.5	284.5	19.2	58.9	3.9	12.0	0	0.0	15'10"	50.7	184.3	0	0.0	159.2	468.8	37.4
8/31/2020	Aug	8.3	25.5	8.3	25.5	17'11"	67.6	325.4	13.3	40.8	2.3	7.1	0	0.0	14'0"	67.0	168.0	0	0.0	134.56	493.4	32.5
9/30/2020	Sep	8.2	25.2	8.2	25.2	19'2"	53.3	339.7	8.4	25.8	2.3	7.1	14	43.0	13'0"	76.8	158.2	13.9	42.7	130.09	497.9	74.9
10/31/2020	Oct	8.8	27.0	8.8	27.0	21'2"	33.7	359.3	11.9	36.5	2.4	7.4	0	0.0	17'9"	36.2	198.8	23.4	71.8	69.86	558.1	106.2
11/30/2020	Nov	9.1	27.9	3.5	10.7	22'	26.8	366.2	7.62	23.4	2.3	7.1	0	0.0	18'8"	30.1	204.9	30.7	94.2	56.89	571.1	112.0
12/31/2020	Dec	9.9	30.4	0	0.0	21'0"	35.9	357.1	8.8	27.0	0	0.0	0	0.0	16'8"	44.1	190.9	0	0.0	79.97	548.0	0.0
Total:		**112.9**	**346.4**	**46.8**	**143.6**				**105.4**	**323.4**	**26.4**	**81.0**	**14.0**	**43.0**				**129.6**	**397.9**			**622.5**
2021																						
1/31/2021	Jan	12.6	38.7	0	0.0	17'6"	72.7	320.3	3.9	12.0	0	0.0	0	0.0	15'3"	55.6	179.4	0	0.0	128.3	499.7	0.0
2/28/2021	Feb	10.9	33.5	0	0.0	16'1"	91.5	301.5	2.6	8.0	0	0.0	0	0.0	14'9"	60.0	175.0	0	0.0	151.49	476.5	0.0
3/31/2021	Mar	11.9	36.5	0	0.0	13'1"	138.2	254.8	3.5	10.7	0	0.0	0	0.0	14'7"	61.5	173.5	0	0.0	199.65	428.4	0.0
4/30/2021	Apr	10.2	31.3	0	0.0	14'7"	113.7	279.3		0.0	0	0.0	0	0.0	16'11"	42.2	192.8	20.7	63.5	155.85	472.2	63.5
5/31/2021	May	10.7	32.8	6.6	20.3	19'10"	46.3	346.7	27.2	83.5	0	0.0	0	0.0	21'4"	15.7	219.3	36.2	111.1	61.97	566.0	131.3
6/30/2021	Jun	10.4	31.9	7.4	22.7	21'5"	31.6	361.4	8.7	26.7	0	0.0	0	0.0	20'10"	18.0	217.0	1.9	5.8	49.6	578.4	28.5
7/31/2021	Jul	10.2	31.3	7.1	21.8	22'1"	26.2	366.8	3.9	12.0	0.2	0.6	0	0.0	21'0'	17.2	217.8	0	0.0	43.39	584.6	22.4
8/31/2021	Aug	10.1	31.0	6.9	21.2	22'6"	23.0	370.0	5.6	17.2	2	6.1	0	0.0	21'6"	15.0	220.0	0	0.0	37.96	590.0	27.3
9/30/2021	Sep	9.7	29.8	5.2	16.0	23'8"	15.2	377.8	6.9	21.2	1.7	5.2	0	0.0	21'0"	17.2	217.8	0	0.0	32.38	595.6	21.2
10/31/2021	Oct	13.8	42.4	3.6	11.0	20'5"	40.6	352.4	5	15.3	0	0.0	0	0.0	19'1"	27.5	207.5	0	0.0	68.06	559.9	11.0
11/30/2021	Nov	11.7	35.9	0	0.0	18'11"	56.0	337.0	7.9	24.2	0	0.0	0	0.0	18'1"	33.9	201.1	0	0.0	89.89	538.1	0.0
12/31/2021	Dec	21.2	65.1	0	0.0	14'2"	120.2	272.8		0.0	0	0.0	0	0.0	14'8"	60.8	174.2	0	0.0	180.98	447.0	0.0
Total:		**143.4**	**440.1**	**36.8**	**112.9**				**75.2**	**230.8**	**3.9**	**12.0**	**0.0**	**0.0**				**58.8**	**180.5**			**305.4**
2022																						
1/31/2022	Jan	12.9	39.6	0	0.0	12'9"	142.9	250.1	6.2	19.0	0	0.0	0	0.0	13'9"	69.4	165.6	0	0.0	212.25	415.8	0.0
2/28/2022	Feb	10.6	32.5	0	0.0	12'0"	157.3	235.7	5.5	16.9	0	0.0	0	0.0	12'10"	78.5	156.5	0	0.0	235.79	392.2	0.0
3/31/2022	Mar	11	33.8	0	0.0	11'8"	163.4	229.6	2.7	8.3	0	0.0	0	0.0	12'1"	86.4	148.6	1.6	4.9	249.83	378.2	4.9
4/30/2022	Apr	12.7	39.0	0	0.0	11'3"	171.3	221.7	9.1	27.9	0	0.0	0	0	10'1"	109.4	125.6	0.1	0.3	280.62	347.4	0.3
5/31/2022	May	12.1	37.1	0	0.0	12'2"	154.3	238.7	11.7	35.9	0	0.0	0	0	9'0"	122.9	112.1	1.7	5.2	277.21	350.8	5.2
6/30/2022	Jun	11.2	34.4	10.1	31.0	14'3"	118.9	274.1	11.2	34.4	7.2	22.1	0	0	8'11"	124.0	111.0	5	15.3	242.9	385.1	68.4
7/31/2022	Jul	11.6	35.6	11.6	35.6	16'3"	89.2	303.8	9.4	28.8	8.1	24.9	0	0	9'3"	119.7	115.3	0	0.0	208.9	419.1	60.5
8/31/2022	Aug	9.8	30.1	9.8	30.1	18'1"	65.6	327.4	8.4	25.8	7.7	23.6	0	0	9'8"	114.5	120.5	0.5	1.5	180.1	447.9	55.2
9/30/2022	Sep	8.5	26.1	7.6	23.3	9'8"	48.9	344.1	8.6	26.4	6.5	19.9	0	0	9'9"	113.4	121.6	0.9	2.8	162.3	465.7	46.0
10/31/2022	Oct	9.3	28.5	9.3	28.5	22'0"	26.8	366.2	9.8	30.1	8.7	26.7	0	0	11'8"	91.0	144.0	4.5	13.8	117.8	510.2	69.0
11/30/2022	Nov	9.9	30.4	0	0.0	19'7"	48.8	344.2	3.3	10.1	0	0.0	0	0	15'2"	56.6	178.4	11.3	34.7	105.4	522.6	34.7
12/31/2022	Dec	20.3	62.3	0	0.0	13'10"	125.6	267.4	2.8	8.6	0	0.0	0	0	13'0"	76.8	158.2	0	0.0	202.41	425.6	0.0
Total:		**139.9**	**429.3**	**48.4**	**148.5**				**88.7**	**272.2**	**38.2**	**117.2**	**0.0**	**0.0**				**25.6**	**78.6**			**344.3**
2023																						
1/31/2023	Jan	28.1	86.2	0.0	0.0	7'6"	249.9	143.1	3.0	9.2	0.0	0.0	0.0	0.0	9'8"	114.5	120.5	0.0	0.0	364.4	263.6	0.0
2/28/2023	Feb	14.5	44.5	0.0	0.0	5'7"	295.7	97.3		0.0	0.0	0.0	0.0	0.0	9'4"	118.7	116.3	0.0	0.0	414.4	213.6	0.0
3/31/2023	Mar	24.3	74.6	0.0	0.0	3'9"	343.0	50.0	18.3	56.2	0.0	0.0	0.0	0.0	4'10"		235.0	0.0	0.0	343.0	285.0	0.0
4/30/2023	Apr	9.5	29.2	0.0	0.0	3'2"	358.8	34.2	8.2	25.2	6.3	19.3	0.0	0.0	5'0"	180.0	55.0	2.1	6.4	538.8	89.2	25.8
5/31/2023	May	8.9	27.3	0.0	0.0	3'8"	345.3	47.7	10.9	33.5	10.0	30.7	0.0	0.0	8'2"	133.9	101.1	18.8	57.7	479.2	148.8	88.4
6/30/2023	Jun	9.2	28.2	5.7	17.5	6'2"	281.3	111.7	21.5	66.0	9.7	29.8	0.0	0.0	11'1"	97.5	137.5	25.8	79.2	378.8	249.2	126.4
7/31/2023	Jul	9.1	27.9	9.1	27.9	11'4"	169.7	223.3	31.0	95.1	2.2	6.8	0.0	0.0	11'5"	93.8	141.2	29.5	90.5	263.5	364.5	125.2
8/31/2023	Aug	10.6	32.5	10.6	32.5	17'11"	67.6	325.4	29.6	90.8	4.9	15.0	0.0	0.0	13'6"	71.8	163.2	26.9	82.6	139.4	488.6	130.1
9/30/2023	Sep	10.5	32.2	10.5	32.2	20'0"	44.6	348.4	9.7	29.8	8.8	27.0	0.0	0.0	16'0"	49.3	185.7	5.3	16.3	93.9	534.1	75.5
10/31/2023	Oct	11.2	34.4	7.9	24.2	19'10"	46.3	346.7	5.4	16.6	3.2	9.8	0.0	0.0	16'2"	48.0	187.0	0.0	0.0	94.3	533.7	34.1
11/30/2023	Nov	10.3	31.6	0.0	0.0	18'7"	59.7	333.3	3.6	11.0	0.0	0.0	0.0	0.0	15'11"	50.0	185.0	0.0	0.0	109.7	518.3	0.0
12/31/2023	Dec	10.9	33.5	0.0	0.0	17'0"	79.1	313.9	5.2	16.0	0.0	0.0	0.0	0.0	15'1"	57.1	177.9	0.0	0.0	136.2	491.8	0.0
Total:		**157.1**	**482.1**	**43.8**	**134.4**				**146.4**	**449.3**	**45.1**	**138.4**	**0.0**	**0.0**				**108.4**	**332.7**			**605.5**

ARSA Facilities Monthly Status Reports - Provided by ARSA Staff

Date		Sutter Creek WWTP Flow (mg)	Sutter Creek WWTP (ac ft)	Bowers Irrigation (mg)	Bowers Volume irrigated (ac ft)	Henderson Freeboard	Volume in Henderson (af)	Capacity Remaining in Henderson	Henderson Outflow (mg)	Henderson outflow (ac ft)	Hoskins Irrigation (mg)	Hoskins Volume irrigated (ac ft)	Mule Creek Inflow (mg)	Mule Creek Inflow (ac ft)	Preston Freeboard	Volume in Preston (af)	Capacity Remaining in Preston (ac ft)	Outflow to Ione (mg)	Volume sent to Ione (ac ft)	TOTAL Ac Ft of Effluent in the system	TOTAL Remaining Capacity for Winter (ac ft)	TOTAL USED FOR IRRIGATIO N (ac ft)
2024																						
1/31/2024	Jan	14.2	43.6	0.0	0.0	14'3"	118.9	274.1		0.0	0.0	0.0	0.0	0.0	13'5"	71.8	163.2	0.0	0.0	190.7	437.3	0.0
2/29/2024	Feb	17.1	52.5	0.0	0.0	10'11"	177.7	215.3	4.4	13.5	0.0	0.0	0.0	0.0	11'9"	90.0	145.0	0.0	0.0	267.7	360.3	0.0
3/31/2024	Mar	17.8	54.6	0.0	0.0	8'5"	229.3	163.7	4.4	13.5	0.0	0.0	0.0	0.0	10'8"	102.4	132.6	0.0	0.0	331.7	296.3	0.0
4/30/2024	Apr	13.1	40.2	0.0	0.0	7'8"	246.1	146.9	3.0	9.2	0.0	0.0	0.0	0.0	9'7"	115.5	119.5	0.5	1.5	361.6	266.4	1.5
5/31/2024	May	10.9	33.5	0.0	0.0	9'0"	216.7	176.3	18.2	55.9	0.0	0.0	0.0	0.0	11'5"	93.8	141.2	18.9	58.0	310.5	317.5	58.0
6/30/2024	Jun	10.1	31.0	9.4	28.8	13'1"	138.2	254.8	24.6	75.5	1.7	5.2	0.0	0.0	15'7"	52.8	182.2	31.8	97.6	191.0	437.0	131.7
7/31/2024	Jul	10.0	30.7	10.0	30.7	19'11"	45.4	347.6	28.7	88.1	0.0	0.0	0.0	0.0	19'2"	27.0	208.0	31.8	97.6	72.4	555.6	128.3
8/31/2024	Aug				0.0			393.0		0.0		0.0	0.0	0.0			235.0		0.0	0.0	628.0	0.0
9/30/2024	Sep				0.0			393.0		0.0		0.0	0.0	0.0			235.0		0.0	0.0	628.0	0.0
10/31/2024	Oct				0.0			393.0		0.0		0.0	0.0	0.0			235.0		0.0	0.0	628.0	0.0
11/30/2024	Nov				0.0			393.0		0.0		0.0	0.0	0.0			235.0		0.0	0.0	628.0	0.0
12/31/2024	Dec				0.0			393.0		0.0		0.0	0.0	0.0			235.0		0.0	0.0	628.0	0.0
Total:		**93.2**	**286.0**	**19.4**	**59.5**				**83.3**	**255.6**	**1.7**	**5.2**	**0.0**	**0.0**				**83.0**	**254.7**			**319.5**

Date	Sutter Creek Effluent Flow (GPD)
6/1/2017	329,600
6/2/2017	315,000
6/3/2017	312,600
6/4/2017	292,400
6/5/2017	324,400
6/6/2017	297,400
6/7/2017	346,000
6/8/2017	311,400
6/9/2017	310,600
6/10/2017	284,600
6/11/2017	297,000
6/12/2017	296,000
6/13/2017	328,300
6/14/2017	301,700
6/15/2017	296,000
6/16/2017	293,000
6/17/2017	282,600
6/18/2017	269,400
6/19/2017	310,400
6/20/2017	304,200
6/21/2017	296,400
6/22/2017	311,600
6/23/2017	293,000
6/24/2017	260,000
6/25/2017	258,000
6/26/2017	314,200
6/27/2017	282,400
6/28/2017	289,600
6/29/2017	268,800
6/30/2017	267,600
7/1/2017	193,000
7/2/2017	353,800
7/3/2017	310,600
7/4/2017	242,800
7/5/2017	286,400
7/6/2017	295,600
7/7/2017	275,000
7/8/2017	232,400
7/9/2017	238,800
7/10/2017	280,200
7/11/2017	278,400
7/12/2017	262,000
7/13/2017	310,800
7/14/2017	338,000
7/15/2017	260,800
7/16/2017	256,200
7/17/2017	275,000
7/18/2017	283,200
7/19/2017	340,600
7/20/2017	293,400
7/21/2017	276,000
7/22/2017	265,200
7/23/2017	252,000
7/24/2017	307,300
7/25/2017	275,700
7/26/2017	276,800
7/27/2017	290,600
7/28/2017	291,400
7/29/2017	261,200
7/30/2017	260,600
7/31/2017	299,400
8/1/2017	290,000
8/2/2017	264,600
8/3/2017	293,400
8/4/2017	308,600
8/5/2017	257,200
8/6/2017	250,600
8/7/2017	348,800
8/8/2017	304,200
8/9/2017	
8/10/2017	
8/11/2017	266,000
8/12/2017	332,400
8/13/2017	346,000
8/14/2017	415,400
8/15/2017	416,200
8/16/2017	454,000
8/17/2017	315,000
8/18/2017	272,000

Date	Sutter Creek Effluent Flow (GPD)
8/19/2017	259,400
8/20/2017	254,200
8/21/2017	300,000
8/22/2017	255,600
8/23/2017	281,400
8/24/2017	271,400
8/25/2017	326,600
8/26/2017	271,000
8/27/2017	271,800
8/28/2017	296,000
8/29/2017	296,400
8/30/2017	289,200
8/31/2017	275,600
9/1/2017	303,600
9/2/2017	267,400
9/3/2017	249,800
9/4/2017	276,600
9/5/2017	248,800
9/6/2017	269,000
9/7/2017	300,200
9/8/2017	278,800
9/9/2017	279,000
9/10/2017	266,000
9/11/2017	307,200
9/12/2017	279,400
9/13/2017	300,400
9/14/2017	294,200
9/15/2017	288,600
9/16/2017	236,400
9/17/2017	235,200
9/18/2017	291,000
9/19/2017	279,200
9/20/2017	284,000
9/21/2017	268,200
9/22/2017	300,600
9/23/2017	313,000
9/24/2017	289,000
9/25/2017	314,000
9/26/2017	289,400
9/27/2017	304,600
9/28/2017	329,600
9/29/2017	482,000
9/30/2017	297,400
10/1/2017	280,000
10/2/2017	284,400
10/3/2017	261,800
10/4/2017	265,400
10/5/2017	304,600
10/6/2017	282,600
10/7/2017	315,500
10/8/2017	280,300
10/9/2017	276,400
10/10/2017	310,400
10/11/2017	273,600
10/12/2017	299,400
10/13/2017	268,600
10/14/2017	251,400
10/15/2017	274,000
10/16/2017	304,000
10/17/2017	267,800
10/18/2017	249,600
10/19/2017	263,600
10/20/2017	288,600
10/21/2017	233,600
10/22/2017	242,200
10/23/2017	17,600
10/24/2017	39,400
10/25/2017	226,000
10/26/2017	289,900
10/27/2017	239,500
10/28/2017	238,000
10/29/2017	243,800
10/30/2017	403,000
10/31/2017	377,000
11/1/2017	427,200
11/2/2017	442,800

Date	Sutter Creek Effluent Flow (GPD)
11/3/2017	390,600
11/4/2017	337,800
11/5/2017	321,400
11/6/2017	344,200
11/7/2017	360,400
11/8/2017	291,800
11/9/2017	319,000
11/10/2017	278,400
11/11/2017	226,800
11/12/2017	231,600
11/13/2017	265,600
11/14/2017	261,000
11/15/2017	437,600
11/16/2017	963,800
11/17/2017	476,000
11/18/2017	347,600
11/19/2017	278,000
11/20/2017	310,400
11/21/2017	309,000
11/22/2017	372,200
11/23/2017	304,000
11/24/2017	368,600
11/25/2017	354,600
11/26/2017	772,600
11/27/2017	642,200
11/28/2017	420,000
11/29/2017	341,400
11/30/2017	353,200
12/1/2017	319,000
12/2/2017	335,000
12/3/2017	335,200
12/4/2017	312,600
12/5/2017	344,400
12/6/2017	319,400
12/7/2017	370,600
12/8/2017	308,400
12/9/2017	297,600
12/10/2017	297,000
12/11/2017	306,800
12/12/2017	304,800
12/13/2017	320,200
12/14/2017	297,000
12/15/2017	287,800
12/16/2017	283,800
12/17/2017	280,200
12/18/2017	324,400
12/19/2017	347,000
12/20/2017	374,600
12/21/2017	322,800
12/22/2017	355,800
12/23/2017	288,400
12/24/2017	259,000
12/25/2017	244,000
12/26/2017	340,600
12/27/2017	325,400
12/28/2017	335,600
12/29/2017	284,800
12/30/2017	265,400
12/31/2017	252,400
1/1/2018	256,800
1/2/2018	321,600
1/3/2018	318,200
1/4/2018	301,000
1/5/2018	368,400
1/6/2018	400,000
1/7/2018	316,200
1/8/2018	1,023,000
1/9/2018	1,096,000
1/10/2018	630,800
1/11/2018	485,400
1/12/2018	455,400
1/13/2018	364,400
1/14/2018	348,200
1/15/2018	360,800
1/16/2018	360,400
1/17/2018	344,000

Date	Sutter Creek Effluent Flow (GPD)
1/18/2018	417,600
1/19/2018	442,600
1/20/2018	353,800
1/21/2018	336,800
1/22/2018	385,600
1/23/2018	353,000
1/24/2018	511,600
1/25/2018	567,600
1/26/2018	474,000
1/27/2018	413,600
1/28/2018	390,200
1/29/2018	364,400
1/30/2018	516,000
1/31/2018	370,800
2/1/2018	357,200
2/2/2018	328,600
2/3/2018	332,000
2/4/2018	302,200
2/5/2018	340,000
2/6/2018	332,800
2/7/2018	366,200
2/8/2018	322,400
2/9/2018	332,800
2/10/2018	299,800
2/11/2018	264,800
2/12/2018	282,800
2/13/2018	323,600
2/14/2018	269,000
2/15/2018	289,600
2/16/2018	277,200
2/17/2018	265,600
2/18/2018	249,400
2/19/2018	274,200
2/20/2018	275,800
2/21/2018	301,400
2/22/2018	306,000
2/23/2018	313,600
2/24/2018	283,800
2/25/2018	275,600
2/26/2018	
2/27/2018	
2/28/2018	
3/1/2018	734,400
3/2/2018	983,800
3/3/2018	872,600
3/4/2018	597,800
3/5/2018	499,000
3/6/2018	451,600
3/7/2018	404,400
3/8/2018	409,200
3/9/2018	356,800
3/10/2018	325,600
3/11/2018	352,200
3/12/2018	443,800
3/13/2018	1,304,400
3/14/2018	1,205,800
3/15/2018	1,243,200
3/16/2018	1,391,400
3/17/2018	934,600
3/18/2018	745,600
3/19/2018	700,600
3/20/2018	659,000
3/21/2018	1,046,000
3/22/2018	1,412,200
3/23/2018	931,400
3/24/2018	728,600
3/25/2018	656,200
3/26/2018	566,200
3/27/2018	476,600
3/28/2018	457,200
3/29/2018	427,200
3/30/2018	393,000
3/31/2018	391,800
4/1/2018	355,000

Date	Sutter Creek Effluent Flow (GPD)
4/2/2018	377,200
4/3/2018	384,200
4/4/2018	393,600
4/5/2018	448,600
4/6/2018	1,042,800
4/7/2018	1,126,600
4/8/2018	745,800
4/9/2018	640,600
4/10/2018	556,500
4/11/2018	503,300
4/12/2018	479,400
4/13/2018	451,000
4/14/2018	431,000
4/15/2018	420,400
4/16/2018	497,800
4/17/2018	466,000
4/18/2018	447,000
4/19/2018	418,400
4/20/2018	375,800
4/21/2018	362,000
4/22/2018	359,800
4/23/2018	409,800
4/24/2018	379,800
4/25/2018	364,000
4/26/2018	371,000
4/27/2018	350,200
4/28/2018	317,800
4/29/2018	309,000
4/30/2018	365,400
5/1/2018	353,400
5/2/2018	344,400
5/3/2018	337,600
5/4/2018	293,000
5/5/2018	272,400
5/6/2018	265,600
5/7/2018	313,000
5/8/2018	297,200
5/9/2018	181,000
5/10/2018	308,200
5/11/2018	291,000
5/12/2018	260,400
5/13/2018	316,200
5/14/2018	238,400
5/15/2018	284,200
5/16/2018	307,600
5/17/2018	291,600
5/18/2018	300,200
5/19/2018	286,800
5/20/2018	254,600
5/21/2018	323,800
5/22/2018	325,600
5/23/2018	311,200
5/24/2018	319,600
5/25/2018	330,200
5/26/2018	297,800
5/27/2018	294,600
5/28/2018	324,800
5/29/2018	310,200
5/30/2018	298,200
5/31/2018	342,183
6/1/2018	296,200
6/2/2018	273,800
6/3/2018	272,400
6/4/2018	287,600
6/5/2018	295,800
6/6/2018	296,600
6/7/2018	278,800
6/8/2018	288,400
6/9/2018	249,800
6/10/2018	266,400
6/11/2018	299,800
6/12/2018	314,800
6/13/2018	305,800
6/14/2018	324,800
6/15/2018	299,800
6/16/2018	283,400

Date	Sutter Creek Effluent Flow (GPD)
6/17/2018	241,400
6/18/2018	294,200
6/19/2018	313,600
6/20/2018	285,200
6/21/2018	275,000
6/22/2018	274,400
6/23/2018	234,600
6/24/2018	229,200
6/25/2018	282,600
6/26/2018	298,800
6/27/2018	190,000
6/28/2018	293,800
6/29/2018	317,400
6/30/2018	257,200
7/1/2018	267,200
7/2/2018	325,600
7/3/2018	321,400
7/4/2018	259,000
7/5/2018	319,200
7/6/2018	336,400
7/7/2018	262,000
7/8/2018	271,800
7/9/2018	273,400
7/10/2018	305,400
7/11/2018	302,200
7/12/2018	301,000
7/13/2018	305,400
7/14/2018	271,000
7/15/2018	276,800
7/16/2018	317,200
7/17/2018	328,800
7/18/2018	310,600
7/19/2018	311,200
7/20/2018	329,800
7/21/2018	272,400
7/22/2018	281,500
7/23/2018	300,500
7/24/2018	292,800
7/25/2018	290,600
7/26/2018	306,000
7/27/2018	345,800
7/28/2018	285,400
7/29/2018	288,200
7/30/2018	313,800
7/31/2018	322,600
8/1/2018	295,800
8/2/2018	314,200
8/3/2018	311,800
8/4/2018	281,800
8/5/2018	313,400
8/6/2018	328,600
8/7/2018	311,200
8/8/2018	337,800
8/9/2018	350,200
8/10/2018	318,200
8/11/2018	295,600
8/12/2018	322,400
8/13/2018	336,400
8/14/2018	331,000
8/15/2018	360,000
8/16/2018	297,400
8/17/2018	314,200
8/18/2018	294,600
8/19/2018	283,800
8/20/2018	342,800
8/21/2018	351,400
8/22/2018	364,800
8/23/2018	335,000
8/24/2018	298,600
8/25/2018	291,400
8/26/2018	277,000
8/27/2018	302,200
8/28/2018	275,400
8/29/2018	299,600

Date	Sutter Creek Effluent Flow (GPD)
8/30/2018	295,200
8/31/2018	317,600
9/1/2018	209,800
9/2/2018	244,200
9/3/2018	284,200
9/4/2018	316,600
9/5/2018	306,000
9/6/2018	334,000
9/7/2018	354,400
9/8/2018	294,000
9/9/2018	272,400
9/10/2018	321,600
9/11/2018	304,600
9/12/2018	303,400
9/13/2018	318,200
9/14/2018	263,200
9/15/2018	263,800
9/16/2018	280,600
9/17/2018	329,200
9/18/2018	246,800
9/19/2018	276,800
9/20/2018	274,800
9/21/2018	298,400
9/22/2018	246,000
9/23/2018	333,800
9/24/2018	355,800
9/25/2018	404,200
9/26/2018	355,000
9/27/2018	356,400
9/28/2018	331,000
9/29/2018	257,000
9/30/2018	268,000
10/1/2018	273,200
10/2/2018	258,000
10/3/2018	286,200
10/4/2018	322,200
10/5/2018	304,800
10/6/2018	256,000
10/7/2018	266,600
10/8/2018	337,600
10/9/2018	298,200
10/10/2018	266,000
10/11/2018	236,600
10/12/2018	270,200
10/13/2018	236,800
10/14/2018	232,200
10/15/2018	252,200
10/16/2018	299,800
10/17/2018	303,800
10/18/2018	305,000
10/19/2018	279,400
10/20/2018	258,800
10/21/2018	291,800
10/22/2018	330,400
10/23/2018	336,600
10/24/2018	316,600
10/25/2018	313,000
10/26/2018	305,600
10/27/2018	290,600
10/28/2018	293,600
10/29/2018	321,800
10/30/2018	300,200
10/31/2018	305,600
11/1/2018	303,800
11/2/2018	287,600
11/3/2018	287,400
11/4/2018	301,800
11/5/2018	296,400
11/6/2018	263,600
11/7/2018	305,000
11/8/2018	289,000
11/9/2018	299,000
11/10/2018	251,200
11/11/2018	255,200
11/12/2018	304,000
11/13/2018	253,600

Date	Sutter Creek Effluent Flow (GPD)
11/14/2018	302,400
11/15/2018	313,400
11/16/2018	278,800
11/17/2018	270,000
11/18/2018	269,600
11/19/2018	312,800
11/20/2018	310,400
11/21/2018	365,600
11/22/2018	386,400
11/23/2018	591,200
11/24/2018	453,600
11/25/2018	367,600
11/26/2018	338,800
11/27/2018	329,200
11/28/2018	470,200
11/29/2018	794,800
11/30/2018	647,600
12/1/2018	616,800
12/2/2018	480,000
12/3/2018	472,000
12/4/2018	407,400
12/5/2018	384,200
12/6/2018	373,600
12/7/2018	280,800
12/8/2018	270,200
12/9/2018	280,000
12/10/2018	298,600
12/11/2018	326,000
12/12/2018	299,000
12/13/2018	298,800
12/14/2018	298,200
12/15/2018	272,400
12/16/2018	338,000
12/17/2018	427,000
12/18/2018	375,600
12/19/2018	309,000
12/20/2018	327,400
12/21/2018	378,000
12/22/2018	352,800
12/23/2018	325,800
12/24/2018	673,600
12/25/2018	593,600
12/26/2018	457,000
12/27/2018	451,400
12/28/2018	370,000
12/29/2018	317,000
12/30/2018	313,400
12/31/2018	342,200
1/1/2019	277,000
1/2/2019	365,800
1/3/2019	342,800
1/4/2019	200,200
1/5/2019	470,800
1/6/2019	612,000
1/7/2019	647,800
1/8/2019	628,400
1/9/2019	821,200
1/10/2019	576,900
1/11/2019	532,100
1/12/2019	367,600
1/13/2019	348,600
1/14/2019	394,000
1/15/2019	582,600
1/16/2019	1,117,000
1/17/2019	1,489,200
1/18/2019	905,200
1/19/2019	621,200
1/20/2019	889,000
1/21/2019	707,200
1/22/2019	586,000
1/23/2019	514,800
1/24/2019	467,200
1/25/2019	449,600
1/26/2019	478,800
1/27/2019	398,200
1/28/2019	418,400

Date	Sutter Creek Effluent Flow (GPD)
1/29/2019	393,600
1/30/2019	370,200
1/31/2019	385,600
2/1/2019	387,000
2/2/2019	666,400
2/3/2019	1,032,600
2/4/2019	1,338,200
2/5/2019	988,600
2/6/2019	752,200
2/7/2019	646,400
2/8/2019	540,600
2/9/2019	966,000
2/10/2019	980,600
2/11/2019	694,200
2/12/2019	759,400
2/13/2019	1,284,600
2/14/2019	1,395,400
2/15/2019	1,479,400
2/16/2019	1,139,200
2/17/2019	1,157,600
2/18/2019	889,200
2/19/2019	830,200
2/20/2019	778,000
2/21/2019	596,200
2/22/2019	609,400
2/23/2019	487,000
2/24/2019	443,200
2/25/2019	419,000
2/26/2019	521,200
2/27/2019	771,000
2/28/2019	720,600
3/1/2019	642,000
3/2/2019	1,206,200
3/3/2019	1,674,000
3/4/2019	1,128,000
3/5/2019	966,200
3/6/2019	1,169,000
3/7/2019	1,258,600
3/8/2019	1,017,200
3/9/2019	703,800
3/10/2019	607,600
3/11/2019	559,000
3/12/2019	497,600
3/13/2019	487,600
3/14/2019	458,000
3/15/2019	408,000
3/16/2019	379,800
3/17/2019	369,000
3/18/2019	376,800
3/19/2019	431,600
3/20/2019	434,200
3/21/2019	405,800
3/22/2019	492,400
3/23/2019	742,000
3/24/2019	514,400
3/25/2019	481,600
3/26/2019	483,600
3/27/2019	531,400
3/28/2019	487,800
3/29/2019	491,200
3/30/2019	412,400
3/31/2019	397,400
4/1/2019	469,200
4/2/2019	657,400
4/3/2019	544,800
4/4/2019	494,200
4/5/2019	499,600
4/6/2019	462,600
4/7/2019	385,200
4/8/2019	400,600

Date	Sutter Creek Effluent Flow (GPD)
4/9/2019	381,600
4/10/2019	378,800
4/11/2019	379,400
4/12/2019	338,400
4/13/2019	302,800
4/14/2019	313,800
4/15/2019	376,200
4/16/2019	529,800
4/17/2019	445,600
4/18/2019	406,800
4/19/2019	424,200
4/20/2019	349,400
4/21/2019	353,000
4/22/2019	389,800
4/23/2019	366,200
4/24/2019	361,600
4/25/2019	370,000
4/26/2019	331,200
4/27/2019	304,400
4/28/2019	303,800
4/29/2019	327,200
4/30/2019	295,000
5/1/2019	318,600
5/2/2019	316,200
5/3/2019	288,200
5/4/2019	284,400
5/5/2019	293,200
5/6/2019	347,400
5/7/2019	356,800
5/8/2019	256,000
5/9/2019	302,200
5/10/2019	275,800
5/11/2019	270,200
5/12/2019	272,800
5/13/2019	344,600
5/14/2019	339,200
5/15/2019	420,200
5/16/2019	596,800
5/17/2019	441,600
5/18/2019	463,000
5/19/2019	739,000
5/20/2019	566,600
5/21/2019	687,800
5/22/2019	602,400
5/23/2019	546,400
5/24/2019	482,400
5/25/2019	413,600
5/26/2019	419,800
5/27/2019	410,600
5/28/2019	436,800
5/29/2019	416,800
5/30/2019	375,600
5/31/2019	398,600
6/1/2019	334,200
6/2/2019	349,600
6/3/2019	404,000
6/4/2019	411,800
6/5/2019	396,600
6/6/2019	404,800
6/7/2019	421,000
6/8/2019	367,600
6/9/2019	287,800
6/10/2019	339,800
6/11/2019	315,600
6/12/2019	344,800
6/13/2019	351,600
6/14/2019	353,800
6/15/2019	276,800
6/16/2019	292,200
6/17/2019	352,800

Date	Sutter Creek Effluent Flow (GPD)
6/18/2019	336,600
6/19/2019	363,400
6/20/2019	343,200
6/21/2019	352,400
6/22/2019	292,800
6/23/2019	294,800
6/24/2019	350,000
6/25/2019	329,600
6/26/2019	270,400
6/27/2019	271,600
6/28/2019	316,800
6/29/2019	259,400
6/30/2019	263,000
7/1/2019	323,800
7/2/2019	325,400
7/3/2019	327,800
7/4/2019	257,200
7/5/2019	325,400
7/6/2019	304,600
7/7/2019	271,200
7/8/2019	332,000
7/9/2019	348,400
7/10/2019	320,400
7/11/2019	322,200
7/12/2019	310,800
7/13/2019	268,200
7/14/2019	280,200
7/15/2019	330,600
7/16/2019	314,400
7/17/2019	330,200
7/18/2019	316,000
7/19/2019	314,000
7/20/2019	289,200
7/21/2019	275,600
7/22/2019	299,600
7/23/2019	449,600
7/24/2019	353,400
7/25/2019	420,000
7/26/2019	792,600
7/27/2019	1,661,600
7/28/2019	245,400
7/29/2019	303,800
7/30/2019	290,200
7/31/2019	441,600
8/1/2019	316,894
8/2/2019	347,800
8/3/2019	294,100
8/4/2019	306,256
8/5/2019	331,544
8/6/2019	338,231
8/7/2019	334,719
8/8/2019	334,744
8/9/2019	317,500
8/10/2019	291,093
8/11/2019	284,319
8/12/2019	348,694
8/13/2019	333,312
8/14/2019	313,575
8/15/2019	357,100
8/16/2019	312,713
8/17/2019	270,562
8/18/2019	299,213
8/19/2019	328,606
8/20/2019	324,094
8/21/2019	323,544
8/22/2019	348,787
8/23/2019	338,456
8/24/2019	296,269
8/25/2019	287,588
8/26/2019	336,987

Date	Sutter Creek Effluent Flow (GPD)
8/27/2019	326,088
8/28/2019	332,343
8/29/2019	361,444
8/30/2019	363,513
8/31/2019	303,081
9/1/2019	300,675
9/2/2019	320,369
9/3/2019	356,425
9/4/2019	324,681
9/5/2019	379,031
9/6/2019	327,956
9/7/2019	302,738
9/8/2019	311,125
9/9/2019	371,812
9/10/2019	339,725
9/11/2019	370,425
9/12/2019	324,888
9/13/2019	334,875
9/14/2019	299,744
9/15/2019	295,018
9/16/2019	378,163
9/17/2019	350,325
9/18/2019	353,050
9/19/2019	329,987
9/20/2019	308,100
9/21/2019	268,657
9/22/2019	268,425
9/23/2019	304,762
9/24/2019	323,081
9/25/2019	322,988
9/26/2019	322,275
9/27/2019	325,500
9/28/2019	296,056
9/29/2019	284,419
9/30/2019	361,569
10/1/2019	305,318
10/2/2019	325,925
10/3/2019	315,919
10/4/2019	322,756
10/5/2019	269,619
10/6/2019	289,581
10/7/2019	317,882
10/8/2019	337,718
10/9/2019	172,068
10/10/2019	243,851
10/11/2019	332,738
10/12/2019	281,721
10/13/2019	262,562
10/14/2019	317,314
10/15/2019	312,843
10/16/2019	325,946
10/17/2019	302,608
10/18/2019	281,119
10/19/2019	269,859
10/20/2019	278,593
10/21/2019	333,014
10/22/2019	339,241
10/23/2019	291,573
10/24/2019	315,899
10/25/2019	313,845
10/26/2019	244,313
10/27/2019	195,000
10/28/2019	220,800
10/29/2019	288,800
10/30/2019	289,800
10/31/2019	350,600
11/1/2019	221,400
11/2/2019	155,200
11/3/2019	177,600
11/4/2019	209,600

Date	Sutter Creek Effluent Flow (GPD)
11/5/2019	103,600
11/6/2019	146,000
11/7/2019	241,200
11/8/2019	134,600
11/9/2019	119,400
11/10/2019	182,800
11/11/2019	268,600
11/12/2019	258,600
11/13/2019	209,000
11/14/2019	280,400
11/15/2019	289,000
11/16/2019	237,000
11/17/2019	244,800
11/18/2019	305,000
11/19/2019	232,600
11/20/2019	188,000
11/21/2019	222,600
11/22/2019	237,000
11/23/2019	216,800
11/24/2019	239,200
11/25/2019	276,400
11/26/2019	366,000
11/27/2019	410,800
11/28/2019	368,800
11/29/2019	379,600
11/30/2019	319,400
12/1/2019	695,200
12/2/2019	556,400
12/3/2019	424,000
12/4/2019	674,200
12/5/2019	647,000
12/6/2019	553,800
12/7/2019	685,400
12/8/2019	627,000
12/9/2019	464,000
12/10/2019	388,600
12/11/2019	367,600
12/12/2019	387,400
12/13/2019	424,600
12/14/2019	421,200
12/15/2019	354,000
12/16/2019	348,600
12/17/2019	264,600
12/18/2019	304,000
12/19/2019	296,000
12/20/2019	327,200
12/21/2019	289,000
12/22/2019	330,000
12/23/2019	386,600
12/24/2019	307,200
12/25/2019	256,800
12/26/2019	319,800
12/27/2019	310,600
12/28/2019	258,800
12/29/2019	283,900
12/30/2019	309,100
12/31/2019	322,000
1/1/2020	261,400
1/2/2020	334,200
1/3/2020	309,600
1/4/2020	247,000
1/5/2020	269,200
1/6/2020	296,000
1/7/2020	300,800
1/8/2020	288,600
1/9/2020	373,600
1/10/2020	335,600
1/11/2020	337,000
1/12/2020	286,200
1/13/2020	342,400

Date	Sutter Creek Effluent Flow (GPD)
1/14/2020	334,800
1/15/2020	357,200
1/16/2020	466,800
1/17/2020	353,000
1/18/2020	300,400
1/19/2020	305,600
1/20/2020	340,200
1/21/2020	326,600
1/22/2020	354,600
1/23/2020	393,200
1/24/2020	303,600
1/25/2020	261,400
1/26/2020	382,800
1/27/2020	368,200
1/28/2020	346,800
1/29/2020	410,000
1/30/2020	398,400
1/31/2020	331,400
2/1/2020	208,000
2/2/2020	181,200
2/3/2020	238,200
2/4/2020	231,000
2/5/2020	245,200
2/6/2020	295,000
2/7/2020	297,000
2/8/2020	204,200
2/9/2020	179,800
2/10/2020	227,600
2/11/2020	294,600
2/12/2020	281,600
2/13/2020	280,400
2/14/2020	296,200
2/15/2020	227,000
2/16/2020	193,400
2/17/2020	269,400
2/18/2020	324,000
2/19/2020	303,400
2/20/2020	286,400
2/21/2020	297,800
2/22/2020	236,600
2/23/2020	223,800
2/24/2020	280,800
2/25/2020	286,800
2/26/2020	314,400
2/27/2020	306,200
2/28/2020	456,200
2/29/2020	594,400
3/1/2020	266,000
3/2/2020	282,200
3/3/2020	318,000
3/4/2020	229,000
3/5/2020	208,400
3/6/2020	208,200
3/7/2020	222,200
3/8/2020	201,600
3/9/2020	190,200
3/10/2020	173,000
3/11/2020	243,400
3/12/2020	201,000
3/13/2020	201,000
3/14/2020	489,200
3/15/2020	1,035,200
3/16/2020	1,767,400
3/17/2020	995,600
3/18/2020	725,000
3/19/2020	545,600
3/20/2020	501,400
3/21/2020	380,600
3/22/2020	341,100
3/23/2020	353,100

Date	Sutter Creek Effluent Flow (GPD)
3/24/2020	399,600
3/25/2020	411,200
3/26/2020	380,000
3/27/2020	339,800
3/28/2020	309,000
3/29/2020	310,800
3/30/2020	313,800
3/31/2020	308,200
4/1/2020	328,600
4/2/2020	309,400
4/3/2020	285,400
4/4/2020	366,800
4/5/2020	1,285,200
4/6/2020	1,192,200
4/7/2020	730,200
4/8/2020	615,800
4/9/2020	492,600
4/10/2020	436,000
4/11/2020	402,000
4/12/2020	351,400
4/13/2020	369,000
4/14/2020	373,800
4/15/2020	362,600
4/16/2020	376,400
4/17/2020	350,000
4/18/2020	299,800
4/19/2020	295,000
4/20/2020	314,600
4/21/2020	363,200
4/22/2020	142,800
4/23/2020	360,800
4/24/2020	421,200
4/25/2020	336,200
4/26/2020	271,200
4/27/2020	298,800
4/28/2020	317,600
4/29/2020	319,800
4/30/2020	244,600
5/1/2020	308,400
5/2/2020	186,200
5/3/2020	190,800
5/4/2020	269,800
5/5/2020	264,000
5/6/2020	295,400
5/7/2020	272,200
5/8/2020	300,200
5/9/2020	196,000
5/10/2020	181,200
5/11/2020	303,700
5/12/2020	258,700
5/13/2020	259,000
5/14/2020	286,000
5/15/2020	307,200
5/16/2020	276,400
5/17/2020	482,000
5/18/2020	568,400
5/19/2020	400,800
5/20/2020	358,000
5/21/2020	297,800
5/22/2020	315,200
5/23/2020	215,400
5/24/2020	232,800
5/25/2020	536,800
5/26/2020	313,800
5/27/2020	328,600
5/28/2020	281,225
5/29/2020	273,750
5/30/2020	244,375
5/31/2020	296,600
6/1/2020	275,926

Date	Sutter Creek Effluent Flow (GPD)
6/2/2020	283,875
6/3/2020	288,700
6/4/2020	257,844
6/5/2020	269,481
6/6/2020	252,138
6/7/2020	255,143
6/8/2020	279,525
6/9/2020	319,150
6/10/2020	346,282
6/11/2020	349,493
6/12/2020	277,100
6/13/2020	224,119
6/14/2020	233,694
6/15/2020	270,525
6/16/2020	290,887
6/17/2020	288,213
6/18/2020	267,006
6/19/2020	285,231
6/20/2020	234,675
6/21/2020	237,857
6/22/2020	294,843
6/23/2020	264,125
6/24/2020	272,688
6/25/2020	279,044
6/26/2020	271,718
6/27/2020	285,432
6/28/2020	255,162
6/29/2020	279,756
6/30/2020	305,013
7/1/2020	303,906
7/2/2020	295,369
7/3/2020	253,137
7/4/2020	242,244
7/5/2020	243,131
7/6/2020	296,675
7/7/2020	270,719
7/8/2020	307,300
7/9/2020	264,431
7/10/2020	282,819
7/11/2020	231,225
7/12/2020	235,994
7/13/2020	263,062
7/14/2020	262,188
7/15/2020	282,919
7/16/2020	276,762
7/17/2020	290,019
7/18/2020	239,025
7/19/2020	238,775
7/20/2020	287,419
7/21/2020	269,837
7/22/2020	286,063
7/23/2020	273,256
7/24/2020	268,450
7/25/2020	224,531
7/26/2020	219,900
7/27/2020	269,694
7/28/2020	271,019
7/29/2020	276,075
7/30/2020	283,112
7/31/2020	243,594
8/1/2020	230,856
8/2/2020	226,550
8/3/2020	267,894
8/4/2020	289,819
8/5/2020	279,743
8/6/2020	278,988
8/7/2020	276,481
8/8/2020	233,275
8/9/2020	230,250
8/10/2020	284,106

Date	Sutter Creek Effluent Flow (GPD)
8/11/2020	286,438
8/12/2020	298,706
8/13/2020	280,106
8/14/2020	269,150
8/15/2020	235,600
8/16/2020	242,194
8/17/2020	293,288
8/18/2020	274,731
8/19/2020	287,756
8/20/2020	267,800
8/21/2020	281,413
8/22/2020	243,206
8/23/2020	248,406
8/24/2020	299,638
8/25/2020	279,450
8/26/2020	248,300
8/27/2020	291,737
8/28/2020	271,082
8/29/2020	239,951
8/30/2020	253,157
8/31/2020	278,472
9/1/2020	282,828
9/2/2020	305,253
9/3/2020	288,473
9/4/2020	268,512
9/5/2020	237,345
9/6/2020	233,074
9/7/2020	262,933
9/8/2020	258,364
9/9/2020	284,871
9/10/2020	272,706
9/11/2020	278,049
9/12/2020	245,169
9/13/2020	243,672
9/14/2020	278,430
9/15/2020	284,736
9/16/2020	278,000
9/17/2020	293,689
9/18/2020	290,178
9/19/2020	253,719
9/20/2020	251,135
9/21/2020	280,676
9/22/2020	270,898
9/23/2020	291,187
9/24/2020	282,218
9/25/2020	282,218
9/26/2020	270,501
9/27/2020	255,724
9/28/2020	284,200
9/29/2020	292,003
9/30/2020	287,510
10/1/2020	267,834
10/2/2020	293,377
10/3/2020	260,220
10/4/2020	259,539
10/5/2020	313,763
10/6/2020	295,309
10/7/2020	292,223
10/8/2020	293,897
10/9/2020	313,689
10/10/2020	253,814
10/11/2020	250,657
10/12/2020	301,911
10/13/2020	284,219
10/14/2020	291,862
10/15/2020	314,592
10/16/2020	273,453
10/17/2020	255,828
10/18/2020	279,360
10/19/2020	296,243

Date	Sutter Creek Effluent Flow (GPD)
10/20/2020	284,813
10/21/2020	276,816
10/22/2020	273,359
10/23/2020	282,595
10/24/2020	252,864
10/25/2020	254,138
10/26/2020	295,106
10/27/2020	287,533
10/28/2020	294,847
10/29/2020	264,719
10/30/2020	314,751
10/31/2020	280,261
11/1/2020	274,027
11/2/2020	288,375
11/3/2020	292,317
11/4/2020	314,937
11/5/2020	274,844
11/6/2020	311,819
11/7/2020	267,570
11/8/2020	275,514
11/9/2020	315,828
11/10/2020	289,649
11/11/2020	348,509
11/12/2020	301,677
11/13/2020	316,301
11/14/2020	315,305
11/15/2020	248,126
11/16/2020	315,461
11/17/2020	400,499
11/18/2020	363,183
11/19/2020	352,203
11/20/2020	329,683
11/21/2020	267,070
11/22/2020	273,569
11/23/2020	296,704
11/24/2020	305,833
11/25/2020	318,445
11/26/2020	258,846
11/27/2020	298,103
11/28/2020	267,831
11/29/2020	276,827
11/30/2020	309,586
12/1/2020	290,509
12/2/2020	326,588
12/3/2020	297,709
12/4/2020	302,287
12/5/2020	268,266
12/6/2020	277,938
12/7/2020	311,359
12/8/2020	326,519
12/9/2020	331,662
12/10/2020	338,725
12/11/2020	345,331
12/12/2020	307,379
12/13/2020	382,590
12/14/2020	358,269
12/15/2020	319,150
12/16/2020	356,022
12/17/2020	374,312
12/18/2020	331,969
12/19/2020	296,250
12/20/2020	304,547
12/21/2020	333,037
12/22/2020	326,010
12/23/2020	346,231
12/24/2020	304,397
12/25/2020	273,734
12/26/2020	319,816
12/27/2020	297,800
12/28/2020	347,553

Date	Sutter Creek Effluent Flow (GPD)
12/29/2020	325,675
12/30/2020	340,431
12/31/2020	
1/1/2021	279,313
1/2/2021	292,900
1/3/2021	298,087
1/4/2021	366,316
1/5/2021	345,616
1/6/2021	331,493
1/7/2021	316,872
1/8/2021	347,813
1/9/2021	280,087
1/10/2021	291,472
1/11/2021	309,563
1/12/2021	347,518
1/13/2021	303,747
1/14/2021	324,031
1/15/2021	337,257
1/16/2021	294,359
1/17/2021	293,966
1/18/2021	342,437
1/19/2021	352,825
1/20/2021	295,385
1/21/2021	331,337
1/22/2021	351,828
1/23/2021	300,053
1/24/2021	377,778
1/25/2021	430,388
1/26/2021	414,559
1/27/2021	822,560
1/28/2021	1,414,122
1/29/2021	852,506
1/30/2021	519,659
1/31/2021	438,585
2/1/2021	439,775
2/2/2021	563,225
2/3/2021	453,168
2/4/2021	396,282
2/5/2021	386,634
2/6/2021	329,603
2/7/2021	333,075
2/8/2021	355,313
2/9/2021	345,437
2/10/2021	359,625
2/11/2021	482,263
2/12/2021	526,731
2/13/2021	438,431
2/14/2021	390,775
2/15/2021	515,769
2/16/2021	420,425
2/17/2021	387,050
2/18/2021	382,556
2/19/2021	385,513
2/20/2021	358,762
2/21/2021	335,063
2/22/2021	356,056
2/23/2021	343,281
2/24/2021	340,913
2/25/2021	328,400
2/26/2021	357,268
2/27/2021	301,350
2/28/2021	301,132
4/1/2021	334,987
4/2/2021	331,419
4/3/2021	313,606
4/4/2021	293,125
4/5/2021	372,182
4/6/2021	331,162
4/7/2021	336,813
4/8/2021	372,456

Date	Sutter Creek Effluent Flow (GPD)
4/9/2021	300,725
4/10/2021	290,637
4/11/2021	309,938
4/12/2021	356,075
4/13/2021	340,575
4/14/2021	395,031
4/15/2021	368,725
4/16/2021	365,669
4/17/2021	326,031
4/18/2021	335,638
4/19/2021	364,281
4/20/2021	343,088
4/21/2021	347,887
4/22/2021	345,650
4/23/2021	337,181
4/24/2021	307,250
4/25/2021	328,519
4/26/2021	375,500
4/27/2021	376,187
4/28/2021	349,275
4/29/2021	353,369
4/30/2021	373,581
5/1/2021	293,107
5/2/2021	335,143
5/3/2021	354,963
5/4/2021	355,581
5/5/2021	357,444
5/6/2021	410,531
5/7/2021	343,819
5/8/2021	328,969
5/9/2021	310,068
5/10/2021	387,657
5/11/2021	374,737
5/12/2021	375,150
5/13/2021	357,444
5/14/2021	370,081
5/15/2021	322,038
5/16/2021	327,493
5/17/2021	355,232
5/18/2021	355,412
5/19/2021	333,663
5/20/2021	345,825
5/21/2021	356,875
5/22/2021	299,381
5/23/2021	313,612
5/24/2021	347,744
5/25/2021	366,044
5/26/2021	372,175
5/27/2021	363,056
5/28/2021	363,944
5/29/2021	298,475
5/30/2021	304,131
5/31/2021	318,075
6/1/2021	351,063
6/2/2021	361,562
6/3/2021	344,575
6/4/2021	353,444
6/5/2021	310,831
6/6/2021	313,938
6/7/2021	375,737
6/8/2021	349,156
6/9/2021	354,863
6/10/2021	370,287
6/11/2021	336,738
6/12/2021	325,525
6/13/2021	308,956
6/14/2021	373,081
6/15/2021	383,625
6/16/2021	359,482
6/17/2021	370,050

Date	Sutter Creek Effluent Flow (GPD)
6/18/2021	341,418
6/19/2021	311,463
6/20/2021	312,152
6/21/2021	351,487
6/22/2021	348,915
6/23/2021	361,912
6/24/2021	365,716
6/25/2021	355,226
6/26/2021	304,982
6/27/2021	337,139
6/28/2021	355,487
6/29/2021	332,677
6/30/2021	346,808
7/1/2021	366,675
7/2/2021	349,132
7/3/2021	290,578
7/4/2021	280,508
7/5/2021	319,094
7/6/2021	350,209
7/7/2021	347,771
7/8/2021	375,469
7/9/2021	333,906
7/10/2021	285,509
7/11/2021	285,791
7/12/2021	339,873
7/13/2021	358,260
7/14/2021	346,276
7/15/2021	329,902
7/16/2021	338,827
7/17/2021	291,967
7/18/2021	294,703
7/19/2021	313,600
7/20/2021	362,271
7/21/2021	348,297
7/22/2021	331,852
7/23/2021	339,969
7/24/2021	295,907
7/25/2021	293,597
7/26/2021	341,681
7/27/2021	319,928
7/28/2021	346,766
7/29/2021	355,681
7/30/2021	318,806
7/31/2021	298,833
8/1/2021	301,740
8/2/2021	352,868
8/3/2021	338,704
8/4/2021	342,360
8/5/2021	321,581
8/6/2021	353,714
8/7/2021	304,658
8/8/2021	290,787
8/9/2021	342,657
8/10/2021	306,073
8/11/2021	366,997
8/12/2021	316,761
8/13/2021	360,258
8/14/2021	322,623
8/15/2021	303,580
8/16/2021	330,653
8/17/2021	326,306
8/18/2021	352,595
8/19/2021	330,844
8/20/2021	354,722
8/21/2021	303,719
8/22/2021	311,914
8/23/2021	324,441
8/24/2021	336,601
8/25/2021	329,938
8/26/2021	352,046

Date	Sutter Creek Effluent Flow (GPD)
8/27/2021	310,319
8/28/2021	271,333
8/29/2021	278,539
8/30/2021	294,292
8/31/2021	332,011
9/1/2021	321,174
9/2/2021	386,317
9/3/2021	340,084
9/4/2021	309,136
9/5/2021	290,694
9/6/2021	322,330
9/7/2021	333,232
9/8/2021	315,738
9/9/2021	315,206
9/10/2021	357,460
9/11/2021	286,506
9/12/2021	297,434
9/13/2021	314,063
9/14/2021	342,290
9/15/2021	325,647
9/16/2021	348,313
9/17/2021	315,186
9/18/2021	298,817
9/19/2021	289,381
9/20/2021	341,325
9/21/2021	331,781
9/22/2021	337,775
9/23/2021	352,069
9/24/2021	327,609
9/25/2021	304,235
9/26/2021	289,665
9/27/2021	354,413
9/28/2021	316,941
9/29/2021	341,828
9/30/2021	328,565
10/1/2021	329,547
10/2/2021	281,556
10/3/2021	298,847
10/4/2021	327,678
10/5/2021	360,454
10/6/2021	334,984
10/7/2021	370,084
10/8/2021	338,941
10/9/2021	306,412
10/10/2021	303,319
10/11/2021	327,603
10/12/2021	342,350
10/13/2021	328,785
10/14/2021	356,000
10/15/2021	327,653
10/16/2021	302,494
10/17/2021	335,737
10/18/2021	368,750
10/19/2021	348,122
10/20/2021	350,081
10/21/2021	380,769
10/22/2021	380,356
10/23/2021	354,678
10/24/2021	1,731,788
10/25/2021	1,480,584
10/26/2021	657,094
10/27/2021	558,809
10/28/2021	440,660
10/29/2021	441,797
10/30/2021	407,003
10/31/2021	373,781
11/1/2021	384,791
11/2/2021	410,665
11/3/2021	419,153
11/4/2021	363,603

Date	Sutter Creek Effluent Flow (GPD)
11/5/2021	325,991
11/6/2021	340,128
11/7/2021	336,219
11/8/2021	410,072
11/9/2021	575,972
11/10/2021	426,734
11/11/2021	423,175
11/12/2021	426,022
11/13/2021	375,734
11/14/2021	383,819
11/15/2021	422,750
11/16/2021	369,656
11/17/2021	406,957
11/18/2021	393,918
11/19/2021	398,819
11/20/2021	344,000
11/21/2021	360,200
11/22/2021	395,756
11/23/2021	398,000
11/24/2021	372,632
11/25/2021	332,575
11/26/2021	369,156
11/27/2021	357,519
11/28/2021	374,031
11/29/2021	384,231
11/30/2021	414,419
12/1/2021	428,287
12/2/2021	380,682
12/3/2021	385,881
12/4/2021	380,244
12/5/2021	365,518
12/6/2021	375,707
12/7/2021	407,237
12/8/2021	390,519
12/9/2021	502,362
12/10/2021	380,275
12/11/2021	352,257
12/12/2021	711,600
12/13/2021	1,276,425
12/14/2021	1,073,893
12/15/2021	824,369
12/16/2021	855,506
12/17/2021	604,663
12/18/2021	502,887
12/19/2021	471,282
12/20/2021	485,262
12/21/2021	441,494
12/22/2021	572,437
12/23/2021	1,376,307
12/24/2021	937,900
12/25/2021	1,110,175
12/26/2021	989,600
12/27/2021	1,566,568
12/28/2021	919,132
12/29/2021	898,475
12/30/2021	677,037
12/31/2021	583,794
1/1/2022	493,656
1/2/2022	465,925
1/3/2022	493,331
1/4/2022	478,807
1/5/2022	481,300
1/6/2022	466,056
1/7/2022	489,287
1/8/2022	425,194
1/9/2022	421,525
1/10/2022	449,363
1/11/2022	441,975
1/12/2022	418,343
1/13/2022	419,532

Date	Sutter Creek Effluent Flow (GPD)
1/14/2022	409,137
1/15/2022	388,450
1/16/2022	398,944
1/17/2022	431,831
1/18/2022	387,338
1/19/2022	410,393
1/20/2022	407,788
1/21/2022	385,519
1/22/2022	358,850
1/23/2022	353,250
1/24/2022	383,600
1/25/2022	386,037
1/26/2022	376,569
1/27/2022	404,219
1/28/2022	357,887
1/29/2022	345,069
1/30/2022	359,319
1/31/2022	381,456
2/1/2022	370,912
2/2/2022	386,488
2/3/2022	394,781
2/4/2022	368,188
2/5/2022	354,606
2/6/2022	514,081
2/7/2022	420,944
2/8/2022	440,106
2/9/2022	438,150
2/10/2022	376,506
2/11/2022	372,432
2/12/2022	351,631
2/13/2022	354,744
2/14/2022	416,537
2/15/2022	384,075
2/16/2022	371,456
2/17/2022	362,771
2/18/2022	359,552
2/19/2022	338,289
2/20/2022	349,258
2/21/2022	369,009
2/22/2022	362,382
2/23/2022	344,981
2/24/2022	372,675
2/25/2022	372,924
2/26/2022	336,096
2/27/2022	333,406
2/28/2022	371,913
3/1/2022	359,463
3/2/2022	363,627
3/3/2022	375,536
3/4/2022	379,576
3/5/2022	358,708
3/6/2022	354,003
3/7/2022	387,659
3/8/2022	363,116
3/9/2022	382,587
3/10/2022	361,466
3/11/2022	107,911
3/12/2022	268,566
3/13/2022	276,454
3/14/2022	320,623
3/15/2022	373,206
3/16/2022	379,536
3/17/2022	345,794
3/18/2022	367,818
3/19/2022	332,534
3/20/2022	346,611
3/21/2022	395,014
3/22/2022	376,457
3/23/2022	385,324
3/24/2022	394,829

Date	Sutter Creek Effluent Flow (GPD)
3/25/2022	404,906
3/26/2022	338,553
3/27/2022	358,991
3/28/2022	406,297
3/29/2022	385,162
3/30/2022	386,941
3/31/2022	387,570
4/1/2022	376,909
4/2/2022	353,132
4/3/2022	366,156
4/4/2022	395,156
4/5/2022	378,730
4/6/2022	388,825
4/7/2022	385,340
4/8/2022	375,060
4/9/2022	339,312
4/10/2022	352,500
4/11/2022	417,411
4/12/2022	391,230
4/13/2022	390,286
4/14/2022	477,253
4/15/2022	411,956
4/16/2022	522,683
4/17/2022	386,847
4/18/2022	414,356
4/19/2022	429,510
4/20/2022	436,942
4/21/2022	1,044,439
4/22/2022	291,487
4/23/2022	499,078
4/24/2022	463,902
4/25/2022	502,116
4/26/2022	466,175
4/27/2022	427,656
4/28/2022	423,709
4/29/2022	278,107
4/30/2022	305,768
5/1/2022	349,169
5/2/2022	346,794
5/3/2022	397,462
5/4/2022	398,419
5/5/2022	405,453
5/6/2022	407,956
5/7/2022	371,529
5/8/2022	365,334
5/9/2022	393,484
5/10/2022	394,850
5/11/2022	417,991
5/12/2022	418,812
5/13/2022	400,919
5/14/2022	376,813
5/15/2022	377,889
5/16/2022	409,436
5/17/2022	412,543
5/18/2022	410,954
5/19/2022	400,490
5/20/2022	375,816
5/21/2022	390,222
5/22/2022	372,575
5/23/2022	421,722
5/24/2022	407,084
5/25/2022	391,378
5/26/2022	395,588
5/27/2022	387,512
5/28/2022	364,266
5/29/2022	343,718
5/30/2022	358,444
5/31/2022	415,572
6/1/2022	391,506
6/2/2022	421,750

Date	Sutter Creek Effluent Flow (GPD)
6/3/2022	387,944
6/4/2022	376,828
6/5/2022	369,913
6/6/2022	413,197
6/7/2022	381,400
6/8/2022	393,437
6/9/2022	425,181
6/10/2022	321,085
6/11/2022	313,178
6/12/2022	344,140
6/13/2022	437,785
6/14/2022	373,159
6/15/2022	339,710
6/16/2022	381,390
6/17/2022	408,535
6/18/2022	342,743
6/19/2022	339,425
6/20/2022	405,247
6/21/2022	379,806
6/22/2022	368,888
6/23/2022	374,000
6/24/2022	372,869
6/25/2022	317,234
6/26/2022	324,934
6/27/2022	387,107
6/28/2022	375,025
6/29/2022	376,290
6/30/2022	366,657
7/1/2022	406,743
7/2/2022	323,085
7/3/2022	315,340
7/4/2022	346,357
7/5/2022	411,731
7/6/2022	408,787
7/7/2022	419,057
7/8/2022	370,093
7/9/2022	337,194
7/10/2022	352,888
7/11/2022	420,612
7/12/2022	382,988
7/13/2022	380,062
7/14/2022	389,150
7/15/2022	324,287
7/16/2022	364,788
7/17/2022	325,675
7/18/2022	400,081
7/19/2022	392,219
7/20/2022	383,806
7/21/2022	370,944
7/22/2022	392,106
7/23/2022	339,925
7/24/2022	354,019
7/25/2022	381,569
7/26/2022	417,456
7/27/2022	389,663
7/28/2022	399,575
7/29/2022	378,268
7/30/2022	356,519
7/31/2022	369,994
8/1/2022	403,181
8/2/2022	426,325
8/3/2022	368,156
8/4/2022	324,050
8/5/2022	349,005
8/6/2022	338,105
8/7/2022	347,596
8/8/2022	297,895
8/9/2022	304,456
8/10/2022	167,125
8/11/2022	390,944

Date	Sutter Creek Effluent Flow (GPD)
8/12/2022	351,310
8/13/2022	324,330
8/14/2022	343,763
8/15/2022	367,595
8/16/2022	430,865
8/17/2022	327,828
8/18/2022	324,980
8/19/2022	306,059
8/20/2022	262,434
8/21/2022	257,371
8/22/2022	268,292
8/23/2022	304,686
8/24/2022	297,028
8/25/2022	286,939
8/26/2022	305,556
8/27/2022	252,858
8/28/2022	268,216
8/29/2022	292,654
8/30/2022	298,215
8/31/2022	292,000
9/1/2022	296,299
9/2/2022	306,621
9/3/2022	235,865
9/4/2022	237,366
9/5/2022	260,255
9/6/2022	282,911
9/7/2022	277,756
9/8/2022	297,989
9/9/2022	309,174
9/10/2022	258,772
9/11/2022	274,229
9/12/2022	274,770
9/13/2022	297,913
9/14/2022	271,269
9/15/2022	322,007
9/16/2022	283,719
9/17/2022	271,362
9/18/2022	298,075
9/19/2022	315,002
9/20/2022	305,254
9/21/2022	288,111
9/22/2022	304,769
9/23/2022	284,827
9/24/2022	252,032
9/25/2022	278,408
9/26/2022	296,369
9/27/2022	290,591
9/28/2022	283,201
9/29/2022	
9/30/2022	
10/1/2022	266,252
10/2/2022	284,550
10/3/2022	317,787
10/4/2022	316,272
10/5/2022	321,424
10/6/2022	320,433
10/7/2022	308,322
10/8/2022	278,628
10/9/2022	281,053
10/10/2022	289,007
10/11/2022	293,530
10/12/2022	332,945
10/13/2022	294,405
10/14/2022	293,564
10/15/2022	281,669
10/16/2022	299,866
10/17/2022	313,506
10/18/2022	325,562
10/19/2022	309,321
10/20/2022	326,790

Date	Sutter Creek Effluent Flow (GPD)
10/21/2022	307,678
10/22/2022	274,571
10/23/2022	281,454
10/24/2022	307,600
10/25/2022	271,382
10/26/2022	310,317
10/27/2022	296,894
10/28/2022	320,256
10/29/2022	254,547
10/30/2022	290,251
10/31/2022	323,289
11/1/2022	335,830
11/2/2022	351,931
11/3/2022	318,169
11/4/2022	316,572
11/5/2022	319,862
11/6/2022	318,629
11/7/2022	364,009
11/8/2022	530,594
11/9/2022	361,781
11/10/2022	344,207
11/11/2022	331,418
11/12/2022	290,044
11/13/2022	294,750
11/14/2022	326,156
11/15/2022	330,103
11/16/2022	333,353
11/17/2022	321,716
11/18/2022	326,762
11/19/2022	292,322
11/20/2022	309,747
11/21/2022	348,847
11/22/2022	341,531
11/23/2022	352,169
11/24/2022	266,331
11/25/2022	293,181
11/26/2022	290,713
11/27/2022	301,537
11/28/2022	330,632
11/29/2022	334,762
11/30/2022	335,056
12/1/2022	574,341
12/2/2022	377,250
12/3/2022	1,015,050
12/4/2022	632,497
12/5/2022	526,737
12/6/2022	453,050
12/7/2022	371,647
12/8/2022	416,928
12/9/2022	379,544
12/10/2022	1,337,988
12/11/2022	1,337,787
12/12/2022	653,360
12/13/2022	681,731
12/14/2022	388,422
12/15/2022	415,093
12/16/2022	401,988
12/17/2022	374,609
12/18/2022	394,607
12/19/2022	387,831
12/20/2022	411,265
12/21/2022	386,663
12/22/2022	404,703
12/23/2022	385,075
12/24/2022	352,366
12/25/2022	317,753
12/26/2022	454,306
12/27/2022	1,370,588
12/28/2022	640,537
12/29/2022	727,638

Date	Sutter Creek Effluent Flow (GPD)
12/30/2022	2,057,212
12/31/2022	1,662,733
1/1/2023	1,166,036
1/2/2023	990,525
1/3/2023	913,794
1/4/2023	825,312
1/5/2023	1,407,831
1/6/2023	1,154,582
1/7/2023	1,025,135
1/8/2023	1,227,827
1/9/2023	1,509,094
1/10/2023	1,287,631
1/11/2023	941,500
1/12/2023	744,381
1/13/2023	1,466,875
1/14/2023	2,130,232
1/15/2023	1,521,593
1/16/2023	1,603,325
1/17/2023	1,024,725
1/18/2023	829,019
1/19/2023	664,556
1/20/2023	580,888
1/21/2023	562,018
1/22/2023	529,225
1/23/2023	455,244
1/24/2023	507,425
1/25/2023	507,425
1/26/2023	449,325
1/27/2023	434,188
1/28/2023	404,187
1/29/2023	392,613
1/30/2023	398,893
1/31/2023	428,682
2/1/2023	392,631
2/2/2023	420,625
2/3/2023	407,350
2/4/2023	431,712
2/5/2023	489,613
2/6/2023	448,556
2/7/2023	453,431
2/8/2023	411,482
2/9/2023	417,087
2/10/2023	405,281
2/11/2023	369,744
2/12/2023	372,350
2/13/2023	366,544
2/14/2023	378,131
2/15/2023	353,925
2/16/2023	362,438
2/17/2023	359,493
2/18/2023	335,663
2/19/2023	354,487
2/20/2023	394,750
2/21/2023	380,813
2/22/2023	348,656
2/23/2023	378,063
2/24/2023	779,656
2/25/2023	601,737
2/26/2023	914,332
2/27/2023	1,387,218
2/28/2023	
3/1/2023	1,004,413
3/2/2023	697,493
3/3/2023	612,105
3/4/2023	595,808
3/5/2023	862,405
3/6/2023	654,217
3/7/2023	612,267
3/8/2023	680,162
3/9/2023	1,272,686

Date	Sutter Creek Effluent Flow (GPD)
3/10/2023	1,636,981
3/11/2023	911,705
3/12/2023	852,385
3/13/2023	1,193,776
3/14/2023	1,581,664
3/15/2023	839,272
3/16/2023	676,145
3/17/2023	553,194
3/18/2023	514,082
3/19/2023	734,558
3/20/2023	684,725
3/21/2023	711,058
3/22/2023	760,066
3/23/2023	639,870
3/24/2023	579,913
3/25/2023	515,196
3/26/2023	509,883
3/27/2023	471,305
3/28/2023	855,556
3/29/2023	801,413
3/30/2023	685,729
3/31/2023	560,935
4/1/2023	435,400
4/2/2023	392,200
4/3/2023	368,800
4/4/2023	404,200
4/5/2023	376,200
4/6/2023	309,600
4/7/2023	326,400
4/8/2023	341,200
4/9/2023	273,000
4/10/2023	323,200
4/11/2023	338,600
4/12/2023	386,200
4/13/2023	298,400
4/14/2023	304,400
4/15/2023	253,600
4/16/2023	258,000
4/17/2023	294,400
4/18/2023	266,400
4/19/2023	287,400
4/20/2023	308,000
4/21/2023	272,400
4/22/2023	255,600
4/23/2023	280,400
4/24/2023	348,000
4/25/2023	299,800
4/26/2023	254,800
4/27/2023	299,200
4/28/2023	400,316
4/29/2023	239,800
4/30/2023	259,400
5/1/2023	254,600
5/2/2023	315,200
5/3/2023	289,400
5/4/2023	276,800
5/5/2023	303,000
5/6/2023	376,000
5/7/2023	293,000
5/8/2023	305,800
5/9/2023	308,400
5/10/2023	299,000
5/11/2023	292,800
5/12/2023	258,400
5/13/2023	215,200
5/14/2023	235,600
5/15/2023	286,800
5/16/2023	291,000
5/17/2023	285,400
5/18/2023	300,200

Date	Sutter Creek Effluent Flow (GPD)
5/19/2023	322,600
5/20/2023	297,000
5/21/2023	325,600
5/22/2023	286,800
5/23/2023	297,200
5/24/2023	329,400
5/25/2023	265,000
5/26/2023	261,400
5/27/2023	239,800
5/28/2023	231,800
5/29/2023	248,000
5/30/2023	264,000
5/31/2023	343,400
6/1/2023	325,200
6/2/2023	345,200
6/3/2023	325,800
6/4/2023	259,800
6/5/2023	278,600
6/6/2023	311,200
6/7/2023	318,800
6/8/2023	313,200
6/9/2023	354,400
6/10/2023	310,600
6/11/2023	315,400
6/12/2023	349,400
6/13/2023	304,000
6/14/2023	299,400
6/15/2023	348,400
6/16/2023	299,800
6/17/2023	266,600
6/18/2023	263,600
6/19/2023	304,400
6/20/2023	292,200
6/21/2023	313,000
6/22/2023	289,600
6/23/2023	309,200
6/24/2023	265,800
6/25/2023	281,200
6/26/2023	303,800
6/27/2023	324,600
6/28/2023	314,000
6/29/2023	321,000
6/30/2023	298,200
7/1/2023	241,400
7/2/2023	255,800
7/3/2023	288,200
7/4/2023	245,800
7/5/2023	307,200
7/6/2023	323,800
7/7/2023	319,200
7/8/2023	259,400
7/9/2023	270,200
7/10/2023	319,400
7/11/2023	300,400
7/12/2023	319,000
7/13/2023	310,400
7/14/2023	293,000
7/15/2023	276,800
7/16/2023	286,400
7/17/2023	327,800
7/18/2023	325,800
7/19/2023	300,400
7/20/2023	302,800
7/21/2023	318,000
7/22/2023	270,800
7/23/2023	289,200
7/24/2023	301,000
7/25/2023	306,400
7/26/2023	296,800
7/27/2023	308,400

Date	Sutter Creek Effluent Flow (GPD)
7/28/2023	303,000
7/29/2023	267,800
7/30/2023	273,200
7/31/2023	304,200
8/1/2023	290,800
8/2/2023	286,000
8/3/2023	296,000
8/4/2023	259,200
8/5/2023	286,200
8/6/2023	318,200
8/7/2023	336,000
8/8/2023	358,350
8/9/2023	385,425
8/10/2023	378,662
8/11/2023	353,788
8/12/2023	332,825
8/13/2023	338,800
8/14/2023	378,363
8/15/2023	378,363
8/16/2023	401,075
8/17/2023	355,650
8/18/2023	376,512
8/19/2023	320,800
8/20/2023	337,757
8/21/2023	362,168
8/22/2023	377,482
8/23/2023	354,637
8/24/2023	359,775
8/25/2023	326,881
8/26/2023	324,582
8/27/2023	329,843
8/28/2023	355,275
8/29/2023	345,082
8/30/2023	343,493
8/31/2023	369,644
9/1/2023	369,513
9/2/2023	326,625
9/3/2023	322,412
9/4/2023	350,219
9/5/2023	358,594
9/6/2023	384,312
9/7/2023	393,844
9/8/2023	373,031
9/9/2023	330,994
9/10/2023	324,681
9/11/2023	346,131
9/12/2023	410,394
9/13/2023	367,538
9/14/2023	395,925
9/15/2023	366,131
9/16/2023	329,431
9/17/2023	337,150
9/18/2023	375,000
9/19/2023	336,669
9/20/2023	354,794
9/21/2023	355,331
9/22/2023	364,544
9/23/2023	310,920
9/24/2023	313,092
9/25/2023	354,719
9/26/2023	152,456
9/27/2023	350,838
9/28/2023	362,006
9/29/2023	379,569
9/30/2023	357,618
10/1/2023	328,650
10/2/2023	371,857
10/3/2023	357,300
10/4/2023	331,900
10/5/2023	382,500

Date	Sutter Creek Effluent Flow (GPD)
10/6/2023	341,518
10/7/2023	339,182
10/8/2023	332,425
10/9/2023	366,537
10/10/2023	355,913
10/11/2023	340,081
10/12/2023	345,512
10/13/2023	406,375
10/14/2023	352,307
10/15/2023	339,981
10/16/2023	314,575
10/17/2023	350,287
10/18/2023	353,850
10/19/2023	353,007
10/20/2023	362,706
10/21/2023	328,937
10/22/2023	506,369
10/23/2023	392,419
10/24/2023	418,100
10/25/2023	396,216
10/26/2023	359,859
10/27/2023	368,548
10/28/2023	336,450
10/29/2023	325,877
10/30/2023	358,976
10/31/2023	350,410
11/1/2023	349,656
11/2/2023	386,860
11/3/2023	381,792
11/4/2023	342,374
11/5/2023	356,019
11/6/2023	392,784
11/7/2023	349,712
11/8/2023	340,591
11/9/2023	356,977
11/10/2023	345,601
11/11/2023	312,927
11/12/2023	978,804
11/13/2023	978,804
11/14/2023	346,300
11/15/2023	346,423
11/16/2023	366,622
11/17/2023	359,661
11/18/2023	379,770
11/19/2023	337,479
11/20/2023	323,533
11/21/2023	323,459
11/22/2023	353,200
11/23/2023	276,494
11/24/2023	349,589
11/25/2023	310,689
11/26/2023	310,469
11/27/2023	307,228
11/28/2023	340,780
11/29/2023	326,094
11/30/2023	311,853
12/1/2023	373,780
12/2/2023	312,299
12/3/2023	301,146
12/4/2023	313,904
12/5/2023	374,850
12/6/2023	330,667
12/7/2023	379,150
12/8/2023	318,986
12/9/2023	370,272
12/10/2023	300,353
12/11/2023	335,086
12/12/2023	307,483
12/13/2023	370,579
12/14/2023	400,929

Date	Sutter Creek Effluent Flow (GPD)
12/15/2023	385,392
12/16/2023	364,776
12/17/2023	304,889
12/18/2023	422,652
12/19/2023	421,495
12/20/2023	414,610
12/21/2023	350,150
12/22/2023	359,398
12/23/2023	325,638
12/24/2023	265,559
12/25/2023	234,094
12/26/2023	290,817
12/27/2023	307,976
12/28/2023	401,904
12/29/2023	387,304
12/30/2023	534,061
12/31/2023	295,246
1/1/2024	273,164
1/2/2024	483,243
1/3/2024	536,383
1/4/2024	415,064
1/5/2024	418,583
1/6/2024	392,136
1/7/2024	353,686
1/8/2024	343,916
1/9/2024	340,165
1/10/2024	364,006
1/11/2024	374,913
1/12/2024	356,625
1/13/2024	582,800
1/14/2024	483,900
1/15/2024	444,819
1/16/2024	570,618
1/17/2024	538,875
1/18/2024	478,391
1/19/2024	384,847
1/20/2024	535,591
1/21/2024	758,193
1/22/2024	818,591
1/23/2024	543,072
1/24/2024	566,200
1/25/2024	500,615
1/26/2024	420,860
1/27/2024	383,553
1/28/2024	387,366
1/29/2024	330,590
1/30/2024	354,338
1/31/2024	449,575
2/1/2024	734,827
2/2/2024	911,148
2/3/2024	662,887
2/4/2024	765,447
2/5/2024	797,644
2/6/2024	648,284
2/7/2024	818,903
2/8/2024	632,163
2/9/2024	597,144
2/10/2024	438,196
2/11/2024	418,891
2/12/2024	419,916
2/13/2024	404,978
2/14/2024	472,015
2/15/2024	458,629
2/16/2024	412,696
2/17/2024	489,907
2/18/2024	750,768
2/19/2024	858,460
2/20/2024	774,306
2/21/2024	708,300
2/22/2024	563,875

Date	Sutter Creek Effluent Flow (GPD)
2/23/2024	513,141
2/24/2024	453,909
2/25/2024	433,656
2/26/2024	448,275
2/27/2024	405,113
2/28/2024	396,119
2/29/2024	693,868
3/1/2024	1,520,063
3/2/2024	1,233,994
3/3/2024	1,156,906
3/4/2024	798,325
3/5/2024	664,225
3/6/2024	535,956
3/7/2024	500,600
3/8/2024	482,288
3/9/2024	447,937
3/10/2024	416,900
3/11/2024	430,063
3/12/2024	466,581
3/13/2024	409,294
3/14/2024	416,112
3/15/2024	390,319
3/16/2024	374,130
3/17/2024	387,676
3/18/2024	427,131
3/19/2024	414,757
3/20/2024	412,043
3/21/2024	394,913
3/22/2024	593,356
3/23/2024	667,988
3/24/2024	676,487
3/25/2024	540,838
3/26/2024	481,762
3/27/2024	488,575
3/28/2024	511,350
3/29/2024	578,200
3/30/2024	523,369
3/31/2024	420,000
4/1/2024	472,475
4/2/2024	473,312
4/3/2024	459,750
4/4/2024	640,463
4/5/2024	673,637
4/6/2024	492,794
4/7/2024	455,444
4/8/2024	129,200
4/9/2024	741,737
4/10/2024	420,132
4/11/2024	404,768
4/12/2024	407,069
4/13/2024	653,963
4/14/2024	501,925
4/15/2024	452,193
4/16/2024	428,200
4/17/2024	409,913
4/18/2024	395,044
4/19/2024	383,612
4/20/2024	354,000
4/21/2024	357,644
4/22/2024	382,481
4/23/2024	416,506
4/24/2024	406,569
4/25/2024	417,094
4/26/2024	369,919
4/27/2024	339,337
4/28/2024	331,156
4/29/2024	351,444
4/30/2024	409,563
5/1/2024	250,000
5/2/2024	204,400

Date	Sutter Creek Effluent Flow (GPD)
5/3/2024	247,600
5/4/2024	332,600
5/5/2024	256,400
5/6/2024	340,200
5/7/2024	464,400
5/8/2024	411,600
5/9/2024	379,000
5/10/2024	233,200
5/11/2024	279,400
5/12/2024	276,800
5/13/2024	235,200
5/14/2024	253,200
5/15/2024	292,400
5/16/2024	286,000
5/17/2024	240,000
5/18/2024	222,600
5/19/2024	271,000
5/20/2024	229,600
5/21/2024	295,800
5/22/2024	231,000
5/23/2024	1,371,400
5/24/2024	320,200
5/25/2024	275,200
5/26/2024	255,200
5/27/2024	340,000
5/28/2024	1,159,200
5/29/2024	222,200
5/30/2024	276,400
5/31/2024	420,000
6/1/2024	357,060
6/2/2024	329,509
6/3/2024	384,351
6/4/2024	388,477
6/5/2024	386,655
6/6/2024	372,454
6/7/2024	392,656
6/8/2024	329,524
6/9/2024	317,214
6/10/2024	353,788
6/11/2024	319,672
6/12/2024	358,449
6/13/2024	330,927
6/14/2024	281,070
6/15/2024	303,452
6/16/2024	285,869
6/17/2024	325,500
6/18/2024	321,651
6/19/2024	303,523
6/20/2024	368,003
6/21/2024	352,665
6/22/2024	295,968
6/23/2024	310,856
6/24/2024	354,438
6/25/2024	335,048
6/26/2024	329,302
6/27/2024	670,097
6/28/2024	297,337
6/29/2024	322,211
6/30/2024	329,786
7/1/2024	329,786
7/2/2024	339,692
7/3/2024	325,353
7/4/2024	323,780
7/5/2024	316,123
7/6/2024	293,202
7/7/2024	305,367
7/8/2024	318,019
7/9/2024	335,375
7/10/2024	374,305
7/11/2024	337,884

Date	Sutter Creek Effluent Flow (GPD)
7/12/2024	347,164
7/13/2024	294,373
7/14/2024	313,094
7/15/2024	323,982
7/16/2024	323,982
7/17/2024	332,486
7/18/2024	338,955
7/19/2024	345,831
7/20/2024	297,508
7/21/2024	306,319
7/22/2024	285,671
7/23/2024	313,341
7/24/2024	338,246
7/25/2024	319,393
7/26/2024	333,719
7/27/2024	297,572
7/28/2024	298,759
7/29/2024	322,761
7/30/2024	353,793
7/31/2024	335,279
8/1/2024	337,500
8/2/2024	320,636
8/3/2024	303,335
8/4/2024	296,478
8/5/2024	292,559
8/6/2024	338,372
8/7/2024	314,666
8/8/2024	303,796
8/9/2024	324,710
8/10/2024	344,862
8/11/2024	359,366
8/12/2024	344,050
8/13/2024	341,181
8/14/2024	350,203
8/15/2024	341,257
8/16/2024	294,968
8/17/2024	306,650
8/18/2024	323,035
8/19/2024	359,618
8/20/2024	362,507
8/21/2024	346,531
8/22/2024	332,459
8/23/2024	206,957
8/24/2024	248,371
8/25/2024	279,047
8/26/2024	325,313
8/27/2024	362,806
8/28/2024	382,816
8/29/2024	318,390
8/30/2024	311,982
8/31/2024	284,215
9/1/2024	283,072
9/2/2024	276,463
9/3/2024	349,118
9/4/2024	362,841
9/5/2024	327,491
9/6/2024	299,496
9/7/2024	266,019
9/8/2024	304,866
9/9/2024	317,990
9/10/2024	312,947
9/11/2024	283,641
9/12/2024	320,209
9/13/2024	291,066
9/14/2024	262,034
9/15/2024	286,750
9/16/2024	315,710
9/17/2024	306,706
9/18/2024	299,606
9/19/2024	307,391

Date	Sutter Creek Effluent Flow (GPD)
9/20/2024	310,740
9/21/2024	263,616
9/22/2024	262,938
9/23/2024	286,134
9/24/2024	312,700
9/25/2024	286,053
9/26/2024	284,784
9/27/2024	273,932
9/28/2024	252,803
9/29/2024	259,765
9/30/2024	294,210

ATTACHMENT B

Amador Regional Sanitation Agency
2024 Individual Water Balance Update

Draft 2023 Sutter Creek WWTP I/I Analysis Update
by Carollo Engineers

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PROJECT MEMORANDUM

CITY OF SUTTER CREEK

Wastewater Treatment Plant Upgrade Project

Project No.: 12029A60
Date: October 10, 2023
Prepared By: Michael Wetterau, PE
Reviewed By: Ryan Orgill, PE; Louis Lefebvre, PE; Christina Romano, PE
Subject: Infiltration and Inflow Analysis Update

Background and Purpose

As part of the 2020 to 2021 Project Report efforts, Carollo Engineers (Carollo) developed a simple model of the collection system to estimate wet weather flow (WWF) design criteria. This information was used to conceptually size project alternative facilities evaluated in the Project Report. A typical peak wet weather flow (PWWF) factor ranges from three to six times the average daily flow (ADF). By comparison the City of Sutter Creek's (City's) PWWF is approximately 16, an order of magnitude higher than typical.

The City has been implementing infiltration and inflow (I/I) mitigation projects with the goal of reducing I/I impacts on its wastewater system. In the winter of 2023, the City performed sewer flow monitoring to help determine the areas with the highest I/I flows to further focus I/I reduction efforts. Some of the most common sources of I/I are shown on Figure 1.

Carollo was asked to review the data collected and incorporate it into the wastewater treatment plant (WWTP) project rescoping efforts. This memorandum includes the following:

- Verification of existing WWF factors.
- Identification of potential priority zones within the existing wastewater collection system for potential future I/I reduction projects.
- Development of ranges of possible WWF reduction if I/I reduction projects are implemented.

These three items are important because they could affect the size and cost of the WWTP upgrade project, as well as optimize the value of any future I/I reduction efforts. WWF factors could be used to size pumping facilities, sewage screens and grinders (i.e., headworks facilities, equalization tanks and sewer pipes). With lower WWFs, these facilities could be smaller and less costly. Understanding the areas that could be prioritized for I/I mitigation projects will increase the value of resources spent on those projects while decreasing the amount of time to observe benefits (i.e., reduced WWFs). Furthermore, I/I mitigation projects have the potential to increase the service life of existing sewers without costly replacement. Lastly, understanding the range of WWF reduction the City could see by undertaking future I/I reduction projects sets the level of expected benefit. The analysis considered historical WWTP influent flow along with temporary flow monitoring data to determine the expected WWTP influent flow during a design storm event.

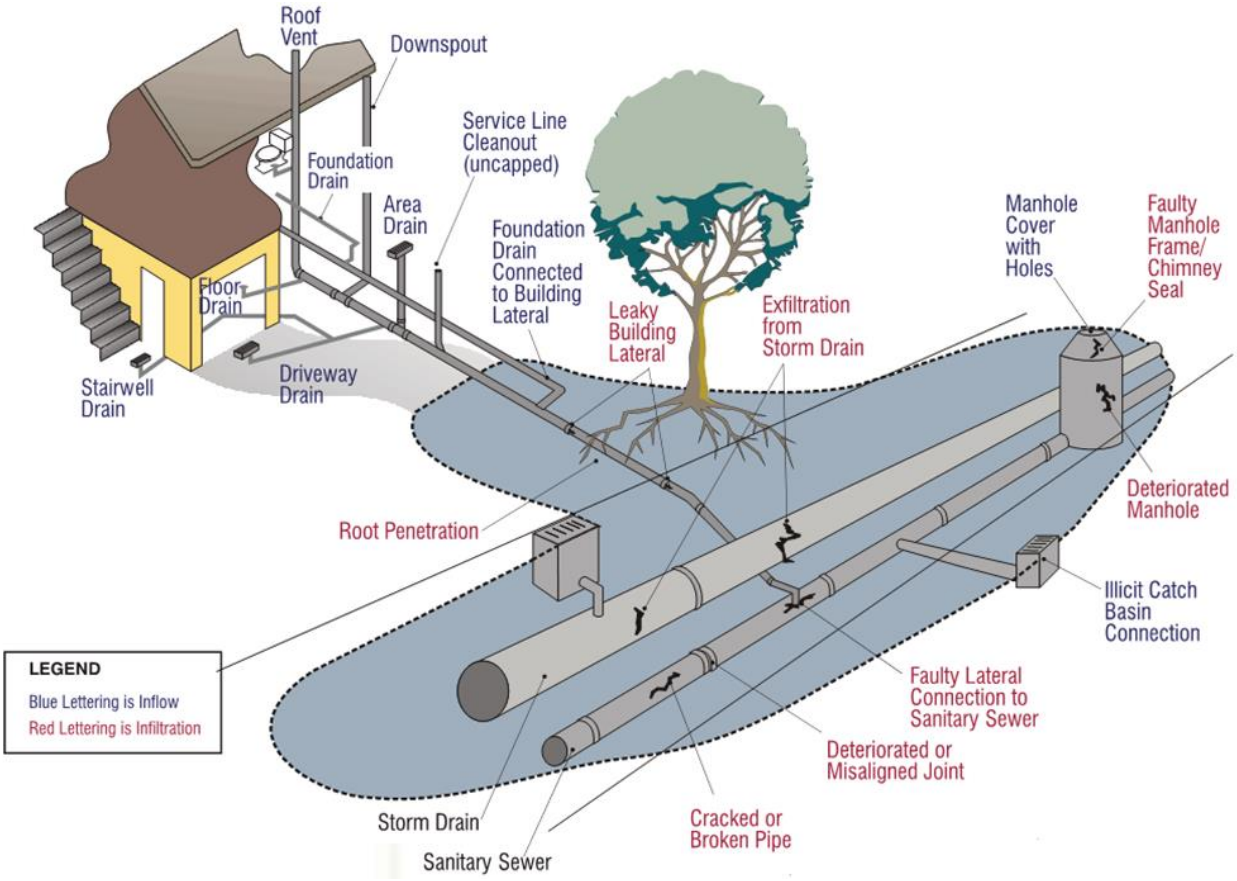

Figure 1 Typical Sources of I/I

Methods

Historical influent plant data was used to determine the dry weather flow (DWF) and WWF conditions during the monitoring period. A hydraulic model was developed using InfoSWMM[1] to model the influent flow at the WWTP for historical events. The hydraulic model's parameters were adjusted to match historical flow monitoring data.

For this project, DWF monitoring was determined based on historical plant data. Figure 2 shows the weekday and weekend hourly DWF multipliers for the entire system. A multiplier equal to 0.5 indicates at that hour of the day the flow is equal to one-half of the ADF.

[1] InfoSWMM is a fully dynamic, geospatial wastewater and stormwater modeling and management software application, which is built to run within the ESRI ArcGIS software platform. The hydraulic modeling engine for the InfoSWMM software package uses the Environmental Protection Agency's (EPA) Storm Water Management Model (SWMM), which is widely used throughout the world for planning, analysis, and design related to stormwater runoff, combined sewers, sanitary sewers, and other drainage systems. InfoSWMM routes flows through the model using the Dynamic Wave method, which solves the complete Saint Venant, one dimensional equations of fluid flow.

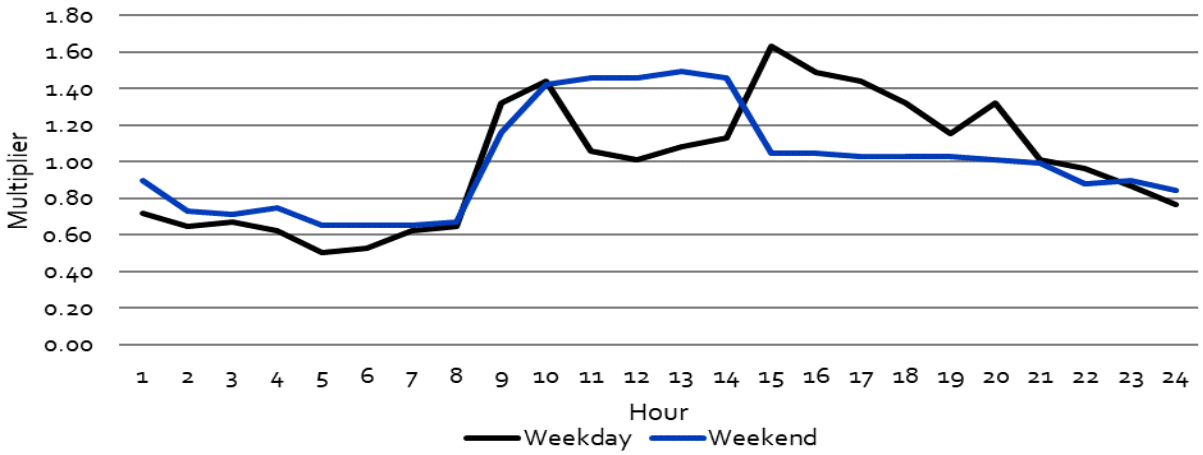

Figure 2 Weekday and Weekend DWF Hourly Multiplier

The WWF calibration consists of using actual influent WWTP flow data recorded during wet weather events, for which we have rainfall data, and adjusting model parameters so that the modeled flows match the actual flows. The model parameters are discussed later. The WWF calibration consisted of five periods with storm events. The amount of I/I is essentially the difference between the WWF and DWF components. The storm events were identified between the following dates:

- Period 1: January 2, 2017, through January 15, 2017.
- Period 2: February 5, 2017, through February 12, 2017.
- Period 3: March 12, 2018, through March 24, 2018.
- Period 4: March 1, 2019, through March 8, 2019.
- Period 5: March 9, 2023, through March 16, 2023.

The main step in the WWF calibration process includes creating a custom unit hydrograph for the City service area using the "RTK Method," which is widely used in collection system master planning. Using the RTK Method, the I/I unit hydrograph is the summation of three separate triangular hydrographs (short term, medium term, and long term), which are each defined by three parameters: R, T, and K. R represents the fraction of rainfall over the sewer basin that enters the collection system; T represents the time to peak of the hydrograph; K represents the ratio from time to peak to time of end of hydrograph. Therefore, there are a total of nine separate variables associated with a unit hydrograph. Figure 3 shows the shape of an example unit hydrograph. The WWF calibration sheets show figures comparing the measured data and model results for flow in response to rainfall. The WWF calibration sheets are included in Attachment A.

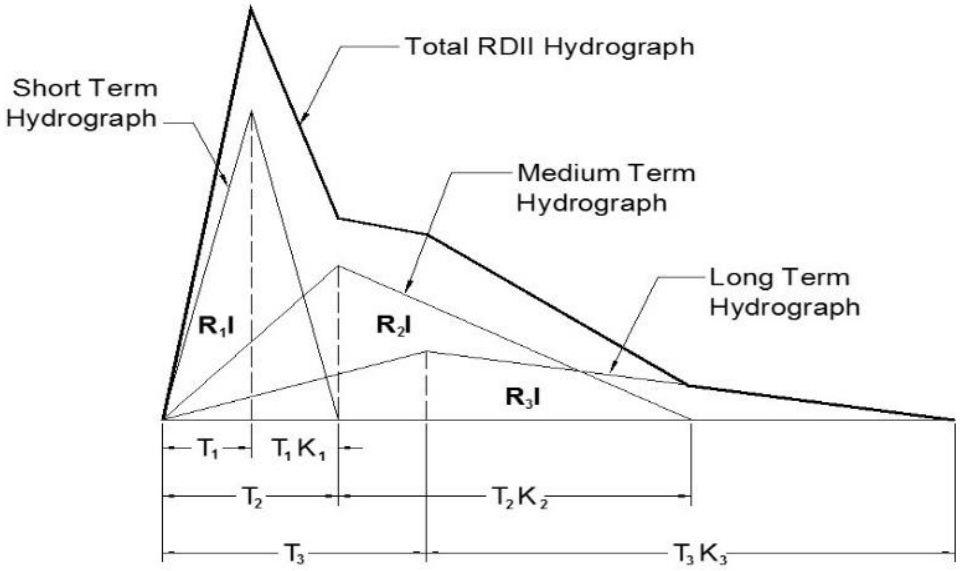

Figure 3 Example Rainfall Dependent Infiltration and Inflow (RDII) Unit Hydrograph

Design Storm

Design storms are rainfall events used to analyze the performance of a collection system under select wet weather events. The City's design storm was routed through the collection system model to determine PWWFs. The first step in the development of the design storm is to define its recurrence interval and rainfall duration. The recurrence interval is based on the probability that a given rainfall event will occur or be exceeded in any given year. For example, a "100-year storm" means there is a 1 in 100 chance that a storm as large as or larger than this event will occur at a specific location in any year.

Duration is the length of time in which the rainfall occurs. It is industry standard in California to use the 10-year, 24-hour design storm for analyzing wastewater collection system performance during PWWF conditions and for sizing some WWTP facilities (e.g., equalization tanks and pump stations). The 10-year, 24-hour design storm depth is 3.98 inches as document by National Oceanic and Atmospheric Administration (NOAA) Atlas 14.

Once the design storm recurrence interval, duration, and associated rainfall volume have been determined, the next step in defining the design storm is to distribute the total rainfall over the duration of the storm. The Natural Resources Conservation Service (NRCS) Type 1A rainfall distribution was used. Figure 4 shows the 10-year, 24-hour design storm.

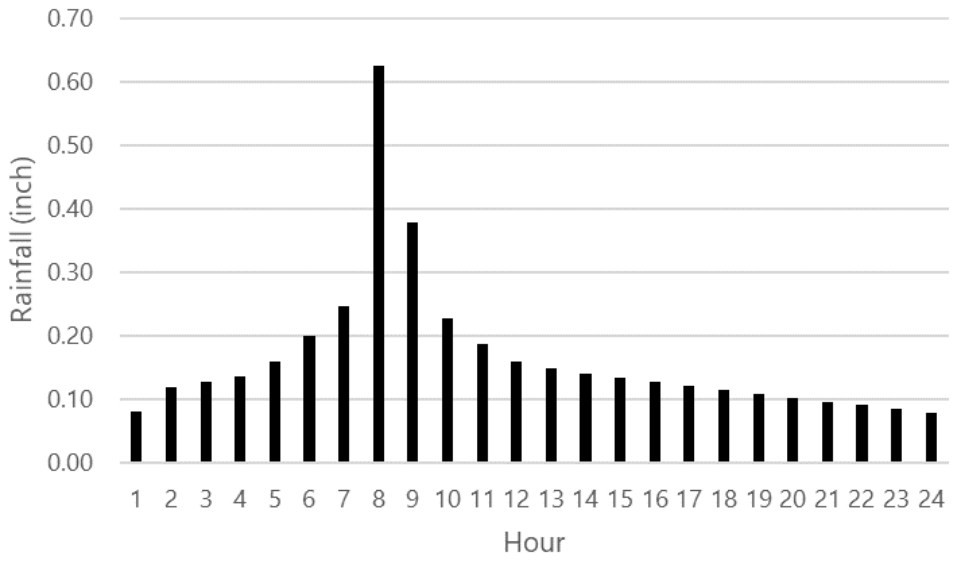

Figure 4 10-year 24-hour Design Storm Event

Hydraulic Evaluation

Following the DWF and WWF calibration of the model the design storm was applied to forecast sewer flow. The hydraulic analysis assumes all flow is conveyed to the WWTP and no flow is restricted or escapes the collection system. Figure 5 shows the peak influent flow based on the design storm at the WWTP. The model predicts that a peak hour WWF of 5.36 million gallons per day (mgd) could be observed if there were no restrictions in the collection system and if no wastewater escapes the collection system. Additionally, the model predicts that a peak day WWF of 3.16 mgd could be observed at the WWTP as a result of the 10-year, 24-hour design storm event.

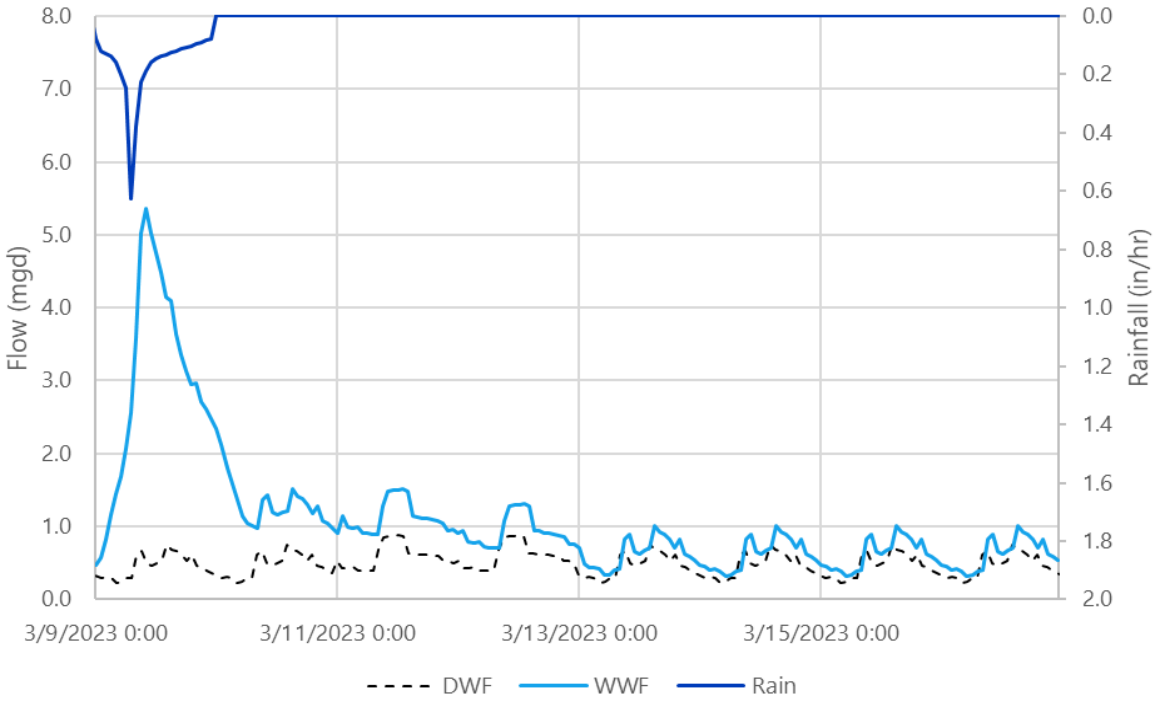

Figure 5 Modeled Influent PWWF - 10-year, 24-hour Design Storm

Temporary Flow Monitoring Program

The City completed a temporary flow monitoring program between March 8, 2023, and April 6, 2023. The flow monitoring program consisted of ten flow meters installed throughout the collection system in hopes of identifying areas in the collection system with high amounts of I/I. Table 1 summarizes the measured flow data.

Table 1 Temporary Flow Monitoring Data Summarized

Basin	Measured DWF (mgd)	Measured Peak Flow (mgd)	Peaking Factor	Pipe Length (feet)
1	0.04	0.17	4.1	0
2	0.23	1.97	8.5	18,670
3	0.07	0.16	2.3	8,010
4	0.07	0.21	3.1	7,000
5	0.01	0.13	17.9	2,960
6	0.01	0.12	9.6	3,470
7	0.18	0.76	4.1	14,480
8	0.07	0.33	5.0	4,300
9	0.08	0.46	5.5	7,020
10	0.02	0.10	5.4	10,900

Notes:
(1) Source: Flow monitoring program March 8, 2023, through April 6, 2023.

I/I Reduction

The adverse effects of I/I are that it increases both the flow volume and peak flow rate. If the City were to implement an I/I reduction program this may allow for reducing the size of some WWTP facilities (e.g., pump stations and equalization tanks). An efficient I/I reduction program will target rehabilitating the portions of the sewer collection system with the highest I/I rates. The City's sewer collection system was broken down into portions, referred to as basins (see Figure 6). I/I rates within the different basins were calculated per length of pipe in that basin. Basins 5, 6, 8, and 9 have the highest I/I rates per foot of sewer pipe and could be targeted for I/I reduction efforts. Collectively these basins account for approximately 18 percent of the total sewer collection system by length.

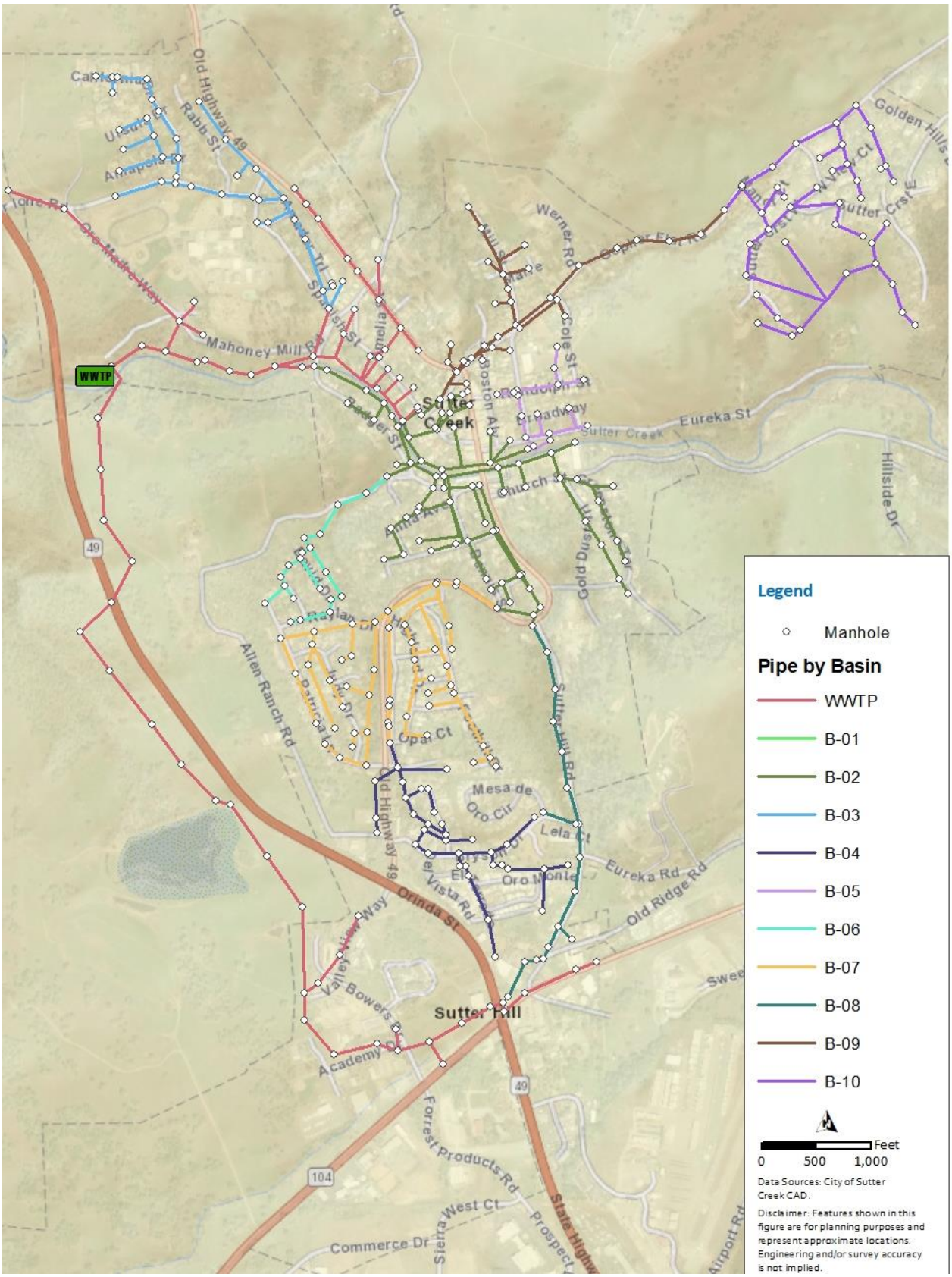

Figure 6 Meter Basins Map

There are a variety of I/I reduction techniques that can be used. I/I reduction projects can range from manhole rehabilitation to sewer main replacement/rehabilitation and lateral rehabilitation. Implementing an I/I reduction program is no guarantee that the desired I/I reduction will be achieved. However, there is a baseline benefit to rehabbing existing facilities because it would extend their life. For this analysis 30 percent and 65 percent I/I reduction in the selected basins was assumed to estimate the potential reduction in peak flows. Table 2 summarizes the potential reduction of peak influent flow at the WWTP for the range of I/I reduction assumed. Based on a review of historical literature and Carollo's experience in order to achieve an I/I reduction of 65 percent, the City may need to incorporate pipe, manhole, and service laterals rehabilitation.

Table 2 Peak Influent Flows

Scenario	Peak Influent Flow (mgd)
No Reduction	5.36
30% Reduction in Basins 5, 6, 8, and 9	4.74
65% Reduction in Basins 5, 6, 8, and 9	4.03

Conclusion

This memorandum verified existing WWFs, identified basins with highest I/I, and identified potential reductions in WWFs if I/I reduction projects are implemented in the priority basins. The planned WWTP upgrade project could expect a peak hour flow of 5.36 mgd and a peak day flow of 3.16 mgd as a result of the 10-year, 24-hour design storm.

Basins 5, 6, 8, and 9 could be prioritized for I/I reductions because I/I rates are highest in these basins. Approximately 18 percent of the total sewer collection system length is in these basins. If I/I is reduced in these basins between 30 percent and 65 percent a reduction in peak hour flow between 0.62 mgd and 1.33 mgd could be realized.

ATTACHMENT C

Amador Regional Sanitation Agency
2024 Individual Water Balance Update

ARSA Storage Reservoirs Supporting Documentation

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HENDERSON RESERVOIR AERIAL TOPOGRAPHIC SURVEY DATA
PROVIDED BY ARSA STAFF AND GARY GHIO

PIPE
W/L 7531
W/L 7531
ELEVATED VALVAT
PIPES
SOLAR PANEL
PIPE
PIPE
PILES
W/L 7612
GATE
GATE
GATE

SITE PLAN

LEGEND:

WATERSHED RUNOFF AREA, (4.3 ACRES)

0 300 600

Weber, Ghio & Associates, Inc.
Professional Engineers
394 East Saint Charles
P.O. Box 251
SAN ANDREAS, CALIFORNIA 95249

PROJECT NAME:

HENDERSON RESERVOIR RUNOFF AREA

PROJECT No.: 2457

Plot Aug 09, 2017 at 9:35am M:\Projects\ARSA\2457\Reservoirs\Runoff Areas.dwg

SITE PLAN

LEGEND:

WATERSHED RUNOFF AREA,
(14.0 ACRES)

N

0 300 600

Weber, Ghio & Associates, Inc.
Professional Engineers
394 East Saint Charles
P.O. Box 251
SAN ANDREAS, CALIFORNIA 95249

PROJECT NAME:

PRESTON RESERVOIR RUNOFF AREA

PROJECT No.: 2457

Plot Aug 09, 2017 at 8:58am M:\Projects\ARSA\2457\Reservoirs\Runoff Areas.dwg

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES
Division of Safety of Dams

Dam Information Summary

Preston Dam, No. 2029.003, Area 6, Amador County

Amador Regional Sanitation Authority

Dam Dimensions

Dam Height, Ft	40.00
Crest Width, Ft	20.00
Dam Length, Ft	647.00
Crest Elevation, Ft	360.00
Volume, CY	86,519.00
Barrier Height, Ft	35.00
MPWS Elev., Ft	355.00
MPWS Capacity, AF	268.00
Parapet Code	None
Parapet Height, Ft	0.00
Total Freeboard, Ft	5.00
Oper. Freeboard, Ft	5.00

Certificate Information

Max Cert. Elev., Ft	355.00
Issue Date	10/6/1980

Reservoir

Name	Primary Reservoir
Duration	Year Round
Surface Area, Ac	17.00
Storage Capacities, AF	
at Cert Elev.	268.00
at Dam Crest	0.00
at SW Crest	0.00

Primary Spillway

Crest Elev, Ft	355.00
Type	(Unselected)
Gates	Ungated

Dam Information

Type	Earth
Status	Certified
Purpose(s)	STO
Use(s)	SEW, IRR

Location

Year Built	1949
Latitude	38.3698°
Longitude	-120.9398°
Stream	Tr Mule Creek
Tributary To	
US Public Land Survey System	
-¼, S24, T6N, R9E, MD B&M	
Quad Book	2C-37A3
Quad Map	IONE
National Forest	N.I.N.F.
NID Number	CA00012

Hazard Potential

Hazard Class	2B
Total Class Weight	14
Fed. Hazard Class	Significant

Jurisdiction

FERC Number	
Exempt Desc.	(Unselected)

Attributes

Inoperable	No
Receives Spillway Letter	No
Instrumentation	No

Hydrology

Estimate Date	8/18/1948
Est. Type	DWR
Drainage Area, Sq Mi	0.12
Mean Annual Precip, In	0.00
Peak Inflow, cfs	
Peak Outflow, cfs	
Max Stage, Ft	
Residual Freeboard, Ft	0.00

Seismic Parameters

Estimate Date	
Fault	
Max Magnitude	
Deterministic Level	
Peak Ground Acc., g	
Arias Intensity, m/s	
Shear Wave Vel., m/s	

Outlet Works

Type	
Drawdown Estimates, Days	
Short Term	
Long Term	

Restrictions

Restriction	None
Duration	
Restricted Elev., Ft	
Reason	
Start Date	

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES
Division of Safety of Dams

Dam Information Summary

Preston Forebay Dam, No. 2029.002, Area 6, Amador County

Amador Regional Sanitation Authority

Dam Dimensions

Dam Height, Ft	40.00
Crest Width, Ft	0.00
Dam Length, Ft	176.00
Crest Elevation, Ft	624.00
Volume, CY	22,400.00
Barrier Height, Ft	36.00
MPWS Elev., Ft	620.00
MPWS Capacity, AF	30.00
Parapet Code	None
Parapet Height, Ft	0.00
Total Freeboard, Ft	4.00
Oper. Freeboard, Ft	4.00

Certificate Information

Max Cert. Elev., Ft	620.00
Issue Date	10/6/1980

Reservoir

Name	Primary Reservoir
Duration	Year Round
Surface Area, Ac	2.00
Storage Capacities, AF	
at Cert Elev.	30.00
at Dam Crest	0.00
at SW Crest	0.00

Primary Spillway

Crest Elev, Ft	620.00
Type	(Unselected)
Gates	Ungated

Dam Information

Type	Earth
Status	Certified
Purpose(s)	REG
Use(s)	SEW, IRR

Location

Year Built	1892
Latitude	38.3754°
Longitude	-120.9233°
Stream	Offstream
Tributary To	
US Public Land Survey System	
-¼, S18, T6N, R10E, MD B&M	
Quad Book	2C-37A1
Quad Map	IRISH HILL
National Forest	N.I.N.F.
NID Number	CA00006

Hazard Potential

Hazard Class	1C
Total Class Weight	6
Fed. Hazard Class	Low

Jurisdiction

FERC Number	
Exempt Desc.	(Unselected)

Attributes

Inoperable	No
Receives Spillway Letter	No
Instrumentation	No

Hydrology

Estimate Date	4/19/1940
Est. Type	1000
Drainage Area, Sq Mi	0.00
Mean Annual Precip, In	0.00
Peak Inflow, cfs	20.00
Peak Outflow, cfs	20.00
Max Stage, Ft	2.20
Residual Freeboard, Ft	2.20

Seismic Parameters

Estimate Date	
Fault	
Max Magnitude	
Deterministic Level	
Peak Ground Acc., g	
Arias Intensity, m/s	
Shear Wave Vel., m/s	

Outlet Works

Type	
Drawdown Estimates, Days	
Short Term	
Long Term	

Restrictions

Restriction	None
Duration	
Restricted Elev., Ft	
Reason	
Start Date	

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES
Division of Safety of Dams

Dam Information Summary

Henderson Dam, No. 2029.000, Area 6, Amador County

Amador Regional Sanitation Authority

Dam Dimensions

Dam Height, Ft	56.00
Crest Width, Ft	8.00
Dam Length, Ft	630.00
Crest Elevation, Ft	86.50
Volume, CY	70,000.00
Barrier Height, Ft	53.00
MPWS Elev., Ft	83.50
MPWS Capacity, AF	500.00
Parapet Code	None
Parapet Height, Ft	0.00
Total Freeboard, Ft	3.00
Oper. Freeboard, Ft	3.00

Certificate Information

Max Cert. Elev., Ft	83.50
Issue Date	10/6/1980

Reservoir

Name	Primary Reservoir
Duration	Year Round
Surface Area, Ac	31.00
Storage Capacities, AF	
at Cert Elev.	500.00
at Dam Crest	595.00
at SW Crest	500.00

Primary Spillway

Crest Elev, Ft	83.50
Type	Sharp Crested Weir
Gates	Ungated

Dam Information

Type	Earth
Status	Certified
Purpose(s)	STO
Use(s)	SEW, IRR

Location

Year Built	1923
Latitude	38.3856°
Longitude	-120.8771°
Stream	Jackass Creek
Tributary To	
US Public Land Survey System	
-¼, S9, T6N, R10E, MD B&M	
Quad Book	2C-37A1
Quad Map	IRISH HILL
National Forest	N.I.N.F.
NID Number	CA00005

Hazard Potential

Hazard Class	2B
Total Class Weight	12
Fed. Hazard Class	Significant

Jurisdiction

FERC Number	
Exempt Desc.	(Unselected)

Attributes

Inoperable	No
Receives Spillway Letter	No
Instrumentation	No

Hydrology

Estimate Date	5/2/1971
Est. Type	1000
Drainage Area, Sq Mi	1.00
Mean Annual Precip, In	0.00
Peak Inflow, cfs	752.00
Peak Outflow, cfs	489.00
Max Stage, Ft	785.30
Residual Freeboard, Ft	1.30

Seismic Parameters

Estimate Date	
Fault	
Max Magnitude	
Deterministic Level	
Peak Ground Acc., g	
Arias Intensity, m/s	
Shear Wave Vel., m/s	

Outlet Works

Type	
Drawdown Estimates, Days	
Short Term	
Long Term	

Restrictions

Restriction	None
Duration	
Restricted Elev., Ft	
Reason	
Start Date	

HENDERSON RESERVOIR STAGE-STORAGE DATA

BASED ON AERIAL TOPOGRAPHIC SURVEY DATA
PROVIDED BY ARSA STAFF AND GARY GHIO

AMADOR REGIONAL SANITATION AUTHORITY

HENDERSON RESERVOIR VOLUME

4/21/2015

Elev (ft)	Area (ac)	Volume (ac-ft)	Cumulative Volume (ac-ft)	Cumulative Volume (MG)	Incremental Volume Increase (ac-ft)	
780	30.06	14.96	451.83	147.22	14.96	Spillway
779.5	29.80	14.84	436.86	142.34	14.84	
779	29.57	14.70	422.02	137.51	14.70	
778.5	29.22	14.53	407.33	132.72	14.53	
778	28.88	14.34	392.80	127.99	14.34	2 ' Freeboard
777.5	28.47	14.14	378.46	123.31	14.14	
777	28.07	13.92	364.33	118.71	13.92	
776.5	27.62	13.70	350.41	114.17	13.70	
776	27.17	13.47	336.71	109.71	13.47	
775.5	26.69	13.23	323.24	105.32	13.23	
775	26.23	12.97	310.01	101.01	12.97	
774.5	25.67	12.69	297.04	96.78	12.69	
774	25.11	12.39	284.34	92.65	12.39	
773.5	24.46	12.10	271.95	88.61	12.10	
773	23.96	11.83	259.84	84.66	11.83	
772.5	23.34	11.53	248.02	80.81	11.53	
772	22.78	11.20	236.49	77.05	11.20	
771.5	22.01	10.86	225.29	73.41	10.86	
771	21.41	10.54	214.44	69.87	10.54	
770.5	20.73	10.18	203.90	66.44	10.18	
770	19.99	9.85	193.72	63.12	9.85	
769.5	19.40	9.55	183.87	59.91	9.55	
769	18.79	9.24	174.33	56.80	9.24	
768.5	18.17	8.94	165.09	53.79	8.94	
768	17.57	8.64	156.15	50.88	8.64	
767.5	16.97	8.33	147.51	48.06	8.33	
767	16.34	8.03	139.19	45.35	8.03	
766.5	15.79	7.79	131.15	42.73	7.79	
766	15.36	7.57	123.37	40.20	7.57	
765.5	14.93	7.36	115.80	37.73	7.36	
765	14.52	7.16	108.43	35.33	7.16	
764.5	14.11	6.96	101.28	33.00	6.96	
764	13.73	6.74	94.32	30.73	6.74	
763.5	13.25	6.53	87.57	28.53	6.53	
763	12.86	6.34	81.05	26.41	6.34	
762.5	12.51	6.16	74.71	24.34	6.16	
762	12.13	5.91	68.55	22.34	5.91	
761.5	11.52	5.67	62.64	20.41	5.67	
761	11.15	5.47	56.97	18.56	5.47	
760.5	10.75	5.26	51.50	16.78	5.26	
760	10.30	5.03	46.23	15.06	5.03	
759.5	9.83	4.80	41.20	13.42	4.80	
759	9.37	4.57	36.40	11.86	4.57	
758.5	8.91	4.35	31.83	10.37	4.35	

758	8.48	4.12	27.48	8.96	4.12
757.5	8.00	3.89	23.36	7.61	3.89
757	7.57	3.65	19.47	6.34	3.65
756.5	7.03	3.40	15.82	5.16	3.40
756	6.59	3.15	12.42	4.05	3.15
755.5	6.01	2.88	9.27	3.02	2.88
755	5.49	2.55	6.39	2.08	2.55
754.5	4.70	2.20	3.85	1.25	2.20
754	4.12	1.34	1.64	0.54	1.34
753.5	1.23	0.31	0.31	0.10	0.31
753	0	0.00	0.00	0.00	0.00

* spillway elevation = 780'
Volume established from 11-07-08 aerial topo

PRESTON RESERVOIR STAGE-STORAGE DATA PROVIDED BY ARSA STAFF AND GARY GHIO

Preston Reservoir

Elevation	Area (AC)	Capacity (AC-FT)	Elevation	
325	0	0	325	
330	3	5	330	
335	6	25	335	
340	8	60	340	
345	12	110	345	
350	16	175	350	
353	18	235	353	2' Freeboard
355	20	270	355	Spillway

ATTACHMENT D
Amador Regional Sanitation Agency
2024 Individual Water Balance Update

City of Ione Response to February 3, 2025, Review Letter and
2024 COWRF Capacity and Operations TM
by West Yost Engineers

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City of Ione
P.O. Box 398
1 E. Main Street
Ione, CA 95640

February 24, 2024 SENT VIA: EMAIL

Kari Holmes, P.E.
Supervising Water Resources Control Engineer
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, #200
Rancho Cordova, CA
Kari.Holmes@waterboards.ca.gov

Subject: Certification Letter for Castle Oaks Golf Course Recycled Water Demands

Dear Ms. Holmes,

On August 14, 2024, the Central Valley Water Quality Control Board (Regional Board) issued a 13267 Order letter to the City of Ione (City), Amador Regional Sanitation Agency (ARSA) and Portlock International Ltd. (Portlock), the three entities permitted the Regional Board under Water Reclamation Requirement Order 93-240 (WRRs) to land apply recycled water from the Castle Oaks Water Reclamation Facility (COWRF) to the Castle Oaks Golf Course (golf course). The City owns and operates the COWRF, which provides the recycled water to the golf course. The City also owns the golf course, which is leased and operated by Portlock. ARSA is permitted to supply water to the COWRF to meet the irrigation needs of the golf course.

The 13267 Order requires that the three WRRs permittees submit an updated water balance for the ARSA system to the Regional Board by December 13, 2024. Most of the required information under the 13267 Order does not pertain to the COWRF or golf course operations. Consequently, ARSA lead the development of the response required under the 13267 Order.

To address requirements specific to the City-led operations, the City previously submitted the *Castle Oaks Golf Course Recycled Water Demands Technical Memorandum* (Water Demands TM) that provided information and supporting documentation for the following topics:

- Historical and theoretical influent flows to the COWRF,
- Historical and theoretical recycled water use at the Golf Course,
- Agronomic water demands of the Golf Course,
- Storage capacity and operation of the Golf Course recycled water storage ponds, and

- Golf Course tailwater and overspray control and monitoring – including BMPs minimize runoff or overspray and practices to improve the application of recycled water to the use area.

On February 3, 2025, the Regional Board issued a letter titled *Review of Site-Specific Water Balance, Amador County Regional Outfall And Castle Oaks Golf Course And Development, City Of Ione/Amador Regional Sanitation Authority/Portlock Int. LLC., WDR 93-240, Amador County*. This letter documented additional information that must be addressed in the site-specific water balance. The specific items identified that apply to the City's operation and the City's response to these items are summarized in the table below.

Summary of Responses to Regional Board Comments

Regional Board Comment	City Response
The City of Ione is currently developing a Title 22 Engineering Report for the use of recycled water produced at the COWRF on the COGC. Title 22 requires setbacks for the irrigation of recycled water near water courses, residential areas, and public spaces. It is unclear if the acreage used to calculate the COGC disposal capacity considers these setbacks. More information shall be submitted, and the water balance shall be updated accordingly as needed.	Title 22 includes the following setback distance requirements applicable to disinfected tertiary recycled water: • No irrigation with disinfected tertiary recycled water shall take place within 50 feet of any domestic water supply well. • No impoundment of disinfected tertiary recycled water shall occur within 100 feet of any domestic water supply well. • Any use of recycled water shall comply with the following: – Any irrigation runoff shall be confined to the recycled water use area, unless the runoff does not pose a public health threat and is authorized by the regulatory agency. – Spray, mist, or runoff shall not enter dwellings, designated outdoor eating areas, or food handling facilities. – Drinking water fountains shall be protected against contact with recycled water spray, mist, or runoff. As part of development of the Title 22 Report, the City's consultant team West Yost Associates comprised of cross-connection control specialists conducted surveys of the golf course to confirm setback distance requirements were being satisfied. The irrigated acreages used in the water balances were developed from the information obtained during this survey. There are no known domestic water supply wells within 50-feet of the use area (or within 100 feet of the irrigation impoundments). The team also observed spray irrigation practices and confirmed there was no evidence of spray mist or runoff entering enter dwellings, designated

Summary of Responses to Regional Board Comments	
Regional Board Comment	**City Response**
	outdoor eating areas, or food handling facilities or drinking fountains. Based on this information, the setback distances do not need to be modified to meet the requirements of Title 22. The existing irrigated acreages used in the water balances were developed from the information obtained during this survey. These acreages do not need to be modified to conform to Title 22. Additional details will be included in the Title 22 Report. No change is required to address this statement.
The submittal indicates that COGC has an "overflow" from one of the recycled water holding ponds into Mule Creek. This is an unpermitted discharge and cannot be used as part of the water balance. The submittal also states "In addition, the recycled water remaining in Lake I at the end of the irrigation season is diluted with 1.2 million gallons of potable water. Golf course staff reported that this practice was developed in partnership with the California Department of Health Services to minimize the potential for discharge of recycled water to surface waters." No such practice has been permitted by the Department of Health Services (now the Division of Drinking Water, or DDW) nor the Central Valley Water Board. It is inaccurate to state that the Discharger believed this to be an approved discharge, as an NOV was issued for the same discharge on 28 January 2020. This discharge must cease immediately, the water balance shall be updated appropriately.	The City understands the Board's direction that the "dual use" of the ponds on the golf course is not an approved discharge and must cease. Importantly, for purposes of addressing comments on the updated water balance for the ARSA system, discharge from these ponds was not accounted for in the City's water balance. Accordingly, no revision is required to the water balance to address the Regional Board's comment. Moving forward, the City will reach out to and coordinate with the Regional Board, DDW, and the golf course to take action to address the prohibited discharge. Development of such action(s) may be appropriate as part of the preparation and finalization of the City's Title 22 Report.

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this letter and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Sincerely,

George Lee, City Manager

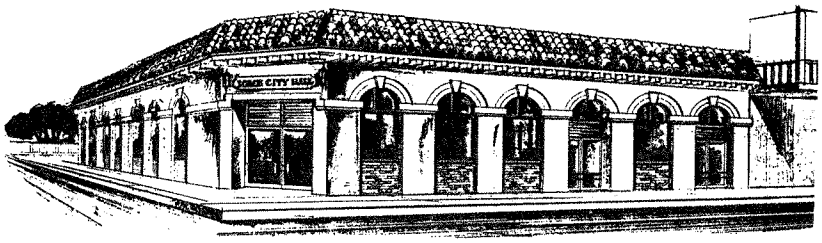
CC:

Mr. Kenny Croyle, PE
Water Resources Control Engineer
Central Valley Regional Water Quality Control Board
Kenny.Croyle@waterboards.ca.gov

Mr. Howard Hold
Senior Engineering Geologist
Central Valley Regional Water Quality Control Board
Harold.Hold@waterboards.ca.gov

Mr. Scott Armstrong
Senior Engineering Geologist
Central Valley Regional Water Quality Control Board
Scott.Armstrong@waterboards.ca.gov

City of Ione



Corner of Church & Main P.O. Box 398 Ione, California 95640
Phone (209) 274-2412

December 9, 2024

John Baum, P.E. (sent via email: John.Baum@waterboards.ca.gov)
Assistant Executive Officer, Rancho Cordova Office
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, #200
Rancho Cordova, CA

Subject: Certification Letter for Castle Oaks Water Reclamation Facility Capacity and Operations TM, Water Reclamation Requirement Order 93-240

Dear Mr. John Baum,

On August 14, 2024, the Central Valley Water Quality Control Board (Regional Board) issued a 13267 Order letter to the City of Ione (City), Amador Regional Sanitation Agency (ARSA) and Portlock International Ltd. (Portlock), the three entities permitted the Regional Board under Water Reclamation Requirement Order 93-240 (WRRs) to land apply recycled water from the Castle Oaks Water Reclamation Facility (COWRF) to the Castle Oaks Golf Course (golf course). The City owns and operates the COWRF, which provides recycled water to the golf course. The City also owns the golf course, which is leased and operated by Portlock. ARSA is permitted to supply water to the COWRF to meet the irrigation needs of the golf course.

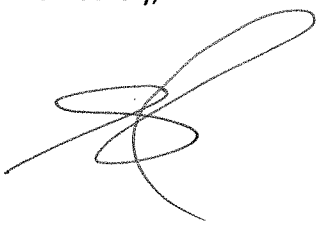
The 13267 Order requires that the three WRRs permittees submit an updated water balance for the ARSA system to the Regional Board by December 13, 2024. The letter specifies six items (A through F) that must be provided. The attached *Castle Oaks Water Reclamation Facility Capacity and Operations Technical Memorandum* (Capacity Operations TM) addresses the requirements under Item D of this letter, which states the following information must be provided:

The current and expected treatment capacity and operation schedule of the tertiary treatment plant. These numbers should be provided and certified by Ione. Supporting documentation must be included.

The City of Ione, City Manager has reviewed the contents of the Capacity Operations TM and provides the following certification statement:

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Sincerely,



George Lee
City of Ione
City Manager

CC: Kenny Croyle, PE, WDRS and Title 27 Compliance and Enforcement Unit, CVRWQCB

Howard Hold, Senior Engineering Geologist, WDRS and Title 27 Compliance and Enforcement Unit, CVRWQCB

Scott Armstrong, CVRWQCB, Rancho Cordova

Ginachi Amah, Recycled Water Unit Supervisor, Division of Drinking Water, State Water Resources Control Board

WEST YOST
Water. Engineered.

1001 Galaxy Way
Suite 310
Concord CA 94520

925.949.580
925.949.5845 fax
westyost.com

TECHNICAL MEMORANDUM

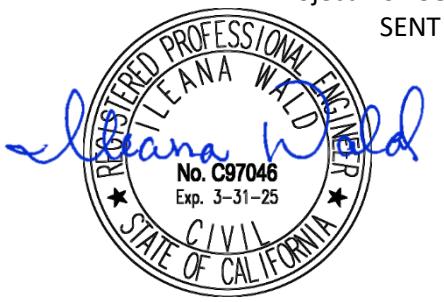
DATE: December 9, 2024

Project No.: 988-50-24-10
SENT VIA: EMAIL

TO: George Lee, City of Ione

FROM: Ileana Wald, PE, RCE #97046

REVIEWED BY: Kathryn Gies, PE, RCE #65022



SUBJECT: Castle Oaks Water Reclamation Facility Capacity and Operations Summary

This technical memorandum (TM) provides information and supporting documentation related to the capacity and operations of the Castle Oaks Water Reclamation Facility (COWRF), which is owned and operated by the City of Ione (City). The purpose of this TM is to inform development of a water balance for the Amador Regional Sanitation Authority (ARSA) wastewater disposal system. The following topics are addressed:

- Background Information
- Treatment Facilities Description
- Recycled Water Treatment Operations
- Treatment Capacity Summary

BACKGROUND INFORMATION

Facility Overview

The COWRF is a tertiary-only recycled water treatment plant located at 10100 Five Mile Drive in Ione, Amador County, California (see Figure 1, Vicinity Map). The facility receives disinfected secondary treated wastewater that is further treated through coagulation, filtration, and chlorine disinfection processes. A schematic diagram, hydraulic profile and design criteria for the COWRF that were included in the As-Built drawing set are included as Attachment A.

The COWRF produces "Disinfected Tertiary Recycled Water" as defined under the California Code of Regulations (CCR), Title 22 for irrigation use at the Castle Oaks Golf Course (golf course), which is leased and operated by Portlock International Ltd. (Portlock). There are no other uses or use areas. The City's Wastewater Treatment Facility (WWTF) is located adjacent to the COWRF but does not presently send treated effluent to the COWRF for treatment.

WEST YOST - N:\Clients\988 City of Ione\50-24-10 As Needed\GIS\MXD\Vicinity Map.mxd - aguillebeau - 11/20/2024

Prepared by:

WEST YOST

N

0 200 400 Feet

Prepared for:

City of Ione
Capacity and Operations TM

Vicinity Map

Figu 81

Regulatory History

The City, ARSA and Portlock are the three entities permitted the Central Valley Water Quality Control Board (Regional Board) under Water Reclamation Requirement Order 93-240 (WRRs) to discharge recycled water from the COWRF to the golf course. ARSA is specifically permitted to supply secondary treated wastewater to the COWRF to meet the irrigation needs of the golf course.

On August 14, 2024, the Regional Board issued a 13267 Order letter to the three WRRs permittees that requires the submission of an updated water balance for the ARSA system to the Regional Board by December 13, 2024. The letter specifies six items (A through F) that must be provided. This TM addresses the requirements under Item D of this letter, which states the following information must be provided:

> *The current and expected treatment capacity and operation schedule of the tertiary treatment plant. These numbers should be provided and certified by Ione. Supporting documentation must be included.*

TREATMENT FACILITIES DESCRIPTION

The treatment process train consists of preliminary screening, chemical coagulation, direct sand filtration, and chlorine disinfection. The layout of COWRF's treatment facilities are shown on Figure 2. The major treatment components of the COWRF include:

- Influent flow control and screening,
- Coagulation/flocculation,
- Filtration,
- Chlorine disinfection,
- Effluent pumping, and
- Solids treatment and handling.

Influent Flow Control and Screening

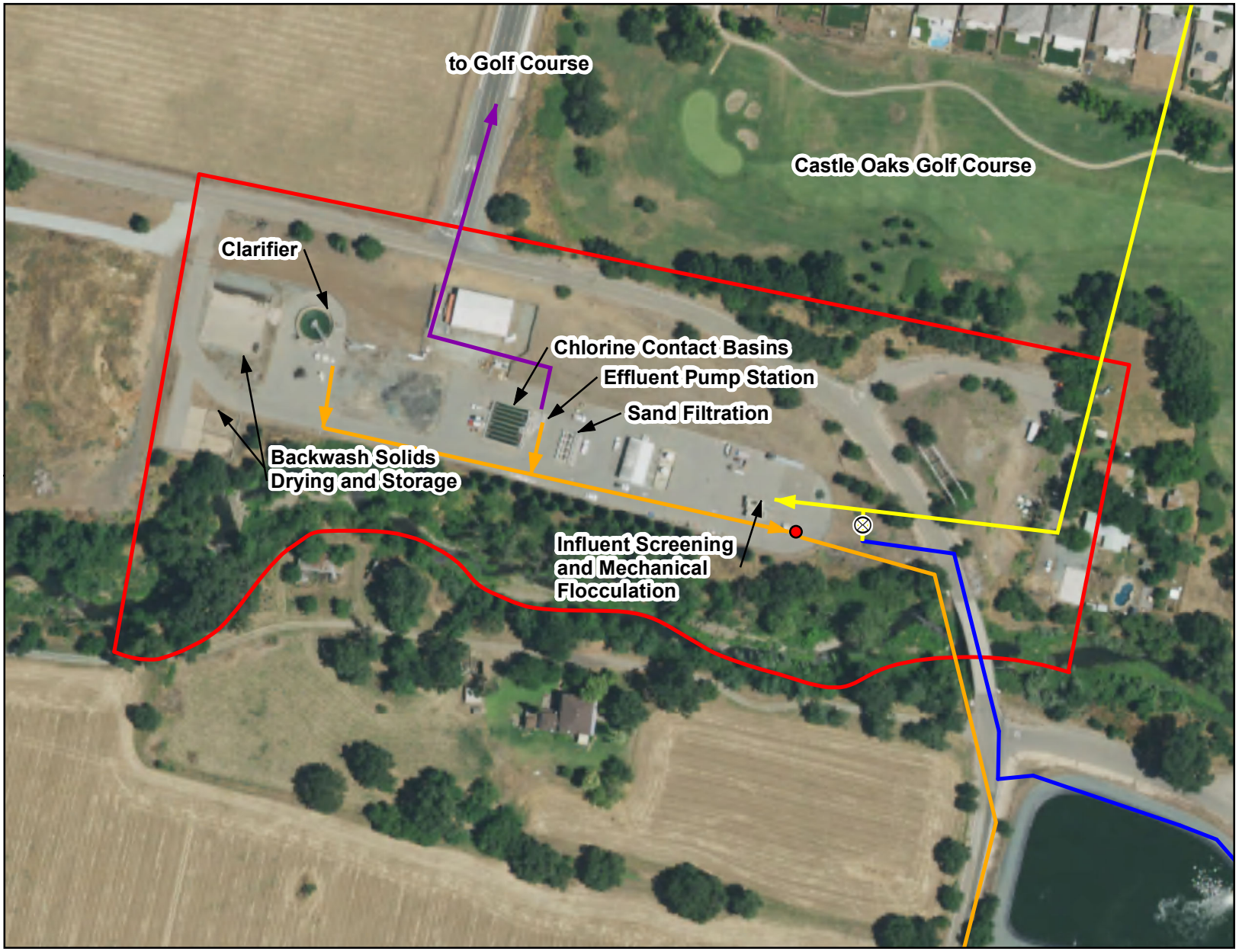
The COWRF headworks structure includes a magnetic flow meter, a pneumatically operated butterfly valve for flow control, screens, and an influent sample tap. The flow through the COWRF is controlled by the butterfly control valve and is based on an operator-set target flow rate. The flow rate is set to match the demand from the golf course. The valve will shut automatically in the event of a critical process failure (high liquid levels, high turbidity, or low chlorine residual) or power outage.

One static parabolic screen is provided to remove large solids prior to filtration. The screen opening size is 0.10 inch and the stated capacity of the screen is 1,350 gallons per minute (gpm).

Coagulation/Flocculation

Screened recycled water flows by gravity to the rapid mix chamber. Alum and/or polymer are added downstream of the static screen and prior to rapid mixer that promotes coagulation of the solids. Additional polymer can also be added before recycled water flows through two mechanical flocculation chambers. The signal from the influent flow meter is used to automatically flow pace the alum and polymer metering pumps to achieve a desired dosing rate. Adjustments to the dosing rate can be made by the operators based on measured filter effluent turbidity.

WEST YOST - \\wya.local\Corporate\Clients\988 City of Ione\50-24-10 As Needed\GIS\MXD\COWRF Facilities.mxd - aguillebeau - 11/20/2024



- Control Valve
- Pump Station
- to Golf Course
- COWRF Influent
- Discharge to WWTP
- Discharge to WWTP Ponds
- COWRF Boundary

Prepared by:

WEST YOST

N

0 100 200 Feet

Prepared for:

City of Ione

Capacity and Operations TM

COWRF Facilities

Figu

Filtration

After flocculation, recycled water flows from the flocculation chambers by gravity through the tertiary filters. The tertiary filtration system consists of continuous backwash, upflow, deep bed, and granular media DynaSand filters manufactured by Parkson Corporation. There are four filter cells, each containing two 50 square feet (ft^2) filter modules. The filter cells are operated in parallel with three duty and one standby unit. The design filtration rate for each filter cell is 2.8 gallons per minute per square foot (gpm/ft^2); however, each filter unit should be able to process up to 5 gpm/ ft^2.

The Parkson Dyansand filter is approved for the production of disinfected tertiary recycled water, as documented in a letter dated December 1, 1986, from the CDPH Drinking Water Program (now known as DDW)[1]. Additional design criteria for the tertiary filtration system is summarized in Attachment A.

Compressed air is used for continuous backwashing of a portion of the sand medium. Backwash (filter reject) from the filters is collected in a common trough and flows by gravity to the filter backwash clarifier. The filter reject stream is expected to be 5 to 10 percent of the total plant flow[2]. However, the filter reject flows are measured, and this data indicates that backwash flows are 10 to 20 percent of the total plant flow.

Chlorine Disinfection

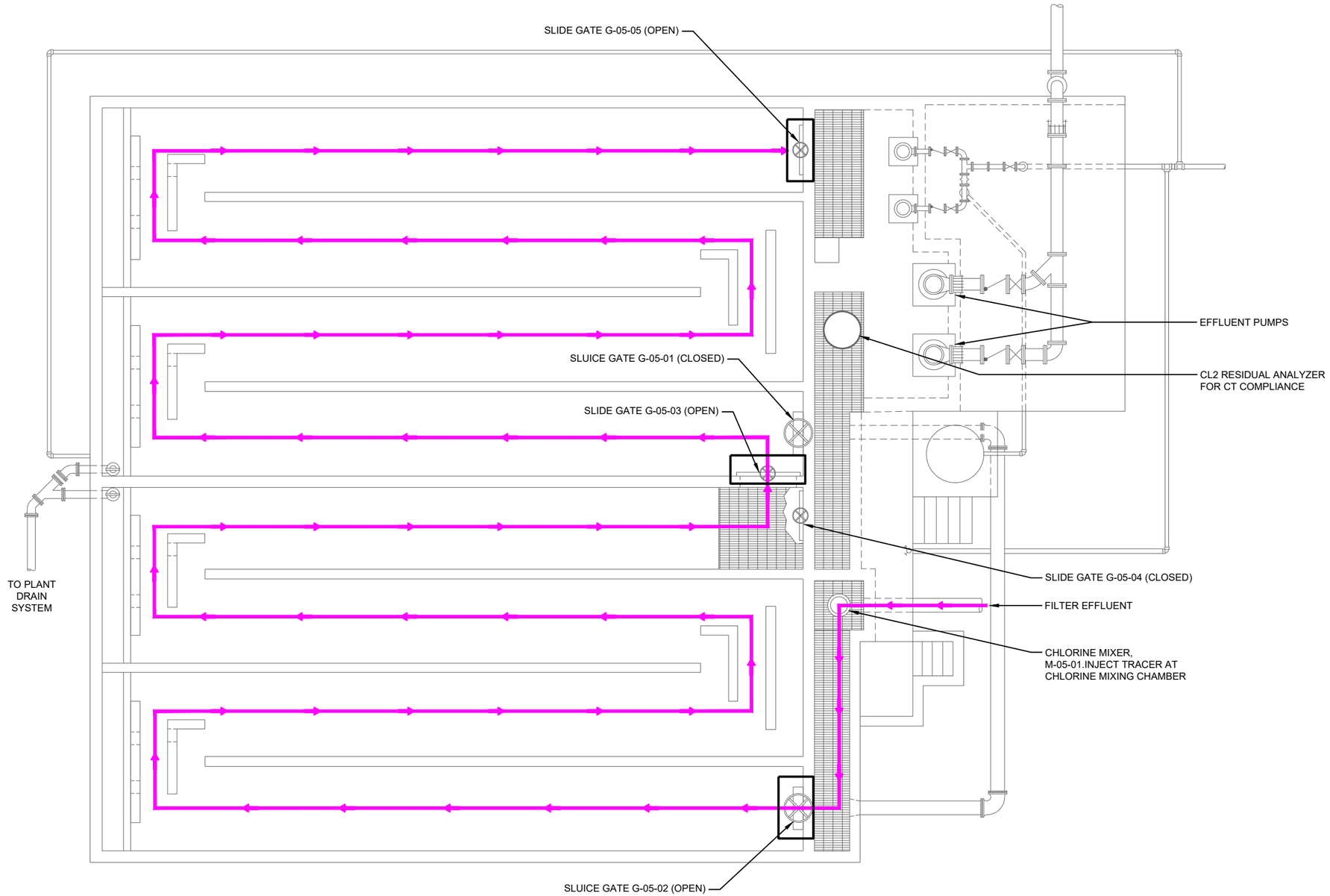
After filtration, recycled water flows to the chlorine mixing chamber where the sodium hypochlorite solution is added. The sodium hypochlorite solution dosing pumps are flow paced to the plant influent flow meter to achieve a desired dosing rate. Adjustments to the dosing rate can be made by the operators based on measured final effluent chlorine residual. A high-speed mechanical mixer in the chlorine mixing chamber ensures that the chlorine solution is well mixed with the recycled water flow.

After mixing, recycled water enters the Chlorine Contact Basin (CCB), which is a concrete basin with a serpentine, rectangular shape (Figure 3). The CCB is divided into two halves (CCB-1 and CCB-2) which could be operated individually in parallel or together in series. However, the two basins are exclusively operated in series. Each half can also be isolated and operated independently when the other needs to be drained for maintenance. However, CCB maintenance is typically done when the COWRF is offline.

The total volume of the CCB is reported as a nominal 100,000 gallons[3]. The channels are 6 feet wide and 6 feet deep and are separated by 8-foot-high concrete baffle walls. However, the detailed record drawings for the COWRF[4] show that the CCB operating volume is approximately 112,000 gallons, with a length-to-width ratio of 66 to 1. At the COWRF's design flow of 1.2 million gallons per day (MGD), the CCB's hydraulic retention (HRT) time is 134 minutes. The HRT in the CCB is controlled solely by the influent flow rate. The fixed volume of water in the CCB is controlled by a slide gate in each CCB half that allows water to overflow into the effluent clear well. If only one half of the CCB is operated (CCB-1 or CCB-2), the maximum flow that can be treated is 0.6 MGD.

A tracer study will be conducted to demonstrate modal contact time for flow through CCB for compliance with CCR, Title 22, Section 60301.230.a.1. The tracer study protocol was submitted to the State Water Resources Control Board (SWRCB), Division of Drinking Water (DDW) for review on October 1, 2024. The tracer study will be conducted in winter 2024/2025, the results of which will be incorporated into an updated Title 22 Engineering Report.

[1] CA SWRCB Division of Drinking Water. April 2023. Alternative Treatment Technology Report for Recycled Water, Appendix C. Historic Conditionally Accepted Granular Media Filters.
[2] City of Ione. May 1994. Castle Oaks Operation & Maintenance Manual.
[3] City of Ione. May 1994. Castle Oaks Operation & Maintenance Manual.
[4] Nolte and Associates. March 1992. City of Ione, Castle Oaks Wastewater Reclamation Plant, Record Drawings.



W:\Clients\988 City of Ione\50-23-05 Title 22 Update\CAD\Figures\98850-2305-Fig3 Chlor-Contact-Basin Flow Schematic.dwg 11/21/2024 7:41 AM sbarber

Figure 3

Chlorine Contact Basin Flow Schematic

Effluent Pumping

Downstream of the CCB effluent weir, the disinfected recycled water enters the effluent pump station wet well. There are two effluent pumps, each rated at 850 gpm. Therefore, each pump can convey the entire treatment flow of 1.2 mgd to the golf course.

The effluent flow meter that was originally installed at the COWRF was not capable of providing an accurate flow measurement in its configuration. Therefore, the City historically reported effluent flow as influent flow. With the adoption of the current Monitoring and Reporting Program in October 2021, the City began reporting the effluent flow as the difference between the influent flow and the measured filter backwash flow at the start of the 2022 irrigation season. The City recently replaced the effluent flow meter and will initiate using this flow meter to report effluent flow in the 2025 irrigation season.

Solids Treatment and Handling

The filter backwash stream is routed to the Filter Backwash Clarifier, where suspended solids are removed in the through settling. The solids concentration of the filter reject stream is estimated to be 400 to 600 mg/L and the maximum alum sludge loading from the filter is projected at 300 to 1,000 lb/day.

Overflow from the Filter Backwash Clarifier is discharged to the plant drain system that leads to the Decant Pump Station. The pump station discharges the backwash flow to the City of Ione WWTF collections system, where it is combined with raw wastewater and directed to the WWTF for treatment.

Sludge from the Filter Backwash Clarifier is pumped to one of the three sludge drying beds. After drying, the sludge is stored and eventually disposed of in a landfill. An under-drain on Sludge Drying Beds 1 and 2 returns decanted water by gravity to the Decant Pump Station. Sludge Drying Bed 3, constructed in 2002, is provided with an integral sump to return decant water to the Filter Backwash Clarifier.

RECYCLED WATER TREATMENT OPERATIONS

Secondary effluent is stored prior to discharge to the COWRF. As such, the influent flow does not follow a diurnal pattern. Instead, flow through the plant is steady throughout the day. As previously noted, the influent control valve is used to set the desired influent flow rate to the COWRF based on the demands of the golf course.

The COWRF is in operation when there is irrigation demand at the golf course, typically April through November. Recent flow rates at the COWRF from available Daily Monitoring Report (DMR) data from January 2018 through October 2023[5] are summarized on Figure 4. As previously noted, influent flow was reported as effluent flow prior to April 2022 and starting in 2022 effluent flows have been calculated. The maximum daily influent flow to the COWRF was approximately 1.25 MGD in January 2018. For months where no influent or effluent flows are shown, the COWRF was offline.

[5] DMR data for May 2023 at COWRF was not available.

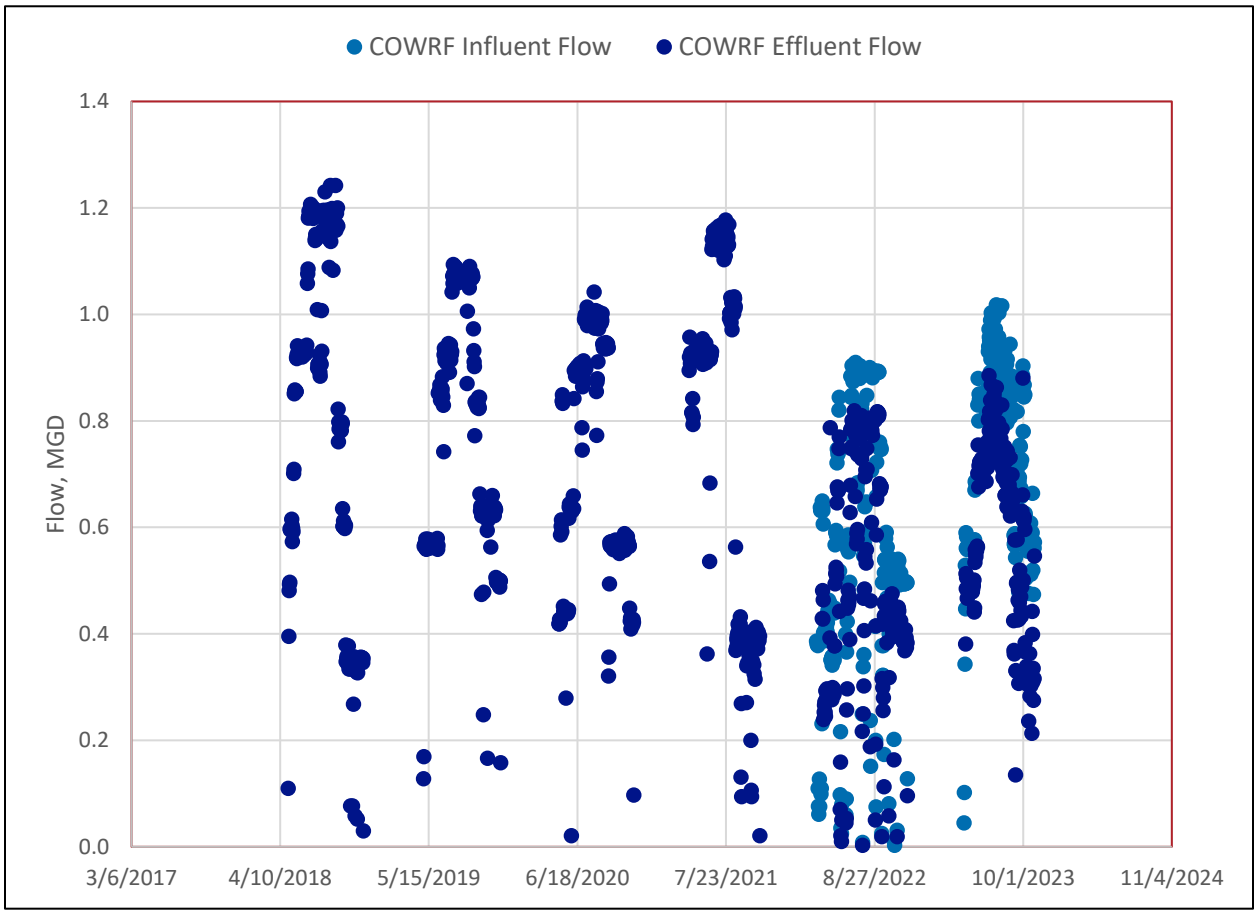


Figure 4. Recent COWRF Flows

Monthly average effluent flows from COWRF are summarized in Table 2. In recent years the average monthly flow through the COWRF ranged from 0.43 MGD to 0.95 MGD.

Table 2. Monthly Average Effluent Flows from COWRF

Month	Effluent Flow[a,b], MGD
January	-
February	-
March	-
April	0.53
May	0.63
June	0.82
July	0.95
August	0.92
September	0.68
October	0.48
November	0.43
December	-

a) Data from available DMR data averaged over period between January 2018 and October 2023. The sole flow meter is located at the influent pump station. Prior to April 2022, influent flow was reported as effluent flow. Starting in 2022, effluent flows have been estimated.
b) For months where a dash (-) is shown, plant was offline, therefore there was no effluent flow.
MGD = Million Gallons per Day

TREATMENT CAPACITY

The COWRF is designed to treat an average peak flow of 1.2 MGD. The facility's treatment capacity is primarily limited by the CCB capacity.

REFERENCES

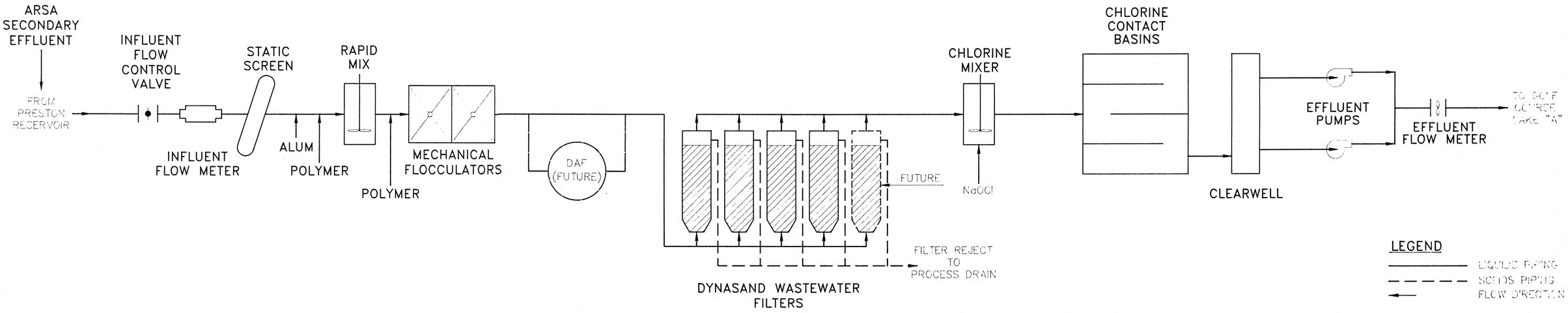
California State Water Resources Control Board, Division of Drinking Water. April 2023. *Alternative Treatment Technology Report for Recycled Water,* Appendix C. Historic Conditionally Accepted Granular Media Filters.

City of Ione. May 1994. *Castle Oaks Operation & Maintenance Manual*.

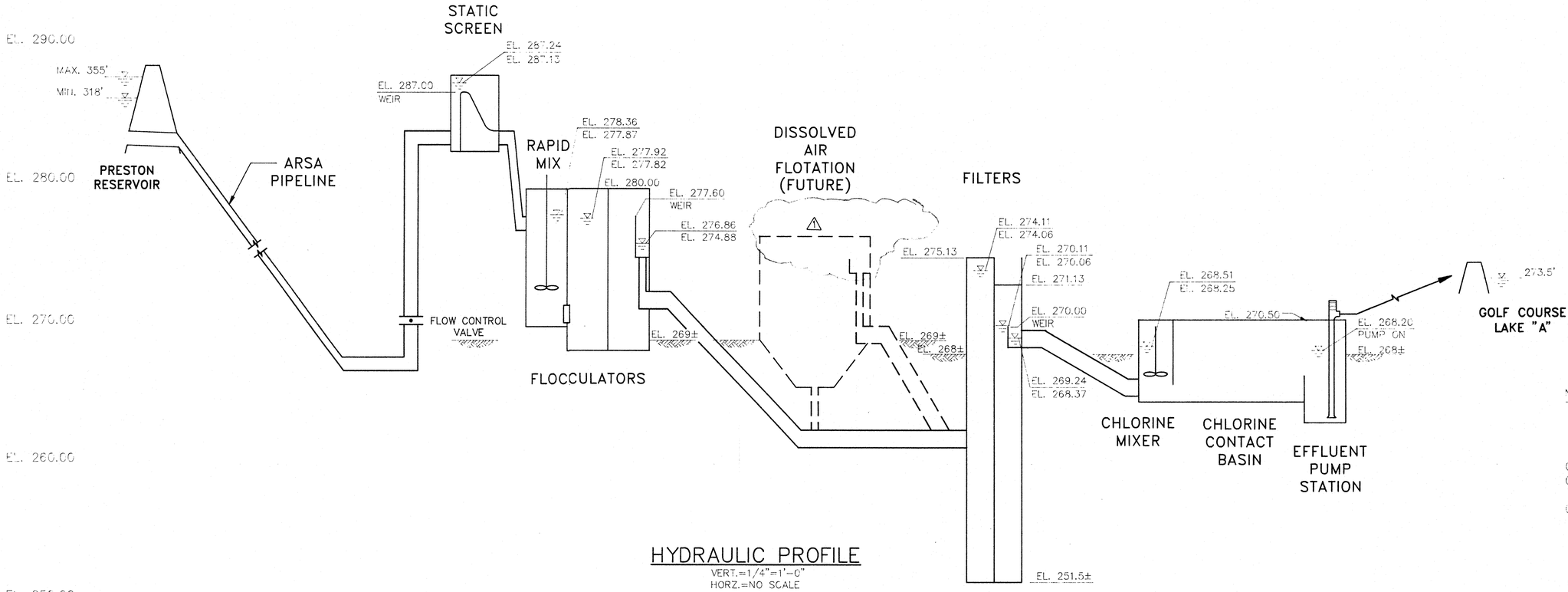
Nolte and Associates. March 1992. *City of Ione, Castle Oaks Wastewater Reclamation Plant*, Record Drawings.

Attachment A

As-Built Drawing Set Excerpts



PROCESS FLOW DIAGRAM



HYDRAULIC PROFILE

VERT.=1/4"=1'-0"
HORZ.=NO SCALE

NOTES FOR HYDRAULIC PROFILE

EL. 274.11 WSEL AT QMAX
EL. 274.06 WSEL AT QMIN

QMAX = 1.5 MGD
QMIN = 0.6 MGD

ONE FILTER OUT OF SERVICE

UNAUTHORIZED CHANGES & USES

CAUTION: The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. All changes to the plans must be in writing and must be approved by the preparer of these plans.

REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

DATE:	DEC 1991
SCALE:	AS NOTED
DRAWN BY:	K.C. HAYES
CHECKED BY:	C.C. LEKVEN
PROJ. MGR.:	DAVE RICHARD
PROJ. ENGR.:	C.C. LEKVEN

NO.	BY	DATE	REVISIONS
1		3/2/92	ADDENDUM 3

NOLTE and ASSOCIATES
Engineers / Planners / Surveyors
■ Sacramento (916) 641-1500 □ San Diego (619) 278-9392 □ San Jose (408) 287-3460 □ Walnut Creek (415) 934-8060

CITY OF IONE
CASTLE OAKS WASTEWATER RECLAMATION PLANT
COI 006960

PROCESS FLOW DIAGRAM & HYDRAULIC PROFILE

SHEET G1.2
OF SHEETS
JOB NO. 2853-90-52

DESIGN CRITERIA

PARAMETER	VALUE
INFLUENT CHARACTERISTICS	
DESIGN FLOW	1.2 mgd
TURBIDITY	40 – 60 NTU
SUSPENDED SOLIDS	mg/L
HEADWORKS	
STATIC SCREEN	
NUMBER OF UNITS	1
OPENING SIZE	0.10 IN.
CAPACITY, CLEAN WATER	1,350 gpm
RAPID MIX – FLOCCULATION	
RAPID MIX	
NUMBER OF CHAMBERS	1
VOLUME	357 gal
DETENTION TIME AT 1.2 mgd	26 sec
SIDEWATER DEPTH	5.3 ft
NUMBER OF RAPID MIXERS	1
MAXIMUM VELOCITY GRADIENT	750 sec^{-1}
MAXIMUM MIXER SPEED	500 rpm
FLOCCULATION	
NUMBER OF COMPARTMENTS	2
DETENTION TIME AT 1.2 mgd	20 min
SIDEWATER DEPTH	9.5 ft
NUMBER OF FLOCCULATORS	2
TYPE OF FLOCCULATOR	VERTICAL TURBINE
MAXIMUM VELOCITY GRADIENT	80 sec^{-1}
MAXIMUM FLOCCULATOR SPEED	30 rpm
FILTERS	
TYPE	CONTINUOUS BACKWASH, UPFLOW
NUMBER OF CELLS	4
CELL SIZE	100 ft^2
TOTAL FILTER AREA	400 ft^2
MEDIUM CHARACTERISTICS	
DEPTH	80 inches
SAND DIAMETER	1.4 mm
UNIFORMITY COEFFICIENT	1.5
FILTRATION RATE	
FOUR CELLS IN OPERATION	2.08 gpm/ft^2
THREE CELLS IN OPERATION	2.78 gpm/ft^2
AIRLIFT COMPRESSOR	
TYPE	SINGLE STAGE RECIPROCATING
NUMBER	2
CAPACITY	35 cfm
PRESSURE	35 psi
MOTOR SIZE	20 hp

PARAMETER	VALUE
CHLORINE CONTACT BASIN	
CHLORINE MIXING	
NUMBER OF CHAMBERS	1
VOLUME PER CHAMBER	209 gal
DETENTION TIME AT 1.2 mgd	15 sec
SIDEWATER DEPTH	3.1 ft
NUMBER OF CHLORINE MIXERS	1
MINIMUM VELOCITY GRADIENT	500 sec^{-1}
MAXIMUM MIXER SPEED	500 rpm
CHLORINE CONTACT BASIN	
VOLUME	100,000 gal
DETENTION TIME AT 1.2 mgd	2 hrs
SIDEWATER DEPTH	6 ft
ALUM FEED SYSTEM	
STORAGE TANKS	
NUMBER	2
TYPE	CROSS–LINKED POLYETHYLENE
VOLUME, EACH	5,000 gal
METERING PUMPS	
DESIGN DOSE	100 mg/L
NUMBER	2
CAPACITY, EACH	10 gph
TYPE	MECHANICAL DIAPHRAGM
CONTROL	FLOW PACED
POLYMER FEED SYSTEM	
DESIGN DOSE	1 – 5 mg/L
AUTOMATIC LIQUID POLYMER DILUTION UNITS, NUMBER	2
CAPACITY, EACH	1.0 gph
TYPE OF POLYMER	EMULSION
EFFLUENT PUMPING	
EFFLUENT PUMPS	
NUMBER OF PUMPS	2
TYPE	VERTICAL TURBINE
CAPACITY, EACH	850 gpm @ 35 ft. TDH
MOTOR SIZE	15 hp

PARAMETER	VALUE
CHLORINATION	
CHLORINE STORAGE/FEED	
TYPE	LIQUID SODIUM HYPOCHLORITE
STORAGE TANK, NUMBER	1
VOLUME, EACH	3,000
CHLORINE DOSAGE	15 mg/L
METERING PUMPS	
NUMBER	2
CAPACITY, EACH	0–12 gph
TYPE	MECHANICAL DIAPHRAGM
CONTROL	COMPOUND LOOP
RESIDUAL ANALYZERS, NUMBER	1
PLANT WATER	
PLANT WATER PUMPS	
NUMBER OF PUMPS	2
TYPE	VERTICAL TURBINE
CAPACITY, EACH	125 gpm @ 161 ft. TDH
MOTOR SIZE	10 hp
HYDROPNEUMATIC TANK VOLUME	528 gallons
TYPE	BLADDER
PLANT HYDRAULIC	
DESIGN FLOWS	
FILTER INFLUENT PIPING, Q MAX.	1.5 mgd
PLANT DRAIN, Q MAX.	1,000 gpm

UNAUTHORIZED CHANGES & USES

CAUTION: The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. All changes to the plans must be in writing and must be approved by the preparer of these plans.

DATE: DEC 1991
SCALE: AS NOTED
DRAWN BY: K.C. HAYES
CHECKED BY: C.C.LEKVEN
PROJ. MGR.: DAVE RICHARD
PROJ. ENGR.: C.C.LEKVEN

NO.	BY	DATE	REVISIONS
6			
5			
4			
3			
2			
1			

NOLTE and ASSOCIATES
Engineers / Planners / Surveyors
■ Sacramento (916) 641-1500 □ San Diego (619) 278-9392 □ San Jose (408) 287-3400 □ Walnut Creek (415) 934-8060

CITY OF IONE
CASTLE OAKS WASTEWATER RECLAMATION PLANT
COI 006961

DESIGN CRITERIA

SHEET G1.3 OF SHEETS
JOB NO. 2853-90-52

DATE: XX, 1991
XK-G13.DWG

ATTACHMENT E

Amador Regional Sanitation Agency
2024 Individual Water Balance Update

2024 COGC Recycled Water Demands TM
by West Yost Engineers

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City of Ione
P.O. Box 398
1 E. Main Street
Ione, CA 95640

John Baum, P.E. (sent via email: John.Baum@waterboards.ca.gov)
Assistant Executive Officer, Rancho Cordova Office
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, #200
Rancho Cordova, CA

Subject: Certification Letter for Castle Oaks Golf Course Recycled Water Demands

Dear Mr. John Baum,

On August 14, 2024, the Central Valley Water Quality Control Board (Regional Board) issued a 13267 Order letter to the City of Ione (City), Amador Regional Sanitation Agency (ARSA) and Portlock International Ltd. (Portlock), the three entities permitted the Regional Board under Water Reclamation Requirement Order 93-240 (WRRs) to land apply recycled water from the Castle Oaks Water Reclamation Facility (COWRF) to the Castle Oaks Golf Course (golf course). The City owns and operates the COWRF, which provides the recycled water to the golf course. The City also owns the golf course, which is leased and operated by Portlock. ARSA is permitted to supply water to the COWRF to meet the irrigation needs of the golf course.

The 13267 Order requires that the three WRRs permittees submit an updated water balance for the ARSA system to the Regional Board by December 13, 2024. The letter specifies six items (A through F) that must be provided. Most of the required information under the 13267 Order does not pertain to the COWRF or golf course operations. Consequently, ARSA is leading the development of the response required under the 13267 Order, which will be presented separately. The attached *Castle Oaks Golf Course Recycled Water Demands Technical Memorandum* (Water Demands TM) only addresses the requirements under Item B of the 13267 Order, which states:

> *The acreage and agronomic rate at which recycled water can be applied to the Castle Oaks Golf Course without violating setback requirements, Title 22 requirements, impacting groundwater, or causing runoff to surface water. These numbers and calculations should be provided and certified by Ione and Portlock*

International LTD. Supporting documentation and references must be included in the submittal. Information regarding tailwater control/return and monitoring plans for compliance with applicable land application area requirements must also be included.

The Water Demands TM provides information and supporting documentation for the following topics:

- Historical and theoretical influent flows to the COWRF,
- Historical and theoretical recycled water use at the Golf Course,
- Agronomic water demands of the Golf Course,
- Storage capacity and operation of the Golf Course recycled water storage ponds, and
- Golf Course tailwater and overspray control and monitoring – including BMPs to minimize runoff or overspray and practices to improve the application of recycled water to the use area.

The City of Ione has reviewed the contents of the attached Water Demands TM and provide the following certification statement:

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Sincerely,

George Lee
City Manager
City of Ione

CC: Kenny Croyle, PE, WDRS and Title 27 Compliance and Enforcement Unit, CVRWQCB

Howard Hold, Senior Engineering Geologist, WDRS and Title 27 Compliance and Enforcement Unit, CVRWQCB

Scott Armstrong, CVRWQCB, Rancho Cordova

WEST YOST
Water. Engineered.

1001 Galaxy Way
Suite 310
Concord CA 94520

925.949.580
925.949.5845 fax
westyost.com

TECHNICAL MEMORANDUM

DATE: December 10, 2024

Project No.: 988-50-24-10
SENT VIA: EMAIL

TO: George Lee, City of Ione

CC: Daniel Griffin, Castle Oaks Golf Course
Justin Granados, WaterStone Service

FROM: Allie Ahern, EIT

REVIEWED BY: Kathryn Gies, PE, RCE #65022

SUBJECT: Castle Oaks Golf Course Recycled Water Demands

This technical memorandum (TM) provides information and supporting documentation related to water needs of the Castle Oaks Golf Course (golf course), which receives recycled water from the Castle Oaks Water Reclamation Facility (COWRF). The purpose of this TM is to inform development of a water balance for the Amador Regional Sanitation Authority (ARSA) wastewater disposal system. The following topics are addressed:

- Background Information
- Golf Course Irrigable Acreage
- Golf Course Storage Ponds
- Golf Course Agronomic Water Demands
- COWRF Influent Flows
- Golf Course Tailwater and Overspray Control and Monitoring

BACKGROUND INFORMATION

This section provides background information relevant to this TM. The following topics are addressed:

- Regulatory History
- Applicable Regulatory Standards for Water Balances
- Golf Course Demands vs. COWRF Influent Flows

Regulatory History

The City of Ione (City), ARSA and Portlock International Ltd. (Portlock) are the three entities permitted the Central Valley Water Quality Control Board (Regional Board) under Water Reclamation Requirement Order 93-240 (WRRs) to land apply recycled water from the COWRF to the golf course. The City owns and operates the COWRF, which provides the recycled water to the golf course. The City also owns the golf course, which is leased and operated by Portlock. ARSA is permitted to supply water to the COWRF to meet the irrigation needs of the golf course.

On August 14, 2024, the Regional Board issued a 13267 Order letter to the three WRRs permittees that requires the submission of an updated water balance for the ARSA system to the Regional Board by December 13, 2024. The letter specifies six items (A through F) that must be provided. This TM addresses the requirements under Item B of this letter, which states:

> *The acreage and agronomic rate at which recycled water can be applied to the Castle Oaks Golf Course without violating setback requirements, Title 22 requirements, impacting groundwater, or causing runoff to surface water. These numbers and calculations should be provided and certified by Ione and Portlock International LTD. Supporting documentation and references must be included in the submittal. Information regarding tailwater control/return and monitoring plans for compliance with applicable land application area requirements must also be included.*

Applicable Regulatory Standards for Water Balances

The 13267 Order states that the water balance must be in compliance with the requirements and guidance of the Regional Board's guidance document *Requirements for Water Balance Update and Calibration*, which is provided as Attachment A to the 13267 Order. Several of the procedures defined in this guidance document are applicable to the development of this TM, as follows:

<u>Requirements for Water Balance Update and Calibration, Section 4:</u>

> *The normal operations and maintenance of land application areas should be considered. [Operations and Maintenance] O&M Manuals should be referenced as well as historical monitoring data (i.e. percolation rates, observed standing water). Specific conditions of the [WRRs] should also be taken into account. The following should be taken into consideration:*
>
> *A. Recycling area/land application area/disposal system hydraulic loading rates should be distributed monthly in accordance with expected seasonal variations based on crop evapotranspiration rates.*
>
> *B. The distribution of precipitation (i.e. storm intensity, light rain over a lot of days or heavy rain over a few days), as well as other factors such as wind and saturated conditions must be taken into account when determining the number of days a disposal system can be operated each month. The most reliable way to estimate this is based off of historical records from a water year of intensity similar to that which is being modeled.*
>
> *C. It should be specified whether the tailwater is collected, and if so if it is returned to the sprayfields directly or to one of the ponds.*
>
> *D. If applicable, storm water runoff shall be accounted for in the tailwater return calculations.*
>
> *E. Maximum disposal capacity of land application areas should be based on soil studies, cropping plans, percolation studies, and/or operator notes.*

Requirements for Water Balance Update and Calibration, Section 5:

A. All water balances shall start on 1 October and end on 30 September.

…

C. The water balance should include an assessment of the facility's capacity and performance during a normal water year and during a year with a total annual precipitation for a return period of 100 years.

D. Local precipitation data for the 100-year annual return period, distributed monthly in accordance with mean monthly precipitation patterns shall be used. However, periods of high intensity storms should also be considered in the calculations.

E. All water balances should be based on all available data. All data should also be quality controlled and used with discretion.

…

G. For each wastewater treatment, storage, or disposal pond and containment structure, provide the following information:

a. Identification (name) and function of the pond.

b. Surface area, depth, and volumetric capacity at two feet of freeboard.

c. Height (relative to surrounding grade), crest width, interior slope, and exterior slope of each berm or levee.

d. Materials used to construct each berm or levee.

e. Description of engineered liner, if any. Include a copy of the Construction Quality

f. Estimated steady state percolation rate for each unlined pond.

g. Depth to shallow groundwater below the base and pond inverts.

h. Precipitation and evapotranspiration data shall be from recognized stations. The source of this information shall be provided, including a link to the data.

i. Overfilling/overflow prevention features.

j. Operation and maintenance procedures.

Golf Course Demands vs. COWRF Influent Flows

During the COWRF tertiary treatment process, a fraction of the influent to the COWRF is discarded as filter backwash and sent to the City of Ione's Wastewater Treatment Facility (WWTF). The remaining influent to the COWRF is treated to tertiary standards and recycled at the golf course. Therefore, the influent flow to the COWRF needs to be greater than the agronomic water demand of the golf course to accommodate the losses due to filter backwash, and the ARSA water balances need to include the portion of influent sent as filter backwash to the WWTF.

The City is concurrently in the process of preparing a water balance for its WWTF in accordance with a separate 13267 Order. The WWTF water balance will also need to account for the COWRF backwash flows. Accordingly, this TM presents calculations that define both the COWRF influent flows needed to meet the golf course agronomic demands for use in the ARSA water balance and the backwash flow from the COWRF to the WWTF for use in the WWTF water balance.

GOLF COURSE IRRIGABLE ACREAGE

The irrigable acreage of the golf course was determined based on inspection of the golf course irrigation system and discussions with staff. This area was mapped and quantified using GIS mapping and data processing tools. Figure 1 presents the map created. The following areas of the golf course were not included in the calculated irrigable acreage:

- natural, undeveloped areas surrounding Mule Creek and Sutter Creek
- areas abutting residences surrounding the golf course; some of these areas are irrigated by residents while others remain unirrigated
- hardscape and permanent water features

The total irrigable area of the golf course was determined to be 130 acres.

COGC_TM_Fig1: W:\Clients\988 City of Ione\50-23-05 Title 22 Update\GIS\Title 22 Update\Title 22 Update.aprx - aahern - 11/6/2024

City of Ione Boundary

Golf Course Irrigable Area

Lakes

PS Irrigation Pump Station

Prepared by:

WEST YOST

0 800 1,600 US Feet

Prepared for:

City of Ione

Castle Oaks Golf Course

Recycled Water Demands

Castle Oaks Golf Course Irrigable Area

Fig 100

GOLF COURSE STORAGE PONDS

The golf course has nine ponds that can be filled with recycled water during the irrigation season. The ponds serve as aesthetic features and water hazard obstacles for the golf course and are used to hold recycled water before it is pumped to the golf course. Limited construction information is available for the ponds, but the ponds are understood to be unlined and constructed of native soil material. Estimates of the depth, volume and percolation rates of the ponds are not available. However, it is estimated that on average, the depth of groundwater below the golf course ranges from 8 to 13 feet. The surface area of each pond has been estimated using GIS mapping and data processing tools and is presented in Table 1.

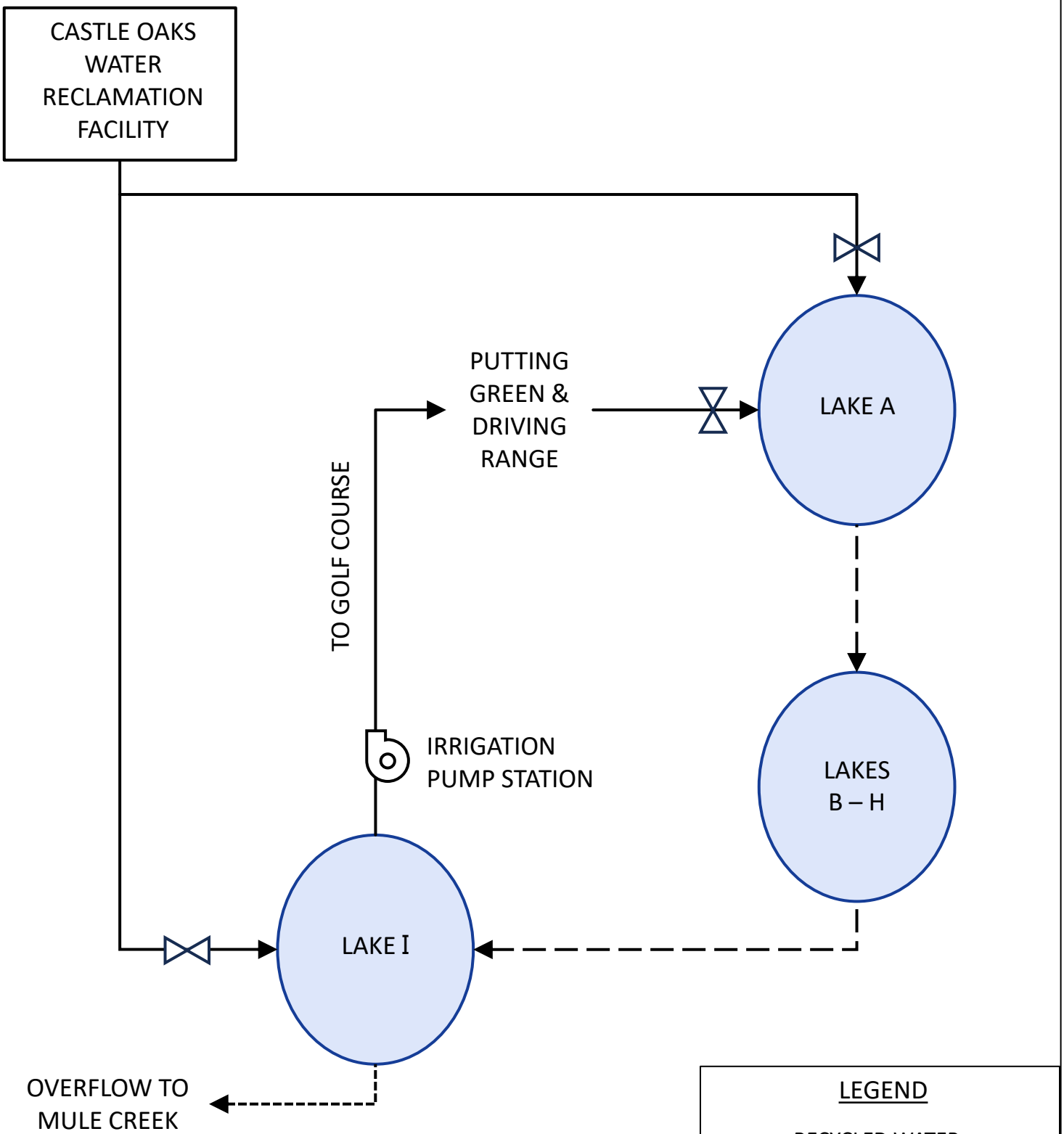
Table 1. Golf Course Storage Pond Surface Area

Pond Name	Surface Area, acres
Lake A	0.8
Lake B	1.2
Lake C	0.4
Lake D	1.1
Lake E	2.2
Lake F	1.1
Lake G	1.6
Lake H	1.4
Lake I	3.1

The ponds are hydraulically connected to each other. The maximum water level of each pond is controlled by a fixed standpipe located in an access port approximately 20 to 100 feet from the lake's edge. Water overflowing the standpipe of the upstream lake is conveyed by to the following lake downstream, with Lake A being the furthest upstream lake, and Lake I being the furthest downstream lake. The Lake I overflow standpipe connects to a wetlands area that is tributary to the nearby surface water body Mule Creek. Figure 2 presents a schematic of the recycled water irrigation system.

Recycled water from the COWRF can be pumped directly to either Lake I or Lake A. Recycled water is then pumped from Lake I to the golf course irrigation system. Under current operations, recycled water is sent by default to Lake I. Golf course staff relate that recycled water is only pumped to Lake A for short periods during the irrigation season, when golf course demands are not keeping up with flows from the COWRF and Lake I is at risk of overflowing. Typically, recycled water that is directed to Lake A will remain in the Lake until it has percolated or evaporated. However, recycled water can discharge from Lake A to the downstream lakes if Lake A overflows. However, golf course staff indicate that the amount of recycled water flow sent to Lake A is not enough to result in overflows.

Figure 2. Castle Oaks Golf Course Recycled Water Storage and Irrigation System Schematic



The ponds also serve as catchment for stormwater runoff the golf course. During the winter rainfall season, stormwater runoff will fill the nine ponds, and they will eventually overflow to Mule Creek. To prevent the discharge of recycled water to Mule Creek, recycled water is only delivered to the golf course during the irrigation season (typically between April and October). This allows for water in Lake I to percolate and evaporate before the rainy season begins. In addition, the recycled water remaining in Lake I at the end of the irrigation season is diluted with 1.2 million gallons of potable water. Golf course staff reported that this practice was developed in partnership with the California Department of Health Services1 to minimize the potential for discharge of recycled water to surface waters.

GOLF COURSE AGRONOMIC WATER DEMANDS

Calculation Procedures

The steps and major assumptions used to determine the rate at which recycled water can be supplied to the golf course are described below.

Climate Data

Rainfall data reported by the Ione National Climate Data Center (NCDC) weather station #0442832 was used to define the average annual rainfall, 1-in-100-year annual rainfall, and the monthly distributions of rainfall, as follows:

- The average rainfall year was defined as having a total rainfall of 22.0 inches.
- The 1-in-100 rainfall year was defined as having a total rainfall of 41.1 inches.
- The monthly distributions were defined based on the 1906 to 1977 monthly Normal rainfall distribution values, with the Normal values being statistically determined values reported by the California Department of Water Resources (DWR).

DWR defined all of these values. This information on is documented in Attachment A and summarized in Table 2.

Reference evapotranspiration (ET) for each month is based on long-term monthly average ET values for the Plymouth California Irrigation Management Information System (CIMIS) Station #227, located approximately 13 miles northeast of the golf course. This information is documented in Attachment A of this TM and summarized in Table 2, along with the monthly total rainfall values for the average and 1-in-100 rainfall years.

[1] CDPH has since been incorporated into the State Water Board as the Division of Drinking Water (DDW).

Table 2. Applicable Climate Data

Month	Average Rainfall,[(a)] inches	1-in-100 Year Rainfall,[(a)] inches	Reference ET,[(b)] inches
October	1.15	2.15	3.24
November	2.81	5.24	1.68
December	3.54	6.58	1.21
January	5.09	9.48	1.48
February	3.14	5.86	1.95
March	3.20	5.95	3.02
April	1.75	3.26	4.57
May	0.63	1.18	5.97
June	0.23	0.43	7.19
July	0.07	0.13	7.64
August	0.13	0.24	6.98
September	0.33	0.62	4.99
Total	**22.1**	**41.1**	**49.9**

(a) NCDC weather station #044283
(b) Plymouth CIMIS station #227

Crop ET

Monthly crop ET values for the golf course were calculated by multiplying the reference ET values from Table 2 by a representative crop coefficient. Grasses grown on the golf course include:

- perennial rye grass
- poa annua
- creeping bent grass
- tall fescue
- Bermuda grass

Apart from Bermuda grass, all grasses used on the golf course are considered cool season grasses. Meyer and Gibeault at the University of California, Irvine report monthly crop coefficients for cool season grasses (see of Attachment B). The average of these reported monthly crop coefficients for April to October, calculated to be 0.88, was used as a representative crop coefficient for all months.

Pond ET

Monthly ET values for the storage pond Lake I were set equal to the respective monthly reference ET values.

Historical Recycled Water Demands

Evaluation of historical recycled water demands was based on the following:

- To properly maintain the golf course greens, recycled water is delivered to the COWRF and golf course solely based on golf course demands.
- Golf course flow data is tracked by golf course staff, and total monthly and annual flow volumes based on this data are shown in Table 3.
- The historical average volume of recycled water delivered was calculated for each calendar month and was used to calibrate and confirm the theoretical recycled water demand for the golf course.

Table 3. Historical Golf Course Recycled Water Demand

Month	Volume of Recycled Water Used, million gallons (MG)									Average, acre-feet
	2017	2018	2019	2020	2021	2022	2023	2024	Average	
October	16.5	8.4	16.7	14.5	8.2	9.1	11.9	20.3[a]	12.2	37.4
November	0	3.2	13.9	6.1	0	9.1	0	2.6[a]	5.3	16.4
December	0	0	0	0	0	0	0	0	0	0
January	0	0	0	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0	0	0	0
April	0	0	0	1.1	12.7	8.1	0.9	0	2.9	8.8
May	18.1	19.1	15.1	14.1	25.2	12.1[b]	15.8	17.6	17.9	54.9
June	25.6	26.5	21.1	19.6	21.4	10.8[b]	22.0	28.3	23.5	72.2
July	29.4	29.0	27.2	26.6	31.7	20.4	25.1	28.3	27.2	83.6
August	29.1	29.8	26.5	25.8	23.3	21.0	22.0	26.1	25.5	78.1
September	23.0	24.1	24.1	16.2	9.0[c]	15.7	15.0	24.2	20.3	62.4
Total, MG	**141.7**	**140.2**	**144.6**	**123.9**	**131.5**	**106.3**	**118.1**	**147.5**	**134.8**	**413.8**

(a) Values excluded from average calculation. The COWRF influent flow meter failed on October 9, 2024 and COWRF staff requested that water be sent to the COWRF at a steady rate of 800 gallons per minute until the end of the irrigation season in mid-November. Therefore, during this period, there was less ability to match the effluent flows from the COWRF to golf course agronomic demands and it is not clear these are representative values.

(b) Values excluded from average calculation. There was limited recycled water supply available from ARSA during the period of May to June 2022 and the golf course was under-irrigated.

(b) Value is excluded from average because it is anomalous when compared with September recycled water use volumes of other years. Operations staff responsible for this data are not available to confirm its accuracy.

Theoretical Recycled Water Demands

Theoretical recycled water demands for the golf course were developed based on the following:

- Theoretical agronomic demands are calculated by multiplying the difference between the calculated monthly crop ET and monthly rainfall values by the total area of the golf course (130 acres) and dividing by an irrigation efficiency factor. For months with more precipitation than ET, the irrigation demand was set equal to zero.

- Irrigation efficiencies for solid set spray irrigation systems like that used on the golf course can range from 60 to 85 percent (see Attachment C, Table 8.2b). A calibration process, described in the next section, has been used to define the irrigation efficiency for this site.
- Theoretical evaporative losses from the storage ponds are calculated by multiplying the difference between the reference ET and monthly rainfall values by the total area of the impoundment.
- As noted previously, recycled water is only sent to and pumped from Lake I. Therefore, evaporative losses from only Lake I (3.1 acres) are included.
- Losses are calculated for months only when recycled water is delivered to the golf course.
- There have been no attempts to quantify percolation losses from Lake I. Therefore, percolation losses are assumed to be zero.
- Total theoretical recycled water demands are the sum of the theoretical monthly golf course agronomic demands and the theoretical monthly evaporative losses from Lake I.

Average Year Theoretical Recycled Water Demand Calibration

The site-specific irrigation efficiency factor used to calculate the theoretical irrigation demand is determined by adjusting the irrigation efficiency value used in the calculation of the average-year theoretical recycled water demand until the demand matches the historical recycled water supplied.

The resulting irrigation efficiency is 84 percent, on the upper end of the typical range for spray irrigation cited above. ***This calibration process demonstrates that the golf course irrigation system is very efficient and experiences limited losses.***

1-in-100 Year Recycled Water Demand

The 100-year theoretical recycled water demand is calculated using the procedures described above but applying 1-in-100-year rainfall values and retaining the 84 percent irrigation efficiency determined from the average year water balance.

Agronomic Water Demands

The calculated average rainfall year theoretical demand to be used in the water balance analysis is shown in Table 4. The calculated average 1-in-100-year theoretical demand to be used in the water balance analysis is shown in Table 5.

The historical data show irrigation demands in November, but the theoretical demands do not indicate a need for irrigation water in this month. This discrepancy likely reflects the fact that rainfall typically does not begin until late November in this area, while there are still irrigation demands earlier in the month. Despite this discrepancy, the annual theorical demand matches closely to the historical values for the average year. Therefore, the methodology applied provides an accurate estimate for purposes of developing an annual water balance for COWRF.

Table 4. Monthly Golf Course Recycled Water Demand for an Average Rainfall Year

Month	(1) Climate Values, inches: Rainfall	(2) Climate Values, inches: Reference ET	(3) Historical Demand, acre-feet	(4) Theoretical Average-Year Demand, acre-feet: Irrigation Demand	(5) Theoretical Average-Year Demand, acre-feet: Pond Losses	(6) Theoretical Average-Year Demand, acre-feet: Total Demand
October	1.15	3.24	37.4	21.9	0.5	22.4
November	2.81	1.68	16.4	0	0	0
December	3.54	1.21	0	0	0	0
January	5.09	1.48	0	0	0	0
February	3.14	1.95	0	0	0	0
March	3.20	3.02	0	0	0	0
April	1.75	4.57	8.8	29.3	0.7	30.0
May	0.63	5.97	54.9	59.6	1.4	61.0
June	0.23	7.19	72.2	78.6	1.8	80.4
July	0.07	7.64	83.6	85.8	2.0	87.8
August	0.13	6.98	78.1	77.5	1.8	79.3
September	0.33	4.99	62.4	52.4	1.2	53.6
Total, acre-feet per year (AFY)	**22.0**	**49.9**	**413.8**	**405.1**	**9.4**	**414.5**

Notes:
(1) 1906-1977 monthly rainfall normals for Ione NCDC weather station #044283
(2) Long-term monthly average reference ET from Plymouth CIMIS station #227
(3) Average of monthly irrigation volumes applied to the golf course from 2017 to 2024 from Table 3
(4) = (irrigated area of 130 acres) x [Column 2 x (crop coefficient of 0.88) - Column 1] / (irrigation efficiency of 0.84) / 12 inches/foot
(5) = (storage pond area of 3.1 acres) x (Column 2 - Column 1) / 12 inches per foot
(6) = Column 4 + Column 5

Table 5. Monthly Golf Course Recycled Water Demand for a 1-in-100 Rainfall Year

	(1)	(2)	(3)	(4)	(5)
	Climate Values, inches		Theoretical 100-Year Demand, acre-feet		
Month	Rainfall	Reference ET	Irrigation Demand	Pond Losses	Total Demand
October	2.15	3.24	9.0	0.3	9.3
November	5.24	1.68	0	0	0
December	6.58	1.21	0	0	0
January	9.48	1.48	0	0	0
February	5.86	1.95	0	0	0
March	5.95	3.02	0	0	0
April	3.26	4.57	9.8	0.3	10.1
May	1.18	5.97	52.5	1.2	53.7
June	0.43	7.19	76.1	1.7	77.8
July	0.13	7.64	85.0	1.9	86.9
August	0.24	6.98	76.1	1.7	77.8
September	0.62	4.99	48.6	1.1	49.7
Total, AFY	**41.1**	**49.9**	**357.1**	**8.2**	**365.3**

Notes:

(1) = 100-year return period annual total distributed monthly in proportion to 1906-1997 monthly Normals for Ione NCDC weather station #044283

(2) Long-term monthly average reference ET from Plymouth CIMIS station #227

(3) = (irrigated area of 130 acres) x [Column 2 x (crop coefficient of 0.88) - Column 1] / (irrigation efficiency of 0.84) / 12 inches per foot

(4) = (storage pond area of 3.1 acres) x (Column 2 - Column 1) / 12 inches/foot

(5) = Column 4 + Column 5

COWRF INFLUENT FLOWS

Calculation Procedures

The theoretical influent flow to the COWRF is calculated for each month using the following formula:

Golf Course Irrigation Demand/(1-backwash percentage)

The Golf Course Irrigation Demands were discussed in the previous section. The backwash percentages are calculated based on historical COWRF influent and backwash flow data, as described in the sections below.

Historical COWRF Influent Flows

Historical monthly influent flows to the COWRF are shown in Table 6. Influent flows beginning in April 2022 are reported in the monthly COWRF discharge monitoring reports (DMRs). Prior to 2022, COWRF DMRs did not present influent flows. However, the influent flows were determined from available golf course demand data and backwash flow data.[2]

Table 6. Historical COWRF Influent Flows

Month	Volume of COWRF Influent Flow, MG								
	2017	2018	2019	2020	2021	2022	2023	2024	Average
October	19.5	10.3	20.7	17.9	10.5	10.9	19.2	27.7[(a)]	17.1
November	0	4.8	15.8	7.8	0	11.3	9.3	4.0[(a)]	8.8
December	0	0	0	0	0	0	0	0	0
January	0	0	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0	0	0
March	0	0	0	0	0	2.0	0	0	2.0
April	0	0	0	0.9	14.4	12.7	2.1	0	7.5
May	20.4	21.6	17.1	16.8	29.1	14.0[(b)]	18.8	19.8	19.7
June	29.1	30.1	23.7	23.0	24.7	13.1[(b)]	25.8	32.0	25.2
July	34.1	33.5	31.2	30.2	35.7	23.1	29.5	32.1	31.2
August	33.3	36.9	33.3	30.1	27.0	23.2	27.4	32.3	30.3
September	27.1	27.7	28.1	20.2	11.2[(b)]	18.5	21.4	28.0	22.8
Total, MG	**163.4**	**164.9**	**169.7**	**146.7**	**152.7**	**128.8**	**153.5**	**174.7**	**164.5**

(a) Values excluded from this evaluation. The COWRF influent flow meter failed on October 9, 2024. Reported influent is an estimate of the actual flow received during this period.

(b) Although values reported in these months are not representative of typical influent flows (and thus irrigation demands), they are useful in determining the percentage of backwash flow generated. Therefore, these values are not excluded from this portion of the analysis.

[2] To determine influent flows prior to April 2022, monthly COWRF effluent flows from the DMRs were compared to golf course flows and filter backwash flows. If the reported COWRF effluent flow was larger than the golf course flow, it was confirmed to be actual influent flow by verifying that it was equal to the sum of the golf course influent flow and the filter backwash flow. If the reported COWRF effluent flow was equivalent to the golf course flow, the COWRF influent flow was calculated by summing the COWRF effluent flow and filter backwash flow. The 2017 COWRF influent flows were calculated by summing monthly golf course influent flows and filter backwash flows because COWRF DMRs were not available.

Historical COWRF Backwash Flows

Historical monthly filter backwash flows from the COWRF are shown in Table 7 .

Table 7. Historical COWRF Filter Backwash Flows

Month	Volume of COWRF Filter Backwash Flow, MG								
	2017	2018	2019	2020	2021	2022	2023	2024	Average
October	3.0	1.9	4.0	3.4	2.4	1.7	7.3[(a)]	5.0	3.1
November	0	1.1	1.9	1.7	0	2.3	4.1[(a)]	1.7	1.2
December	0	0	0	0	0	0	0	0	0.0
January	0	0	0	0	0	0	0	0	0.0
February	0	0	0	0	0	0	0	0	0.0
March	0	0	0	0	0	0	0	0	0.0
April	0	0	0	0	2.0	2.0	0.1	0	1.4
May	2.2	2.5	1.9	2.7	3.9	1.9	3.0	2.2	2.5
June	3.4	3.6	2.5	3.8	3.4	2.0	3.7	3.6	3.2
July	4.7	4.4	3.9	3.6	4.0	2.7	4.4	3.8	3.9
August	4.2	3.9	3.9	4.3	3.8	2.7	5.4[(a)]	5.1	4.0
September	4.1	3.5	4.0	4.0	2.6	2.2	6.4[(a)]	5.5	3.7
Total, MG	**21.7**	**20.9**	**22.1**	**23.4**	**21.9**	**17.5**	**34.4**	**26.8**	**23.5**

(a) Values were not used in calculated average. Operations staff were performing excessive backwashing of the filters. This practice has since ceased.

Filter Backwash Flow Percentages

The percentage of COWRF influent flow that was discarded as backwash flow to the WWTF each month was calculated by dividing the backwash flow by the influent flow. Table 8 shows the results of this calculation. From the percentages shown, a monthly average was calculated. Monthly average backwash percentages range from 13 to 20 percent.

Table 8. Historical COWRF Filter Backwash Flow Percentage

Month	Filter Backwash Flow as a Percentage of Influent Flow, percent								
	2017	2018	2019	2020	2021	2022	2023	2024	**Average**
October	15	18	19	19	23	16	38[a]	18[b]	**18**
November	-[c]	23	12	22	-	20	44[a]	41[b]	**19**
December	-	-	-	-	-	-	-	-	**-**
January	-	-	-	-	-	-	-	-	**-**
February	-	-	-	-	-	-	-	-	**-**
March	-	-	-	-	-	-	-	-	**-**
April	-	-	-	-	14	16	7[d]	-	**15**
May	11	12	11	16	13	13	16	11	**13**
June	12	12	11	16	14	15	15	11	**13**
July	14	13	13	12	11	12	15	12	**13**
August	13	11	12	14	14	12	20[a]	16	**13**
September	15	13	14	20	23	12	30[a]	20	**17**

(a) Values were not used in calculated average. Operations staff were performing excessive backwashing of the filters. This practice has since ceased.

(b) Values excluded from this evaluation. The COWRF influent flow meter failed on October 9, 2024. Reported influent is an estimate of the actual flow received during this period.

(c) "-" indicate there were no flows to the COWRF during this period.

(d) The backwash percentage during April 2023 was abnormally low. Influent flow to the COWRF began six days before the end of the month and effluent and backwash were only discharged on two of the six days. This value was not used in the calculated average.

Theoretical COWRF Influent Flow

The calculated average rainfall year theoretical flow to the COWRF to be used in the water balance analysis is shown in Table 9. The calculated average 1-in-100-year theoretical flow to the COWRF to be used in the water balance analysis is shown in Table 10.

Table 9. Monthly COWRF Influent Demand for an Average Rainfall Year

Month	Average-Year Golf Course Recycled Water Demand,[(a)] acre-feet	COWRF Backwash Flow as a Percentage of Influent Flow,[(b)] percent	Average-Year COWRF Influent Flow,[(c)] acre-feet
October	22.4	18	27.3
November	0	19	0
December	0	-	0
January	0	-	0
February	0	-	0
March	0	-	0
April	30.0	15	35.3
May	61.0	13	70.1
June	80.4	13	92.4
July	87.8	13	100.9
August	79.3	13	91.1
September	53.6	17	64.6
Total, AFY	**414.5**	**-**	**481.7**

(a) From Table 4, Column 6
(b) From Average column in Table 8
(c) = Column 1/(1 - Column 2)

Table 10. Monthly COWRF Influent Capacity for a 1-in-100 Rainfall Year

Month	1-in-100-Year Golf Course Recycled Water Demand,[a] acre-feet	COWRF Backwash Flow as a Percentage of Influent Flow,[b] percent	1-in-100-Year COWRF Influent Flow,[c] acre-feet
October	9.3	18	11.3
November	0	19	0
December	0	-	0
January	0	-	0
February	0	-	0
March	0	-	0
April	10.1	15	11.9
May	53.7	13	61.7
June	77.8	13	89.4
July	86.9	13	99.9
August	77.8	13	89.4
September	49.7	17	59.9
Total, AFY	**365.3**	**-**	**423.5**

(a) From Table 5, Column 5
(b) From Average column in Table 8
(c) = Column 1 / (1 - Column 2)

Theoretical COWRF Backwash Percentages and Flows

A calculated theoretical backwash flow from the COWRF to the WWTF will be used in the water balance analysis for the WWTF, based on the influent flows from Table 9 and Table 10 and average historical backwash flow percentages by month from Table 8. The theoretical COWRF backwash flow for an average rainfall year is shown in Table 11. The theoretical COWRF backwash flow for a 1-in-100 rainfall year is shown in Table 12.

Table 11. Monthly COWRF Backwash Flow for an Average Rainfall Year

Month	Average-Year COWRF Influent Flow,[a] acre-feet	COWRF Backwash Flow as a Percentage of Influent Flow,[b] percent	Average-Year COWRF Backwash to WWTF,[c] acre-feet
October	27.3	18	4.9
November	0	19	0
December	0	-	0
January	0	-	0
February	0	-	0
March	0	-	0
April	35.3	15	5.3
May	70.1	13	9.1
June	92.4	13	12.0
July	100.9	13	13.1
August	91.1	13	11.8
September	64.6	17	11.0
Total, AFY	**481.7**	**-**	**67.2**

(a) From Table 9
(b) From Table 8
(c) = Column 1 x Column 2

Table 12. Monthly COWRF Backwash Flow for a 1-in-100 Rainfall Year

Month	1-in-100-Year COWRF Influent Flow,[a] acre-feet	COWRF Backwash Flow as a Percentage of Influent Flow,[b] percent	1-in-100-Year COWRF Backwash to WWTF,[c] acre-feet
October	11.3	18	2.0
November	0	19	0
December	0	-	0
January	0	-	0
February	0	-	0
March	0	-	0
April	11.9	15	1.8
May	61.7	13	8.0
June	89.4	13	11.6
July	99.9	13	13.0
August	89.4	13	11.6
September	59.9	17	10.2
Total, AFY	**423.5**	**-**	**58.2**

(a) From Table 10
(b) From Table 8
(c) = Column 1 x Column 2

GOLF COURSE TAILWATER AND OVERSPRAY CONTROL AND MONITORING

This section provides information about Best Management Practices (BMPs) and monitoring for tailwater and overspray control from the golf course. The following topics are addressed:

- Golf Course Field Monitoring
- Golf Course Best Management Practices
- Golf Course Storage Pond Monitoring

Golf Course Field Monitoring

The City, in coordination with the golf course management, is required to perform daily, weekly, and monthly monitoring of the golf course when recycled water is being applied, as outlined in the WRR's Monitoring and Reporting Program (MRP). These requirements are summarized in Table 13. In addition to the elements outlined below, the daily inspections must note any evidence of erosion, field saturation, runoff or the presence of nuisance conditions.

The MRP was adopted December 21, 2021, and did not become effective until after the end of the 2021 irrigation season. Since its adoption, the MRP requirements related to the golf course operations shown in Table 13 have not been satisfied. The City and golf course staff are currently developing the protocols to implement this monitoring and will initiate the program beginning in the 2025 irrigation season.

Table 13. Golf Course Monitoring Requirements

Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency
Flow	gallons	Continuous	Daily	Monthly
Rainfall[a]	inches	Measurement		
Acreage Applied[b]	acres	Calculated		
Tailwater Runoff Observation	--	Observation		

(a) As measured at the weather station nearest to the disposal site.
(b) Specific disposal fields shall be identified.

Flow

Currently, golf course staff monitor the daily total flow that is applied to the golf course. This flow is measured from the irrigation pump station and recorded in the golf course's central computer system. The measurement can be reported in up to 15-minute increments. Golf course staff report the daily total flows to the City.

Rainfall

Rainfall collects in a plastic rain gage located at the maintenance yard, and golf course staff manually read the gage daily at approximately the same time of day. That measurement is compared to a reported weather station located in the nearby City of Jackson to confirm its accuracy. The onsite, measured rainfall data is reported to the City.

Acreage Applied

The golf course's central computer system has the ability report the areas that are watered each night. These areas are grouped and reported by area category according to the type of plant that is watered. The area categories are:

- Greens
- Tees
- Fairway
- Perimeter
- Rough
- Club House
- Driving Range
- Putting Green

Irrigation generally occurs on all areas of the golf course simultaneously. In rare instances an area category may be watered alone. Starting with the 2025 irrigation season, golf course staff will report the acreage that is watered daily and include that information in the flow report provided to the City monthly.

Tailwater Runoff Observation Monitoring

Starting with the 2025 irrigation season, City staff will inspect the golf course daily for evidence of runoff and overspray. These inspections will occur in the morning, just after irrigation occurs. During these inspections, special attention will be paid to the following five vulnerable areas, which have the most potential for recycled water to escape the use area:

- Castle Oaks Clubhouse
- Areas abutting Mule Creek
- Spyglass Drive near the Irrigation Pump Station
- Castle Oaks Drive and Shakeley Lane intersection
- Near the bathroom by Vista Lane

Monitoring each location will be done through an observatory drive by each location in the early morning. Evidence of runoff or overspray includes wet areas on hardscape sidewalks and roadways surrounding the extents of the landscaped area. If these areas are wet or water appears to be draining from landscape into the gutters, the irrigation system should be further investigated for problems. Inspection logbook entries for the golf course monitoring will be submitted with the monthly monitoring reports.

Golf Course Best Management Practices

Overspray and runoff of recycled water from the use area is minimized and controlled through the implementation of BMPs. Spray irrigation systems are vulnerable to inefficiencies related to runoff or overspray caused by pressure fluctuations, wind, or equipment malfunction. If any part of the system is not working optimally, the result is a less uniform application of water which increases the likelihood of water escaping the recycled water use area. Even the most efficiently designed system must be maintained and constantly monitored to mitigate system avoid problems.

The COWRF BMP strategies include engineered controls and mechanisms to minimize runoff or overspray and practices to improve the application of water to a use area. Specific BMPs employed to control for runoff or overspray include:

- Irrigation is ceased during extended and extensive windy periods.
- Irrigation is avoided when the soil is saturated to prevent runoff.
- All sprinkler heads are uniform in brand, model and nozzle size to apply water as uniformly across the plant material as possible.
- A minimum four-foot distance from neighboring backyards and buildings is maintained as practical throughout areas of the golf course. This has been done through head removal, spray range or arc reduction or elimination of a zone. In areas where the four-foot buffer cannot be maintained and irrigated turf is desired, such as near a tee, hole or walkways, the irrigation water is applied with lower impact heads with a smaller arc radius.
- Irrigation occurs in the evening or early morning hours to avoid public interaction, reduce evaporative loses, and take advantage of calmer wind patterns.
- Good horticultural practices are performed including, mowing, de-thatching, aeration, and pest control as necessary to increase the plant and soil water absorbance.
- Irrigation is applied as close as practical to match the amount of water lost through ET and the soil needs.

- Duration of water application is applied to match percolation rates to reduce runoff.
- Installation of low angle heads have been installed in areas near residential backyards to reduce mist from wind drift of spray.
- Tall plants are present along edges and perimeters to create a plant buffer.
- Regular maintenance is performed of the irrigation system which includes inspecting and repairing leaks.

Golf Course Storage Pond Monitoring

Monitoring of irrigation storage ponds when they contain recycled water is also required under the MRP. These requirements are summarized in Table 14.

Table 14. Golf Course Storage Pond Monitoring Requirements

Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency
Freeboard	feet	Measurement	Twice Weekly – 3 days apart	Monthly
Odors	--	Observation	Weekly	
Dissolved Oxygen	milligrams per liter	Grab	Weekly	
pH	pH units	Grab	Monthly	

Similar to the irrigation area, the MRP requirements related to the ponds have not been consistently satisfied. The City and golf course staff are currently developing the protocols to implement this monitoring and will initiate the program beginning in the 2025 irrigation season.

Freeboard

The MRP requires the freeboard be monitored as the difference between the top of the bank of the storage pond to the level of the water. This measurement provides the City with confidence that recycled water cannot escape the storage pond containment area. However, as noted previously, each pond is equipped with a standpipe that serves as an overflow structure. Therefore, it is more appropriate to monitor freeboard as the difference between the top of the overflow structure to the top of the water surface.

Currently, the City has the ability to measure the freeboard of Lake A by means of a level monitoring rod. This capability is not set up in Lakes B through I. Lake I is manually kept at a level that is below the 12-inch overflow standpipe that conveys overflow water to a wetland area that eventually flows to Mule Creek. Prior to the start of the 2025 irrigation season, the City will need to install a level monitoring rod in each pond so that freeboard can be measured.

In addition, the City will employ the following monitoring practices in the 2025 irrigation season:

- Twice a week during the irrigation season, each storage pond should be observed, and freeboard monitored.
- For Pond I, it is expected that there will be recycled water present in the pond throughout the irrigation season and this pond should be monitored during each bi-weekly event.

- Recycled water is occasionally directed to Pond A. Therefore, this pond will be inspected as part of the bi-weekly monitoring. If there is standing water present in Pond A, then monitoring of this pond will be completed.
- If there is any evidence that Pond A has overflowed to Pond B (or any downstream pond) via the pond standpipes, then monitoring of the downstream ponds will also be performed.
- City staff will be responsible for making the appropriate observations to determine whether recycled water is being stored in any of the ponds.
- Golf course staff will provide information to the City regarding where COWRF flows are directed. Specifically, the monthly reports provided to the City will include information about which pond was receiving flow on each day.

Odors

The City is required to evaluate if any objectionable odors are being emitted from the storage ponds once every week. This will be needed for each pond that holds recycled water.

Dissolved Oxygen and pH

The City is required to collect and measure the dissolved oxygen and pH in a grab sample collected from each recycled water storage pond weekly. These measurements can be made using field test instruments provided that:

- The operator is trained in proper use and maintenance of the instruments,
- The instruments are field calibrated at the frequency recommended by the manufacturer,
- The instruments are serviced and/or calibrated at the manufacturer's recommended frequency, and
- Field calibration reports are maintained and a calibration log verifying calibration of all handheld monitoring instruments and devices are submitted with the monthly monitoring report.

Attachment A

Rainfall and Reference ET Data

IONE, CALIFORNIA (044283)

Period of Record Monthly Climate Summary

Period of Record : 03/01/1906 to 06/30/1977

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)					Insuff	icient	Data						
Average Min. Temperature (F)					Insuff	icient	Data						
Average Total Precipitation (in.)	5.08	3.14	3.19	1.75	0.63	0.23	0.07	0.13	0.33	1.15	2.81	3.53	22.04
Average Total SnowFall (in.)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 0% Min. Temp.: 0% Precipitation: 99.9% Snowfall: 99.9% Snow Depth: 99.8%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

D

Rainfall Depth Duration Frequency at Ione

Station Number	Station	County	Latitude	Longitude	Elevation	Years Recorded
B00 4283 00	Ione	Amador	38.348	-120.938	284.0	89

Rainfall Statistics	1-Day	2-Day	3-Day	4-Day	5-Day	6-Day	8-Day	10-Day	15-Day	20-Day	30-Day	60-Day	1-Year
Pr=0.5	1.92	2.55	3.01	3.38	3.70	3.99	4.48	4.91	5.79	6.51	7.68	10.19	21.28
Pr=0.2	2.55	3.37	3.98	4.47	4.89	5.27	5.92	6.48	7.64	8.58	10.11	13.39	27.84
Pr=0.1	2.92	3.87	4.55	5.11	5.60	6.02	6.76	7.40	8.71	9.78	11.52	15.23	31.54
Pr=0.04	3.36	4.44	5.22	5.86	6.40	6.89	7.73	8.45	9.94	11.16	13.13	17.32	35.70
Pr=0.02	3.66	4.83	5.67	6.36	6.96	7.48	8.39	9.17	10.78	12.09	14.22	18.74	38.51
Pr=0.01	3.94	5.19	6.10	6.84	7.47	8.04	9.01	9.84	11.57	12.97	15.23	20.06	41.11
Pr=0.005	4.21	5.54	6.51	7.29	7.96	8.56	9.59	10.48	12.31	13.79	16.19	21.31	43.57
Pr=0.002	4.54	5.97	7.01	7.85	8.58	9.22	10.33	11.28	13.23	14.82	17.40	22.87	46.64
Pr=0.001	4.79	6.29	7.38	8.26	9.02	9.69	10.85	11.85	13.90	15.57	18.26	23.99	48.84
Pr=0.0001	5.53	7.26	8.50	9.52	10.39	11.15	12.48	13.62	15.96	17.87	20.94	27.46	55.66

Annual Maxima	1-Day	2-Day	3-Day	4-Day	5-Day	6-Day	8-Day	10-Day	15-Day	20-Day	30-Day	60-Day	1-Year
2007	---	---	---	---	---	---	---	---	---	---	---	---	---
2006	---	---	---	---	---	---	---	---	---	---	---	---	---
2005	---	---	---	---	---	---	---	---	---	---	---	---	---
2004	---	---	---	---	---	---	---	---	---	---	---	---	---
2003	---	---	---	---	---	---	---	---	---	---	---	---	---
2002	---	---	---	---	---	---	---	---	---	---	---	---	---
2001	---	---	---	---	---	---	---	---	---	---	---	---	---
2000	1.85	2.80	4.29	4.74	4.99	4.99	5.22	5.79	7.52	9.05	10.35	11.82	21.39
1999	2.02	2.44	3.42	3.42	3.42	3.42	3.42	4.17	5.51	5.72	8.41	10.90	15.39
1998	2.37	3.55	4.11	4.36	4.98	5.85	6.61	7.31	8.07	10.05	14.21	21.25	30.46
1997	2.37	3.55	4.11	4.36	4.98	5.85	6.61	7.31	8.07	10.05	14.21	21.25	43.59
1996	3.75	3.85	3.85	3.85	3.85	3.85	3.85	3.85	4.74	5.27	6.16	11.53	22.80
1995	2.90	4.71	5.05	5.33	5.58	5.71	7.45	8.02	9.08	9.83	12.42	16.90	35.50
1994	1.27	1.70	1.95	2.05	2.15	2.42	2.55	2.55	3.45	3.67	5.27	5.87	15.52
1993	1.81	2.26	2.26	2.84	3.18	4.50	4.91	5.13	7.10	7.52	10.16	16.58	29.21
1992	2.30	3.18	3.18	3.24	4.11	5.17	5.97	6.06	6.98	7.16	9.13	10.62	20.43
1991	1.60	2.28	2.88	3.52	3.52	3.52	4.08	5.15	6.28	7.38	10.07	11.94	16.59
1990	1.82	2.35	2.37	2.37	2.37	2.37	2.37	2.37	2.90	2.90	3.33	6.23	17.33
1989	1.05	1.90	2.05	2.06	2.26	2.41	2.52	2.82	3.36	3.75	5.85	7.67	16.85
1988	1.55	1.90	1.90	1.90	1.90	1.90	2.05	2.13	2.75	3.47	4.78	6.57	11.67
1987	1.81	2.43	2.54	2.54	2.87	2.87	3.38	3.62	3.62	5.31	5.31	9.80	13.86
1986	2.75	4.85	5.65	6.65	6.85	6.95	7.90	8.00	8.00	9.45	12.97	18.47	33.02
1985	---	---	---	---	---	---	---	---	---	---	---	---	17.93
1984	---	---	---	---	---	---	---	---	---	---	---	---	23.39
1983	---	---	---	---	---	---	---	---	---	---	---	---	41.81
1982	---	---	---	4.62	5.24	5.24	5.53	5.53	7.29	8.43	9.95	15.59	39.56
1981	2.04	2.94	3.80	4.17	4.32	5.01	6.02	6.02	6.21	6.21	6.62	11.24	17.15
1980	---	---	---	---	---	---	---	---	---	---	---	---	

1979	1.54	2.28	2.83	3.82	3.82	3.82	4.02	4.97	5.49	6.53	7.09		
1978	1.54	2.28	2.83	3.82	3.82	3.82	4.02	4.97	5.49	6.53	7.09	12.65	20.87
1977	0.92	1.03	1.09	1.12	1.12	1.12	1.24	1.26	1.26	1.26	2.18	3.32	8.73
1976	0.78	1.23	1.70	1.70	1.91	2.06	2.06	2.06	2.18	3.21	3.73	5.00	11.87
1975	1.97	2.56	3.14	3.27	3.38	3.52	4.84	6.08	7.82	8.47	8.50	15.06	28.24
1974	---	---	---	---	---	---	---	---	---	---	---	---	33.80
1973	2.48	2.76	3.51	4.54	4.86	4.86	6.09	7.38	8.60	9.26	12.09	19.82	35.95
1972	3.05	3.88	3.92	3.98	3.98	5.03	5.90	5.96	6.05	6.73	7.92	9.62	16.80
1971	3.05	4.40	5.02	5.13	6.25	6.57	6.57	7.61	8.20	8.22	9.81	13.34	21.20
1970	2.94	2.94	3.48	3.48	3.72	3.72	4.97	5.90	6.37	7.01	9.55	12.27	21.13
1969	2.75	3.15	3.15	3.23	3.31	3.54	5.63	6.09	8.33	8.80	9.89	16.66	30.23
1968	1.76	2.12	2.12	2.43	2.43	2.48	2.51	3.20	3.20	3.49	4.61	8.77	17.12
1967	2.52	4.13	4.15	4.63	4.97	4.99	5.38	6.53	7.36	7.36	7.89	11.44	29.07
1966	1.79	1.95	2.46	2.48	3.27	3.74	4.03	4.13	5.17	5.17	5.17	9.69	16.47
1965	---	3.43	---	---	---	---	---	7.18	8.10	---	---	---	25.01
1964	1.98	2.44	2.86	3.06	3.06	3.06	3.25	3.45	5.45	6.58	6.84	9.13	18.12
1963	2.88	3.52	4.20	4.65	4.65	4.65	4.65	4.65	6.07	6.38	6.38	10.35	24.44
1962	1.25	2.08	2.93	3.02	4.05	4.53	6.47	7.17	7.61	7.75	9.09	11.98	18.00
1961	1.38	1.68	2.16	2.16	2.16	2.26	2.40	2.77	2.93	3.23	4.81	6.51	13.82
1960	1.33	1.53	1.86	1.86	2.09	2.42	2.82	3.25	3.67	5.03	6.18	7.86	16.68
1959	1.65	2.09	2.09	2.55	2.88	3.22	3.68	4.01	4.01	4.75	6.13	10.54	13.45
1958	---	---	---	---	---	---	---	---	---	---	---	---	41.69
1957	---	---	---	---	---	---	---	---	---	---	---	---	18.93
1956	---	---	---	---	---	---	---	---	---	---	---	---	28.58
1955	---	---	---	---	---	---	---	---	---	---	---	---	18.28
1954	---	---	---	---	---	---	---	---	---	---	---	---	16.40
1953	---	---	---	---	---	---	---	---	---	---	---	---	15.10
1952	2.21	3.15	3.68	3.77	3.77	3.77	3.77	4.06	4.68	6.56	7.47	13.11	27.05
1951	4.65	5.30	5.30	5.30	5.55	5.70	6.24	6.25	6.25	8.87	10.85	14.60	28.76
1950	2.70	2.70	2.70	3.97	3.97	3.97	3.97	5.05	5.05	5.55	9.52	10.41	18.30
1949	1.76	2.71	3.14	3.14	3.14	3.14	3.72	3.86	4.87	5.45	6.93	10.49	17.23
1948	1.28	1.41	1.70	1.83	2.03	2.03	2.43	2.43	4.08	4.39	6.67	8.68	17.76
1947	2.16	3.12	3.20	3.20	3.91	3.91	3.91	4.13	4.13	4.13	4.82	7.33	14.54
1946	1.90	1.90	3.20	3.38	4.37	4.98	5.16	5.42	5.70	6.31	7.49	11.80	20.14
1945	2.68	3.88	4.78	4.78	4.98	5.27	5.27	5.27	5.66	5.66	5.66	9.58	23.66
1944	2.25	2.41	2.53	2.53	3.23	3.39	3.93	4.28	5.68	5.68	7.47	10.20	19.25
1943	2.05	2.78	3.58	3.81	4.43	4.77	5.38	5.42	7.10	8.03	10.13	15.90	27.61
1942	2.00	3.48	4.20	4.60	5.32	5.81	5.91	5.91	7.68	8.17	8.17	12.92	26.67
1941	1.85	2.40	2.46	3.46	5.46	5.46	4.17	4.52	7.17	8.59	11.13	14.00	25.17
1940	1.65	2.72	3.46	3.76	4.20	4.79	5.24	5.54	5.95	6.00	8.96	16.37	24.86
1939	1.72	2.40	2.55	2.80	2.80	2.80	2.80	2.80	2.80	3.17	3.42	5.93	14.01
1938	2.30	3.65	4.05	4.55	4.80	4.80	5.25	6.95	9.40	10.35	12.10	16.00	27.25
1937	4.40	4.65	5.85	6.15	6.60	6.95	7.70	8.15	8.70	9.50	10.10	19.90	34.99
1936	2.00	2.30	3.50	4.20	4.35	4.50	6.05	6.40	10.33	10.33	13.28	19.99	28.29
1935	2.50	2.72	2.72	2.72	3.25	4.30	4.52	4.52	5.22	5.65	6.35	9.47	23.94
1934	1.70	2.85	2.85	4.05	4.52	4.52	4.52	4.52	4.52	6.40	8.77	9.67	

1933	1.20	1.72	1.72	1.72	2.32	3.12	3.12	3.82	3.82	3.82	5.07		
1932	1.75	1.92	2.59	3.58	3.75	3.80	4.49	4.97	5.58	5.88	6.60	10.05	19.99
1931	1.65	1.65	1.65	2.53	2.53	2.53	2.65	2.65	2.65	2.65	3.92	6.39	12.62
1930	1.39	2.25	2.25	2.57	2.57	2.78	3.35	3.71	5.17	5.33	5.62	10.86	17.07
1929	1.91	2.98	3.49	3.49	3.49	3.49	3.49	3.57	4.07	4.07	4.07	6.57	15.52
1928	1.68	2.60	3.40	4.06	4.79	4.92	4.92	4.92	5.92	6.10	6.27	9.09	18.80
1927	1.50	3.00	3.00	4.25	4.25	4.51	5.46	5.96	6.26	6.91	7.41	10.51	24.11
1926	2.55	2.80	2.90	3.55	3.55	4.55	5.10	5.10	6.48	8.99	10.04	10.29	21.54
1925	1.95	3.05	3.27	3.27	3.52	3.74	4.27	5.79	5.94	7.79	8.41	11.84	28.60
1924	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	2.35	3.00	3.00	4.95	10.50
1923	2.20	3.00	4.30	5.30	5.30	5.30	5.50	6.10	6.70	6.70	9.30	14.15	26.07
1922	2.17	2.52	3.45	3.95	3.95	3.95	3.95	4.44	7.09	7.16	9.46	14.80	24.30
1921	3.85	3.95	4.50	4.72	4.72	4.72	4.72	5.72	6.62	7.02	7.72	13.51	26.57
1920	2.10	3.55	3.90	4.05	4.20	4.20	4.20	4.31	4.82	5.19	7.04	9.26	15.46
1919	2.25	3.55	3.90	4.00	4.05	4.40	4.60	4.70	5.00	6.45	8.15	10.35	18.75
1918	1.60	2.35	2.35	2.35	3.45	4.25	4.70	4.70	6.50	6.50	8.10	11.30	15.50
1917	1.30	2.30	2.60	2.90	3.25	3.55	4.10	4.35	4.55	4.55	5.35	7.25	17.70
1916	---	---	---	---	---	---	---	---	---	---	---	---	20.00
1915	1.50	1.95	2.15	2.30	2.83	3.03	3.88	4.20	5.88	6.20	7.77	10.87	22.80
1914	2.26	3.11	3.49	3.61	3.99	3.99	3.99	4.48	5.47	6.96	9.81	13.52	22.90
1913	1.20	1.84	2.22	2.72	2.95	3.36	3.36	3.55	4.01	4.01	4.01	4.86	14.26
1912	0.69	1.04	1.15	1.22	1.30	1.45	1.86	2.16	2.47	2.86	3.43	5.36	12.68
1911	2.17	3.57	5.27	6.12	6.45	7.30	7.80	8.42	10.82	15.51	18.06	24.30	30.46
1910	2.00	3.00	3.00	3.45	3.88	3.88	3.93	3.93	4.00	4.69	5.92	8.90	20.89
1909	1.45	2.60	3.80	4.42	4.54	5.07	5.99	6.39	7.99	9.21	12.66	19.24	26.01
1908	1.30	1.60	1.60	1.78	1.78	1.78	1.83	3.03	3.63	3.63	5.51	9.04	14.27
1907	4.37	6.79	7.38	7.53	8.38	8.53	8.53	8.53	8.53	10.60	12.20	18.04	33.82
1906	2.40	2.54	3.22	3.62	3.85	3.85	3.85	5.03	7.47	9.20	10.45	15.43	30.93
1905	2.90	2.90	2.90	3.20	4.20	4.20	4.55	4.85	5.55	5.55	5.50	9.65	25.95
1904	1.51	2.62	3.12	3.15	3.15	3.25	3.75	4.86	6.07	6.42	7.20	12.05	21.42
1903	1.85	2.92	3.58	4.10	5.01	5.03	5.03	5.53	5.53	7.54	9.71	10.34	22.39
1902	1.21	1.79	2.09	2.61	3.01	3.41	3.87	4.41	5.03	6.03	7.72	9.29	20.19
1901	2.05	2.79	3.61	4.03	4.03	4.72	5.54	5.52	5.54	7.35	7.69	11.29	25.48
1900	1.85	2.34	2.41	2.80	2.86	2.86	2.86	3.88	4.82	5.66	6.45	9.69	21.51
1899	1.93	2.56	3.20	3.54	4.04	4.04	4.94	7.17	7.80	7.93	9.00	9.22	20.03
1898	3.60	4.47	4.64	4.64	4.64	4.64	4.64	4.76	5.11	5.11	5.23	7.30	13.77
1897	---	---	---	---	---	---	---	---	---	---	---	---	---
1896	---	---	---	---	---	---	---	---	---	---	---	---	---
1895	---	---	---	---	---	---	---	---	---	---	---	---	---
1894	---	---	---	---	---	---	---	---	---	---	---	---	---
1893	---	---	---	---	---	---	---	---	---	---	---	---	---
1892	---	---	---	---	---	---	---	---	---	---	---	---	---
1891	---	---	---	---	---	---	---	---	---	---	---	---	---
1890	---	---	---	---	---	---	---	---	---	---	---	---	---
1889	---	---	---	---	---	---	---	---	---	---	---	---	---
1888	---	---	---	---	---	---	---	---	---	---	---	---	---

Monthly Average ETo Report

California Irrigation Management Information System (CIMIS)

Rendered in ENGLISH Units.

Printed on Wednesday, August 31, 2022

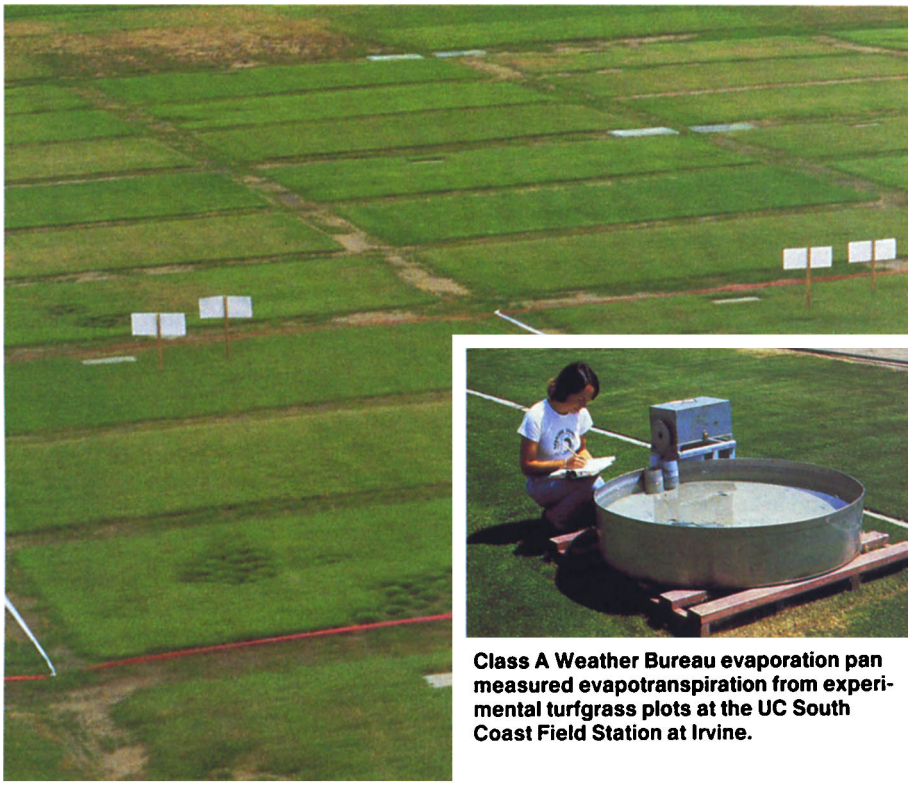
Average ETo Values by Station

Stn Id	Stn Name	CIMIS Region	Jan (in)	Feb (in)	Mar (in)	Apr (in)	May (in)	Jun (in)	Jul (in)	Aug (in)	Sep (in)	Oct (in)	Nov (in)	Dec (in)	Total (in)
227	Plymouth	SFH	1.48	1.95	3.02	4.57	5.97	7.19	7.64	6.98	4.99	3.24	1.68	1.21	49.92

CIMIS Region Abbreviations		
BIS - Bishop	CCV - Central Coast Valleys	ICV - Imperial/Coachella Valley
LAB - Los Angeles Basin	MBY - Monterey Bay	NCV - North Coast Valleys
NEP - Northeast Plateau	SAV - Sacramento Valley	SBE - San Bernardino
SFB - San Francisco Bay	SJV - San Joaquin Valley	SFH - Sierra Foothill
SCV - South Coast Valleys		

Attachment B

Turfgrass Performance Under Reduced Irrigation
Meyer and Gibeault



Class A Weather Bureau evaporation pan measured evapotranspiration from experimental turfgrass plots at the UC South Coast Field Station at Irvine.

Turfgrass performance under reduced irrigation

Jewell L. Meyer □ Victor A. Gibeault

Turfgrass in California requires irrigation during all or most of the year. Water restrictions imposed during the drought in 1976 and 1977 forced turf managers to reexamine many concepts about irrigation. Turfgrass managers had to make drastic cuts in water use and hope that the turf would survive. One significant result of the drought was the realization that lower levels of turf quality were acceptable in many situations and that large water savings could be achieved. No information was available, however, on the best conservation practices or on the minimum amounts of water needed to keep the turf alive.

Research was begun in 1979 to produce irrigation methodology that could be used to develop water-saving irrigation practices anywhere in California and in other arid and semiarid regions. The three-year study showed that major savings of water can be achieved, especially with warm-season grasses, with no appreciable loss of turf quality.

Turf-irrigation study

Specifically, the objectives of the research were to: (1) investigate the effects of applying reduced amounts of irrigation water calculated as a percentage of evapotranspiration of applied water on cool-season and warm-season turfgrasses; (2) evaluate a below-ground system as a potentially more efficient method of turf irrigation than standard sprinkler application; and (3) develop a set of crop coefficients that California turfgrass managers can use to determine on-site water use by both cool- and warm-season turfgrasses.

The study was conducted at the University of California South Coast Field Station, Irvine. The variables tested included: two irrigation methods, sprinkler application of water and a subterranean or buried trickle/drip water application (8-inch depth, 23-inch spacing); three irrigation regimes, 100, 80, and 60 percent of calculated evapotranspiration; and six commonly used turfgrasses, three cool-season varieties (Kentucky bluegrass, perennial ryegrass, and tall fescue) and three warm-season types (hybrid bermudagrass, zoysiagrass, and Seashore Paspalum).

The field plot was a randomized split-block design. The area was divided into two turf blocks, one for cool-season grasses and the other for warm-season grasses. Each block consisted of four replications, and within each replication were six randomized irrigation plots measuring 15 by 24 feet. Irrigation plots were divided into three turf subplots of 8 by 15 feet. The three sprinkler and three subterranean irrigation plots per replication were installed in September 1979 for above- and below-ground water application. Each sprinkler irrigation plot contained six high-pop brass sprinkler heads designed to apply 10 gallons of water per minute at a pressure of 35 pounds per square inch. The coefficient of uniformity was 87 percent.

Tensiometers at 3- and 6-inch depths in the cool-season grasses and 8- and 12-inch depths in the warm-season grasses indicated soil water status; neutron probe access tubes were installed in plots to a depth of 4 feet in the cool-season and 6 feet in the warm-season grasses. Scheduling was by the water budget technique calculated weekly using wind-modified pan evaporation data. State-of-the-art controllers were programmed with this irrigation scheduling information. The amount of irrigation was modified so that water did not pass below the 4-foot and 6-foot depths of the neutron probe access tubes during the irrigation season.

Annual crop coefficients, determined from previous research using applied water and evaporation pan data, were 0.7 annually for warm-season grasses and 0.8 for cool-season grasses. Monthly crop coefficients were developed in this experiment to evaluate responses of the six turfgrass species to 60 percent and 80 percent of replacement evapotranspiration for water conservation.

Turf performance

Overhead sprinkler irrigation provided acceptable performance of some turfgrass species, even when less than the optimum amount of water was applied. Subterranean irrigation did not provide acceptable turf with the shallow-rooted cool-season species, at the system depth and spacing used in this study. The very deeply rooted hybrid bermudagrass was the best-performing species with subterranean irrigation.

Under sprinkler irrigation, there was no significant difference in cool-season grass performance between the 100 percent and 80 percent regimes (table 1). This could be described as a potential level of water conservation amounting to 21.1 percent savings (77.2 inches versus 61 inches). The savings could be tenuous, however, because of more weed and disease activity (such as Gerlachia patch on Kentucky bluegrass) when irrigated with less than the optimum amount of water. The 60 percent regime significantly reduced the turf quality of the three cool-season grasses tested.

In the warm-season grasses, the appearance of hybrid bermudagrass and Seashore Paspalum was not significantly different under any of the irrigation regimes. As irrigation amounts were reduced, zoysiagrass appearance ratings declined because of nematode activity ob-

served on the roots. Both Santa Ana hybrid bermudagrass and Adalayd (Excalibre) Seashore Paspalum had very good color, density, texture, uniformity, and freedom from weeds and diseases, irrespective of irrigation regimes. Clearly there is potential for considerable water savings with these grasses. This study showed a 40 percent reduction in actual water applied between the optimum and lowest irrigation regime (65.5 versus 39 inches).

Because of the field plot design necessary for this study, it wasn't possible to compare statistically the turf performance results between the warm- and cool-season grasses. Hybrid bermuda and Seashore Paspalum performed very well, however, with 52.7 inches of water applied (60 percent irrigation regime), whereas the cool-season grasses needed at least 82.4 inches (80 percent irrigation regime). Thirty-six percent less water was applied to the warm-season species than to the cool-season species for acceptable turf quality. If applied water in the 60 percent irrigation treatment in warm-season grasses (52.7 inches) is compared with that in the 100 percent treatment in cool-season grasses (104.4 inches), the saving in water is 49.5 percent.

Water application

The cool-season grass in the 100 percent regime received 43 inches of water in 1982 (table 2). Warm-season grasses received only 34 inches. Rainfall of 18.45 inches occurred primarily from November to March. The soil profile held about 10 inches depth of water in the top 6 feet. Rainfall did not appreciably affect the applied water during the primary growing season, April through November. Likewise, the 34 inches applied to the warm-season grasses was not appreciably affected by, nor was there evidence of, deep percolation during the primary growing season, when only 4 inches of rain fell. The rainfall is subtracted from the original evaporation pan reading and is therefore reasonably accounted for in the calculated applications.

In 1983, a higher than normal rainfall of 32 inches occurred. The soil profile was filled during the winter, however, and only 9 inches of rain fell from April to October 30, of which 4 inches occurred in early April. Water moved below the root zone only on June 29, August 29, October 5, and October 17 in all plots of 100 and 80 percent irrigation in 1983. Even during a season of higher than normal rainfall, the applied water, 38.7 inches in cool-season grasses (1983), was similar to that of the drier year (1982) with 43 inches applied. Most of the 5 inches of implied higher use by cool-season grasses may have moved through deep percolation.

The water applied to warm-season grasses was 34 inches in 1982 and 33 inches in 1983. This small difference indicates that managers can schedule carefully and conserve water in a wet or dry season.

TABLE 1. Cool- and warm-season turfgrass appearance ratings and water applied for the duration of the study (August 1981 to December 1983).

Irrigation regime	Turf appearance 8/81 - 12/83*			Water application (actual)	ET_{grass}†
% of ET				*in.*	
Cool season	Ken. blue	Per. rye	Tall fesc.		
100	5.5 y	6.2 y	5.8 y	104.4	77.3
80	5.3 y	5.9 y	5.7 yz	82.4	61.0
60	4.8 z	5.0 z	5.3 z	62.7	46.4
Warm season	Bermuda	Paspalum	Zoysia		
100	6.5 ns‡	5.8 ns	5.6 x	88.4	65.5
80	6.5	5.8	4.8 y	69.4	51.4
60	6.4	5.4	4.2 z	52.7	39.0

* Rated on a scale of 1 to 9, with 1 indicating worst appearance and 9 best. Values followed by common letters are not significantly different at the 5% level of probability.
† ET_{grass} equals the actual applied water divided by the extra water factor (EWF_{90}), which is 1.35.
‡ No significant difference.

TABLE 2. Actual water applied in 1982 (1/1/82 to 12/31/82) and 1983 (1/1/83 to 12/31/83)

Sprinkler plots	1982		1983	
	Water applied*	Rainfall	Water applied†	Rainfall
% of ET	*inches*			
Cool season				
100	43.2	18.45	38.7	31.78
80	35.0		31.9	
60	26.6		24.5	
Warm season				
100	34.0		33.0	
80	27.4		25.8	
60	21.6		19.6	

* Class A pan evaporation 55.0 inches for 1982.
† Class A pan evaporation 55.63 inches for 1983.

TABLE 3. Turfgrass crop coefficients (Kp and Kc) of warm- and cool-season grasses.

Month	Kp*		Kc†	
	Warm	Cool	Warm	Cool
J	.44	.49	.55	.61
F	.43	.51	.54	.64
M	.61	.60	.76	.75
A	.58	.83	.72	1.04
M	.63	.76	.79	.95
J	.54	.70	.68	.88
J	.57	.75	.71	.94
A	.57	.69	.71	.86
S	.50	.59	.62	.74
O	.43	.60	.54	.75
N	.46	.55	.58	.69
D	.44	.48	.55	.60

* Monthly crop coefficient (Kp) is used with a Class A Weather Bureau evaporation pan with the equation $ET_{grass} = ET_{pan} \times Kp$
† The crop coefficient Kc is used with reference evapotranspiration (ETo) from a CIMIS weather station with the equation $ET_{grass} = ETo \times Kc$.

Conclusions

The monthly crop coefficients (table 3) calculated and used for nearly three years proved to be very accurate for both warm- and cool-season turfgrasses. Crop coefficients can be used with reference evapotranspiration from the Department of Water Resources California Irrigation Management Information System (CIMIS) program. Turfgrass managers can use these crop coefficients to determine on-site water use by turfgrasses from either a Class A Weather Bureau evaporation pan or from a computerized weather station that gives reference evapotranspiration with the equation given in table 3.

In conclusion, warm-season turfgrasses have a greater potential for water conservation than do cool-season turfgrasses. Under the conditions of this study, sprinkler irrigation was superior to subterranean irrigation for water conservation and turfgrass performance. And lastly, a well-designed, uniform irrigation system is necessary to maximize water conservation in turfgrass management.

Jewell L. Meyer is Irrigation and Soils Specialist and Victor A. Gibeault is Environmental Horticulturist, Cooperative Extension, University of California, Riverside. *Financial support for this study was granted by the Metropolitan Water District of Southern California, City of Los Angeles Department of Water and Power, Municipal Water District of Orange County, and the San Diego County Water Authority. Also the support of the Southern California Turfgrass Council, the Lloyd Foundation, and the Golf Course Superintendent's Association of Southern California is appreciated. The authors acknowledge the assistance of Ralph Strohman and Mark Mahody, Staff Research Associates, UC Riverside.*

Attachment C

Water Application Efficiency,
Bill Kranz, University of Nebraska Lincoln Extension
Irrigation Specialist,
Northeast Research and Extension Center

Irrigation Chapter 8 - Irrigation Efficiencies

Author: Bill Kranz, University of Nebraska Lincoln Extension Irrigation Specialist, Northeast Research and Extension Center, Norfolk, NE.

Water Application **Efficiency**

The ability to manage an irrigation system is contingent on an accurate estimate of the percentage of water pumped that becomes available for crop use. No irrigation system delivers water at 100 percent efficiency. Water may be lost through delivery systems or pipelines and some water may remain in the **soil**, but not be used by the crop. Some water may run off the soil surface into lowland areas. Still other water may be lost to evaporation in the air, or from the soil and plant surfaces. *Figures 8.1a* and *8.1b* show the major losses for sprinkler and surface irrigation systems. To know how much water to pump, these losses must be totaled and added to the amount of water needed by the crop.

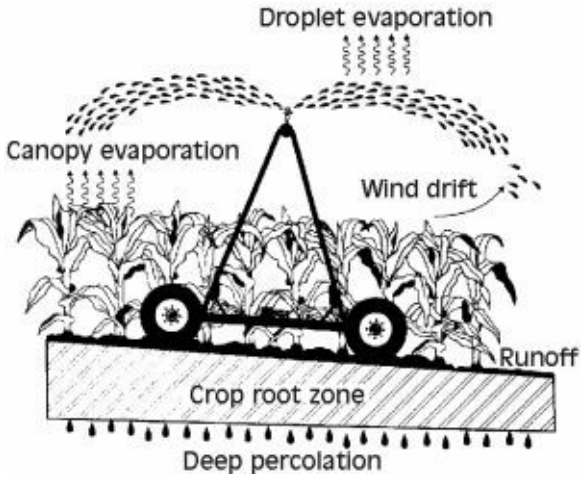


Figure 8.1. a) Potential water losses during irrigation with a center pivot. b) Potential water losses during irrigation with a **furrow irrigation** system.

In most cases, the goal is to insure that all areas of the field receive a **set** amount of uniformly applied water. Consider the catch can test data shown in *Figure 8.2.* The cans recording application depths below the horizontal line are not receiving enough water — catches are less than the desired 0.85 inches. Another application will be needed to insure that the entire field receives at least 0.85 inches of water. This will require using more water and energy than is necessary. If this pattern occurs during each irrigation, plants in the areas receiving less than 0.85 inches eventually could experience water stress. The cans recording application depths above the line receive at least 0.85 inches of water. Any extra water applied could lead to surface **runoff** or deep **percolation**.

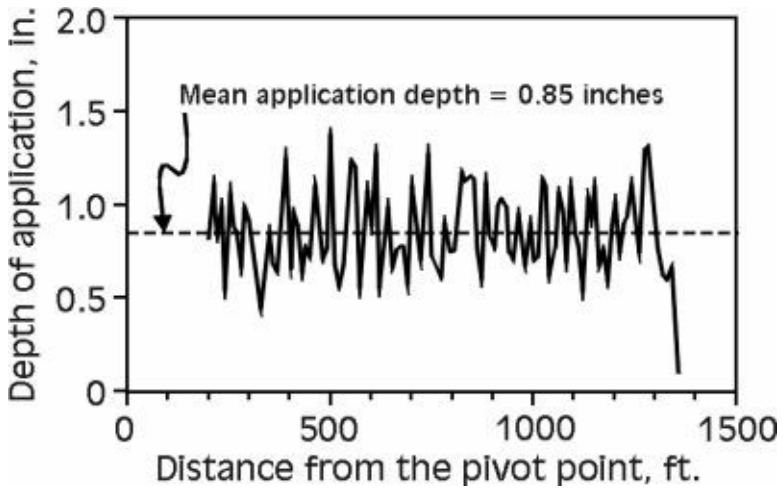


Figure 8.2. Example of catch-can data from a center pivot with low pressure spray nozzle, mounted at 10 foot intervals and 7 feet above the soil surface.

Water application efficiency accounts for how uniformly the water is applied and can be used for other assessments. If the center pivot owner is trying to decide whether switching to a new sprinkler package would be economical, the change in water application efficiency could be a major factor. If water becomes limited, changing to a system with a higher water application efficiency will provide more useable water to the crop and reduce pumping costs.

To maximize irrigation water use, it must be uniformly applied in the right amount and at the right time. Reaching these objectives requires knowledge of water delivery characteristics, field soils and slopes, and the expected crop water use rates.

Mathematical relationships have been developed to help quantify the amount of applied water that becomes available for plant use.

Water application efficiency refers to the amount of water applied that is stored in the crop root zone. This value is determined by water distribution characteristics, system management, soil conditions, the crop, and weather conditions. Water application efficiency pertains to an individual irrigation event.

Equation 8.1 is used to determine water application efficiency.

Equation 8.1 $E_a = [\frac{\text{Depth of water stored in the rootzone } (d_s) \times 100}{\text{Depth of water pumped } (d_p)}]$

where:

E_a = Average water application efficiency, %

Depth of water stored in the rootzone (d_s) = Average depth of water stored in the rootzone, inches

Depth of water pumped (d_p) = Average depth of water delivered from source, inches

Irrigation efficiency refers to the amount of water removed from the water source that is used by the crop. This value is determined by irrigation system management, water distribution characteristics, crop water use rates, weather and soil conditions. Irrigation efficiency pertains to the use of water for an entire growing season.

Depth Stored

The depth of water stored in the root zone can be estimated based on field observation of what happens to the water during an application event. Field observation reports should note if runoff occurs and estimate the amount of runoff. With experience, you'll begin to know where and when runoff is likely to occur. For example, runoff from center pivot systems will likely occur first near the outside edge of the irrigated area because the water application rate is greatest there. Other factors include low **infiltration** rate soils, steep slopes and lack of plant residue cover.

Another more accurate method is to record the **soil water** content before and after an irrigation event using one of the methods discussed in *Chapter 3, Soil Water*. If the hand-feel method is used, the **soil water content** will need to be recorded at enough locations to develop accurate estimates of the water stored in the crop root zone. The depth of water applied is found by subtracting the reading taken before the irrigation.

Equation 8.2 d_s = *["After" reading – "Before" reading]*

Where:

d_s = Depth of water stored in the rootzone

Example 8.1

A center pivot irrigation system is supplied with enough water to apply 1.1 inches of water to an irrigated area. Soil water content readings recorded before the irrigation event showed an average water content of 3.5 inches in the top 3 feet of soil. Soil water content readings after the irrigation showed an average of 4.4 inches in the top 3 feet of soil. To find the average depth of water stored in the crop rootzone we subtract the before irrigation reading from the after irrigation reading.

Using *Equation 8.2* d_s = ["After" reading – "Before" reading]

d_s = [4.4 inches – 3.5 inches]

d_s = 0.9 inches

Depth Pumped

The depth of water pumped can be determined using the procedures presented in *Chapter 7, Flow Measurements and Basic Water Calculations*. The information needed includes an accurate estimate of the pumping rate in gallons per minute. This information can be recorded using a flow meter installed as part of the system or periodically using an attached flow meter (ultrasonic flow meter, pilot tube type meter, etc.).

The average flow rate can be determined by recording the accumulator reading prior to and after each irrigation event. Subtracting the reading recorded prior to the irrigation from the reading after the irrigation event will result in the total volume of water pumped. Taking the total volume and dividing by the irrigation time will give the average pumping rate. For this estimate to be accurate, the irrigation time must be accurate to the nearest hour if possible. A more precise record of the total irrigation time will improve the estimate of the pumping flow rate. (The hour meter on the motor or center pivot is accurate enough to estimate the pumping time.) *Equations 8.3* and *8.4* are used to make these calculations. The following example shows how to incorporate field data into the equations.

Equation 8.3 Pumping rate = [Reading 2 – Reading 1] / [Time]

where:

Pumping rate = Water deliver rate, gallons per minute or acre-inches per minute

Reading 1 = Totalizer reading before the irrigation event, gallons or acre-inches

Reading 2 = Totalizer reading after the irrigation event, gallons or acre-inches

Time = Time required to complete the irrigation event, minutes

Example 8.2

The meter also has an accumulator at the bottom that registers total gallons pumped. Before the irrigation event, the accumulator reading was 6,553,300 gallons, and after the irrigation event the meter read 10,167,500 gallons. The irrigation event required 77 hours and 15 minutes.

Using *Equation 8.3*

Pumping rate = [Reading 2-Reading 1] / [Time]

Pumping rate = [10,167,500 - 6,553,300] gallons [(77 hr x 60 min/hr) + 15 min]

Pumping rate = [3,614,200] gallons / [4620 + 15] minutes

Pumping rate = 780 gallons per minute

If the accumulator records flow in acre-inches, the same process is used unless the desire is to determine the flow rate in gallons per minute. To convert acre-inches per minute to gallons per minute, multiply the result from *Equation 8.3* in acre-inches per minute by 27,154 gallons per acre-inch.

To convert the flow rate in gallons per minute to the gross depth of water pumped, we use *Equation 8.4.* If the result from *Equation 8.3* is in acre-inches per minute, the constant 27,154 gallons per acre-inch is not used.

Equation 8.4 d_p = [flow rate x time] / [area irrigated x 27,154]

where:

d_p = Depth pumped = Average depth of water pumped, *inches*

Flow rate = Average water delivery rate, *gallons per minute*

Time = Total irrigation time, *minutes*

Area irrigated = Total irrigated area, *acres*

27,154 = Conversion factor, *gallons per acre-inch or gal / ac-in*

Example 8.3

Let's assume that the field area for Example 8.2 was 123 acres. We calculated the flow rate at 780 gallons per minute and the total irrigation time at 4635 minutes. Using *Equation 8.3*:

Depth pumped (d_p) = [Flow rate x time] / [Area irrigated x 27,154]

Depth pumped (d_p) = [780 *gal/min* x 4635 *minutes*] [123 *acres* x 27154 *gal / ac-in*]

Depth pumped (d_p) = [3,615,300]*gallons* / [3,339,942] *gallons / inch*

Depth pumped (d_p) = 1.08 inches

To complete the calculation of the water application efficiency, use *Equation 8.1* to compare the amount of water pumped with the increase in water stored in the crop rootzone.

Example 8.4

From Example 8.1 we found that 0.9 inches of water was stored in the three-foot crop rootzone. From Example 8.3 we found that 1.08 inches of water was pumped from the water source into the center pivot. To find the application efficiency we use *Equation 8.1.*

$$E_a = \left[\frac{\text{Depth of water stored in the rootzone } (d_s) \times 100}{\text{Depth of water pumped } (d_p)} \right]$$

$$E_a = [\ 0.9 \text{ inches} / 1.08 \text{ inches}\ ] \times 100$$

$$E_a = 83\%$$

In these examples it was determined that only 83 percent of the water pumped from the irrigation source reached the soil and was usable by the crop. That means that 17 percent of the water was lost during application.

Potential Delivery Losses

The amount of water loss due to irrigation depends of the type of irrigation system — sprinkler or surface. In addition, the magnitude of each type of loss may be different. Let's begin by listing some major sources of water loss during irrigation. To keep the losses for surface and sprinkler irrigation separate, *Table 8.1* lists the potential losses for each type of system.

Table 8.1. Potential sources of water loss during an irrigation event for surface and sprinkler irrigation systems.

Sources of water losses	Surface Irrigation	Sprinkler irrigation
Distribution system	Yes	Yes
Air evaporation	No	Yes
Plant interception	No	Yes
Soil evaporation	Yes	Yes
Deep percolation	Yes	Yes
Runoff	Yes	Yes

Surface Irrigation Systems

The major losses for surface irrigation systems are deep percolation and surface runoff. These two losses could cause the water application efficiency to be reduced to less than 50 percent if the system is not managed properly. Ways to minimize these losses are discussed in *Chapter 11, Furrow Irrigation Management* (https://passel2.unl.edu/view/lesson/bda727eb8a5a/11).

Another source of water loss is in the distribution system. If the water flows across the head of the field in an open ditch, each foot of ditch loses water to soil infiltration and water surface evaporation. The best way to eliminate these losses is to transport the water through an enclosed pipeline. For many furrow irrigated fields this will require a small pumping plant to overcome the friction loss associated with forcing water through the pipeline.

Surface irrigation implies that surface evaporation will contribute to water loss. One way to limit soil evaporation loss is to wet less of the soil surface. For fields with slopes less than 1 percent, irrigating every other furrow is a viable option. This effectively cuts surface evaporation losses by nearly 50 percent without sacrificing crop production. Irrigating every other furrow also will reduce the amount of water lost to deep percolation and surface runoff.

Pipelines can have losses too. Worn gaskets or loose fitting pipeline connections could produce leaks at each joint. These losses are usually small in comparison to other losses, but by their sheer number could add up to substantial water losses. This kind of loss is the easiest to eliminate by replacing gaskets.

Sprinkler Irrigation Systems

Sprinkler irrigation systems, especially center pivots, typically have greater water application efficiencies than surface systems. While they may have more potential sources of loss, the magnitude of each loss is generally quite low. *Table 8.1* shows that sprinkler irrigation systems may experience loss from all six of the potential water loss sources while surface irrigation systems lose water from only four. This is because most sprinkler irrigation systems spray water into the air to deliver water to the entire soil surface with an upright crop canopy located between the sprinkler and soil.

Developments in sprinkler technology have reduced the amount of water lost between the sprinkler/nozzle and soil surface. The irrigation time or the accumulated time that water is applied to the crop canopy causes the major loss during sprinkler irrigation events. Applied water evaporates off the leaves of the crop canopy. Thus, the longer water droplets are delivered to the crop, the greater the total evaporation loss. Lowering the sprinkler/nozzle pressure reduces the wetted diameter of the sprinkler/nozzle thus reducing irrigation time and total canopy evaporation losses. In addition, lower wetted diameters reduce water evaporation losses in the air and wind drift losses.

Proper management of sprinkler irrigation systems can greatly reduce deep percolation losses. An irrigation system managed to keep the soil profile completely full at all times will experience some deep percolation losses. This is because the system does not apply water at 100 percent uniformity. Some areas will receive more water than others due to sprinkler pressure differences caused by soil elevation differences. Pressure regulators or flow control nozzles help insure that water delivered to the soil surface is as uniform as possible. Other portions of the field could be affected when wind distorts the water application pattern. Such distortion can be reduced by avoiding operation when winds exceed 10 mph.

How do I Evaluate Losses?

There are two main ways to evaluate water loss during irrigation: 1) take detailed field measurements; and 2) visually estimate losses. In some cases it may be necessary to combine these methods to develop an accurate estimate of where losses occur and how significant they are to the system’s application efficiency. For example, to estimate water losses during irrigation, measure the flow rate of water entering the system with a flow meter. Visually estimate how much of the water is lost to runoff. This amount, however, will not account for other potential losses. *Table 8.2* presents the potential magnitude of some of these losses for different irrigation systems. For furrow irrigation systems record how long it takes for the water to reach a certain point in the field or record flow rates into the furrow and how long it takes water to reach the end of the furrow. When coupled with soil types and furrow slopes, a computer model can be used to estimate how efficiently the water is being applied.

Table 8.2a. Percent irrigation water losses for different furrow irrigation systems.

Type of irrigation system	Distribution system	Air evaporation	Soil evaporation	Canopy evaporation	Deep percolation	Surface runoff	efficiency
Every row	1-5	<1.0	1--5	0.0	10-20	10-35	40-75
W/Surge valve	1-5	<1.0	1-5	0.0	5-15	5-15	60-85
W/Reuse	1-5	1-2	1-5	0.0	10-20	0	55-90
Siphon tube	5-10	1-2	1-5	0.0	15-25	15-25	40-75
Alternate row	1-5	<0.5	1-5	0.0	5-15	10-20	60-85

Table 8.2b. Percent irrigation water losses for different Sprinkler Irrigation systems.

Type of irrigation system	Distribution system	Air evaporation	Soil evaporation	Canopy evaporation	Deep percolation	Surface runoff	Overall efficiency
Handmove	<1.0	3-5	1-5	10-15	5-10	0-5	60-80
Solid set	<1.0	3-5	1-5	10-15	0-10	0-5	60-85
Traveler	<1.0	1-3	1-5	1-5	0-5	5-10	55-75
High pressure impact	<0.5	1-3	0-1	1-5	0-5	0-5	70-80
Low pressure impact	<0.5	1-3	0-1	1-3	0.5	0-10	75-85
Low pressure spray	<0.5	1-3	0-1	1-3	0-5	0-20	70-90
Low pressure bubble	<0.5	0.0	0-0.5	0.0	0-5	20-40	60-95
Drip irrigation	<0.5	0.0	0.0	0.0	5-30	0.0	70-95

ATTACHMENT F

Amador Regional Sanitation Agency
2024 Individual Water Balance Update

2025 Revised ARSA Detailed Water Balance Calculations

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Water Balance Update - ARSA Storage & Disposal Facilities

Scenario 1: Current Flows & Facilities, Uncalibrated

February 2025 By: Bill Slenter/Steven Whittlesey, HydroScience

WASTEWATER INFLUENT FLOW		***MAX STORAGE CAPACITIES***		***OTHER INPUTS***	
Daily Average Wastewater Influent Flow	**312,636** gpd	Henderson Reservoir	392.8 ac-ft		
		Preston Reservoir	235.0 ac-ft	100-YR Multiplier	1.92 unitless
		Total System	627.8 ac-ft	Pan Evap Coefficient	0.75 unitless

		100-YEAR ANNUAL PRECIPITATION RETURN PERIOD													***AVERAGE ANNUAL PRECIPITATION RETURN PERIOD***											
	No. Days	31	30	31	31	28	31	30	31	30	31	31	30		31	30	31	31	28	31	30	31	30	31	31	30	
	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
CLIMATE INPUTS																											
Precipitation	in	2.30	6.66	6.72	7.35	5.95	5.78	3.96	0.90	0.29	0.19	0.36	0.63	41.11	1.20	3.47	3.50	3.83	3.10	3.01	2.06	0.47	0.15	0.10	0.19	0.33	21.41
2016/2017 WY Precipitation	in	6.31	2.55	5.38	15.07	4.73	3.39	4.09	0.53	1.28	0.00	0.02	0.02	43.37													
Pan Evaporation	in	3.77	1.40	0.72	1.12	2.32	4.18	7.04	9.43	11.17	9.50	6.51		57.88	3.77	2.10	1.50	1.50	2.20	3.70	5.60	7.40	8.60	9.40	8.30	6.60	60.67
Effective Water Surface Evaporation	in	2.83	0.79	0.41	0.41	0.63	1.31	3.14	5.28	7.07	8.38	7.13	4.88	42.23	2.83	1.05	0.54	0.54	0.84	1.74	3.14	5.28	7.07	8.38	7.13	4.88	43.41
WASTEWATER GENERATION																											
Facility Wastewater Effluent (ADWF)	MG	9.7	9.4	9.7	9.7	8.8	9.7	9.4	9.7	9.4	9.7	9.7	9.4	114.1	9.7	9.4	9.7	9.7	8.8	9.7	9.4	9.7	9.4	9.7	9.7	9.4	114.1
I/I Contributions	MG	3.0	7.4	7.5	8.1	6.7	6.5	4.7	1.6	1.0	0.9	1.1	1.4	49.9	1.9	4.2	4.2	4.6	3.8	3.7	2.8	1.2	0.9	0.8	0.9	1.1	30.1
TOTAL Wastewater Effluent	ac-ft	39.1	51.5	52.6	54.6	47.4	49.7	43.2	34.7	31.9	32.6	33.1	33.0	503.2	35.7	41.7	42.7	43.7	38.6	41.2	37.3	33.4	31.5	32.3	32.6	32.0	442.7
2016/2017 WY Effluent Flow Values	ac-ft	33.8	34.3	50.6	94.9	81.3	47.6	49.4	29.5	27.3	26.5	33.8	33.8	542.8													
WATERSHED CONTRIBUTING AREAS																											
Precipitation into Henderson Reservoir	ac-ft	5.5	16.0	16.2	17.7	14.3	13.9	9.5	2.2	0.7	0.5	0.9	1.5	98.9	2.9	8.4	8.4	9.2	7.5	7.2	5.0	1.1	0.4	0.2	0.5	0.8	51.5
Run-off into Henderson Reservoir	ac-ft	0.8	2.4	2.4	2.7	2.2	2.1	1.4	0.3	0.1	0.1	0.1	0.2	14.8	0.4	1.3	1.3	1.4	1.1	1.1	0.7	0.2	0.1	0.0	0.1	0.1	7.7
Precipitation into Preston Forebay	ac-ft	0.4	1.1	1.1	1.2	1.0	1.0	0.7	0.2	0.0	0.0	0.1	0.1	6.9	0.2	0.6	0.6	0.6	0.5	0.5	0.3	0.1	0.0	0.0	0.0	0.1	3.6
Precipitation into Preston Reservoir	ac-ft	3.5	10.0	10.1	11.0	8.9	8.7	5.9	1.4	0.4	0.3	0.5	1.0	61.7	1.8	5.2	5.3	5.7	4.7	4.5	3.1	0.7	0.2	0.2	0.3	0.5	32.1
Run-off into Preston Reservoir	ac-ft	2.7	7.8	7.9	8.6	7.0	6.8	4.7	1.1	0.3	0.2	0.4	0.7	48.3	1.4	4.1	4.1	4.5	3.6	3.5	2.4	0.6	0.2	0.1	0.2	0.4	25.2
STORAGE RESERVOIRS																											
Henderson Reservoir Volume	ac-ft	27.5	56.6	125.9	196.6	270.8	333.4	392.8	392.8	336.4	238.9	130.1	41.7		27.5	35.6	86.2	138.0	191.6	237.4	283.6	281.6	218.8	122.6	27.5	27.5	
Henderson Reservoir Evaporation	ac-ft	-1.8	-0.7	-0.5	-0.7	-1.3	-2.9	-7.5	-12.6	-16.0	-16.0	-9.6	-3.6	-73.1	-1.8	-0.7	-0.6	-0.8	-1.4	-3.3	-6.6	-11.0	-12.9	-10.9	-4.4	-3.0	-57.4
Henderson Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Forebay Evaporation	ac-ft	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.5	-0.9	-1.2	-1.4	-1.2	-0.8	-6.6	-0.5	-0.2	-0.1	-0.1	-0.1	-0.3	-0.5	-0.9	-1.2	-1.4	-1.2	0.0	-6.4
Preston Forebay Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Reservoir Volume	ac-ft	0.0	6.5	25.2	44.1	64.7	81.1	99.6	139.9	135.5	127.2	117.3	109.8		75.1	75.9	84.7	94.1	104.5	112.3	118.9	120.9	115.8	107.9	89.7	0.0	
Preston Reservoir Evaporation	ac-ft	0.0	-0.2	-0.2	-0.2	-0.4	-1.1	-2.9	-6.1	-8.0	-9.1	-7.3	-4.8	-40.2	-2.2	-0.8	-0.4	-0.5	-0.8	-1.7	-3.3	-5.5	-7.2	-8.2	-6.2	0.0	-36.8
Preston Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Beginning Water Storage	ac-ft	27.5	63.2	151.1	240.7	335.5	414.5	492.4	532.7	471.9	366.1	247.4	151.5		102.6	111.5	170.9	232.2	296.1	349.7	402.5	402.6	334.7	230.5	117.1	27.5	
Reservoir Evaporation	ac-ft	-1.8	-1.0	-0.8	-1.0	-1.8	-4.2	-10.9	-19.5	-25.1	-26.5	-18.1	-9.2	-119.9	-4.4	-1.7	-1.1	-1.3	-2.4	-5.4	-10.3	-17.4	-21.3	-20.4	-11.8	-3.0	-100.6
Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LAND APPLICATION DISPOSAL DEMANDS																											
Bowers' Ranch	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2016/2017 WY Bower's Ranch	ac-ft	-7.7	0	0	0	0	0	0	0	-24.6	-26.7	-26.7	-26.7	-112.4													
Hoskins' Ranch	ac-ft	-3.3	0.0	0.0	0.0	0.0	0.0	-2.3	-19.4	-24.7	-26.0	-23.5	-16.4	-115.5	-1.8	0.0	0.0	0.0	0.0	0.0	-3.2	-16.4	-22.8	-24.9	-23.1	-14.6	-106.7
2016/2017 WY Hoskin's Ranch	ac-ft	0	0	0	0	0	0	0	-8.3	-27	-32.8	-26.4	-36.5	-131.0													
Castle Oaks Golf Course	ac-ft	-11.3	0.0	0.0	0.0	0.0	0.0	-11.9	-61.7	-89.4	-99.9	-89.4	-59.9	-423.4	-27.3	0.0	0.0	0.0	0.0	0.0	-35.3	-70.1	-92.4	-100.9	-91.1	-64.6	-481.7
RAW WATER MAKE-UP																											
Bower's Ranch Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Hoskin's Ranch Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
COGC Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	48.4	
Total Unmet Irrigation Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	48.4	51.1
MONTHLY STORAGE BALANCE																											
Total Inflows (excluding Unmet Irrigation Demands)	ac-ft	52.0	88.9	90.3	95.8	80.8	82.2	65.4	39.8	33.5	33.6	35.1	36.5	733.9	42.4	61.1	62.4	65.2	56.0	58.1	48.9	36.1	32.3	32.8	33.6	33.9	562.8
Total Inflows (including Unmet Irrigation Demands)	ac-ft	52.0	88.9	90.3	95.8	80.8	82.2	65.4	39.8	33.5	33.6	35.1	36.5	733.9	42.4	61.1	62.4	65.2	56.0	58.1	48.9	36.1	32.3	32.8	36.3	82.3	613.9
Total Outflows	ac-ft	-16.3	-1.0	-0.7	-1.0	-1.8	-4.2	-25.1	-100.6	-139.2	-152.4	-131.0	-85.5	-658.8	-33.5	-1.7	-1.1	-1.3	-2.4	-5.4	-48.8	-103.9	-136.5	-146.2	-126.0	-82.3	-689.0
Beginning Storage Volume	ac-ft	27.5	63.2	151.1	240.7	335.5	414.5	492.4	532.7	471.9	366.1	247.4	151.5		102.6	111.5	170.9	232.2	296.1	349.7	402.5	402.6	334.7	230.5	117.1	27.5	
Change in Water Volume	ac-ft	35.7	87.9	89.6	94.9	79.0	77.9	40.2	-60.8	-105.7	-118.8	-95.9	-49.0		8.9	59.4	61.3	63.9	53.7	52.8	0.1	-67.9	-104.2	-113.4	-89.7	0.0	
Final Storage Volume	ac-ft	63.2	151.1	240.7	335.5	414.5	492.4	532.7	471.9	366.1	247.4	151.5	102.6		111.5	170.9	232.2	296.1	349.7	402.5	402.6	334.7	230.5	117.1	27.5	27.5	

Maximum Seasonal Storage Used (ac-ft)	**532.7**	173.6 Mgal		Maximum Seasonal Storage Used (ac-ft)	**402.6**	131.2 Mgal
Henderson Unutilized Capacity (ac-ft)	**0.0**	0.0 Mgal		Henderson Unutilized Capacity (ac-ft)	**109.2**	35.6 Mgal
Preston Unutilized Capacity (ac-ft)	**95.1**	31.0 Mgal		Preston Unutilized Capacity (ac-ft)	**114.1**	37.2 Mgal

Water Balance Update - ARSA Storage & Disposal Facilities

Scenario 2a: Current Flows & Facilities, Calibrated at Avg Year Rainfall Distribution

February 2025 By: Bill Slenter/Steven Whittlesey, HydroScience

WASTEWATER INFLUENT FLOW		***MAX STORAGE CAPACITIES***		***OTHER INPUTS***	
		Henderson Reservoir	392.8 ac-ft		
Daily Average Wastewater Influent Flow	**312,636** gpd	Preston Reservoir	235.0 ac-ft	100-YR Multiplier	1.92 unitless
		Total System	627.8 ac-ft	Pan Evap Coefficient	0.75 unitless

		100-YEAR ANNUAL PRECIPITATION RETURN PERIOD													***AVERAGE ANNUAL PRECIPITATION RETURN PERIOD***											
	No. Days	31	30	31	31	28	31	30	31	30	31	31	30		31	30	31	31	28	31	30	31	30	31	31	30	
	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
CLIMATE INPUTS																											
Precipitation - Calibrated Avg Year Distribution	in	2.30	6.66	6.72	7.35	5.95	5.78	3.96	0.90	0.29	0.19	0.36	0.63	41.11	1.20	3.47	3.50	3.83	3.10	3.01	2.06	0.47	0.15	0.10	0.19	0.33	21.41
Precipitation - Calibrated & 2016/207 Distribution	in	5.98	2.42	5.10	14.28	4.48	3.21	3.88	0.50	1.21	0.00	0.02	0.02														
2016/2017 WY Precipitation	in	6.31	2.55	5.38	15.07	4.73	3.39	4.09	0.53	1.28	0.00	0.02	0.02	43.37													
Pan Evaporation	in	3.77	1.40	0.72	0.72	1.12	2.32	4.18	7.04	9.43	11.17	9.50	6.51	57.88	3.77	2.10	1.50	1.50	2.20	3.70	5.60	7.40	8.60	9.40	8.30	6.60	60.67
Effective Water Surface Evaporation	in	2.83	0.79	0.41	0.41	0.63	1.31	3.14	5.28	7.07	8.38	7.13	4.88	42.23	2.83	1.05	0.54	0.54	0.84	1.74	3.14	5.28	7.07	8.38	7.13	4.88	43.41
WASTEWATER GENERATION																											
Facility Wastewater Effluent (ADWF)	MG	9.7	9.4	9.7	9.7	8.8	9.7	9.4	9.7	9.4	9.7	9.7	9.4	114.1	9.7	9.4	9.7	9.7	8.8	9.7	9.4	9.7	9.4	9.7	9.7	9.4	114.1
I/I Contributions - Climate Calibration Only	MG	3.0	7.4	7.5	8.1	6.7	6.5	4.7	1.6	1.0	0.9	1.1	1.4	49.9	1.9	4.2	4.2	4.6	3.8	3.7	2.8	1.2	0.9	0.8	0.9	1.1	
I/I Contributions - Calibrated (25% Factor Applied)	MG	3.0	7.4	9.3	10.1	8.4	8.1	5.9	1.6	1.0	0.9	1.1	1.4	58.2	1.9	4.2	5.3	5.7	4.8	4.7	3.5	1.2	0.9	0.8	0.9	1.1	34.9
TOTAL Wastewater Effluent - Climate Calibration Only	ac-ft	39.1	51.5	52.6	54.6	47.4	49.7	43.2	34.7	31.9	32.6	33.1	33.0	503.2	35.7	41.7	42.7	43.7	38.6	41.2	37.3	33.4	31.5	32.3	32.6	32.0	442.7
TOTAL Wastewater Effluent	ac-ft	39.1	51.5	58.3	60.8	52.5	54.7	46.8	34.7	31.9	32.6	33.1	33.0	528.9	35.7	41.7	46.0	47.2	41.6	44.1	39.5	33.4	31.5	32.3	32.6	32.0	457.4
2016/2017 WY Effluent Flow Values	ac-ft	33.8	34.3	50.6	94.9	81.3	47.6	49.4	29.5	27.3	26.5	33.8	33.8	542.8													
WATERSHED CONTRIBUTING AREAS																											
Precipitation into Henderson Reservoir	ac-ft	5.5	16.0	16.2	17.7	14.3	13.9	9.5	2.2	0.7	0.5	0.9	1.5	98.9	2.9	8.4	8.4	9.2	7.5	7.2	5.0	1.1	0.4	0.2	0.5	0.8	51.5
Run-off into Henderson Reservoir	ac-ft	0.8	2.4	2.4	2.7	2.2	2.1	1.4	0.3	0.1	0.1	0.1	0.2	14.8	0.4	1.3	1.3	1.4	1.1	1.1	0.7	0.2	0.1	0.0	0.1	0.1	7.7
Precipitation into Preston Forebay	ac-ft	0.4	1.1	1.1	1.2	1.0	1.0	0.7	0.2	0.0	0.0	0.1	0.1	6.9	0.2	0.6	0.6	0.6	0.5	0.5	0.3	0.1	0.0	0.0	0.0	0.1	3.6
Precipitation into Preston Reservoir	ac-ft	3.5	10.0	10.1	11.0	8.9	8.7	5.9	1.4	0.4	0.3	0.5	1.0	61.7	1.8	5.2	5.3	5.7	4.7	4.5	3.1	0.7	0.2	0.2	0.3	0.5	32.1
Run-off into Preston Reservoir	ac-ft	2.7	7.8	7.9	8.6	7.0	6.8	4.7	1.1	0.3	0.2	0.4	0.7	48.3	1.4	4.1	4.1	4.5	3.6	3.5	2.4	0.6	0.2	0.1	0.2	0.4	25.2
STORAGE RESERVOIRS																											
Henderson Reservoir Volume	ac-ft	27.5	56.6	125.9	202.3	282.7	350.4	392.8	392.8	336.4	238.9	130.1	41.7		27.5	35.6	86.2	141.3	198.4	247.0	296.1	296.1	233.0	136.4	31.6	27.5	
Henderson Reservoir Evaporation	ac-ft	-1.8	-0.7	-0.5	-0.7	-1.3	-3.0	-7.5	-12.6	-16.0	-16.0	-9.6	-3.6	-73.2	-1.8	-0.7	-0.6	-0.8	-1.4	-3.4	-6.7	-11.3	-13.4	-11.6	-4.7	-3.0	-59.3
Henderson Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Forebay Evaporation	ac-ft	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.5	-0.9	-1.2	-1.4	-1.2	-0.8	-6.6	-0.5	-0.2	-0.1	-0.1	-0.1	-0.3	-0.5	-0.9	-1.2	-1.4	-1.2	-0.8	-7.2
Preston Forebay Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Reservoir Volume	ac-ft	0.0	6.5	25.2	44.1	64.7	81.1	121.6	165.0	160.1	151.0	140.1	131.8		96.5	96.8	105.6	114.9	125.2	132.9	139.3	141.0	135.4	126.7	116.5	26.9	
Preston Reservoir Evaporation	ac-ft	0.0	-0.2	-0.2	-0.2	-0.4	-1.1	-3.3	-6.6	-8.7	-10.0	-8.2	-5.4	-44.3	-2.6	-1.0	-0.5	-0.5	-0.9	-1.9	-3.6	-6.1	-8.0	-9.0	-7.3	-1.9	-43.3
Preston Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Beginning Water Storage	ac-ft	27.5	63.2	151.1	246.4	347.4	431.5	514.4	557.8	496.4	389.9	270.2	173.5		124.0	132.5	191.8	256.2	323.5	380.0	435.3	437.1	368.4	263.1	148.1	54.4	
Total Reservoir Evaporation	ac-ft	-1.8	-1.0	-0.8	-1.0	-1.9	-4.3	-11.3	-20.1	-25.9	-27.5	-18.9	-9.8	-124.1	-4.8	-1.9	-1.2	-1.4	-2.5	-5.6	-10.8	-18.2	-22.5	-22.0	-13.2	-5.8	-109.8
Total Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LAND APPLICATION DISPOSAL DEMANDS																											
Bowers' Ranch	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2016/2017 WY Bower's Ranch	ac-ft	-7.7	0	0	0	0	0	0	-24.6	-26.7	-26.7	-26.7	-112.4														
Hoskins' Ranch	ac-ft	-3.3	0.0	0.0	0.0	0.0	0.0	-2.3	-19.4	-24.7	-26.0	-23.5	-16.4	-115.5	-1.8	0.0	0.0	0.0	0.0	0.0	-3.2	-16.4	-22.8	-24.9	-23.1	-14.6	-106.7
2016/2017 WY Hoskin's Ranch	ac-ft	0	0	0	0	0	0	0	-8.3	-27	-32.8	-26.4	-36.5	-131.0													
Castle Oaks Golf Course	ac-ft	-11.3	0.0	0.0	0.0	0.0	0.0	-11.9	-61.7	-89.4	-99.9	-89.4	-59.9	-423.4	-27.3	0.0	0.0	0.0	0.0	0.0	-35.3	-70.1	-92.4	-100.9	-91.1	-64.6	-481.7
UNMET IRRIGATION DEMANDS																											
Bower's Ranch Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Hoskin's Ranch Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
COGC Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.2	
Total Unmet Irrigation Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.2	24.2
MONTHLY STORAGE BALANCE																											
Total Inflows (excluding Unmet Irrigation Demands)	ac-ft	52.0	88.9	96.0	102.0	85.9	87.1	68.9	39.8	33.5	33.6	35.1	36.5	759.5	42.4	61.1	65.6	68.7	58.9	61.0	51.0	36.1	32.3	32.8	33.6	33.9	577.5
Total Inflows (including Unmet Irrigation Demands)	ac-ft	52.0	88.9	96.0	102.0	85.9	87.1	68.9	39.8	33.5	33.6	35.1	36.5	759.5	42.4	61.1	65.6	68.7	58.9	61.0	51.0	36.1	32.3	32.8	33.6	58.1	601.8
Total Outflows	ac-ft	-16.3	-1.0	-0.7	-1.0	-1.8	-4.3	-25.5	-101.2	-140.0	-153.4	-131.8	-86.1	-663.1	-33.9	-1.8	-1.2	-1.4	-2.5	-5.6	-49.3	-104.7	-137.7	-147.8	-127.3	-85.0	-698.2
Beginning Storage Volume	ac-ft	27.5	63.2	151.1	246.4	347.4	431.5	514.4	557.8	496.4	389.9	270.2	173.5		124.0	132.5	191.8	256.2	323.5	380.0	435.3	437.1	368.4	263.1	148.1	54.4	
Change in Water Volume	ac-ft	35.7	87.9	95.3	101.0	84.1	82.9	43.4	-61.4	-106.5	-119.7	-96.7	-49.5		8.5	59.3	64.4	67.3	56.5	55.4	1.8	-68.7	-105.4	-115.0	-93.7	-26.9	
Final Storage Volume	ac-ft	63.2	151.1	246.4	347.4	431.5	514.4	557.8	496.4	389.9	270.2	173.5	124.0		132.5	191.8	256.2	323.5	380.0	435.3	437.1	368.4	263.1	148.1	54.4	27.5	

Maximum Seasonal Storage Used (ac-ft)	**557.8**	181.8 Mgal		Maximum Seasonal Storage Used (ac-ft)	**437.1**	142.4 Mgal
Henderson Unutilized Capacity (ac-ft)	**0.0**	0.0 Mgal		Henderson Unutilized Capacity (ac-ft)	**96.7**	31.5 Mgal
Preston Unutilized Capacity (ac-ft)	**70.0**	22.8 Mgal		Preston Unutilized Capacity (ac-ft)	**94.0**	30.6 Mgal

Water Balance Update - ARSA Storage & Disposal Facilities

Scenario 2b: Current Flows & Facilities, Calibrated at 2016/17 Rainfall Distribution

February 2025 By: Bill Slenter/Steven Whittlesey, HydroScience

WASTEWATER INFLUENT FLOW		***MAX STORAGE CAPACITIES***		***OTHER INPUTS***	
		Henderson Reservoir	392.8 ac-ft		
Daily Average Wastewater Influent Flow	**312,636** gpd	Preston Reservoir	235.0 ac-ft	100-YR Multiplier	1.92 unitless
		Total System	627.8 ac-ft	Pan Evap Coefficient	0.75 unitless

		100-YEAR ANNUAL PRECIPITATION RETURN PERIOD													***AVERAGE ANNUAL PRECIPITATION RETURN PERIOD***											
	No. Days	31	30	31	31	28	31	30	31	30	31	31	30		31	30	31	31	28	31	30	31	30	31	31	30	
	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
CLIMATE INPUTS																											
Precipitation - Calibrated & 2016/17 Distribution	in	5.98	2.42	5.10	14.28	4.48	3.21	3.88	0.50	1.21	0.00	0.02	0.02	41.11	1.20	3.47	3.50	3.83	3.10	3.01	2.06	0.47	0.15	0.10	0.19	0.33	21.41
Precipitation - Calibrated & 2016/207 Distribution	in	5.98	2.42	5.10	14.28	4.48	3.21	3.88	0.50	1.21	0.00	0.02	0.02														
2016/2017 WY Precipitation	in	6.31	2.55	5.38	15.07	4.73	3.39	4.09	0.53	1.28	0.00	0.02	0.02	43.37													
Pan Evaporation	in	3.77	1.40	0.72	0.72	1.12	2.32	4.18	7.04	9.43	11.17	9.50	6.51	57.88	3.77	2.10	1.50	1.50	2.20	3.70	5.60	7.40	8.60	9.40	8.30	6.60	60.67
Effective Water Surface Evaporation	in	2.83	0.79	0.41	0.41	0.63	1.31	3.14	5.28	7.07	8.38	7.13	4.88	42.23	2.83	1.05	0.54	0.54	0.84	1.74	3.14	5.28	7.07	8.38	7.13	4.88	43.41
WASTEWATER GENERATION																											
Facility Wastewater Effluent (ADWF)	MG	9.7	9.4	9.7	9.7	8.8	9.7	9.4	9.7	9.4	9.7	9.7	9.4	114.1	9.7	9.4	9.7	9.7	8.8	9.7	9.4	9.7	9.4	9.7	9.7	9.4	114.1
I/I Contributions - Climate Calibration Only	MG	6.7	3.1	5.8	15.0	5.2	3.9	4.6	1.2	1.9	0.7	0.7	0.7	49.9	1.9	4.2	4.2	4.6	3.8	3.7	2.8	1.2	0.9	0.8	0.9	1.1	30.1
I/I Contributions - Calibrated (25% Factor Applied)	MG	6.7	3.1	7.3	18.8	6.5	4.9	5.8	1.2	1.9	0.7	0.7	0.7	58.5	1.9	4.2	5.3	5.7	4.8	4.7	3.5	1.2	0.9	0.8	0.9	1.1	34.9
TOTAL Wastewater Effluent - Climate Calibration Only	ac-ft	50.3	38.4	47.6	75.8	42.9	41.8	42.9	33.5	34.7	32.0	32.0	31.1	503.2	35.7	41.7	42.7	43.7	38.6	41.2	37.3	33.4	31.5	32.3	32.6	32.0	442.7
TOTAL Wastewater Effluent	ac-ft	50.3	38.4	52.1	87.4	46.9	44.9	46.5	33.5	34.7	32.0	32.0	31.1	529.8	35.7	41.7	46.0	47.2	41.6	44.1	39.5	33.4	31.5	32.3	32.6	32.0	457.4
2016/2017 WY Effluent Flow Values	ac-ft	33.8	34.3	50.6	94.9	81.3	47.6	49.4	29.5	27.3	26.5	33.8	33.8	542.8													
WATERSHED CONTRIBUTING AREAS																											
Precipitation into Henderson Reservoir	ac-ft	14.4	5.8	12.3	34.4	10.8	7.7	9.3	1.2	2.9	0.0	0.0	0.0	98.9	2.9	8.4	8.4	9.2	7.5	7.2	5.0	1.1	0.4	0.2	0.5	0.8	51.5
Run-off into Henderson Reservoir	ac-ft	2.2	0.9	1.8	5.2	1.6	1.2	1.4	0.2	0.4	0.0	0.0	0.0	14.8	0.4	1.3	1.3	1.4	1.1	1.1	0.7	0.2	0.1	0.0	0.1	0.1	7.7
Precipitation into Preston Forebay	ac-ft	1.0	0.4	0.8	2.4	0.7	0.5	0.6	0.1	0.2	0.0	0.0	0.0	6.9	0.2	0.6	0.6	0.6	0.5	0.5	0.3	0.1	0.0	0.0	0.0	0.1	3.6
Precipitation into Preston Reservoir	ac-ft	9.0	3.6	7.6	21.4	6.7	4.8	5.8	0.8	1.8	0.0	0.0	0.0	61.7	1.8	5.2	5.3	5.7	4.7	4.5	3.1	0.7	0.2	0.2	0.3	0.5	32.1
Run-off into Preston Reservoir	ac-ft	7.0	2.8	6.0	16.8	5.3	3.8	4.6	0.6	1.4	0.0	0.0	0.0	48.3	1.4	4.1	4.1	4.5	3.6	3.5	2.4	0.6	0.2	0.1	0.2	0.4	25.2
STORAGE RESERVOIRS																											
Henderson Reservoir Volume	ac-ft	27.5	78.1	122.4	188.2	314.4	372.3	392.8	392.8	334.0	242.0	132.0	41.5		27.5	35.6	86.2	141.3	198.4	247.0	296.1	296.1	233.0	136.4	31.6	27.5	
Henderson Reservoir Evaporation	ac-ft	-1.8	-0.8	-0.5	-0.7	-1.4	-3.1	-7.5	-12.6	-15.9	-16.2	-9.7	-3.6	-73.6	-1.8	-0.7	-0.6	-0.8	-1.4	-3.4	-6.7	-11.3	-13.4	-11.6	-4.7	-3.0	-59.3
Henderson Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Forebay Evaporation	ac-ft	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.5	-0.9	-1.2	-1.4	-1.2	-0.8	-6.6	-0.5	-0.2	-0.1	-0.1	-0.1	-0.3	-0.5	-0.9	-1.2	-1.4	-1.2	-0.8	-7.2
Preston Forebay Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Reservoir Volume	ac-ft	0.0	17.0	23.5	37.8	78.1	90.3	128.3	170.9	164.7	158.1	146.4	136.9		95.9	96.3	105.0	114.4	124.6	132.4	138.7	140.5	134.9	126.2	116.0	26.4	
Preston Reservoir Evaporation	ac-ft	0.0	-0.2	-0.1	-0.2	-0.5	-1.1	-3.4	-6.8	-8.9	-10.3	-8.4	-5.5	-45.4	-2.6	-1.0	-0.5	-0.5	-0.9	-1.9	-3.6	-6.1	-7.9	-9.0	-7.3	-1.9	-43.2
Preston Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Beginning Water Storage	ac-ft	27.5	95.1	145.9	225.9	392.5	462.6	521.1	563.7	498.7	400.1	278.4	178.4		123.4	131.9	191.2	255.6	323.0	379.4	434.8	436.6	367.9	262.5	147.6	53.9	
Total Reservoir Evaporation	ac-ft	-1.8	-1.2	-0.7	-0.9	-2.0	-4.4	-11.4	-20.2	-26.0	-27.8	-19.2	-9.9	-125.6	-4.8	-1.8	-1.2	-1.4	-2.5	-5.6	-10.8	-18.2	-22.5	-22.0	-13.1	-5.8	-109.7
Total Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LAND APPLICATION DISPOSAL DEMANDS																											
Bowers' Ranch	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2016/2017 WY Bower's Ranch	ac-ft	-7.7	0	0	0	0	0	0	-24.6	-26.7	-26.7	-26.7	-26.7	-112.4													
Hoskins' Ranch	ac-ft	-3.3	0.0	0.0	0.0	0.0	0.0	-2.3	-19.4	-24.7	-26.0	-23.5	-16.4	-115.5	-1.8	0.0	0.0	0.0	0.0	0.0	-3.2	-16.4	-22.8	-24.9	-23.1	-14.6	-106.7
2016/2017 WY Hoskin's Ranch	ac-ft	0	0	0	0	0	0	0	-8.3	-27	-32.8	-26.4	-36.5	-131.0													
Castle Oaks Golf Course	ac-ft	-11.3	0.0	0.0	0.0	0.0	0.0	-11.9	-61.7	-89.4	-99.9	-89.4	-59.9	-423.4	-27.3	0.0	0.0	0.0	0.0	0.0	-35.3	-70.1	-92.4	-100.9	-91.1	-64.6	-481.7
UNMET IRRIGATION DEMANDS																											
Bower's Ranch Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Hoskin's Ranch Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
COGC Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.7	
Total Unmet Irrigation Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.7	24.7
MONTHLY STORAGE BALANCE																											
Total Inflows (excluding Unmet Irrigation Demands)	ac-ft	83.9	52.0	80.7	167.5	72.0	62.9	68.2	36.3	41.5	32.0	32.1	31.2	760.4	42.4	61.1	65.6	68.7	58.9	61.0	51.0	36.1	32.3	32.8	33.6	33.9	577.5
Total Inflows (including Unmet Irrigation Demands)	ac-ft	83.9	52.0	80.7	167.5	72.0	62.9	68.2	36.3	41.5	32.0	32.1	31.2	760.4	42.4	61.1	65.6	68.7	58.9	61.0	51.0	36.1	32.3	32.8	33.6	58.6	602.2
Total Outflows	ac-ft	-16.3	-1.2	-0.7	-0.9	-2.0	-4.4	-25.6	-101.3	-140.1	-153.7	-132.1	-86.2	-664.5	-33.9	-1.8	-1.2	-1.4	-2.5	-5.6	-49.3	-104.7	-137.7	-147.8	-127.3	-85.0	-698.1
Beginning Storage Volume	ac-ft	27.5	95.1	145.9	225.9	392.5	462.6	521.1	563.7	498.7	400.1	278.4	178.4		123.4	131.9	191.2	255.6	323.0	379.4	434.8	436.6	367.9	262.5	147.6	53.9	
Change in Water Volume	ac-ft	67.6	50.8	80.0	166.6	70.1	58.5	42.6	-65.0	-98.6	-121.8	-100.0	-55.0		8.5	59.3	64.4	67.3	56.5	55.4	1.8	-68.7	-105.3	-114.9	-93.7	-26.4	
Final Storage Volume	ac-ft	95.1	145.9	225.9	392.5	462.6	521.1	563.7	498.7	400.1	278.4	178.4	123.4		131.9	191.2	255.6	323.0	379.4	434.8	436.6	367.9	262.5	147.6	53.9	27.5	

Maximum Seasonal Storage Used (ac-ft)	**563.7**	183.7 Mgal			Maximum Seasonal Storage Used (ac-ft)	**436.6**	142.3 Mgal
Henderson Unutilized Capacity (ac-ft)	**0.0**	0.0 Mgal			Henderson Unutilized Capacity (ac-ft)	**96.7**	31.5 Mgal
Preston Unutilized Capacity (ac-ft)	**64.1**	20.9 Mgal			Preston Unutilized Capacity (ac-ft)	**94.5**	30.8 Mgal

Water Balance Update - ARSA Storage & Disposal Facilities

Scenario 3a: Future Flows & Facilities, Calibrated at Avg Year Rainfall Distribution

February 2025 By: Bill Slenter/Steven Whittlesey, HydroScience

WASTEWATER INFLUENT FLOW	***MAX STORAGE CAPACITIES***		***OTHER INPUTS***	
Daily Average Wastewater Influent Flow **319,420** gpd	Henderson Reservoir	392.8 ac-ft	I/I Reduction Factor	0.00% unitless
	Preston Reservoir	235.0 ac-ft	100-YR Multiplier	1.92 unitless
	Total System	627.8 ac-ft	Pan Evap Coefficient	0.75 unitless

		100-YEAR ANNUAL PRECIPITATION RETURN PERIOD													***AVERAGE ANNUAL PRECIPITATION RETURN PERIOD***												
	No. Days	31	30	31	31	28	31	30	31	30	31	31	30		31	30	31	31	28	31	30	31	30	31	31	30	
	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
CLIMATE INPUTS																											
Precipitation - Calibrated Avg Year Distribution	in	2.30	6.66	6.72	7.35	5.95	5.78	3.96	0.90	0.29	0.19	0.36	0.63	41.11	1.20	3.47	3.50	3.83	3.10	3.01	2.06	0.47	0.15	0.10	0.19	0.33	21.41
Precipitation - Calibrated & 2016/17 Distribution	in	5.98	2.42	5.10	14.28	4.48	3.21	3.88	0.50	1.21	0.00	0.02	0.02	41.11													
2016/2017 WY Precipitation	in	6.31	2.55	5.38	15.07	4.73	3.39	4.09	0.53	1.28	0.00	0.02	0.02	43.37													
Pan Evaporation	in	3.77	1.40	0.72	0.72	1.12	2.32	4.18	7.04	9.43	11.17	9.50	6.51	57.88	3.77	2.10	1.50	1.50	2.20	3.70	5.60	7.40	8.60	9.40	8.30	6.60	60.67
Effective Water Surface Evaporation	in	2.83	0.79	0.41	0.41	0.63	1.31	3.14	5.28	7.07	8.38	7.13	4.88	42.23	2.83	1.05	0.54	0.54	0.84	1.74	3.14	5.28	7.07	8.38	7.13	4.88	43.41
WASTEWATER GENERATION																											
Facility Wastewater Effluent (ADWF)	MG	9.9	9.6	9.9	9.9	8.9	9.9	9.6	9.9	9.6	9.9	9.9	9.6	116.6	9.9	9.6	9.9	9.9	8.9	9.9	9.6	9.9	9.6	9.9	9.9	9.6	116.6
I/I Contributions - Calibrated	MG	3.0	7.4	9.3	10.1	8.4	8.1	5.9	1.6	1.0	0.9	1.1	1.4	58.2	1.9	4.2	5.3	5.7	4.8	4.7	3.5	1.2	0.9	0.8	0.9	1.1	34.9
TOTAL Wastewater Effluent	ac-ft	39.7	52.1	59.0	61.41	53.1	55.4	47.4	35.4	32.5	33.2	33.7	33.6	536.5	36.3	42.3	46.6	47.9	42.1	44.7	40.1	34.1	32.1	32.9	33.2	32.7	465.0
2016/2017 WY Effluent Flow Values	ac-ft	33.8	34.3	50.6	94.9	81.3	47.6	49.4	29.5	27.3	26.5	33.8	33.8	542.8													
WATERSHED CONTRIBUTING AREAS																											
Precipitation into Henderson Reservoir	ac-ft	5.5	16.0	16.2	17.7	14.3	13.9	9.5	2.2	0.7	0.5	0.9	1.5	98.9	2.9	8.4	8.4	9.2	7.5	7.2	5.0	1.1	0.4	0.2	0.5	0.8	51.5
Run-off into Henderson Reservoir	ac-ft	0.8	2.4	2.4	2.7	2.2	2.1	1.4	0.3	0.1	0.1	0.1	0.2	14.8	0.4	1.3	1.3	1.4	1.1	1.1	0.7	0.2	0.1	0.0	0.1	0.1	7.7
Precipitation into Preston Forebay	ac-ft	0.4	1.1	1.1	1.2	1.0	1.0	0.7	0.2	0.0	0.0	0.1	0.1	6.9	0.2	0.6	0.6	0.6	0.5	0.5	0.3	0.1	0.0	0.0	0.0	0.1	3.6
Precipitation into Preston Reservoir	ac-ft	3.5	10.0	10.1	11.0	8.9	8.7	5.9	1.4	0.4	0.3	0.5	1.0	61.7	1.8	5.2	5.3	5.7	4.7	4.5	3.1	0.7	0.2	0.2	0.3	0.5	32.1
Run-off into Preston Reservoir	ac-ft	2.7	7.8	7.9	8.6	7.0	6.8	4.7	1.1	0.3	0.2	0.4	0.7	48.3	1.4	4.1	4.1	4.5	3.6	3.5	2.4	0.6	0.2	0.1	0.2	0.4	25.2
STORAGE RESERVOIRS																											
Henderson Reservoir Volume	ac-ft	27.5	57.3	127.2	204.2	285.3	353.5	392.8	392.8	337.0	240.2	132.0	44.1		27.5	36.3	87.4	143.2	200.9	250.2	299.8	300.4	237.9	141.7	37.3	27.5	
Henderson Reservoir Evaporation	ac-ft	-1.8	-0.7	-0.5	-0.7	-1.3	-3.0	-7.5	-12.6	-16.0	-16.1	-9.7	-3.7	-73.5	-1.8	-0.7	-0.6	-0.8	-1.5	-3.4	-6.7	-11.4	-13.5	-11.8	-5.0	-3.0	-60.2
Henderson Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Forebay Evaporation	ac-ft	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.5	-0.9	-1.2	-1.4	-1.2	-0.8	-6.6	-0.5	-0.2	-0.1	-0.1	-0.1	-0.3	-0.5	-0.9	-1.2	-1.4	-1.2	-0.8	-7.2
Preston Forebay Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Reservoir Volume	ac-ft	0.0	6.5	25.2	44.1	64.7	81.1	125.3	169.3	164.3	155.1	144.1	135.6		103.2	103.4	112.1	121.4	131.7	139.4	145.7	147.3	141.6	132.6	122.2	38.4	
Preston Reservoir Evaporation	ac-ft	0.0	-0.2	-0.2	-0.2	-0.4	-1.1	-3.4	-6.7	-8.9	-10.2	-8.3	-5.5	-45.0	-2.7	-1.0	-0.5	-0.6	-0.9	-2.0	-3.7	-6.2	-8.2	-9.3	-7.5	-2.4	-45.0
Preston Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Beginning Water Storage	ac-ft	27.5	63.8	152.3	248.3	350.0	434.6	518.1	562.1	501.3	395.3	276.0	179.7		130.6	139.7	199.6	264.6	332.6	389.6	445.5	447.7	379.5	274.4	159.5	65.9	
Total Reservoir Evaporation	ac-ft	-1.8	-1.0	-0.8	-1.0	-1.9	-4.3	-11.4	-20.2	-26.0	-27.7	-19.1	-10.0	-125.0	-4.9	-1.9	-1.2	-1.4	-2.5	-5.7	-10.9	-18.5	-22.9	-22.5	-13.7	-6.2	-112.4
Total Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LAND APPLICATION DISPOSAL DEMANDS																											
Bowers' Ranch	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2016/2017 WY Bower's Ranch	ac-ft	-7.7	0	0	0	0	0	0	0	-24.6	-26.7	-26.7	-26.7	-112.4													
Hoskins' Ranch	ac-ft	-3.3	0.0	0.0	0.0	0.0	0.0	-2.3	-19.4	-24.7	-26.0	-23.5	-16.4	-115.5	-1.8	0.0	0.0	0.0	0.0	0.0	-3.2	-16.4	-22.8	-24.9	-23.1	-14.6	-106.7
2016/2017 WY Hoskin's Ranch	ac-ft	0	0	0	0	0	0	0	-8.3	-27	-32.8	-26.4	-36.5	-131.0													
COWRF and Castle Oaks Golf Course	ac-ft	-11.3	0.0	0.0	0.0	0.0	0.0	-11.9	-61.7	-89.4	-99.9	-89.4	-59.9	-423.4	-27.3	0.0	0.0	0.0	0.0	0.0	-35.3	-70.1	-92.4	-100.9	-91.1	-64.6	-481.7
UNMET IRRIGATION DEMANDS																											
Bower's Ranch Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Hoskin's Ranch Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
COGC Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	
Total Unmet Irrigation Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	12.5
MONTHLY STORAGE BALANCE																											
Total Inflows (excluding Unmet Irrigation Demands)	ac-ft	52.6	89.5	96.7	102.7	86.5	87.8	69.6	40.5	34.1	34.3	35.8	37.1	767.1	43.0	61.8	66.3	69.4	59.5	61.6	51.7	36.7	32.9	33.5	34.3	34.5	585.1
Total Inflows (including Unmet Irrigation Demands)	ac-ft	52.6	89.5	96.7	102.7	86.5	87.8	69.6	40.5	34.1	34.3	35.8	37.1	767.1	43.0	61.8	66.3	69.4	59.5	61.6	51.7	36.7	32.9	33.5	34.3	47.0	597.7
Total Outflows	ac-ft	-16.3	-1.0	-0.7	-1.0	-1.8	-4.3	-25.6	-101.3	-140.2	-153.6	-132.0	-86.2	-664.0	-34.0	-1.9	-1.2	-1.4	-2.5	-5.7	-49.4	-105.0	-138.0	-148.3	-127.9	-85.5	-700.8
Beginning Storage Volume	ac-ft	27.5	63.8	152.3	248.3	350.0	434.6	518.1	562.1	501.3	395.3	276.0	179.7		130.6	139.7	199.6	264.6	332.6	389.6	445.5	447.7	379.5	274.4	159.5	65.9	
Change in Water Volume	ac-ft	36.3	88.5	95.9	101.7	84.6	83.5	44.0	-60.8	-106.0	-119.3	-96.3	-49.1		9.0	59.9	65.1	68.0	57.0	55.9	2.2	-68.3	-105.1	-114.8	-93.6	-38.4	
Final Storage Volume	ac-ft	63.8	152.3	248.3	350.0	434.6	518.1	562.1	501.3	395.3	276.0	179.7	130.6		139.7	199.6	264.6	332.6	389.6	445.5	447.7	379.5	274.4	159.5	65.9	27.5	

Maximum Seasonal Storage Used (ac-ft)	**562.1**	183.2 Mgal	Maximum Seasonal Storage Used (ac-ft)	**447.7**	145.9 Mgal
Henderson Unutilized Capacity (ac-ft)	**0.0**	0.0 Mgal	Henderson Unutilized Capacity (ac-ft)	**92.4**	30.1 Mgal
Preston Unutilized Capacity (ac-ft)	**65.7**	21.4 Mgal	Preston Unutilized Capacity (ac-ft)	**87.7**	28.6 Mgal

Water Balance Update - ARSA Storage & Disposal Facilities

Scenario 3b: Future Flows & Facilities, Calibrated at 2016/17 Rainfall Distribution

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WASTEWATER INFLUENT FLOW		***MAX STORAGE CAPACITIES***		***OTHER INPUTS***	
Daily Average Wastewater Influent Flow	**319,420** gpd	Henderson Reservoir	392.8 ac-ft	I/I Reduction Factor	0.00% unitless
		Preston Reservoir	235.0 ac-ft	100-YR Multiplier	1.92 unitless
		Total System	627.8 ac-ft	Pan Evap Coefficient	0.75 unitless

		100-YEAR ANNUAL PRECIPITATION RETURN PERIOD													***AVERAGE ANNUAL PRECIPITATION RETURN PERIOD***												
	No. Days	31	30	31	31	28	31	30	31	30	31	31	30		31	30	31	31	28	31	30	31	30	31	31	30	
	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
CLIMATE INPUTS																											
Precipitation - Calibrated & 2016/17 Distribution	in	5.98	2.42	5.10	14.28	4.48	3.21	3.88	0.50	1.21	0.00	0.02	0.02	41.11	1.20	3.47	3.50	3.83	3.10	3.01	2.06	0.47	0.15	0.10	0.19	0.33	21.41
Precipitation - Calibrated & 2016/17 Distribution	in	5.98	2.42	5.10	14.28	4.48	3.21	3.88	0.50	1.21	0.00	0.02	0.02														
2016/2017 WY Precipitation	in	6.31	2.55	5.38	15.07	4.73	3.39	4.09	0.53	1.28	0.00	0.02	0.02	43.37													
Pan Evaporation	in	3.77	1.40	0.72	0.72	1.12	2.32	4.18	7.04	9.43	11.17	9.50	6.51	57.88	3.77	2.10	1.50	1.50	2.20	3.70	5.60	7.40	8.60	9.40	8.30	6.60	60.67
Effective Water Surface Evaporation	in	2.83	0.79	0.41	0.41	0.63	1.31	3.14	5.28	7.07	8.38	7.13	4.88	42.23	2.83	1.05	0.54	0.54	0.84	1.74	3.14	5.28	7.07	8.38	7.13	4.88	43.41
WASTEWATER GENERATION																											
Facility Wastewater Effluent (ADWF)	MG	9.9	9.6	9.9	9.9	8.9	9.9	9.6	9.9	9.6	9.9	9.9	9.6	116.6	9.9	9.6	9.9	9.9	8.9	9.9	9.6	9.9	9.6	9.9	9.9	9.6	116.6
I/I Contributions - Calibrated	MG	6.7	3.1	7.3	18.8	6.5	4.9	5.8	1.2	1.9	0.7	0.7	0.7	58.5	1.9	4.2	5.3	5.7	4.8	4.7	3.5	1.2	0.9	0.8	0.9	1.1	34.9
TOTAL Wastewater Effluent	ac-ft	51.0	39.1	52.8	88.02	47.4	45.5	47.1	34.2	35.4	32.6	32.7	31.7	537.4	36.3	42.3	46.6	47.9	42.1	44.7	40.1	34.1	32.1	32.9	33.2	32.7	465.0
2016/2017 WY Effluent Flow Values	ac-ft	33.8	34.3	50.6	94.9	81.3	47.6	49.4	29.5	27.3	26.5	33.8	33.8	542.8													
WATERSHED CONTRIBUTING AREAS																											
Precipitation into Henderson Reservoir	ac-ft	14.4	5.8	12.3	34.4	10.8	7.7	9.3	1.2	2.9	0.0	0.0	0.0	98.9	2.9	8.4	8.4	9.2	7.5	7.2	5.0	1.1	0.4	0.2	0.5	0.8	51.5
Run-off into Henderson Reservoir	ac-ft	2.2	0.9	1.8	5.2	1.6	1.2	1.4	0.2	0.4	0.0	0.0	0.0	14.8	0.4	1.3	1.3	1.4	1.1	1.1	0.7	0.2	0.1	0.0	0.1	0.1	7.7
Precipitation into Preston Forebay	ac-ft	1.0	0.4	0.8	2.4	0.7	0.5	0.6	0.1	0.2	0.0	0.0	0.0	6.9	0.2	0.6	0.6	0.6	0.5	0.5	0.3	0.1	0.0	0.0	0.0	0.1	3.6
Precipitation into Preston Reservoir	ac-ft	9.0	3.6	7.6	21.4	6.7	4.8	5.8	0.8	1.8	0.0	0.0	0.0	61.7	1.8	5.2	5.3	5.7	4.7	4.5	3.1	0.7	0.2	0.2	0.3	0.5	32.1
Run-off into Preston Reservoir	ac-ft	7.0	2.8	6.0	16.8	5.3	3.8	4.6	0.6	1.4	0.0	0.0	0.0	48.3	1.4	4.1	4.1	4.5	3.6	3.5	2.4	0.6	0.2	0.1	0.2	0.4	25.2
STORAGE RESERVOIRS																											
Henderson Reservoir Volume	ac-ft	27.5	78.8	123.7	190.1	317.0	375.4	392.8	392.8	334.7	243.3	133.8	43.9		27.5	36.3	87.4	143.2	200.9	250.2	299.8	300.4	237.9	141.7	37.3	27.5	
Henderson Reservoir Evaporation	ac-ft	-1.8	-0.8	-0.5	-0.7	-1.4	-3.1	-7.5	-12.6	-15.9	-16.2	-9.7	-3.7	-73.8	-1.8	-0.7	-0.6	-0.8	-1.5	-3.4	-6.7	-11.4	-13.5	-11.8	-5.0	-3.0	-60.2
Henderson Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Forebay Evaporation	ac-ft	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.5	-0.9	-1.2	-1.4	-1.2	-0.8	-6.6	-0.5	-0.2	-0.1	-0.1	-0.1	-0.3	-0.5	-0.9	-1.2	-1.4	-1.2	-0.8	-7.2
Preston Forebay Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Reservoir Volume	ac-ft	0.0	17.0	23.5	37.8	78.1	90.3	132.0	175.2	168.9	162.2	150.4	140.7		102.6	102.9	111.6	120.9	131.1	138.9	145.2	146.8	141.1	132.2	121.8	38.0	
Preston Reservoir Evaporation	ac-ft	0.0	-0.2	-0.1	-0.2	-0.5	-1.1	-3.5	-6.8	-9.0	-10.4	-8.5	-5.6	-46.1	-2.7	-1.0	-0.5	-0.6	-0.9	-2.0	-3.7	-6.2	-8.1	-9.3	-7.5	-2.4	-44.9
Preston Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Beginning Water Storage	ac-ft	27.5	95.8	147.2	227.9	395.1	465.7	524.8	568.0	503.6	405.5	284.2	184.6		130.1	139.1	199.0	264.1	332.0	389.0	445.0	447.2	379.0	273.9	159.1	65.5	
Total Reservoir Evaporation	ac-ft	-1.8	-1.2	-0.7	-0.9	-2.0	-4.4	-11.5	-20.3	-26.1	-28.0	-19.4	-10.1	-126.5	-4.9	-1.9	-1.2	-1.4	-2.5	-5.7	-10.9	-18.5	-22.8	-22.5	-13.7	-6.2	-112.3
Total Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LAND APPLICATION DISPOSAL DEMANDS																											
Bowers' Ranch	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2016/2017 WY Bower's Ranch	ac-ft	-7.7	0	0	0	0	0	0	0	-24.6	-26.7	-26.7	-26.7	-112.4													
Hoskins' Ranch	ac-ft	-3.3	0.0	0.0	0.0	0.0	0.0	-2.3	-19.4	-24.7	-26.0	-23.5	-16.4	-115.5	-1.8	0.0	0.0	0.0	0.0	0.0	-3.2	-16.4	-22.8	-24.9	-23.1	-14.6	-106.7
2016/2017 WY Hoskin's Ranch	ac-ft	0	0	0	0	0	0	0	-8.3	-27	-32.8	-26.4	-36.5	-131.0													
COWRF and Castle Oaks Golf Course	ac-ft	-11.3	0.0	0.0	0.0	0.0	0.0	-11.9	-61.7	-89.4	-99.9	-89.4	-59.9	-423.4	-27.3	0.0	0.0	0.0	0.0	0.0	-35.3	-70.1	-92.4	-100.9	-91.1	-64.6	-481.7
UNMET IRRIGATION DEMANDS																											
Bower's Ranch Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Hoskin's Ranch Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
COGC Unmet Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	
Total Unmet Irrigation Demands	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	13.0
MONTHLY STORAGE BALANCE																											
Total Inflows (excluding Unmet Irrigation Demands)	ac-ft	84.5	52.6	81.4	168.2	72.6	63.5	68.8	37.0	42.2	32.6	32.8	31.8	768.0	43.0	61.8	66.3	69.4	59.5	61.6	51.7	36.7	32.9	33.5	34.3	34.5	585.1
Total Inflows (including Unmet Irrigation Demands)	ac-ft	84.5	52.6	81.4	168.2	72.6	63.5	68.8	37.0	42.2	32.6	32.8	31.8	768.0	43.0	61.8	66.3	69.4	59.5	61.6	51.7	36.7	32.9	33.5	34.3	47.5	598.1
Total Outflows	ac-ft	-16.3	-1.2	-0.7	-0.9	-2.0	-4.4	-25.7	-101.4	-140.3	-153.9	-132.3	-86.4	-665.4	-34.0	-1.9	-1.2	-1.4	-2.5	-5.7	-49.4	-105.0	-138.0	-148.3	-127.9	-85.5	-700.7
Beginning Storage Volume	ac-ft	27.5	95.8	147.2	227.9	395.1	465.7	524.8	568.0	503.6	405.5	284.2	184.6		130.1	139.1	199.0	264.1	332.0	389.0	445.0	447.2	379.0	273.9	159.1	65.5	
Change in Water Volume	ac-ft	68.3	51.5	80.6	167.2	70.6	59.1	43.2	-64.4	-98.1	-121.3	-99.6	-54.6		9.1	59.9	65.1	68.0	57.0	55.9	2.3	-68.3	-105.1	-114.8	-93.6	-38.0	
Final Storage Volume	ac-ft	95.8	147.2	227.9	395.1	465.7	524.8	568.0	503.6	405.5	284.2	184.6	130.1		139.1	199.0	264.1	332.0	389.0	445.0	447.2	379.0	273.9	159.1	65.5	27.5	

Maximum Seasonal Storage Used (ac-ft)	**568.0**	185.1 Mgal		Maximum Seasonal Storage Used (ac-ft)	**447.2**	145.7 Mgal
Henderson Unutilized Capacity (ac-ft)	**0.0**	0.0 Mgal		Henderson Unutilized Capacity (ac-ft)	**92.4**	30.1 Mgal
Preston Unutilized Capacity (ac-ft)	**59.8**	19.5 Mgal		Preston Unutilized Capacity (ac-ft)	**88.2**	28.7 Mgal

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TECHNICAL MEMORANDUM

DATE: February 26, 2024

Project No.: 988-50-24-10
SENT VIA: EMAIL

TO: George Lee, City Manager, City of Ione

CC: Justin Granados, WaterStone Services

FROM: Kathryn Gies, PE, RCE #65022
Allie Ahern, EIT

REVIEWED BY: Charles Hardy, PE, RCE #71015

SUBJECT: Updated Water Balance for City of Ione Wastewater Treatment Facility, Waste Discharger Requirements Order R5-2013-0022-001

This technical memorandum (TM) provides information and supporting documentation related to an updated water balance for the City of Ione (City) Wastewater Treatment Facility (WWTF). The following topics are addressed:

- Background Information
- Existing Facilities
- Historical Influent Flows
- Climate Data
- Current (2024) Influent Flows
- Projected 2030 Influent Flows
- Estimated Capacity of Existing Discharge Areas
- Operational Assumptions
- Water Balance Results

BACKGROUND INFORMATION

Waste Discharge Requirements

The City and the Jackson Rancheria Development Corporation (Jackson Rancheria) are the two entities permitted under Central Valley Regional Water Quality Control Board (Regional Board) Waste Discharge Requirements (WDRs) Order R5-2013-0022-001 and the associated Revised Monitoring and Reporting Program R5-2013-0022 REV1 (MRP) (Regional Board, 2014b) for the treatment of domestic wastewater at the WWTF and disposal and reuse of the secondary effluent. The WDRs were initially adopted on April 11, 2013, and revised December 5, 2014 (Regional Board, 2014c).

The WDRs present the following information related to the capacity of the WWTF and disposal system:

- The allowable influent average dry weather flow (ADWF)[1] to the WWTF is limited to 0.50 million gallons per day (mgd) based on the water balances that were included in the City's 2012 Report of Waste Discharge (ROWD) (GHD Inc., 2012a).
- The allowable influent ADWF to the WWTF can increase to 0.52 mgd following Executive Officer approval of a 2020 Capacity Expansion Completion Report. The WDRs were modified in 2014 to make this provision performance-based because of changes in City operations that occurred in 2013 that effectively increased the available disposal capacity provided by the percolation basins. However, the 0.52 mgd limit was not modified. The understanding at the time was the capacity limit would be modified with the submission of the 2020 Capacity Expansion Completion Report.
- WDRs Finding 29 states: "The City states that the current treatment capacity is 0.55 mgd."

Cease and Desist Order

On December 5, 2014, the Regional Bord adopted Cease and Desist Order 2014-0157 (CDO) (Regional Board, 2014a) that addressed the City's inability to comply with the following requirements of the WDRs:

- **Prohibition A.1:** Discharge of wastes to surface waters or surface water drainage courses is prohibited. (Only as this provision relates to the discharge of degraded groundwater into Sutter Creek).
- **Groundwater Limitation D.2:** Release of waste constituents from any portion of the WWTF shall not cause groundwater to contain constituents in concentrations that exceed either the Primary or Secondary Maximum Contaminant Levels established therein.
- **Discharge Specification E.1:** No waste constituent shall be released, discharged, or placed where it will be released or discharged, in a concentration or in a mass that causes violation of the Groundwater Limitations of [the WDRs].
- **Discharge Specification E.3:** The discharge shall remain within the permitted waste treatment/containment structures and land application areas (LAAs) at all times.

The CDO specifically requires a series of actions to be completed by the City to address the issues identified above. These actions are as follows:

- Construct facility improvements that will effectively stop the mechanisms that result in the mobilization and discharge of iron and manganese in violation of the Groundwater Limitations in the WDRs;
- Effectively stop any indirect discharge (seepage) of polluted groundwater to Sutter Creek; and
- Bring the facility into compliance with the WDRs.

[1] ADWF is defined in the WDRs as the total flow for the months of July through September, inclusive, divided by 92 days.

Compliance with the first requirement was to be demonstrated through achievement of specific groundwater numeric targets defined in the CDO. The CDO also requires that all ponds be lined or permanently closed if the specified groundwater numeric targets for iron and manganese defined in the CDO are not met by their compliance dates.

13267 Order Requirements

On August 14, 2024, the Regional Board issued a 13267 Order letter to the two WDRs permittees that requires submittal of an updated water balance for the WWTF to the Regional Board by December 13, 2024. The letter specifies the following three items that should be included in the water balance:

- The forecasted influent flows and proposed flows over the next 5 years based on population growth. Estimates must be supported by City planning documents.
- Any changes to collection system, treatment plant, and disposal features or their operation planned in the next 5 years.
- If the facility does not have sufficient capacity to treat and dispose of all wastewater onsite, the submittal must include the volume of excess effluent that would need to be disposed of each year to ensure all wastewater is treated and disposed of properly without causing or threatening to cause a violation of the permit or a condition of pollution.

The 13267 Order also states that the water balance must be in compliance with the requirements and guidance of the Regional Board's guidance document *Requirements for Water Balance Update and Calibration*.

In addition to the above requirements, Regional Board staff issued an email to the City that stated that the Regional Board cannot consider a water balance complete if it represents operation of a facility that causes violation of a WDRs and/or an enforcement order, with the following examples of reasons the Regional Board would consider a water balance incomplete:

1. The provided influent flow rate is higher than the treatment capacity, which could cause effluent limit exceedances.
2. The provided rate of treated wastewater being applied to a LAA is too high and threatens to impact groundwater or violate conditions of the WDRs such as runoff or saturated conditions.
3. The inclusion of disposal capacity via percolation ponds which are required to be lined or closed by an enforcement order.
4. The acceptance of a waste stream not described in the WDRs.
5. The operation of ponds or reservoirs that would exceed freeboard requirements of the WDRs.

Of the above-listed examples, Numbers 1 and 3 could pertain to the WWTF. Therefore, both topics are addressed herein.

Review Of Site-Specific Water Balance

On February 3, 2025, Regional Board staff issued a letter titled Review of Site Specific Water Balance that identified data gaps and deficiencies that must be addressed. The following specific changes were required:

- *The WDRs state that the total disposal capacity of the facility is 0.75 MGD, with the caveat that: "The water balances are based on the assumption of year-round cropping of all available LAAs. Therefore, this Order requires year round cropping of all LAAs and allows year-round irrigation with recycled effluent to meet crop water needs." The Town Field, a 67 acre land application area (LAA) that provides roughly 85% of the permitted disposal capacity, is leased to and managed by a farmer who does not crop year round. Standing water after rain events percolates slowly due to higher groundwater leaving the LAA saturated for long periods of time. Consequently, irrigation and cropping during the wet season is highly variable. Board staff's understanding is that the City has no control of how the LAA is managed.*

  In addition, since the WDRs were adopted the City modified the treatment train by lining Ponds 1-5. Ponds 1-4 were unlined treatment ponds, and pond 5 was a percolation pond. Lining Ponds 1-5 decreased the disposal capacity due to the loss of percolation.

  The water balance includes scenarios where Ponds 6 and/or 7 are used for percolation. This is not consistent with the requirements of the Ione WWTF WDRs or Cease and Desist Order (CDO) R5-2014-0157, which requires the lining or closure of the ponds. The effluent disposal capacity and flow limit in the WDRs have not been modified to reflect these changes. Therefore the 0.75 MGD effluent disposal capacity is an overestimation and should not be used. *The Report shall be updated to reflect the calculated current disposal capacity conditions within the requirements of the CDO and WDRs, and include supporting technical analysis to support that value.*
- *Rainfall data for a 1-100-year wet season is based on 2016/2017. Although the total rainfall is higher than 2020-2024 the distribution of storms is very different. In 2017 the rain was much heavier in January/February, but other months had more rain during 2020-2024 than they did in 2017. It may be more representative to distribute the total flow more evenly over the wet season of the 1-100 model year. However, as this is occurring in the midst of the wet season when storage capacity is high and irrigation potential is low the effect may be minimal. The Discharger shall examine the sensitivity of the water balance to changes in monthly rainfall and include narrative analysis of the findings. If needed a factor of safety should be integrated into the water balance to accommodate fluctuations in estimated monthly rainfall values.*
- *Tailwater flows from the Town Field are estimated as no flow data is available. However, for months when greater than eight (8) inches of precipitation are projected the submitted water balance caps the amount of tailwater received from the Town Field at eight (8) inches. More information shall be submitted to support this restriction* [i.e. the water balance caps the amount of tailwater received from the Town Field as the runoff calculated form eight (8) inches of rainfall], *or the water balance shall be revised to not include a cap on precipitation values used to estimate tailwater flows.*

- *The water balance shall reflect true site conditions, and not include operational decisions that would cause a violation of the WDRs, applicable enforcement Order, or any applicable regulation. For example, the water balance cannot include assumptions such as the use of an unpermitted discharge to surface water, irrigation when LAAs are saturated, or discharge at a flow rate that would cause violations of applicable effluent limits. If the current facility cannot accommodate current or projected 5 year flows the volume of that deficit shall be calculated as required by Item 3 of the 14 August 2024 Water Code Section 13267 Order. In order to properly examine the water balance calculations, it is necessary that the spreadsheets containing the data and formulas are submitted along with the narrative portion of the report. All spreadsheets used to construct the tables and surmise conclusions shall be submitted.*

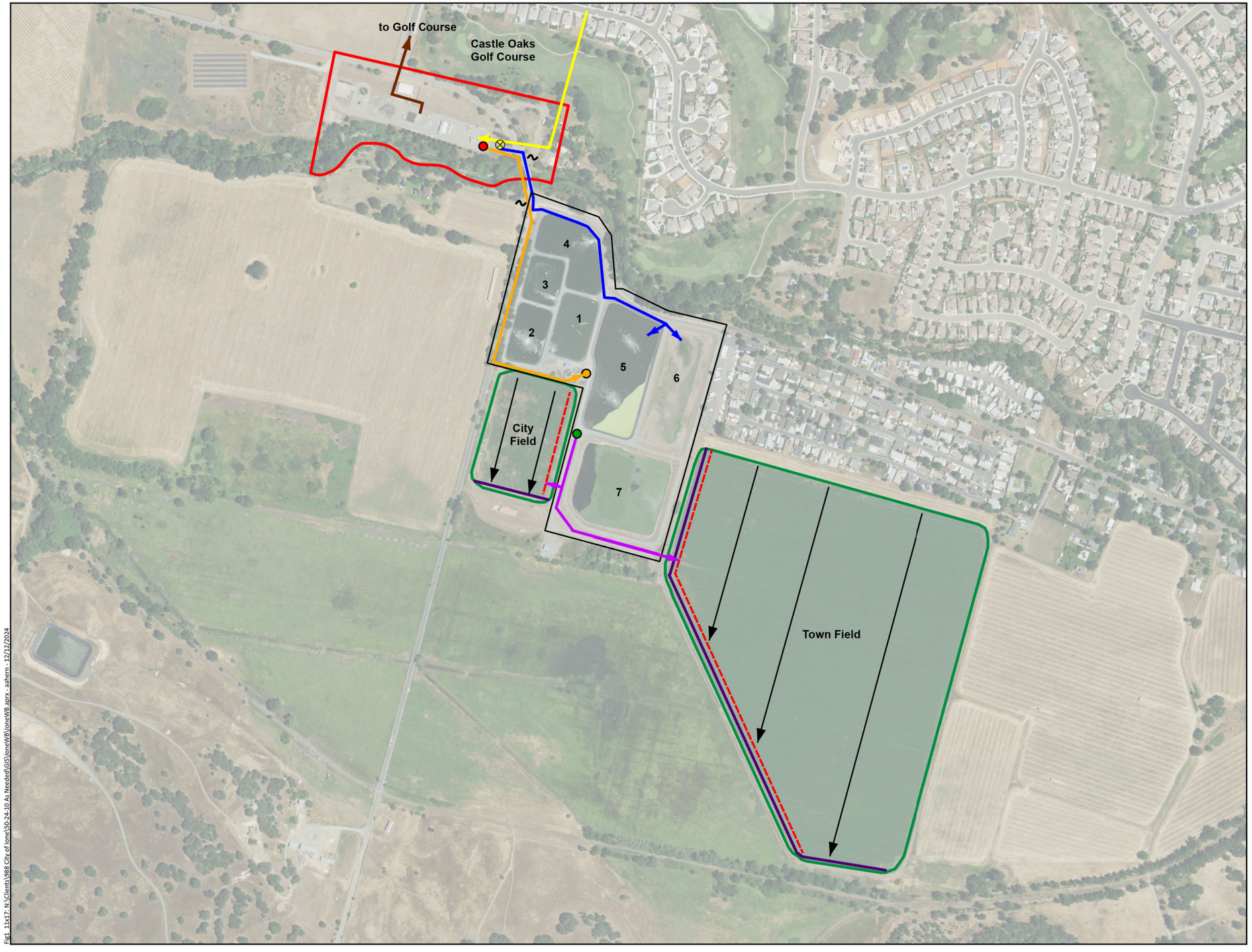
EXISTING FACILITIES

This section provides an overview of the WWTF pond system and LAA facilities.

WWTF Pond System

The WWTF is a pond-based treatment facility owned by the City and operated under contract by WaterStone Services, LLC. The WWTF is located south of the City, near the intersection of Marlette Road and Dave Brubeck Road. A map of the WWTF and connected facilities is shown on Figure 1. A flow schematic of the WWTF system is shown on Figure 2.

The WWTF treats wastewater generated from the City in five lined and aerated treatment ponds (Ponds 1 through 5). These ponds provide secondary wastewater treatment through aeration and settling. Pond 5 was historically operated as a percolation pond and is described as such in the current WDRs. However, with the lining and aeration improvements made since the WDRs were adopted, Pond 5 currently functions as a treatment pond. Ponds 6 and 7 are currently used for disposal through percolation and evaporation during periods when the effluent cannot be used for irrigation purposes.



- City WWTF Headworks
- Secondary Effluent Pump Station
- COWRF Pump Station
- Control Valve
- WWTF Boundary
- Castle Oaks Water Reclamation Facility (COWRF) Boundary
- Irrigation Area Boundary
- COWRF Influent
- COWRF Effluent to Golf Course
- Filter Backwash from COWRF
- Secondary Effluent from ARSA
- Irrigation Pipeline
- Wheel Line Irrigation Header
- Tailwater Ditch

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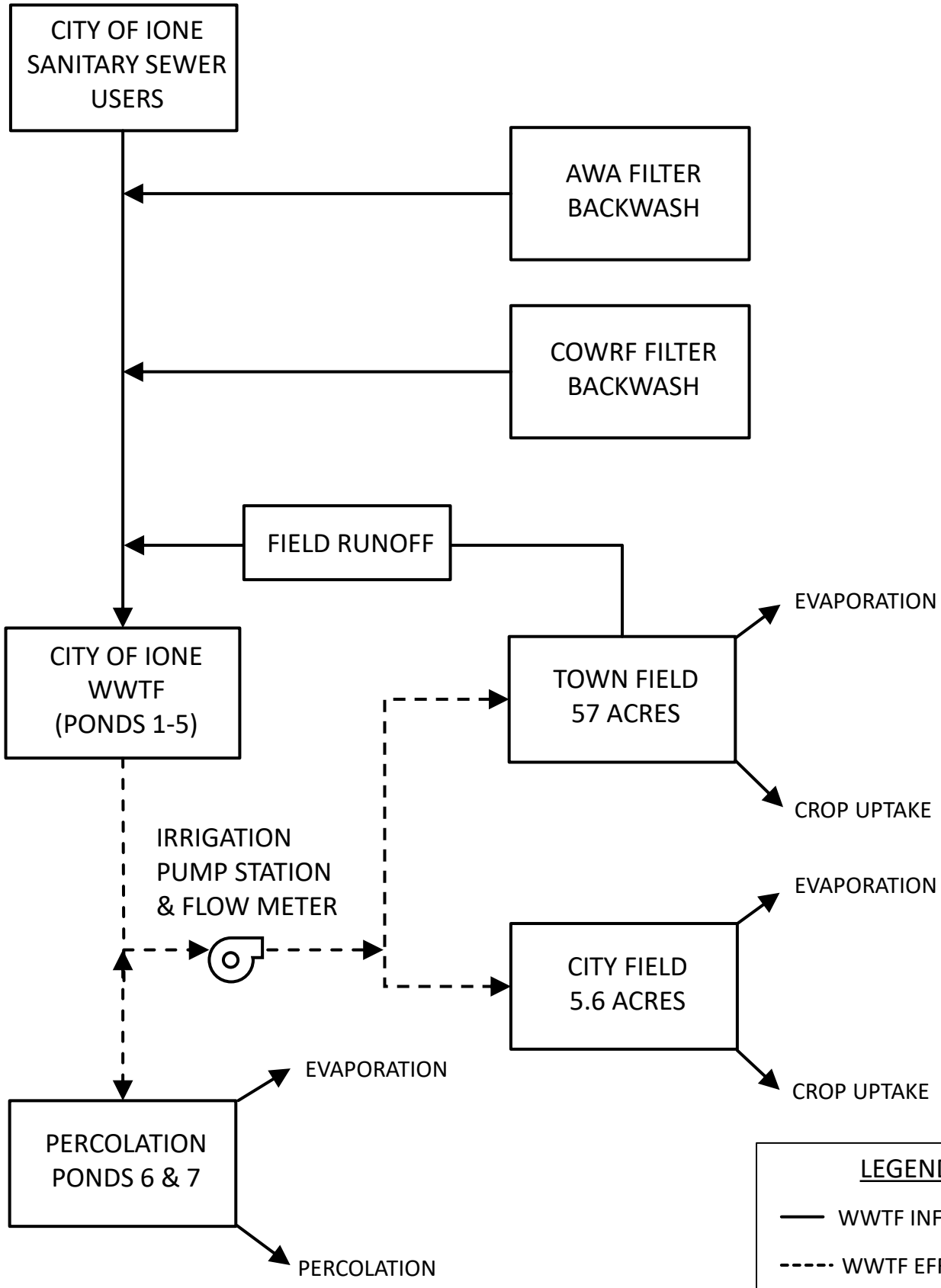
City of Ione

Updated Water Balance

WWTF Site Map

Fig 149

Figure 2. WWTF System Schematic



Detailed dimensions of each pond are presented in Table 1. Figure 3 provides a more detailed layout of the City's pond system, interconnection piping and groundwater monitoring piezometers described further below.

Table 1. WWTF Pond Dimensions

Pond[a]	Depth,[b] feet	Water Surface Area,[b] acres	Volume,[b] million gallons (MG)	Volume,[b] acre-feet	Pond Bottom Elevation, feet mean sea level (msl)
1	8.0	1.5	3.2	9.8	265.0
2	8.0	1.2	2.2	6.8	265.0
3	7.0	1.0	1.8	5.5	266.0
4	8.0	2.0	3.8	11.7	265.0
5	10.0	4.7	13.6	41.8	263.0
6	7.3	3.9	8.2	25.2	266.7
7	5.3	5.3	8.4	25.8	265.7

Source: 2017/2018 Pond 1-5 As-Built Survey

(a) Information for Ponds 1 - 5 is from the 2017/2018 Pond 1-5 As-Built Survey. Information for Ponds 6 and 7 is from the 2020 Capacity Expansion Completion Report.

(b) Depth, surface area and volume are shown at two feet of freeboard.

Quarterly groundwater monitoring is conducted at serval monitoring wells associated with the WWTF site. Piezometers 1, 2 and 3 (P1, P2 and P3) are specifically used to measure the groundwater elevations surrounding unlined Ponds 6 and 7. As shown on Figure 3, P1 lies on the east side of Pond 7, P3 lies in the northwest corner of Pond 7, and P2 lies northeast of Pond 6 adjacent to Sutter Creek. In this location, groundwater elevations at P2 are also likely influenced by creek water levels.

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- Headworks
- Secondary Effluent Pump Station
- Manholes
- Pond System Control Structures
- Groundwater Monitoring Point
- Irrigation Area Boundary
- Secondary Effluent from ARSA
- Filter Backwash from COWRF
- Irrigation Pipeline

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City of Ione

Updated Water Balance

WWTF Pond Layout

Fig 152

The influence of the WWTF ponds on the groundwater elevations at the WWTF site has changed significantly since the lining of Ponds 1 through 5 in 2019. Therefore, an assessment of depth to groundwater beneath the ponds should be based on data collected since 2019. A review of post 2019 quarterly groundwater monitoring data indicates that the highest groundwater elevations at P1, P2 and P3 occurred in the first quarter of 2023 (P2) and first quarter of 2024 (P1 and P3). The lowest groundwater elevations occurred in the third quarter of 2021 (for all 3). The groundwater elevations and corresponding depths below the invert of Ponds 6 and 7 for these periods are shown in Table 2 and Table 3. Groundwater elevation gradient maps from these monitoring periods are also included in Attachment A, taken from the respective quarterly monitoring reports prepared by others for the City.

Table 2. Pond 6 Depth to Groundwater

Measurement Period	Season	P2 Groundwater Elevation, feet msl	Groundwater Depth Below Pond 6, feet[(a)]
Q3 2021	Dry	257.30	9.4
Q1 2023	Wet	264.10	2.6
Q1 2024		262.64	4.1

(a) Groundwater depths below the invert of Pond 6 at 266.7 feet msl based on the respective P2 groundwater elevations.

Table 3. Pond 7 Depth to Groundwater

Measurement Period	Season	Groundwater Elevation, feet msl			Average Groundwater Depth Below Pond 7, feet[(a)]
		P1	P3	Average	
Q3 2021	Dry	256.80	251.60	254.20	11.5
Q1 2023	Wet	264.11	259.11	261.61	4.1
Q1 2024		264.61	260.44	261.03	4.7

(a) Groundwater depths below the invert of Pond 7 at 265.7 feet msl based on the respective averages of P1 and P3 groundwater elevations.

Land Application Areas

During the summer irrigation season, treated WWTF effluent is distributed via the secondary effluent pump station to two LAAs: the Town Field and City Field. Pertinent details regarding these two LAAs are as follows:

- Both LAAs are used to grow fodder crops (i.e. crops not intended for human consumption).
- As shown on Figure 1, the City Field is a 5.6-acre area located within the WWTF site. Currently, alfalfa is grown on the City field.
- The Town Field is a 57-acre irrigation site owned by Jackson Rancheria and is located directly east of the WWTF (see Figure 1).
- Since the City began irrigating the site with recycled water, alfalfa has been grown on this the Town Field.
- Both LAAs are irrigated by hand-move spray irrigation systems and are managed by an agricultural worker employed by Jackson Rancheria.

- Runoff is collected from the Town Field year-round and returned to the WWTF via the City's collection system.
- Runoff from the City Field is collected during the irrigation season. During the winter months, runoff is allowed to pond within the property until it evaporates or percolates.

A certification letter from Jackson Rancheria specific to the Town Field recycled water operations is provided in Attachment B.

Facility Changes Impacting Treatment Capacity Defined in the ROWD

The City has made significant changes to the WWTF since the development of the 2012 ROWD, as discussed above. These changes have impacted both the treatment and disposal capacity values that were stated in the ROWD, and that are documented in the WDRs[2].

With respect to treatment capacity, the WDRs state that the City reported that the influent ADWF capacity of the WWTF is 0.55 mgd. A disconnect between the stated capacity and the improvements made to the pond treatment system is found upon review of the June 2009 Wastewater Master Plan (Lee & Ro, Inc. and PMC, 2009), the March 2010 ROWD (Lee & Ro, Inc., 2010) and the November 2012 Supplement to the Revised ROWD (GHD Inc., 2012b). Specifically, the capacity statements made in the 2010 ROWD lean heavily on the 2009 Wastewater Master Plan values to define capacity with little to no assessment of the benefits provided by the City's projects that provided solids removal, pond lining, and increased aeration. Moreover, the 2009 Wastewater Master Plan does not characterize or assess the low load flows (i.e. backwash from the Castle Oaks Water Reclamation Facility (COWRF) and filter backwash from the Ione Water Treatment Plant (WTP)) that contribute to the ADWF entering the WWTF but have virtually no impact on treatment capacity.

Table 4 provides a summary of the aeration improvements made to the pond system since 2009. As shown, the City has significantly increased the aeration provided in the treatment ponds. This increase provides for added capacity through increased oxygen availability and improved mixing. More importantly, by lining and adding aeration to Pond 5, this facility no longer operates as a percolation/disposal pond as described in the WDRs. Indeed, Pond 5 is now better characterized as a treatment pond.

[2] As previously noted, and as documented in the 2014 WDR Amendment, the City has also made operational changes that have increased the available disposal capacity of the percolation ponds. However, because these water balances may not consider the percolation ponds as a vehicle for disposal, additional discussion regarding these changes is not included in this report.

Table 4. WWTF Pond System Aeration Improvements			
Facility	Original Aeration Capacity	Upgraded Aeration Capacity	Upgraded Aerator Type
Pond 1	1 aerator @ 15 horsepower (HP)	2@7.5 HP 1@ 15 HP	Floating Brush High-Speed Floating
Pond 2	1@ 7.5 HP	1@ 7.5 HP 1@ 15 HP	Floating Brush High-Speed Floating
Pond 3	1@ 7.5 HP	1@ 7.5 HP 1@ 15 HP	Floating Brush High-Speed Floating
Pond 4	1@ 7.5 HP	1@ 7.5 HP	Floating Brush
Pond 5	None	2@15) HP	High-Speed

A preliminary modeling analysis of the treatment pond system was developed to define the capacity of the ponds at current flow rates and at the projected 2030 flow rates, as defined in this TM. In addition, a model was developed to define the overall treatment capacity. For this analysis, the following assumptions were applied:

- Biochemical Oxygen Demand (BOD) removal in Ponds 1 through 4 is a first-order mechanism, where the first-order removal-rate constant "k" at 20 degrees Celsius (°C) is assumed to be 0.276 per day (U.S. Environmental Protection Agency, 2011).
- For Pond 5, the first order rate coefficient was defined based on the loading rate to the pond. Values ranged from 0.083 to 0.129 per day.
- The reaction rate coefficients were adjusted to reflect a treated water temperature of 10.9°C, which is based on the lowest monthly average measured influent temperature of Pond 5 in December and January. Assuming that the influent temperature of Pond 5 is the treatment temperature for all upstream ponds is a conservative assumption.
- The available volume of Pond 5 was adjusted down from the total capacity of 13.7 million gallons (MG) to 10.1 MG (or 31 acre-feet) based on average December through January operating levels (see Table 33 later in this TM).

The results of this analysis are shown in Table 5. As shown, the existing treatment system potentially has a theoretical ADWF capacity to process flows up to 0.72 mgd.

Table 5. WWTF Treatment Pond Modeling Analysis Results

Parameter	Units	Current (2024) Flows	Year 2030 Flows	Estimated Design Flows
Base Flow	mgd	0.41[(a)]	0.51[(b)]	0.58
ADWF[(c)]	mgd	0.55	0.65	0.72
Maximum Month Influent Flow	mgd	1.09	1.34	1.53
Maximum Month Influent BOD Load	pounds per day	1,450	1,800	2,060
Pond 4 Effluent BOD	mg/L	32	41	48
Pond 5 Effluent BOD	mg/L	20	24	30

(a) See Current (2024) Influent Flows section presented later in this TM.
(b) See Projected 2030 Influent Flows section presented later in this TM.
(c) Difference between Base Flow and ADWF values are the non-load inputs from sewer system inflow and infiltration, COWRF filter backwash, and AWA WTP filter backwash.

The City is currently working to update and calibrate the model of the treatment system. A final assessment of the current WWTF treatment capacity, including Pond 5, will be presented in a technical report prepared by a California Licensed Civil Engineer.

It is also noted that the effluent limitations described in the WDRs are specifically applied to effluent discharged to the percolation ponds. Since Pond 5 is lined it no longer is a percolation pond, these limits should apply only to discharges to Pond 6 and Pond 7. To remedy this, the City proposes a modification to the MRP[3] to change the effluent monitoring location.

[3] The City will need to develop new water storage and/or effluent management strategies to ensure compliance with the CDO. Once the new strategies are identified, the City will be in position to prepare and submit a new ROWD so support development of a new permit that incorporates changes to the treatment system.

A summary of the proposed changes to the MRP is provided in the table below.

The City of Ione shall collect un-disinfected effluent samples immediately downstream of Pond ~~4~~ 5 before the effluent is discharged into the percolation ponds. At a minimum, effluent monitoring shall include the following:

Constituent	Units	Sample Type	Sample Frequency	Reporting Frequency
ARSA secondary effluent flows to the percolation ponds	gpd	Meter Observation	Daily	Monthly
Total effluent flows to the percolation ponds[1, 2]	gpd	Calculated	Daily	Monthly
BOD_5	mg/L	Grab	Monthly	Monthly
Total dissolved solids	mg/L	Grab	Monthly	Monthly
Electrical conductivity	µmhos/cm	Grab	Monthly	Monthly
Total nitrogen	mg/L	Grab	Monthly	Monthly
pH	pH units	Grab	Monthly	Monthly
Standard minerals[3]	mg/L	Grab	Annually	Annually

1. *Sum of influent flows at the headworks and ARSA secondary effluent flows to the percolation ponds.*
2. *For continuous analyzers, the City shall document and report routine meter maintenance activities including date, time of day, and duration, in which the analyzer(s) is not in operation.*
3. *Standard minerals shall include, at a minimum, the following elements/compounds: arsenic, aluminum,boron, calcium, chloride, dissolved iron, magnesium, dissolved manganese, potassium, sodium, sulfate,total alkalinity (including alkalinity series), and hardness.*

HISTORICAL INFLUENT FLOWS

This section describes the historical flows from each source that contributes to the WWTF influent.

Total Influent Flows

Influent flows to the WWTF come from the following sources:

- Filter backwash from the Castle Oaks Water Reclamation Facility (COWRF)
- Filter backwash from the Ione Water Treatment Plant (WTP), operated by the Amador Water Agency (AWA)
- Base City flows (i.e. wastewater from City sewer customers)
- Wet weather flows, which including inflow and infiltration (I&I) to the wastewater collection system and tailwater runoff from the Town Field

The total historical average daily influent flows to the WWTF are shown in Table 6. The average annual flow (AAF) and ADWF to the WWTF for each year is also shown.[4]

As shown, flows were significantly higher in the 2024 irrigation season as compared to previous years. WWTF staff have reported that they suspect that during the 2024 irrigation season there was a leak in the valve that connects the COWRF and WWTF influent flow lines. This leak caused a portion of the flow sent from Preston Reservoir to enter the WWTF instead of the COWRF. This observation is supported by a review of the COWRF data that demonstrates the flow sent from Preston Reservoir was 100,000 to 300,000 gallons per day (gpd) higher than the reported COWRF influent flows. As discussed recently with the Regional Board staff, **the City has identified the cause of the leak as a damaged seal in the drain valves in the chlorine contact basins. The City has fixed the issue.**

[4] The ADWF period is defined as July through September, consistent with the definition in the WDRs.

Table 6. Historical Average WWTF Influent Flow									
	Average Daily WWTF Influent Flow, mgd								
Month	2016	2017	2018	2019	2020	2021	2022	2023	2024
October	0.381	0.423	0.395	0.486	0.502	0.490	0.390	0.615	0.860
November	0.329	0.352	0.386	0.530	0.431	0.343	0.433	0.447	0.583
December	0.371	0.318	0.344	0.430	0.346	0.555	0.510	0.431	-
January	0.433	0.656	0.406	0.480	0.399	0.412	0.451	0.894	0.545
February	0.386	0.582	0.353	0.805	0.361	0.434	0.396	0.575	0.723
March	0.474	0.454	0.609	0.790	0.460	0.351	0.395	0.939	0.656
April	0.364	0.422	0.471	0.495	0.473	0.395	0.546	0.582	0.590
May	0.375	0.375	0.438	0.546	0.538	0.395	0.485	0.607	0.849
June	0.406	0.381	0.404	0.470	0.562	0.462	0.457	0.597	0.839
July	0.386	0.418	0.333	0.355	0.563	0.520	0.454	0.578	0.784
August	0.395	0.453	0.247	0.447	0.554	0.505	0.474	0.656	0.897
September	0.413	0.490	0.375	0.517	0.536	0.465	0.409	0.616	0.894
AAF, mgd	**0.393**	**0.444**	**0.397**	**0.529**	**0.477**	**0.444**	**0.450**	**0.628**	**0.747**
ADWF, mgd	**0.398**	**0.454**	**0.318**	**0.440**	**0.551**	**0.497**	**0.446**	**0.617**	**0.858**

COWRF Backwash Flows

The COWRF provides tertiary recycled water to meet the irrigation demands of the Castle Oaks Golf Course (golf course). During the COWRF tertiary treatment process, a fraction of the flows through the COWRF is discarded as filter backwash and sent to the WWTF. Historical COWRF backwash flows are shown in Table 7. The COWRF ADWF for each year, which is used in calculating historical Base City flows, is also shown.

Table 7. Historical COWRF Backwash Flow

Month	Volume of COWRF Backwash Flow, MG								
	2016	2017	2018	2019	2020	2021	2022	2023	2024
October	2.2	3.0	1.9	4.0	3.4	2.4	1.7	7.3[(a)]	5.0
November	0	0	1.1	1.9	1.7	0	2.3	4.1[(a)]	1.7
December	0	0	0	0	0	0	0	0	-
January	0	0	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0	0	0
April	0	0	0	0	0	2.0	2.0	0.1	0
May	1.7	2.2	2.5	1.9	2.7	3.9	1.9	3.0	2.2
June	3.6	3.4	3.6	2.5	3.8	3.4	2.0	3.7	3.6
July	3.4	4.7	4.4	3.9	3.6	4.0	2.7	4.4	3.8
August	3.7	4.2	3.9	3.9	4.3	3.8	2.7	5.4[(a)]	5.1
September	4.1	4.1	3.5	4.0	4.0	2.6	2.2	6.4[(a)]	5.5
Total, MG	**18.7**	**21.7**	**20.9**	**22.1**	**23.4**	**21.9**	**17.5**	**34.4**	**26.9**
ADWF, mgd	**0.122**	**0.141**	**0.128**	**0.128**	**0.129**	**0.113**	**0.083**	**0.158**	**0.157**

(a) Backwash flows during this period were irregular due to filter maintenance. Values were not used in calculated average.

AWA Backwash Flows

The AWA discharges filter backwash flows from the Ione WTP to the City's wastewater system. Historical monthly backwash flows from AWA are shown in Table 8. The AWA filter ADWF backwash for each year, which was used in calculating the historical Base City flows, is also shown.

AWA flows to the WWTF decreased significantly after the completion of a filter upgrade project in 2016. Since then, intentional efforts have been made by AWA to further reduce flows. Between 2020 and 2021, the total volume of AWA flows sent to the WWTF decreased from 3.45 MG to 1.72 MG. Since 2021, total AWA flows to the WWTF have remained below 2 MG per year.

Table 8. Historical AWA Backwash Flow									
Month	Volume of AWA Backwash Flow, MG								
	2016	2017	2018	2019	2020	2021	2022	2023	2024
October	0.10	0.13	0.27	0.13	0.32	0.14	0.02	0.24	0.53
November	1.56	0.47	0.05	0.62	0.27	0.06	0.14	0.16	0.31
December	1.66	0.26	0.11	0.11	0.50	0.23	0.08	0.19	-
January	1.23	1.72	0.51	0.32	0.35	0.15	0.06	0.16	0.10
February	1.08	0.29	0.41	0.23	0.38	0.21	0.05	0.04	0.29
March	0.09	0.10	0.40	0.01	0.21	0.16	0.05	0.04	0.21
April	0.48	0.09	0.09	0.50	0.30	0.29	0.22	0.04	0.20
May	0.34	0.28	0.40	0.59	0.40	0.10	0.06	0.34	0.22
June	0.10	0.29	0.51	0.50	0.33	0.11	0.06	0.06	0.09
July	0.29	0.27	0.25	0.32	0.05	0.14	0.13	0.06	0.43
August	0.13	0.16	0.14	0.18	0.18	0.06	0.30	0.08	0.19
September	0.05	0.57	0.24	0.02	0.16	0.07	0.03	0.28	0.17
Total, MG	**7.11**	**4.60**	**3.38**	**3.53**	**3.45**	**1.72**	**1.20**	**1.69**	**1.90**
ADWF, mgd	**0.005**	**0.011**	**0.007**	**0.006**	**0.004**	**0.003**	**0.005**	**0.005**	**0.009**

Base City Flows

The base flow for the City can be determined by subtracting COWRF and AWA backwash ADWFs from the WWTF ADWF. The calculated daily average Base City flows for 2016 through 2024 are shown in Table 9.

Table 9. Historical Base City Wastewater Flows				
Year	ADWF, mgd			
	WWTF Influent ADWF	COWRF Backwash ADWF	AWA Backwash ADWF	Base City ADWF
2016	0.398	0.122	0.005	0.271
2017	0.454	0.142	0.011	0.301
2018	0.318	0.128	0.007	0.183
2019	0.440	0.128	0.006	0.306
2020	0.551	0.129	0.004	0.418
2021	0.497	0.113	0.003	0.381
2022	0.446	0.083	0.005	0.358
2023	0.617	0.158	0.005	0.454
2024	0.858	0.157	0.009	0.692
Average (2016-2023)[(a)]	**0.465**	**0.125**	**0.006**	**0.334**

(a) Averages exclude 2024 flow values due to the influence of Preston Reservoir flows being inadvertently directed to the WWTF.

Wet Weather Flows

During wet weather months, I&I from the City's collection system and collected tailwater runoff from the Town Field enter the WWTF. These flows have been calculated for each month by subtracting COWRF backwash flows, AWA backwash flows and base City flows from the total WWTF influent flow. For this analysis the monthly Base City flows were calculated by multiplying the Base City flow determined for each year, as presented in Table 9, by the number of days in each month. Calculated wet weather flows are presented in Table 10.

Table 10. Historical Wet Weather Flows

Month	Volume of Wet Weather Flows, MG[(a)]							
	2016	2017	2018	2019	2020	2021	2022	2023
October	1.1	0.6	4.4	1.5	0	0.8	0	0
November	0.2	1.0	4.9	4.2	0	0	0	0
December	1.4	0.2	4.9	3.7	0	5.2	4.6	0
January	3.8	9.2	6.4	5.1	0	0.8	2.8	13.5
February	2.1	7.6	4.3	13.7	0	1.3	1.0	3.3
March	6.2	4.6	12.8	15.0	1.1	0	1.1	15.0
April	2.3	3.5	8.5	5.2	1.4	0	3.4	3.7
May	1.2	0	5.0	5.0	0.6	0	2.0	1.4
June	0.3	0	2.5	1.9	0.2	0	0.9	0.5
July	0	0	0	0	0.8	0.2	0.1	0
August	0	0.3	0	0.3	0	0	0.6	0.8
September	0.1	1.0	2.0	2.3	0	0	0	0
Total	**18.7**	**28.0**	**55.7**	**57.9**	**4.1**	**8.3**	**16.5**	**38.2**

(a) Calculated wet weather flows include I&I and collected tailwater runoff from the Town Field.

CLIMATE DATA

The California Department of Water Resources (DWR) has defined the average annual rainfall, 1-in-100-year annual rainfall, and the monthly distributions of rainfall based on rainfall data for the Ione National Climate Data Center (NCDC) weather station. These values are as follows:

- The average rainfall year was defined as having a total rainfall of 22.0 inches.
- The 1-in-100 rainfall year was defined as having a total rainfall of 41.1 inches.
- The monthly rainfall distribution values were defined based on the 1906 to 1997 "Normal" monthly values as calculated by the DWR.

Reference evapotranspiration (ET) for each month is based on long-term monthly average ET values for the Plymouth California Irrigation Management Information System (CIMIS) station, located approximately 13 miles northeast of the WWTF. This rainfall and reference ET information is presented in Table 11, based on the DWR information provided in Attachment C.

Table 11. Applicable Climate Data

Month	Average Rainfall,[(a)] inches	1-in-100 Year Rainfall,[(a,b)] inches	Reference ET,[(c)] inches
October	1.15	2.15	3.24
November	2.81	5.24	1.68
December	3.53	6.58	1.21
January	5.08	9.48	1.48
February	3.14	5.86	1.95
March	3.19	5.95	3.02
April	1.75	3.26	4.57
May	0.63	1.18	5.97
June	0.23	0.43	7.19
July	0.07	0.13	7.64
August	0.13	0.24	6.98
September	0.33	0.62	4.99
Total	**22.0**	**41.1**	**49.9**

(a) Ione NCDC weather station #044283.
(b) Monthly 1-in-100 rainfall values are calculated from the total 1-in-100 year rainfall value and the ratio of average monthly rainfall to average total rainfall.
(c) Plymouth CIMIS station #227.

CURRENT (2024) INFLUENT FLOWS

This section presents the estimated current (2024) influent flows to the WWTF from each source. These flows will be used to develop the current condition water balances.

Current Base Flows

Equivalent dwelling unit (EDU) data was used to calculate the average daily Base City flow per EDU for each year. The number of EDUs and calculated Base City flow per EDU for each year are presented in Table 12.

Table 12. Development of Daily Average Base City Flow per EDU

Year	Number of EDUs	Base City ADWF, mgd	Flow per EDU, gpd/EDU
2016	1,825[(a)]	0.271	148
2017	1,899[(b)]	0.302	159
2018	1,973[(b)]	0.183	93
2019	2,047[(c)]	0.306	149
2020	2,269[(d)]	0.418	184
2021	2,208[(d)]	0.381	173
2022	2,373[(d)]	0.358	151
2023	2,481[(d)]	0.454	183
2024	2,520[(d)]	0.692	275
Average[(e)]		**0.334**	**164**

(a) From 2020 Expansion Completion Report by Dexter Wilson Engineering (2016).
(b) The 2017 and 2018 EDU values were calculated by taking the difference between the reported 2019 and 2016 EDUs and distributing their addition across the three years.
(c) From 2021 Water Balance Update and 2020 Expansion Completion Report by Coastland Engineers.
(d) From City Sewer January Billing Register for January of each year.
(e) Averages exclude 2018 and 2024 flow values.

As previously noted, the WWTF influent flows in 2024 included flows from Preston Reservoir that were inadvertently discharged to the WWTF. Atypical flows in 2024 is further demonstrated by that fact that the ADWF per EDU in 2024 was almost twice the ADWF per EDU of the four years prior. Due to the uncertainty associated with estimating this atypical influent flow to the WWTF, 2024 Base City flows have been excluded from the water balance analysis.

In addition, the 2018 Base City flow per EDU of 93 gpd is also anomalous when compared with the Base City flows of past and future years. Therefore, the data from 2018 has also been excluded from the calculation of the average Base City flow per EDU.

With the two exclusions noted above, the data in Table 12 demonstrates that the overall average daily base flow per EDU for 2016 to 2023 was calculated to be 164 gpd per EDU. To define the current daily base flow for use in the calibrated water balance, the overall average daily base flow per EDU was multiplied by the number of EDUs in 2024. **The current (2024) base flow is value is calculated to be 0.41 mgd.**

COWRF Backwash

The theoretical agronomic demands of the golf course, the COWRF influent rate needed to fulfill these demands, and the fraction of influent discarded as backwash were determined in the recently completed Castle Oaks Golf Course Recycled Water Demands TM, which is included as Attachment D. The calculated theoretical backwash flows will be used in the WWTF water balance analyses. The theoretical COWRF backwash flow for an average rainfall year is shown in Table 13. The theoretical COWRF backwash flow for a 1-in-100 rainfall year is shown in Table 14.

Table 13. Theoretical Monthly COWRF Backwash Flow for an Average Rainfall Year

Month	Average-Year COWRF Influent Flow, acre-feet	COWRF Backwash Flow as a Percentage of Influent Flow, percent	Average-Year COWRF Backwash to WWTF, acre-feet
October	27.3	18	4.9
November	0	19	0
December	0	-	0
January	0	-	0
February	0	-	0
March	0	-	0
April	35.3	15	5.3
May	70.1	13	9.1
June	92.4	13	12.0
July	100.9	13	13.1
August	91.1	13	11.8
September	64.6	17	11.0
Total, AFY	**481.7**	**-**	**67.2**

Source: Castle Oaks Golf Course Recycled Water Demands TM, Table 11

AFY = acre-feet per year

Table 14. Theoretical Monthly COWRF Backwash Flow for a 1-in-100 Rainfall Year

Month	1-in-100-Year COWRF Influent Flow, acre-feet	COWRF Backwash Flow as a Percentage of Influent Flow, percent	1-in-100-Year COWRF Backwash to WWTF, acre-feet
October	11.3	18	2.0
November	0	19	0
December	0	-	0
January	0	-	0
February	0	-	0
March	0	-	0
April	11.9	15	1.8
May	61.7	13	8.0
June	89.4	13	11.6
July	99.9	13	13.0
August	89.4	13	11.6
September	59.9	17	10.2
Total, AFY	**423.5**	**-**	**58.2**

Source: Castle Oaks Golf Course Recycled Water Demands TM, Table 12

AWA Backwash Flows

As previously noted, AWA flows to the WWTF decreased significantly since 2021. Therefore, AWA flow data from 2021 to 2024 were used as the basis for defining current AWA flows in the average water balances. Monthly AWA backwash flows from 2021 to 2024 are shown in Table 15. The average AWA backwash flow received was calculated for each month and was used directly in the average rainfall year and 1-in-100 rainfall year water balances.

Table 15. Historical AWA Backwash Flow

Month	Volume of AWA Backwash Flow, MG					Average, acre-feet
	2021	2022	2023	2024	Average	
October	0.14	0.02	0.24	0.53	0.23	0.71
November	0.06	0.14	0.16	0.31	0.17	0.52
December	0.23	0.08	0.19	-	0.17	0.52
January	0.15	0.06	0.16	0.10	0.12	0.37
February	0.21	0.05	0.04	0.29	0.15	0.46
March	0.16	0.05	0.04	0.21	0.12	0.37
April	0.29	0.22	0.04	0.20	0.19	0.58
May	0.10	0.06	0.34	0.22	0.18	0.55
June	0.11	0.06	0.06	0.09	0.08	0.25
July	0.14	0.13	0.06	0.43	0.19	0.58
August	0.06	0.30	0.08	0.19	0.16	0.49
September	0.07	0.03	0.28	0.17	0.14	0.43
Total	**1.72**	**1.20**	**1.69**	**2.74**	**1.90**	**5.83**

Town Field Tailwater Runoff

The City is required to collect winter tailwater runoff from the Town Field and recirculate it to the headworks. However, the volume of tailwater collected is not measured before it is combined with the overall WWTF influent flow. Therefore, an estimate of runoff must be made (as noted above, this estimated is also used to define the I&I relationship). A modified rational method for calculating runoff based on precipitation and ET was used to estimate theoretical monthly runoff volumes for inclusion in the water balance using the following equations:

Runoff = Precipitation – Crop ET - Interception - Infiltration

Infiltration = Infiltration Factor x (Precipitation – Crop ET - Interception)

Monthly total precipitation and reference ET from the Plymouth CIMIS Station were used to calibrate the theoretical runoff calculation parameters.[5] These values are presented in Table 16 and Table 17, respectively.

Table 16. Historical Monthly Precipitation

Year	Total Precipitation by Month, inches[(a)]												
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	**Total**
2019	6.3	11.1	7.0	1.9	6.3	0	0	0	1.4	0	1.5	6.2	**42**
2020	2.2	0.0	6.4	3.3	2.5	0	0	0	0	0	1.8	1.8	**18**
2021	5.9	2.4	2.8	0.1	0.1	0	0	0	0	8.5	1.0	8.7	**29**
2022	0.3	0.1	1.0	3.9	0.1	0.3	0	0	0.7	0	0.5	15.9	**23**
2023	9.7	4.6	8.3	0.2	1.1	0.1	0	0	0.6	1.4	1.7	2.1	**30**

(a) Plymouth CIMIS station #227.

Table 17. Historical Monthly ET

Year	Total Reference ET by Month, inches[(a)]												
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	**Total**
2019	1.8	1.6	3.0	4.6	5.0	7.2	7.8	7.1	4.9	3.9	2.2	1.5	**50**
2020	1.6	2.7	2.9	4.5	6.1	7.6	8.3	7.0	5.3	4.2	2.0	1.3	**53**
2021	1.4	2.0	3.4	5.5	7.2	7.8	8.4	7.1	4.4	1.1	1.3	0.8	**50**
2022	1.7	2.5	3.7	3.3	2.6	7.4	8.1	6.8	3.7	1.9	1.4	0.9	**44**
2023	1.3	1.7	2.3	5.0	5.8	6.7	8.5	7.3	4.7	3.6	2.0	1.2	**50**

(a) Plymouth CIMIS station #227.

The monthly crop ET was set equal to the monthly reference ET, as the alfalfa that is grown on the Town Field is typically assigned a crop coefficient of 1 (DWR, 2015).

Interception is the precipitation in inches captured on the vegetation, including the leaves and roots of the plants, and surface depressions in the soil. The calibrated interception value was determined to be 3 inches.

The formula for infiltration also includes an infiltration factor. Different infiltration factors were used for saturated and unsaturated soil conditions:

- For months with saturated soil conditions, an infiltration factor of 0.4 was used.
- For months with unsaturated soil conditions, an infiltration factor of 0.6 was used.

[5] The Ione NCDC weather station (#044283), which was used to define average and 1-in-100 year rainfall statistics previously in this TM is no longer an active station. Therefore, the Plymouth CIMIS station is the closest currently active rain gauge to the WWTF. Also, the Plymouth CIMIS station data does not have an adequate historical record to establish average and 1-in-100 year rainfall statistics.

Soil conditions were considered saturated when the two-month cumulative precipitation was greater than 10 inches. The two-month cumulative precipitation was calculated as the sum of total precipitation in the previous and current month.

Finally, the City has the ability to shut off tailwater flow from the Town Field when rainfall is heavy and tailwater flows threaten to inundate the WWTF. Shutting off the return flow causes stormwater to accumulate on the field, allowing it to infiltrate over a longer period and reduce the total runoff volume to the WWTF. This has been the historical practice to avoid overwhelming the plant. To calibrate the runoff and I&I models (both of which depend on the same flow data), the maximum monthly precipitation cutoff value used to calculate runoff was set to 8 inches for any month where the total precipitation was greater than 8 inches. Using this cutoff value, the combined runoff and I&I models provided reasonable results (i.e. if the value was not cutoff, the I&I calculations would be under-estimated). A summary of the calculated historical Town Field Runoff is provided in Table 18.

Table 18. Estimated Historical Town Field Runoff

Year	Total Runoff by Month, acre-feet												
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	**Total**
2019	2.8	4.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	**13.0**
2020	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.9**
2021	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	0.0	6.1	**15.1**
2022	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
2023	7.2	0.0	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**14.3**

As noted above, the historical values shown in Table 18 were used to define the I&I relationship. However, holding runoff on the Town Field may have historically resulted in runoff leaving the site. Therefore, the practice of holding runoff on the Town Field is not included in the analysis of future conditions. To address this in the water balance model, the minimum rainfall cutoff value was set to 20 inches, which far exceeds the monthly rainfall for any month. Therefore, the model effectively ignores this cutoff value[6].

A summary of the parameters used to calculate the theoretical tailwater runoff flows is shown in Table 19. The theoretical Town Field tailwater runoff for an average rainfall year is shown in Table 20. The theoretical Town Field tailwater runoff for a 1-in-100 rainfall year is shown in Table 21.

[6] The runoff cap feature of the model was retained in the event the model is used in the future where runoff capture is improved/allowed.

Table 19. Summary of Tailwater Runoff Calculation Parameters

Parameter	Value
Interception, inches	3
Two-Month Cumulative Precipitation to Saturate Soil, inches	10
Unsaturated Soil Infiltration Factor	0.4
Saturated Soil Infiltration Factor	0.6
Maximum Monthly Precipitation Used to Calculate Runoff, inches	20[(a)]

(a) The calibrated value was 8 inches. However, future models apply 20 inches of rainfall, which far exceeds monthly rainfall values and is effectively negates the storage of runoff on the Town Field. The monthly maximum rainfall cutoff value is retained in the model in the event effective runoff capture is developed in the future.

Table 20. Theoretical Monthly Town Field Tailwater Runoff for an Average Rainfall Year

Month	Average Year Rainfall, inches[(a)]	ET, inches[(a)]	Theoretical Infiltration, inches	Theoretical Runoff, inches	Theoretical Runoff, acre-feet
October	1.15	3.24	0	0	0
November	2.81	1.68	0	0	0
December	3.54	1.21	0	0	0
January	5.09	1.48	0.36	0.24	3.5
February	3.14	1.95	0	0	0
March	3.2	3.02	0	0	0
April	1.75	4.57	0	0	0
May	0.63	5.97	0	0	0
June	0.23	7.19	0	0	0
July	0.07	7.64	0	0	0
August	0.13	6.98	0	0	0
September	0.33	4.99	0	0	0
Total	**22.0**	**49.9**	**0.36**	**0.24**	**3.5**

(a) From Table 11.

Table 21. Theoretical Monthly Town Field Tailwater Runoff for a 1-in-100 Rainfall Year

Month	1-in-100 Year Rainfall, inches[(a)]	ET, inches[(a)]	Theoretical Infiltration, inches	Theoretical Runoff, inches	Theoretical Runoff, acre-feet	Theoretical Runoff without Rainfall Cap, acre-feet
October	2.15	3.24	0	0	0	0
November	5.24	1.68	0.3	0.2	3.3	3.3
December	6.58	1.21	0.9	1.4	20.7	20.7
January	9.48	1.48	2.0	3.0	22.2	43.7
February	5.86	1.95	0.4	0.5	8.0	8.0
March	5.95	3.02	0	0	0	0
April	3.26	4.57	0	0	0	0
May	1.18	5.97	0	0	0	0
June	0.43	7.19	0	0	0	0
July	0.13	7.64	0	0	0	0
August	0.24	6.98	0	0	0	0
September	0.62	4.99	0	0	0	0
Total	**41.1**	**49.9**	**3.6**	**3.7**	**54.2**	**75.7**

(a) From Table 11.

Inflow and Infiltration

Theoretical I&I into the City collection system was determined using a linear regression analysis of historical WWTF influent and climate data. Monthly data from 2019 to 2023 was analyzed. For each wet weather month, defined as November to April, monthly I&I was calculated using the following equation:

I&I = WWTF Influent - Base City Flow - AWA Backwash - Estimated Town Field Runoff

If the calculated I&I for any month was less than zero, that month was excluded from the analysis. The average daily I&I for each month was calculated by dividing the monthly I&I by the number of days in the month.

For each month, the average daily precipitation was calculated by dividing the monthly precipitation by the number of days in the month. The two-month average precipitation was calculated as the sum of the daily average precipitation of the previous and current month.

The average daily I&I and two-month average precipitation were plotted for each month and used to calculate a linear equation. The plotted data and corresponding equation are shown on Figure 4.

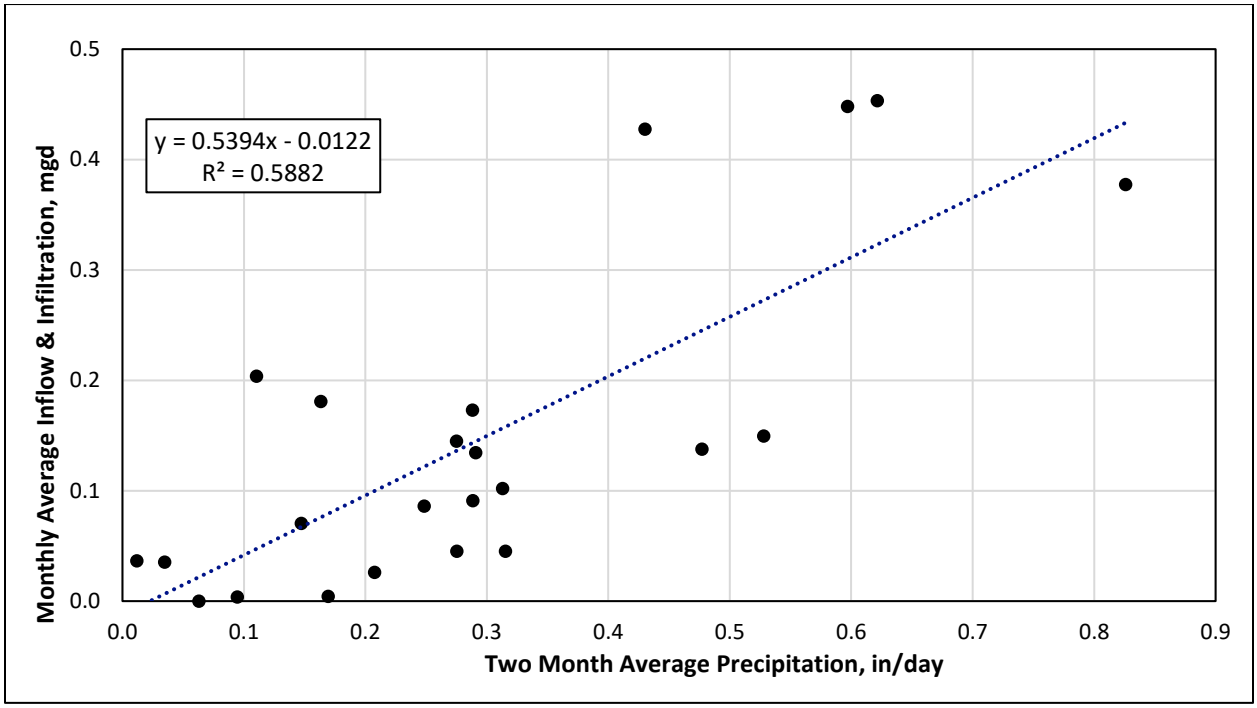

Figure 4. Two-Month Average Precipitation versus Daily Average I&I per Month

The slope and intercept from the linear regression equation were used to calculate the theoretical I&I for each month as a function of the two-month cumulative precipitation. The theoretical monthly I&I for an average rainfall year is shown in Table 22. The theoretical monthly I&I for a 1-in-100 rainfall year is shown in Table 23.

I&I is assumed to not increase appreciably with expansion of the City collection system in the next 5 years, as new infrastructure is less susceptible to I&I. Therefore, the same I&I was used for the current and Year 2030 water balance models.

Table 22. Theoretical Monthly I&I Flows for an Average Rainfall Year

Month	Average Year Rainfall, inches[(a)]	Theoretical I&I, mgd	Theoretical I&I, acre-feet
October	1.15	0.61	1.9
November	2.81	1.50	4.6
December	3.54	1.89	5.8
January	5.09	2.73	8.4
February	3.14	1.68	5.2
March	3.2	1.71	5.2
April	1.75	0.93	2.9
May	0.63	0.33	1.0
June	0.23	0.11	0.3
July	0.07	0.03	0.1
August	0.13	0.06	0.2
September	0.33	0.17	0.5
Total	**22.0**	**11.8**	**36.1**

(a) From Table 11.

Table 23. Theoretical Monthly I&I Flows for a 1-in-100 Rainfall Year

Month	1-in-100 Year Rainfall, inches[(a)]	Theoretical I&I, inches	Theoretical I&I, acre-feet
October	2.15	1.15	3.5
November	5.24	2.81	8.6
December	6.58	3.53	10.8
January	9.48	5.10	15.7
February	5.86	3.15	9.7
March	5.95	3.20	9.8
April	3.26	1.75	5.4
May	1.18	0.62	1.9
June	0.43	0.22	0.7
July	0.13	0.06	0.2
August	0.24	0.12	0.4
September	0.62	0.32	1.0
Total	**41.1**	**22.0**	**67.7**

(a) From Table 11.

Total Influent Flows

The current theoretical influent flows to the WWTF used for the average rainfall year and 1-in-100 rainfall year water balances are presented in Table 24 and Table 25, respectively. **As shown, the current ADWF is estimated to be approximately 0.55 mgd.**

Table 24. Current Theoretical Influent Flows for an Average Rainfall Year

Month	Inflows, acre-feet					
	Base City	I&I	Field Runoff	COWRF Backwash	AWA Backwash	Total
October	39.3	1.9	0	4.9	0.71	46.8
November	38.0	4.6	0	0	0.52	43.1
December	39.3	5.8	0	0	0.52	45.6
January	39.3	8.4	3.5	0	0.37	51.6
February	35.5	5.2	0	0	0.46	41.2
March	39.3	5.2	0	0	0.37	44.9
April	38.0	2.9	0	5.3	0.58	46.8
May	39.3	1.0	0	9.1	0.55	50.0
June	38.0	0.3	0	12.0	0.25	50.6
July	39.3	0.1	0	13.1	0.58	53.1
August	38.0	0.2	0	11.8	0.49	50.5
September	39.3	0.5	0	11.0	0.43	51.2
Total, AFY	**462.6**	**36.1**	**3.5**	**67.2**	**5.83**	**575.2**
AAF, mgd	**0.41**	**0.032**	**0.003**	**0.060**	**0.005**	**0.51**
ADWF, mgd	**0.41**	**0.003**	**0**	**0.127**	**0.005**	**0.55**

Table 25. Current Theoretical Influent Flows for a 1-in-100 Rainfall Year

Month	Inflows, acre-feet					
	Base City	I&I	Field Runoff	COWRF Backwash	AWA Backwash	Total
October	39.3	3.5	0	2	0.71	45.5
November	38.0	8.6	3.3	0	0.52	50.4
December	39.3	10.8	20.7	0	0.52	71.3
January	39.3	15.7	43.7	0	0.37	99.1
February	35.5	9.7	8	0	0.46	53.7
March	39.3	9.8	0	0	0.37	49.5
April	38.0	5.4	0	1.8	0.58	45.8
May	39.3	1.9	0	8	0.55	49.8
June	38.0	0.7	0	11.6	0.25	50.6
July	39.3	0.2	0	13	0.58	53.1
August	38.0	0.4	0	11.6	0.49	50.5
September	39.3	1.0	0	10.2	0.43	50.9
Total, AFY	**462.6**	**67.7**	**54.2**	**58.2**	**5.83**	**670.0**
AAF, mgd	**0.41**	**0.06**	**0.048**	**0.052**	**0.005**	**0.60**
ADWF, mgd	**0.41**	**0.006**	**0**	**0.123**	**0.005**	**0.55**

PROJECTED 2030 INFLUENT FLOWS

The City reports that 75 to 100 homes per year are expected to be built in each of the next 5 years. The projected number of EDUs for 2025 through 2030 was calculated by conservatively adding 100 EDUs for each year to the reported 2,520 EDUs in January 2024. The projected daily Base City flow for each year was calculated by multiplying the number of EDUs by the calculated average daily base flow per EDU of 164 gpd per EDU (from Table 12). The projected Base City flows are summarized in Table 26.

Table 26. Projected Base City Flows

Year	Projected Number of EDUs	Projected Base City Flow, mgd[(a)]
2025	2,620	0.43
2026	2,720	0.45
2027	2,820	0.46
2028	2,920	0.48
2029	3,020	0.50
2030	3,120	0.51

(a) Projected Base City Flow = (Projected Number of EDUs) x (Average Daily Base Flow of 164 gpd per EDU).

The projected Year 2030 theoretical influent flows to the WWTF used for the average rainfall year and 1-in-100 rainfall year water balances are presented in Table 27 and Table 28, respectively. **As shown, the projected 2030 ADWF is approximately 0.65 mgd[7].**

Table 27. Projected 2030 Influent Flows for an Average Rainfall Year

Month	Inflows, acre-feet					
	Base City	I&I	Field Runoff	COWRF Backwash	AWA Backwash	**Total**
October	48.5	1.9	0	4.9	0.71	56.0
November	47.0	4.6	0	0	0.52	52.1
December	48.5	5.8	0	0	0.52	54.8
January	48.5	8.4	3.5	0	0.37	60.8
February	43.8	5.2	0	0	0.46	49.5
March	48.5	5.2	0	0	0.37	54.1
April	47.0	2.9	0	5.3	0.58	55.8
May	48.5	1.0	0	9.1	0.55	59.2
June	47.0	0.3	0	12.0	0.25	59.6
July	48.5	0.1	0	13.1	0.58	62.3
August	47.0	0.2	0	11.8	0.49	59.5
September	48.5	0.5	0	11.0	0.43	60.4
Total, AFY	**571.0**	**36.1**	**3.5**	**67.2**	**5.83**	**683.9**
AAF, mgd	**0.51**	**0.032**	**0.003**	**0.060**	**0.005**	**0.61**
ADWF, mgd	**0.51**	**0.003**	**0**	**0.127**	**0.005**	**0.65**

[7] It is noted that this flow is lower than the current estimated treatment capacity for the WWTF including Pond 5. As noted, this capacity will be confirmed through future analyses and submitted to the Regional Board.

Table 28. Projected 2030 Influent Flows for a 1-in-100 Rainfall Year						
	Inflows, acre-feet					
Month	Base City	I&I	Field Runoff	COWRF Backwash	AWA Backwash	**Total**
October	48.5	3.5	0	2.0	0.71	54.7
November	47.0	8.6	3.3	0	0.52	59.4
December	48.5	10.8	20.7	0	0.52	80.5
January	48.5	15.7	43.7	0	0.37	108.3
February	43.8	9.7	8	0	0.46	62.0
March	48.5	9.8	0	0	0.37	58.7
April	47.0	5.4	0	1.8	0.58	54.8
May	48.5	1.9	0	8.0	0.55	59.0
June	47.0	0.7	0	11.6	0.25	59.6
July	48.5	0.2	0	13.0	0.58	62.3
August	47.0	0.4	0	11.6	0.49	59.5
September	48.5	1.0	0	10.2	0.43	60.1
Total, AFY	**571.0**	**67.7**	**54.2**	**58.2**	**5.83**	**778.7**
AAF, mgd	**0.51**	**0.06**	**0.048**	**0.052**	**0.005**	**0.70**
ADWF, mgd	**0.51**	**0.006**	**0**	**0.123**	**0.005**	**0.64**

ESTIMATED CAPACITY OF EXISTING DISCHARGE AREAS

This section describes the procedures used to calculate the theoretical capacity of the WWTF disposal areas. As previously noted, the WWTF currently relies on two ways to discharge effluent: land application and percolation.

Land Application Area Irrigation Demands

During the summer irrigation season, the WWTF sends secondary effluent to two LAAs, the 57-acre Town Field and 5.6-acre City Field. The capacity of the LAAs to accept flows is limited by the crop irrigation demands[8]. The theoretical irrigation demand of each LAA for an average rainfall year was calibrated using historical monthly irrigation demand values. The historical monthly irrigation demands for the Town and City Fields are shown in Table 29 and Table 30.

[8] It

Table 29. Historical Town Field Irrigation Demands

Month	Volume of Secondary Effluent Used, MG							Average, acre-feet
	2019	2020	2021	2022	2023	2024	Average	
October	0	0	0	7.3	0	1.2	1.4	4.3
November	0	0	0	0	0	2.3	0.4	1.2
December	0	0	0	0	0	0	0	0
January	0	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0	0
April	0	0	3.6	0	0	0	0.6	1.8
May	0	0	1.0	0	0	0	0.2	0.6
June	2.6	4.7	7.8	8.6	0.3	5.7	5.0	15.4
July	3.2	5.4	3.7	4.6	1.8	7.9	4.4	13.5
August	4.6	6.9	7.3	4.4	5.2	12.8	6.9	21.2
September	1.3	5.3	4.6	1.0	4.6	5.9	3.8	11.7
Total	**11.7**	**22.3**	**28**	**25.9**	**11.9**	**35.8**	**22.7**	**69.7**

Table 30. Historical City Field Irrigation Demands

Month	Volume of Secondary Effluent Used, MG							Average, acre-feet
	2018	2019	2020	2021	2022	2023	Average	
October	0	0	0	0	0.5	0	0.1	0.3
November	0	0	0	0	0	0	0	0
December	0	0	0	0	0	0	0	0
January	0	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0	0
April	0	0	0	0	0	0	0	0
May	0.4	0	0	0	0	0	0.1	0.3
June	0.3	0.3	0.2	0.3	0.9	0.4	0.4	1.2
July	0.5	0.7	0.2	0.3	0[(a)]	0.3	0.4	1.2
August	0.6	0.3	0.4	0.7	0[(a)]	0.8	0.6	1.8
September	0.3	0.1	0.7	0.8	0[(a)]	1	0.6	1.8
Total	**2.1**	**1.4**	**1.5**	**2.1**	**1.4**	**2.5**	**2.2**	**6.6**

(a) Values excluded from average. Effluent was not sent to the City Field during this period due to circumstances unrelated to irrigation demand.

Theoretical irrigation demands are calculated using the following formula:

Irrigation Demand = (Crop ET - Precipitation) / Crop Area / Irrigation Efficiency

The crop ET is calculated by multiplying the Reference ET shown in Table 11 by a representative crop coefficient. Crop coefficients for alfalfa crops such as those grown on the Town and City Fields are typically close to 1 (DWR, 2015). Irrigation efficiencies for hand-move spray irrigation systems like that used on the Town and City Fields can range from 60 to 80 percent (see Attachment E, Table 8.2b).

The theoretical irrigation demand can be calibrated by adjusting the irrigation efficiency value until the theoretical demand matches the historical irrigation volume supplied. However, assuming the highest irrigation efficiency value of 80 percent, the crop coefficient required to match the theoretical irrigation demand to historical irrigation volumes for the Town and City Fields was 0.32. These findings suggest that either (a) the historical reported irrigation flows are not accurate and/or (b) the fields are being irrigated well below agronomic rates (which would be the case if the field is not well drained). Given the uncertainty with the irrigation efficient values, it is suspected that the irrigation demands of the Town and City Fields are likely in between the historical irrigation demands and theoretical irrigation demands calculated with a crop coefficient of 1.

Discussions with City staff indicate that there is very little flow directed to the percolation basins during the summer irrigation season, suggesting that most of the flow is sent to the Town Field and City Field. This would not be the case if the crop coefficient was 0.32. Therefore, the water balance models were developed using two different methods:

1. Using the theoretical irrigation demand calculated with the calibrated crop coefficient of 0.32.
2. Using theoretical irrigation demand calculated with a crop coefficient of 1.

A comparison of these values with historical irrigation volumes for the Town Field is presented in Table 31 and for the City Field in Table 32. It is also noted that the City is planning to replace the effluent flow meter for the Town Field prior to the initiation of the 2025 irrigation season to allow for ongoing assessment of the crop coefficient and irrigation demands to be made.

Table 31. Historical and Theoretical Town Field Irrigation Demand

Month	Historical Average Irrigation Volume, acre-feet	Theoretical Irrigation Demand, acre-feet[(a)]	
		Calculated with Crop Coefficient of 0.32	Calculated with Crop Coefficient of 1
October	4.3	4.0	12.4
November	1.2	0	0
December	0	0	0
January	0	0	0
February	0	0	0
March	0	0	0
April	1.8	5.4	16.7
May	0.6	10.1	31.7
June	15.4	13.2	41.3
July	13.5	14.4	44.9
August	21.2	13.0	40.7
September	11.7	8.9	27.7
Total, AFY	**69.7**	**69.0**	**215.5**

(a) Theoretical irrigation demand for an average rainfall year.

Table 32. Historical and Theoretical City Field Irrigation Demand

Month	Historical Average Irrigation Volume, acre-feet	Theoretical Irrigation Demand, acre-feet[(a)]	
		Calculated with Crop Coefficient of 0.32	Calculated with Crop Coefficient of 1
October	0.3	0.4	1.2
November	0	0	0
December	0	0	0
January	0	0	0
February	0	0	0
March	0	0	0
April	0	0.5	1.6
May	0.3	1.0	3.1
June	1.2	1.3	4.1
July	1.2	1.4	4.4
August	1.8	1.3	4.0
September	1.8	0.9	2.7
Total, AFY	**6.6**	**6.8**	**21.2**

(a) Theoretical irrigation demand for an average rainfall year.

Percolation Ponds Percolation Rates

Effluent flows that exceed the demand of the LAAs are currently disposed of via percolation in Ponds 6 and 7. The capacity of the percolation ponds to accept flows is limited by the sustained percolation rate. As noted in the December 12 Water Balance TM, a percolation rate for Ponds 6 and 7 was estimated using a water balance approach around the ponds. This analysis demonstrated that the ponds have a sustained percolation rate of 3.0 inches per day in months where saturated soil conditions were likely to occur (February through May) and a percolation rate of 3.6 inches per day in other months (June through January). **However, as required by Regional Board staff, the water balances presented herein do not account for any percolation disposal in the ponds to reflect the requirements of the CDO.**

OPERATIONAL ASSUMPTIONS

This section addresses the operational assumptions applied in developing the water balances.

Pond 5

As previously noted, the City currently operates Pond 5 as a treatment pond, where it is used to equalize flows prior to discharge to the percolation ponds and LAAs. For purposes of the water balance, monthly net storage volumes for Pond 5 were matched to historical monthly storage volumes over the past five years. The average monthly Pond 5 storage volumes from 2019 to 2023 are shown in Table 33.[9] The overall average storage volume was calculated for each month and used in the water balances.

Table 33. Historical Pond 5 Storage

Month	Monthly Pond 5 Storage Volume, acre-feet					
	2019	2020	2021	2022	2023	Average
October	32.1	37.1	38.5	35.9	41.7	37.1
November	30.6	23.3	38.9	36.2	30	31.8
December	32.7	23.5	36.9	38.3	11.3	28.5
January	37.1	33.0	25.8	35.2	36.6	33.5
February	38.3	33.2	26.8	34.9	40.4	34.7
March	39.9	33.6	27.3	34.3	41.2	35.3
April	38.8	39.9	32.2	38.6	41.5	38.2
May	37.8	39.0	37.4	37.1	40.1	38.3
June	32.7	27.7	30.8	29.3	31.5	30.4
July	15.6	34.8	26.4	23.4	34.3	26.9
August	29.9	20.4	14.7	31.8	41.7	27.7
September	34.1	29.3	19.2	36.7	41.7	32.2

[9] A volume-to-depth curve was used to calculate the storage volume of Pond 5 from weekly freeboard measurements. The monthly averages of the calculated storage volumes are shown in Table 33.

Ponds 6 and 7

The analysis assumes that both Ponds 6 and 7 are emptied in October to another storage location (not yet defined). Each month thereafter, flows that exceed the storage/evaporative capacity of the two ponds are also assumed to be directed to the same storage location.

WATER BALANCE RESULTS

Water balance models were developed for the current and projected 2030 flow conditions assuming the disposal capacity provided by percolation ponds is eliminated and the ponds are converted to storage. To provide a better understanding of the range of potential operating conditions, models were developed for the following scenarios:

- Average rainfall year and crop coefficient of 0.32 for the Town and City Fields[10]
- Average rainfall year and crop coefficient of 1 for the Town and City Fields[11]
- 1-in-100 rainfall year and crop coefficient of 0.32 for the Town and City Fields
- 1-in-100 rainfall year and crop coefficient of 1 for the Town and City Fields

The results of the water balances are summarized for the current flow conditions in Table 34 and for the 1-in-100 yar conditions in Table 35. Additional details are provided in Attachment F. Key findings from this analysis are as follows:

- **At current City Base Flows of 0.41 mgd, the City would have an excess of up to 594 acre-feet of water that requires storage and/or disposal if the percolation ponds were lined.**
- **At projected 2030 City Base Flows 0.51 mgd, an excess of up to 697 acre-feet of water would require storage and/or disposal if the percolation ponds were lined[12].**

As a final note, Regional Board staff have requested that the City consider the sensitivity of the water balance to the distribution of rainfall. For this analysis, the existing facilities do not provide adequate capacity for storage and disposal and there is excess water each month. Given this, the amount of excess flow generated in each month will not impact the results of the analysis.

[10] The recent data suggests an unusually low crop coefficient for the Town and City Fields. Additional data collection is needed to confirm the value.

[11] A crop coefficient of 1 would be typical for the types of crops grown on the City and Town Fields.

[12] As discussed in the December Water Balance TM, the existing disposal capacity provided at the WWTF with the observed percolation rates is approximately 0.75 mgd ADWF. Therefore, there is no immediate risk of overflow based on the current configuration.

Table 34. Summary of Current Water Balance Results, No Percolation

Scenario	Base City Flow, mgd	Total WWTF Inflows, AFY	Irrigation, AFY				Pond 6 & 7 Flows, AFY				Excess Flow to Additional Storage, AFY
			Town Field Demand	Town Field Provided	City Field Demand	City Field Provided	Pond 7 Inflows	Pond 7 Outflows	Pond 6 Inflows	Pond 6 Outflows	
Average Rainfall Year											
Crop Coeff. of 0.32	0.41	572.0	69	69	7	7	474	0	462	0	453
Crop Coeff. of 1			215	215	21	21	313	0	301	0	292
1-in-100 Rainfall Year											
Crop Coeff. of 0.32	0.41	666.8	62	62	6	6	600	0	597	0	594
Crop Coeff. of 1			193	193	19	19	457	0	454	0	451

Table 35. Summary of 2030 Water Balance Results, No Percolation

Scenario	Base City Flow, mgd	Total WWTF Inflows, AFY	Irrigation, AFY				Pond 6 & 7 Flows, AFY				Excess Flow to Additional Storage, AFY
			Town Field Demand	Town Field Provided	City Field Demand	City Field Provided	Pond 7 Inflows	Pond 7 Outflows	Pond 6 Inflows	Pond 6 Outflows	
Average Rainfall Year											
Crop Coeff. of 0.32	0.51	683.9	69	69	7	7	586	0	574	0	563
Crop Coeff. of 1			215	215	21	21	425	0	413	0	403
1-in-100 Rainfall Year											
Crop Coeff. of 0.32	0.51	778.7	62	62	6	6	703	0	700	0	693
Crop Coeff. of 1			193	193	19	19	559	0	556	0	550

REFERENCES

California Department of Water Resources (DWR) and University of California, Davis, 2015. *Consumptive Use Program Plus (CUP+) Model, Version 6.1.* Accessed at https://water.ca.gov/Programs/Water-Use-And-Efficiency/Land-And-Water-Use/Agricultural-Water-Use-Models on December 11, 2024.

Central Valley Regional Water Quality Control Board, 2014a. *Cease and Desist Order R5-2014-0157 for City of Ione Wastewater Treatment Facility, Amador County.* December 2014.

Central Valley Regional Water Quality Control Board, 2014b. *Revised Monitoring and Reporting Program R5-2013-0022 (Rev 1) for City of Ione and Greenrock Ranch Lands, LLC., Ione Wastewater Treatment Facility, Amador County.* December 2014.

Central Valley Regional Water Quality Control Board, 2014c. *Waste Discharge Requirements Order R5-2013-0022-001 for City of Ione and Greenrock Ranch Lands, LLC., Ione Wastewater Treatment Facility, Amador County.* December 2014.

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Dexter Wilson Engineering, Inc., 2016. *City of Ione 2020 Capacity Expansion Completion Report.* December 2016.

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Lee & Ro, Inc., 2010. *Ione Water Reclamation Facility Report of Waste Discharge.* March 2010.

GHD Inc., 2012a. *City of Ione Revised Report of Waste Discharge.* September 2012.

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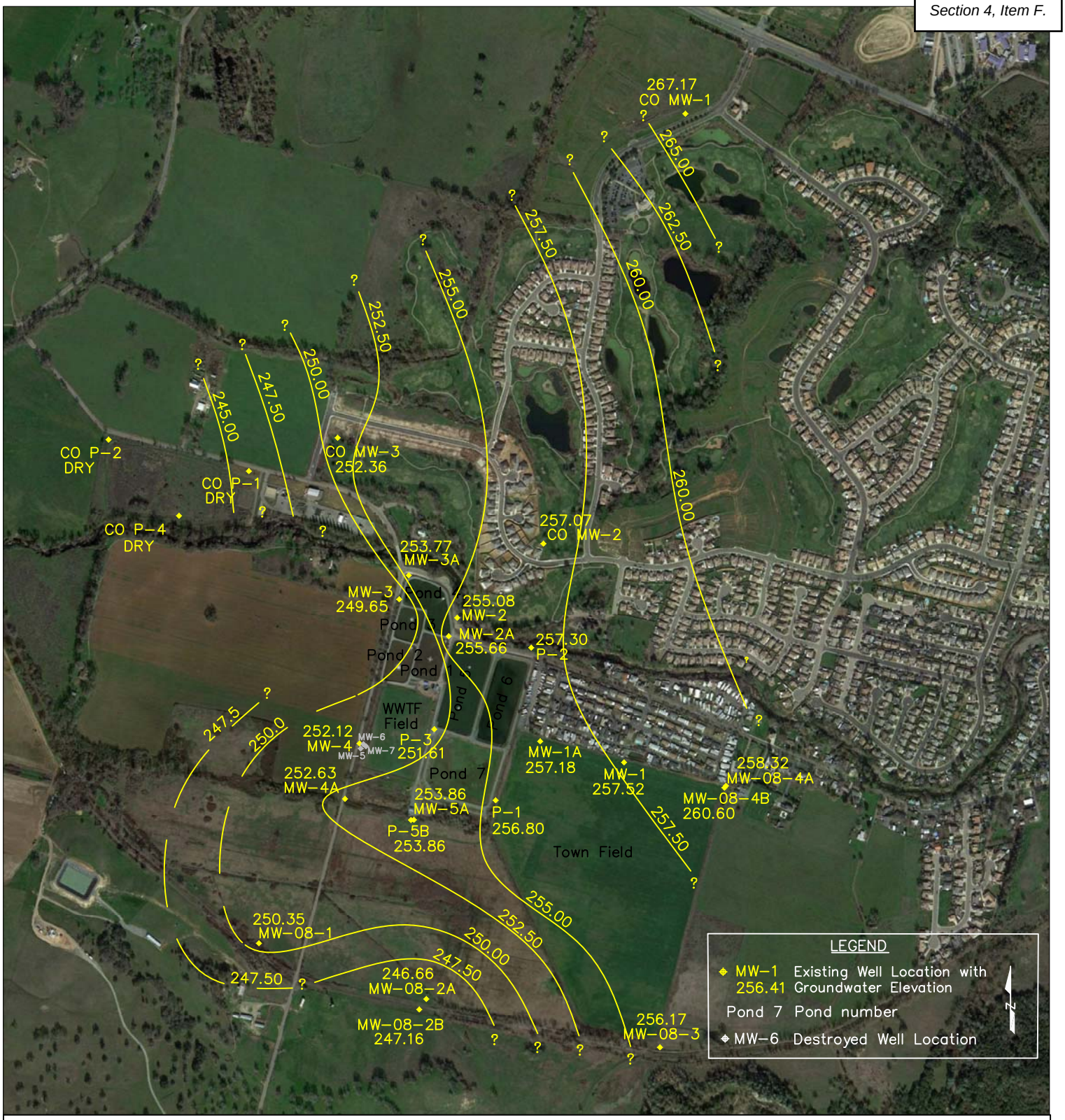
U.S. Environmental Protection Agency, 2011. *Principles of Wastewater Treatment Pond Systems for Plant Operators, Engineers, and Managers.* August 2011.

Attachment A

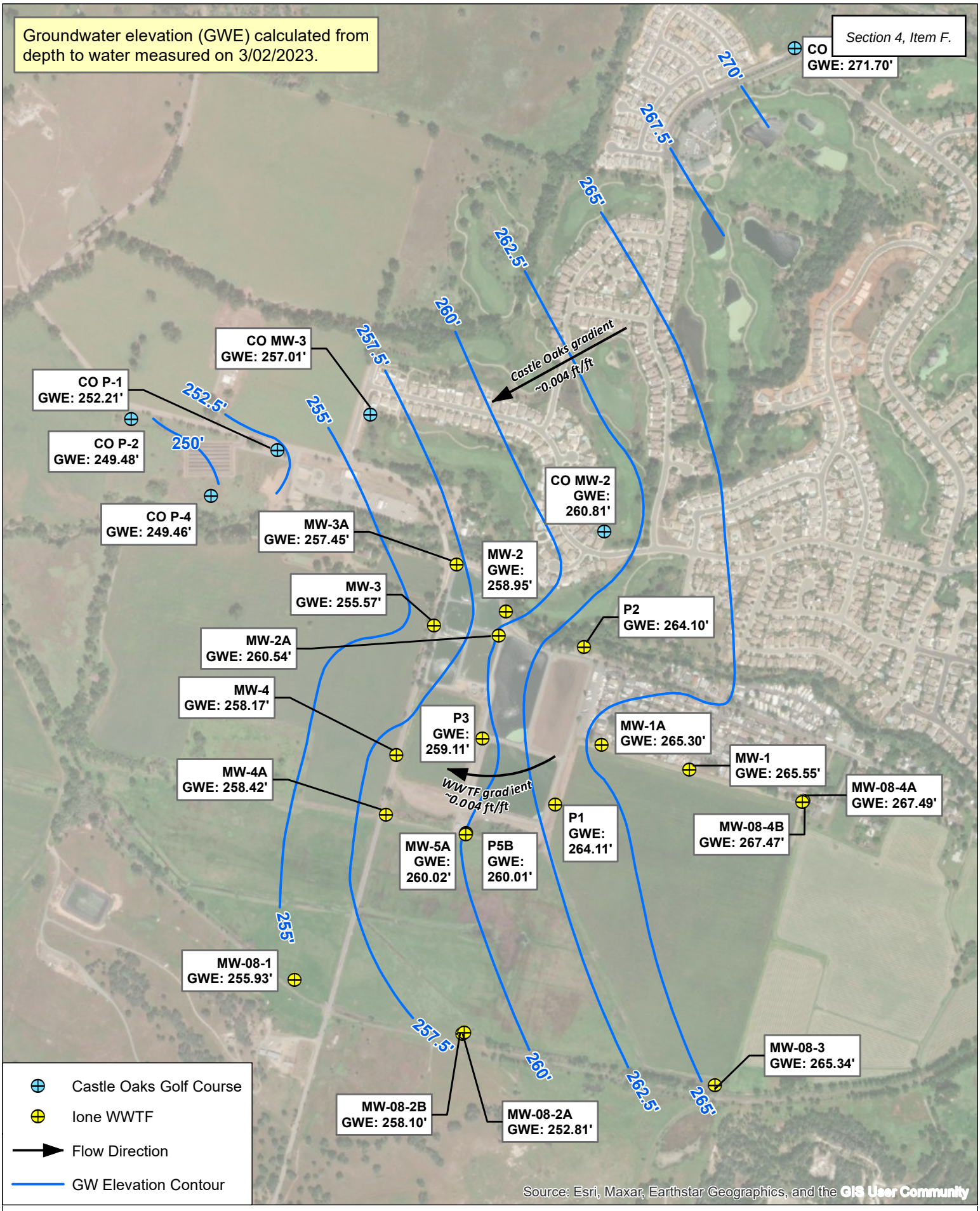
Groundwater Gradient Maps



EcoUrban Associates
PO Box 411
Ione, CA 95640
(209)487-4802

Figure 3
Groundwater Gradient Map
Third Quarter 2021
Wastewater Treatment Facility
City of Ione
Ione, California

Project No.:	AMA.104.01
Drawn by:	CES
Dated:	10/20/21
Scale:	~1"=1,000'
Rev'd by:	CE



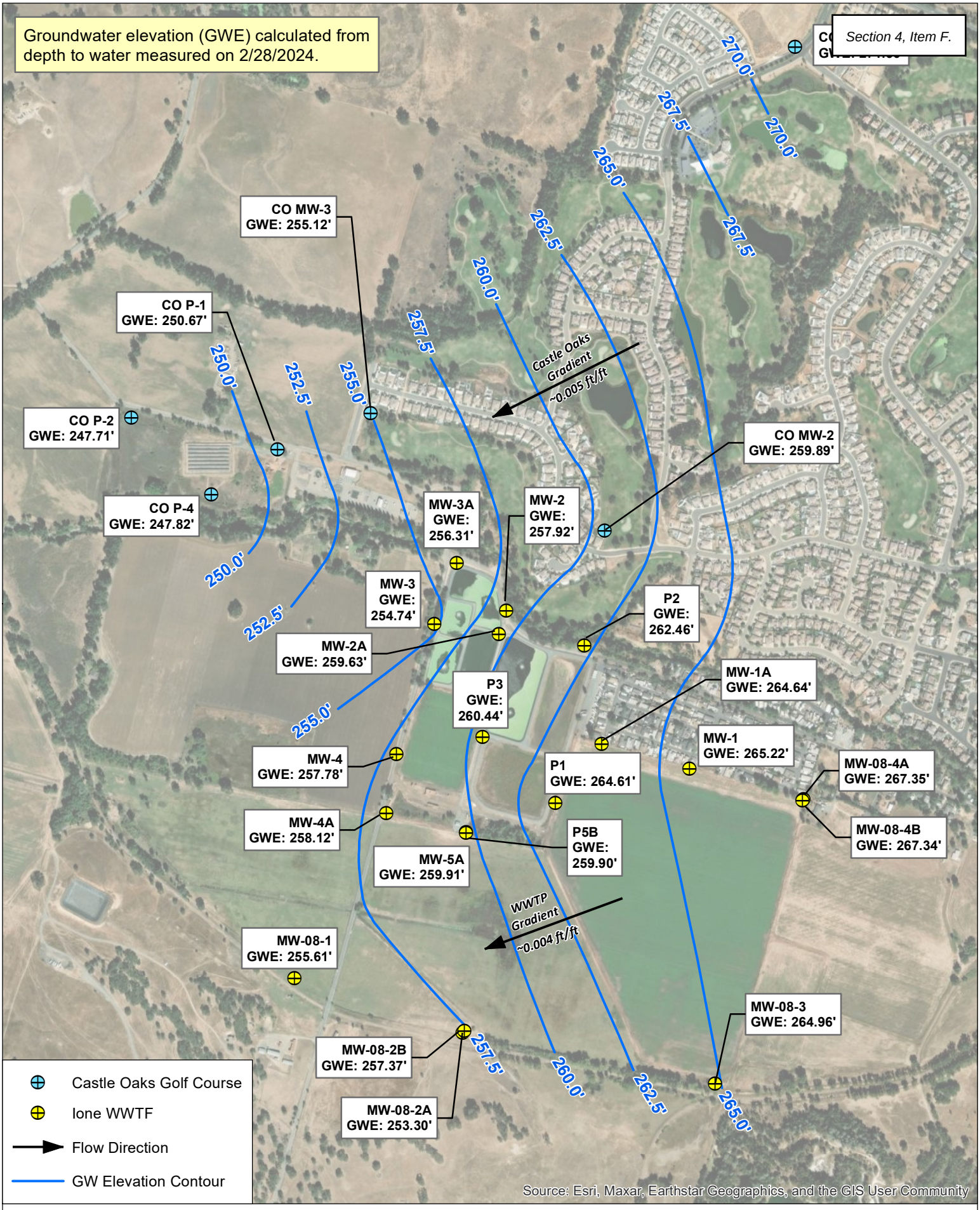
0 500 1,000
Feet

Groundwater Elevation Map

Ione WWTF & Castle Oaks Golf Course

PROVOST & PRITCHA

3/28/2023 G:\Dellavalle-1020\102022001-Ione WWTP & Castle Oak GW Consulting\400 GIS\Map\1Q2023_GW_elevation_map.mxd



0 500 1,000
Feet

Groundwater Elevation Map

Ione WWTF & Castle Oaks Golf Course

PROVOST & PRITCHA

4/23/2024 G:\Dellavalle-1020\102022001-Ione WWTP & Castle Oak GW Consulting\400 GIS\Map\1Q2024_GW_elevation_map.mxd

Attachment B

Jackson Rancheria Water Balance Certification Letter

JACKSON RANCHERIA
BAND OF MIWUK INDIANS

December 10, 2024

John Baum, P.E. (sent via email: John.Baum@waterboards.ca.gov)
Assistant Executive Officer, Rancho Cordova Office
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, #200
Rancho Cordova, CA

Subject: Certification Letter Regarding Town Field Operations, Waste Discharger Requirements R5-2013-0022-001

Dear Mr. John Baum,

On August 14, 2024, the Central Valley Water Quality Control Board (Regional Board) issued a California Water Code section 13267 Order (Order) to the City of Ione (City) and Jackson Rancheria Development Corporation (Jackson Rancheria), the two entities permitted by the Regional Board under Waste Discharger Requirements (WDRs) R5-2013-0022-001, which regulates the treatment and disposal and reuse of domestic wastewater from the City's serviced area. The WDRs were initially adopted on April 11, 2013, and were revised December 5, 2014.

The City owns and operates its Wastewater Treatment Facility (WWTF) and delivers secondary-23 recycled water to Town Field, where Jackson Rancheria Development Corporation (the Property's owner) applies the recycled water to the land pursuant to the 2013 Recycled Water Agreement (Recycled Water Agreement), which is attached hereto.

The 13267 Order requires submission of an updated water balance for the WWTF to the Regional Board by December 13, 2024. The letter specifies the following three items that should be included in the water balance:

1. *The forecasted influent flows and proposed flows over the next 5 years based on population growth. Estimates must be supported by City planning documents.*
2. *Any changes to collection system, treatment plant, and disposal features or their operation planned in the next 5 years.*
3. *If the facility does not have sufficient capacity to treat and dispose of all wastewater onsite, the submittal must include the volume of excess effluent that would need to be disposed of each year to ensure all wastewater is treated and disposed of properly without causing or threatening to cause a violation of the permit or a condition of pollution*

Although Jackson Rancheria is a permittee under WDRs R5-2013-0022-001, the City is responsible for providing the information required to be submitted in the 13267 Order pursuant to the Recycled Water Agreement. Furthermore, the City owns and operates the pump station that delivers water to the Town

Field, and the City measures and records the flows that are sent. Consequently, the City is leading development of the responses to the 13267 Order, which will be presented separately in the *Updated Water Balance for the City of Ione Wastewater Treatment Facility Waste Discharger Requirements R5-2013-0022-001 Technical Memorandum* (Ione WWTF TM).

Because the City controls the quality of water that is developed under the permit, the amount of relevant information that can be certified by Jackson Rancheria Development Corporation is very limited. This information is as follows:

- The Town Field is a 57-acre land application area (LAA) located east of the City's WWTF.
- The LAA is used to grow fodder crops (i.e., crops not intended for human consumption). Since the initiation of irrigation with recycled water, the field has been planted in an alfalfa crop.
- During the summer irrigation season, the water received from the City is applied to irrigation via a hand-move spray irrigation system.
- An agricultural employee manages the operations of the Town Field. The employee requests water deliveries based on observed crop needs.
- Runoff is collected from the Town Field year-round and returned to the WWTF.

The Chief Executive Officer (CEO) of the Jackson Rancheria Development Corporation has reviewed the contents of the Ione WWTF TM and hereby certifies the facts recited in the bullets above, with the following certification statement:

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this letter, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Sincerely,

Crystal Jack
CEO
Jackson Rancheria Development Corporation

CC: Kenny Croyle, PE, WDRS and Title 27 Compliance and Enforcement Unit, CVRWQCB

Howard Hold, Senior Engineering Geologist, WDRS and Title 27 Compliance and Enforcement Unit, CVRWQCB

Scott Armstrong, CVRWQCB, Rancho Cordova

Ginachi Amah, Recycled Water Unit Supervisor, Division of Drinking Water, State Water Resources Control Board

Amador County Recorder
Kimberly L. Grady
DOC- 2013-0002941-00
REQD BY CITY OF IONE
Tuesday, APR 02, 2013 14:48
Ttl Pd $0.00 Nbr-0000237718
CT2/R1/1-17

RECORDING REQUESTED BY AND WHEN RECORDED MAIL TO:

City Clerk
City of Ione
P.O. Box 398
Ione, CA 95640

No recording fee required pursuant to Government Code sections 6103 and 27383

THIS SPACE FOR RECORDERS USE ONLY

Recycled Water Agreement

This Recycled Water Agreement ("Agreement") is made and entered into as of March 5, 2013 ("Effective Date"), by and between Greenrock Ranch Lands LLC ("GREENROCK"), a Delaware Limited Liability Corporation, including designated lessees, agents, employees and assigns, and the City of Ione ("CITY"), a municipal corporation of the State of California. GREENROCK and the CITY are sometimes individually referred to herein as a "Party" and, together, as the "Parties."

RECITALS

A. The CITY owns and operates certain wastewater treatment and disposal facilities known as the City of Ione Wastewater Treatment Plant ("Treatment Plant"). The Treatment Plant, located at 1600 West Marlette Street (APNs 005-130-023, 039, 042, 043, 045), treats effluent to secondary standards in four treatment ponds and disposes of the effluent through three percolation/evaporation ponds (percolation ponds).

B. The Treatment Plant treats domestic wastewater from the City of Ione and filter backwash water from a water treatment plant operated by Amador Water Agency. The percolation/evaporation ponds also accept secondary effluent from Preston Reservoir, and in the future may receive additional wastewater and influent from these and other facilities.

C. The Treatment Plant operates under Waste Discharge Requirements Order No. 95-125 dated May 26, 1995 issued by the Central Valley Regional Water Quality Control Board ("Central Valley Board"). The Treatment Plant is subject to a Cease and Desist Order ("CDO") issued by the Central Valley Board concerning groundwater conditions near the percolation ponds at the Treatment Plant. As a component of the CITY's CDO compliance strategy, the CITY proposes to reduce the hydraulic loading to the percolation ponds by reducing storage in the percolation ponds during certain times of the year. In order to reduce storage and percolation to groundwater in the City's percolation/evaporation ponds, the CITY proposes to deliver Recycled Water to neighboring lands for irrigation purposes.

D. GREENROCK owns certain real property in Amador County, Assessor's Parcel No. 00513005200, consisting of approximately 65-acres ("Property"). The Property is depicted on the map attached hereto as Exhibit "A" and described in Exhibit "B," both of which are incorporated herein by reference. The Property is currently leased by GREENROCK for agricultural operations.

E. GREENROCK and the CITY contemplate that the CITY will provide and GREENROCK and its lessee will accept secondary-23 recycled water ("Recycled Water") for agricultural irrigation on the Property, as set forth herein.

COVENANTS AND AGREEMENT

NOW THEREFORE, based on the foregoing recitals, which are incorporated into the operative provisions of this Agreement, and for good and valuable consideration, the receipt and sufficiency of which are acknowledged by the Parties, the Parties covenant and agree as follows:

1. TERM

a. The term of this Agreement is for a period of 30 years, commencing upon execution of both Parties, and shall renew automatically for successive terms, without further action of either Party unless earlier terminated by mutual written agreement of the Parties, or as otherwise provided herein.

2. RECYCLED WATER DELIVERY

a. **Delivery Amount:** The CITY will deliver and GREENROCK will accept as much Recycled Water as GREENROCK may request for the reasonable irrigation of the Property. For illustrative purposes only, GREENROCK anticipates an average annual demand of approximately 280 acre feet of Recycled Water for irrigation of the Town Field..

b. **Location of Water Delivery:** The CITY will deliver Recycled Water to the Property near the location delineated "Point of Beginning" on Exhibit "A." The CITY at its sole costs and expense, and at no cost or expense to GREENROCK, will obtain all required easements, entitlements, permits and other property necessary to deliver Recycled Water to the Property, and the CITY will construct, install, control, operate, maintain, replace, and be responsible for, the pipeline, pumps, equipment and material required to deliver Recycled Water from the Treatment Plant to the Property.

c. **Coordination for Water Delivery:** The CITY and GREENROCK will each designate a representative to coordinate water delivery to the Property. The designated representatives shall develop a mutually acceptable delivery schedule through an "Implementation Agreement" that will govern the operations of both Parties with regard to water delivery and irrigation of the Town Field and any other irrigated lands covered by the City's Waste Discharge Requirements such as, but not limited to, the Clifton Field.

i) The CITY shall notify GREENROCK's designated representative at least fourteen (14) days prior to the commencement of scheduled delivery to confirm deliveries. Delivery of Recycled Water to the Property shall be supplied, to the extent feasible, to meet the irrigation demands of the Property.

d. **Limitations Precluding Delivery of Water:** The Parties acknowledge and agree that such delivery and/or use of Recycled Water may not be possible, feasible or practical at times, or may be prohibited for unanticipated reasons or for reasons beyond the control of the CITY and/or GREENROCK. The CITY will not be obligated to provide and GREENROCK will not be required to accept Recycled Water pursuant to the terms of this Agreement when such delivery and/or acceptance is prevented by, without limitation: Acts of God, shortage of Recycled Water not caused by the intentional or negligent acts of the CITY, reduction in transmission capacity, equipment malfunction, changes in operations on the Property, discharge or monitoring requirements, a determination by any regulatory agency that Recycled Water is not suitable for the intended use, a determination that the activity is unlawful, a determination that the activity may violate any operations permits, including but not limited to any National Pollutant Discharge Elimination System permits, a determination that a constituent of Recycled Water is harmful to the plants or animals on the Property, or any other unanticipated cause. In the event of such acts or any one of them causing delay or suspension of deliveries, the Parties shall immediately meet and confer and shall develop an alternative delivery schedule or such other resolution as may be acceptable to both parties.

3. RECYCLED WATER QUALITY AND USE

a. Recycled Water delivered to GREENROCK pursuant to this Agreement will be treated to the secondary-23 recycled water standards, and will be of a quality to comply with the CITY's Waste Discharge Requirements and any other permits administered by the Central Valley Regional Water Quality Control Board. The CITY will also maintain compliance with current California Department of Health Services regulations. The CITY will provide to GREENROCK copies of any test reports of Recycled Water as are periodically required of the CITY by regulatory agencies to characterize the Recycled Water.

b. GREENROCK will irrigate the Property pursuant to good farming and agricultural practices, consistent with runoff, ponding, and environmental restrictions required pursuant to statute, ordinance, regulation, permit or law, and not harmful to the Property or GREENROCK's operations thereon. CITY shall notify the GREENROCK in writing of modifications to the CITY's delivery practices to the extent necessary to comply with statute, ordinance, regulation, permit or law. In irrigating the Property, GREENROCK shall not use Recycled Water in violation of any statute, ordinance, regulation, permit or law.

c. Delivery of Recycled Water and GREENROCK's use thereof is subject to the "Defense, Indemnification, and Hold Harmless Agreement Between the City of Ione and Greenrock Ranch Lands LLC" entered into on October 2, 2012 and which is incorporated herein by reference and attached hereto as Exhibit "C."

4. CITY TO PAY COST OF RECYCLED WATER USE

a. The CITY at its sole costs and expense, with no cost or expense to GREENROCK, will pay all costs to construct, install, control, operate, maintain, and replace the irrigation equipment on the Property associated with the delivery and use of the Recycled Water. Such works may include but not be limited to land leveling, irrigation lines, pipelines, valves, meters, pumps, discharge equipment, and containment or tail-water recovery equipment ("Irrigation Equipment"). In the event that excavating a portion of the Property is necessary to construct, install, control, operate, maintain or replace the Irrigation Equipment, GREENROCK will notify the CITY in writing of the required work and City shall perform the work in accordance with all applicable laws.

b. Upon termination of this Agreement, the Irrigation Equipment shall become the property of GREENROCK, once the Parties negotiate a reasonable sale price for the residual value of any such equipment, unless GREENROCK notifies the CITY in writing prior to termination that it wants the CITY to remove the Irrigation Equipment. If GREENROCK notifies the CITY that it wants the CITY to remove some or all of the Irrigation Equipment, the CITY shall remove the designated Irrigation Equipment and return the Property to its original condition to the extent reasonably practicable.

5. EASEMENT FOR DELIVERY OF RECYCLED WATER AND IRRIGATION

a. **Easement:** GREENROCK grants and conveys to the CITY a non-exclusive easement to: (1) convey and deliver Recycled Water to and onto the Property and for irrigation of the Property; (2) construct, install, control, operate and maintain the Irrigation Equipment and/or other supporting or associated fixtures, equipment and appurtenances to the Turnout; and (3) enter upon and access the Property to accomplish the purposes of (1) and (2) above (collectively, "Easement"). The Easement granted herein may be used by the CITY's employees, agents, representatives and contractors. Prior to entry upon the Property, the CITY shall provide notice (written or oral) to GREENROCK of any required access, and shall work with GREENROCK to schedule a mutually convenient time for the CITY to access the Property.

b. **Interference with Operations:** When entering the Property, the CITY shall not interfere with the Property and GREENROCK's operations thereon except to the extent necessary to comply with any conditions of the Central Valley Board's Waste Discharge Requirements. In addition to the CITY's indemnity obligations pursuant to Exhibit "C," the CITY is solely responsible for any damage caused or liability suffered by GREENROCK resulting from the CITY entering the Property.

6. GREENROCKTO OWN EQUIPMENT AND CROPS

a. GREENROCK's operations and equipment on the Property, including all crops raised and harvested and any supporting or associated equipment and appurtenances, will be solely owned and controlled by GREENROCK. The CITY shall not interfere with GREENROCK's operations on the Property and shall not have or acquire any right, title or interest to any equipment or resulting benefit or asset, monetary or otherwise, associated with the operations.

7. CONSIDERATION

a. GREENROCK agrees to accept and use Recycled Water in return for the CITY's agreement to deliver Recycled Water and pay for all costs for facilities, works and other appurtenances necessary for delivery and use of the Recycled Water, pursuant to the terms of this Agreement. CITY agrees to construct, operate, maintain, replace and grant facilities and Irrigation Equipment, and deliver Recycled Water, as required in this Agreement.

b. In addition, CITY shall make a single payment to GREENROCK of $15,000 within 30 days of the effective date of this agreement, as fair and reasonable consideration for uncertainties in the delivery and timing of Recycled Water during the 2013 calendar year ("Temporary Easement Fee"). To the extent Recycled Water cannot be reliably delivered to GREENROCK pursuant to this agreement by October, 2013, the parties shall meet and confer to discuss whether the Temporary Easement Fee should be extended beyond 2013.

8. RIGHT OF FIRST REFUSAL TO ADDITIONAL WATER

a. To the extent that the CITY possesses, controls and/or owns Recycled Water in excess of the Committed Delivery that is available for the CITY to supply to a water user and which has not been previously committed to another water user as of the Effective Date ("Additional Recycled Water"), GREENROCK shall have the right to accept and take delivery of all or a portion of the Additional Water pursuant to the terms of this Agreement, either on the subject property or any other property owned or controlled by GREENROCK or its parent company, prior to the CITY offering and/or providing any of the Additional Water to another water user or otherwise disposing of the Additional Water. If the CITY has Additional Recycled Water available, it shall notify GREENROCK to determine if GREENROCK desires to accept and take delivery of the Additional Water. The Parties understand and acknowledge that the sources of the Additional Water are not limited to the current Recycled Water sources available to the CITY, but include any and all sources of Recycled Water that the CITY may have or obtain in the future.

b. The Parties acknowledge this provision excludes any Recycled Water receiving additional treatment beyond the existing supply that receives secondary treatment with disinfection, such as, but not limited to Recycled Water treated to tertiary standards. In no case, however, shall CITY reduce deliveries to GREENROCK subject to this Agreement as a result of secondary treatment to tertiary or other standards, except upon mutual agreement of the Parties.

9. RECORDATION

a. The Parties will cause this Agreement to be recorded promptly after its execution in the Official Records of the County of Amador, State of California.

10. METHOD AND PLACE OF GIVING NOTICE, SUBMITTING BILLS AND MAKING PAYMENTS

a. Except as otherwise specified in this Agreement, all notices, bills, and payments shall be made in writing and shall be personally delivered or sent by prepaid registered or certified mail, return receipt requested, to the following address:

CITY:
Attn: City Manager
City of Ione
P.O. Box 398
1 E. Main Street
Ione, CA 95640

GREENROCK:
Attn: John C. Telischak
Greenrock Ranch Lands, LLC
45 Koch Road, Suite A
Corte Madera, CA 94925

When so addressed and sent by prepaid registered or certified mail, said notice, bill, or payment shall be deemed given or made upon deposit in the United States mail. In all other instances, notices, bills, or payments shall be deemed given or made at the time of actual delivery.

Changes may be made in the names or addresses of the person to whom notices, bills, or payments are to be given by giving notice pursuant to this paragraph.

11. BREACH; REMEDIES

a. Should one party breach any of the terms and conditions of this Agreement, the non-breaching Party shall give written notice to the other Party. If the breach is not cured within 30 calendar days from the date notice is given, the non-breaching party may, in addition to any remedies provided by this Agreement or by law or equity, terminate this Agreement on an additional 30 calendar days written notice.

12. ASSIGNMENT

a. Except as otherwise specified in this Agreement, no Party may assign its rights and obligations hereunder without the prior written consent of the other Party.

13. ENVIRONMENTAL COMPLIANCE

a. The CITY is solely responsible for its compliance with any statute, ordinance, regulation, permit, or law regulating the delivery, use and/or recovery of Recycled Water.

14. GENERAL PROVISIONS

a. **Authority:** Each Party represents that the representative of the Party executing this Agreement has the authority to enter into this Agreement on behalf of such Party and bind such Party to the terms and conditions of this Agreement and the performance of such Party's obligations and responsibilities as set forth in this Agreement, and this Agreement has been duly authorized by all required action and that the Party's execution of this Agreement and performance of its obligations under this Agreement will not violate any contract, transaction, option, covenant, condition, obligation or undertaking of such party, nor to the best of such Party's knowledge will it violate any law, ordinance, statute, order, permit or regulation.

b. **Construction and Interpretation:** To the fullest extent allowed by law, the provision of this Agreement shall be construed and given effect in a manner that avoids any violation of statute, ordinance,

regulation, permit or law. This Agreement is entered into freely and voluntarily. This Agreement has been arrived at through negotiation; each Party has consulted with counsel and had a full and fair opportunity to revise the terms of this Agreement. As such, any interpretation of this Agreement should not favor any Party.

c. **Third-Party Beneficiaries:** This Agreement is not intended to create any third-party beneficiaries. This Agreement is for the sole benefit of the Parties and their respective successors and/or permitted assignees, and no other person or entity shall be entitled to rely on or receive any benefit from this Agreement.

d. **Severability:** If any provision of this Agreement is determined to be void by any court of competent jurisdiction, then such determination shall not affect any other provision of this Agreement, and all such other provisions shall remain in full force and effect provided, however, that the purpose of this Agreement is not frustrated. It is the intention of the Parties that if any provision of this Agreement is capable of two constructions, one of which would render the provision void and the other of which would render the provision valid, then the provision shall have the meaning which renders it valid.

e. Waiver: No waiver by either Party of any provisions or breach of this Agreement shall be deemed to be a waiver of any other provision hereof or of any subsequent breach by either Party of the same or any other provisions.

f. **Entire Agreement:** This Agreement contains the entire agreement of the Parties with respect to any matter covered or mentioned in this Agreement, and supersedes all prior negotiations, understanding and agreements, and no prior agreement or understanding pertaining to any such matter shall be effective for any purpose.

g. **Amendments:** No provision of this Agreement may be amended or added to except by an agreement in writing signed by the Parties or their respective successors in interest, expressing by its terms an intention to modify this Agreement.

h. **Successors and Assigns:** The right and benefit to receive and the obligation to take Recycled Water shall be a covenant running with the Property, and the obligation to provide Recycled Water to the Property shall be that of the CITY. Upon transfer of title or interest in the Treatment Plant or the Property, all rights, duties, and obligations undertaken by this Agreement shall succeed to the new owner(s), lessees, heirs, executors, or assigns.

i. **Attorneys' Fees:** The prevailing party in any action or proceeding to enforce or interpret this Agreement or otherwise arising out of or in connection with the subject matter hereof (including, but not limited to, any suit, arbitration, entry of judgment, post-judgment motion or enforcement, appeal, bankruptcy litigation, attachment or levy) shall be entitled to recover its costs and expenses, including, but not limited to, attorneys', experts' and consultants' fees and costs.

j. **Necessary Actions:** Each Party agrees to execute and deliver additional documents and instruments and to take any additional actions as may be reasonably required to carry out the purposes of this Agreement.

k. **Force Majeure:** No Party will be liable by reason of any failure or delay in the performance of its obligations for any cause beyond its reasonable control, including but not limited to electrical outages, riots, insurrection, war, fires, flood, earthquakes, explosions and other Acts of God.

l. **Governing Law and Venue:** This Agreement shall be construed and interpreted in accordance with the laws of the State of California. Any action brought relating to this Agreement shall be heard exclusively in a State court in the County of Amador.

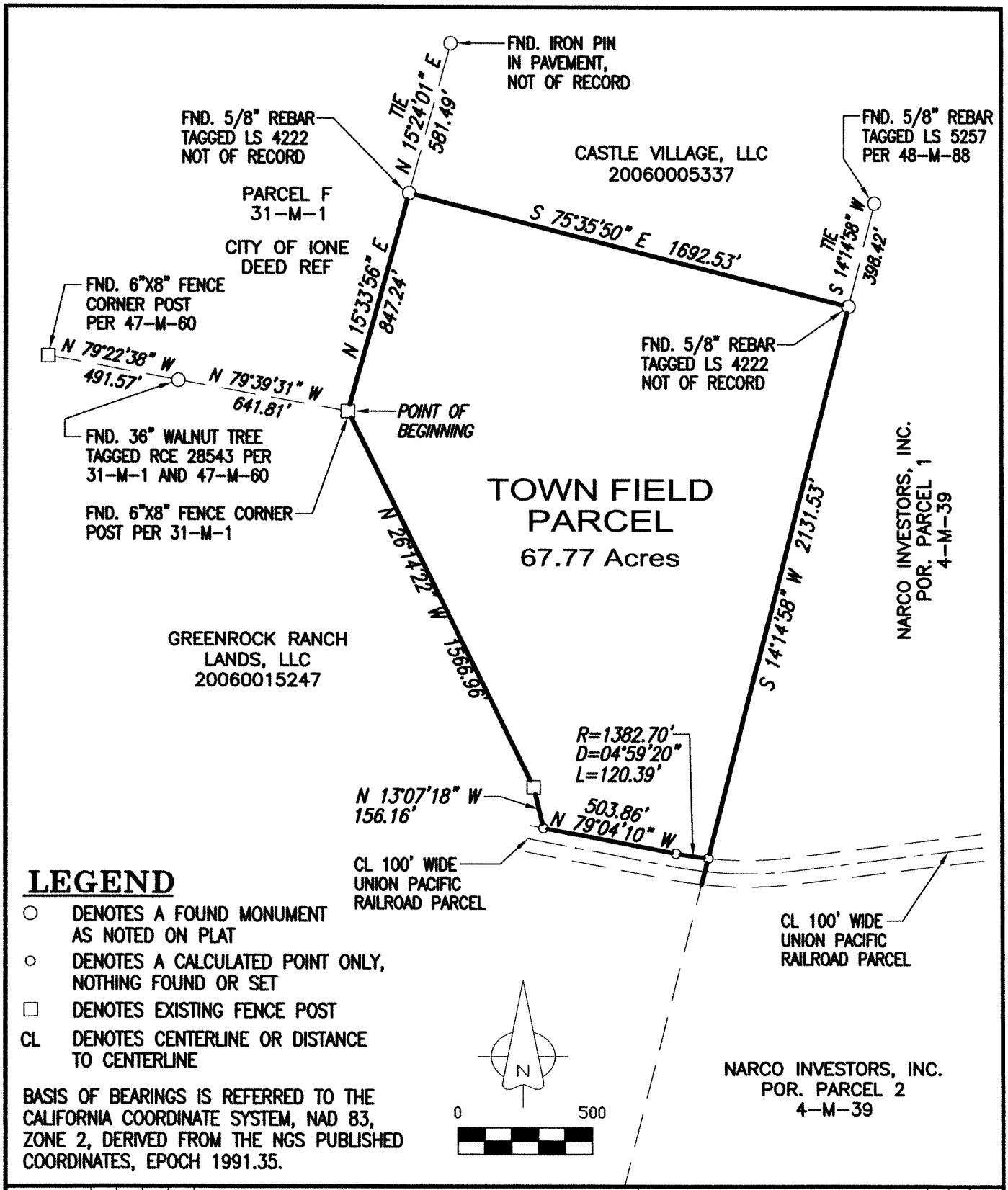
m. **Counterparts; Faxed/Electronic Signatures:** This Agreement may be signed in counterparts and facsimile or electronic signatures shall have the same effect as original signatures.

IN WITNESS WHEREOF, the Parties have fully executed this **AGREEMENT**.

GREENROCK RANCH LANDS, LLC By _____ John Telischak, Authorized Agent	CITY OF IONE By _____ Dan Epperson, Mayor of Ione
	CITY OF IONE APPROVED AS TO FORM: By _____ James D. Maynard, City Attorney

EXHIBIT "A"

Map Depicting Property



LEGEND

- ○ DENOTES A FOUND MONUMENT AS NOTED ON PLAT
- ○ DENOTES A CALCULATED POINT ONLY, NOTHING FOUND OR SET
- □ DENOTES EXISTING FENCE POST
- CL DENOTES CENTERLINE OR DISTANCE TO CENTERLINE

BASIS OF BEARINGS IS REFERRED TO THE CALIFORNIA COORDINATE SYSTEM, NAD 83, ZONE 2, DERIVED FROM THE NGS PUBLISHED COORDINATES, EPOCH 1991.35.

EXHIBIT MAP
TOWN FIELD PARCEL

BEING A PORTION OF THE RANCHO ARROYO SECO
AMADOR COUNTY, CALIFORNIA

TOMA & ASSOCIATES INC.
ENGINEERING - SURVEYING - PLANNING
41 Summit Street, Jackson, CA 95642
(209) 223-0156

SHEET 1 OF 1 SHEETS
JOB NO.: 1211-11
DRAWN BY: GMW
SCALE: 1" = 500'
DATE: 12.13.2012

REVISIONS
BY

EXHIBIT "B"

Legal Description of the Property

TOWN FIELD PARCEL 67.77 Acres

A parcel of land situated in the County of Amador, State of California, and being a portion of the Rancho Arroyo Seco, and being more particularly described as follows:

Beginning at a fence corner post at the Southeast corner of "PARCEL "F" 15.67 AC.", as shown and so designated upon that certain official map entitled "RECORD OF SURVEY A PORTION OF RANCHO ARROYO SECO AND THE CITY OF IONE AMADOR COUNTY CALIFORNIA", and recorded in the office of the Recorder of Amador County in Book 31 of Maps and Plats at Page 1, et seq; thence, from said point of beginning, along the East line of said Parcel F, North 15° 33' 56" East 847.24 feet; thence, leaving said East line, South 75° 35' 50" East 1692.53 feet to a 5/8 inch rebar lagged LS 4222 found on the West line of "PARCEL No 1 78.556 AC.", as shown and so designated upon that certain official map entitled "PLAT OF F.P. TOMAIUOLO RANCH", and recorded in Book 4 of Maps and Plats at Page 39, Amador County Records; thence, along said West line of Parcel No. 1, South 14° 14' 58" West 2131.53 feet to a point in the North line of the Union Pacific Railroad parcel of land; thence, along said North line of said Union Pacific Railroad parcel of land, along the arc of a non-tangent curve to the right, having a radius of 1,382.70 feet, through a central angle of 04° 59' 20", for an arc length of 120.39 feet; thence North 79° 04' 10" West 503.86 feet; thence, leaving said Union Pacific Railroad parcel of land, North 13° 07' 18" West 156.16 feet to a fence corner post; thence North 26° 14' 22" West 1,566.96 feet to the point of beginning, and containing 67.77 acres of land, more or less.

The basis of bearings for the legal description above is referred to the California Coordinate System, NAD 83, Zone 2.

C. L. Toma 12/13/12

Ciro L. Toma PLS 3570 License expires 6/30/14

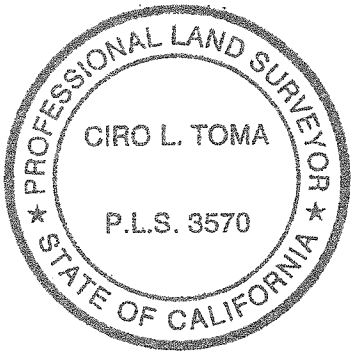


EXHIBIT "C"

Defense, Indemnification, and Hold Harmless Agreement between the City of Ione and Greenrock Ranch LLC

Attachment C

Rainfall and Reference ET Data

IONE, CALIFORNIA (044283)

Period of Record Monthly Climate Summary

Period of Record : 03/01/1906 to 06/30/1977

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)					Insuff	icient	Data						
Average Min. Temperature (F)					Insuff	icient	Data						
Average Total Precipitation (in.)	5.08	3.14	3.19	1.75	0.63	0.23	0.07	0.13	0.33	1.15	2.81	3.53	22.04
Average Total SnowFall (in.)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 0% Min. Temp.: 0% Precipitation: 99.9% Snowfall: 99.9% Snow Depth: 99.8%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

D

Rainfall Depth Duration Frequency at Ione

Station Number	Station	County	Latitude	Longitude	Elevation	Years Recorded
B00 4283 00	Ione	Amador	38.348	-120.938	284.0	89

Rainfall Statistics	1-Day	2-Day	3-Day	4-Day	5-Day	6-Day	8-Day	10-Day	15-Day	20-Day	30-Day	60-Day	1-Year
Pr=0.5	1.92	2.55	3.01	3.38	3.70	3.99	4.48	4.91	5.79	6.51	7.68	10.19	21.28
Pr=0.2	2.55	3.37	3.98	4.47	4.89	5.27	5.92	6.48	7.64	8.58	10.11	13.39	27.84
Pr=0.1	2.92	3.87	4.55	5.11	5.60	6.02	6.76	7.40	8.71	9.78	11.52	15.23	31.54
Pr=0.04	3.36	4.44	5.22	5.86	6.40	6.89	7.73	8.45	9.94	11.16	13.13	17.32	35.70
Pr=0.02	3.66	4.83	5.67	6.36	6.96	7.48	8.39	9.17	10.78	12.09	14.22	18.74	38.51
Pr=0.01	3.94	5.19	6.10	6.84	7.47	8.04	9.01	9.84	11.57	12.97	15.23	20.06	41.11
Pr=0.005	4.21	5.54	6.51	7.29	7.96	8.56	9.59	10.48	12.31	13.79	16.19	21.31	43.57
Pr=0.002	4.54	5.97	7.01	7.85	8.58	9.22	10.33	11.28	13.23	14.82	17.40	22.87	46.64
Pr=0.001	4.79	6.29	7.38	8.26	9.02	9.69	10.85	11.85	13.90	15.57	18.26	23.99	48.84
Pr=0.0001	5.53	7.26	8.50	9.52	10.39	11.15	12.48	13.62	15.96	17.87	20.94	27.46	55.66

Annual Maxima	1-Day	2-Day	3-Day	4-Day	5-Day	6-Day	8-Day	10-Day	15-Day	20-Day	30-Day	60-Day	1-Year
2007	---	---	---	---	---	---	---	---	---	---	---	---	---
2006	---	---	---	---	---	---	---	---	---	---	---	---	---
2005	---	---	---	---	---	---	---	---	---	---	---	---	---
2004	---	---	---	---	---	---	---	---	---	---	---	---	---
2003	---	---	---	---	---	---	---	---	---	---	---	---	---
2002	---	---	---	---	---	---	---	---	---	---	---	---	---
2001	---	---	---	---	---	---	---	---	---	---	---	---	---
2000	1.85	2.80	4.29	4.74	4.99	4.99	5.22	5.79	7.52	9.05	10.35	11.82	21.39
1999	2.02	2.44	3.42	3.42	3.42	3.42	3.42	4.17	5.51	5.72	8.41	10.90	15.39
1998	2.37	3.55	4.11	4.36	4.98	5.85	6.61	7.31	8.07	10.05	14.21	21.25	30.46
1997	2.37	3.55	4.11	4.36	4.98	5.85	6.61	7.31	8.07	10.05	14.21	21.25	43.59
1996	3.75	3.85	3.85	3.85	3.85	3.85	3.85	3.85	4.74	5.27	6.16	11.53	22.80
1995	2.90	4.71	5.05	5.33	5.58	5.71	7.45	8.02	9.08	9.83	12.42	16.90	35.50
1994	1.27	1.70	1.95	2.05	2.15	2.42	2.55	2.55	3.45	3.67	5.27	5.87	15.52
1993	1.81	2.26	2.26	2.84	3.18	4.50	4.91	5.13	7.10	7.52	10.16	16.58	29.21
1992	2.30	3.18	3.18	3.24	4.11	5.17	5.97	6.06	6.98	7.16	9.13	10.62	20.43
1991	1.60	2.28	2.88	3.52	3.52	3.52	4.08	5.15	6.28	7.38	10.07	11.94	16.59
1990	1.82	2.35	2.37	2.37	2.37	2.37	2.37	2.37	2.90	2.90	3.33	6.23	17.33
1989	1.05	1.90	2.05	2.06	2.26	2.41	2.52	2.82	3.36	3.75	5.85	7.67	16.85
1988	1.55	1.90	1.90	1.90	1.90	1.90	2.05	2.13	2.75	3.47	4.78	6.57	11.67
1987	1.81	2.43	2.54	2.54	2.87	2.87	3.38	3.62	3.62	5.31	5.31	9.80	13.86
1986	2.75	4.85	5.65	6.65	6.85	6.95	7.90	8.00	8.00	9.45	12.97	18.47	33.02
1985	---	---	---	---	---	---	---	---	---	---	---	---	17.93
1984	---	---	---	---	---	---	---	---	---	---	---	---	23.39
1983	---	---	---	---	---	---	---	---	---	---	---	---	41.81
1982	---	---	---	4.62	5.24	5.24	5.53	5.53	7.29	8.43	9.95	15.59	39.56
1981	2.04	2.94	3.80	4.17	4.32	5.01	6.02	6.02	6.21	6.21	6.62	11.24	17.15
1980	---	---	---	---	---	---	---	---	---	---	---	---	

1979	1.54	2.28	2.83	3.82	3.82	3.82	4.02	4.97	5.49	6.53	7.09		
1978	1.54	2.28	2.83	3.82	3.82	3.82	4.02	4.97	5.49	6.53	7.09	12.65	20.87
1977	0.92	1.03	1.09	1.12	1.12	1.12	1.24	1.26	1.26	1.26	2.18	3.32	8.73
1976	0.78	1.23	1.70	1.70	1.91	2.06	2.06	2.06	2.18	3.21	3.73	5.00	11.87
1975	1.97	2.56	3.14	3.27	3.38	3.52	4.84	6.08	7.82	8.47	8.50	15.06	28.24
1974	---	---	---	---	---	---	---	---	---	---	---	---	33.80
1973	2.48	2.76	3.51	4.54	4.86	4.86	6.09	7.38	8.60	9.26	12.09	19.82	35.95
1972	3.05	3.88	3.92	3.98	3.98	5.03	5.90	5.96	6.05	6.73	7.92	9.62	16.80
1971	3.05	4.40	5.02	5.13	6.25	6.57	6.57	7.61	8.20	8.22	9.81	13.34	21.20
1970	2.94	2.94	3.48	3.48	3.72	3.72	4.97	5.90	6.37	7.01	9.55	12.27	21.13
1969	2.75	3.15	3.15	3.23	3.31	3.54	5.63	6.09	8.33	8.80	9.89	16.66	30.23
1968	1.76	2.12	2.12	2.43	2.43	2.48	2.51	3.20	3.20	3.49	4.61	8.77	17.12
1967	2.52	4.13	4.15	4.63	4.97	4.99	5.38	6.53	7.36	7.36	7.89	11.44	29.07
1966	1.79	1.95	2.46	2.48	3.27	3.74	4.03	4.13	5.17	5.17	5.17	9.69	16.47
1965	---	3.43	---	---	---	---	---	7.18	8.10	---	---	---	25.01
1964	1.98	2.44	2.86	3.06	3.06	3.06	3.25	3.45	5.45	6.58	6.84	9.13	18.12
1963	2.88	3.52	4.20	4.65	4.65	4.65	4.65	4.65	6.07	6.38	6.38	10.35	24.44
1962	1.25	2.08	2.93	3.02	4.05	4.53	6.47	7.17	7.61	7.75	9.09	11.98	18.00
1961	1.38	1.68	2.16	2.16	2.16	2.26	2.40	2.77	2.93	3.23	4.81	6.51	13.82
1960	1.33	1.53	1.86	1.86	2.09	2.42	2.82	3.25	3.67	5.03	6.18	7.86	16.68
1959	1.65	2.09	2.09	2.55	2.88	3.22	3.68	4.01	4.01	4.75	6.13	10.54	13.45
1958	---	---	---	---	---	---	---	---	---	---	---	---	41.69
1957	---	---	---	---	---	---	---	---	---	---	---	---	18.93
1956	---	---	---	---	---	---	---	---	---	---	---	---	28.58
1955	---	---	---	---	---	---	---	---	---	---	---	---	18.28
1954	---	---	---	---	---	---	---	---	---	---	---	---	16.40
1953	---	---	---	---	---	---	---	---	---	---	---	---	15.10
1952	2.21	3.15	3.68	3.77	3.77	3.77	3.77	4.06	4.68	6.56	7.47	13.11	27.05
1951	4.65	5.30	5.30	5.30	5.55	5.70	6.24	6.25	6.25	8.87	10.85	14.60	28.76
1950	2.70	2.70	2.70	3.97	3.97	3.97	3.97	5.05	5.05	5.55	9.52	10.41	18.30
1949	1.76	2.71	3.14	3.14	3.14	3.14	3.72	3.86	4.87	5.45	6.93	10.49	17.23
1948	1.28	1.41	1.70	1.83	2.03	2.03	2.43	2.43	4.08	4.39	6.67	8.68	17.76
1947	2.16	3.12	3.20	3.20	3.91	3.91	3.91	4.13	4.13	4.13	4.82	7.33	14.54
1946	1.90	1.90	3.20	3.38	4.37	4.98	5.16	5.42	5.70	6.31	7.49	11.80	20.14
1945	2.68	3.88	4.78	4.78	4.98	5.27	5.27	5.27	5.66	5.66	5.66	9.58	23.66
1944	2.25	2.41	2.53	2.53	3.23	3.39	3.93	4.28	5.68	5.68	7.47	10.20	19.25
1943	2.05	2.78	3.58	3.81	4.43	4.77	5.38	5.42	7.10	8.03	10.13	15.90	27.61
1942	2.00	3.48	4.20	4.60	5.32	5.81	5.91	5.91	7.68	8.17	8.17	12.92	26.67
1941	1.85	2.40	2.46	3.46	5.46	5.46	4.17	4.52	7.17	8.59	11.13	14.00	25.17
1940	1.65	2.72	3.46	3.76	4.20	4.79	5.24	5.54	5.95	6.00	8.96	16.37	24.86
1939	1.72	2.40	2.55	2.80	2.80	2.80	2.80	2.80	2.80	3.17	3.42	5.93	14.01
1938	2.30	3.65	4.05	4.55	4.80	4.80	5.25	6.95	9.40	10.35	12.10	16.00	27.25
1937	4.40	4.65	5.85	6.15	6.60	6.95	7.70	8.15	8.70	9.50	10.10	19.90	34.99
1936	2.00	2.30	3.50	4.20	4.35	4.50	6.05	6.40	10.33	10.33	13.28	19.99	28.29
1935	2.50	2.72	2.72	2.72	3.25	4.30	4.52	4.52	5.22	5.65	6.35	9.47	23.94
1934	1.70	2.85	2.85	4.05	4.52	4.52	4.52	4.52	4.52	6.40	8.77	9.67	

1933	1.20	1.72	1.72	1.72	2.32	3.12	3.12	3.82	3.82	3.82	5.07		
1932	1.75	1.92	2.59	3.58	3.75	3.80	4.49	4.97	5.58	5.88	6.60	10.05	19.99
1931	1.65	1.65	1.65	2.53	2.53	2.53	2.65	2.65	2.65	2.65	3.92	6.39	12.62
1930	1.39	2.25	2.25	2.57	2.57	2.78	3.35	3.71	5.17	5.33	5.62	10.86	17.07
1929	1.91	2.98	3.49	3.49	3.49	3.49	3.49	3.57	4.07	4.07	4.07	6.57	15.52
1928	1.68	2.60	3.40	4.06	4.79	4.92	4.92	4.92	5.92	6.10	6.27	9.09	18.80
1927	1.50	3.00	3.00	4.25	4.25	4.51	5.46	5.96	6.26	6.91	7.41	10.51	24.11
1926	2.55	2.80	2.90	3.55	3.55	4.55	5.10	5.10	6.48	8.99	10.04	10.29	21.54
1925	1.95	3.05	3.27	3.27	3.52	3.74	4.27	5.79	5.94	7.79	8.41	11.84	28.60
1924	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	2.35	3.00	3.00	4.95	10.50
1923	2.20	3.00	4.30	5.30	5.30	5.30	5.50	6.10	6.70	6.70	9.30	14.15	26.07
1922	2.17	2.52	3.45	3.95	3.95	3.95	3.95	4.44	7.09	7.16	9.46	14.80	24.30
1921	3.85	3.95	4.50	4.72	4.72	4.72	4.72	5.72	6.62	7.02	7.72	13.51	26.57
1920	2.10	3.55	3.90	4.05	4.20	4.20	4.20	4.31	4.82	5.19	7.04	9.26	15.46
1919	2.25	3.55	3.90	4.00	4.05	4.40	4.60	4.70	5.00	6.45	8.15	10.35	18.75
1918	1.60	2.35	2.35	2.35	3.45	4.25	4.70	4.70	6.50	6.50	8.10	11.30	15.50
1917	1.30	2.30	2.60	2.90	3.25	3.55	4.10	4.35	4.55	4.55	5.35	7.25	17.70
1916	---	---	---	---	---	---	---	---	---	---	---	---	20.00
1915	1.50	1.95	2.15	2.30	2.83	3.03	3.88	4.20	5.88	6.20	7.77	10.87	22.80
1914	2.26	3.11	3.49	3.61	3.99	3.99	3.99	4.48	5.47	6.96	9.81	13.52	22.90
1913	1.20	1.84	2.22	2.72	2.95	3.36	3.36	3.55	4.01	4.01	4.01	4.86	14.26
1912	0.69	1.04	1.15	1.22	1.30	1.45	1.86	2.16	2.47	2.86	3.43	5.36	12.68
1911	2.17	3.57	5.27	6.12	6.45	7.30	7.80	8.42	10.82	15.51	18.06	24.30	30.46
1910	2.00	3.00	3.00	3.45	3.88	3.88	3.93	3.93	4.00	4.69	5.92	8.90	20.89
1909	1.45	2.60	3.80	4.42	4.54	5.07	5.99	6.39	7.99	9.21	12.66	19.24	26.01
1908	1.30	1.60	1.60	1.78	1.78	1.78	1.83	3.03	3.63	3.63	5.51	9.04	14.27
1907	4.37	6.79	7.38	7.53	8.38	8.53	8.53	8.53	8.53	10.60	12.20	18.04	33.82
1906	2.40	2.54	3.22	3.62	3.85	3.85	3.85	5.03	7.47	9.20	10.45	15.43	30.93
1905	2.90	2.90	2.90	3.20	4.20	4.20	4.55	4.85	5.55	5.55	5.50	9.65	25.95
1904	1.51	2.62	3.12	3.15	3.15	3.25	3.75	4.86	6.07	6.42	7.20	12.05	21.42
1903	1.85	2.92	3.58	4.10	5.01	5.03	5.03	5.53	5.53	7.54	9.71	10.34	22.39
1902	1.21	1.79	2.09	2.61	3.01	3.41	3.87	4.41	5.03	6.03	7.72	9.29	20.19
1901	2.05	2.79	3.61	4.03	4.03	4.72	5.54	5.52	5.54	7.35	7.69	11.29	25.48
1900	1.85	2.34	2.41	2.80	2.86	2.86	2.86	3.88	4.82	5.66	6.45	9.69	21.51
1899	1.93	2.56	3.20	3.54	4.04	4.04	4.94	7.17	7.80	7.93	9.00	9.22	20.03
1898	3.60	4.47	4.64	4.64	4.64	4.64	4.64	4.76	5.11	5.11	5.23	7.30	13.77
1897	---	---	---	---	---	---	---	---	---	---	---	---	---
1896	---	---	---	---	---	---	---	---	---	---	---	---	---
1895	---	---	---	---	---	---	---	---	---	---	---	---	---
1894	---	---	---	---	---	---	---	---	---	---	---	---	---
1893	---	---	---	---	---	---	---	---	---	---	---	---	---
1892	---	---	---	---	---	---	---	---	---	---	---	---	---
1891	---	---	---	---	---	---	---	---	---	---	---	---	---
1890	---	---	---	---	---	---	---	---	---	---	---	---	---
1889	---	---	---	---	---	---	---	---	---	---	---	---	---
1888	---	---	---	---	---	---	---	---	---	---	---	---	---

Monthly Average ETo Report

California Irrigation Management Information System (CIMIS)

Rendered in ENGLISH Units.

Printed on Wednesday, August 31, 2022

Average ETo Values by Station

Stn Id	Stn Name	CIMIS Region	Jan (in)	Feb (in)	Mar (in)	Apr (in)	May (in)	Jun (in)	Jul (in)	Aug (in)	Sep (in)	Oct (in)	Nov (in)	Dec (in)	Total (in)
227	Plymouth	SFH	1.48	1.95	3.02	4.57	5.97	7.19	7.64	6.98	4.99	3.24	1.68	1.21	49.92

CIMIS Region Abbreviations		
BIS - Bishop	CCV - Central Coast Valleys	ICV - Imperial/Coachella Valley
LAB - Los Angeles Basin	MBY - Monterey Bay	NCV - North Coast Valleys
NEP - Northeast Plateau	SAV - Sacramento Valley	SBE - San Bernardino
SFB - San Francisco Bay	SJV - San Joaquin Valley	SFH - Sierra Foothill
SCV - South Coast Valleys		

Attachment D

Castle Oaks Golf Course Recycled Water Demands TM

WEST YOST
Water. Engineered.

1001 Galaxy Way
Suite 310
Concord CA 94520

925.949.580
925.949.5845 fax
westyost.com

TECHNICAL MEMORANDUM

DATE: December 10, 2024

Project No.: 988-50-24-10
SENT VIA: EMAIL

TO: George Lee, City of Ione

CC: Daniel Griffin, Castle Oaks Golf Course
Justin Granados, WaterStone Service

FROM: Allie Ahern, EIT

REVIEWED BY: Kathryn Gies, PE, RCE #65022

SUBJECT: Castle Oaks Golf Course Recycled Water Demands

This technical memorandum (TM) provides information and supporting documentation related to water needs of the Castle Oaks Golf Course (golf course), which receives recycled water from the Castle Oaks Water Reclamation Facility (COWRF). The purpose of this TM is to inform development of a water balance for the Amador Regional Sanitation Authority (ARSA) wastewater disposal system. The following topics are addressed:

- Background Information
- Golf Course Irrigable Acreage
- Golf Course Storage Ponds
- Golf Course Agronomic Water Demands
- COWRF Influent Flows
- Golf Course Tailwater and Overspray Control and Monitoring

BACKGROUND INFORMATION

This section provides background information relevant to this TM. The following topics are addressed:

- Regulatory History
- Applicable Regulatory Standards for Water Balances
- Golf Course Demands vs. COWRF Influent Flows

Regulatory History

The City of Ione (City), ARSA and Portlock International Ltd. (Portlock) are the three entities permitted the Central Valley Water Quality Control Board (Regional Board) under Water Reclamation Requirement Order 93-240 (WRRs) to land apply recycled water from the COWRF to the golf course. The City owns and operates the COWRF, which provides the recycled water to the golf course. The City also owns the golf course, which is leased and operated by Portlock. ARSA is permitted to supply water to the COWRF to meet the irrigation needs of the golf course.

On August 14, 2024, the Regional Board issued a 13267 Order letter to the three WRRs permittees that requires the submission of an updated water balance for the ARSA system to the Regional Board by December 13, 2024. The letter specifies six items (A through F) that must be provided. This TM addresses the requirements under Item B of this letter, which states:

> *The acreage and agronomic rate at which recycled water can be applied to the Castle Oaks Golf Course without violating setback requirements, Title 22 requirements, impacting groundwater, or causing runoff to surface water. These numbers and calculations should be provided and certified by Ione and Portlock International LTD. Supporting documentation and references must be included in the submittal. Information regarding tailwater control/return and monitoring plans for compliance with applicable land application area requirements must also be included.*

Applicable Regulatory Standards for Water Balances

The 13267 Order states that the water balance must be in compliance with the requirements and guidance of the Regional Board's guidance document *Requirements for Water Balance Update and Calibration*, which is provided as Attachment A to the 13267 Order. Several of the procedures defined in this guidance document are applicable to the development of this TM, as follows:

<u>Requirements for Water Balance Update and Calibration, Section 4:</u>

> *The normal operations and maintenance of land application areas should be considered. [Operations and Maintenance] O&M Manuals should be referenced as well as historical monitoring data (i.e. percolation rates, observed standing water). Specific conditions of the [WRRs] should also be taken into account. The following should be taken into consideration:*
>
> *A. Recycling area/land application area/disposal system hydraulic loading rates should be distributed monthly in accordance with expected seasonal variations based on crop evapotranspiration rates.*
>
> *B. The distribution of precipitation (i.e. storm intensity, light rain over a lot of days or heavy rain over a few days), as well as other factors such as wind and saturated conditions must be taken into account when determining the number of days a disposal system can be operated each month. The most reliable way to estimate this is based off of historical records from a water year of intensity similar to that which is being modeled.*
>
> *C. It should be specified whether the tailwater is collected, and if so if it is returned to the sprayfields directly or to one of the ponds.*
>
> *D. If applicable, storm water runoff shall be accounted for in the tailwater return calculations.*
>
> *E. Maximum disposal capacity of land application areas should be based on soil studies, cropping plans, percolation studies, and/or operator notes.*

Requirements for Water Balance Update and Calibration, Section 5:

A. All water balances shall start on 1 October and end on 30 September.

…

C. The water balance should include an assessment of the facility's capacity and performance during a normal water year and during a year with a total annual precipitation for a return period of 100 years.

D. Local precipitation data for the 100-year annual return period, distributed monthly in accordance with mean monthly precipitation patterns shall be used. However, periods of high intensity storms should also be considered in the calculations.

E. All water balances should be based on all available data. All data should also be quality controlled and used with discretion.

…

G. For each wastewater treatment, storage, or disposal pond and containment structure, provide the following information:

a. Identification (name) and function of the pond.

b. Surface area, depth, and volumetric capacity at two feet of freeboard.

c. Height (relative to surrounding grade), crest width, interior slope, and exterior slope of each berm or levee.

d. Materials used to construct each berm or levee.

e. Description of engineered liner, if any. Include a copy of the Construction Quality

f. Estimated steady state percolation rate for each unlined pond.

g. Depth to shallow groundwater below the base and pond inverts.

h. Precipitation and evapotranspiration data shall be from recognized stations. The source of this information shall be provided, including a link to the data.

i. Overfilling/overflow prevention features.

j. Operation and maintenance procedures.

Golf Course Demands vs. COWRF Influent Flows

During the COWRF tertiary treatment process, a fraction of the influent to the COWRF is discarded as filter backwash and sent to the City of Ione's Wastewater Treatment Facility (WWTF). The remaining influent to the COWRF is treated to tertiary standards and recycled at the golf course. Therefore, the influent flow to the COWRF needs to be greater than the agronomic water demand of the golf course to accommodate the losses due to filter backwash, and the ARSA water balances need to include the portion of influent sent as filter backwash to the WWTF.

The City is concurrently in the process of preparing a water balance for its WWTF in accordance with a separate 13267 Order. The WWTF water balance will also need to account for the COWRF backwash flows. Accordingly, this TM presents calculations that define both the COWRF influent flows needed to meet the golf course agronomic demands for use in the ARSA water balance and the backwash flow from the COWRF to the WWTF for use in the WWTF water balance.

GOLF COURSE IRRIGABLE ACREAGE

The irrigable acreage of the golf course was determined based on inspection of the golf course irrigation system and discussions with staff. This area was mapped and quantified using GIS mapping and data processing tools. Figure 1 presents the map created. The following areas of the golf course were not included in the calculated irrigable acreage:

- natural, undeveloped areas surrounding Mule Creek and Sutter Creek
- areas abutting residences surrounding the golf course; some of these areas are irrigated by residents while others remain unirrigated
- hardscape and permanent water features

The total irrigable area of the golf course was determined to be 130 acres.

COGC_TM_Fig1: W:\Clients\988 City of Ione\50-23-05 Title 22 Update\GIS\Title 22 Update\Title 22 Update.aprx - aahern - 11/6/2024

City of Ione Boundary

Golf Course Irrigable Area

Lakes

PS Irrigation Pump Station

Prepared by:

WEST YOST

0 800 1,600 US Feet

Prepared for:

City of Ione

Castle Oaks Golf Course

Recycled Water Demands

Castle Oaks Golf Course Irrigable Area

Fig

GOLF COURSE STORAGE PONDS

The golf course has nine ponds that can be filled with recycled water during the irrigation season. The ponds serve as aesthetic features and water hazard obstacles for the golf course and are used to hold recycled water before it is pumped to the golf course. Limited construction information is available for the ponds, but the ponds are understood to be unlined and constructed of native soil material. Estimates of the depth, volume and percolation rates of the ponds are not available. However, it is estimated that on average, the depth of groundwater below the golf course ranges from 8 to 13 feet. The surface area of each pond has been estimated using GIS mapping and data processing tools and is presented in Table 1.

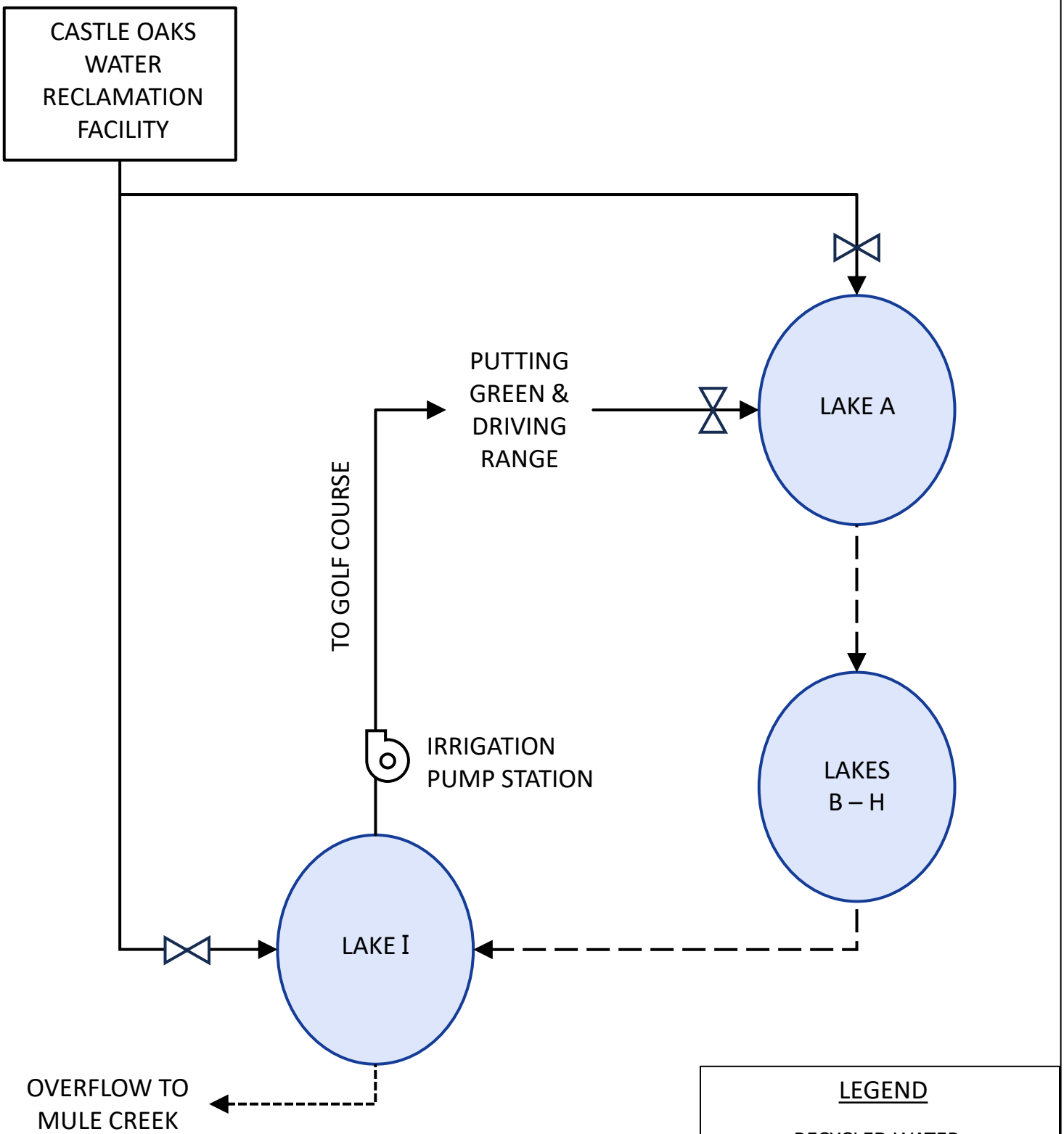
Table 1. Golf Course Storage Pond Surface Area

Pond Name	Surface Area, acres
Lake A	0.8
Lake B	1.2
Lake C	0.4
Lake D	1.1
Lake E	2.2
Lake F	1.1
Lake G	1.6
Lake H	1.4
Lake I	3.1

The ponds are hydraulically connected to each other. The maximum water level of each pond is controlled by a fixed standpipe located in an access port approximately 20 to 100 feet from the lake's edge. Water overflowing the standpipe of the upstream lake is conveyed by to the following lake downstream, with Lake A being the furthest upstream lake, and Lake I being the furthest downstream lake. The Lake I overflow standpipe connects to a wetlands area that is tributary to the nearby surface water body Mule Creek. Figure 2 presents a schematic of the recycled water irrigation system.

Recycled water from the COWRF can be pumped directly to either Lake I or Lake A. Recycled water is then pumped from Lake I to the golf course irrigation system. Under current operations, recycled water is sent by default to Lake I. Golf course staff relate that recycled water is only pumped to Lake A for short periods during the irrigation season, when golf course demands are not keeping up with flows from the COWRF and Lake I is at risk of overflowing. Typically, recycled water that is directed to Lake A will remain in the Lake until it has percolated or evaporated. However, recycled water can discharge from Lake A to the downstream lakes if Lake A overflows. However, golf course staff indicate that the amount of recycled water flow sent to Lake A is not enough to result in overflows.

Figure 2. Castle Oaks Golf Course Recycled Water Storage and Irrigation System Schematic



The ponds also serve as catchment for stormwater runoff the golf course. During the winter rainfall season, stormwater runoff will fill the nine ponds, and they will eventually overflow to Mule Creek. To prevent the discharge of recycled water to Mule Creek, recycled water is only delivered to the golf course during the irrigation season (typically between April and October). This allows for water in Lake I to percolate and evaporate before the rainy season begins. In addition, the recycled water remaining in Lake I at the end of the irrigation season is diluted with 1.2 million gallons of potable water. Golf course staff reported that this practice was developed in partnership with the California Department of Health Services1 to minimize the potential for discharge of recycled water to surface waters.

GOLF COURSE AGRONOMIC WATER DEMANDS

Calculation Procedures

The steps and major assumptions used to determine the rate at which recycled water can be supplied to the golf course are described below.

Climate Data

Rainfall data reported by the Ione National Climate Data Center (NCDC) weather station #0442832 was used to define the average annual rainfall, 1-in-100-year annual rainfall, and the monthly distributions of rainfall, as follows:

- The average rainfall year was defined as having a total rainfall of 22.0 inches.
- The 1-in-100 rainfall year was defined as having a total rainfall of 41.1 inches.
- The monthly distributions were defined based on the 1906 to 1977 monthly Normal rainfall distribution values, with the Normal values being statistically determined values reported by the California Department of Water Resources (DWR).

DWR defined all of these values. This information on is documented in Attachment A and summarized in Table 2.

Reference evapotranspiration (ET) for each month is based on long-term monthly average ET values for the Plymouth California Irrigation Management Information System (CIMIS) Station #227, located approximately 13 miles northeast of the golf course. This information is documented in Attachment A of this TM and summarized in Table 2, along with the monthly total rainfall values for the average and 1-in-100 rainfall years.

[1] CDPH has since been incororpated into the State Water Board as the Division of Drinking Water (DDW).

Table 2. Applicable Climate Data

Month	Average Rainfall,[(a)] inches	1-in-100 Year Rainfall,[(a)] inches	Reference ET,[(b)] inches
October	1.15	2.15	3.24
November	2.81	5.24	1.68
December	3.54	6.58	1.21
January	5.09	9.48	1.48
February	3.14	5.86	1.95
March	3.20	5.95	3.02
April	1.75	3.26	4.57
May	0.63	1.18	5.97
June	0.23	0.43	7.19
July	0.07	0.13	7.64
August	0.13	0.24	6.98
September	0.33	0.62	4.99
Total	**22.1**	**41.1**	**49.9**

(a) NCDC weather station #044283
(b) Plymouth CIMIS station #227

Crop ET

Monthly crop ET values for the golf course were calculated by multiplying the reference ET values from Table 2 by a representative crop coefficient. Grasses grown on the golf course include:

- perennial rye grass
- poa annua
- creeping bent grass
- tall fescue
- Bermuda grass

Apart from Bermuda grass, all grasses used on the golf course are considered cool season grasses. Meyer and Gibeault at the University of California, Irvine report monthly crop coefficients for cool season grasses (see of Attachment B). The average of these reported monthly crop coefficients for April to October, calculated to be 0.88, was used as a representative crop coefficient for all months.

Pond ET

Monthly ET values for the storage pond Lake I were set equal to the respective monthly reference ET values.

Historical Recycled Water Demands

Evaluation of historical recycled water demands was based on the following:

- To properly maintain the golf course greens, recycled water is delivered to the COWRF and golf course solely based on golf course demands.
- Golf course flow data is tracked by golf course staff, and total monthly and annual flow volumes based on this data are shown in Table 3.
- The historical average volume of recycled water delivered was calculated for each calendar month and was used to calibrate and confirm the theoretical recycled water demand for the golf course.

Table 3. Historical Golf Course Recycled Water Demand

Month	Volume of Recycled Water Used, million gallons (MG)									Average, acre-feet
	2017	2018	2019	2020	2021	2022	2023	2024	Average	
October	16.5	8.4	16.7	14.5	8.2	9.1	11.9	20.3[a]	12.2	37.4
November	0	3.2	13.9	6.1	0	9.1	0	2.6[a]	5.3	16.4
December	0	0	0	0	0	0	0	0	0	0
January	0	0	0	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0	0	0	0
April	0	0	0	1.1	12.7	8.1	0.9	0	2.9	8.8
May	18.1	19.1	15.1	14.1	25.2	12.1[b]	15.8	17.6	17.9	54.9
June	25.6	26.5	21.1	19.6	21.4	10.8[b]	22.0	28.3	23.5	72.2
July	29.4	29.0	27.2	26.6	31.7	20.4	25.1	28.3	27.2	83.6
August	29.1	29.8	26.5	25.8	23.3	21.0	22.0	26.1	25.5	78.1
September	23.0	24.1	24.1	16.2	9.0[c]	15.7	15.0	24.2	20.3	62.4
Total, MG	**141.7**	**140.2**	**144.6**	**123.9**	**131.5**	**106.3**	**118.1**	**147.5**	**134.8**	**413.8**

(a) Values excluded from average calculation. The COWRF influent flow meter failed on October 9, 2024 and COWRF staff requested that water be sent to the COWRF at a steady rate of 800 gallons per minute until the end of the irrigation season in mid-November. Therefore, during this period, there was less ability to match the effluent flows from the COWRF to golf course agronomic demands and it is not clear these are representative values.

(b) Values excluded from average calculation. There was limited recycled water supply available from ARSA during the period of May to June 2022 and the golf course was under-irrigated.

(b) Value is excluded from average because it is anomalous when compared with September recycled water use volumes of other years. Operations staff responsible for this data are not available to confirm its accuracy.

Theoretical Recycled Water Demands

Theoretical recycled water demands for the golf course were developed based on the following:

- Theoretical agronomic demands are calculated by multiplying the difference between the calculated monthly crop ET and monthly rainfall values by the total area of the golf course (130 acres) and dividing by an irrigation efficiency factor. For months with more precipitation than ET, the irrigation demand was set equal to zero.

- Irrigation efficiencies for solid set spray irrigation systems like that used on the golf course can range from 60 to 85 percent (see Attachment C, Table 8.2b). A calibration process, described in the next section, has been used to define the irrigation efficiency for this site.
- Theoretical evaporative losses from the storage ponds are calculated by multiplying the difference between the reference ET and monthly rainfall values by the total area of the impoundment.
- As noted previously, recycled water is only sent to and pumped from Lake I. Therefore, evaporative losses from only Lake I (3.1 acres) are included.
- Losses are calculated for months only when recycled water is delivered to the golf course.
- There have been no attempts to quantify percolation losses from Lake I. Therefore, percolation losses are assumed to be zero.
- Total theoretical recycled water demands are the sum of the theoretical monthly golf course agronomic demands and the theoretical monthly evaporative losses from Lake I.

Average Year Theoretical Recycled Water Demand Calibration

The site-specific irrigation efficiency factor used to calculate the theoretical irrigation demand is determined by adjusting the irrigation efficiency value used in the calculation of the average-year theoretical recycled water demand until the demand matches the historical recycled water supplied.

The resulting irrigation efficiency is 84 percent, on the upper end of the typical range for spray irrigation cited above. ***This calibration process demonstrates that the golf course irrigation system is very efficient and experiences limited losses.***

1-in-100 Year Recycled Water Demand

The 100-year theoretical recycled water demand is calculated using the procedures described above but applying 1-in-100-year rainfall values and retaining the 84 percent irrigation efficiency determined from the average year water balance.

Agronomic Water Demands

The calculated average rainfall year theoretical demand to be used in the water balance analysis is shown in Table 4. The calculated average 1-in-100-year theoretical demand to be used in the water balance analysis is shown in Table 5.

The historical data show irrigation demands in November, but the theoretical demands do not indicate a need for irrigation water in this month. This discrepancy likely reflects the fact that rainfall typically does not begin until late November in this area, while there are still irrigation demands earlier in the month. Despite this discrepancy, the annual theorical demand matches closely to the historical values for the average year. Therefore, the methodology applied provides an accurate estimate for purposes of developing an annual water balance for COWRF.

Table 4. Monthly Golf Course Recycled Water Demand for an Average Rainfall Year

Month	(1) Climate Values, inches: Rainfall	(2) Climate Values, inches: Reference ET	(3) Historical Demand, acre-feet	(4) Theoretical Average-Year Demand, acre-feet: Irrigation Demand	(5) Theoretical Average-Year Demand, acre-feet: Pond Losses	(6) Theoretical Average-Year Demand, acre-feet: Total Demand
October	1.15	3.24	37.4	21.9	0.5	22.4
November	2.81	1.68	16.4	0	0	0
December	3.54	1.21	0	0	0	0
January	5.09	1.48	0	0	0	0
February	3.14	1.95	0	0	0	0
March	3.20	3.02	0	0	0	0
April	1.75	4.57	8.8	29.3	0.7	30.0
May	0.63	5.97	54.9	59.6	1.4	61.0
June	0.23	7.19	72.2	78.6	1.8	80.4
July	0.07	7.64	83.6	85.8	2.0	87.8
August	0.13	6.98	78.1	77.5	1.8	79.3
September	0.33	4.99	62.4	52.4	1.2	53.6
Total, acre-feet per year (AFY)	**22.0**	**49.9**	**413.8**	**405.1**	**9.4**	**414.5**

Notes:
(1) 1906-1977 monthly rainfall normals for Ione NCDC weather station #044283
(2) Long-term monthly average reference ET from Plymouth CIMIS station #227
(3) Average of monthly irrigation volumes applied to the golf course from 2017 to 2024 from Table 3
(4) = (irrigated area of 130 acres) x [Column 2 x (crop coefficient of 0.88) - Column 1] / (irrigation efficiency of 0.84) / 12 inches/foot
(5) = (storage pond area of 3.1 acres) x (Column 2 - Column 1) / 12 inches per foot
(6) = Column 4 + Column 5

Table 5. Monthly Golf Course Recycled Water Demand for a 1-in-100 Rainfall Year

	(1)	(2)	(3)	(4)	(5)
	Climate Values, inches		Theoretical 100-Year Demand, acre-feet		
Month	Rainfall	Reference ET	Irrigation Demand	Pond Losses	Total Demand
October	2.15	3.24	9.0	0.3	9.3
November	5.24	1.68	0	0	0
December	6.58	1.21	0	0	0
January	9.48	1.48	0	0	0
February	5.86	1.95	0	0	0
March	5.95	3.02	0	0	0
April	3.26	4.57	9.8	0.3	10.1
May	1.18	5.97	52.5	1.2	53.7
June	0.43	7.19	76.1	1.7	77.8
July	0.13	7.64	85.0	1.9	86.9
August	0.24	6.98	76.1	1.7	77.8
September	0.62	4.99	48.6	1.1	49.7
Total, AFY	**41.1**	**49.9**	**357.1**	**8.2**	**365.3**

Notes:

(1) = 100-year return period annual total distributed monthly in proportion to 1906-1997 monthly Normals for Ione NCDC weather station #044283

(2) Long-term monthly average reference ET from Plymouth CIMIS station #227

(3) = (irrigated area of 130 acres) x [Column 2 x (crop coefficient of 0.88) - Column 1] / (irrigation efficiency of 0.84) / 12 inches per foot

(4) = (storage pond area of 3.1 acres) x (Column 2 - Column 1) / 12 inches/foot

(5) = Column 4 + Column 5

COWRF INFLUENT FLOWS

Calculation Procedures

The theoretical influent flow to the COWRF is calculated for each month using the following formula:

Golf Course Irrigation Demand/(1-backwash percentage)

The Golf Course Irrigation Demands were discussed in the previous section. The backwash percentages are calculated based on historical COWRF influent and backwash flow data, as described in the sections below.

Historical COWRF Influent Flows

Historical monthly influent flows to the COWRF are shown in Table 6. Influent flows beginning in April 2022 are reported in the monthly COWRF discharge monitoring reports (DMRs). Prior to 2022, COWRF DMRs did not present influent flows. However, the influent flows were determined from available golf course demand data and backwash flow data.[2]

Table 6. Historical COWRF Influent Flows

Month	Volume of COWRF Influent Flow, MG								
	2017	2018	2019	2020	2021	2022	2023	2024	Average
October	19.5	10.3	20.7	17.9	10.5	10.9	19.2	27.7[(a)]	17.1
November	0	4.8	15.8	7.8	0	11.3	9.3	4.0[(a)]	8.8
December	0	0	0	0	0	0	0	0	0
January	0	0	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0	0	0
March	0	0	0	0	0	2.0	0	0	2.0
April	0	0	0	0.9	14.4	12.7	2.1	0	7.5
May	20.4	21.6	17.1	16.8	29.1	14.0[(b)]	18.8	19.8	19.7
June	29.1	30.1	23.7	23.0	24.7	13.1[(b)]	25.8	32.0	25.2
July	34.1	33.5	31.2	30.2	35.7	23.1	29.5	32.1	31.2
August	33.3	36.9	33.3	30.1	27.0	23.2	27.4	32.3	30.3
September	27.1	27.7	28.1	20.2	11.2[(b)]	18.5	21.4	28.0	22.8
Total, MG	**163.4**	**164.9**	**169.7**	**146.7**	**152.7**	**128.8**	**153.5**	**174.7**	**164.5**

(a) Values excluded from this evaluation. The COWRF influent flow meter failed on October 9, 2024. Reported influent is an estimate of the actual flow received during this period.

(b) Although values reported in these months are not representative of typical influent flows (and thus irrigation demands), they are useful in determining the percentage of backwash flow generated. Therefore, these values are not excluded from this portion of the analysis.

[2] To determine influent flows prior to April 2022, monthly COWRF effluent flows from the DMRs were compared to golf course flows and filter backwash flows. If the reported COWRF effluent flow was larger than the golf course flow, it was confirmed to be actual influent flow by verifying that it was equal to the sum of the golf course influent flow and the filter backwash flow. If the reported COWRF effluent flow was equivalent to the golf course flow, the COWRF influent flow was calculated by summing the COWRF effluent flow and filter backwash flow. The 2017 COWRF influent flows were calculated by summing monthly golf course influent flows and filter backwash flows because COWRF DMRs were not available.

Historical COWRF Backwash Flows

Historical monthly filter backwash flows from the COWRF are shown in Table 7 .

Table 7. Historical COWRF Filter Backwash Flows

Month	Volume of COWRF Filter Backwash Flow, MG								
	2017	2018	2019	2020	2021	2022	2023	2024	Average
October	3.0	1.9	4.0	3.4	2.4	1.7	7.3[(a)]	5.0	3.1
November	0	1.1	1.9	1.7	0	2.3	4.1[(a)]	1.7	1.2
December	0	0	0	0	0	0	0	0	0.0
January	0	0	0	0	0	0	0	0	0.0
February	0	0	0	0	0	0	0	0	0.0
March	0	0	0	0	0	0	0	0	0.0
April	0	0	0	0	2.0	2.0	0.1	0	1.4
May	2.2	2.5	1.9	2.7	3.9	1.9	3.0	2.2	2.5
June	3.4	3.6	2.5	3.8	3.4	2.0	3.7	3.6	3.2
July	4.7	4.4	3.9	3.6	4.0	2.7	4.4	3.8	3.9
August	4.2	3.9	3.9	4.3	3.8	2.7	5.4[(a)]	5.1	4.0
September	4.1	3.5	4.0	4.0	2.6	2.2	6.4[(a)]	5.5	3.7
Total, MG	**21.7**	**20.9**	**22.1**	**23.4**	**21.9**	**17.5**	**34.4**	**26.8**	**23.5**

(a) Values were not used in calculated average. Operations staff were performing excessive backwashing of the filters. This practice has since ceased.

Filter Backwash Flow Percentages

The percentage of COWRF influent flow that was discarded as backwash flow to the WWTF each month was calculated by dividing the backwash flow by the influent flow. Table 8 shows the results of this calculation. From the percentages shown, a monthly average was calculated. Monthly average backwash percentages range from 13 to 20 percent.

Table 8. Historical COWRF Filter Backwash Flow Percentage

Month	Filter Backwash Flow as a Percentage of Influent Flow, percent								
	2017	2018	2019	2020	2021	2022	2023	2024	**Average**
October	15	18	19	19	23	16	38[a]	18[b]	**18**
November	-[c]	23	12	22	-	20	44[a]	41[b]	**19**
December	-	-	-	-	-	-	-	-	**-**
January	-	-	-	-	-	-	-	-	**-**
February	-	-	-	-	-	-	-	-	**-**
March	-	-	-	-	-	-	-	-	**-**
April	-	-	-	-	14	16	7[d]	-	**15**
May	11	12	11	16	13	13	16	11	**13**
June	12	12	11	16	14	15	15	11	**13**
July	14	13	13	12	11	12	15	12	**13**
August	13	11	12	14	14	12	20[a]	16	**13**
September	15	13	14	20	23	12	30[a]	20	**17**

(a) Values were not used in calculated average. Operations staff were performing excessive backwashing of the filters. This practice has since ceased.

(b) Values excluded from this evaluation. The COWRF influent flow meter failed on October 9, 2024. Reported influent is an estimate of the actual flow received during this period.

(c) "-" indicate there were no flows to the COWRF during this period.

(d) The backwash percentage during April 2023 was abnormally low. Influent flow to the COWRF began six days before the end of the month and effluent and backwash were only discharged on two of the six days. This value was not used in the calculated average.

Theoretical COWRF Influent Flow

The calculated average rainfall year theoretical flow to the COWRF to be used in the water balance analysis is shown in Table 9. The calculated average 1-in-100-year theoretical flow to the COWRF to be used in the water balance analysis is shown in Table 10.

Table 9. Monthly COWRF Influent Demand for an Average Rainfall Year

Month	Average-Year Golf Course Recycled Water Demand,[(a)] acre-feet	COWRF Backwash Flow as a Percentage of Influent Flow,[(b)] percent	Average-Year COWRF Influent Flow,[(c)] acre-feet
October	22.4	18	27.3
November	0	19	0
December	0	-	0
January	0	-	0
February	0	-	0
March	0	-	0
April	30.0	15	35.3
May	61.0	13	70.1
June	80.4	13	92.4
July	87.8	13	100.9
August	79.3	13	91.1
September	53.6	17	64.6
Total, AFY	**414.5**	**-**	**481.7**

(a) From Table 4, Column 6
(b) From Average column in Table 8
(c) = Column 1/(1 - Column 2)

Table 10. Monthly COWRF Influent Capacity for a 1-in-100 Rainfall Year

Month	1-in-100-Year Golf Course Recycled Water Demand,[a] acre-feet	COWRF Backwash Flow as a Percentage of Influent Flow,[b] percent	1-in-100-Year COWRF Influent Flow,[c] acre-feet
October	9.3	18	11.3
November	0	19	0
December	0	-	0
January	0	-	0
February	0	-	0
March	0	-	0
April	10.1	15	11.9
May	53.7	13	61.7
June	77.8	13	89.4
July	86.9	13	99.9
August	77.8	13	89.4
September	49.7	17	59.9
Total, AFY	**365.3**	**-**	**423.5**

(a) From Table 5, Column 5
(b) From Average column in Table 8
(c) = Column 1 / (1 - Column 2)

Theoretical COWRF Backwash Percentages and Flows

A calculated theoretical backwash flow from the COWRF to the WWTF will be used in the water balance analysis for the WWTF, based on the influent flows from Table 9 and Table 10 and average historical backwash flow percentages by month from Table 8. The theoretical COWRF backwash flow for an average rainfall year is shown in Table 11. The theoretical COWRF backwash flow for a 1-in-100 rainfall year is shown in Table 12.

Table 11. Monthly COWRF Backwash Flow for an Average Rainfall Year

Month	Average-Year COWRF Influent Flow,[a] acre-feet	COWRF Backwash Flow as a Percentage of Influent Flow,[b] percent	Average-Year COWRF Backwash to WWTF,[c] acre-feet
October	27.3	18	4.9
November	0	19	0
December	0	-	0
January	0	-	0
February	0	-	0
March	0	-	0
April	35.3	15	5.3
May	70.1	13	9.1
June	92.4	13	12.0
July	100.9	13	13.1
August	91.1	13	11.8
September	64.6	17	11.0
Total, AFY	**481.7**	**-**	**67.2**

(a) From Table 9
(b) From Table 8
(c) = Column 1 x Column 2

Table 12. Monthly COWRF Backwash Flow for a 1-in-100 Rainfall Year

Month	1-in-100-Year COWRF Influent Flow,[a] acre-feet	COWRF Backwash Flow as a Percentage of Influent Flow,[b] percent	1-in-100-Year COWRF Backwash to WWTF,[c] acre-feet
October	11.3	18	2.0
November	0	19	0
December	0	-	0
January	0	-	0
February	0	-	0
March	0	-	0
April	11.9	15	1.8
May	61.7	13	8.0
June	89.4	13	11.6
July	99.9	13	13.0
August	89.4	13	11.6
September	59.9	17	10.2
Total, AFY	**423.5**	**-**	**58.2**

(a) From Table 10
(b) From Table 8
(c) = Column 1 x Column 2

GOLF COURSE TAILWATER AND OVERSPRAY CONTROL AND MONITORING

This section provides information about Best Management Practices (BMPs) and monitoring for tailwater and overspray control from the golf course. The following topics are addressed:

- Golf Course Field Monitoring
- Golf Course Best Management Practices
- Golf Course Storage Pond Monitoring

Golf Course Field Monitoring

The City, in coordination with the golf course management, is required to perform daily, weekly, and monthly monitoring of the golf course when recycled water is being applied, as outlined in the WRR's Monitoring and Reporting Program (MRP). These requirements are summarized in Table 13. In addition to the elements outlined below, the daily inspections must note any evidence of erosion, field saturation, runoff or the presence of nuisance conditions.

The MRP was adopted December 21, 2021, and did not become effective until after the end of the 2021 irrigation season. Since its adoption, the MRP requirements related to the golf course operations shown in Table 13 have not been satisfied. The City and golf course staff are currently developing the protocols to implement this monitoring and will initiate the program beginning in the 2025 irrigation season.

Table 13. Golf Course Monitoring Requirements

Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency
Flow	gallons	Continuous	Daily	Monthly
Rainfall[a]	inches	Measurement		
Acreage Applied[b]	acres	Calculated		
Tailwater Runoff Observation	--	Observation		

(a) As measured at the weather station nearest to the disposal site.
(b) Specific disposal fields shall be identified.

Flow

Currently, golf course staff monitor the daily total flow that is applied to the golf course. This flow is measured from the irrigation pump station and recorded in the golf course's central computer system. The measurement can be reported in up to 15-minute increments. Golf course staff report the daily total flows to the City.

Rainfall

Rainfall collects in a plastic rain gage located at the maintenance yard, and golf course staff manually read the gage daily at approximately the same time of day. That measurement is compared to a reported weather station located in the nearby City of Jackson to confirm its accuracy. The onsite, measured rainfall data is reported to the City.

Acreage Applied

The golf course's central computer system has the ability report the areas that are watered each night. These areas are grouped and reported by area category according to the type of plant that is watered. The area categories are:

- Greens
- Tees
- Fairway
- Perimeter
- Rough
- Club House
- Driving Range
- Putting Green

Irrigation generally occurs on all areas of the golf course simultaneously. In rare instances an area category may be watered alone. Starting with the 2025 irrigation season, golf course staff will report the acreage that is watered daily and include that information in the flow report provided to the City monthly.

Tailwater Runoff Observation Monitoring

Starting with the 2025 irrigation season, City staff will inspect the golf course daily for evidence of runoff and overspray. These inspections will occur in the morning, just after irrigation occurs. During these inspections, special attention will be paid to the following five vulnerable areas, which have the most potential for recycled water to escape the use area:

- Castle Oaks Clubhouse
- Areas abutting Mule Creek
- Spyglass Drive near the Irrigation Pump Station
- Castle Oaks Drive and Shakeley Lane intersection
- Near the bathroom by Vista Lane

Monitoring each location will be done through an observatory drive by each location in the early morning. Evidence of runoff or overspray includes wet areas on hardscape sidewalks and roadways surrounding the extents of the landscaped area. If these areas are wet or water appears to be draining from landscape into the gutters, the irrigation system should be further investigated for problems. Inspection logbook entries for the golf course monitoring will be submitted with the monthly monitoring reports.

Golf Course Best Management Practices

Overspray and runoff of recycled water from the use area is minimized and controlled through the implementation of BMPs. Spray irrigation systems are vulnerable to inefficiencies related to runoff or overspray caused by pressure fluctuations, wind, or equipment malfunction. If any part of the system is not working optimally, the result is a less uniform application of water which increases the likelihood of water escaping the recycled water use area. Even the most efficiently designed system must be maintained and constantly monitored to mitigate system avoid problems.

The COWRF BMP strategies include engineered controls and mechanisms to minimize runoff or overspray and practices to improve the application of water to a use area. Specific BMPs employed to control for runoff or overspray include:

- Irrigation is ceased during extended and extensive windy periods.
- Irrigation is avoided when the soil is saturated to prevent runoff.
- All sprinkler heads are uniform in brand, model and nozzle size to apply water as uniformly across the plant material as possible.
- A minimum four-foot distance from neighboring backyards and buildings is maintained as practical throughout areas of the golf course. This has been done through head removal, spray range or arc reduction or elimination of a zone. In areas where the four-foot buffer cannot be maintained and irrigated turf is desired, such as near a tee, hole or walkways, the irrigation water is applied with lower impact heads with a smaller arc radius.
- Irrigation occurs in the evening or early morning hours to avoid public interaction, reduce evaporative loses, and take advantage of calmer wind patterns.
- Good horticultural practices are performed including, mowing, de-thatching, aeration, and pest control as necessary to increase the plant and soil water absorbance.
- Irrigation is applied as close as practical to match the amount of water lost through ET and the soil needs.

- Duration of water application is applied to match percolation rates to reduce runoff.
- Installation of low angle heads have been installed in areas near residential backyards to reduce mist from wind drift of spray.
- Tall plants are present along edges and perimeters to create a plant buffer.
- Regular maintenance is performed of the irrigation system which includes inspecting and repairing leaks.

Golf Course Storage Pond Monitoring

Monitoring of irrigation storage ponds when they contain recycled water is also required under the MRP. These requirements are summarized in Table 14.

Table 14. Golf Course Storage Pond Monitoring Requirements

Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency
Freeboard	feet	Measurement	Twice Weekly – 3 days apart	Monthly
Odors	--	Observation	Weekly	
Dissolved Oxygen	milligrams per liter	Grab	Weekly	
pH	pH units	Grab	Monthly	

Similar to the irrigation area, the MRP requirements related to the ponds have not been consistently satisfied. The City and golf course staff are currently developing the protocols to implement this monitoring and will initiate the program beginning in the 2025 irrigation season.

Freeboard

The MRP requires the freeboard be monitored as the difference between the top of the bank of the storage pond to the level of the water. This measurement provides the City with confidence that recycled water cannot escape the storage pond containment area. However, as noted previously, each pond is equipped with a standpipe that serves as an overflow structure. Therefore, it is more appropriate to monitor freeboard as the difference between the top of the overflow structure to the top of the water surface.

Currently, the City has the ability to measure the freeboard of Lake A by means of a level monitoring rod. This capability is not set up in Lakes B through I. Lake I is manually kept at a level that is below the 12-inch overflow standpipe that conveys overflow water to a wetland area that eventually flows to Mule Creek. Prior to the start of the 2025 irrigation season, the City will need to install a level monitoring rod in each pond so that freeboard can be measured.

In addition, the City will employ the following monitoring practices in the 2025 irrigation season:

- Twice a week during the irrigation season, each storage pond should be observed, and freeboard monitored.
- For Pond I, it is expected that there will be recycled water present in the pond throughout the irrigation season and this pond should be monitored during each bi-weekly event.

- Recycled water is occasionally directed to Pond A. Therefore, this pond will be inspected as part of the bi-weekly monitoring. If there is standing water present in Pond A, then monitoring of this pond will be completed.
- If there is any evidence that Pond A has overflowed to Pond B (or any downstream pond) via the pond standpipes, then monitoring of the downstream ponds will also be performed.
- City staff will be responsible for making the appropriate observations to determine whether recycled water is being stored in any of the ponds.
- Golf course staff will provide information to the City regarding where COWRF flows are directed. Specifically, the monthly reports provided to the City will include information about which pond was receiving flow on each day.

Odors

The City is required to evaluate if any objectionable odors are being emitted from the storage ponds once every week. This will be needed for each pond that holds recycled water.

Dissolved Oxygen and pH

The City is required to collect and measure the dissolved oxygen and pH in a grab sample collected from each recycled water storage pond weekly. These measurements can be made using field test instruments provided that:

- The operator is trained in proper use and maintenance of the instruments,
- The instruments are field calibrated at the frequency recommended by the manufacturer,
- The instruments are serviced and/or calibrated at the manufacturer's recommended frequency, and
- Field calibration reports are maintained and a calibration log verifying calibration of all handheld monitoring instruments and devices are submitted with the monthly monitoring report.

Attachment A

Rainfall and Reference ET Data

IONE, CALIFORNIA (044283)

Period of Record Monthly Climate Summary

Period of Record : 03/01/1906 to 06/30/1977

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)					Insuff	icient	Data						
Average Min. Temperature (F)					Insuff	icient	Data						
Average Total Precipitation (in.)	5.08	3.14	3.19	1.75	0.63	0.23	0.07	0.13	0.33	1.15	2.81	3.53	22.04
Average Total SnowFall (in.)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 0% Min. Temp.: 0% Precipitation: 99.9% Snowfall: 99.9% Snow Depth: 99.8%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

D

Rainfall Depth Duration Frequency at Ione

Station Number	Station	County	Latitude	Longitude	Elevation	Years Recorded
B00 4283 00	Ione	Amador	38.348	-120.938	284.0	89

Rainfall Statistics	1-Day	2-Day	3-Day	4-Day	5-Day	6-Day	8-Day	10-Day	15-Day	20-Day	30-Day	60-Day	1-Year
Pr=0.5	1.92	2.55	3.01	3.38	3.70	3.99	4.48	4.91	5.79	6.51	7.68	10.19	21.28
Pr=0.2	2.55	3.37	3.98	4.47	4.89	5.27	5.92	6.48	7.64	8.58	10.11	13.39	27.84
Pr=0.1	2.92	3.87	4.55	5.11	5.60	6.02	6.76	7.40	8.71	9.78	11.52	15.23	31.54
Pr=0.04	3.36	4.44	5.22	5.86	6.40	6.89	7.73	8.45	9.94	11.16	13.13	17.32	35.70
Pr=0.02	3.66	4.83	5.67	6.36	6.96	7.48	8.39	9.17	10.78	12.09	14.22	18.74	38.51
Pr=0.01	3.94	5.19	6.10	6.84	7.47	8.04	9.01	9.84	11.57	12.97	15.23	20.06	41.11
Pr=0.005	4.21	5.54	6.51	7.29	7.96	8.56	9.59	10.48	12.31	13.79	16.19	21.31	43.57
Pr=0.002	4.54	5.97	7.01	7.85	8.58	9.22	10.33	11.28	13.23	14.82	17.40	22.87	46.64
Pr=0.001	4.79	6.29	7.38	8.26	9.02	9.69	10.85	11.85	13.90	15.57	18.26	23.99	48.84
Pr=0.0001	5.53	7.26	8.50	9.52	10.39	11.15	12.48	13.62	15.96	17.87	20.94	27.46	55.66

Annual Maxima	1-Day	2-Day	3-Day	4-Day	5-Day	6-Day	8-Day	10-Day	15-Day	20-Day	30-Day	60-Day	1-Year
2007	---	---	---	---	---	---	---	---	---	---	---	---	---
2006	---	---	---	---	---	---	---	---	---	---	---	---	---
2005	---	---	---	---	---	---	---	---	---	---	---	---	---
2004	---	---	---	---	---	---	---	---	---	---	---	---	---
2003	---	---	---	---	---	---	---	---	---	---	---	---	---
2002	---	---	---	---	---	---	---	---	---	---	---	---	---
2001	---	---	---	---	---	---	---	---	---	---	---	---	---
2000	1.85	2.80	4.29	4.74	4.99	4.99	5.22	5.79	7.52	9.05	10.35	11.82	21.39
1999	2.02	2.44	3.42	3.42	3.42	3.42	3.42	4.17	5.51	5.72	8.41	10.90	15.39
1998	2.37	3.55	4.11	4.36	4.98	5.85	6.61	7.31	8.07	10.05	14.21	21.25	30.46
1997	2.37	3.55	4.11	4.36	4.98	5.85	6.61	7.31	8.07	10.05	14.21	21.25	43.59
1996	3.75	3.85	3.85	3.85	3.85	3.85	3.85	3.85	4.74	5.27	6.16	11.53	22.80
1995	2.90	4.71	5.05	5.33	5.58	5.71	7.45	8.02	9.08	9.83	12.42	16.90	35.50
1994	1.27	1.70	1.95	2.05	2.15	2.42	2.55	2.55	3.45	3.67	5.27	5.87	15.52
1993	1.81	2.26	2.26	2.84	3.18	4.50	4.91	5.13	7.10	7.52	10.16	16.58	29.21
1992	2.30	3.18	3.18	3.24	4.11	5.17	5.97	6.06	6.98	7.16	9.13	10.62	20.43
1991	1.60	2.28	2.88	3.52	3.52	3.52	4.08	5.15	6.28	7.38	10.07	11.94	16.59
1990	1.82	2.35	2.37	2.37	2.37	2.37	2.37	2.37	2.90	2.90	3.33	6.23	17.33
1989	1.05	1.90	2.05	2.06	2.26	2.41	2.52	2.82	3.36	3.75	5.85	7.67	16.85
1988	1.55	1.90	1.90	1.90	1.90	1.90	2.05	2.13	2.75	3.47	4.78	6.57	11.67
1987	1.81	2.43	2.54	2.54	2.87	2.87	3.38	3.62	3.62	5.31	5.31	9.80	13.86
1986	2.75	4.85	5.65	6.65	6.85	6.95	7.90	8.00	8.00	9.45	12.97	18.47	33.02
1985	---	---	---	---	---	---	---	---	---	---	---	---	17.93
1984	---	---	---	---	---	---	---	---	---	---	---	---	23.39
1983	---	---	---	---	---	---	---	---	---	---	---	---	41.81
1982	---	---	---	4.62	5.24	5.24	5.53	5.53	7.29	8.43	9.95	15.59	39.56
1981	2.04	2.94	3.80	4.17	4.32	5.01	6.02	6.02	6.21	6.21	6.62	11.24	17.15
1980	---	---	---	---	---	---	---	---	---	---	---	---	

1979	1.54	2.28	2.83	3.82	3.82	3.82	4.02	4.97	5.49	6.53	7.09		
1978	1.54	2.28	2.83	3.82	3.82	3.82	4.02	4.97	5.49	6.53	7.09	12.65	20.87
1977	0.92	1.03	1.09	1.12	1.12	1.12	1.24	1.26	1.26	1.26	2.18	3.32	8.73
1976	0.78	1.23	1.70	1.70	1.91	2.06	2.06	2.06	2.18	3.21	3.73	5.00	11.87
1975	1.97	2.56	3.14	3.27	3.38	3.52	4.84	6.08	7.82	8.47	8.50	15.06	28.24
1974	---	---	---	---	---	---	---	---	---	---	---	---	33.80
1973	2.48	2.76	3.51	4.54	4.86	4.86	6.09	7.38	8.60	9.26	12.09	19.82	35.95
1972	3.05	3.88	3.92	3.98	3.98	5.03	5.90	5.96	6.05	6.73	7.92	9.62	16.80
1971	3.05	4.40	5.02	5.13	6.25	6.57	6.57	7.61	8.20	8.22	9.81	13.34	21.20
1970	2.94	2.94	3.48	3.48	3.72	3.72	4.97	5.90	6.37	7.01	9.55	12.27	21.13
1969	2.75	3.15	3.15	3.23	3.31	3.54	5.63	6.09	8.33	8.80	9.89	16.66	30.23
1968	1.76	2.12	2.12	2.43	2.43	2.48	2.51	3.20	3.20	3.49	4.61	8.77	17.12
1967	2.52	4.13	4.15	4.63	4.97	4.99	5.38	6.53	7.36	7.36	7.89	11.44	29.07
1966	1.79	1.95	2.46	2.48	3.27	3.74	4.03	4.13	5.17	5.17	5.17	9.69	16.47
1965	---	3.43	---	---	---	---	---	7.18	8.10	---	---	---	25.01
1964	1.98	2.44	2.86	3.06	3.06	3.06	3.25	3.45	5.45	6.58	6.84	9.13	18.12
1963	2.88	3.52	4.20	4.65	4.65	4.65	4.65	4.65	6.07	6.38	6.38	10.35	24.44
1962	1.25	2.08	2.93	3.02	4.05	4.53	6.47	7.17	7.61	7.75	9.09	11.98	18.00
1961	1.38	1.68	2.16	2.16	2.16	2.26	2.40	2.77	2.93	3.23	4.81	6.51	13.82
1960	1.33	1.53	1.86	1.86	2.09	2.42	2.82	3.25	3.67	5.03	6.18	7.86	16.68
1959	1.65	2.09	2.09	2.55	2.88	3.22	3.68	4.01	4.01	4.75	6.13	10.54	13.45
1958	---	---	---	---	---	---	---	---	---	---	---	---	41.69
1957	---	---	---	---	---	---	---	---	---	---	---	---	18.93
1956	---	---	---	---	---	---	---	---	---	---	---	---	28.58
1955	---	---	---	---	---	---	---	---	---	---	---	---	18.28
1954	---	---	---	---	---	---	---	---	---	---	---	---	16.40
1953	---	---	---	---	---	---	---	---	---	---	---	---	15.10
1952	2.21	3.15	3.68	3.77	3.77	3.77	3.77	4.06	4.68	6.56	7.47	13.11	27.05
1951	4.65	5.30	5.30	5.30	5.55	5.70	6.24	6.25	6.25	8.87	10.85	14.60	28.76
1950	2.70	2.70	2.70	3.97	3.97	3.97	3.97	5.05	5.05	5.55	9.52	10.41	18.30
1949	1.76	2.71	3.14	3.14	3.14	3.14	3.72	3.86	4.87	5.45	6.93	10.49	17.23
1948	1.28	1.41	1.70	1.83	2.03	2.03	2.43	2.43	4.08	4.39	6.67	8.68	17.76
1947	2.16	3.12	3.20	3.20	3.91	3.91	3.91	4.13	4.13	4.13	4.82	7.33	14.54
1946	1.90	1.90	3.20	3.38	4.37	4.98	5.16	5.42	5.70	6.31	7.49	11.80	20.14
1945	2.68	3.88	4.78	4.78	4.98	5.27	5.27	5.27	5.66	5.66	5.66	9.58	23.66
1944	2.25	2.41	2.53	2.53	3.23	3.39	3.93	4.28	5.68	5.68	7.47	10.20	19.25
1943	2.05	2.78	3.58	3.81	4.43	4.77	5.38	5.42	7.10	8.03	10.13	15.90	27.61
1942	2.00	3.48	4.20	4.60	5.32	5.81	5.91	5.91	7.68	8.17	8.17	12.92	26.67
1941	1.85	2.40	2.46	3.46	5.46	5.46	4.17	4.52	7.17	8.59	11.13	14.00	25.17
1940	1.65	2.72	3.46	3.76	4.20	4.79	5.24	5.54	5.95	6.00	8.96	16.37	24.86
1939	1.72	2.40	2.55	2.80	2.80	2.80	2.80	2.80	2.80	3.17	3.42	5.93	14.01
1938	2.30	3.65	4.05	4.55	4.80	4.80	5.25	6.95	9.40	10.35	12.10	16.00	27.25
1937	4.40	4.65	5.85	6.15	6.60	6.95	7.70	8.15	8.70	9.50	10.10	19.90	34.99
1936	2.00	2.30	3.50	4.20	4.35	4.50	6.05	6.40	10.33	10.33	13.28	19.99	28.29
1935	2.50	2.72	2.72	2.72	3.25	4.30	4.52	4.52	5.22	5.65	6.35	9.47	23.94
1934	1.70	2.85	2.85	4.05	4.52	4.52	4.52	4.52	4.52	6.40	8.77	9.67	

1933	1.20	1.72	1.72	1.72	2.32	3.12	3.12	3.82	3.82	3.82	5.07		
1932	1.75	1.92	2.59	3.58	3.75	3.80	4.49	4.97	5.58	5.88	6.60	10.05	19.99
1931	1.65	1.65	1.65	2.53	2.53	2.53	2.65	2.65	2.65	2.65	3.92	6.39	12.62
1930	1.39	2.25	2.25	2.57	2.57	2.78	3.35	3.71	5.17	5.33	5.62	10.86	17.07
1929	1.91	2.98	3.49	3.49	3.49	3.49	3.49	3.57	4.07	4.07	4.07	6.57	15.52
1928	1.68	2.60	3.40	4.06	4.79	4.92	4.92	4.92	5.92	6.10	6.27	9.09	18.80
1927	1.50	3.00	3.00	4.25	4.25	4.51	5.46	5.96	6.26	6.91	7.41	10.51	24.11
1926	2.55	2.80	2.90	3.55	3.55	4.55	5.10	5.10	6.48	8.99	10.04	10.29	21.54
1925	1.95	3.05	3.27	3.27	3.52	3.74	4.27	5.79	5.94	7.79	8.41	11.84	28.60
1924	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	2.35	3.00	3.00	4.95	10.50
1923	2.20	3.00	4.30	5.30	5.30	5.30	5.50	6.10	6.70	6.70	9.30	14.15	26.07
1922	2.17	2.52	3.45	3.95	3.95	3.95	3.95	4.44	7.09	7.16	9.46	14.80	24.30
1921	3.85	3.95	4.50	4.72	4.72	4.72	4.72	5.72	6.62	7.02	7.72	13.51	26.57
1920	2.10	3.55	3.90	4.05	4.20	4.20	4.20	4.31	4.82	5.19	7.04	9.26	15.46
1919	2.25	3.55	3.90	4.00	4.05	4.40	4.60	4.70	5.00	6.45	8.15	10.35	18.75
1918	1.60	2.35	2.35	2.35	3.45	4.25	4.70	4.70	6.50	6.50	8.10	11.30	15.50
1917	1.30	2.30	2.60	2.90	3.25	3.55	4.10	4.35	4.55	4.55	5.35	7.25	17.70
1916	---	---	---	---	---	---	---	---	---	---	---	---	20.00
1915	1.50	1.95	2.15	2.30	2.83	3.03	3.88	4.20	5.88	6.20	7.77	10.87	22.80
1914	2.26	3.11	3.49	3.61	3.99	3.99	3.99	4.48	5.47	6.96	9.81	13.52	22.90
1913	1.20	1.84	2.22	2.72	2.95	3.36	3.36	3.55	4.01	4.01	4.01	4.86	14.26
1912	0.69	1.04	1.15	1.22	1.30	1.45	1.86	2.16	2.47	2.86	3.43	5.36	12.68
1911	2.17	3.57	5.27	6.12	6.45	7.30	7.80	8.42	10.82	15.51	18.06	24.30	30.46
1910	2.00	3.00	3.00	3.45	3.88	3.88	3.93	3.93	4.00	4.69	5.92	8.90	20.89
1909	1.45	2.60	3.80	4.42	4.54	5.07	5.99	6.39	7.99	9.21	12.66	19.24	26.01
1908	1.30	1.60	1.60	1.78	1.78	1.78	1.83	3.03	3.63	3.63	5.51	9.04	14.27
1907	4.37	6.79	7.38	7.53	8.38	8.53	8.53	8.53	8.53	10.60	12.20	18.04	33.82
1906	2.40	2.54	3.22	3.62	3.85	3.85	3.85	5.03	7.47	9.20	10.45	15.43	30.93
1905	2.90	2.90	2.90	3.20	4.20	4.20	4.55	4.85	5.55	5.55	5.50	9.65	25.95
1904	1.51	2.62	3.12	3.15	3.15	3.25	3.75	4.86	6.07	6.42	7.20	12.05	21.42
1903	1.85	2.92	3.58	4.10	5.01	5.03	5.03	5.53	5.53	7.54	9.71	10.34	22.39
1902	1.21	1.79	2.09	2.61	3.01	3.41	3.87	4.41	5.03	6.03	7.72	9.29	20.19
1901	2.05	2.79	3.61	4.03	4.03	4.72	5.54	5.52	5.54	7.35	7.69	11.29	25.48
1900	1.85	2.34	2.41	2.80	2.86	2.86	2.86	3.88	4.82	5.66	6.45	9.69	21.51
1899	1.93	2.56	3.20	3.54	4.04	4.04	4.94	7.17	7.80	7.93	9.00	9.22	20.03
1898	3.60	4.47	4.64	4.64	4.64	4.64	4.64	4.76	5.11	5.11	5.23	7.30	13.77
1897	---	---	---	---	---	---	---	---	---	---	---	---	---
1896	---	---	---	---	---	---	---	---	---	---	---	---	---
1895	---	---	---	---	---	---	---	---	---	---	---	---	---
1894	---	---	---	---	---	---	---	---	---	---	---	---	---
1893	---	---	---	---	---	---	---	---	---	---	---	---	---
1892	---	---	---	---	---	---	---	---	---	---	---	---	---
1891	---	---	---	---	---	---	---	---	---	---	---	---	---
1890	---	---	---	---	---	---	---	---	---	---	---	---	---
1889	---	---	---	---	---	---	---	---	---	---	---	---	---
1888	---	---	---	---	---	---	---	---	---	---	---	---	---

Monthly Average ETo Report

California Irrigation Management Information System (CIMIS)

Rendered in ENGLISH Units.

Printed on Wednesday, August 31, 2022

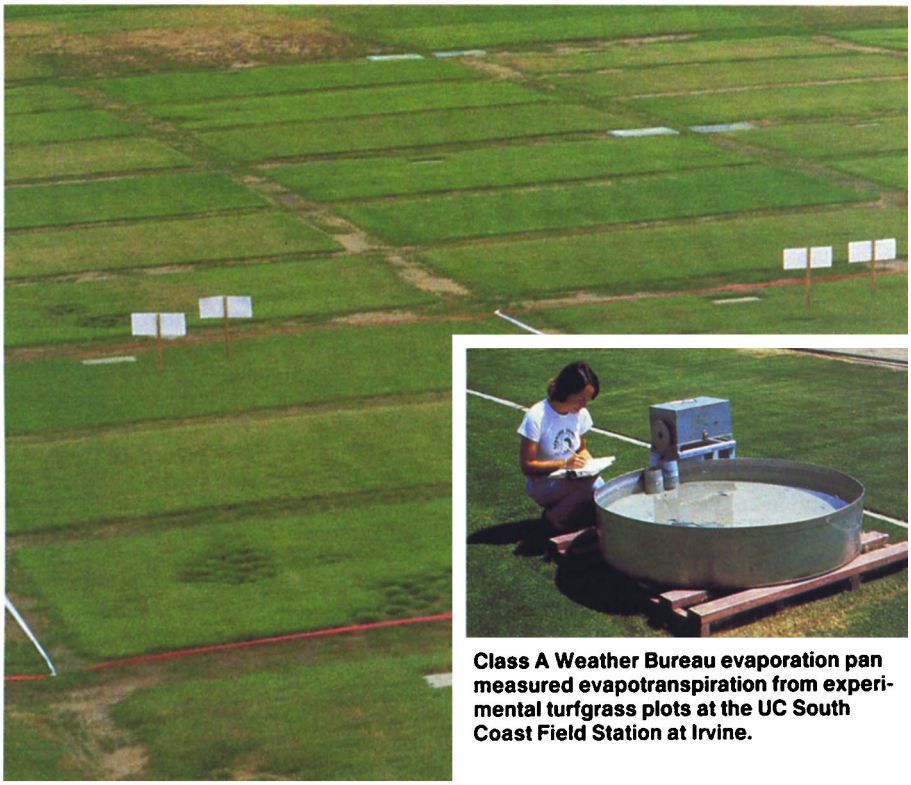
Average ETo Values by Station

Stn Id	Stn Name	CIMIS Region	Jan (in)	Feb (in)	Mar (in)	Apr (in)	May (in)	Jun (in)	Jul (in)	Aug (in)	Sep (in)	Oct (in)	Nov (in)	Dec (in)	Total (in)
227	Plymouth	SFH	1.48	1.95	3.02	4.57	5.97	7.19	7.64	6.98	4.99	3.24	1.68	1.21	49.92

CIMIS Region Abbreviations		
BIS - Bishop	CCV - Central Coast Valleys	ICV - Imperial/Coachella Valley
LAB - Los Angeles Basin	MBY - Monterey Bay	NCV - North Coast Valleys
NEP - Northeast Plateau	SAV - Sacramento Valley	SBE - San Bernardino
SFB - San Francisco Bay	SJV - San Joaquin Valley	SFH - Sierra Foothill
SCV - South Coast Valleys		

Attachment B

Turfgrass Performance Under Reduced Irrigation
Meyer and Gibeault



Class A Weather Bureau evaporation pan measured evapotranspiration from experimental turfgrass plots at the UC South Coast Field Station at Irvine.

Turfgrass performance under reduced irrigation

Jewell L. Meyer □ Victor A. Gibeault

Turfgrass in California requires irrigation during all or most of the year. Water restrictions imposed during the drought in 1976 and 1977 forced turf managers to reexamine many concepts about irrigation. Turfgrass managers had to make drastic cuts in water use and hope that the turf would survive. One significant result of the drought was the realization that lower levels of turf quality were acceptable in many situations and that large water savings could be achieved. No information was available, however, on the best conservation practices or on the minimum amounts of water needed to keep the turf alive.

Research was begun in 1979 to produce irrigation methodology that could be used to develop water-saving irrigation practices anywhere in California and in other arid and semiarid regions. The three-year study showed that major savings of water can be achieved, especially with warm-season grasses, with no appreciable loss of turf quality.

Turf-irrigation study

Specifically, the objectives of the research were to: (1) investigate the effects of applying reduced amounts of irrigation water calculated as a percentage of evapotranspiration of applied water on cool-season and warm-season turfgrasses; (2) evaluate a below-ground system as a potentially more efficient method of turf irrigation than standard sprinkler application; and (3) develop a set of crop coefficients that California turfgrass managers can use to determine on-site water use by both cool- and warm-season turfgrasses.

The study was conducted at the University of California South Coast Field Station, Irvine. The variables tested included: two irrigation methods, sprinkler application of water and a subterranean or buried trickle/drip water application (8-inch depth, 23-inch spacing); three irrigation regimes, 100, 80, and 60 percent of calculated evapotranspiration; and six commonly used turfgrasses, three cool-season varieties (Kentucky bluegrass, perennial ryegrass, and tall fescue) and three warm-season types (hybrid bermudagrass, zoysiagrass, and Seashore Paspalum).

The field plot was a randomized split-block design. The area was divided into two turf blocks, one for cool-season grasses and the other for warm-season grasses. Each block consisted of four replications, and within each replication were six randomized irrigation plots measuring 15 by 24 feet. Irrigation plots were divided into three turf subplots of 8 by 15 feet. The three sprinkler and three subterranean irrigation plots per replication were installed in September 1979 for above- and below-ground water application. Each sprinkler irrigation plot contained six high-pop brass sprinkler heads designed to apply 10 gallons of water per minute at a pressure of 35 pounds per square inch. The coefficient of uniformity was 87 percent.

Tensiometers at 3- and 6-inch depths in the cool-season grasses and 8- and 12-inch depths in the warm-season grasses indicated soil water status; neutron probe access tubes were installed in plots to a depth of 4 feet in the cool-season and 6 feet in the warm-season grasses. Scheduling was by the water budget technique calculated weekly using wind-modified pan evaporation data. State-of-the-art controllers were programmed with this irrigation scheduling information. The amount of irrigation was modified so that water did not pass below the 4-foot and 6-foot depths of the neutron probe access tubes during the irrigation season.

Annual crop coefficients, determined from previous research using applied water and evaporation pan data, were 0.7 annually for warm-season grasses and 0.8 for cool-season grasses. Monthly crop coefficients were developed in this experiment to evaluate responses of the six turfgrass species to 60 percent and 80 percent of replacement evapotranspiration for water conservation.

Turf performance

Overhead sprinkler irrigation provided acceptable performance of some turfgrass species, even when less than the optimum amount of water was applied. Subterranean irrigation did not provide acceptable turf with the shallow-rooted cool-season species, at the system depth and spacing used in this study. The very deeply rooted hybrid bermudagrass was the best-performing species with subterranean irrigation.

Under sprinkler irrigation, there was no significant difference in cool-season grass performance between the 100 percent and 80 percent regimes (table 1). This could be described as a potential level of water conservation amounting to 21.1 percent savings (77.2 inches versus 61 inches). The savings could be tenuous, however, because of more weed and disease activity (such as Gerlachia patch on Kentucky bluegrass) when irrigated with less than the optimum amount of water. The 60 percent regime significantly reduced the turf quality of the three cool-season grasses tested.

In the warm-season grasses, the appearance of hybrid bermudagrass and Seashore Paspalum was not significantly different under any of the irrigation regimes. As irrigation amounts were reduced, zoysiagrass appearance ratings declined because of nematode activity ob-

served on the roots. Both Santa Ana hybrid bermudagrass and Adalayd (Excalibre) Seashore Paspalum had very good color, density, texture, uniformity, and freedom from weeds and diseases, irrespective of irrigation regimes. Clearly there is potential for considerable water savings with these grasses. This study showed a 40 percent reduction in actual water applied between the optimum and lowest irrigation regime (65.5 versus 39 inches).

Because of the field plot design necessary for this study, it wasn't possible to compare statistically the turf performance results between the warm- and cool-season grasses. Hybrid bermuda and Seashore Paspalum performed very well, however, with 52.7 inches of water applied (60 percent irrigation regime), whereas the cool-season grasses needed at least 82.4 inches (80 percent irrigation regime). Thirty-six percent less water was applied to the warm-season species than to the cool-season species for acceptable turf quality. If applied water in the 60 percent irrigation treatment in warm-season grasses (52.7 inches) is compared with that in the 100 percent treatment in cool-season grasses (104.4 inches), the saving in water is 49.5 percent.

Water application

The cool-season grass in the 100 percent regime received 43 inches of water in 1982 (table 2). Warm-season grasses received only 34 inches. Rainfall of 18.45 inches occurred primarily from November to March. The soil profile held about 10 inches depth of water in the top 6 feet. Rainfall did not appreciably affect the applied water during the primary growing season, April through November. Likewise, the 34 inches applied to the warm-season grasses was not appreciably affected by, nor was there evidence of, deep percolation during the primary growing season, when only 4 inches of rain fell. The rainfall is subtracted from the original evaporation pan reading and is therefore reasonably accounted for in the calculated applications.

In 1983, a higher than normal rainfall of 32 inches occurred. The soil profile was filled during the winter, however, and only 9 inches of rain fell from April to October 30, of which 4 inches occurred in early April. Water moved below the root zone only on June 29, August 29, October 5, and October 17 in all plots of 100 and 80 percent irrigation in 1983. Even during a season of higher than normal rainfall, the applied water, 38.7 inches in cool-season grasses (1983), was similar to that of the drier year (1982) with 43 inches applied. Most of the 5 inches of implied higher use by cool-season grasses may have moved through deep percolation.

The water applied to warm-season grasses was 34 inches in 1982 and 33 inches in 1983. This small difference indicates that managers can schedule carefully and conserve water in a wet or dry season.

TABLE 1. Cool- and warm-season turfgrass appearance ratings and water applied for the duration of the study (August 1981 to December 1983).

Irrigation regime	Turf appearance 8/81 - 12/83*			Water application (actual)	ET_{grass}†
% of ET				*in.*	
Cool season	Ken. blue	Per. rye	Tall fesc.		
100	5.5 y	6.2 y	5.8 y	104.4	77.3
80	5.3 y	5.9 y	5.7 yz	82.4	61.0
60	4.8 z	5.0 z	5.3 z	62.7	46.4
Warm season	Bermuda	Paspalum	Zoysia		
100	6.5 ns‡	5.8 ns	5.6 x	88.4	65.5
80	6.5	5.8	4.8 y	69.4	51.4
60	6.4	5.4	4.2 z	52.7	39.0

* Rated on a scale of 1 to 9, with 1 indicating worst appearance and 9 best. Values followed by common letters are not significantly different at the 5% level of probability.
† ET_{grass} equals the actual applied water divided by the extra water factor (EWF_{90}), which is 1.35.
‡ No significant difference.

TABLE 2. Actual water applied in 1982 (1/1/82 to 12/31/82) and 1983 (1/1/83 to 12/31/83)

Sprinkler plots	1982		1983	
	Water applied*	Rainfall	Water applied†	Rainfall
% of ET	*inches*			
Cool season				
100	43.2	18.45	38.7	31.78
80	35.0		31.9	
60	26.6		24.5	
Warm season				
100	34.0		33.0	
80	27.4		25.8	
60	21.6		19.6	

* Class A pan evaporation 55.0 inches for 1982.
† Class A pan evaporation 55.63 inches for 1983.

TABLE 3. Turfgrass crop coefficients (Kp and Kc) of warm- and cool-season grasses.

Month	Kp*		Kc†	
	Warm	Cool	Warm	Cool
J	.44	.49	.55	.61
F	.43	.51	.54	.64
M	.61	.60	.76	.75
A	.58	.83	.72	1.04
M	.63	.76	.79	.95
J	.54	.70	.68	.88
J	.57	.75	.71	.94
A	.57	.69	.71	.86
S	.50	.59	.62	.74
O	.43	.60	.54	.75
N	.46	.55	.58	.69
D	.44	.48	.55	.60

* Monthly crop coefficient (Kp) is used with a Class A Weather Bureau evaporation pan with the equation $ET_{grass} = ET_{pan} \times Kp$
† The crop coefficient Kc is used with reference evapotranspiration (ETo) from a CIMIS weather station with the equation $ET_{grass} = ETo \times Kc$.

Conclusions

The monthly crop coefficients (table 3) calculated and used for nearly three years proved to be very accurate for both warm- and cool-season turfgrasses. Crop coefficients can be used with reference evapotranspiration from the Department of Water Resources California Irrigation Management Information System (CIMIS) program. Turfgrass managers can use these crop coefficients to determine on-site water use by turfgrasses from either a Class A Weather Bureau evaporation pan or from a computerized weather station that gives reference evapotranspiration with the equation given in table 3.

In conclusion, warm-season turfgrasses have a greater potential for water conservation than do cool-season turfgrasses. Under the conditions of this study, sprinkler irrigation was superior to subterranean irrigation for water conservation and turfgrass performance. And lastly, a well-designed, uniform irrigation system is necessary to maximize water conservation in turfgrass management.

Jewell L. Meyer is Irrigation and Soils Specialist and Victor A. Gibeault is Environmental Horticulturist, Cooperative Extension, University of California, Riverside. *Financial support for this study was granted by the Metropolitan Water District of Southern California, City of Los Angeles Department of Water and Power, Municipal Water District of Orange County, and the San Diego County Water Authority. Also the support of the Southern California Turfgrass Council, the Lloyd Foundation, and the Golf Course Superintendent's Association of Southern California is appreciated. The authors acknowledge the assistance of Ralph Strohman and Mark Mahody, Staff Research Associates, UC Riverside.*

Attachment C

Water Application Efficiency,
Bill Kranz, University of Nebraska Lincoln Extension
Irrigation Specialist,
Northeast Research and Extension Center

Irrigation Chapter 8 - Irrigation Efficiencies

Author: Bill Kranz, University of Nebraska Lincoln Extension Irrigation Specialist, Northeast Research and Extension Center, Norfolk, NE.

Water Application **Efficiency**

The ability to manage an irrigation system is contingent on an accurate estimate of the percentage of water pumped that becomes available for crop use. No irrigation system delivers water at 100 percent efficiency. Water may be lost through delivery systems or pipelines and some water may remain in the **soil**, but not be used by the crop. Some water may run off the soil surface into lowland areas. Still other water may be lost to evaporation in the air, or from the soil and plant surfaces. *Figures 8.1a* and *8.1b* show the major losses for sprinkler and surface irrigation systems. To know how much water to pump, these losses must be totaled and added to the amount of water needed by the crop.

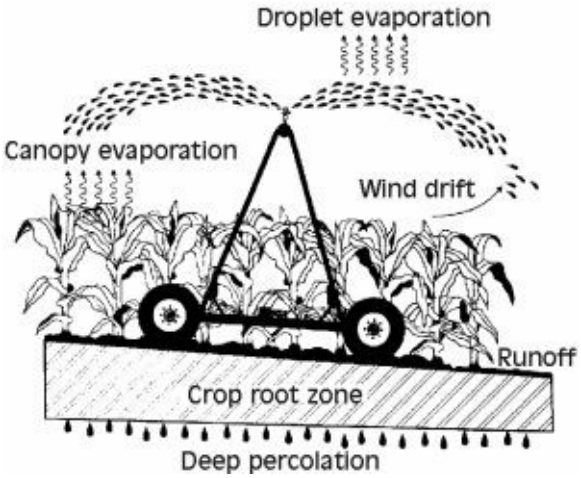


Figure 8.1. a) Potential water losses during irrigation with a center pivot. b) Potential water losses during irrigation with a **furrow irrigation** system.

In most cases, the goal is to insure that all areas of the field receive a **set** amount of uniformly applied water. Consider the catch can test data shown in *Figure 8.2.* The cans recording application depths below the horizontal line are not receiving enough water — catches are less than the desired 0.85 inches. Another application will be needed to insure that the entire field receives at least 0.85 inches of water. This will require using more water and energy than is necessary. If this pattern occurs during each irrigation, plants in the areas receiving less than 0.85 inches eventually could experience water stress. The cans recording application depths above the line receive at least 0.85 inches of water. Any extra water applied could lead to surface **runoff** or deep **percolation**.

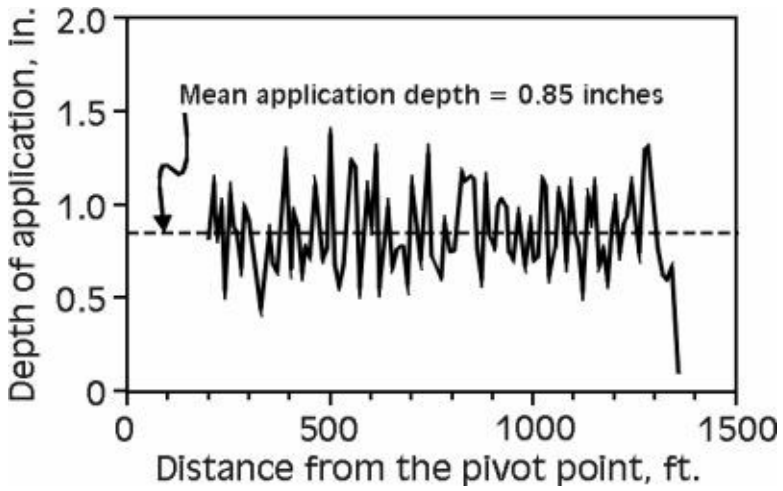


Figure 8.2. Example of catch-can data from a center pivot with low pressure spray nozzle, mounted at 10 foot intervals and 7 feet above the soil surface.

Water application efficiency accounts for how uniformly the water is applied and can be used for other assessments. If the center pivot owner is trying to decide whether switching to a new sprinkler package would be economical, the change in water application efficiency could be a major factor. If water becomes limited, changing to a system with a higher water application efficiency will provide more useable water to the crop and reduce pumping costs.

To maximize irrigation water use, it must be uniformly applied in the right amount and at the right time. Reaching these objectives requires knowledge of water delivery characteristics, field soils and slopes, and the expected crop water use rates.

Mathematical relationships have been developed to help quantify the amount of applied water that becomes available for plant use.

Water application efficiency refers to the amount of water applied that is stored in the crop root zone. This value is determined by water distribution characteristics, system management, soil conditions, the crop, and weather conditions. Water application efficiency pertains to an individual irrigation event.

Equation 8.1 is used to determine water application efficiency.

Equation 8.1 $E_a = [\frac{\text{Depth of water stored in the rootzone } (d_s) \times 100}{\text{Depth of water pumped } (d_p)}]$

where:

E_a = Average water application efficiency, %

Depth of water stored in the rootzone (d_s) = Average depth of water stored in the rootzone, inches

Depth of water pumped (d_p) = Average depth of water delivered from source, inches

Irrigation efficiency refers to the amount of water removed from the water source that is used by the crop. This value is determined by irrigation system management, water distribution characteristics, crop water use rates, weather and soil conditions. Irrigation efficiency pertains to the use of water for an entire growing season.

Depth Stored

The depth of water stored in the root zone can be estimated based on field observation of what happens to the water during an application event. Field observation reports should note if runoff occurs and estimate the amount of runoff. With experience, you'll begin to know where and when runoff is likely to occur. For example, runoff from center pivot systems will likely occur first near the outside edge of the irrigated area because the water application rate is greatest there. Other factors include low **infiltration** rate soils, steep slopes and lack of plant residue cover.

Another more accurate method is to record the **soil water** content before and after an irrigation event using one of the methods discussed in *Chapter 3, Soil Water*. If the hand-feel method is used, the **soil water content** will need to be recorded at enough locations to develop accurate estimates of the water stored in the crop root zone. The depth of water applied is found by subtracting the reading taken before the irrigation.

Equation 8.2 d_s = *["After" reading – "Before" reading]*

Where:

d_s = Depth of water stored in the rootzone

Example 8.1

A center pivot irrigation system is supplied with enough water to apply 1.1 inches of water to an irrigated area. Soil water content readings recorded before the irrigation event showed an average water content of 3.5 inches in the top 3 feet of soil. Soil water content readings after the irrigation showed an average of 4.4 inches in the top 3 feet of soil. To find the average depth of water stored in the crop rootzone we subtract the before irrigation reading from the after irrigation reading.

Using *Equation 8.2* d_s = ["After" reading – "Before" reading]

d_s = [4.4 inches – 3.5 inches]

d_s = 0.9 inches

Depth Pumped

The depth of water pumped can be determined using the procedures presented in *Chapter 7, Flow Measurements and Basic Water Calculations*. The information needed includes an accurate estimate of the pumping rate in gallons per minute. This information can be recorded using a flow meter installed as part of the system or periodically using an attached flow meter (ultrasonic flow meter, pilot tube type meter, etc.).

The average flow rate can be determined by recording the accumulator reading prior to and after each irrigation event. Subtracting the reading recorded prior to the irrigation from the reading after the irrigation event will result in the total volume of water pumped. Taking the total volume and dividing by the irrigation time will give the average pumping rate. For this estimate to be accurate, the irrigation time must be accurate to the nearest hour if possible. A more precise record of the total irrigation time will improve the estimate of the pumping flow rate. (The hour meter on the motor or center pivot is accurate enough to estimate the pumping time.) *Equations 8.3* and *8.4* are used to make these calculations. The following example shows how to incorporate field data into the equations.

Equation 8.3 ***Pumping rate = [Reading 2 – Reading 1] / [Time]***

where:

Pumping rate = Water deliver rate, gallons per minute or acre-inches per minute

Reading 1 = Totalizer reading before the irrigation event, gallons or acre-inches

Reading 2 = Totalizer reading after the irrigation event, gallons or acre-inches

Time = Time required to complete the irrigation event, minutes

Example 8.2

The meter also has an accumulator at the bottom that registers total gallons pumped. Before the irrigation event, the accumulator reading was 6,553,300 gallons, and after the irrigation event the meter read 10,167,500 gallons. The irrigation event required 77 hours and 15 minutes.

Using *Equation 8.3*

Pumping rate = [Reading 2-Reading 1] / [Time]

Pumping rate = [10,167,500 - 6,553,300] gallons [(77 hr x 60 min/hr) + 15 min]

Pumping rate = [3,614,200] gallons / [4620 + 15] minutes

Pumping rate = 780 gallons per minute

If the accumulator records flow in acre-inches, the same process is used unless the desire is to determine the flow rate in gallons per minute. To convert acre-inches per minute to gallons per minute, multiply the result from *Equation 8.3* in acre-inches per minute by 27,154 gallons per acre-inch.

To convert the flow rate in gallons per minute to the gross depth of water pumped, we use *Equation 8.4.* If the result from *Equation 8.3* is in acre-inches per minute, the constant 27,154 gallons per acre-inch is not used.

Equation 8.4 $d_p = [\text{flow rate} \times \text{time}] / [\text{area irrigated} \times 27{,}154]$

where:

d_p = Depth pumped = Average depth of water pumped, *inches*

Flow rate = Average water delivery rate, *gallons per minute*

Time = Total irrigation time, *minutes*

Area irrigated = Total irrigated area, *acres*

27,154 = Conversion factor, *gallons per acre-inch or gal / ac-in*

Example 8.3

Let's assume that the field area for Example 8.2 was 123 acres. We calculated the flow rate at 780 gallons per minute and the total irrigation time at 4635 minutes. Using *Equation 8.3*:

Depth pumped (d_p) = [Flow rate x time] / [Area irrigated x 27,154]

Depth pumped (d_p) = [780 *gal/min* x 4635 *minutes*] [123 *acres* x 27154 *gal / ac-in*]

Depth pumped (d_p) = [3,615,300]*gallons* / [3,339,942] *gallons / inch*

Depth pumped (d_p) = 1.08 inches

To complete the calculation of the water application efficiency, use *Equation 8.1* to compare the amount of water pumped with the increase in water stored in the crop rootzone.

Example 8.4

From Example 8.1 we found that 0.9 inches of water was stored in the three-foot crop rootzone. From Example 8.3 we found that 1.08 inches of water was pumped from the water source into the center pivot. To find the application efficiency we use *Equation 8.1.*

$$E_a = \left[\frac{\text{Depth of water stored in the rootzone } (d_s) \times 100}{\text{Depth of water pumped } (d_p)} \right]$$

$$E_a = [\ 0.9 \text{ inches} / 1.08 \text{ inches}\ ] \times 100$$

$$E_a = 83\%$$

In these examples it was determined that only 83 percent of the water pumped from the irrigation source reached the soil and was usable by the crop. That means that 17 percent of the water was lost during application.

Potential Delivery Losses

The amount of water loss due to irrigation depends of the type of irrigation system — sprinkler or surface. In addition, the magnitude of each type of loss may be different. Let's begin by listing some major sources of water loss during irrigation. To keep the losses for surface and sprinkler irrigation separate, *Table 8.1* lists the potential losses for each type of system.

Table 8.1. Potential sources of water loss during an irrigation event for surface and sprinkler irrigation systems.

Sources of water losses	Surface Irrigation	Sprinkler irrigation
Distribution system	Yes	Yes
Air evaporation	No	Yes
Plant interception	No	Yes
Soil evaporation	Yes	Yes
Deep percolation	Yes	Yes
Runoff	Yes	Yes

Surface Irrigation Systems

The major losses for surface irrigation systems are deep percolation and surface runoff. These two losses could cause the water application efficiency to be reduced to less than 50 percent if the system is not managed properly. Ways to minimize these losses are discussed in *Chapter 11, Furrow Irrigation Management* (https://passel2.unl.edu/view/lesson/bda727eb8a5a/11).

Another source of water loss is in the distribution system. If the water flows across the head of the field in an open ditch, each foot of ditch loses water to soil infiltration and water surface evaporation. The best way to eliminate these losses is to transport the water through an enclosed pipeline. For many furrow irrigated fields this will require a small pumping plant to overcome the friction loss associated with forcing water through the pipeline.

Surface irrigation implies that surface evaporation will contribute to water loss. One way to limit soil evaporation loss is to wet less of the soil surface. For fields with slopes less than 1 percent, irrigating every other furrow is a viable option. This effectively cuts surface evaporation losses by nearly 50 percent without sacrificing crop production. Irrigating every other furrow also will reduce the amount of water lost to deep percolation and surface runoff.

Pipelines can have losses too. Worn gaskets or loose fitting pipeline connections could produce leaks at each joint. These losses are usually small in comparison to other losses, but by their sheer number could add up to substantial water losses. This kind of loss is the easiest to eliminate by replacing gaskets.

Sprinkler Irrigation Systems

Sprinkler irrigation systems, especially center pivots, typically have greater water application efficiencies than surface systems. While they may have more potential sources of loss, the magnitude of each loss is generally quite low. *Table 8.1* shows that sprinkler irrigation systems may experience loss from all six of the potential water loss sources while surface irrigation systems lose water from only four. This is because most sprinkler irrigation systems spray water into the air to deliver water to the entire soil surface with an upright crop canopy located between the sprinkler and soil.

Developments in sprinkler technology have reduced the amount of water lost between the sprinkler/nozzle and soil surface. The irrigation time or the accumulated time that water is applied to the crop canopy causes the major loss during sprinkler irrigation events. Applied water evaporates off the leaves of the crop canopy. Thus, the longer water droplets are delivered to the crop, the greater the total evaporation loss. Lowering the sprinkler/nozzle pressure reduces the wetted diameter of the sprinkler/nozzle thus reducing irrigation time and total canopy evaporation losses. In addition, lower wetted diameters reduce water evaporation losses in the air and wind drift losses.

Proper management of sprinkler irrigation systems can greatly reduce deep percolation losses. An irrigation system managed to keep the soil profile completely full at all times will experience some deep percolation losses. This is because the system does not apply water at 100 percent uniformity. Some areas will receive more water than others due to sprinkler pressure differences caused by soil elevation differences. Pressure regulators or flow control nozzles help insure that water delivered to the soil surface is as uniform as possible. Other portions of the field could be affected when wind distorts the water application pattern. Such distortion can be reduced by avoiding operation when winds exceed 10 mph.

How do I Evaluate Losses?

There are two main ways to evaluate water loss during irrigation: 1) take detailed field measurements; and 2) visually estimate losses. In some cases it may be necessary to combine these methods to develop an accurate estimate of where losses occur and how significant they are to the system’s application efficiency. For example, to estimate water losses during irrigation, measure the flow rate of water entering the system with a flow meter. Visually estimate how much of the water is lost to runoff. This amount, however, will not account for other potential losses. *Table 8.2* presents the potential magnitude of some of these losses for different irrigation systems. For furrow irrigation systems record how long it takes for the water to reach a certain point in the field or record flow rates into the furrow and how long it takes water to reach the end of the furrow. When coupled with soil types and furrow slopes, a computer model can be used to estimate how efficiently the water is being applied.

Table 8.2a. Percent irrigation water losses for different furrow irrigation systems.

Type of irrigation system	Distribution system	Air evaporation	Soil evaporation	Canopy evaporation	Deep percolation	Surface runoff	efficiency
Every row	1-5	<1.0	1--5	0.0	10-20	10-35	40-75
W/Surge valve	1-5	<1.0	1-5	0.0	5-15	5-15	60-85
W/Reuse	1-5	1-2	1-5	0.0	10-20	0	55-90
Siphon tube	5-10	1-2	1-5	0.0	15-25	15-25	40-75
Alternate row	1-5	<0.5	1-5	0.0	5-15	10-20	60-85

Table 8.2b. Percent irrigation water losses for different Sprinkler Irrigation systems.

Type of irrigation system	Distribution system	Air evaporation	Soil evaporation	Canopy evaporation	Deep percolation	Surface runoff	Overall efficiency
Handmove	<1.0	3-5	1-5	10-15	5-10	0-5	60-80
Solid set	<1.0	3-5	1-5	10-15	0-10	0-5	60-85
Traveler	<1.0	1-3	1-5	1-5	0-5	5-10	55-75
High pressure impact	<0.5	1-3	0-1	1-5	0-5	0-5	70-80
Low pressure impact	<0.5	1-3	0-1	1-3	0.5	0-10	75-85
Low pressure spray	<0.5	1-3	0-1	1-3	0-5	0-20	70-90
Low pressure bubble	<0.5	0.0	0-0.5	0.0	0-5	20-40	60-95
Drip irrigation	<0.5	0.0	0.0	0.0	5-30	0.0	70-95

Attachment E

Irrigation Efficiency

Irrigation Chapter 8 - Irrigation Efficiencies

Author: Bill Kranz, University of Nebraska Lincoln Extension Irrigation Specialist, Northeast Research and Extension Center, Norfolk, NE.

Water Application **Efficiency**

The ability to manage an irrigation system is contingent on an accurate estimate of the percentage of water pumped that becomes available for crop use. No irrigation system delivers water at 100 percent efficiency. Water may be lost through delivery systems or pipelines and some water may remain in the **soil**, but not be used by the crop. Some water may run off the soil surface into lowland areas. Still other water may be lost to evaporation in the air, or from the soil and plant surfaces. *Figures 8.1a* and *8.1b* show the major losses for sprinkler and surface irrigation systems. To know how much water to pump, these losses must be totaled and added to the amount of water needed by the crop.

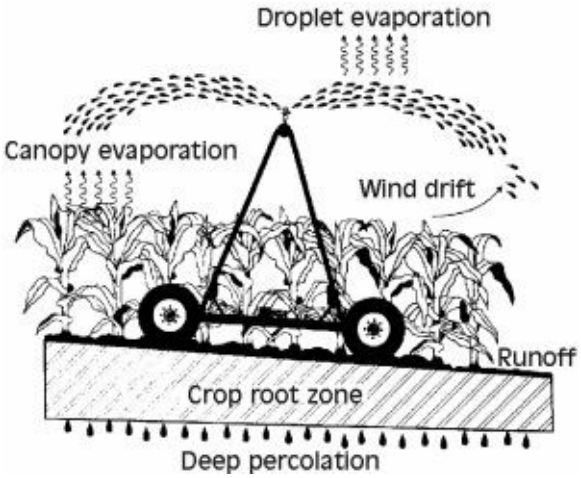


Figure 8.1. a) Potential water losses during irrigation with a center pivot. b) Potential water losses during irrigation with a **furrow irrigation** system.

In most cases, the goal is to insure that all areas of the field receive a **set** amount of uniformly applied water. Consider the catch can test data shown in *Figure 8.2.* The cans recording application depths below the horizontal line are not receiving enough water — catches are less than the desired 0.85 inches. Another application will be needed to insure that the entire field receives at least 0.85 inches of water. This will require using more water and energy than is necessary. If this pattern occurs during each irrigation, plants in the areas receiving less than 0.85 inches eventually could experience water stress. The cans recording application depths above the line receive at least 0.85 inches of water. Any extra water applied could lead to surface **runoff** or deep **percolation**.

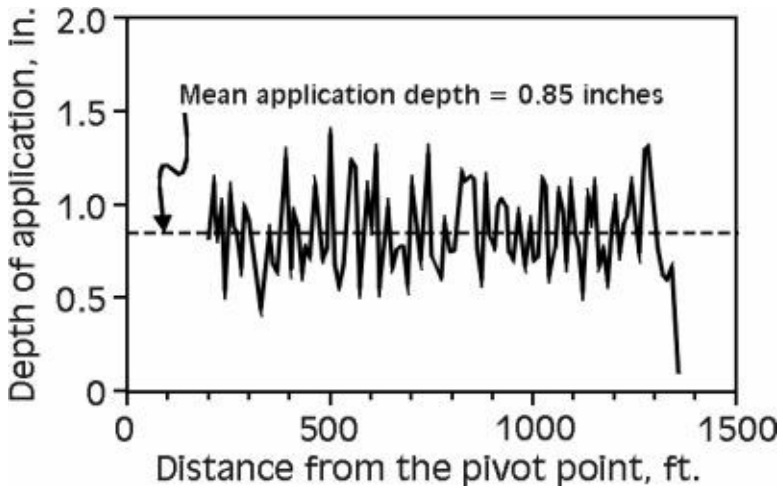


Figure 8.2. Example of catch-can data from a center pivot with low pressure spray nozzle, mounted at 10 foot intervals and 7 feet above the soil surface.

Water application efficiency accounts for how uniformly the water is applied and can be used for other assessments. If the center pivot owner is trying to decide whether switching to a new sprinkler package would be economical, the change in water application efficiency could be a major factor. If water becomes limited, changing to a system with a higher water application efficiency will provide more useable water to the crop and reduce pumping costs.

To maximize irrigation water use, it must be uniformly applied in the right amount and at the right time. Reaching these objectives requires knowledge of water delivery characteristics, field soils and slopes, and the expected crop water use rates.

Mathematical relationships have been developed to help quantify the amount of applied water that becomes available for plant use.

Water application efficiency refers to the amount of water applied that is stored in the crop root zone. This value is determined by water distribution characteristics, system management, soil conditions, the crop, and weather conditions. Water application efficiency pertains to an individual irrigation event.

Equation 8.1 is used to determine water application efficiency.

Equation 8.1 $E_a = [\frac{\text{Depth of water stored in the rootzone } (d_s) \times 100}{\text{Depth of water pumped } (d_p)}]$

where:

E_a = Average water application efficiency, %

Depth of water stored in the rootzone (d_s) = Average depth of water stored in the rootzone, inches

Depth of water pumped (d_p) = Average depth of water delivered from source, inches

Irrigation efficiency refers to the amount of water removed from the water source that is used by the crop. This value is determined by irrigation system management, water distribution characteristics, crop water use rates, weather and soil conditions. Irrigation efficiency pertains to the use of water for an entire growing season.

Depth Stored

The depth of water stored in the root zone can be estimated based on field observation of what happens to the water during an application event. Field observation reports should note if runoff occurs and estimate the amount of runoff. With experience, you'll begin to know where and when runoff is likely to occur. For example, runoff from center pivot systems will likely occur first near the outside edge of the irrigated area because the water application rate is greatest there. Other factors include low **infiltration** rate soils, steep slopes and lack of plant residue cover.

Another more accurate method is to record the **soil water** content before and after an irrigation event using one of the methods discussed in *Chapter 3, Soil Water*. If the hand-feel method is used, the **soil water content** will need to be recorded at enough locations to develop accurate estimates of the water stored in the crop root zone. The depth of water applied is found by subtracting the reading taken before the irrigation.

Equation 8.2 d_s = *["After" reading – "Before" reading]*

Where:

d_s = Depth of water stored in the rootzone

Example 8.1

A center pivot irrigation system is supplied with enough water to apply 1.1 inches of water to an irrigated area. Soil water content readings recorded before the irrigation event showed an average water content of 3.5 inches in the top 3 feet of soil. Soil water content readings after the irrigation showed an average of 4.4 inches in the top 3 feet of soil. To find the average depth of water stored in the crop rootzone we subtract the before irrigation reading from the after irrigation reading.

Using *Equation 8.2* d_s = ["After" reading – "Before" reading]

d_s = [4.4 inches – 3.5 inches]

d_s = 0.9 inches

Depth Pumped

The depth of water pumped can be determined using the procedures presented in *Chapter 7, Flow Measurements and Basic Water Calculations*. The information needed includes an accurate estimate of the pumping rate in gallons per minute. This information can be recorded using a flow meter installed as part of the system or periodically using an attached flow meter (ultrasonic flow meter, pilot tube type meter, etc.).

The average flow rate can be determined by recording the accumulator reading prior to and after each irrigation event. Subtracting the reading recorded prior to the irrigation from the reading after the irrigation event will result in the total volume of water pumped. Taking the total volume and dividing by the irrigation time will give the average pumping rate. For this estimate to be accurate, the irrigation time must be accurate to the nearest hour if possible. A more precise record of the total irrigation time will improve the estimate of the pumping flow rate. (The hour meter on the motor or center pivot is accurate enough to estimate the pumping time.) *Equations 8.3* and *8.4* are used to make these calculations. The following example shows how to incorporate field data into the equations.

Equation 8.3 Pumping rate = [Reading 2 – Reading 1] / [Time]

where:

Pumping rate = Water deliver rate, gallons per minute or acre-inches per minute

Reading 1 = Totalizer reading before the irrigation event, gallons or acre-inches

Reading 2 = Totalizer reading after the irrigation event, gallons or acre-inches

Time = Time required to complete the irrigation event, minutes

Example 8.2

The meter also has an accumulator at the bottom that registers total gallons pumped. Before the irrigation event, the accumulator reading was 6,553,300 gallons, and after the irrigation event the meter read 10,167,500 gallons. The irrigation event required 77 hours and 15 minutes.

Using *Equation 8.3*

Pumping rate = [Reading 2-Reading 1] / [Time]

Pumping rate = [10,167,500 - 6,553,300] gallons [(77 hr x 60 min/hr) + 15 min]

Pumping rate = [3,614,200] gallons / [4620 + 15] minutes

Pumping rate = 780 gallons per minute

If the accumulator records flow in acre-inches, the same process is used unless the desire is to determine the flow rate in gallons per minute. To convert acre-inches per minute to gallons per minute, multiply the result from *Equation 8.3* in acre-inches per minute by 27,154 gallons per acre-inch.

To convert the flow rate in gallons per minute to the gross depth of water pumped, we use *Equation 8.4.* If the result from *Equation 8.3* is in acre-inches per minute, the constant 27,154 gallons per acre-inch is not used.

Equation 8.4 d_p = [flow rate x time] / [area irrigated x 27,154]

where:

d_p = Depth pumped = Average depth of water pumped, *inches*

Flow rate = Average water delivery rate, *gallons per minute*

Time = Total irrigation time, *minutes*

Area irrigated = Total irrigated area, *acres*

27,154 = Conversion factor, *gallons per acre-inch or gal / ac-in*

Example 8.3

Let's assume that the field area for Example 8.2 was 123 acres. We calculated the flow rate at 780 gallons per minute and the total irrigation time at 4635 minutes. Using *Equation 8.3*:

Depth pumped (d_p) = [Flow rate x time] / [Area irrigated x 27,154]

Depth pumped (d_p) = [780 *gal/min* x 4635 *minutes*] [123 *acres* x 27154 *gal / ac-in*]

Depth pumped (d_p) = [3,615,300]*gallons* / [3,339,942] *gallons / inch*

Depth pumped (d_p) = 1.08 inches

To complete the calculation of the water application efficiency, use *Equation 8.1* to compare the amount of water pumped with the increase in water stored in the crop rootzone.

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From Example 8.1 we found that 0.9 inches of water was stored in the three-foot crop rootzone. From Example 8.3 we found that 1.08 inches of water was pumped from the water source into the center pivot. To find the application efficiency we use *Equation 8.1.*

$$E_a = \left[\frac{\text{Depth of water stored in the rootzone } (d_s) \times 100}{\text{Depth of water pumped } (d_p)} \right]$$

$$E_a = [\ 0.9 \text{ inches} / 1.08 \text{ inches}\ ] \times 100$$

$$E_a = 83\%$$

In these examples it was determined that only 83 percent of the water pumped from the irrigation source reached the soil and was usable by the crop. That means that 17 percent of the water was lost during application.

Potential Delivery Losses

The amount of water loss due to irrigation depends of the type of irrigation system — sprinkler or surface. In addition, the magnitude of each type of loss may be different. Let's begin by listing some major sources of water loss during irrigation. To keep the losses for surface and sprinkler irrigation separate, *Table 8.1* lists the potential losses for each type of system.

Table 8.1. Potential sources of water loss during an irrigation event for surface and sprinkler irrigation systems.

Sources of water losses	Surface Irrigation	Sprinkler irrigation
Distribution system	Yes	Yes
Air evaporation	No	Yes
Plant interception	No	Yes
Soil evaporation	Yes	Yes
Deep percolation	Yes	Yes
Runoff	Yes	Yes

Surface Irrigation Systems

The major losses for surface irrigation systems are deep percolation and surface runoff. These two losses could cause the water application efficiency to be reduced to less than 50 percent if the system is not managed properly. Ways to minimize these losses are discussed in *Chapter 11, Furrow Irrigation Management* (https://passel2.unl.edu/view/lesson/bda727eb8a5a/11).

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Surface irrigation implies that surface evaporation will contribute to water loss. One way to limit soil evaporation loss is to wet less of the soil surface. For fields with slopes less than 1 percent, irrigating every other furrow is a viable option. This effectively cuts surface evaporation losses by nearly 50 percent without sacrificing crop production. Irrigating every other furrow also will reduce the amount of water lost to deep percolation and surface runoff.

Pipelines can have losses too. Worn gaskets or loose fitting pipeline connections could produce leaks at each joint. These losses are usually small in comparison to other losses, but by their sheer number could add up to substantial water losses. This kind of loss is the easiest to eliminate by replacing gaskets.

Sprinkler Irrigation Systems

Sprinkler irrigation systems, especially center pivots, typically have greater water application efficiencies than surface systems. While they may have more potential sources of loss, the magnitude of each loss is generally quite low. *Table 8.1* shows that sprinkler irrigation systems may experience loss from all six of the potential water loss sources while surface irrigation systems lose water from only four. This is because most sprinkler irrigation systems spray water into the air to deliver water to the entire soil surface with an upright crop canopy located between the sprinkler and soil.

Developments in sprinkler technology have reduced the amount of water lost between the sprinkler/nozzle and soil surface. The irrigation time or the accumulated time that water is applied to the crop canopy causes the major loss during sprinkler irrigation events. Applied water evaporates off the leaves of the crop canopy. Thus, the longer water droplets are delivered to the crop, the greater the total evaporation loss. Lowering the sprinkler/nozzle pressure reduces the wetted diameter of the sprinkler/nozzle thus reducing irrigation time and total canopy evaporation losses. In addition, lower wetted diameters reduce water evaporation losses in the air and wind drift losses.

Proper management of sprinkler irrigation systems can greatly reduce deep percolation losses. An irrigation system managed to keep the soil profile completely full at all times will experience some deep percolation losses. This is because the system does not apply water at 100 percent uniformity. Some areas will receive more water than others due to sprinkler pressure differences caused by soil elevation differences. Pressure regulators or flow control nozzles help insure that water delivered to the soil surface is as uniform as possible. Other portions of the field could be affected when wind distorts the water application pattern. Such distortion can be reduced by avoiding operation when winds exceed 10 mph.

How do I Evaluate Losses?

There are two main ways to evaluate water loss during irrigation: 1) take detailed field measurements; and 2) visually estimate losses. In some cases it may be necessary to combine these methods to develop an accurate estimate of where losses occur and how significant they are to the system’s application efficiency. For example, to estimate water losses during irrigation, measure the flow rate of water entering the system with a flow meter. Visually estimate how much of the water is lost to runoff. This amount, however, will not account for other potential losses. *Table 8.2* presents the potential magnitude of some of these losses for different irrigation systems. For furrow irrigation systems record how long it takes for the water to reach a certain point in the field or record flow rates into the furrow and how long it takes water to reach the end of the furrow. When coupled with soil types and furrow slopes, a computer model can be used to estimate how efficiently the water is being applied.

Table 8.2a. Percent irrigation water losses for different furrow irrigation systems.

Type of irrigation system	Distribution system	Air evaporation	Soil evaporation	Canopy evaporation	Deep percolation	Surface runoff	efficiency
Every row	1-5	<1.0	1--5	0.0	10-20	10-35	40-75
W/Surge valve	1-5	<1.0	1-5	0.0	5-15	5-15	60-85
W/Reuse	1-5	1-2	1-5	0.0	10-20	0	55-90
Siphon tube	5-10	1-2	1-5	0.0	15-25	15-25	40-75
Alternate row	1-5	<0.5	1-5	0.0	5-15	10-20	60-85

Table 8.2b. Percent irrigation water losses for different Sprinkler Irrigation systems.

Type of irrigation system	Distribution system	Air evaporation	Soil evaporation	Canopy evaporation	Deep percolation	Surface runoff	Overall efficiency
Handmove	<1.0	3-5	1-5	10-15	5-10	0-5	60-80
Solid set	<1.0	3-5	1-5	10-15	0-10	0-5	60-85
Traveler	<1.0	1-3	1-5	1-5	0-5	5-10	55-75
High pressure impact	<0.5	1-3	0-1	1-5	0-5	0-5	70-80
Low pressure impact	<0.5	1-3	0-1	1-3	0.5	0-10	75-85
Low pressure spray	<0.5	1-3	0-1	1-3	0-5	0-20	70-90
Low pressure bubble	<0.5	0.0	0-0.5	0.0	0-5	20-40	60-95
Drip irrigation	<0.5	0.0	0.0	0.0	5-30	0.0	70-95

Attachment F

Water Balance Model Results

Current Flows: Average Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 0.32

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(17)	(16)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	Climate Values, inches		Inflows, ac-ft							Treatment Ponds			Storage Pond 5					Golf Course Irrigation						
Month	Rainfall	Ref. ET	Base City	I&I	Town Field Runoff	COWRF Backwash	AWA Backwash	CDCR	ARSA	Rainfall	Evap.	Total Inflow to Pond 5	Rainfall	Evap.	To/From Storage	Net Storage	Historical Storage	Historical Demand	Theoretical Demand	Theoretical Pond Losses	Total Theoretical Demand	Provided by Partners	Provided by City	Total Provided
Oct.	1.2	3.24	39.0	1.9	0.0	4.9	0.71		27.3	0.5	(1.5)	45.5	0.4	(1.1)	5.4	37.6	37.1	37.4	21.9	0.5	22.4	22.4	0.0	22.4
Nov.	2.8	1.68	37.8	4.6	0.0	0.0	0.52		0.0	1.3	(0.8)	43.5	1.0	(0.6)	(6.1)	31.5	31.8	16.4	0.0	0.0	0.0	0.0	0.0	0.0
Dec.	3.5	1.21	39.0	5.8	0.0	0.0	0.52		0.0	1.7	(0.6)	46.4	1.2	(0.4)	(2.8)	28.7	28.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jan.	5.1	1.48	39.0	8.4	3.5	0.0	0.37		0.0	2.4	(0.7)	53.0	1.8	(0.5)	4.2	33.0	33.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feb.	3.1	1.95	35.2	5.2	0.0	0.0	0.46		0.0	1.5	(0.9)	41.4	1.1	(0.7)	1.8	34.8	34.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mar.	3.2	3.02	39.0	5.2	0.0	0.0	0.37		0.0	1.5	(1.4)	44.7	1.1	(1.1)	0.7	35.5	35.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr.	1.8	4.57	37.8	2.9	0.0	5.3	0.58		35.3	0.8	(2.2)	45.2	0.6	(1.6)	3.4	38.9	38.2	8.8	29.3	0.7	30.0	30.0	0.0	30.0
May	0.6	5.97	39.0	1.0	0.0	9.1	0.55		70.1	0.3	(2.8)	47.1	0.2	(2.1)	(0.9)	38.0	38.3	54.9	59.6	1.4	61.0	61.0	0.0	61.0
Jun.	0.2	7.19	37.8	0.3	0.0	12.0	0.25		92.4	0.1	(3.4)	47.0	0.1	(2.5)	(7.9)	30.1	30.4	71.8	78.6	1.8	80.4	80.4	0.0	80.4
Jul.	0.1	7.64	39.0	0.1	0.0	13.1	0.58		100.9	0.0	(3.6)	49.2	0.0	(2.7)	(3.3)	26.8	26.9	83.4	85.8	2.0	87.8	87.8	0.0	87.8
Aug.	0.1	6.98	37.8	0.2	0.0	11.8	0.49		91.1	0.1	(3.3)	47.0	0.0	(2.4)	0.3	27.1	27.7	78.1	77.5	1.8	79.3	79.3	0.0	79.3
Sep.	0.3	4.99	39.0	0.5	0.0	11.0	0.43		64.6	0.2	(2.4)	48.7	0.1	(1.7)	4.4	32.2	32.2	62.4	52.4	1.2	53.6	53.6	0.0	53.6
Total, AFY	**22.0**	**49.9**	**459**	**36.1**	**3.5**	**67.2**	**5.83**		**481.7**	**10.5**	**(23.7)**	**558.8**	**7.7**	**(17.5)**	**(0.7)**			**413.2**	**405.1**	**9.4**	**414.5**	**414.5**	**0**	**414.5**

Base City Flow	0.410 mgd

Town Field Runoff Calculation Parameters	
Soil Interception, inches	3
Percent Infiltration, saturated soil	0.4
Percent Infiltration, unsaturated soil	0.6
Min 2-month Rainfall for Saturation, inches	10
Max Precip Before Runoff Capture, inches	20

LAA Information	Town Field	City Field	Golf Course	Golf Course Pond
Area, acres	57	5.6	130	3.1
Crop Coefficient	0.32	0.32	0.88	--
Irr. Efficiency	0.80	0.80	0.84	--

Pond Information	Treatment 1	2	3	4	Storage 5	Percolation 6	7
Surface Area, acres	1.5	1.2	1.0	2.0	4.2	3.9	5.3
Storage Volume, ac-ft					41.7	25.2	25.8
Feb.-May. Perc. Rate, in/d						0.0	0.0
Jun.-Jan. Perc. Rate, in/d						0.0	0.0

(1) Average year rainfall from Ione NCDC station (#044283)
(2) Reference evapotranspiration from Plymouth CIMIS station (Station 227)
(3) = (Base City Flow) x (number of days in month) x 3.07
(4) = 3.07 x (I&I in million gallons). I&I in million gallons = 0.539 x (rainfall in inches) - 0.012, using linear equation developed in this TM.
(5) = (Column 1 - Column 2 - interception of 3 inches - infiltration in inches)/(12 inches per foot) x (surface area of Town Field, 57 acres). If Column 1 > 8 inches, then set value of Column 1 to 8 inches.
Infiltration in inches = (percent infiltration) x (Column 1 - Column 2 - interception of 3 inches). If the sum of Column 1 in the current and previous month >= 10 inches, percent infiltration is 0.4. Otherwise, percent infiltration is 0.6.
(6) = (Column 9) x (Percentage of monthly COWRF influent flow discarded as backwash as defined in COGC TM) (see Attachment D)
(7) Average monthly AWA backwash flow from 2021 to 2024
(8) = 0. Assume no CDCR flow.
(9) = Column 21 / (1 - COWRF filter backwash percentage as defined in COGC TM) (see Attachment D)
(10) = (Column 1)/12 x (surface area of Ponds 1-4, 5.7 acres)
(11) = (Column 2)/12 x (surface area of Ponds 1-4, 5.7 acres)
(12) = Column 3 + Column 4 + Column 5 + Column 6 + Column 7 + Column 10 + Column 11
(13) = (Column 1)/12 x (surface area of Pond 5, 4.2 acres)
(14) = (Column 2)/12 x (surface area of Pond 5, 4.2 acres)
(15) = Column 12 + Column 13 + Column 14 - (Column 23 + Column 28 + Column 32 + Column 34)
(16) = Column 16 of previous month + Column 15 of current month. If this is greater than the Pond 5 volume of 41.7 acre-feet, Column 16 is set to 41.7.
In August, Column 16 is set to 22.9 and the value in Column 34 is adjusted so that the formula in Column 15 predicts this value.
(17) Monthly average storage volume in Pond 5 from 2019 to 2024
(18) Historical irrigation demand for COGC, from COGC TM (see Attachment D)
(19) = [Column 1 - (Column 2 x crop coefficient of 0.88)]/12 x (surface area of golf course, 130 acres) x (irrigation efficiency of 0.84). If Column 19 < 0, then set Column 19 to 0.
(20) = (Column 1 - Column 2)/12 x (surface area of golf course pond, 3.1 acres). If Column 20 < 0, then set Column 20 to 0.
(21) = Column 19 + Column 20
(22) = Column 21 - Column 23
(23) = 0. Assume no flow from the City.
(24) = Column 22 + Column 23

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

Current Flows: Average Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 0.32

	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)
	Town Field Irrigation				City Field Irrigation				Percolation Pond 7								Percolation Pond 6								
Month	Avail for Town	Historical Demand	Theoretical Demand	Provided by City	Avail for City	Historical Demand	Theoretical Demand	Provided by City	System Excess	Empty Pond 5	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Empty Pond 7	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Check for System Overflow	Discharge/ Store Elsewhere
Oct.	77.0	4.3	4.0	4.0	73.0	0.3	0.4	0.4	0.0	35	35.0	0.5	(1.4)	0.0	(25.9)	0.0	60	60.0	0.4	(1.1)	0.0	(25.2)	0.0	OK	84.5
Nov.	81.5	1.2	0.0	0.0	81.5	0.0	0.0	0.0	0.0	50	50.0	1.2	(0.7)	0.0	50.5	25.8		24.7	0.9	(0.5)	0.0	25.1	25.1	OK	0.0
Dec.	78.7	0.0	0.0	0.0	78.7	0.0	0.0	0.0	0.0	50	50.0	1.6	(0.5)	0.0	51.0	25.8		51.0	1.1	(0.4)	0.0	(0.0)	25.0	OK	51.8
Jan.	83.0	0.0	0.0	0.0	83.0	0.0	0.0	0.0	0.0	50	50.0	2.2	(0.7)	0.0	51.6	25.8		51.6	1.7	(0.5)	0.0	(0.0)	25.0	OK	52.8
Feb.	74.8	0.0	0.0	0.0	74.8	0.0	0.0	0.0	0.0	40	40.0	1.4	(0.9)	0.0	40.5	25.8		40.5	1.0	(0.6)	0.0	0.0	25.0	OK	40.9
Mar.	79.5	0.0	0.0	0.0	79.5	0.0	0.0	0.0	0.0	44	44.0	1.4	(1.3)	0.0	44.1	25.8		44.1	1.0	(1.0)	0.0	0.0	25.0	OK	44.1
Apr.	79.8	1.8	5.4	5.4	74.4	0.0	0.5	0.5	0.0	35	35.0	0.8	(2.0)	0.0	33.8	25.8		33.8	0.6	(1.5)	0.0	0.0	25.1	OK	32.8
May	84.1	0.6	10.1	10.1	74.0	0.3	1.0	1.0	0.0	35	35.0	0.3	(2.6)	0.0	32.6	25.8		32.6	0.2	(1.9)	0.0	0.0	25.1	OK	30.9
Jun.	82.6	15.4	13.2	13.2	69.4	1.2	1.3	1.3	0.0	38	38.0	0.1	(3.2)	0.0	34.9	25.8		34.9	0.1	(2.3)	0.0	(0.0)	25.1	OK	32.7
Jul.	76.6	13.5	14.4	14.4	62.2	1.2	1.4	1.4	0.0	34	34.0	0.0	(3.4)	0.0	30.7	25.8		30.7	0.0	(2.5)	0.0	(0.0)	25.1	OK	28.2
Aug.	71.4	21.2	13.0	13.0	58.4	1.8	1.3	1.3	0.0	30	30.0	0.1	(3.1)	0.0	27.0	25.8		27.0	0.0	(2.3)	0.0	0.0	25.1	OK	24.7
Sep.	74.2	11.7	8.9	8.9	65.4	1.8	0.9	0.9	0.0	33	33.0	0.1	(2.2)	0.0	30.9	25.8		30.9	0.1	(1.6)	0.0	0.0	25.1	OK	29.4
Total, AFY	**943.1**	**69.7**	**69.0**	**69.0**	**874.2**	**6.8**	**6.8**	**6.8**	**0.0**	**474**	**474.0**	**9.7**	**(22.0)**	**0.0**	**401.7**		**60**	**462**	**7.2**	**(16.2)**	**0.0**	**(0.1)**			**453**
									Total Inflows:		**474**					**Total Inflows:**		**462**					**Total Excess Water:**		**453**
									Total Outflows:		**0**					**Total Outflows:**		**0**							

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

(25) = (Column 16 of previous month) + Column 12 + Column 13 + Column 14 - Column 23. If Column 25 < 0, then set Column 25 to 0.
(26) Monthly average historical irrigation demand for Town Field from 2019 to 2024
(27) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of Town Field, 57 acres) x (irrigation efficiency of 0.8). If Column 27 < 0, then set Column 27 to 0.
(28) If Column 25 < Column 27, Column 25. Otherwise, Column 27.
(29) = Column 25 - Column 28. If Column 29 < 0, then set Column 29 to 0.
(30) Monthly average historical irrigation demand for City Field from 2018 to 2023.
(31) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of City Field, 5.6 acres) x (irrigation efficiency of 0.8). If Column 31 < 0, then set Column 31 to 0.
(32) If Column 29 < Column 31, Column 29. Otherwise, Column 31.
(33) = (Column 16 from previous month) + Column 15 - (Pond 5 volume, 41.7 acre-feet). If Column 33 < 0, then set Column 33 to 0.
(34) Manually entered to move water between Pond 5 and Pond 7 to approximately match historical Pond 5 volumes. Positive values indicate flow from Pond 5 to Pond 7. Negative values indicate flow from Pond 7 to Town Field/City Field.
(35) = Column 33 + Column 34
(36) = (Column 1)/12 x (surface area of Pond 7, 5.3 acres)
(37) = (Column 2)/12 x (surface area of Pond 7, 5.3 acres)
(38) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 7, 5.3 acres). Percolation rate set to 0 inches per day.
(39) = Column 35 + Column 36 + Column 37 + Column 38 - Column 41
(40) = Column 40 of previous month + Column 39 of current month. If this is greater than the Pond 7 volume of 25.8 acre-feet, Column 40 is set to 25.8. If this is < 0, Column 40 is set to 0. In August, Column 40 must be <= 0 in order for the balance to work.
(41) Manually entered to move water between Pond 7 and Pond 6. Positive values indicate flow from Pond 7 to Pond 6. Negative values indicate flow from Pond 6 to Pond 7.
(42) If Column 40 >= Pond 7 volume of 25.8 acre-feet, Column 42 = (Column 40 of previous month) + Column 39 + Column 41 - 25.8. If Column 40 < 25.8, Column 42 = Column 41.
(43) = (Column 1)/12 x (surface area of Pond 6,3.9 acres)
(44) = (Column 2)/12 x (surface area of Pond 6, 3.9 acres)
(45) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 6, 3.9 acres). Percolation rate set to 0 inches per day.
(46) = Column 42 + Column 43 + Column 44 + Column 45
(47) = Column 47 of previous month + Column 46 of current month. If this is greater than the Pond 6 storage volume of 25.2 acre-feet, Column 47 is set to 25.2. If Column 47 < 0, set to 0. In July, Column 47 must be <= 0 in order for the balance to work.
(48) If (Column 46 of current month) + (Column 47 of previous month) > Pond 6 storage volume of 25.2 acre-feet, Column 48 = "Overflow". Otherwise, Column 48 = "OK".
(49) Manually entered to move water between Pond 6 and New Storage/Disposal Site to ensure pond storage capacity is not exceeded.

Current Flows: Average Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(17)	(16)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	Climate Values, inches		Inflows, ac-ft							Treatment Ponds			Storage Pond 5					Golf Course Irrigation						
Month	Rainfall	Ref. ET	Base City	I&I	Town Field Runoff	COWRF Backwash	AWA Backwash	CDCR	ARSA	Rainfall	Evap.	Total Inflow to Pond 5	Rainfall	Evap.	To/From Storage	Net Storage	Historical Storage	Historical Demand	Theoretical Demand	Theoretical Pond Losses	Total Theoretical Demand	Provided by Partners	Provided by City	Total Provided
Oct.	1.2	3.24	39.0	1.9	0.0	4.9	0.71		27.3	0.5	(1.5)	45.5	0.4	(1.1)	5.2	37.4	37.1	37.4	21.9	0.5	22.4	22.4	0.0	22.4
Nov.	2.8	1.68	37.8	4.6	0.0	0.0	0.52		0.0	1.3	(0.8)	43.5	1.0	(0.6)	(6.1)	31.2	31.8	16.4	0.0	0.0	0.0	0.0	0.0	0.0
Dec.	3.5	1.21	39.0	5.8	0.0	0.0	0.52		0.0	1.7	(0.6)	46.4	1.2	(0.4)	(2.8)	28.4	28.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jan.	5.1	1.48	39.0	8.4	3.5	0.0	0.37		0.0	2.4	(0.7)	53.0	1.8	(0.5)	4.2	32.7	33.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feb.	3.1	1.95	35.2	5.2	0.0	0.0	0.46		0.0	1.5	(0.9)	41.4	1.1	(0.7)	1.8	34.5	34.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mar.	3.2	3.02	39.0	5.2	0.0	0.0	0.37		0.0	1.5	(1.4)	44.7	1.1	(1.1)	0.7	35.2	35.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr.	1.8	4.57	37.8	2.9	0.0	5.3	0.58		35.3	0.8	(2.2)	45.2	0.6	(1.6)	2.9	38.1	38.2	8.8	29.3	0.7	30.0	30.0	0.0	30.0
May	0.6	5.97	39.0	1.0	0.0	9.1	0.55		70.1	0.3	(2.8)	47.1	0.2	(2.1)	0.4	38.5	38.3	54.9	59.6	1.4	61.0	61.0	0.0	61.0
Jun.	0.2	7.19	37.8	0.3	0.0	12.0	0.25		92.4	0.1	(3.4)	47.0	0.1	(2.5)	(7.8)	30.7	30.4	71.8	78.6	1.8	80.4	80.4	0.0	80.4
Jul.	0.1	7.64	39.0	0.1	0.0	13.1	0.58		100.9	0.0	(3.6)	49.2	0.0	(2.7)	(3.8)	26.9	26.9	83.4	85.8	2.0	87.8	87.8	0.0	87.8
Aug.	0.1	6.98	37.8	0.2	0.0	11.8	0.49		91.1	0.1	(3.3)	47.0	0.0	(2.4)	(0.0)	26.9	27.7	78.1	77.5	1.8	79.3	79.3	0.0	79.3
Sep.	0.3	4.99	39.0	0.5	0.0	11.0	0.43		64.6	0.2	(2.4)	48.7	0.1	(1.7)	4.7	32.2	32.2	62.4	52.4	1.2	53.6	53.6	0.0	53.6
Total, AFY	**22.0**	**49.9**	**459**	**36.1**	**3.5**	**67.2**	**5.83**		**481.7**	**10.5**	**(23.7)**	**558.8**	**7.7**	**(17.5)**	**(0.6)**			**413.2**	**405.1**	**9.4**	**414.5**	**414.5**	**0**	**414.5**

Base City Flow	0.410 mgd

Town Field Runoff Calculation Parameters	
Soil Interception, inches	3
Percent Infiltration, saturated soil	0.4
Percent Infiltration, unsaturated soil	0.6
Min 2-month Rainfall for Saturation, inches	10
Max Precip Before Runoff Capture, inches	20

LAA Information	Town Field	City Field	Golf Course	Golf Course Pond
Area, acres	57	5.6	130	3.1
Crop Coefficient	1.00	1.00	0.88	--
Irr. Efficiency	0.80	0.80	0.84	--

Pond Information	Treatment 1	2	3	4	Storage 5	Percolation 6	7
Surface Area, acres	1.5	1.2	1.0	2.0	4.2	3.9	5.3
Storage Volume, ac-ft					41.7	25.2	25.8
Feb.-May. Perc. Rate, in/d						0.0	0.0
Jun.-Jan. Perc. Rate, in/d						0.0	0.0

(1) Average year rainfall from Ione NCDC station (#044283)
(2) Reference evapotranspiration from Plymouth CIMIS station (Station 227)
(3) = (Base City Flow) x (number of days in month) x 3.07
(4) = 3.07 x (I&I in million gallons). I&I in million gallons = 0.539 x (rainfall in inches) - 0.012, using linear equation developed in this TM.
(5) = (Column 1 - Column 2 - interception of 3 inches - infiltration in inches)/(12 inches per foot) x (surface area of Town Field, 57 acres). If Column 1 > 8 inches, then set value of Column 1 to 8 inches.
Infiltration in inches = (percent infiltration) x (Column 1 - Column 2 - interception of 3 inches). If the sum of Column 1 in the current and previous month >= 10 inches, percent infiltration is 0.4. Otherwise, percent infiltration is 0.6.
(6) = (Column 9) x (Percentage of monthly COWRF influent flow discarded as backwash as defined in COGC TM) (see Attachment D)
(7) Average monthly AWA backwash flow from 2021 to 2024
(8) = 0. Assume no CDCR flow.
(9) = Column 21 / (1 - COWRF filter backwash percentage as defined in COGC TM) (see Attachment D)
(10) = (Column 1)/12 x (surface area of Ponds 1-4, 5.7 acres)
(11) = (Column 2)/12 x (surface area of Ponds 1-4, 5.7 acres)
(12) = Column 3 + Column 4 + Column 5 + Column 6 + Column 7 + Column 10 + Column 11
(13) = (Column 1)/12 x (surface area of Pond 5, 4.2 acres)
(14) = (Column 2)/12 x (surface area of Pond 5, 4.2 acres)
(15) = Column 12 + Column 13 + Column 14 - (Column 23 + Column 28 + Column 32 + Column 34)
(16) = Column 16 of previous month + Column 15 of current month. If this is greater than the Pond 5 volume of 41.7 acre-feet, Column 16 is set to 41.7.
In September, Column 16 is set to 0 and the value in Column 34 is adjusted so that the formula in Column 15 predicts this value.
(17) Monthly average storage volume in Pond 5 from 2019 to 2024
(18) Historical irrigation demand for COGC, from COGC TM (see Attachment D)
(19) = [Column 1 - (Column 2 x crop coefficient of 0.88)]/12 x (surface area of golf course, 130 acres) x (irrigation efficiency of 0.84). If Column 19 < 0, then set Column 19 to 0.
(20) = (Column 1 - Column 2)/12 x (surface area of golf course pond, 3.1 acres). If Column 20 < 0, then set Column 20 to 0.
(21) = Column 19 + Column 20
(22) = Column 21 - Column 23
(23) = 0. Assume no flow from the City.
(24) = Column 22 + Column 23

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

Current Flows: Average Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 1

	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)
	Town Field Irrigation				City Field Irrigation				Percolation Pond 7								Percolation Pond 6								
Month	Avail for Town	Historical Demand	Theoretical Demand	Provided by City	Avail for City	Historical Demand	Theoretical Demand	Provided by City	System Excess	Empty Pond 5	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Empty Pond 7	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Check for System Overflow	Discharge/Store Elsewhere
Oct.	77.0	4.3	12.4	12.4	64.6	0.3	1.2	1.2	0.0	26	26.0	0.5	(1.4)	0.0	(25.9)	0.0	51	51.0	0.4	(1.1)	0.0	(23.9)	0.0	OK	74.2
Nov.	81.2	1.2	0.0	0.0	81.2	0.0	0.0	0.0	0.0	50	50.0	1.2	(0.7)	0.0	50.5	25.8		24.7	0.9	(0.5)	0.0	25.1	25.1	OK	0.0
Dec.	78.4	0.0	0.0	0.0	78.4	0.0	0.0	0.0	0.0	50	50.0	1.6	(0.5)	0.0	51.0	25.8		51.0	1.1	(0.4)	0.0	0.1	25.1	OK	51.7
Jan.	82.7	0.0	0.0	0.0	82.7	0.0	0.0	0.0	0.0	50	50.0	2.2	(0.7)	0.0	51.6	25.8		51.6	1.7	(0.5)	0.0	(0.0)	25.1	OK	52.8
Feb.	74.5	0.0	0.0	0.0	74.5	0.0	0.0	0.0	0.0	40	40.0	1.4	(0.9)	0.0	40.5	25.8		40.5	1.0	(0.6)	0.0	0.0	25.1	OK	40.9
Mar.	79.2	0.0	0.0	0.0	79.2	0.0	0.0	0.0	0.0	44	44.0	1.4	(1.3)	0.0	44.1	25.8		44.1	1.0	(1.0)	0.0	0.0	25.1	OK	44.1
Apr.	79.5	1.8	16.7	16.7	62.7	0.0	1.6	1.6	0.0	23	23.0	0.8	(2.0)	0.0	21.8	25.8		21.8	0.6	(1.5)	0.0	0.0	25.2	OK	20.8
May	83.3	0.6	31.7	31.7	51.6	0.3	3.1	3.1	0.0	10	10.0	0.3	(2.6)	0.0	7.6	25.8		7.6	0.2	(1.9)	0.0	0.0	25.2	OK	5.9
Jun.	83.1	15.4	41.3	41.3	41.8	1.2	4.1	4.1	0.0	7	7.0	0.1	(3.2)	0.0	3.9	25.8		3.9	0.1	(2.3)	0.0	(0.0)	25.2	OK	1.7
Jul.	77.3	13.5	44.9	44.9	32.3	1.2	4.4	4.4	0.0	1	1.0	0.0	(3.4)	0.0	(2.3)	23.5		0.0	0.0	(2.5)	0.0	(2.5)	22.7	OK	0.0
Aug.	71.6	21.2	40.7	40.7	30.9	1.8	4.0	4.0	0.0	0	0.0	0.1	(3.1)	0.0	(3.0)	20.4		0.0	0.0	(2.3)	0.0	(2.2)	20.5	OK	0.0
Sep.	74.0	11.7	27.7	27.7	46.3	1.8	2.7	2.7	0.0	12	12.0	0.1	(2.2)	0.0	9.9	25.8		4.6	0.1	(1.6)	0.0	3.1	23.5	OK	0.0
Total, AFY	**941.9**	**69.7**	**215.5**	**215.5**	**726.4**	**6.8**	**21.2**	**21.2**	**0.0**	**313**	**313.0**	**9.7**	**(22.0)**	**0.0**	**249.7**		**51**	**301**	**7.2**	**(16.2)**	**0.0**	**(0.4)**			**292**
									Total Inflows:		**313**					**Total Inflows:**		**301**					**Total Excess Water:**		**292**
									Total Outflows:		**0**					**Total Outflows:**		**0**							

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

(25) = (Column 16 of previous month) + Column 12 + Column 13 + Column 14 - Column 23. If Column 25 < 0, then set Column 25 to 0.
(26) Monthly average historical irrigation demand for Town Field from 2019 to 2024
(27) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of Town Field, 57 acres) x (irrigation efficiency of 0.8). If Column 27 < 0, then set Column 27 to 0.
(28) If Column 25 < Column 27, Column 25. Otherwise, Column 27.
(29) = Column 25 - Column 28. If Column 29 < 0, then set Column 29 to 0.
(30) Monthly average historical irrigation demand for City Field from 2018 to 2023.
(31) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of City Field, 5.6 acres) x (irrigation efficiency of 0.8). If Column 31 < 0, then set Column 31 to 0.
(32) If Column 29 < Column 31, Column 29. Otherwise, Column 31.
(33) = (Column 16 from previous month) + Column 15 - (Pond 5 volume, 41.7 acre-feet). If Column 33 < 0, then set Column 33 to 0.
(34) Manually entered to move water between Pond 5 and Pond 7 to approximately match historical Pond 5 volumes. Positive values indicate flow from Pond 5 to Pond 7. Negative values indicate flow from Pond 7 to Town Field/City Field.
(35) = Column 33 + Column 34
(36) = (Column 1)/12 x (surface area of Pond 7, 5.3 acres)
(37) = (Column 2)/12 x (surface area of Pond 7, 5.3 acres)
(38) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 7, 5.3 acres). Percolation rate set to 0 inches per day.
(39) = Column 35 + Column 36 + Column 37 + Column 38 - Column 41
(40) = Column 40 of previous month + Column 39 of current month. If this is greater than the Pond 7 volume of 25.8 acre-feet, Column 40 is set to 25.8. If this is < 0, Column 40 is set to 0. In August, Column 40 must be <= 0 in order for the balance to work.
(41) Manually entered to move water between Pond 7 and Pond 6. Positive values indicate flow from Pond 7 to Pond 6. Negative values indicate flow from Pond 6 to Pond 7.
(42) If Column 40 >= Pond 7 volume of 25.8 acre-feet, Column 42 = (Column 40 of previous month) + Column 39 + Column 41 - 25.8. If Column 40 < 25.8, Column 42 = Column 41.
(43) = (Column 1)/12 x (surface area of Pond 6,3.9 acres)
(44) = (Column 2)/12 x (surface area of Pond 6, 3.9 acres)
(45) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 6, 3.9 acres). Percolation rate set to 0 inches per day.
(46) = Column 42 + Column 43 + Column 44 + Column 45
(47) = Column 47 of previous month + Column 46 of current month. If this is greater than the Pond 6 storage volume of 25.2 acre-feet, Column 47 is set to 25.2. If Column 47 < 0, set to 0. In July, Column 47 must be <= 0 in order for the balance to work.
(48) If (Column 46 of current month) + (Column 47 of previous month) > Pond 6 storage volume of 25.2 acre-feet, Column 48 = "Overflow". Otherwise, Column 48 = "OK".
(49) Manually entered to move water between Pond 6 and New Storage/Disposal Site to ensure pond storage capacity is not exceeded.

Current Flows: 1-in-100 Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 0.32

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(17)	(16)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	Climate Values, inches		Inflows, ac-ft							Treatment Ponds			Storage Pond 5					Golf Course Irrigation						
Month	Rainfall	Ref. ET	Base City	I&I	Town Field Runoff	COWRF Backwash	AWA Backwash	CDCR	ARSA	Rainfall	Evap.	Total Inflow to Pond 5	Rainfall	Evap.	To/From Storage	Net Storage	Historical Storage	Historical Demand	Theoretical Demand	Theoretical Pond Losses	Total Theoretical Demand	Provided by Partners	Provided by City	Total Provided
Oct.	2.2	3.24	39.0	3.5	0.0	2.0	0.71		11.3	1.0	(1.5)	44.7	0.8	(1.1)	5.0	37.2	37.1	37.4	9.0	0.3	9.3	9.3	0.0	9.3
Nov.	5.2	1.68	37.8	8.6	3.3	0.0	0.52		0.0	2.5	(0.8)	51.9	1.8	(0.6)	(5.8)	31.4	31.8	16.4	0.0	0.0	0.0	0.0	0.0	0.0
Dec.	6.6	1.21	39.0	10.8	20.7	0.0	0.52		0.0	3.1	(0.6)	73.6	2.3	(0.4)	(2.5)	28.8	28.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jan.	9.5	1.48	39.0	15.7	43.7	0.0	0.37		0.0	4.5	(0.7)	102.6	3.3	(0.5)	4.4	33.2	33.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feb.	5.9	1.95	35.2	9.7	8.0	0.0	0.46		0.0	2.8	(0.9)	55.2	2.1	(0.7)	1.6	34.8	34.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mar.	6.0	3.02	39.0	9.8	0.0	0.0	0.37		0.0	2.8	(1.4)	50.6	2.1	(1.1)	0.6	35.4	35.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr.	3.3	4.57	37.8	5.4	0.0	1.8	0.58		11.9	1.5	(2.2)	45.0	1.1	(1.6)	2.8	38.2	38.2	8.8	9.8	0.3	10.1	10.1	0.0	10.1
May	1.2	5.97	39.0	1.9	0.0	8.0	0.55		61.7	0.6	(2.8)	47.2	0.4	(2.1)	0.5	38.7	38.3	54.9	52.5	1.2	53.7	53.7	0.0	53.7
Jun.	0.4	7.19	37.8	0.7	0.0	11.6	0.25		89.4	0.2	(3.4)	47.1	0.2	(2.5)	(8.3)	30.3	30.4	71.8	76.1	1.7	77.8	77.8	0.0	77.8
Jul.	0.1	7.64	39.0	0.2	0.0	13.0	0.58		99.9	0.1	(3.6)	49.2	0.0	(2.7)	(4.1)	26.2	26.9	83.4	85.0	1.9	86.9	86.9	0.0	86.9
Aug.	0.2	6.98	37.8	0.4	0.0	11.6	0.49		89.4	0.1	(3.3)	47.1	0.1	(2.4)	1.7	27.9	27.7	78.1	76.1	1.7	77.8	77.8	0.0	77.8
Sep.	0.6	4.99	39.0	1.0	0.0	10.2	0.43		59.9	0.3	(2.4)	48.6	0.2	(1.7)	(4.1)	32.2	32.2	62.4	48.6	1.1	49.7	49.7	0.0	49.7
Total, AFY	**41.1**	**49.9**	**459**	**67.7**	**75.7**	**58.2**	**5.83**		**423.5**	**19.5**	**(23.7)**	**662.7**	**14.4**	**(17.5)**	**(8.4)**			**413.2**	**357.1**	**8.2**	**365.3**	**365.3**	**0**	**365.3**

Base City Flow	0.410 mgd

Town Field Runoff Calculation Parameters	
Soil Interception, inches	3
Percent Infiltration, saturated soil	0.4
Percent Infiltration, unsaturated soil	0.6
Min 2-month Rainfall for Saturation, inches	10
Max Precip Before Runoff Capture, inches	20

LAA Information	Town Field	City Field	Golf Course	Golf Course Pond
Area, acres	57	5.6	130	3.1
Crop Coefficient	0.32	0.32	0.88	--
Irr. Efficiency	0.80	0.80	0.84	--

Pond Information	Treatment 1	2	3	4	Storage 5	Percolation 6	7
Surface Area, acres	1.5	1.2	1.0	2.0	4.2	3.9	5.3
Storage Volume, ac-ft					41.7	25.2	25.8
Feb.-May. Perc. Rate, in/d						0.0	0.0
Jun.-Jan. Perc. Rate, in/d						0.0	0.0

(1) 1-in-100 year rainfall from Ione NCDC station (#044283)
(2) Reference evapotranspiration from Plymouth CIMIS station (Station 227)
(3) = (Base City Flow) x (number of days in month) x 3.07
(4) = 3.07 x (I&I in million gallons). I&I in million gallons = 0.539 x (rainfall in inches) - 0.012, using linear equation developed in this TM.
(5) = (Column 1 - Column 2 - interception of 3 inches - infiltration in inches)/(12 inches per foot) x (surface area of Town Field, 57 acres). If Column 1 > 8 inches, then set value of Column 1 to 8 inches.
Infiltration in inches = (percent infiltration) x (Column 1 - Column 2 - interception of 3 inches). If the sum of Column 1 in the current and previous month >= 10 inches, percent infiltration is 0.4. Otherwise, percent infiltration is 0.6.
(6) = (Column 9) x (Percentage of monthly COWRF influent flow discarded as backwash as defined in COGC TM) (see Attachment D)
(7) Average monthly AWA backwash flow from 2021 to 2024
(8) = 0. Assume no CDCR flow.
(9) = Column 21 / (1 - COWRF filter backwash percentage as defined in COGC TM) (see Attachment D)
(10) = (Column 1)/12 x (surface area of Ponds 1-4, 5.7 acres)
(11) = (Column 2)/12 x (surface area of Ponds 1-4, 5.7 acres)
(12) = Column 3 + Column 4 + Column 5 + Column 6 + Column 7 + Column 10 + Column 11
(13) = (Column 1)/12 x (surface area of Pond 5, 4.2 acres)
(14) = (Column 2)/12 x (surface area of Pond 5, 4.2 acres)
(15) = Column 12 + Column 13 + Column 14 - (Column 23 + Column 28 + Column 32 + Column 34)
(16) = Column 16 of previous month + Column 15 of current month. If this is greater than the Pond 5 volume of 41.7 acre-feet, Column 16 is set to 41.7.
In August, Column 16 is set to 21.2 and the value in Column 34 is adjusted so that the formula in Column 15 predicts this value.
(17) Monthly average storage volume in Pond 5 from 2019 to 2024
(18) Historical irrigation demand for COGC, from COGC TM (see Attachment D)
(19) = [Column 1 - (Column 2 x crop coefficient of 0.88)]/12 x (surface area of golf course, 130 acres) x (irrigation efficiency of 0.84). If Column 19 < 0, then set Column 19 to 0.
(20) = (Column 1 - Column 2)/12 x (surface area of golf course pond, 3.1 acres). If Column 20 < 0, then set Column 20 to 0.
(21) = Column 19 + Column 20
(22) = Column 21 - Column 23
(23) = 0. Assume no flow from the City.
(24) = Column 22 + Column 23

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

Current Flows: 1-in-100 Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 0.32

	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)
	Town Field Irrigation				City Field Irrigation				Percolation Pond 7								Percolation Pond 6								
Month	Avail for Town	Historical Demand	Theoretical Demand	Provided by City	Avail for City	Historical Demand	Theoretical Demand	Provided by City	System Excess	Empty Pond 5	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Empty Pond 7	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Check for System Overflow	Discharge/ Store Elsewhere
Oct.	76.5	4.3	2.1	2.1	74.4	0.3	0.2	0.2	0.0	37	37.0	0.9	(1.4)	0.0	(26.5)	0.0	63	63.0	0.7	(1.1)	0.0	(25.3)	0.0	OK	87.9
Nov.	90.4	1.2	0.0	0.0	90.4	0.0	0.0	0.0	0.0	59	59.0	2.3	(0.7)	0.0	60.6	25.8		34.8	1.7	(0.5)	0.0	25.1	25.1	OK	10.8
Dec.	106.8	0.0	0.0	0.0	106.8	0.0	0.0	0.0	0.0	78	78.0	2.9	(0.5)	0.0	80.4	25.8		80.4	2.1	(0.4)	0.0	0.0	25.1	OK	82.1
Jan.	134.2	0.0	0.0	0.0	134.2	0.0	0.0	0.0	0.0	101	101.0	4.2	(0.7)	0.0	104.5	25.8		104.5	3.1	(0.5)	0.0	0.0	25.2	OK	107.1
Feb.	89.8	0.0	0.0	0.0	89.8	0.0	0.0	0.0	0.0	55	55.0	2.6	(0.9)	0.0	56.7	25.8		56.7	1.9	(0.6)	0.0	(0.0)	25.2	OK	58.0
Mar.	86.4	0.0	0.0	0.0	86.4	0.0	0.0	0.0	0.0	51	51.0	2.6	(1.3)	0.0	52.3	25.8		52.3	1.9	(1.0)	0.0	(0.1)	25.1	OK	53.3
Apr.	79.9	1.8	2.5	2.5	77.4	0.0	0.2	0.2	0.0	39	39.0	1.4	(2.0)	0.0	38.4	25.8		38.4	1.1	(1.5)	0.0	(0.0)	25.1	OK	38.0
May	83.7	0.6	9.1	9.1	74.5	0.3	0.9	0.9	0.0	35	35.0	0.5	(2.6)	0.0	32.9	25.8		32.9	0.4	(1.9)	0.0	0.0	25.1	OK	31.3
Jun.	83.4	15.4	12.8	12.8	70.6	1.2	1.3	1.3	0.0	39	39.0	0.2	(3.2)	0.0	36.0	25.8		36.0	0.1	(2.3)	0.0	0.0	25.2	OK	33.8
Jul.	76.9	13.5	14.3	14.3	62.6	1.2	1.4	1.4	0.0	35	35.0	0.1	(3.4)	0.0	31.7	25.8		31.7	0.0	(2.5)	0.0	(0.1)	25.1	OK	29.3
Aug.	71.0	21.2	12.8	12.8	58.2	1.8	1.3	1.3	0.0	29	29.0	0.1	(3.1)	0.0	26.0	25.8		26.0	0.1	(2.3)	0.0	0.0	25.1	OK	23.8
Sep.	74.9	11.7	8.3	8.3	66.6	1.8	0.8	0.8	0.0	42	42.0	0.3	(2.2)	0.0	40.1	25.8		40.1	0.2	(1.6)	0.0	0.0	25.2	OK	38.6
Total, AFY	**1053.9**	**69.7**	**61.9**	**61.9**	**992.0**	**6.8**	**6.1**	**6.1**	**0.0**	**600**	**600.0**	**18.2**	**(22.0)**	**0.0**	**533.1**		**63**	**597**	**13.4**	**(16.2)**	**0.0**	**(0.1)**			**594**
									Total Inflows:		**600**					**Total Inflows:**		**597**					**Total Excess Water:**		**594**
									Total Outflows:		**0**					**Total Outflows:**		**0**							

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

(25) = (Column 16 of previous month) + Column 12 + Column 13 + Column 14 - Column 23. If Column 25 < 0, then set Column 25 to 0.
(26) Monthly average historical irrigation demand for Town Field from 2019 to 2024
(27) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of Town Field, 57 acres) x (irrigation efficiency of 0.8). If Column 27 < 0, then set Column 27 to 0.
(28) If Column 25 < Column 27, Column 25. Otherwise, Column 27.
(29) = Column 25 - Column 28. If Column 29 < 0, then set Column 29 to 0.
(30) Monthly average historical irrigation demand for City Field from 2018 to 2023.
(31) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of City Field, 5.6 acres) x (irrigation efficiency of 0.8). If Column 31 < 0, then set Column 31 to 0.
(32) If Column 29 < Column 31, Column 29. Otherwise, Column 31.
(33) = (Column 16 from previous month) + Column 15 - (Pond 5 volume, 41.7 acre-feet). If Column 33 < 0, then set Column 33 to 0.
(34) Manually entered to move water between Pond 5 and Pond 7 to approximately match historical Pond 5 volumes. Positive values indicate flow from Pond 5 to Pond 7. Negative values indicate flow from Pond 7 to Town Field/City Field.
(35) = Column 33 + Column 34
(36) = (Column 1)/12 x (surface area of Pond 7, 5.3 acres)
(37) = (Column 2)/12 x (surface area of Pond 7, 5.3 acres)
(38) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 7, 5.3 acres). Percolation rate set to 0 inches per day.
(39) = Column 35 + Column 36 + Column 37 + Column 38 - Column 41
(40) = Column 40 of previous month + Column 39 of current month. If this is greater than the Pond 7 volume of 25.8 acre-feet, Column 40 is set to 25.8. If this is < 0, Column 40 is set to 0. In August, Column 40 must be <= 0 in order for the balance to work.
(41) Manually entered to move water between Pond 7 and Pond 6. Positive values indicate flow from Pond 7 to Pond 6. Negative values indicate flow from Pond 6 to Pond 7.
(42) If Column 40 >= Pond 7 volume of 25.8 acre-feet, Column 42 = (Column 40 of previous month) + Column 39 + Column 41 - 25.8. If Column 40 < 25.8, Column 42 = Column 41.
(43) = (Column 1)/12 x (surface area of Pond 6,3.9 acres)
(44) = (Column 2)/12 x (surface area of Pond 6, 3.9 acres)
(45) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 6, 3.9 acres). Percolation rate set to 0 inches per day.
(46) = Column 42 + Column 43 + Column 44 + Column 45
(47) = Column 47 of previous month + Column 46 of current month. If this is greater than the Pond 6 storage volume of 25.2 acre-feet, Column 47 is set to 25.2. If Column 47 < 0, set to 0. In July, Column 47 must be <= 0 in order for the balance to work.
(48) If (Column 46 of current month) + (Column 47 of previous month) > Pond 6 storage volume of 25.2 acre-feet, Column 48 = "Overflow". Otherwise, Column 48 = "OK".
(49) Manually entered to move water between Pond 6 and New Storage/Disposal Site to ensure pond storage capacity is not exceeded.

Current Flows: 1-in-100 Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(17)	(16)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	Climate Values, inches		Inflows, ac-ft							Treatment Ponds			Storage Pond 5					Golf Course Irrigation						
Month	Rainfall	Ref. ET	Base City	I&I	Town Field Runoff	COWRF Backwash	AWA Backwash	CDCR	ARSA	Rainfall	Evap.	Total Inflow to Pond 5	Rainfall	Evap.	To/From Storage	Net Storage	Historical Storage	Historical Demand	Theoretical Demand	Theoretical Pond Losses	Total Theoretical Demand	Provided by Partners	Provided by City	Total Provided
Oct.	2.2	3.24	39.0	3.5	0.0	2.0	0.71		11.3	1.0	(1.5)	44.7	0.8	(1.1)	5.2	37.4	37.1	37.4	9.0	0.3	9.3	9.3	0.0	9.3
Nov.	5.2	1.68	37.8	8.6	3.3	0.0	0.52		0.0	2.5	(0.8)	51.9	1.8	(0.6)	(5.8)	31.6	31.8	16.4	0.0	0.0	0.0	0.0	0.0	0.0
Dec.	6.6	1.21	39.0	10.8	20.7	0.0	0.52		0.0	3.1	(0.6)	73.6	2.3	(0.4)	(2.5)	29.0	28.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jan.	9.5	1.48	39.0	15.7	43.7	0.0	0.37		0.0	4.5	(0.7)	102.6	3.3	(0.5)	4.4	33.4	33.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feb.	5.9	1.95	35.2	9.7	8.0	0.0	0.46		0.0	2.8	(0.9)	55.2	2.1	(0.7)	1.6	35.0	34.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mar.	6.0	3.02	39.0	9.8	0.0	0.0	0.37		0.0	2.8	(1.4)	50.6	2.1	(1.1)	0.6	35.6	35.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr.	3.3	4.57	37.8	5.4	0.0	1.8	0.58		11.9	1.5	(2.2)	45.0	1.1	(1.6)	3.0	38.5	38.2	8.8	9.8	0.3	10.1	10.1	0.0	10.1
May	1.2	5.97	39.0	1.9	0.0	8.0	0.55		61.7	0.6	(2.8)	47.2	0.4	(2.1)	0.3	38.8	38.3	54.9	52.5	1.2	53.7	53.7	0.0	53.7
Jun.	0.4	7.19	37.8	0.7	0.0	11.6	0.25		89.4	0.2	(3.4)	47.1	0.2	(2.5)	(8.3)	30.5	30.4	71.8	76.1	1.7	77.8	77.8	0.0	77.8
Jul.	0.1	7.64	39.0	0.2	0.0	13.0	0.58		99.9	0.1	(3.6)	49.2	0.0	(2.7)	(4.4)	26.1	26.9	83.4	85.0	1.9	86.9	86.9	0.0	86.9
Aug.	0.2	6.98	37.8	0.4	0.0	11.6	0.49		89.4	0.1	(3.3)	47.1	0.1	(2.4)	0.8	26.9	27.7	78.1	76.1	1.7	77.8	77.8	0.0	77.8
Sep.	0.6	4.99	39.0	1.0	0.0	10.2	0.43		59.9	0.3	(2.4)	48.6	0.2	(1.7)	(4.5)	32.2	32.2	62.4	48.6	1.1	49.7	49.7	0.0	49.7
Total, AFY	**41.1**	**49.9**	**459**	**67.7**	**75.7**	**58.2**	**5.83**		**423.5**	**19.5**	**(23.7)**	**662.7**	**14.4**	**(17.5)**				**413.2**	**357.1**	**8.2**	**365.3**	**365.3**	**0**	**365.3**

Base City Flow	0.410 mgd

Town Field Runoff Calculation Parameters	
Soil Interception, inches	3
Percent Infiltration, saturated soil	0.4
Percent Infiltration, unsaturated soil	0.6
Min 2-month Rainfall for Saturation, inches	10
Max Precip Before Runoff Capture, inches	20

LAA Information	Town Field	City Field	Golf Course	Golf Course Pond
Area, acres	57	5.6	130	3.1
Crop Coefficient	1.00	1.00	0.88	--
Irr. Efficiency	0.80	0.80	0.84	--

Pond Information	Treatment				Storage	Percolation	
	1	2	3	4	5	6	7
Surface Area, acres	1.5	1.2	1.0	2.0	4.2	3.9	5.3
Storage Volume, ac-ft					41.7	25.2	25.8
Feb.-May. Perc. Rate, in/d						0.0	0.0
Jun.-Jan. Perc. Rate, in/d						0.0	0.0

(1) 1-in-100 year rainfall from Ione NCDC station (#044283)
(2) Reference evapotranspiration from Plymouth CIMIS station (Station 227)
(3) = (Base City Flow) x (number of days in month) x 3.07
(4) = 3.07 x (I&I in million gallons). I&I in million gallons = 0.539 x (rainfall in inches) - 0.012, using linear equation developed in this TM.
(5) = (Column 1 - Column 2 - interception of 3 inches - infiltration in inches)/(12 inches per foot) x (surface area of Town Field, 57 acres). If Column 1 > 8 inches, then set value of Column 1 to 8 inches.
Infiltration in inches = (percent infiltration) x (Column 1 - Column 2 - interception of 3 inches). If the sum of Column 1 in the current and previous month >= 10 inches, percent infiltration is 0.4. Otherwise, percent infiltration is 0.6.
(6) = (Column 9) x (Percentage of monthly COWRF influent flow discarded as backwash as defined in COGC TM) (see Attachment D)
(7) Average monthly AWA backwash flow from 2021 to 2024
(8) = 0. Assume no CDCR flow.
(9) = Column 21 / (1 - COWRF filter backwash percentage as defined in COGC TM) (see Attachment D)
(10) = (Column 1)/12 x (surface area of Ponds 1-4, 5.7 acres)
(11) = (Column 2)/12 x (surface area of Ponds 1-4, 5.7 acres)
(12) = Column 3 + Column 4 + Column 5 + Column 6 + Column 7 + Column 10 + Column 11
(13) = (Column 1)/12 x (surface area of Pond 5, 4.2 acres)
(14) = (Column 2)/12 x (surface area of Pond 5, 4.2 acres)
(15) = Column 12 + Column 13 + Column 14 - (Column 23 + Column 28 + Column 32 + Column 34)
(16) = Column 16 of previous month + Column 15 of current month. If this is greater than the Pond 5 volume of 41.7 acre-feet, Column 16 is set to 41.7.
In September, Column 16 is set to 0 and the value in Column 34 is adjusted so that the formula in Column 15 predicts this value.
(17) Monthly average storage volume in Pond 5 from 2019 to 2024
(18) Historical irrigation demand for COGC, from COGC TM (see Attachment D)
(19) = [Column 1 - (Column 2 x crop coefficient of 0.88)]/12 x (surface area of golf course, 130 acres) x (irrigation efficiency of 0.84). If Column 19 < 0, then set Column 19 to 0.
(20) = (Column 1 - Column 2)/12 x (surface area of golf course pond, 3.1 acres). If Column 20 < 0, then set Column 20 to 0.
(21) = Column 19 + Column 20
(22) = Column 21 - Column 23
(23) = 0. Assume no flow from the City.
(24) = Column 22 + Column 23

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

Current Flows: 1-in-100 Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 1

	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)
	Town Field Irrigation				City Field Irrigation				Percolation Pond 7								Percolation Pond 6								
Month	Avail for Town	Historical Demand	Theoretical Demand	Provided by City	Avail for City	Historical Demand	Theoretical Demand	Provided by City	System Excess	Empty Pond 5	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Empty Pond 7	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Check for System Overflow	Discharge/ Store Elsewhere
Oct.	76.5	4.3	6.5	6.5	70.0	0.3	0.6	0.6	0.0	32	32.0	0.9	(1.4)	0.0	(26.5)	0.0	58	58.0	0.7	(1.1)	0.0	(25.4)	0.0	OK	83.0
Nov.	90.6	1.2	0.0	0.0	90.6	0.0	0.0	0.0	0.0	59	59.0	2.3	(0.7)	0.0	60.6	25.8		34.8	1.7	(0.5)	0.0	25.1	25.1	OK	10.8
Dec.	107.0	0.0	0.0	0.0	107.0	0.0	0.0	0.0	0.0	78	78.0	2.9	(0.5)	0.0	80.4	25.8		80.4	2.1	(0.4)	0.0	0.0	25.1	OK	82.1
Jan.	134.4	0.0	0.0	0.0	134.4	0.0	0.0	0.0	0.0	101	101.0	4.2	(0.7)	0.0	104.5	25.8		104.5	3.1	(0.5)	0.0	0.0	25.2	OK	107.1
Feb.	90.0	0.0	0.0	0.0	90.0	0.0	0.0	0.0	0.0	55	55.0	2.6	(0.9)	0.0	56.7	25.8		56.7	1.9	(0.6)	0.0	(0.0)	25.2	OK	58.0
Mar.	86.6	0.0	0.0	0.0	86.6	0.0	0.0	0.0	0.0	51	51.0	2.6	(1.3)	0.0	52.3	25.8		52.3	1.9	(1.0)	0.0	(0.1)	25.1	OK	53.3
Apr.	80.1	1.8	7.8	7.8	72.3	0.0	0.8	0.8	0.0	33	33.0	1.4	(2.0)	0.0	32.4	25.8		32.4	1.1	(1.5)	0.0	(0.0)	25.1	OK	32.0
May	84.0	0.6	28.4	28.4	55.6	0.3	2.8	2.8	0.0	14	14.0	0.5	(2.6)	0.0	11.9	25.8		11.9	0.4	(1.9)	0.0	0.0	25.1	OK	10.3
Jun.	83.5	15.4	40.1	40.1	43.4	1.2	3.9	3.9	0.0	9	9.0	0.2	(3.2)	0.0	6.0	25.8		6.0	0.1	(2.3)	0.0	0.0	25.2	OK	3.8
Jul.	77.1	13.5	44.6	44.6	32.5	1.2	4.4	4.4	0.0	2	2.0	0.1	(3.4)	0.0	(1.3)	24.5		0.0	0.0	(2.5)	0.0	(2.4)	22.7	OK	0.0
Aug.	70.8	21.2	40.0	40.0	30.8	1.8	3.9	3.9	0.0	0	0.0	0.1	(3.1)	0.0	(3.0)	21.5		0.0	0.1	(2.3)	0.0	(2.2)	20.5	OK	0.0
Sep.	73.9	11.7	25.9	25.9	47.9	1.8	2.5	2.5	0.0	23	23.0	0.3	(2.2)	0.0	21.1	25.8		16.8	0.2	(1.6)	0.0	4.7	25.2	OK	10.7
Total, AFY	**1054.3**	**69.7**	**193.4**	**193.4**	**860.9**	**6.8**	**19.0**	**19.0**	**0.0**	**457**	**457.0**	**18.2**	**(22.0)**	**0.0**	**395.1**		**58**	**454**	**13.4**	**(16.2)**	**0.0**	**(0.2)**			**451**
									Total Inflows:		**457**					**Total Inflows:**		**454**					**Total Excess Water:**		**451**
									Total Outflows:		**0**					**Total Outflows:**		**0**							

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

(25) = (Column 16 of previous month) + Column 12 + Column 13 + Column 14 - Column 23. If Column 25 < 0, then set Column 25 to 0.
(26) Monthly average historical irrigation demand for Town Field from 2019 to 2024
(27) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of Town Field, 57 acres) x (irrigation efficiency of 0.8). If Column 27 < 0, then set Column 27 to 0.
(28) If Column 25 < Column 27, Column 25. Otherwise, Column 27.
(29) = Column 25 - Column 28. If Column 29 < 0, then set Column 29 to 0.
(30) Monthly average historical irrigation demand for City Field from 2018 to 2023.
(31) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of City Field, 5.6 acres) x (irrigation efficiency of 0.8). If Column 31 < 0, then set Column 31 to 0.
(32) If Column 29 < Column 31, Column 29. Otherwise, Column 31.
(33) = (Column 16 from previous month) + Column 15 - (Pond 5 volume, 41.7 acre-feet). If Column 33 < 0, then set Column 33 to 0.
(34) Manually entered to move water between Pond 5 and Pond 7 to approximately match historical Pond 5 volumes. Positive values indicate flow from Pond 5 to Pond 7. Negative values indicate flow from Pond 7 to Town Field/City Field.
(35) = Column 33 + Column 34
(36) = (Column 1)/12 x (surface area of Pond 7, 5.3 acres)
(37) = (Column 2)/12 x (surface area of Pond 7, 5.3 acres)
(38) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 7, 5.3 acres). Percolation rate set to 0 inches per day.
(39) = Column 35 + Column 36 + Column 37 + Column 38 - Column 41
(40) = Column 40 of previous month + Column 39 of current month. If this is greater than the Pond 7 volume of 25.8 acre-feet, Column 40 is set to 25.8. If this is < 0, Column 40 is set to 0. In August, Column 40 must be <= 0 in order for the balance to work.
(41) Manually entered to move water between Pond 7 and Pond 6. Positive values indicate flow from Pond 7 to Pond 6. Negative values indicate flow from Pond 6 to Pond 7.
(42) If Column 40 >= Pond 7 volume of 25.8 acre-feet, Column 42 = (Column 40 of previous month) + Column 39 + Column 41 - 25.8. If Column 40 < 25.8, Column 42 = Column 41.
(43) = (Column 1)/12 x (surface area of Pond 6,3.9 acres)
(44) = (Column 2)/12 x (surface area of Pond 6, 3.9 acres)
(45) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 6, 3.9 acres). Percolation rate set to 0 inches per day.
(46) = Column 42 + Column 43 + Column 44 + Column 45
(47) = Column 47 of previous month + Column 46 of current month. If this is greater than the Pond 6 storage volume of 25.2 acre-feet, Column 47 is set to 25.2. If Column 47 < 0, set to 0. In July, Column 47 must be <= 0 in order for the balance to work.
(48) If (Column 46 of current month) + (Column 47 of previous month) > Pond 6 storage volume of 25.2 acre-feet, Column 48 = "Overflow". Otherwise, Column 48 = "OK".
(49) Manually entered to move water between Pond 6 and New Storage/Disposal Site to ensure pond storage capacity is not exceeded.

2030 Flows: Average Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 0.32

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(17)	(16)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	Climate Values, inches		Inflows, ac-ft							Treatment Ponds			Storage Pond 5					Golf Course Irrigation						
Month	Rainfall	Ref. ET	Base City	I&I	Town Field Runoff	COWRF Backwash	AWA Backwash	CDCR	ARSA	Rainfall	Evap.	Total Inflow to Pond 5	Rainfall	Evap.	To/From Storage	Net Storage	Historical Storage	Historical Demand	Theoretical Demand	Theoretical Pond Losses	Total Theoretical Demand	Provided by Partners	Provided by City	Total Provided
Oct.	1.2	3.24	48.5	1.9	0.0	4.9	0.71		27.3	0.5	(1.5)	55.0	0.4	(1.1)	4.9	37.1	37.1	37.4	21.9	0.5	22.4	22.4	0.0	22.4
Nov.	2.8	1.68	47.0	4.6	0.0	0.0	0.52		0.0	1.3	(0.8)	52.7	1.0	(0.6)	(5.9)	31.2	31.8	16.4	0.0	0.0	0.0	0.0	0.0	0.0
Dec.	3.5	1.21	48.5	5.8	0.0	0.0	0.52		0.0	1.7	(0.6)	55.9	1.2	(0.4)	(2.3)	28.9	28.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jan.	5.1	1.48	48.5	8.4	3.5	0.0	0.37		0.0	2.4	(0.7)	62.5	1.8	(0.5)	3.7	32.7	33.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feb.	3.1	1.95	43.8	5.2	0.0	0.0	0.46		0.0	1.5	(0.9)	50.0	1.1	(0.7)	1.4	34.1	34.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mar.	3.2	3.02	48.5	5.2	0.0	0.0	0.37		0.0	1.5	(1.4)	54.2	1.1	(1.1)	1.2	35.3	35.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr.	1.8	4.57	47.0	2.9	0.0	5.3	0.58		35.3	0.8	(2.2)	54.4	0.6	(1.6)	3.6	38.9	38.2	8.8	29.3	0.7	30.0	30.0	0.0	30.0
May	0.6	5.97	48.5	1.0	0.0	9.1	0.55		70.1	0.3	(2.8)	56.6	0.2	(2.1)	(0.4)	38.5	38.3	54.9	59.6	1.4	61.0	61.0	0.0	61.0
Jun.	0.2	7.19	47.0	0.3	0.0	12.0	0.25		92.4	0.1	(3.4)	56.2	0.1	(2.5)	(7.7)	30.8	30.4	71.8	78.6	1.8	80.4	80.4	0.0	80.4
Jul.	0.1	7.64	48.5	0.1	0.0	13.1	0.58		100.9	0.0	(3.6)	58.7	0.0	(2.7)	(3.8)	27.0	26.9	83.4	85.8	2.0	87.8	87.8	0.0	87.8
Aug.	0.1	6.98	47.0	0.2	0.0	11.8	0.49		91.1	0.1	(3.3)	56.2	0.0	(2.4)	0.5	27.5	27.7	78.1	77.5	1.8	79.3	79.3	0.0	79.3
Sep.	0.3	4.99	48.5	0.5	0.0	11.0	0.43		64.6	0.2	(2.4)	58.2	0.1	(1.7)	3.9	32.2	32.2	62.4	52.4	1.2	53.6	53.6	0.0	53.6
Total, AFY	**22.0**	**49.9**	**571**	**36.1**	**3.5**	**67.2**	**5.83**		**481.7**	**10.5**	**(23.7)**	**670.7**	**7.7**	**(17.5)**	**(0.8)**			**413.2**	**405.1**	**9.4**	**414.5**	**414.5**	**0**	**414.5**

Base City Flow	0.510 mgd

Town Field Runoff Calculation Parameters	
Soil Interception, inches	3
Percent Infiltration, saturated soil	0.4
Percent Infiltration, unsaturated soil	0.6
Min 2-month Rainfall for Saturation, inches	10
Max Precip Before Runoff Capture, inches	20

LAA Information	Town Field	City Field	Golf Course	Golf Course Pond
Area, acres	57	5.6	130	3.1
Crop Coefficient	0.32	0.32	0.88	--
Irr. Efficiency	0.80	0.80	0.84	--

Pond Information	Treatment 1	2	3	4	Storage 5	Percolation 6	7
Surface Area, acres	1.5	1.2	1.0	2.0	4.2	3.9	5.3
Storage Volume, ac-ft					41.7	25.2	25.8
Feb.-May. Perc. Rate, in/d						0.0	0.0
Jun.-Jan. Perc. Rate, in/d						0.0	0.0

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

(1) Average year rainfall from Ione NCDC station (#044283)
(2) Reference evapotranspiration from Plymouth CIMIS station (Station 227)
(3) = (Base City Flow) x (number of days in month) x 3.07
(4) = 3.07 x (I&I in million gallons]. I&I in million gallons = 0.539 x (rainfall in inches) - 0.012, using linear equation developed in this TM.
(5) = (Column 1 - Column 2 - interception of 3 inches - infiltration in inches)/(12 inches per foot) x (surface area of Town Field, 57 acres). If Column 1 > 8 inches, then set value of Column 1 to 8 inches.
Infiltration in inches = (percent infiltration) x (Column 1 - Column 2 - interception of 3 inches). If the sum of Column 1 in the current and previous month >= 10 inches, percent infiltration is 0.4. Otherwise, percent infiltration is 0.6.
(6) = (Column 9) x (Percentage of monthly COWRF influent flow discarded as backwash as defined in COGC TM) (see Attachment D)
(7) Average monthly AWA backwash flow from 2021 to 2024
(8) = 0. Assume no CDCR flow.
(9) = Column 21 / (1 - COWRF filter backwash percentage as defined in COGC TM) (see Attachment D)
(10) = (Column 1)/12 x (surface area of Ponds 1-4, 5.7 acres)
(11) = (Column 2)/12 x (surface area of Ponds 1-4, 5.7 acres)
(12) = Column 3 + Column 4 + Column 5 + Column 6 + Column 7 + Column 10 + Column 11
(13) = (Column 1)/12 x (surface area of Pond 5, 4.2 acres)
(14) = (Column 2)/12 x (surface area of Pond 5, 4.2 acres)
(15) = Column 12 + Column 13 + Column 14 - (Column 23 + Column 28 + Column 32 + Column 34)
(16) = Column 16 of previous month + Column 15 of current month. If this is greater than the Pond 5 volume of 41.7 acre-feet, Column 16 is set to 41.7.
In August, Column 16 is set to 22.9 and the value in Column 34 is adjusted so that the formula in Column 15 predicts this value.
(17) Monthly average storage volume in Pond 5 from 2019 to 2024
(18) Historical irrigation demand for COGC, from COGC TM (see Attachment D)
(19) = [Column 1 - (Column 2 x crop coefficient of 0.88)]/12 x (surface area of golf course, 130 acres) x (irrigation efficiency of 0.84). If Column 19 < 0, then set Column 19 to 0.
(20) = (Column 1 - Column 2)/12 x (surface area of golf course pond, 3.1 acres). If Column 20 < 0, then set Column 20 to 0.
(21) = Column 19 + Column 20
(22) = Column 21 - Column 23
(23) = 0. Assume no flow from the City.
(24) = Column 22 + Column 23

2030 Flows: Average Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 0.32

	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)
	Town Field Irrigation				City Field Irrigation				Percolation Pond 7								Percolation Pond 6								
Month	Avail for Town	Historical Demand	Theoretical Demand	Provided by City	Avail for City	Historical Demand	Theoretical Demand	Provided by City	System Excess	Empty Pond 5	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Empty Pond 7	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Check for System Overflow	Discharge/ Store Elsewhere
Oct.	86.5	4.3	4.0	4.0	82.5	0.3	0.4	0.4	0.0	45	45.0	0.5	(1.4)	0.0	(25.9)	0.0	70	70.0	0.4	(1.1)	0.0	(25.2)	0.0	OK	94.5
Nov.	90.2	1.2	0.0	0.0	90.2	0.0	0.0	0.0	0.0	59	59.0	1.2	(0.7)	0.0	59.5	25.8		33.7	0.9	(0.5)	0.0	25.2	25.2	OK	8.9
Dec.	87.9	0.0	0.0	0.0	87.9	0.0	0.0	0.0	0.0	59	59.0	1.6	(0.5)	0.0	60.0	25.8		60.0	1.1	(0.4)	0.0	(0.0)	25.1	OK	60.8
Jan.	92.7	0.0	0.0	0.0	92.7	0.0	0.0	0.0	0.0	60	60.0	2.2	(0.7)	0.0	61.6	25.8		61.6	1.7	(0.5)	0.0	(0.0)	25.1	OK	62.8
Feb.	83.1	0.0	0.0	0.0	83.1	0.0	0.0	0.0	0.0	49	49.0	1.4	(0.9)	0.0	49.5	25.8		49.5	1.0	(0.6)	0.0	0.0	25.1	OK	49.9
Mar.	88.3	0.0	0.0	0.0	88.3	0.0	0.0	0.0	0.0	53	53.0	1.4	(1.3)	0.0	53.1	25.8		53.1	1.0	(1.0)	0.0	0.0	25.1	OK	53.1
Apr.	88.8	1.8	5.4	5.4	83.4	0.0	0.5	0.5	0.0	44	44.0	0.8	(2.0)	0.0	42.8	25.8		42.8	0.6	(1.5)	0.0	0.0	25.2	OK	41.8
May	93.6	0.6	10.1	10.1	83.5	0.3	1.0	1.0	0.0	44	44.0	0.3	(2.6)	0.0	41.6	25.8		41.6	0.2	(1.9)	0.0	0.0	25.2	OK	39.9
Jun.	92.3	15.4	13.2	13.2	79.1	1.2	1.3	1.3	0.0	47	47.0	0.1	(3.2)	0.0	43.9	25.8		43.9	0.1	(2.3)	0.0	(0.0)	25.2	OK	41.7
Jul.	86.8	13.5	14.4	14.4	72.4	1.2	1.4	1.4	0.0	44	44.0	0.0	(3.4)	0.0	40.7	25.8		40.7	0.0	(2.5)	0.0	(0.0)	25.2	OK	38.2
Aug.	80.8	21.2	13.0	13.0	67.8	1.8	1.3	1.3	0.0	39	39.0	0.1	(3.1)	0.0	36.0	25.8		36.0	0.0	(2.3)	0.0	(0.1)	25.1	OK	33.8
Sep.	84.1	11.7	8.9	8.9	75.3	1.8	0.9	0.9	0.0	43	43.0	0.1	(2.2)	0.0	40.9	25.8		40.9	0.1	(1.6)	0.0	0.0	25.1	OK	39.4
Total, AFY	**1055.0**	**69.7**	**69.0**	**69.0**	**986.1**	**6.8**	**6.8**	**6.8**	**0.0**	**586**	**586.0**	**9.7**	**(22.0)**	**0.0**	**503.7**		**70**	**574**	**7.2**	**(16.2)**	**0.0**	**(0.1)**			**565**
									Total Inflows:		**586**					**Total Inflows:**		**574**					**Total Excess Water:**		**565**
									Total Outflows:		**0**					**Total Outflows:**		**0**							

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

(25) = (Column 16 of previous month) + Column 12 + Column 13 + Column 14 - Column 23. If Column 25 < 0, then set Column 25 to 0.
(26) Monthly average historical irrigation demand for Town Field from 2019 to 2024
(27) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of Town Field, 57 acres) x (irrigation efficiency of 0.8). If Column 27 < 0, then set Column 27 to 0.
(28) If Column 25 < Column 27, Column 25. Otherwise, Column 27.
(29) = Column 25 - Column 28. If Column 29 < 0, then set Column 29 to 0.
(30) Monthly average historical irrigation demand for City Field from 2018 to 2023.
(31) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of City Field, 5.6 acres) x (irrigation efficiency of 0.8). If Column 31 < 0, then set Column 31 to 0.
(32) If Column 29 < Column 31, Column 29. Otherwise, Column 31.
(33) = (Column 16 from previous month) + Column 15 - (Pond 5 volume, 41.7 acre-feet). If Column 33 < 0, then set Column 33 to 0.
(34) Manually entered to move water between Pond 5 and Pond 7 to approximately match historical Pond 5 volumes. Positive values indicate flow from Pond 5 to Pond 7. Negative values indicate flow from Pond 7 to Town Field/City Field.
(35) = Column 33 + Column 34
(36) = (Column 1)/12 x (surface area of Pond 7, 5.3 acres)
(37) = (Column 2)/12 x (surface area of Pond 7, 5.3 acres)
(38) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 7, 5.3 acres). Percolation rate set to 0 inches per day.
(39) = Column 35 + Column 36 + Column 37 + Column 38 - Column 41
(40) = Column 40 of previous month + Column 39 of current month. If this is greater than the Pond 7 volume of 25.8 acre-feet, Column 40 is set to 25.8. If this is < 0, Column 40 is set to 0. In August, Column 40 must be <= 0 in order for the balance to work.
(41) Manually entered to move water between Pond 7 and Pond 6. Positive values indicate flow from Pond 7 to Pond 6. Negative values indicate flow from Pond 6 to Pond 7.
(42) If Column 40 >= Pond 7 volume of 25.8 acre-feet, Column 42 = (Column 40 of previous month) + Column 39 + Column 41 - 25.8. If Column 40 < 25.8, Column 42 = Column 41.
(43) = (Column 1)/12 x (surface area of Pond 6,3.9 acres)
(44) = (Column 2)/12 x (surface area of Pond 6, 3.9 acres)
(45) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 6, 3.9 acres). Percolation rate set to 0 inches per day.
(46) = Column 42 + Column 43 + Column 44 + Column 45
(47) = Column 47 of previous month + Column 46 of current month. If this is greater than the Pond 6 storage volume of 25.2 acre-feet, Column 47 is set to 25.2. If Column 47 < 0, set to 0. In July, Column 47 must be <= 0 in order for the balance to work.
(48) If (Column 46 of current month) + (Column 47 of previous month) > Pond 6 storage volume of 25.2 acre-feet, Column 48 = "Overflow". Otherwise, Column 48 = "OK".
(49) Manually entered to move water between Pond 6 and New Storage/Disposal Site to ensure pond storage capacity is not exceeded.

2030 Flows: Average Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(17)	(16)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	Climate Values, inches		Inflows, ac-ft							Treatment Ponds			Storage Pond 5					Golf Course Irrigation						
Month	Rainfall	Ref. ET	Base City	I&I	Town Field Runoff	COWRF Backwash	AWA Backwash	CDCR	ARSA	Rainfall	Evap.	Total Inflow to Pond 5	Rainfall	Evap.	To/From Storage	Net Storage	Historical Storage	Historical Demand	Theoretical Demand	Theoretical Pond Losses	Total Theoretical Demand	Provided by Partners	Provided by City	Total Provided
Oct.	1.2	3.24	48.5	1.9	0.0	4.9	0.71		27.3	0.5	(1.5)	55.0	0.4	(1.1)	5.7	37.9	37.1	37.4	21.9	0.5	22.4	22.4	0.0	22.4
Nov.	2.8	1.68	47.0	4.6	0.0	0.0	0.52		0.0	1.3	(0.8)	52.7	1.0	(0.6)	(5.9)	31.9	31.8	16.4	0.0	0.0	0.0	0.0	0.0	0.0
Dec.	3.5	1.21	48.5	5.8	0.0	0.0	0.52		0.0	1.7	(0.6)	55.9	1.2	(0.4)	(3.3)	28.6	28.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jan.	5.1	1.48	48.5	8.4	3.5	0.0	0.37		0.0	2.4	(0.7)	62.5	1.8	(0.5)	4.7	33.4	33.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feb.	3.1	1.95	43.8	5.2	0.0	0.0	0.46		0.0	1.5	(0.9)	50.0	1.1	(0.7)	1.4	34.8	34.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mar.	3.2	3.02	48.5	5.2	0.0	0.0	0.37		0.0	1.5	(1.4)	54.2	1.1	(1.1)	0.2	35.0	35.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr.	1.8	4.57	47.0	2.9	0.0	5.3	0.58		35.3	0.8	(2.2)	54.4	0.6	(1.6)	3.1	38.1	38.2	8.8	29.3	0.7	30.0	30.0	0.0	30.0
May	0.6	5.97	48.5	1.0	0.0	9.1	0.55		70.1	0.3	(2.8)	56.6	0.2	(2.1)	(0.1)	38.0	38.3	54.9	59.6	1.4	61.0	61.0	0.0	61.0
Jun.	0.2	7.19	47.0	0.3	0.0	12.0	0.25		92.4	0.1	(3.4)	56.2	0.1	(2.5)	(7.6)	30.4	30.4	71.8	78.6	1.8	80.4	80.4	0.0	80.4
Jul.	0.1	7.64	48.5	0.1	0.0	13.1	0.58		100.9	0.0	(3.6)	58.7	0.0	(2.7)	(3.3)	27.1	26.9	83.4	85.8	2.0	87.8	87.8	0.0	87.8
Aug.	0.1	6.98	47.0	0.2	0.0	11.8	0.49		91.1	0.1	(3.3)	56.2	0.0	(2.4)	0.2	27.3	27.7	78.1	77.5	1.8	79.3	79.3	0.0	79.3
Sep.	0.3	4.99	48.5	0.5	0.0	11.0	0.43		64.6	0.2	(2.4)	58.2	0.1	(1.7)	4.2	32.2	32.2	62.4	52.4	1.2	53.6	53.6	0.0	53.6
Total, AFY	**22.0**	**49.9**	**571**	**36.1**	**3.5**	**67.2**	**5.83**		**481.7**	**10.5**	**(23.7)**	**670.7**	**7.7**	**(17.5)**	**(0.7)**			**413.2**	**405.1**	**9.4**	**414.5**	**414.5**	**0**	**414.5**

Base City Flow	0.510 mgd

Town Field Runoff Calculation Parameters	
Soil Interception, inches	3
Percent Infiltration, saturated soil	0.4
Percent Infiltration, unsaturated soil	0.6
Min 2-month Rainfall for Saturation, inches	10
Max Precip Before Runoff Capture, inches	20

LAA Information	Town Field	City Field	Golf Course	Golf Course Pond
Area, acres	57	5.6	130	3.1
Crop Coefficient	1.00	1.00	0.88	--
Irr. Efficiency	0.80	0.80	0.84	--

Pond Information	Treatment 1	2	3	4	Storage 5	Percolation 6	7
Surface Area, acres	1.5	1.2	1.0	2.0	4.2	3.9	5.3
Storage Volume, ac-ft					41.7	25.2	25.8
Feb.-May. Perc. Rate, in/d						0.0	0.0
Jun.-Jan. Perc. Rate, in/d						0.0	0.0

(1) Average year rainfall from Ione NCDC station (#044283)
(2) Reference evapotranspiration from Plymouth CIMIS station (Station 227)
(3) = (Base City Flow) x (number of days in month) x 3.07
(4) = 3.07 x (I&I in million gallons). I&I in million gallons = 0.539 x (rainfall in inches) - 0.012, using linear equation developed in this TM.
(5) = (Column 1 - Column 2 - interception of 3 inches - infiltration in inches)/(12 inches per foot) x (surface area of Town Field, 57 acres). If Column 1 > 8 inches, then set value of Column 1 to 8 inches.
Infiltration in inches = (percent infiltration) x (Column 1 - Column 2 - interception of 3 inches). If the sum of Column 1 in the current and previous month >= 10 inches, percent infiltration is 0.4. Otherwise, percent infiltration is 0.6.
(6) = (Column 9) x (Percentage of monthly COWRF influent flow discarded as backwash as defined in COGC TM) (see Attachment D)
(7) Average monthly AWA backwash flow from 2021 to 2024
(8) = 0. Assume no CDCR flow.
(9) = Column 21 / (1 - COWRF filter backwash percentage as defined in COGC TM) (see Attachment D)
(10) = (Column 1)/12 x (surface area of Ponds 1-4, 5.7 acres)
(11) = (Column 2)/12 x (surface area of Ponds 1-4, 5.7 acres)
(12) = Column 3 + Column 4 + Column 5 + Column 6 + Column 7 + Column 10 + Column 11
(13) = (Column 1)/12 x (surface area of Pond 5, 4.2 acres)
(14) = (Column 2)/12 x (surface area of Pond 5, 4.2 acres)
(15) = Column 12 + Column 13 + Column 14 - (Column 23 + Column 28 + Column 32 + Column 34)
(16) = Column 16 of previous month + Column 15 of current month. If this is greater than the Pond 5 volume of 41.7 acre-feet, Column 16 is set to 41.7.
In September, Column 16 is set to 0 and the value in Column 34 is adjusted so that the formula in Column 15 predicts this value.
(17) Monthly average storage volume in Pond 5 from 2019 to 2024
(18) Historical irrigation demand for COGC, from COGC TM (see Attachment D)
(19) = [Column 1 - (Column 2 x crop coefficient of 0.88)]/12 x (surface area of golf course, 130 acres) x (irrigation efficiency of 0.84). If Column 19 < 0, then set Column 19 to 0.
(20) = (Column 1 - Column 2)/12 x (surface area of golf course pond, 3.1 acres). If Column 20 < 0, then set Column 20 to 0.
(21) = Column 19 + Column 20
(22) = Column 21 - Column 23
(23) = 0. Assume no flow from the City.
(24) = Column 22 + Column 23

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

2030 Flows: Average Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 1

	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)
	Town Field Irrigation				City Field Irrigation				Percolation Pond 7								Percolation Pond 6								
Month	Avail for Town	Historical Demand	Theoretical Demand	Provided by City	Avail for City	Historical Demand	Theoretical Demand	Provided by City	System Excess	Empty Pond 5	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Empty Pond 7	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Check for System Overflow	Discharge/Store Elsewhere
Oct.	86.5	4.3	12.4	12.4	74.1	0.3	1.2	1.2	0.0	35	35.0	0.5	(1.4)	0.0	(25.9)	0.0	60	60.0	0.4	(1.1)	0.0	(24.9)	0.0	OK	84.2
Nov.	90.9	1.2	0.0	0.0	90.9	0.0	0.0	0.0	0.0	59	59.0	1.2	(0.7)	0.0	59.5	25.8		33.7	0.9	(0.5)	0.0	24.8	24.8	OK	9.3
Dec.	88.6	0.0	0.0	0.0	88.6	0.0	0.0	0.0	0.0	60	60.0	1.6	(0.5)	0.0	61.0	25.8		61.0	1.1	(0.4)	0.0	(0.0)	24.7	OK	61.8
Jan.	92.4	0.0	0.0	0.0	92.4	0.0	0.0	0.0	0.0	59	59.0	2.2	(0.7)	0.0	60.6	25.8		60.6	1.7	(0.5)	0.0	(0.0)	24.7	OK	61.8
Feb.	83.8	0.0	0.0	0.0	83.8	0.0	0.0	0.0	0.0	49	49.0	1.4	(0.9)	0.0	49.5	25.8		49.5	1.0	(0.6)	0.0	0.0	24.7	OK	49.9
Mar.	89.0	0.0	0.0	0.0	89.0	0.0	0.0	0.0	0.0	54	54.0	1.4	(1.3)	0.0	54.1	25.8		54.1	1.0	(1.0)	0.0	0.0	24.7	OK	54.1
Apr.	88.5	1.8	16.7	16.7	71.7	0.0	1.6	1.6	0.0	32	32.0	0.8	(2.0)	0.0	30.8	25.8		30.8	0.6	(1.5)	0.0	0.0	24.8	OK	29.8
May	92.8	0.6	31.7	31.7	61.1	0.3	3.1	3.1	0.0	20	20.0	0.3	(2.6)	0.0	17.6	25.8		17.6	0.2	(1.9)	0.0	0.0	24.8	OK	15.9
Jun.	91.8	15.4	41.3	41.3	50.5	1.2	4.1	4.1	0.0	16	16.0	0.1	(3.2)	0.0	12.9	25.8		12.9	0.1	(2.3)	0.0	(0.0)	24.8	OK	10.7
Jul.	86.5	13.5	44.9	44.9	41.5	1.2	4.4	4.4	0.0	10	10.0	0.0	(3.4)	0.0	6.7	25.8		6.7	0.0	(2.5)	0.0	(0.0)	24.8	OK	4.2
Aug.	81.0	21.2	40.7	40.7	40.3	1.8	4.0	4.0	0.0	9	9.0	0.1	(3.1)	0.0	6.0	25.8		6.0	0.0	(2.3)	0.0	0.0	24.8	OK	3.7
Sep.	83.9	11.7	27.7	27.7	56.2	1.8	2.7	2.7	0.0	22	22.0	0.1	(2.2)	0.0	19.9	25.8		19.9	0.1	(1.6)	0.0	0.0	24.8	OK	18.4
Total, AFY	**1055.8**	**69.7**	**215.5**	**215.5**	**840.3**	**6.8**	**21.2**	**21.2**	**0.0**	**425**	**425.0**	**9.7**	**(22.0)**	**0.0**	**352.7**		**60**	**413**	**7.2**	**(16.2)**	**0.0**	**(0.1)**			**404**
									Total Inflows:		**425**					**Total Inflows:**		**413**					**Total Excess Water:**		**404**
									Total Outflows:		**0**					**Total Outflows:**		**0**							

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

(25) = (Column 16 of previous month) + Column 12 + Column 13 + Column 14 - Column 23. If Column 25 < 0, then set Column 25 to 0.
(26) Monthly average historical irrigation demand for Town Field from 2019 to 2024
(27) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of Town Field, 57 acres) x (irrigation efficiency of 0.8). If Column 27 < 0, then set Column 27 to 0.
(28) If Column 25 < Column 27, Column 25. Otherwise, Column 27.
(29) = Column 25 - Column 28. If Column 29 < 0, then set Column 29 to 0.
(30) Monthly average historical irrigation demand for City Field from 2018 to 2023.
(31) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of City Field, 5.6 acres) x (irrigation efficiency of 0.8). If Column 31 < 0, then set Column 31 to 0.
(32) If Column 29 < Column 31, Column 29. Otherwise, Column 31.
(33) = (Column 16 from previous month) + Column 15 - (Pond 5 volume, 41.7 acre-feet). If Column 33 < 0, then set Column 33 to 0.
(34) Manually entered to move water between Pond 5 and Pond 7 to approximately match historical Pond 5 volumes. Positive values indicate flow from Pond 5 to Pond 7. Negative values indicate flow from Pond 7 to Town Field/City Field.
(35) = Column 33 + Column 34
(36) = (Column 1)/12 x (surface area of Pond 7, 5.3 acres)
(37) = (Column 2)/12 x (surface area of Pond 7, 5.3 acres)
(38) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 7, 5.3 acres). Percolation rate set to 0 inches per day.
(39) = Column 35 + Column 36 + Column 37 + Column 38 - Column 41
(40) = Column 40 of previous month + Column 39 of current month. If this is greater than the Pond 7 volume of 25.8 acre-feet, Column 40 is set to 25.8. If this is < 0, Column 40 is set to 0. In August, Column 40 must be <= 0 in order for the balance to work.
(41) Manually entered to move water between Pond 7 and Pond 6. Positive values indicate flow from Pond 7 to Pond 6. Negative values indicate flow from Pond 6 to Pond 7.
(42) If Column 40 >= Pond 7 volume of 25.8 acre-feet, Column 42 = (Column 40 of previous month) + Column 39 + Column 41 - 25.8. If Column 40 < 25.8, Column 42 = Column 41.
(43) = (Column 1)/12 x (surface area of Pond 6,3.9 acres)
(44) = (Column 2)/12 x (surface area of Pond 6, 3.9 acres)
(45) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 6, 3.9 acres). Percolation rate set to 0 inches per day.
(46) = Column 42 + Column 43 + Column 44 + Column 45
(47) = Column 47 of previous month + Column 46 of current month. If this is greater than the Pond 6 storage volume of 25.2 acre-feet, Column 47 is set to 25.2. If Column 47 < 0, set to 0. In July, Column 47 must be <= 0 in order for the balance to work.
(48) If (Column 46 of current month) + (Column 47 of previous month) > Pond 6 storage volume of 25.2 acre-feet, Column 48 = "Overflow". Otherwise, Column 48 = "OK".
(49) Manually entered to move water between Pond 6 and New Storage/Disposal Site to ensure pond storage capacity is not exceeded.

2030 Flows: 1-in-100 Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 0.32

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(17)	(16)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	Climate Values, inches		Inflows, ac-ft							Treatment Ponds			Storage Pond 5					Golf Course Irrigation						
Month	Rainfall	Ref. ET	Base City	I&I	Town Field Runoff	COWRF Backwash	AWA Backwash	CDCR	ARSA	Rainfall	Evap.	Total Inflow to Pond 5	Rainfall	Evap.	To/From Storage	Net Storage	Historical Storage	Historical Demand	Theoretical Demand	Theoretical Pond Losses	Total Theoretical Demand	Provided by Partners	Provided by City	Total Provided
Oct.	2.2	3.24	48.5	3.5	0.0	2.0	0.71		11.3	1.0	(1.5)	54.2	0.8	(1.1)	4.5	36.7	37.1	37.4	9.0	0.3	9.3	9.3	0.0	9.3
Nov.	5.2	1.68	47.0	8.6	3.3	0.0	0.52		0.0	2.5	(0.8)	61.1	1.8	(0.6)	(5.6)	31.1	31.8	16.4	0.0	0.0	0.0	0.0	0.0	0.0
Dec.	6.6	1.21	48.5	10.8	20.7	0.0	0.52		0.0	3.1	(0.6)	83.1	2.3	(0.4)	(3.0)	28.0	28.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jan.	9.5	1.48	48.5	15.7	43.7	0.0	0.37		0.0	4.5	(0.7)	112.1	3.3	(0.5)	4.9	32.9	33.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feb.	5.9	1.95	43.8	9.7	8.0	0.0	0.46		0.0	2.8	(0.9)	63.8	2.1	(0.7)	1.2	34.1	34.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mar.	6.0	3.02	48.5	9.8	0.0	0.0	0.37		0.0	2.8	(1.4)	60.1	2.1	(1.1)	1.1	35.2	35.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr.	3.3	4.57	47.0	5.4	0.0	1.8	0.58		11.9	1.5	(2.2)	54.2	1.1	(1.6)	3.0	38.2	38.2	8.8	9.8	0.3	10.1	10.1	0.0	10.1
May	1.2	5.97	48.5	1.9	0.0	8.0	0.55		61.7	0.6	(2.8)	56.7	0.4	(2.1)	0.0	38.2	38.3	54.9	52.5	1.2	53.7	53.7	0.0	53.7
Jun.	0.4	7.19	47.0	0.7	0.0	11.6	0.25		89.4	0.2	(3.4)	56.3	0.2	(2.5)	(8.1)	30.0	30.4	71.8	76.1	1.7	77.8	77.8	0.0	77.8
Jul.	0.1	7.64	48.5	0.2	0.0	13.0	0.58		99.9	0.1	(3.6)	58.7	0.0	(2.7)	(3.6)	26.4	26.9	83.4	85.0	1.9	86.9	86.9	0.0	86.9
Aug.	0.2	6.98	47.0	0.4	0.0	11.6	0.49		89.4	0.1	(3.3)	56.3	0.1	(2.4)	0.9	27.3	27.7	78.1	76.1	1.7	77.8	77.8	0.0	77.8
Sep.	0.6	4.99	48.5	1.0	0.0	10.2	0.43		59.9	0.3	(2.4)	58.1	0.2	(1.7)	5.4	32.2	32.2	62.4	48.6	1.1	49.7	49.7	0.0	49.7
Total, AFY	**41.1**	**49.9**	**571**	**67.7**	**75.7**	**58.2**	**5.83**		**423.5**	**19.5**	**(23.7)**	**774.6**	**14.4**	**(17.5)**	**0.5**			**413.2**	**357.1**	**8.2**	**365.3**	**365.3**	**0**	**365.3**

Base City Flow	0.510 mgd

Town Field Runoff Calculation Parameters	
Soil Interception, inches	3
Percent Infiltration, saturated soil	0.4
Percent Infiltration, unsaturated soil	0.6
Min 2-month Rainfall for Saturation, inches	10
Max Precip Before Runoff Capture, inches	20

LAA Information	Town Field	City Field	Golf Course	Golf Course Pond
Area, acres	57	5.6	130	3.1
Crop Coefficient	0.32	0.32	0.88	--
Irr. Efficiency	0.80	0.80	0.84	--

Pond Information	Treatment 1	2	3	4	Storage 5	Percolation 6	7
Surface Area, acres	1.5	1.2	1.0	2.0	4.2	3.9	5.3
Storage Volume, ac-ft					41.7	25.2	25.8
Feb.-May. Perc. Rate, in/d						0.0	0.0
Jun.-Jan. Perc. Rate, in/d						0.0	0.0

(1) 1-in-100 year rainfall from Ione NCDC station (#044283)
(2) Reference evapotranspiration from Plymouth CIMIS station (Station 227)
(3) = (Base City Flow) x (number of days in month) x 3.07
(4) = 3.07 x (I&I in million gallons). I&I in million gallons = 0.539 x (rainfall in inches) - 0.012, using linear equation developed in this TM.
(5) = (Column 1 - Column 2 - interception of 3 inches - infiltration in inches)/(12 inches per foot) x (surface area of Town Field, 57 acres). If Column 1 > 8 inches, then set value of Column 1 to 8 inches.
Infiltration in inches = (percent infiltration) x (Column 1 - Column 2 - interception of 3 inches). If the sum of Column 1 in the current and previous month >= 10 inches, percent infiltration is 0.4. Otherwise, percent infiltration is 0.6.
(6) = (Column 9) x (Percentage of monthly COWRF influent flow discarded as backwash as defined in COGC TM) (see Attachment D)
(7) Average monthly AWA backwash flow from 2021 to 2024
(8) = 0. Assume no CDCR flow.
(9) = Column 21 / (1 - COWRF filter backwash percentage as defined in COGC TM) (see Attachment D)
(10) = (Column 1)/12 x (surface area of Ponds 1-4, 5.7 acres)
(11) = (Column 2)/12 x (surface area of Ponds 1-4, 5.7 acres)
(12) = Column 3 + Column 4 + Column 5 + Column 6 + Column 7 + Column 10 + Column 11
(13) = (Column 1)/12 x (surface area of Pond 5, 4.2 acres)
(14) = (Column 2)/12 x (surface area of Pond 5, 4.2 acres)
(15) = Column 12 + Column 13 + Column 14 - (Column 23 + Column 28 + Column 32 + Column 34)
(16) = Column 16 of previous month + Column 15 of current month. If this is greater than the Pond 5 volume of 41.7 acre-feet, Column 16 is set to 41.7.
In August, Column 16 is set to 21.2 and the value in Column 34 is adjusted so that the formula in Column 15 predicts this value.
(17) Monthly average storage volume in Pond 5 from 2019 to 2024
(18) Historical irrigation demand for COGC, from COGC TM (see Attachment D)
(19) = [Column 1 - (Column 2 x crop coefficient of 0.88)]/12 x (surface area of golf course, 130 acres) x (irrigation efficiency of 0.84). If Column 19 < 0, then set Column 19 to 0.
(20) = (Column 1 - Column 2)/12 x (surface area of golf course pond, 3.1 acres). If Column 20 < 0, then set Column 20 to 0.
(21) = Column 19 + Column 20
(22) = Column 21 - Column 23
(23) = 0. Assume no flow from the City.
(24) = Column 22 + Column 23

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

2030 Flows: 1-in-100 Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 0.32

	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)
	Town Field Irrigation				City Field Irrigation				Percolation Pond 7								Percolation Pond 6								
Month	Avail for Town	Historical Demand	Theoretical Demand	Provided by City	Avail for City	Historical Demand	Theoretical Demand	Provided by City	System Excess	Empty Pond 5	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Empty Pond 7	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Check for System Overflow	Discharge/ Store Elsewhere
Oct.	86.0	4.3	2.1	2.1	83.9	0.3	0.2	0.2	0.0	47	47.0	0.9	(1.4)	0.0	(26.5)	0.0	73	73.0	0.7	(1.1)	0.0	(25.3)	0.0	OK	97.9
Nov.	99.1	1.2	0.0	0.0	99.1	0.0	0.0	0.0	0.0	68	68.0	2.3	(0.7)	0.0	69.6	25.8		43.8	1.7	(0.5)	0.0	25.1	25.1	OK	19.8
Dec.	116.0	0.0	0.0	0.0	116.0	0.0	0.0	0.0	0.0	88	88.0	2.9	(0.5)	0.0	90.4	25.8		90.4	2.1	(0.4)	0.0	0.0	25.1	OK	92.1
Jan.	142.9	0.0	0.0	0.0	142.9	0.0	0.0	0.0	0.0	110	110.0	4.2	(0.7)	0.0	113.5	25.8		113.5	3.1	(0.5)	0.0	0.0	25.2	OK	116.1
Feb.	98.1	0.0	0.0	0.0	98.1	0.0	0.0	0.0	0.0	64	64.0	2.6	(0.9)	0.0	65.7	25.8		65.7	1.9	(0.6)	0.0	(0.0)	25.2	OK	67.0
Mar.	95.2	0.0	0.0	0.0	95.2	0.0	0.0	0.0	0.0	60	60.0	2.6	(1.3)	0.0	61.3	25.8		61.3	1.9	(1.0)	0.0	(0.1)	25.1	OK	62.3
Apr.	88.9	1.8	2.5	2.5	86.4	0.0	0.2	0.2	0.0	48	48.0	1.4	(2.0)	0.0	47.4	25.8		47.4	1.1	(1.5)	0.0	(0.0)	25.1	OK	47.0
May	93.2	0.6	9.1	9.1	84.0	0.3	0.9	0.9	0.0	45	45.0	0.5	(2.6)	0.0	42.9	25.8		42.9	0.4	(1.9)	0.0	0.0	25.1	OK	41.3
Jun.	92.1	15.4	12.8	12.8	79.3	1.2	1.3	1.3	0.0	48	48.0	0.2	(3.2)	0.0	45.0	25.8		45.0	0.1	(2.3)	0.0	(0.1)	25.1	OK	42.9
Jul.	86.1	13.5	14.3	14.3	71.8	1.2	1.4	1.4	0.0	44	44.0	0.1	(3.4)	0.0	40.7	25.8		40.7	0.0	(2.5)	0.0	0.0	25.1	OK	38.2
Aug.	80.4	21.2	12.8	12.8	67.6	1.8	1.3	1.3	0.0	39	39.0	0.1	(3.1)	0.0	36.0	25.8		36.0	0.1	(2.3)	0.0	0.0	25.1	OK	33.8
Sep.	83.8	11.7	8.3	8.3	75.5	1.8	0.8	0.8	0.0	42	42.0	0.3	(2.2)	0.0	40.1	25.8		40.1	0.2	(1.6)	0.0	0.0	25.2	OK	38.6
Total, AFY	**1161.8**	**69.7**	**61.9**	**61.9**	**1099.9**	**6.8**	**6.1**	**6.1**	**0.0**	**703**	**703.0**	**18.2**	**(22.0)**	**0.0**	**626.1**		**73**	**700**	**13.4**	**(16.2)**	**0.0**	**(0.1)**			**697**
									Total Inflows:		**703**					**Total Inflows:**		**700**					**Total Excess Water:**		**697**
									Total Outflows:		**0**					**Total Outflows:**		**0**							

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

(25) = (Column 16 of previous month) + Column 12 + Column 13 + Column 14 - Column 23. If Column 25 < 0, then set Column 25 to 0.
(26) Monthly average historical irrigation demand for Town Field from 2019 to 2024
(27) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of Town Field, 57 acres) x (irrigation efficiency of 0.8). If Column 27 < 0, then set Column 27 to 0.
(28) If Column 25 < Column 27, Column 25. Otherwise, Column 27.
(29) = Column 25 - Column 28. If Column 29 < 0, then set Column 29 to 0.
(30) Monthly average historical irrigation demand for City Field from 2018 to 2023.
(31) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of City Field, 5.6 acres) x (irrigation efficiency of 0.8). If Column 31 < 0, then set Column 31 to 0.
(32) If Column 29 < Column 31, Column 29. Otherwise, Column 31.
(33) = (Column 16 from previous month) + Column 15 - (Pond 5 volume, 41.7 acre-feet). If Column 33 < 0, then set Column 33 to 0.
(34) Manually entered to move water between Pond 5 and Pond 7 to approximately match historical Pond 5 volumes. Positive values indicate flow from Pond 5 to Pond 7. Negative values indicate flow from Pond 7 to Town Field/City Field.
(35) = Column 33 + Column 34
(36) = (Column 1)/12 x (surface area of Pond 7, 5.3 acres)
(37) = (Column 2)/12 x (surface area of Pond 7, 5.3 acres)
(38) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 7, 5.3 acres). Percolation rate set to 0 inches per day.
(39) = Column 35 + Column 36 + Column 37 + Column 38 - Column 41
(40) = Column 40 of previous month + Column 39 of current month. If this is greater than the Pond 7 volume of 25.8 acre-feet, Column 40 is set to 25.8. If this is < 0, Column 40 is set to 0. In August, Column 40 must be <= 0 in order for the balance to work.
(41) Manually entered to move water between Pond 7 and Pond 6. Positive values indicate flow from Pond 7 to Pond 6. Negative values indicate flow from Pond 6 to Pond 7.
(42) If Column 40 >= Pond 7 volume of 25.8 acre-feet, Column 42 = (Column 40 of previous month) + Column 39 + Column 41 - 25.8. If Column 40 < 25.8, Column 42 = Column 41.
(43) = (Column 1)/12 x (surface area of Pond 6,3.9 acres)
(44) = (Column 2)/12 x (surface area of Pond 6, 3.9 acres)
(45) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 6, 3.9 acres). Percolation rate set to 0 inches per day.
(46) = Column 42 + Column 43 + Column 44 + Column 45
(47) = Column 47 of previous month + Column 46 of current month. If this is greater than the Pond 6 storage volume of 25.2 acre-feet, Column 47 is set to 25.2. If Column 47 < 0, set to 0. In July, Column 47 must be <= 0 in order for the balance to work.
(48) If (Column 46 of current month) + (Column 47 of previous month) > Pond 6 storage volume of 25.2 acre-feet, Column 48 = "Overflow". Otherwise, Column 48 = "OK".
(49) Manually entered to move water between Pond 6 and New Storage/Disposal Site to ensure pond storage capacity is not exceeded.

2030 Flows: 1-in-100 Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(17)	(16)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	Climate Values, inches		Inflows, ac-ft							Treatment Ponds			Storage Pond 5					Golf Course Irrigation						
Month	Rainfall	Ref. ET	Base City	I&I	Town Field Runoff	COWRF Backwash	AWA Backwash	CDCR	ARSA	Rainfall	Evap.	Total Inflow to Pond 5	Rainfall	Evap.	To/From Storage	Net Storage	Historical Storage	Historical Demand	Theoretical Demand	Theoretical Pond Losses	Total Theoretical Demand	Provided by Partners	Provided by City	Total Provided
Oct.	2.2	3.24	48.5	3.5	0.0	2.0	0.71		11.3	1.0	(1.5)	54.2	0.8	(1.1)	5.7	37.9	37.1	37.4	9.0	0.3	9.3	9.3	0.0	9.3
Nov.	5.2	1.68	47.0	8.6	3.3	0.0	0.52		0.0	2.5	(0.8)	61.1	1.8	(0.6)	(6.6)	31.3	31.8	16.4	0.0	0.0	0.0	0.0	0.0	0.0
Dec.	6.6	1.21	48.5	10.8	20.7	0.0	0.52		0.0	3.1	(0.6)	83.1	2.3	(0.4)	(3.0)	28.2	28.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jan.	9.5	1.48	48.5	15.7	43.7	0.0	0.37		0.0	4.5	(0.7)	112.1	3.3	(0.5)	4.9	33.1	33.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feb.	5.9	1.95	43.8	9.7	8.0	0.0	0.46		0.0	2.8	(0.9)	63.8	2.1	(0.7)	1.2	34.3	34.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mar.	6.0	3.02	48.5	9.8	0.0	0.0	0.37		0.0	2.8	(1.4)	60.1	2.1	(1.1)	1.1	35.4	35.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr.	3.3	4.57	47.0	5.4	0.0	1.8	0.58		11.9	1.5	(2.2)	54.2	1.1	(1.6)	3.2	38.5	38.2	8.8	9.8	0.3	10.1	10.1	0.0	10.1
May	1.2	5.97	48.5	1.9	0.0	8.0	0.55		61.7	0.6	(2.8)	56.7	0.4	(2.1)	(0.2)	38.3	38.3	54.9	52.5	1.2	53.7	53.7	0.0	53.7
Jun.	0.4	7.19	47.0	0.7	0.0	11.6	0.25		89.4	0.2	(3.4)	56.3	0.2	(2.5)	(8.1)	30.2	30.4	71.8	76.1	1.7	77.8	77.8	0.0	77.8
Jul.	0.1	7.64	48.5	0.2	0.0	13.0	0.58		99.9	0.1	(3.6)	58.7	0.0	(2.7)	(3.9)	26.3	26.9	83.4	85.0	1.9	86.9	86.9	0.0	86.9
Aug.	0.2	6.98	47.0	0.4	0.0	11.6	0.49		89.4	0.1	(3.3)	56.3	0.1	(2.4)	1.0	27.3	27.7	78.1	76.1	1.7	77.8	77.8	0.0	77.8
Sep.	0.6	4.99	48.5	1.0	0.0	10.2	0.43		59.9	0.3	(2.4)	58.1	0.2	(1.7)	5.0	32.2	32.2	62.4	48.6	1.1	49.7	49.7	0.0	49.7
Total, AFY	**41.1**	**49.9**	**571**	**67.7**	**75.7**	**58.2**	**5.83**		**423.5**	**19.5**	**(23.7)**	**774.6**	**14.4**	**(17.5)**				**413.2**	**357.1**	**8.2**	**365.3**	**365.3**	**0**	**365.3**

Base City Flow	0.510 mgd

Town Field Runoff Calculation Parameters	
Soil Interception, inches	3
Percent Infiltration, saturated soil	0.4
Percent Infiltration, unsaturated soil	0.6
Min 2-month Rainfall for Saturation, inches	10
Max Precip Before Runoff Capture, inches	20

LAA Information	Town Field	City Field	Golf Course	Golf Course Pond
Area, acres	57	5.6	130	3.1
Crop Coefficient	1.00	1.00	0.88	--
Irr. Efficiency	0.80	0.80	0.84	--

Pond Information	Treatment 1	2	3	4	Storage 5	Percolation 6	7
Surface Area, acres	1.5	1.2	1.0	2.0	4.2	3.9	5.3
Storage Volume, ac-ft					41.7	25.2	25.8
Feb.-May. Perc. Rate, in/d						0.0	0.0
Jun.-Jan. Perc. Rate, in/d						0.0	0.0

(1) 1-in-100 year rainfall from Ione NCDC station (#044283)
(2) Reference evapotranspiration from Plymouth CIMIS station (Station 227)
(3) = (Base City Flow) x (number of days in month) x 3.07
(4) = 3.07 x (I&I in million gallons). I&I in million gallons = 0.539 x (rainfall in inches) - 0.012, using linear equation developed in this TM.
(5) = (Column 1 - Column 2 - interception of 3 inches - infiltration in inches)/(12 inches per foot) x (surface area of Town Field, 57 acres). If Column 1 > 8 inches, then set value of Column 1 to 8 inches.
Infiltration in inches = (percent infiltration) x (Column 1 - Column 2 - interception of 3 inches). If the sum of Column 1 in the current and previous month >= 10 inches, percent infiltration is 0.4. Otherwise, percent infiltration is 0.6.
(6) = (Column 9) x (Percentage of monthly COWRF influent flow discarded as backwash as defined in COGC TM) (see Attachment D)
(7) Average monthly AWA backwash flow from 2021 to 2024
(8) = 0. Assume no CDCR flow.
(9) = Column 21 / (1 - COWRF filter backwash percentage as defined in COGC TM) (see Attachment D)
(10) = (Column 1)/12 x (surface area of Ponds 1-4, 5.7 acres)
(11) = (Column 2)/12 x (surface area of Ponds 1-4, 5.7 acres)
(12) = Column 3 + Column 4 + Column 5 + Column 6 + Column 7 + Column 10 + Column 11
(13) = (Column 1)/12 x (surface area of Pond 5, 4.2 acres)
(14) = (Column 2)/12 x (surface area of Pond 5, 4.2 acres)
(15) = Column 12 + Column 13 + Column 14 - (Column 23 + Column 28 + Column 32 + Column 34)
(16) = Column 16 of previous month + Column 15 of current month. If this is greater than the Pond 5 volume of 41.7 acre-feet, Column 16 is set to 41.7.
In September, Column 16 is set to 0 and the value in Column 34 is adjusted so that the formula in Column 15 predicts this value.
(17) Monthly average storage volume in Pond 5 from 2019 to 2024
(18) Historical irrigation demand for COGC, from COGC TM (see Attachment D)
(19) = [Column 1 - (Column 2 x crop coefficient of 0.88)]/12 x (surface area of golf course, 130 acres) x (irrigation efficiency of 0.84). If Column 19 < 0, then set Column 19 to 0.
(20) = (Column 1 - Column 2)/12 x (surface area of golf course pond, 3.1 acres). If Column 20 < 0, then set Column 20 to 0.
(21) = Column 19 + Column 20
(22) = Column 21 - Column 23
(23) = 0. Assume no flow from the City.
(24) = Column 22 + Column 23

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

2030 Flows: 1-in-100 Rainfall Year Water Balance for City of Ione Wastewater Treatment Plant, No Percolation, Crop Coefficient of 1

	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)
	Town Field Irrigation				City Field Irrigation				Percolation Pond 7								Percolation Pond 6								
Month	Avail for Town	Historical Demand	Theoretical Demand	Provided by City	Avail for City	Historical Demand	Theoretical Demand	Provided by City	System Excess	Empty Pond 5	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Empty Pond 7	Total Flow to Pond	Rainfall	Evap.	Potential Perc.	To/From Storage	Cum. Storage	Check for System Overflow	Discharge/ Store Elsewhere
Oct.	86.0	4.3	6.5	6.5	79.5	0.3	0.6	0.6	0.0	41	41.0	0.9	(1.4)	0.0	(26.5)	0.0	67	67.0	0.7	(1.1)	0.0	(25.2)	0.0	OK	91.8
Nov.	100.3	1.2	0.0	0.0	100.3	0.0	0.0	0.0	0.0	69	69.0	2.3	(0.7)	0.0	70.6	25.8		44.8	1.7	(0.5)	0.0	25.1	25.1	OK	20.8
Dec.	116.2	0.0	0.0	0.0	116.2	0.0	0.0	0.0	0.0	88	88.0	2.9	(0.5)	0.0	90.4	25.8		90.4	2.1	(0.4)	0.0	0.0	25.1	OK	92.1
Jan.	143.1	0.0	0.0	0.0	143.1	0.0	0.0	0.0	0.0	110	110.0	4.2	(0.7)	0.0	113.5	25.8		113.5	3.1	(0.5)	0.0	0.0	25.2	OK	116.1
Feb.	98.3	0.0	0.0	0.0	98.3	0.0	0.0	0.0	0.0	64	64.0	2.6	(0.9)	0.0	65.7	25.8		65.7	1.9	(0.6)	0.0	(0.0)	25.2	OK	67.0
Mar.	95.4	0.0	0.0	0.0	95.4	0.0	0.0	0.0	0.0	60	60.0	2.6	(1.3)	0.0	61.3	25.8		61.3	1.9	(1.0)	0.0	(0.1)	25.1	OK	62.3
Apr.	89.1	1.8	7.8	7.8	81.3	0.0	0.8	0.8	0.0	42	42.0	1.4	(2.0)	0.0	41.4	25.8		41.4	1.1	(1.5)	0.0	(0.0)	25.1	OK	41.0
May	93.5	0.6	28.4	28.4	65.1	0.3	2.8	2.8	0.0	24	24.0	0.5	(2.6)	0.0	21.9	25.8		21.9	0.4	(1.9)	0.0	0.0	25.1	OK	20.3
Jun.	92.2	15.4	40.1	40.1	52.1	1.2	3.9	3.9	0.0	18	18.0	0.2	(3.2)	0.0	15.0	25.8		15.0	0.1	(2.3)	0.0	0.0	25.2	OK	12.8
Jul.	86.3	13.5	44.6	44.6	41.7	1.2	4.4	4.4	0.0	11	11.0	0.1	(3.4)	0.0	7.7	25.8		7.7	0.0	(2.5)	0.0	(0.1)	25.1	OK	5.3
Aug.	80.2	21.2	40.0	40.0	40.2	1.8	3.9	3.9	0.0	9	9.0	0.1	(3.1)	0.0	6.0	25.8		6.0	0.1	(2.3)	0.0	(0.0)	25.1	OK	3.9
Sep.	83.8	11.7	25.9	25.9	57.8	1.8	2.5	2.5	0.0	23	23.0	0.3	(2.2)	0.0	21.1	25.8		21.1	0.2	(1.6)	0.0	0.0	25.1	OK	19.6
Total, AFY	**1164.2**	**69.7**	**193.4**	**193.4**	**970.8**	**6.8**	**19.0**	**19.0**	**0.0**	**559**	**559.0**	**18.2**	**(22.0)**	**0.0**	**488.1**		**67**	**556**	**13.4**	**(16.2)**	**0.0**	**(0.0)**			**553**
									Total Inflows:		**559**					**Total Inflows:**		**556**					**Total Excess Water:**		**553**
									Total Outflows:		**0**					**Total Outflows:**		**0**							

Legend for Cell Shading
- Value not directly used
- Historical value used as reference
- Independent variable (manual input)

(25) = (Column 16 of previous month) + Column 12 + Column 13 + Column 14 - Column 23. If Column 25 < 0, then set Column 25 to 0.
(26) Monthly average historical irrigation demand for Town Field from 2019 to 2024
(27) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of Town Field, 57 acres) x (irrigation efficiency of 0.8). If Column 27 < 0, then set Column 27 to 0.
(28) If Column 25 < Column 27, Column 25. Otherwise, Column 27.
(29) = Column 25 - Column 28. If Column 29 < 0, then set Column 29 to 0.
(30) Monthly average historical irrigation demand for City Field from 2018 to 2023.
(31) = [Column 1 - (Column 2 x crop coefficient of 0.32)]/12 x (surface area of City Field, 5.6 acres) x (irrigation efficiency of 0.8). If Column 31 < 0, then set Column 31 to 0.
(32) If Column 29 < Column 31, Column 29. Otherwise, Column 31.
(33) = (Column 16 from previous month) + Column 15 - (Pond 5 volume, 41.7 acre-feet). If Column 33 < 0, then set Column 33 to 0.
(34) Manually entered to move water between Pond 5 and Pond 7 to approximately match historical Pond 5 volumes. Positive values indicate flow from Pond 5 to Pond 7. Negative values indicate flow from Pond 7 to Town Field/City Field.
(35) = Column 33 + Column 34
(36) = (Column 1)/12 x (surface area of Pond 7, 5.3 acres)
(37) = (Column 2)/12 x (surface area of Pond 7, 5.3 acres)
(38) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 7, 5.3 acres). Percolation rate set to 0 inches per day.
(39) = Column 35 + Column 36 + Column 37 + Column 38 - Column 41
(40) = Column 40 of previous month + Column 39 of current month. If this is greater than the Pond 7 volume of 25.8 acre-feet, Column 40 is set to 25.8. If this is < 0, Column 40 is set to 0. In August, Column 40 must be <= 0 in order for the balance to work.
(41) Manually entered to move water between Pond 7 and Pond 6. Positive values indicate flow from Pond 7 to Pond 6. Negative values indicate flow from Pond 6 to Pond 7.
(42) If Column 40 >= Pond 7 volume of 25.8 acre-feet, Column 42 = (Column 40 of previous month) + Column 39 + Column 41 - 25.8. If Column 40 < 25.8, Column 42 = Column 41.
(43) = (Column 1)/12 x (surface area of Pond 6,3.9 acres)
(44) = (Column 2)/12 x (surface area of Pond 6, 3.9 acres)
(45) = (percolation rate in inches per day)/(12 inches per foot) x (number of days in month) x (surface area of Pond 6, 3.9 acres). Percolation rate set to 0 inches per day.
(46) = Column 42 + Column 43 + Column 44 + Column 45
(47) = Column 47 of previous month + Column 46 of current month. If this is greater than the Pond 6 storage volume of 25.2 acre-feet, Column 47 is set to 25.2. If Column 47 < 0, set to 0. In July, Column 47 must be <= 0 in order for the balance to work.
(48) If (Column 46 of current month) + (Column 47 of previous month) > Pond 6 storage volume of 25.2 acre-feet, Column 48 = "Overflow". Otherwise, Column 48 = "OK".
(49) Manually entered to move water between Pond 6 and New Storage/Disposal Site to ensure pond storage capacity is not exceeded.

KJELDSEN SINNOCK NEUDECK
CIVIL ENGINEERS & LAND SURVEYORS

Stephen
Christopher H. Neudeck, P.E.
Neal T. Colwell, P.E.
Barry O'Regan, P.E.

2518-0050
01-001

TECHNICAL MEMORANDUM

December 13, 2024
Revised February 24, 2025

To: Teauna Miranda, Warden, Mule Creek State Prison
Catherine Frazer, Staff Director, California Dept. of Forestry and Fire Protection

CC: Isolette Gunther, California Department of Corrections and Rehabilitation
Gregor Larabee, California Department of Corrections and Rehabilitation
Laurie Perri, California Department of Corrections and Rehabilitation
Estevan Fregeau, Mule Creek State Prison
Anthony Orta, Mule Creek State Prison
Anthony Stark, Mule Creek State Prison
Antony Wilson, Mule Creek State Prison

Subject: Mule Creek State Prison Individual Water Balance

Project: Mule Creek State Prison Water Balance Calculations and Revised Report of Waste Discharge

Prepared By: Jade Fredeen E.I.T.
Todd Thompson, R.C.E. 58278

Reviewed By: Neal Colwell R.C.E. 59437

1.0 Purpose and Objective

This technical memorandum is a response to the California Regional Water Quality Control Board's August 14, 2024 letter to the California Department of Corrections and Rehabilitation (CDCR) regarding the treatment and disposal capacity of the Wastewater Treatment Plant (WWTP) serving Mule Creek State Prison (MCSP). The wastewater treatment system serves not only MCSP, but includes the Mule Creek Infill Complex (MCIC), the CalFire Training Academy (CFTA), and the Preston Youth Correctional Facility (PYCF). In particular, the letter, issued under Section 13267 of the California Water Code, requested:

- Forecasted wastewater flows for the next 5 years, based from official planning documents, broken down by each source;
- The forecasted wastewater flows should be broken down for all influent sources, including Mule Creek State Prison, the CalFire Training Academy, and the Preston Youth Correctional Facility;
- Any changes to treatment and/or disposal capacity or demand caused by the selected option related to the industrial waste stream;

- The additional disposal capacity from the selected option in Land Application Area Development Technical Report required by the October 6, 2023, Notice of Violation.

If the facility does not have sufficient capacity to treat and dispose of all wastewater onsite, the response is requested to identify the volume of excess effluent that would need to be treated and disposed each year without causing a permit violation or a condition of pollution.

The water balance needed to identify the treatment and disposal capacity conditions noted above, is required to comply with the requirement and guidance of a document attached to the letter entitled: Attachment A: Requirements for Water Balance and Calibration. It is to be limited to CDCR owned and operated property and facilities.

2.0 Historical Water Balance Calculations and Summary of Results

The previous water balance submitted to the Regional Water Quality Control Board, Central Valley Region (RWQCB) was completed on June 1, 2020, and prepared by Kjeldsen, Sinnock, and Neudeck, Inc. (KSN, Inc). The balance was performed in response to a Notice of Violation (NOV) issued on August 13, 2018 and included with a Report of Waste Discharge submitted to the RWQCB. That NOV requested an "Evaluation of compliance under the Waste Discharge Requirements (WDRs) under reduced land application area (LAA)". Since that submission, the LAA use for disposal has not changed.

MCSP has a total of 6 areas used as LAAs, composing a total of approximately 200 acres. The effective area of these LAAs were estimated through an evaluation of historical LAA layouts, modifications to the irrigation system/LAAs as a result of improvements to the site (e.g., construction of the Mule Creek Infill Complex [MCIC]), and through examination of existing aerial imagery indicating the area effectively having treated effluent applied.

The purpose of the MCSP LAAs is to achieve land disposal of treated effluent originating from the MCSP, CFTA, and remaining limited wastewater generated from the now closed PYCF. Land disposal is accomplished through evapotranspiration and limited percolation of treated effluent applied to the LAAs, with remaining effluent constituents being treated, retained in the soil, and/or volatized into the atmosphere. Waste Discharge Order R5-2015-0129 (2015 Order or WDRs) issued for the WWTP includes discharge specifications and LAA specifications to protect beneficial uses of receiving waters. Receiving water objectives are as listed in the Basin Plan and are applicable as noted in the 2015 Order.

The last water balance proposed changes to the management and the operation of the LAAs, which were incorporated into the June 2020 Report of Waste Discharge Technical Report. In particular, the last water balance proposed that MCSP operations promote the establishment of perennial vegetation on the LAAs through the elimination of the use of herbicides and a reduction of disking and mowing of the LAAs. The last water balance also looked at salinity and nitrate in the LAAs. It recommended rotation of the LAA of several years to promote leaching of salts and promote vegetative growth and minimize soil accumulations that may be detrimental (i.e., salt accumulations).

Projected loading was estimated for each LAA and over a range of hydraulic conditions for a projected 0.57 Mgal/d Average Dry Weather Flow (ADWF), where 0.57 represented the projected average influent flow to the MCSP WWTP

from MCSP, the MCIC, CFTA, and PYCF. Water balance evaluations of storage and disposal were performed with that flow scenario and assuming that disposal was performed using:

- Application to the currently existing LAAs,
- Discharge to the Castle Oaks Water Recycling Plant (COWRP) of no more than 350 ac-ft per year (approximately 114 million gallons)
- With a 1-in-100 yr precipitation season followed by 1-in-50 and average year precipitation seasons.

The resulting calculations showed that the projected average influent flow could be treated and disposed of by the current infrastructure. However, under a 1-in-100 year precipitation season with a 0.57 Mgal/d flow would result in water that cannot be applied to fields without the need for discharge of up to 350 ac-feet (114 million gallons) of excess water to the COWRP system. Some conservative assumptions do affect the result, such as using the crop coefficient for a wet year and assuming no percolation out of the MCSP effluent storage reservoir. While not inappropriate for high rainfall season, using a wet year crop coefficient adds another conservative factor to the estimate that reduces how much the LAA can dispose. This is a worst-case scenario with a very low probability of ever occurring.

3.0 MCSP, MCIC, Cal Fire, and PYCF Historical Flows and Flow Projections

The flows treated by MCSP WWTP have generally remained stable since the last water balance. As noted above, the MCSP system has several sub-systems, in addition to MCSP, that use the system for wastewater treatment and disposal. They are MCIC, PYCF, and the CFTA. A summary of the recent average relative contribution by source to the MCSP WWTP is given below in Table 1.

Table 1
Proportion of Recent Average Flow Contributions to the MCSP WWTP

Source	Flow Contribution, %
MCSP	72%
MCIC	26%
CFTA	1.4%
PYCF	0.2%
Total:	100%

A schematic of the interrelation of the existing sources and current flow monitoring locations is presented below in Figure 1.

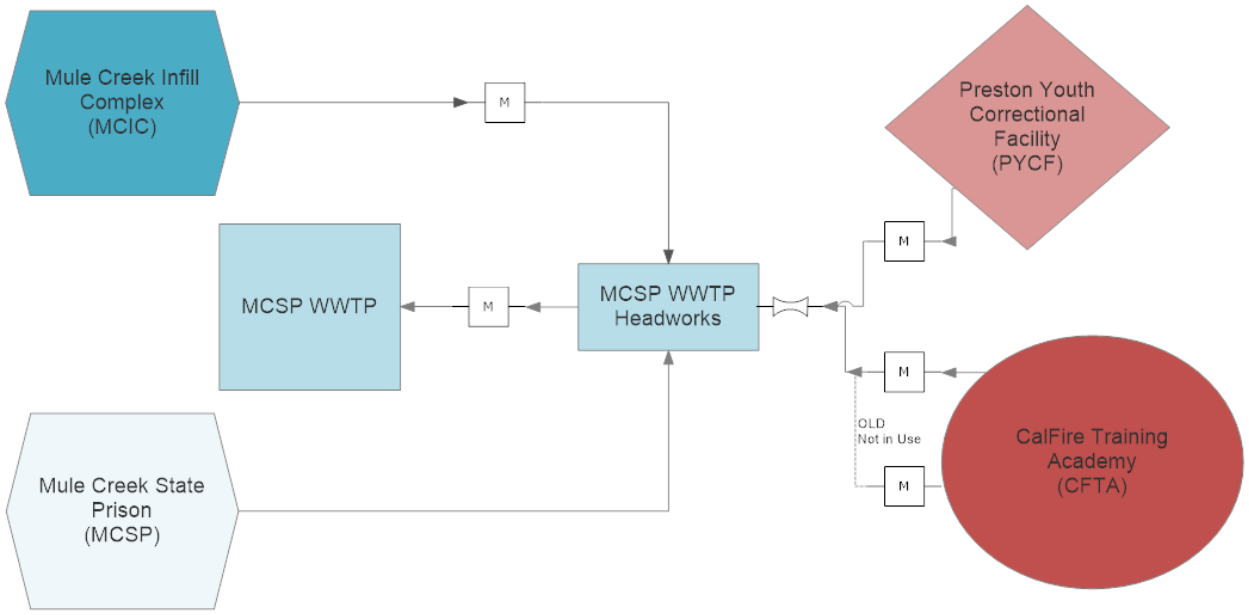


Figure 1
Schematic of Existing Sources and Flow Monitoring Points

The influent flow meter at the MCSP WWTP captures flows from all sources, including, MCSP (with all flows internal to the MCSP operations), MCIC (including all flows internal to the MCIC operations), inputs from the PYCF, and flows from the CFTA. A map of the locations of the sub-systems served by the MCSP WWTP is provided in Figure 2.

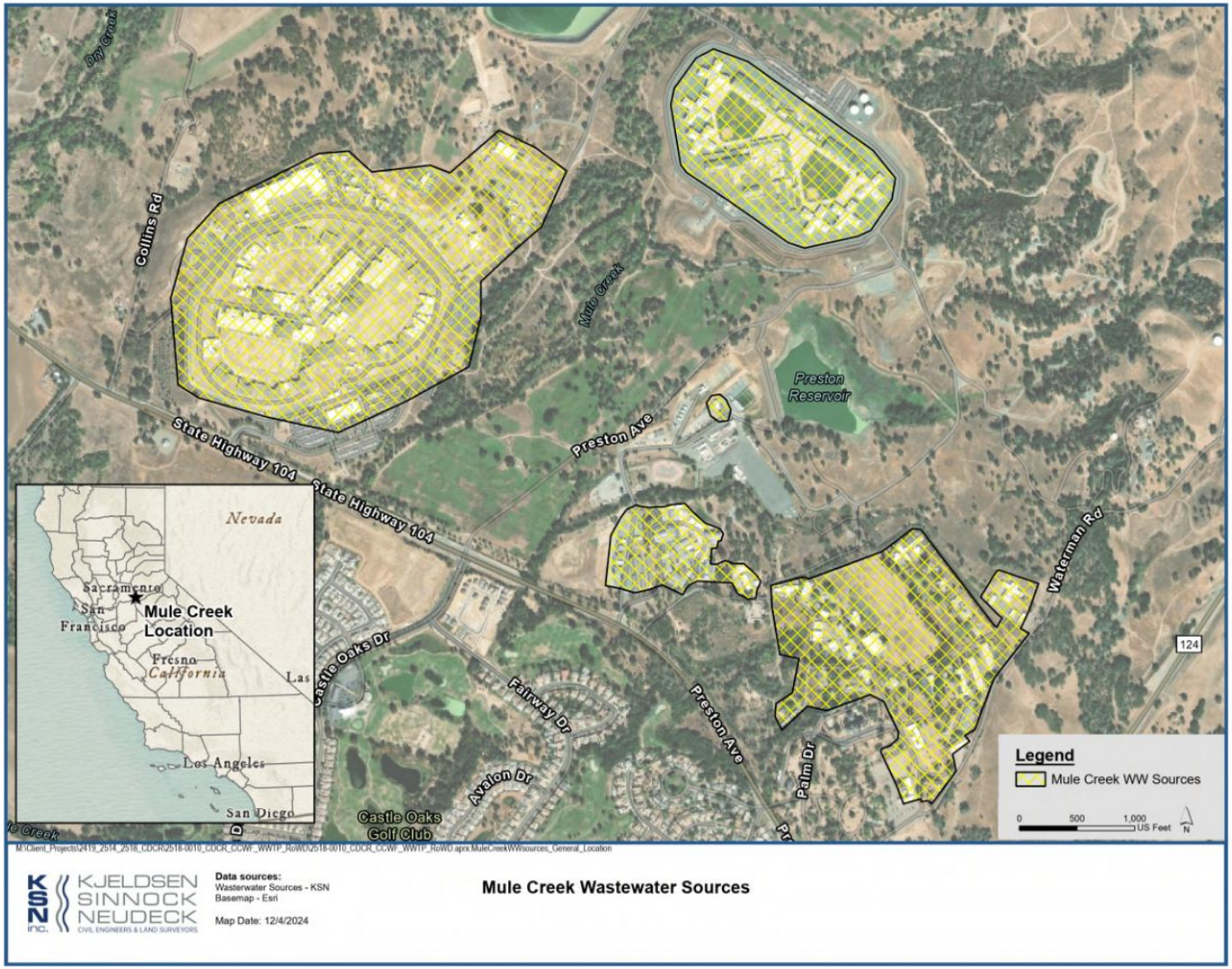


Figure 2
MCSP Wastewater Service Area Map

3.1 MCSP and MCIC Flows and Population

As can be seen from Figure 1, the MCSP WWTP influent flow captures the total influent flow from all sources with a separate measurement of flows originating from the MCIC and PYCF and CFTA. To calculate the flows originating from the MCSP only, those other flows must be subtracted from the WWTP influent flow total. The total MCSP WWTP influent wastewater flows have increased since 2016 as the populations between MCSP and MCIC shifted and as the MCIC population increased to current levels, resulting in a recent stabilized average dry weather influent flow[1] of approximately 0.51 Mgal/d. A review of winter-month average flows and storm-period daily flow totals, indicates that the overall system appears to have some Infiltration and Inflow (I&I). This is indicated by recent peak day influent flows of 1.04 Mgal/d (March 3, 2019), 0.97 Mgal/d (January 28, 2021) and recent peak month influent average flow of up to 0.58 Mgal/d (Feb. 28, 2023). During these time periods the combined MCSP/MCIC population average was 3,876, with a range of 3,743 to 4,051. Reported population data is presented in Exhibit A.

While MCSP does not have industrial waste streams per se, MCSP has several training facilities for prisoner rehabilitation. These include garment and mattress assembly, medical/clinical training, janitorial and HVAC training, coffee roasting, lunch packaging, woodworking and metal working training. None of these facilities appear to generate much wastewater. There is also a meat packing and a laundry. The additional wastewater stream associated with the meat packing is limited but does exist. It is mostly limited to the daily post-operation wash down. The laundry facility operates regularly, producing wastewater generated from laundry service provided to the MCSP, MCIC, CFTA, and other Northern California institutions. However, the wastewater flows from the meat packing and the laundry services are included in the MCSP WWTP influent flow measurement and are part of the per-capita distribution. The waste discharge requirements, Order R5-2015-0129, assigned 0.13 Mgal/day for the laundry. However, adding that flow to the actual measured influent flows would result in a double counting error because they are included in the existing flow basis.

MCIC wastewater flows have nominally increased since 2019 but stabilized at about 0.14 Mgal/d through 2024. The system appears to have no discernable infiltration and inflow as seen with no identifiable flow increases during winter storm events such as the storms in late December 2022 and early January 2023 and through March 2023. MCIC also has rehabilitation and training activities. Like MCSP, those activities do not appear to contribute much to the waste stream and are captured in the per capita flow estimate for the facility. Historical MCSP and MCIC average monthly flow totals and population is shown below in Figure 3 through September 2024.

[1] Calculated based on the average of monthly flows for June, July, and August.

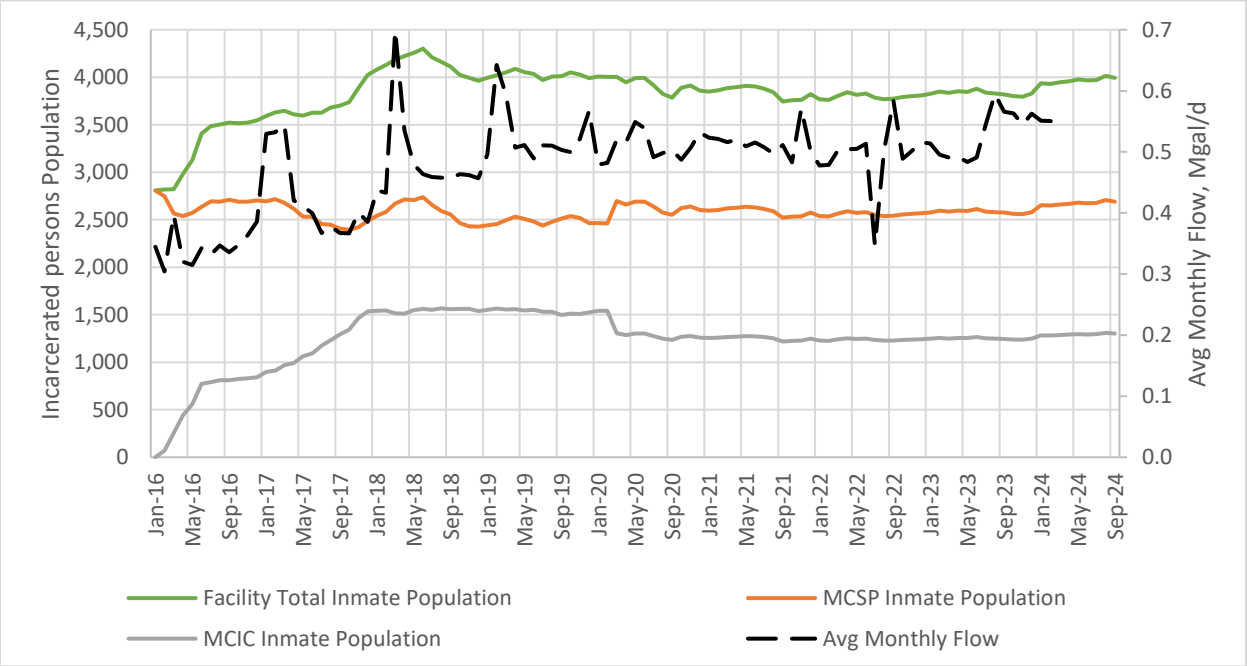


Figure 3
Average MCSP and MCIC Monthly Flow Totals and Incarcerated persons Populations

3.2 CFTA Flows and Population

CFTA wastewater flows vary seasonally and year to year depending upon the number of trainees at the facility. The program objective for cadet training is set by the Governor's office on an annual basis[2], with training assignments to the various statewide facilities varying based on facility capacity and other factors. The recent annual cadet population at the CFTA has been approximately 1,216 cadets in 2023 and 1,373 cadets in 2024, and a projected 1,321 cadets for 2025, with a weekly staff of 120[3]. Current CFTA facilities are limited by the 238 dormitory-style beds for cadets (see Exhibit B) with the 120 staff supporting the CFTA operations split into shifts. The facility has a cafeteria that serves breakfast and lunch. The dormitories have laundry facilities for the residents and for fire equipment. CFTA sends all bedding to be washed to MCSP.

Assuming that 75% to 100% of the CFTA bed capacity is used for any given cohort of cadets, then the recent historical and projected 2025 cadet annual totals would suggest that five to eight training groups come through the CFTA per year. CFTA staff indicated that typical courses rotations occur from January to July[4]. A conservative assumption would be that the facility is fully occupied with 238 cadets and 120 staff during each training session.

Historical flow monitoring for the CFTA occurred at a flow monitoring manhole on the CFTA site, with an existing combined flow meter located at the MCSP WWTP headworks intended to measure combined flow from the CFTA and PYCF using a flume and level sensor on the incoming wastewater line at the WWTP headworks. In mid-2023 (around May 2023) the CFTA installed a flow measurement device in a manhole that serves the CFTA facilities. This flow

[2] Personal communication Jonathan Allen, Chief of Plant Operations, Cal Fire Training Center, November 12, 2024.
[3] Ibid.
[4]Personal communication Jonathan Allen, Chief of Plant Operations, Cal Fire Training Center, November 12, 2024.

measurement device is reported to consist of a SonicSens 3 level sensor and data logging device. At this time the accuracy of this instrumentation to measure and record flow totals in this manhole are suspect and therefore this flow data is not considered to be accurate. Because of a noted backwater effect on the flume level sensor at the MCSP WWTP headworks, the combined influent flow intended to measure flow from the PYCF and CFTA is not expected to be accurate. Therefore, existing, and potential future flows from the CFTA are estimated as outlined below in Table 2.

Table 2
Estimated Cal Fire Training Academy Maximum Wastewater Generation Rate

Occupancy Group	Unit Wastewater Generation Rate (gal/unit/day)[5]	Daily Occupancy	Estimated Wastewater Generation, gallons per day
Cadet Trainees	100	238	23,800
Staff	20	120	2,400
		Total	**26,200**

The above estimated wastewater generation rates are supported by recent recorded potable water use at the CFTA from Amador Water Agency records provided by CFTA for 2020, 2022 and 2023. The records were evaluated for recent average daily use in 2022 to 2023 during the highest expected occupancy time frame of March to June. The average daily water use from 2022 to 2023 during the maximum occupancy timeframe is estimated at 25,952 gallons per day.

3.3 PYCF Flows

PYCF is currently in a warm shut down status meaning that the facilities are maintained in a semi-ready status for potential use or occupancy sometime in the future. At this time there are no plans for the PYCF to be occupied with any wastewater to be discharged to the MCSP WWTP. The only flows coming from the PYCF are associated with rain events. Due to its age, the wastewater system is interconnected with the old storm sewers giving the system significant flows during wet weather. The flow from the PYCF facility is negligible for most dry days as evidenced by the available flow records for the dry months of the year, for 2022 and 2023. 2024 flow data are indicative of reported water system leaks that were discovered in February and partially repaired in May 2024. Current dry-period flow monitoring for the PYCF suggests that water leaks still exist in the PYCF and are continuing to contribute to the wastewater stream. Since circa 2014, a separate flow meter at Preston Lift Station has existed to record and report daily flow from the PYCF. However, for the purposes of this assessment, it was found that the only useable data started in January 2022. The maximum recorded flow during wet weather is 293,898 gallons per day (Dec. 31, 2022). Table 3 presents an assessment of the recent water year 2023 and 2024 meter data and Infiltration and Inflow as a function of monthly total precipitation. This recent data is compared to the previous estimates of I&I generated during preparation of prior MCSP technical studies and as used in the June 2020 Report of Waste Discharge, as estimated based on water year 2017 data. Based on this analysis, continued use of the water year 2017 PYCF flows are supported for this water balance as a reasonably conservative basis for flows occurring during a 1-in-100 year precipitation season from the PYCF system.

[5] Based on Table H201.1(4) of Appendix H of the California Plumbing Code.

Table 3
PYCF Monthly Average Flow Rates and Estimated I&I

	WY 2023			WY 2024			WY 2017 Estimates		
Month	Average Flow (gal/d)	Monthly Rain (in)	I&I (Avg. gallons per day per inch)	Average Flow (gal/d)	Monthly Rain (in)	I&I (Avg. gallons per day per inch)	2016/2017 Estimated I&I (gal/d)	Monthly Rain (in)	Equivalent I&I (Avg. gallons per day per inch)
October	44	0	-	111	0	-	11,000	5.98	1,839
November	717	1.89	379	299	1.06	282	14,000	3.08	4,545
December	49,624	9.42	4,949	204	2.11	97	16,000	3.48	4,597
January	70,416	9.73	7,237	8,451	3.86	2,189	67,000	11.97	5,597
February	5,143	2.19	2,348	31,620	4.49	Water Leak[1]	97,000	9.75	9,948
March	62,084	6.27	9,901	31,516	3.19	Water Leak	29,000	3.29	8,815
April	5,920	0.26	22,769	31,767	1.73	Water Leak	23,000	3.18	7,232
May	743	0.46	1,615	11,816	0.75	Water Leak	1,000	0.25	4,000
June	201	0.03	-	4,663	0	Water Leak[2]	0	0.19	-
July	45	0	-	3,577	0	Water Leak	0	0	-
August	128	0	-	5,135	0	Water Leak	0	0	-
September	51	0.43	-	3,740	0	Water Leak	0	0	-
Total	**-**	**30.68**	**-**	**-**	**17.19**	**-**	**-**	**41.17**	**-**

[1] PYCF Leaks found and reported in the Wastewater Transmission Line Inspection Form, February 2024.

[2] PYCF Wastewater Transmission Line Inspection Form noted no leaks as of June 2024. Uncharacteristically high flows are still reported from June to September 2024 indicating leaks still exist.

3.4 Flow Summary and Estimates

Flows used in the water balance calculations consist of the following:

1. Average dry weather flows for the MCSP, MCIC, and CFTA; and
2. Monthly I&I rates for the MCSP, MCIC, and PYCF.

For these monthly-based water balance calculations, I&I is estimated based on subtracting the flow of wastewater origins, calculated as the ADWF, from the total influent flow on a monthly basis. This requires a reasonable estimate of the flow of wastewater origins contemporaneous with the winter-period flow assumed to include I&I. The June 2020 Report of Waste Discharge evaluated available flow data from Water Year 2017 as a means to estimate I&I under a 1-in-100 year precipitation season. The evaluation summarized in Table 4 presents the estimated I&I from recent MCSP

(inclusive of PYCF and CFTA flows) and MCIC flow data and compares those values to the 1-in-100 year I&I values developed for the June 2020 Report of Waste Discharge. The data analysis is presented in more detail in Exhibit B.

Table 4
Assessment and Comparison of MCSP* and MCIC Estimated I&I

	WY 2020		WY 2021		WY 2022		WY 2023		WY 2024		WY 2017 Basis		
Month	MCSP I&I* (Mgal/d)	MCIC I&I* (Mgal/d)	MCSP I&I* (Mgal/d)	MCIC I&I (Mgal/d)	MCSP I&I* (Mgal/d)	MCIC I&I (Mgal/d)	MCSP I&I* (Mgal/d)	MCIC I&I (Mgal/d)	MCSP I&I* (Mgal/d)	MCIC I&I (Mgal/d)	MCSP I&I* (Mgal/d)	MCIC I&I (Mgal/d)	Total System I&I (Mgal/d)
October	0.00	0.00	0.00	0.00	0.00	0.00	N/A	0.00	0.00	0.00	0.011	0.013	0.024
November	0.00	0.006	0.00	0.00	0.00	0.00	N/A	0.00	0.00	0.00	0.014	0.002	0.016
December	0.033	0.008	0.024	0.00	0.117	0.00	N/A	0.00	0.00	0.00	0.016	0.00	0.016
January	0.00	0.008	0.036	0.00	0.056	0.00	N/A	N/A	0.037	0.00	0.154	0.00	0.154
February	0.00	0.011	0.032	0.00	0.00	0.00	0.004	0.00	0.085	0.00	0.148	0.001	0.149
March	0.00	0.00	0.014	0.00	0.027	0.00	0.082	0.00	0.059	0.00	0.029	0.005	0.034
April	0.00	0.024	0.00	0.00	0.048	0.00	0.00	0.00	0.005	0.00	0.026	0.010	0.036
May	N/A	N/A	0.00	0.00	0.00	0.00	0.024	0.00	0.00	0.00	0.026	0.002	0.028
June	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.018	0.002	0.020
July	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
August	0.00	0.00	0.00	0.00	N/A	N/A	0.00	0.00	0.00	0.00	0.00	0.00	0.00
September	0.00	0.00	0.00	0.00	N/A	0.001	N/A	0.00	0.00	0.00	0.00	0.00	0.00

* Represents combined estimated MCSP, PYCF, and CFTA flows.

N/A = Due to meter equipment errors data was not available for these periods.

Comparing the 2017 estimated infiltration and inflow to recent 2020 through 2024 water year system performance, the 2017-basis is supported and has been used to estimate infiltration and inflow into the system during a 1-in-100 year precipitation season. Average year infiltration and inflow has been estimated based on the average rate indicated by water years 2020 through 2024.

The current flows of wastewater origins consist of flows from the MCSP and MCIC population and activities and the CFTA population and activities. Recent influent flow monitoring indicated an average dry weather flow (ADWF)[6] of 0.51 Mgal/d, up from the previous ADWF of 0.48 Mgal/d as indicated by the average of 2018 and 2019 data. This increase in ADWF is likely due to a combination of variability in MCSP/MCIC populations, nominal increases in water use in the MCIC as the facilities' operations have matured, and potential nominal increase in activity at the CFTA (although not documented). Considering these conditions and the estimated values presented above, Table 5 summarizes the estimated wastewater flow contribution per system served by the MCSP WWTP.

[6] Calculated for the MCSP based on the average of flows from June, July, and August.

Table 5
Estimated Current Contribution to MCSP ADWF of 0.51 Mgal/d

	Source (Mgal/d)			
	MCSP	MCIC	CFTA	**Total**
ADWF Contribution	0.35	0.13	0.03	0.51
Per unit Wastewater Generation (gpid/gpcd)	135	101	126	

gpid = gallons per incarcerated persons per day
gpcd = gallons per cadet per day

3.5 Projection of Future Flows

The August 14, 2024 Water Code Section 13267 letter requests that CDCR project wastewater flows over the next 5 years. Unlike a traditional California community, such as the City of Ione or City of Sutter Creek, the population of institutional facilities such as the Mule Creek State Prison and the Cal Fire Training Academy depend on facilities capacity (such as bed capacity), staffing to support that capacity, and statewide policies and directives. At this time there are no known plans for expanding or modifying the MCSP or CFTA institutions within the next five years and therefore future flows to the MCSP WWTP will be driven by statewide policy such as incarcerated persons population management amongst the CDCR facilities across the state and the Governor's year-to-year direction on Cal Fire cadet training. CDCR's current projections for total incarcerated persons population indicate an average approximately 2% reduction per year through 2028[7]. Within the MCSP system (including the MCSP and MCIC), the incarcerated persons population will be limited to the capacity of the existing facilities and a degree of "overcrowding" that may occur as CDCR manages the statewide incarcerated persons population and its projected decrease over the next five years. As noted above and documented in Exhibit A, the recent total MCSP/MCIC population has ranged from 3,743 to 4,051 incarcerated persons, with an average of 3,876 incarcerated persons, with a report design capacity of 3,284 incarcerated persons as presented in Exhibit A. This current incarcerated persons population level indicates an occupancy at 114% to 123% of design capacity. Although statewide the total incarcerated persons population is projected to decrease, for the purpose of this capacity assessment the current population levels are assumed with a 5% safety factor applied as noted in Table 6. As an alternative potential worst-case condition, Table 6 also presents an estimated maximum potential MCSP/MCIC occupancy at 4,926 incarcerated persons at 150% of design capacity as a basis for projection.

[7] CDCR Spring 2024 Population Projections, May 2024, Table 1, Office of Research, Division of Correctional Policy Research and Internal Oversight, available through https://cdcr/ca/gov/research.

Table 6
Estimated Contributions to Future MCSP ADWF

	Source (Mgal/d)			
	MCSP	MCIC	CFTA	**Total**
Existing Conditions				
ADWF Contribution	0.35	0.13	0.03	0.51
Safety Factor (5%)				0.03
Total				0.54
Max Potential MCSP/MCIC Occupancy[1]				
ADWF Contribution	0.45	0.16	0.03	0.64
Safety Factor (5%)				0.03
Total				0.67

1 Current ADWF plus an additional 1,050 incarcerated persons over recent 3,876 average at 67% at MCSP generating 135 gpid and 33% at MCIC generating 101 gpid. Assumed CFTA at maximum 238 cadet occupancy with staffing at 120.

3.6 Existing Wastewater Treatment System

As documented in the Mule Creek State Prison Wastewater Treatment Plant Improvements design plans, dated August 29, 2014, prepared by GHD, and as reported in the Mule Creek State Prison Wastewater Treatment Plant Improvements Completion Report, dated May 31, 2017, the existing MCSP WWTP has the following hydraulic design capacity:

- Average daily influent flow capacity of 1.0 Mgal/d
- Dry weather daily influent flow of 1.0 Mgal/d
- Peak hour influent flow of 2.86 Mgal/d
- Peak day influent flow of 1.7 Mgal/d
- Peak month influent flow of 1.3 Mgal/d

Other than when the RWQCB requested that CDCR divert stormwater to the WWTP, historical influent flows have been well below the design capacity of these facilities. Projected future flows as noted in Table *6* are below these reported design capacities. The existing MCSP wastewater treatment facilities were designed and constructed to allow for the conveyance and treatment of wastewater under a variety of conditions. CDCR implements a maintenance program on wastewater treatment processes and elements of the sewer system described in detail in the MCSP Sewer System Management Plans (SSMP)[8]. For additional overflow prevention, the MCSP system is equipped alarms and reliability features including alarms and communications to Plant Operations for high water events.

[8] SSMP, Page 11 & 12.

4.0 MCSP Effluent Storage and LAA Characteristics and Operations

The effluent storage reservoir and LAAs are the components that allow the MCSP wastewater system to store and apply treated effluent in a controlled manner protective of water quality. The effluent storage reservoir, like its name implies, holds effluent until climate and LAA conditons and the operators are ready to apply wastewater to the LAAs. The LAAs are provided wastewater when they can readily receive the wastewater in compliance with the LAA discharge specifications. On November 26, 2019, a Land Application Area Management Plan was developed with the intent of aiding operators in meeting the requirements of WDR R5-2015-0129, with the ultimate objective of maintaining or improving groundwater quality to the extent practicable. This was submitted to the Regional Board on that same date. The long-term goal of land application management practices is to be able to maintain and operate the LAAs for the life of the treatment facilities. These characteristics, and the below specifics, have been incorporated into this update to the MCSP water balance calculations.

4.1 Land Application Area Characteristics

MCSP operations staff document the volume effluent applied to each LAA or combination thereof, as well as irrigation durations to each LAA on a daily basis. The approach for calculating the distribution of treated effluent applied to each field involved the following sources of information:

- Daily recorded total irrigation volume applied to the LAA as recorded by the irrigation pump station flow meter;
- Sprinkler counts and estimated spray nozzle capacities; and
- Daily recorded irrigation durations to each land application area.

Each LAA is a bit different, not only in size but soil depth and soil type, shown below in Figure 4. The soil type and depth is balanced with the irrigation timing and duration. CDCR has conducted significant investigation and characterization of the LAAs and their underlying soil characteristics as detailed in the June 2020 Report of Waste Discharge and the following technical reports submitted to the Regional Water Quality Control Board:

1. Technical Report Update, Mule Creek State Prison, October 15, 2018
2. Land Application Area Soil Sampling Plan, Mule Creek State Prison, October 15, 2018
3. Updated Land Application Area Management Plan, Mule Creek State Prison, November 26, 2019
4. Land Application Area Soil Evaluation Report, Mule Creek State Prison, November 26, 2019

The most current and relevant information regarding the MCSP effluent reservoir and LAA facilities characteristics from these prior studies have been incorporated into the enclosed water balance calculations.

As confirmed through site investigations and facilities mapping, the existing MCSP LAAs consist of six distinct irrigation areas, separated by location and irrigation system piping, with the estimated effective area as summarized in Table 7[9].

Table 7
Current LAA Designations and Approximate Net Area

LAA Number	Effective Area (acres)
1	28
2	28
3	31
4	39
6	31
7	43
Total	**200**

The effective area of these LAAs were estimated based on an evaluation of historical LAA layouts, modifications to the irrigation system/LAAs as a result of improvements to the site (e.g., construction of MCIC), and through examination of existing aerial imagery indicating the area effectively having treated effluent applied. The LAAs are managed to avoid any tailwater under normal application practices. This is achieved by closely monitoring and controlling the application durations such that surface soil saturation and runoff do not occur. Each LAA has a 3 to 5 ft earthen berm constructed along the downslope perimeters. Tailwater berms are located downslope of the LAAs and are maintained to capture and contain any runoff that may occur. The LAAs are not operated during or immediately following precipitation events. Below is a description of the LAAs, and their relative use.

LAA1 is located on the Southwest side and is currently divided into three sections for irrigation purposes. Historically LAA1 has been used mostly during the Fall, Spring and Summer (May through October). LAA1 is irrigated about 16 days per year, resting mostly during the Winter.

LAA2 is located in the upper Northwest of the effluent storage reservoir. It is currently divided into two sections for irrigation purposes. Irrigation of LAA2 has historically been mostly during the Fall, Spring, and Summer (May through October). LAA2 is irrigated about 16 days per year, resting mostly during the Winter.

LAA3 is located on the North side of the effluent storage reservoir and is currently divided into three sections for irrigation purposes. Historical irrigation of LAA3 is mostly during the Fall, Spring and Summer (May through October). LAA3 is irrigated about 14 days per year, resting mostly during the Winter.

LAA4 is located East of the effluent storage reservoir. It is currently divided into two sections for irrigation purposes. Irrigation of LAA4 is mostly during the Fall, Spring, and Summer (May through October). LAA4 is irrigated about 25 days per year, resting mostly during the Winter.

[9] LAA areas as validated and reported in the Table 2-1 of the Revised Land Application Area Management Plan, November 2019.

LAA6 is located on the Southwest side and is currently divided into three sections for irrigation purposes. Irrigation of LAA6 has been typically all year long when precipitation conditions allow. LAA6 is irrigated about 27 days per year.

LAA7 is located on the Southwest side and is currently divided into three sections for irrigation purposes. Irrigation of LAA7 has typically been almost all year long when precipitation conditions allow. LAA7 is irrigated about 41 days per year.

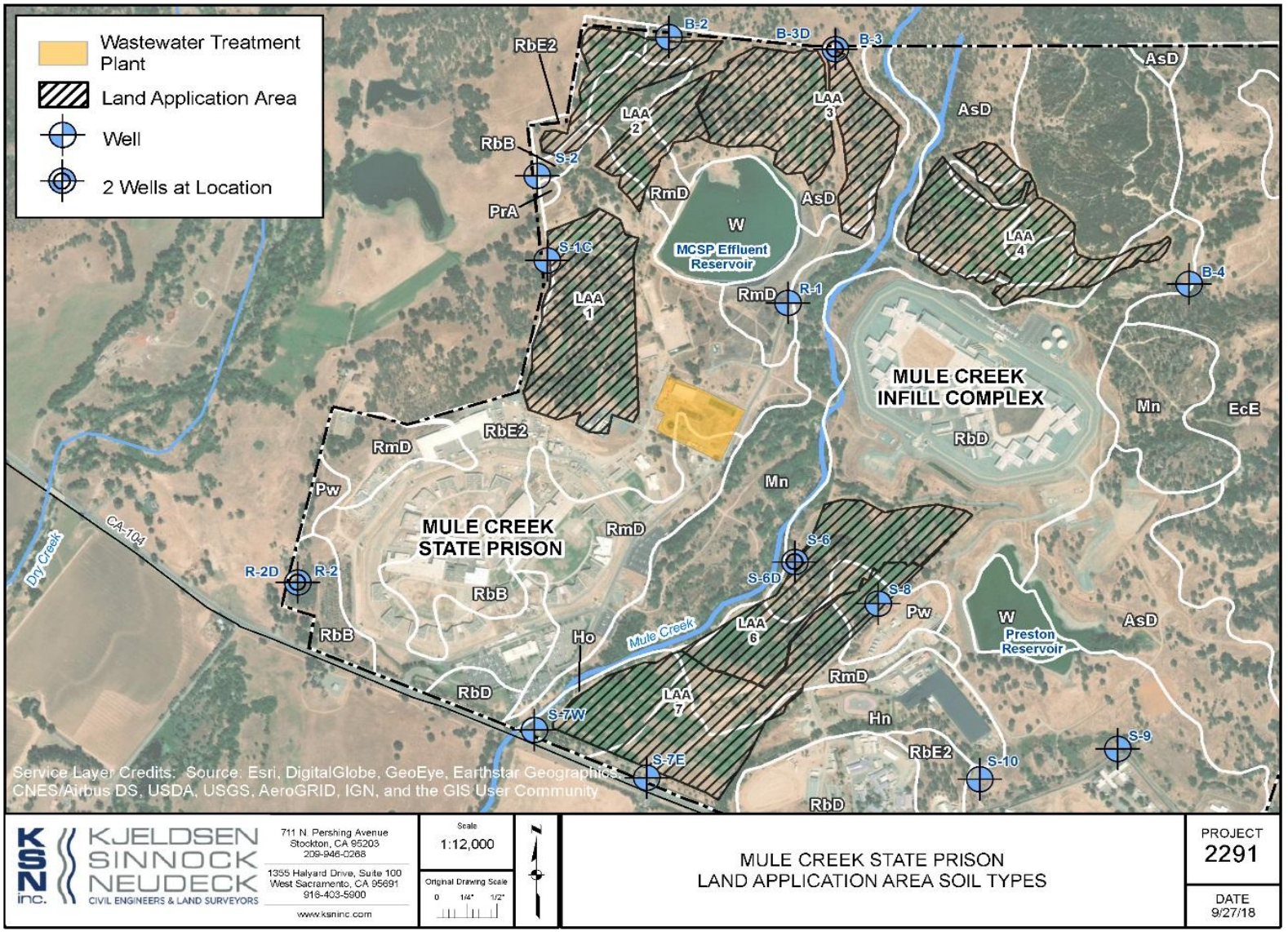


Figure 4.
Soil Types Underlying MCSP LAAs

4.2 Effluent Storage Reservoir Characteristics

The effluent storage reservoir is an integral component of the treatment system. The effluent reservoir is an earthen dam that stands 51 feet high. It is certified by the Department of Water Resources (DWR) and is listed as being in satisfactory condition. The maximum volume listed by DWR is 535 Acre-ft (174 MG). However, the Regional Water Quality Control Board, Central Valley Region requires two feet of freeboard, reducing its permitted capacity to 155 Mgal. The top area open for rainfall to enter the system is 21.6 acres. The bottom area is open for infiltration and groundwater is approximately 10 feet below the bottom of the effluent storage pond. The EPA Design Manual for Municipal Wastewater Stabilization Ponds[10] provides a conservative estimate of seepage rate for percolation ponds of approximately 0.3 in/day. Through the model calibration against the 2017 Water Year, the seepage rate was adjusted to 0.4 in/day to more closely represent actual conditions. Throughout the wet year, treated wastewater enters the reservoir and is held until temperatures increase. Eventually that water is used at the LAAs or the Castle Oaks Golf Course through the Castle Oaks Water Recycling Plant.

4.3 Off Site Discharge to the Castle Oaks Water Recycling Plant

In addition to discharging to on-site LAAs, the MCSP WWTP also has connection to the COWRP, which provides tertiary treated recycled water used for irrigation of the Castle Oaks Golf Course. There are two connections to COWRP, one is through Preston Reservoir and the Preston Outfall and the second is through a direct connection to the Preston Outfall located on the MCSP site consisting of piping and a bypass valve installed in 2017. Since the construction of the bypass valve in 2017, MCSP has delivered effluent directly through this pipeline, and has not sent any water to Preston Reservoir. The MCSP Effluent Storage Reservoir provides storage for MCSP WWTP effluent until it is discharged to either the on-site LAAs or the COWRP. Secondary disinfected effluent is conveyed to the COWRP based on an existing agreement among the Amador Regional Sanitation Authority (ARSA), CDCR, and the City of Ione, the Agreement to Regulate use of Henderson/Preston Wastewater Disposal System, or "Wastewater Agreement". The Wastewater Agreement was first approved in September 2007 by the three parties. This agreement specifies the amount of effluent that ARSA and CDCR have the right to convey for treatment at the COWRP. The Wastewater Agreement was supplemented with the execution by the three parties of the 2009 lease for the storage and conveyance facilities utilized by ARSA. This agreement provides for an allowable total annual discharge of effluent by CDCR to COWRP of 350 acre-feet, which is counted against the allowable annual ARSA discharge of 650 acre-feet. Under the Wastewater Agreement, CDCR has had average monthly discharges as summarized in Table 8. The 2013 to 2024 average discharge volume excludes the water year 2023 distributions, which had uncharacteristically low discharges due to the accommodation of ARSA's need for additional storage space due to reservoir storage repairs leading to atypical WWTP operations involving higher volume accumulation in the effluent storage reservoir throughout the wet season.

The historical average transfer to COWRP presented in Table 8 and the maximum allocations from the Tri Party Agreement were used as benchmarks in the water balance calculations, but the historical average discharge to COWRP was not used in the model scenarios. The waterbalance model scenarios utilized transfers to COWRP in two distinct ways: to demonstrate the need of COWRP transfers to maintain storage and capacity requirements, and to show the storage outcome under the maximized Tri Party Agreement allocation.

[10] EPA Design Manual for Municipal Wastewater Stabilization Ponds, October 1983

Table 8
2013 through 2024 Average COWRP Monthly Transfers

Flow to Castle Oaks, MG	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
WY 2012-2013	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.09	9.58	15.03	23.67	11.84	**88.21**
WY 2013-2014[3]	12.34	8.56	0.00	3.22	12.11	0.00	0.00	0.00	45.16	28.59	0.00	10.05	**120.02**
WY 2014-2015	5.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.74	24.79	22.93	15.08	**84.29**
WY 2015-2016	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	35.93	36.38	10.31	**83.27**
WY 2016-2017	4.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.57	32.33	**68.18**
WY 2017-2018	1.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90	43.80	34.99	**81.41**
WY 2018-2019	21.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.30	24.54	**77.69**
WY 2019-2020[3]	20.58	18.91	2.10	23.12	0.00	0.00	0.00	0.00	0.00	0.00	29.82	30.82	**125.36**
WY 2020-2021	1.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.48	36.47	27.57	11.54	**100.54**
WY 2021-2022	10.50	0.00	0.00	0.00	0.00	0.00	9.53	14.37	8.03	23.33	25.00	17.95	**108.70**
WY 2022-2023[1]	6.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.88	**22.50**
WY 2023-2024	19.82	9.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.17	33.07	**94.60**
Average Discharges[2]:	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1	**93.8**

[1] MCSP staff reported that transfers to COWRP were curtailed as requested by the City of Ione and Sutter Creek to allow Sutter Creek/ARSA to use available capacity in the COWRP system. During WY 2023 virtually all of the MCSP effluent was applied to the MCSP LAAs, except for October 2022 and September 2023.

[2] Average transfers exclude the 2022-2023 Water Year which had an uncharacteristically low annual discharge of 22.5 Mgal.

[3] Water Year is acknowledged to have higher than normal distributions above the Tri-Party Agreement allocation. COWRP distributions are included for historical accuracy.

5.0 Water Balance Climatological Factors and Infiltration and Inflow Inputs

The water balance was updated using data provided by MCSP over the current period of record and review of updated published climatological data summaries and statistics.

5.1 Rainfall Characteristics

The Desert Research Institute publishes tabulated average monthly precipitation for Camp Pardee from 1926 through 2024 and for CalFire Precipitation Station CF1 in Ione from 2012 through 2024. The average of these two monthly precipitation characteristics have been assumed for the MCSP site.

Long-duration depth-duration-frequency statistics were updated based on the most recent data from the Ione Station B00 4283 00 as maintained and published by the California Department of Water Resources, Flood Emergency Response Information Exchange, FERIX. For the 100 year hydrologic condition average monthly rainfall was multiplied by the ratio of the 100 year, 365-day storm to the average annual storm. This ratio is 1.81 and remains unchanged from previous iterations of water balance calculations for the site.

5.2 Soil, Crop, and Evapotranspiration Characteristics

Typical monthly evapotranspiration (ETo) rates were obtained from California Polytechnic State University Irrigation Training and Research Center (ITRC). MCSP falls within reference evapotranspiration Zone 14. Crop evapotranspiration and crop coefficients are available for both average year and wet year conditions. Crop coefficients were based on a representative mixture of pasture grasses and deciduous oaks (see Table 10 and 23 of the referenced document).[11] The soil depth of the LAAs were assumed to be 14 inches for fields 1-4, and 6 and 60 inches for field 7. This is based on field observations. Soil Available Water Holding Capacity (AWHC) – or the total of available water in the root zone, and the Management Allowed Depletion (MAD) – or the amount of water that is allowed to be used by the plant between irrigations was estimated based on values as stated in the NRCS Web Soil Survey. The combination of the ETo, crop coefficients, and soil characteristics were used to estimate the amount of irrigation that each LAA could uptake on a monthly basis.

6.0 Water Balance Model Validation

The water balance was calibrated using available data from the 2017 water year, which had a reported annual total precipitation of over 41 inches, exceeding the 1-in-100 year precipitation season total for Ione, CA. Calibration of the water balance calculations were based on matching predicted peak effluent storage levels, end-of-season applications and remaining effluent as modeled in the water balance calculations with reported data. The following 2017 water year conditions were considered in the water balance calibration:

- Influent and effluent flow totals for the 2017 water year provided by MCSP and CDCR,
- 1-in-100 year infiltration and inflow (included in the total influent flows),

[11] California Crop and Soil Evapotranspiration, Cal Poly Irrigation Training and Research Center, ITRC Report No. R 03-001, January 2003.

- Actual ADWF of 0.38 Mgal/d, to establish a basis for model comparison at reported values;
- Average monthly rainfall totals measured at the MCSP WWTP,
- Recorded discharges to Preston reservoir, and
- Beginning effluent reservoir storage of 20 Mgal.

The ITRC Zone 14 Wet Year evapotranspiration and an adjusted evapotranspiration constant for grass and trees was referenced for consistency with modeled calculations. In effort to provide a basis for comparison between the modeled LAAs and the actual reported conditions, the AWHC between LAA7 and LAAs1-4 and 6 were analyzed separately. An adjustment factor was applied to the LAA application calculations to reflect modeled (calculated) vs. reported system conditions. The model provided full effluent storage disposal by the end of the water year, closely matching actual 1-in-100 year hydrologic conditions. The reported storage values presented an effluent storage accumulation which peaked earlier than the simulated model; however, the modeled volume and rate of increase/decrease were consistent with the values provided by the calibration, justifying the model formulas and processes. A conservative percolation factor of 0.3 in/day was initially used to estimate the percolation losses. After adjustment, a percolation factor of 0.4 in/day was found to provide the disposal conditions that most accurately represent reported system conditions, with this percolation factor still being within a reasonable range. The catchment area runoff coefficient to the effluent storage reservoir was also adjusted from the original conservative assumption of rational runoff coefficient of 0.9 to 0.5 providing for a model result better reflecting recorded water storage conditions. The current adjustment assumes the reservoir water surface capture is 100%, the 0.5 rational runoff coefficient only applies to the embankment surrounding the reservoir. The value was reduced to a more reasonable level of 0.5 during calibration. Soil Survey classified the regional soils in the area around the MCSP Effluent Storage Reservoir and determined them to be heavy and roughly 80% steep and 20% flat; therefore, a reasonable range for embankment runoff coefficients was found to be 0.3 to 0.5. As such the high end of this range is just fine, conservative. The 2017 1-in-100 year water balance calibration is provided in Exhibit D.

7.0 Water Balance Projections and Results

As required by the August 14, 2024 Water Code Section 13267 letter and further clarified by RWQCB staff, the following flow scenarios were evaluated with the water balance calculations under average year and 1-in-100 year precipitation conditions:

1. Under projected 5-year influent flow conditions, projected to 0.54 Mgal/d as presented in Table 6;
2. Under current permit capacity ADWF of 0.74 Mgal/d

In addition to these influent flow bases, a third scenario detailing the estimated maximum potential influent flow at a combined MCSP occupancy of 4,926 incarcerated persons, as presented in Table 6, has also been evaluated.

Disposal conditions assumed under each of these conditions include:

- Evaluation of potential or all effluent to be applied to existing LAAs.

- Need for and use of proposed 61 acres of new on-site LAAs.
- Discharge to COWRP consistent with 2009 Agreement and recent historical discharges.
- Discharge to some other off-site effluent disposal/recycled use location.

The water balance shows that the current system is capable of functioning in all but an extreme case. Conducted at the current annual average with a safety factor of 5% to account for seasonal variability, the water balance shows that the system is currently capable of functioning during both a normal wet weather season and 1-in-100 year season at an ADWF of 0.54 Mgal/d. The MCSP system is also shown to be able to function to treat, dispose and store treated effluent at the 0. 74 Mgal/d design flow, however the water balance does show that the system would have an excess of water if forced to operate at the projected permit design flow during a 1-in-100 year precipitation weather season. Results of the water balance scenarios are discussed below and presented in Table 9 and discussed further in the below sub-sections.

The summaries below include details regarding multiple scenarios including and assumed transfer to COWRP consistent with the average transfers for the past ten years as presented in Table *8*. This scenario is provided to allow for proper context to the interplay of seasonal storage to total disposal needs and the timing of when such disposal is available. Absent integrating proper context to the calculations, providing discharge volumes alone does not accurately depict the characteristics of facilities that could be required to meet capacity needs.

Table 9
Water Balance Result Summary at Current Disposal Capacity

	Item	SCENARIO 1 - 0.54 Mgal/d ADWF				SCENARIO 2 - 0.74 Mgal/d ADWF				SCENARIO 3 - 0.67 Mgal/d ADWF			
		Average Year		1-in-100 Year		Average Year		1-in-100 Year		Average Year		1-in-100 Year	
		MG	AF	MG	AF	MG	AF	MG	AF	MG	AF	MG	AF
ANNUAL INFLOW (MG/AF)	WASTEWATER INFLOW	195	599	195	599	270	829	270	829	245	752	245	752
	INFLOW AND INFILTRATION	5	15	14	43	5	15	14	43	5	15	14	43
	PRECIPITATION INTO RESERVOIR	13	40	24	74	14	43	26	80	13	40	25	77
	TOTAL INFLOW	**213**	**654**	**233**	**715**	**289**	**887**	**310**	**952**	**263**	**807**	**284**	**872**
ANNUAL OUTFLOW POTENTIAL (MG/AF)	EVAPORATION FROM RESERVOIR	18	55	18	55	26	80	25	77	23	71	22	68
	PERCOLATION FROM RESERVOIR	38	117	38	117	38	117	38	117	38	117	38	117
	ON-SITE LAND DISPOSAL	139	427	102	313	139	427	102	313	139	427	102	313
	DISCHARGE TO COWRP	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL OUTFLOW	**195**	**599**	**158**	**485**	**203**	**623**	**165**	**506**	**200**	**614**	**162**	**497**
OVERALL BALANCE (MG/AF)	LAA CAPACITY USED	139	427	102	312	139	427	102	312	139	427	102	312
	COWRP CAPACITY USED	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL DISPOSAL CAPACITY USED	139	427	102	312	139	427	102	312	139	427	102	312
	EFFLUENT REMAINING AT END OF SEASON	**17**	**54**	**76**	**234**	**85**	**261**	**144**	**442**	**62**	**190**	**120**	**368**
STORAGE (MG/AF)	TOTAL REQUIRED STORAGE CAPACITY[1]	86	265	124	382	129	396	172	528	114	351	155	476

1. Maximum available MCSP Effluent Storage Reservoir capacity is 155 Mgal/ 475 AF

7.1 Average and 1-in-100 Year Precipitation Season at Average Recent Flows of 0.54 Mgal/d

Under average conditions and current flows at no more than 0.54 Mgal/d, MCSP WWTP is able to treat and dispose of all seasonal flows through use of the existing on-site LAAs without exceeding the available maximum storage of 155 Mgal. The water balance predicts that the effluent storage reservoir would reach a maximum level of 86 Mgal by the end of April. The effluent generated through the duration of the water year would be accommodated by the existing LAAs leading to an ending storage reservoir balance of 18 Mgal.

Under 1-in-100 year precipitation season conditions, which adds substantial water to the reservoir and severely limits the availability and capacity of the LAAs, the effluent storage reservoir would reach a maximum level of approximately 125 Mgal, 30 Mgal below the facility capacity of 155 Mgal, by May. Once seasonal conditions allow application of effluent to the on-site LAAs, predicted to be no earlier than May, effluent would be applied to the maximum estimated capacity of these facilities throughout the irrigation season. At the end of the season an estimated 76 Mgal would remain in the effluent storage reservoir at the end of September. Utilizing a subsequent water balance calculation assuming an average year following the 1-in-100 year, the resultant following year effluent generation would exceed the capacity of the effluent storage reservoir by April. To remain within reservoir capacity throughout the year, the starting volume would need to less than 70 Mgal in the second year. Therefore, under current flow conditions additional storage and/or disposal capacity is needed. The water balance calculations contained in Exhibit D indicate the following:

- After expanding the on-site LAAs by 61 acres:
    - Maximum storage is reduced to 121 Mgal by May.
    - Effluent in storage is reduced to 50 Mgal by the end of September.
    - The calculations indicate that with the addition of the previously proposed 61 acres of LAA that the system may be able to accommodate wastewater flows, however with a risk of exceeding permitted effluent storage volumes with subsequent wet years.
- Utilizing the existing LAAs but discharging to the COWRP at 83 Mgal/year (lower than the historical rate of 93.8 Mgal):
    - Maximum storage is reduced to 114 Mgal by May.
    - Effluent in storage is reduced to 0 Mgal by the end of September.
    - The calculations indicate that using the COWRP discharge would result in the system being able to contain the 1-in-100 year conditions and subsequent average years without exceeding effluent storage capacity and being able to return to an empty reservoir by the end of the second year using only the onsite LAAs.

7.2 Average and 1-in-100 Year Precipitation Season at Permit Capacity Flow of 0.74 Mgal/d

Under current permit flow limit conditions of 0.74 Mgal/d and average year precipitation conditions, MCSP WWTP is able to treat and dispose of all seasonal flows through use of the existing on-site LAAs without exceeding the available maximum storage of

155 Mgal. The water balance predicts that the effluent storage reservoir would reach a maximum level of 129 Mgal by the end of April, leading to an effluent storage of 85 Mgal by the end of the water year. Although flows under the first average year condition remain within capacity, an ending storage balance of 85 Mgal is expected to cause violations in a following average year.

Under 1-in-100 year precipitation season conditions the effluent storage reservoir would exceed its maximum capacity of 155 Mgal in April. If the effluent could be stored, once seasonal conditions allow application of effluent to the on-site LAAs, predicted to be no earlier than May, effluent would be applied to the maximum estimated capacity of these facilities throughout the irrigation season. At the end of the season, effluent storage needs would continue to exceed the capacity of the effluent storage reservoir through the end of July. Therefore, under current permit flow limit of 0.74 Mgal/d conditions additional storage and/or disposal capacity is needed. The water balance calculations contained in Exhibit D indicate the following:

- After expanding the on-site LAAs by 61 acres:
    - Maximum effluent storage is exceeded in May.
    - The calculations indicate that additional storage and/or disposal capacity would be needed.
- Utilizing the existing LAAs but also discharging to the COWRP at 83 Mgal/year:
    - Maximum effluent storage is still exceeded in May.
    - The calculations indicate that additional storage and/or disposal capacity would be needed.
- After expanding the LAAs and discharging to the COWRP at 350 ac-ft per year in accordance with the Tri Party Agreement:
    - Maximum effluent storage is 126 Mgal in May.
    - Effluent storage would be reduced to nearly empty in June.
    - The calculations indicate that the yearly effluent storage need is fully accommodated with the utilization of the CDCR allocation of 350 ac-ft per year discharge to COWRP.

Expanded storage and effluent disposal capacity is expected to be needed if the MCSP system is to operate independently at a permit capacity of 0.74 Mgal/d, beyond that provided by expanding the on-site LAAs or utilizing the COWRP discharge consistent with historical rates.

7.3 Average and 1-in-100 Year Precipitation Season at Maximum Capacity Flow of 0.67 Mgal/d

The MCSP and MCIC maximum potential occupancy scenario condition is expected to generate 0.67 Mgal/d. In an average year rainfall condition, the water balance calculations indicate that the existing MCSP WWTP facilities have the capacity to dispose of all effluent flows within the 155 Mgal volume of the effluent storage reservoir. The peak volume contained within the effluent storage reservoir is estimated at 115 Mgal at the end of April. The effluent reservoir volume steadily decreases as land

application disposal is available by the end of March. In September, the remaining year end reservoir volume is 62 Mgal, which is anticipated to lead to an exceedance of storage reservoir volume in the following average year.

Under 1-in-100 year conditions, the maximum effluent storage reservoir volume of 155 Mgal is met by the end of May, therefore, the results of the water balance analysis indicate that additional effluent disposal is required. The water balance results for the maximum capacity ADWF condition provided in Exhibit D are summarized below:

- Expanding the on-site LAAs by 61 acres under a 1-in-100 year precipitation conditions:
    - Maximum storage capacity is nearly met in May.
    - The ending balance in the storage reservoir is 94 Mgal, which is expected to lead to an exceedance in storage volume in the following average year.
- Disposal to the existing LAAs with discharge to the COWRP at 83 Mgal/year under a 1-in-100 year precipitation conditions:
    - Maximum effluent storage capacity is nearly met in May.
    - The ending balance in effluent reservoir storage is 41 Mgal in September.
    - The calculations indicate that the yearly effluent storage need is fully accommodated in following average precipitation years with starting storage volume of 41 Mgal.
- After expanding the LAAs and discharging to the COWRP at 350 ac-ft per year in accordance with the Tri Party Agreement:
    - Maximum effluent storage is 112 Mgal in May.
    - Effluent storage would be emptied by the end of September.
    - The yearly effluent storage need is fully accommodated with the utilization of the CDCR allocation of 350 ac-ft per year discharge to COWRP.

If the MCSP system is to operate independently at a maximum population capacity flow of 0.67 Mgal/d, expanded storage and effluent disposal capacity is expected to be needed by at least what is provided by expanding the on-site LAAs by adding 61 acres of State lands or utilizing the COWRP discharge at historical rates.

8.0 Assessment of Needed Expanded Capacity

As is previously noted, the water balance shows that the current system is capable of functioning in all but the extreme cases. With a safety factor of 5% to account for seasonal variability, the water balance shows that the system is currently capable of functioning during both a normal wet weather season and a 1-in-100 year precipitation season at an ADWF of 0.54 Mgal/d,

except during the year following the 1-in-100 precipitation year. The MCSP system, designed for daily wastewater treatment flow rate of 1.0 Mgal/d, can treat all expected higher flows.

However, the MCSP system cannot dispose and store treated effluent at the higher flows of 0.74 and 0.67 Mgal/day. Subsequent years and, when combined with a 1-in-100 year precipitation inflow, compound the problem specifically in the permit capacity of 0.74 Mgal/d scenario. Adding storage alone will not relieve the additional flow contribution to the system. To address this, MCSP would have to increase LAA areas and/or storage to accommodate the larger events and subsequent events. The water balance model was run to conceptually establish to what extent MCSP needs additional storage capacity and/or LAA area to accommodate extreme events.

8.1 Conceptual Expansion With On and/or Offsite Facilities

Based on the above-summarized water balance analysis, disposal and/or storage improvements would be necessary for MCSP to be in compliance with permit requirements under 0.54, 0.74, and 0.67 Mgal/d flows. The amount of excess volume for the three scenarios is shown in Table 10. The volume of excess is the overflow volume in the 1-in-100 season plus the difference between the volume of the end of the first year and the maximum allowable volume in the second year without causing or threatening to cause a effluent storage violation of the permit in the third year. The requirements for additional area for use as net LAA disposal, whether onsite or offsite, depends on the type of land available, especially the soils and geology. However, assuming characteristics similar to the existing MCSP LAAs 1-4, general conclusions can be made in quantifying the required area needed to accommodate the current influent flows, estimated maximum capacity flow rate and permitted maximum flow rate of 0.54 Mgal/d, 0.67 Mgal/day and 0.74 Mgal/day, respectively.

Table 10
Annual Excess Volume

Item	SCENARIO 1 0.54 Mgal/d ADWF		SCENARIO 2 0.74 Mgal/d ADWF		SCENARIO 3 0.67 Mgal/d ADWF	
	1-in-100 Year		1-in-100 Year		1-in-100 Year	
	MG	AF	MG	AF	MG	AF
Additional Annual MCSP WWTP Effluent Storage and Disposal Need	6	17	134	411	78	239

Average Recent Flows of 0.54 Mgal/d

Under current influent flow and disposal conditions, 1-in-100 year precipitation flows are fully contained. However, in the average precipitation year following the 1-in-100 year precipitation conditions at current capacity ADWF of 0.54 Mgal, effluent storage capacity is exceeded in April with a starting storage volume of 76 Mgal. In the average year following a 1-in-100 precipitation year, a starting storage volume of 70 Mgal is the maximum volume to be accommodated in order to maintain compliance with the WDRs. Adding 61 net acres of additional LAA, equal to the area proposed in 2015, will relieve the problem, with the additional disposal area providing adequate disposal of effluent flows and remaining volume within the effluent storage reservoir at the year end.

Permit Capacity Flow of 0.74 Mgal/d

Under current disposal conditions, 1-in-100 year precipitation conditions, and permit capacity ADWF of 0.74 Mgal, effluent storage capacity is exceeded by April. Ending volume in the storage reservoir is estimated to be 144 Mgal. In an average year following a 1-in-100 precipitation year, a starting storage volume of 26 Mgal is the maximum volume to be accommodated to remain within storage capacity limits. The addition of 250 net acres of LAAs would lead to an ending storage balance of 36 Mgal, which is able to be processed within the next average year. Additional storage of at least 9 Mgal would also be needed to contain effluent flows through peak flow periods of the year.

Maximum Capacity Flow of 0.67 Mgal/d

Under current disposal limits and a 1-in-100 precipitation year condition, effluent storage is met in May and the year-end volume in reservoir storage is estimated to be 120 Mgal. This carryover into an average following year leads to consistent period of storage exceedance starting in December. The maximum beginning storage volume in year 2 would need to be reduced to 41 Mgal to remain within current storage capacity. The addition of a total of 163 net on or off-site acres would result in a year-end storage balance of 50 Mgal. With the additional land application area, all storage needs throughout the year would be met. With the addition of the 163 net acres of additional LAA areas, flows are also accommodated in an average year following a 1-in-100 precipitation year, including the starting effluent storage volume of 50 Mgal.

Tri-Party Agreement Maximum Discharge to COWRP at 350 Ac-ft/year

As was previously noted above, in addition to discharging to on-site LAAs, the MCSP WWTP also has connection to the COWRP, which provides treated secondary water for use in making tertiary treated recycled water used for irrigation of the Castle Oaks Golf Course. This is based on an existing agreement among the ARSA, CDCR, and the City of Ione. This agreement provides for an allowable total annual discharge of effluent by CDCR to COWRP of 350 acre-feet, which is counted against the allowable annual ARSA discharge of 650 acre-feet.

A review of the historical use of this agreement shows that MCSP has not been taking full advantage of it, although has been using quite a bit of the agreement's allowable use. In fact, full use of the agreement on the agreed monthly maximum increments provides a solution to capacity exceedances during peak storage accumulation points throughout the year by fully diverting effluent storage reservoir volumes to COWRP by June. If capacity were available, the use of the full CDCR allocation of the Wastewater Agreement would provide a viable option for additional disposal capacity needs in the Permit Capacity Flow and Maximum Capacity Flow scenarios under 0.74 and 0.67 Mgal/d ADWF respectively.

Exhibit A

MCSP Recent Population Reports

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
February 1, 2019

Monthly Report of Population
As of Midnight January 31, 2019

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	4,110	2,920	140.8	4,370
Calipatria State Prison (CAL)	3,490	2,308	151.2	3,333
California Correctional Center (CCC)	4,197	3,883	108.1	4,762
California Correctional Institution (CCI)	4,059	2,783	145.8	4,120
Centinela State Prison (CEN)	3,391	2,308	146.9	3,333
California Health Care Facility - Stockton (CHCF)	2,656	2,951	90.0	2,951
California Institution for Men (CIM)	3,662	2,976	123.1	4,186
California Men's Colony (CMC)	3,665	3,838	95.5	4,398
California Medical Facility (CMF)	2,330	2,361	98.7	2,847
California State Prison, Corcoran (COR)	3,291	3,116	105.6	4,270
California Rehabilitation Center (CRC)	2,314	2,491	92.9	3,210
Correctional Training Facility (CTF)	5,250	3,312	158.5	4,887
Chuckawalla Valley State Prison (CVSP)	2,733	1,738	157.2	2,478
Deuel Vocational Institution (DVI)	2,491	1,681	148.2	2,353
Folsom State Prison (FOL)	2,925	2,066	141.6	2,895
High Desert State Prison (HDSP)	3,240	2,324	139.4	3,361
Ironwood State Prison (ISP)	2,691	2,200	122.3	3,200
Kern Valley State Prison (KVSP)	3,703	2,448	151.3	3,522
California State Prison, Los Angeles County (LAC)	3,131	2,300	136.1	3,300
Mule Creek State Prison (MCSP)	3,993	3,284	121.6	4,009
North Kern State Prison (NKSP)	4,130	2,694	153.3	3,911
Pelican Bay State Prison (PBSP)	2,578	2,380	108.3	3,250
Pleasant Valley State Prison (PVSP)	3,129	2,308	135.6	3,333
RJ Donovan Correctional Facility (RJD)	3,841	2,992	128.4	3,942
California State Prison, Sacramento (SAC)	2,108	1,828	115.3	2,449
California Substance Abuse Treatment Facility (SATF)	5,586	3,424	163.1	5,111
Sierra Conservation Center (SCC)	4,167	3,936	105.9	4,570
California State Prison, Solano (SOL)	4,223	2,610	161.8	3,882
San Quentin State Prison (SQ)	3,977	3,082	129.0	3,984
Salinas Valley State Prison (SVSP)	3,353	2,452	136.7	3,409
Valley State Prison (VSP)	3,186	1,980	160.9	2,954
Wasco State Prison (WSP)	4,520	2,984	151.5	4,351
Male Total	112,120	85,958	130.4	116,931
Female Institutions				
Central California Women's Facility (CCWF)	2,812	2,004	140.3	2,964
California Institution for Women (CIW)	1,848	1,398	132.2	1,877
Folsom State Prison (FOL)	450	403	111.7	530
Female Total	5,110	3,805	134.3	5,371
Institution Total	117,230	89,763	130.6	122,302

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
March 1, 2019

Monthly Report of Population
As of Midnight February 28, 2019

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	4,133	2,920	141.5	4,370
Calipatria State Prison (CAL)	3,551	2,308	153.9	3,333
California Correctional Center (CCC)	4,120	3,883	106.1	4,762
California Correctional Institution (CCI)	4,000	2,783	143.7	4,120
Centinela State Prison (CEN)	3,450	2,308	149.5	3,333
California Health Care Facility - Stockton (CHCF)	2,667	2,951	90.4	2,951
California Institution for Men (CIM)	3,743	2,976	125.8	4,186
California Men's Colony (CMC)	3,647	3,838	95.0	4,398
California Medical Facility (CMF)	2,336	2,361	98.9	2,847
California State Prison, Corcoran (COR)	3,346	3,116	107.4	4,270
California Rehabilitation Center (CRC)	2,445	2,491	98.2	3,210
Correctional Training Facility (CTF)	5,426	3,312	163.8	4,887
Chuckawalla Valley State Prison (CVSP)	2,738	1,738	157.5	2,478
Deuel Vocational Institution (DVI)	2,573	1,681	153.1	2,353
Folsom State Prison (FOL)	2,972	2,066	143.9	2,895
High Desert State Prison (HDSP)	3,179	2,324	136.8	3,361
Ironwood State Prison (ISP)	2,584	2,200	117.5	3,200
Kern Valley State Prison (KVSP)	3,698	2,448	151.1	3,522
California State Prison, Los Angeles County (LAC)	3,116	2,300	135.5	3,300
Mule Creek State Prison (MCSP)	4,021	3,284	122.4	4,009
North Kern State Prison (NKSP)	4,057	2,694	150.6	3,911
Pelican Bay State Prison (PBSP)	2,559	2,380	107.5	3,250
Pleasant Valley State Prison (PVSP)	3,185	2,308	138.0	3,333
RJ Donovan Correctional Facility (RJD)	3,765	2,992	125.8	3,942
California State Prison, Sacramento (SAC)	2,043	1,828	111.8	2,449
California Substance Abuse Treatment Facility (SATF)	5,526	3,424	161.4	5,111
Sierra Conservation Center (SCC)	4,048	3,936	102.8	4,570
California State Prison, Solano (SOL)	4,263	2,610	163.3	3,882
San Quentin State Prison (SQ)	3,851	3,082	125.0	3,984
Salinas Valley State Prison (SVSP)	3,429	2,452	139.8	3,409
Valley State Prison (VSP)	3,124	1,980	157.8	2,954
Wasco State Prison (WSP)	4,501	2,984	150.8	4,351
Male Total	112,096	85,958	130.4	116,931
Female Institutions				
Central California Women's Facility (CCWF)	2,835	2,004	141.5	2,964
California Institution for Women (CIW)	1,835	1,398	131.3	1,877
Folsom State Prison (FOL)	415	403	103.0	530
San Quentin State Prison (SQ)	1	3,082	0.0	3,273
Female Total	5,086	3,805	133.7	8,644
Institution Total	117,182	89,763	130.5	125,575

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
April 1, 2019

Monthly Report of Population
As of Midnight March 31, 2019

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	4,043	2,920	138.5	4,370
Calipatria State Prison (CAL)	3,546	2,308	153.6	3,333
California Correctional Center (CCC)	3,984	3,883	102.6	4,762
California Correctional Institution (CCI)	3,930	2,783	141.2	4,120
Centinela State Prison (CEN)	3,488	2,308	151.1	3,333
California Health Care Facility - Stockton (CHCF)	2,646	2,951	89.7	2,951
California Institution for Men (CIM)	3,766	2,976	126.5	4,186
California Men's Colony (CMC)	3,524	3,838	91.8	4,398
California Medical Facility (CMF)	2,350	2,361	99.5	2,847
California State Prison, Corcoran (COR)	3,351	3,116	107.5	4,270
California Rehabilitation Center (CRC)	2,617	2,491	105.1	3,210
Correctional Training Facility (CTF)	5,447	3,312	164.5	4,887
Chuckawalla Valley State Prison (CVSP)	2,755	1,738	158.5	2,478
Deuel Vocational Institution (DVI)	2,569	1,681	152.8	2,353
Folsom State Prison (FOL)	2,983	2,066	144.4	2,895
High Desert State Prison (HDSP)	3,224	2,324	138.7	3,361
Ironwood State Prison (ISP)	2,578	2,200	117.2	3,200
Kern Valley State Prison (KVSP)	3,716	2,448	151.8	3,522
California State Prison, Los Angeles County (LAC)	3,136	2,300	136.3	3,300
Mule Creek State Prison (MCSP)	4,051	3,284	123.4	4,009
North Kern State Prison (NKSP)	4,148	2,694	154.0	3,911
Pelican Bay State Prison (PBSP)	2,553	2,380	107.3	3,250
Pleasant Valley State Prison (PVSP)	3,260	2,308	141.2	3,333
RJ Donovan Correctional Facility (RJD)	3,763	2,992	125.8	3,942
California State Prison, Sacramento (SAC)	2,057	1,828	112.5	2,449
California Substance Abuse Treatment Facility (SATF)	5,508	3,424	160.9	5,111
Sierra Conservation Center (SCC)	4,014	3,936	102.0	4,570
California State Prison, Solano (SOL)	4,294	2,610	164.5	3,882
San Quentin State Prison (SQ)	3,885	3,082	126.1	3,984
Salinas Valley State Prison (SVSP)	3,408	2,452	139.0	3,409
Valley State Prison (VSP)	3,068	1,980	154.9	2,954
Wasco State Prison (WSP)	4,788	2,984	160.5	4,351
Male Total	112,450	85,958	130.8	116,931
Female Institutions				
Central California Women's Facility (CCWF)	2,861	2,004	142.8	2,964
California Institution for Women (CIW)	1,796	1,398	128.5	1,877
Folsom State Prison (FOL)	447	403	110.9	530
San Quentin State Prison (SQ)	1	3,082	0.0	3,273
Female Total	5,105	3,805	134.2	8,644
Institution Total	117,555	89,763	131.0	125,575

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
May 1, 2019

Monthly Report of Population
As of Midnight April 30, 2019

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,989	2,920	136.6	4,370
Calipatria State Prison (CAL)	3,538	2,308	153.3	3,333
California Correctional Center (CCC)	4,018	3,883	103.5	4,762
California Correctional Institution (CCI)	3,891	2,783	139.8	4,120
Centinela State Prison (CEN)	3,513	2,308	152.2	3,333
California Health Care Facility - Stockton (CHCF)	2,647	2,951	89.7	2,951
California Institution for Men (CIM)	3,675	2,976	123.5	4,186
California Men's Colony (CMC)	3,427	3,838	89.3	4,398
California Medical Facility (CMF)	2,520	2,361	106.7	2,847
California State Prison, Corcoran (COR)	3,235	3,116	103.8	4,270
California Rehabilitation Center (CRC)	2,753	2,491	110.5	3,210
Correctional Training Facility (CTF)	5,551	3,312	167.6	4,887
Chuckawalla Valley State Prison (CVSP)	2,789	1,738	160.5	2,478
Deuel Vocational Institution (DVI)	2,368	1,681	140.9	2,353
Folsom State Prison (FOL)	3,015	2,066	145.9	2,895
High Desert State Prison (HDSP)	3,187	2,324	137.1	3,361
Ironwood State Prison (ISP)	2,642	2,200	120.1	3,200
Kern Valley State Prison (KVSP)	3,679	2,448	150.3	3,522
California State Prison, Los Angeles County (LAC)	3,200	2,300	139.1	3,300
Mule Creek State Prison (MCSP)	4,088	3,284	124.5	4,009
North Kern State Prison (NKSP)	3,954	2,694	146.8	3,911
Pelican Bay State Prison (PBSP)	2,588	2,380	108.7	3,250
Pleasant Valley State Prison (PVSP)	3,357	2,308	145.5	3,333
RJ Donovan Correctional Facility (RJD)	3,773	2,992	126.1	3,942
California State Prison, Sacramento (SAC)	2,101	1,828	114.9	2,449
California Substance Abuse Treatment Facility (SATF)	5,598	3,424	163.5	5,111
Sierra Conservation Center (SCC)	4,106	3,936	104.3	4,570
California State Prison, Solano (SOL)	4,373	2,610	167.5	3,882
San Quentin State Prison (SQ)	3,973	3,082	128.9	3,984
Salinas Valley State Prison (SVSP)	3,337	2,452	136.1	3,409
Valley State Prison (VSP)	2,962	1,980	149.6	2,954
Wasco State Prison (WSP)	4,992	2,984	167.3	4,351
Male Total	112,839	85,958	131.3	116,931
Female Institutions				
Central California Women's Facility (CCWF)	2,894	2,004	144.4	2,964
California Institution for Women (CIW)	1,759	1,398	125.8	1,877
Folsom State Prison (FOL)	450	403	111.7	530
San Quentin State Prison (SQ)	1	3,082	0.0	3,273
Female Total	5,104	3,805	134.1	8,644
Institution Total	117,943	89,763	131.4	125,575

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
June 1, 2019

Monthly Report of Population
As of Midnight May 31, 2019

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,775	2,920	129.3	4,370
Calipatria State Prison (CAL)	3,506	2,308	151.9	3,333
California Correctional Center (CCC)	4,050	3,883	104.3	4,762
California Correctional Institution (CCI)	3,858	2,783	138.6	4,120
Centinela State Prison (CEN)	3,531	2,308	153.0	3,333
California Health Care Facility - Stockton (CHCF)	2,675	2,951	90.6	2,951
California Institution for Men (CIM)	3,663	2,976	123.1	4,186
California Men's Colony (CMC)	3,463	3,838	90.2	4,398
California Medical Facility (CMF)	2,561	2,361	108.5	2,847
California State Prison, Corcoran (COR)	3,192	3,116	102.4	4,270
California Rehabilitation Center (CRC)	2,890	2,491	116.0	3,210
Correctional Training Facility (CTF)	5,571	3,312	168.2	4,887
Chuckawalla Valley State Prison (CVSP)	2,746	1,738	158.0	2,478
Deuel Vocational Institution (DVI)	2,343	1,681	139.4	2,353
Folsom State Prison (FOL)	3,006	2,066	145.5	2,895
High Desert State Prison (HDSP)	3,128	2,324	134.6	3,361
Ironwood State Prison (ISP)	2,626	2,200	119.4	3,200
Kern Valley State Prison (KVSP)	3,644	2,448	148.9	3,522
California State Prison, Los Angeles County (LAC)	3,193	2,300	138.8	3,300
Mule Creek State Prison (MCSP)	4,054	3,284	123.4	4,009
North Kern State Prison (NKSP)	4,033	2,694	149.7	3,911
Pelican Bay State Prison (PBSP)	2,600	2,380	109.2	3,250
Pleasant Valley State Prison (PVSP)	3,460	2,308	149.9	3,333
RJ Donovan Correctional Facility (RJD)	3,876	2,992	129.5	3,942
California State Prison, Sacramento (SAC)	2,100	1,828	114.9	2,449
California Substance Abuse Treatment Facility (SATF)	5,498	3,424	160.6	5,111
Sierra Conservation Center (SCC)	3,851	3,936	97.8	4,570
California State Prison, Solano (SOL)	4,478	2,610	171.6	3,882
San Quentin State Prison (SQ)	4,088	3,082	132.6	3,984
Salinas Valley State Prison (SVSP)	3,189	2,452	130.1	3,409
Valley State Prison (VSP)	2,907	1,980	146.8	2,954
Wasco State Prison (WSP)	5,011	2,984	167.9	4,351
Male Total	112,566	85,958	131.0	116,931
Female Institutions				
Central California Women's Facility (CCWF)	2,784	2,004	138.9	2,964
California Institution for Women (CIW)	1,782	1,398	127.5	1,877
Folsom State Prison (FOL)	454	403	112.7	530
San Quentin State Prison (SQ)	1	3,082	0.0	3,273
Female Total	5,021	3,805	132.0	8,644
Institution Total	117,587	89,763	131.0	125,575

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
July 1, 2019

Monthly Report of Population
As of Midnight June 30, 2019

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,744	2,920	128.2	4,370
Calipatria State Prison (CAL)	3,493	2,308	151.3	3,333
California Correctional Center (CCC)	3,853	3,883	99.2	4,762
California Correctional Institution (CCI)	3,739	2,783	134.4	4,120
Centinela State Prison (CEN)	3,515	2,308	152.3	3,333
California Health Care Facility - Stockton (CHCF)	2,704	2,951	91.6	2,951
California Institution for Men (CIM)	3,665	2,976	123.2	4,186
California Men's Colony (CMC)	3,540	3,838	92.2	4,398
California Medical Facility (CMF)	2,539	2,361	107.5	2,847
California State Prison, Corcoran (COR)	3,179	3,116	102.0	4,270
California Rehabilitation Center (CRC)	2,933	2,491	117.7	3,210
Correctional Training Facility (CTF)	5,492	3,312	165.8	4,887
Chuckawalla Valley State Prison (CVSP)	2,741	1,738	157.7	2,478
Deuel Vocational Institution (DVI)	2,249	1,681	133.8	2,353
Folsom State Prison (FOL)	2,995	2,066	145.0	2,895
High Desert State Prison (HDSP)	3,127	2,324	134.6	3,361
Ironwood State Prison (ISP)	2,693	2,200	122.4	3,200
Kern Valley State Prison (KVSP)	3,604	2,448	147.2	3,522
California State Prison, Los Angeles County (LAC)	3,207	2,300	139.4	3,300
Mule Creek State Prison (MCSP)	4,035	3,284	122.9	4,009
North Kern State Prison (NKSP)	4,246	2,694	157.6	3,911
Pelican Bay State Prison (PBSP)	2,663	2,380	111.9	3,250
Pleasant Valley State Prison (PVSP)	3,416	2,308	148.0	3,333
RJ Donovan Correctional Facility (RJD)	3,980	2,992	133.0	3,942
California State Prison, Sacramento (SAC)	2,112	1,828	115.5	2,449
California Substance Abuse Treatment Facility (SATF)	5,454	3,424	159.3	5,111
Sierra Conservation Center (SCC)	3,918	3,936	99.5	4,570
California State Prison, Solano (SOL)	4,533	2,610	173.7	3,882
San Quentin State Prison (SQ)	4,243	3,082	137.7	3,984
Salinas Valley State Prison (SVSP)	3,148	2,452	128.4	3,409
Valley State Prison (VSP)	2,885	1,980	145.7	2,954
Wasco State Prison (WSP)	5,023	2,984	168.3	4,351
Male Total	112,668	85,958	131.1	116,931
Female Institutions				
Central California Women's Facility (CCWF)	2,781	2,004	138.8	2,964
California Institution for Women (CIW)	1,798	1,398	128.6	1,877
Folsom State Prison (FOL)	434	403	107.7	530
San Quentin State Prison (SQ)	1	3,082	0.0	3,273
Female Total	5,014	3,805	131.8	8,644
Institution Total	117,682	89,763	131.1	125,575

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
August 1, 2019

Monthly Report of Population
As of Midnight July 31, 2019

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,751	2,920	128.5	4,370
Calipatria State Prison (CAL)	3,474	2,308	150.5	3,333
California Correctional Center (CCC)	3,964	3,883	102.1	4,762
California Correctional Institution (CCI)	3,678	2,783	132.2	4,120
Centinela State Prison (CEN)	3,495	2,308	151.4	3,333
California Health Care Facility - Stockton (CHCF)	2,784	2,951	94.3	2,951
California Institution for Men (CIM)	3,644	2,976	122.4	4,186
California Men's Colony (CMC)	3,682	3,838	95.9	4,398
California Medical Facility (CMF)	2,556	2,361	108.3	2,847
California State Prison, Corcoran (COR)	3,161	3,116	101.4	4,233
California Rehabilitation Center (CRC)	2,958	2,491	118.7	3,210
Correctional Training Facility (CTF)	5,414	3,312	163.5	4,887
Chuckawalla Valley State Prison (CVSP)	2,709	1,738	155.9	2,478
Deuel Vocational Institution (DVI)	2,169	1,681	129.0	2,353
Folsom State Prison (FOL)	2,994	2,066	144.9	2,895
High Desert State Prison (HDSP)	3,130	2,324	134.7	3,361
Ironwood State Prison (ISP)	2,681	2,200	121.9	3,200
Kern Valley State Prison (KVSP)	3,568	2,448	145.8	3,522
California State Prison, Los Angeles County (LAC)	3,175	2,300	138.0	3,300
Mule Creek State Prison (MCSP)	3,970	3,284	120.9	4,009
North Kern State Prison (NKSP)	4,195	2,694	155.7	3,911
Pelican Bay State Prison (PBSP)	2,625	2,380	110.3	3,250
Pleasant Valley State Prison (PVSP)	3,332	2,308	144.4	3,333
RJ Donovan Correctional Facility (RJD)	4,099	2,992	137.0	3,942
California State Prison, Sacramento (SAC)	2,126	1,828	116.3	2,449
California Substance Abuse Treatment Facility (SATF)	5,516	3,424	161.1	5,111
Sierra Conservation Center (SCC)	4,066	3,936	103.3	4,570
California State Prison, Solano (SOL)	4,575	2,610	175.3	3,882
San Quentin State Prison (SQ)	4,329	3,082	140.5	3,984
Salinas Valley State Prison (SVSP)	3,143	2,452	128.2	3,409
Valley State Prison (VSP)	2,845	1,980	143.7	2,954
Wasco State Prison (WSP)	4,906	2,984	164.4	4,351
Male Total	112,714	85,958	131.1	116,894
Female Institutions				
Central California Women's Facility (CCWF)	2,826	2,004	141.0	2,964
California Institution for Women (CIW)	1,752	1,398	125.3	1,877
Folsom State Prison (FOL)	454	403	112.7	530
San Quentin State Prison (SQ)	1	3,082	0.0	3,273
Female Total	5,033	3,805	132.3	8,644
Institution Total	117,747	89,763	131.2	125,538

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
September 1, 2019

Monthly Report of Population
As of Midnight August 31, 2019

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,778	2,920	129.4	4,370
Calipatria State Prison (CAL)	3,449	2,308	149.4	3,333
California Correctional Center (CCC)	3,648	3,883	93.9	4,762
California Correctional Institution (CCI)	3,709	2,783	133.3	4,120
Centinela State Prison (CEN)	3,530	2,308	152.9	3,333
California Health Care Facility - Stockton (CHCF)	2,780	2,951	94.2	2,951
California Institution for Men (CIM)	3,633	2,976	122.1	4,186
California Men's Colony (CMC)	3,833	3,838	99.9	4,308
California Medical Facility (CMF)	2,571	2,361	108.9	2,847
California State Prison, Corcoran (COR)	3,182	3,116	102.1	4,233
California Rehabilitation Center (CRC)	3,054	2,491	122.6	3,210
Correctional Training Facility (CTF)	5,329	3,312	160.9	4,887
Chuckawalla Valley State Prison (CVSP)	2,692	1,738	154.9	2,478
Deuel Vocational Institution (DVI)	2,336	1,681	139.0	2,353
Folsom State Prison (FOL)	2,953	2,066	142.9	2,895
High Desert State Prison (HDSP)	3,321	2,324	142.9	3,361
Ironwood State Prison (ISP)	2,740	2,200	124.5	3,200
Kern Valley State Prison (KVSP)	3,584	2,448	146.4	3,522
California State Prison, Los Angeles County (LAC)	3,159	2,300	137.3	3,300
Mule Creek State Prison (MCSP)	4,008	3,284	122.0	4,009
North Kern State Prison (NKSP)	4,058	2,694	150.6	3,911
Pelican Bay State Prison (PBSP)	2,616	2,380	109.9	3,250
Pleasant Valley State Prison (PVSP)	3,233	2,308	140.1	3,333
RJ Donovan Correctional Facility (RJD)	4,071	2,992	136.1	3,942
California State Prison, Sacramento (SAC)	2,135	1,828	116.8	2,449
California Substance Abuse Treatment Facility (SATF)	5,540	3,424	161.8	5,111
Sierra Conservation Center (SCC)	4,145	3,936	105.3	4,570
California State Prison, Solano (SOL)	4,559	2,610	174.7	3,882
San Quentin State Prison (SQ)	4,193	3,082	136.0	3,984
Salinas Valley State Prison (SVSP)	3,051	2,452	124.4	3,409
Valley State Prison (VSP)	2,855	1,980	144.2	2,954
Wasco State Prison (WSP)	4,979	2,984	166.9	4,351
Male Total	112,724	85,958	131.1	116,804
Female Institutions				
Central California Women's Facility (CCWF)	2,752	2,004	137.3	2,964
California Institution for Women (CIW)	1,701	1,398	121.7	1,877
Folsom State Prison (FOL)	488	403	121.1	530
San Quentin State Prison (SQ)	1	3,082	0.0	3,273
Female Total	4,942	3,805	129.9	8,644
Institution Total	117,666	89,763	131.1	125,448

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
October 1, 2019

Monthly Report of Population
As of Midnight September 30, 2019

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,885	2,920	133.0	4,370
Calipatria State Prison (CAL)	3,442	2,308	149.1	3,333
California Correctional Center (CCC)	3,640	3,883	93.7	4,762
California Correctional Institution (CCI)	3,779	2,783	135.8	4,120
Centinela State Prison (CEN)	3,544	2,308	153.6	3,333
California Health Care Facility - Stockton (CHCF)	2,819	2,951	95.5	2,951
California Institution for Men (CIM)	3,605	2,976	121.1	4,186
California Men's Colony (CMC)	3,836	3,838	99.9	4,308
California Medical Facility (CMF)	2,626	2,361	111.2	2,847
California State Prison, Corcoran (COR)	3,212	3,116	103.1	4,233
California Rehabilitation Center (CRC)	3,284	2,491	131.8	3,210
Correctional Training Facility (CTF)	5,273	3,312	159.2	4,887
Chuckawalla Valley State Prison (CVSP)	2,716	1,738	156.3	2,478
Deuel Vocational Institution (DVI)	2,511	1,681	149.4	2,353
Folsom State Prison (FOL)	2,875	2,066	139.2	2,895
High Desert State Prison (HDSP)	3,190	2,324	137.3	3,361
Ironwood State Prison (ISP)	2,738	2,200	124.5	3,200
Kern Valley State Prison (KVSP)	3,554	2,448	145.2	3,522
California State Prison, Los Angeles County (LAC)	3,118	2,300	135.6	3,300
Mule Creek State Prison (MCSP)	4,009	3,284	122.1	4,009
North Kern State Prison (NKSP)	4,317	2,694	160.2	3,911
Pelican Bay State Prison (PBSP)	2,616	2,380	109.9	3,265
Pleasant Valley State Prison (PVSP)	3,143	2,308	136.2	3,333
RJ Donovan Correctional Facility (RJD)	4,015	2,992	134.2	3,942
California State Prison, Sacramento (SAC)	2,131	1,828	116.6	2,449
California Substance Abuse Treatment Facility (SATF)	5,477	3,424	160.0	5,111
Sierra Conservation Center (SCC)	4,077	3,936	103.6	4,570
California State Prison, Solano (SOL)	4,538	2,610	173.9	3,882
San Quentin State Prison (SQ)	4,234	3,082	137.4	3,984
Salinas Valley State Prison (SVSP)	3,015	2,452	123.0	3,409
Valley State Prison (VSP)	2,856	1,980	144.2	2,954
Wasco State Prison (WSP)	4,825	2,984	161.7	4,351
Male Total	112,900	85,958	131.3	116,819
Female Institutions				
Central California Women's Facility (CCWF)	2,775	2,004	138.5	2,964
California Institution for Women (CIW)	1,684	1,398	120.5	1,877
Folsom State Prison (FOL)	476	403	118.1	530
San Quentin State Prison (SQ)	1	3,082	0.0	3,273
Female Total	4,936	3,805	129.7	8,644
Institution Total	117,836	89,763	131.3	125,463

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
October 31, 2019

Monthly Report of Population
As of Midnight October 31, 2019

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,999	2,920	137.0	4,370
Calipatria State Prison (CAL)	3,384	2,308	146.6	3,333
California Correctional Center (CCC)	3,757	3,883	96.8	4,762
California Correctional Institution (CCI)	3,749	2,783	134.7	4,120
Centinela State Prison (CEN)	3,566	2,308	154.5	3,333
California Health Care Facility - Stockton (CHCF)	2,818	2,951	95.5	2,951
California Institution for Men (CIM)	3,680	2,976	123.7	4,186
California Men's Colony (CMC)	3,811	3,838	99.3	4,308
California Medical Facility (CMF)	2,587	2,361	109.6	2,847
California State Prison, Corcoran (COR)	3,225	3,116	103.5	4,233
California Rehabilitation Center (CRC)	3,481	2,491	139.7	3,210
Correctional Training Facility (CTF)	5,215	3,312	157.5	4,887
Chuckawalla Valley State Prison (CVSP)	2,745	1,738	157.9	2,478
Deuel Vocational Institution (DVI)	2,268	1,681	134.9	2,353
Folsom State Prison (FOL)	2,890	2,066	139.9	2,895
High Desert State Prison (HDSP)	3,201	2,324	137.7	3,361
Ironwood State Prison (ISP)	2,839	2,200	129.0	3,200
Kern Valley State Prison (KVSP)	3,574	2,448	146.0	3,522
California State Prison, Los Angeles County (LAC)	3,124	2,300	135.8	3,300
Mule Creek State Prison (MCSP)	4,051	3,284	123.4	4,009
North Kern State Prison (NKSP)	4,061	2,694	150.7	3,911
Pelican Bay State Prison (PBSP)	2,644	2,380	111.1	3,265
Pleasant Valley State Prison (PVSP)	3,150	2,308	136.5	3,333
RJ Donovan Correctional Facility (RJD)	3,946	2,992	131.9	3,942
California State Prison, Sacramento (SAC)	2,152	1,828	117.7	2,449
California Substance Abuse Treatment Facility (SATF)	5,380	3,424	157.1	5,111
Sierra Conservation Center (SCC)	4,247	3,936	107.9	4,570
California State Prison, Solano (SOL)	4,574	2,610	175.2	3,882
San Quentin State Prison (SQ)	4,182	3,082	135.7	3,984
Salinas Valley State Prison (SVSP)	2,931	2,452	119.5	3,409
Valley State Prison (VSP)	2,867	1,980	144.8	2,954
Wasco State Prison (WSP)	4,818	2,984	161.5	4,351
Male Total	112,916	85,958	131.4	116,819
Female Institutions				
Central California Women's Facility (CCWF)	2,832	2,004	141.3	2,964
California Institution for Women (CIW)	1,690	1,398	120.9	1,877
Folsom State Prison (FOL)	450	403	111.7	530
San Quentin State Prison (SQ)	1	3,082	0.0	3,273
Female Total	4,973	3,805	130.7	8,644
Institution Total	117,889	89,763	131.3	125,463

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
December 1, 2019

Monthly Report of Population
As of Midnight November 30, 2019

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,990	2,920	136.6	4,370
Calipatria State Prison (CAL)	3,292	2,308	142.6	3,333
California Correctional Center (CCC)	3,831	3,883	98.7	4,762
California Correctional Institution (CCI)	3,720	2,783	133.7	4,120
Centinela State Prison (CEN)	3,606	2,308	156.2	3,333
California Health Care Facility - Stockton (CHCF)	2,840	2,951	96.2	2,951
California Institution for Men (CIM)	3,656	2,976	122.8	4,186
California Men's Colony (CMC)	3,813	3,838	99.3	4,308
California Medical Facility (CMF)	2,548	2,361	107.9	2,847
California State Prison, Corcoran (COR)	3,147	3,116	101.0	4,233
California Rehabilitation Center (CRC)	3,540	2,491	142.1	3,210
Correctional Training Facility (CTF)	5,194	3,312	156.8	4,887
Chuckawalla Valley State Prison (CVSP)	2,763	1,738	159.0	2,478
Deuel Vocational Institution (DVI)	2,209	1,681	131.4	2,353
Folsom State Prison (FOL)	2,838	2,066	137.4	2,897
High Desert State Prison (HDSP)	3,164	2,324	136.1	3,361
Ironwood State Prison (ISP)	2,844	2,200	129.3	3,200
Kern Valley State Prison (KVSP)	3,619	2,448	147.8	3,522
California State Prison, Los Angeles County (LAC)	3,138	2,300	136.4	3,300
Mule Creek State Prison (MCSP)	4,027	3,284	122.6	4,009
North Kern State Prison (NKSP)	4,002	2,694	148.6	3,911
Pelican Bay State Prison (PBSP)	2,600	2,380	109.2	3,265
Pleasant Valley State Prison (PVSP)	3,159	2,308	136.9	3,333
RJ Donovan Correctional Facility (RJD)	3,925	2,992	131.2	3,942
California State Prison, Sacramento (SAC)	2,214	1,828	121.1	2,449
California Substance Abuse Treatment Facility (SATF)	5,362	3,424	156.6	5,111
Sierra Conservation Center (SCC)	4,334	3,836	113.0	4,570
California State Prison, Solano (SOL)	4,457	2,610	170.8	3,882
San Quentin State Prison (SQ)	4,216	3,082	136.8	3,984
Salinas Valley State Prison (SVSP)	2,963	2,452	120.8	3,409
Valley State Prison (VSP)	2,904	1,980	146.7	2,954
Wasco State Prison (WSP)	4,780	2,984	160.2	4,351
Male Total	112,695	85,858	131.3	116,821
Female Institutions				
Central California Women's Facility (CCWF)	2,801	2,004	139.8	2,964
California Institution for Women (CIW)	1,672	1,398	119.6	1,877
Folsom State Prison (FOL)	467	403	115.9	530
San Quentin State Prison (SQ)	1	3,082	0.0	3,273
Female Total	4,941	3,805	129.9	8,644
Institution Total	117,636	89,663	131.2	125,465

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
January 1, 2020

Monthly Report of Population
As of Midnight December 31, 2019

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	4,036	2,920	138.2	4,370
Calipatria State Prison (CAL)	3,189	2,308	138.2	3,333
California Correctional Center (CCC)	3,803	3,883	97.9	4,762
California Correctional Institution (CCI)	3,694	2,783	132.7	4,120
Centinela State Prison (CEN)	3,550	2,308	153.8	3,333
California Health Care Facility - Stockton (CHCF)	2,831	2,951	95.9	2,951
California Institution for Men (CIM)	3,646	2,976	122.5	4,186
California Men's Colony (CMC)	3,755	3,838	97.8	4,308
California Medical Facility (CMF)	2,554	2,361	108.2	2,847
California State Prison, Corcoran (COR)	3,141	3,116	100.8	4,233
California Rehabilitation Center (CRC)	3,573	2,491	143.4	3,210
Correctional Training Facility (CTF)	5,095	3,312	153.8	4,887
Chuckawalla Valley State Prison (CVSP)	2,756	1,738	158.6	2,478
Deuel Vocational Institution (DVI)	2,142	1,681	127.4	2,353
Folsom State Prison (FOL)	2,839	2,066	137.4	2,897
High Desert State Prison (HDSP)	3,110	2,324	133.8	3,361
Ironwood State Prison (ISP)	2,840	2,200	129.1	3,200
Kern Valley State Prison (KVSP)	3,589	2,448	146.6	3,522
California State Prison, Los Angeles County (LAC)	3,193	2,300	138.8	3,300
Mule Creek State Prison (MCSP)	3,989	3,284	121.5	4,009
North Kern State Prison (NKSP)	4,344	2,694	161.2	3,911
Pelican Bay State Prison (PBSP)	2,598	2,380	109.2	3,265
Pleasant Valley State Prison (PVSP)	3,159	2,308	136.9	3,333
RJ Donovan Correctional Facility (RJD)	3,874	2,992	129.5	3,942
California State Prison, Sacramento (SAC)	2,270	1,828	124.2	2,449
California Substance Abuse Treatment Facility (SATF)	5,303	3,424	154.9	5,111
Sierra Conservation Center (SCC)	4,381	3,836	114.2	4,570
California State Prison, Solano (SOL)	4,356	2,610	166.9	3,882
San Quentin State Prison (SQ)	4,161	3,082	135.0	3,984
Salinas Valley State Prison (SVSP)	2,946	2,452	120.1	3,409
Valley State Prison (VSP)	2,951	1,980	149.0	2,954
Wasco State Prison (WSP)	4,828	2,984	161.8	4,351
Male Total	112,496	85,858	131.0	116,821
Female Institutions				
Central California Women's Facility (CCWF)	2,779	2,004	138.7	2,964
California Institution for Women (CIW)	1,681	1,398	120.2	1,877
Folsom State Prison (FOL)	436	403	108.2	530
San Quentin State Prison (SQ)	1	3,082	0.0	3,273
Female Total	4,897	3,805	128.7	8,644
Institution Total	117,393	89,663	130.9	125,465

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
February 1, 2020

Monthly Report of Population
As of Midnight January 31, 2020

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	4,205	2,920	144.0	4,387
Calipatria State Prison (CAL)	3,113	2,308	134.9	3,451
California Correctional Center (CCC)	4,054	3,883	104.4	4,752
California Correctional Institution (CCI)	3,700	2,783	133.0	4,085
Centinela State Prison (CEN)	3,476	2,308	150.6	3,446
California Health Care Facility - Stockton (CHCF)	2,848	2,951	96.5	2,951
California Institution for Men (CIM)	3,627	2,976	121.9	4,226
California Men's Colony (CMC)	3,764	3,838	98.1	4,407
California Medical Facility (CMF)	2,507	2,361	106.2	2,861
California State Prison, Corcoran (COR)	3,042	3,116	97.6	4,476
California Rehabilitation Center (CRC)	3,812	2,491	153.0	3,159
Correctional Training Facility (CTF)	5,064	3,312	152.9	4,887
Chuckawalla Valley State Prison (CVSP)	2,771	1,738	159.4	2,578
Deuel Vocational Institution (DVI)	2,053	1,681	122.1	2,413
Folsom State Prison (FOL)	2,872	2,066	139.0	2,986
High Desert State Prison (HDSP)	3,161	2,324	136.0	3,461
Ironwood State Prison (ISP)	2,898	2,200	131.7	3,300
Kern Valley State Prison (KVSP)	3,553	2,448	145.1	3,622
California State Prison, Los Angeles County (LAC)	3,219	2,300	140.0	3,400
Mule Creek State Prison (MCSP)	4,007	3,284	122.0	4,105
North Kern State Prison (NKSP)	4,356	2,694	161.7	4,011
Pelican Bay State Prison (PBSP)	2,648	2,380	111.3	3,361
Pleasant Valley State Prison (PVSP)	3,131	2,308	135.7	3,433
RJ Donovan Correctional Facility (RJD)	3,845	2,992	128.5	4,038
California State Prison, Sacramento (SAC)	2,354	1,828	128.8	2,545
California Substance Abuse Treatment Facility (SATF)	5,296	3,424	154.7	5,111
Sierra Conservation Center (SCC)	4,396	3,836	114.6	4,570
California State Prison, Solano (SOL)	4,308	2,610	165.1	3,882
San Quentin State Prison (SQ)	4,033	3,082	130.9	3,984
Salinas Valley State Prison (SVSP)	2,921	2,452	119.1	3,509
Valley State Prison (VSP)	3,005	1,980	151.8	2,954
Wasco State Prison (WSP)	4,564	2,984	152.9	4,447
Male Total	112,603	85,858	131.2	118,798
Female Institutions				
Central California Women's Facility (CCWF)	2,816	2,004	140.5	2,988
California Institution for Women (CIW)	1,620	1,398	115.9	1,877
Folsom State Prison (FOL)	415	403	103.0	530
Female Total	4,851	3,805	127.5	5,395
Institution Total	117,454	89,663	131.0	124,193

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
March 1, 2020

Monthly Report of Population
As of Midnight February 29, 2020

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	4,223	2,920	144.6	4,387
Calipatria State Prison (CAL)	2,977	2,308	129.0	3,451
California Correctional Center (CCC)	4,177	3,883	107.6	4,752
California Correctional Institution (CCI)	3,659	2,783	131.5	4,085
Centinela State Prison (CEN)	3,405	2,308	147.5	3,446
California Health Care Facility - Stockton (CHCF)	2,822	2,951	95.6	2,951
California Institution for Men (CIM)	3,552	2,976	119.4	4,226
California Men's Colony (CMC)	3,782	3,838	98.5	4,407
California Medical Facility (CMF)	2,485	2,361	105.3	2,861
California State Prison, Corcoran (COR)	2,915	3,116	93.5	4,476
California Rehabilitation Center (CRC)	3,937	2,491	158.0	3,084
Correctional Training Facility (CTF)	5,073	3,312	153.2	4,887
Chuckawalla Valley State Prison (CVSP)	2,904	1,738	167.1	2,578
Deuel Vocational Institution (DVI)	1,994	1,681	118.6	2,190
Folsom State Prison (FOL)	2,871	2,066	139.0	2,986
High Desert State Prison (HDSP)	3,255	2,324	140.1	3,461
Ironwood State Prison (ISP)	2,925	2,200	133.0	3,300
Kern Valley State Prison (KVSP)	3,512	2,448	143.5	3,622
California State Prison, Los Angeles County (LAC)	3,200	2,300	139.1	3,400
Mule Creek State Prison (MCSP)	4,003	3,284	121.9	4,105
North Kern State Prison (NKSP)	4,249	2,694	157.7	4,011
Pelican Bay State Prison (PBSP)	2,628	2,380	110.4	3,361
Pleasant Valley State Prison (PVSP)	3,203	2,308	138.8	3,433
RJ Donovan Correctional Facility (RJD)	3,893	2,992	130.1	4,038
California State Prison, Sacramento (SAC)	2,425	1,828	132.7	2,545
California Substance Abuse Treatment Facility (SATF)	5,297	3,424	154.7	5,111
Sierra Conservation Center (SCC)	4,326	3,836	112.8	4,570
California State Prison, Solano (SOL)	4,243	2,610	162.6	3,882
San Quentin State Prison (SQ)	4,051	3,082	131.4	3,984
Salinas Valley State Prison (SVSP)	2,957	2,452	120.6	3,509
Valley State Prison (VSP)	2,988	1,980	150.9	2,954
Wasco State Prison (WSP)	4,611	2,984	154.5	4,447
Male Total	112,542	85,858	131.1	118,500
Female Institutions				
Central California Women's Facility (CCWF)	2,760	2,004	137.7	2,988
California Institution for Women (CIW)	1,635	1,398	117.0	1,877
Folsom State Prison (FOL)	407	403	101.0	530
Female Total	4,802	3,805	126.2	5,395
Institution Total	117,344	89,663	130.9	123,895

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
April 1, 2020

Monthly Report of Population
As of Midnight March 31, 2020

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	4,294	2,920	147.1	4,387
Calipatria State Prison (CAL)	3,055	2,308	132.4	3,451
California Correctional Center (CCC)	4,309	3,883	111.0	4,752
California Correctional Institution (CCI)	3,666	2,783	131.7	4,085
Centinela State Prison (CEN)	3,385	2,308	146.7	3,446
California Health Care Facility - Stockton (CHCF)	2,834	2,951	96.0	2,951
California Institution for Men (CIM)	3,515	2,976	118.1	4,226
California Men's Colony (CMC)	3,823	3,838	99.6	4,407
California Medical Facility (CMF)	2,475	2,361	104.8	2,861
California State Prison, Corcoran (COR)	2,819	3,116	90.5	4,476
California Rehabilitation Center (CRC)	4,015	2,491	161.2	3,084
Correctional Training Facility (CTF)	5,096	3,312	153.9	4,887
Chuckawalla Valley State Prison (CVSP)	2,948	1,738	169.6	2,578
Deuel Vocational Institution (DVI)	1,910	1,681	113.6	2,190
Folsom State Prison (FOL)	2,818	2,066	136.4	2,986
High Desert State Prison (HDSP)	3,352	2,324	144.2	3,461
Ironwood State Prison (ISP)	2,819	2,200	128.1	3,300
Kern Valley State Prison (KVSP)	3,602	2,448	147.1	3,622
California State Prison, Los Angeles County (LAC)	3,220	2,300	140.0	3,400
Mule Creek State Prison (MCSP)	4,003	3,284	121.9	4,105
North Kern State Prison (NKSP)	3,866	2,694	143.5	4,011
Pelican Bay State Prison (PBSP)	2,677	2,380	112.5	3,361
Pleasant Valley State Prison (PVSP)	3,169	2,308	137.3	3,433
RJ Donovan Correctional Facility (RJD)	3,873	2,992	129.4	4,038
California State Prison, Sacramento (SAC)	2,417	1,828	132.2	2,545
California Substance Abuse Treatment Facility (SATF)	5,278	3,424	154.1	5,111
Sierra Conservation Center (SCC)	4,334	3,836	113.0	4,570
California State Prison, Solano (SOL)	4,179	2,610	160.1	3,882
San Quentin State Prison (SQ)	3,988	3,082	129.4	3,984
Salinas Valley State Prison (SVSP)	2,930	2,452	119.5	3,509
Valley State Prison (VSP)	3,024	1,980	152.7	2,954
Wasco State Prison (WSP)	4,359	2,984	146.1	4,447
Male Total	112,052	85,858	130.5	118,500
Female Institutions				
Central California Women's Facility (CCWF)	2,795	2,004	139.5	2,988
California Institution for Women (CIW)	1,650	1,398	118.0	1,877
Folsom State Prison (FOL)	389	403	96.5	530
Female Total	4,834	3,805	127.0	5,395
Institution Total	116,886	89,663	130.4	123,895

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
May 1, 2020

Monthly Report of Population
As of Midnight April 30, 2020

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	4,197	2,920	143.7	4,387
Calipatria State Prison (CAL)	2,935	2,308	127.2	3,451
California Correctional Center (CCC)	4,064	3,883	104.7	4,752
California Correctional Institution (CCI)	3,516	2,783	126.3	4,085
Centinela State Prison (CEN)	3,284	2,308	142.3	3,446
California Health Care Facility - Stockton (CHCF)	2,751	2,951	93.2	2,951
California Institution for Men (CIM)	3,357	2,976	112.8	4,350
California Men's Colony (CMC)	3,727	3,838	97.1	4,407
California Medical Facility (CMF)	2,396	2,361	101.5	2,861
California State Prison, Corcoran (COR)	3,719	3,116	119.4	4,476
California Rehabilitation Center (CRC)	3,341	2,491	134.1	3,084
Correctional Training Facility (CTF)	4,801	3,312	145.0	4,941
Chuckawalla Valley State Prison (CVSP)	2,324	1,738	133.7	2,578
Deuel Vocational Institution (DVI)	2,047	1,681	121.8	2,413
Folsom State Prison (FOL)	2,694	2,066	130.4	2,986
High Desert State Prison (HDSP)	3,286	2,324	141.4	3,461
Ironwood State Prison (ISP)	3,203	2,200	145.6	3,300
Kern Valley State Prison (KVSP)	3,534	2,448	144.4	3,622
California State Prison, Los Angeles County (LAC)	3,158	2,300	137.3	3,400
Mule Creek State Prison (MCSP)	3,948	3,284	120.2	4,207
North Kern State Prison (NKSP)	3,630	2,694	134.7	4,011
Pelican Bay State Prison (PBSP)	2,608	2,380	109.6	3,361
Pleasant Valley State Prison (PVSP)	3,062	2,308	132.7	3,535
RJ Donovan Correctional Facility (RJD)	3,806	2,992	127.2	4,038
California State Prison, Sacramento (SAC)	2,363	1,828	129.3	2,545
California Substance Abuse Treatment Facility (SATF)	4,844	3,424	141.5	5,111
Sierra Conservation Center (SCC)	4,012	3,836	104.6	4,570
California State Prison, Solano (SOL)	3,752	2,610	143.8	4,010
San Quentin State Prison (SQ)	3,776	3,082	122.5	3,984
Salinas Valley State Prison (SVSP)	2,877	2,452	117.3	3,509
Valley State Prison (VSP)	2,971	1,980	150.1	2,954
Wasco State Prison (WSP)	4,121	2,984	138.1	4,447
Male Total	108,104	85,858	125.9	119,233
Female Institutions				
Central California Women's Facility (CCWF)	2,640	2,004	131.7	2,988
California Institution for Women (CIW)	1,553	1,398	111.1	1,877
Folsom State Prison (FOL)	276	403	68.5	530
Female Total	4,469	3,805	117.5	5,395
Institution Total	112,573	89,663	125.6	124,628

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
June 1, 2020

Monthly Report of Population
As of Midnight May 31, 2020

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	4,158	2,920	142.4	4,499
Calipatria State Prison (CAL)	3,084	2,308	133.6	3,451
California Correctional Center (CCC)	4,006	3,883	103.2	4,752
California Correctional Institution (CCI)	3,655	2,783	131.3	4,085
Centinela State Prison (CEN)	3,343	2,308	144.8	3,446
California Health Care Facility - Stockton (CHCF)	2,724	2,951	92.3	2,951
California Institution for Men (CIM)	3,098	2,976	104.1	4,350
California Men's Colony (CMC)	3,711	3,838	96.7	4,407
California Medical Facility (CMF)	2,378	2,361	100.7	2,861
California State Prison, Corcoran (COR)	3,741	3,116	120.1	4,476
California Rehabilitation Center (CRC)	3,254	2,491	130.6	3,084
Correctional Training Facility (CTF)	4,817	3,312	145.4	4,941
Chuckawalla Valley State Prison (CVSP)	2,261	1,738	130.1	2,578
Deuel Vocational Institution (DVI)	1,898	1,681	112.9	2,413
Folsom State Prison (FOL)	2,819	2,066	136.4	2,986
High Desert State Prison (HDSP)	3,453	2,324	148.6	3,461
Ironwood State Prison (ISP)	3,251	2,200	147.8	3,300
Kern Valley State Prison (KVSP)	3,645	2,448	148.9	3,622
California State Prison, Los Angeles County (LAC)	3,149	2,300	136.9	3,400
Mule Creek State Prison (MCSP)	3,990	3,284	121.5	4,207
North Kern State Prison (NKSP)	2,892	2,694	107.3	4,011
Pelican Bay State Prison (PBSP)	2,578	2,380	108.3	3,361
Pleasant Valley State Prison (PVSP)	3,233	2,308	140.1	3,535
RJ Donovan Correctional Facility (RJD)	3,792	2,992	126.7	4,038
California State Prison, Sacramento (SAC)	2,346	1,828	128.3	2,545
California Substance Abuse Treatment Facility (SATF)	4,845	3,424	141.5	5,111
Sierra Conservation Center (SCC)	4,015	3,836	104.7	4,570
California State Prison, Solano (SOL)	3,720	2,610	142.5	4,010
San Quentin State Prison (SQ)	3,626	3,082	117.7	3,984
Salinas Valley State Prison (SVSP)	2,904	2,452	118.4	3,509
Valley State Prison (VSP)	3,025	1,980	152.8	2,954
Wasco State Prison (WSP)	3,273	2,984	109.7	4,447
Male Total	106,684	85,858	124.3	119,345
Female Institutions				
Central California Women's Facility (CCWF)	2,609	2,004	130.2	2,988
California Institution for Women (CIW)	1,518	1,398	108.6	1,877
Folsom State Prison (FOL)	261	403	64.8	530
Female Total	4,388	3,805	115.3	5,395
Institution Total	111,072	89,663	123.9	124,740

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
July 1, 2020

Monthly Report of Population
As of Midnight June 30, 2020

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	4,044	2,920	138.5	4,719
Calipatria State Prison (CAL)	3,113	2,308	134.9	3,451
California Correctional Center (CCC)	3,798	3,883	97.8	4,752
California Correctional Institution (CCI)	3,715	2,783	133.5	4,085
Centinela State Prison (CEN)	3,346	2,308	145.0	3,446
California Health Care Facility - Stockton (CHCF)	2,679	2,951	90.8	3,111
California Institution for Men (CIM)	2,956	2,976	99.3	4,350
California Men's Colony (CMC)	3,637	3,838	94.8	4,407
California Medical Facility (CMF)	2,354	2,361	99.7	2,861
California State Prison, Corcoran (COR)	3,572	3,116	114.6	4,476
California Rehabilitation Center (CRC)	3,096	2,491	124.3	3,262
Correctional Training Facility (CTF)	4,860	3,312	146.7	4,941
Chuckawalla Valley State Prison (CVSP)	2,213	1,738	127.3	2,578
Deuel Vocational Institution (DVI)	1,675	1,681	99.6	2,413
Folsom State Prison (FOL)	2,839	2,066	137.4	2,986
High Desert State Prison (HDSP)	3,572	2,324	153.7	3,461
Ironwood State Prison (ISP)	3,205	2,200	145.7	3,300
Kern Valley State Prison (KVSP)	3,700	2,448	151.1	3,622
California State Prison, Los Angeles County (LAC)	3,101	2,300	134.8	3,400
Mule Creek State Prison (MCSP)	3,992	3,284	121.6	4,207
North Kern State Prison (NKSP)	2,229	2,694	82.7	4,011
Pelican Bay State Prison (PBSP)	2,524	2,380	106.1	3,361
Pleasant Valley State Prison (PVSP)	3,200	2,308	138.6	3,535
RJ Donovan Correctional Facility (RJD)	3,804	2,992	127.1	4,038
California State Prison, Sacramento (SAC)	2,363	1,828	129.3	2,545
California Substance Abuse Treatment Facility (SATF)	4,836	3,424	141.2	5,111
Sierra Conservation Center (SCC)	4,028	3,836	105.0	4,570
California State Prison, Solano (SOL)	3,698	2,610	141.7	4,010
San Quentin State Prison (SQ)	3,462	3,082	112.3	4,044
Salinas Valley State Prison (SVSP)	2,896	2,452	118.1	3,509
Valley State Prison (VSP)	3,021	1,980	152.6	2,954
Wasco State Prison (WSP)	2,649	2,984	88.8	4,447
Male Total	104,177	85,858	121.3	119,963
Female Institutions				
Central California Women's Facility (CCWF)	2,519	2,004	125.7	2,988
California Institution for Women (CIW)	1,477	1,398	105.7	1,877
Folsom State Prison (FOL)	220	403	54.6	530
Female Total	4,216	3,805	110.8	5,395
Institution Total	108,393	89,663	120.9	125,358

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
August 1, 2020

Monthly Report of Population
As of Midnight July 31, 2020

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,824	2,920	131.0	4,719
Calipatria State Prison (CAL)	2,955	2,308	128.0	3,451
California Correctional Center (CCC)	3,275	3,883	84.3	4,752
California Correctional Institution (CCI)	3,445	2,783	123.8	4,115
Centinela State Prison (CEN)	3,237	2,308	140.3	3,446
California Health Care Facility - Stockton (CHCF)	2,575	2,951	87.3	3,111
California Institution for Men (CIM)	2,557	2,976	85.9	4,450
California Men's Colony (CMC)	3,486	3,838	90.8	4,407
California Medical Facility (CMF)	2,207	2,361	93.5	2,981
California State Prison, Corcoran (COR)	3,453	3,116	110.8	4,476
California Rehabilitation Center (CRC)	2,837	2,491	113.9	3,262
Correctional Training Facility (CTF)	4,630	3,312	139.8	4,941
Chuckawalla Valley State Prison (CVSP)	2,116	1,738	121.7	2,578
Deuel Vocational Institution (DVI)	1,517	1,681	90.2	2,413
Folsom State Prison (FOL)	2,499	2,066	121.0	3,026
High Desert State Prison (HDSP)	3,461	2,324	148.9	3,461
Ironwood State Prison (ISP)	3,058	2,200	139.0	3,300
Kern Valley State Prison (KVSP)	3,580	2,448	146.2	3,622
California State Prison, Los Angeles County (LAC)	3,068	2,300	133.4	3,400
Mule Creek State Prison (MCSP)	3,917	3,284	119.3	4,207
North Kern State Prison (NKSP)	1,799	2,694	66.8	4,011
Pelican Bay State Prison (PBSP)	2,432	2,380	102.2	3,361
Pleasant Valley State Prison (PVSP)	3,016	2,308	130.7	3,535
RJ Donovan Correctional Facility (RJD)	3,645	2,992	121.8	4,038
California State Prison, Sacramento (SAC)	2,316	1,828	126.7	2,545
California Substance Abuse Treatment Facility (SATF)	4,674	3,424	136.5	5,111
Sierra Conservation Center (SCC)	3,678	3,836	95.9	4,570
California State Prison, Solano (SOL)	3,575	2,610	137.0	4,010
San Quentin State Prison (SQ)	3,158	3,082	102.5	4,636
Salinas Valley State Prison (SVSP)	2,817	2,452	114.9	3,509
Valley State Prison (VSP)	2,919	1,980	147.4	2,954
Wasco State Prison (WSP)	2,208	2,984	74.0	4,447
Male Total	97,934	85,858	114.1	120,845
Female Institutions				
Central California Women's Facility (CCWF)	2,155	2,004	107.5	2,988
California Institution for Women (CIW)	1,296	1,398	92.7	1,877
Folsom State Prison (FOL)	138	403	34.2	530
Female Total	3,589	3,805	94.3	5,395
Institution Total	101,523	89,663	113.2	126,240

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
September 1, 2020

Monthly Report of Population
As of Midnight August 31, 2020

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,727	2,920	127.6	4,719
Calipatria State Prison (CAL)	2,893	2,308	125.3	3,451
California Correctional Center (CCC)	2,899	3,883	74.7	4,752
California Correctional Institution (CCI)	3,313	2,783	119.0	4,175
Centinela State Prison (CEN)	3,137	2,308	135.9	3,446
California Health Care Facility - Stockton (CHCF)	2,530	2,951	85.7	3,211
California Institution for Men (CIM)	2,448	2,976	82.3	4,450
California Men's Colony (CMC)	3,316	3,838	86.4	4,687
California Medical Facility (CMF)	2,148	2,361	91.0	2,981
California State Prison, Corcoran (COR)	3,314	3,116	106.4	4,476
California Rehabilitation Center (CRC)	2,589	2,491	103.9	3,262
Correctional Training Facility (CTF)	4,441	3,312	134.1	4,997
Chuckawalla Valley State Prison (CVSP)	2,051	1,738	118.0	2,578
Deuel Vocational Institution (DVI)	1,504	1,681	89.5	2,413
Folsom State Prison (FOL)	2,408	2,066	116.6	3,282
High Desert State Prison (HDSP)	3,349	2,324	144.1	3,461
Ironwood State Prison (ISP)	2,940	2,200	133.6	3,300
Kern Valley State Prison (KVSP)	3,520	2,448	143.8	3,622
California State Prison, Los Angeles County (LAC)	3,016	2,300	131.1	3,424
Mule Creek State Prison (MCSP)	3,824	3,284	116.4	4,207
North Kern State Prison (NKSP)	1,639	2,694	60.8	4,011
Pelican Bay State Prison (PBSP)	2,380	2,380	100.0	3,361
Pleasant Valley State Prison (PVSP)	2,876	2,308	124.6	3,535
RJ Donovan Correctional Facility (RJD)	3,616	2,992	120.9	4,038
California State Prison, Sacramento (SAC)	2,250	1,828	123.1	2,545
California Substance Abuse Treatment Facility (SATF)	4,531	3,424	132.3	5,157
Sierra Conservation Center (SCC)	3,271	3,836	85.3	4,570
California State Prison, Solano (SOL)	3,429	2,610	131.4	4,010
San Quentin State Prison (SQ)	3,062	3,082	99.4	4,422
Salinas Valley State Prison (SVSP)	2,754	2,452	112.3	3,509
Valley State Prison (VSP)	2,813	1,980	142.1	2,954
Wasco State Prison (WSP)	1,922	2,984	64.4	4,447
Male Total	93,910	85,858	109.4	121,453
Female Institutions				
Central California Women's Facility (CCWF)	2,037	2,004	101.6	2,988
California Institution for Women (CIW)	1,212	1,398	86.7	1,877
Folsom State Prison (FOL)	107	403	26.6	530
Female Total	3,356	3,805	88.2	5,395
Institution Total	97,266	89,663	108.5	126,848

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
October 1, 2020

Monthly Report of Population
As of Midnight September 30, 2020

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,557	2,920	121.8	4,719
Calipatria State Prison (CAL)	2,898	2,308	125.6	3,451
California Correctional Center (CCC)	2,560	3,883	65.9	4,752
California Correctional Institution (CCI)	3,103	2,783	111.5	4,175
Centinela State Prison (CEN)	3,123	2,308	135.3	3,446
California Health Care Facility - Stockton (CHCF)	2,460	2,951	83.4	3,211
California Institution for Men (CIM)	2,295	2,976	77.1	4,450
California Men's Colony (CMC)	3,202	3,838	83.4	4,407
California Medical Facility (CMF)	2,077	2,361	88.0	2,981
California State Prison, Corcoran (COR)	3,234	3,116	103.8	4,476
California Rehabilitation Center (CRC)	2,370	2,491	95.1	3,262
Correctional Training Facility (CTF)	4,369	3,312	131.9	4,997
Chuckawalla Valley State Prison (CVSP)	1,925	1,738	110.8	2,578
Deuel Vocational Institution (DVI)	1,577	1,681	93.8	2,413
Folsom State Prison (FOL)	2,258	2,066	109.3	3,858
High Desert State Prison (HDSP)	3,352	2,324	144.2	3,461
Ironwood State Prison (ISP)	2,920	2,200	132.7	3,300
Kern Valley State Prison (KVSP)	3,515	2,448	143.6	3,622
California State Prison, Los Angeles County (LAC)	2,959	2,300	128.7	3,424
Mule Creek State Prison (MCSP)	3,785	3,284	115.3	4,207
North Kern State Prison (NKSP)	1,857	2,694	68.9	4,011
Pelican Bay State Prison (PBSP)	2,317	2,380	97.4	3,361
Pleasant Valley State Prison (PVSP)	2,841	2,308	123.1	3,535
RJ Donovan Correctional Facility (RJD)	3,566	2,992	119.2	4,038
California State Prison, Sacramento (SAC)	2,243	1,828	122.7	2,545
California Substance Abuse Treatment Facility (SATF)	4,442	3,424	129.7	5,157
Sierra Conservation Center (SCC)	3,024	3,836	78.8	4,570
California State Prison, Solano (SOL)	3,337	2,610	127.9	4,010
San Quentin State Prison (SQ)	2,930	3,082	95.1	4,491
Salinas Valley State Prison (SVSP)	2,759	2,452	112.5	3,509
Valley State Prison (VSP)	2,766	1,980	139.7	2,954
Wasco State Prison (WSP)	1,784	2,984	59.8	4,447
Male Total	91,405	85,858	106.5	121,818
Female Institutions				
Central California Women's Facility (CCWF)	1,957	2,004	97.7	3,068
California Institution for Women (CIW)	1,173	1,398	83.9	1,877
Folsom State Prison (FOL)	93	403	23.1	530
Female Total	3,223	3,805	84.7	5,475
Institution Total	94,628	89,663	105.5	127,293

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
November 1, 2020

Monthly Report of Population
As of Midnight October 31, 2020

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,473	2,920	118.9	4,719
Calipatria State Prison (CAL)	2,987	2,308	129.4	3,451
California Correctional Center (CCC)	2,409	3,883	62.0	4,752
California Correctional Institution (CCI)	3,000	2,783	107.8	4,175
Centinela State Prison (CEN)	3,141	2,308	136.1	3,446
California Health Care Facility - Stockton (CHCF)	2,441	2,951	82.7	3,051
California Institution for Men (CIM)	2,178	2,976	73.2	4,450
California Men's Colony (CMC)	3,118	3,838	81.2	4,407
California Medical Facility (CMF)	2,044	2,361	86.6	2,981
California State Prison, Corcoran (COR)	2,958	3,116	94.9	4,476
California Rehabilitation Center (CRC)	2,260	2,491	90.7	3,514
Correctional Training Facility (CTF)	4,390	3,312	132.5	4,997
Chuckawalla Valley State Prison (CVSP)	1,936	1,738	111.4	2,578
Deuel Vocational Institution (DVI)	1,476	1,681	87.8	2,413
Folsom State Prison (FOL)	2,189	2,066	106.0	3,078
High Desert State Prison (HDSP)	3,342	2,324	143.8	3,461
Ironwood State Prison (ISP)	2,892	2,200	131.5	3,300
Kern Valley State Prison (KVSP)	3,623	2,448	148.0	3,622
California State Prison, Los Angeles County (LAC)	2,805	2,300	122.0	3,424
Mule Creek State Prison (MCSP)	3,890	3,284	118.5	4,207
North Kern State Prison (NKSP)	2,192	2,694	81.4	4,011
Pelican Bay State Prison (PBSP)	2,290	2,380	96.2	3,361
Pleasant Valley State Prison (PVSP)	2,833	2,308	122.7	3,535
RJ Donovan Correctional Facility (RJD)	3,608	2,992	120.6	4,038
California State Prison, Sacramento (SAC)	2,246	1,828	122.9	2,545
California Substance Abuse Treatment Facility (SATF)	4,446	3,424	129.8	5,157
Sierra Conservation Center (SCC)	3,076	3,836	80.2	4,570
California State Prison, Solano (SOL)	3,299	2,610	126.4	4,010
San Quentin State Prison (SQ)	2,851	3,082	92.5	4,226
Salinas Valley State Prison (SVSP)	2,799	2,452	114.2	3,509
Valley State Prison (VSP)	2,763	1,980	139.5	3,034
Wasco State Prison (WSP)	2,095	2,984	70.2	4,447
Male Total	91,050	85,858	106.0	120,945
Female Institutions				
Central California Women's Facility (CCWF)	1,998	2,004	99.7	3,068
California Institution for Women (CIW)	1,135	1,398	81.2	1,877
Folsom State Prison (FOL)	87	403	21.6	530
Female Total	3,220	3,805	84.6	5,475
Institution Total	94,270	89,663	105.1	126,420

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
November 30, 2020

Monthly Report of Population
As of Midnight November 30, 2020

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,412	2,920	116.8	4,719
Calipatria State Prison (CAL)	2,963	2,308	128.4	3,451
California Correctional Center (CCC)	2,279	3,883	58.7	4,492
California Correctional Institution (CCI)	2,983	2,783	107.2	4,175
Centinela State Prison (CEN)	3,104	2,308	134.5	3,446
California Health Care Facility - Stockton (CHCF)	2,399	2,951	81.3	3,051
California Institution for Men (CIM)	2,072	2,976	69.6	4,450
California Men's Colony (CMC)	3,137	3,838	81.7	4,407
California Medical Facility (CMF)	2,046	2,361	86.7	2,981
California State Prison, Corcoran (COR)	2,970	3,116	95.3	4,476
California Rehabilitation Center (CRC)	2,149	2,491	86.3	3,434
Correctional Training Facility (CTF)	4,344	3,312	131.2	5,049
Chuckawalla Valley State Prison (CVSP)	1,885	1,738	108.5	2,578
Deuel Vocational Institution (DVI)	1,379	1,681	82.0	2,413
Folsom State Prison (FOL)	2,107	2,066	102.0	3,078
High Desert State Prison (HDSP)	3,338	2,324	143.6	3,461
Ironwood State Prison (ISP)	2,824	2,200	128.4	3,300
Kern Valley State Prison (KVSP)	3,643	2,448	148.8	3,622
California State Prison, Los Angeles County (LAC)	2,739	2,300	119.1	3,424
Mule Creek State Prison (MCSP)	3,914	3,284	119.2	4,207
North Kern State Prison (NKSP)	2,642	2,694	98.1	4,011
Pelican Bay State Prison (PBSP)	2,243	2,380	94.2	3,361
Pleasant Valley State Prison (PVSP)	2,795	2,308	121.1	3,535
RJ Donovan Correctional Facility (RJD)	3,605	2,992	120.5	4,038
California State Prison, Sacramento (SAC)	2,249	1,828	123.0	2,545
California Substance Abuse Treatment Facility (SATF)	4,377	3,424	127.8	5,657
Sierra Conservation Center (SCC)	3,095	3,836	80.7	4,570
California State Prison, Solano (SOL)	3,230	2,610	123.8	4,056
San Quentin State Prison (SQ)	2,734	3,082	88.7	4,226
Salinas Valley State Prison (SVSP)	2,819	2,452	115.0	3,509
Valley State Prison (VSP)	2,779	1,980	140.4	3,034
Wasco State Prison (WSP)	2,672	2,984	89.5	4,447
Male Total	90,927	85,858	105.9	121,203
Female Institutions				
Central California Women's Facility (CCWF)	2,048	2,004	102.2	3,068
California Institution for Women (CIW)	1,092	1,398	78.1	1,877
Folsom State Prison (FOL)	79	403	19.6	530
Female Total	3,219	3,805	84.6	5,475
Institution Total	94,146	89,663	105.0	126,678

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
January 1, 2021

Monthly Report of Population
As of Midnight December 31, 2020

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,333	2,920	114.1	4,719
Calipatria State Prison (CAL)	2,926	2,308	126.8	3,451
California Correctional Center (CCC)	2,138	3,883	55.1	4,392
California Correctional Institution (CCI)	2,914	2,783	104.7	4,175
Centinela State Prison (CEN)	3,068	2,308	132.9	3,446
California Health Care Facility - Stockton (CHCF)	2,359	2,951	79.9	3,051
California Institution for Men (CIM)	2,026	2,976	68.1	4,450
California Men's Colony (CMC)	3,076	3,838	80.1	4,407
California Medical Facility (CMF)	2,008	2,361	85.0	3,021
California State Prison, Corcoran (COR)	2,918	3,116	93.6	4,476
California Rehabilitation Center (CRC)	2,064	2,491	82.9	3,434
Correctional Training Facility (CTF)	4,241	3,312	128.0	5,311
Chuckawalla Valley State Prison (CVSP)	1,852	1,738	106.6	2,578
Deuel Vocational Institution (DVI)	1,332	1,681	79.2	2,413
Folsom State Prison (FOL)	2,060	2,066	99.7	3,078
High Desert State Prison (HDSP)	3,302	2,324	142.1	3,461
Ironwood State Prison (ISP)	2,773	2,200	126.0	3,300
Kern Valley State Prison (KVSP)	3,617	2,448	147.8	3,622
California State Prison, Los Angeles County (LAC)	2,704	2,300	117.6	3,424
Mule Creek State Prison (MCSP)	3,859	3,284	117.5	4,455
North Kern State Prison (NKSP)	2,522	2,694	93.6	4,011
Pelican Bay State Prison (PBSP)	2,209	2,380	92.8	3,361
Pleasant Valley State Prison (PVSP)	2,753	2,308	119.3	3,535
RJ Donovan Correctional Facility (RJD)	3,561	2,992	119.0	4,182
California State Prison, Sacramento (SAC)	2,227	1,828	121.8	2,545
California Substance Abuse Treatment Facility (SATF)	4,315	3,424	126.0	5,202
Sierra Conservation Center (SCC)	2,938	3,836	76.6	4,250
California State Prison, Solano (SOL)	3,174	2,610	121.6	4,056
San Quentin State Prison (SQ)	2,659	3,082	86.3	4,226
Salinas Valley State Prison (SVSP)	2,802	2,452	114.3	3,509
Valley State Prison (VSP)	2,733	1,980	138.0	3,173
Wasco State Prison (WSP)	2,512	2,984	84.2	4,447
Male Total	88,975	85,858	103.6	121,161
Female Institutions				
Central California Women's Facility (CCWF)	1,999	2,004	99.8	3,068
California Institution for Women (CIW)	1,068	1,398	76.4	1,777
Folsom State Prison (FOL)	74	403	18.4	530
Female Total	3,141	3,805	82.5	5,375
Institution Total	92,116	89,663	102.7	126,536

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
February 1, 2021

Monthly Report of Population
As of Midnight January 31, 2021

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,286	2,920	112.5	4,719
Calipatria State Prison (CAL)	2,916	2,308	126.3	3,451
California Correctional Center (CCC)	2,099	3,443	61.0	4,392
California Correctional Institution (CCI)	2,929	2,783	105.2	4,175
Central California Women's Facility (CCWF)	5	2,004	0.2	1,536
Centinela State Prison (CEN)	3,080	2,308	133.4	3,446
California Health Care Facility - Stockton (CHCF)	2,379	2,951	80.6	3,051
California Institution for Men (CIM)	1,956	2,976	65.7	4,450
California Men's Colony (CMC)	3,023	3,838	78.8	4,445
California Medical Facility (CMF)	1,963	2,361	83.1	3,021
California State Prison, Corcoran (COR)	2,917	3,116	93.6	4,476
California Rehabilitation Center (CRC)	1,976	2,491	79.3	3,274
Correctional Training Facility (CTF)	4,200	3,312	126.8	5,311
Chuckawalla Valley State Prison (CVSP)	1,855	1,738	106.7	2,578
Deuel Vocational Institution (DVI)	1,258	1,681	74.8	2,413
Folsom State Prison (FOL)	2,011	2,066	97.3	3,078
High Desert State Prison (HDSP)	3,295	2,324	141.8	3,461
Ironwood State Prison (ISP)	2,741	2,200	124.6	3,300
Kern Valley State Prison (KVSP)	3,629	2,448	148.2	3,622
California State Prison, Los Angeles County (LAC)	2,680	2,300	116.5	3,424
Mule Creek State Prison (MCSP)	3,850	3,284	117.2	4,455
North Kern State Prison (NKSP)	2,306	2,694	85.6	4,011
Pelican Bay State Prison (PBSP)	2,191	2,380	92.1	3,361
Pleasant Valley State Prison (PVSP)	2,743	2,308	118.8	3,535
RJ Donovan Correctional Facility (RJD)	3,514	2,992	117.4	4,182
California State Prison, Sacramento (SAC)	2,233	1,828	122.2	2,545
California Substance Abuse Treatment Facility (SATF)	4,321	3,424	126.2	5,202
Sierra Conservation Center (SCC)	2,865	3,486	82.2	4,250
California State Prison, Solano (SOL)	3,165	2,610	121.3	4,056
San Quentin State Prison (SQ)	2,614	3,082	84.8	4,157
Salinas Valley State Prison (SVSP)	2,885	2,452	117.7	3,509
Valley State Prison (VSP)	2,661	1,980	134.4	3,069
Wasco State Prison (WSP)	2,345	2,984	78.6	4,447
Male Total	87,891	85,068	103.3	122,402
Female Institutions				
Central California Women's Facility (CCWF)	1,991	2,004	99.4	3,068
California Institution for Women (CIW)	1,042	1,298	80.3	1,777
California Medical Facility (CMF)	2	2,361	0.1	2,562
Folsom State Prison (FOL)	65	403	16.1	530
High Desert State Prison (HDSP)	1	2,324	0.0	750
Mule Creek State Prison (MCSP)	1	3,284	0.0	800
California Substance Abuse Treatment Facility (SATF)	2	3,424	0.1	837
Female Total	3,104	3,705	83.8	10,324
Institution Total	90,995	88,773	102.5	132,726

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
March 1, 2021

Monthly Report of Population
As of Midnight February 28, 2021

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,232	2,920	110.7	4,719
Calipatria State Prison (CAL)	2,938	2,308	127.3	3,451
California Correctional Center (CCC)	2,093	3,443	60.8	4,392
California Correctional Institution (CCI)	2,912	2,783	104.6	4,175
Central California Women's Facility (CCWF)	4	2,004	0.2	1,420
Centinela State Prison (CEN)	3,056	2,308	132.4	3,446
California Health Care Facility - Stockton (CHCF)	2,435	2,951	82.5	3,051
California Institution for Men (CIM)	1,905	2,976	64.0	4,450
California Men's Colony (CMC)	3,004	3,838	78.3	4,445
California Medical Facility (CMF)	1,916	2,361	81.2	2,921
California State Prison, Corcoran (COR)	2,962	3,116	95.1	4,476
California Rehabilitation Center (CRC)	1,881	2,491	75.5	3,274
Correctional Training Facility (CTF)	4,260	3,312	128.6	5,103
Chuckawalla Valley State Prison (CVSP)	1,862	1,738	107.1	2,578
Deuel Vocational Institution (DVI)	1,159	1,681	68.9	2,181
Folsom State Prison (FOL)	1,963	2,066	95.0	3,078
High Desert State Prison (HDSP)	3,290	2,324	141.6	3,461
Ironwood State Prison (ISP)	2,702	2,200	122.8	3,300
Kern Valley State Prison (KVSP)	3,630	2,448	148.3	3,622
California State Prison, Los Angeles County (LAC)	2,663	2,300	115.8	3,424
Mule Creek State Prison (MCSP)	3,861	3,284	117.6	4,255
North Kern State Prison (NKSP)	2,596	2,694	96.4	4,011
Pelican Bay State Prison (PBSP)	2,182	2,380	91.7	3,361
Pleasant Valley State Prison (PVSP)	2,695	2,308	116.8	3,535
RJ Donovan Correctional Facility (RJD)	3,502	2,992	117.0	4,182
California State Prison, Sacramento (SAC)	2,233	1,828	122.2	2,545
California Substance Abuse Treatment Facility (SATF)	4,444	3,424	129.8	5,202
Sierra Conservation Center (SCC)	2,926	3,486	83.9	4,056
California State Prison, Solano (SOL)	3,135	2,610	120.1	4,056
San Quentin State Prison (SQ)	2,530	3,082	82.1	4,157
Salinas Valley State Prison (SVSP)	2,976	2,452	121.4	3,509
Valley State Prison (VSP)	2,753	1,980	139.0	3,034
Wasco State Prison (WSP)	2,480	2,984	83.1	4,447
Male Total	88,180	85,068	103.7	121,317
Female Institutions				
Central California Women's Facility (CCWF)	2,037	2,004	101.6	3,068
California Institution for Women (CIW)	1,007	1,298	77.6	1,777
Folsom State Prison (FOL)	54	403	13.4	530
California State Prison, Los Angeles County (LAC)	1	2,300	0.0	725
Female Total	3,099	3,705	83.6	6,100
Institution Total	91,279	88,773	102.8	127,417

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
April 1, 2021

Monthly Report of Population
As of Midnight March 31, 2021

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,134	2,920	107.3	4,719
Calipatria State Prison (CAL)	2,965	2,308	128.5	3,451
California Correctional Center (CCC)	2,090	3,443	60.7	4,392
California Correctional Institution (CCI)	2,898	2,783	104.1	4,175
Central California Women's Facility (CCWF)	3	2,004	0.1	1,420
Centinela State Prison (CEN)	3,056	2,308	132.4	3,446
California Health Care Facility - Stockton (CHCF)	2,447	2,951	82.9	3,051
California Institution for Men (CIM)	1,858	2,976	62.4	4,450
California Men's Colony (CMC)	2,980	3,838	77.6	4,445
California Medical Facility (CMF)	1,924	2,361	81.5	2,921
California State Prison, Corcoran (COR)	3,011	3,116	96.6	4,476
California Rehabilitation Center (CRC)	1,813	2,491	72.8	3,274
Correctional Training Facility (CTF)	4,341	3,312	131.1	4,929
Chuckawalla Valley State Prison (CVSP)	1,914	1,738	110.1	2,578
Deuel Vocational Institution (DVI)	925	1,681	55.0	2,181
Folsom State Prison (FOL)	1,929	2,066	93.4	3,078
High Desert State Prison (HDSP)	3,293	2,324	141.7	3,461
Ironwood State Prison (ISP)	2,643	2,200	120.1	3,300
Kern Valley State Prison (KVSP)	3,637	2,448	148.6	3,622
California State Prison, Los Angeles County (LAC)	2,665	2,300	115.9	3,424
Mule Creek State Prison (MCSP)	3,886	3,284	118.3	4,255
North Kern State Prison (NKSP)	2,957	2,694	109.8	4,011
Pelican Bay State Prison (PBSP)	2,154	2,380	90.5	3,361
Pleasant Valley State Prison (PVSP)	2,680	2,308	116.1	3,535
RJ Donovan Correctional Facility (RJD)	3,463	2,992	115.7	4,182
California State Prison, Sacramento (SAC)	2,232	1,828	122.1	2,545
California Substance Abuse Treatment Facility (SATF)	4,511	3,424	131.7	5,202
Sierra Conservation Center (SCC)	2,915	3,486	83.6	4,250
California State Prison, Solano (SOL)	3,090	2,610	118.4	4,056
San Quentin State Prison (SQ)	2,460	3,082	79.8	4,157
Salinas Valley State Prison (SVSP)	3,038	2,452	123.9	3,509
Valley State Prison (VSP)	2,761	1,980	139.4	3,034
Wasco State Prison (WSP)	3,026	2,984	101.4	4,447
Male Total	88,699	85,068	104.3	121,337
Female Institutions				
Central California Women's Facility (CCWF)	2,169	2,004	108.2	3,068
California Institution for Women (CIW)	990	1,298	76.3	1,777
Folsom State Prison (FOL)	45	403	11.2	530
Female Total	3,204	3,705	86.5	5,375
Institution Total	91,903	88,773	103.5	126,712

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
May 1, 2021

Monthly Report of Population
As of Midnight April 30, 2021

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,119	2,920	106.8	4,719
Calipatria State Prison (CAL)	2,935	2,308	127.2	3,451
California Correctional Center (CCC)	2,181	3,443	63.3	4,392
California Correctional Institution (CCI)	2,957	2,783	106.3	4,175
Central California Women's Facility (CCWF)	7	2,004	0.3	1,420
Centinela State Prison (CEN)	3,037	2,308	131.6	3,446
California Health Care Facility - Stockton (CHCF)	2,455	2,951	83.2	3,051
California Institution for Men (CIM)	1,947	2,976	65.4	4,350
California Men's Colony (CMC)	3,006	3,838	78.3	4,407
California Medical Facility (CMF)	1,963	2,361	83.1	2,921
California State Prison, Corcoran (COR)	3,079	3,116	98.8	4,476
California Rehabilitation Center (CRC)	1,896	2,491	76.1	3,274
Correctional Training Facility (CTF)	4,552	3,312	137.4	4,929
Chuckawalla Valley State Prison (CVSP)	1,911	1,738	110.0	2,578
Deuel Vocational Institution (DVI)	561	1,681	33.4	2,181
Folsom State Prison (FOL)	1,950	2,066	94.4	3,078
High Desert State Prison (HDSP)	3,303	2,324	142.1	3,461
Ironwood State Prison (ISP)	2,634	2,200	119.7	3,300
Kern Valley State Prison (KVSP)	3,584	2,448	146.4	3,622
California State Prison, Los Angeles County (LAC)	2,721	2,300	118.3	3,424
Mule Creek State Prison (MCSP)	3,896	3,284	118.6	4,255
North Kern State Prison (NKSP)	3,061	2,694	113.6	4,011
Pelican Bay State Prison (PBSP)	2,135	2,380	89.7	3,361
Pleasant Valley State Prison (PVSP)	2,742	2,308	118.8	3,535
RJ Donovan Correctional Facility (RJD)	3,403	2,992	113.7	4,182
California State Prison, Sacramento (SAC)	2,217	1,828	121.3	2,545
California Substance Abuse Treatment Facility (SATF)	4,653	3,424	135.9	5,202
Sierra Conservation Center (SCC)	2,883	3,486	82.7	4,250
California State Prison, Solano (SOL)	3,220	2,610	123.4	4,056
San Quentin State Prison (SQ)	2,387	3,082	77.4	4,157
Salinas Valley State Prison (SVSP)	3,048	2,452	124.3	3,509
Valley State Prison (VSP)	2,884	1,980	145.7	3,034
Wasco State Prison (WSP)	2,980	2,984	99.9	4,447
Male Total	89,307	85,068	105.0	121,199
Female Institutions				
Central California Women's Facility (CCWF)	2,351	2,004	117.3	3,068
California Institution for Women (CIW)	973	1,298	75.0	1,777
Folsom State Prison (FOL)	54	403	13.4	530
Female Total	3,378	3,705	91.2	5,375
Institution Total	92,685	88,773	104.4	126,574

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
June 1, 2021

Monthly Report of Population
As of Midnight May 31, 2021

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,167	2,920	108.5	4,719
Calipatria State Prison (CAL)	2,939	2,308	127.3	3,451
California Correctional Center (CCC)	2,294	3,443	66.6	4,392
California Correctional Institution (CCI)	2,952	2,783	106.1	4,175
Central California Women's Facility (CCWF)	14	2,004	0.7	2,172
Centinela State Prison (CEN)	2,981	2,308	129.2	3,446
California Health Care Facility - Stockton (CHCF)	2,488	2,951	84.3	3,051
California Institution for Men (CIM)	2,090	2,976	70.2	4,350
California Men's Colony (CMC)	3,079	3,838	80.2	4,407
California Medical Facility (CMF)	2,007	2,361	85.0	2,921
California State Prison, Corcoran (COR)	3,136	3,116	100.6	4,476
California Rehabilitation Center (CRC)	2,032	2,491	81.6	3,274
Correctional Training Facility (CTF)	4,629	3,312	139.8	4,929
Chuckawalla Valley State Prison (CVSP)	1,982	1,738	114.0	2,579
Deuel Vocational Institution (DVI)	433	1,681	25.8	2,181
Folsom State Prison (FOL)	2,006	2,066	97.1	3,078
High Desert State Prison (HDSP)	3,262	2,324	140.4	3,461
Ironwood State Prison (ISP)	2,589	2,200	117.7	3,300
Kern Valley State Prison (KVSP)	3,497	2,448	142.9	3,622
California State Prison, Los Angeles County (LAC)	2,753	2,300	119.7	3,424
Mule Creek State Prison (MCSP)	3,911	3,284	119.1	4,255
North Kern State Prison (NKSP)	3,414	2,694	126.7	4,011
Pelican Bay State Prison (PBSP)	2,091	2,380	87.9	3,361
Pleasant Valley State Prison (PVSP)	2,670	2,308	115.7	3,535
RJ Donovan Correctional Facility (RJD)	3,366	2,992	112.5	4,182
California State Prison, Sacramento (SAC)	2,197	1,828	120.2	2,545
California Substance Abuse Treatment Facility (SATF)	4,790	3,424	139.9	5,202
Sierra Conservation Center (SCC)	3,019	3,486	86.6	4,250
California State Prison, Solano (SOL)	3,257	2,610	124.8	4,056
San Quentin State Prison (SQ)	2,419	3,082	78.5	4,157
Salinas Valley State Prison (SVSP)	3,021	2,452	123.2	3,509
Valley State Prison (VSP)	2,946	1,980	148.8	3,034
Wasco State Prison (WSP)	3,153	2,984	105.7	4,447
Male Total	90,584	85,068	106.5	121,952
Female Institutions				
Central California Women's Facility (CCWF)	2,389	2,004	119.2	3,068
California Institution for Women (CIW)	983	1,298	75.7	1,777
Folsom State Prison (FOL)	147	403	36.5	530
Female Total	3,519	3,705	95.0	5,375
Institution Total	94,103	88,773	106.0	127,327

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
June 30, 2021

Weekly Report of Population
As of Midnight June 30, 2021

Weekly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,376	2,920	115.6	4,719
Calipatria State Prison (CAL)	2,915	2,308	126.3	3,451
California Correctional Center (CCC)	2,373	3,443	68.9	4,392
California Correctional Institution (CCI)	2,985	2,783	107.3	4,175
Central California Women's Facility (CCWF)	15	2,004	0.7	2,172
Centinela State Prison (CEN)	2,787	2,308	120.8	3,446
California Health Care Facility - Stockton (CHCF)	2,482	2,951	84.1	2,951
California Institution for Men (CIM)	2,312	2,976	77.7	4,350
California Institution for Women (CIW)	6	1,298	0.5	1,494
California Men's Colony (CMC)	3,067	3,838	79.9	4,407
California Medical Facility (CMF)	1,987	2,361	84.2	2,921
California State Prison, Corcoran (COR)	3,259	3,116	104.6	4,476
California Rehabilitation Center (CRC)	2,240	2,491	89.9	3,274
Correctional Training Facility (CTF)	4,715	3,312	142.4	4,929
Chuckawalla Valley State Prison (CVSP)	2,136	1,738	122.9	2,579
Deuel Vocational Institution (DVI)	190	1,681	11.3	2,181
Folsom State Prison (FOL)	2,184	2,066	105.7	3,148
High Desert State Prison (HDSP)	3,285	2,324	141.4	3,461
Ironwood State Prison (ISP)	2,569	2,200	116.8	3,300
Kern Valley State Prison (KVSP)	3,447	2,448	140.8	3,622
California State Prison, Los Angeles County (LAC)	2,729	2,300	118.7	3,424
Mule Creek State Prison (MCSP)	3,903	3,284	118.8	4,255
North Kern State Prison (NKSP)	3,412	2,694	126.7	4,011
Pelican Bay State Prison (PBSP)	2,112	2,380	88.7	3,361
Pleasant Valley State Prison (PVSP)	2,646	2,308	114.6	3,535
RJ Donovan Correctional Facility (RJD)	3,329	2,992	111.3	4,182
California State Prison, Sacramento (SAC)	2,135	1,828	116.8	2,545
California Substance Abuse Treatment Facility (SATF)	4,969	3,424	145.1	5,202
Sierra Conservation Center (SCC)	3,200	3,486	91.8	4,250
California State Prison, Solano (SOL)	3,231	2,610	123.8	4,056
San Quentin State Prison (SQ)	2,483	3,082	80.6	4,092
Salinas Valley State Prison (SVSP)	3,009	2,452	122.7	3,509
Valley State Prison (VSP)	2,938	1,980	148.4	3,034
Wasco State Prison (WSP)	3,275	2,984	109.8	4,447
Male Total	91,701	85,068	107.8	123,351
Female Institutions				
Central California Women's Facility (CCWF)	2,399	2,004	119.7	3,068
California Institution for Women (CIW)	990	1,298	76.3	1,777
Folsom State Prison (FOL)	214	403	53.1	530
Female Total	3,603	3,705	97.2	5,375
Institution Total	95,304	88,773	107.4	128,726

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
July 31, 2021

Monthly Report of Population
As of Midnight July 31, 2021

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,396	2,909	116.7	4,387
Calipatria State Prison (CAL)	2,907	2,308	126.0	3,451
California Correctional Center (CCC)	2,238	3,377	66.3	3,427
California Correctional Institution (CCI)	2,842	2,739	103.8	4,145
Central California Women's Facility (CCWF)	14	1,990	0.7	2,940
Centinela State Prison (CEN)	2,868	2,308	124.3	3,446
California Health Care Facility - Stockton (CHCF)	2,437	2,953	82.5	2,951
California Institution for Men (CIM)	2,392	2,736	87.4	4,226
California Institution for Women (CIW)	7	1,281	0.5	1,494
California Men's Colony (CMC)	3,020	3,816	79.1	4,407
California Medical Facility (CMF)	2,008	2,318	86.6	2,921
California State Prison, Corcoran (COR)	3,241	3,115	104.0	4,476
California Rehabilitation Center (CRC)	2,394	2,380	100.6	3,174
Correctional Training Facility (CTF)	4,645	3,300	140.8	4,929
Chuckawalla Valley State Prison (CVSP)	2,182	1,738	125.5	2,579
Folsom State Prison (FOL)	2,265	2,065	109.7	3,148
High Desert State Prison (HDSP)	3,222	2,324	138.6	3,461
Ironwood State Prison (ISP)	2,435	2,200	110.7	3,300
Kern Valley State Prison (KVSP)	3,426	2,448	140.0	3,622
California State Prison, Los Angeles County (LAC)	2,696	2,300	117.2	3,400
Mule Creek State Prison (MCSP)	3,878	3,284	118.1	4,155
North Kern State Prison (NKSP)	3,708	2,694	137.6	4,011
Pelican Bay State Prison (PBSP)	2,127	2,380	89.4	3,361
Pleasant Valley State Prison (PVSP)	2,646	2,308	114.6	3,433
RJ Donovan Correctional Facility (RJD)	3,300	2,992	110.3	4,182
California State Prison, Sacramento (SAC)	2,077	1,828	113.6	2,545
California Substance Abuse Treatment Facility (SATF)	5,058	3,424	147.7	5,111
Sierra Conservation Center (SCC)	3,314	3,404	97.4	4,250
California State Prison, Solano (SOL)	3,261	2,594	125.7	4,056
San Quentin State Prison (SQ)	2,549	3,084	82.7	3,984
Salinas Valley State Prison (SVSP)	3,006	2,452	122.6	3,509
Valley State Prison (VSP)	2,956	1,961	150.7	2,954
Wasco State Prison (WSP)	3,717	2,984	124.6	4,447
Male Total	92,232	84,404	109.3	119,882
Female Institutions				
Central California Women's Facility (CCWF)	2,351	1,990	118.1	3,068
California Institution for Women (CIW)	982	1,281	76.7	1,777
Folsom State Prison (FOL)	244	403	60.5	530
Female Total	3,577	3,674	97.4	5,375
Institution Total	95,809	84,404	113.5	125,257

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
September 1, 2021

Monthly Report of Population
As of Midnight August 31, 2021

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,550	2,909	122.0	4,387
Calipatria State Prison (CAL)	2,870	2,308	124.4	3,451
California Correctional Center (CCC)	2,097	3,377	62.1	3,487
California Correctional Institution (CCI)	2,786	2,739	101.7	4,145
Central California Women's Facility (CCWF)	14	1,990	0.7	2,940
Centinela State Prison (CEN)	2,939	2,308	127.3	3,446
California Health Care Facility - Stockton (CHCF)	2,417	2,953	81.8	2,951
California Institution for Men (CIM)	2,484	2,736	90.8	4,226
California Institution for Women (CIW)	5	1,281	0.4	1,494
California Men's Colony (CMC)	3,089	3,816	80.9	4,407
California Medical Facility (CMF)	2,018	2,318	87.1	2,921
California State Prison, Corcoran (COR)	3,380	3,115	108.5	4,476
California Rehabilitation Center (CRC)	2,532	2,380	106.4	3,174
Correctional Training Facility (CTF)	4,539	3,300	137.5	4,929
Chuckawalla Valley State Prison (CVSP)	2,274	1,738	130.8	2,579
Folsom State Prison (FOL)	2,440	2,065	118.2	3,148
High Desert State Prison (HDSP)	3,233	2,324	139.1	3,461
Ironwood State Prison (ISP)	2,363	2,200	107.4	3,300
Kern Valley State Prison (KVSP)	3,438	2,448	140.4	3,622
California State Prison, Los Angeles County (LAC)	2,705	2,300	117.6	3,400
Mule Creek State Prison (MCSP)	3,843	3,284	117.0	4,155
North Kern State Prison (NKSP)	3,651	2,694	135.5	4,011
Pelican Bay State Prison (PBSP)	2,121	2,380	89.1	3,361
Pleasant Valley State Prison (PVSP)	2,705	2,308	117.2	3,433
RJ Donovan Correctional Facility (RJD)	3,288	2,992	109.9	4,182
California State Prison, Sacramento (SAC)	2,077	1,828	113.6	2,545
California Substance Abuse Treatment Facility (SATF)	5,030	3,424	146.9	5,111
Sierra Conservation Center (SCC)	3,293	3,404	96.7	4,250
California State Prison, Solano (SOL)	3,298	2,594	127.1	4,056
San Quentin State Prison (SQ)	2,665	3,084	86.4	3,984
Salinas Valley State Prison (SVSP)	2,997	2,452	122.2	3,509
Valley State Prison (VSP)	2,980	1,961	152.0	2,954
Wasco State Prison (WSP)	3,490	2,984	117.0	4,447
Male Total	92,611	84,404	109.7	119,942
Female Institutions				
Central California Women's Facility (CCWF)	2,379	1,990	119.5	3,068
California Institution for Women (CIW)	970	1,281	75.7	1,777
Folsom State Prison (FOL)	234	403	58.1	530
Female Total	3,583	3,674	97.5	5,375
Institution Total	96,194	84,404	114.0	125,317

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
October 1, 2021

Monthly Report of Population
As of Midnight September 30, 2021

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,609	2,909	124.1	4,387
Calipatria State Prison (CAL)	2,841	2,308	123.1	3,451
California Correctional Center (CCC)	1,974	3,377	58.5	3,487
California Correctional Institution (CCI)	2,694	2,739	98.4	3,299
Central California Women's Facility (CCWF)	15	1,990	0.8	2,940
Centinela State Prison (CEN)	2,865	2,308	124.1	3,446
California Health Care Facility - Stockton (CHCF)	2,357	2,953	79.8	2,951
California Institution for Men (CIM)	2,538	2,736	92.8	4,076
California Institution for Women (CIW)	6	1,281	0.5	1,494
California Men's Colony (CMC)	3,065	3,816	80.3	4,407
California Medical Facility (CMF)	2,000	2,318	86.3	2,888
California State Prison, Corcoran (COR)	3,433	3,115	110.2	4,476
California Rehabilitation Center (CRC)	2,670	2,380	112.2	3,174
Correctional Training Facility (CTF)	4,439	3,300	134.5	4,125
Chuckawalla Valley State Prison (CVSP)	2,343	1,738	134.8	2,579
Folsom State Prison (FOL)	2,513	2,065	121.7	3,078
High Desert State Prison (HDSP)	3,208	2,324	138.0	3,461
Ironwood State Prison (ISP)	2,279	2,200	103.6	3,300
Kern Valley State Prison (KVSP)	3,414	2,448	139.5	3,622
California State Prison, Los Angeles County (LAC)	2,748	2,300	119.5	3,400
Mule Creek State Prison (MCSP)	3,743	3,284	114.0	4,155
North Kern State Prison (NKSP)	3,788	2,694	140.6	4,011
Pelican Bay State Prison (PBSP)	2,087	2,380	87.7	3,361
Pleasant Valley State Prison (PVSP)	2,653	2,308	114.9	3,433
RJ Donovan Correctional Facility (RJD)	3,256	2,992	108.8	4,086
California State Prison, Sacramento (SAC)	2,013	1,828	110.1	2,545
California Substance Abuse Treatment Facility (SATF)	5,007	3,424	146.2	5,111
Sierra Conservation Center (SCC)	3,283	3,404	96.4	4,250
California State Prison, Solano (SOL)	3,239	2,594	124.9	3,992
San Quentin State Prison (SQ)	2,807	3,084	91.0	3,984
Salinas Valley State Prison (SVSP)	2,978	2,452	121.5	3,509
Valley State Prison (VSP)	2,972	1,961	151.6	2,954
Wasco State Prison (WSP)	3,572	2,984	119.7	4,447
Male Total	92,409	82,723	111.7	117,879
Female Institutions				
Central California Women's Facility (CCWF)	2,328	1,990	117.0	3,068
California Institution for Women (CIW)	988	1,281	77.1	1,777
Folsom State Prison (FOL)	225	403	55.8	530
Female Total	3,541	3,674	96.4	5,375
Institution Total	95,950	86,397	111.1	123,254

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
November 1, 2021

Monthly Report of Population
As of Midnight October 31, 2021

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Male Institutions				
Avenal State Prison (ASP)	3,665	2,909	126.0	4,387
Calipatria State Prison (CAL)	2,912	2,308	126.2	3,451
California Correctional Center (CCC)	1,843	3,377	54.6	3,487
California Correctional Institution (CCI)	2,654	2,172	122.2	3,299
Central California Women's Facility (CCWF)	15	1,990	0.8	2,940
Centinela State Prison (CEN)	2,864	2,308	124.1	3,446
California Health Care Facility - Stockton (CHCF)	2,261	2,953	76.6	2,951
California Institution for Men (CIM)	2,620	2,736	95.8	4,226
California Institution for Women (CIW)	6	1,281	0.5	1,494
California Men's Colony (CMC)	3,049	3,816	79.9	4,407
California Medical Facility (CMF)	1,999	2,318	86.2	2,888
California State Prison, Corcoran (COR)	3,492	3,115	112.1	4,476
California Rehabilitation Center (CRC)	2,786	2,380	117.1	3,174
Correctional Training Facility (CTF)	4,363	2,800	155.8	4,269
Chuckawalla Valley State Prison (CVSP)	2,418	1,738	139.1	2,579
Folsom State Prison (FOL)	2,585	2,065	125.2	3,078
High Desert State Prison (HDSP)	3,193	2,324	137.4	3,461
Ironwood State Prison (ISP)	2,241	2,200	101.9	3,300
Kern Valley State Prison (KVSP)	3,410	2,448	139.3	3,622
California State Prison, Los Angeles County (LAC)	2,755	2,300	119.8	3,400
Mule Creek State Prison (MCSP)	3,757	3,284	114.4	4,155
North Kern State Prison (NKSP)	3,586	2,694	133.1	4,011
Pelican Bay State Prison (PBSP)	2,044	2,380	85.9	3,361
Pleasant Valley State Prison (PVSP)	2,631	2,308	114.0	3,433
RJ Donovan Correctional Facility (RJD)	3,264	2,992	109.1	4,182
California State Prison, Sacramento (SAC)	2,005	1,828	109.7	2,545
California Substance Abuse Treatment Facility (SATF)	5,015	3,424	146.5	5,111
Sierra Conservation Center (SCC)	3,275	3,404	96.2	4,250
California State Prison, Solano (SOL)	3,295	2,594	127.0	3,992
San Quentin State Prison (SQ)	2,950	3,084	95.7	3,984
Salinas Valley State Prison (SVSP)	2,944	2,452	120.1	3,509
Valley State Prison (VSP)	2,975	1,961	151.7	2,954
Wasco State Prison (WSP)	3,842	2,984	128.8	4,447
Male Total	92,714	81,656	113.5	118,269
Female Institutions				
Central California Women's Facility (CCWF)	2,245	1,990	112.8	3,068
California Institution for Women (CIW)	1,026	1,281	80.1	1,777
Folsom State Prison (FOL)	268	403	66.5	530
Female Total	3,539	3,674	96.3	5,375
Institution Total	96,253	85,330	112.8	123,644

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
December 1, 2021

Monthly Report of Population
As of Midnight November 30, 2021

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	3,759	2,909	129.2	4,387
Calipatria State Prison (CAL)	2,918	2,308	126.4	3,451
California Correctional Center (CCC)	1,735	3,377	51.4	3,487
California Correctional Institution (CCI)	2,677	2,172	123.3	3,299
Central California Women's Facility (CCWF)	2,227	1,990	111.9	3,068
Centinela State Prison (CEN)	2,851	2,308	123.5	3,446
California Health Care Facility - Stockton (CHCF)	2,205	2,953	74.7	2,951
California Institution for Men (CIM)	2,688	2,736	98.2	4,226
California Institution for Women (CIW)	1,034	1,281	80.7	1,687
California Men's Colony (CMC)	3,170	3,816	83.1	4,407
California Medical Facility (CMF)	1,990	2,318	85.8	2,888
California State Prison, Corcoran (COR)	3,625	3,115	116.4	4,476
California Rehabilitation Center (CRC)	2,769	2,380	116.3	3,174
Correctional Training Facility (CTF)	4,308	2,800	153.9	4,269
Chuckawalla Valley State Prison (CVSP)	2,494	1,738	143.5	2,279
Folsom State Prison (FOL)	2,637	2,065	127.7	3,078
Folsom Women’s Facility (FWF)	240	403	59.6	530
High Desert State Prison (HDSP)	2,949	2,324	126.9	3,461
Ironwood State Prison (ISP)	2,227	2,200	101.2	3,300
Kern Valley State Prison (KVSP)	3,385	2,448	138.3	3,526
California State Prison, Los Angeles County (LAC)	2,732	2,300	118.8	3,400
Mule Creek State Prison (MCSP)	3,762	3,284	114.6	4,155
North Kern State Prison (NKSP)	3,636	2,694	135.0	4,011
Pelican Bay State Prison (PBSP)	2,024	2,380	85.0	2,881
Pleasant Valley State Prison (PVSP)	2,626	2,308	113.8	3,433
RJ Donovan Correctional Facility (RJD)	3,328	2,992	111.2	3,894
California State Prison, Sacramento (SAC)	1,991	1,828	108.9	2,545
California Substance Abuse Treatment Facility (SATF)	5,005	3,424	146.2	5,111
Sierra Conservation Center (SCC)	3,231	3,404	94.9	4,250
California State Prison, Solano (SOL)	3,310	2,594	127.6	3,842
San Quentin State Prison (SQ)	3,055	3,084	99.1	3,671
Salinas Valley State Prison (SVSP)	2,982	2,452	121.6	3,509
Valley State Prison (VSP)	2,987	1,961	152.3	2,954
Wasco State Prison (WSP)	3,792	2,984	127.1	4,447
Institution Total	96,349	85,330	112.9	117,493

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
January 1, 2022

Monthly Report of Population
As of Midnight December 31, 2021

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	3,840	2,909	132.0	4,387
Calipatria State Prison (CAL)	2,883	2,308	124.9	3,451
California Correctional Center (CCC)	1,663	3,377	49.2	3,367
California Correctional Institution (CCI)	3,073	2,172	141.5	3,299
Central California Women's Facility (CCWF)	2,278	1,990	114.5	3,068
Centinela State Prison (CEN)	2,832	2,308	122.7	3,446
California Health Care Facility - Stockton (CHCF)	2,221	2,953	75.2	2,951
California Institution for Men (CIM)	2,718	2,736	99.3	4,226
California Institution for Women (CIW)	1,034	1,281	80.7	1,777
California Men's Colony (CMC)	3,244	3,816	85.0	4,407
California Medical Facility (CMF)	2,033	2,318	87.7	5,267
California State Prison, Corcoran (COR)	3,615	3,115	116.1	4,476
California Rehabilitation Center (CRC)	2,690	2,380	113.0	3,174
Correctional Training Facility (CTF)	4,242	2,800	151.5	4,269
Chuckawalla Valley State Prison (CVSP)	2,509	1,738	144.4	2,579
Folsom State Prison (FOL)	2,702	2,065	130.8	3,078
Folsom Women’s Facility (FWF)	224	403	55.6	530
High Desert State Prison (HDSP)	2,317	2,324	99.7	2,711
Ironwood State Prison (ISP)	2,246	2,200	102.1	3,300
Kern Valley State Prison (KVSP)	3,363	2,448	137.4	3,622
California State Prison, Los Angeles County (LAC)	2,771	2,300	120.5	3,400
Mule Creek State Prison (MCSP)	3,823	3,284	116.4	4,155
North Kern State Prison (NKSP)	3,743	2,694	138.9	4,011
Pelican Bay State Prison (PBSP)	1,985	2,380	83.4	3,361
Pleasant Valley State Prison (PVSP)	2,602	2,308	112.7	3,433
RJ Donovan Correctional Facility (RJD)	3,371	2,992	112.7	4,182
California State Prison, Sacramento (SAC)	1,908	1,828	104.4	2,577
California Substance Abuse Treatment Facility (SATF)	4,958	3,424	144.8	5,111
Sierra Conservation Center (SCC)	3,184	3,404	93.5	4,250
California State Prison, Solano (SOL)	3,313	2,594	127.7	3,992
San Quentin State Prison (SQ)	3,142	3,084	101.9	3,984
Salinas Valley State Prison (SVSP)	3,003	2,452	122.5	3,509
Valley State Prison (VSP)	2,963	1,961	151.1	2,942
Wasco State Prison (WSP)	3,979	2,984	133.3	4,447
Institution Total	96,472	85,330	113.1	120,739

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
January 31, 2022

Monthly Report of Population
As of Midnight January 31, 2022

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	3,731	2,909	128.3	4,493
Calipatria State Prison (CAL)	2,799	2,308	121.3	3,451
California Correctional Center (CCC)	1,495	3,377	44.3	4,072
California Correctional Institution (CCI)	3,043	2,172	140.1	3,389
Central California Women's Facility (CCWF)	2,214	1,990	111.3	3,068
Centinela State Prison (CEN)	2,746	2,308	119.0	3,446
California Health Care Facility - Stockton (CHCF)	2,182	2,953	73.9	2,951
California Institution for Men (CIM)	2,554	2,736	93.3	4,226
California Institution for Women (CIW)	995	1,281	77.7	1,777
California Men's Colony (CMC)	3,215	3,816	84.3	4,407
California Medical Facility (CMF)	1,976	2,318	85.2	2,888
California State Prison, Corcoran (COR)	3,498	3,115	112.3	4,476
California Rehabilitation Center (CRC)	2,517	2,380	105.8	3,174
Correctional Training Facility (CTF)	4,166	2,800	148.8	4,323
Chuckawalla Valley State Prison (CVSP)	2,455	1,738	141.3	2,804
Folsom State Prison (FOL)	2,665	2,065	129.1	3,078
Folsom Women’s Facility (FWF)	199	403	49.4	530
High Desert State Prison (HDSP)	2,233	2,324	96.1	2,711
Ironwood State Prison (ISP)	2,147	2,200	97.6	3,300
Kern Valley State Prison (KVSP)	3,306	2,448	135.0	3,622
California State Prison, Los Angeles County (LAC)	2,753	2,300	119.7	3,400
Mule Creek State Prison (MCSP)	3,767	3,284	114.7	4,255
North Kern State Prison (NKSP)	3,794	2,694	140.8	4,011
Pelican Bay State Prison (PBSP)	1,932	2,380	81.2	3,361
Pleasant Valley State Prison (PVSP)	2,525	2,308	109.4	3,433
RJ Donovan Correctional Facility (RJD)	3,353	2,992	112.1	4,234
California State Prison, Sacramento (SAC)	1,825	1,828	99.8	2,577
California Substance Abuse Treatment Facility (SATF)	4,859	3,424	141.9	5,227
Sierra Conservation Center (SCC)	3,014	3,404	88.5	4,250
California State Prison, Solano (SOL)	3,248	2,594	125.2	4,092
San Quentin State Prison (SQ)	3,066	3,084	99.4	4,161
Salinas Valley State Prison (SVSP)	2,969	2,452	121.1	3,509
Valley State Prison (VSP)	2,902	1,961	148.0	2,942
Wasco State Prison (WSP)	3,627	2,984	121.5	4,447
Institution Total	93,770	85,330	109.9	120,085

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
March 1, 2022

Monthly Report of Population
As of Midnight February 28, 2022

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	3,742	2,909	128.6	4,493
Calipatria State Prison (CAL)	2,719	2,308	117.8	3,451
California Correctional Center (CCC)	1,630	3,377	48.3	3,487
California Correctional Institution (CCI)	3,126	2,172	143.9	3,389
Central California Women's Facility (CCWF)	2,120	1,990	106.5	3,068
Centinela State Prison (CEN)	2,863	2,308	124.0	3,446
California Health Care Facility - Stockton (CHCF)	2,140	2,953	72.5	2,951
California Institution for Men (CIM)	2,523	2,736	92.2	4,226
California Institution for Women (CIW)	1,006	1,281	78.5	1,777
California Men's Colony (CMC)	3,198	3,816	83.8	4,407
California Medical Facility (CMF)	1,918	2,318	82.7	2,888
California State Prison, Corcoran (COR)	3,444	3,115	110.6	4,476
California Rehabilitation Center (CRC)	2,384	2,380	100.2	3,174
Correctional Training Facility (CTF)	4,081	2,800	145.8	4,323
Chuckawalla Valley State Prison (CVSP)	2,402	1,738	138.2	2,804
Folsom State Prison (FOL)	2,682	2,065	129.9	3,078
Folsom Women’s Facility (FWF)	189	403	46.9	530
High Desert State Prison (HDSP)	2,225	2,324	95.7	2,711
Ironwood State Prison (ISP)	2,077	2,200	94.4	3,300
Kern Valley State Prison (KVSP)	3,328	2,448	135.9	3,622
California State Prison, Los Angeles County (LAC)	2,739	2,300	119.1	3,400
Mule Creek State Prison (MCSP)	3,760	3,284	114.5	4,255
North Kern State Prison (NKSP)	3,515	2,694	130.5	4,011
Pelican Bay State Prison (PBSP)	1,916	2,380	80.5	3,361
Pleasant Valley State Prison (PVSP)	2,519	2,308	109.1	3,433
RJ Donovan Correctional Facility (RJD)	3,331	2,992	111.3	4,234
California State Prison, Sacramento (SAC)	1,786	1,828	97.7	2,577
California Substance Abuse Treatment Facility (SATF)	4,791	3,424	139.9	5,227
Sierra Conservation Center (SCC)	2,950	3,404	86.7	4,250
California State Prison, Solano (SOL)	3,192	2,594	123.1	4,092
San Quentin State Prison (SQ)	3,046	3,084	98.8	4,161
Salinas Valley State Prison (SVSP)	2,958	2,452	120.6	3,509
Valley State Prison (VSP)	2,908	1,961	148.3	2,942
Wasco State Prison (WSP)	3,181	2,984	106.6	4,447
Institution Total	92,389	85,330	108.3	119,500

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
April 1, 2022

Monthly Report of Population
As of Midnight March 31, 2022

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	3,831	2,909	131.7	4,492
Calipatria State Prison (CAL)	2,737	2,308	118.6	3,451
California Correctional Center (CCC)	1,649	3,377	48.8	3,487
California Correctional Institution (CCI)	3,121	2,172	143.7	3,389
Central California Women's Facility (CCWF)	2,241	1,990	112.6	3,068
Centinela State Prison (CEN)	2,952	2,308	127.9	3,446
California Health Care Facility - Stockton (CHCF)	2,189	2,953	74.1	2,951
California Institution for Men (CIM)	2,544	2,736	93.0	4,226
California Institution for Women (CIW)	990	1,281	77.3	1,777
California Men's Colony (CMC)	3,197	3,816	83.8	4,407
California Medical Facility (CMF)	1,910	2,318	82.4	2,888
California State Prison, Corcoran (COR)	3,424	3,115	109.9	4,476
California Rehabilitation Center (CRC)	2,297	2,380	96.5	3,174
Correctional Training Facility (CTF)	4,039	2,800	144.3	4,308
Chuckawalla Valley State Prison (CVSP)	2,400	1,738	138.1	2,804
Folsom State Prison (FOL)	2,743	2,065	132.8	3,078
Folsom Women’s Facility (FWF)	182	403	45.2	530
High Desert State Prison (HDSP)	2,253	2,324	96.9	2,711
Ironwood State Prison (ISP)	2,062	2,200	93.7	3,300
Kern Valley State Prison (KVSP)	3,252	2,448	132.8	3,622
California State Prison, Los Angeles County (LAC)	2,743	2,300	119.3	3,400
Mule Creek State Prison (MCSP)	3,805	3,284	115.9	4,255
North Kern State Prison (NKSP)	3,719	2,694	138.0	4,011
Pelican Bay State Prison (PBSP)	1,852	2,380	77.8	3,361
Pleasant Valley State Prison (PVSP)	2,635	2,308	114.2	3,433
RJ Donovan Correctional Facility (RJD)	3,370	2,992	112.6	4,234
California State Prison, Sacramento (SAC)	1,743	1,828	95.4	2,577
California Substance Abuse Treatment Facility (SATF)	4,731	3,424	138.2	5,227
Sierra Conservation Center (SCC)	2,903	3,404	85.3	4,250
California State Prison, Solano (SOL)	3,212	2,594	123.8	4,092
San Quentin State Prison (SQ)	3,040	3,084	98.6	4,161
Salinas Valley State Prison (SVSP)	2,859	2,452	116.6	3,509
Valley State Prison (VSP)	2,941	1,961	150.0	2,942
Wasco State Prison (WSP)	3,280	2,984	109.9	4,447
Institution Total	92,846	85,330	108.8	119,484

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
May 1, 2022

Monthly Report of Population
As of Midnight April 30, 2022

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	3,907	2,909	134.3	4,387
Calipatria State Prison (CAL)	2,657	2,308	115.1	3,451
California Correctional Center (CCC)	1,752	3,377	51.9	3,427
California Correctional Institution (CCI)	3,118	2,172	143.6	3,299
Central California Women's Facility (CCWF)	2,204	1,990	110.8	3,068
Centinela State Prison (CEN)	2,903	2,308	125.8	3,446
California Health Care Facility - Stockton (CHCF)	2,182	2,953	73.9	2,951
California Institution for Men (CIM)	2,672	2,736	97.7	4,226
California Institution for Women (CIW)	1,002	1,281	78.2	1,777
California Men's Colony (CMC)	3,314	3,816	86.8	4,407
California Medical Facility (CMF)	1,950	2,318	84.1	2,888
California State Prison, Corcoran (COR)	3,419	3,115	109.8	4,476
California Rehabilitation Center (CRC)	2,308	2,380	97.0	3,162
Correctional Training Facility (CTF)	3,983	2,800	142.3	4,138
Chuckawalla Valley State Prison (CVSP)	2,348	1,738	135.1	2,598
Folsom State Prison (FOL)	2,731	2,065	132.3	3,078
Folsom Women’s Facility (FWF)	216	403	53.6	530
High Desert State Prison (HDSP)	2,363	2,324	101.7	2,711
Ironwood State Prison (ISP)	1,992	2,200	90.5	3,300
Kern Valley State Prison (KVSP)	3,195	2,448	130.5	3,622
California State Prison, Los Angeles County (LAC)	2,640	2,300	114.8	3,275
Mule Creek State Prison (MCSP)	3,842	3,284	117.0	4,105
North Kern State Prison (NKSP)	4,075	2,694	151.3	4,011
Pelican Bay State Prison (PBSP)	1,817	2,380	76.3	3,361
Pleasant Valley State Prison (PVSP)	2,560	2,308	110.9	3,433
RJ Donovan Correctional Facility (RJD)	3,340	2,992	111.6	4,086
California State Prison, Sacramento (SAC)	1,915	1,828	104.8	2,577
California Substance Abuse Treatment Facility (SATF)	4,443	3,424	129.8	5,111
Sierra Conservation Center (SCC)	2,659	3,404	78.1	4,250
California State Prison, Solano (SOL)	3,243	2,594	125.0	3,882
San Quentin State Prison (SQ)	3,158	3,084	102.4	3,984
Salinas Valley State Prison (SVSP)	2,862	2,452	116.7	3,509
Valley State Prison (VSP)	2,947	1,961	150.3	2,942
Wasco State Prison (WSP)	3,677	2,984	123.2	4,447
Institution Total	93,394	85,330	109.5	117,915

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
June 1, 2022

Monthly Report of Population
As of Midnight May 31, 2022

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,030	2,909	138.5	4,387
Calipatria State Prison (CAL)	2,667	2,308	115.6	3,451
California Correctional Center (CCC)	2,057	3,377	60.9	3,487
California Correctional Institution (CCI)	3,033	2,172	139.6	3,299
Central California Women's Facility (CCWF)	2,166	1,990	108.8	3,068
Centinela State Prison (CEN)	2,925	2,308	126.7	3,446
California Health Care Facility - Stockton (CHCF)	2,212	2,953	74.9	2,951
California Institution for Men (CIM)	2,956	2,736	108.0	4,226
California Institution for Women (CIW)	995	1,281	77.7	1,777
California Men's Colony (CMC)	3,416	3,816	89.5	4,407
California Medical Facility (CMF)	1,923	2,318	83.0	2,888
California State Prison, Corcoran (COR)	3,440	3,115	110.4	4,476
California Rehabilitation Center (CRC)	2,252	2,380	94.6	3,162
Correctional Training Facility (CTF)	4,036	2,800	144.1	4,205
Chuckawalla Valley State Prison (CVSP)	2,298	1,738	132.2	2,598
Folsom State Prison (FOL)	2,779	2,065	134.6	3,078
Folsom Women’s Facility (FWF)	272	403	67.5	530
High Desert State Prison (HDSP)	2,168	2,324	93.3	2,411
Ironwood State Prison (ISP)	2,051	2,200	93.2	3,300
Kern Valley State Prison (KVSP)	3,080	2,448	125.8	3,622
California State Prison, Los Angeles County (LAC)	2,592	2,300	112.7	2,975
Mule Creek State Prison (MCSP)	3,816	3,284	116.2	4,155
North Kern State Prison (NKSP)	4,181	2,694	155.2	4,011
Pelican Bay State Prison (PBSP)	1,723	2,380	72.4	3,375
Pleasant Valley State Prison (PVSP)	2,589	2,308	112.2	3,433
RJ Donovan Correctional Facility (RJD)	3,214	2,992	107.4	4,086
California State Prison, Sacramento (SAC)	1,979	1,828	108.3	2,577
California Substance Abuse Treatment Facility (SATF)	4,435	3,424	129.5	5,111
Sierra Conservation Center (SCC)	2,600	3,404	76.4	4,250
California State Prison, Solano (SOL)	3,280	2,594	126.4	3,882
San Quentin State Prison (SQ)	3,222	3,084	104.5	3,984
Salinas Valley State Prison (SVSP)	2,868	2,452	117.0	3,209
Valley State Prison (VSP)	2,965	1,961	151.2	2,942
Wasco State Prison (WSP)	3,711	2,984	124.4	4,447
Institution Total	93,931	85,330	110.1	117,206

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
July 1, 2022

Monthly Report of Population
As of Midnight June 30, 2022

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,072	2,909	140.0	4,387
Calipatria State Prison (CAL)	2,623	2,308	113.6	3,451
California Correctional Center (CCC)	2,285	3,377	67.7	3,487
California Correctional Institution (CCI)	3,012	2,172	138.7	3,299
Central California Women's Facility (CCWF)	2,097	1,990	105.4	3,068
Centinela State Prison (CEN)	2,932	2,308	127.0	3,446
California Health Care Facility - Stockton (CHCF)	2,206	2,953	74.7	2,951
California Institution for Men (CIM)	3,034	2,736	110.9	4,226
California Institution for Women (CIW)	950	1,281	74.2	1,777
California Men's Colony (CMC)	3,466	3,816	90.8	4,407
California Medical Facility (CMF)	1,921	2,318	82.9	2,888
California State Prison, Corcoran (COR)	3,427	3,115	110.0	4,476
California Rehabilitation Center (CRC)	2,289	2,380	96.2	3,162
Correctional Training Facility (CTF)	4,132	2,800	147.6	4,205
Chuckawalla Valley State Prison (CVSP)	2,230	1,738	128.3	2,598
Folsom State Prison (FOL)	2,739	2,065	132.6	3,078
Folsom Women’s Facility (FWF)	274	403	68.0	530
High Desert State Prison (HDSP)	1,931	2,324	83.1	2,411
Ironwood State Prison (ISP)	2,341	2,200	106.4	3,300
Kern Valley State Prison (KVSP)	2,973	2,448	121.4	3,497
California State Prison, Los Angeles County (LAC)	2,328	2,300	101.2	2,975
Mule Creek State Prison (MCSP)	3,827	3,284	116.5	4,205
North Kern State Prison (NKSP)	4,134	2,694	153.5	4,011
Pelican Bay State Prison (PBSP)	1,670	2,380	70.2	3,375
Pleasant Valley State Prison (PVSP)	2,695	2,308	116.8	3,433
RJ Donovan Correctional Facility (RJD)	3,092	2,992	103.3	4,186
California State Prison, Sacramento (SAC)	2,067	1,828	113.1	2,577
California Substance Abuse Treatment Facility (SATF)	4,542	3,424	132.7	5,111
Sierra Conservation Center (SCC)	2,603	3,404	76.5	4,250
California State Prison, Solano (SOL)	3,334	2,594	128.5	3,992
San Quentin State Prison (SQ)	3,273	3,084	106.1	3,984
Salinas Valley State Prison (SVSP)	2,912	2,452	118.8	3,209
Valley State Prison (VSP)	3,015	1,961	153.7	2,942
Wasco State Prison (WSP)	3,579	2,984	119.9	4,447
Institution Total	94,005	85,330	110.2	117,341

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
August 1, 2022

Monthly Report of Population
As of Midnight July 31, 2022

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,062	2,909	139.6	4,387
Calipatria State Prison (CAL)	2,543	2,308	110.2	3,451
California Correctional Center (CCC)	2,308	3,377	68.3	3,487
California Correctional Institution (CCI)	2,962	2,172	136.4	3,299
Central California Women's Facility (CCWF)	2,178	1,990	109.4	3,068
Centinela State Prison (CEN)	2,906	2,308	125.9	3,446
California Health Care Facility - Stockton (CHCF)	2,228	2,953	75.4	2,951
California Institution for Men (CIM)	3,135	2,736	114.6	4,076
California Institution for Women (CIW)	940	1,281	73.4	1,777
California Men's Colony (CMC)	3,414	3,816	89.5	4,407
California Medical Facility (CMF)	1,887	2,318	81.4	2,888
California State Prison, Corcoran (COR)	3,440	3,115	110.4	4,476
California Rehabilitation Center (CRC)	2,322	2,380	97.6	3,162
Correctional Training Facility (CTF)	4,076	2,800	145.6	4,205
Chuckawalla Valley State Prison (CVSP)	2,176	1,738	125.2	2,598
Folsom State Prison (FOL)	2,664	2,065	129.0	3,078
Folsom Women’s Facility (FWF)	243	403	60.3	530
High Desert State Prison (HDSP)	1,823	2,324	78.4	2,411
Ironwood State Prison (ISP)	2,464	2,200	112.0	3,300
Kern Valley State Prison (KVSP)	2,907	2,448	118.8	3,497
California State Prison, Los Angeles County (LAC)	2,322	2,300	101.0	2,975
Mule Creek State Prison (MCSP)	3,785	3,284	115.3	4,205
North Kern State Prison (NKSP)	4,100	2,694	152.2	4,011
Pelican Bay State Prison (PBSP)	1,654	2,380	69.5	3,375
Pleasant Valley State Prison (PVSP)	2,688	2,308	116.5	3,433
RJ Donovan Correctional Facility (RJD)	3,074	2,992	102.7	4,234
California State Prison, Sacramento (SAC)	2,031	1,828	111.1	2,577
California Substance Abuse Treatment Facility (SATF)	4,603	3,424	134.4	5,111
Sierra Conservation Center (SCC)	2,528	3,404	74.3	4,250
California State Prison, Solano (SOL)	3,255	2,594	125.5	3,992
San Quentin State Prison (SQ)	3,239	3,084	105.0	4,033
Salinas Valley State Prison (SVSP)	2,941	2,452	119.9	3,209
Valley State Prison (VSP)	3,014	1,961	153.7	2,942
Wasco State Prison (WSP)	3,667	2,984	122.9	4,447
Institution Total	93,579	85,330	109.7	117,288

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
September 1, 2022

Monthly Report of Population
As of Midnight August 31, 2022

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,082	2,909	140.3	4,387
Calipatria State Prison (CAL)	2,550	2,308	110.5	3,451
California Correctional Center (CCC)	2,341	3,377	69.3	3,475
California Correctional Institution (CCI)	2,918	2,172	134.3	3,255
Central California Women's Facility (CCWF)	2,211	1,990	111.1	3,067
Centinela State Prison (CEN)	2,941	2,308	127.4	3,446
California Health Care Facility - Stockton (CHCF)	2,278	2,953	77.1	2,953
California Institution for Men (CIM)	3,230	2,736	118.1	3,773
California Institution for Women (CIW)	907	1,281	70.8	1,777
California Men's Colony (CMC)	3,392	3,816	88.9	4,412
California Medical Facility (CMF)	1,880	2,318	81.1	2,810
California State Prison, Corcoran (COR)	3,396	3,115	109.0	4,501
California Rehabilitation Center (CRC)	2,450	2,380	102.9	3,501
Correctional Training Facility (CTF)	4,014	2,800	143.4	4,049
Chuckawalla Valley State Prison (CVSP)	2,163	1,738	124.5	2,617
Folsom State Prison (FOL)	2,571	2,065	124.5	3,019
Folsom Women’s Facility (FWF)	204	403	50.6	530
High Desert State Prison (HDSP)	1,779	2,324	76.5	2,385
Ironwood State Prison (ISP)	2,561	2,200	116.4	3,300
Kern Valley State Prison (KVSP)	2,817	2,448	115.1	3,497
California State Prison, Los Angeles County (LAC)	2,345	2,300	102.0	3,100
Mule Creek State Prison (MCSP)	3,767	3,284	114.7	4,205
North Kern State Prison (NKSP)	3,850	2,694	142.9	4,011
Pelican Bay State Prison (PBSP)	1,664	2,380	69.9	3,151
Pleasant Valley State Prison (PVSP)	2,738	2,308	118.6	3,433
RJ Donovan Correctional Facility (RJD)	3,002	2,992	100.3	4,234
California State Prison, Sacramento (SAC)	2,032	1,828	111.2	2,547
California Substance Abuse Treatment Facility (SATF)	4,671	3,424	136.4	5,111
Sierra Conservation Center (SCC)	2,666	3,404	78.3	4,236
California State Prison, Solano (SOL)	3,265	2,594	125.9	3,992
San Quentin State Prison (SQ)	3,191	3,084	103.5	3,997
Salinas Valley State Prison (SVSP)	2,964	2,452	120.9	3,209
Valley State Prison (VSP)	3,052	1,961	155.6	3,022
Wasco State Prison (WSP)	3,446	2,984	115.5	4,447
Institution Total	93,338	85,330	109.4	116,900

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
October 1, 2022

Monthly Report of Population
As of Midnight September 30, 2022

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,140	2,909	142.3	4,387
Calipatria State Prison (CAL)	2,554	2,308	110.7	3,451
California Correctional Center (CCC)	2,224	3,377	65.9	3,415
California Correctional Institution (CCI)	2,917	2,172	134.3	3,255
Central California Women's Facility (CCWF)	2,209	1,990	111.0	2,987
Centinela State Prison (CEN)	3,089	2,308	133.8	3,446
California Health Care Facility - Stockton (CHCF)	2,291	2,953	77.6	2,953
California Institution for Men (CIM)	3,300	2,736	120.6	3,773
California Institution for Women (CIW)	892	1,281	69.6	1,777
California Men's Colony (CMC)	3,360	3,816	88.1	4,480
California Medical Facility (CMF)	1,885	2,318	81.3	2,810
California State Prison, Corcoran (COR)	3,380	3,115	108.5	4,502
California Rehabilitation Center (CRC)	2,632	2,380	110.6	3,501
Correctional Training Facility (CTF)	3,984	2,800	142.3	3,993
Chuckawalla Valley State Prison (CVSP)	2,113	1,738	121.6	2,617
Folsom State Prison (FOL)	2,564	2,065	124.2	3,021
Folsom Women’s Facility (FWF)	182	403	45.2	530
High Desert State Prison (HDSP)	1,725	2,324	74.2	2,411
Ironwood State Prison (ISP)	2,591	2,200	117.8	3,275
Kern Valley State Prison (KVSP)	2,617	2,448	106.9	3,497
California State Prison, Los Angeles County (LAC)	2,354	2,300	102.3	3,100
Mule Creek State Prison (MCSP)	3,773	3,284	114.9	4,105
North Kern State Prison (NKSP)	3,873	2,694	143.8	4,011
Pelican Bay State Prison (PBSP)	1,737	2,380	73.0	3,151
Pleasant Valley State Prison (PVSP)	2,747	2,308	119.0	3,433
RJ Donovan Correctional Facility (RJD)	3,015	2,992	100.8	4,038
California State Prison, Sacramento (SAC)	1,942	1,828	106.2	2,259
California Substance Abuse Treatment Facility (SATF)	4,725	3,424	138.0	5,111
Sierra Conservation Center (SCC)	2,771	3,404	81.4	4,236
California State Prison, Solano (SOL)	3,314	2,594	127.8	3,882
San Quentin State Prison (SQ)	3,154	3,084	102.3	3,997
Salinas Valley State Prison (SVSP)	2,943	2,452	120.0	3,209
Valley State Prison (VSP)	3,025	1,961	154.3	2,942
Wasco State Prison (WSP)	3,158	2,984	105.8	4,447
Institution Total	93,180	85,330	109.2	116,002

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
November 1, 2022

Monthly Report of Population
As of Midnight October 31, 2022

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,080	2,909	140.3	4,359
Calipatria State Prison (CAL)	2,534	2,308	109.8	3,433
California Correctional Center (CCC)	38	3,377	1.1	298
California Correctional Institution (CCI)	2,848	2,172	131.1	3,239
Central California Women's Facility (CCWF)	2,140	1,990	107.5	2,949
Centinela State Prison (CEN)	3,032	2,308	131.4	3,433
California Health Care Facility - Stockton (CHCF)	2,311	2,953	78.3	2,953
California Institution for Men (CIM)	3,157	2,736	115.4	3,695
California Institution for Women (CIW)	923	1,281	72.1	1,743
California Men's Colony (CMC)	3,285	3,816	86.1	4,430
California Medical Facility (CMF)	1,898	2,318	81.9	2,760
California State Prison, Corcoran (COR)	3,286	3,115	105.5	4,502
California Rehabilitation Center (CRC)	2,637	2,380	110.8	3,491
Correctional Training Facility (CTF)	3,936	2,800	140.6	3,981
Chuckawalla Valley State Prison (CVSP)	2,078	1,738	119.6	2,603
Folsom State Prison (FOL)	2,510	2,065	121.5	3,021
Folsom Women’s Facility (FWF)	182	403	45.2	530
High Desert State Prison (HDSP)	2,340	2,324	100.7	3,161
Ironwood State Prison (ISP)	2,630	2,200	119.5	3,275
Kern Valley State Prison (KVSP)	2,541	2,448	103.8	3,497
California State Prison, Los Angeles County (LAC)	2,377	2,300	103.3	3,100
Mule Creek State Prison (MCSP)	3,791	3,284	115.4	4,105
North Kern State Prison (NKSP)	4,121	2,694	153.0	4,011
Pelican Bay State Prison (PBSP)	1,759	2,380	73.9	3,151
Pleasant Valley State Prison (PVSP)	2,695	2,308	116.8	3,433
RJ Donovan Correctional Facility (RJD)	3,022	2,992	101.0	4,038
California State Prison, Sacramento (SAC)	1,917	1,828	104.9	2,259
California Substance Abuse Treatment Facility (SATF)	4,698	3,424	137.2	5,111
Sierra Conservation Center (SCC)	3,796	3,404	111.5	5,726
California State Prison, Solano (SOL)	3,329	2,594	128.3	3,866
San Quentin State Prison (SQ)	3,256	3,084	105.6	3,985
Salinas Valley State Prison (SVSP)	2,947	2,452	120.2	3,209
Valley State Prison (VSP)	2,990	1,961	152.5	2,931
Wasco State Prison (WSP)	3,711	2,984	124.4	4,447
Institution Total	92,795	85,330	108.7	114,725

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
December 1, 2022

Monthly Report of Population
As of Midnight November 30, 2022

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,355	2,909	149.7	4,359
Calipatria State Prison (CAL)	2,505	2,308	108.5	3,433
California Correctional Institution (CCI)	2,762	2,172	127.2	3,239
Central California Women's Facility (CCWF)	2,130	1,990	107.0	2,949
Centinela State Prison (CEN)	2,962	2,308	128.3	3,433
California Health Care Facility - Stockton (CHCF)	2,331	2,953	78.9	2,953
California Institution for Men (CIM)	2,979	2,736	108.9	3,695
California Institution for Women (CIW)	934	1,281	72.9	1,743
California Men's Colony (CMC)	3,180	3,816	83.3	4,430
California Medical Facility (CMF)	1,889	2,318	81.5	2,760
California State Prison, Corcoran (COR)	3,229	3,115	103.7	4,502
California Rehabilitation Center (CRC)	3,024	2,380	127.1	3,491
Correctional Training Facility (CTF)	3,867	2,800	138.1	4,161
Chuckawalla Valley State Prison (CVSP)	2,041	1,738	117.4	2,603
Folsom State Prison (FOL)	2,486	2,065	120.4	3,021
Folsom Women’s Facility (FWF)	213	403	52.9	530
High Desert State Prison (HDSP)	2,291	2,324	98.6	3,474
Ironwood State Prison (ISP)	2,578	2,200	117.2	3,275
Kern Valley State Prison (KVSP)	2,465	2,448	100.7	3,497
California State Prison, Los Angeles County (LAC)	2,421	2,300	105.3	3,100
Mule Creek State Prison (MCSP)	3,801	3,284	115.7	4,105
North Kern State Prison (NKSP)	4,071	2,694	151.1	4,011
Pelican Bay State Prison (PBSP)	1,790	2,380	75.2	3,151
Pleasant Valley State Prison (PVSP)	2,627	2,308	113.8	3,433
RJ Donovan Correctional Facility (RJD)	3,008	2,992	100.5	4,038
California State Prison, Sacramento (SAC)	1,883	1,828	103.0	2,259
California Substance Abuse Treatment Facility (SATF)	4,707	3,424	137.5	5,111
Sierra Conservation Center (SCC)	3,886	3,404	114.2	5,704
California State Prison, Solano (SOL)	3,314	2,594	127.8	3,866
San Quentin State Prison (SQ)	3,274	3,084	106.2	3,985
Salinas Valley State Prison (SVSP)	2,968	2,452	121.0	3,209
Valley State Prison (VSP)	2,936	1,961	149.7	2,931
Wasco State Prison (WSP)	3,713	2,984	124.4	4,447
Institution Total	92,620	85,330	108.5	114,898

Design capacity for California Correctional Center will be included until the June 2023 closure date.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
January 1, 2023

Monthly Report of Population
As of Midnight December 31, 2022

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,025	2,909	138.4	4,359
Calipatria State Prison (CAL)	2,531	2,308	109.7	3,433
California Correctional Institution (CCI)	2,681	2,172	123.4	3,239
Central California Women's Facility (CCWF)	2,253	1,990	113.2	2,949
Centinela State Prison (CEN)	2,877	2,308	124.7	3,433
California Health Care Facility - Stockton (CHCF)	2,373	2,953	80.4	2,953
California Institution for Men (CIM)	3,007	2,736	109.9	3,695
California Institution for Women (CIW)	928	1,281	72.4	1,743
California Men's Colony (CMC)	3,232	3,816	84.7	4,430
California Medical Facility (CMF)	1,880	2,318	81.1	2,760
California State Prison, Corcoran (COR)	3,348	3,115	107.5	4,502
California Rehabilitation Center (CRC)	2,809	2,380	118.0	3,491
Correctional Training Facility (CTF)	3,860	2,800	137.9	4,125
Chuckawalla Valley State Prison (CVSP)	2,090	1,738	120.3	2,603
Folsom State Prison (FOL)	2,404	2,065	116.4	3,021
Folsom Women’s Facility (FWF)	81	403	20.1	530
High Desert State Prison (HDSP)	2,362	2,324	101.6	3,474
Ironwood State Prison (ISP)	2,568	2,200	116.7	3,275
Kern Valley State Prison (KVSP)	2,418	2,448	98.8	3,497
California State Prison, Los Angeles County (LAC)	2,472	2,300	107.5	3,100
Mule Creek State Prison (MCSP)	3,810	3,284	116.0	4,105
North Kern State Prison (NKSP)	4,304	2,694	159.8	4,011
Pelican Bay State Prison (PBSP)	1,744	2,380	73.3	3,151
Pleasant Valley State Prison (PVSP)	2,578	2,308	111.7	3,433
RJ Donovan Correctional Facility (RJD)	2,975	2,992	99.4	4,038
California State Prison, Sacramento (SAC)	1,735	1,828	94.9	2,259
California Substance Abuse Treatment Facility (SATF)	4,684	3,424	136.8	5,111
Sierra Conservation Center (SCC)	4,213	3,404	123.8	5,704
California State Prison, Solano (SOL)	3,296	2,594	127.1	3,866
San Quentin State Prison (SQ)	3,295	3,084	106.8	3,985
Salinas Valley State Prison (SVSP)	2,969	2,452	121.1	3,209
Valley State Prison (VSP)	2,922	1,961	149.0	2,931
Wasco State Prison (WSP)	3,882	2,984	130.1	4,447
Institution Total	92,606	85,330	108.5	114,862

Design capacity for California Correctional Center will be included until the June 2023 closure date.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
February 1, 2023

Monthly Report of Population
As of Midnight January 31, 2023

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,062	2,909	139.6	4,359
Calipatria State Prison (CAL)	2,500	2,308	108.3	3,433
California Correctional Institution (CCI)	2,611	2,172	120.2	3,239
Central California Women's Facility (CCWF)	2,279	1,990	114.5	2,949
Centinela State Prison (CEN)	2,773	2,308	120.1	3,433
California Health Care Facility - Stockton (CHCF)	2,401	2,953	81.3	2,953
California Institution for Men (CIM)	2,867	2,736	104.8	3,695
California Institution for Women (CIW)	983	1,281	76.7	1,743
California Men's Colony (CMC)	3,254	3,816	85.3	4,430
California Medical Facility (CMF)	1,910	2,318	82.4	2,760
California State Prison, Corcoran (COR)	3,443	3,115	110.5	4,502
California Rehabilitation Center (CRC)	3,029	2,380	127.3	3,491
Correctional Training Facility (CTF)	3,927	2,800	140.3	4,125
Chuckawalla Valley State Prison (CVSP)	1,731	1,738	99.6	2,603
Folsom State Prison (FOL)	2,513	2,065	121.7	3,021
High Desert State Prison (HDSP)	2,083	2,324	89.6	3,474
Ironwood State Prison (ISP)	2,601	2,200	118.2	3,275
Kern Valley State Prison (KVSP)	2,431	2,448	99.3	3,497
California State Prison, Los Angeles County (LAC)	2,503	2,300	108.8	3,100
Mule Creek State Prison (MCSP)	3,824	3,284	116.4	4,105
North Kern State Prison (NKSP)	4,380	2,694	162.6	4,011
Pelican Bay State Prison (PBSP)	1,711	2,380	71.9	3,151
Pleasant Valley State Prison (PVSP)	2,562	2,308	111.0	3,433
RJ Donovan Correctional Facility (RJD)	2,920	2,992	97.6	4,038
California State Prison, Sacramento (SAC)	1,585	1,828	86.7	2,259
California Substance Abuse Treatment Facility (SATF)	4,650	3,424	135.8	5,111
Sierra Conservation Center (SCC)	4,461	3,404	131.1	5,804
California State Prison, Solano (SOL)	3,326	2,594	128.2	3,866
San Quentin State Prison (SQ)	3,542	3,084	114.9	3,985
Salinas Valley State Prison (SVSP)	2,934	2,452	119.7	3,209
Valley State Prison (VSP)	2,973	1,961	151.6	2,931
Wasco State Prison (WSP)	3,698	2,984	123.9	4,447
Institution Total	92,467	85,330	108.4	114,432

Design capacity for California Correctional Center will be included until the June 2023 closure date.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
March 1, 2023

Monthly Report of Population
As of Midnight February 28, 2023

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,195	2,909	144.2	4,359
Calipatria State Prison (CAL)	2,453	2,308	106.3	3,433
California Correctional Institution (CCI)	2,533	2,172	116.6	3,239
Central California Women's Facility (CCWF)	2,334	1,990	117.3	2,949
Centinela State Prison (CEN)	2,664	2,308	115.4	3,433
California Health Care Facility - Stockton (CHCF)	2,429	2,953	82.3	2,953
California Institution for Men (CIM)	2,718	2,736	99.3	3,695
California Institution for Women (CIW)	970	1,281	75.7	1,743
California Men's Colony (CMC)	3,359	3,816	88.0	4,430
California Medical Facility (CMF)	1,905	2,318	82.2	2,760
California State Prison, Corcoran (COR)	3,423	3,115	109.9	4,502
California Rehabilitation Center (CRC)	2,920	2,380	122.7	3,491
Correctional Training Facility (CTF)	3,955	2,800	141.3	4,125
Chuckawalla Valley State Prison (CVSP)	1,834	1,738	105.5	2,603
Folsom State Prison (FOL)	2,657	2,065	128.7	3,021
High Desert State Prison (HDSP)	1,981	2,324	85.2	3,474
Ironwood State Prison (ISP)	2,620	2,200	119.1	3,275
Kern Valley State Prison (KVSP)	2,420	2,448	98.9	3,497
California State Prison, Los Angeles County (LAC)	2,513	2,300	109.3	3,100
Mule Creek State Prison (MCSP)	3,850	3,284	117.2	4,105
North Kern State Prison (NKSP)	4,205	2,694	156.1	4,011
Pelican Bay State Prison (PBSP)	1,686	2,380	70.8	3,151
Pleasant Valley State Prison (PVSP)	2,514	2,308	108.9	3,433
RJ Donovan Correctional Facility (RJD)	2,936	2,992	98.1	4,038
California State Prison, Sacramento (SAC)	1,535	1,828	84.0	2,259
California Substance Abuse Treatment Facility (SATF)	4,638	3,424	135.5	5,111
Sierra Conservation Center (SCC)	4,431	3,404	130.2	5,804
California State Prison, Solano (SOL)	3,323	2,594	128.1	3,866
San Quentin State Prison (SQ)	3,743	3,084	121.4	3,985
Salinas Valley State Prison (SVSP)	2,958	2,452	120.6	3,209
Valley State Prison (VSP)	2,987	1,961	152.3	2,931
Wasco State Prison (WSP)	3,750	2,984	125.7	4,447
Institution Total	92,439	85,330	108.3	114,432

Design capacity for California Correctional Center will be included until the June 2023 closure date.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
March 31, 2023

Monthly Report of Population
As of Midnight March 31, 2023

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,364	2,909	150.0	4,359
Calipatria State Prison (CAL)	2,503	2,308	108.4	3,433
California Correctional Institution (CCI)	2,347	2,172	108.1	3,239
Central California Women's Facility (CCWF)	2,316	1,990	116.4	2,949
Centinela State Prison (CEN)	2,553	2,308	110.6	3,433
California Health Care Facility - Stockton (CHCF)	2,477	2,953	83.9	2,953
California Institution for Men (CIM)	2,364	2,736	86.4	3,695
California Institution for Women (CIW)	965	1,281	75.3	1,743
California Men's Colony (CMC)	3,316	3,816	86.9	4,430
California Medical Facility (CMF)	1,919	2,318	82.8	2,760
California State Prison, Corcoran (COR)	3,406	3,115	109.3	4,502
California Rehabilitation Center (CRC)	2,931	2,380	123.2	3,491
Correctional Training Facility (CTF)	3,995	2,800	142.7	4,125
Chuckawalla Valley State Prison (CVSP)	1,858	1,738	106.9	2,603
Folsom State Prison (FOL)	2,837	2,065	137.4	3,021
High Desert State Prison (HDSP)	2,317	2,324	99.7	3,474
Ironwood State Prison (ISP)	2,695	2,200	122.5	3,275
Kern Valley State Prison (KVSP)	2,525	2,448	103.1	3,497
California State Prison, Los Angeles County (LAC)	2,568	2,300	111.7	3,100
Mule Creek State Prison (MCSP)	3,835	3,284	116.8	4,105
North Kern State Prison (NKSP)	4,221	2,694	156.7	4,011
Pelican Bay State Prison (PBSP)	1,643	2,380	69.0	3,151
Pleasant Valley State Prison (PVSP)	2,638	2,308	114.3	3,433
RJ Donovan Correctional Facility (RJD)	2,903	2,992	97.0	4,038
California State Prison, Sacramento (SAC)	1,460	1,828	79.9	2,259
California Substance Abuse Treatment Facility (SATF)	4,692	3,424	137.0	5,111
Sierra Conservation Center (SCC)	4,182	3,404	122.9	5,804
California State Prison, Solano (SOL)	3,299	2,594	127.2	3,866
San Quentin State Prison (SQ)	4,024	3,084	130.5	3,985
Salinas Valley State Prison (SVSP)	2,895	2,452	118.1	3,209
Valley State Prison (VSP)	2,963	1,961	151.1	2,931
Wasco State Prison (WSP)	3,742	2,984	125.4	4,447
Institution Total	92,753	85,330	108.7	114,432

Design capacity for California Correctional Center will be included until the June 2023 closure date.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
May 1, 2023

Monthly Report of Population
As of Midnight April 30, 2023

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,494	2,909	154.5	4,359
Calipatria State Prison (CAL)	2,488	2,308	107.8	3,433
California Correctional Institution (CCI)	2,149	2,172	98.9	3,239
Central California Women's Facility (CCWF)	2,342	1,990	117.7	2,952
Centinela State Prison (CEN)	2,539	2,308	110.0	3,433
California Health Care Facility - Stockton (CHCF)	2,407	2,953	81.5	2,953
California Institution for Men (CIM)	2,223	1,604	138.6	2,225
California Institution for Women (CIW)	949	1,281	74.1	1,743
California Men's Colony (CMC)	3,237	3,816	84.8	4,430
California Medical Facility (CMF)	1,926	2,318	83.1	2,777
California State Prison, Corcoran (COR)	3,346	3,115	107.4	4,503
California Rehabilitation Center (CRC)	2,916	1,822	160.0	2,654
Correctional Training Facility (CTF)	4,070	2,800	145.4	4,125
Chuckawalla Valley State Prison (CVSP)	1,926	1,738	110.8	2,603
Folsom State Prison (FOL)	2,955	2,065	143.1	3,021
High Desert State Prison (HDSP)	2,529	2,324	108.8	3,474
Ironwood State Prison (ISP)	2,987	2,200	135.8	3,275
Kern Valley State Prison (KVSP)	2,616	2,448	106.9	3,497
California State Prison, Los Angeles County (LAC)	2,569	2,300	111.7	3,100
Mule Creek State Prison (MCSP)	3,851	3,284	117.3	4,105
North Kern State Prison (NKSP)	4,270	2,694	158.5	4,011
Pelican Bay State Prison (PBSP)	1,599	2,380	67.2	3,151
Pleasant Valley State Prison (PVSP)	2,800	2,308	121.3	3,433
RJ Donovan Correctional Facility (RJD)	2,904	2,992	97.1	4,038
California State Prison, Sacramento (SAC)	1,468	1,828	80.3	2,259
California Substance Abuse Treatment Facility (SATF)	4,608	3,424	134.6	5,111
Sierra Conservation Center (SCC)	4,003	3,404	117.6	5,804
California State Prison, Solano (SOL)	3,321	2,594	128.0	3,866
San Quentin State Prison (SQ)	4,034	3,084	130.8	3,985
Salinas Valley State Prison (SVSP)	2,901	2,452	118.3	3,209
Valley State Prison (VSP)	3,017	1,961	153.9	2,931
Wasco State Prison (WSP)	3,804	2,984	127.5	4,447
Institution Total	93,248	84,927	109.8	112,146

Design capacity for California Correctional Center will be included until the June 2023 closure date.

As of April 7, 2023, the design capacity has officially been reduced by 403 beds due to the closure of Folsom Women's Facility on January 13, 2023.

As of April 15, 2023, the design capacity decreased an additional 1,690 beds due to the closure of Facility A at CRC and the deactivation of 1,132 of 1,142 beds in Facility D at CIM.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
May 31, 2023

Monthly Report of Population
As of Midnight May 31, 2023

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,612	2,909	158.5	4,359
Calipatria State Prison (CAL)	2,494	2,308	108.1	3,433
California Correctional Institution (CCI)	1,900	2,172	87.5	3,239
Central California Women's Facility (CCWF)	2,355	1,990	118.3	2,952
Centinela State Prison (CEN)	2,589	2,308	112.2	3,433
California Health Care Facility - Stockton (CHCF)	2,360	2,953	79.9	2,953
California Institution for Men (CIM)	2,196	1,604	136.9	2,225
California Institution for Women (CIW)	983	1,281	76.7	1,743
California Men's Colony (CMC)	3,161	3,816	82.8	4,430
California Medical Facility (CMF)	1,975	2,318	85.2	2,777
California State Prison, Corcoran (COR)	3,284	3,115	105.4	4,503
California Rehabilitation Center (CRC)	3,026	1,822	166.1	2,654
Correctional Training Facility (CTF)	4,265	2,800	152.3	4,125
Chuckawalla Valley State Prison (CVSP)	2,094	1,738	120.5	2,603
Folsom State Prison (FOL)	3,023	2,065	146.4	3,021
High Desert State Prison (HDSP)	2,518	2,324	108.3	3,474
Ironwood State Prison (ISP)	3,180	2,200	144.5	3,275
Kern Valley State Prison (KVSP)	2,694	2,448	110.0	3,497
California State Prison, Los Angeles County (LAC)	2,557	2,300	111.2	3,100
Mule Creek State Prison (MCSP)	3,846	3,284	117.1	4,105
North Kern State Prison (NKSP)	4,153	2,694	154.2	4,011
Pelican Bay State Prison (PBSP)	1,602	2,380	67.3	3,153
Pleasant Valley State Prison (PVSP)	2,940	2,308	127.4	3,433
RJ Donovan Correctional Facility (RJD)	2,938	2,992	98.2	4,038
California State Prison, Sacramento (SAC)	1,513	1,828	82.8	2,259
California Substance Abuse Treatment Facility (SATF)	4,535	3,424	132.4	5,111
Sierra Conservation Center (SCC)	3,956	3,404	116.2	5,804
California State Prison, Solano (SOL)	3,438	2,594	132.5	3,866
San Quentin State Prison (SQ)	3,897	3,084	126.4	3,985
Salinas Valley State Prison (SVSP)	2,900	2,452	118.3	3,225
Valley State Prison (VSP)	3,044	1,961	155.2	2,931
Wasco State Prison (WSP)	3,951	2,984	132.4	4,447
Institution Total	93,979	84,927	110.7	112,164

Design capacity for California Correctional Center will be included until the June 2023 closure date.

As of April 7, 2023, the design capacity has officially been reduced by 403 beds due to the closure of Folsom Women's Facility on January 13, 2023.

As of April 15, 2023, the design capacity decreased an additional 1,690 beds due to the closure of Facility A at CRC and the deactivation of 1,132 of 1,142 beds in Facility D at CIM.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
July 1, 2023

Monthly Report of Population
As of Midnight June 30, 2023

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,660	2,909	160.2	4,359
Calipatria State Prison (CAL)	2,633	2,308	114.1	3,433
California Correctional Institution (CCI)	1,628	1,508	108.0	2,243
Central California Women's Facility (CCWF)	2,395	1,990	120.4	2,952
Centinela State Prison (CEN)	2,765	2,308	119.8	3,433
California Health Care Facility - Stockton (CHCF)	2,334	2,953	79.0	2,953
California Institution for Men (CIM)	2,258	1,604	140.8	2,225
California Institution for Women (CIW)	973	1,281	76.0	1,743
California Men's Colony (CMC)	2,910	3,816	76.3	4,430
California Medical Facility (CMF)	2,082	2,318	89.8	2,777
California State Prison, Corcoran (COR)	3,334	3,115	107.0	4,503
California Rehabilitation Center (CRC)	3,146	1,822	172.7	2,654
Correctional Training Facility (CTF)	4,248	2,800	151.7	4,125
Chuckawalla Valley State Prison (CVSP)	2,215	1,738	127.4	2,603
Folsom State Prison (FOL)	2,958	2,065	143.2	3,021
High Desert State Prison (HDSP)	2,460	2,337	105.3	3,474
Ironwood State Prison (ISP)	3,196	2,200	145.3	3,275
Kern Valley State Prison (KVSP)	2,727	2,448	111.4	3,497
California State Prison, Los Angeles County (LAC)	2,588	2,300	112.5	3,100
Mule Creek State Prison (MCSP)	3,879	3,284	118.1	4,105
North Kern State Prison (NKSP)	3,771	2,694	140.0	4,011
Pelican Bay State Prison (PBSP)	1,599	2,380	67.2	3,153
Pleasant Valley State Prison (PVSP)	3,110	2,308	134.7	3,433
RJ Donovan Correctional Facility (RJD)	2,956	2,992	98.8	4,038
California State Prison, Sacramento (SAC)	1,717	1,828	93.9	2,259
California Substance Abuse Treatment Facility (SATF)	4,513	3,424	131.8	5,111
Sierra Conservation Center (SCC)	3,920	4,872	80.5	5,804
California State Prison, Solano (SOL)	3,575	2,594	137.8	3,866
San Quentin State Prison (SQ)	3,812	3,084	123.6	3,985
Salinas Valley State Prison (SVSP)	2,894	2,452	118.0	3,225
Valley State Prison (VSP)	3,174	1,961	161.9	2,931
Wasco State Prison (WSP)	3,651	2,984	122.4	4,447
Institution Total	94,081	80,677	116.6	111,168

As of April 7, 2023, the design capacity has officially been reduced by 403 beds due to the closure of Folsom Women's Facility on January 13, 2023.

As of April 15, 2023, the design capacity decreased an additional 1,690 beds due to the closure of Facility A at CRC and the deactivation of 1,132 of 1,142 beds in Facility D at CIM.

As of June 15, 2023, the design capacity decreased an additional 664 beds due to the closure of Facility D at California Correctional Institution.

As of June 30, 2023, the design capacity decreased an additional 1,896 beds. California Correction Center has officially closed its 1,909 facility beds and deactivated 1,468 fire camp beds for a total of 3,377 beds. Sierra Conservation Center reactivated the 1,468 fire camp beds. High Desert State Prison activated 13 firehouse beds.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
August 1, 2023

Monthly Report of Population
As of Midnight July 31, 2023

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,636	2,909	159.4	4,359
Calipatria State Prison (CAL)	2,705	2,308	117.2	3,433
California Correctional Institution (CCI)	1,627	1,508	107.9	2,243
Central California Women's Facility (CCWF)	2,384	1,990	119.8	2,952
Centinela State Prison (CEN)	2,779	2,308	120.4	3,433
California Health Care Facility - Stockton (CHCF)	2,340	2,953	79.2	2,953
California Institution for Men (CIM)	2,295	1,604	143.1	2,225
California Institution for Women (CIW)	972	1,281	75.9	1,743
California Men's Colony (CMC)	2,691	3,816	70.5	3,755
California Medical Facility (CMF)	2,164	2,318	93.4	2,760
California State Prison, Corcoran (COR)	3,448	3,115	110.7	4,503
California Rehabilitation Center (CRC)	2,946	1,822	161.7	2,654
Correctional Training Facility (CTF)	4,249	2,800	151.8	4,125
Chuckawalla Valley State Prison (CVSP)	2,173	1,738	125.0	2,603
Folsom State Prison (FOL)	2,876	2,065	139.3	3,021
High Desert State Prison (HDSP)	2,413	2,337	103.3	3,474
Ironwood State Prison (ISP)	3,101	2,200	141.0	3,275
Kern Valley State Prison (KVSP)	2,796	2,448	114.2	3,622
California State Prison, Los Angeles County (LAC)	2,631	2,300	114.4	3,400
Mule Creek State Prison (MCSP)	3,837	3,284	116.8	4,105
North Kern State Prison (NKSP)	3,859	2,694	143.2	4,011
Pelican Bay State Prison (PBSP)	1,581	2,380	66.4	3,153
Pleasant Valley State Prison (PVSP)	3,087	2,308	133.8	3,433
RJ Donovan Correctional Facility (RJD)	3,028	2,992	101.2	4,038
California State Prison, Sacramento (SAC)	1,735	1,828	94.9	2,547
California Substance Abuse Treatment Facility (SATF)	4,547	3,424	132.8	5,111
Sierra Conservation Center (SCC)	4,066	4,972	81.8	5,804
California State Prison, Solano (SOL)	3,653	2,594	140.8	3,866
San Quentin State Prison (SQ)	3,728	3,084	120.9	3,985
Salinas Valley State Prison (SVSP)	2,832	2,452	115.5	3,525
Valley State Prison (VSP)	3,310	1,961	168.8	2,931
Wasco State Prison (WSP)	3,526	2,984	118.2	4,447
Institution Total	94,015	80,777	116.4	111,489

As of April 7, 2023, the design capacity has officially been reduced by 403 beds due to the closure of Folsom Women's Facility on January 13, 2023.

As of April 15, 2023, the design capacity decreased an additional 1,690 beds due to the closure of Facility A at CRC and the deactivation of 1,132 of 1,142 beds in Facility D at CIM.

As of June 15, 2023, the design capacity decreased an additional 664 beds due to the closure of Facility D at California Correctional Institution.

As of June 30, 2023, the design capacity decreased an additional 1,896 beds. California Correction Center has officially closed its 1,909 facility beds and deactivated 1,468 fire camp beds for a total of 3,377 beds. Sierra Conservation Center reactivated the 1,468 fire camp beds. High Desert State Prison activated 13 firehouse beds.

The design capacity increased by 100 beds when the Pine Grove Youth Conservation Camp was moved under Sierra Conservation Center.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
September 1, 2023

Monthly Report of Population
As of Midnight August 31, 2023

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,668	2,909	160.5	4,359
Calipatria State Prison (CAL)	2,721	2,308	117.9	3,433
California Correctional Institution (CCI)	1,657	1,508	109.9	2,243
Central California Women's Facility (CCWF)	2,431	1,990	122.2	2,952
Centinela State Prison (CEN)	2,795	2,308	121.1	3,433
California Health Care Facility - Stockton (CHCF)	2,334	2,953	79.0	2,953
California Institution for Men (CIM)	2,354	1,604	146.8	2,225
California Institution for Women (CIW)	968	1,281	75.6	1,743
California Men's Colony (CMC)	2,323	3,816	60.9	3,755
California Medical Facility (CMF)	2,204	2,318	95.1	2,760
California State Prison, Corcoran (COR)	3,525	3,115	113.2	4,503
California Rehabilitation Center (CRC)	2,841	1,822	155.9	2,654
Correctional Training Facility (CTF)	4,283	2,800	153.0	4,125
Chuckawalla Valley State Prison (CVSP)	2,132	1,738	122.7	2,603
Folsom State Prison (FOL)	2,901	2,065	140.5	3,021
High Desert State Prison (HDSP)	2,535	2,337	108.5	3,474
Ironwood State Prison (ISP)	3,094	2,200	140.6	3,275
Kern Valley State Prison (KVSP)	2,816	2,448	115.0	3,622
California State Prison, Los Angeles County (LAC)	2,601	2,300	113.1	3,400
Mule Creek State Prison (MCSP)	3,828	3,284	116.6	4,105
North Kern State Prison (NKSP)	3,576	2,694	132.7	4,011
Pelican Bay State Prison (PBSP)	1,530	2,380	64.3	3,153
Pleasant Valley State Prison (PVSP)	3,010	2,308	130.4	3,433
RJ Donovan Correctional Facility (RJD)	3,194	2,992	106.8	4,038
California State Prison, Sacramento (SAC)	1,803	1,828	98.6	2,547
California Substance Abuse Treatment Facility (SATF)	4,678	3,424	136.6	5,111
Sierra Conservation Center (SCC)	4,370	4,972	87.9	5,804
California State Prison, Solano (SOL)	3,649	2,594	140.7	3,866
San Quentin State Prison (SQ)	3,639	3,084	118.0	3,985
Salinas Valley State Prison (SVSP)	2,772	2,452	113.1	3,525
Valley State Prison (VSP)	3,364	1,961	171.5	2,931
Wasco State Prison (WSP)	3,332	2,984	111.7	4,447
Institution Total	93,928	80,777	116.3	111,489

As of April 7, 2023, the design capacity has officially been reduced by 403 beds due to the closure of Folsom Women's Facility on January 13, 2023.

As of April 15, 2023, the design capacity decreased an additional 1,690 beds due to the closure of Facility A at CRC and the deactivation of 1,132 of 1,142 beds in Facility D at CIM.

As of June 15, 2023, the design capacity decreased an additional 664 beds due to the closure of Facility D at California Correctional Institution.

As of June 30, 2023, the design capacity decreased an additional 1,896 beds. California Correction Center has officially closed its 1,909 facility beds and deactivated 1,468 fire camp beds for a total of 3,377 beds. Sierra Conservation Center reactivated the 1,468 fire camp beds. High Desert State Prison activated 13 firehouse beds.

The design capacity increased by 100 beds when the Pine Grove Youth Conservation Camp was moved under Sierra Conservation Center.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
October 1, 2023

Monthly Report of Population
As of Midnight September 30, 2023

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,609	2,909	158.4	4,359
Calipatria State Prison (CAL)	2,670	2,308	115.7	3,433
California Correctional Institution (CCI)	1,698	1,508	112.6	2,243
Central California Women's Facility (CCWF)	2,443	1,990	122.8	2,952
Centinela State Prison (CEN)	2,803	2,308	121.4	3,433
California Health Care Facility - Stockton (CHCF)	2,300	2,953	77.9	2,953
California Institution for Men (CIM)	2,366	1,604	147.5	2,225
California Institution for Women (CIW)	993	1,281	77.5	1,743
California Men's Colony (CMC)	2,135	3,816	55.9	3,755
California Medical Facility (CMF)	2,220	2,318	95.8	2,760
California State Prison, Corcoran (COR)	3,491	3,115	112.1	4,503
California Rehabilitation Center (CRC)	2,869	1,822	157.5	2,654
Correctional Training Facility (CTF)	4,310	2,800	153.9	4,125
Chuckawalla Valley State Prison (CVSP)	2,067	1,738	118.9	2,603
Folsom State Prison (FOL)	2,895	2,065	140.2	3,021
High Desert State Prison (HDSP)	2,475	2,337	105.9	3,474
Ironwood State Prison (ISP)	3,112	2,200	141.5	3,275
Kern Valley State Prison (KVSP)	2,848	2,448	116.3	3,622
California State Prison, Los Angeles County (LAC)	2,611	2,300	113.5	3,400
Mule Creek State Prison (MCSP)	3,820	3,284	116.3	4,105
North Kern State Prison (NKSP)	3,718	2,694	138.0	4,011
Pelican Bay State Prison (PBSP)	1,544	2,380	64.9	3,153
Pleasant Valley State Prison (PVSP)	2,817	2,308	122.1	3,433
RJ Donovan Correctional Facility (RJD)	3,270	2,992	109.3	4,038
California State Prison, Sacramento (SAC)	1,863	1,828	101.9	2,547
California Substance Abuse Treatment Facility (SATF)	4,757	3,424	138.9	5,111
Sierra Conservation Center (SCC)	4,360	4,972	87.7	5,804
California State Prison, Solano (SOL)	3,670	2,594	141.5	3,866
San Quentin State Prison (SQ)	3,576	3,084	116.0	3,985
Salinas Valley State Prison (SVSP)	2,738	2,452	111.7	3,525
Valley State Prison (VSP)	3,332	1,961	169.9	2,931
Wasco State Prison (WSP)	3,378	2,984	113.2	4,447
Institution Total	93,758	80,777	116.1	111,489

As of April 7, 2023, the design capacity has officially been reduced by 403 beds due to the closure of Folsom Women's Facility on January 13, 2023.

As of April 15, 2023, the design capacity decreased an additional 1,690 beds due to the closure of Facility A at CRC and the deactivation of 1,132 of 1,142 beds in Facility D at CIM.

As of June 15, 2023, the design capacity decreased an additional 664 beds due to the closure of Facility D at California Correctional Institution.

As of June 30, 2023, the design capacity decreased an additional 1,896 beds. California Correction Center has officially closed its 1,909 facility beds and deactivated 1,468 fire camp beds for a total of 3,377 beds. Sierra Conservation Center reactivated the 1,468 fire camp beds. High Desert State Prison activated 13 firehouse beds.

The design capacity increased by 100 beds when the Pine Grove Youth Conservation Camp was moved under Sierra Conservation Center.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
November 1, 2023

Monthly Report of Population
As of Midnight October 31, 2023

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,592	2,909	157.9	4,359
Calipatria State Prison (CAL)	2,706	2,308	117.2	3,433
California Correctional Institution (CCI)	1,715	1,508	113.7	2,243
Central California Women's Facility (CCWF)	2,290	1,990	115.1	2,952
Centinela State Prison (CEN)	2,802	2,308	121.4	3,433
California Health Care Facility - Stockton (CHCF)	2,258	2,953	76.5	2,953
California Institution for Men (CIM)	2,371	1,604	147.8	2,225
California Institution for Women (CIW)	1,149	1,281	89.7	1,743
California Men's Colony (CMC)	2,065	3,816	54.1	2,642
California Medical Facility (CMF)	2,218	2,318	95.7	2,760
California State Prison, Corcoran (COR)	3,505	3,115	112.5	4,503
California Rehabilitation Center (CRC)	2,919	1,822	160.2	2,654
Correctional Training Facility (CTF)	4,293	2,800	153.3	4,125
Chuckawalla Valley State Prison (CVSP)	2,021	1,738	116.3	2,603
Folsom State Prison (FOL)	2,869	2,065	138.9	3,021
High Desert State Prison (HDSP)	2,387	2,337	102.1	3,474
Ironwood State Prison (ISP)	3,051	2,200	138.7	3,275
Kern Valley State Prison (KVSP)	2,871	2,448	117.3	3,622
California State Prison, Los Angeles County (LAC)	2,679	2,300	116.5	3,400
Mule Creek State Prison (MCSP)	3,803	3,284	115.8	4,105
North Kern State Prison (NKSP)	3,799	2,694	141.0	4,011
Pelican Bay State Prison (PBSP)	1,576	2,380	66.2	3,153
Pleasant Valley State Prison (PVSP)	2,660	2,308	115.3	3,433
RJ Donovan Correctional Facility (RJD)	3,291	2,992	110.0	4,038
California State Prison, Sacramento (SAC)	1,841	1,828	100.7	2,547
California Substance Abuse Treatment Facility (SATF)	4,821	3,424	140.8	5,111
Sierra Conservation Center (SCC)	4,265	4,972	85.8	5,804
California State Prison, Solano (SOL)	3,718	2,594	143.3	3,866
San Quentin State Prison (SQ)	3,488	3,084	113.1	3,985
Salinas Valley State Prison (SVSP)	2,687	2,452	109.6	3,525
Valley State Prison (VSP)	3,247	1,961	165.6	2,931
Wasco State Prison (WSP)	3,620	2,984	121.3	4,447
Institution Total	93,577	80,777	115.8	110,376

As of April 7, 2023, the design capacity has officially been reduced by 403 beds due to the closure of Folsom Women's Facility on January 13, 2023.

As of April 15, 2023, the design capacity decreased an additional 1,690 beds due to the closure of Facility A at CRC and the deactivation of 1,132 of 1,142 beds in Facility D at CIM.

As of June 15, 2023, the design capacity decreased an additional 664 beds due to the closure of Facility D at California Correctional Institution.

As of June 30, 2023, the design capacity decreased an additional 1,896 beds. California Correction Center has officially closed its 1,909 facility beds and deactivated 1,468 fire camp beds for a total of 3,377 beds. Sierra Conservation Center reactivated the 1,468 fire camp beds. High Desert State Prison activated 13 firehouse beds.

The design capacity increased by 100 beds when the Pine Grove Youth Conservation Camp was moved under Sierra Conservation Center.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
December 1, 2023

Monthly Report of Population
As of Midnight November 30, 2023

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,608	2,909	158.4	4,359
Calipatria State Prison (CAL)	2,799	2,308	121.3	3,433
California Correctional Institution (CCI)	1,718	1,508	113.9	2,243
Central California Women's Facility (CCWF)	2,217	1,990	111.4	2,952
Centinela State Prison (CEN)	2,740	2,308	118.7	3,433
California Health Care Facility - Stockton (CHCF)	2,240	2,953	75.9	2,953
California Institution for Men (CIM)	2,367	1,604	147.6	2,225
California Institution for Women (CIW)	1,191	1,281	93.0	1,743
California Men's Colony (CMC)	2,048	2,613	78.4	2,642
California Medical Facility (CMF)	2,188	2,318	94.4	2,760
California State Prison, Corcoran (COR)	3,479	3,115	111.7	4,503
California Rehabilitation Center (CRC)	2,989	1,822	164.1	2,654
Correctional Training Facility (CTF)	4,211	2,800	150.4	4,125
Chuckawalla Valley State Prison (CVSP)	1,965	1,738	113.1	2,603
Folsom State Prison (FOL)	2,826	2,065	136.9	3,021
High Desert State Prison (HDSP)	2,296	2,337	98.2	3,474
Ironwood State Prison (ISP)	3,119	2,200	141.8	3,275
Kern Valley State Prison (KVSP)	2,867	2,448	117.1	3,622
California State Prison, Los Angeles County (LAC)	2,790	2,300	121.3	3,400
Mule Creek State Prison (MCSP)	3,796	3,284	115.6	4,105
North Kern State Prison (NKSP)	3,930	2,694	145.9	4,011
Pelican Bay State Prison (PBSP)	1,534	2,380	64.5	3,153
Pleasant Valley State Prison (PVSP)	2,565	2,308	111.1	3,433
RJ Donovan Correctional Facility (RJD)	3,278	2,992	109.6	4,038
California State Prison, Sacramento (SAC)	1,818	1,828	99.5	2,547
California Substance Abuse Treatment Facility (SATF)	4,856	3,424	141.8	5,111
Sierra Conservation Center (SCC)	4,162	4,972	83.7	5,804
California State Prison, Solano (SOL)	3,750	2,594	144.6	3,866
San Quentin State Prison (SQ)	3,479	3,084	112.8	3,985
Salinas Valley State Prison (SVSP)	2,661	2,452	108.5	3,525
Valley State Prison (VSP)	3,228	1,961	164.6	2,931
Wasco State Prison (WSP)	3,656	2,984	122.5	4,447
Institution Total	93,371	79,574	117.3	110,376

As of April 7, 2023, the design capacity has officially been reduced by 403 beds due to the closure of Folsom Women's Facility on January 13, 2023.

As of April 15, 2023, the design capacity decreased an additional 1,690 beds due to the closure of Facility A at CRC and the deactivation of 1,132 of 1,142 beds in Facility D at CIM.

As of June 15, 2023, the design capacity decreased an additional 664 beds due to the closure of Facility D at California Correctional Institution.

As of June 30, 2023, the design capacity decreased an additional 1,896 beds. California Correction Center has officially closed its 1,909 facility beds and deactivated 1,468 fire camp beds for a total of 3,377 beds. Sierra Conservation Center reactivated the 1,468 fire camp beds. High Desert State Prison activated 13 firehouse beds.

The design capacity increased by 100 beds when the Pine Grove Youth Conservation Camp was moved under Sierra Conservation Center.

As of November 4, 2023, the design capacity decreased an additional 1,203 beds due to the deactivation of beds at California Men's Colony.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
January 1, 2024

Monthly Report of Population
As of Midnight December 31, 2023

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,634	2,909	159.3	4,359
Calipatria State Prison (CAL)	2,741	2,308	118.8	3,433
California Correctional Institution (CCI)	1,750	1,508	116.0	2,243
Central California Women's Facility (CCWF)	2,196	1,990	110.4	2,952
Centinela State Prison (CEN)	2,692	2,308	116.6	3,433
California Health Care Facility - Stockton (CHCF)	2,258	2,953	76.5	2,953
California Institution for Men (CIM)	2,303	1,604	143.6	2,225
California Institution for Women (CIW)	1,190	1,281	92.9	1,743
California Men's Colony (CMC)	2,116	2,613	81.0	2,642
California Medical Facility (CMF)	2,193	2,318	94.6	2,760
California State Prison, Corcoran (COR)	3,463	3,115	111.2	4,503
California Rehabilitation Center (CRC)	3,018	1,822	165.6	2,654
Correctional Training Facility (CTF)	4,130	2,800	147.5	4,125
Chuckawalla Valley State Prison (CVSP)	1,803	1,738	103.7	2,603
Folsom State Prison (FOL)	2,785	2,065	134.9	3,021
High Desert State Prison (HDSP)	2,242	2,337	95.9	3,474
Ironwood State Prison (ISP)	3,051	2,200	138.7	3,275
Kern Valley State Prison (KVSP)	2,914	2,448	119.0	3,622
California State Prison, Los Angeles County (LAC)	2,808	2,300	122.1	3,400
Mule Creek State Prison (MCSP)	3,827	3,284	116.5	4,105
North Kern State Prison (NKSP)	4,016	2,694	149.1	4,011
Pelican Bay State Prison (PBSP)	1,524	1,804	84.5	2,445
Pleasant Valley State Prison (PVSP)	2,499	2,308	108.3	3,433
RJ Donovan Correctional Facility (RJD)	3,297	2,992	110.2	4,038
California State Prison, Sacramento (SAC)	1,795	1,828	98.2	2,557
California Substance Abuse Treatment Facility (SATF)	4,755	3,424	138.9	5,111
Sierra Conservation Center (SCC)	4,028	4,972	81.0	5,804
California State Prison, Solano (SOL)	3,788	2,594	146.0	3,866
San Quentin State Prison (SQ)	3,486	3,084	113.0	3,985
Salinas Valley State Prison (SVSP)	2,623	2,452	107.0	3,525
Valley State Prison (VSP)	3,198	1,961	163.1	2,931
Wasco State Prison (WSP)	3,774	2,984	126.5	4,447
Institution Total	92,897	78,998	117.6	109,678

As of April 7, 2023, the design capacity has officially been reduced by 403 beds due to the closure of Folsom Women's Facility on January 13, 2023.

As of April 15, 2023, the design capacity decreased an additional 1,690 beds due to the closure of Facility A at CRC and the deactivation of 1,132 of 1,142 beds in Facility D at CIM.

As of June 15, 2023, the design capacity decreased an additional 664 beds due to the closure of Facility D at California Correctional Institution.

As of June 30, 2023, the design capacity decreased an additional 1,896 beds. California Correction Center has officially closed its 1,909 facility beds and deactivated 1,468 fire camp beds for a total of 3,377 beds. Sierra Conservation Center reactivated the 1,468 fire camp beds. High Desert State Prison activated 13 firehouse beds.

The design capacity increased by 100 beds when the Pine Grove Youth Conservation Camp was moved under Sierra Conservation Center.

As of November 4, 2023, the design capacity decreased an additional 1,203 beds due to the deactivation of beds at California Men's Colony.

As of December 3, 2023, the design capaciy decreased an additional 576 beds due to the closure of Facility C at Pelican Bay State Prison.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
February 1, 2024

Monthly Report of Population
As of Midnight January 31, 2024

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,717	2,909	162.2	4,359
Calipatria State Prison (CAL)	2,654	2,308	115.0	3,433
California Correctional Institution (CCI)	1,784	1,508	118.3	2,243
Central California Women's Facility (CCWF)	2,183	1,990	109.7	2,952
Centinela State Prison (CEN)	2,894	2,308	125.4	3,433
California Health Care Facility - Stockton (CHCF)	2,238	2,953	75.8	2,953
California Institution for Men (CIM)	2,194	1,604	136.8	2,225
California Institution for Women (CIW)	1,185	1,281	92.5	1,743
California Men's Colony (CMC)	2,249	2,613	86.1	2,642
California Medical Facility (CMF)	2,177	2,318	93.9	2,635
California State Prison, Corcoran (COR)	3,452	3,115	110.8	4,503
California Rehabilitation Center (CRC)	3,128	1,822	171.7	2,654
Correctional Training Facility (CTF)	4,122	2,800	147.2	4,125
Chuckawalla Valley State Prison (CVSP)	1,756	1,738	101.0	2,603
Folsom State Prison (FOL)	2,765	2,065	133.9	3,021
High Desert State Prison (HDSP)	2,246	2,337	96.1	3,474
Ironwood State Prison (ISP)	2,532	2,200	115.1	3,275
Kern Valley State Prison (KVSP)	2,928	2,448	119.6	3,622
California State Prison, Los Angeles County (LAC)	2,894	2,300	125.8	3,400
Mule Creek State Prison (MCSP)	3,935	3,284	119.8	4,105
North Kern State Prison (NKSP)	3,772	2,694	140.0	4,011
Pelican Bay State Prison (PBSP)	1,433	1,804	79.4	2,445
Pleasant Valley State Prison (PVSP)	2,707	2,308	117.3	3,433
RJ Donovan Correctional Facility (RJD)	3,299	2,992	110.3	4,038
California State Prison, Sacramento (SAC)	1,835	1,828	100.4	2,557
California Substance Abuse Treatment Facility (SATF)	4,417	3,424	129.0	5,111
Sierra Conservation Center (SCC)	3,940	4,972	79.2	5,804
California State Prison, Solano (SOL)	3,895	2,594	150.2	3,866
San Quentin State Prison (SQ)	3,551	3,084	115.1	3,985
Salinas Valley State Prison (SVSP)	2,628	2,452	107.2	3,525
Valley State Prison (VSP)	3,147	1,961	160.5	2,931
Wasco State Prison (WSP)	3,774	2,984	126.5	4,447
Institution Total	92,431	78,998	117.0	109,553

As of April 7, 2023, the design capacity has officially been reduced by 403 beds due to the closure of Folsom Women's Facility on January 13, 2023.

As of April 15, 2023, the design capacity decreased an additional 1,690 beds due to the closure of Facility A at CRC and the deactivation of 1,132 of 1,142 beds in Facility D at CIM.

As of June 15, 2023, the design capacity decreased an additional 664 beds due to the closure of Facility D at California Correctional Institution.

As of June 30, 2023, the design capacity decreased an additional 1,896 beds. California Correction Center has officially closed its 1,909 facility beds and deactivated 1,468 fire camp beds for a total of 3,377 beds. Sierra Conservation Center reactivated the 1,468 fire camp beds. High Desert State Prison activated 13 firehouse beds.

The design capacity increased by 100 beds when the Pine Grove Youth Conservation Camp was moved under Sierra Conservation Center.

As of November 4, 2023, the design capacity decreased an additional 1,203 beds due to the deactivation of beds at California Men's Colony.

As of December 3, 2023, the design capaciy decreased an additional 576 beds due to the closure of Facility C at Pelican Bay State Prison.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
March 1, 2024

Monthly Report of Population
As of Midnight February 29, 2024

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,862	2,909	167.1	4,359
Calipatria State Prison (CAL)	2,591	2,308	112.3	3,433
California Correctional Institution (CCI)	1,774	1,508	117.6	2,243
Central California Women's Facility (CCWF)	2,223	1,990	111.7	2,946
Centinela State Prison (CEN)	2,945	2,308	127.6	3,433
California Health Care Facility - Stockton (CHCF)	2,211	2,953	74.9	2,953
California Institution for Men (CIM)	2,181	1,604	136.0	2,225
California Institution for Women (CIW)	1,171	1,281	91.4	1,743
California Men's Colony (CMC)	2,320	2,613	88.8	2,642
California Medical Facility (CMF)	2,186	2,318	94.3	2,760
California State Prison, Corcoran (COR)	3,442	3,115	110.5	4,503
California Rehabilitation Center (CRC)	3,190	1,822	175.1	2,654
Correctional Training Facility (CTF)	4,086	2,800	145.9	4,125
Chuckawalla Valley State Prison (CVSP)	1,499	1,738	86.2	2,018
Folsom State Prison (FOL)	2,710	2,065	131.2	3,021
High Desert State Prison (HDSP)	2,387	2,337	102.1	3,474
Ironwood State Prison (ISP)	2,600	2,200	118.2	3,275
Kern Valley State Prison (KVSP)	2,994	2,448	122.3	3,622
California State Prison, Los Angeles County (LAC)	3,017	2,300	131.2	3,400
Mule Creek State Prison (MCSP)	3,931	3,284	119.7	4,105
North Kern State Prison (NKSP)	3,485	2,694	129.4	4,011
Pelican Bay State Prison (PBSP)	1,545	1,804	85.6	2,445
Pleasant Valley State Prison (PVSP)	2,717	2,308	117.7	3,433
RJ Donovan Correctional Facility (RJD)	3,301	2,992	110.3	4,038
California State Prison, Sacramento (SAC)	1,865	1,828	102.0	2,557
California Substance Abuse Treatment Facility (SATF)	4,216	3,424	123.1	5,111
Sierra Conservation Center (SCC)	3,984	4,972	80.1	5,804
California State Prison, Solano (SOL)	3,948	2,594	152.2	3,866
San Quentin State Prison (SQ)	3,556	3,084	115.3	3,935
Salinas Valley State Prison (SVSP)	2,625	2,452	107.1	3,525
Valley State Prison (VSP)	3,093	1,961	157.7	2,931
Wasco State Prison (WSP)	3,613	2,984	121.1	4,447
Institution Total	92,268	78,998	116.8	109,037

As of April 7, 2023, the design capacity has officially been reduced by 403 beds due to the closure of Folsom Women's Facility on January 13, 2023.

As of April 15, 2023, the design capacity decreased an additional 1,690 beds due to the closure of Facility A at CRC and the deactivation of 1,132 of 1,142 beds in Facility D at CIM.

As of June 15, 2023, the design capacity decreased an additional 664 beds due to the closure of Facility D at California Correctional Institution.

As of June 30, 2023, the design capacity decreased an additional 1,896 beds. California Correction Center has officially closed its 1,909 facility beds and deactivated 1,468 fire camp beds for a total of 3,377 beds. Sierra Conservation Center reactivated the 1,468 fire camp beds. High Desert State Prison activated 13 firehouse beds.

The design capacity increased by 100 beds when the Pine Grove Youth Conservation Camp was moved under Sierra Conservation Center.

As of November 4, 2023, the design capacity decreased an additional 1,203 beds due to the deactivation of beds at California Men's Colony.

As of December 3, 2023, the design capaciy decreased an additional 576 beds due to the closure of Facility C at Pelican Bay State Prison.

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
April 1, 2024

Monthly Report of Population
As of Midnight March 31, 2024

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,796	2,909	164.9	4,359
Calipatria State Prison (CAL)	2,839	2,308	123.0	3,433
California Correctional Institution (CCI)	1,751	1,508	116.1	2,227
Central California Women's Facility (CCWF)	2,247	1,986	113.1	2,946
Centinela State Prison (CEN)	3,074	2,308	133.2	3,433
California Health Care Facility - Stockton (CHCF)	2,209	2,953	74.8	2,953
California Institution for Men (CIM)	2,201	1,604	137.2	2,225
California Institution for Women (CIW)	1,150	1,281	89.8	1,743
California Men's Colony (CMC)	2,356	2,613	90.2	2,642
California Medical Facility (CMF)	2,158	2,319	93.1	2,760
California State Prison, Corcoran (COR)	2,599	3,114	83.5	4,503
California Rehabilitation Center (CRC)	3,091	1,822	169.6	2,654
Correctional Training Facility (CTF)	4,044	2,800	144.4	4,125
Chuckawalla Valley State Prison (CVSP)	1,136	1,738	65.4	1,433
Folsom State Prison (FOL)	2,662	2,065	128.9	3,021
High Desert State Prison (HDSP)	2,622	2,337	112.2	3,442
Ironwood State Prison (ISP)	2,932	2,200	133.3	3,275
Kern Valley State Prison (KVSP)	3,133	2,448	128.0	3,574
California State Prison, Los Angeles County (LAC)	3,149	2,300	136.9	3,400
Mule Creek State Prison (MCSP)	3,948	3,284	120.2	4,105
North Kern State Prison (NKSP)	3,291	2,694	122.2	4,011
Pelican Bay State Prison (PBSP)	1,677	1,804	93.0	2,429
Pleasant Valley State Prison (PVSP)	2,657	2,308	115.1	3,433
RJ Donovan Correctional Facility (RJD)	3,356	2,992	112.2	4,038
California State Prison, Sacramento (SAC)	1,862	1,828	101.9	2,493
California Substance Abuse Treatment Facility (SATF)	4,338	3,424	126.7	5,111
Sierra Conservation Center (SCC)	3,966	4,972	79.8	5,804
California State Prison, Solano (SOL)	3,932	2,594	151.6	3,866
San Quentin State Prison (SQ)	3,523	3,084	114.2	3,985
Salinas Valley State Prison (SVSP)	2,611	2,452	106.5	3,509
Valley State Prison (VSP)	3,040	1,961	155.0	2,931
Wasco State Prison (WSP)	3,622	2,984	121.4	4,447
Institution Total	91,972	78,994	116.4	108,310

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
May 1, 2024

Monthly Report of Population
As of Midnight April 30, 2024

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,744	2,909	163.1	4,359
Calipatria State Prison (CAL)	2,788	2,308	120.8	3,433
California Correctional Institution (CCI)	1,702	1,508	112.9	2,227
Central California Women's Facility (CCWF)	2,215	1,986	111.5	2,946
Centinela State Prison (CEN)	3,131	2,308	135.7	3,433
California Health Care Facility - Stockton (CHCF)	2,180	2,953	73.8	2,953
California Institution for Men (CIM)	2,220	1,604	138.4	2,225
California Institution for Women (CIW)	1,174	1,281	91.6	1,743
California Men's Colony (CMC)	2,311	2,613	88.4	2,642
California Medical Facility (CMF)	2,101	2,319	90.6	2,761
California State Prison, Corcoran (COR)	2,492	3,114	80.0	4,502
California Rehabilitation Center (CRC)	2,986	1,822	163.9	2,654
Correctional Training Facility (CTF)	3,963	2,800	141.5	4,125
Chuckawalla Valley State Prison (CVSP)	749	1,738	43.1	2,603
Folsom State Prison (FOL)	2,599	2,065	125.9	3,021
High Desert State Prison (HDSP)	2,636	2,337	112.8	3,442
Ironwood State Prison (ISP)	3,283	2,200	149.2	3,275
Kern Valley State Prison (KVSP)	3,196	2,448	130.6	3,574
California State Prison, Los Angeles County (LAC)	3,212	2,300	139.7	3,400
Mule Creek State Prison (MCSP)	3,958	3,284	120.5	4,105
North Kern State Prison (NKSP)	3,248	2,694	120.6	4,011
Pelican Bay State Prison (PBSP)	1,848	1,804	102.4	2,429
Pleasant Valley State Prison (PVSP)	2,607	2,308	113.0	3,433
RJ Donovan Correctional Facility (RJD)	3,357	2,992	112.2	4,038
California State Prison, Sacramento (SAC)	1,869	1,828	102.2	2,493
California Substance Abuse Treatment Facility (SATF)	4,469	3,424	130.5	5,111
Sierra Conservation Center (SCC)	3,962	4,972	79.7	5,804
California State Prison, Solano (SOL)	3,910	2,594	150.7	3,866
San Quentin State Prison (SQ)	3,486	3,084	113.0	3,985
Salinas Valley State Prison (SVSP)	2,558	2,452	104.3	3,509
Valley State Prison (VSP)	2,999	1,961	152.9	2,931
Wasco State Prison (WSP)	3,795	2,984	127.2	4,447
Institution Total	91,748	78,994	116.1	109,480

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
June 1, 2024

Monthly Report of Population
As of Midnight May 31, 2024

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,710	2,909	161.9	4,359
Calipatria State Prison (CAL)	2,842	2,308	123.1	3,433
California Correctional Institution (CCI)	1,679	1,508	111.3	2,227
Central California Women's Facility (CCWF)	2,244	1,986	113.0	2,946
Centinela State Prison (CEN)	3,075	2,308	133.2	3,433
California Health Care Facility - Stockton (CHCF)	2,152	2,953	72.9	2,953
California Institution for Men (CIM)	2,217	1,604	138.2	2,225
California Institution for Women (CIW)	1,125	1,281	87.8	1,743
California Men's Colony (CMC)	2,258	2,613	86.4	2,642
California Medical Facility (CMF)	2,069	2,319	89.2	2,761
California State Prison, Corcoran (COR)	2,549	3,114	81.9	4,502
California Rehabilitation Center (CRC)	2,900	1,822	159.2	2,654
Correctional Training Facility (CTF)	3,986	2,800	142.4	4,125
Chuckawalla Valley State Prison (CVSP)	489	1,738	28.1	2,603
Folsom State Prison (FOL)	2,577	2,065	124.8	3,021
High Desert State Prison (HDSP)	2,563	2,337	109.7	3,442
Ironwood State Prison (ISP)	3,186	2,200	144.8	3,275
Kern Valley State Prison (KVSP)	3,339	2,448	136.4	3,574
California State Prison, Los Angeles County (LAC)	3,205	2,300	139.3	3,400
Mule Creek State Prison (MCSP)	3,978	3,284	121.1	4,105
North Kern State Prison (NKSP)	3,378	2,694	125.4	4,011
Pelican Bay State Prison (PBSP)	1,973	1,804	109.4	2,429
Pleasant Valley State Prison (PVSP)	2,474	2,308	107.2	3,433
RJ Donovan Correctional Facility (RJD)	3,373	2,992	112.7	4,038
California State Prison, Sacramento (SAC)	1,868	1,828	102.2	2,493
California Substance Abuse Treatment Facility (SATF)	4,722	3,424	137.9	5,111
Sierra Conservation Center (SCC)	4,041	4,972	81.3	5,804
California State Prison, Solano (SOL)	3,943	2,594	152.0	3,866
San Quentin State Prison (SQ)	3,333	3,084	108.1	3,985
Salinas Valley State Prison (SVSP)	2,548	2,452	103.9	3,509
Valley State Prison (VSP)	3,047	1,961	155.4	2,931
Wasco State Prison (WSP)	3,824	2,984	128.2	4,447
Institution Total	91,667	78,994	116.0	109,480

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
July 1, 2024

Monthly Report of Population
As of Midnight June 30, 2024

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,654	2,909	160.0	4,359
Calipatria State Prison (CAL)	2,900	2,308	125.6	3,433
California Correctional Institution (CCI)	1,658	1,508	109.9	2,227
Central California Women's Facility (CCWF)	2,214	1,986	111.5	2,946
Centinela State Prison (CEN)	3,006	2,308	130.2	3,433
California Health Care Facility - Stockton (CHCF)	2,173	2,953	73.6	2,953
California Institution for Men (CIM)	2,244	1,604	139.9	2,225
California Institution for Women (CIW)	1,167	1,281	91.1	1,743
California Men's Colony (CMC)	2,194	2,613	84.0	2,642
California Medical Facility (CMF)	2,052	2,319	88.5	2,761
California State Prison, Corcoran (COR)	2,510	3,114	80.6	4,502
California Rehabilitation Center (CRC)	2,775	1,822	152.3	2,654
Correctional Training Facility (CTF)	3,934	2,800	140.5	4,125
Chuckawalla Valley State Prison (CVSP)	273	1,738	15.7	2,603
Folsom State Prison (FOL)	2,610	2,065	126.4	3,021
High Desert State Prison (HDSP)	2,548	2,337	109.0	3,442
Ironwood State Prison (ISP)	3,147	2,200	143.0	3,285
Kern Valley State Prison (KVSP)	3,269	2,448	133.5	3,574
California State Prison, Los Angeles County (LAC)	3,199	2,300	139.1	3,400
Mule Creek State Prison (MCSP)	3,967	3,284	120.8	4,105
North Kern State Prison (NKSP)	3,321	2,694	123.3	4,011
Pelican Bay State Prison (PBSP)	2,183	1,804	121.0	2,429
Pleasant Valley State Prison (PVSP)	2,395	2,308	103.8	3,433
RJ Donovan Correctional Facility (RJD)	3,345	2,992	111.8	4,038
California State Prison, Sacramento (SAC)	1,868	1,828	102.2	2,493
California Substance Abuse Treatment Facility (SATF)	4,971	3,424	145.2	5,111
Sierra Conservation Center (SCC)	4,019	4,972	80.8	5,804
California State Prison, Solano (SOL)	4,000	2,594	154.2	3,866
San Quentin Rehabilitation Center (SQ)	3,361	3,084	109.0	3,985
Salinas Valley State Prison (SVSP)	2,527	2,452	103.1	3,509
Valley State Prison (VSP)	3,145	1,961	160.4	2,931
Wasco State Prison (WSP)	3,701	2,984	124.0	4,447
Institution Total	91,330	78,994	115.6	109,490

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
August 1, 2024

Monthly Report of Population
As of Midnight July 31, 2024

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,560	2,909	156.8	3,759
Calipatria State Prison (CAL)	2,894	2,308	125.4	3,433
California Correctional Institution (CCI)	1,710	1,508	113.4	2,227
Central California Women's Facility (CCWF)	2,106	1,986	106.0	2,946
Centinela State Prison (CEN)	3,061	2,308	132.6	3,433
California Health Care Facility - Stockton (CHCF)	2,172	2,953	73.6	2,953
California Institution for Men (CIM)	2,250	1,604	140.3	2,225
California Institution for Women (CIW)	1,258	1,281	98.2	1,743
California Men's Colony (CMC)	2,120	2,613	81.1	2,642
California Medical Facility (CMF)	2,044	2,319	88.1	2,657
California State Prison, Corcoran (COR)	2,493	3,114	80.1	3,164
California Rehabilitation Center (CRC)	2,782	1,822	152.7	2,579
Correctional Training Facility (CTF)	3,965	2,800	141.6	4,125
Folsom State Prison (FOL)	2,731	2,065	132.3	3,021
High Desert State Prison (HDSP)	2,556	2,337	109.4	3,442
Ironwood State Prison (ISP)	3,049	2,200	138.6	3,285
Kern Valley State Prison (KVSP)	3,220	2,448	131.5	3,136
California State Prison, Los Angeles County (LAC)	3,227	2,300	140.3	3,250
Mule Creek State Prison (MCSP)	3,970	3,284	120.9	3,811
North Kern State Prison (NKSP)	3,119	2,694	115.8	4,011
Pelican Bay State Prison (PBSP)	2,251	1,804	124.8	2,425
Pleasant Valley State Prison (PVSP)	2,364	2,308	102.4	3,433
RJ Donovan Correctional Facility (RJD)	3,096	2,992	103.5	3,750
California State Prison, Sacramento (SAC)	1,929	1,828	105.5	2,265
California Substance Abuse Treatment Facility (SATF)	5,486	3,424	160.2	5,111
Sierra Conservation Center (SCC)	4,048	4,972	81.4	5,804
California State Prison, Solano (SOL)	4,086	2,594	157.5	3,866
San Quentin Rehabilitation Center (SQ)	3,295	3,084	106.8	3,935
Salinas Valley State Prison (SVSP)	2,481	2,452	101.2	2,471
Valley State Prison (VSP)	3,213	1,961	163.8	2,931
Wasco State Prison (WSP)	3,457	2,984	115.9	4,447
Institution Total	90,993	78,994	115.2	102,280

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
September 1, 2024

Monthly Report of Population
As of Midnight August 31, 2024

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,431	2,909	152.3	3,759
Calipatria State Prison (CAL)	2,792	2,308	121.0	3,433
California Correctional Institution (CCI)	1,709	1,508	113.3	2,227
Central California Women's Facility (CCWF)	2,092	1,986	105.3	2,946
Centinela State Prison (CEN)	3,101	2,308	134.4	3,433
California Health Care Facility - Stockton (CHCF)	2,135	2,953	72.3	2,953
California Institution for Men (CIM)	2,233	1,604	139.2	2,225
California Institution for Women (CIW)	1,286	1,281	100.4	1,743
California Men's Colony (CMC)	2,087	2,613	79.9	2,642
California Medical Facility (CMF)	2,017	2,319	87.0	2,657
California State Prison, Corcoran (COR)	2,496	3,114	80.2	3,164
California Rehabilitation Center (CRC)	2,792	1,822	153.2	2,579
Correctional Training Facility (CTF)	4,028	2,800	143.9	4,125
Folsom State Prison (FOL)	2,797	2,065	135.4	3,021
High Desert State Prison (HDSP)	2,718	2,337	116.3	3,442
Ironwood State Prison (ISP)	2,954	2,200	134.3	3,285
Kern Valley State Prison (KVSP)	3,163	2,448	129.2	3,136
California State Prison, Los Angeles County (LAC)	3,221	2,300	140.0	3,250
Mule Creek State Prison (MCSP)	4,015	3,284	122.3	3,811
North Kern State Prison (NKSP)	3,139	2,694	116.5	4,011
Pelican Bay State Prison (PBSP)	2,211	1,804	122.6	2,425
Pleasant Valley State Prison (PVSP)	2,598	2,308	112.6	3,433
RJ Donovan Correctional Facility (RJD)	2,932	2,992	98.0	3,750
California State Prison, Sacramento (SAC)	2,032	1,828	111.2	2,265
California Substance Abuse Treatment Facility (SATF)	5,460	3,424	159.5	5,111
Sierra Conservation Center (SCC)	3,965	4,972	79.7	5,804
California State Prison, Solano (SOL)	4,044	2,594	155.9	3,866
San Quentin Rehabilitation Center (SQ)	3,221	3,084	104.4	3,935
Salinas Valley State Prison (SVSP)	2,509	2,452	102.3	2,471
Valley State Prison (VSP)	3,264	1,961	166.4	2,931
Wasco State Prison (WSP)	3,314	2,984	111.1	4,447
Institution Total	90,756	78,994	114.9	102,280

California Department of Corrections and Rehabilitation
Division of Correctional Policy Research and Internal Oversight
Office of Research
October 1, 2024

Monthly Report of Population
As of Midnight September 30, 2024

Monthly Institution Population Detail

Institutions	Felon/ Other	Design Capacity	Percent Occupied	Staffed Capacity
Avenal State Prison (ASP)	4,230	2,509	168.6	3,759
Calipatria State Prison (CAL)	2,613	2,308	113.2	3,433
California Correctional Institution (CCI)	1,594	1,508	105.7	2,227
Central California Women's Facility (CCWF)	2,107	1,986	106.1	2,946
Centinela State Prison (CEN)	3,084	2,308	133.6	3,433
California Health Care Facility - Stockton (CHCF)	2,120	2,953	71.8	2,953
California Institution for Men (CIM)	2,283	1,524	149.8	2,225
California Institution for Women (CIW)	1,249	1,281	97.5	1,743
California Men's Colony (CMC)	2,044	2,613	78.2	2,642
California Medical Facility (CMF)	1,992	2,229	89.4	2,657
California State Prison, Corcoran (COR)	2,477	2,222	111.5	3,164
California Rehabilitation Center (CRC)	2,804	1,722	162.8	2,579
Correctional Training Facility (CTF)	4,168	2,800	148.9	4,125
Folsom State Prison (FOL)	2,784	2,065	134.8	3,021
High Desert State Prison (HDSP)	2,840	2,337	121.5	3,442
Ironwood State Prison (ISP)	2,948	2,200	134.0	3,283
Kern Valley State Prison (KVSP)	3,138	2,156	145.5	3,136
California State Prison, Los Angeles County (LAC)	3,270	2,200	148.6	3,250
Mule Creek State Prison (MCSP)	3,992	3,088	129.3	3,811
North Kern State Prison (NKSP)	3,104	2,694	115.2	4,011
Pelican Bay State Prison (PBSP)	2,195	1,804	121.7	2,441
Pleasant Valley State Prison (PVSP)	2,871	2,308	124.4	3,433
RJ Donovan Correctional Facility (RJD)	2,863	2,800	102.3	3,750
California State Prison, Sacramento (SAC)	2,147	1,508	142.4	2,265
California Substance Abuse Treatment Facility (SATF)	5,471	3,424	159.8	5,111
Sierra Conservation Center (SCC)	4,004	4,972	80.5	5,904
California State Prison, Solano (SOL)	4,004	2,594	154.4	3,866
San Quentin Rehabilitation Center (SQ)	3,152	3,084	102.2	3,935
Salinas Valley State Prison (SVSP)	2,519	1,760	143.1	2,471
Valley State Prison (VSP)	3,308	1,961	168.7	2,931
Wasco State Prison (WSP)	3,444	2,984	115.4	4,447
Institution Total	90,819	75,640	120.1	102,394

Exhibit B

Cal Fire Training Academy Documentation of Facilities Capacity

DEPARTMENT OF FORESTRY AND FIRE PROTECTION
P.O. Box 944246
SACRAMENTO, CA 94244-2460
(916) 653-7772
Website: www.fire.ca.gov

November 20, 2024

REF: Ione Training Center Bed Count

The CAL FIRE Ione Training Center is located in the City of Ione, in Amador County at 4501 State Highway 104, Ione, CA 95640. The Ione Training Center had two dormitories, (Dormitory 1 and Dormitory 2) and 5 modular buildings utilized for sleeping. Combined, the Ione Training Center has a maximum bed capacity of 238 beds.

Dormitory 1 – 91 beds
Dormitory 2 – 85 beds
Modular Sleeping Buildings - 62 beds

Sincerely,

Nicole Gissell
Assistant Chief
CAL FIRE Training Center

Exhibit C

Summary of Water Year 2020 to Water Year 2024

Infiltration and Inflow Analysis Per Water Year (WY)
MCSP Sewer System Contributors

Month	WY 2020											
	Total Average Influent Flow (Mgal/d)	MCIC Average Influent Flow (Mgal/d)	Estimated MCSP + PYCF + CFTA Influent Flow (Mgal/d)	Monthly Rainfall Total (in.)	Estimated MCIC I&I (Mgal/d)	Estimated MCSP + PYCF + CFTA I&I (Mgal/d)	MCSP Population	MCIC Population	Assumed CFTA Population	Estimated Total MCSP + CFTA Population	MCSP gpid	MCIC gpid
October	0.50	0.12	0.38	0.00	0.00	0.00	2540	1511	120	2660	143	79
November	0.52	0.11	0.41	0.68	0.01	0.00	2520	1507	120	2640	155	74
December	0.57	0.11	0.45	5.14	0.01	0.03	2465	1524	120	2585	175	75
January	0.48	0.11	0.37	1.82	0.01	0.00	2464	1543	120	2584	141	74
February	0.48	0.12	0.37	0.01	0.01	0.00	2460	1543	120	2580	142	75
March	0.52	0.12	0.40	0.00	0.00	0.00	2698	1305	120	2818	141	94
April	0.52	0.13	0.39	2.67	0.02	0.00	2661	1287	120	2781	139	100
May[1]	N/A	N/A	N/A	0.00	-	-	2689	1301	120	2809	-	-
June	0.55	0.13	0.42	0.00	0.00	0.00	2690	1302	120	2810	149	99
July	0.54	0.13	0.41	0.00	0.00	0.00	2640	1277	120	2760	149	100
August[2]	0.49	0.06	0.43	0.00	0.00	0.00	2577	1247	120	2697	160	48
September	0.50	0.13	0.37	0.00	0.00	0.00	2551	1234	120	2671	138	106
Total	5.66	1.28	4.39	10.32	0.06	0.03	-	-	-	-	-	-
Dry Weather Average / ADWF	0.53	0.11	0.42	-	-	-	2636	1275	120	2756	153	83
Yearly Average / AAF	0.51	0.12	0.40	0.86	0.01	0.00	2580	1382	120	2700	-	-

[1]Flow data not available for May

[2]MCIC flows not provided from August 11 to 25

Month	WY 2021											
	Total Average Influent Flow (Mgal/d)	MCIC Average Influent Flow (Mgal/d)	Estimated MCSP + PYCF + CFTA Influent Flow (Mgal/d)	Monthly Rainfall Total (in.)	Estimated MCIC I&I (Mgal/d)	Estimated MCSP + PYCF + CFTA I&I (Mgal/d)	MCSP Population	MCIC Population	Assumed CFTA Population	Estimated Total MCSP + CFTA Population	MCSP gpid	MCIC gpid
October	0.50	0.13	0.37	0.00	0.00	0.00	2622	1268	120	2742	135	105
November	0.49	0.12	0.37	9.98	0.00	0.00	2638	1276	120	2758	133	94
December	0.51	0.12	0.39	1.35	0.00	0.02	2601	1258	120	2721	143	92
January	0.53	0.13	0.40	6.07	0.00	0.04	2595	1255	120	2715	148	103
February	0.52	0.13	0.40	2.06	0.00	0.03	2602	1259	120	2722	146	99
March	0.52	0.14	0.38	2.34	0.00	0.01	2619	1267	120	2739	139	111
April	0.52	0.14	0.37	0.00	0.00	0.00	2626	1270	120	2746	136	113
May	0.52	0.15	0.37	0.00	0.00	0.00	2636	1275	120	2756	136	114
June	0.51	0.14	0.37	0.00	0.00	0.00	2630	1273	120	2750	133	112
July	0.52	0.14	0.37	0.00	0.00	0.00	2613	1265	120	2733	136	114
August	0.51	0.15	0.36	0.00	0.00	0.00	2590	1253	120	2710	134	116
September	0.50	0.14	0.36	0.06	0.00	0.00	2523	1220	120	2643	135	115
Total	6.14	1.62	4.51	21.86	0.00	0.11	-	-	-	-	-	-
Dry Weather Average / ADWF	0.51	0.14	0.37	-	-	-	2611	1264	120	2731	134	114
Yearly Average / AAF	0.51	0.14	0.38	1.82	0.00	0.01	2608	1260	120	2728	-	-

Month	WY 2022											
	Total Average Influent Flow (Mgal/d)	MCIC Average Influent Flow (Mgal/d)	Estimated MCSP + PYCF + CFTA Influent Flow (Mgal/d)	Monthly Rainfall Total (in.)	Estimated MCIC I&I (Mgal/d)	Estimated MCSP + PYCF + CFTA I&I (Mgal/d)	MCSP Population	MCIC Population	Assumed CFTA Population	Estimated Total MCSP + CFTA Population	MCSP gpid	MCIC gpid
October	0.51	0.14	0.37	0.00	0.00	0.00	2532	1225	120	2652	140	114
November	0.48	0.13	0.35	0.00	0.00	0.00	2535	1227	120	2655	132	107
December	0.57	0.13	0.44	6.61	0.00	0.12	2576	1247	120	2696	163	106
January	0.50	0.12	0.38	0.08	0.00	0.06	2539	1228	120	2659	142	101
February	0.48	0.13	0.35	0.00	0.00	0.00	2534	1226	120	2654	130	108
March	0.48	0.13	0.35	1.24	0.00	0.03	2564	1241	120	2684	130	105
April	0.50	0.13	0.37	2.17	0.00	0.05	2589	1253	120	2709	136	107
May	0.50	0.13	0.37	0.00	0.00	0.00	2572	1244	120	2692	138	107
June[2]	0.50	0.13	0.37	0.00	0.00	0.00	2579	1248	120	2699	138	105
July[2]	0.51	0.13	0.38	0.00	0.00	0.00	2551	1234	120	2671	142	109
August[1,2]	N/A	0.14	0.21	0.09	0.00	0.00	2539	1228	120	2659	80	110
September[1,2]	N/A	0.13	-	0.21	0.00	-	2543	1230	120	2663	-	110
Total	5.05	1.32	3.72	10.31	0.00	0.25	-	-	-	-	-	-
Dry Weather Average / ADWF	0.46	0.13	0.32	-	-	-	2556	1237	120	2676	120	108
Yearly Average / AAF	0.50	0.13	0.37	1.01	0.00	0.02	2554	1235	120	2674	-	-

[1]Influent flow readings unavailable due to faulty check valve at WWTP headworks

[2]CalFire flows unavailable due to inoperable flow meter

Infiltration and Inflow Analysis Per Water Year (WY)
MCSP Sewer System Contributors

Month	WY 2023											
	Total Average Influent Flow (Mgal/d)	MCIC Average Influent Flow (Mgal/d)	Estimated MCSP + PYCF + CFTA Influent Flow (Mgal/d)	Monthly Rainfall Total (in.)	Estimated MCIC I&I (Mgal/d)	Estimated MCSP + PYCF + CFTA I&I (Mgal/d)	MCSP Population	MCIC Population	Assumed CFTA Population	Estimated total MCSP + CFTA Population	MCSP gpid	MCIC gpid
October[1,2]	N/A	0.13	N/A	0.00	N/A	N/A	2555	1236	120	2675	N/A	107
November[1,2]	N/A	0.12	N/A	1.89	N/A	N/A	2562	1239	120	2682	N/A	100
December[1,2]	N/A	0.13	N/A	9.42	N/A	N/A	2568	1242	120	2688	N/A	103
January[1,2]	N/A	0.13	N/A	9.73	N/A	N/A	2577	1247	120	2697	N/A	102
February[2]	0.51	0.13	0.38	2.19	0.00	0.00	2595	1255	120	2715	139	105
March[2]	0.58	0.13	0.46	6.27	0.00	0.08	2585	1250	120	2705	168	102
April	0.49	0.13	0.36	0.26	0.00	0.00	2595	1256	120	2715	132	105
May[3]	0.50	0.10	0.40	0.46	0.00	0.02	2592	1254	120	2712	147	83
June	0.52	0.14	0.38	0.03	0.00	0.01	2614	1265	120	2734	139	107
July	0.51	0.13	0.38	0.00	0.00	0.00	2586	1251	120	2706	140	107
August	0.50	0.13	0.36	0.00	0.00	0.00	2580	1248	120	2700	134	108
September	0.49	0.13	0.36	0.43	0.00	0.00	2574	1246	120	2694	133	107
Total	4.10	1.54	3.07	30.68	0.00	0.12	-	-	-	-	-	-
Dry Weather Average / ADWF	0.51	0.13	0.37	-	-	-	2593	1255	120	2713	138	107
Yearly Average / AAF	0.51	0.13	0.38	2.56	0.00	0.01	2582	1249	120	2702	-	-

[1]Influent flow readings unavailable due to faulty check valve at WWTP headworks

[2]CalFire flows unavailable due to inoperable flow meter

[3]MCIC flows unavailable due to SCADA malfunction at lift station from May 25 to May 31

Infiltration and Inflow Analysis Per Water Year (WY)
MCSP Sewer System Contributors

Month	WY 2024												
	Total Average Influent Flow (Mgal/d)	MCIC Average Influent Flow (Mgal/d)	Estimated MCSP + PYCF + CFTA Influent Flow (Mgal/d)	Estimated MCSP + PYCF + CFTA Influent Flow W/O Leakage (Mgal/d)	Monthly Rainfall Total (in.)	Estimated MCIC I&I (Mgal/d)	Estimated MCSP + PYCF + CFTA I&I (Mgal/d)	MCSP Population	MCIC Population	Assumed CFTA Population	Estimated total MCSP + CFTA Population	MCSP gpid	MCIC gpid
October	0.49	0.13	0.36	0.36	0.00	0.00	0.00	2563	1240	120	2683	133	108
November	0.48	0.13	0.35	0.35	1.06	0.00	0.00	2558	1238	120	2678	132	104
December	0.49	0.13	0.36	0.36	2.11	0.00	0.00	2579	1248	120	2699	134	103
January[1,2]	0.54	0.13	0.41	0.41	3.86	0.00	0.04	2652	1283	120	2772	148	105
February[1,2]	0.59	0.14	0.46	0.42	4.49	0.00	0.04	2649	1282	120	2769	150	106
March[1,2]	0.57	0.13	0.43	0.39	3.19	0.00	0.02	2661	1287	120	2781	140	104
April[1,2]	0.56	0.14	0.42	0.38	1.73	0.00	0.01	2667	1291	120	2787	136	110
May[1,2]	0.54	0.14	0.41	0.37	0.75	0.00	0.00	2681	1297	120	2801	130	106
June[1,2]	0.56	0.14	0.42	0.38	0.00	0.00	0.00	2673	1294	120	2793	135	110
July[1,2]	0.55	0.14	0.41	0.37	0.00	0.00	0.00	2675	1295	120	2795	133	106
August[1,2]	0.55	0.14	0.41	0.37	0.00	0.00	0.00	2706	1309	120	2826	131	105
September[1,2]	0.55	0.14	0.41	0.37	0.00	0.00	0.00	2690	1302	120	2810	130	106
Total	6.49	1.63	4.86	4.52	17.19	0.00	0.10	-	-	-	-	-	-
Dry Weather Average / ADWF	0.55	0.14	0.42	0.37	-	-	-	2685	1299	120	2805	133	107
Yearly Average / AAF	0.54	0.14	0.40	0.38	1.43	0.00	0.01	2646	1279	120	2766	-	-

[1]Substantial water leak detected at PYCF, values adjusted to account for expected influent flows without leakage

[2]CalFire flows unavailable due to inoperable flow meter

Exhibit D

Water Balance Scenarios

MULE CREEK STATE PRISON **Scenario 1** FILE: 2518-0050

RECENT AVERAGE OCCUPANCY ADWF WATER BALANCE UNDER AVG YEAR TYPE HYDROLOGIC CONDITIONS, NO OFF-SITE DISCHARGES

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.54
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGI	
CLIMATOLOGICAL DESIGN BASIS	Avg. Year Cond.
DESIGN PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 TYPICAL YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	56.2	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
ZONE 12 WET REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	53.4	3.72	1.80	0.93	1.24	1.96	3.41	5.10	6.82	7.80	8.06	7.13	5.40
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING GRASSES		0.85	0.74	0.93	1.18	0.65	0.65	0.84	1.00	1.01	1.00	1.02	0.99
CROP COEFFICIENT (Kc), TREES (OAKS)		0.69	0.48	0.93	1.18	0.39	0.30	0.43	0.86	0.94	0.93	0.95	0.92
WEIGHTED Kc CROP COEFFICIENT FOR MCSP SITE		0.82	0.68	0.93	1.18	0.60	0.58	0.76	0.97	1.00	0.99	1.01	0.97
MCIC FACILITY I/I VOLUME (MGD)		0.000	0.001	0.002	0.002	0.002	0.000	0.005	0.000	0.000	0.000	0.000	0.000
MCSP, PYCF, CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.043	0.032	0.026	0.035	0.011	0.006	0.001	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.000	0.001	0.045	0.034	0.028	0.035	0.016	0.006	0.001	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.54	0.54	0.58	0.57	0.56	0.57	0.55	0.54	0.54	0.54	0.54	0.54

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, Avg. Year Cond. (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
EFFECTIVE RAIN FOR PLANTS (IN)	20.7	0.29	1.11	2.56	3.32	4.29	3.18	3.12	1.73	0.70	0.23	0.05	0.09
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	51	3.16	0.86	1.06	0.86	1.42	2.40	4.41	7.38	7.97	8.24	7.15	5.67
Avg. Year Cond. DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	51	3.16	0.86	1.06	0.86	1.42	2.40	4.41	7.38	7.97	8.24	7.15	5.67
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	56	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	195	16.6	16.1	16.6	16.6	15.0	16.6	16.1	16.6	16.1	16.6	16.6	16.1
I/I FLOW VOLUME (MG)	5	0.00	0.04	1.40	1.06	0.79	1.08	0.48	0.19	0.04	0.00	0.00	0.01
TOTAL INFLUENT FLOW VOLUME (MG)	***201***	***16.7***	***16.2***	***18.0***	***17.7***	***15.8***	***17.7***	***16.6***	***16.8***	***16.2***	***16.7***	***16.7***	***16.1***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.26	1.75	4.20	4.20	4.20	2.91	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION RATE (IN/MONTH)	37	3.15	0.00	0.00	0.00	0.00	0.00	0.00	3.01	8.00	8.81	7.81	6.14
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION VOLUME (MG)	43	3.68	0.00	0.00	0.00	0.00	0.00	0.00	3.52	9.34	10.29	9.12	7.16
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		16.7	18.1	33.3	48.7	62.8	79.2	92.7	103.2	96.1	79.2	59.5	43.3
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	43	3.68	0.00	0.00	0.00	0.00	0.00	0.00	3.52	9.34	10.29	9.12	7.16
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.31	0.33	0.29	0.24
EFFLUENT IRRIGATION RATE (IN/MONTH)	37	3.15	0.00	0.00	0.00	0.00	0.00	0.00	3.01	8.00	8.81	7.81	6.14
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.26	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION RATE (IN/MONTH)	22	1.72	0.00	0.00	0.00	0.00	0.00	0.61	3.39	4.36	4.81	4.26	3.35
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION VOLUME (MG)	96	7.32	0.00	0.00	0.00	0.00	0.00	2.58	14.45	18.60	20.49	18.16	14.27
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		13.02	18.13	33.27	48.74	62.84	79.17	92.74	99.68	86.73	68.92	50.38	36.14
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	96	7.32	0.00	0.00	0.00	0.00	0.00	2.58	14.45	18.60	20.49	18.16	14.27
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.24	0.00	0.00	0.00	0.00	0.00	0.09	0.47	0.62	0.66	0.59	0.48
EFFLUENT IRRIGATION RATE (IN/MONTH)	22	1.72	0.00	0.00	0.00	0.00	0.00	0.61	3.39	4.36	4.81	4.26	3.35
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MONTHLY DISCHARGE TO COWRP (MG)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	1.93	15.27	31.04	47.04	61.47	76.14	86.40	79.87	62.51	42.80	27.20
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		5.71	16.20	18.00	17.70	15.80	17.70	14.02	-1.17	-11.74	-14.07	-10.58	-5.33
UNADJUSTED STORAGE VOLUME (MG)		5.71	18.13	33.27	48.74	62.84	79.17	90.16	85.23	68.13	48.43	32.22	21.87
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		5.3	6.7	8.3	10.0	11.6	13.3	14.6	14.0	12.1	10.0	8.2	7.1
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	18	0.68	0.27	0.29	0.22	0.82	1.63	2.48	3.14	2.89	2.53	1.81	1.30
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	11	0.14	0.53	1.29	1.75	2.36	1.83	1.85	1.01	0.39	0.12	0.03	0.04
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	1	0.02	0.07	0.17	0.22	0.28	0.21	0.21	0.11	0.05	0.02	0.00	0.01
STORAGE AT END OF MONTH (MG)		1.93	15.27	31.04	47.04	61.47	76.14	86.40	79.87	62.51	42.80	27.20	17.49
								MAXIMUM STORAGE REQUIRED (MG)					86.4
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	195
INFLOW AND INFILTRATION	5
PRECIPITATION INTO WWTP AND RESERVOIR	13
TOTAL INFLOW	**213**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	18
PERCOLATION	38
ON-SITE LAND DISPOSAL	139
DISCHARGE TO COWRP	0
TOTAL OUTFLOW	**195**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	-18
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	69

MULE CREEK STATE PRISON **Scenario 1** FILE: 2/13/2025

RECENT AVERAGE OCCUPANCY ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, NO OFF-SITE DISCHARGES

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.54
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.56	0.55	0.55	0.69	0.68	0.57	0.57	0.56	0.56	0.54	0.54	0.54

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	195	16.6	16.1	16.6	16.6	15.0	16.6	16.1	16.6	16.1	16.6	16.6	16.1
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***210***	***17.4***	***16.6***	***17.1***	***21.4***	***19.2***	***17.7***	***17.2***	***17.5***	***16.7***	***16.7***	***16.7***	***16.1***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		17.4	22.7	37.6	58.2	77.7	97.2	114.1	130.8	141.1	134.6	116.6	99.6
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		14.79	22.72	37.60	58.20	77.73	97.23	114.09	130.79	137.53	125.27	107.63	93.45
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.46	0.60	0.58	0.41
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MONTHLY DISCHARGE TO COWRP (MG)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	6.12	20.50	36.80	58.53	79.53	96.89	113.29	124.38	117.94	99.94	83.46
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		9.60	16.60	17.10	21.40	19.20	17.70	17.20	14.29	-0.72	-11.32	-10.24	-2.17
UNADJUSTED STORAGE VOLUME (MG)		9.60	22.72	37.60	58.20	77.73	97.23	114.09	127.58	123.66	106.62	89.70	81.29
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		5.7	7.2	8.8	11.1	13.2	15.3	17.2	18.6	18.2	16.4	14.5	13.6
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	18	0.54	0.20	0.24	0.10	0.25	0.97	1.61	2.22	3.49	3.74	3.07	2.01
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	22	0.25	0.98	2.37	3.26	4.46	3.48	3.57	2.04	0.82	0.26	0.06	0.09
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		6.12	20.50	36.80	58.53	79.53	96.89	113.29	124.38	117.94	99.94	83.46	76.27
								MAXIMUM STORAGE REQUIRED (MG)					124.4
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	195
INFLOW AND INFILTRATION	14
PRECIPITATION INTO WWTP AND RESERVOIR	24
TOTAL INFLOW	**233**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	18
PERCOLATION	38
ON-SITE LAND DISPOSAL	102
DISCHARGE TO COWRP	0
TOTAL OUTFLOW	**158**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	-75
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	31

MULE CREEK STATE PRISON **Scenario 1** FILE:

RECENT AVERAGE OCCUPANCY ADWF WATER BALANCE UNDER AVG YEAR FOLLOWING 1 IN 100 YEAR HYDROLOGIC CONDITIONS, NO OFF-SITE DISCHARGES

2/13/2025

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS

STARTING AVERAGE FLOW (MGD)	0.54

IRRIGATION AREA CHARACTERISTICS

POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS

CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**

EXISTING WWTP PROCESS AREAS

OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS

CLIMATOLOGICAL DESIGN BASIS	Avg. Year Cond.
DESIGN PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 TYPICAL YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	56.2	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING GRASSES		0.85	0.74	0.93	1.18	0.65	0.65	0.84	1.00	1.01	1.00	1.02	0.99
CROP COEFFICIENT (Kc), TREES (OAKS)		0.69	0.48	0.93	1.18	0.39	0.30	0.43	0.86	0.94	0.93	0.95	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.82	0.68	0.93	1.18	0.60	0.58	0.76	0.97	1.00	0.99	1.01	0.97
MCIC FACILITY I/I VOLUME (MGD)		0.000	0.001	0.002	0.002	0.002	0.000	0.005	0.000	0.000	0.000	0.000	0.000
MCSP, PYCF, CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.043	0.032	0.026	0.035	0.011	0.006	0.001	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.000	0.001	0.045	0.034	0.028	0.035	0.016	0.006	0.001	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.54	0.54	0.58	0.57	0.56	0.57	0.55	0.54	0.54	0.54	0.54	0.54

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, Avg. Year Cond. (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
EFFECTIVE RAIN FOR PLANTS (IN)	20.7	0.29	1.11	2.56	3.32	4.29	3.18	3.12	1.73	0.70	0.23	0.05	0.09
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	51	3.16	0.86	1.06	0.86	1.42	2.40	4.41	7.38	7.97	8.24	7.15	5.67
Avg. Year Cond. DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	51	3.16	0.86	1.06	0.86	1.42	2.40	4.41	7.38	7.97	8.24	7.15	5.67
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	56	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	195	16.6	16.1	16.6	16.6	15.0	16.6	16.1	16.6	16.1	16.6	16.6	16.1
I/I FLOW VOLUME (MG)	5	0.00	0.04	1.40	1.06	0.79	1.08	0.48	0.19	0.04	0.00	0.00	0.01
TOTAL INFLUENT FLOW VOLUME (MG)	***201***	***16.7***	***16.2***	***18.0***	***17.7***	***15.8***	***17.7***	***16.6***	***16.8***	***16.2***	***16.7***	***16.7***	***16.1***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.26	1.75	4.20	4.20	4.20	2.91	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION RATE (IN/MONTH)	37	3.15	0.00	0.00	0.00	0.00	0.00	0.00	3.01	8.00	8.81	7.81	6.14
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION VOLUME (MG)	43	3.68	0.00	0.00	0.00	0.00	0.00	0.00	3.52	9.34	10.29	9.12	7.16
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		93.0	93.6	108.6	124.1	138.4	154.7	167.7	177.2	168.6	150.1	128.7	111.0
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	43	3.68	0.00	0.00	0.00	0.00	0.00	0.00	3.52	9.34	10.29	9.12	7.16
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.31	0.33	0.29	0.24
EFFLUENT IRRIGATION RATE (IN/MONTH)	37	3.15	0.00	0.00	0.00	0.00	0.00	0.00	3.01	8.00	8.81	7.81	6.14
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.26	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION RATE (IN/MONTH)	22	1.72	0.00	0.00	0.00	0.00	0.00	0.61	3.39	4.36	4.81	4.26	3.35
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION VOLUME (MG)	96	7.32	0.00	0.00	0.00	0.00	0.00	2.58	14.45	18.60	20.49	18.16	14.27
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		89.29	93.56	108.55	124.06	138.39	154.69	167.72	173.73	159.30	139.84	119.56	103.87
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	96	7.32	0.00	0.00	0.00	0.00	0.00	2.58	14.45	18.60	20.49	18.16	14.27
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.24	0.00	0.00	0.00	0.00	0.00	0.09	0.47	0.62	0.66	0.59	0.48
EFFLUENT IRRIGATION RATE (IN/MONTH)	22	1.72	0.00	0.00	0.00	0.00	0.00	0.61	3.39	4.36	4.81	4.26	3.35
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MONTHLY DISCHARGE TO COWRP (MG)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		76.27	77.36	90.55	106.36	122.59	136.99	151.12	160.44	152.44	133.43	111.98	94.93
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		5.71	16.20	18.00	17.70	15.80	17.70	14.02	-1.17	-11.74	-14.07	-10.58	-5.33
UNADJUSTED STORAGE VOLUME (MG)		81.97	93.56	108.55	124.06	138.39	154.69	165.13	159.27	140.70	119.35	101.40	89.60
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		13.7	14.9	16.6	18.3	19.8	21.6	22.8	22.1	20.1	17.7	15.8	14.5
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	30	1.55	0.55	0.55	0.38	1.35	2.55	3.78	4.82	4.61	4.29	3.27	2.47
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	14	0.17	0.67	1.59	2.14	2.87	2.21	2.22	1.21	0.47	0.15	0.03	0.05
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	1	0.02	0.07	0.17	0.22	0.28	0.21	0.21	0.11	0.05	0.02	0.00	0.01
STORAGE AT END OF MONTH (MG)		77.36	90.55	106.36	122.59	136.99	151.12	160.44	152.44	133.43	111.98	94.93	84.05
								MAXIMUM STORAGE REQUIRED (MG)					160.4
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)		ANNUAL OUTFLOWS (MG)		OVERALL BALANCE (MUST NOT BE NEGATIVE)	
WASTEWATER	195	EVAPORATION	30	TOTAL UNUSED DISPOSAL CAPACITY (MG)	-8
INFLOW AND INFILTRATION	5	PERCOLATION	38	UNUSED LAA CAPACITY (MG)	0
PRECIPITATION INTO WWTP AND RESERVOIR	15	ON-SITE LAND DISPOSAL	139	UNUSED COWRP CAPACITY (MG)	0
		DISCHARGE TO COWRP	0	TOTAL UNUSED STORAGE CAPACITY (MG)	-5
TOTAL INFLOW	**215**	**TOTAL OUTFLOW**	**207**		

MULE CREEK STATE PRISON **Scenario 1** FILE: 2/13/2025

RECENT AVERAGE OCCUPANCY ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, EXPANDED LAAs

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.54
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**261**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**61**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.56	0.55	0.55	0.69	0.68	0.57	0.57	0.56	0.56	0.54	0.54	0.54

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	195	16.6	16.1	16.6	16.6	15.0	16.6	16.1	16.6	16.1	16.6	16.6	16.1
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***210***	***17.4***	***16.6***	***17.1***	***21.4***	***19.2***	***17.7***	***17.2***	***17.5***	***16.7***	***16.7***	***16.7***	***16.1***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		17.4	20.7	35.6	56.2	75.7	95.2	112.0	128.7	137.8	126.1	101.2	77.7
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		218	218	218	218	218	218	218	218	218	218	218	218
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	99	7.21	0.00	0.00	0.00	0.00	0.00	0.00	4.46	19.27	25.90	24.90	16.89
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		14.79	20.71	35.60	56.19	75.70	95.18	112.03	128.74	134.26	116.76	92.23	71.56
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	99	7.21	0.00	0.00	0.00	0.00	0.00	0.00	4.46	19.27	25.90	24.90	16.89
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.64	0.84	0.80	0.56
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MONTHLY DISCHARGE TO COWRP (MG)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	4.11	18.50	34.79	56.50	77.48	94.83	111.24	121.11	109.43	84.53	61.57
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		7.59	16.60	17.10	21.40	19.20	17.70	17.20	13.04	-6.12	-18.57	-17.21	-6.89
UNADJUSTED STORAGE VOLUME (MG)		7.59	20.71	35.60	56.19	75.70	95.18	112.03	124.29	114.99	90.86	67.33	54.67
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		5.5	6.9	8.6	10.8	13.0	15.1	16.9	18.3	17.3	14.6	12.1	10.7
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	17	0.52	0.20	0.23	0.10	0.25	0.96	1.59	2.18	3.32	3.37	2.59	1.61
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	21	0.25	0.98	2.35	3.24	4.43	3.46	3.55	2.03	0.80	0.25	0.05	0.09
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		4.11	18.50	34.79	56.50	77.48	94.83	111.24	121.11	109.43	84.53	61.57	50.04
								MAXIMUM STORAGE REQUIRED (MG)					121.1
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	195
INFLOW AND INFILTRATION	14
PRECIPITATION INTO WWTP AND RESERVOIR	24
TOTAL INFLOW	**233**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	17
PERCOLATION	38
ON-SITE LAND DISPOSAL	129
DISCHARGE TO COWRP	0
TOTAL OUTFLOW	**184**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	-49
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	34

MULE CREEK STATE PRISON **Scenario 1** FILE:

RECENT AVERAGE OCCUPANCY ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, EXISTING LAAs + DISCHARGE TO COWRP

2/13/2025

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.54
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.56	0.55	0.55	0.69	0.68	0.57	0.57	0.56	0.56	0.54	0.54	0.54

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	195	16.6	16.1	16.6	16.6	15.0	16.6	16.1	16.6	16.1	16.6	16.6	16.1
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***210***	***17.4***	***16.6***	***17.1***	***21.4***	***19.2***	***17.7***	***17.2***	***17.5***	***16.7***	***16.7***	***16.7***	***16.1***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		17.4	22.7	33.7	54.0	73.0	90.7	107.5	124.3	130.6	114.3	82.1	39.3
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		14.79	22.72	33.70	53.98	72.97	90.70	107.54	124.25	127.07	104.98	73.14	33.17
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.46	0.60	0.58	0.41
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.13	0.01	0.02	0.06	0.00	0.00	0.13	0.34	0.48	0.87	0.66
MONTHLY DISCHARGE TO COWRP (MG)	83	0.0	3.9	0.3	0.5	1.7	0.0	0.0	4.0	10.2	15.0	27.1	19.9
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	6.12	16.60	32.58	53.77	73.00	90.34	106.75	113.92	97.65	65.44	23.18
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		9.60	12.70	16.80	20.90	17.50	17.70	17.20	10.29	-10.92	-26.32	-37.34	-22.07
UNADJUSTED STORAGE VOLUME (MG)		9.60	18.82	33.40	53.48	71.27	90.70	107.54	117.05	102.99	71.33	28.10	1.11
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		5.7	6.7	8.3	10.5	12.5	14.6	16.5	17.5	16.0	12.5	7.8	4.8
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	14	0.54	0.19	0.23	0.10	0.24	0.93	1.54	2.09	3.08	2.92	1.75	0.81
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	21	0.25	0.97	2.34	3.22	4.38	3.42	3.51	1.99	0.78	0.24	0.05	0.07
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		6.12	16.60	32.58	53.77	73.00	90.34	106.75	113.92	97.65	65.44	23.18	0.00
								MAXIMUM STORAGE REQUIRED (MG)					113.9
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)		ANNUAL OUTFLOWS (MG)		OVERALL BALANCE (MUST NOT BE NEGATIVE)	
WASTEWATER	195	EVAPORATION	14	TOTAL UNUSED DISPOSAL CAPACITY (MG)	4
INFLOW AND INFILTRATION	14	PERCOLATION	38	UNUSED LAA CAPACITY (MG)	0
PRECIPITATION INTO WWTP AND RESERVOIR	24	ON-SITE LAND DISPOSAL	102	UNUSED COWRP CAPACITY (MG)	0
		DISCHARGE TO COWRP	83	TOTAL UNUSED STORAGE CAPACITY (MG)	41
TOTAL INFLOW	**233**	**TOTAL OUTFLOW**	**237**		

MULE CREEK STATE PRISON **Scenario 1** FILE:

RECENT AVERAGE OCCUPANCY ADWF WATER BALANCE AVERAGE YEAR FOLLOWING 1 IN 100 YEAR TYPE HYDROLOGIC CONDITIONS, EXISTING LAAS + DISCHARGE TO COWRP

2/13/2025

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS

STARTING AVERAGE FLOW (MGD)	0.54

IRRIGATION AREA CHARACTERISTICS

POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS

CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**

EXISTING WWTP PROCESS AREAS

OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS

CLIMATOLOGICAL DESIGN BASIS	Average
DESIGN PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 TYPICAL YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	56.2	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.06	0.97	0.64	0.43	0.77	0.76	0.61	0.84	0.94	1.01	0.86
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.88	0.96	0.59	0.41	0.60	0.66	0.61	0.82	0.85	0.95	0.79
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.82	0.68	0.93	1.18	0.60	0.58	0.76	0.97	1.00	0.99	1.01	0.97
MCIC FACILITY I/I VOLUME (MGD)		0.000	0.001	0.002	0.002	0.002	0.000	0.005	0.000	0.000	0.000	0.000	0.000
MCSP, PYCF, CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.043	0.032	0.026	0.035	0.011	0.006	0.001	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.000	0.001	0.045	0.034	0.028	0.035	0.016	0.006	0.001	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.54	0.54	0.58	0.57	0.56	0.57	0.55	0.54	0.54	0.54	0.54	0.54

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, Average (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
EFFECTIVE RAIN FOR PLANTS (IN)	20.7	0.29	1.11	2.56	3.32	4.29	3.18	3.12	1.73	0.70	0.23	0.05	0.09
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	51	3.16	0.86	1.06	0.86	1.42	2.40	4.41	7.38	7.97	8.24	7.15	5.67
Average DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	51	3.16	0.86	1.06	0.86	1.42	2.40	4.41	7.38	7.97	8.24	7.15	5.67
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	56	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	195	16.6	16.1	16.6	16.6	15.0	16.6	16.1	16.6	16.1	16.6	16.6	16.1
I/I FLOW VOLUME (MG)	5	0.00	0.04	1.40	1.06	0.79	1.08	0.48	0.19	0.04	0.00	0.00	0.01
TOTAL INFLUENT FLOW VOLUME (MG)	***201***	***16.7***	***16.2***	***18.0***	***17.7***	***15.8***	***17.7***	***16.6***	***16.8***	***16.2***	***16.7***	***16.7***	***16.1***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.26	1.75	4.20	4.20	4.20	2.91	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL Average EFFLUENT APPLICATION RATE (IN/MONTH)	37	3.15	0.00	0.00	0.00	0.00	0.00	0.00	3.01	8.00	8.81	7.81	6.14
POTENTIAL Average EFFLUENT APPLICATION VOLUME (MG)	43	3.68	0.00	0.00	0.00	0.00	0.00	0.00	3.52	9.34	10.29	9.12	7.16
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		16.7	18.2	29.5	44.8	58.6	73.5	87.4	98.1	87.3	60.7	26.8	16.1
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	43	3.68	0.00	0.00	0.00	0.00	0.00	0.00	3.52	9.34	10.29	9.12	7.16
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.31	0.33	0.29	0.24
EFFLUENT IRRIGATION RATE (IN/MONTH)	37	3.15	0.00	0.00	0.00	0.00	0.00	0.00	3.01	8.00	8.81	7.81	6.14
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.26	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL Average EFFLUENT APPLICATION RATE (IN/MONTH)	22	1.72	0.00	0.00	0.00	0.00	0.00	0.61	3.39	4.36	4.81	4.26	3.35
POTENTIAL Average EFFLUENT APPLICATION VOLUME (MG)	96	7.32	0.00	0.00	0.00	0.00	0.00	2.58	14.45	18.60	20.49	18.16	14.27
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		13.02	18.15	29.47	44.81	58.61	73.53	87.35	94.57	77.91	50.38	17.67	8.94
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	90	7.32	0.00	0.00	0.00	0.00	0.00	2.58	14.45	18.60	20.49	17.67	8.94
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.24	0.00	0.00	0.00	0.00	0.00	0.09	0.47	0.62	0.66	0.57	0.30
EFFLUENT IRRIGATION RATE (IN/MONTH)	21	1.72	0.00	0.00	0.00	0.00	0.00	0.61	3.39	4.36	4.81	4.15	2.10
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.13	0.01	0.02	0.06	0.00	0.00	0.13	0.34	0.48	0.87	0.66
MONTHLY DISCHARGE TO COWRP (MG)	83	0.0	3.9	0.3	0.5	1.7	0.0	0.0	4.0	10.2	15.0	27.1	19.9
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	1.95	11.47	27.11	42.81	55.83	70.75	81.29	71.05	43.97	10.09	0.00
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		5.71	12.30	17.70	17.20	14.10	17.70	14.02	-5.17	-21.94	-29.07	-37.19	-19.90
UNADJUSTED STORAGE VOLUME (MG)		5.71	14.25	29.17	44.31	56.91	73.53	84.77	76.11	49.11	14.89	-27.10	-19.90
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		5.3	6.2	7.9	9.5	10.9	12.7	14.0	13.0	10.1	6.3	0.0	0.0
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	13	0.68	0.25	0.28	0.21	0.77	1.56	2.39	2.93	2.44	1.70	0.00	0.00
PERCOLATION LOSS FROM STORAGE (MG)	32	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	0.00	0.00
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	11	0.14	0.53	1.27	1.73	2.32	1.80	1.83	0.99	0.37	0.11	0.02	0.03
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	1	0.02	0.07	0.17	0.22	0.28	0.21	0.21	0.11	0.05	0.02	0.00	0.01
STORAGE AT END OF MONTH (MG)		1.95	11.47	27.11	42.81	55.83	70.75	81.29	71.05	43.97	10.09	0.00	0.00

MAXIMUM STORAGE REQUIRED (MG)	81.3
TOTAL AVAILABLE STORAGE (MG)	155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	195
INFLOW AND INFILTRATION	5
PRECIPITATION INTO WWTP AND RESERVOIR	13
TOTAL INFLOW	**213**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	13
PERCOLATION	32
ON-SITE LAND DISPOSAL	133
DISCHARGE TO COWRP	83
TOTAL OUTFLOW	**261**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	48
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	74

MULE CREEK STATE PRISON **Scenario 1** FILE: 2/13/2025

RECENT AVERAGE OCCUPANCY ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, EXISTING LAAS + TRI-PARTY AGREEMENT DISCHARGE TO COWRP

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.54
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.56	0.55	0.55	0.69	0.68	0.57	0.57	0.56	0.56	0.54	0.54	0.54

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	195	16.6	16.1	16.6	16.6	15.0	16.6	16.1	16.6	16.1	16.6	16.6	16.1
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***210***	***17.4***	***16.6***	***17.1***	***21.4***	***19.2***	***17.7***	***17.2***	***17.5***	***16.7***	***16.7***	***16.7***	***16.1***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		17.4	21.0	34.1	52.9	70.6	88.3	103.3	102.8	96.2	73.5	40.1	16.1
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		14.79	20.97	34.09	52.91	70.62	88.27	103.34	102.80	92.61	64.18	31.05	9.99
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	69	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	9.99
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.46	0.60	0.58	0.33
EFFLUENT IRRIGATION RATE (IN/MONTH)	16	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.34
DESIGN DISCHARGE TO COWRP													
EFFLUENT AVAILABLE TO SEND TO COWRP (MG)		14.8	21.0	34.1	52.9	70.6	88.3	103.3	102.8	92.6	64.2	31.1	10.0
AVERAGE COWRP DISCHARGE (MGD)		0.06	0.06	0.06	0.06	0.06	0.06	0.58	0.56	0.58	0.56	0.56	0.33
MONTHLY DISCHARGE TO COWRP (MG)	107	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	10.0
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	4.37	16.99	31.51	51.42	70.57	86.14	85.30	79.45	56.85	23.36	0.00
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		7.85	14.84	15.34	19.64	17.44	15.94	-0.07	-2.98	-17.99	-28.59	-27.51	-9.99
UNADJUSTED STORAGE VOLUME (MG)		7.85	19.21	32.34	51.16	68.86	86.51	86.07	82.33	61.46	28.26	-4.15	-9.99
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		5.5	6.8	8.2	10.3	12.2	14.2	14.1	13.7	11.4	7.8	0.0	0.0
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	9	0.53	0.19	0.22	0.10	0.24	0.90	1.34	1.67	2.26	1.91	0.00	0.00
PERCOLATION LOSS FROM STORAGE (MG)	32	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	0.00	0.00
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	21	0.25	0.97	2.33	3.20	4.35	3.38	3.32	1.82	0.69	0.21	0.04	0.06
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		4.37	16.99	31.51	51.42	70.57	86.14	85.30	79.45	56.85	23.36	0.00	0.00
								MAXIMUM STORAGE REQUIRED (MG)					86.1
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	195
INFLOW AND INFILTRATION	14
PRECIPITATION INTO WWTP AND RESERVOIR	23
TOTAL INFLOW	**232**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	9
PERCOLATION	32
ON-SITE LAND DISPOSAL	99
DISCHARGE TO COWRP	107
TOTAL OUTFLOW	**247**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	15
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	69

MULE CREEK STATE PRISON **Scenario 2** FILE: 2/13/2025

CURRENT PERMIT ADWF WATER BALANCE UNDER AVG YEAR TYPE HYDROLOGIC CONDITIONS, NO OFF-SITE DISCHARGES

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.74
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	Avg. Year Cond.
DESIGN PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 TYPICAL YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	56.2	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
ZONE 12 WET REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	53.4	3.72	1.80	0.93	1.24	1.96	3.41	5.10	6.82	7.80	8.06	7.13	5.40
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING GRASSES		0.85	0.74	0.93	1.18	0.65	0.65	0.84	1.00	1.01	1.00	1.02	0.99
CROP COEFFICIENT (Kc), TREES (OAKS)		0.69	0.48	0.93	1.18	0.39	0.30	0.43	0.86	0.94	0.93	0.95	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.82	0.68	0.93	1.18	0.60	0.58	0.76	0.97	1.00	0.99	1.01	0.97
MCIC FACILITY I/I VOLUME (MGD)		0.000	0.001	0.002	0.002	0.002	0.000	0.005	0.000	0.000	0.000	0.000	0.000
MCSP, PYCF, CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.043	0.032	0.024	0.036	0.011	0.006	0.001	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.000	0.001	0.045	0.034	0.026	0.036	0.016	0.006	0.001	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.74	0.74	0.79	0.77	0.77	0.78	0.76	0.75	0.74	0.74	0.74	0.74

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, Avg. Year Cond. (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
EFFECTIVE RAIN FOR PLANTS (IN)	20.7	0.29	1.11	2.56	3.32	4.29	3.18	3.12	1.73	0.70	0.23	0.05	0.09
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	51	3.16	0.86	1.06	0.86	1.42	2.40	4.41	7.38	7.97	8.24	7.15	5.67
Avg. Year Cond. DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	51	3.16	0.86	1.06	0.86	1.42	2.40	4.41	7.38	7.97	8.24	7.15	5.67
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	56	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	270	22.9	22.2	22.9	22.9	20.7	22.9	22.2	22.9	22.2	22.9	22.9	22.2
I/I FLOW VOLUME (MG)	5	0.00	0.04	1.40	1.06	0.74	1.13	0.48	0.19	0.04	0.00	0.00	0.01
TOTAL INFLUENT FLOW VOLUME (MG)	***276***	***23.0***	***22.3***	***24.4***	***24.0***	***21.5***	***24.1***	***22.7***	***23.2***	***22.3***	***23.0***	***23.0***	***22.3***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.26	1.75	4.20	4.20	4.20	2.91	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION RATE (IN/MONTH)	37	3.15	0.00	0.00	0.00	0.00	0.00	0.00	3.01	8.00	8.81	7.81	6.14
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION VOLUME (MG)	43	3.68	0.00	0.00	0.00	0.00	0.00	0.00	3.52	9.34	10.29	9.12	7.16
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		23.0	30.5	52.0	73.8	93.6	116.4	135.8	152.1	150.1	138.3	123.4	112.1
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	43	3.68	0.00	0.00	0.00	0.00	0.00	0.00	3.52	9.34	10.29	9.12	7.16
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.31	0.33	0.29	0.24
EFFLUENT IRRIGATION RATE (IN/MONTH)	37	3.15	0.00	0.00	0.00	0.00	0.00	0.00	3.01	8.00	8.81	7.81	6.14
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.26	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION RATE (IN/MONTH)	22	1.72	0.00	0.00	0.00	0.00	0.00	0.61	3.39	4.36	4.81	4.26	3.35
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION VOLUME (MG)	96	7.32	0.00	0.00	0.00	0.00	0.00	2.58	14.45	18.60	20.49	18.16	14.27
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		19.32	30.46	51.98	73.76	93.63	116.35	135.75	148.56	140.73	128.00	114.31	104.92
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	96	7.32	0.00	0.00	0.00	0.00	0.00	2.58	14.45	18.60	20.49	18.16	14.27
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.24	0.00	0.00	0.00	0.00	0.00	0.09	0.47	0.62	0.66	0.59	0.48
EFFLUENT IRRIGATION RATE (IN/MONTH)	22	1.72	0.00	0.00	0.00	0.00	0.00	0.61	3.39	4.36	4.81	4.26	3.35
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MONTHLY DISCHARGE TO COWRP (MG)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	8.16	27.58	49.76	72.13	92.25	113.05	128.88	127.77	115.28	100.43	89.79
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		12.01	22.30	24.40	24.00	21.50	24.10	20.12	5.23	-5.64	-7.77	-4.28	0.87
UNADJUSTED STORAGE VOLUME (MG)		12.01	30.46	51.98	73.76	93.63	116.35	133.17	134.11	122.13	107.51	96.15	90.66
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		6.0	8.0	10.4	12.8	14.9	17.4	19.3	19.4	18.1	16.5	15.2	14.6
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	26	0.75	0.31	0.36	0.28	1.03	2.08	3.23	4.25	4.17	4.00	3.16	2.49
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	12	0.14	0.56	1.36	1.88	2.57	2.02	2.06	1.15	0.45	0.14	0.03	0.05
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	1	0.02	0.07	0.17	0.22	0.28	0.21	0.21	0.11	0.05	0.02	0.00	0.01
STORAGE AT END OF MONTH (MG)		8.16	27.58	49.76	72.13	92.25	113.05	128.88	127.77	115.28	100.43	89.79	85.09
MAXIMUM STORAGE REQUIRED (MG)													128.9
TOTAL AVAILABLE STORAGE (MG)													155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	270
INFLOW AND INFILTRATION	5
PRECIPITATION INTO WWTP AND RESERVOIR	14
TOTAL INFLOW	**289**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	26
PERCOLATION	38
ON-SITE LAND DISPOSAL	139
DISCHARGE TO COWRP	0
TOTAL OUTFLOW	**203**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	-86
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	26

MULE CREEK STATE PRISON **Scenario 2** FILE: 2/13/2025

CURRENT PERMIT ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, NO OFF-SITE DISCHARGES

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.74
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.76	0.76	0.76	0.89	0.89	0.77	0.78	0.77	0.76	0.74	0.74	0.74

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	270	22.9	22.2	22.9	22.9	20.7	22.9	22.2	22.9	22.2	22.9	22.9	22.2
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***285***	***23.7***	***22.7***	***23.5***	***27.8***	***24.9***	***24.0***	***23.3***	***23.9***	***22.8***	***23.0***	***23.0***	***22.2***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		23.7	35.0	56.2	83.0	108.0	133.6	156.3	179.0	194.8	193.6	180.5	168.2
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		21.09	35.03	56.19	82.97	108.01	133.61	156.27	178.97	191.25	184.25	171.54	162.10
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.46	0.60	0.58	0.41
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MONTHLY DISCHARGE TO COWRP (MG)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	12.33	32.69	55.17	83.11	109.61	132.97	155.07	172.00	170.62	157.55	146.00
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		15.90	22.70	23.50	27.80	24.90	24.00	23.30	20.69	5.38	-5.02	-3.94	3.93
UNADJUSTED STORAGE VOLUME (MG)		15.90	35.03	56.19	82.97	108.01	133.61	156.27	175.76	177.37	165.60	153.61	149.94
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		6.4	8.5	10.8	13.8	16.5	19.3	21.8	23.9	24.1	22.8	21.5	21.1
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	25	0.60	0.23	0.29	0.12	0.31	1.21	2.01	2.81	4.55	5.12	4.44	3.03
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	24	0.25	1.02	2.50	3.50	4.83	3.81	3.94	2.28	0.92	0.30	0.07	0.11
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		12.33	32.69	55.17	83.11	109.61	132.97	155.07	172.00	170.62	157.55	146.00	143.89
								MAXIMUM STORAGE REQUIRED (MG)					172.0
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)		ANNUAL OUTFLOWS (MG)		OVERALL BALANCE (MUST NOT BE NEGATIVE)	
WASTEWATER	270	EVAPORATION	25	TOTAL UNUSED DISPOSAL CAPACITY (MG)	-145
INFLOW AND INFILTRATION	14	PERCOLATION	38	UNUSED LAA CAPACITY (MG)	0
PRECIPITATION INTO WWTP AND RESERVOIR	26	ON-SITE LAND DISPOSAL	102	UNUSED COWRP CAPACITY (MG)	0
		DISCHARGE TO COWRP	0	TOTAL UNUSED STORAGE CAPACITY (MG)	-17
TOTAL INFLOW	**310**	**TOTAL OUTFLOW**	**165**		

MULE CREEK STATE PRISON **Scenario 2** FILE: 2/13/2025

CURRENT PERMIT ADWF WATER BALANCE AVERAGE YEAR FOLLOWING 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, NO OFF-SITE DISCHARGES

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.74
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	Average
DESIGN PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 TYPICAL YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	56.2	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.06	0.97	0.64	0.43	0.77	0.76	0.61	0.84	0.94	1.01	0.86
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.88	0.96	0.59	0.41	0.60	0.66	0.61	0.82	0.85	0.95	0.79
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.02	0.97	0.63	0.43	0.74	0.74	0.61	0.84	0.92	1.00	0.85
MCIC FACILITY I/I VOLUME (MGD)		0.000	0.001	0.002	0.002	0.002	0.000	0.005	0.000	0.000	0.000	0.000	0.000
MCSP, PYCF, CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.043	0.032	0.026	0.035	0.011	0.006	0.001	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.000	0.001	0.045	0.034	0.028	0.035	0.016	0.006	0.001	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.74	0.74	0.79	0.77	0.77	0.77	0.76	0.75	0.74	0.74	0.74	0.74

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, Average (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
EFFECTIVE RAIN FOR PLANTS (IN)	20.7	0.29	1.11	2.56	3.32	4.29	3.18	3.12	1.73	0.70	0.23	0.05	0.09
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
Average DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	56	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	270	22.9	22.2	22.9	22.9	20.7	22.9	22.2	22.9	22.2	22.9	22.9	22.2
I/I FLOW VOLUME (MG)	5	0.00	0.04	1.40	1.06	0.79	1.08	0.48	0.19	0.04	0.00	0.00	0.01
TOTAL INFLUENT FLOW VOLUME (MG)	***276***	***23.0***	***22.3***	***24.4***	***24.0***	***21.6***	***24.1***	***22.7***	***23.2***	***22.3***	***23.0***	***23.0***	***22.3***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.00	1.45	4.20	4.20	4.20	3.02	0.09	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL Average EFFLUENT APPLICATION RATE (IN/MONTH)	31	3.43	0.18	0.00	0.00	0.00	0.00	0.00	0.00	6.50	8.23	7.76	5.31
POTENTIAL Average EFFLUENT APPLICATION VOLUME (MG)	37	4.01	0.21	0.00	0.00	0.00	0.00	0.00	0.00	7.59	9.61	9.06	6.20
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		166.9	171.8	192.5	214.5	235.1	258.1	276.7	291.7	297.3	287.1	270.6	256.4
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	37	4.01	0.21	0.00	0.00	0.00	0.00	0.00	0.00	7.59	9.61	9.06	6.20
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.13	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.31	0.29	0.21
EFFLUENT IRRIGATION RATE (IN/MONTH)	31	3.43	0.18	0.00	0.00	0.00	0.00	0.00	0.00	6.50	8.23	7.76	5.31
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.00	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL Average EFFLUENT APPLICATION RATE (IN/MONTH)	19	1.87	0.10	0.00	0.00	0.00	0.00	0.54	1.76	3.60	4.49	4.23	2.90
POTENTIAL Average EFFLUENT APPLICATION VOLUME (MG)	83	7.98	0.42	0.00	0.00	0.00	0.00	2.30	7.51	15.33	19.14	18.04	12.35
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		162.88	171.59	192.48	214.51	235.13	258.09	276.67	291.73	289.72	277.53	261.57	250.17
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	83	7.98	0.42	0.00	0.00	0.00	0.00	2.30	7.51	15.33	19.14	18.04	12.35
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.26	0.01	0.00	0.00	0.00	0.00	0.08	0.24	0.51	0.62	0.58	0.41
EFFLUENT IRRIGATION RATE (IN/MONTH)	19	1.87	0.10	0.00	0.00	0.00	0.00	0.54	1.76	3.60	4.49	4.23	2.90
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MONTHLY DISCHARGE TO COWRP (MG)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		143.89	149.50	168.08	190.51	213.53	233.99	253.97	268.53	275.01	264.14	247.63	234.07
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		11.01	21.67	24.40	24.00	21.60	24.10	20.40	15.69	-0.61	-5.74	-4.10	3.75
UNADJUSTED STORAGE VOLUME (MG)		154.90	171.17	192.48	214.51	235.13	258.09	274.37	284.22	274.40	258.39	243.53	237.82
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		21.6	23.4	25.8	28.2	30.4	32.9	34.7	35.8	34.7	33.0	31.3	30.7
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	51	2.39	0.83	0.83	0.58	2.02	3.82	5.67	7.65	7.79	7.75	6.28	5.04
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	17	0.20	0.80	1.93	2.61	3.52	2.72	2.75	1.55	0.62	0.20	0.04	0.07
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	1	0.02	0.07	0.17	0.22	0.28	0.21	0.21	0.11	0.05	0.02	0.00	0.01
STORAGE AT END OF MONTH (MG)		149.50	168.08	190.51	213.53	233.99	253.97	268.53	275.01	264.14	247.63	234.07	229.73
								MAXIMUM STORAGE REQUIRED (MG)					275.0
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	270
INFLOW AND INFILTRATION	5
PRECIPITATION INTO WWTP AND RESERVOIR	18
TOTAL INFLOW	**293**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	51
PERCOLATION	38
ON-SITE LAND DISPOSAL	120
DISCHARGE TO COWRP	0
TOTAL OUTFLOW	**209**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	-84
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	-120

MULE CREEK STATE PRISON **Scenario 2** FILE: 2/13/2025

CURRENT PERMIT ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, EXPANDED LAAs

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.74
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**261**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 _ New AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**61**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.76	0.76	0.76	0.89	0.89	0.77	0.78	0.77	0.76	0.74	0.74	0.74

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	270	22.9	22.2	22.9	22.9	20.7	22.9	22.2	22.9	22.2	22.9	22.9	22.2
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***285***	***23.7***	***22.7***	***23.5***	***27.8***	***24.9***	***24.0***	***23.3***	***23.9***	***22.8***	***23.0***	***23.0***	***22.2***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		23.7	33.0	54.2	81.0	106.0	131.6	154.2	176.9	191.5	185.1	165.1	146.3
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		218	218	218	218	218	218	218	218	218	218	218	218
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	99	7.21	0.00	0.00	0.00	0.00	0.00	0.00	4.46	19.27	25.90	24.90	16.89
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		21.09	33.03	54.19	80.96	105.98	131.56	154.22	176.92	187.98	175.74	156.14	140.20
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	99	7.21	0.00	0.00	0.00	0.00	0.00	0.00	4.46	19.27	25.90	24.90	16.89
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.64	0.84	0.80	0.56
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MONTHLY DISCHARGE TO COWRP (MG)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	10.33	30.69	53.16	81.08	107.56	130.92	153.02	168.72	162.11	142.14	124.11
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		13.89	22.70	23.50	27.80	24.90	24.00	23.30	19.44	-0.02	-12.27	-10.91	-0.79
UNADJUSTED STORAGE VOLUME (MG)		13.89	33.03	54.19	80.96	105.98	131.56	154.22	172.46	168.70	149.84	131.24	123.32
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		6.2	8.3	10.6	13.5	16.3	19.1	21.6	23.6	23.2	21.1	19.0	18.2
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	23	0.58	0.23	0.28	0.12	0.31	1.20	1.99	2.77	4.38	4.75	3.96	2.63
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	23	0.25	1.01	2.49	3.48	4.80	3.79	3.92	2.26	0.91	0.29	0.06	0.11
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		10.33	30.69	53.16	81.08	107.56	130.92	153.02	168.72	162.11	142.14	124.11	117.66
								MAXIMUM STORAGE REQUIRED (MG)					168.7
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	270
INFLOW AND INFILTRATION	14
PRECIPITATION INTO WWTP AND RESERVOIR	26
TOTAL INFLOW	**310**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	23
PERCOLATION	38
ON-SITE LAND DISPOSAL	129
DISCHARGE TO COWRP	0
TOTAL OUTFLOW	**190**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	-120
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	-14

MULE CREEK STATE PRISON **Scenario 2** FILE: 2/13/2025

CURRENT PERMIT ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, EXISTING LAAs + DISCHARGE TO COWRP

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.74
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.76	0.76	0.76	0.89	0.89	0.77	0.78	0.77	0.76	0.74	0.74	0.74

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	270	22.9	22.2	22.9	22.9	20.7	22.9	22.2	22.9	22.2	22.9	22.9	22.2
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***285***	***23.7***	***22.7***	***23.5***	***27.8***	***24.9***	***24.0***	***23.3***	***23.9***	***22.8***	***23.0***	***23.0***	***22.2***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		23.7	35.0	52.3	78.8	103.3	127.1	149.7	172.4	184.3	173.3	146.1	107.9
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		21.09	35.03	52.29	78.75	103.25	127.08	149.73	172.43	180.79	163.96	137.05	101.82
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.46	0.60	0.58	0.41
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.13	0.01	0.02	0.06	0.00	0.00	0.13	0.34	0.48	0.87	0.66
MONTHLY DISCHARGE TO COWRP (MG)	83	0.0	3.9	0.3	0.5	1.7	0.0	0.0	4.0	10.2	15.0	27.1	19.9
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	12.33	28.79	50.95	78.35	103.08	126.43	148.53	161.53	150.32	123.05	85.72
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		15.90	18.80	23.20	27.30	23.20	24.00	23.30	16.69	-4.82	-20.02	-31.04	-15.97
UNADJUSTED STORAGE VOLUME (MG)		15.90	31.13	51.99	78.25	101.55	127.08	149.73	165.22	156.71	130.31	92.01	69.76
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		6.4	8.1	10.4	13.2	15.8	18.6	21.1	22.8	21.8	18.9	14.8	12.3
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	21	0.60	0.22	0.27	0.12	0.30	1.17	1.95	2.68	4.14	4.30	3.12	1.83
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	23	0.25	1.01	2.47	3.45	4.75	3.75	3.88	2.23	0.88	0.28	0.06	0.09
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		12.33	28.79	50.95	78.35	103.08	126.43	148.53	161.53	150.32	123.05	85.72	64.89
								MAXIMUM STORAGE REQUIRED (MG)					161.5
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	270
INFLOW AND INFILTRATION	14
PRECIPITATION INTO WWTP AND RESERVOIR	26
TOTAL INFLOW	**310**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	21
PERCOLATION	38
ON-SITE LAND DISPOSAL	102
DISCHARGE TO COWRP	83
TOTAL OUTFLOW	**244**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	-66
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	-7

MULE CREEK STATE PRISON **Scenario 2** FILE: 2/13/2025

CURRENT PERMIT ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, EXPANDED LAAs + DISCHARGE TO COWRP

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.74
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**261**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**61**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.76	0.76	0.76	0.89	0.89	0.77	0.78	0.77	0.76	0.74	0.74	0.74

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	270	22.9	22.2	22.9	22.9	20.7	22.9	22.2	22.9	22.2	22.9	22.9	22.2
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***285***	***23.7***	***22.7***	***23.5***	***27.8***	***24.9***	***24.0***	***23.3***	***23.9***	***22.8***	***23.0***	***23.0***	***22.2***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		23.7	33.0	50.3	76.7	101.2	125.0	147.7	170.4	181.1	164.8	130.7	86.0
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		218	218	218	218	218	218	218	218	218	218	218	218
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	99	7.21	0.00	0.00	0.00	0.00	0.00	0.00	4.46	19.27	25.90	24.90	16.89
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		21.09	33.03	50.29	76.74	101.22	125.03	147.67	170.38	177.51	155.44	121.65	79.92
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	99	7.21	0.00	0.00	0.00	0.00	0.00	0.00	4.46	19.27	25.90	24.90	16.89
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.64	0.84	0.80	0.56
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.13	0.01	0.02	0.06	0.00	0.00	0.13	0.34	0.48	0.87	0.66
MONTHLY DISCHARGE TO COWRP (MG)	83	0.0	3.9	0.3	0.5	1.7	0.0	0.0	4.0	10.2	15.0	27.1	19.9
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	10.33	26.79	48.94	76.32	101.03	124.37	146.48	158.26	141.81	107.65	63.83
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		13.89	18.80	23.20	27.30	23.20	24.00	23.30	15.44	-10.22	-27.27	-38.01	-20.69
UNADJUSTED STORAGE VOLUME (MG)		13.89	29.13	49.99	76.24	99.52	125.03	147.67	161.93	148.04	114.54	69.64	43.14
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		6.2	7.9	10.2	13.0	15.6	18.4	20.8	22.4	20.9	17.2	12.3	9.4
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	19	0.58	0.22	0.27	0.12	0.30	1.15	1.93	2.64	3.97	3.93	2.64	1.44
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	23	0.25	1.00	2.46	3.43	4.72	3.73	3.86	2.21	0.86	0.27	0.05	0.08
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		10.33	26.79	48.94	76.32	101.03	124.37	146.48	158.26	141.81	107.65	63.83	38.66
								MAXIMUM STORAGE REQUIRED (MG)					158.3
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	270
INFLOW AND INFILTRATION	14
PRECIPITATION INTO WWTP AND RESERVOIR	25
TOTAL INFLOW	**309**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	19
PERCOLATION	38
ON-SITE LAND DISPOSAL	129
DISCHARGE TO COWRP	83
TOTAL OUTFLOW	**269**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	-40
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	-3

MULE CREEK STATE PRISON **Scenario 2** FILE:

CURRENT PERMIT ADWF WATER BALANCE AVERAGE YEAR FOLLOWING 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, EXPANDED LAAS + DISCHARGE TO COWRP

2/13/2025

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.74
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**261**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**61**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	Average
DESIGN PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 TYPICAL YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	56.2	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.06	0.97	0.64	0.43	0.77	0.76	0.61	0.84	0.94	1.01	0.86
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.88	0.96	0.59	0.41	0.60	0.66	0.61	0.82	0.85	0.95	0.79
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.02	0.97	0.63	0.43	0.74	0.74	0.61	0.84	0.92	1.00	0.85
MCIC FACILITY I/I VOLUME (MGD)		0.000	0.001	0.002	0.002	0.002	0.000	0.005	0.000	0.000	0.000	0.000	0.000
MCSP, PYCF, CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.043	0.032	0.026	0.035	0.011	0.006	0.001	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.000	0.001	0.045	0.034	0.028	0.035	0.016	0.006	0.001	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.74	0.74	0.79	0.77	0.77	0.77	0.76	0.75	0.74	0.74	0.74	0.74

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, Average (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
EFFECTIVE RAIN FOR PLANTS (IN)	20.7	0.29	1.11	2.56	3.32	4.29	3.18	3.12	1.73	0.70	0.23	0.05	0.09
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
Average DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	56	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	270	22.9	22.2	22.9	22.9	20.7	22.9	22.2	22.9	22.2	22.9	22.9	22.2
I/I FLOW VOLUME (MG)	5	0.00	0.04	1.40	1.06	0.79	1.08	0.48	0.19	0.04	0.00	0.00	0.01
TOTAL INFLUENT FLOW VOLUME (MG)	***276***	***23.0***	***22.3***	***24.4***	***24.0***	***21.6***	***24.1***	***22.7***	***23.2***	***22.3***	***23.0***	***23.0***	***22.3***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.00	1.45	4.20	4.20	4.20	3.02	0.09	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL Average EFFLUENT APPLICATION RATE (IN/MONTH)	31	3.43	0.18	0.00	0.00	0.00	0.00	0.00	0.00	6.50	8.23	7.76	5.31
POTENTIAL Average EFFLUENT APPLICATION VOLUME (MG)	37	4.01	0.21	0.00	0.00	0.00	0.00	0.00	0.00	7.59	9.61	9.06	6.20
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		61.7	64.7	81.5	103.2	122.9	144.2	163.6	179.2	180.3	157.0	121.8	77.2
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	37	4.01	0.21	0.00	0.00	0.00	0.00	0.00	0.00	7.59	9.61	9.06	6.20
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.13	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.31	0.29	0.21
EFFLUENT IRRIGATION RATE (IN/MONTH)	31	3.43	0.18	0.00	0.00	0.00	0.00	0.00	0.00	6.50	8.23	7.76	5.31
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.00	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		218	218	218	218	218	218	218	218	218	218	218	218
POTENTIAL Average EFFLUENT APPLICATION RATE (IN/MONTH)	19	1.87	0.10	0.00	0.00	0.00	0.00	0.54	1.76	3.60	4.49	4.23	2.90
POTENTIAL Average EFFLUENT APPLICATION VOLUME (MG)	115	11.09	0.58	0.00	0.00	0.00	0.00	3.19	10.42	21.28	26.57	25.05	17.15
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		57.65	64.45	81.50	103.16	122.94	144.24	163.65	179.23	172.69	147.36	112.71	71.05
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	115	11.09	0.58	0.00	0.00	0.00	0.00	3.19	10.42	21.28	26.57	25.05	17.15
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.36	0.02	0.00	0.00	0.00	0.00	0.11	0.34	0.71	0.86	0.81	0.57
EFFLUENT IRRIGATION RATE (IN/MONTH)	19	1.87	0.10	0.00	0.00	0.00	0.00	0.54	1.76	3.60	4.49	4.23	2.90
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.13	0.01	0.02	0.06	0.00	0.00	0.13	0.34	0.48	0.87	0.66
MONTHLY DISCHARGE TO COWRP (MG)	83	0.0	3.9	0.3	0.5	1.7	0.0	0.0	4.0	10.2	15.0	27.1	19.9
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		38.66	42.36	57.10	79.16	101.34	120.14	140.95	156.03	157.98	133.97	98.77	54.95
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		7.90	17.60	24.10	23.50	19.90	24.10	19.51	8.78	-16.77	-28.18	-38.21	-20.95
UNADJUSTED STORAGE VOLUME (MG)		46.56	59.97	81.20	102.66	121.24	144.24	160.45	164.81	141.21	105.79	60.56	34.00
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		9.8	11.2	13.6	15.9	18.0	20.5	22.2	22.7	20.1	16.3	11.3	8.4
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	27	1.15	0.42	0.46	0.34	1.22	2.43	3.70	4.94	4.63	3.95	2.41	1.51
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	13	0.15	0.61	1.48	2.03	2.76	2.16	2.20	1.23	0.47	0.14	0.03	0.05
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	1	0.02	0.07	0.17	0.22	0.28	0.21	0.21	0.11	0.05	0.02	0.00	0.01
STORAGE AT END OF MONTH (MG)		42.36	57.10	79.16	101.34	120.14	140.95	156.03	157.98	133.97	98.77	54.95	29.41
								MAXIMUM STORAGE REQUIRED (MG)					158.0
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)		ANNUAL OUTFLOWS (MG)		OVERALL BALANCE (MUST NOT BE NEGATIVE)	
WASTEWATER	270	EVAPORATION	27	TOTAL UNUSED DISPOSAL CAPACITY (MG)	10
INFLOW AND INFILTRATION	5	PERCOLATION	38	UNUSED LAA CAPACITY (MG)	0
PRECIPITATION INTO WWTP AND RESERVOIR	15	ON-SITE LAND DISPOSAL	152	UNUSED COWRP CAPACITY (MG)	0
		DISCHARGE TO COWRP	83	TOTAL UNUSED STORAGE CAPACITY (MG)	-3
TOTAL INFLOW	**290**	**TOTAL OUTFLOW**	**300**		

MULE CREEK STATE PRISON **Scenario 2** FILE: 2/13/2025

CURRENT PERMIT ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, EXISTING LAAS + TRI-PARTY AGREEMENT DISCHARGE TO COWRP

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.74
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.76	0.76	0.76	0.89	0.89	0.77	0.78	0.77	0.76	0.74	0.74	0.74

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	270	22.9	22.2	22.9	22.9	20.7	22.9	22.2	22.9	22.2	22.9	22.9	22.2
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***285***	***23.7***	***22.7***	***23.5***	***27.8***	***24.9***	***24.0***	***23.3***	***23.9***	***22.8***	***23.0***	***23.0***	***22.2***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		23.7	33.3	52.9	78.2	101.8	126.0	147.3	153.1	152.2	134.9	106.3	78.7
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		21.09	33.32	52.85	78.16	101.78	126.05	147.31	153.14	148.68	125.56	97.33	72.58
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.46	0.60	0.58	0.41
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
EFFLUENT AVAILABLE TO SEND TO COWRP (MG)		21.1	33.3	52.9	78.2	101.8	126.0	147.3	153.1	148.7	125.6	97.3	72.6
AVERAGE COWRP DISCHARGE (MGD)		0.06	0.06	0.06	0.06	0.06	0.06	0.58	0.56	0.58	0.56	0.56	0.58
MONTHLY DISCHARGE TO COWRP (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	10.62	29.35	50.36	76.88	102.05	124.01	129.24	129.42	111.92	83.34	56.48
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		14.15	20.94	21.74	26.04	23.14	22.24	6.03	3.42	-11.89	-22.29	-21.21	-13.34
UNADJUSTED STORAGE VOLUME (MG)		14.15	31.56	51.09	76.40	100.02	124.29	130.05	132.66	117.53	89.64	62.13	43.15
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		6.2	8.1	10.3	13.0	15.6	18.3	18.9	19.2	17.5	14.5	11.5	9.4
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	17	0.58	0.23	0.27	0.12	0.30	1.15	1.76	2.28	3.37	3.34	2.47	1.44
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	23	0.25	1.01	2.46	3.43	4.73	3.72	3.71	2.07	0.80	0.25	0.05	0.08
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		10.62	29.35	50.36	76.88	102.05	124.01	129.24	129.42	111.92	83.34	56.48	38.68
								MAXIMUM STORAGE REQUIRED (MG)					129.4
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	270
INFLOW AND INFILTRATION	14
PRECIPITATION INTO WWTP AND RESERVOIR	25
TOTAL INFLOW	**309**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	17
PERCOLATION	38
ON-SITE LAND DISPOSAL	102
DISCHARGE TO COWRP	114
TOTAL OUTFLOW	**271**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	-38
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	26

MULE CREEK STATE PRISON **Scenario 2** FILE: 2/13/2025

CURRENT PERMIT ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, EXPANDED LAAS + TRI-PARTY AGREEMENT DISCHARGE TO COWRP

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.74
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**261**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**61**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.76	0.76	0.76	0.89	0.89	0.77	0.78	0.77	0.76	0.74	0.74	0.74

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	270	22.9	22.2	22.9	22.9	20.7	22.9	22.2	22.9	22.2	22.9	22.9	22.2
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***285***	***23.7***	***22.7***	***23.5***	***27.8***	***24.9***	***24.0***	***23.3***	***23.9***	***22.8***	***23.0***	***23.0***	***22.2***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		23.7	31.3	50.9	76.1	99.8	124.0	145.3	151.1	148.9	126.4	90.9	56.8
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		218	218	218	218	218	218	218	218	218	218	218	218
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	99	7.21	0.00	0.00	0.00	0.00	0.00	0.00	4.46	19.27	25.90	24.90	16.89
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		21.09	31.32	50.85	76.15	99.75	124.00	145.26	151.09	145.40	117.04	81.93	50.68
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	99	7.21	0.00	0.00	0.00	0.00	0.00	0.00	4.46	19.27	25.90	24.90	16.89
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.64	0.84	0.80	0.56
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
EFFLUENT AVAILABLE TO SEND TO COWRP (MG)		21.1	31.3	50.9	76.1	99.8	124.0	145.3	151.1	145.4	117.0	81.9	50.7
AVERAGE TYPICAL COWRP DISCHARGE (MGD)		0.06	0.06	0.06	0.06	0.06	0.06	0.58	0.56	0.58	0.56	0.56	0.58
MONTHLY DISCHARGE TO COWRP (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	8.62	27.35	48.35	74.85	100.00	121.96	127.19	126.15	103.41	67.93	34.59
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		12.13	20.94	21.74	26.04	23.14	22.24	6.03	2.18	-17.28	-29.53	-28.17	-18.06
UNADJUSTED STORAGE VOLUME (MG)		12.13	29.56	49.09	74.39	97.99	122.24	127.99	129.36	108.86	73.88	39.76	16.53
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		6.0	7.9	10.1	12.8	15.4	18.1	18.7	18.8	16.6	12.8	9.0	6.5
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	16	0.56	0.22	0.27	0.12	0.29	1.14	1.74	2.24	3.20	2.98	2.00	1.04
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	22	0.25	1.00	2.45	3.42	4.71	3.70	3.69	2.05	0.79	0.24	0.05	0.08
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		8.62	27.35	48.35	74.85	100.00	121.96	127.19	126.15	103.41	67.93	34.59	12.45
								MAXIMUM STORAGE REQUIRED (MG)					127.2
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	270
INFLOW AND INFILTRATION	14
PRECIPITATION INTO WWTP AND RESERVOIR	25
TOTAL INFLOW	**309**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	16
PERCOLATION	38
ON-SITE LAND DISPOSAL	129
DISCHARGE TO COWRP	114
TOTAL OUTFLOW	**297**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	-12
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	28

MULE CREEK STATE PRISON **Scenario 3** FILE: 2/13/2025

MAX POTENTIAL OCCUPANCY ADWF WATER BALANCE UNDER AVG YEAR TYPE HYDROLOGIC CONDITIONS, NO OFF-SITE DISCHARGES

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.67
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	Avg. Year Cond.
DESIGN PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 TYPICAL YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	56.2	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
ZONE 12 WET REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	53.4	3.72	1.80	0.93	1.24	1.96	3.41	5.10	6.82	7.80	8.06	7.13	5.40
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING GRASSES		0.85	0.74	0.93	1.18	0.65	0.65	0.84	1.00	1.01	1.00	1.02	0.99
CROP COEFFICIENT (Kc), TREES (OAKS)		0.69	0.48	0.93	1.18	0.39	0.30	0.43	0.86	0.94	0.93	0.95	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.82	0.68	0.93	1.18	0.60	0.58	0.76	0.97	1.00	0.99	1.01	0.97
MCIC FACILITY I/I VOLUME (MGD)		0.000	0.001	0.002	0.002	0.002	0.000	0.005	0.000	0.000	0.000	0.000	0.000
MCSP, PYCF, CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.043	0.032	0.024	0.036	0.011	0.006	0.001	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.000	0.001	0.045	0.034	0.026	0.036	0.016	0.006	0.001	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.67	0.67	0.72	0.70	0.70	0.71	0.69	0.68	0.67	0.67	0.67	0.67

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, Avg. Year Cond. (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
EFFECTIVE RAIN FOR PLANTS (IN)	20.7	0.29	1.11	2.56	3.32	4.29	3.18	3.12	1.73	0.70	0.23	0.05	0.09
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	51	3.16	0.86	1.06	0.86	1.42	2.40	4.41	7.38	7.97	8.24	7.15	5.67
Avg. Year Cond. DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	51	3.16	0.86	1.06	0.86	1.42	2.40	4.41	7.38	7.97	8.24	7.15	5.67
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	56	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	245	20.8	20.1	20.8	20.8	18.8	20.8	20.1	20.8	20.1	20.8	20.8	20.1
I/I FLOW VOLUME (MG)	5	0.00	0.04	1.40	1.06	0.74	1.13	0.48	0.19	0.04	0.00	0.00	0.01
TOTAL INFLUENT FLOW VOLUME (MG)	***250***	***20.8***	***20.2***	***22.2***	***21.9***	***19.5***	***21.9***	***20.6***	***21.0***	***20.2***	***20.8***	***20.8***	***20.2***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.26	1.75	4.20	4.20	4.20	2.91	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION RATE (IN/MONTH)	37	3.15	0.00	0.00	0.00	0.00	0.00	0.00	3.01	8.00	8.81	7.81	6.14
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION VOLUME (MG)	43	3.68	0.00	0.00	0.00	0.00	0.00	0.00	3.52	9.34	10.29	9.12	7.16
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		20.8	26.2	45.5	65.2	83.0	103.6	121.0	135.3	131.5	117.9	101.4	88.4
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	43	3.68	0.00	0.00	0.00	0.00	0.00	0.00	3.52	9.34	10.29	9.12	7.16
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.31	0.33	0.29	0.24
EFFLUENT IRRIGATION RATE (IN/MONTH)	37	3.15	0.00	0.00	0.00	0.00	0.00	0.00	3.01	8.00	8.81	7.81	6.14
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.26	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION RATE (IN/MONTH)	22	1.72	0.00	0.00	0.00	0.00	0.00	0.61	3.39	4.36	4.81	4.26	3.35
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION VOLUME (MG)	96	7.32	0.00	0.00	0.00	0.00	0.00	2.58	14.45	18.60	20.49	18.16	14.27
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		17.12	26.19	45.51	65.18	83.03	103.56	120.95	131.74	122.15	107.64	92.25	81.23
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	96	7.32	0.00	0.00	0.00	0.00	0.00	2.58	14.45	18.60	20.49	18.16	14.27
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.24	0.00	0.00	0.00	0.00	0.00	0.09	0.47	0.62	0.66	0.59	0.48
EFFLUENT IRRIGATION RATE (IN/MONTH)	22	1.72	0.00	0.00	0.00	0.00	0.00	0.61	3.39	4.36	4.81	4.26	3.35
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MONTHLY DISCHARGE TO COWRP (MG)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	5.99	23.31	43.28	63.53	81.66	100.35	114.26	111.29	97.12	80.56	68.19
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		9.81	20.20	22.20	21.90	19.50	21.90	18.02	3.03	-7.74	-9.97	-6.48	-1.23
UNADJUSTED STORAGE VOLUME (MG)		9.81	26.19	45.51	65.18	83.03	103.56	118.37	117.29	103.55	87.15	74.09	66.96
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		5.8	7.5	9.7	11.8	13.8	16.0	17.6	17.5	16.0	14.2	12.8	12.0
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	23	0.72	0.30	0.33	0.26	0.96	1.93	2.97	3.87	3.73	3.49	2.69	2.08
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	12	0.14	0.55	1.34	1.84	2.50	1.95	1.99	1.10	0.43	0.14	0.03	0.05
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	1	0.02	0.07	0.17	0.22	0.28	0.21	0.21	0.11	0.05	0.02	0.00	0.01
STORAGE AT END OF MONTH (MG)		5.99	23.31	43.28	63.53	81.66	100.35	114.26	111.29	97.12	80.56	68.19	61.80
								MAXIMUM STORAGE REQUIRED (MG)					114.3
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	245
INFLOW AND INFILTRATION	5
PRECIPITATION INTO WWTP AND RESERVOIR	13
TOTAL INFLOW	**263**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	23
PERCOLATION	38
ON-SITE LAND DISPOSAL	139
DISCHARGE TO COWRP	0
TOTAL OUTFLOW	**200**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	-63
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	41

MULE CREEK STATE PRISON **Scenario 3** FILE: 2/13/2025

MAX POTENTIAL OCCUPANCY ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, NO OFF-SITE DISCHARGES

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS

STARTING AVERAGE FLOW (MGD)	0.67

IRRIGATION AREA CHARACTERISTICS

POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS

CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**

EXISTING WWTP PROCESS AREAS

OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS

CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.69	0.69	0.69	0.82	0.82	0.70	0.71	0.70	0.69	0.67	0.67	0.67

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	245	20.8	20.1	20.8	20.8	18.8	20.8	20.1	20.8	20.1	20.8	20.8	20.1
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***259***	***21.6***	***20.6***	***21.3***	***25.6***	***23.0***	***21.9***	***21.2***	***21.7***	***20.7***	***20.8***	***20.8***	***20.1***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		21.6	30.8	49.8	74.4	97.4	120.8	141.3	161.9	175.7	172.7	157.9	143.9
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		18.99	30.85	49.80	74.36	97.42	120.81	141.34	161.85	172.16	163.30	148.86	137.80
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.46	0.60	0.58	0.41
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MONTHLY DISCHARGE TO COWRP (MG)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	10.25	28.50	48.76	74.42	98.91	120.14	140.15	155.00	151.87	137.07	123.81
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		13.80	20.60	21.30	25.60	23.00	21.90	21.20	18.49	3.28	-7.22	-6.14	1.83
UNADJUSTED STORAGE VOLUME (MG)		13.80	30.85	49.80	74.36	97.42	120.81	141.34	158.65	158.28	144.65	130.93	125.64
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		6.2	8.1	10.1	12.8	15.3	17.9	20.2	22.0	22.0	20.5	19.0	18.4
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	22	0.58	0.22	0.27	0.12	0.29	1.13	1.87	2.60	4.17	4.63	3.95	2.67
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	23	0.25	1.01	2.45	3.41	4.70	3.69	3.81	2.19	0.89	0.29	0.06	0.11
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		10.25	28.50	48.76	74.42	98.91	120.14	140.15	155.00	151.87	137.07	123.81	119.96

MAXIMUM STORAGE REQUIRED (MG)	155.0
TOTAL AVAILABLE STORAGE (MG)	155.0

SUMMARY

ANNUAL INFLOWS (MG)		ANNUAL OUTFLOWS (MG)		OVERALL BALANCE (MUST NOT BE NEGATIVE)	
WASTEWATER	245	EVAPORATION	22	TOTAL UNUSED DISPOSAL CAPACITY (MG)	-122
INFLOW AND INFILTRATION	14	PERCOLATION	38	UNUSED LAA CAPACITY (MG)	0
PRECIPITATION INTO WWTP AND RESERVOIR	25	ON-SITE LAND DISPOSAL	102	UNUSED COWRP CAPACITY (MG)	0
		DISCHARGE TO COWRP	0	TOTAL UNUSED STORAGE CAPACITY (MG)	0
TOTAL INFLOW	**284**	**TOTAL OUTFLOW**	**162**		

MULE CREEK STATE PRISON **Scenario 3** FILE: 2/13/2025

MAX POTENTIAL OCCUPANCY ADWF WATER BALANCE AVERAGE YEAR FOLLOWING 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, NO OFF-SITE DISCHARGES

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.67
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	Average
DESIGN PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 TYPICAL YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	56.2	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.06	0.97	0.64	0.43	0.77	0.76	0.61	0.84	0.94	1.01	0.86
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.88	0.96	0.59	0.41	0.60	0.66	0.61	0.82	0.85	0.95	0.79
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.02	0.97	0.63	0.43	0.74	0.74	0.61	0.84	0.92	1.00	0.85
MCIC FACILITY I/I VOLUME (MGD)		0.000	0.001	0.002	0.002	0.002	0.000	0.005	0.000	0.000	0.000	0.000	0.000
MCSP, PYCF, CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.043	0.032	0.026	0.035	0.011	0.006	0.001	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.000	0.001	0.045	0.034	0.028	0.035	0.016	0.006	0.001	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.67	0.67	0.72	0.70	0.70	0.70	0.69	0.68	0.67	0.67	0.67	0.67

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, Average (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
EFFECTIVE RAIN FOR PLANTS (IN)	20.7	0.29	1.11	2.56	3.32	4.29	3.18	3.12	1.73	0.70	0.23	0.05	0.09
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
Average DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	56	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	245	20.8	20.1	20.8	20.8	18.8	20.8	20.1	20.8	20.1	20.8	20.8	20.1
I/I FLOW VOLUME (MG)	5	0.00	0.04	1.40	1.06	0.79	1.08	0.48	0.19	0.04	0.00	0.00	0.01
TOTAL INFLUENT FLOW VOLUME (MG)	***250***	***20.8***	***20.2***	***22.2***	***21.9***	***19.6***	***21.9***	***20.6***	***21.0***	***20.2***	***20.8***	***20.8***	***20.2***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.00	1.45	4.20	4.20	4.20	3.02	0.09	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL Average EFFLUENT APPLICATION RATE (IN/MONTH)	31	3.43	0.18	0.00	0.00	0.00	0.00	0.00	0.00	6.50	8.23	7.76	5.31
POTENTIAL Average EFFLUENT APPLICATION VOLUME (MG)	37	4.01	0.21	0.00	0.00	0.00	0.00	0.00	0.00	7.59	9.61	9.06	6.20
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		140.8	143.9	162.4	182.3	200.8	221.6	238.3	251.7	256.0	244.5	226.9	211.4
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	37	4.01	0.21	0.00	0.00	0.00	0.00	0.00	0.00	7.59	9.61	9.06	6.20
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.13	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.31	0.29	0.21
EFFLUENT IRRIGATION RATE (IN/MONTH)	31	3.43	0.18	0.00	0.00	0.00	0.00	0.00	0.00	6.50	8.23	7.76	5.31
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.00	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL Average EFFLUENT APPLICATION RATE (IN/MONTH)	19	1.87	0.10	0.00	0.00	0.00	0.00	0.54	1.76	3.60	4.49	4.23	2.90
POTENTIAL Average EFFLUENT APPLICATION VOLUME (MG)	83	7.98	0.42	0.00	0.00	0.00	0.00	2.30	7.51	15.33	19.14	18.04	12.35
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		136.75	143.65	162.39	182.31	200.83	221.60	238.34	251.68	248.37	234.92	217.80	205.22
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	83	7.98	0.42	0.00	0.00	0.00	0.00	2.30	7.51	15.33	19.14	18.04	12.35
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.26	0.01	0.00	0.00	0.00	0.00	0.08	0.24	0.51	0.62	0.58	0.41
EFFLUENT IRRIGATION RATE (IN/MONTH)	19	1.87	0.10	0.00	0.00	0.00	0.00	0.54	1.76	3.60	4.49	4.23	2.90
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MONTHLY DISCHARGE TO COWRP (MG)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		119.96	123.66	140.19	160.41	181.23	199.70	217.74	230.68	235.76	223.73	206.06	191.22
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		8.81	19.57	22.20	21.90	19.60	21.90	18.30	13.49	-2.71	-7.94	-6.30	1.65
UNADJUSTED STORAGE VOLUME (MG)		128.77	143.23	162.39	182.31	200.83	221.60	236.04	244.17	233.05	215.78	199.76	192.87
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		18.8	20.4	22.5	24.6	26.7	28.9	30.5	31.4	30.2	28.3	26.6	25.8
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	44	2.09	0.73	0.73	0.51	1.78	3.38	5.01	6.74	6.81	6.69	5.35	4.26
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	16	0.19	0.75	1.81	2.45	3.29	2.54	2.57	1.44	0.57	0.18	0.04	0.07
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	1	0.02	0.07	0.17	0.22	0.28	0.21	0.21	0.11	0.05	0.02	0.00	0.01
STORAGE AT END OF MONTH (MG)		123.66	140.19	160.41	181.23	199.70	217.74	230.68	235.76	223.73	206.06	191.22	185.56
								MAXIMUM STORAGE REQUIRED (MG)					235.8
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	245
INFLOW AND INFILTRATION	5
PRECIPITATION INTO WWTP AND RESERVOIR	17
TOTAL INFLOW	**267**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	44
PERCOLATION	38
ON-SITE LAND DISPOSAL	120
DISCHARGE TO COWRP	0
TOTAL OUTFLOW	**202**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	-65
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	-81

MULE CREEK STATE PRISON **Scenario 3** FILE:

MAX POTENTIAL OCCUPANCY ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, EXPANDED LAAs 1

2/13/2025

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.67
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**261**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 _ New AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**61**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.69	0.69	0.69	0.82	0.82	0.70	0.71	0.70	0.69	0.67	0.67	0.67

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	245	20.8	20.1	20.8	20.8	18.8	20.8	20.1	20.8	20.1	20.8	20.8	20.1
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***259***	***21.6***	***20.6***	***21.3***	***25.6***	***23.0***	***21.9***	***21.2***	***21.7***	***20.7***	***20.8***	***20.8***	***20.1***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		21.6	28.8	47.8	72.3	95.4	118.8	139.3	159.8	172.4	164.2	142.5	122.0
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		218	218	218	218	218	218	218	218	218	218	218	218
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	99	7.21	0.00	0.00	0.00	0.00	0.00	0.00	4.46	19.27	25.90	24.90	16.89
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		18.99	28.85	47.80	72.35	95.40	118.76	139.29	159.80	168.88	154.79	133.46	115.91
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	99	7.21	0.00	0.00	0.00	0.00	0.00	0.00	4.46	19.27	25.90	24.90	16.89
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.64	0.84	0.80	0.56
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MONTHLY DISCHARGE TO COWRP (MG)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	8.25	26.50	46.75	72.40	96.86	118.09	138.10	151.73	143.35	121.67	101.92
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		11.79	20.60	21.30	25.60	23.00	21.90	21.20	17.24	-2.12	-14.47	-13.11	-2.89
UNADJUSTED STORAGE VOLUME (MG)		11.79	28.85	47.80	72.35	95.40	118.76	139.29	155.35	149.61	128.89	108.56	99.02
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		6.0	7.8	9.9	12.6	15.1	17.7	19.9	21.7	21.1	18.8	16.6	15.5
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	21	0.56	0.22	0.26	0.11	0.29	1.11	1.85	2.56	4.00	4.26	3.47	2.27
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	23	0.25	1.00	2.44	3.40	4.67	3.67	3.79	2.18	0.87	0.28	0.06	0.10
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		8.25	26.50	46.75	72.40	96.86	118.09	138.10	151.73	143.35	121.67	101.92	93.73
								MAXIMUM STORAGE REQUIRED (MG)					151.7
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	245
INFLOW AND INFILTRATION	14
PRECIPITATION INTO WWTP AND RESERVOIR	25
TOTAL INFLOW	**284**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	21
PERCOLATION	38
ON-SITE LAND DISPOSAL	129
DISCHARGE TO COWRP	0
TOTAL OUTFLOW	**188**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	-96
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	3

MULE CREEK STATE PRISON **Scenario 3** FILE: 2/13/2025

MAX POTENTIAL OCCUPANCY ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, EXISTING LAAs + DISCHARGE TO COWRP

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.67
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.69	0.69	0.69	0.82	0.82	0.70	0.71	0.70	0.69	0.67	0.67	0.67

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	245	20.8	20.1	20.8	20.8	18.8	20.8	20.1	20.8	20.1	20.8	20.8	20.1
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***259***	***21.6***	***20.6***	***21.3***	***25.6***	***23.0***	***21.9***	***21.2***	***21.7***	***20.7***	***20.8***	***20.8***	***20.1***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		21.6	30.8	45.9	70.1	92.7	114.3	134.8	155.3	165.2	152.4	123.4	83.6
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		18.99	30.85	45.90	70.14	92.66	114.28	134.80	155.32	161.70	143.01	114.37	77.52
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.46	0.60	0.58	0.41
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.13	0.01	0.02	0.06	0.00	0.00	0.13	0.34	0.48	0.87	0.66
MONTHLY DISCHARGE TO COWRP (MG)	83	0.0	3.9	0.3	0.5	1.7	0.0	0.0	4.0	10.2	15.0	27.1	19.9
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	10.25	24.60	44.54	69.66	92.38	113.60	133.62	144.54	131.57	102.58	63.53
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		13.80	16.70	21.00	25.10	21.30	21.90	21.20	14.49	-6.92	-22.22	-33.24	-18.07
UNADJUSTED STORAGE VOLUME (MG)		13.80	26.95	45.60	69.64	90.96	114.28	134.80	148.11	137.62	109.35	69.34	45.46
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		6.2	7.6	9.7	12.3	14.6	17.2	19.4	20.9	19.7	16.7	12.3	9.7
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	18	0.58	0.21	0.26	0.11	0.28	1.08	1.80	2.47	3.76	3.81	2.63	1.47
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	22	0.25	1.00	2.42	3.37	4.62	3.63	3.75	2.14	0.84	0.26	0.05	0.09
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		10.25	24.60	44.54	69.66	92.38	113.60	133.62	144.54	131.57	102.58	63.53	40.95
								MAXIMUM STORAGE REQUIRED (MG)					144.5
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)		ANNUAL OUTFLOWS (MG)		OVERALL BALANCE (MUST NOT BE NEGATIVE)	
WASTEWATER	245	EVAPORATION	18	TOTAL UNUSED DISPOSAL CAPACITY (MG)	-43
INFLOW AND INFILTRATION	14	PERCOLATION	38	UNUSED LAA CAPACITY (MG)	0
PRECIPITATION INTO WWTP AND RESERVOIR	25	ON-SITE LAND DISPOSAL	102	UNUSED COWRP CAPACITY (MG)	0
		DISCHARGE TO COWRP	83	TOTAL UNUSED STORAGE CAPACITY (MG)	10
TOTAL INFLOW	**284**	**TOTAL OUTFLOW**	**241**		

MULE CREEK STATE PRISON **Scenario 3** FILE:

MAX POTENTIAL OCCUPANCY ADWF WATER BALANCE AVERAGE YEAR FOLLOWING AVERAGE YEAR TYPE HYDROLOGIC CONDITIONS, EXISTING LAAS + DISCHARGE TO COWRP

2/13/2025

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.67
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	Average
DESIGN PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 TYPICAL YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	56.2	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.06	0.97	0.64	0.43	0.77	0.76	0.61	0.84	0.94	1.01	0.86
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.88	0.96	0.59	0.41	0.60	0.66	0.61	0.82	0.85	0.95	0.79
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.02	0.97	0.63	0.43	0.74	0.74	0.61	0.84	0.92	1.00	0.85
MCIC FACILITY I/I VOLUME (MGD)		0.000	0.001	0.002	0.002	0.002	0.000	0.005	0.000	0.000	0.000	0.000	0.000
MCSP, PYCF, CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.043	0.032	0.026	0.035	0.011	0.006	0.001	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.000	0.001	0.045	0.034	0.028	0.035	0.016	0.006	0.001	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.67	0.67	0.72	0.70	0.70	0.70	0.69	0.68	0.67	0.67	0.67	0.67

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, Average (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
EFFECTIVE RAIN FOR PLANTS (IN)	20.7	0.29	1.11	2.56	3.32	4.29	3.18	3.12	1.73	0.70	0.23	0.05	0.09
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
Average DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	56	3.86	1.25	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	245	20.8	20.1	20.8	20.8	18.8	20.8	20.1	20.8	20.1	20.8	20.8	20.1
I/I FLOW VOLUME (MG)	5	0.00	0.04	1.40	1.06	0.79	1.08	0.48	0.19	0.04	0.00	0.00	0.01
TOTAL INFLUENT FLOW VOLUME (MG)	***250***	***20.8***	***20.2***	***22.2***	***21.9***	***19.6***	***21.9***	***20.6***	***21.0***	***20.2***	***20.8***	***20.8***	***20.2***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.00	1.45	4.20	4.20	4.20	3.02	0.09	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL Average EFFLUENT APPLICATION RATE (IN/MONTH)	31	3.43	0.18	0.00	0.00	0.00	0.00	0.00	0.00	6.50	8.23	7.76	5.31
POTENTIAL Average EFFLUENT APPLICATION VOLUME (MG)	37	4.01	0.21	0.00	0.00	0.00	0.00	0.00	0.00	7.59	9.61	9.06	6.20
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		61.8	65.7	80.5	100.1	117.9	136.9	154.3	168.7	170.7	151.2	121.2	81.5
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	37	4.01	0.21	0.00	0.00	0.00	0.00	0.00	0.00	7.59	9.61	9.06	6.20
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.13	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.31	0.29	0.21
EFFLUENT IRRIGATION RATE (IN/MONTH)	31	3.43	0.18	0.00	0.00	0.00	0.00	0.00	0.00	6.50	8.23	7.76	5.31
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.00	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL Average EFFLUENT APPLICATION RATE (IN/MONTH)	19	1.87	0.10	0.00	0.00	0.00	0.00	0.54	1.76	3.60	4.49	4.23	2.90
POTENTIAL Average EFFLUENT APPLICATION VOLUME (MG)	83	7.98	0.42	0.00	0.00	0.00	0.00	2.30	7.51	15.33	19.14	18.04	12.35
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		57.74	65.51	80.52	100.08	117.85	136.95	154.31	168.69	163.12	141.63	112.17	75.28
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	83	7.98	0.42	0.00	0.00	0.00	0.00	2.30	7.51	15.33	19.14	18.04	12.35
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.26	0.01	0.00	0.00	0.00	0.00	0.08	0.24	0.51	0.62	0.58	0.41
EFFLUENT IRRIGATION RATE (IN/MONTH)	19	1.87	0.10	0.00	0.00	0.00	0.00	0.54	1.76	3.60	4.49	4.23	2.90
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.13	0.01	0.02	0.06	0.00	0.00	0.13	0.34	0.48	0.87	0.66
MONTHLY DISCHARGE TO COWRP (MG)	83	0.0	3.9	0.3	0.5	1.7	0.0	0.0	4.0	10.2	15.0	27.1	19.9
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		40.95	45.52	58.32	78.18	98.25	115.05	133.71	147.69	150.51	130.44	100.43	61.28
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		8.81	15.67	21.90	21.40	17.90	21.90	18.30	9.49	-12.91	-22.94	-33.40	-18.25
UNADJUSTED STORAGE VOLUME (MG)		49.76	61.19	80.22	99.58	116.15	136.95	152.01	157.18	137.59	107.50	67.02	43.03
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		10.1	11.4	13.5	15.6	17.4	19.7	21.3	21.9	19.7	16.4	12.0	9.4
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	27	1.18	0.43	0.45	0.33	1.19	2.34	3.55	4.77	4.54	4.00	2.54	1.67
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	13	0.16	0.61	1.48	2.02	2.72	2.12	2.16	1.21	0.47	0.14	0.03	0.05
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	1	0.02	0.07	0.17	0.22	0.28	0.21	0.21	0.11	0.05	0.02	0.00	0.01
STORAGE AT END OF MONTH (MG)		45.52	58.32	78.18	98.25	115.05	133.71	147.69	150.51	130.44	100.43	61.28	38.29
								MAXIMUM STORAGE REQUIRED (MG)					150.5
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)		ANNUAL OUTFLOWS (MG)		OVERALL BALANCE (MUST NOT BE NEGATIVE)	
WASTEWATER	245	EVAPORATION	27	TOTAL UNUSED DISPOSAL CAPACITY (MG)	3
INFLOW AND INFILTRATION	5	PERCOLATION	38	UNUSED LAA CAPACITY (MG)	0
PRECIPITATION INTO WWTP AND RESERVOIR	15	ON-SITE LAND DISPOSAL	120	UNUSED COWRP CAPACITY (MG)	0
		DISCHARGE TO COWRP	83	TOTAL UNUSED STORAGE CAPACITY (MG)	4
TOTAL INFLOW	**265**	**TOTAL OUTFLOW**	**268**		

MULE CREEK STATE PRISON **Scenario 3** FILE: 2/13/2025

MAX POTENTIAL OCCUPANCY ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, EXPANDED LAAs + DISCHARGE TO COWRP

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.67
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**261**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**61**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.69	0.69	0.69	0.82	0.82	0.70	0.71	0.70	0.69	0.67	0.67	0.67

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	245	20.8	20.1	20.8	20.8	18.8	20.8	20.1	20.8	20.1	20.8	20.8	20.1
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***259***	***21.6***	***20.6***	***21.3***	***25.6***	***23.0***	***21.9***	***21.2***	***21.7***	***20.7***	***20.8***	***20.8***	***20.1***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		21.6	28.8	43.9	68.1	90.6	112.2	132.7	153.3	162.0	143.9	108.0	61.7
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		218	218	218	218	218	218	218	218	218	218	218	218
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	99	7.21	0.00	0.00	0.00	0.00	0.00	0.00	4.46	19.27	25.90	24.90	16.89
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		18.99	28.85	43.90	68.12	90.63	112.23	132.74	153.26	158.42	134.49	98.97	55.63
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	99	7.21	0.00	0.00	0.00	0.00	0.00	0.00	4.46	19.27	25.90	24.90	16.89
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.64	0.84	0.80	0.56
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.13	0.01	0.02	0.06	0.00	0.00	0.13	0.34	0.48	0.87	0.66
MONTHLY DISCHARGE TO COWRP (MG)	83	0.0	3.9	0.3	0.5	1.7	0.0	0.0	4.0	10.2	15.0	27.1	19.9
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	8.25	22.60	42.52	67.63	90.33	111.54	131.56	141.27	123.06	87.17	41.64
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		11.79	16.70	21.00	25.10	21.30	21.90	21.20	13.24	-12.32	-29.47	-40.21	-22.79
UNADJUSTED STORAGE VOLUME (MG)		11.79	24.95	43.60	67.62	88.93	112.23	132.74	144.81	128.95	93.59	46.97	18.84
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		6.0	7.4	9.5	12.1	14.4	17.0	19.2	20.5	18.8	14.9	9.8	6.7
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	17	0.56	0.21	0.25	0.11	0.28	1.07	1.78	2.43	3.59	3.44	2.15	1.07
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	22	0.25	0.99	2.41	3.35	4.60	3.61	3.73	2.13	0.83	0.25	0.05	0.08
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		8.25	22.60	42.52	67.63	90.33	111.54	131.56	141.27	123.06	87.17	41.64	14.72
								MAXIMUM STORAGE REQUIRED (MG)					141.3
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)		ANNUAL OUTFLOWS (MG)		OVERALL BALANCE (MUST NOT BE NEGATIVE)	
WASTEWATER	245	EVAPORATION	17	TOTAL UNUSED DISPOSAL CAPACITY (MG)	-17
INFLOW AND INFILTRATION	14	PERCOLATION	38	UNUSED LAA CAPACITY (MG)	0
PRECIPITATION INTO WWTP AND RESERVOIR	25	ON-SITE LAND DISPOSAL	129	UNUSED COWRP CAPACITY (MG)	0
		DISCHARGE TO COWRP	83	TOTAL UNUSED STORAGE CAPACITY (MG)	14
TOTAL INFLOW	**284**	**TOTAL OUTFLOW**	**267**		

MULE CREEK STATE PRISON **Scenario 3** FILE:

MAX POTENTIAL OCCUPANCY ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, EXISTING LAAS + TRI-PARTY AGREEMENT DISCHARGE TO COWRP

2/13/2025

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.67
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.69	0.69	0.69	0.82	0.82	0.70	0.71	0.70	0.69	0.67	0.67	0.67

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	245	20.8	20.1	20.8	20.8	18.8	20.8	20.1	20.8	20.1	20.8	20.8	20.1
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***259***	***21.6***	***20.6***	***21.3***	***25.6***	***23.0***	***21.9***	***21.2***	***21.7***	***20.7***	***20.8***	***20.8***	***20.1***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		21.6	29.1	46.5	69.5	91.2	113.3	132.4	136.0	133.1	114.0	83.7	54.4
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		18.99	29.14	46.47	69.54	91.19	113.25	132.38	136.02	129.59	104.60	74.66	48.28
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	71	5.19	0.00	0.00	0.00	0.00	0.00	0.00	3.21	13.88	18.65	17.93	12.16
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.46	0.60	0.58	0.41
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
EFFLUENT AVAILABLE TO SEND TO COWRP (MG)		19.0	29.1	46.5	69.5	91.2	113.3	132.4	136.0	129.6	104.6	74.7	48.3
AVERAGE COWRP DISCHARGE (MGD)		0.06	0.06	0.06	0.06	0.06	0.06	0.58	0.56	0.58	0.56	0.56	0.58
MONTHLY DISCHARGE TO COWRP (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	8.54	25.17	43.94	68.19	91.35	111.18	114.32	112.43	93.17	62.86	34.29
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		12.05	18.84	19.54	23.84	21.24	20.14	3.93	1.22	-13.99	-24.49	-23.41	-15.44
UNADJUSTED STORAGE VOLUME (MG)		12.05	27.38	44.71	67.78	89.43	111.49	115.12	115.55	98.44	68.68	39.45	18.85
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		6.0	7.7	9.6	12.1	14.5	16.9	17.3	17.3	15.5	12.2	9.0	6.7
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	15	0.56	0.21	0.26	0.11	0.28	1.07	1.62	2.07	2.99	2.85	1.99	1.08
PERCOLATION LOSS FROM STORAGE (MG)	38	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	3.13
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	22	0.25	1.00	2.42	3.35	4.60	3.61	3.57	1.98	0.77	0.24	0.05	0.08
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		8.54	25.17	43.94	68.19	91.35	111.18	114.32	112.43	93.17	62.86	34.29	14.74
								MAXIMUM STORAGE REQUIRED (MG)					114.3
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	245
INFLOW AND INFILTRATION	14
PRECIPITATION INTO WWTP AND RESERVOIR	24
TOTAL INFLOW	**283**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	15
PERCOLATION	38
ON-SITE LAND DISPOSAL	102
DISCHARGE TO COWRP	114
TOTAL OUTFLOW	**269**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	-14
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	41

MULE CREEK STATE PRISON **Scenario 3** FILE:

MAX POTENTIAL OCCUPANCY ADWF WATER BALANCE UNDER 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS, EXPANDED LAAS + TRI-PARTY AGREEMENT DISCHARGE TO COWRP

2/13/2025

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.67
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**261**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**61**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
AVG PRECIP, AVG OF IONE & PARDEE (IN)	21.8	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.88	1.07	0.95	1.13	1.16	1.05	1.00	1.13	1.01	0.98	0.99	0.98
PRESTON YOUTH FACILITY I/I VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY I/I VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP + CAL FIRE FACILITY I/I VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL I/I VOLUME (MGD)		0.024	0.016	0.016	0.154	0.149	0.034	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.69	0.69	0.69	0.82	0.82	0.70	0.71	0.70	0.69	0.67	0.67	0.67

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39.4	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37.4	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	46	3.42	1.28	1.11	0.46	1.01	3.04	4.30	4.66	6.69	7.71	7.11	4.92
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	42	2.56	0.96	0.83	0.35	0.76	2.28	3.23	4.66	6.69	7.71	7.11	4.92
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	245	20.8	20.1	20.8	20.8	18.8	20.8	20.1	20.8	20.1	20.8	20.8	20.1
I/I FLOW VOLUME (MG)	14	0.74	0.48	0.50	4.77	4.17	1.05	1.08	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	***259***	***21.6***	***20.6***	***21.3***	***25.6***	***23.0***	***21.9***	***21.2***	***21.7***	***20.7***	***20.8***	***20.8***	***20.1***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.05	4.20	4.20	4.20	4.20	4.20	2.67	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		21.6	27.1	44.5	67.5	89.2	111.2	130.3	134.0	129.9	105.5	68.3	32.5
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	31	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.55	9.37	9.00	6.11
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	26	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	8.02	7.71	5.23
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		218	218	218	218	218	218	218	218	218	218	218	218
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	99	7.21	0.00	0.00	0.00	0.00	0.00	0.00	4.46	19.27	25.90	24.90	16.89
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		18.99	27.14	44.46	67.53	89.16	111.20	130.33	133.97	126.31	96.09	59.25	26.39
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	99	7.21	0.00	0.00	0.00	0.00	0.00	0.00	4.46	19.27	25.90	24.90	16.89
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.64	0.84	0.80	0.56
EFFLUENT IRRIGATION RATE (IN/MONTH)	17	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.26	4.38	4.21	2.85
DESIGN DISCHARGE TO COWRP													
EFFLUENT AVAILABLE TO SEND TO COWRP (MG)		19.0	27.1	44.5	67.5	89.2	111.2	130.3	134.0	126.3	96.1	59.3	26.4
AVERAGE COWRP DISCHARGE (MGD)		0.06	0.06	0.06	0.06	0.06	0.06	0.58	0.56	0.58	0.56	0.56	0.58
MONTHLY DISCHARGE TO COWRP (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	6.54	23.16	41.93	66.16	89.30	109.13	112.27	109.16	84.66	47.46	12.39
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		10.03	18.84	19.54	23.84	21.24	20.14	3.93	-0.02	-19.38	-31.73	-30.37	-20.16
UNADJUSTED STORAGE VOLUME (MG)		10.03	25.38	42.71	65.77	87.40	109.44	113.06	112.25	89.77	52.92	17.08	-7.77
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		5.8	7.5	9.4	11.9	14.2	16.7	17.1	17.0	14.5	10.5	6.5	0.0
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	13	0.55	0.21	0.25	0.11	0.27	1.05	1.60	2.03	2.82	2.49	1.51	0.00
PERCOLATION LOSS FROM STORAGE (MG)	35	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	3.23	0.00
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	22	0.25	0.99	2.40	3.33	4.58	3.59	3.56	1.97	0.75	0.23	0.05	0.06
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	2	0.04	0.13	0.31	0.40	0.51	0.38	0.37	0.21	0.08	0.03	0.01	0.01
STORAGE AT END OF MONTH (MG)		6.54	23.16	41.93	66.16	89.30	109.13	112.27	109.16	84.66	47.46	12.39	0.00
								MAXIMUM STORAGE REQUIRED (MG)					112.3
								TOTAL AVAILABLE STORAGE (MG)					155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER	245
INFLOW AND INFILTRATION	14
PRECIPITATION INTO WWTP AND RESERVOIR	24
TOTAL INFLOW	**283**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	13
PERCOLATION	35
ON-SITE LAND DISPOSAL	129
DISCHARGE TO COWRP	114
TOTAL OUTFLOW	**291**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	8
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	0
TOTAL UNUSED STORAGE CAPACITY (MG)	43

MULE CREEK STATE PRISON **Calibration** FILE:

WATER YEAR 2017 WATER BALANCE CALIBRATION - 1-in-100 YEAR TYPE HYDROLOGIC CONDITIONS

2/13/2025

INPUT DATA, CONSTANT

SANITARY FLOW CHARACTERISTICS	
STARTING AVERAGE FLOW (MGD)	0.38
IRRIGATION AREA CHARACTERISTICS	
POST MCIC IRRIGATION AREA TOTAL (AC)	**200**
POST MCIC IRRIGATION FIELDS 1 -4 & 6 AREA (AC)	**157**
POST MCIC IRRIGATION FIELD 7 AREA (AC)	**43**
POST MCIC NEW AREA (AC)	**0**
POST MCIC NEW AREA W/I RESERVOIR (AC)	**0**
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	**1.10**
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	**0.60**

EXISTING STORAGE RESERVOIRS	
CATCHMENT AREA (AC)	**27.0**
WATER SURFACE (AC)	**21.6**
BOTTOM SURFACE (AC)	**9.6**
STORAGE AVAILABLE (MG)	**155**
EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	**0.40**
EXISTING WWTP PROCESS AREAS	
OXIDATION DITCH SURFACE AREA (AC)	**0.28**
COMBINED CLARIFIER SURFACE AREA (AC)	**0.18**
CHLORINE CONTACT BASIN SURFACE AREA (AC)	**0.7**
TOTAL TREATMENT PROCESS SURFACE AREA (AC)	**1.2**

CLIMATOLOGICAL FACTORS	
CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR
DESIGN PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	0.75
MAY-SEP EVAP/AVG EVAP RATIO	1.00
IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05
STORAGE CATCHMENT SOIL RUNOFF COEFF	0.50
STORAGE CATCHMENT RESERVOIR RUNOFF COEFF	1.00

INPUT DATA, MONTHLY VARIABLE

MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
2017 PRECIP, MCSP WWTP (IN)	**41.2**	**5.98**	**3.08**	**3.48**	**8.34**	**8.34**	**8.34**	**3.18**	**0.25**	**0.19**	**0.00**	**0.00**	**0.00**
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING MISC. GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.83	1.02	0.94	1.10	1.14	0.97	0.96	1.13	1.00	0.95	0.97	0.96
TOTAL INFLUENT FLOW RATE WY 2017 (MGD)		**0.35**	**0.36**	**0.39**	**0.53**	**0.53**	**0.54**	**0.42**	**0.41**	**0.40**	**0.37**	**0.38**	**0.37**
ESTIMATED 2017 WY I&I (MG)	**0.6**	**0.000**	**0.000**	**0.006**	**0.150**	**0.152**	**0.164**	**0.041**	**0.031**	**0.020**	**0.000**	**0.000**	**0.000**
1 IN 100 YEAR I&I AND ADWF (MG)		0.40	0.40	0.40	0.53	0.53	0.41	0.42	0.41	0.40	0.38	0.38	0.38

CALCULATIONS

CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		14.5%	7.5%	8.5%	20.3%	20.3%	20.3%	7.7%	0.6%	0.5%	0.0%	0.0%	0.0%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	41.2	5.98	3.08	3.48	8.34	8.34	8.34	3.18	0.25	0.19	0.00	0.00	0.00
EFFECTIVE RAIN FOR PLANTS (IN)	39.1	5.68	2.93	3.31	7.92	7.92	7.92	3.02	0.24	0.18	0.00	0.00	0.00
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (ETo * Weighted Kc)	44	3.22	1.21	1.11	0.45	0.99	2.82	4.12	4.67	6.63	7.48	6.98	4.80
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	41	2.41	0.91	0.83	0.34	0.74	2.12	3.09	4.67	6.63	7.48	6.98	4.80
WWTP / STORAGE RESERVOIR EVAPORATION (IN) (ETo * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
WY 2017 ACTUAL TOTAL INFLUENT FLOW VOLUME, INCLUDES I&I (MG)	***153***	***10.8***	***10.9***	***12.0***	***16.4***	***14.9***	***16.9***	***12.6***	***12.7***	***12.0***	***11.4***	***11.7***	***11.0***
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	3.27	4.20	4.20	4.20	4.20	4.20	4.13	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	7.09	8.23	7.68	5.27
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	8.28	9.61	8.96	6.16
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		30.8	40.9	51.2	66.1	82.6	101.4	115.2	125.3	89.8	39.3	13.4	11.0
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	8.28	9.61	8.96	6.16
ACTUAL EFFLUENT APPLIED TO LAA 7, WY 2017(MG)	**27**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**6.00**	**5.85**	**4.85**	**5.75**	**4.20**
DIFFERENCE BETWEEN MODEL AND REPORTED (%)		0%	0%	0%	0%	0%	0%	0%	94%	-42%	-98%	-56%	-47%
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.28	0.31	0.29	0.21
EFFLUENT IRRIGATION RATE (IN/MONTH)	29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	7.09	8.23	7.68	5.27
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.21	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.53	3.87	4.49	4.19	2.88
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.80	16.50	19.13	17.85	12.26
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		30.77	40.94	51.23	66.12	82.61	101.43	115.19	124.90	81.49	29.72	4.43	4.85
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.80	16.50	19.13	4.43	4.85
ACTUAL EFFLUENT APPLIED TO LAA 1-4& 6, WY 2017(MG)	**62**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.59**	**12.14**	**19.00**	**15.15**	**10.65**
DIFFERENCE BETWEEN MODEL AND REPORTED (%)		0%	0%	0%	0%	0%	0%	0%	-135%	-36%	-1%	71%	54%
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.55	0.62	0.14	0.16
EFFLUENT IRRIGATION RATE (IN/MONTH)	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.53	3.87	4.49	1.04	1.14
DESIGN DISCHARGE TO COWRP													
AVERAGE COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MONTHLY DISCHARGE TO COWRP (MG)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HISTORICAL AVERAGE DISCHARGE TO COWRP (MG)	93.8	8.9	3.4	0.2	2.4	1.1	0.0	0.9	3.9	9.3	15.0	27.7	21.1
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (MG)	114	1.8	1.8	1.8	1.8	1.8	1.8	17.3	17.3	17.3	17.3	17.3	17.3
CDCR/ARSA AGREEMENT LIMITED PRESTON DISCHARGE (ACFT)	350	5.4	5.4	5.4	5.4	5.4	5.4	53.0	53.0	53.0	53.0	53.0	53.0
WY 2017 PRESTON DISCHARGE (MG)	**68**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**31.6**	**32.3**	**4.3**	**0.0**	**0.0**
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		**20.00**	30.03	39.27	49.70	67.71	84.57	102.57	112.56	77.78	27.95	1.68	0.00
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		10.77	10.91	11.96	16.42	14.90	16.87	12.62	-30.03	-45.12	-21.63	-1.68	0.00
UNADJUSTED STORAGE VOLUME (MG)		30.77	40.94	51.23	66.12	82.61	101.43	115.19	82.53	32.67	6.31	0.00	0.00
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		8.0	9.2	10.3	11.9	13.7	15.8	17.3	13.7	8.3	5.4	4.7	4.7
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
APPROXIMATE AREA OF WWTP PROCESSES (AC)		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EVAPORATIVE LOSS FROM STORAGE (MG)	9	0.72	0.25	0.27	0.11	0.26	1.00	1.62	1.67	1.69	1.40	0.00	0.00
PERCOLATION LOSS FROM STORAGE (MG)	32	3.23	3.13	3.23	3.23	2.92	3.23	3.13	3.23	3.13	3.23	0.00	0.00
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	22	2.85	1.51	1.76	4.41	4.61	4.84	1.91	0.14	0.09	0.00	0.00	0.00
PRECIP CAPTURED BY WWTP PROCESS AREAS (MG)	3	0.38	0.19	0.22	0.53	0.53	0.53	0.20	0.02	0.01	0.00	0.00	0.00
STORAGE AT END OF MONTH (MG)		30.03	39.27	49.70	67.71	84.57	102.57	112.56	77.78	27.95	1.68	0.00	0.00
ACTUAL STORAGE AT END OF MONTH WY 2017 AT ADWF 0.38 MGD (MG)		**31.00**	**46.00**	**70.40**	**111.30**	**104.30**	**104.00**	**84.00**	**50.90**	**13.20**	**0.00**	**0.00**	**14.20**

MAXIMUM STORAGE REQUIRED (MG)	112.6
TOTAL AVAILABLE STORAGE (MG)	155.0

SUMMARY

ANNUAL INFLOWS (MG)	
WASTEWATER AND I&I	153
PRECIPITATION INTO WWTP AND RESERVOIR	25
TOTAL INFLOW	**178**

ANNUAL OUTFLOWS (MG)	
EVAPORATION	9
PERCOLATION	32
ON-SITE LAND DISPOSAL	89
DISCHARGE TO PRESTON RESERVOIR	68
TOTAL OUTFLOW	**198**

OVERALL BALANCE (MUST NOT BE NEGATIVE)	
TOTAL UNUSED DISPOSAL CAPACITY (MG)	20
UNUSED LAA CAPACITY (MG)	0
UNUSED COWRP CAPACITY (MG)	68
TOTAL UNUSED STORAGE CAPACITY (MG)	42

Stantec

PROFESSIONAL SERVICES AGREEMENT

This Agreement is made and entered into effective March 17, 2025 (the "Agreement Date") by and between:

"Client"

Name:	Amador Regional Wastewater Authority, A Joint Powers Agency in the State of California		
Address:	18 Main Street, Sutter Creek, CA 95685		
Phone:	(916) 273-6012		
Representative:	Steven Whittlesey, ARSA Engineer	Email:	swhittlesey@hydroscience.com

"Stantec"

Name:	Stantec Consulting Services Inc.		
Address:	101 Providence Mine Road, Suite 202, Nevada City, CA 95959		
Phone:	(530) 913-9197		
Representative:	Gabe Aronow, Principal	Email:	gabe.aronow@stantec.com

Henderson Reservoir Outlet Improvement Project (the "Project"):

Henderson Reservoir, outside Sutter Creek, California

DESCRIPTION OF WORK: Stantec shall render the services described in Attachment "A" (hereinafter called the "Services") in accordance with this Agreement. Stantec may, at its discretion and at any stage, engage subconsultants to perform all or any part of the Services. The Client and Stantec by written amendment to this Agreement may from time to time make changes to the Services. All changed work shall be carried out under this Agreement. The time for completion of the Services shall be adjusted accordingly.

COMPENSATION: Charges for the Services rendered will be made in accordance with the Contract Price indicated in Attachment "A", or, if no Contract Price is indicated, in accordance with Stantec's Schedule of Fees and Disbursements in effect from time to time as the Services are rendered.

Invoices shall be paid by the Client in the currency of the jurisdiction in which the Services are provided without deduction or setoff within 28 days of receipt. Failure to make any payment when due is a material breach of this Agreement and will entitle Stantec, at its option, to suspend or terminate this Agreement and the provision of the Services. Interest will accrue on accounts overdue at the lesser of 1.5 percent per month (18 percent per annum) or the maximum legal rate of interest. The Client will make electronic payment of the invoices, the details of which can be obtained or verified by contacting *ar@stantec.com*.

Unless expressly defined in the scope of work attached to this Agreement, the Services do not include any services related to lawsuits, arbitrations, mediations, government enforcement actions, or freedom of information requests ("FOI"). The Client agrees to compensate Stantec on a time and materials basis at rates two times (2x) those identified in Stantec's current rate table if Stantec is required to respond to a FOI, subpoena, serve as a witness, or prepare for or attend a deposition, examination for discovery, trial, arbitration, or mediation arising out of the Project or related to a legal proceeding to which Stantec is not a named defendant.

REPRESENTATIVES: Each party shall designate in the space provided above a representative who is authorized to act on behalf of that party and receive notices under this Agreement. Such representatives have complete authority to act on behalf of their principals in respect to all matters arising under this Agreement.

NOTICES: All notices, consents, and approvals required to be given hereunder shall be in writing and shall be given to the representatives of each party. All notices required by this Agreement to be given by either party shall be deemed to be properly given and received within two (2) business days if made in writing to the other party by certified mail or email, addressed to the regular business address of such party as identified above.

CLIENT'S RESPONSIBILITIES: The Client shall provide to Stantec in writing, the Client's total requirements in connection with the Project, including the Project budget and time constraints. The Client shall make available to Stantec all relevant information or data pertinent to the Project which is required by Stantec to perform the Services. Stantec shall be entitled to rely upon the accuracy and completeness of all information and data furnished by the Client, including information and data originating with other consultants employed by the Client whether such consultants are engaged at the request of Stantec or otherwise. Where such information or data originates either with the Client or its consultants then Stantec shall not be responsible to the Client for the consequences of any error or omission contained therein.

When required by Stantec, the Client shall engage specialist consultants directly to perform items of work necessary to enable Stantec to carry out the Services. Whether arranged by the Client or Stantec, these services shall be deemed to be provided under direct contracts to the Client unless expressly provided otherwise.

The Client shall give prompt consideration to all documentation related to the Project prepared by Stantec and whenever prompt action is necessary shall inform Stantec of Client's decisions in such reasonable time so as not to delay the schedule for providing the Services.

When applicable, the Client shall arrange and make provision for Stantec's entry to the Project site as well as other public and private property as necessary for Stantec to perform the Services. The Client shall obtain any required approvals, licenses and permits from governmental or other authorities having jurisdiction over the Project so as not to delay Stantec in the performance of the Services.

STANTEC'S RESPONSIBILITIES: Stantec shall furnish the necessary qualified personnel to provide the Services. Stantec represents that it has access to the experience and capability necessary to and agrees to perform the Services with the reasonable skill and diligence required by customarily accepted professional practices and procedures normally provided in the performance of the Services at the time when and the location in which the Services were performed. This undertaking does not imply or guarantee a perfect Project and in the event of failure or partial failure of the product or the Services, Stantec will be liable only for its failure to exercise diligence, reasonable care, and professional skill. This standard of care is the sole and exclusive standard of care that will be applied to measure Stantec's performance. There are no other representations or warranties expressed or implied made by Stantec. In particular, but not by way of limitation, no implied warranty of merchantability or fitness for a particular purpose shall apply to the Services provided by Stantec nor shall Stantec warrant or guarantee economic, market or financial conditions, proforma projections, schedules for public agency approvals, or other factors beyond Stantec's reasonable control. Stantec does not warrant the Services to any third party and the Client shall indemnify and hold harmless Stantec from any demands, claims, suits, or actions of third parties arising out of Stantec's performance of the Services.

In performing the Services under this Agreement, Stantec shall operate as and have the status of an independent contractor and shall not act as or be an employee of the Client.

TERMINATION: Stantec may terminate this Agreement without cause upon thirty (30) days' notice in writing. If either party breaches this Agreement, the non-defaulting party may terminate this Agreement after giving seven (7) days' notice to remedy the breach. On termination of this Agreement, the Client shall forthwith pay Stantec for the Services performed to the date of termination. Non-payment by the Client of Stantec's invoices within 30 days of Stantec rendering same is agreed to constitute a material breach of this Agreement and, upon written notice as prescribed above, the duties, obligations, and responsibilities of Stantec are terminated.

SUSPENSION OF SERVICES: If the project is suspended for more than thirty (30) calendar days in the aggregate, Stantec shall be compensated for services performed and charges incurred prior to receipt of notice to suspend and, upon resumption, an equitable adjustment in fees to accommodate the resulting demobilization and remobilization costs. In addition, there shall be an equitable adjustment in the project schedule based on the delay caused by the suspension. If the Project is suspended for more than ninety (90) days, Stantec may, at its option, terminate this agreement upon giving notice in writing to the Client.

ENVIRONMENTAL: Except as specifically described in this Agreement, Stantec's field investigation, laboratory testing and engineering recommendations will not address or evaluate pollution of soil or pollution of groundwater.

Where the Services include storm water pollution prevention (SWPP), sedimentation or erosion control plans, specifications, procedures or related construction observation or administrative field functions, Client acknowledges that such Services proposed or performed by Stantec are not guaranteed to provide complete SWPP, sedimentation or erosion control, capture all run off or siltation, that any physical works are to be constructed and maintained by the Client's contractor or others and that Stantec has no control over the ultimate effectiveness of any such works or procedures. Except to the extent that there were errors or omissions in the Services provided by Stantec, Client agrees to indemnify and hold Stantec harmless from and against all claims, costs, liabilities, or damages whatsoever arising from any storm water pollution, erosion, sedimentation, or discharge of silt or other deleterious substances into any waterway, wetland or woodland and any resulting charges, fines, legal action, cleanup, or related costs.

In the prosecution of work, Stantec will take reasonable precautions to avoid damage to subterranean structures or utilities. However, it is the responsibility of the Client to provide Stantec with assistance in locating underground structures and utilities in the vicinity of any construction, exploration, or investigation. Stantec shall also rely upon third party sources in order to determine the existence and location of any underground structures and utilities of any kind. The Client acknowledges and agrees that Stantec may rely on such third-party advice, so long as such third party is, in Stantec's opinion, a reasonable source for such information, without any requirement that Stantec shall make an independent evaluation or investigation of such underground structures and utilities. In the event that the information supplied by third parties in incorrect, the Client acknowledges that Stantec shall not be responsible for any damages done to any such underground structures or utilities. If neither party can confirm the location of such structures and utilities, the Client agrees to accept all liabilities, costs, expenses and damages, whether direct, indirect, economic, punitive, incidental, special, exemplary or consequential, associated with the repair, replacement or restoration of any damages to such structures and utilities caused by Stantec or its subcontractor(s) or subconsultant(s) in the performance of the Services and the Client agrees to defend, indemnify and hold Stantec harmless from any such damages.

BUILDING CODES, BYLAWS AND OTHER PUBLIC REGULATIONS: Stantec shall, to the best of its ability, interpret building codes, by-laws, and other public regulations as they apply to the Project and as they are published at the time Services commence. Furthermore, Stantec shall observe and comply with all applicable laws, ordinances, codes, and regulations of government agencies, including federal, state, provincial, municipal, and local governing bodies having jurisdiction over the conduct of the Services ("LAWS"). However, it is expressly acknowledged and agreed by the Client that as the Project progresses such building codes, by-laws, other public regulations, and LAWS may change or the interpretation of any public authority may differ from the interpretation of Stantec, through no fault of Stantec, and any extra costs necessary to conform to such changes or interpretations during or after execution of the Services will be paid by the Client.

Stantec shall continue to provide equal employment opportunity to all qualified persons and to recruit, hire, train, promote and compensate persons in all jobs without regard to race, color, religion, sex, age, disability or national origin or any other basis prohibited by applicable laws.

COST AND SCHEDULE OF CONSTRUCTION WORK: In providing opinions of probable cost and project schedule, it is recognized that neither the Client nor Stantec has control over the costs of labor, equipment, or materials, or over the Contractor's methods of determining prices or time. The opinions of probable cost or project duration are based on Stantec's reasonable professional judgment and experience and do not constitute a warranty, express or implied, that the Contractors' bids, project schedules, or the negotiated price of the Work or schedule will not vary from the Client's budget or schedule or from any opinion of probable cost or project schedule prepared by Stantec. Exact costs and times will be determined only when bids have been received for the Project and when the construction work has been performed and payments finalized.

ADMINISTRATION OF CONSTRUCTION CONTRACTS: When applicable, Stantec shall provide field services during the construction of the Project only to the extent that such Services are included and defined in this Agreement. The performance of the construction contract is not Stantec's responsibility nor are Stantec's field services rendered for the construction contractor's benefit.

It is understood and agreed by the Client and Stantec that only work which has been seen during an examination by Stantec can be said to have been appraised and comments on the balance of any construction work are assumptions only.

When field services are provided by Stantec, the authority for general administration of the Project shall reside with Stantec only to the extent defined in this Agreement. In such case, Stantec shall coordinate the activities of other consultants employed by the Client, only to the extent that Stantec is empowered to do so by such other consultants' contracts with the Client.

Stantec shall not be responsible for any contractor's failure to carry out the work in accordance with the contract documents nor for the acts or omissions of any contractor, subcontractor, any of their agents or employees, or any other persons performing any of the work in connection with the Project. When field services are provided, no acceptance by Stantec of the work or services of a construction contractor or other consultants, whether express or implied, shall relieve such construction contractor or other consultants from their responsibilities to the Client for the proper performance of such work or services and further, Stantec shall not be responsible to the Client or to the construction contractor or to the other consultants for the means, methods, techniques, sequences, procedures and use of equipment of any nature whatsoever, whether reviewed by Stantec or not, which are employed by the construction contractor or the other consultants in executing, designing, or administering any phases of the Project, or for placing into operation any plant or equipment or for safety precautions and programs incidental thereto.

When field services are provided, Stantec will not be designated as the party responsible for the compliance by others on the construction work site with the purposes or requirements of applicable environmental, occupational health and safety, or similar legislation. The Client shall designate a responsible party, other than Stantec, for the coordination and performance of environmental, occupational health and safety activities on the construction work site as required by applicable legislation and associated regulations.

JOBSITE SAFETY: Neither the professional activities of Stantec, nor the presence of Stantec or its employees and subconsultants at a construction site, shall relieve the Client and any other entity of their obligations, duties and responsibilities with respect to job site safety. Subject only to applicable legislation, Stantec and its personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions.

INDEMNITY: The Client releases Stantec from any liability and agrees to defend, indemnify, and hold Stantec harmless from any and all claims, damages, losses, and/or expenses, direct and indirect, or consequential damages, including but not limited to attorney's fees and charges and court and arbitration costs, arising out of, or claimed to arise out of, the performance of the Services, excepting liability arising from the negligence or willful misconduct of Stantec.

LIMITATION OF LIABILITY: It is agreed that, to the fullest extent possible under the applicable law, the total amount of all claims (including any and all costs associated with such claims such as attorney and expert fees and interest) the Client may have against Stantec under this Agreement or arising from the performance or non-performance of the Services under any theory of law, including but not limited to claims for negligence, negligent misrepresentation and breach of contract, shall be strictly limited to the lesser of the fees paid to Stantec for the Services or $500,000. No claim may be brought against Stantec in contract or tort more than two (2) years after the cause of action arose. As the Client's sole and exclusive remedy under this Agreement any claim, demand or suit shall be directed and/or asserted only against Stantec and not against any of Stantec's employees, officers, or directors.

Stantec's liability with respect to any claims arising out of this Agreement shall be absolutely limited to direct damages arising out of the Services and Stantec shall bear no liability whatsoever for any consequential loss, injury or damage incurred by the Client, including but not limited to claims for loss of use, loss of profits and loss of markets.

In no event shall Stantec's obligation to pay damages of any kind exceed its proportionate share of liability for causing such damages.

DOCUMENTS: All documents prepared by Stantec or on behalf of Stantec in connection with the Project are instruments of service for the execution of the Project. Stantec retains the property and copyright in these documents, whether the Project is executed or not. Payment to Stantec of the compensation prescribed in this Agreement shall be a condition precedent to the Client's right to use documentation prepared by Stantec. These documents may not be used for any other purpose without the prior written agreement of Stantec. The Client shall have a permanent non-exclusive, royalty-free license to use any concept, product or process which is patentable or capable of trademark, produced by or resulting from the Services rendered by Stantec in connection with the Project, for the life of the Project. The Client shall not use, infringe upon, or appropriate such concepts, products or processes without the express written agreement of Stantec. In the event Stantec's documents are subsequently reused or modified in any material respect without the prior consent of Stantec, the Client agrees to indemnify Stantec from any claims advanced on account of said reuse or modification.

Any document produced by Stantec in relation to the Services is intended for the sole use of Client. The documents may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion. Any such consent will provide no greater rights to the third party than those held by the Client under the contract and will only be authorized pursuant to the conditions of Stantec's standard form reliance letter.

Stantec cannot guarantee the authenticity, integrity or completeness of data files supplied in electronic format ("Electronic Files"). Client shall release, indemnify, and hold Stantec, its officers, employees, consultants, and agents harmless from any claims or damages arising from the use of Electronic Files. Electronic files will not contain stamps or seals, remain the property of Stantec, are not to be used for any purpose other than that for which they were transmitted, and are not to be retransmitted to a third party without Stantec's written consent.

PROJECT PROMOTION: Where the Client has control or influence over construction signage, press releases and/or other promotional information identifying the project ("Project Promotion"), the Client agrees to include Stantec in such Project Promotion.

FORCE MAJEURE: Any default in the performance of this Agreement caused by any of the following events and without fault or negligence on the part of the defaulting party shall not constitute a breach of contract: labor strikes, riots, war, acts of governmental authorities, unusually severe weather conditions or other natural catastrophe, disease, epidemic or pandemic, or any other cause beyond the reasonable control or contemplation of either party. Nothing herein relieves the Client of its obligation to pay Stantec for services rendered.

GOVERNING LAW: This Agreement shall be governed, construed, and enforced in accordance with the laws of the jurisdiction in which the majority of the Services are performed.

DISPUTE RESOLUTION: If requested in writing by either the Client or Stantec, the Client and Stantec shall attempt to resolve any dispute between them arising out of or in connection with this Agreement by entering into structured non-binding negotiations with the assistance of a mediator on a without prejudice basis. The mediator shall be appointed by agreement of the parties. The Parties agree that any actions under this Agreement will be brought in the appropriate court in the jurisdiction of Governing Law, or elsewhere by mutual agreement. Nothing herein however prevents Stantec from any exercising statutory lien rights or remedies in accordance with legislation where the project site is located.

ATTORNEYS FEES: In the event of a dispute hereunder, the prevailing party is entitled to recover from the other party all costs incurred by the prevailing party in enforcing this Agreement and prosecuting the dispute, including reasonable attorney's and expert's fees, whether incurred through formal legal proceedings or otherwise.

ASSIGNMENT AND SUCCESSORS: The Client shall not, without the prior written consent of Stantec, assign the benefit or in any way transfer the obligations of this Agreement or any part hereof. This Agreement shall inure to the benefit of and be binding upon the parties hereto, and except as otherwise provided herein, upon their executors, administrators, successors, and assigns.

PROTECTION OF PRIVACY LAWS: The parties acknowledge that information relating to an identified or identifiable person ("Personal Information") may be exchanged in the course of this Project pursuant to this Agreement.

The party disclosing Personal Information (the "Disclosing Party") warrants that is has all necessary authorizations and approvals required to process and disclose the Personal Information and to enable the party receiving the Personal Information (the "Receiving Party") to process it in performing the Services. The Disclosing Party will provide the Receiving Party with written notice containing the details of what Personal Information will be provided.

The Receiving Party will comply with any reasonable instruction from the Disclosing Party in respect of such Personal Information and implement appropriate technical and organization measures to protect the Personal Information against unauthorized or unlawful processing and accidental loss, theft, use, disclosure, destruction and/or damage.

The Receiving Party shall be permitted, upon prior written consent of the Disclosing Party, to transfer Personal Information outside the jurisdiction if required for performance of the Services provided that such transfers are in accordance with relevant and applicable requirements under applicable legislation. The Receiving Party shall provide the Disclosing Party with full cooperation and assistance in meeting its obligations under applicable privacy legislation, including in relation to the security of processing, the notification of Personal Information breaches, the notification of requests from individuals and Personal Information protection impact assessments.

On termination of this Agreement, the Receiving Party shall cease processing Personal Information and shall delete and destruct or return to the Disclosing Party (as the Disclosing Party may require) all Personal Information held or processed by the Receiving Party on the Disclosing Party's behalf. It is understood however, that the Receiving Party may need to keep a copy of all Personal Information for legal purposes and therefore it will continue to take reasonable steps to protect the Personal Information as outlined herein and will proceed with the destruction of the Personal Information within a reasonable period of time if there is no longer any legal justification to keep the Personal Information.

Nothing herein relieves either party from their responsibilities for compliance with applicable privacy legislation.

ENTIRE AGREEMENT: This Agreement constitutes the sole and entire agreement between the Client and Stantec relating to the Project and supersedes all prior agreements between them, whether written or oral respecting the subject matter hereof and no other terms, conditions, or warranties, whether express or implied, shall form a part hereof. This Agreement may be amended only by written instrument signed by both the Client and Stantec. All attachments referred to in this Agreement are incorporated herein by this reference; however, in the event of any conflict between attachments and the terms and conditions of this Agreement, the terms and conditions of this Agreement shall take precedence.

SEVERABILITY: If any term, condition, or covenant of this Agreement is held by a court of competent jurisdiction to be invalid, void, or unenforceable, the remaining provisions of this Agreement shall be binding on the Client and Stantec.

CONTRA PROFERENTEM: The parties agree that in the event this Agreement is subject to interpretation or construction by a third party, such third party shall not construe this Agreement or any part of it against either party as the drafter of this Agreement.

BUSINESS PRACTICES: Each Party shall comply with all applicable laws, contractual requirements and mandatory or best practice guidance regarding improper or illegal payments, gifts or gratuities, and will not pay, promise to pay or authorize the payment of any money or anything of value, directly or indirectly, to any person (whether a government official or private individual) or entity for the purpose or illegally or improperly inducing a decision or obtaining or retaining business in connection with this Agreement or the Services.

THE PARTIES EXPRESSLY ACKNOWLEDGE THAT THIS AGREEMENT CONTAINS LIMITATION OF LIABILITY PROVISIONS RESTRICTING RIGHTS FOR THE RECOVERY OF DAMAGES.

The Parties, intending to be legally bound, have made, accepted, and executed this Agreement as of the Agreement Date noted above.

Amador Regional Wastewater Authority, A Joint Powers Agency in the State of California		**Stantec Consulting Services Inc.**	
	_____		Gabe Aronow, Principal
	Print Name and Title		Print Name and Title
Signature	_____	Signature	Gabe Aronow
	_____		_____
	Print Name and Title		Print Name and Title
Signature	_____	Signature	_____

Stantec

PROFESSIONAL SERVICES AGREEMENT
ATTACHMENT "A"

Attached to and forming part of the Agreement BETWEEN:

Amador Regional Wastewater Authority, A Joint Powers Agency in the State of California

(Hereinafter called the "Client")

- and -

Stantec Consulting Services Inc.

(Hereinafter called "Stantec")

EFFECTIVE: March 17, 2025

This Attachment details the Services, Contract Time, Contract Price, Additional Conditions and Additional Attachments forming part of the above-described Agreement.

SERVICES: Stantec shall perform the following Services:

[Click and enter in any format the details you wish to use to express Scope of Services]

(Hereinafter called the "Services")

CONTRACT TIME:

Commencement Date:	March 17, 2025
Estimated Completion Date:	December 31, 2026

CONTRACT PRICE: Subject to the terms below, Client will compensate Stantec as follows:

Time and materials up to $48,720 with rates as presented in the attached scope, Table 1 and the Rate Table for alternative staff.

Where not stated as being included in the fees, project specific subconsultant, contractor, lab and other similar third-party charges will be charged as invoiced to Stantec with a ten percent (10%) markup.

Unless otherwise noted, the fees in this agreement do not include any value added, sales, or other taxes that may be applied by Government on fees for services. Such taxes will be added to all invoices as required.

Where the Services or services conditions change, Stantec shall submit to the Client in a timely manner, documentation of the revisions to Attachment "A" adjusting the Contract Services Time and Price as required.

Unless otherwise specified, charges for Services are based on Stantec's hourly billing rate table ("Rate Table"), attached hereto. The Rate Table is subject to escalation from time to time. At a minimum, effective each January 1 during the term of this Agreement, Stantec's charges for Services shall escalate by either (a) the most current Consumer Price Index year over year percentage increase, not seasonally adjusted, for the preceding July, all items, as published by Statistics Canada (for Projects in Canada) plus 1.0%, or (b) the most current Consumer Price Index for All Urban Consumers (CPI-U) year over year percentage increase, not seasonally adjusted, for the preceding July, as published by the U.S. Bureau of Labor Statistics plus 1.0% (for all other projects).

ADDITIONAL CONDITIONS: The following additional conditions shall be read in conjunction with and constitute part of this Agreement:

See attached scope.

ADDITIONAL ATTACHMENTS:	The following additional attachments shall be read in conjunction with and constitute part of this Agreement: Rate Table
INSURANCE REQUIREMENTS:	Before any services are provided under this agreement, Stantec shall procure, and maintain insurance coverage during the term of this agreement.

Stantec Consulting Services Inc.
101 Providence Mine, Suite 202
Nevada City, CA 95959
Tel: (530) 470-0515

ATTACHMENT A

March 10, 2025
File: 184030495

Mr. Marc Fernandez
Weber Ghio & Associates
384 East St. Charles Street
San Andreas, CA 95249

Reference: Scope for Amador Regional Sanitation Authority Henderson Reservoir Outlet Improvement Sliplining Bid and Engineering Support During Construction

Dear Mr. Fernandez:

Thank you for the reaching out to Stantec to provide continued support to Amador Regional Sanitation Authority (ARSA) to assist with Henderson Reservoir Dam Outlet Improvement Sliplining bid and construction. The existing dam outlet pipe is corroded and must be repaired under direction of the Division of Safety of Dams (DSOD). Stantec provided a study for improvement alternatives in 2016 and completed the design in 2017, including coordination with DSOD. Stantec then supported ARSA in addressing two more DSOD reviews and issued a revised design in 2023. It is understood that there are no additional DSOD or ARSA design comments and that the 2023 stamped and signed design can be bid as is per the ARSA 2025 proposed project schedule. The attached scope will provide engineering technical support during bidding and construction, including development of record drawings.

Please do not hesitate to call with questions.

Sincerely,

Stantec Consulting Services, Inc.

Gabe Aronow, P.E.
Senior Associate
Office: (530) 470-0515
gabe.aronow@stantec.com

Reference: **Scope for Amador Regional Sanitation Authority Henderson Reservoir Outlet Improvement Bid and Engineering Support During Construction**

Scope of Services for

Amador Regional Sanitation Authority

Henderson Reservoir Outlet Improvement Project

March 10, 2025

This scope is to support ARSA implement a sliplining and open-cut repair improvment project for the Henderson Reservoir outlet pipe, which is regulated by the Division of Safety of Dams (DSOD). The outlet pipe is a critical part of the reservoir infrastructure and provides a means of releasing impounded water to downstream facilities, as well as serve a critical safety function in case a rapid draw down of the water level is required.

Task 1: Project Management

Stantec will administer technical staff and resources through bidding and construction in support of Amador Regional Sanitation Authority, including tracking budget, deliverables and schedule and will provide a status report of work completed with monthly billing.

Task 2: Bid Support

Stantec will provide technical support, including responding to RFIs (requests for information) during the project bidding process. It is assumed that there will be no more than 5 RFIs during the bid process and that project advertising, coordination, issuance of addenda (if needed) and bid evaluations will be provided directly by ARSA. It is also assumed that ARSA will provide any coordination required with DSOD. Stantec will attend a virtual pre-bid meeting.

This is a relatively small project and it is assumed that conformed drawings and specifications for construction (100% design documents plus addenda materials generated during the bid process) are not required.

If ARSA would like additional administrative or managerial support during the bid process, or to attend an on-site prebid meeting, additional scope can be provided.

Reference: Scope for Amador Regional Sanitation Authority Henderson Reservoir Outlet Improvement Bid and Engineering Support During Construction

Task 3: Construction Support

Stantec will provide technical support, including responding to RFIs and reviewing technical submittals during the bid and construction periods. Stantec will also attend a virtual pre-construction meeting and provide stamped and signed as-built drawings in pdf format (as-built drawings are not typically stamped, but DSOD requires this). It is assumed that ARSA will be the primary contact and manager through the construction period of the project, including coordination with bidders, the selected contractor and DSOD, and drawing reproduction for the selected contractor. It is also assumed that ARSA will have a qualified construction manager and inspector onsite during construction. This scope assumes 6 RFIs and 6 submittals will be submitted during construction.

Stantec can provide additional bid and construction support, reproduction, management, bid/contractor review services, etcetera. However, it is understood at this time that services will be limited to technical engineering input.

Task 4: Contingency Allowance

This contingency allowance is to allow ARSA to request additional services from Stantec. This may be used to support DSOD site visits requiring the engineer, if needed.

PROJECT SCHEDULE

It is assumed that the ARSA project schedule will hold, with bid support required in late March through April 2025 and construction support required from April to September 2025.

ASSUMPTIONS

The assumptions are included in this scope and summarized below:

- ARSA will coordinate with DSOD.
- Files will be delivered in electronic format. Hard copy reproductions can be added to this scope but are currently assumed to be by ARSA or the Contractor.
- ARSA will provide all required front-end specifications and tender documents necessary to administer and control the project other than the 2023 drawings and technical specifications prepared by Stantec.
- ARSA will provide construction management, field inspection, and material testing services.

Reference: Scope for Amador Regional Sanitation Authority Henderson Reservoir Outlet Improvement Bid and Engineering Support During Construction

FEE ESTIMATE

This scope of work will be conducted on a time and materials basis with a not to exceed amount of $48,720. A cost summary is included in Table 1 below.

Table 1: Fee Estimate Services for ARSA Henderson Reservoir Outlet Repair Bid and Engineering Services During Construction

FEE ESTIMATE - Henderson Dam Outlet Improvements

	Project Manager	Technical Lead	Designer	Admin	Direct Costs
Name	Aronow, Gabe	Ruiz, Albert	Giarta, Rusdi	Herrera, Olivia	
Project Billing Rate	$305	$305	$245	$185	$1
Total Units	26	98	16	8	500
Fee	$7,930	$29,890	$3,920	$1,480	$500
Escalation	$0	$0	$0	$0	$0
Total Fee	$7,930	$23,180	$3,920	$1,480	$500

Project Summary Hours	Labour	Expense	Total
148	$43,220	$500	**$48,720**

Task	Task Name	Start Date	End Date	Units					Hours	Labour	Expense	Total
1	Project Managment	2025-03-20	2025-09-26	10	8		4		22	$6,230	$0	$6,230
2	Bid Support	2025-03-20	2025-04-10	8	20	4			32	$9,520	$0	$9,520
3	Construction Support	2025-07-07	2025-09-26	8	70	12	4	$500	94	$27,470	$500	$27,970
4	Contingency											$5,000

Stantec

SCHEDULE OF BILLING RATES – 2025 (USD)

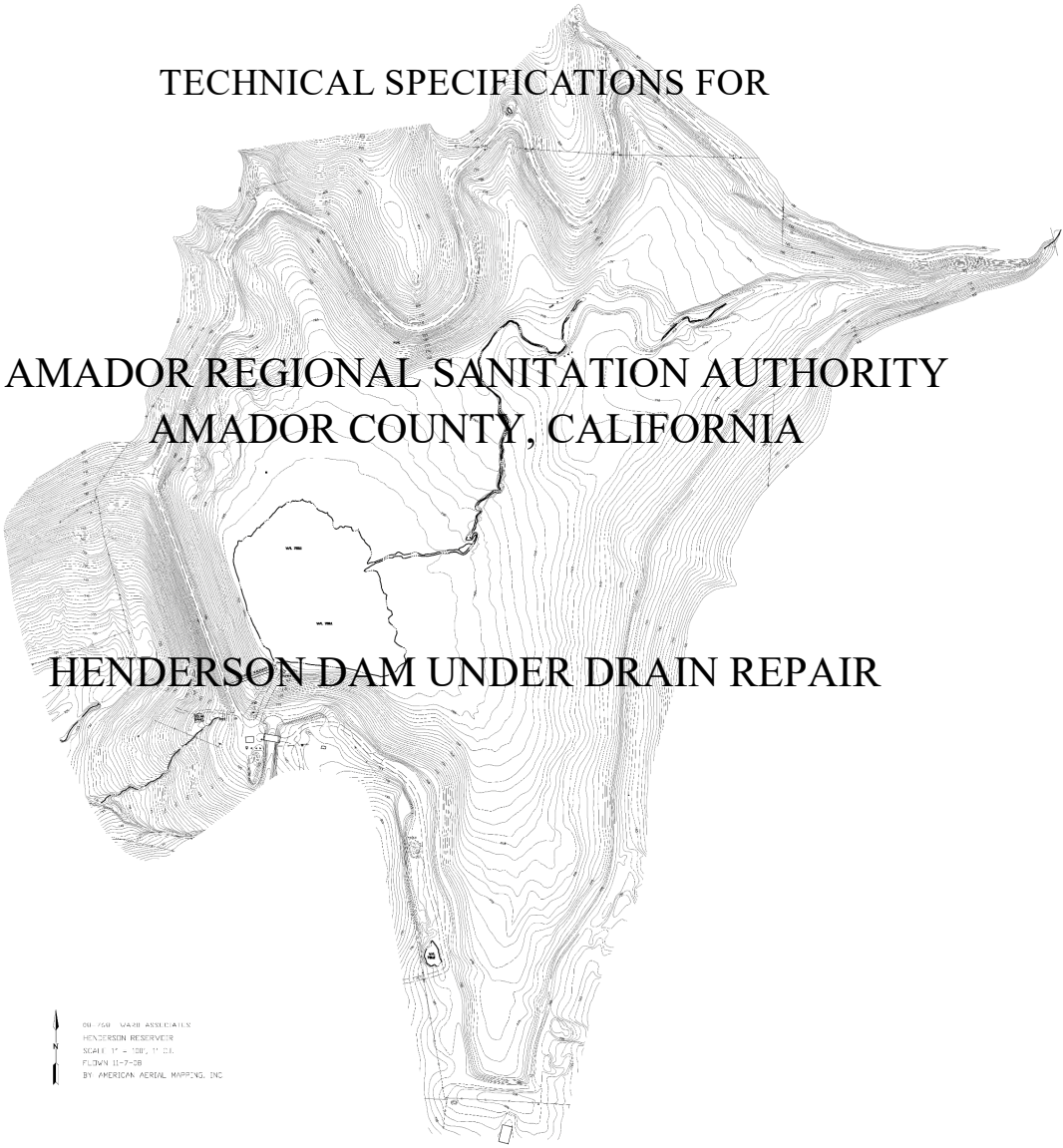
Billing Level	Hourly Rate	Description
		Junior Level position
		❑ Independently carries out assignments of limited scope using standard procedures, methods and techniques
3	$133	❑ Assists senior staff in carrying out more advanced procedures
4	$141	❑ Completed work is reviewed for feasibility and soundness of judgment
5	$158	❑ Graduate from an appropriate post-secondary program or equivalent
		❑ Generally, one to three years' experience
		Fully Qualified Professional Position
		❑ Carries out assignments requiring general familiarity within a broad field of the respective profession
6	$165	❑ Makes decisions by using a combination of standard methods and techniques
7	$179	❑ Actively participates in planning to ensure the achievement of objectives
8	$187	❑ Works independently to interpret information and resolve difficulties
		❑ Graduate from an appropriate post-secondary program, with credentials or equivalent
		❑ Generally, three to six years' experience
		First Level Supervisor or first complete Level of Specialization
		❑ Provides applied professional knowledge and initiative in planning and coordinating work programs
9	$195	❑ Adapts established guidelines as necessary to address unusual issues
10	$204	❑ Decisions accepted as technically accurate, however may on occasion be reviewed for soundness of judgement
11	$219	❑ Graduate from an appropriate post-secondary program, with credentials or equivalent
		❑ Generally, five to nine years' experience
		Highly Specialized Technical Professional or Supervisor of groups of professionals
		❑ Provides multi-discipline knowledge to deliver innovative solutions in related field of expertise
12	$231	❑ Participates in short and long range planning to ensure the achievement of objectives
13	$241	❑ Makes responsible decisions on all matters, including policy recommendations, work methods, and financial controls associated with large expenditures
14	$261	❑ Reviews and evaluates technical work
		❑ Graduate from an appropriate post-secondary program, with credentials or equivalent
		❑ Generally, ten to fifteen years' experience with extensive, broad experience
		Senior Level Consultant or Management
		❑ Recognized as an authority in a specific field with qualifications of significant value
15	$274	❑ Provides multi-discipline knowledge to deliver innovative solutions in related field of expertise
16	$292	❑ Independently conceives programs and problems for investigation
17	$301	❑ Participates in discussions to ensure the achievement of program and/or project objectives
		❑ Makes responsible decisions on expenditures, including large sums or implementation of major programs and/or projects
		❑ Graduate from an appropriate post-secondary program, with credentials or equivalent
		❑ Generally, more than twelve years' experience with extensive experience
		Senior Level Management under review by Vice President or higher
		❑ Recognized as an authority in a specific field with qualifications of significant value
18	$302	❑ Responsible for long range planning within a specific area of practice or region
19	$313	❑ Makes decisions which are far reaching and limited only by objectives and policies of the organization
20	$324	❑ Plans/approves projects requiring significant human resources or capital investment
21	$344	❑ Graduate from an appropriate post-secondary program, with credentials or equivalent
		❑ Generally, fifteen years' experience with extensive professional and management experience

Expert Witness Services carry a 50% premium on labor. Overtime will be charged at 1.5 times the standard billing rate. All labor rates will be subject to annual increase.

TECHNICAL SPECIFICATIONS FOR

AMADOR REGIONAL SANITATION AUTHORITY
AMADOR COUNTY, CALIFORNIA

HENDERSON DAM UNDER DRAIN REPAIR



PROJECT NO. 175578307

March 2023

100% SUBMITTAL

Stantec

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00 11 16 – NOTICE INVITING BIDS

NOTICE IS HEREBY GIVEN that the Board of Directors of the Amador Regional Sanitation Authority ("Authority") invites and will receive sealed Bids up to but not later than **2:00 p.m. on April 10th 2025** at the City of Sutter Creek City Hall, located at 18 Main Street, Sutter Creek, CA 95685, for the furnishing to Authority of all labor, equipment, materials, tools, services, transportation, permits, utilities, and all other items necessary for **2025 HENDERSON DAM UNDER DRAIN REPAIR PROJECT** (the "Project"). At said time, Bids will be publicly opened and read aloud at the Authority Office. Bids received after said time shall be returned unopened. Bids shall be valid for a period of 90 calendar days after the Bid opening date.

The work generally includes, but is not limited to, furnishing all products, labor, equipment, material, transportation, and incidental services to construct the following:

A. Sliplining of existing 20" concrete outlet pipe using 16" DR 17 HDPE, ASTM F714 pipe for approximately 170 LF total and grouting the annulus between the host pipe and the sliplined pipe.

B. Removal and replacement of approximately 95 LF of 20" AC concrete pipe with 16" DR 17 HDPE, ASTM F714 pipe.

C. Connection of the sliplined and open-cut sections of the 16" DR 17 HDPE Pipe, and connection of the 16" DR 17 HDPE pipe to the existing 20" Ductile Iron Pipe at the concrete junction chamber.

D. Completely backfill with cement-grout an existing abandoned-in-place 16" diameter outlet pipe which proceeds beneath approximately the middle of the dam.

E. Field verification of post-installation conditions using a rover with a tilt and pan CCTV camera.

Bids must be submitted on the Authority's Bid Forms. Bidders may obtain a copy of the Contract Documents from the Authority at 18 Main Street, Sutter Creek, CA 95685, (209) 267-5647 for $50 (non-refundable). An additional non-refundable charge of $50 will be required of any bidder who requests the Contract Documents. be mailed within California (costs for out-of-state mailings will be higher). To the extent required by section 20103.7 of the Public Contract Code, upon request from a contractor plan room service, the Authority shall provide an electronic copy of the Contract Documents at no charge to the contractor plan room.

Each Bid shall be accompanied by cash, a certified or cashier's check, or Bid Bond secured from a surety company satisfactory to the Board of Directors, the amount of which shall not be less than ten percent (10%) of the submitted Total Bid Price, made payable to Amador Regional Sanitation Authority as bid security. The bid security shall be provided as a guarantee that within five (5) working days after the Authority provides the successful bidder the Notice of Award, the successful Bidder will enter into a contract and provide the necessary bonds and certificates of insurance. The bid security will be declared forfeited if the successful Bidder fails to comply within said time. No interest will be paid on funds deposited with Authority.

A MANDATORY Pre-Bid Conference is scheduled for April 1, 2025 at 10:00 AM to review the Project's existing conditions at City of Sutter Creek City Hall at 18 Main Street, Sutter Creek, CA 95685. Representatives of the Authority and consulting engineers, if any, will be present.

Questions asked by Bidders at the Pre-Bid Conference not specifically addressed within the Contract Documents shall be answered in writing, and shall be sent to all Bidders present at the Pre-Bid Conference. Bids will not be accepted from any bidder who did not attend the mandatory Pre-Bid Conference.

The successful Bidder will be required to furnish a Faithful Performance Bond and a Labor and Material Payment Bond each in an amount equal to one hundred percent (100%) of the Contract Price. Each bond shall be in the forms set forth herein, shall be secured from a surety company that meets all State of California bonding requirements, as defined in California Code of Civil Procedure Section 995.120, and that is a California admitted surety insurer.

Pursuant to Section 22300 of the Public Contract Code of the State of California, the successful Bidder may substitute certain securities for funds withheld by Authority to ensure its performance under the contract.

Pursuant to Labor Code Section 1773, Authority has obtained the prevailing rate of per diem wages and the prevailing wage rate for holiday and overtime work applicable in Amador County from the Director of the Department of Industrial Relations for each craft, classification, or type of worker needed to execute this contract. A copy of these prevailing wage rates may be obtained via the internet at: www.dir.ca.gov/dlsr/

The successful bidder shall post a copy of the prevailing wage rates at each job site. It shall be mandatory upon the Bidder to whom the Contract is awarded, and upon any subcontractors, to comply with all Labor Code provisions, which include but are not limited to the payment of not less than the said specified prevailing wage rates to all workers employed by them in the execution of the Contract, employment of apprentices, hours of labor and debarment of contractors and subcontractors.

Pursuant to Labor Code sections 1725.5 and 1771.1, all contractors and subcontractors that wish to bid on, be listed in a bid proposal, or enter into a contract to perform public work must be registered with the Department of Industrial Relations. No Bid will be accepted nor any contract entered into without proof of the contractor's and subcontractors' current registration with the Department of Industrial Relations to perform public work. If awarded a contract, the Bidder and its subcontractors, of any tier, shall maintain active registration with the Department of Industrial Relations for the duration of the Project.

This Project is subject to compliance monitoring and enforcement by the Department of Industrial Relations. In bidding on this Project, it shall be the Bidder's sole responsibility to evaluate and include the cost of complying with all labor compliance requirements under this contract and applicable law in its Bid.

Unless otherwise provided in the Instructions for Bidders, each Bidder shall be a licensed contractor pursuant to sections 7000 et seq. of the Business and Professions Code in the following classification(s) throughout the time it submits its Bid and for the duration of the contract: CLASS A LICENSE.

Substitution requests shall be made within 35 calendar days after the award of the contract. Pursuant to Public Contract Code Section 3400(b), the Authority may make findings designating that certain additional materials, methods or services by specific brand or trade name other than those listed in the Standard Specifications be used for the Project. Such findings, if any, as well

as the materials, methods or services and their specific brand or trade names that must be used for the Project may be found in the Special Conditions.

Authority shall award the contract for the Project to the lowest responsive, responsible Bidder as determined by the Authority from the BASE BID ALONE. Authority reserves the right to reject any or all bids or to waive any irregularities or informalities in any bids or in the bidding process.

For further information, contact Steven Whittlesey, ARSA Engineer, at swhittlesey@hydroscience.com or 916-518-9735.

END OF NOTICE INVITING BIDS

00 21 13 – INSTRUCTIONS TO BIDDERS

ARTICLE 1. SECURING DOCUMENTS

Bids must be submitted to the Authority on the Bid Forms which are a part of the Bid Package for the Project. Bid and Contract Documents may be obtained from the Authority at the location(s) and at the time(s) indicated in the Notice Inviting Bids. Prospective bidders are encouraged to telephone in advance to determine the availability of Contract Documents. Any charge for the Contract Documents is stated in the Notice Inviting Bids.

The Authority may also make the Contract Documents available for review at one or more plan rooms, as indicated in the Notice Inviting Bids. Please Note: Prospective Bidders who choose to review the Contract Documents at a plan room must contact the Authority to obtain the required Contract Documents if they decide to submit a bid for the Project.

Addenda, if any, issued during the bid period will be sent only to those contractors who have obtained documents from the Authority. Failure to acknowledge addenda may make a bid nonresponsive and not eligible for award of the contract.

ARTICLE 2. EXAMINATION OF SITE AND CONTRACT DOCUMENTS

At its own expense and prior to submitting its Bid, each Bidder shall visit the site of the proposed work and fully acquaint itself with the conditions relating to the construction and labor required so that the Bidder may fully understand the work, including but not limited to difficulties and restrictions attending the execution of the work under the contract. Each Bidder shall carefully examine the Drawings, and shall read the Specifications, Contract, and all other documents referenced herein. Each Bidder shall also determine the local conditions which may in any way affect the performance of the work, including local tax structure, contractors' licensing requirements, availability of required insurance, the prevailing wages and other relevant cost factors, shall familiarize itself with all federal, state and local laws, ordinances, rules, regulations and codes affecting the performance of the work, including the cost of permits and licenses required for the work, and shall make such surveys and investigations, including investigations of subsurface or latent physical conditions at the site or where work is to be performed as may be required. Bidders are responsible for consulting the standards referenced in the Contract. The failure or omission of any Bidder to receive or examine any contract documents, forms, instruments, addenda, or other documents, or to visit the site and acquaint itself with conditions there existing shall in no way relieve any Bidder from any obligation with respect to its Bid or to the contract and no relief for error or omission will be given except as required under State law. The submission of a Bid shall be taken as conclusive evidence of compliance with this Article.

ARTICLE 3. INTERPRETATION OF DRAWINGS AND DOCUMENTS

Prospective Bidders unclear as to the true meaning of any part of the Drawings, Specifications or other proposed contract documents may submit to the Engineer of the Authority a written request for interpretation. The prospective Bidder submitting the request is responsible for prompt delivery. Interpretation of the Drawings, Specifications or other proposed contract documents will be made only by a written addendum duly issued and a copy of such addenda will be mailed or delivered to each prospective Bidder who has purchased a set of Drawings and Specifications. The Authority will not be responsible for any other explanation or interpretations of the proposed documents. If a Prospective Bidders becomes aware of any errors or omissions in any part of the Contract Documents, it is the obligation of the Prospective Bidder to

promptly bring it to the attention of the Authority.

ARTICLE 4. PRE-BID CONFERENCE

A Mandatory Pre-Bid Conference is scheduled for April, 2025 at 10:00 AM to review the Project's existing conditions at City of Sutter Creek City Hall at 18 Main Street, Sutter Creek, CA 95685. Representatives of the Authority and consulting engineers, if any, will be present. Questions asked by Bidders at the Pre-Bid Conference not specifically addressed within the Contract Documents shall be answered in writing, and shall be sent to all Bidders present at the Pre-Bid Conference**.** Bids will not be accepted from any bidder who did not attend the mandatory Pre-Bid Conference.

ARTICLE 5. ADDENDA

The Authority reserves the right to revise the Contract Documents prior to the Bid opening date. Revisions, if any, shall be made by written Addenda. All Addenda issued by the Authority shall be included in the Bid and made part of the Contract Documents. Pursuant to Public Contract Code Section 4104.5, if the Authority issues an Addendum which includes material changes to the Project less than 72 hours prior to the deadline for submission of Bids, the Authority will extend the deadline for submission of Bids. The Authority may determine, in its sole discretion, whether an Addendum warrants postponement of the Bid submission date. Each prospective Bidder shall provide Authority a name, address, email address, and facsimile number to which Addenda may be sent, as well as a telephone number by which the Authority can contact the Bidder. Copies of Addenda will be furnished by email, facsimile, first class mail, express mail or other proper means of delivery without charge to all parties who have obtained a copy of the Contract Documents and provided such current information. Please Note: Bidders are responsible for ensuring that they have received any and all Addenda. To this end, each Bidder should contact the **ARSA Engineer at 916-518-9735** to verify that it has received all Addenda issued, if any, prior to the Bid opening. The Bidder shall indicate the Addenda received prior to bidding in the space provided in the Bid Form. Failure to indicate all Addenda may be sufficient cause for rejecting the Bid.

ARTICLE 6. ALTERNATE BIDS

If alternate bid items are called for in the Contract Documents, the time required for completion of the alternate bid items has already been factored into the Contract duration and no additional Contract time will be awarded for any of the alternate bid items. The Authority may elect to include one or more of the alternate bid items, or to otherwise remove certain work from the Project scope of work. Accordingly, each bidder must ensure that each bid item contains a proportionate share of profit, overhead, and other costs or expenses which will be incurred by the bidder.

ARTICLE 7. COMPLETION OF BID FORMS

Bids shall only be prepared using copies of the Bid Forms which are included in the Contract Documents. The use of substitute Bid Forms other than clear and correct photocopies of those provided by the Authority will not be permitted. Bids shall be executed by an authorized signatory as described in these Instructions to Bidders. In addition, Bidders shall fill in all blank spaces (including inserting “N/A” where applicable), and initial all interlineations, alterations, or erasures to the Bid Forms. Bidders shall neither delete, modify, nor supplement the printed matter on the Bid Forms nor make substitutions thereon. USE OF BLACK OR BLUE INK,

INDELIBLE PENCIL, OR A TYPEWRITER IS REQUIRED. Deviations in the Bid Forms may result in the Bid being deemed non-responsive.

ARTICLE 8. MODIFICATIONS OF BIDS

Each Bidder shall submit its Bid in strict conformity with the requirements of the Contract Documents. Unauthorized additions, modifications, revisions, conditions, limitations, exclusions or provisions attached to a Bid may render it non-responsive and may cause its rejection. Bidders shall not delete, modify, or supplement the printed matter on the Bid Forms, or make substitutions thereon. Oral, telephonic and electronic modifications will not be considered.

ARTICLE 9. SUBCONTRACTORS

Bidder shall set forth the name, address of the place of business, and contractor license number of each subcontractor who will perform work, labor, furnish materials or render services to the bidder on said contract and each subcontractor licensed by the State of California who, under subcontract to bidder, specially fabricates and installs a portion of the Work described in the Drawings and Specifications in an amount in excess of one half of one percent (0.5%) of the total bid price, and shall indicate the portion of the work to be done by such subcontractor in accordance with Public Contract Code Section 4104.

ARTICLE 10. LICENSING REQUIREMENTS

Pursuant to Business and Professions Code Section 7028.15 and Public Contract Code Section 3300, all bidders must possess proper licenses for performance of this Contract. Subcontractors must possess the appropriate licenses for each specialty subcontracted. Pursuant to Business and Professions Code Section 7028.5, the Authority shall consider any bid submitted by a contractor not currently licensed in accordance with state law and pursuant to the requirements found in the Contract Documents to be nonresponsive, and the Authority shall reject the Bid. The Authority shall have the right to request, and Bidders shall provide within ten (10) calendar days, evidence satisfactory to the Authority of all valid license(s) currently held by that Bidder and each of the Bidder's subcontractors, before awarding the Contract.

Notwithstanding anything contained herein, if the Work involves federal funds, the Contractor shall be properly licensed by the time the Contract is awarded, pursuant to the provisions of Public Contract Code section 20103.5.

ARTICLE 11. BID GUARANTEE (BOND)

Each bid shall be accompanied by: (a) cash; (b) a certified or cashier's check made payable to Amador Regional Sanitation Authority; or (c) a Bid Bond secured from a surety company satisfactory to the Board of Directors, the amount of which shall not be less than ten percent (10%) of the Total Bid Price, made payable to Amador Regional Sanitation Authority as bid security. Personal sureties and unregistered surety companies are unacceptable. The surety insurer shall be California admitted surety insurer, as defined in Code of Civil Procedure Section 995.120. The bid security shall be provided as a guarantee that within ten (10) working days after the Authority provides the successful bidder the Notice of Award, the successful bidder will enter into a contract and provide the necessary bonds and certificates of insurance. The bid security will be declared forfeited if the successful bidder fails to comply within said time, and Authority may enter into a contract with the next lowest responsive responsible bidder, or may

call for new bids. No interest shall be paid on funds deposited with the Authority. Authority will return the security accompanying the bids of all unsuccessful bidders no later than 60 calendar days after award of the contract.

ARTICLE 12. IRAN CONTRACTING ACT OF 2010

In accordance with Public Contract Code Section 2200 *et seq*., the Authority requires that any person that submits a bid or proposal or otherwise proposes to enter into or renew a contract with the Authority with respect to goods or services of one million dollars ($1,000,000) or more, certify at the time the bid is submitted or the contract is renewed, that the person is not identified on a list created pursuant to subdivision (b) of Public Contract Code Section 2203 as a person engaging in investment activities in Iran described in subdivision (a) of Public Contract Code Section 2202.5, or as a person described in subdivision (b) of Public Contract Code Section 2202.5, as applicable.

The form of such Iran Contracting Certificate is included with the bid package and must be signed and dated under penalty of perjury.

ARTICLE 13. NONCOLLUSION DECLARATION

Bidders on all public works contracts are required to submit a declaration of noncollusion with their bid. This form is included with the bid package and must be signed and dated under penalty of perjury.

ARTICLE 14. PUBLIC WORKS CONTRACTOR REGISTRATION CERTIFICATION

Pursuant to Labor Code sections 1725.5 and 1771.1, all contractors and subcontractors that wish to bid on, be listed in a bid proposal, or enter into a contract to perform public work must be registered with the Department of Industrial Relations. No bid will be accepted nor any contract entered into without proof of the contractor's and subcontractors' current registration with the Department of Industrial Relations to perform public work. If awarded a contract, the bidder and its subcontractors, of any tier, shall maintain active registration with the Department of Industrial Relations for the duration of the Project. To this end, Bidder shall sign and submit with its Bid the Public Works Contractor Registration Certification on the form provided, attesting to the facts contained therein. Failure to submit this form may render the bid non-responsive. In addition, each Bidder shall provide the registration number for each listed subcontractor in the space provided in the Designation of Subcontractors form.

ARTICLE 15. BIDDER INFORMATION AND EXPERIENCE FORM

Each Bidder shall complete the questionnaire provided herein and shall submit the questionnaire along with its Bid. Failure to provide all information requested within the questionnaire along with the Bid may cause the bid to be rejected as non-responsive. The Authority reserves the right to reject any Bid if an investigation of the information submitted does not satisfy the Engineer that the Bidder is qualified to properly carry out the terms of the contract.

ARTICLE 16. WORKERS' COMPENSATION CERTIFICATION

In accordance with the provisions of Labor Code Section 3700, Contractor shall secure the payment of compensation to its employees. Contractor shall sign and file with the Authority the

following certificate prior to performing the work under this Contract:

> I am aware of the provisions of Section 3700 of the Labor Code, which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract.

The form of such Workers' Compensation Certificate is included as part of this document.

ARTICLE 17. SIGNING OF BIDS

All Bids submitted shall be executed by the Bidder or its authorized representative. Bidders may be asked to provide evidence in the form of an authenticated resolution of its Board of Directors or a Power of Attorney evidencing the capacity of the person signing the Bid to bind the Bidder to each Bid and to any Contract arising therefrom.

If a Bidder is a joint venture or partnership, it may be asked to submit an authenticated Power of Attorney executed by each joint venturer or partner appointing and designating one of the joint venturers or partners as a management sponsor to execute the Bid on behalf of Bidder. Only that joint venturer or partner shall execute the Bid. The Power of Attorney shall also: (1) authorize that particular joint venturer or partner to act for and bind Bidder in all matters relating to the Bid; and (2) provide that each venturer or partner shall be jointly and severally liable for any and all of the duties and obligations of Bidder assumed under the Bid and under any Contract arising therefrom. The Bid shall be executed by the designated joint venturer or partner on behalf of the joint venture or partnership in its legal name.

ARTICLE 18. SUBMISSION OF SEALED BIDS

Once the Bid and supporting documents have been completed and signed as set forth herein, they shall be placed, along with the Bid Guarantee and other required materials, in a sealed envelope, addressed and delivered or mailed, postage prepaid, to the Engineering Department of the Authority before the time and day set for the receipt of bids. The envelope shall bear the title of the work and the name of the bidder. No oral or telephonic bids will be considered. No forms transmitted via the internet, e-mail, facsimile, or any other electronic means will be considered unless specifically authorized by the Authority as provided herein. Bids received after the time and day set for the receipt of bids shall be returned to the bidder unopened. The envelope shall also contain the following in the lower left-hand corner thereof:

Bid of _____ (Bidder's Name) _____
for the 2025 HENDERSON DAM UNDER DRAIN REPAIR

Only where expressly permitted in the Notice Inviting Bids may bidders submit their bids via electronic transmission pursuant to Public Contract Code sections 1600 and 1601. Any acceptable method(s) of electronic transmission shall be stated in the Notice Inviting Bids. Authority may reject any bid not strictly complying with Authority's designated methods for delivery.

ARTICLE 19. OPENING OF BIDS

At the time and place set for the opening and reading of bids, or any time thereafter, each and every bid received prior to the time and day set for the receipt of bids will be publicly opened

and read. The Authority will leave unopened any Bid received after the specified date and time, and any such unopened Bid will be returned to the bidder. It is the bidder's sole responsibility to ensure that its Bid is received as specified. Bids may be submitted earlier than the date(s) and time(s) indicated.

The public reading of each bid will include the following information:

A. The name and business location of the bidder.

B. The nature and amount of the bid security furnished by bidder.

C. The bid amount.

Bidders or their representatives and other interested persons may be present at the opening of the bids. The Authority may, in its sole discretion, elect to postpone the opening of the submitted Bids. The Authority reserves the right to reject any or all Bids and to waive any informality or irregularity in any Bid.

ARTICLE 20. WITHDRAWAL OF BID

Any bid may be withdrawn either personally or by written request, incurring no penalty, at any time prior to the scheduled closing time for receipt of bids. Requests to withdraw bids shall be worded so as not to reveal the amount of the original bid. Withdrawn bids may be resubmitted until the time and day set for the receipt of bids, provided that resubmitted bids are in conformance with the instructions herein.

Bids may be withdrawn after bid opening only by providing written notice to Authority within five (5) working days of the bid opening and in compliance with Public Contract Code Section 5100 *et seq*., or as otherwise may be allowed with the consent of the Authority.

ARTICLE 21. BIDDERS INTERESTED IN MORE THAN ONE BID

No Bidder shall be allowed to make, file or be interested in more than one bid for the same work unless alternate bids are specifically called for. A person, firm or corporation that has submitted a sub-proposal to a Bidder, or that has quoted prices of materials to a Bidder, is not thereby disqualified from submitting a sub-proposal or quoting prices to other bidders. No person, firm, corporation, or other entity may submit a sub-proposal to a Bidder, or quote prices of materials to a Bidder, when also submitting a prime Bid on the same Project.

ARTICLE 22. SUBSTITUTION OF SECURITY

The Contract Documents call for monthly progress payments based upon the percentage of the Work completed. The Authority will retain a percentage of each progress payment as provided by the Contract Documents. At the request and expense of the successful Bidder, the Authority will substitute securities for the amount so retained in accordance with Public Contract Code Section 22300.

ARTICLE 23. PREVAILING WAGES

The Authority has obtained from the Director of the Department of Industrial Relations the general prevailing rate of per diem wages in the locality in which this work is to be performed for

each craft or type of worker needed to execute the Contract. These rates may be obtained online at http://www.dir.ca.gov. Bidders are advised that a copy of these rates must be posted by the successful Bidder at the job site(s).

ARTICLE 24. DEBARMENT OF CONTRACTORS AND SUBCONTRACTORS

In accordance with the provisions of the Labor Code, contractors or subcontractors may not perform work on a public works project with a subcontractor who is ineligible to perform work on a public project pursuant to Labor Code Sections 1777.1 or 1777.7. Any contract on a public works project entered into between a contractor and a debarred subcontractor is void as a matter of law. A debarred subcontractor may not receive any public money for performing work as a subcontractor on a public works contract. Any public money that is paid to a debarred subcontractor by the Contractor for the Project shall be returned to the Authority. The Contractor shall be responsible for the payment of wages to workers of a debarred subcontractor who has been allowed to work on the Project.

ARTICLE 25. INSURANCE REQUIREMENTS

Prior to commencing work, the successful bidder shall purchase and maintain insurance as set forth in the General Conditions.

ARTICLE 26. PERFORMANCE BOND AND PAYMENT BOND REQUIREMENTS

The successful bidder will be required to furnish a Labor and Material Payment Bond and a Faithful Performance Bond each in an amount equal to one hundred percent (100%) of the contract price. Each bond shall be secured from a surety company that meets all State of California bonding requirements, as defined in California Code of Civil Procedure Section 995.120 and is admitted by the State of California. Each bond shall be accompanied, upon the request of Authority, with all documents required by California Code of Civil Procedure Section 995.660 to the extent required by law. All bonding and insurance requirements shall be completed and submitted to Authority within ten (10) working days from the date the Authority provides the successful bidder with the Notice of Award.

ARTICLE 27. SALES AND OTHER APPLICABLE TAXES, PERMITS, LICENSES AND FEES

Contractor and its subcontractors performing work under this Contract will be required to pay California sales tax and other applicable taxes, and to pay for permits, licenses and fees required by the agencies with authority in the jurisdiction in which the Work will be located, unless otherwise expressly provided by the Contract Documents.

ARTICLE 28. PERMIT AND INSPECTION FEE ALLOWANCE

Notwithstanding anything contained herein, the Bid Form contains an allowance for the Contractor's cost of acquiring traffic control permits and for construction inspection fees that may be charged to the Contractor by the Agency of Jurisdiction. The allowance is included within the Bid Form to eliminate the need by bidders to research or estimate the costs of traffic control permits and construction inspection fees prior to submitting a bid. The allowance is specifically intended to account for the costs of traffic control permits and construction inspection fees charged by the local Agency of Jurisdiction only. No other costs payable by Contractor to the Agency of Jurisdiction are included within the allowance.

ARTICLE 29. FILING OF BID PROTESTS

Bidders may file a "protest" of a Bid with the Authority's General Manager. In order for a Bidder's protest to be considered valid, the protest must:

A. Be filed in writing within five (5) calendar days after the bid opening date;

B. Clearly identify the specific irregularity or accusation;

C. Clearly identify the specific Authority staff determination or recommendation being protested;

D. Specify in detail the grounds for protest and the facts supporting the protest; and

E. Include all relevant, supporting documentation with the protest at time of filing.

If the protest does not comply with each of these requirements, the Authority may reject the protest without further review.

If the protest is timely and complies with the above requirements, the Authority's General Manager, or other designated Authority staff member, shall review the protest, any response from the challenged Bidder(s), and all other relevant information. The General Manager will provide a written decision to the protestor.

The procedure and time limits set forth in this Article are mandatory and are the sole and exclusive remedy in the event of a Bid protest. Failure to comply with these procedures shall constitute a failure to exhaust administrative remedies and a waiver of any right to further pursue the Bid protest, including filing a Government Code Claim or legal proceedings.

ARTICLE 30. BASIS OF AWARD; BALANCED BID

The Authority shall award the Contract to the lowest responsible Bidder submitting a responsive Bid. The lowest Bid will be determined on the basis of the Total Bid Price.

The Authority may reject any Bid which, in its opinion when compared to other Bids received or to the Authority's internal estimates, does not accurately reflect the cost to perform the Work. The Authority may reject as non-responsive any Bid which unevenly weights or allocates costs, including but not limited to overhead and profit to one or more particular bid items.

ARTICLE 31. AWARD PROCESS

Once all Bids are opened and reviewed to determine the lowest responsive and responsible Bidder, the Board of Directors may award the contract. The apparent successful Bidder should begin to prepare the following documents: (1) the Performance Bond; (2) the Payment Bond; and (3) the required insurance certificates and endorsements. Once the Authority notifies the Bidder of the award, the Bidder will have ten (10) working days from the date of this notification to execute the Contract and supply the Authority with all of the required documents and certifications. Regardless of whether the Bidder supplies the required documents and certifications in a timely manner, the Contract time will begin to run twenty (20) working days from the date of the notification. Once the Authority receives all of the properly drafted and executed documents and certifications from the Bidder, the Authority shall issue a Notice to

Proceed to that Bidder.

ARTICLE 32. EXECUTION OF CONTRACT

As required herein the Bidder to whom an award is made shall execute the Contract in the amount determined by the Contract Documents. The Authority may require appropriate evidence that the persons executing the Contract are duly empowered to do so. The Contract and bond forms to be executed by the successful Bidder are included within these Specifications and shall not be detached.

ARTICLE 33. QUESTIONS

Questions regarding this Notice Inviting Bids may be directed to Steven Whittlesey, ARSA Engineer, at 916-518-9735 or email at swhittlesey@hydroscience.com. No other members of the Authority's staff or Board of Directors should be contacted about this procurement during the bidding process. Any and all inquiries and comments regarding this Bid must be communicated in writing, unless otherwise instructed by the Authority. The Authority may, in its sole discretion, disqualify any Bidder who engages in any prohibited communications.

00 41 43 – BID FORMS

1.1 Bid.

Bids will be received at the main offices of the Amador Regional Sanitation Authority, 18 Main Street, Sutter Creek, CA 95685, until **2:00 P.M on April 10th, 2025.**

NAME OF BIDDER: _____

To the Board of Directors
of the Amador Regional Sanitation Authority
18 Main Street
Sutter Creek, CA 95685

The undersigned hereby declare that we have carefully examined the location of the proposed Work, and have read and examined the Contract Documents, including all plans, specifications, and all addenda, if any for the following Project:

2025 HENDERSON DAM UNDER DRAIN REPAIR

We hereby propose to furnish all labor, materials, equipment, tools, transportation, and services, and to discharge all duties and obligations necessary and required to perform and complete the Project, as described and in strict conformity with the Drawings, and these Specifications for TOTAL BID PRICE indicated herein.

The undersigned acknowledges receipt, understanding, and full consideration of the following addenda to the Contract Documents:

Addenda No. _____

1. Attached is the required Bid Guarantee in the amount of not less than 10% of the Total Bid Price.
2. Attached is the completed Designation of Subcontractors form.
3. Attached is the fully executed Noncollusion Declaration form.
4. Attached is the completed Iran Contracting Act Certification form.
5. Attached is the completed Public Works Contractor Registration Certification form.
6. Attached is the completed Contractor's Certificate Regarding Workers' Compensation form.
7. Attached is the completed Bidder Information and Experience form.

A. BID SCHEDULE

NO.	ITEM DESCRIPTION	UNIT OF MEASURE	EST. QTY.	UNIT PRICE	ITEM COST
1.	Mobilization, Bonds, Permits,and Demobilization	LS	1		
2.	Sliplining for Henderson Dam Outlet Pipe	LS	1		
3.	Open-Cut Installation from Slipline Section to Concrete Junction Chamber	LS	1		
4.	Open-Cut Installation from Concrete Junction Chamber to Flume	LS	1		
5.	Backfilling of Existing Abandoned-In-Place Concrete Pipe	LS	1		
6.	(Provisional) GPR of Existing Abandoned-in-Place Concrete Pipe	LS	1		

The costs for any Work shown or required in the Contract Documents, but not specifically identified as a line item are to be included in the related line items and no additional compensation shall be due to Contractor for the performance of the Work.

In case of discrepancy between the Unit Price and the Item Cost set forth for a unit basis item, the unit price shall prevail and shall be utilized as the basis for determining the lowest responsive, responsible Bidder. However, if the amount set forth as a unit price is ambiguous, unintelligible or uncertain for any cause, or is omitted, or is the same amount as the entry in the “Item Cost” column, then the amount set forth in the “Item Cost” column for the item shall prevail and shall be divided by the estimated quantity for the item and the price thus obtained shall be the Unit Price.

For purposes of evaluating Bids, the Authority will correct any apparent errors in the extension of unit prices and any apparent errors in the addition of lump sum and extended prices.

The estimated quantities for Unit Price items are for purposes of comparing Bids only and the Authority makes no representation that the actual quantities of work performed will not vary from the estimates. Final payment shall be determined by the Engineer from measured quantities of work performed based upon the Unit Price.

B. TOTAL BID PRICE:

TOTAL BID PRICE BASED ON BID SCHEDULE TOTAL OF UNIT PRICES
FOR 2025 HENDERSON DAM UNDER DRAIN REPAIR

$_____
Total Bid Price in Numbers

$_____
Total Bid Price in Written Form

In case of discrepancy between the written price and the numerical price, the written price shall prevail.

The undersigned agrees that this Bid Form constitutes a firm offer to the Authority which cannot be withdrawn for the number of calendar days indicated in the Notice Inviting Bids from and after the Bid opening, or until a Contract for the Work is fully executed by the Authority and a third party, whichever is earlier.

The successful bidder hereby agrees to sign the contract and furnish the necessary bonds and certificates of insurance within ten (10) working days after the Authority provides the successful bidder with the Notice of Award.

Upon receipt of the signed contract and other required documents, the contract will be executed by the Authority, after which the Authority will prepare a letter giving Contractor Notice to Proceed. The official starting date shall be the date of the Notice to Proceed, unless otherwise specified. The undersigned agrees to begin the Work within ten (10) working days of the date of the Notice to Proceed, unless otherwise specified.

The undersigned has examined the location of the proposed work and is familiar with the Drawings and Specifications and the local conditions at the place where work is to be done.

If awarded the contract, the undersigned agrees that there shall be paid by the undersigned and by all subcontractors to all laborers, workers and mechanics employed in the execution of such contract no less than the prevailing wage rate within San Luis Obispo County for each craft, classification, or type of worker needed to complete the Work contemplated by this contract as established by the Director of the Department of Industrial Relations. A copy of the prevailing rate of per diem wages are on file at the Authority's Administration Office and shall be made available to interested parties upon request.

Enclosed find cash, bidder's bond, or cashier's or certified check No. _____ from the _____ Bank in the amount of _____, which is not less than ten percent (10%) of this bid, payable to Amador Regional Sanitation Authority as bid security and which is given as a guarantee that the undersigned will enter into a contract and provide the necessary bonds and certificates of insurance if awarded the Work.

The bidder furthermore agrees that in case of bidder's default in executing said contract and furnishing required bonds and certificates of insurance, the cash, bidder's bond, or cashier's or certified check accompanying this proposal and the money payable thereon shall become and shall remain the property of the Amador Regional Sanitation Authority.

Bidder is an individual _____, or corporation _____, or partnership _____, organized under the laws of the State of _____.

Bidder confirms license(s) required by California State Contractor's License Law for the performance of the subject project are in full effect and proper order. The following are the Bidder's applicable license number(s), with their expiration date(s) and class of license(s):

_____

_____

_____

If the Bidder is a joint venture, each member of the joint venture must include the required licensing information.

Sureties that will furnish the Faithful Performance Bond and the Labor and Material Payment Bond, in the form specified herein, in an amount equal to one hundred percent (100%) of the contract price within ten (10) working days from the date the Authority provides the successful bidder the Notice of Award. Sureties must meet all of the State of California bonding requirements, as defined in California Code of Civil Procedure Section 995.120 and must be authorized by the State of California.

The insurance company or companies to provide the insurance required in the contract documents must have a Financial Strength Rating of not less than "A-" and a Financial Size Category of not less than "Class VII" according to the latest Best Key Rating Guide. At the sole discretion of the Authority, the Authority may waive the Financial Strength Rating and the Financial Size Category classifications for Workers' Compensation insurance.

(signatures continued on next page)

I hereby certify under penalty of perjury under the laws of the State of California that all of the information submitted in connection with this Bid and all of the representations made herein are true and correct.

Executed at _____, on this ____ day of _____, _____.

(Bidders Name – Print or Type)

_____
(Name and Title)

(Corporate Seal)

_____
(Signature)

Names of individual members of firm or names and titles of all officers of corporation and their addresses are listed below:

Name_____ Title_____

Complete Address_____

Phone_____ FAX_____

Name_____ Title_____

Complete Address_____

Phone_____ FAX_____

Name_____ Title_____

Complete Address_____

Phone_____ FAX_____

Name_____ Title_____

Complete Address_____

Phone_____ FAX_____

1.2 Bid Bond

[Note: Not required when other form of Bidder's Security, e.g. cash, certified check or cashier's check, accompanies bid.]

The makers of this bond are, _____, as Principal, and _____, as Surety and are held and firmly bound unto the Amador Regional Sanitation Authority, hereinafter called the Authority, in the penal sum of TEN PERCENT (10%) OF THE TOTAL BID PRICE of the Principal submitted to the Amador Regional Sanitation Authority for the work described below, for the payment of which sum in lawful money of the United States, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted the accompanying bid dated _____, 20 ____, for 2025 HENDERSON DAM UNDER DRAIN REPAIR.

If the Principal does not withdraw its Bid within the time specified in the Contract Documents; and if the Principal is awarded the Contract and provides all documents to the Authority as required by the Contract Documents; then this obligation shall be null and void. Otherwise, this bond will remain in full force and effect.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract Documents shall in affect its obligation under this bond, and Surety does hereby waive notice of any such changes.

In the event a lawsuit is brought upon this bond by the Authority and judgment is recovered, the Surety shall pay all litigation expenses incurred by the Authority in such suit, including reasonable attorneys' fees, court costs, expert witness fees and expenses.

IN WITNESS WHEREOF, the above-bound parties have executed this instrument under their several seals this _____ day of _____, 20____, the name and corporate seal of each corporation.

(Corporate Seal)

_____
Contractor/ Principal

By_____

Title_____

_____
Surety

(Corporate Seal)

By _____
Attorney-in-Fact

(Attach Attorney-in-Fact Certificate)

Title_____

Notary Acknowledgment

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF _____

On _____, 20___, before me, _____, Notary Public, personally

appeared _____, who proved to me on the basis of satisfactory
Name(s) of Signer(s)

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

_____
Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

CAPACITY CLAIMED BY SIGNER

- ☐ Individual
- ☐ Corporate Officer

_____
Title(s)

- ☐ Partner(s) ☐ Limited ☐ General
- ☐ Attorney-In-Fact
- ☐ Trustee(s)
- ☐ Guardian/Conservator
- ☐ Other:

Signer is representing:
Name Of Person(s) Or Entity(ies)

_____

_____

DESCRIPTION OF ATTACHED DOCUMENT

_____
Title or Type of Document

_____
Number of Pages

_____
Date of Document

_____
Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for Contractor/Principal.

Notary Acknowledgment

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF _____

On _____, 20___, before me, _____, Notary Public, personally

appeared _____, who proved to me on the basis of satisfactory

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

_____

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

CAPACITY CLAIMED BY SIGNER

- ☐ Individual
- ☐ Corporate Officer

_____
Title(s)

- ☐ Partner(s) ☐ Limited ☐ General
- ☐ Attorney-In-Fact
- ☐ Trustee(s)
- ☐ Guardian/Conservator
- ☐ Other:

Signer is representing:
Name Of Person(s) Or Entity(ies)

_____

_____

DESCRIPTION OF ATTACHED DOCUMENT

_____
Title or Type of Document

_____
Number of Pages

_____
Date of Document

_____
Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for the Attorney-in-Fact. The Power-of-Attorney to local representatives of the bonding company must also be attached.

END OF BID BOND

1.3 List of Subcontractors

In compliance with the Subletting and Subcontracting Fair Practices Act Chapter 4 (commencing at Section 4100), Part 1, Division 2 of the Public Contract Code of the State of California and any amendments thereof, Bidder shall set forth below: (a) the name and the location of the place of business, (b) the California contractor license number, (c) the DIR public works contractor registration number, and (d) the portion of the work which will be done by each subcontractor who will perform work or labor or render service to the Bidder in or about the construction of the work or improvement to be performed under this Contract in an amount in excess of one-half of one percent (0.5%) of the Bidder's Total Bid Price. Notwithstanding the foregoing, if the work involves the construction of streets and highways, then the Bidder shall list each subcontractor who will perform work or labor or render service to the Bidder in or about the work in an amount in excess of one-half of one percent (0.5%) of the Bidder's Total Bid Price or $10,000, whichever is greater. No additional time shall be granted to provide the below requested information.

If a Bidder fails to specify a subcontractor or if a contractor specifies more than one subcontractor for the same portion of work, then the Bidder shall be deemed to have agreed that it is fully qualified to perform that portion of work and that it shall perform that portion itself.

Work to be done by Subcontractor	Name of Subcontractor	Location of Business	CSLB Contractor License No.	DIR Registration Number	% of Work

Work to be done by Subcontractor	Name of Subcontractor	Location of Business	CSLB Contractor License No.	DIR Registration Number	% of Work

(Attach additional sheets if necessary)

Name of Bidder_____

Signature_____

Name and Title_____

Dated_____

1.4 Bidder Information and Experience Form

ARTICLE 1. INFORMATION ABOUT BIDDER

(Indicate not applicable ("N/A") where appropriate.)

NOTE: Where Bidder is a joint venture, pages shall be duplicated and information provided for all parties to the joint venture.

1.0 Name of Bidder: _____

2.0 Type, if Entity: _____

3.0 Bidder Address: _____

_____

_____

Facsimile Number Telephone Number

_____

Email Address

4.0 How many years has Bidder's organization been in business as a Contractor? _____

5.0 How many years has Bidder's organization been in business under its present name? _____

5.1 Under what other or former names has Bidder's organization operated?_____

6.0 If Bidder's organization is a corporation, answer the following:

6.1 Date of Incorporation: _____

6.2 State of Incorporation: _____

6.3 President's Name: _____

6.4 Vice-President's Name(s): _____

_____

6.5 Secretary's Name: _____

6.6 Treasurer's Name: _____

7.0 If an individual or a partnership, answer the following:

7.1 Date of Organization: _____

7.2 Name and address of all partners (state whether general or limited partnership):

_____

_____

_____

8.0 If other than a corporation or partnership, describe organization and name principals:

_____

_____

9.0 List other states in which Bidder's organization is legally qualified to do business.

_____

_____

_____

10.0 What type of work does the Bidder normally perform with its own forces?

_____

_____

11.0 Has Bidder ever failed to complete any work awarded to it? If so, note when, where, and why:

_____

_____

12.0 Within the last five years, has any officer or partner of Bidder's organization ever been an officer or partner of another organization when it failed to complete a contract? If so, attach a separate sheet of explanation:

_____

_____

13.0 List Trade References:

_____

_____

14.0 List Bank References (Bank and Branch Address):

15.0 Name of Bonding Company and Name and Address of Agent:

[REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK]

ARTICLE 2. LIST OF CURRENT PROJECTS (BACKLOG)

[**Duplicate Page if needed for listing additional current projects.**]

Project	Description of Bidder's Work	Completion Date	Cost of Bidder's Work

ARTICLE 3. LIST OF COMPLETED PROJECTS – LAST THREE YEARS

[**Duplicate Page if needed for listing additional completed projects.**]

Please include only those projects which are similar enough to demonstrate Bidder's ability to perform the required Work.

Project	Description of Bidder's Work	Completion Date	Cost of Bidder's Work

ARTICLE 4. EXPERIENCE AND TECHNICAL QUALIFICATIONS QUESTIONNAIRE

Personnel:

The Bidder shall identify the key personnel to be assigned to this project in a management, construction supervision or engineering capacity.

1. List each person's job title, name and percent of time to be allocated to this project:

_____

_____

_____

2. Summarize each person's specialized education:

_____

_____

_____

3. List each person's years of construction experience relevant to the project:

_____

_____

_____

4. Summarize such experience:

_____

_____

_____

Bidder agrees that personnel named in this Bid will remain on this Project until completion of all relevant Work, unless substituted by personnel of equivalent experience and qualifications approved in advance by the Authority.

Changes Occuring Since Prequalification

If any substantive changes have occurred since Bidder submitted its prequalification package for this Project, Bidder shall list them below. If none are listed, Bidder certifies that no substantive changes have occurred.

_____

_____

_____

_____

_____

_____

Additional Bidder's Statements:

If the Bidder feels that there is additional information which has not been included in the questionnaire above, and which would contribute to the qualification review, it may add that information in a statement here or on an attached sheet, appropriately marked:

_____
_____
_____
_____
_____
_____

ARTICLE 5. VERIFICATION AND EXECUTION

These Bid Forms shall be executed only by a duly authorized official of the Bidder:

I declare under penalty of perjury under the laws of the State of California that the foregoing information is true and correct:

Name of Bidder_____

Signature_____

Name_____

Title_____

Date_____

1.5 Non-Collusion Declaration

The undersigned declares:

I am the _____ of _____, the party making the foregoing Bid.

The Bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The Bid is genuine and not collusive or sham. The Bidder has not directly or indirectly induced or solicited any other Bidder to put in a false or sham bid. The Bidder has not directly or indirectly colluded, conspired, connived, or agreed with any Bidder or anyone else to put in a sham bid, or to refrain from bidding. The Bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the Bid Price of the Bidder or any other Bidder, or to fix any overhead, profit, or cost element of the Bid Price, or of that of any other Bidder. All statements contained in the Bid are true. The Bidder has not, directly or indirectly, submitted his or her Bid Price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose.

Any person executing this declaration on behalf of a Bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the Bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____ [date], at _____ [city], _____ [state].

Name of Bidder_____

Signature_____

Name_____

Title_____

1.6 Iran Contracting Act Certification.
(Public Contract Code section 2200 et seq.)

As required by California Public Contract Code Section 2204, the Contractor certifies subject to penalty for perjury that the option checked below relating to the Contractor's status in regard to the Iran Contracting Act of 2010 (Public Contract Code Section 2200 *et seq*.) is true and correct:

☐ The Contractor is not:

(1) identified on the current list of person and entities engaged in investment activities in Iran prepared by the California Department of General Services in accordance with subdivision (b) of Public Contract Code Section 2203; or

(2) a financial instruction that extends, for 45 days or more, credit in the amount of $20,000,000 or more to any other person or entity identified on the current list of persons and entities engaging in investment activities in Iran prepared by the California Department of General Services in accordance with subdivision (b) of Public Contract Code Section 2203, if that person or entity uses or will use the credit to provide goods or services in the energy sector in Iran.

☐ The Authority has exempted the Contractor from the requirements of the Iran Contracting Act of 2010 after making a public finding that, absent the exemption, the Authority will be unable to obtain the goods and/or services to be provided pursuant to the Contract.

☐ The amount of the Contract payable to the Contractor for the Project does not exceed $1,000,000.

Signature:_____

Printed Name:_____

Title:_____

Firm Name:_____

Date:_____

Note: In accordance with Public Contract Code Section 2205, false certification of this form shall be reported to the California Attorney General and may result in civil penalties equal to the greater of $250,000 or twice the Contract amount, termination of the Contract and/or ineligibility to bid on contracts for three years.

1.7 Public Works Contractor Registration Certification

Pursuant to Labor Code sections 1725.5 and 1771.1, all contractors and subcontractors that wish to bid on, be listed in a bid proposal, or enter into a contract to perform public work must be registered with the Department of Industrial Relations. See http://www.dir.ca.gov/Public-Works/PublicWorks.html for additional information.

No bid will be accepted nor any contract entered into without proof of the contractor's and subcontractors' current registration with the Department of Industrial Relations to perform public work.

Bidder hereby certifies that it is aware of the registration requirements set forth in Labor Code sections 1725.5 and 1771.1 and is currently registered as a contractor with the Department of Industrial Relations.

Name of Bidder:_____

DIR Registration Number:_____

DIR Registration Expiration:_____

Bidder further acknowledges:

1. Bidder shall maintain a current DIR registration for the duration of the project.
2. Bidder shall include the requirements of Labor Code sections 1725.5 and 1771.1 in its contract with subcontractors and ensure that all subcontractors are registered at the time of bid opening and maintain registration status for the duration of the project.
3. Failure to submit this form or comply with any of the above requirements may result in a finding that the bid is non-responsive.

Name of Bidder_____

Signature_____

Name and Title_____

Dated_____

1.8 Contractor's Certificate Regarding Workers' Compensation.

I am aware of the provisions of section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this Contract.

Name of Bidder _____

Signature _____

Name _____

Title _____

Dated _____

00 52 13 – CONTRACT

This CONTRACT, No. _____ is made and entered into this ____ day of _____, _____, by and between Amador Regional Sanitation Authority, sometimes hereinafter called "Authority," and _____, sometimes hereinafter called "Contractor."

WITNESSETH: That the parties hereto have mutually covenanted and agreed, and by these presents do covenant and agree with each other as follows:

a. **SCOPE OF WORK.** The Contractor shall perform all Work within the time stipulated in the Contract, and shall provide all labor, materials, equipment, tools, utility services, and transportation to complete all of the Work required in strict compliance with the Contract Documents as specified in Article 5, below, for the following Project:

2025 HENDERSON DAM UNDER DRAIN REPAIR

The Contractor and its surety shall be liable to the Authority for any damages arising as a result of the Contractor's failure to comply with this obligation.

b. **TIME FOR COMPLETION.** Time is of the essence in the performance of the Work. The Work shall be commenced on the date stated in the Distric's Notice to Proceed. The Contractor shall complete all Work required by the Contract Documents within **Sixty [60]** calendar days from the commencement date stated in the Notice to Proceed. By its signature hereunder, Contractor agrees the time for completion set forth above is adequate and reasonable to complete the Work.

c. **CONTRACT PRICE.** The Authority shall pay to the Contractor as full compensation for the performance of the Contract, subject to any additions or deductions as provided in the Contract Documents, and including all applicable taxes and costs, the sum of _____ Dollars ($_____). Payment shall be made as set forth in the General Conditions.

d. **LIQUIDATED DAMAGES.** In accordance with Government Code section 53069.85, it is agreed that the Contractor will pay the Authority the sum set forth in Section 00 73 13, Article 1.11 for each and every calendar day of delay beyond the time prescribed in the Contract Documents for finishing the Work, as Liquidated Damages and not as a penalty or forfeiture. In the event this is not paid, the Contractor agrees the Authority may deduct that amount from any money due or that may become due the Contractor under the Contract. This Article does not exclude recovery of other damages specified in the Contract Documents.

e. **COMPONENT PARTS OF THE CONTRACT.** The "Contract Documents" include the following:

Notice Inviting Bids
Instructions to Bidders
Bid Form
Bid Bond
Designation of Subcontractors
Information Required of Bidders

Non-Collusion Declaration Form
Iran Contracting Act Certification
Public Works Contractor Registration Certification
Performance Bond
Payment (Labor and Materials) Bond
General Conditions
Special Conditions
Technical Specifications
Addenda
Plans and Drawings
Caltrans Standard Specifications, 2015 Edition (excluding Division I)
Applicable Local Agency Standards and Specifications, as last revised
Approved and fully executed change orders
Any other documents contained in or incorporated into the Contract

The Contractor shall complete the Work in strict accordance with all of the Contract Documents.

All of the Contract Documents are intended to be complementary. Work required by one of the Contract Documents and not by others shall be done as if required by all. This Contract shall supersede any prior agreement of the parties.

f. **PROVISIONS REQUIRED BY LAW AND CONTRACTOR COMPLIANCE.** Each and every provision of law required to be included in these Contract Documents shall be deemed to be included in these Contract Documents. The Contractor shall comply with all requirements of applicable federal, state and local laws, rules and regulations, including, but not limited to, the provisions of the California Labor Code and California Public Contract Code which are applicable to this Work.

g. **INDEMNIFICATION.** Contractor shall provide indemnification and defense as set forth in the General Conditions.

h. **PREVAILING WAGES.** Contractor shall be required to pay the prevailing rate of wages in accordance with the Labor Code which such rates shall be made available at the Authority's Administrative Office or may be obtained online at http://www.dir.ca.gov and which must be posted at the job site.

[REMAINDER OF PAGE LEFT INTENTIONALLY BLANK]

IN WITNESS WHEREOF, this Contract has been duly executed by the above-named parties, on the day and year above written.

AMADOR REGIONAL SANITATION AUTHORITY [INSERT NAME OF CONTRACTOR]

By: _____
[INSERT NAME]
[INSERT TITLE]

By: _____

Its: _____

Printed Name: _____

ATTEST:

By: _____
Board Clerk

(CONTRACTOR'S SIGNATURE MUST BE NOTARIZED AND CORPORATE SEAL AFFIXED, IF APPLICABLE)

END OF CONTRACT

Notary Acknowledgment

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF _____

On _____, 20___, before me, _____, Notary Public, personally

appeared _____, who proved to me on the basis of satisfactory

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

_____

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

CAPACITY CLAIMED BY SIGNER

☐ Individual
☐ Corporate Officer

_____
Title(s)

☐ Partner(s) ☐ Limited ☐ General
☐ Attorney-In-Fact
☐ Trustee(s)
☐ Guardian/Conservator
☐ Other:

Signer is representing:
Name Of Person(s) Or Entity(ies)

_____

_____

DESCRIPTION OF ATTACHED DOCUMENT

_____
Title or Type of Document

_____
Number of Pages

_____
Date of Document

_____
Signer(s) Other Than Named Above

00 61 13 – BOND FORMS

1.1 Performance Bond.

KNOW ALL PERSONS BY THESE PRESENTS:

THAT WHEREAS, the Amador Regional Sanitation Authority, (hereinafter referred to as "Authority") has awarded to _____, (hereinafter referred to as the "Contractor") an agreement for **Contract No.**_____, (hereinafter referred to as the "Project").

WHEREAS, the work to be performed by the Contractor is more particularly set forth in the Contract Documents for the Project dated _____, (hereinafter referred to as "Contract Documents"), the terms and conditions of which are expressly incorporated herein by reference; and

WHEREAS, the Contractor is required by said Contract Documents to perform the terms thereof and to furnish a bond for the faithful performance of said Contract Documents.

NOW, THEREFORE, we, _____, the undersigned Contractor and _____ as Surety, a corporation organized and duly authorized to transact business under the laws of the State of California, are held and firmly bound unto the Authority in the sum of _____ DOLLARS, ($_____), said sum being not less than one hundred percent (100%) of the total amount of the Contract, for which amount well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that, if the Contractor, his or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in the Contract Documents and any alteration thereof made as therein provided, on its part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their intent and meaning; and shall faithfully fulfill all obligations including the one (1) year guarantee of all materials and workmanship; and shall indemnify and save harmless the Authority, its officials, officers, employees, and authorized volunteers, as stipulated in said Contract Documents, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

As a part of the obligation secured hereby and in addition to the face amount specified therefore, there shall be included costs and reasonable expenses and fees including reasonable attorney's fees, incurred by Authority in enforcing such obligation.

As a condition precedent to the satisfactory completion of the Contract Documents, unless otherwise provided for in the Contract Documents, the above obligation shall hold good for a period of one (1) year after the acceptance of the work by Authority, during which time if Contractor shall fail to make full, complete, and satisfactory repair and replacements and totally protect the Authority from loss or damage resulting from or caused by defective materials or faulty workmanship. The obligations of Surety hereunder shall continue so long as any obligation of Contractor remains. Nothing herein shall limit the Authority's rights or the

Contractor or Surety's obligations under the Contract, law or equity, including, but not limited to, California Code of Civil Procedure Section 337.15.

Whenever Contractor shall be, and is declared by the Authority to be, in default under the Contract Documents, the Surety shall remedy the default pursuant to the Contract Documents, or shall promptly, at the Authority's option:

i. Take over and complete the Project in accordance with all terms and conditions in the Contract Documents; or

ii. Obtain a bid or bids for completing the Project in accordance with all terms and conditions in the Contract Documents and upon determination by Surety of the lowest responsive and responsible bidder, arrange for a Contract between such bidder, the Surety and the Authority, and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Contractor by the Authority under the Contract and any modification thereto, less any amount previously paid by the Authority to the Contractor and any other set offs pursuant to the Contract Documents.

iii. Permit the Authority to complete the Project in any manner consistent with California law and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Contractor by the Authority under the Contract and any modification thereto, less any amount previously paid by the Authority to the Contractor and any other set offs pursuant to the Contract Documents.

Surety expressly agrees that the Authority may reject any contractor or subcontractor which may be proposed by Surety in fulfillment of its obligations in the event of default by the Contractor.

Surety shall not utilize Contractor in completing the Project nor shall Surety accept a bid from Contractor for completion of the Project if the Authority, when declaring the Contractor in default, notifies Surety of the Authority's objection to Contractor's further participation in the completion of the Project.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project to be performed thereunder shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project.

[REMAINDER OF PAGE LEFT INTENTIONALLY BLANK]

IN WITNESS WHEREOF, we have hereunto set our hands and seals this _____ day of _____, 20___.

(Corporate Seal)

_____
Contractor/ Principal

By_____

Title_____

(Corporate Seal)

_____
Surety

By _____
Attorney-in-Fact

(Attach Attorney-in-Fact Certificate)

Title_____

The rate of premium on this bond is _____ per thousand. The total amount of premium charges is $_____.
(The above must be filled in by corporate attorney.)

THIS IS A REQUIRED FORM

Any claims under this bond may be addressed to:

(Name and Address of Surety) _____
_____
_____

(Name and Address of Agent or Representative for service of process in California, if different from above) _____
_____
_____

(Telephone number of Surety and Agent or Representative for service of process in California) _____

Notary Acknowledgment

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF _____

On _____, 20___, before me, _____, Notary Public, personally

appeared _____, who proved to me on the basis of satisfactory

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

_____

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

CAPACITY CLAIMED BY SIGNER

- ☐ Individual
- ☐ Corporate Officer

_____
Title(s)

- ☐ Partner(s) ☐ Limited ☐ General
- ☐ Attorney-In-Fact
- ☐ Trustee(s)
- ☐ Guardian/Conservator
- ☐ Other:

Signer is representing:
Name Of Person(s) Or Entity(ies)

_____

_____

DESCRIPTION OF ATTACHED DOCUMENT

_____
Title or Type of Document

_____
Number of Pages

_____
Date of Document

_____
Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for Contractor/Principal.

Notary Acknowledgment

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COUNTY OF _____

On _____, 20___, before me, _____, Notary Public, personally

appeared _____, who proved to me on the basis of satisfactory

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

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DESCRIPTION OF ATTACHED DOCUMENT

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Title or Type of Document

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Number of Pages

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Date of Document

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Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for the Attorney-in-Fact. The Power-of Attorney to local representatives of the bonding company must also be attached.

END OF PERFORMANCE BOND

1.2 Payment Bond (Labor and Materials).

KNOW ALL MEN BY THESE PRESENTS That

WHEREAS, the Amador Regional Sanitation Authority (hereinafter designated as the "Authority"), by action taken or a resolution passed _____ , 20_____, has awarded to _____ hereinafter designated as the "Principal," a contract for the work described as follows: **Contract No.**_____ (the "Project"); and

WHEREAS, said Principal is required to furnish a bond in connection with said contract; providing that if said Principal or any of its Subcontractors shall fail to pay for any materials, provisions, provender, equipment, or other supplies used in, upon, for or about the performance of the work contracted to be done, or for any work or labor done thereon of any kind, or for amounts due under the Unemployment Insurance Code or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of said Principal and its Subcontractors with respect to such work or labor the Surety on this bond will pay for the same to the extent hereinafter set forth.

NOW THEREFORE, we, the Principal and _____ as Surety, are held and firmly bound unto the Authority in the penal sum of _____ Dollars ($_____) lawful money of the United States of America, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if said Principal, his or its subcontractors, heirs, executors, administrators, successors or assigns, shall fail to pay any of the persons named in Civil Code Section 9100, fail to pay for any materials, provisions or other supplies, used in, upon, for or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or amounts due under the Unemployment Insurance Code with respect to work or labor performed under the contract, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department or Franchise Tax Board from the wages of employees of the contractor and his subcontractors pursuant to Revenue and Taxation Code Section 18663, with respect to such work and labor the Surety or Sureties will pay for the same, in an amount not exceeding the sum herein above specified, and also, in case suit is brought upon this bond, all litigation expenses incurred by the Authority in such suit, including reasonable attorneys' fees, court costs, expert witness fees and investigation expenses.

This bond shall inure to the benefit of any of the persons named in Civil Code Section 9100 so as to give a right of action to such persons or their assigns in any suit brought upon this bond.

It is further stipulated and agreed that the Surety on this bond shall not be exonerated or released from the obligation of this bond by any change, extension of time for performance, addition, alteration or modification in, to, or of any contract, plans, specifications, or agreement pertaining or relating to any scheme or work of improvement herein above described, or pertaining or relating to the furnishing of labor, materials, or equipment therefore, nor by any change or modification of any terms of payment or extension of the time for any payment pertaining or relating to any scheme or work of improvement herein above described, nor by any rescission or attempted rescission or attempted rescission of the contract, agreement or bond, nor by any conditions precedent or subsequent in the bond attempting to limit the right of recovery of claimants otherwise entitled to recover under any such contract or agreement or

under the bond, nor by any fraud practiced by any person other than the claimant seeking to recover on the bond and that this bond be construed most strongly against the Surety and in favor of all persons for whose benefit such bond is given, and under no circumstances shall Surety be released from liability to those for whose benefit such bond has been given, by reason of any breach of contract between the owner or Authority and original contractor or on the part of any obligee named in such bond, but the sole conditions of recovery shall be that claimant is a person described in Civil Code Section 9100, and has not been paid the full amount of his claim and that Surety does hereby waive notice of any such change, extension of time, addition, alteration or modification herein mentioned, including but not limited to the provisions of sections 2819 and 2845 of the California Civil Code.

IN WITNESS WHEREOF, we have hereunto set our hands and seals this _____ day of _____, 20__.

(Corporate Seal)

_____
Contractor/ Principal

By_____

Title_____

(Corporate Seal)

_____
Surety

By _____
Attorney-in-Fact

(Attach Attorney-in-Fact Certificate)

Title_____

Notary Acknowledgment

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STATE OF CALIFORNIA
COUNTY OF _____

On _____, 20___, before me, _____, Notary Public, personally

appeared _____, who proved to me on the basis of satisfactory

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

_____

Signature of Notary Public

OPTIONAL

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CAPACITY CLAIMED BY SIGNER

- ☐ Individual
- ☐ Corporate Officer

_____
Title(s)

- ☐ Partner(s) ☐ Limited ☐ General
- ☐ Attorney-In-Fact
- ☐ Trustee(s)
- ☐ Guardian/Conservator
- ☐ Other:

Signer is representing:
Name Of Person(s) Or Entity(ies)

_____

_____

DESCRIPTION OF ATTACHED DOCUMENT

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Title or Type of Document

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Number of Pages

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Date of Document

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Signer(s) Other Than Named Above

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Signer is representing:
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Number of Pages

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Date of Document

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Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for the Attorney-in-Fact. The Power-of-Attorney to local representatives of the bonding company must also be attached.

END OF PAYMENT BOND

00 72 13 – GENERAL CONDITIONS

ARTICLE 1. DEFINED TERMS

Whenever used in the Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined below, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

A. Act of God – An earthquake of magnitude of 3.5 or higher on the Richter scale or a tidal wave.

B. Addenda -- Written or graphic instruments issued prior to the submission of Bids which clarify, correct, or change the Contract Documents.

C. Additional Work -- New or unforeseen work will be classified as "Additional Work" when the Authority's Representative determines that it is not covered by the Contract.

D. Applicable Laws -- The laws, statutes, ordinances, rules, codes, regulations, permits, and licenses of any kind, issued by local, state or federal governmental authorities or private authorities with jurisdiction (including utilities), to the extent they apply to the Work.

E. Authority -- The Amador Regional Sanitation Authority.

F. Bid -- The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices and other terms for the Work to be performed.

G. Bidder -- The individual or entity who submits a Bid directly to the Authority.

H. Board of Directors, Board -- The Board of Directors of the Authority.

I. Change Order ("CO") -- A document that authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Contract, in accordance with the Contract Documents and in the form contained in the Contract Documents.

J. Change Order Request ("COR") -- A request made by the Contractor for an adjustment in the Contract Price and/or Contract Times as the result of a Contractor-claimed change to the Work. This term may also be referred to as a Change Order Proposal ("COP"), or Request for Change ("RFC").

K. Authority's Representative -- The individual or entity as identified in the Special Conditions to act as the Authority's Representative.

L. Claim -- A demand or assertion by the Authority or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

M. Contract -- The entire integrated written agreement between the Authority and Contractor concerning the Work. “Contract” may be used interchangeably with “Agreement” in the Contract Documents. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral, and includes all Contract Documents.

N. Contract Documents -- The documents listed in Section 00 52 13, Article 5. Some documents provided by the Authority to the Bidders and Contractor, including but not limited to reports and drawings of subsurface and physical conditions are not Contract Documents.

O. Contract Price -- Amount to be paid by the Authority to the Contractor as full compensation for the performance of the Contract and completion of the Work, subject to any additions or deductions as provided in the Contract Documents, and including all applicable taxes and costs.

P. Contract Times -- The number of days or the dates stated in the Contract Documents to: achieve defined Milestones, if any; and to complete the Work so that it is ready for final payment.

Q. Contractor -- The individual or entity with which the Authority has contracted for performance of the Work.

R. Contractor’s Designated On-Site Representative -- The Contractor’s Designated On-Site Representative will be as identified in Section 00 72 13, Article 3 and shall not be changed without prior written consent of the Authority.

S. Daily Rate -- The Daily Rate stipulated in the Contract Documents as full compensation to the Contractor due to the Authority’s unreasonable delay to the Project that was not contemplated by the parties.

T. Day -- A calendar day of 24 hours measured from midnight to the next midnight.

U. Defective Work -- Work that is unsatisfactory, faulty, or deficient; or that does not conform to the Contract Documents; or that does not meet the requirements of any inspection, reference standard, test, or approval referenced in the Contract Documents.

V. Demobilization -- The complete dismantling and removal by the Contractor of all of the Contractor’s temporary facilities, equipment, and personnel at the Site.

W. Drawings -- That part of the Contract Documents prepared by of the Engineer of Record which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

X. Effective Date of the Contract -- The date indicated in the Contract on which it becomes effective, but if no such date is indicated, it means the date on which the Contract is signed and delivered by the last of the two parties to sign and deliver.

Y. Engineer, whenever not qualified, shall mean the Engineer of the Authority, acting either directly or through properly authorized agents, such agents acting severally within the scope of the particular duties entrusted to them. On all questions concerning the acceptance of materials, machinery, the classifications of material, the execution of work, conflicting interest of the contractors performing related work and the determination of costs, the decision of the Engineer, duly authorized by the Board of Directors, shall be binding and final upon both parties.

Z. Engineer of Record -- The individual, partnership, corporation, joint venture, or other legal entity named as such in Section 00 73 13, Article 1.1. or any succeeding entity designated by the Authority.

AA. Hazardous Waste -- The term "Hazardous Waste" shall have the meaning provided in Section 104 of the Solid Waste Disposal Act (42 U.S.C. § 6903) as amended from time to time or, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a class I, class II, or class III disposal site in accordance with provisions of existing law, whichever is more restrictive.

BB. Holiday – The Holidays occur on:

New Year's Day - January 1
President's Day – Third Monday in February
Memorial Day - Last Monday in May
Independence Day - July 4
Labor Day - First Monday in September
Veteran's Day - November 11
Thanksgiving Day - Fourth Thursday in November
Friday after Thanksgiving
Christmas Eve – December 24
Christmas Day - December 25
Day After Christmas – December 26
New Year's Eve – December 31

If any Holiday listed above falls on a Saturday, Saturday and the preceding Friday are both Holidays. If the Holiday should fall on a Sunday, Sunday and the following Monday are both Holidays.

CC. Notice of Award -- The written notice by the Authority to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, the Authority will sign and deliver the Contract.

DD. Notice of Completion -- The form which may be executed by the Authority and recorded by the county where the Project is located constituting final acceptance of the Project.

EE. Notice to Proceed -- A written notice given by the Authority to Contractor fixing the date on which the Contractor may proceed with the Work and when Contract Times will commence to run.

FF. Project -- The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

GG. Recyclable Waste Materials -- Materials removed from the Site which are required to be diverted to a recycling center rather than an area landfill. Recyclable Waste Materials include asphalt, concrete, brick, concrete block, and rock.

HH. Schedule of Submittals -- A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to facilitate scheduled performance of related construction activities.

II. Shop Drawings -- All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

JJ. Specifications -- That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

KK. Standard Specifications -- Caltrans Standard Specifications, 2015 Edition (excluding Division I).

LL. Stop Payment Notice -- A written notice as defined in Civil Code section 8044.

MM. Subcontractor -- An individual or entity other than a Contractor having a contract with any other entity than the Authority for performance of any portion of the Work at the Site.

NN. Submittal -- Written and graphic information and physical samples prepared and supplied by the Contractor demonstrating various portions of the Work.

OO. Successful Bidder -- The Bidder submitting a responsive Bid to whom the Authority makes an award.

PP. Supplier -- A manufacturer, fabricator, supplier, distributor, material man, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment used in the performance of the Work or to be incorporated in the Work.

QQ. Underground Facilities -- All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

RR. Unit Price Work -- Work to be paid for on the basis of unit prices as provided by the Contractor in its bid or as adjusted in accordance with the Contract Documents.

SS. Warranty -- A written guarantee provided to the Authority by the Contractor that the Work will remain free of defects and suitable for its intended use for the period required by the Contract Documents or the longest period permitted by the law of this State, whichever is longer.

TT. Work -- The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

ARTICLE 2. CONTRACT DOCUMENTS

A. **Contract Documents.** The Contract Documents are complementary, and what is called for by one shall be as binding as if called for by all.

B. **Interpretations.** The Contract Documents are intended to be fully cooperative and complementary. If the Contractor observes that any documents are in conflict, the Contractor shall promptly notify the Engineer in writing. In case of conflicts between the Contract Documents, the order of precedence shall be as follows:

1. Change Orders
2. Addenda
3. Special Conditions
4. Technical Specifications
5. Plans (Contract Drawings)
6. Contract
7. General Conditions
8. Instructions to Bidders
9. Notice Inviting Bids
10. Contractor's Bid Forms
11. Caltrans Standard Specifications, 2015 Edition (excluding Division I)
12. Applicable Local Agency Standards and Specifications
13. Standard Drawings
14. Reference Documents

With reference to the Drawings, the order of precedence shall be as follows:

1. Figures govern over scaled dimensions
2. Detail drawings govern over general drawings
3. Addenda or Change Order drawings govern over Contract Drawings
4. Contract Drawings govern over Standard Drawings
5. Contract Drawings govern over Shop Drawings

C. **Conflicts in Contract Documents.** Notwithstanding the orders of precedence established above, in the event of conflicts, the higher standard, higher quality, and most expensive shall always apply.

D. **Organization of Contract Documents.** Organization of the Contract Documents into divisions, sections, and articles, and arrangement of drawings shall not control

the Contractor in dividing Project Work among subcontractors or in establishing the extent of Work to be performed by any trade.

ARTICLE 3. PRECONSTRUCTION AND CONSTRUCTION COMMUNICATION

Before any Work at the site is started, a conference attended by the Authority, Contractor, Authority's Representative, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to herein, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

At this conference the Authority and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

ARTICLE 4. CONTRACT DOCUMENTS: COPIES & MAINTENANCE

Contractor will be furnished, free of charge, **five (5)** copies of the Contract Documents. Additional copies may be obtained at cost of reproduction.

Contractor shall maintain a clean, undamaged set of Contract Documents, including submittals, at the Project site.

ARTICLE 5. EXAMINATION OF DRAWINGS, SPECIFICATIONS AND SITE OF WORK

A. **Examination of Contract Documents.** Before commencing any portion of the Work, Contractor shall again carefully examine all applicable Contract Documents, the Project site, and other information given to Contractor as to materials and methods of construction and other Project requirements. Contractor shall immediately notify the Engineer of any potential error, inconsistency, ambiguity, conflict, or lack of detail or explanation. If Contractor performs, permits, or causes the performance of any Work which is in error, inconsistent or ambiguous, or not sufficiently detailed or explained, Contractor shall bear any and all resulting costs, including, without limitation, the cost of correction. In no case shall the Contractor or any subcontractor proceed with Work if uncertain as to the applicable requirements.

B. **Additional Instructions.** After notification of any error, inconsistency, ambiguity, conflict, or lack of detail or explanation, the Engineer will provide any required additional instructions, by means of drawings or other written direction, necessary for proper execution of Work.

C. **Quality of Parts, Construction and Finish.** All parts of the Work shall be of the best quality of their respective kinds and the Contractor must use all diligence to inform itself fully as to the required construction and finish.

D. **Contractor's Variation from Contract Document Requirements.** If it is found that the Contractor has varied from the requirements of the Contract Documents including the requirement to comply with all applicable laws, ordinances, rules and regulations, the Engineer may at any time, before or after completion of the Work,

order the improper Work removed, remade or replaced by the Contractor at the Contractor's expense.

ARTICLE 6. MOBILIZATION

A. When a bid item is included in the Bid Form for mobilization, the costs of Work in advance of construction operations and not directly attributable to any specific bid item will be included in the progress estimate ("Initial Mobilization"). When no bid item is provided for "Initial Mobilization," payment for such costs will be deemed to be included in the other items of the Work.

B. Payment for Initial Mobilization based on the lump sum provided in the Bid Form, which shall constitute full compensation for all such Work. No payment for Initial Mobilization will be made until all of the listed items have been completed to the satisfaction of the Engineer. The scope of the Work included under Initial Mobilization shall include, but shall not be limited to, the following principal items:

1. Obtaining and paying for all bonds, insurance, and permits.

2. Moving on to the Project site of all Contractor's plant and equipment required for the first month's operations.

3. Installing temporary construction power, wiring, and lighting facilities, as applicable.

4. Establishing fire protection system, as applicable.

5. Developing and installing a construction water supply, if applicable.

6. Providing and maintaining the field office trailers for the Contractor, if necessary, and the Engineer (if specified), complete, with all specified furnishings and utility services.

7. Providing on-site sanitary facilities and potable water facilities as specified per Cal-OSHA and these Contract Documents.

8. Furnishing, installing, and maintaining all storage buildings or sheds required for temporary storage of products, equipment, or materials that have not yet been installed in the Work. All such storage shall meet manufacturer's specified storage requirements, and the specific provisions of the specifications, including temperature and humidity control, if recommended by the manufacturer, and for all security.

9. Arranging for and erection of Contractor's work and storage yard.

10. Posting all OSHA required notices and establishment of safety programs per Cal-OSHA.

11. Full-time presence of Contractor's superintendent at the job site as required herein.

12. Submittal of Construction Schedule as required by the Contract Documents.

ARTICLE 7. EXISTENCE OF UTILITIES AT THE WORK SITE

A. The Authority has endeavored to determine the existence of utilities at the Project site from the records of the owners of known utilities in the vicinity of the Project. The positions of these utilities as derived from such records are shown on the Plans.

B. Unless indicated otherwise on the Plans and Specifications, no excavations were made to verify the locations shown for underground utilities. The service connections to these utilities are not shown on the Plans. Water service connections may be shown on the Plans showing general locations of such connections. It shall be the responsibility of the Contractor to determine the exact location of all service connections. The Contractor shall make its own investigations, including exploratory excavations, to determine the locations and type of service connections, prior to commencing Work which could result in damage to such utilities. The Contractor shall immediately notify the Authority in writing of any utility discovered in a different position than shown on the Plans or which is not shown on the Plans.

C. If applicable, all water meters, water valves, fire hydrants, electrical utility vaults, telephone vaults, gas utility valves, and other subsurface structures shall be relocated or adjusted to final grade by the Contractor. Locations of existing utilities shown on the Plans are approximate and may not be complete. The Contractor shall be responsible for coordinating its Work with all utility companies during the construction of the Work.

D. Notwithstanding the above, pursuant to section 4215 of the Government Code, the Authority has the responsibility to identify, with reasonable accuracy, main or trunkline facilities on the plans and specifications. In the event that main or trunkline utility facilities are not identified with reasonable accuracy in the plans and specifications made a part of the invitation for Bids, the Authority shall assume the responsibility for their timely removal, relocation, or protection.

E. Contractor, except in an emergency, shall contact the appropriate regional notification center at 811 or 1-800-227-2600 or on-line at www.digalert.org at least two working days prior to commencing any excavation if the excavation will be performed in an area which is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the Authority, and obtain an inquiry identification number from that notification center. No excavation shall be commenced or carried out by the Contractor unless such an inquiry identification number has been assigned to the Contractor or any subcontractor of the Contractor and the Authority has been given the identification number by the Contractor.

ARTICLE 8. SOILS INVESTIGATIONS

A. Reports and Drawings. The Special Conditions identify:

1. those reports known to the Authority of explorations and tests of subsurface conditions at or contiguous to the site; and

2. those drawings known to the Authority of physical conditions relating to existing surface or subsurface structures at the site (except Underground Facilities).

B. Limited Reliance by Contractor on Technical Data Authorized. Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, which were expressly not created or obtained to evaluate or assist in the evaluation of constructability, and are not Contract Documents. Contractor shall make its own interpretation of the "technical data" and shall be solely responsible for any such interpretations. Except for reliance on the accuracy of such "technical data," Contractor may not rely upon or make any claim against the Authority, Authority's Representative, or Engineer of Record, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including without limitation any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, conclusions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

ARTICLE 9. CONTRACTOR'S SUPERVISION

Contractor shall continuously keep at the Project site, a competent and experienced full-time Project superintendent acceptable to the Authority. Superintendent must be able to proficiently speak, read and write in English and shall have the authority to make decisions on behalf of the Contractor. Contractor shall continuously provide efficient supervision of the Project.

ARTICLE 10. WORKERS

A. Contractor shall at all times enforce strict discipline and good order among its employees. Contractor shall not employ on the Project any unfit person or any one not skilled in the Work assigned to him or her.

B. Any person in the employ of the Contractor whom the Authority may deem incompetent or unfit shall be dismissed from the Work and shall not be employed on this Project.

ARTICLE 11. INDEPENDENT CONTRACTORS

Contractor shall be an independent contractor for the Authority and not an employee. Contractor understands and agrees that it and all of its employees shall not be considered officers, employees, or agents of Authority and are not entitled to benefits of any kind normally provided employees of Authority, including but not limited to, state unemployment compensation or workers' compensation. Contractor assumes full responsibility for the acts and omissions of its employees or agents related to the Work.

ARTICLE 12. SUBCONTRACTS

A. Contractor agrees to bind every subcontractor to the terms of the Contract Documents as far as such terms are applicable to subcontractor's portion of the Work. Contractor shall be as fully responsible to the Authority for the acts and omissions of its subcontractors and of persons either directly or indirectly employed by its subcontractors, as Contractor is for acts and omissions of persons directly employed by Contractor. Nothing contained in these Contract Documents shall create any contractual relationship between any subcontractor and the Authority.

B. The Authority reserves the right to accept all subcontractors. The Authority's acceptance of any subcontractor under this Contract shall not in any way relieve Contractor of its obligations in the Contract Documents.

C. Prior to substituting any subcontractor listed in the Bid Forms, Contractor must comply with the requirements of the Subletting and Subcontracting Fair Practices Act pursuant to California Public Contract Code section 4100 et seq.

ARTICLE 13. VERIFICATION OF EMPLOYMENT ELIGIBILITY

By executing this Contract, Contractor verifies that it fully complies with all requirements and restrictions of state and federal law respecting the employment of undocumented aliens, including, but not limited to, the Immigration Reform and Control Act of 1986, as may be amended from time to time, and shall require all subcontractors, sub-subcontractors and consultants to comply with the same. Each person executing this Contract on behalf of Contractor verifies that he or she is a duly authorized officer of Contractor and that any of the following shall be grounds for the Authority to terminate the Contract for cause: (1) failure of the Contractor or its subcontractors, sub-subcontractors or consultants to meet any of the requirements provided for in this Article; (2) any misrepresentation or material omission concerning compliance with such requirements; or (3) failure to immediately remove from the Work any person found not to be in compliance with such requirements.

ARTICLE 14. REQUESTS FOR SUBSTITUTION

A. For the purposes of this provision, the term "substitution" shall mean the substitution of any material, method or service substantially equal to or better in every respect to that indicated in the Standard Specifications or otherwise referenced herein.

B. Pursuant to Public Contract Code section 3400(b), the Authority may make a finding that is described in the Notice Inviting Bids that designates certain products, things, or services by specific brand or trade name.

C. Unless specifically designated in the Special Conditions, whenever any material, process, or article is indicated or specified by grade, patent, or proprietary name or by name of manufacturer, such specifications shall be deemed to be used for the purpose of facilitating the description of the material, process, or article desired and shall be deemed to be followed by the words "or equal." Contractor may, unless otherwise stated, offer for substitution any material, process, or article which may be substantially equal to or better in every respect to that so indicated or specified in the Contract Documents. However, the Authority has adopted uniform standards for certain materials, processes, and articles.

D. The Contractor shall submit substitution requests, together with substantiating data, for substitution of any “or equal” material, process, or article no later than thirty-five (35) calendar days after award of Contract. Provisions regarding submission of substitution requests shall not in any way authorize an extension of time for the performance of this Contract. If a substitution request is rejected by the Authority, the Contractor shall provide the material, method or service specified herein. The Authority shall not be responsible for any costs incurred by the Contractor associated with substitution requests. The burden of proof as to the equality of any material, process, or article shall rest with the Contractor. The Engineer has the complete and sole discretion to determine if a material, process, or article is substantially equal to or better than that specified and to approve or reject all substitution requests.

E. Substantiating data as described above shall include, at a minimum, the following information:

1. A signed affidavit from the Contractor stating that the material, process, or article proposed as a substitution is substantially equal to or better than that specified in every way except as may be listed on the affidavit.

2. Illustrations, specifications, catalog cut sheets, and any other relevant data required to prove that the material, process, or article is substantially equal to or better than that specified.

3. A statement of the cost implications of the substitution being requested, indicating whether and why the proposed substitution will reduce or increase the amount of the contract.

4. Information detailing the durability and lifecycle costs of the proposed substitution.

F. Failure to submit all the required substantiating data detailed above in a timely manner so that the substitution request can be adequately reviewed may result in rejection of the substitution request. The Engineer is not obligated to review multiple submittals related the same substitution request resulting from the Contractor’s failure to initially submit a complete package.

G. Time limitations within this Article shall be strictly complied with and in no case will an extension of time for completion of the contract be granted because of Contractor’s failure to provide substitution requests at the time and in the manner described herein.

H. The Contractor shall bear the costs of all Authority work associated with the review of substitution requests.

I. If substitution requests approved by the Engineer require that Contractor furnish materials, methods or services more expensive than that specified, the increased costs shall be borne by Contractor.

ARTICLE 15. SHOP DRAWINGS

A. Contractor shall check and verify all field measurements and shall submit with such promptness as to provide adequate time for review and cause no delay in its own Work or in that of any other contractor, subcontractor, or worker on the Project, six (6) copies of all shop drawings, calculations, schedules, and materials list, and all other provisions required by the Contract Documents. Contractor shall sign all submittals affirming that submittals have been reviewed and approved by Contractor prior to submission to Engineer. Each signed submittal shall affirm that the submittal meets all the requirements of the Contract Documents except as specifically and clearly noted and listed on the transmittal letter of the submittal.

B. Contractor shall make any corrections required by the Engineer, and file with the Engineer six (6) corrected copies each, and furnish such other copies as may be needed for completion of the Work. Engineer's acceptance of shop drawings shall not relieve Contractor from responsibility for deviations from the Contract Documents unless Contractor has, in writing, called Engineer's attention to such deviations at time of submission and has secured the Engineer's written acceptance. Engineer's acceptance of shop drawings shall not relieve Contractor from responsibility for errors in shop drawings.

ARTICLE 16. SUBMITTALS

A. Contractor shall furnish to the Engineer for approval, prior to purchasing or commencing any Work, a log of all samples, material lists and certifications, mix designs, schedules, and other submittals, as required in the Contract Documents. The log shall indicate whether samples will be provided in accordance with other provisions of this Contract.

B. Contractor will provide samples and submittals, together with catalogs and supporting data required by the Engineer, to the Engineer within a reasonable time period to provide for adequate review and avoid delays in the Work.

C. These requirements shall not authorize any extension of time for performance of this Contract. Engineer will check and approve such samples, but only for conformance with design concept of work and for compliance with information given in the Contract Documents. Work shall be in accordance with approved samples and submittals.

ARTICLE 17. MATERIALS

A. Except as otherwise specifically stated in the Contract Documents, Contractor shall provide and pay for all materials, labor, tools, equipment, lights, power, transportation, superintendence, temporary constructions of every nature, and all other services and facilities of every nature whatsoever necessary to execute and complete this Contract within specified time.

B. Unless otherwise specified, all materials shall be new and the best of their respective kinds and grades as noted and/or specified, and workmanship shall be of good quality.

C. Materials shall be furnished in ample quantities and at such times as to ensure uninterrupted progress of the Work and shall be stored properly and protected as required by the Contract Documents. Contractor shall be entirely responsible for damage or loss by weather or other causes to materials or Work.

D. No materials, supplies, or equipment for Work under this Contract shall be purchased subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. Contractor warrants good title to all material, supplies, and equipment installed or incorporated in the Work and agrees upon completion of all work to deliver the Project, to the Authority free from any claims, liens, or charges.

E. Materials shall be stored on the Project site in such manner so as not to interfere with any operations of the Authority or any independent contractor.

F. Contractor shall verify all measurements, dimensions, elevations, and quantities before ordering any materials or performing any Work, and the Authority shall not be liable for Contractor's failure to so. No additional compensation, over and above payment for the actual quantities at the prices set out in the Bid Form, will be allowed because of differences between actual measurements, dimension, elevations and quantities and those indicated on the Plans and in the Specifications. Any difference therein shall be submitted to the Engineer for consideration before proceeding with the Work.

ARTICLE 18. PERMITS AND LICENSES

A. Authority will apply and pay for the review of necessary encroachment permits for Work within the public rights-of-way. Contractor shall obtain all other necessary permits and licenses for the construction of the Project, including encroachment permits, and shall pay all fees required by law and shall comply with all laws, ordinances, rules and regulations relating to the Work and to the preservation of public health and safety. Before acceptance of the Project, the Contractor shall submit all licenses, permits, certificates of inspection and required approvals to the Authority.

B. The Bid Form contains an allowance for the Contractor's cost of acquiring traffic control permits and for construction inspection fees that may be charged to the Contractor by the Agency of Jurisdiction. The allowance is included within the Bid Form to eliminate the need by bidders to research or estimate the costs of traffic control permits and construction inspection fees prior to submitting a bid. The allowance is specifically intended to account for the costs of traffic control permits and construction inspection fees charged by the local Agency of Jurisdiction only. No other costs payable by Contractor to the Agency of Jurisdiction are included within the allowance. Payment by Authority to Contractor under the Permit and Inspection Allowance Bid Item shall be made based on actual cost receipts only and in accordance with the provisions of these specifications.

ARTICLE 19. TRENCHES

A. **Trenches Five Feet or More in Depth.** Contractor shall submit to the Engineer at the preconstruction meeting, a detailed plan showing the design of shoring, bracing,

sloping or other provisions to be made for worker protection from hazards of caving ground during the excavation of any trench or trenches five feet or more in depth. If such plan varies from shoring system standards established by the Construction Safety Orders of the California Code of Regulations, Department of Industrial Relations, the plan shall be prepared by a California registered civil or structural engineer. The plan shall not be less effective than the shoring, bracing, sloping, or other provisions of the Construction Safety Orders, as defined in the California Code of Regulations. The Contractor shall designate in writing the "competent person" as defined in Title 8, California Code of Regulations, who shall be present at the Work Site each day that trenching/excavation is in progress. The "competent person" shall prepare and provide daily trenching/excavation inspection reports to the Engineer. Contractor shall also submit a copy of its annual California Occupational Safety and Health Administration (Cal/OSHA) trench/excavation permit.

B. **Excavations Deeper than Four Feet.** If the Work involves excavating trenches or other excavations that extend deeper than four feet below the surface, Contractor shall promptly, and before the excavation is further disturbed, notify the Authority in writing of any of the following conditions:

1. Material that the Contractor believes may be material that is hazardous waste, as defined in section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

2. Subsurface or latent physical conditions at the site differing from those indicated.

3. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract

The Authority shall promptly investigate the conditions, and if it finds that the conditions do so materially differ, or do involve hazardous waste, and cause a decrease or increase in Contractor's cost of, or the time required for, performance of any part of the Work, shall issue a change order under the procedures described in the Contract Documents.

In the event that a dispute arises between the Authority and the Contractor as to whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the Work, the Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all Work to be performed under the Contract. Contractor shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between the parties.

ARTICLE 20. TRAFFIC CONTROL

A. Traffic control plan(s) for the Work may be required by the Agency(s) of Jurisdiction. Traffic control plans, if required, shall be prepared at Contractor's expense, and traffic control shall be performed at Contractor's expense in accordance with the requirements of the Agency(s) of Jurisdiction. The Permit and Inspection Allowance

included within the Bid Form includes the cost of required traffic control permit(s) and construction inspection by the Agency(s) of Jurisdiction only. The Permit and Inspection Allowance does not include costs for preparation of any required traffic control plans, implementation of any traffic control requirements or for any traffic signal services that may be required. Costs for traffic control plans, implementation of traffic control, or traffic signal services required by the Agency(s) of Jurisdiction shall be included in the Contractor's Bid.

B. All warning signs and safety devices used by the Contractor to perform the Work shall conform to the requirements contained in the State of California, Department of Transportation's current edition of "Manual of Traffic Controls for Construction and Maintenance Work Zones" or to the requirements of the local agency. The Contractor shall also be responsible for all traffic control required by the agency having jurisdiction over the project on the intersecting streets. Contractor must submit a traffic control plan to the agency having jurisdiction over the project for approval prior to starting work.

C. The Contractor's representative on the site responsible for traffic control shall produce evidence that he/she has completed training acceptable to the California Department of Transportation for safety through construction zones. All of the streets in which the Work will occur shall remain open to traffic and one lane of traffic maintained at all times unless otherwise directed by the agency of jurisdiction. Businesses and residences adjacent to the Work shall be notified forty-eight (48) hours in advance of closing of driveways. The Contractor shall make every effort to minimize the amount of public parking temporarily eliminated due to construction in areas fronting businesses. No stockpiles of pipe or other material will be allowed in traveled right-of-ways after working hours unless otherwise approved by the Engineer.

ARTICLE 21. DIVERSION OF RECYCLABLE WASTE MATERIALS

In compliance with the applicable Authority's waste reduction and recycling efforts, Contractor shall divert all Recyclable Waste Materials to appropriate recycling centers as required for compliance with the local jurisdiction's waste diversion ordinances. Contractor will be required to submit weight tickets and written proof of diversion with its monthly progress payment requests. Contractor shall complete and execute any certification forms required by Authority or other applicable agencies to document Contractor's compliance with these diversion requirements. All costs incurred for these waste diversion efforts shall be the responsibility of the Contractor.

ARTICLE 22. REMOVAL OF HAZARDOUS MATERIALS

Should Contractor encounter material reasonably believed to be polychlorinated biphenyl (PCB) or other toxic wastes and hazardous materials which have not been rendered harmless at the Project site, the Contractor shall immediately stop work at the affected Project site and shall report the condition to the Authority in writing. The Authority shall contract for any services required to directly remove and/or abate PCBs and other toxic wastes and hazardous materials, if required by the Project site(s), and shall not require the Contractor to subcontract for such services. The Work in the affected area shall not thereafter be resumed except by written agreement of the Authority and Contractor.

ARTICLE 23. SANITARY FACILITIES

Contractor shall provide sanitary temporary toilet buildings and hand washing facilities for the use of all workers. All toilets and hand washing facilities shall comply with local codes and ordinances. Toilets shall be kept supplied with toilet paper and shall have workable door fasteners. Toilets and hand washing facilities shall be serviced no less than once weekly and shall be present in a quantity of not less than 1 per 20 workers as required by Cal/OSHA regulations. The toilets and hand washing facilities shall be maintained in a sanitary condition at all times. Use of toilet and hand washing facilities in the Work under construction shall not be permitted. Any other Sanitary Facilities required by Cal/OSHA shall be the responsibility of the Contractor.

ARTICLE 24. AIR POLLUTION CONTROL

Contractor shall comply with all air pollution control rules, regulations, ordinances and statutes, including, but not limited to, those required by the appropriate Air Quality Management District. All containers of paint, thinner, curing compound, solvent or liquid asphalt shall be labeled to indicate that the contents fully comply with the applicable material requirements.

ARTICLE 25. LAYOUT AND FIELD ENGINEERING

All field engineering required for laying out the Work and establishing grades for earthwork operations shall be furnished by the Contractor at its expense.

ARTICLE 26. TESTS AND INSPECTIONS

A. If the Contract Documents, the Engineer, or any instructions, laws, ordinances, or public authority requires any part of the Work to be tested or Approved, Contractor shall provide the Engineer at least two (2) working days' notice of its readiness for observation or inspection. If inspection is by a public authority other than the Authority, Contractor shall promptly inform the Authority of the date fixed for such inspection. Required certificates of inspection (or similar) shall be secured by Contractor. Costs for Authority testing and Authority inspection shall be paid by the Authority. Costs of tests for Work found not to be in compliance shall be paid by the Contractor.

B. If any Work is done or covered up without the required testing or approval, the Contractor shall uncover or deconstruct the Work, and the Work shall be redone after completion of the testing at the Contractor's cost in compliance with the Contract Documents.

C. Where inspection and testing are to be conducted by an independent laboratory or agency, materials or samples of materials to be inspected or tested shall be selected by such laboratory or agency, or by the Authority, and not by Contractor. All tests or inspections of materials shall be made in accordance with the commonly recognized standards of national organizations.

D. In advance of manufacture of materials to be supplied by Contractor which must be tested or inspected, Contractor shall notify the Authority so that the Authority may arrange for testing at the source of supply. Any materials which have not

satisfactorily passed such testing and inspection shall not be incorporated into the Work.

E. If the manufacture of materials to be inspected or tested will occur in a plant or location greater than sixty (60) miles from the Authority, the Contractor shall pay for any excessive or unusual costs associated with such testing or inspection, including but not limited to excessive travel time, standby time and required lodging.

F. Reexamination of Work may be ordered by the Authority. If so ordered, Work must be uncovered or deconstructed by Contractor. If Work is found to be in accordance with the Contract Documents, the Authority shall pay the costs of reexamination and reconstruction. If such work is found not to be in accordance with the Contract Documents, Contractor shall pay all costs.

ARTICLE 27. PROTECTION OF WORK AND PROPERTY

A. The Contractor shall be responsible for all damages to persons or property that occurs as a result of the Work. Contractor shall be responsible for the proper care and protection of all materials delivered and Work performed until completion and final Acceptance by the Authority. All Work shall be solely at the Contractor's risk. Contractor shall adequately protect adjacent property from settlement or loss of lateral support as necessary. Contractor shall comply with all applicable safety laws and building codes to prevent accidents or injury to persons on, about, or adjacent to the Project site where Work is being performed. Contractor shall erect and properly maintain at all times, as required by field conditions and progress of work, all necessary safeguards, signs, barriers, lights, and watchmen for protection of workers and the public, and shall post danger signs warning against hazards created in the course of construction.

B. In an emergency affecting safety of life or of work or of adjoining property, Contractor, without special instruction or authorization from the Engineer, is hereby permitted to act to prevent such threatened loss or injury; and Contractor shall so act, without appeal, if so authorized or instructed by the Engineer or the Authority. Any compensation claimed by Contractor on account of emergency work shall be determined by and agreed upon by the Authority and the Contractor.

ARTICLE 28. CONTRACTOR'S MEANS AND METHODS

Contractor is solely responsible for the means and methods utilized to perform the Work. In no case shall the Contractor's means and methods deviate from commonly used industry standards.

ARTICLE 29. AUTHORIZED REPRESENTATIVES

The Authority shall designate representatives, who shall have the right to be present at the Project site at all times. The Authority may designate an inspector who shall have the right to observe all of the Contractor's Work. The inspector shall not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. Contractor shall provide safe and proper facilities for such access.

ARTICLE 30. HOURS OF WORK

A. As provided in Article 3 (commencing at section 1810), Chapter 1, Part 7, Division 2 of the Labor Code, Contractor stipulates that eight (8) hours of labor shall constitute a legal day's work. The time of service of any worker employed at any time by the Contractor or by any subcontractor on any subcontract under this Contract upon the Work or upon any part of the Work contemplated by this Contract is limited and restricted to eight (8) hours during any one calendar day and 40 hours during any one calendar week, except as hereinafter provided. Notwithstanding the provisions herein above set forth, work performed by employees of Contractor in excess of eight (8) hours per day, and 40 hours during any one week, shall be permitted upon this public work upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and one-half times the basic rate of pay.

B. The Contractor and every subcontractor shall keep an accurate record showing the name of and actual hours worked each calendar day and each calendar week by each worker employed in connection with the Work or any part of the Work contemplated by this Contract. The record shall be kept open at all reasonable hours to the inspection of the Authority and to the Division of Labor Law Enforcement, Department of Industrial Relations of the State of California.

C. The Contractor shall pay to the Authority a penalty of twenty-five dollars ($25.00) for each worker employed in the execution of this Contract by the Contractor or by any subcontractor for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any calendar day and 40 hours in any one calendar week in violation of the provisions of Article 3 (commencing at section 1810), Chapter 1, Part 7, Division 2 of the Labor Code.

D. Any work necessary to be performed after regular working hours, or on Saturdays and Sundays or other holidays, shall be performed without additional expense to the Authority.

E. Authority will provide inspection during normal working hours from 7:00 a.m. to 3:30 p.m. Monday through Friday. Inspection before or after this time will be charged to the Contractor as reimbursable inspection time. Inspections on weekends requires two days' notice for review and approval. Upon written request and approval the 8.5 hour working day may be changed to other limits subject to city/county ordinance.

F. It shall be unlawful for any person to operate, permit, use, or cause to operate any of the following at the Project site, other than between the hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, with no Work allowed on the Authority-observed holidays, unless otherwise approved by the Authority:

   1. Powered Vehicles

   2. Construction Equipment

   3. Loading and Unloading Vehicles

   4. Domestic Power Tools

ARTICLE 31. PAYROLL RECORDS

A. Pursuant to Labor Code section 1776, Contractor and all subcontractors shall maintain weekly certified payroll records, showing the names, addresses, Social Security numbers, work classifications, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by them in connection with the Work under this Contract. Contractor shall certify under penalty of perjury that records maintained and submitted by Contractor are true and accurate. Contractor shall also require subcontractor(s) to certify weekly payroll records under penalty of perjury.

B. In accordance with Labor Code section 1771.4, the Contractor and each subcontractor shall furnish the certified payroll records directly to the Department of Industrial Relations ("DIR") on the specified interval and format prescribed by the DIR, which may include electronic submission. Contractor shall comply with all requirements and regulations from the DIR relating to labor compliance monitoring and enforcement.

C. The payroll records described herein shall be certified and submitted by the Contractor at a time designated by the Authority. The Contractor shall also provide the following:

1. A certified copy of the employee's payroll records shall be made available for inspection or furnished to such employee or his or her authorized representative on request.

2. A certified copy of all payroll records described herein shall be made available for inspection or furnished upon request of the DIR.

D. Unless submitted electronically, the certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement ("DLSE") of the DIR or shall contain the same information as the forms provided by the DLSE.

E. Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency, the Authority, the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address and social security number. The name and address of the Contractor awarded the Contract or performing the contract shall not be marked or obliterated.

F. In the event of noncompliance with the requirements of this Article, the Contractor shall have ten (10) calendar days in which to comply subsequent to receipt of written notice specifying in what respects the Contractor must comply with this Article. Should noncompliance still be evident after such 10-day period, the Contractor shall pay a penalty of one hundred dollars ($100.00) to the Authority for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, such penalties shall be withheld from progress payment then due.

G. The responsibility for compliance with this Article shall rest upon the Contractor.

ARTICLE 32. PREVAILING RATES OF WAGES

A. The Contractor is aware of the requirements of Labor Code sections 1720 *et seq.* and 1770 *et seq.*, as well as California Code of Regulations, Title 8, Section 16000 *et seq.* ("Prevailing Wage Laws"), which require the payment of prevailing wage rates and the performance of other requirements on certain "public works" and "maintenance" projects. Since this Project involves an applicable "public works" or "maintenance" project, as defined by the Prevailing Wage Laws, and since the total compensation is $1,000 or more, Contractor agrees to fully comply with such Prevailing Wage Laws. The Contractor shall obtain a copy of the prevailing rates of per diem wages at the commencement of this Contract from the website of the Division of Labor Statistics and Research of the Department of Industrial Relations located at www.dir.ca.gov. In the alternative, the Contractor may view a copy of the prevailing rate of per diem wages which are on file at the Authority's Administration Office and shall be made available to interested parties upon request. Contractor shall make copies of the prevailing rates of per diem wages for each craft, classification, or type of worker needed to perform work on the Project available to interested parties upon request, and shall post copies at the Contractor's principal place of business and at the Project site. Contractor shall defend, indemnify and hold the Authority, its officials, officers, employees and authorized volunteers free and harmless from any claims, liabilities, costs, penalties or interest arising out of any failure or allege failure to comply with the Prevailing Wage Laws.

B. The Contractor shall forfeit as a penalty to the Authority not more than Two Hundred Dollars ($200.00), pursuant to Labor Code section 1775, for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rate as determined by the Director of the Department of Industrial Relations for such work or craft in which such worker is employed for any public work done under the Contract by it or by any subcontractor under it. The difference between such prevailing wage rate and the amount paid to each worker for each calendar day or portion thereof, for which each worker was paid less than the prevailing wage rate, shall be paid to each worker by the Contractor.

C. Contractor shall post, at appropriate conspicuous points on the Project site, a schedule showing all determined general prevailing wage rates and all authorized deductions, if any, from unpaid wages actually earned.

ARTICLE 33. PUBLIC WORKS CONTRACTOR REGISTRATION

Pursuant to Labor Code sections 1725.5 and 1771.1, the Contractor and its subcontractors must be registered with the Department of Industrial Relations prior to the execution of a contract to perform public works. By entering into this Contract, Contractor represents that it is aware of the registration requirement and is currently registered with the DIR. Contractor shall maintain a current registration for the duration of the Project. Contractor shall further include the requirements of Labor Code sections 1725.5 and 1771.1 in any subcontract and ensure that all subcontractors are registered at the time this Contract is entered into and maintain registration for the duration of the Project.

ARTICLE 34. EMPLOYMENT OF APPRENTICES

A. Contractor and all subcontractors shall comply with the requirements of Labor Code sections 1777.5 and 1777.6 in the employment of apprentices.

B. Information relative to apprenticeship standards, wage schedules, and other requirements may be obtained from the Director of Industrial Relations, ex officio the Administrator of Apprenticeship, San Francisco, California, or from the Division of Apprenticeship Standards and its branch offices.

C. Knowing violations of Labor Code section 1777.5 will result in forfeiture not to exceed one hundred dollars ($100.00) for each calendar day of non-compliance pursuant to Labor Code section 1777.7.

D. The responsibility for compliance with this Article shall rest upon the Contractor.

ARTICLE 35. NONDISCRIMINATION/EQUAL EMPLOYMENT OPPORTUNITY

Pursuant to Labor Code section 1735 and other applicable provisions of law, the Contractor and its subcontractors shall not discriminate against any employee or applicant for employment because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, marital status, sex, age, sexual orientation, or any other classifications protected by law on this Project. The Contractor will take affirmative action to insure that employees are treated during employment or training without regard to their race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, marital status, sex, age, sexual orientation, or any other classifications protected by law.

Employment Eligibility; Contractor. By executing this Contract, Contractor verifies that it fully complies with all requirements and restrictions of state and federal law respecting the employment of undocumented aliens, including, but not limited to, the Immigration Reform and Control Act of 1986, as may be amended from time to time. Such requirements and restrictions include, but are not limited to, examination and retention of documentation confirming the identity and immigration status of each employee of the Contractor. Contractor also verifies that it has not committed a violation of any such law within the five (5) years immediately preceding the date of execution of this Contract, and shall not violate any such law at any time during the term of the Contract. Contractor shall avoid any violation of any such law during the term of this Contract by participating in an electronic verification of work authorization program operated by the United States Department of Homeland Security, by participating in an equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, or by some other legally acceptable method. Contractor shall maintain records of each such verification, and shall make them available to the Authority or its representatives for inspection and copy at any time during normal business hours. The Authority shall not be responsible for any costs or expenses related to Contractor's compliance with the requirements provided for or referred to herein.

Employment Eligibility; Subcontractors, Sub-subcontractors and Consultants. To the same extent and under the same conditions as Contractor, Contractor shall require all of its subcontractors, sub-subcontractors and consultants performing any part of the Work or of this Contract to make the same verifications and comply with all requirements and restrictions provided for herein.

Employment Eligibility; Failure to Comply. Each person executing this Contract on behalf of Contractor verifies that he or she is a duly authorized officer of Contractor, and understands that any of the following shall be grounds for the Authority to terminate the Contract for cause: (1) failure of Contractor or its subcontractors, sub-subcontractors or consultants to meet any of the requirements provided for herein; (2) any misrepresentation or material omission concerning compliance with such requirements; or (3) failure to immediately remove from the Work any person found not to be in compliance with such requirements.

ARTICLE 36. DEBARMENT OF CONTRACTORS AND SUBCONTRACTORS

Contractors or subcontractors may not perform work on a public works project with a subcontractor who is ineligible to perform work on a public project pursuant to Labor Code section 1777.1 or 1777.7. Any contract on a public works project entered into between a contractor and a debarred subcontractor is void as a matter of law. A debarred subcontractor may not receive any public money for performing work as a subcontractor on a public works contract. Any public money that is paid, or may have been paid to a debarred subcontractor by a contractor on the project shall be returned to the Authority. The Contractor shall be responsible for the payment of wages to workers of a debarred subcontractor who has been allowed to work on the project.

ARTICLE 37. LABOR/EMPLOYMENT SAFETY

The Contractor shall comply with all applicable laws and regulations of the federal, state, and local government, including Cal/OSHA requirements and requirements for verification of employees' legal right to work in the United States.

The Contractor shall maintain emergency first aid treatment for his employees which complies with the Federal Occupational Safety and Health Act of 1970 (29 U.S.C. § 651 *et seq*.), and California Code of Regulations, Title 8, Industrial Relations Division 1, Department of Industrial Relations, Chapter 4. The Contractor shall ensure the availability of emergency medical services for its employees in accordance with California Code of Regulations, Title 8, Section 1512.

The Contractor shall submit the Illness and Injury Prevention Program and a Project site specific safety program to the Authority prior to beginning Work at the Project site. Contractor shall maintain a confined space program that meets or exceeds the Authority Standards. Contractor shall adhere to the Authority's lock out tag out program.

ARTICLE 38. INSURANCE

The Contractor shall obtain, and at all times during performance of the Work of Contract, maintain all of the insurance described in this Article. Contractor shall not commence Work under this Contract until it has provided evidence satisfactory to the Authority that it has secured all insurance required hereunder. Contractor shall not allow any subcontractor to commence work on any subcontract until it has provided evidence satisfactory to the Authority that the subcontractor has secured all insurance required under this Article. Failure to provide and maintain all required insurance shall be grounds for the Authority to terminate this Contract for cause. Contractor shall furnish Authority with original certificates of insurance and endorsements effective coverage required by this Contract on forms satisfactory to the Authority. The certificates and endorsements for each insurance policy shall be signed by a person authorized by that insurer to bind coverage on its behalf, and shall be on forms

acceptable to the Authority. All certificates and endorsements must be received and approved by the Authority before Work commences.

A. **Additional Insureds; Waiver of Subrogation**. The Authority, its officials, officers, employees, agents and authorized volunteers shall be named as Additional Insureds on Contractor's All Risk policy and on Contractor's and its subcontractors' policies of Commercial General Liability and Automobile Liability insurance using, for Contractor's policy/ies of Commercial General Liability insurance, ISO CG forms 20 10 and 20 37 (or endorsements providing the exact same coverage, including completed operations), and, for subcontractors' policies of Commercial General Liability insurance, ISO CG form 20 38 (or endorsements providing the exact same coverage). Notwithstanding the minimum limits set forth in this Contract for any type of insurance coverage, all available insurance proceeds in excess of the specified minimum limits of coverage shall be available to the parties required to be named as Additional Insureds hereunder. Contractor and its insurance carriers shall provide a Waiver of Subrogation in favor of those parties.

B. **Workers' Compensation Insurance**. The Contractor shall provide workers' compensation insurance for all of the employees engaged in Work under this Contract, on or at the Site, and, in case of any sublet Work, the Contractor shall require the subcontractor similarly to provide workers' compensation insurance for all the latter's employees as prescribed by State law. Any class of employee or employees not covered by a subcontractor's insurance shall be covered by the Contractor's insurance. In case any class of employees engaged in work under this Contract, on or at the Site, is not protected under the Workers' Compensation Statutes, the Contractor shall provide or shall cause a subcontractor to provide, adequate insurance coverage for the protection of such employees not otherwise protected. The Contractor is required to secure payment of compensation to his employees in accordance with the provisions of section 3700 of the Labor Code. The Contractor shall file with the Authority certificates of his insurance protecting workers. Company or companies providing insurance coverage shall be acceptable to the Authority, if in the form and coverage as set forth in the Contract Documents.

C. **Employer's Liability Insurance**. Contractor shall provide Employer's Liability Insurance, including Occupational Disease, in the amount of at least one million dollars ($1,000,000.00) per person per accident. Contractor shall provide Authority with a certificate of Employer's Liability Insurance. Such insurance shall comply with the provisions of the Contract Documents. The policy shall be endorsed, if applicable, to provide a Borrowed Servant/Alternate Employer Endorsement and contain a Waiver of Subrogation in favor of the Authority.

D. **Commercial General Liability Insurance**. Contractor shall provide "occurrence" form Commercial General Liability insurance coverage at least as broad as the most current ISO CGL Form 00 01, including but not limited to, premises liability, contractual liability, products/completed operations, personal and advertising injury which may arise from or out of Contractor's operations, use, and management of the Site, or the performance of its obligations hereunder. The policy shall not contain any exclusion contrary to this Contract including but not limited to endorsements or provisions limiting coverage for (1) contractual liability (including but not limited to ISO CG 24 26 or 21 39); or (2) cross-liability for claims or suits against one insured against another. Policy limits shall not be less than $1,000,000 per occurrence for

bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit. Defense costs shall be paid in addition to the limits.

1. Such policy shall comply with all the requirements of this Article. The limits set forth herein shall apply separately to each insured against whom claims are made or suits are brought, except with respect to the limits of liability. Further the limits set forth herein shall not be construed to relieve the Contractor from liability in excess of such coverage, nor shall it limit Contractor's indemnification obligations to the Authority, and shall not preclude the Authority from taking such other actions available to the Authority under other provisions of the Contract Documents or law.

2. All general liability policies provided pursuant to the provisions of this Article shall comply with the provisions of the Contract Documents.

3. All general liability policies shall be written to apply to all bodily injury, including death, property damage, personal injury, owned and non-owned equipment, blanket contractual liability, completed operations liability, explosion, collapse, under-ground excavation, removal of lateral support, and other covered loss, however occasioned, occurring during the policy term, and shall specifically insure the performance by Contractor of that part of the indemnification contained in these General Conditions relating to liability for injury to or death of persons and damage to property.

4. If the coverage contains one or more aggregate limits, a minimum of 50% of any such aggregate limit must remain available at all times; if over 50% of any aggregate limit has been paid or reserved, the Authority may require additional coverage to be purchased by Contractor to restore the required limits. Contractor may combine primary, umbrella, and as broad as possible excess liability coverage to achieve the total limits indicated above. Any umbrella or excess liability policy shall include the additional insured endorsement described in the Contract Documents.

5. All policies of general liability insurance shall permit and Contractor does hereby waive any right of subrogation which any insurer of Contractor may acquire from Contractor by virtue of the payment of any loss.

E. **Automobile Liability Insurance**. Contractor shall provide "occurrence" form Automobile Liability Insurance at least as broad as ISO CA 00 01 (Any Auto) in the amount of, at least, one million dollars ($1,000,000) per accident for bodily injury and property damage. Such insurance shall provide coverage with respect to the ownership, operation, maintenance, use, loading or unloading of any auto owned, leased, hired or borrowed by Contractor or for which Contractor is responsible, in a form and with insurance companies acceptable to the Authority. All policies of automobile insurance shall permit and Contractor does hereby waive any right of subrogation which any insurer of Contractor may acquire from Contractor by virtue of the payment of any loss.

F. **Builder's Risk ["All Risk"]**

1. It is the Contractor's responsibility to maintain or cause to be maintained Builder's Risk ["All Risk"] extended coverage insurance on all work, material, equipment, appliances, tools, and structures that are or will become part of the Work and subject to loss or damage by fire, and vandalism and malicious mischief, in an amount to cover 100% of the replacement cost. The Authority accepts no responsibility for the Work until the Work is formally accepted by the Authority. The Contractor shall provide a certificate evidencing this coverage before commencing performance of the Work.

2. The named insureds shall be Contractor, all Subcontractors of any tier (excluding those solely responsible for design work), suppliers, and Authority, its elected officials, officers, employees, agents and authorized volunteers, as their interests may appear. Contractor shall not be required to maintain property insurance for any portion of the Work following acceptance by Authority.

3. Policy shall be provided for replacement value on an "all risk" basis. There shall be no coinsurance penalty provision in any such policy. Policy must include: (1) coverage for any ensuing loss from faulty workmanship, nonconforming work, omission or deficiency in design or specifications; (2) coverage against machinery accidents and operational testing; (3) coverage for removal of debris, and insuring the buildings, structures, machinery, equipment, materials, facilities, fixtures and all other properties constituting a part of the Project; (4) transit coverage, including ocean marine coverage (unless insured by the supplier), with sub-limits sufficient to insure the full replacement value of any key equipment item; and (5) coverage with sub-limits sufficient to insure the full replacement value of any property or equipment stored either on or off the Site. Such insurance shall be on a form acceptable to Authority to ensure adequacy and sublimit.

4. In addition, the policy shall meet the following requirements:

   a. Insurance policies shall be so conditioned as to cover the performance of any extra work performed under the Contract.

   b. Coverage shall include all materials stored on site and in transit.

   c. Coverage shall include Contractor's tools and equipment.

   d. Insurance shall include boiler, machinery and material hoist coverage.

G. **Contractor's Pollution Liability Coverage**. Contractor shall provide pollution liability insurance in an amount not less than $1,000,000 per occurrence and $2,000,000 aggregate.

H. Contractor shall require all tiers of sub-contractors working under this Contract to provide the insurance required under this Article unless otherwise agreed to in writing by Authority. Contractor shall make certain that any and all subcontractors hired by Contractor are insured in accordance with this Contract. If any subcontractor's coverage does not comply with the foregoing provisions, Contractor

shall indemnify and hold the Authority harmless from any damage, loss, cost, or expense, including attorneys' fees, incurred by the Authority as a result thereof.

ARTICLE 39. FORM AND PROOF OF CARRIAGE OF INSURANCE

A. Any insurance carrier providing insurance coverage required by the Contract Documents shall be admitted to and authorized to do business in the State of California unless waived, in writing, by the Authority's Risk Manager. Carrier(s) shall have an A.M. Best rating of not less than an A:VII. Insurance deductibles or self-insured retentions must be declared by the Contractor. At the election of the Authority the Contractor shall either 1) reduce or eliminate such deductibles or self-insured retentions, or 2) procure a bond which guarantees payment of losses and related investigations, claims administration, and defense costs and expenses. If umbrella or excess liability coverage is used to meet any required limit(s) specified herein, the Contractor shall provide a "follow form" endorsement satisfactory to the Authority indicating that such coverage is subject to the same terms and conditions as the underlying liability policy.

B. Each insurance policy required by this Contract shall be endorsed to state that: (1) coverage shall not be suspended, voided, reduced or cancelled except after thirty (30) days prior written notice by certified mail, return receipt requested, has been given to the Authority; and (2) any failure to comply with reporting or other provisions of the policies, including breaches of warranties, shall not affect coverage provided to the Authority, its officials, officers, agents, employees, and volunteers.

C. The Certificates(s) and policies of insurance shall contain or shall be endorsed to contain the covenant of the insurance carrier(s) that it shall provide no less than thirty (30) days written notice be given to the Authority prior to any material modification or cancellation of such insurance. In the event of a material modification or cancellation of coverage, the Authority may terminate the Contract or stop the Work in accordance with the Contract Documents, unless the Authority receives, prior to such effective date, another properly executed original Certificate of Insurance and original copies of endorsements or certified original policies, including all endorsements and attachments thereto evidencing coverage's set forth herein and the insurance required herein is in full force and effect. Contractor shall not take possession, or use the Site, or commence operations under this Contract until the Authority has been furnished original Certificate(s) of Insurance and certified original copies of endorsements or policies of insurance including all endorsements and any and all other attachments as required in this Article. The original endorsements for each policy and the Certificate of Insurance shall be signed by an individual authorized by the insurance carrier to do so on its behalf.

D. The Certificate(s) of Insurance, policies and endorsements shall so covenant and shall be construed as primary, and the Authority's insurance and/or deductibles and/or self-insured retentions or self-insured programs shall not be construed as contributory.

E. Authority reserves the right to adjust the monetary limits of insurance coverages during the term of this Contract including any extension thereof if, in the Authority's reasonable judgment, the amount or type of insurance carried by the Contractor becomes inadequate.

F. Contractor shall report to the Authority, in addition to the Contractor's insurer, any and all insurance claims submitted by the Contractor in connection with the Work under this Contract.

ARTICLE 40. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

A. **Time for Completion/Liquidated Damages.** Time is of the essence in the completion of the Work. Work shall be commenced within ten (10) Days of the date stated in the Authority's Notice to Proceed and shall be completed by Contractor in the time specified in the Contract Documents. The Authority is under no obligation to consider early completion of the Project; and the Contract completion date shall not be amended by the Authority's receipt or acceptance of the Contractor's proposed earlier completion date. Furthermore, Contractor shall not, under any circumstances, receive additional compensation from the Authority (including but not limited to indirect, general, administrative or other forms of overhead costs) for the period between the time of earlier completion proposed by the Contractor and the Contract completion date. If the Work is not completed as stated in the Contract Documents, it is understood that the Authority will suffer damage. In accordance with Government Code section 53069.85, being impractical and infeasible to determine the amount of actual damage, it is agreed that Contractor shall pay to the Authority as fixed and liquidated damages, and not as a penalty, the sum stipulated in the Contract for each calendar day of delay until the Work is fully completed. Contractor and its surety shall be liable for any liquidated damages. Any money due or to become due the Contractor may be retained to cover liquidated damages.

B. **Inclement Weather.** Contractor shall abide by the Engineer's determination of what constitutes inclement weather. Time extensions for inclement weather shall only be granted when the Work stopped during inclement weather is on the critical path of the Project schedule.

C. **Extension of Time.** Contractor shall not be charged liquidated damages because of any delays in completion of the Work due to unforeseeable causes beyond the control and without the fault or negligence of Contractor (or its subcontractors or suppliers). Contractor shall within five (5) Days of identifying any such delay notify the Authority in writing of causes of delay. The Authority shall ascertain the facts and extent of delay and grant extension of time for completing the Work when, in its judgment, the facts justify such an extension. Time extensions to the Project shall be requested by the Contractor as they occur and without delay. No delay claims shall be permitted unless the event or occurrence delays the completion of the Project beyond the Contract completion date.

D. **No Damages for Reasonable Delay.** The Authority's liability to Contractor for delays for which the Authority is responsible shall be limited to only an extension of time unless such delays were unreasonable under the circumstances. In no case shall the Authority be liable for any costs which are borne by the Contractor in the regular course of business, including, but not limited to, home office overhead and other ongoing costs. Damages caused by unreasonable Authority delay, including delays caused by items that are the responsibility of the Authority pursuant to Government Code section 4215, shall be based on actual costs only, no proportions or formulas shall be used to calculate any delay damages.

ARTICLE 41. COST BREAKDOWN AND PERIODIC ESTIMATES

Contractor shall furnish on forms Approved by the Authority:

A. Within ten (10) Days of Notice to Proceed with the Contract, a detailed estimate giving a complete breakdown of the Contract price, if the Contract amount is a lump sum.

B. A monthly itemized estimate of Work done for the purpose of making progress payments. In order for the Authority to consider and evaluate each progress payment application, the Contractor shall submit a detailed measurement of Work performed and a progress estimate of the value thereof before the tenth (10th) Day of the following month.

C. Contractor shall submit, with each of its payment requests, an adjusted list of actual quantities, verified by the Engineer, for unit price items listed, if any, in the Bid Form.

D. Following the Authority's Acceptance of the Work, the Contractor shall submit to the Authority a written statement of the final quantities of unit price items for inclusion in the final payment request.

E. The Authority shall have the right to adjust any estimate of quantity and to subsequently correct any error made in any estimate for payment.

Contractor shall certify under penalty of perjury, that all cost breakdowns and periodic estimates accurately reflect the Work on the Project.

ARTICLE 42. PROGRESS ESTIMATES AND PAYMENT

A. By the tenth (10th) Day of the following calendar month, Contractor shall submit to Engineer a payment request which shall set forth in detail the value of the Work done for the period beginning with the date work was first commenced and ending on the end of the calendar month for which the payment request is prepared. Contractor shall include any amount earned for authorized extra work. From the total thus computed, a deduction shall be made in the amount of five percent (5%) for retention, except where the Authority has adopted a finding that the Work done under the Contract is substantially complex, and then the amount withheld as retention shall be the percentage specified in the Notice Inviting Bids. From the remainder a further deduction may be made in accordance with Section B below. The amount computed, less the amount withheld for retention and any amounts withheld as set forth below, shall be the amount of the Contractor's payment request.

B. The Authority may withhold a sufficient amount or amounts of any payment or payments otherwise due to Contractor, as in his judgment may be necessary to cover:

   1. Payments which may be past due and payable for just claims against Contractor or any subcontractors for labor or materials furnished in and about the performance of work on the Project under this Contract.

   2. Defective work not remedied.

3. Failure of Contractor to make proper payments to his subcontractor or for material or labor.

4. Completion of the Contract if there is a reasonable doubt that the Work can be completed for balance then unpaid.

5. Damage to another contractor or a third party.

6. Amounts which may be due the Authority for claims against Contractor.

7. Failure of Contractor to keep the record ("as-built") drawings up to date.

8. Failure to provide update on construction schedule as required herein.

9. Site cleanup.

10. Failure to comply with Contract Documents.

11. Liquidated damages.

12. Legally permitted penalties.

C. The Authority may apply such withheld amount or amounts to payment of such claims or obligations at its discretion with the exception of subsections (B)(1), (3), and (5) of this Article, which must be retained or applied in accordance with applicable law. In so doing, the Authority shall be deemed the agent of Contractor and any payment so made by the Authority shall be considered as a payment made under contract by the Authority to Contractor and the Authority shall not be liable to Contractor for such payments made in good faith. Such payments may be made without prior judicial determination of claim or obligations. The Authority will render Contractor a proper accounting of such funds disbursed on behalf of Contractor.

D. Upon receipt, the Engineer shall review the payment request to determine whether it is undisputed and suitable for payment. If the payment request is determined to be unsuitable for payment, it shall be returned to Contractor as soon as practicable but not later than seven (7) Days after receipt, accompanied by a document setting forth in writing the reasons why the payment request is not proper. The Authority shall make the progress payment within 30 calendar days after the receipt of an undisputed and properly submitted payment request from Contractor, provided that a release of liens and claims has been received from the Contractor pursuant to Civil Code section 8132. The number of days available to the Authority to make a payment without incurring interest pursuant to this paragraph shall be reduced by the number of days by which the Engineer exceeds the seven (7) Day requirement.

E. A payment request shall be considered properly executed if funds are available for payment of the payment request and payment is not delayed due to an audit inquiry by the financial officer of the Authority.

ARTICLE 43. SECURITIES FOR MONEY WITHHELD

Pursuant to section 22300 of the Public Contract Code of the State of California, Contractor may

request the Authority to make retention payments directly to an escrow agent or may substitute securities for any money withheld by the Authority to ensure performance under the contract. At the request and expense of Contractor, securities equivalent to the amount withheld shall be deposited with the Authority or with a state or federally chartered bank as the escrow agent who shall return such securities to Contractor upon satisfactory completion of the contract. Deposit of securities with an escrow agent shall be subject to a written agreement substantially in the form provided in section 22300 of the Public Contract Code.

ARTICLE 44. CHANGES AND EXTRA WORK.

A. **Contract Change Orders**.

1. The Authority, without invalidating the Contract, may order changes in the Work consisting of additions, deletions or other revisions, and the Contract Price and Contract Time shall be adjusted accordingly. Except as otherwise provided herein, all such changes in the Work shall be authorized by Change Order, and shall be performed under the applicable conditions of the Contract Documents. A Change Order signed by the Contractor indicates the Contractor's agreement therewith, including any adjustment in the Contract Price or the Contract Time, and the full and final settlement of all costs (direct, indirect and overhead) related to the Work authorized by the Change Order.

2. Contractor shall promptly execute changes in the Work as directed in writing by the Authority even when the parties have not reached agreement on whether the change increases the scope of Work or affects the Contract Price or Contract Time. All claims for additional compensation to the Contractor shall be presented in writing. No claim will be considered after the Work in question has been done unless a written Change Order has been issued or a timely written notice of claim has been made by Contractor.

3. Whenever any change is made as provided for herein, such change shall be considered and treated as though originally included in the Contract, and shall be subject to all terms, conditions, and provisions of the original Contract.

4. Contractor shall not be entitled to claim or bring suit for damages, whether for loss of profits or otherwise, on account of any decrease or omission of any item or portion of Work to be done.

5. No dispute, disagreement, or failure of the parties to reach agreement on the terms of the Change Order shall relieve the Contractor from the obligation to proceed with performance of the work, including Additional Work, promptly and expeditiously.

6. Contractor shall make available to the Authority any of the Contractor’s documents related to the Project immediately upon request of the Authority, as set forth in Article 52.

7. Any alterations, extensions of time, Additional Work, or any other changes may be made without securing consent of the Contractor’s surety or sureties.

B. **Contract Price Change**.

1. Process for Determining Adjustments in Contract Price.

   a. Owner Initiated Change. The Contractor must submit a complete cost proposal, including any change in the Contract Price or Contract Time, within seven (7) Days after receipt of a scope of a proposed change order initiated by the Authority, unless the Authority requests that proposals be submitted in less than seven (7) Days.

   b. Contractor Initiated Change. The Contractor must give written notice of a proposed change order required for compliance with the Contract Documents within seven (7) Days of discovery of the facts giving rise to the proposed change order.

   c. Whenever possible, any changes to the Contract amount shall be in a lump sum mutually agreed to by the Contractor and the Authority.

   d. Price quotations from the Contractor shall be accompanied by sufficiently detailed supporting documentation to permit verification by the Authority, including but not limited to estimates and quotations from subcontractors or material suppliers, as the Authority may reasonably request. Contractor shall certify the accuracy of all Change Order Requests under penalty of perjury.

   e. If the Contractor fails to submit a complete cost proposal within the seven (7) Day period (or as requested), the Authority has the right to order the Contractor in writing to commence the Work immediately on a time and materials basis and/or issue a lump sum change to the Contract Price and/or Contract Time in accordance with the Authority's estimate. If the change is issued based on the Authority's estimate, the Contractor will waive its right to dispute the action unless within fifteen (15) Days following completion of the added/deleted work, the Contractor presents written proof that the Authority's estimate was in error.

2. Unit Price Change Orders.

   a. When the actual quantity of a Unit Price item varies from the Bid Form, compensation for the change in quantity will be calculated by multiplying the actual quantity by the Unit Price. This calculation may result in either an additive or deductive Final Change Order pursuant to the Contract Documents.

   b. No Mark up for Overhead and Profit. Because the Contract Unit Prices provided in the Bid Form include Overhead and Profit as determined by Contractor at the time of Bid submission, no mark up or deduction for Overhead and Profit will be included in Unit Price Change Orders.

   c. Bid items included on the Bid Form may be deducted from the Work in their entirety without any negotiated extra costs.

   d. Contractor acknowledges that unit quantities are estimates and agrees that the estimated unit quantities listed on the Bid Form will be adjusted to reflect the actual unit quantities which may result in an adjustment to the Contract

Unit Prices. Such an adjustment will be made by execution of a final additive or deductive Change Order following Contractor's completion of the Work. Upon notification, Contractor's failure to respond within seven (7) Days will result in Authority's issuance of a unit quantity adjustment to the Contract Unit Prices and/or Contract Time in accordance with the Contract Documents.

e. The Authority or Contractor may make a Claim for an adjustment in the Unit Price in accordance with the Contract Documents if:

i. the quantity of any item of Unit Price Work performed by Contractor differs by twenty-five percent (25%) or more from the estimated quantity of such item indicated in the Contract; and

ii. there is no corresponding adjustment with respect to any other item of Work; and

iii. Contractor believes that Contractor is entitled to an increase in Unit Price as a result of having incurred additional expense or the Authority believes that the Authority is entitled to a decrease in Unit Price and the parties are unable to agree as to the amount of any such increase or decrease..

3. Lump Sum Change Orders. Compensation for Lump Sum Change Orders shall be limited to expenditures necessitated specifically by the Additional Work, and shall be segregated as follows:

a. Labor. The costs of labor will be the actual cost for wages prevailing locally for each craft or type of worker at the time the Additional Work is done, plus employer payments of payroll taxes and insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State or local laws, as well as assessment or benefits required by lawful collective bargaining agreements. The use of a labor classification which would increase the Additional Work cost will not be permitted unless the Contractor establishes the necessity for such new classifications. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.

b. Materials. The cost of materials reported shall be at invoice or lowest current price at which such materials are locally available in the quantities involved, plus sales tax, freight, and delivery. Materials costs shall be based upon supplier or manufacturer's invoice. If invoices or other satisfactory evidence of cost are not furnished within fifteen (15) Days of delivery, then the Authority shall determine the materials cost, at its sole discretion.

c. Tool and Equipment Use. Costs for the use of small tools, which are tools that have a replacement value of $1,000 or less, shall be considered included in the Overhead and Profit mark-ups established below. Regardless of ownership, the rates to be used in determining equipment use costs shall not exceed listed rates prevailing locally at equipment rental agencies, or distributors, at the time the Work is performed.

4. Time and Materials Change Orders.

a. General. The term Time and Materials means the sum of all costs reasonably and necessarily incurred and paid by Contractor for labor, materials, and equipment in the proper performance of Additional Work. Except as otherwise may be agreed to in writing by the Authority, such costs shall be in amounts no higher than those prevailing in the locality of the Project, and shall include only the following items.

b. Timely and Final Documentation.

i. T&M Daily Sheets. Contractor must submit timesheets, materials invoices, records of equipment hours, and records of rental equipment hours to the Authority's Representative for an approval signature **each day** Additional Work is performed. Failure to get the Authority's Representative's approval signature each Day shall result in a waiver of Contractor's right to claim these costs. The Authority's Representative's signature on time sheets only serves as verification that the Work was performed and is not indicative of Authority's agreement to Contractor's entitlement to the cost.

ii. T&M Daily Summary Sheets. All documentation of incurred costs ("T&M Daily Summary Sheets") shall be submitted by Contractor within **three (3) Days** of incurring the cost for labor, material, equipment, and special services as Additional Work is performed. Contractor's actual costs shall be presented in a summary table in an electronic spreadsheet file by labor, material, equipment, and special services. Each T&M Daily Summary Sheet shall include Contractor's actual costs incurred for the Additional Work performed that day and a cumulative total of Contractor's actual costs incurred for the Additional Work. Contractor's failure to provide a T&M Daily Summary Sheet showing a total cost summary within three (3) Days but within five (5) Days of performance of the Work will result in the Contractor's otherwise allowable overhead and profit being reduced by 50% for that portion of Additional Work which was not documented in a timely manner. Contractor's failure to submit the T&M Daily Summary Sheet within five (5) Days of performance of the Work will result in a total waiver of Contractor's right to claim these costs.

iii. T&M Total Cost Summary Sheet. Contractor shall submit a T&M Total Cost Summary Sheet, which shall include total actual costs, within **seven (7) Days** following completion of Authority approved Additional Work. Contractor's total actual cost shall be presented in a summary table in an electronic spreadsheet file by labor, material, equipment, and special services. Contractor's failure to submit the T&M Total Cost Summary Sheet within seven (7) Days of completion of the Additional Work will result in Contractor's waiver for any reimbursement of any costs associated with the T&M Summary Sheets or the performance of the Additional Work.

c. Labor. The Contractor will be paid the cost of labor for the workers used in the actual and direct performance of the Work. The cost of labor will be the sum of the actual wages paid (which shall include any employer payments to or on behalf of the workers for health and welfare, pension, vacation, and

similar purposes) substantiated by timesheets and certified payroll for wages prevailing for each craft or type of workers performing the Additional Work at the time the Additional Work is done, and the labor surcharge set forth in the Department of Transportation publication entitled *Labor Surcharge and Equipment Rental Rates*, which is in effect on the date upon which the Work is accomplished and which is a part of the Contract. The labor surcharge shall constitute full compensation for all payments imposed by Federal, State, or local laws and for all other payments made to, or on behalf of, the workers, other than actual wages.

i. Equipment Operator Exception. Labor costs for equipment operators and helpers shall be paid only when such costs are not included in the invoice for equipment rental.

ii. Foreman Exception. The labor costs for foremen shall be proportioned to all of their assigned work and only that applicable to the Additional Work shall be paid. Indirect labor costs, including, without limitation, the superintendent, project manager, and other labor identified in the Contract Documents will be considered Overhead.

d. Materials. The cost of materials reported shall be itemized at invoice or lowest current price at which materials are locally available and delivered to the Project site in the quantities involved, plus the cost of sales tax, freight, delivery, and storage.

i. Trade discounts available to the purchaser shall be credited to the Authority notwithstanding the fact that such discounts may not have been taken by Contractor.

ii. For materials secured by other than a direct purchase and direct billing to the purchaser, the cost shall be deemed to be the price paid to the actual supplier as determined by the Authority's Representative.

iii. Payment for materials from sources owned wholly or in part by the purchaser shall not exceed the price paid by the purchaser for similar materials from said sources on Additional Work items or the current wholesale price for such materials delivered to the Project site, whichever price is lower.

iv. If, in the opinion of the Authority's Representative, the cost of materials is excessive, or Contractor does not furnish satisfactory evidence of the cost of such materials, then the cost shall be deemed to be the lowest current wholesale price for the total quantity concerned delivered to the Project site less trade discounts.

v. The Authority reserves the right to furnish materials for the Additional Work and no Claim shall be allowed by Contractor for costs of such materials or Indirect Costs or profit on Authority furnished materials.

e. Equipment.

i. Rental Time. The rental time to be paid for equipment on the Project site shall be the time the equipment is in productive operation on the Additional Work being performed and, in addition, shall include the time required to move the equipment to the location of the Additional Work and return it to the original location or to another location requiring no more time than that required to return it to its original location; except that moving time will not be paid if the equipment is used on other than the Additional Work, even though located at the site of the Additional Work.

(a) Rental Time Not Allowed. Rental time will not be allowed while equipment is inoperative due to breakdowns.

(b) Computation Method. The following shall be used in computing the rental time of equipment on the Project site.

(i) When hourly rates are paid, any part of an hour less than 30 minutes of operation shall be considered to be 1/2-hour of operation, and any part of an hour in excess of 30 minutes will be considered one hour of operation.

(ii) When daily rates are paid, any part of a day less than 4 hours operation shall be considered to be 1/2-day of operation, and any part of an hour in excess of 4 hours will be considered one day of operation.

ii. Rental Rates. Contractor will be paid for the use of equipment at the lesser of (i) the actual rental rate, or (ii) the rental rate listed for that equipment in the California Department of Transportation publication entitled *Labor Surcharge and Equipment Rental Rates*, which is in effect on the date upon which the Contract was executed. Such rental rates will be used to compute payments for equipment whether the equipment is under Contractor's control through direct ownership, leasing, renting, or another method of acquisition. The rental rate to be applied for use of each item of equipment shall be the rate (i.e., daily, monthly) resulting in the least total cost to the Authority for the total period of use. If it is deemed necessary by Contractor to use equipment not listed in the publication, an equitable rental rate for the equipment will be established by the Authority's Representative. Contractor may furnish cost data which might assist the Authority's Representative in the establishment of the rental rate.

iii. Contractor-Owned Equipment.

(a) For Contractor-owned equipment, the allowed equipment rental rate will be limited to the monthly equipment rental rate using a utilization rate of 173 hours per month.

(b) For Contractor-owned equipment, the rental time to be paid for equipment on the Site shall be the time the equipment is in productive operation, unless, in the instance of standby time, the equipment could be actively used by Contractor on another project,

then Authority shall pay for the entirety of the time the equipment is on Site. It shall be Contractor's burden to demonstrate to the Authority that the equipment could be actively used on another project.

iv. All equipment shall, in the opinion of the Authority's Representative, be in good working condition and suitable for the purpose for which the equipment is to be used.

v. Before construction equipment is used on the Additional Work, Contractor shall plainly stencil or stamp an identifying number thereon at a conspicuous location, and shall furnish to the Authority's Representative, in duplicate, a description of the equipment and its identifying number and the scheduled Additional Work activities planned.

vi. Unless otherwise specified, manufacturer's rating and manufacturer approved modifications shall be used to classify equipment for the determination of applicable rental rates. Equipment which has no direct power unit shall be powered by a unit of at least the minimum rating recommended by the manufacturer.

f. Special Services. Special work or services are defined as that Additional Work characterized by extraordinary complexity, sophistication, or innovation or a combination of the foregoing attributes which are unique to the construction industry.

i. Invoices for Special Services. When the Authority's Representative and Contractor determine that a special service is required which cannot be performed by the forces of Contractor or those of any of its Subcontractors, the special service may be performed by an entity especially skilled in the Additional Work. Invoices for special services based upon the current fair market value thereof may be accepted without complete itemization of labor, material, and equipment rental costs, after validation of market values by the Authority's Representative.

ii. Discount and Allowance. All invoices for special services will be adjusted by deducting all trade discounts offered or available, whether the discounts were taken or not. In lieu of Overhead and Profit specified herein, a total allowance not to exceed fifteen percent (15%) for Overhead and Profit will be added to invoices for Special Services.

iii. When the Authority determines, in its sole discretion, that competitive bidding is necessary for certain special services, Contractor shall solicit competitive bids for those special services.

g. Excluded Costs. The term Time and Material shall not include any of the following costs or any other home or field office overhead costs, all of which are to be considered administrative costs covered by Contractor's allowance for Overhead and Profit.

i. Overhead Cost. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, timekeepers, clerks, and other personnel employed by Contractor whether at the Site or in Contractor's principal office or any branch office, material yard, or shop for general administration of the Additional Work;

ii. Office Expenses. Expenses of Contractor's principal and branch offices;

iii. Capital Expenses. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Additional Work and charges against Contractor for delinquent payments;

iv. Negligence. Costs due to the negligence of Contractor or any Subcontractor or Supplier, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including without limitation the correction of Defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property;

v. Other. Other overhead or general expense costs of any kind and the cost of any item not specifically and expressly included in the Contract Documents;

vi. Small Tools. Cost of small tools valued at less than $1,000 and that remain the property of Contractor;

vii. Administrative Costs. Costs associated with the preparation of Change Orders (whether or not ultimately authorized), cost estimates, or the preparation or filing of Claims;

viii. Anticipated Lost Profits. Expenses of Contractor associated with anticipated lost profits or lost revenues, lost income or earnings, lost interest on earnings, or unpaid retention;

ix. Home Office Overhead. Costs derived from the computation of a "home office overhead" rate by application of the *Eichleay, Allegheny*, burden fluctuation, or other similar methods;

x. Special Consultants and Attorneys. Costs of special consultants or attorneys, whether or not in the direct employ of Contractor, employed for services specifically related to the resolution of a Claim, dispute, or other matter arising out of or relating to the performance of the Additional Work.

h. Overhead, Profit and Other Charges. The mark-up for overhead (including supervision) and profit on work added to the Contract shall be according to the following:

i. "Net Cost" is defined as consisting of costs of labor, materials, and tools and equipment only excluding overhead and profit. The costs of applicable insurance and bond premium will be reimbursed to the

Contractor and subcontractors at cost only, without mark-up. Contractor shall provide Authority with documentation of the costs, including, but not limited to, payroll records, invoices, and such other information as Authority may reasonably request.

ii. For Work performed by the Contractor's forces, the added cost for overhead and profit shall not exceed fifteen percent (15%) of the Net Cost of the Work.

iii. For Work performed by a subcontractor, the added cost for overhead and profit shall not exceed fifteen percent (15%) of the subcontractor's Net Cost of the Work to which the Contractor may add five percent (5%) of the subcontractor's Net Cost.

iv. For Work performed by a sub-subcontractor, the added cost for overhead and profit shall not exceed fifteen percent (15%) of the sub-subcontractor's Net Cost for Work to which the subcontractor and general contractor may each add an additional five percent (5%) of the Net Cost of the lower tier subcontractor.

v. No additional mark-up will be allowed for lower tier subcontractors, and in no case shall the added cost for overhead and profit payable by Authority exceed twenty-five percent (25%) of the Net Cost as defined herein, of the party that performs the Work.

5. All of the following costs are included in the markups for overhead and profit described above, and Contractor shall not receive any additional compensation for: Submittals, drawings, field drawings, Shop Drawings, including submissions of drawings; field inspection; General Superintendence; General administration and preparation of cost proposals, schedule analysis, Change Orders, and other supporting documentation; computer services; reproduction services; Salaries of project engineer, superintendent, timekeeper, storekeeper, and secretaries; Janitorial services; Small tools, incidentals and consumables; Temporary On-Site facilities (Offices, Telephones, High Speed Internet Access, Plumbing, Electrical Power, Lighting; Platforms, Fencing, Water), Jobsite and Home office overhead or other expenses; vehicles and fuel used for work otherwise included in the Contract Documents; Surveying; Estimating; Protection of Work; Handling and disposal fees; Final Cleanup; Other Incidental Work; Related Warranties; insurance and bond premiums.

6. For added or deducted Work by subcontractors, the Contractor shall furnish to the Authority the subcontractor's signed detailed record of the cost of labor, material and equipment, including the subcontractor markup for overhead and profit. The same requirement shall apply to sub-subcontractors

7. For added or deducted work furnished by a vendor or supplier, the Contractor shall furnish to the Authority a detailed record of the cost to the Contractor, signed by such vendor or supplier.

8. Any change in the Work involving both additions and deletions shall indicate a net total cost, including subcontracts and materials. Allowance for overhead and

profit, as specified herein, shall be applied if the net total cost is an increase in the Contract Price; overhead and profit allowances shall not be applied if the net total cost is a deduction to the Contract Price. The estimated cost of deductions shall be based on labor and material prices on the date the Contract was executed.

9. Contractor shall not reserve a right to assert impact costs, extended job site costs, extended overhead, constructive acceleration and/or actual acceleration beyond what is stated in the Change Order for Work. No claims shall be allowed for impact, extended overhead costs, constructive acceleration and/or actual acceleration due to a multiplicity of changes and/or clarifications. The Contractor may not change or modify the Authority's change order form in an attempt to reserve additional rights.

10. If the Authority disagrees with the proposal submitted by Contractor, it will notify the Contractor and the Authority will provide its opinion of the appropriate price and/or time extension. If the Contractor agrees with the Authority, a Change Order will be issued by the Authority. If no agreement can be reached, the Authority shall have the right to issue a unilateral Change Order setting forth its determination of the reasonable additions or savings in costs and time attributable to the extra or deleted work. Such determination shall become final and binding if the Contractor fails to submit a claim in writing to the Authority within fifteen (15) Days of the issuance of the unilateral Change Order, disputing the terms of the unilateral Change Order, and providing such supporting documentation for its position as the Authority may require.

C. **Change of Contract Times**.

1. The Contract Times may only be changed by a Change Order.

2. All changes in the Contract Price and/or adjustments to the Contract Times related to each change shall be included in Contractor's COR pursuant to this Article. No cost or time will be allowed for cumulative effects of multiple changes. All Change Orders must state that the Contract Time is not changed or is either increased or decreased by a specific number of days. Failure to include a change to time shall waive any change to the time unless the parties mutually agree in writing to postpone a determination of the change to time resulting from the Change Order.

3. Notice of the amount of the request for adjustment in the Contract Times with supporting data shall be delivered within seven (7) Days after such start of occurrence, unless Authority's Representative allows an additional period of time to ascertain more accurate data in support of the request. No extension of time or additional compensation shall be given for a delay if the Contractor failed to give notice in the manner and within the time prescribed.

4. Authority may elect, at Authority's sole discretion, to grant an extension in Contract Times, without Contractor's request, because of delays or other factors.

5. <u>Use of Float and Critical Path.</u>

a. Float is for the benefit of the Project. Float shall not be considered for the exclusive use or benefit of either the Authority or the Contractor.

b. Contractor shall not be entitled to compensation, and Authority will not compensate Contractor, for delays which impact early completion. Any difference in time between the Contractor's early completion and the Contract Time shall be considered a part of the Project float.

6. Contractor's entitlement to an extension of the Contract Times is limited to a Authority-caused extension of the critical path, reduced by the Contractor's concurrent delays, and established by a proper time impact analysis. No time extension shall be allowed unless, and then only to the extent that, the Authority-caused delay extends the critical path beyond the previously approved Contract Time. If approved, the increase in time required to complete the Work shall be added to the Contract Time.

   a. Contractor shall not be entitled to an adjustment in the Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

   b. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions (as determined by the Authority), Acts of God, acts or failures to act of utility owners not under the control of Authority, or other causes not the fault of and beyond control of Authority and Contractor, then Contractor shall be entitled to an time extension when the Work stopped is on the critical path. Such a non-compensable adjustment shall be Contractor's sole and exclusive remedy for such delays. Contractor must submit a timely request in accordance with the requirements of this Article.

   c. Utility-Related Delays.

      i. Contractor shall immediately notify in writing the utility owner and Authority's Representative of its construction schedule and any subsequent changes in the construction schedule which will affect the time available for protection, removal, or relocation of utilities. Requests for extensions of time arising out of utility relocation or repair delays shall be filed in accordance with this Article.

      ii. Contractor shall not be entitled to damages or additional payment for delays attributable to utility relocations or alterations if correctly located, as noted in the Contract Documents or by the Underground Service Alert survey.

7. Content for Requests for Contract Extension. Contractor's justification for entitlement shall be clear and complete citing specific Contract Document references and reasons on which Contractor's entitlement is based. At a minimum, each request for a time extension must include:

a. Each request for an extension of Contract Time must identify the impacting event, in narrative form, providing a description of the delay event and sufficient justification as to why the Contractor is entitled to a time extension. Contractor must demonstrate that the delay arises from unforeseeable causes beyond the control and without the fault or negligence of both Contractor and any Subcontractors or Suppliers, or any other persons or organizations employed by any of them or for whose acts any of them may be liable, and that such causes in fact lead to performance or completion of the Work, or specified part in question, beyond the corresponding Contract Times, despite Contractor's reasonable and diligent actions to guard against those effects.

b. Each request for an extension of Contract Time must include a time impact analysis in CPM format, using the Contemporaneous Impacted As-Planned Schedule Analysis to calculate the impact of the delay event.

8. No Damages for Reasonable Delay.

a. Authority's liability to Contractor for delays for which Authority is responsible shall be limited to only an extension of time unless such delays were unreasonable under the circumstances. In no case shall Authority be liable for any costs which are borne by the Contractor in the regular course of business, including, but not limited to, home office overhead and other ongoing costs.

b. Damages caused by unreasonable Authority delay that impact the critical path, including delays caused by items that are the responsibility of the Authority pursuant to Government Code section 4215, shall be compensated at the Daily Rate established in the Special Conditions. No other calculations, proportions or formulas shall be used to calculate any delay damages.

c. Authority and Authority's Representative, and the officers, members, partners, employees, agents, consultants, or subcontractors of each of them, shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

9. Contractor's failure, neglect, or refusal to comply with the requirements of the Contract Documents, or any portion thereof, shall bar Contractor's request for extensions of the Contract Times. Such failure, neglect, or refusal prejudices Authority's and Authority's Representative's ability to recognize and mitigate delay, and such failure, neglect, or refusal prevent the timely analysis of requests for extensions of Contract Times, and whether such extensions may be warranted. Contractor hereby waives all rights to extensions of Contract Times due to delays or accelerations that result from or occur during periods of time for which Contractor fails, neglects, or refuses to fully comply with the requirements of this Article.

ARTICLE 45. FINAL ACCEPTANCE AND PAYMENT

A. The acceptance of the Work on behalf of the Authority will be made by the Engineer. Such acceptance by the Authority shall not constitute a waiver of defects. When the Work has been accepted there shall be paid to Contractor a sum equal to the contract price less any amounts previously paid Contractor and less any amounts withheld by the Authority from Contractor under the terms of the contract. The final five percent (5%), or the percentage specified in the notice inviting bids where the Authority has adopted a finding of substantially complete, shall not become due and payable until five (5) calendar days shall have elapsed after the expiration of the period within which all claims may be filed under the provisions of Civil Code section 9356. If the Contractor has placed securities with the Authority as described herein, the Contractor shall be paid a sum equal to one hundred percent (100%) of the contract price less any amounts due the Authority under the terms of the Contract.

B. Unless Contractor advises the Authority in writing prior to acceptance of the final five percent (5%) or the percentage specified in the notice inviting bids where the Authority has adopted a finding of substantially complete, or the return of securities held as described herein, said acceptance shall operate as a release to the Authority of all claims and all liability to Contractor for all things done or furnished in connection with this work and for every act of negligence of the Authority and for all other claims relating to or arising out of this work. If Contractor advises the Authority in writing prior to acceptance of final payment or return of the securities that there is a dispute regarding the amount due the Contractor, the Authority may pay the undisputed amount contingent upon the Contractor furnishing a release of all undisputed claims against the Authority with the disputed claims in stated amounts being specifically excluded by Contractor from the operation of the release. No payments, however, final or otherwise, shall operate to release Contractor or its sureties from the Faithful Performance Bond, Labor and Material Payment Bond, or from any other obligation under this contract.

C. In case of suspension of the contract any unpaid balance shall be and become the sole and absolute property of the Authority to the extent necessary to repay the Authority any excess in the cost of the Work above the contract price.

D. Final payment shall be made no later than 60 days after the date of acceptance of the Work by the Authority or the date of occupation, beneficial use and enjoyment of the Work by the Authority including any operation only for testing, start-up or commissioning accompanied by cessation of labor on the Work, provided that a release of liens and claims has been received from the Contractor pursuant to Civil Code section 8136. In the event of a dispute between the Authority and the Contractor, the Authority may withhold from the final payment an amount not to exceed 150% of the disputed amount.

E. Within ten (10) calendar days from the time that all or any portion of the retention proceeds are received by Contractor, Contractor shall pay each of its subcontractors from whom retention has been withheld each subcontractor's share of the retention received. However, if a retention payment received by Contractor is specifically designated for a particular subcontractor, payment of the retention shall be made to the designated subcontractor if the payment is consistent with the terms of the subcontract.

ARTICLE 46. OCCUPANCY

The Authority reserves the right to occupy or utilize any portion of the Work at any time before completion, and such occupancy or use shall not constitute acceptance of any part of Work covered by this Contract. This use shall not relieve the Contractor of its responsibilities under the Contract.

ARTICLE 47. INDEMNIFICATION

To the fullest extent permitted by law, Contractor shall immediately defend (with counsel of the Authority's choosing), indemnify and hold harmless the Authority, officials, officers, agents, employees, and representatives, and each of them from and against:

A. Any and all claims, demands, causes of action, costs, expenses, injuries, losses or liabilities, in law or in equity, of every kind or nature whatsoever, but not limited to, injury to or death, including wrongful death, of any person, and damages to or destruction of property of any person, arising out of, related to, or in any manner directly or indirectly connected with the Work or this Contract, including claims made by subcontractors for nonpayment, including without limitation the payment of all consequential damages and attorney's fees and other related costs and expenses, however caused, regardless of whether the allegations are false, fraudulent, or groundless, and regardless of any negligence of the Authority or its officers, employees, or authorized volunteers (including passive negligence), except the sole negligence or willful misconduct or active negligence of the Authority or its officials, officers, employees, or authorized volunteers.

B. Contractor's defense and indemnity obligation herein includes, but is not limited to damages, fines, penalties, attorney's fees and costs arising from claims under the Americans with Disabilities Act (ADA) or other federal or state disability access or discrimination laws arising from Contractor's Work during the course of construction of the improvements or after the Work is complete, as the result of defects or negligence in Contractor's construction of the improvements.

C. Any and all actions, proceedings, damages, costs, expenses, fines, penalties or liabilities, in law or equity, of every kind or nature whatsoever, arising out of, resulting from, or on account of the violation of any governmental law or regulation, compliance with which is the responsibility of Contractor;

D. Any and all losses, expenses, damages (including damages to the Work itself), attorney's fees, and other costs, including all costs of defense which any of them may incur with respect to the failure, neglect, or refusal of Contractor to faithfully perform the Work and all of Contractor's obligations under the agreement. Such costs, expenses, and damages shall include all costs, including attorney's fees, incurred by the indemnified parties in any lawsuit to which they are a party.

Contractor shall immediately defend, at Contractor's own cost, expense and risk, with the Board of Directors's choosing, any and all such aforesaid suits, actions or other legal proceedings of every kind that may be brought or instituted against the Authority, its officials, officers, agents, employees and representatives. Contractor shall pay and satisfy any judgment, award or decree that may be rendered against the Authority, its officials, officers, employees, agents, employees and representatives, in any such suit, action or other legal proceeding. Contractor shall

reimburse the Authority, its officials, officers, agents, employees and representatives for any and all legal expenses and costs incurred by each of them in connection therewith or in enforcing the indemnity herein provided. The only limitations on this provision shall be those imposed by Civil Code section 2782.

ARTICLE 48. PROCEDURE FOR RESOLVING DISPUTES

In accordance with Public Contract Code sections 20104 *et seq.* and other applicable law, public works claims of $375,000 or less which arise between the Contractor and the Authority shall be resolved under the following statutory procedure unless the Authority has elected to resolve the dispute pursuant to Public Contract Code section 10240 *et seq.*

A. **All Claims.** All claims shall be submitted in writing and accompanied by substantiating documentation. Claims must be filed on or before the date of final payment unless other notice requirements are provided in the contract. "Claim" means a separate demand by the Contractor for (1) a time extension, (2) payment of money or damages arising from work done by or on behalf of the Contractor and payment of which is not otherwise expressly provided for or the Contractor is not otherwise entitled, or (3) an amount the payment of which is disputed by the Authority.

B. **Claims Under $50,000.** The Authority shall respond in writing to the claim within 45 calendar days of receipt of the claim, or, the Authority may request, in writing, within 30 calendar days of receipt of the claim, any additional documentation supporting the claim or relating to defenses or claims the Authority may have. If additional information is needed thereafter, it shall be provided upon mutual agreement of the Authority and the Contractor. The Authority's written response shall be submitted 15 calendar days after receiving the additional documentation, or within the same period of time taken by the Contractor to produce the additional information, whichever is greater.

C. **Claims over $50,000 but less than or equal to $375,000.** The Authority shall respond in writing within 60 calendar days of receipt, or, may request in writing within 30 calendar days of receipt of the claim, any additional documents supporting the claim or relating to defenses or claims the Authority may have against the Authority. If additional information is needed thereafter, it shall be provided pursuant to mutual agreement between the Authority and the Contractor. The Authority response shall be submitted within 30 calendar days after receipt of the further documents, or within the same period of time taken by the Contractor to produce the additional information or documents, whichever is greater. The Contractor shall make these records and documents available at all reasonable times, without any direct charge.

D. **All Claims.** The Contractor will submit the claim justification in the following format:

    1. Summary of claim merit and price, and Contract clause pursuant to which the claim is made.

    2. List of documents relating to claim:

        a. Specifications
        b. Drawings

c. Clarifications (Requests for Information)
d. Schedules
e. Other (All Related Documents)

3. Chronology of events and correspondence.

4. Analysis of claim merit.

5. Analysis of claim cost.

6. Analysis of time impact analysis in CPM format.

7. Cover letter and certification of validity of the claim.

E. **All Claims.** If the Contractor disputes the Authority's response, or if the Authority fails to respond within the statutory time period(s), the Contractor may so notify the Authority within 15 calendar days of the receipt of the response or the failure to respond, and demand an informal conference to meet and confer for settlement. Upon such demand, the Authority shall schedule a meet and confer conference within 30 calendar days.

F. The Contractor must comply with the claims filing procedures set forth in Government Code sections 900 *et seq.* for any claim or any portion thereof that remains in dispute, after the meet and confer conference. For purposes of those provisions, the time within which a claim must be filed shall be tolled from the time the Contractor submits the written claim until the time the claim is denied, including any time utilized for the meet and confer conference. Submission of a claim, properly certified, with all required supporting documentation, and written rejection or denial of all or part of the claim by the Authority, is a condition precedent to any action, proceeding, litigation, suit, general conditions claim, or demand for arbitration by Contractor.

G. **Government Code Claim.** In addition to any and all contract requirements pertaining to notices of and requests for compensation or payment for extra work, disputed work, construction claims and/or changed conditions, the Contractor must comply with the claim procedures set forth in Government Code sections 900 *et seq.* prior to filing any lawsuit against the Authority. Such Government Code claims and any subsequent lawsuit based upon the Government Code claims shall be limited to those matters that remain unresolved after all procedures pertaining to extra work, disputed work, construction claims, and/or changed conditions have been followed by Contractor. If no such Government Code claim is submitted, or if the prerequisite contractual requirements are not otherwise satisfied as specified herein, Contractor shall be barred from bringing and maintaining a valid lawsuit against the Authority.

ARTICLE 49. AUTHORITY'S RIGHT TO TERMINATE CONTRACT

A. **Termination for Cause by the Authority:**

1. In the sole estimation of the Authority, if the Contractor refuses or fails to prosecute the Work or any separable part thereof with such diligence as will insure its completion within the time specified by the Contract Documents, or any

extension thereof, or fails to complete such Work within such time, or if the Contractor should be adjudged a bankrupt, or if it should make a general assignment for the benefit of its creditors, or if a receiver should be appointed on account of its insolvency, or the Contractor or any of its subcontractors should violate any of the provisions of this Contract, the Authority may serve written notice upon the Contractor and its Surety of the Authority's intention to terminate this Contract. This notice of intent to terminate shall contain the reasons for such intention to terminate this Contract, and a statement to the effect that the Contractor's right to perform this Contract shall cease and terminate upon the expiration of ten (10) calendar days unless such violations have ceased and arrangements satisfactory to the Authority have been made for correction of said violations.

2. In the event that the Authority serves such written notice of termination upon the Contractor and the Surety, the Surety shall have the right to take over and perform the Contract. If the Surety does not: (1) give the Authority written notice of Surety's intention to take over and commence performance of the Contract within 15 calendar days of the Authority's service of said notice of intent to terminate upon Surety; and (2) actually commence performance of the Contract within 30 calendar days of the Authority's service of said notice upon Surety; then the Authority may take over the Work and prosecute the same to completion by separate contract or by any other method it may deem advisable for the account and at the expense of the Contractor.

3. In the event that the Authority elects to obtain an alternative performance of the Contract as specified above: (1) the Authority may, without liability for so doing, take possession of and utilize in completion of the Work such materials, appliances, plants and other property belonging to the Contractor that are on the site and reasonably necessary for such completion (A special lien to secure the claims of the Authority in the event of such suspension is hereby created against any property of Contractor taken into the possession of the Authority under the terms hereof and such lien may be enforced by sale of such property under the direction of the Board of Directors without notice to Contractor. The proceeds of the sale after deducting all expenses thereof and connected therewith shall be credited to Contractor. If the net credits shall be in excess of the claims of the Authority against Contractor, the balance will be paid to Contractor or Contractor’s legal representatives.); and (2) Surety shall be liable to the Authority for any cost or other damage to the Authority necessitated by the Authority securing an alternate performance pursuant to this Article.

B. **Termination for Convenience by the Authority:**

1. The Authority may terminate performance of the Work called for by the Contract Documents in whole or, from time to time, in part, if the Authority determines that a termination is in the Authority's interest.

2. The Contractor shall terminate all or any part of the Work upon delivery to the Contractor of a Notice of Termination specifying that the termination is for the convenience of the Authority, the extent of termination, and the Effective Date of such termination.

3. After receipt of Notice of Termination, and except as directed by the Authority's Representative, the Contractor shall, regardless of any delay in determining or adjusting any amounts due under this Termination for Convenience clause, immediately proceed with the following obligations:

    a. Stop Work as specified in the Notice.

    b. Complete any Work specified in the Notice of Termination in a least cost/shortest time manner while still maintaining the quality called for under the Contract Documents.

    c. Leave the property upon which the Contractor was working and upon which the facility (or facilities) forming the basis of the Contract Document is situated in a safe and sanitary manner such that it does not pose any threat to the public health or safety.

    d. Terminate all subcontracts to the extent that they relate to the portions of the Work terminated.

    e. Place no further subcontracts or orders, except as necessary to complete the continued portion of the Contract.

    f. Submit to the Authority's Representative, within ten (10) calendar days from the Effective Date of the Notice of Termination, all of the usual documentation called for by the Contract Documents to substantiate all costs incurred by the Contractor for labor, materials and equipment through the Effective Date of the Notice of Termination. Any documentation substantiating costs incurred by the Contractor solely as a result of the Authority's exercise of its right to terminate this Contract pursuant to this clause, which costs the contractor is authorized under the Contract documents to incur, shall: (1) be submitted to and received by the Engineer no later than 30 calendar days after the Effective Date of the Notice of Termination; (2) describe the costs incurred with particularity; and (3) be conspicuously identified as “Termination Costs occasioned by the Authority's Termination for Convenience.”

4. Termination of the Contract shall not relieve Surety of its obligation for any just claims arising out of or relating to the Work performed.

5. In the event that the Authority exercises its right to terminate this Contract pursuant to this clause, the Authority shall pay the Contractor, upon the Contractor's submission of the documentation required by this clause and other applicable provisions of the Contract Documents, the following amounts:

    a. All actual reimbursable costs incurred according to the provisions of this Contract.

    b. A reasonable allowance for profit on the cost of the Work performed, provided Contractor establishes to the satisfaction of the Authority's Representative that it is reasonably probable that Contractor would have made a profit had the Contract been completed and provided further, that the profit allowed shall in no event exceed fifteen (15%) percent of the costs.

c. A reasonable allowance for Contractor's administrative costs in determining the amount payable due to termination of the Contract under this Article.

C. Notwithstanding any other provision of this Article, when immediate action is necessary to protect life and safety or to reduce significant exposure or liability, the Authority may immediately order Contractor to cease Work on the Project until such safety or liability issues are addressed to the satisfaction of the Authority or the Contract is terminated.

ARTICLE 50. WARRANTY AND GUARANTEE OF WORK

A. Contractor hereby warrants that materials and Work shall be completed in conformance with the Contract Documents and that the materials and Work provided will fulfill the requirements of this Warranty. Contractor hereby agrees to repair or replace, at the discretion of the Authority, any or all Work that may prove to be defective in its workmanship, materials furnished, methods of installation or fail to conform to the Contract Document requirements together with any other Work which may be damaged or displaced by such defect(s) within a period of one (1) year from the date of the Notice of Completion of the Project without any expense whatever to the Authority, ordinary wear and tear and unusual abuse and neglect excepted. Contractor shall be required to promptly repair or replace defective equipment or materials, at Contractor's option. All costs associated with such corrective actions and testing, including the removal, replacement, and reinstitution of equipment and materials necessary to gain access, shall be the sole responsibility of the Contractor.

B. For any Work so corrected, Contractor's obligation hereunder to correct defective Work shall be reinstated for an additional one (1) year period, commencing with the date of acceptance of such corrected Work. The reinstatement of the one (1) year warranty shall apply only to that portion of work that was corrected. Contractor shall perform such tests as Authority may require to verify that any corrective actions, including, without limitation, redesign, repairs, and replacements comply with the requirements of the Contract. In the event of Contractor's failure to comply with the above-mentioned conditions within ten (10) calendar days after being notified in writing of required repairs, to the reasonable satisfaction of the Authority, the Authority shall have the right to correct and replace any defective or non-conforming Work and any work damaged by such work or the replacement or correction thereof at Contractor's sole expense. Contractor shall be obligated to fully reimburse the Authority for any expenses incurred hereunder immediately upon demand.

C. In addition to the warranty set forth in this Article, Contractor shall obtain for Authority all warranties that would be given in normal commercial practice and assign to Authority any and all manufacturer's or installer's warranties for equipment or materials not manufactured by Contractor and provided as part of the Work, to the extent that such third-party warranties are assignable and extend beyond the warranty period set forth in this Article. Contractor shall furnish the Authority with all warranty and guarantee documents prior to final Acceptance of the Project by the Authority as required.

D. When specifically indicated in the Contract Documents or when directed by the Engineer, the Authority may furnish materials or products to the Contractor for installation. In the event any act or failure to act by Contractor shall cause a

warranty applicable to any materials or products purchased by the Authority for installation by the Contractor to be voided or reduced, Contractor shall indemnify Authority from and against any cost, expense, or other liability arising therefrom, and shall be responsible to the Authority for the cost of any repairs, replacement or other costs that would have been covered by the warranty but for such act or failure to act by Contractor.

E. The Contractor shall remedy at its expense any damage to Authority-owned or controlled real or personal property.

F. The Authority shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage. The Contractor shall within ten (10) calendar days after being notified commence and perform with due diligence all necessary Work. If the Contractor fails to promptly remedy any defect, or damage; the Authority shall have the right to replace, repair or otherwise remedy the defect, or damage at the Contractor's expense.

G. In the event of any emergency constituting an immediate hazard to health, safety, property, or licensees, when caused by Work of the Contractor not in accordance with the Contract requirements, the Authority may undertake at Contractor's expense, and without prior notice, all Work necessary to correct such condition.

H. Acceptance of Defective Work.

1. If, instead of requiring correction or removal and replacement of Defective Work, the Authority prefers to accept it, Authority may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Authority's evaluation of and determination to accept such Defective Work and for the diminished value of the Work.

2. If any acceptance of defective work occurs prior to release of the Project Retention, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Authority shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work and all costs incurred by Authority.

3. If the Project Retention is held in an escrow account as permitted by the Contract Documents, Contractor will promptly alert the escrow holder, in writing, of the amount of Retention to be paid to Authority.

4. If the acceptance of Defective Work occurs after release of the Project Retention, an appropriate amount will be paid by Contractor to Authority.

I. Authority May Correct Defective Work.

1. If Contractor fails within a reasonable time after written notice from Authority's Representative to correct Defective Work, or to remove and replace rejected Work as required by Authority, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with

any other provision of the Contract Documents, Authority may, after seven (7) Days' written notice to Contractor, correct, or remedy any such deficiency.

2. In connection with such corrective or remedial action, Authority may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Authority has paid Contractor but which are stored elsewhere. Contractor shall allow Authority and Authority's Representative, and the agents, employees, other contractors, and consultants of each of them, access to the Site to enable Authority to exercise the rights and remedies to correct the Defective Work.

3. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Authority correcting the Defective Work will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions into the Contract Documents with respect to the Work; and Authority shall be entitled to an appropriate decrease in the Contract Price.

4. Such claims, costs, losses and damages will include, but not be limited to, all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Defective Work.

5. If the Change Order is executed after all payments under the Contract have been paid by Authority and the Project Retention is held in an escrow account as permitted by the Contract Documents, Contractor will promptly alert the escrow holder, in writing, of the amount of Retention to be paid to Authority.

6. If the Change Order is executed after release of the Project Retention, an appropriate amount will be paid by Contractor to Authority.

7. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to Authority correcting Defective work.

J. Nothing in the Warranty or in the Contract Documents shall be construed to limit the rights and remedies available to Authority at law or in equity, including, but not limited to, Code of Civil Procedure section 337.15.

ARTICLE 51. DOCUMENT RETENTION & EXAMINATION

A. In accordance with Government Code section 8546.7, records of both the Authority and the Contractor shall be subject to examination and audit by the State Auditor General for a period of three (3) years after final payment.

B. Contractor shall make available to the Authority any of the Contractor's other documents related to the Project immediately upon request of the Authority.

C. In addition to the State Auditor rights above, the Authority shall have the right to examine and audit all books, estimates, records, contracts, documents, bid documents, subcontracts, and other data of the Contractor (including computations and projections) related to negotiating, pricing, or performing the modification in order to evaluate the accuracy and completeness of the cost or pricing data at no additional cost to the Authority, for a period of four (4) years after final payment.

ARTICLE 52. SEPARATE CONTRACTS

A. The Authority reserves the right to let other contracts in connection with this Work or on the Project site. Contractor shall permit other contractors reasonable access and storage of their materials and execution of their work and shall properly connect and coordinate its Work with theirs.

B. To ensure proper execution of its subsequent Work, Contractor shall immediately inspect work already in place and shall at once report to the Engineer any problems with the Work in place or discrepancies with the Contract Documents.

C. Contractor shall ascertain to its own satisfaction the scope of the Project and nature of any other contracts that have been or may be awarded by the Authority in prosecution of the Project to the end that Contractor may perform this Contract in the light of such other contracts, if any. Nothing herein contained shall be interpreted as granting to Contractor exclusive occupancy at site of the Project. Contractor shall not cause any unnecessary hindrance or delay to any other contractor working on the Project. If simultaneous execution of any contract for the Project is likely to cause interference with performance of some other contract or contracts, the Engineer shall decide which Contractor shall cease Work temporarily and which contractor shall continue or whether work can be coordinated so that contractors may proceed simultaneously. The Authority shall not be responsible for any damages suffered or for extra costs incurred by Contractor resulting directly or indirectly from award, performance, or attempted performance of any other contract or contracts on the Project site.

ARTICLE 53. NOTICE AND SERVICE THEREOF

All notices shall be in writing and either served by personal delivery or mailed to the other party as designated in the Bid Forms. Written notice to the Contractor shall be addressed to Contractor's principal place of business unless Contractor designates another address in writing for service of notice. Notice to Authority shall be addressed to the Authority as designated in the Notice Inviting Bids unless Authority designates another address in writing for service of notice. Notice shall be effective upon receipt or five (5) calendar days after being sent by first class mail, whichever is earlier. Notice given by facsimile shall not be effective unless acknowledged in writing by the receiving party.

ARTICLE 54. NOTICE OF THIRD PARTY CLAIMS

Pursuant to Public Contract Code section 9201, the Authority shall provide the Contractor with timely notification of the receipt of any third-party claims relating to the Contract. The Authority is entitled to recover reasonable costs incurred in providing such notification.

ARTICLE 55. STATE LICENSE BOARD NOTICE

Contractors are required by law to be licensed and regulated by the Contractors' State License Board which has jurisdiction to investigate complaints against contractors if a complaint regarding a patent act or omission is filed within four (4) years of the date of the alleged violation. A complaint regarding a latent act or omission pertaining to structural defects must be filed within ten (10) years of the date of the alleged violation. Any questions concerning a contractor may be referred to the Registrar, Contractors' State License Board, P.O. Box 26000, Sacramento, California 95826.

ARTICLE 56. INTEGRATION

A. **Oral Modifications Ineffective.** No oral order, objection, direction, claim or notice by any party or person shall affect or modify any of the terms or obligations contained in the Contract Documents.

B. **Contract Documents Represent Entire Contract.** The Contract Documents represent the entire agreement of the Authority and Contractor.

ARTICLE 57. ASSIGNMENT OF CONTRACT

Contractor shall not assign, transfer, convey, sublet or otherwise dispose of the rights or title of interest of any or all of this contract without the prior written consent of the Authority. Any assignment or change of Contractor's name of legal entity without the written consent of the Authority shall be void. Any assignment of money due or to become due under this Contract shall be subject to a prior lien for services rendered or Material supplied for performance of Work called for under the Contract Documents in favor of all persons, firms, or corporations rendering such services or supplying such Materials to the extent that claims are filed pursuant to the Civil Code, the Code of Civil Procedure or the Government Code.

ARTICLE 58. CHANGE IN NAME AND NATURE OF CONTRACTOR'S LEGAL ENTITY

Should a change be contemplated in the name or nature of the Contractor's legal entity, the Contractor shall first notify the Authority in order that proper steps may be taken to have the change reflected on the Contract and all related documents. No change of Contractor's name or nature will affect Authority's rights under the Contract, including but not limited to the bonds.

ARTICLE 59. ASSIGNMENT OF ANTITRUST ACTIONS

Pursuant to Public Contract Code section 7103.5, in entering into a public works contract or subcontract to supply goods, services, or materials pursuant to a public works contract, Contractor or subcontractor offers and agrees to assign to the Authority all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 USC, Section 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from the purchase of goods, services, or materials pursuant to this contract or any subcontract. This assignment shall be made and become effective at the time the Authority tenders final payment to the Contractor, without further acknowledgment by the parties.

ARTICLE 60. PROHIBITED INTERESTS

No Authority official or representative who is authorized in such capacity and on behalf of the Authority to negotiate, supervise, make, accept, or approve, or to take part in negotiating, supervising, making, accepting or approving any engineering, inspection, construction or material supply contract or any subcontract in connection with construction of the project, shall be or become directly or indirectly interested financially in the Contract.

ARTICLE 61. CONTROLLING LAW

Notwithstanding any subcontract or other contract with any subcontractor, supplier, or other person or organization performing any part of the Work, this Contract shall be governed by the law of the State of California excluding any choice of law provisions.

ARTICLE 62. JURISDICTION; VENUE

Contractor and any subcontractor, supplier, or other person or organization performing any part of the Work agrees that any action or suits at law or in equity arising out of or related to the bidding, award, or performance of the Work shall be maintained in the Superior Court of San Luis Obispo County, California, and expressly consent to the jurisdiction of said court, regardless of residence or domicile, and agree that said court shall be a proper venue for any such action.

ARTICLE 63. LAWS AND REGULATIONS

A. Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on conduct of work as indicated and specified. If Contractor observes that drawings and specifications are at variance therewith, it shall promptly notify the Engineer in writing and any necessary changes shall be adjusted as provided for in this Contract for changes in work. If Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Engineer, it shall bear all costs arising therefrom.

B. Contractor shall be responsible for familiarity with the Americans with Disabilities Act ("ADA") (42 U.S.C. § 12101 et seq.). The Work will be performed in compliance with ADA regulations.

ARTICLE 64. PATENTS

Contractor shall hold and save the Authority, officials, officers, employees, and authorized volunteers harmless from liability of any nature or kind of claim therefrom including costs and expenses for or on account of any patented or unpatented invention, article or appliance manufactured, furnished or used by Contractor in the performance of this contract.

ARTICLE 65. OWNERSHIP OF CONTRACT DOCUMENTS

All Contract Documents furnished by the Authority are Authority property. They are not to be used by Contractor or any subcontractor on other work nor shall Contractor claim any right to such documents. With exception of one complete set of Contract Documents, all documents shall be returned to the Authority on request at completion of the Work.

ARTICLE 66. NOTICE OF TAXABLE POSSESSORY INTEREST

In accordance with Revenue and Taxation Code section 107.6, the Contract Documents may create a possessory interest subject to personal property taxation for which Contractor will be responsible.

ARTICLE 67. SURVIVAL OF OBLIGATIONS

All reresentations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

00 73 13 – SPECIAL CONDITIONS

1.1 Engineer of Record.

A. For purposes of this Project, the Engineer of Record or Engineer shall be: Anil Dean, Stantec Consulting Services.

1.2 Location of the Project.

A. The Project is located at the Henderson Reservoir in Amador County, California, approximately 4 miles west of the City of Sutter Creek, California.

B. The general location of the Project is shown on Authority Drawing No. 175578307.

1.3 Shared Cost Savings for Reductions in Contract Price; Value Engineering. Should the cost of construction be less than the agreed upon Contract Price, then the savings shall be shared between the Contractor and the Authority. The Contractor shall receive twenty-five percent (25%) of any reductions realized in the Contract Price, and the Authority shall receive the remaining seventy-five percent (75%) of the savings.

1.4 Status of the Project Area and Rights-of-Way.

A. Authority, at its expense, will provide all rights-of-way or permits, or both, covering the crossing of private property and public and private rights-of-way necessary for the permanent Work; provided, however, Contractor shall, at its expense, obtain any bonds or insurance policies or pay any fees and enter into any agreements required by a controlling authority, *e.g.*, Caltrans or railroad companies with jurisdiction, before Contractor enters upon any property or right-of-way under the jurisdiction of any such controlling authority for the purpose of performing Work.

B. Authority has acquired or is negotiating to acquire any rights-of-way, or both, necessary for the permanent Work.

C. If such permits are required, all operations of Contractor shall conform to the restrictions, regulations, and requirements set forth in said permits, copies of which will be included in the Contract Documents.

D. Contractor may be required, as a condition for receiving final payment, to obtain, and provide Authority's Representative with copies of, executed damage releases from the owners of public and private property whose property has been damaged by the Work. The damage releases will be on a form provided by Authority.

E. Contractor shall, also, as a condition for receiving final payment, obtain, and provide Authority's Representative with copies of, executed damage releases from the owners of certain public and private property or areas which have been crossed by the Work or otherwise affected by the Work. The damage releases will be on a form provided by Authority.

1.5 Site Data.

A. The data provided herein is for the information of Contractor and is subject to all limitations and conditions set forth in the Contract Documents.

Copies of these reports, drawings and other materials may be examined at Authority's office during regular business hours.

1.6 Pre-Purchased or Pre-Negotiated Material.

[NOT USED.]

1.7 Designation of Authority's Representative.

A. Unless otherwise modified by Authority, Authority's Representative shall be Steven Whittlesey.

1.8 Modification of Hours of Work.

[NOT USED.]

1.9 Project Retention

In accordance with Public Contract Code § 7201, Authority will withhold 5% of each progress payment as retention on the Project.

1.10 Reverse Liquidated Damages Due to Unreasonable Authority Delay.

A. In compliance with the provisions of California Public Contract Code § 7102, the Contractor will be compensated for damages incurred due to delays in completing the Work due solely to the fault of the Authority, where such delay is unreasonable under the circumstances and not contemplated by the parties and such delay is not the result of Additional Work. The Contractor and Authority agree that determining actual damages is impracticable and extremely difficult. As such, the Contractor shall be entitled to the appropriate time extension and to payment of liquidated damages in the sum of **$2,500** per Day of delay in excess of the time specified for the Completion of the Work. Such amount shall constitute the only payment allowed and shall necessarily include all overhead (direct or indirect), all profit, all administrative costs, all bond costs, all labor, materials, equipment and rental costs, and any other costs, expenses and fees incurred or sustained as a result of such delay. The Contractor expressly agrees to be limited solely to the liquidated damages for all such delays as defined in this subsection.

1.11 Liquidated Damages Due to Contractor Delay.

A. Time is of the essence. Should Contractor fail to complete all or any part of the Work within the time specified in the Contract Documents, Authority will suffer damage, the amount of which is difficult, if not impossible, to ascertain and, pursuant to the authority of Government Code section 53069.85, Authority shall therefore be entitled to **$2,500** per Day as liquidated damages for each Day or part thereof that actual completion extends beyond the time specified.

B. Liquidated damages may be deducted from progress payments due Contractor, Project retention or may be collected directly from Contractor, or from Contractor's surety. These provisions for liquidated damages shall not prevent Authority, in case of Contractor's default, from terminating the Contractor.

1.12 Utility Outages – Notices to Residents.

A. Should Contractor's operations require interruption of any utility service, Contractor shall notify Authority at least ten (10) Days prior to the scheduled outage. Contractor will notify all impacted residents on a form provided by Authority at least seven (7) Days prior to the scheduled outage.

B. Contractor shall be responsible for providing, at its cost, any temporary utility or facilities necessitated by the utility outage.

1.13 Schedule Constraints.

All work involving sliplining, backfilling, excavation, and work requiring entry into Henderson Reservoir shall be completed by September 30, 2025.

1.14 Noise Restrictions

A. Contractor shall use only such equipment on the Work and in such state of repair so that the emission of sound therefrom is within the noise tolerance level of that equipment as established by Cal/OSHA.

B. Contractor shall comply with the most restrictive of the following: (1) local sound control and noise level rules, regulations and ordinances and (2) the requirements contained in these Contract Documents, including hours of operation requirements.

C. No internal combustion engine shall be operated on the Project without a muffler of the type recommended by the manufacturer. Should any muffler or other control device sustain damage or be determined to be ineffective or defective, the Contractor shall promptly remove the equipment and shall not return said equipment to the job until the device is repaired or replaced. Said noise and vibration level requirements shall apply to all equipment on the job or related to the job, including but not limited to, trucks, transit mixers or transit equipment that may or may not be owned by the Contractor.

1.15 Safety Programs.

[NOT USED.]

1.16 Coordination with Other Contractors.

A. In addition to the Contract requirements relating to other work at the Site, Authority anticipates that other contractors will be performing work within the Site. Specifically:

ARSA Public Works Staff: Repair of Existing Sluice Gate

B. Authority has considered these other contractors when determining the Contract Times and no additional time or compensation will be added to the Contract due to these other contractors.

END OF SPECIAL CONDITIONS

01 00 00 – GENERAL REQUIREMENTS

PART 1 -- GENERAL

1.1 DESCRIPTION

A. The work generally includes, but is not limited to, furnishing all products, labor, equipment, material, transportation, and incidental services to construct the following:

1. Sliplining of existing 20” concrete outlet pipe using 16” DR17 HDPE, ASTM F714 pipe for approximately 170 LF total and grouting the annulus between the host pipe and the sliplined pipe.

2. Removal and replacement of approximately 95 LF of 20” AC Concrete pipe with 16” DR17 HDPE, ASTM F714 pipe.

3. Removal and replacement of approximately 100 LF of 20” AC Concrete pipe with 24” DR17 HDPE, ASTM F714 pipe.

4. Connection of the sliplined and open-cut sections of the 16” DR17 HDPE Pipe, and connection of the 16” DR17 HDPE pipe to the existing 20” Ductile Iron Pipe at the concrete junction chamber and connection of the 20” DR17 HDPE pipe to the existing 20” Ductile Iron Pipe at the concrete junction box.

5. Completely backfill with cement-grout an existing abandoned-in-place 16-inch diameter outlet pipe which proceeds beneath approximately the middle of the dam.

6. Field verification of post-installation conditions using a rover with a tilt and pan CCTV camera.

1.2 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 LAYOUT OF WORK AND QUANTITY SURVEYS

A. General. The Contractor shall utilize a properly licensed surveyor to perform all layout surveys required for the control and completion of the Work, and all necessary surveys to compute quantities of Work performed.

Authority and/or the Engineer of Record has established primary control to be used by the Contractor for establishing lines and grades required for the Work.

Primary control consists of benchmarks and horizontal control points in the vicinity of the Work. A listing and identification of the primary control is provided on the Drawings. Before beginning any layout work or construction activity, the Contractor shall check and verify primary control, and shall advise the Authority Representative of any discrepancies.

B. Quantity surveys. The Contractor shall perform such surveys and computations as are necessary to determine quantities of Work performed or placed during each progress payment period, and shall perform all surveys necessary for the Authority Representative to determine final quantities of Work in place. The Authority Representative will determine final quantities based upon the survey data provided by the Contractor, and the design lines and grades. If requested by the Authority Representative, the Contractor shall provide an electronic copy of data used for quantity computations.

All surveys performed for measurement of final quantities of Work and material shall be subject to approval of Authority's Representative. Unless waived by Authority's Representative in each specific case, quantity surveys made by the Contractor shall be made in the presence of Authority's Representative.

C. Surveying

1. Accuracy. Degree of accuracy shall be an order high enough to satisfy tolerances specified for the Work and the following:

   (a) Right-of-way and alignment of tangents and curves shall be within 0.1 foot.

   (b) Structure points shall be set within 0.01 foot, except where operational function of the special features or installation of metalwork and equipment require closer tolerances. When formwork has been placed and is ready for concrete, the Contractor shall check the formwork for conformance with the drawings and to ensure that the forms are sufficiently within the tolerance limits for the completed work.

   (c) Cross-section points shall be located within 0.1 foot, horizontally and vertically.

   (d) Aerial Mapping shall meet National Mapping Standards for 2-foot contour intervals.

D. Records. Survey data shall be recorded in accordance with recognized professional surveying standards. Original field notes, computations, and other surveying data shall be recorded on electronic data collectors or in standard field books and must be of sufficient quality to enable the Contractor to prepare accurate record drawings as required by the Contract Documents.

E. Cost. Unless otherwise called for by the Contract Documents, the cost of all material, equipment, and labor required for surveys for the layout of work and quantity surveys shall be included in the Schedule of Pay Items for items of work requiring the surveys. No additional compensation shall be made to the Contractor for this Work.

3.2 SCHEDULE

A. Estimated Schedule. Within 14 Days after the issuance of the Notice to Proceed, Contractor shall prepare a Project schedule and shall submit this to the Engineer for Approval. The receipt or Approval of any schedules by the Engineer or the Authority shall not in any way relieve the Contractor of its obligations under the Contract Documents. The Contractor is fully responsible to determine and provide for any and all staffing and resources at levels which allow for good quality and timely completion of the Project. Contractor's failure to incorporate all elements of Work required for the performance of the Contract or any inaccuracy in the schedule shall not excuse the Contractor from performing all Work required for a completed Project within the specified Contract time period. If the required schedule is not received by the time the first payment under the Contract is due, Contractor shall not be paid until the schedule is received, reviewed and accepted by the Engineer.

B. Schedule Contents. The schedule shall indicate the beginning and completion dates of all phases of construction; critical path for all critical, sequential time related activities; and "float time" for all "slack" or "gaps" in the non-critical activities. The schedule shall clearly identify all staffing and other resources which in the Contractor's judgment are needed to complete the Project within the time specified for completion. The overall Project Schedule duration shall be within the Contract time.

C. Schedule Updates. Contractor shall continuously update its construction schedule. Contractor shall submit an updated and accurate construction schedule to the Engineer monthly when requested to do so by Engineer. Contractor shall also submit schedules showing a three week detailed look-ahead at bi-weekly meetings conducted with the Authority. The Engineer may withhold progress payments or other amounts due under the Contract Documents if Contractor fails to submit an updated and accurate construction schedule.

3.3 TEMPORARY FIELD OFFICE

NOT USED.

OR

A. Inspector's Field Office. Contractor shall be responsible for providing the inspector's field office. The office shall be a substantial waterproof construction with adequate natural light and ventilation by means of stock design windows. Door shall have a key type lock or padlock clasp. The office shall have heating and air conditioning and shall be equipped with a telephone, a telephone answering machine, high-speed internet connection, and a fax machine at Contractor's expense. A table satisfactory for the study of plans and two chairs shall be provided by Contractor. Contractor shall provide and pay for adequate electric lights, local telephone service, and adequate heat and air conditioning for the field office until authorized removal.

B. Utility Services. Contractor, at its expense, shall arrange for, develop and maintain all utilities, including but not limited to water, electric power, sewage disposal and telephone communications, at the Site to meet the requirements of the Work.

C. Sanitation. The Contractor shall provide sanitary facilities for all persons working on the project. These facilities shall be kept clean and shall not be unsightly or produce odors.

3.4 PROTECTION OF WORK AND PROPERTY

A. All traffic detector loops, fences, walls, culverts, property line monuments, or other obstructions (except property line monuments within five (5) feet of the centerline of the mains) which are removed, damaged, or destroyed in the course of the Work, shall be replaced or repaired to the original condition. If Contractor provides the Authority with reasonable notice of the need for such repair or replacement, it shall be performed by the Authority. If the Contractor fails to provide the Authority with reasonable notice, the repair or replacement shall be performed by and at the expense of the Contractor to the satisfaction of the Authority, whether or not those obstructions have been shown on the Plans, unless otherwise stated herein. It is then the Contractor's responsibility to employ at its expense a Licensed Land Surveyor to restore all property line monuments located more than five (5) feet from the centerline of the mains, which are destroyed or obliterated. Property line monuments located within five (5) feet of the centerline of the mains will be replaced by the Authority at no expense to the Contractor, provided the Authority is notified at least 48 hours before the property line monuments are damaged.

B. Contractor shall provide such heat, covering, and enclosures as are necessary to protect all Work, materials, equipment, appliances, and tools against damage by weather conditions.

C. Contractor shall take adequate precautions to protect existing sidewalks, curbs, pavements, utilities, and other adjoining property and structures, and to avoid damage thereto, and Contractor shall repair any damage thereto caused by the Work operations. Contractor shall:

1. Enclose the working area with a substantial barricade, and arrange work to cause minimum amount of inconvenience and danger to the public.

2. Provide substantial barricades around any shrubs or trees indicated to be preserved.

3. Deliver materials to the Project site over a route designated by the Engineer.

4. Provide any and all dust control required and follow the Applicable air quality regulations as appropriate. If the Contractor does not comply, the Authority shall have the immediate authority to provide dust control and deduct the cost from payments to the Contractor.

5. Confine Contractor's apparatus, the storage of materials, and the operations of its workers to limits required by law, ordinances, permits, or directions of the Engineer. Contractor shall not unreasonably encumber the Project site with its materials.

6. Take care to prevent disturbing or covering any survey markers, monuments, or other devices marking property boundaries or corners. If such markers are

disturbed by accident, they shall be replaced by a civil engineer or land surveyor acceptable to the Authority, at no cost to the Authority.

7. Ensure that existing facilities, fences and other structures are all adequately protected and that, upon completion of all Work, all facilities that may have been damaged are restored to a condition acceptable to the Authority.

8. Preserve and protect from injury all buildings, pole lines and all direction, warning and mileage signs that have been placed within the right-of-way.

9. At the completion of work each day, leave the Project site in a clean, safe condition.

10. Comply with any stage construction and traffic control plans. Access to residences and businesses shall be maintained at all times, unless otherwise permitted in writing by the Authority.

D. These precautionary measures will apply continuously and not be limited to normal working hours. Full compensation for the Work involved in the preservation of life, safety and property as above specified shall be considered as included in the prices paid for the various contract items of Work, and no additional allowance will be made therefore.

E. Should damage to persons or property occur as a result of the Work, Contractor shall be responsible for proper investigation, documentation, including video or photography, to adequately memorialize and make a record of what transpired. The Authority shall be entitled to inspect and copy any such documentation, video, or photographs.

3.5 SITE CONDITIONS SURVEYS

A. Work Included.

Contractor shall conduct thorough pre-construction and post-construction site condition surveys of the entire project area. Site Conditions surveys shall include written documentation of the conditions found, as well as photographs and video recordings of the area within at least 80 feet of any construction area and staging area. The written notes, photographs, and video shall be suitable for forensic purposes to resolve any damage claims that may arise as a result of construction.

B. Submittals.

1. Written documentation of site condition survey at pre-construction and post-construction.

2. Photographs as described herein of pre-construction and post-construction conditions.

3. Video recordings as described herein of pre-construction and post-construction conditions.

4. Submittals shall be made within three days of the surveys. All post-construction data shall be submitted prior to the final project inspection.

C. Site Condition Written Documentation.

Written documentation shall include the time, date, and conditions under which the site survey was made. The documentation shall note the condition of structures, pavement, sidewalks, utilities, fences, and etc. within the work areas.

D. Photographs.

1. General – Contractor shall take enough photographs during each site survey to provide a record of conditions existing prior to construction and conditions after construction. Pre-construction photographs shall be taken prior to any construction or mobilization of equipment, but not more that one week prior to actual start of work. The pre-construction photographs may be staged at different times to match the progression of the Work.

2. The photographs shall document existing damage to public and private facilities, both prior to and after construction. Conditions to be documented include, but are not limited to: sidewalk cracks, broken curbs, separated property walls, improvements within public right-of-ways, access roads used, utility covers and markings, signs, pavement striping, pavement, unique or unusual conditions, adjacent driveways, landscaping, survey markers, and any feature directed by the Engineer. Private property that is adjacent to the public right-of-way shall be documented to the extent visible from the public right-of-way.

3. Photographs shall include items to indicate scale, as needed. In particular, scales or other items shall be laid next to close ups of structural cracks and other damaged areas being recorded. Scaling shall also be used to document elevation differences, as needed.

4. One set of color prints shall be submitted. Additional sets shall be available for reviewing in settling any construction disputes. A set of photos shall also be furnished in electronic format. The resolution shall be at least equal to 7 mega-pixels. All photos shall be documented as to time and date taken, photographer, project number, location, and orientation. Documentation shall include a brief description of objects photographed.

E. Video Recording.

1. Video recordings shall document the conditions of the entire area affected by construction, as well as nearby structures and facilities. The general documentation requirements for videos are the same as for photographs. Video recorders shall accurately and continuously record the time and date.

2. Video recordings shall include an audio portion made simultaneously during the videoing. The audio recording shall describe the location, time, orientation, and objects being recorded. Special commentary shall be provided for unusual conditions or damage noted.

3. Video equipment shall be capable of producing high resolution images and shall have zoom capabilities.

4. Video recordings shall provide an overall picture of the sites and shall provide detailed images of damaged areas. Video shall extend to the maximum height of structures.

5. The Engineer shall have the right to reject any audio video recordings submitted with unintelligible audio, uncontrolled pan or zoom, or of poor quality. Video recordings shall be repeated when rejected.

6. Video recordings shall be submitted with labels indicating the project, date, recorder, and other pertinent information. Recordings shall be submitted on standard DVDs in a standard format.

F. Timing.

Contractor shall provide written notice of the time scheduled for the site conditions survey and the place it is to begin. Contractor shall obtain the Engineer's concurrence prior to beginning the condition survey. The Engineer reserves the right to cancel the survey due to weather conditions or other problems. Videoing shall be done during times of good visibility and no videoing or photography shall be done during periods of visible precipitation or when standing water obscures pavement. Contractor shall provide the Engineer with an opportunity to have a representative present when taking the photos and provide guidance during photographing.

G. Site Surveyor.

The site condition surveyor(s) shall be experienced in construction and potential damage concerns. The site condition surveyor(s) shall be familiar with the photography and video equipment being used.

H. Field Quality Control.

Prior to submitting videos and photographs, the Contractor shall spot check the photos and videos in the field to insure they accurately reflect the actual conditions and to insure they are correctly labeled.

I. Soils Compaction Testing.

1. All soils compaction testing will be done by a licensed geotechnical engineer furnished by the Authority. Soils compaction testing will be done for all footings and foundations prior to placement of rebar or concrete.

2. For pipeline construction, soil compaction testing will be done at 100-foot intervals at the bottom of the trench prior to placement of pipe bedding; at the top of the pipe bedding above the pipe; every two vertical feet of trench backfill; at the top of the trench backfill, which sould be the bottom of the pavement section; and at the top of the aggregate base prior to pavement construction.

3.6 SUBMITTAL REQUIREMENTS FOR MANUALS AND RECORD DRAWINGS

A. General. The Contractor shall furnish all materials and perform all Work required for furnishing submittals to Authority in accordance with Contract Documents.

B. Technical Manuals.

1. The Contractor shall submit technical operation and maintenance information for each item of mechanical, electrical and instrumentation equipment in an organized manner in the Technical Manual. It shall be written so that it can be used and understood by Authority's operation and maintenance staff.

2. The Technical Manual shall be subdivided first by specification section number; second, by equipment item; and last, by "Category." "Categories" shall conform to the following (as applicable):

(a) Category 1 - Equipment Summary:

(1) Summary: A summary table shall indicate the equipment name, equipment number, and process area in which the equipment is installed.

(b) Category 2 - Operational Procedures:

(1) Procedures: Manufacturer-recommended procedures on the following shall be included in Part 2:

a. Installation

b. Adjustment

c. Startup

d. Location of controls, special tools, equipment required, or related instrumentation needed for operation

e. Operation procedures

f. Load changes

g. Calibration

h. Shutdown

i. Troubleshooting

j. Disassembly

k. Reassembly

l. Realignment

m. Testing to determine performance efficiency

n. Tabulation of proper settings for all pressure relief valves, low and high pressure switches, and other protection devices

o. List of all electrical relay settings including alarm and contact settings

(c) Category 3 - Preventive Maintenance Procedures:

(1) Procedures: Preventive maintenance procedures shall include all manufacturer-recommended procedures to be performed on a periodic basis, both by removing and replacing the equipment or component, and by leaving the equipment in place.

(2) Schedules: Recommended frequency of preventive maintenance procedures shall be included. Lubrication schedules, including lubricant SAE grade, type, and temperature ranges, shall be covered.

(d) Category 4 - Parts List:

(1) Parts List: A complete parts list shall be furnished, including a generic description and manufacturer's identification number for each part. Addresses and telephone numbers of the nearest supplier and parts warehouse shall be included.

(2) Drawings: Cross-sectional or exploded view drawings shall accompany the parts list.

(e) Category 5 - Wiring Diagrams:

(1) Diagrams: Part 5 shall include complete internal and connection wiring diagrams for electrical equipment items.

(f) Category 6 - Shop Drawings:

(1) Drawings: This part shall include approved shop or fabrication drawings, complete with dimensions.

(g) Category 7 - Safety:

(1) Procedures: This part describes the safety precautions to be taken when operating and maintaining the equipment or working near it.

(h) Category 8 - Documentation:

(1) All equipment warranties, affidavits, and certifications required by the Technical Specifications shall be placed in this part.

3. The Contractor shall furnish to Authority six (6) identical Technical Manuals. Each set shall consist of one or more volumes, each of which shall be bound in a standard binder.

C. Spare Parts List - The Contractor shall furnish to Authority six (6) identical sets of spare parts information for all mechanical, electrical, and instrumentation equipment.

The spare parts list shall include the current list price of each spare part. The spare parts list shall include those spare parts which each manufacturer recommends be maintained by Authority in inventory. Each manufacturer or supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts to assist Authority in ordering. The Contractor shall cross-reference all spare parts lists to the equipment numbers designated in the Contract Documents. The spare parts lists shall be bound in standard size, 3-ring binder.

D. Record Drawings

1. The Contractor shall maintain one record set of Drawings at the Site. On these, it shall mark all Project conditions, locations, configurations, and any other changes or deviations which may vary from the information represented in the original Contract Documents, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were not indicated on the Contract Drawings. Said record drawings shall be supplemented by any detailed sketches as necessary or directed to fully indicate the Work as actually constructed. These master record drawings of the as-built conditions, including all revisions made necessary by Addenda and Change Orders shall be maintained up-to-date during the progress of the Project. Red ink shall be used for alterations and notes. Notes shall identify relevant Change Orders by number and date.

2. For all Projects involving the installation of any pipeline, Contractor shall survey and record the top of the pipe at a minimum of every 100 linear feet, and at each bend, recording both the horizontal and vertical locations.

3. Record drawings shall be accessible to Authority's Representative at all times during the construction period. Failure on the Contractor's part to keep record drawings current could result in withholding partial payment.

4. Upon Completion of the Project and as a condition of final acceptance, the Contractor shall finalize and deliver a complete set of Record Drawings to Authority's Representative. The information submitted by the Contractor will be assumed to be correct, and the Contractor shall be responsible for, and liable to Authority, for the accuracy of such information, and for any errors or omissions which may or may not appear on the Record Drawings.

E. Cost. Unless otherwise called for by the Contract Documents, the cost of all material, equipment, and labor required to complete the Manuals and Record Drawings shall be included in Contractor's bid and distributed in the Schedule of Pay. No additional compensation shall be made to the Contractor for this Work.

3.7 MATERIALS

A. Materials to be Furnished by the Contractor

1. Inspection of Materials. Materials furnished by the Contractor which will become a part of the Project shall be subject to inspection at any one or more of the following locations, as determined by Authority's Representative: at the place of

production or manufacture, at the shipping point, or at the site of the Work. To allow sufficient time to provide for inspection, the Contractor shall submit to Authority's Representative, at the time of issuance, copies of purchase orders or other written instrument confirming procurement of the materials, including drawings and other pertinent information, covering materials on which inspection will be made.

2. No later than fourteen (14) Days prior to manufacture of material, Contractor shall inform Authority's Representative, in writing, the date the material is to be manufactured.

3. Contractors Obligations. The inspection of materials at any of the locations specified above or the waiving of the inspection thereof shall not impact whether the materials and equipment conform to the Contract Documents. Contractor will not be relieved from furnishing materials meeting the requirements of the Contract Documents due to Authority's inspection or lack of inspection of the equipment or materials. Acceptance of any materials will be made only after materials are installed in the Project.

4. Cost. Unless otherwise called for by the Contract Documents, the cost of all material, equipment, and labor required to accommodate Authority's testing efforts, including any travel required by Contractor's forces, shall be included in Contractor's bid and distributed in the Schedule of Pay Items related to the materials requiring testing. No additional compensation shall be made to the Contractor for this Work.

3.8 LOCAL CONDITIONS AND REQUIREMENTS

A. Access to Work and Haul Routes

1. General. All work on the rights-of-way necessary for access to the Site shall be performed by the Contractor.

2. Access, Damage, Restoration. The Contractor shall make his own investigation of the condition of available public or private roads and of clearances, restrictions, bridge-load limits, permit or bond requirements, and other limitations that affect or may affect transportation and ingress or egress at the Site. Claims for changes in Contract Price or Contract Times arising out of the unavailability of transportation facilities or limitations thereon shall not be considered by Authority.

3. The Contractor shall maintain and repair any damage arising out of Contractor's operations to all roads used during construction of the Project, and upon completion of all Work, but prior to final acceptance, the roads shall be restored to their original condition. Prior to using any road for access to the Site, the Contractor shall conduct a photograph and/or video survey of the roadway with a copy submitted to Authority's Representative.

4. Cost. Unless otherwise called for by the Contract Documents, the cost of all material, equipment, and labor required to complete this Work, shall be included in

Contractor's bid and distributed in the Schedule of Pay Items. No additional compensation shall be made to the Contractor for this Work.

B. Power. Contractor shall provide at its own expense all necessary power required for operations under the contract. The Contractor shall provide and maintain in good order such modern equipment and installations as shall be adequate in the opinion of the Engineer to perform in a safe and satisfactory manner the Work required by the contract.

C. Construction Water.

1. Construction water shall not be used for purposes other than those required to satisfactorily complete the contract.

2. All connections to the Authority's water system used for the purposes of obtaining construction water shall utilize a temporary construction meter and backflow prevention device supplied by the Authority. The Authority-furnished backflow prevention device shall be tested immediately after installation and the construction meter and backflow prevention device shall not be placed into service until the backflow prevention device passes such tests. Test results shall be provided to the Engineer. If the temporary construction meter and backflow prevention device are moved to alternate location(s) during construction, the backflow prevention device shall again be tested as described above immediately after re-installation.

3. For each temporary construction meter requested by the Contractor for the performance of work under this contract, an amount equivalent to the deposit requirement for temporary construction meters listed in the current approved version of the Authority's Policies and Procedures Manual shall be withheld from the final contract payment until the temporary construction meters are returned.

D. Operation of Existing Water Facilities

1. The Contractor shall not operate any of the existing water systems, including pumps, motors, and hydrants, but shall contact the Authority two (2) working days in advance with a list and location of the water system facilities that will require operating, opening, stopping, or closure by the Authority.

2. At the option of the Engineer, the Contractor may be permitted to operate valves for the purpose of making connections to existing mains. The Authority will perform all notification to existing customers regarding temporary loss of service.

3. Contractor shall submit a request on Authority's standard form for any shut-down of existing water facilities.

E. Construction at Existing Utilities

1. General. Where the Work to be performed crosses or otherwise interferes with water, sewer, gas, or oil pipelines; buried cable; or other public or private utilities, the Contractor shall perform construction in such a manner so that no damage will result to either public or private utilities. It shall be the responsibility of the

Contractor to determine the actual locations of, and make accommodates to maintain, all utilities.

2. Permission, Notice and Liability. Before any utility is taken out of service, permission shall be obtained by the Contractor from the owner. The owner, any impacted resident or business owner and the Authority Representative will be advised of the nature and duration of the utility outage as well as the Contractor's plan for providing temporary utilities if required by the owner. The Contractor shall be liable for all damage which may result from its failure to maintain utilities during the progress of the Work, and the Contractor shall indemnify Authority as required by the Contract Documents from all claims arising out of or connected with damage to utilities encountered during construction; damages resulting from disruption of service; and injury to persons or damage to property resulting from the negligent, accidental, or intentional breaching of utilities.

3. Cost. Unless otherwise called for by the Contract Documents, the cost of all material, equipment, and labor required to complete this Work, shall be included in Contractor's bid and distributed in the Schedule of Pay Items. No additional compensation shall be made to the Contractor for this Work.

F. Traffic Control

1. General. Contractor shall abide by traffic control plans approved by the appropriate jurisdiction.

2. Protections. Roads subject to interference by the Work shall be kept open or suitable temporary passages through the Work shall be provided and maintained by the Contractor. The Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient flasher lights, flag persons, danger signals, and signs, and shall take all necessary precautions for the protection of the Work and the safety of the public. No construction work along public or private roads may proceed until the Contractor has proper barricades, flasher lights, flag persons, signals, and signs in place at the construction site.

3. Cost. Unless otherwise called for by the Contract Documents, the cost of all material, equipment, and labor required to complete this Work, shall be included in Contractor's bid and distributed in the Schedule of Pay Items. No additional compensation shall be made to the Contractor for this Work.

G. Cleaning Up

1. Contractor at all times shall keep premises free from debris such as waste, rubbish, and excess materials and equipment. Contractor shall not store debris under, in, or about the premises. Contractor shall also clean all asphalt and concrete areas to the degree necessary to remove oil, grease, fuel, or other stains caused by Contractor operations or equipment. The use of water, resulting in mud on streets, will not be permitted as substitute for sweeping or other methods. Dust control may require having a water truck onsite for the duration of the project, and/or use of temporary hoses and pipelines to convey water.

2. Contractor shall fully clean up the site at the completion of the Work. If the Contractor fails to immediately clean up at the completion of the Work, the Authority may do so and the cost of such clean up shall be charged back to the Contractor.

3.9 ENVIRONMENTAL QUALITY PROTECTION

A. Environmental Conditions

1. Contractor must comply with all applicable environmental laws, Project conditions, and constraints.

2. Authority has considered these Environmental Conditions when determining the Contract Times and no additional time or compensation will be added to the Contract due to these Conditions.

B. Landscape and Vegetation Preservation

1. General. The Contractor shall exercise care to preserve the natural landscape and vegetation, and shall conduct operations so as to prevent unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the Work.

2. Damage and Restoration. Movement of crews and equipment within the rights-of-way and over routes provided for access to the Work shall be performed in a manner to prevent damage to property. When no longer required, construction roads shall be restored to original contours.

3. Upon completion of the Work, and following removal of construction facilities and required cleanup, land used for construction purposes and not required for the completed installation shall be scarified and regraded, as required, so that all surfaces are left in a condition that will facilitate natural revegetation, provide for proper drainage, and prevent erosion.

4. Cost. Unless otherwise called for by the Contract Documents, the cost of all material, equipment, and labor required to complete this Work, shall be included in Contractor's bid and distributed in the Schedule of Pay Items. No additional compensation shall be made to the Contractor for this Work.

C. Protected Species

1. General. If, in the performance of the Work, evidence of the possible occurrence of any Federally listed threatened or endangered plant or animal is discovered, the Contractor shall notify the Authority Representative immediately, giving the location and nature of the findings. Written confirmation of the evidence, location and nature of the findings shall be forwarded to Authority within 2 Days.

2. Procedures. The Contractor shall immediately cease all construction activities in the immediate area of the discovery to the extent necessary to protect the endangered plant or animal.

If directed by the Authority Representative, Contractor will refrain from working in the immediate area, suspend the Work in its entirety, or alter its performance to ensure full compliance with all applicable permits, laws and regulations. Any Authority directed changes to the Work as a result of a siting will be pursuant to the Contract Documents.

3. False Siting. Any costs or delays incurred by Authority or the Contractor due to unreasonable or false notification of an endangered plant or animal will be borne by the Contractor.

4. Cost. Unless otherwise called for by the Contract Documents, the cost of all material, equipment, and labor required to comply with this paragraph, shall be included in Contractor's bid and distributed in the Schedule of Pay Items. No additional compensation shall be made to the Contractor for this Work.

D. Preservation of Historical and Archeological Resources

1. General. If, in the performance of the Work, Contractor should unearth cultural resources (for example, human remains, animal bones, stone tools, artifacts and/or midden deposits) through excavation, grading, watering or other means, the Contractor notify the Construction/Archeological Monitor and/or the Authority Representative immediately, giving the location and nature of the findings. Written confirmation of the evidence, location and nature of the findings shall be forwarded to the Construction/Archeological Monitor and/or Authority within 2 Days.

2. Procedures. The Contractor shall immediately cease all construction activities in the immediate area of the discovery to the extent necessary to protect the cultural resource.

   If directed by the Authority Representative, Contractor will refrain from working in the immediate area, suspend the Work in its entirety, or re-sequence and/or alter its performance to ensure full compliance with all applicable permits, laws and regulations. Should the presence of cultural resources be confirmed, the Contractor will assist the Authority Representative and the Construction/Archeological Monitor in the preparation and implementation of a data recovery plan. The Contractor shall provide such cooperation and assistance as may be necessary to preserve the cultural resources for removal or other disposition. Any Authority directed changes to the Work as a result of the cultural resource will be pursuant to the Contract Documents.

3. Contractor's Liability. Should Contractor, without permission, injure, destroy, excavate, appropriate, or remove any cultural resource on or adjacent to the Site, it will be subject to disciplinary action, arrest and penalty under applicable law. The Contractor shall be principally responsible for all costs of mitigation and/or restoration of cultural resources related to the unauthorized actions identified above. Contractor shall be required to pay for unauthorized damage and mitigation costs to cultural resources (historical and archeological resources) as a result of unauthorized activities that damage cultural resources and shall indemnify Authority pursuant to the Contract Documents.

4. Cost. Unless otherwise called for by the Contract Documents, the cost of all material, equipment, and labor required to comply with this paragraph, shall be included in Contractor's bid and distributed in the Schedule of Pay Items. No additional compensation shall be made to the Contractor for this Work.

E. Dust and Pollution Control

1. Contractor shall provide all necessary material, equipment and labor to prevent and control the emission of dust and any other potential pollutant on site.

2. Contractor shall not discharge into the atmosphere from any source smoke, dust or other air contaminants in violation of the law, rules, and regulations of the governing agency.

3. Cost. Unless otherwise called for by the Contract Documents, the cost of all material, equipment, and labor required to comply with this paragraph, shall be included in Contractor's bid and distributed in the Schedule of Pay Items. No additional compensation shall be made to the Contractor for this Work.

F. Fugitive Dust

NOT USED.

G. Management of Storm, Surface and Other Waters

1. Storm water, surface water, groundwater, and nuisance, or other waters may be encountered at various times during construction of the Project. Federal and State laws require the Authority and its contractors to manage such waters pursuant to the requirements of California State Water Resources Control Board Order Number 2009-0009-DWQ, the Federal Clean Water Act, and the California Porter Cologne Water Quality Control Act. Contractor acknowledges that it has investigated the risk arising from such waters in conjunction with the Project, and assumes any and all risks and liabilities arising therefrom.

2. The Contractor shall perform all construction operations in such a manner as to comply, and ensure all subcontractors to comply, with all applicable Federal, State, and local laws, orders, and regulations concerning the control and abatement of water pollution; and all terms and conditions of any applicable permits issued for the Project. In the event there is a conflict between Federal, State, and local laws, regulations, and requirements, the most stringent shall apply.

3. Contractor violations. If noncompliance should occur, the Contractor shall report this to the Authority Representative immediately, with the specific information submitted in writing within 2 Days. Consistent violations of applicable Federal, State, or local laws, orders, regulations, or Water Quality Standards may result in Authority stopping all site activity until compliance is ensured. The Contractor shall not be entitled to any change in Contract Price or Contract Times, claim for damage, or additional compensation by reason of such a work stoppage. Corrective measures required to bring activities into compliance shall be at the Contractor's expense.

4. Compliance with Construction General Storm Water Permit. Contractor shall be required to comply with all aspects of the State Water Resources Control Board (State Board) Water Quality Order No. 2009-0009-DWQ, National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Construction Activity (Permit) for all projects that involve construction on or disturbance of one acre or more of land or which are part of a larger common area of development.

   (a) Contractor shall prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) for the Project site based on the appropriate Risk Level requirements, and draft and coordinate submittal of all Permit related documents with Authority's Legally Responsible Person and/or Authorized Signatory as those terms are defined in the Permit. The Contractor shall submit the SWPPP to the Authority Representative for review not less than fifteen (15) Days prior to the start of on- site construction work. Authority will file the Notice of Intent and pay the filing fee.

   (b) The SWPPP shall be developed by a Qualified SWPPP Developer and implemented by a Qualified SWPPP Practitioner as those terms are defined in the Permit and shall include industry standard requirements for water quality control including but not be limited to the following:

      (1) Sediment and erosion control measures to manage sediment and erosion including vegetative practices, structural control, silt fences, straw dikes, sediment controls or operator controls as appropriate. Storm water management measures shall be instituted as required, including velocity dissipaters, and solid waste controls shall address controls for building materials and offsite tracking of sediment.

      (2) Wastewater and storm water management controls to divert offsite surface flows around the Project site and to divert surface flows within the Project area away from areas of open earth or stockpiles of building and other materials. Wastewater from general construction activities, such as drain water collection, aggregate processing, concrete batching, drilling, grouting, or other construction operations, shall not enter flowing or dry watercourses without having met the authorized non-storm water discharge requirements listed in State Board Water Quality Order No. 2009-0009-DWQ, Section III.C., including proper notification to the Regional Water Board.

      (3) Pollution prevention measures including methods of dewatering, unwatering, excavating, or stockpiling earth and rock materials which include prevention measures to control silting and erosion, and which will intercept and settle any runoff of sediment-laden waters.

      (4) Turbidity prevention measures for prevention of excess turbidity including, but are not restricted to, intercepting ditches, settling ponds, gravel filter entrapment dikes, flocculating processes, recirculation, combinations thereof, or other approved methods that are not harmful to aquatic life. All such wastewaters discharged into surface waters, shall contain the least concentration of settleable material possible, and shall meet all conditions of section 402, the National Pollutant Discharge Elimination System (NPDES) permit.

(5) Overall construction site management measures to address changes at the Project site as the Project moves through different phases and changes that account for rainy and dry season management practices.

(6) Pollution control measures and construction activity methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris, or other pollutants or wastes, into streams, flowing or dry watercourses, lakes, wetlands, reservoirs, or underground water sources. Such pollutants and wastes include, but are not restricted to: refuse, garbage, cement, sanitary waste, industrial waste, hazardous materials, radioactive substances, oil and other petroleum products, aggregate processing, tailings, mineral salts, and thermal pollution.

(7) Control measures for stockpiled or deposited materials prohibiting the stockpile or deposit of excavated materials, or other construction materials, near or on stream banks, lake shorelines, or other watercourse perimeters where they can be washed away by high water or storm runoff, or can, in any way, encroach upon the watercourse.

(8) Develop and implement a Rain Event Action Plan (REAP), if required, that must be designed and implemented to protect all exposed portions of the site 48 hours prior to any likely precipitation event.

(9) Monitoring, reporting and record keeping, as necessary to achieve compliance with applicable Permit requirements, including but not limited to annual reports and rain event reports.

(c) Before any Permit related documents, including the SWPPP, rain event reports, or annual reports may be submitted to the State Board or implemented on the Project site, they must first be reviewed and approved by Authority.

(d) Authority retains the right to procure and maintain coverage under the Permit for the Project site if the Contractor fails to draft a SWPPP or other Permit related document, or fails to proceed in a manner that is satisfactory to Authority. Authority reserves the right to implement its own SWPPP at the Project site, and hire additional contractors to maintain compliance. Whether Contractor has adequately maintained compliance with the Permit shall be Authority's sole determination. In the event that Contractor has failed or is unable to maintain compliance with the Permit, any costs or fines incurred by Authority in implementing a SWPPP, or otherwise maintaining compliance with the Construction General Permit shall be paid by the Contractor.

(e) Failure to implement the SWPPP or otherwise comply with the Permit is a violation of federal and state law. Contractor hereby agrees to indemnify Authority as required by the Contract Documents for any noncompliance or alleged noncompliance with the Permit arising out of or in connection with the Project, except for liability resulting from the sole established negligence, willful misconduct or active negligence of Authority. Authority may seek damages from Contractor for delay in completing the Contract in accordance with the Contract Documents, caused by Contractor's failure to comply with the Permit.

5. In addition to compliance with the Permit, Contractor shall comply with the lawful requirements of any applicable municipality, district, drainage district, flood control district, and other local agencies regarding discharges of storm water, surface water, groundwater or other nuisance waters off of the Project site.

6. Oil storage tanks management.

   (a) Storage tank placement. All oil or other petroleum product (hereinafter referred to collectively as oil) storage tanks shall be placed at least 20 feet from streams, flowing or dry watercourses, lakes, wetlands, reservoirs, and any other water source.

   (b) Storage area dikes. Storage areas shall be diked at least 12 inches high or graded and sloped to permit safe containment of leaks and spills equal to the capacity of all tanks and/or containers located within each area, plus a sufficient amount of freeboard to contain the 25-year rainstorm.

   (c) Diked area barriers. Diked areas shall have an impermeable barrier at least 10 mils thick. Areas used for refueling operations shall have an impermeable liner at least 10 mils thick buried under 2 to 4 inches of soil.

   (d) Spill Prevention Control and Countermeasure Plan (SPCC). Where the location of a construction site is such that oil from an accidental spillage could reasonably be expected to enter into or upon the navigable waters of the United States or adjoining shorelines, and the aggregate storage of oil at the site is over 1,320 gallons or a single container has a capacity in excess of 660 gallons, the Contractor shall prepare an SPCC Plan. The Contractor shall submit the SPCC Plan to the Engineer at least 30 days prior to delivery or storage of oil at the site. The Plan must have been reviewed and certified by a registered professional engineer in accordance with 40 C.F.R., part 112

7. Underground tank prohibition. The Contractor shall not use underground storage tanks.

8. Construction safety standards. The Contractor shall comply with the sanitation and potable water requirements of Section 7 of United States Bureau of Reclamation's publication “Reclamation Safety And Health Standards.”

9. Other Permits.

   (a) Other permits applicable to the Project are listed in the Special Conditions. The Contractor shall obtain all other necessary licenses and permits.

   (b) Monitoring. The Contractor is required to conduct monitoring in order to meet the requirements of the permits, which may include sampling, testing and inspections.

   (c) Recordkeeping. The Contractor shall retain all records and data required by the permits for the time specified in the contract.

10. Cost. Except as specified herein, the cost of complying with this section shall be included in the Schedule of Pay Items for work which necessitate the water pollution prevention measures required by this paragraph.

END OF GENERAL REQUIREMENT

TECHNICAL SPECIFICATIONS

AMADOR REGIONAL SANITATION AUTHORITY

HENDERSON DAM UNDER DRAIN REPAIR
100% SUBMITTAL

LICENSEE RESPONSIBLE FOR SPECIFICATIONS

Contract Documents prepared by or under the direction of the following registered persons:

Gabriel Aronow, PE (Project Manager)
Stantec Consulting Services Inc.
101 Providence Mine Road, Suite 202
Nevada City, CA 95959
(530) 913-9197

03/10/2026

AMADOR COUNTY SANITATION AUTHORITY
HENDERSON DAM UNDER DRAIN REPAIR
175578307

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Not used.

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Not used.

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Not used.

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Not used.

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Not used.

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Not used.

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Not used.

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Not used.

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Not used.

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Not used.

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Not used.

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Not used.

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Not used.

Attachments

A – Existing Sluice Gate Detail

B – Henderson Reservoir Water Quality Testing Data, September, 2011

END OF SECTION

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK OF THIS SECTION

The work to be performed under this Contract shall consist of furnishing all tools, equipment, materials, supplies, and manufactured articles, and furnishing all labor, transportation, and services, including fuel, power, water, and essential communications, and performing all work, or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents, no additional compensation shall be allowed. This includes the cost of work not specifically listed in the Bid Schedule or Schedule of Values, but is necessary to complete the project as described and shown in the Contract Documents. The anticipated completion date for this project is October 2023.

Note that in the following sections there are 195 feet of 20" AC pipe to be removed and replaced. Contractor shall take appropriate safety precautions and adhere to all Local, State and Federal standards and laws in the removal, handling, cutting, disturbance and disposal of AC pipe and AC containing materials.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

The work generally includes, but is not limited to, furnishing all products, labor, equipment, material, transportation, and incidental services to construct the following:

A. Sliplining of existing 20" concrete outlet pipe using 16" DR17 HDPE, ASTM F714 pipe for approximately 170 LF total and grouting the annulus between the host pipe and the sliplined pipe.

B. Removal and replacement of approximately 95 LF of 20" AC Concrete pipe with 16" DR17 HDPE, ASTM F714 pipe.

C. Removal and replacement of approximately 100 LF of 20" AC Concrete pipe with 24" DR17 HDPE, ASTM F714 pipe.

D. Connection of the sliplined and open-cut sections of the 16" DR17 HDPE Pipe, and connection of the 16" DR17 HDPE pipe to the existing 20" Ductile Iron Pipe at the concrete junction chamber and connection of the 20" DR17 HDPE pipe to the existing 20" Ductile Iron Pipe at the concrete junction box.

E. Completely backfill with cement-grout an existing abandoned-in-place 16-inch diameter outlet pipe which proceeds beneath approximately the middle of the dam.

F. Field verification of post-installation conditions using a rover with a tilt and pan CCTV camera.

G. Contractor use of site

1. Contractor shall confine its operations to the work areas indicated on the drawings.

2. Contractor use of the site shall be limited to its construction operations, including on site storage of materials, equipment, parking of construction employee's vehicles, and on-site fabrication facilities.

H. Line and Grade

1. Work shall be done to the lines, grades and elevations indicated on the plans.

1.3 PROJECT LOCATION

A. The existing outlet pipe is located at the Henderson Reservoir in Amador County, California, approximately 4 miles west of the City of Sutter Creek, California. The existing outlet pipe is an approximately 265-foot long, 20-inch diameter concrete pipe, which includes a 95-ft section of asbestos cement pipe to the discharge end. From the intake structure in the reservoir portion at the sluice gate, the pipe runs for approximately 170-feet to a 22.5-degree bend in the pipe, and then additional approximately 95-feet to the downstream side of the dam to a junction box. The pipe runs further west after the junction box for approximately 100-ft where it meets an existing flume. The scope of work for this project also includes complete backfilling of an abandoned-in-place 16-inch diameter outlet pipe that proceeds beneath the dam.

B. The existing 20-inch outlet pipe is located at the western bank of the reservoir. The outlet pipe is a critical part of the reservoir infrastructure and provides a means of releasing impounded water to downstream facilities as well as serve a critical safety function in case a rapid draw down of the water level is required.

C. Drawings are enclosed with these specifications depicting the work at each location.

1.4 SITE PREPARATION

A. The site of all trenches shall be cleared of all vegetation, stumps, roots, sod, and debris prior to excavating. Any other structures stipulated on the drawings to be removed, or otherwise authorized by the Engineer to be removed, shall be removed and later replaced in a manner acceptable to the Engineer and equivalent to its original undisturbed conditions.

B. Stockpiling of Excavated Materials, Pipe, Etc.

1. In accordance with and in addition to the requirements of the General Contract Conditions, no excavated materials, pipe, equipment, or any other items shall be stockpiled or stored on private property without the express written approval of the property owner of record. Duplicate copies of any written approval or authorization given to the Contractor shall be submitted to the Engineer and ARSA and shall be so worded as to hold harmless the project owner of any responsibility whatsoever to the stockpiling and storage of material and equipment. All costs incurred shall be borne by the Contractor.

1.5 EXISTING FACILITIES

A. General: the Contractor shall at all times take extreme and proper precautions for the protection of utilities, the presence of which are known or can be determined by the examination of appropriate utility maps, use of electronic locating, exploratory excavations, etc. The Contractor shall be responsible for all costs associated with the repair of any service and/or utility damaged by construction.

B. The Contractor shall notify all appropriate utility companies, as well as property owners and all other interested parties, prior to commencement of work in order to ensure that there will not be service interruptions during construction. Existing utility lines and utility poles, trees, shrubbery, fences, water main, gas mains, sewers, cables, conduits, curb, gutter, wales, and other structures in the vicinity of work not authorized to be removed, shall be supported and protected from damage by the Contractor until all construction and related work is complete. The Contractor shall be liable for all damages to existing facilities, structures, and property.

C. Utilities

1. It shall be the responsibility of the Contractor to verify the existence and location (vertically and horizontally) of all underground utilities along the route of the work, to ensure construction as shown in the Contract Documents.

D. Exploratory Excavations:

1. In additions to those areas as may be designated on the Contract Documents, it shall be the responsibly of the contractor to excavate and locate all utilities and appurtenances which may affect construction or require protection during construction of the project scope. All exploratory excavation shall occur far enough in advance of the construction to permit any necessary relocations.

PART 2 MATERIALS

2.1 GENERAL

The Contractor shall provide all labor, material, equipment, and incidentals for the work described within these specifications and construction drawings. Payment for each bid item shall be included in the contract unit price or lump sum price shown on the bidder's proposal. Measurement for payment of lump sum items will be based on the component parts listed in the Bid Items, as required in this specification. Payment for component parts will be based on the Schedule of Values approved by the Engineer. The cost breakdown shall include quantities and items aggregating the Bid Item in payments during construction. Payment for each bid item shall include full compensation for all labor, materials, tools, and equipment necessary to complete the work as shown on the construction drawings and within these specifications and no additional compensation shall be allowed. This included the cost of work not specifically listed in the Bid Schedule or Schedule of Values, but is necessary to complete the project as described and shown in the Contract Documents. Work for which no separate payment has been provided will be considered a subsidiary obligation of the Contractor, and the cost therefore shall be included in the applicable contract price for the item to with the work applies. All measurement of work done will be made by the Owner or its representative.

2.2 BID ITEM 1 – MOBILIZATION, BONDS, PERMITS AND DEMOBILIZATION

Payment for mobilization, bonds, permits and demobilization shall be made at the contract lump sum, complete and in accordance with the Contract Documents, and as directed by the Owner. The Contract Price shall include, but is not limited to the following principal items: obtaining all permits, insurance, and bonds; preparing schedule and schedule of values; mobilizing labor force, equipment and construction facilities onto site; providing field office and storage yard (if Contractor deems necessary); securing construction water supply; providing power necessary for construction, providing all temporary construction fencing; installing, maintaining and removing project signs; providing on-site sanitary facilities; posting OSHA and CAL/OSHA requirements for establishing safety programs; performing all work and documentation necessary for the mobilization, bonding, and permitting for construction of the project as described within the Contract Documents. This work also includes the cost for maintaining and submitting the project record drawings at the end of the project. These record drawings must be reviewed monthly with the Engineer and Owner to receive payment for any work. The amount for this bid item shall be limited to 10% of the total contract amount: The first half of the amount of Bid Item 1 shall be payable at the project outset for mobilization, and the second half of the amount of Bid Item 1 shall be payable at the conclusion of the project for demobilization.

2.3 BID ITEM 2 – SLIPLINING FOR HENDERSON DAM OUTLET PIPE

Payment for sliplining the 16" DR17 HDPE pipe within the existing 20" concrete outlet pipe at the Henderson Reservoir will be made at the contract unit price to include 16" DR17 HDPE, ASTM F714 pipe along the alignment accordingly, complete and in accordance with the Contract Documents. The Contract price for work under this bid item shall include all sliplining rehabilitation equipment, and labor necessary to complete the work, including a final videotape and installation report of the sliplined pipe segment to be submitted two weeks following completion of the sliplined work, and restoring site to pre-construction conditions for areas where excavation/grading was necessary to complete the work, including hydroseeding all vegetated areas downstream of the dam crest. The work includes preparation and development of the sliplining access pit, which will include installation of shoring, excavation, and access to and provision of

entry and exit points for sliplining. Bulkheads shall be installed by the Contractor at both the upstream and downstream ends of the pipe after sliplining insertion.

This bid item will also include continuous bypass pumping of the reservoir to facilitate site work on the dam side, and all required cleaning of the existing host pipe, and grouting of the annulus, per these Contract Documents in order to successfully perform the sliplining. This item will also include preparing a CCTV inspection video after cleaning the existing pipe in preparation for the sliplining operation, and a CCTV report at the conclusion of the sliplining installation. A final CCTV inspection video will also be conducted after all necessary connections have been made and the project has been completed.

Additionally, Bid Item 2 will cover labor, equipment, and materials necessary to backfill the sliplining access pit in accordance with the Contract Documents, hydroseeding all areas where disturbance or excavation/grading was necessary to complete the work, removal of temporary facilities such as shoring required for the sliplining access pit, modifications to the existing sluice gate at the upstream end of the outlet pipeline, and restoration of any modified facilities such as those at the upstream face of the dam and any other restoration required.

2.4 BID ITEM 3 – OPEN-CUT INSTALLATION FROM SLIPLINE SECTION TO CONCRETE JUNCTION CHAMBER

Payment for open-cut installation will be made at the contract unit price complete, in accordance with the Contract Documents. The contract price for work under this item shall include but is not limited to furnishing all labor, material, tools, and equipment and performing all work required for removal and replacement of the 95-ft section of existing 20” AC Concrete outlet pipe with 16” DR17 HDPE, ASTM F714 Pipe. This bid item will also include connection to the sliplined pipe section, connection to the existing 20” ductile iron pipe section at the concrete junction chamber, modifications upstream of the existing 20-inch wye within the existing junction chamber, offsite disposal of the existing pipeline removed from the trench, and all other materials derived from or relating to construction of the work in accordance with all applicable regulations, backfilling and compaction of the trenches and placement of reinforcement and reinforced concrete, a concrete mud slab, native soil, and top soil in accordance with the Contract Documents, CCTV reports post-installation, restoring site to pre-construction conditions, and hydroseeding all areas where disturbance or excavation/grading was necessary to complete the work.

2.5 BID ITEM 4 - OPEN-CUT INSTALLATION FROM CONCRETE JUNCTION CHAMBER TO FLUME

Payment for open-cut installation will be made at the contract unit price complete, in accordance with the Contract Documents. The contract price for work under this item shall include but is not limited to furnishing all labor, material, tools, and equipment and performing all work required for removal and replacement of the 100-ft section of existing 20" AC Concrete outlet pipe with 24" DR17 HDPE, ASTM F714 Pipe. This bid item will also include connection to the existing 20" ductile iron pipe section at the concrete junction chamber, modifications downstream of the existing 20-inch wye within the existing junction chamber, offsite disposal of the existing pipe removed from the trench, and all other materials derived from or relating to construction of the work in accordance with all applicable regulations, backfilling and compaction of the trenches and work with flowable fill and native soil in accordance with the Contract Documents, CCTV reports post-installation, and restoring site to pre-construction conditions and hydroseeding all areas where disturbance or excavation/grading was necessary to complete the work.

2.6 BID ITEM 5 – BACKFILLING OF EXISTING ABANDONED-IN-PLACE CONCRETE OUTLET PIPE

Payment for backfilling the existing abandoned-in-place outlet pipe will be made at the contract unit price, in accordance with the Contract Documents. The Contract price for work under this item shall include but is not limited to furnishing all labor, material, tools, and equipment and performing all work required to locate and expose both ends of the pipe, backfilling the pipe with grout, and restoring site to pre-construction conditions for areas where disturbance or excavation/grading is necessary to complete the work, and hydroseeding areas disturbed downstream of the dam crest. This item also includes performing CCTV inspection of the existing abandoned concrete pipe and all related handling and disposal of construction derived waste, excess material, and all other materials as needed to restore the site to pre-construction conditions.

2.7 BID ITEM 6 (PROVISIONAL) – GPR OF EXISTING ABANDONED-IN-PLACE CONCRETE PIPE

Payment for ground penetrating radar (GPR) of the existing abandoned-in-place outlet pipe will be made at the contract unit price, in accordance with the Contract Documents. This item is provisional and shall only be provided if CCTV performed under bid item 5 is not possible and upon the written direction of ARSA. The Contract price work under this item shall include but is not limited to furnishing all labor, material, tools, and equipment and performing all work required for GPR of the existing abandoned concrete pipe, and restoring site to pre-construction conditions.

PART 3 EXECUTION

3.1 CLEANING

A. Exterior Cleaning: Sweep paved surfaces; rake other surfaces or grounds.

B. Final Cleaning: Remove all tools, equipment, surplus materials, and rubbish. Refinish surfaces of existing facilities that are marred, scratched, or damaged to match original

condition. Remove grease, dirt, stains, foreign materials, and labels from interior and exterior finished surfaces. Do any required waxing and polishing. Restore existing drive over dam to pre-project conditions. At time of final inspection, project shall be thoroughly clean and ready for use.

3.2 WORK SEQUENCE

A. The Contractor is responsible for developing a plan for both cleaning and inspection to be reviewed and approved by the Engineer.

B. The Contractor shall obtain all necessary permits required to complete the Work.

C. Submit shop drawings and other submittals required by the plans or Contract Documents.

D. The Contractor shall arrange Contractor's Milestone and work and shall submit such schedule to the Engineer for approval. The detailed Time & Work Schedule shall be settled prior to any construction activities taking place.

E. Milestones or specific dates listed in these Contract Documents represent only the major items of construction/erection work or interface dates. The milestone dates indicated are considered essential to the satisfactory performance of this Contract and to the coordination of work on the project. The Milestone Dates are not intended to be a complete listing of all work under this Contract.

F. The Milestone Dates listed represent the latest allowable completion dates. Earlier completion dates may be established as agreed by the Contractor and the Engineer.

G. If the Contractor should desire or intend to complete the Work earlier than any required milestone or completion date, the Owner or the Engineer shall not be liable to the Contractor for any costs or other damages should the Contractor be unable to complete the Work before such milestone or completion date. The duties, obligations, and warranties of the Owner to the Contractor shall be consistent with and applicable only to the completion of the Work on the milestone and completion dates required in the Owner-Contractor Agreement, unless the Owner, the Engineer, and the Contractor otherwise agree in writing.

H. Complete the work according to approved project schedule.

I. Delivery of as-built drawings.

J. Complete Punch List Items.

K. Finalize clean up and restore construction areas.

3.3 CONTRACTOR'S USE OF WORK SITE

A. The Contractor's use of the project site shall be limited to its construction operations. On-site storage of materials, on site fabrication of pipe, and field offices (if deemed necessary by the Contractor) are permitted on site. The fence delineating the property line to the west may be cut for proper staging of the pipe string during sliplining, if necessary, open cut construction , and other activities if needed, provided Owner approval is obtained before construction begins and the fence is restored to pre-construction conditions. The maximum amount of time the fence may be temporarily removed is four weeks total during the course of this contract.

B. The Contractor shall install signs, barricades, and lights necessary to ensure safety of the public, Contractor's operators and personnel, and Owner and Engineer's operators and personnel.

3.4 OWNER USE OF THE PROJECT SITE

The Owner may utilize all or part of the existing facilities during the entire period of construction for the conduct of the Owner's normal operations. The Contractor shall cooperate and coordinate with the Owner to facilitate the Owner's operations and to minimize interference with the Contractor's operations at the same time. In any event, the Owner shall be allowed to access the project site during the period of construction. The Contractor shall provide free access to the site and the work to the Owner and Owner's representatives at all times during construction as well as representatives from the State of California.

Representatives from DSOD will periodically inspect the work in progress during construction, including the materials being incorporated into the works, as well as the test results and documentation associated with the project. The contractor must allow DSOD representatives access to all locations within the project boundaries. All communications with DSOD pertaining to the project must be coordinated through the Owner's Engineer or their designated representative. DSOD approval of foundation conditions, steel reinforcement, pipe installation, and grouting setup is required prior to placing backfill or concrete associated with the new outlet, grouting the annulus between the old and new outlet pipe, and grouting for the abandonment of the 16-inch outlet.

A 72-hour notice from the Owner's representative is required to schedule a DSOD inspection. Therefore, the contractor must cooperate with the Owner's representative by giving at least 72-hour notice of any inspection requiring DSOD involvement to ensure the Owner has sufficient time to coordinate with DSOD. The 72-hour notification does not include weekends or holidays

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 CONSTRUCTION SITE LOCATION

A. General

1. Shop Drawings and engineering data (submittals) covering all equipment and all fabricated components and building materials which will become a permanent part of the Work under this Contract shall be submitted to Engineer for review, as required. Submittals shall verify compliance with the Contract Documents and shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and the operation of component materials and devices; the external connections, anchorages, and supports required; the performance characteristics; and dimensions needed for installation and correlation with other materials and equipment.

2. Each submittal shall cover items from only one section of the specification unless the item consists of components from several sources. Contractor shall submit a complete initial submittal including all components. When an item consists of components from several sources, Contractor's initial submittal shall be complete including all components.

3. Contractor shall be solely responsible for the completeness of each submittal. Contractor's stamp or affixed approval statement of a submittal, is a representation to Owner and Engineer that Contractor accepts sole responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, and that Contractor has reviewed and coordinated each submittal with the requirements of the Work and the Contract Documents.

4. All deviations from the Contract Documents shall be identified as deviations on each submittal and shall be tabulated in Contractor's letter of transmittal. If there are no deviations, the Contractor shall state “NO DEVIATIONS” on their transmittal. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by Contractor (including modifications to other facilities that may be a result of the deviation) and all required piping and wiring diagrams.

5. The Contractor shall submit submittals, shop drawings and as-builts in both hard copy and electronically.

6. For hard copy portion of the submittals three (3) copies of each drawing and the necessary data shall be submitted to ARSA. ARSA will then submit to ENGINEER for review and will return one (1) marked copy to the Contractor if necessary.

7. For the electronic portion of the submittals, drawings and the necessary data shall be submitted electronically to ARSA as specified below. Submittal documents shall be in black and white unless color is required for the review of the submittal. All electronic files shall be in Portable Document Format (PDF) as generated by Adobe Acrobat Professional Version 7.0 or higher. The PDF file(s) shall be searchable with thumbnails generated. PDF images must be at a readable resolution. For most documents, they should be scanned or generated at 300 dots per inch (dpi). Optical Character Recognition (OCR) capture must be performed on these images so that text can be searched, selected and copied from the generated PDF file. Thumbnails shall be generated for each page or graphic in the PDF file.

8. PDF document properties shall include the submittal number for the document title.

9. Electronic submittal file sizes shall be limited to 10 MB. When multiple files are required for a submittal the least number of files possible shall be created.

10. The Contractor shall email submittals to the Engineer and the Engineer will email submittal review comments back to the Contractor. If necessary, a hard copy will also be marked-up with one (1) copy returned to the Contractor.

11. Facsimiles (fax) will not be acceptable. Engineer will not accept submittals from anyone but Contractor. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.

12. The Contractor will submit draft and final As-Builts for review by the Engineer. The final as-built drawings will be signed and stamped by an Engineer hired by the Contractor and Registered in the State of California.

B. Engineer’s Review of Submittals

1. Engineer's review of submittals covers only general conformity to the Drawings and Specifications, external connections, and dimensions that affect the layout; it does not indicate thorough review of all dimensions, quantities, and details of the material, equipment, device, or item covered. Engineer's review shall not relieve Contractor of sole responsibility for errors, omissions, or deviations in the drawings and data, nor of Contractor's sole responsibility for compliance with the Contract Documents.

2. Engineer's submittal review period shall be 28 consecutive calendar days and shall commence on the first calendar day following receipt of the submittal or re-submittal in Engineer's office. The time required to mail the submittal or re-submittal back to Contractor shall not be considered a part of the submittal review period.

3. When the drawings and data are returned with review status "NOT ACCEPTABLE" or "RETURNED FOR CORRECTION", the corrections shall be made as instructed by the Engineer. Three (3) hard-copy corrected copies shall be resubmitted as well as the corrected electronic file. The corrected electronic drawings and data shall be resubmitted to the Engineer. Re-submittals by facsimile will not be accepted. When

the drawings and data are returned with review status "EXCEPTIONS NOTED", "NO EXCEPTIONS NOTED", or "RECORD COPY", no additional copies need be furnished unless specifically requested by ARSA or the Engineer.

4. Engineer's review of submittals in no way implies any additional compensation or extension of time to Contractor.

C. Re-Submittal of Drawings and Data

1. Contractor shall accept full responsibility for the completeness of each re-submittal. Contractor shall verify that all corrected data and additional information previously requested by the Engineer are provided on the re-submittal.

2. When corrected copies are resubmitted, Contractor shall direct specific attention to all revisions in writing and shall list separately any revisions made other than those called for by the Engineer on previous submittals. Requirements specified for initial submittals shall also apply to re-submittals. Re-submittals shall bear the number of the first submittal followed by a letter (A, B, etc.) or a unique identification that indicates the initial submittal and correct sequence of each re-submittal.

3.

4. When re-submittals are needed, re-submittals shall be made within 30 calendar days of the date of the letter returning the material to be modified or corrected.

5. The need for more than one re-submittal, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Times unless delay of the Work is the direct result of a change in the Work authorized by a Change Order or failure of Engineer to review and return any submittal to Contractor within the specified review period.

D. Shop Drawings.

1. Shop drawings shall designate the complete installation and shall be suitable for coordinating work of the various trades.

2.

3. Mark each copy to identify applicable products, models, options and other data. Supplement manufacturers' standard data to provide information specific to this Project.

4. After review distribute in accordance with the Submittal Procedures article above.

E. As-Built Drawings:

1. Upon completion of the project, the Contractor shall submit to the Engineer one set of mylar as-built drawings depicting all constructed details of the project.

2. Format and General Requirements:

a. Size shall be 24in X 36in.

b. All information shall be drawn in ink.

c. The use of posche (shading) is prohibited.

d. The Contractor will submit draft and final As-Builts for review by the Engineer. The final as-built drawings will be signed and stamped by an Engineer hired by the Contractor and Registered in the State of California.

e. The draft submittal may be on paper. The final submittal shall be both electronic in pdf format and on mylar.

3. Quality of As-Builts

a. Appearance: As-builts shall be prepared in a professional manner consistent with common engineering standards for layout, lettering and line-work.

b. "Understandability": As-built information shall be portrayed in a manner that is readily understandable by someone not familiar with the specific job.

c. Clarity: The Contractor shall endeavor to present as-built information clearly without "cluttering" the drawing.

1.2 CERTIFICATES

A. When specified in individual Specification Sections, submit certification by the manufacturer, installation/application subcontractor, or Contractor to Engineer, in quantities specified for Shop Drawings.

B. Indicate material or equipment conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or equipment but must be acceptable to Engineer.

1.3 MANUFACTURER'S INSTRUCTIONS

A. Keep one copy of manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing on Site.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 02100

CONTROLLED DENSITY BACKFILL

PART 1 GENERAL

1.1 SUMMARY

A. Sections Includes

1. The Contractor shall furnish all labor, equipment, and materials to provide controlled density backfill (CDF) in accordance with the provisions of this Section and shall mix, place, finish, and do all other work to produce a cementitious, excavatable mixture of aggregate, cement, pozzolan, water, and admixtures used as initial backfill, structure backfill, trench dams, and abandonment grout, in accordance with the Contract Documents.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals

B. Section 02200 – Excavation, Backfilling and Compaction

1.3 REFERENCES

A. Commercial Standards

1. ACI 229: Controlled Low Strength Materials.
2. ACI 232: Fly Ash/Other Pozzolans in Concrete.
3. ASTM C31: Standard Practice for Making and Curing Concrete Test Specimens in the Field.
4. ATSM C33: Standard Specification for Concrete Aggregates.
5. ASTM C39: Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
6. ASTM C42: Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
7. ASTM C94: Standard Specification for Ready-Mixed Concrete.
8. ASTM C150: Standard Specification for Portland Cement.
9. ASTM C260: Standard Specification for Air-Entraining Admixtures for Concrete.
10. ASTM C494: Standard Specification for Chemical Admixtures for Concrete.

11. ASTM C618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
12. ASTM D4832: Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.
13. ASTM D6024: Standard Test Method for Ball Drop on Controlled Low Strength Material (CLSM) to Determine Stability for Load Application.

1.4 SUBMITTALS

A. Submittals shall be made in accordance with Section 01300 - Submittals.

B. Quality Control Submittals

1. Design Data

a. Mix Design: Before designing the Work, the Contractor shall submit to the Engineer, CDF mix designs that show the proportions and gradations of all materials proposed for each class and type of CDF specified herein. An independent testing laboratory shall test the mix designs for properties specified herein and results shall be submitted to the Engineer. All costs related to such testing shall be borne by the Contractor.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping

1. CDF shall be delivered to the Work in standard transit mix trucks.

B. Acceptance at Site

1. CDF shall be batched by a ready-mix batching plant acceptable to the Engineer. Batching by the Contractor’s own mixing plant will be allowed only after the Contractor provides proof of material suitability through acceptable test batches of the CDF and with the written acceptance by the Engineer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The material supplied shall be CDF supplied by Pozzolanic International, Flowable Compacting Fill by RMC Lonestar, or approved equal.

2.2 MATERIALS

A. Cement: Cement shall be Type II in accordance with the requirements of ASTM C150 and shall be from a single source.

B. Pozzolan: Pozzolan shall be added to improve the flowability and shall be Type F in accordance with the requirements of ASTM C618.

C. Fine Aggregate: Fine aggregates shall consist of clean, sharp, natural sand, Size 7 and shall conform to ASTM C33. All fine aggregates shall be furnished from one (1) source.

D. Coarse Aggregate: Coarse aggregate shall consist of natural gravels, combinations of gravels and crushed gravels, crushed stone, or a combination of these materials with a maximum size aggregate of one (1) inch. One hundred percent shall pass the one inch sieve. Not more than 50 percent shall be retained by the 3/8-inch sieve and not more than 20 percent shall pass the No. 200 sieve. All material shall be free from organic matter and not contain more alkali, sulfates, or salts than the native materials at the site of the Work.

E. Admixtures

1. Air entraining admixtures shall be added to improve the workability and shall be in accordance with the requirements of ASTM C260.

2. Water reducing agent shall be added to improve the workability and shall be in accordance with the requirements of ASTM C494.

3. Any accelerating agents to be added shall be free of calcium chloride and any other materials that may be corrosive to the pipe or anything in the surrounding area. All accelerators shall be in accordance with the requirements of ASTM C494.

4. Admixtures shall be submitted as part of the mix design.

F. Water: Water shall be clean and potable containing less than 50 ppm of chlorides.

G. CDF Compressive Strength: The minimum 28-day compressive strength shall be 50 psi, and the maximum 28-day compressive strength shall be 300 psi.

2.3 SOURCE QUALITY CONTROL

A. Tests

1. CDF quality testing will be performed by the Contractor as follows:

a. Frequency of sampling: Cast a minimum of five (5) cylinders from each 50 cubic yards, or fraction thereof, of CDF placed in any one (1) day. Sampling and curing shall conform to ASTM D4832.

b. CDF shall be tested for compressive strength per ASTM C39.

c. CDF materials with test results for strength that are not within the specified range shall be removed and replaced with material conforming to the specifications. All work associated with the removal and replacement of defective materials including any other impacts to the work shall be the sole responsibility of the Contractor at no additional cost to the Owner.

PART 3 EXECUTION

3.1 EXAMINATION

A. The subgrade and compacted fill and/or trenches/pits to receive CDF shall be complete and acceptable in accordance with SECTION 02200 – Excavation, Backfilling and Compaction.

3.2 ERECTION INSTALLATION APPLICATION

A. Special Techniques

1. Placing CDF

a. CDF shall be delivered in place by means of tailgate discharge, conveyor belts, pumped in place tremie pipes, or other means acceptable to the Engineer. Placement shall not cause the material to fall and separate/segregate. A vertical drop of no more than five (5) feet will be allowed.

b. CDF shall be directed in place by means of a vibrator to ensure that all voids, crevices, and pockets are filled with CDF. Care shall be taken to avoid over-consolidation of the material. The CDF shall be thoroughly settled and compacted through the entire depth of the layer that is being consolidated into a dense, homogeneous mass. When used as pipe bedding, CDF placement shall not disjoint or shift pipelines.

c. CDF shall be continuously placed against fresh material, unless otherwise approved by the Engineer. Where new CDF must be placed against existing CDF, the placement area shall be clean of all loose and foreign material. The surface of existing CDF shall be soaked a minimum of one (1) hour before placement of fresh CDF. No standing water will be allowed before starting placement of fresh CDF.

2. Finishing CDF

a. The finished surface of CDF shall be relatively smooth, free from undulations, and to the grade shown or directed by the Engineer. Finishing by wood float, steel trowel, or other similar method is not required.

3.3 PROTECTION

A. Protecting CDF

1. CDF shall be protected from running water, rain, freezing, and all other conditions that could damage the material before final curing and until the material has been accepted for backfill placement.

B. Shoring Systems

1. Any void left by removal of shoring systems shall be filled with CDF as approved by the Engineer to provide soil support between the backfill zone and the native soil.

END OF SECTION

SECTION 02200

EXCAVATION, BACKFILL AND COMPACTION

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Excavating, backfilling, compacting, and disposing of earth materials as shown, specified, and required for the purpose of replacing the existing 20-inch diameter concrete outlet pipe as specified in the contract documents.

B. This Work of this section includes, excavation, backfilling, compaction, grading, and disposal of earth materials required to accomplish the Work.

1.2 RELATED SECTIONS

A. Section 01300 – SUBMITTALS

B. Section 02100 – CONTROLLED-DENSITY BACKFILL

C. Section 02720 – SLIPLINING

D. Section 02721 – BACKFILL GROUTING FOR SLIPLINED CULVERTS

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. The specifications in this Section are subject to the administrative and procedural requirements specified in Division 1, as well as the broader requirements of the General Conditions.

B. Standards that are referenced below are the latest known edition of the Standard. The Contractor shall follow the most current industry Standard.

C. Reference Standards:

1. ASTM C136 - Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D75 - Standard Practice for Sampling Aggregates.

3. ASTM D1140 - Standard Test Methods for Amount of Material in Soils Finer Than the No. 200 (75-μm) Sieve.
4. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
5. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
6. ASTM D2216 - Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
7. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System.
8. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D2974 – Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.
10. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
11. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
12. ASTM D6024 - Ball Drop on Controlled Low Strength Material (CLSM) to Determine Suitability for Load Application.
13. CALTRANS Standard Specifications.
14. CALTRANS Trenching and Shoring Manual.

1.4 SUBMITTALS

A. Permits:

1. The Contractor shall submit a copy of all approved excavation and land use permits to the Engineer prior to site access and the start of construction.

B. Shop Drawings: Comply with Section 01300 and provide the following:

1. Excavation Plan, Detailing:
   a. Excavation layouts in plan and profile for all excavations.
   b. Methods and sequence of excavation of sliplining insertion pit, including sloping and shoring as necessary.
   c. Methods and sequence of excavation for open-cut trenches, including sloping, shoring, and benching as necessary.

d. Numbers, types, and sizes of equipment proposed to perform excavations.

e. Proposed locations of stockpiled excavated material. Stockpiles shall isolate materials from different locations as identified in the special easement conditions.

f. Proposed spoil disposal sites with written authorization from the property owner or facility manager accepting the spoil material.

g. Contingency plans if signs of instability are observed within excavation or toe of dam.

2. Backfill Compaction Plan, Detailing:

a. Proposed backfill material including origin, description and method of transportation.

b. Proposed methods and sequencing of placement including spreading, moisture conditioning, lift thickness and compaction.

c. Proposed compaction equipment including catalog and manufacturer's data sheet

C. Quality Control Submittals:

1. The Contractor shall submit samples of all imported materials proposed to be used in the work not less than 30 days prior to delivery on site. Sample sizes shall be as determined by the Engineer.

2. Certified Gradation Analysis (ASTM C136): Submit not less than 30 days prior to delivery for all imported materials. Sampling shall be in accordance with ASTM D75.

3. Quality Control Testing Plan, including Contractor’s internal quality control procedures.

4. Qualifications of material testing laboratory.

5. Results of Contractor’s quality control testing, including test locations and method of testing.

6. Manufacturer’s product literature, design certifications and calculations signed and sealed by a Professional Engineer currently registered in the State of California for the following items:

a. Excavation, shoring, sheeting and/or bracing or other support, where required or needed;

b. Trench boxes and shields, where required or needed.

D. The Contractor shall include in his bid the services of a qualified testing laboratory acceptable to the Engineer to perform compaction testing:

1. Test reports on borrow material.

2. Verification of suitability of trench bottom subgrade material, in accordance with specified requirements.

3. Gradation analysis for sub-base and base materials.

4. Field reports; in-place soil density tests will be performed by testing firm retained by the Contractor and approved by the Engineer.

1.5 QUALITY CONTROL

A. All testing necessary to satisfy Contractor's internal Quality Control (QC) procedures, including but not limited to, tests required to identify materials, to determine suitability of natural and imported materials, to determine compaction characteristics (ASTM D1557), to determine moisture content (ASTM D2216 and D3017), and to determine density of fill in place (ASTM D1556) shall be the sole responsibility of Contractor and shall be performed at no additional cost to the Owner. Contractor shall submit test results to the Engineer.

B. All testing performed by the Contractor's materials testing laboratory shall be in accordance with the reference standards listed in this Section.

C. Contractor shall repeat QC tests that fail to meet specifications at no additional cost to the Owner.

D. References to this Section to soil classification types and standards shall have the meanings and definitions of the Unified Soil Classification System (USCS) indicated in ASTM D2487. Contractor shall be bound by all applicable provisions of said ASTM D2487 in the interpretation of soil classifications.

1.6 QUALITY ASSURANCE

A. Owner will provide field and laboratory Quality Assurance (QA) testing under the contract, except as in the paragraph below. The materials testing laboratory will work under the direction of the Engineer.

B. The Owner's materials testing laboratory will perform such periodic tests as are required to identify materials, to determine compaction characteristics, to determine moisture content, and to determine density of fill in place. These tests will be used to verify that backfill conforms to the requirements of these specifications. Such tests are not considered to be part of the Contractor's QC procedure and are not intended to provide the Contractor with information required for the proper execution of the work.

C. Contractor shall provide free and safe access to the excavation for the Owner's soil compaction testing technician or inspector at all times. This shall include providing all safety equipment and temporary shoring to enable compaction testing at multiple levels in the excavation as directed by the Engineer. Should the Contractor have backfilled to an elevation above that required to be tested, the Contractor shall excavate the backfill down to the necessary level for testing and provide shoring at the Contractor's cost. Subsequent backfilling shall also be at the Contractor's cost.

D. At each tested location, in case the first QA test of the fill or backfill shows noncompliance with the required specification, the Contractor shall accomplish such remedy as may be required to ensure compliance. After the first test at each location, subsequent QA testing to verify compliance shall be by the Owner's material testing laboratory and shall be at the Contractor's expense.

1.7 DEFINITIONS

A. Lift: Loose layer of material spread but not compacted.

B. Relative Compaction: The ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by ASTM D1557. Corrections for oversize material may be applied to either the as-compacted field dry density or the maximum dry density, as determined by the Engineer.

C. Well-Graded: A mixture of particle sizes that has no specific concentration or lack thereof of one or more sizes producing a material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids. Coefficient of uniformity, coefficient of curvature, and other specific grain size distribution parameters are as defined by ASTM D2487.

D. Optimum Moisture Content: The optimum moisture content of a specified material is determined by ASTM D1557 to obtain the maximum dry density of that material when compacted. Field moisture content shall be determined on the basis of the fraction passing the 3/4-inch sieve.

1.8 WEATHER LIMITATIONS

Material excavated during inclement weather shall not be used as fill or backfill until after material drains and dries sufficiently or has been blended with suitable material to achieve the proper moisture content that allows for proper compaction.

PART 2 MATERIALS

2.1 SUITABLE FILL AND BACKILL MATERIAL REQUIREMENTS

A. Only materials defined in these specifications as suitable materials may be used as fill or backfill subject to the indicated limitations. Materials listed as unsuitable shall not be used for the Work. In addition, when acceptable to the Engineer, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a composite suitable material.

B. Fill and backfill materials shall be selected or processed clean, fine earth, rock, or sand, free from organic matter (grass, roots, brush, or other vegetation).

C. Suitable materials may be obtained from on-site excavations, may be processed on-site materials, or may be imported. If imported materials are required by this Section to meet the quality and/or quantity requirements of the project, the Contractor shall provide the imported materials as part of the work for that bid item at no additional cost to the Owner.

1. The following types of suitable materials are defined:

a. Controlled-Density Fill, in accordance with specification section 02100.

b. Native Soil:

1) Native Soil material shall be soil, loam, or other excavated material with a liquid limit less than 40, and a plasticity index less than 25 when measured in accordance with ASTM D4318. Native Soil material shall be free from rocks or unbroken clods having a maximum dimension of larger than 3 inches.

2) The Contractor may choose to import material for use as Native Soil at no additional cost to the Owner. Imported Native Soil material shall meet the requirements of this Section and shall meet the following gradation:

U.S. Standard Sieve Size	Percent by Weight Passing
1 inch	100
3/4 inch	70-100
No. 4	50-100
No. 50	30-100
No. 200	10-70

3) Native Soil material shall be free from roots or organic matter, refuse, or other deleterious materials. Native Soil, both local and imported, shall not be unsuitable material, as defined below.

4) Soils that require conditioning to meet the requirements of Native Soils material shall be processed by the Contractor in approved lay down areas at no additional cost to the Owner.

2.2 UNSUITABLE MATERIAL

A. Unsuitable materials include:

1. Soils which, when classified under ASTM D 2487 fall in the classifications of PT, OH, CH, MH, or OL.

2. Materials that contain hazardous or designated waste materials including petroleum hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.

3. Soils that are considered to be corrosive or deleterious to the pipe, fittings or concrete.

4. Topsoil, except if required for site restoration.

5. Soil with an organic content of greater than 1 when tested per ASTM D2974

2.3 USE OF FILL AND BACKFILL MATERIAL TYPES

A. Where these Specifications conflict with the requirements of any local agency having jurisdiction or with the requirements of a pipe material manufacturer, the Engineer shall be immediately notified. In case of conflict between types of trench or final backfill types, the Contractor shall use the agency-specified backfill material if that material provides the greater in-place density after compaction

2.4 WATER FOR MOISTURE CONDITIONING

A. All foundation and backfill material shall be moisture conditioned.

B. Use water free of hazardous or toxic contaminants or contaminants deleterious to proper compaction.

PART 3 EXECUTION

3.1 GENERAL

A. During construction, the Contractor shall provide and maintain adequate equipment to properly remove and dispose of all water entering the trenches, sliplining pit, or other parts of the work. Pipe trenches shall be kept free from water during excavation, pipe laying and jointing. The Contractor shall be responsible for damage resulting from the dewatering operations.

B. Perform clearing and grubbing as required to perform the Work. Erosion control and Best Management Practices (BMPs) must be established to reduce soil erosion from Work and contain surface water runoff. A SWPPP is not required for this project.

C. Excavation support: Install and maintain excavation support in the sliplining pit and pipe trench as necessary to support sides of excavations and prevent detrimental and lateral movement of existing facilities and completed Work. As with all work, all applicable CAL/OSHA, State, and County regulations must be followed.

D. Restrict all excavation to outside of the dam embankment buffer, as outlined on the Contract Drawings.

E. Do not over excavate without written authorization of the Engineer.

F. Contractor will coordinate with Division of Safety of Dams (DSOD) no less than fourteen (14) calendar days prior to the start of construction. Coordination with DSOD will be facilitated through the Engineer.

3.2 PROTECTION OF OPEN EXCAVATIONS

Open excavations shall be fenced to protect the public.

3.3 BACKFILLWITHIN TRENCHES

A. Backfill shall not be dropped directly upon any structure or pipe.

B. If a section of the concrete junction box requires removal for the HDPE pipe to DIP pipe connection at the junction, no backfill material shall be deposited against the replaced concrete section until the concrete has developed a compressive strength of 3,000 psi, or the concrete has been in place for 7 days, whichever comes later.

C. Where shown on the drawings, backfill in the trench shall consist of controlled density fill (CDF), placed up approximately 1 to 2 feet below existing grade within the excavation, in accordance with Specification Section 02100 – Controlled Density Backfill. Upon setting, native soil and topsoil shall be placed to restore the site to pre-existing conditions.

D. For founding the pipe, a 6-inch thick compacted layer of bedding at the bottom of the trench/excavation, and compacted to minimum 95% modified proctor as determined by ASTM D1557 shall be used.

E. Any over-excavation to get to suitable material shall be backfilled with lean concrete.

F. For earth fill sections, backfill materials shall be placed and spread evenly in layers. The backfill layers shall be evenly spread so that each layer shall not exceed 4 to 6 inches in loose uncompacted thickness.

G. During spreading each lift shall be thoroughly mixed at the stockpile as necessary to promote uniformity of materials in the lift.

H. Fill materials shall be moisture conditioned as required to achieve specified compaction densities. In general, field moisture shall be maintained between 1% below optimum moisture content to 3% above optimum moisture content to achieve compaction requirements. Where the backfill material moisture content is below the specified range,

water shall be added before spreading until the proper moisture content for compaction is achieved. Where the backfill material moisture content is too high to permit the specified degree of compaction, the material shall be worked and/or mixed with drier material until the moisture content is satisfactory.

I. All moisture conditioning shall be done within the stockpile area and not within the excavation itself.

J. The excavation at the insertion pit shall be backfilled to an elevation to match conditions prior to start of the Work. Backfill around the pipe in the insertion pit shall be the same as specified for the open-trench.

K. If shoring systems are used to support the insertion pit or pipe trenches, any voids left by removal of the shoring system shall be filled with Controlled Density Fill (CDF), as approved by the Engineer, to provide soil support between the backfill zone and the native soil.

3.4 FILL

A. The area where a fill is to be constructed shall be cleared of all vegetation, roots and foreign material. Following this, the surface shall be moistened, scarified to a depth of 6 inches, and rolled or otherwise mechanically compacted. Fill material shall be placed and spread evenly in approximately horizontal layers. Each layer shall be moistened or aerated, as necessary. Unless otherwise approved by the Engineer, each layer shall not exceed 6 inches of compacted thickness.

B. When a fill is to be made and compacted against an existing slope steeper than 4:1, the slope shall be scarified before loose lift is placed and compacted. A minimum of 12-inches normal to the slope shall be removed and recompacted as fill is brought up in layers. Material thus cut shall be recompacted along with the new material. Backfill shall not be keyed or benched into slopes.

3.5 COMPACTION

A. Each lift of backfill or fill material shall be compacted.

B. Flooding, ponding, or jetting shall not be used.

C. Compaction of native backfill material under the pipe as well as backfill material above the CDF shall be completed using a Jumping Jack Rammer Compactor, Mikasa MTX70HD or equivalent. Compaction equipment other than jumping jacks must be approved by the Engineer at least thirty (30) days prior to the start of Work. Care should be taken not to damage structures during backfilling. This backfill must be compacted to a minimum of 95% modified proctor.

D. Compaction requirements shall be as shown in the following table in accordance with ASTM D1557. Where agency, utility company or encroachment permit requirements govern, the highest compaction standards shall apply. No more than 1 test out of every 5 performed shall result in a compaction less than 95% modified proctor with no test less than 93%.

Compaction Requirements

Location	Required Percentage of Maximum Dry Unit Weight (D 1557)
Backfill in unpaved areas	95%
Backfill in open trench	95%
Dam Embankment Fill	95%
Backfill beneath structures	95%

3.6 FIELD QUALITY CONTROL

The Contractor shall perform a minimum of one test per 20 cubic yards of backfill or fraction thereof placed. The in-place density of compacted fill shall be determined using ASTM D1556. Nuclear Density Gauge tests are acceptable for the small fill placement provided calibration is performed based on an ASTM D1556 sand cone test. For the development of soil compaction curves, the Contractor shall collect and process a sample for every soil type to be placed during construction. The Contractor shall provide for sieve analysis every soil type used as backfill to determine the percentage of material passing the No. 200 sieve for backfill materials (ASTM D1140).

3.7 SETTLEMENT OF BACKFILL

Settlement of pipe backfill, structure backfill or of fill constructed over trench or structure backfill, will be considered a result of defective compaction of backfill and will be corrected at no cost to the Owner regardless of the compaction test results performed during construction. It is the Contractor's responsibility to repair settlement within the warranty period.

3.8 STOCKPILING EXCAVATED MATERIAL

A. Stockpile Topsoil in separate topsoil stockpiles so that the topsoil is replaced on the same parcel from where it was removed. Install erosion control measures and BMPs as required by Amador County.

B. Stockpile native excavated material that is suitable for use as fill or backfill until material is needed.

C. Confine stockpiles to within easements and approved work and lay down areas. Do not obstruct pathways.

D. Do not stockpile excavated material adjacent to excavations unless excavation support systems are designed, constructed, and maintained for stockpile loads.

E. Do not stockpile excavated materials near or over existing facilities, adjacent property, or completed Work.

3.9 DISPOSAL OF SPOIL

A. Dispose of excavated materials, which are unsuitable or exceed quantity needed for fill or backfill, offsite. Contractor shall make arrangements for and pay all costs and/or retain all profits. Contractor shall provide the Engineer with the location of disposal sites, copies of approved grading plan, copy of grading permit, and written approval by the landowner to dispose of the material.

B. Dispose of debris resulting from removal of underground facilities in accordance with State and local regulations.

3.10 HYDROSEEDING

A. Contractor shall hydroseed all areas where construction disturbance occurred upon completion of backfilling and all other site work necessary to complete the project. Hydroseeding shall be performed in accordance with the California Department of Transportation Standard Specifications edition in place at the time of bidding.

3.11 MONITORING AND FIELD REPORTS

A. Monitor site conditions related to excavation at a toe of a dam and perform daily walkthrough of site at the beginning and end of each shift to observe for tension cracks or other observations that would indicate instability.

B. Notify Engineer immediately if signs of instability are observed.

C. Monitor trench for water conditions.

D. Sand to filter seepage exit shall be stockpiled onsite to address seepage if observed.

E. All daily observations shall be recorded in a daily observation log and submitted to the Engineer within 24 hours of each shift completion.

END OF SECTION

SECTION 02720

SLIPLINING AND OPEN-CUT PIPE

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This section specifies the requirements for rehabilitating the existing 20-inch diameter concrete outlet pipe at Henderson Dam using sliplining of 16-inch diameter DR17 smooth-wall high density polyethylene (HDPE) pipe. The new HDPE outlet pipe will be inserted by a winch cable, or other approved method, through the host pipe. The winch cable, or other approved method, will be attached to the front of the new HDPE outlet pipe which is then pulled and/or pushed through the host pipe. The voids or annulus between the host pipe shall be filled with cementitious grout.

B. This section also covers requirements for the 16-inch diameter DR 17 and 24-inch diameter DR 17 smooth wall high density polyethylene (HDPE) pipe to be installed by open-cut.

C. This Work of this section cover for the general requirements for the specifications, manufacturer and installer qualifications, submittal and warranty guidelines, materials, pre-installation and installation procedures, and testing.

1.2 RELATED SECTIONS

A. Section 01010 – SUMMARY OF WORK

B. Section 01300 - SUBMITTALS

C. Section 02200 – EXCAVATION, BACKFILLING AND COMPACTION

D. Section 02721 – BACKFILL GROUTING FOR SLIPLINED CULVERTS

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. This section references American Society for Testing and Materials (ASTM) standards, which are part of this specification. All standards shall be the latest edition and revision at time of Tender submission. The materials, manufacturing, operations, testing, inspection, and production of pipe shall conform to the following standards

1. ASTM D1693 - Standard Test Method for Environmental Stress Cracking of Ethylene Plastics.
2. ASTM D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.
3. ASTM D2290 - Standard Test Method for Apparent Hoop Tensile Strength of Plastic or Reinforced Plastic Pipe.
4. ASTM D2412 Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
5. ASTM D2657 Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
6. ASTM D2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
7. ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
8. ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
9. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) For Joining Plastic Pipe.
10. ASTM F585 Standard Guide for Insertion of Flexible Polyethylene Pipe Into Existing Sewers.
11. ASTM F679 Standard Specification for Polyvinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
12. ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.
13. ASTM F1473 Standard Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins.
14. ASTM F2620 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

B. Regulations:

1. All rules, regulations, bylaws and standards referred to shall be the most current, amended and updated versions at the time of Tender submission.

1.4 SUBMITTALS

A. The Contractor shall submit the following to the Engineer for review at thirty (30) working days in advance of commencing the Work. Submittals shall be done in accordance with Section 01300 – SUBMITTALS.

1. Design Calculations.
2. Detailed work plan and installation procedures and specific procedures for rehabilitation of the 20" concrete outlet pipe and for open-cut installation work.
3. Complete details about sliplining system design for the underdrain including all assumptions, component materials and properties, and installation requirements.
4. A detailed discussion of the proposed quality controls to be performed by the Contractor, including required laboratory testing and on-site testing of liner or other materials.
5. Shop Drawings.
6. Manufacturer's product data with complete information on pipeline materials, physical properties, dimensions, maximum recorded external grout pressure, and minimum bending radius or maximum joint angular deflection. Include a manufacturer's certificate of compliance with specifications for proposed materials.
7. Material safety data sheets (MSDS) for all chemicals to be used.
8. Third party test results for physical properties shall be submitted for all Polyethylene pipe products and associated technologies to be furnished.
9. Certified copies that the Contractor is trained and certified to use the Manufacturer's material.
10. Video tapes showing the completed installation.
11. Construction QA/QC Procedure.
12. Work schedule.
13. Work site footprint and work space requirements.
14. Workplan for CCTV inspection of existing pipe prior to sliplining and CCTV inspection of new HDPE sliplined pipe upon completion.
15. Submit proposed spacers including spacer manufacture, model, drawings shown spacer arrangement, and spacing.
16. Details of mandrel to be used prior to sliplining including material, length and outside diameter.

B. The Contractor shall submit resumes of the work crew indicating the Contractor and crew meet the experience requirements for this project:

1. Contractor must have minimum five (5) years experience in sliplining projects of similar size and complexity to this project.
2. Fusing technician must have minimum three (3) years in fusion of HDPE joints per ASTM D3261.

C. The Contractor shall submit, engineering design calculations, for the required thickness of the proposed new HDPE outlet pipe proposed for the project, using the most severe line condition, (sliplining and open cut sections) and apply that design to all of the line sections. These calculations shall be performed and certified by a qualified, licensed Professional Engineer currently registered in the State of California. All calculations shall include data that conforms to the requirements of these specifications. In the event the calculated thickness by the contractor is thinner than those shown in the bid tabulation, the Contractor will install the specified thickness shown in the bid tabulation.

PART 2 MATERIALS

2.1 NEW HIGH DENSITY POLYETHYLENE OUTLET PIPE

A. Pipe shall be manufactured to meet the requirements of ASTM F714. Fusing of pipe joints shall meet the requirements of ASTM D2657. Installation practices shall follow the standard practices as set forth in ASTM F585.

B. The standard dimension ratio (SDR), defined as the specified outside diameter (OD) divided by the minimum wall thickness, shall be demonstrated by calculation to be sufficient to support the worst combination of internal and external installation and operating loads. The wall thickness tolerance shall be within plus 10%. A minimum thickness of 0.94-inches is required.

C. Fusion of joints shall be performed as per ASTM D3261 by a technician with a minimum of three years of experience. The roll over bead at the point of fusion shall be removed from the interior and exterior of pipe before inserting into the host pipe. Neither the outside diameter of the pipe shall be increased nor the internal diameter of the pipe decreased at each joint.

D. New HDPE outlet pipe shall be homogeneous and without defects. Cause for rejection includes physical defects of the pipe, such as concentrated ridges, discoloration, excessive spot roughness, pitting, visible cracks, foreign inclusions, varying wall thickness, and diameter variations greater than 5 percent due to temperature induced flattening.

2.2 CEMENTITIOUS GROUT FOR ANNULAR SPACE

Materials, properties, and mix designs for non-shrink grouting of the annular space between the sliplined pipe and the host pipe shall be in accordance with specification Section 02721 – Backfill Grouting For Sliplined Culverts.

2.3 TELEVISION EQUIPMENT

A. Pipe Inspection Camera:

1. Camera system shall be installed on rover sized appropriately for navigating the length of the sliplined and open-cut installations. The camera system shall be pan and tilt type and capable of 180-degree viewpoint.

B. Video of the cleaned existing concrete pipe prior to sliplining, and video sliplined and open-cut pipe shall be recorded upon completion of the installation and all necessary backfilling, annular grouting, and connections. Video shall be recorded at standard play at the necessary resolution to identify any interior imperfection in the pipe. Video shall be submitted to the Engineer and to ARSA upon completion as an electronic file in standard video format that may be viewed using any standard Microsoft Windows operating system on any computer.

2.4 PIPE SUPPORT (SPACERS)

A. Slipline pipe support shall meet the following requirements:

1. Spacers shall be constructed of circular stainless steel bands, which bolt together forming a shell around the carrier pipes. The spacers shall be designed with risers and runners to support within the carrier pipe within the casing and maintain a clearance as shown on the drawings. The design shall maintain pipeline integrity in the event the pipeline floats during installation of backfill grouting.
2. The band shall be manufactured of 8” wide 14-gauge T-304 stainless steel. The risers and runners shall be constructed of high molded polymer or approved equal determined by manufacturer’s recommendation. The number of runners and risers is to be determined by the manufacturer’s recommendation.
3. Interior surfaces of the circular stainless steel band shall be lined with PVC, having a minimum thickness of .090” with a hardness of Durometer “A” 85
4. Position spacers 1 every 6-ft to 8-ft or more often as recommended by manufacturer.

B. Manufacturers:

1. PSI Products, Inc. (Vancouver, BC)
2. Advance Product & System, Inc. (Lafayette, LA)
3. Engineer Approved Equal

2.5 Mandrel

A. Furnish a solid wall cylindrical mandrel with maximum length of two times the host pipe inside diameter and a minimum length of 75% of the host pipe inside diameter. Outer diameter of mandrel shall be equal to 1-inch less than the inside diameter of the host pipe. Rigid mandrel shall be constructed of metal or rigid plastic material that can withstand 200 psi without being deformed. Rigid mandrel shall not have adjustable or collapsible legs which would allow reduction in mandrel diameter during testing.

B. Proving Ring. Furnish "proving ring" with each mandrel. Fabricate ring of 1/2-inch-thick, 3-inch-wide bar steel to diameter 0.02 inches larger than approved mandrel diameter.

PART 3 EXECUTION

3.1 GENERAL

A. Upon approval by the Engineer, allow three weeks for DSOD to review slip-lining installation plan, including means of cleaning existing pipe interior, pulling head and connection details for winching of HDPE pipe, pulling method, and actual installation procedure.

B. The Contractor shall notify the Engineer a minimum of fourteen (14) calendar days prior to the start of slip lining operations to coordinate with the Division of Safety of Dams (DSOD).

C. DSOD inspection and approval of pipe placement, grouting setup, headwall construction, and venting ports is required prior to grouting. 72-hours-notice is required to schedule any DSOD inspection.

D. Contractor to provide continuous bypass pumping at the upstream sluice gate to dewater the work area and facilitate sliplining work.

3.2 SAFETY

A. The Contractor shall strictly observe the California Occupational Safety and Health guidelines for this work, with special emphasis on work near excavations.

B. Provide material safety data sheets (MSDS) for all chemicals to be used to the Engineer for approval, per paragraph 1.4. A.7.

3.3 CLEANING AND PREPARATION

A. The floor and interior walls of the existing pipe shall be thoroughly cleaned and made free of all foreign materials including dirt, grit, roots, grease, sludge and all debris or material that may be attached to the wall or bottom of the pipe.

B. Contractor to select appropriate means and methods to completely clean interior of existing concrete outlet pipe without causing additional damage to the pipe, and submit means and methods to the Engineer for review. Means and methods shall effectively remove all debris and corrosive buildup that may obstruct the diameter of the sliplining pipe inclusive of the grout collar brackets. Consideration should be given to the highly degraded condition of the pipe when selecting means and methods for cleaning. Contractor will verify with CCTV video upon completion of interior cleaning that all debris has been cleared and that sliplining can proceed without obstruction.

C. When grease and oil are present within the pipe an approved detergent may be added to the water or a dilute solution of muriatic acid may be used integrally with the high pressure cleaning water.

D. All materials resulting from the cleaning of the pipe shall be removed and properly disposed of prior to application of the lining material.

E. All waste material and cleaning liquids used in the process shall be disposed of properly and shall not be allowed to flow downstream.

3.4 DELIVERY, STORAGE AND HANDLING

A. Prevent injury or abrasion to pipe during loading, transportation, and unloading. Do not drop pipe from cars or trucks, nor allow pipe to roll down skids without proper restraining ropes. Use suitable, pads, strips, or blocks for each pipe during transportations and while awaiting installation in the field.

B. Pipes with cuts, gashes, nicks, abrasions, or any such physical damage which are deeper than 10-percent of the wall thickness shall be removed from the Site and be replaced with undamaged pipe at no additional cost to the Owner.

3.5 INSERTION OR ACCESS PITS

A. Locate pits so that the total number is minimized and footage of new HDPE outlet pipe to be installed in a single pull or push is maximized.

B. Excavate insertion or access pit in accordance with specification Section 02200 – Excavation, Backfilling, and Compaction.

C. The insertion pit(s) should be long enough to avoid imposing a bending radius of less than 35 times the outside diameter of the pipe liner during insertion in the case of HDPE.

D. The insertion pit(s) should be sufficient to allow the entry of the workmen. Shoring and bracing requirements will depend on depth and ground conditions and the Contractor shall determine the necessity for such sheathing and bracing. All temporary supports shall be designed and stamped by a professional engineer currently licensed in the State of California. The top of the existing underdrain shall be exposed to the springline and the crown of the pipe shall be removed as necessary for insertion of the liner. All locations for insertion pits shall be approved by the Engineer and ARSA prior to any work being done.

E. Sections of liner shall be field connected above the insertion pit using butt-fused joints (in strict accordance with the manufacturer's recommendations and in accordance with applicable specifications of ASTM D-2657). Maximum allowable lateral deflection shall be one inch. Contractor shall take precautions to prevent scoring of slip liner as it is being pushed/pulled into existing underdrain. Fencing on site may be temporarily removed to facilitate string pipe and related requirements for up to 4 weeks as indicated in Specification 01010. All sections of liner must be joined before sliplining activities commence.

F. All locations for insertion pits must be approved by the ARSA Engineer, and DSOD prior to any work being done.

G. Pull mandrel through the entire length of pipe to be sliplined. If the mandrel will not pass the entire length, note the location and pull the mandrel from the other and to define the entire length of the undersize pipe or obstruction. Contractor shall notify the Engineer and DSOD immediately if mandrel is unable to pass through host pipe.

3.6 INSTALLATION OF SLIPLINING

A. Connect a power winch cable to the end of the liner by use of a suitable pulling head. Secure pulling head to liner and attach to power winch cable so that liner can be satisfactorily fed and pulled through the host underdrain. Provide proper protection in insertion pit to prevent ragged edges of existing pipe form scarring new HDPE outlet pipe. Refer to insertion procedure given in ASTM F 585. Do not allow sand or other debris to enter the liner.

B. Joints:

1. Assemble section of HDPE new HDPE outlet pipe above ground. Fusion joining shall be performed with equipment designed for butt-fusion of pipe by trained personnel. Tensile strength at yield of the butt-fusion joints shall not be less than the pipe.

2. Form joints with a smooth, uniform double rolled back bead made while applying the proper melt, pressure, and alignment. Fabricate a sample joint from each machine

before proceeding with the pipe joints. The Contractor shall visually evaluate each sample joint for bond continuity and test for impact resistance.

3. Prevent machine damage to liner or breakage of butt-fused joints. Allow sufficient time for liner to return to its normal length.

4. Fusion jointing shall be used to join sliplined section of pipe to open-cut section of pipe at the insertion pit.

C. Installation of HDPE pipeline:

1. New HDPE pipe will be installed by pulling.

2. Limit pulling force exerted on the liner to that recommended by the manufacture for the outside diameter and SDR of the liner.

3. Use suitable pipe and pulling head arrangement so that pulling tension will not exceed the manufacturer's recommended value.

4. The pipe shall be inserted with a power winch and steel cable connected to the end of the pipe using an appropriate pulling head. Where necessary a second pulling head may be attached to the other end of the liner for attachment of a tag line to pull the liner back out of the pipe. Alternative pipe pulling methods shall be subject to the approval of the Engineer.

5. Pulling of each liner section shall be continuous from start to completion without interruption, and precautions shall be taken during insertion to protect the new HDPE outlet pipe so that any ragged edges of the host pipe will not score the outside of the liner.

6. A final CCTV inspection of the completed slip-lined HDPE pipe shall be completed and submitted ARSA who shall provide a copy to DSOD.

D. Spacers:

1. Ensure that each pipe section is firmly secured by providing spacers that conform to the specified product requirements. Casing spacers shall be designed to prevent flotation, settlement, and lateral/axial movement of the pipe during placement of backfill grout around pipe.

2. Spacers will be those specified in the Drawings and/or the Specifications. Wood skids or concrete "donuts" are not acceptable.

3. Allowable forces applied to the spacer assembly shall be assessed in advance of insertion into casing. Allowable forces shall not exceed those recommended by the manufacturers of the casing spacer assemblies.

4. The Contractor shall install the casing spacers in accordance with the manufacturer's recommendations. Special care is needed to ensure that sub-components are correctly assembled and evenly tightened, and that no damage is inflicted upon the slipline pipe

3.7 FIELD TESTING

After pipe installation, perform a low-pressure air test before annular grouting and before pipe is sealed in place at existing gate valves. Check integrity of joints that have been fused and verify that liner has not been damaged by inserting it into the host underdrain pipe. Also perform low-pressure air test for open-cut pipe. Should any leaks be observed, they shall be repaired using pipe manufacturer's recommended procedures and retest for leaks. All leakage testing shall be performed in the presence of the Engineer. Repair procedures shall be submitted to the Engineer for review and DSOD for approval prior to commencement of repairs.

3.8 ANNULAR GROUTING

A. Place bulkheads at upstream and downstream locations immediately following installation of sliplining and prior to grouting.

B. Commence annular grouting immediately following installation of liner and air test as per paragraph 3.7. The annular space between the liner and the existing underdrain shall be grouted in accordance with specification Section 02721 – Backfill Grouting of Sliplined Culverts.

C. Precautions shall be taken to prevent collapse of the liner owing to excessive grouting pressure. Limit grouting pressure to 10 psi at the injection point.

3.9 CLEANUP

A. Upon completion of the Work, cleanup and restore any disturbed areas to a conditions at least equal to that existing prior to commencing the Work, in accordance with other applicable sections of the Contract Document and to the satisfaction of the Engineer.

B. Restoration of fencing required within 4 weeks of temporary fence removal.

C. Remove and haul debris, cut-off flush grout pipe and valving to an approved disposal site.

END OF SECTION

SECTION 02721

BACKFILL GROUTING FOR SLIPLINED CULVERTS AND ABANDONED OUTLET PIPE

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section covers backfill grouting of the annular space between the 16-inch DR17 HDPE sliplined pipe and the existing 20-inch diameter host concrete outlet pipe, as detailed on the Contract Drawings. This section also includes location of the existing abandoned 16-inch pipe and backfilling the pipe per the Contract Documents.

B. The Contractor's work under this Section shall include: all work necessary to perform grouting operations including furnishing, handling, transporting, and storing of all materials and equipment for grouting; mixing and injecting grouts; capping, patching, and plugging the finished grout holes; cleanup of work areas; and all other operations incidental to grouting.

1.2 RELATED SECTIONS

A. Section 01300 - SUBMITTALS

B. Section 02720 - SLIPLINING

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. American Society for Testing and Materials (ASTM):

1. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field
2. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
3. ASTM C109 – Standard test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50-mm Cube Specimens)
4. ASTM C144 – Standard Specification of Masonry Mortar

5. ASTM C150 – Standard Specification for Portland Cement
6. ASTM C311 – Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
7. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
8. ASTM C937 – Standard Specification for Grout Fluidifier for Preplaced-Aggregate Concrete

B. ENVIRONMENTAL PROTECTION AGENCY (EPA):

1. EPA Test Method 9045D – Soil and Waste pH

1.4 SUBMITTALS

A. Provide all submittals at least 30 days in advance of start of backfill grouting operations, with the exception of daily reports, which are to be submitted per the schedule specified below.

B. Experience Submittals:

1. Backfill grouting for sliplining projects is specialty contractor work and Contractor shall have a minimum of 5 years of experience working on similar projects. The Contractor or subcontractor supplying and placing backfill grout shall be capable of developing a mix design; batching, mixing, handling and placing grout for sliplining projects; have furnished and placed grout on at least three sliplining projects of the general type and the size specified herein that have been in successful operation; and have a record of experience and quality of work using grout that meets the specifications in the contract documents. Submit evidence of required experience of Contractor and supervisory staff as described elsewhere in this Section. Provide references to substantiate all experience.
2. Submit qualifications for all Professional Engineers retained by the Contractor for the work, including evidence of required experience as described elsewhere in this Section.
3. Submit qualifications of Supervisors, including the Contractor's backfill grouting superintendent and foreman, shall be fully qualified to perform the work. The grouting superintendent shall have had previous experience in backfill grouting for sliplining projects under similar project conditions.
4. As an alternative to the above qualification requirements, the Contractor may employ a manufacturer's representative to supervise supplying and placing of grout. The manufacturer's representative shall be capable of complying with the qualifications specified for the Contractor and shall be acceptable to the Engineer. The manufacturer's representative shall supervise all backfill grouting operations including training the contractor's personnel, mixing designs, and placement of grout in the tunnel.

5. Proposed approved AASHTO and ASTM certified testing laboratory, including qualifications to perform sampling and testing requirements as outlined in the contract documents.

6. Proposed grout manufacturer, to be approved by the Engineer.

C. Submit workplan for locating existing 16-inch outlet pipe. Workplan shall identify the following:

1. Workplan for using CCTV to locate the existing pipe.

2. Workplan for using GPR to locate the existing pipe at the upstream end.

3. Workplan for exposing the existing pipe from the upstream end.

4. Submit findings from the investigation and grout plan.

D. Shop drawings showing backfilling arrangement including breather pipes, bulkheads, backfill pipes, grout mixing and pumping operation.

E. Mix Design and Product Data: Submit mix designs for backfill grout proposed. Each mix design shall show the ingredients of the mix and shall include:

1. Type, brand, source, and amounts of cement, fly ash, other pozzolans, admixtures, and all other additives.

2. Source and amount of water.

3. Specific gravity of all materials.

4. Test results of proposed grout that will be used on this project.

5. A certificate of compliance signed by the supplier identifying the type of fly ash and stating that the fly ash is Class F, in accordance with ASTM C 618. Supporting test data shall be furnished. All sampling and testing procedures shall be in accordance with ASTM C 311 and ASTM C 618.

6. Admixtures: Material specifications and instructions for use.

7. Air content, unit weight, and compressive strength test results for proposed mix design.

F. Equipment: Manufacturer's specifications and operation instructions for grouting equipment, including pumps, and ancillary equipment.

G. Work plan for placing backfill grout: The work plan shall be designed to prevent flotation of carrier pipe, deformation of carrier pipe, and opening of carrier pipe joints. The work plan shall be fully compatible with the work plan submitted for carrier pipe placement and blocking. Potential effects of admixtures on set time shall be addressed in the work plan. Calculations and details of backfill grout placement sequence and procedures shall be prepared by the Contractor's Professional Engineer. The work plan shall also include:

1. Type(s) of equipment.

2. Pumping pressures and rates.
3. Volumes to be placed per day.
4. Pipe and injection point locations.
5. Placing procedures including bulkhead details, batching, mixing, and pumping procedures, conveyance provisions, slickline arrangement (including moving and breaking), arrangement of valves, communications provisions, methods for monitoring mix, testing procedures, and cleanup procedures.

H. Procedures for backfilling the abandoned 16-inch concrete pipe, including methodology for locating extent of existing sand backfill within pipe, grouting setup, headwall construction, grout mix design, pumping rates and pressures, pumping location, and grout mix design.

I. Following location of the existing 16-inch concrete pipe, submit the pipe length, diameter, and corresponding pipe volume and submit the corresponding anticipated volume of grout. If CCTV entry and recording was possible, submit the amount of voids or perforations in the pipe and potential additional grout leakage from the pipe into the surrounding backfill that may be experienced.

J. Test Reports and Certifications:

1. Mill test reports for cement and fly ash.
2. Certificates of compliance for cement and fly ash.
3. Certificates of compliance for all admixtures.
4. A printout of the actual scale weights for all loads batched (submitted at the end of each working day).
5. Results of compressive strength tests from an approved AASHTO and ASTM certified testing laboratory.

K. Daily reports and records of backfill grout placement, including but not limited to volumes of materials delivered, volumes placed, stationing of placement, injection locations, pressures, unit weight and air content testing results, time of placement, and designation of test samples prepared that day. Submit daily reports within one day of activities recorded.

PART 2 MATERIALS

2.1 GROUT DESIGN

Grout shall be pumpable through a 0.75-inch diameter steel pipe for a distance of up to 175 feet with a maximum pressure of 10 psi at the point of placement. The grout mix shall provide non-shrink grout concrete with 12-hour minimum initial set up time for grouting process and sequence to be performed in a 24-hour maximum grouting period.

2.2 MATERIALS

A. Bulkheads for Sliplining

1. Hydrophilic Grout: DE NEEF Sealfoam PURe closed cell foam grout; or approved equal.
2. Hydrophobic Grout: Avanti AV-275 Soilgrout; or approved equal.
3. Mortar: Euclid Chemical Speed Crete Blue Line repair mortar; Euclid Chemical Speed Plug hydraulic cement; Cook Brand Rapid Cure Vertical Grade mortar; or approved equal.
4. Carrier to hold grout in place: Avanti AV-219 Fibrotite (Oakum); or approved equal.

B. Cementitious Grout for Backfill

1. Cement: Portland cement, ASTM C 150, Type I or II.
2. Fly ash: Type F, ASTM C618.
3. Sand: If used, shall conform to ASTM C144, except as modified below:

U.S. Standard Sieve Size	Percent Passing by Weight
No. 16	100
No. 30	60-85
No. 50	10-35
No. 100	5-25
No. 200	0-10

4. Water: Use potable water free from deleterious amounts of alkali, acid, and organic materials which would adversely affect the setting time or strength of the backfill grout.
5. Admixtures: Admixtures may only be used when specifically approved by supplier in writing. Admixtures shall be selected by the manufacturer of the sliplining grout to meet the performance requirements, to improve pumpability, to control set time, and to reduce segregation.
6. Limiting Requirements: Unless otherwise specified, each grout mix shall be designed and controlled within the following limits:
7. Portland cement based grout with minimum compressive strength at 28 days shall be 2000 psi, in accordance with ASTM C39. The grout mix shall have less than 1 percent shrinkage by volume

8. The application system shall have sufficient gages, monitoring devices, and tests to determine the efficiency and effectiveness of the grouting work and provide means of accurately determining the amount of grout injected. The Contractor shall be prepared to modify or change his operation should the grouting not perform as proposed. Such modifications and changes shall be done in a timely manner to avoid unnecessary delay to the completion of the Project.

2.3 EQUIPMENT

A. General:

1. Use equipment for mixing and injecting grout that is designed for underground backfill grouting service. Maintain equipment in good operating condition capable of satisfactorily mixing, agitating, and forcing backfill grout through piping at a uniform flow rate under the required constant pressure.

2. Batching, mixing and pumping equipment shall be compatible and of sufficient size and capacity to place grout to distances and volumes required. A constant pressure pump must be used. Use Moyno constant pressure pump or approved equal.

3. An adequate inventory of spare parts or backup equipment shall be provided to ensure that operable backfill grouting equipment is available at all times during the work. Maintain sufficient quantities of spare pressure gauges, stop valves, and other parts on site.

4. Use hose of proper type and diameter to withstand maximum injection pressures used. Limit maximum injection pressures to those described herein.

5. Backfill grouting equipment shall be configured so flushing can be accomplished with grout intake valves closed, with water supply valve open, and with grout pump running at full speed.

6. A back-up pump must be available on-site during the grouting operation. Backup pump shall be a piston pump.

7. The grout system shall be equipped with a re-circulating system so that grout does not harden in the grout lines when switching between grout ports and/or during unexpected breaks in the work.

PART 3 EXECUTION

3.1 GENERAL

A. Upon approval of the grouting plan by Engineer, allow three weeks for DSOD to review and approve grout mix design and grouting plan, including bulkhead design, mix design, types of equipment, pumping rates and pressures, pumping procedures, and injection locations.

B. Engineer to coordinate with Division of Safety of Dams (DSOD) as required a minimum of fourteen (14) calendar days prior to the start of construction operation.

3.2 LOCATING EXISTING 16-INCH PIPE

A. The pipe shall be located as accurately as possible with the following approach:
   1. Place a robotic CCTV camera with live video recording capacity and with tracking sonde locator into the exposed downstream outlet.
   2. Operate the CCTV camera along the pipe toward the upstream inlet to the furthest extent accessible, and track and mark the sonde location from the surface.
   3. Mark the approximate inlet location if this can be determined. Note, the sonde shall be selected so that it emits at a frequency appropriate for the site conditions, pipe and ground material, and depth to allow maximum alignment verification.

B. If CCTV camera cannot reach the entire length of the sewer or the inlet is not clear, the Contractor shall use a ground penetrating radar (GPR) in the estimated vicinity of the inlet to estimate the location of the 16” pipe or pipe trench/excavation, starting with the location shown on drawings. It is anticipated that an area of minimum 50’ by 50’ may need to be scanned. The inlet and pipe shall be marked on the ground surface.

C. Upon location of the upstream end of the pipe, the pipe shall be exposed by excavating. Excavation shall be sloped or shored in accordance with OSHA requirements.

D. The findings from the investigation and grout plan need to be submitted to DSOD for review and approval prior to the start of grouting. Allow three weeks for DSOD review and approval.

E. If the upstream end of the pipe cannot be located in the field through any of the methods noted above, an alternative methodology for grouting the 16” pipe from the downstream end only has been included in section 3.7 below. This is only to be applicable after all other efforts to locate and expose the upstream end of the pipe have been exhausted.

3.3 BATCHING AND MIXING

A. All grout shall be mechanically mixed to produce a uniform distribution of the materials with a suitable consistency and the specified requirements. Excessive mixing shall be avoided in order to reduce the possibility of changes in unit weight and consistency.

B. In batch mixing operations, follow the manufacturer's recommendations concerning the order of charging the mixer with the various ingredients. The as-cast unit weight shall be monitored at the point of placement. Allowance should be made for any additional mixing that may result from the method of placement, such as mechanical or pneumatic pumping, and for any unit weight changes that may result from these methods.

C. For continuous mixing operations, provision shall be made for reasonably uniform and continuous rate of addition of all mix components at appropriate positions in the mixing machine, and in the correct ratio, to assure uniformity and the specified limiting requirements at the point of placement.

D. Alternative methods for batching and mixing grout may be considered on a case-by-case basis and may or may not be acceptable at the sole discretion of the Engineer.

3.4 PLACEMENT OF GROUT IN ANNULAR SPACE BETWEEN SLIPLINED PIPE AND HOST PIPE

A. Grout shall be placed in the annular space between the sliplined pipe and the host outlet pipe. The annular space shall be completely filled without exceeding the manufacturers recommended pipe deflection or exceeding the grout pressure recommended by the pipe manufacturer, or a maximum grouting pressure at the injection point of 10 psi, whichever is less.

B. A bulkhead shall be constructed at the open end of each reach of pipe to be backfilled so the annular space will be completely backfilled in accordance with the Contractor's submittal as reviewed by the Engineer and approved by DSOD. Bulkheads shall not be removed until after the grout has set and cured for a 7-day minimum period. Bulkhead shall be designed by the Contractor to withstand grouting pressure loads without leakage and to seal the annular space from water flow.

C. Take all necessary precautions to protect and preserve the slipliner pipe from damage. Spills shall be minimized and shall be cleaned up immediately. Any damage to the pipe caused by or occurring during the backfilling operations shall be repaired by a method approved by the Engineer, at no additional cost to ARSA.

D. Standing or running water in the annular space shall be removed or controlled to maintain the correct water ratio of the grout mixture. The annular space shall be grouted by injecting grout from one end of the pipeline segment, allowing it to flow toward the other end. The annular space shall be vented to assure uniform filling of the void space.

E. All void space outside of the carrier pipe shall be completely filled with backfill grout. Place backfill grout from the downstream to upstream locations, and from the top of the pipe downwards, in accordance with the Contract Documents.

F. Backfilling of the annular space between the sliplined pipe and the host outlet pipe shall be accomplished by placing backfill in stages, starting from the downstream and working to the upstream locations, and form the bottom of the pipe upward. Contractor shall grout in six stages through ¾-inch nominal diameter schedule 40 steel grout piping fixed to the HDPE liner pipe with stainless steel collar brackets, as detailed in the contract documents. Placement of grout in fewer stages may be acceptable, provided the contractor can demonstrate that the placement techniques will not induce movement of the pipe, pipe overstressing or excessive deformation to the satisfaction of the Engineer, who should have sole discretion in this regard. Pipe flotation shall not be allowed under any scenario.

G. Provide positive venting to ensure complete grouting around the carrier pipe, particularly in the invert and crown locations. Equip each bulkhead with vent pipes with risers and drain pipes. Begin grouting at a previously completed segment or a bulkhead located at the downstream end of the existing host outlet pipe and proceed upstream. Provide means to allow water and thinned or contaminated grout at the leading edge of the lift to escape. Provide positive venting of air to ensure complete grouting around the carrier pipe, particularly along the existing host outlet pipe crown.

H. Grouting flow valving and pressure gauges of appropriate range for monitoring the backfill concrete injection pressures shall be located in the line transporting the backfill grout at the point of injection. The maximum grouting pressure at the injection point is 10 psi, but shall not exceed the rated pressure of the pipe joint of values required to prevent carrier pipe movement or damage. Regardless of the pressure, the Contractor shall be solely responsible for any damage or distortion to the slipliner pipe due to grouting. An open ended, high point tap or equivalent vent must be provided and monitored at the bulkhead opposite to the point of grouting.

I. Volume of backfill grout injected shall be measured, recorded and compared with the anticipated volume per foot of pipe backfill grout. Contractor shall attempt to fill to 100% of theoretical grout volume, however, if 100% is not achievable, and the grout placed is 80% of the estimate, the pipe should be considered successfully grouted and abandoned. If less than 80% is achieved, the Contractor and Engineer shall meet to discuss reasons for lower grout take. The Engineer in their sole discretion will then determine if the lower grout take is acceptable or if additional measures are required. If grout volume exceeds 110% of the theoretical volume for backfilling between the new slip lined pipe and the existing 20-inch pipe, Contractor shall contact the Engineer and DSOD immediately.

J. Observe the inlet and outlet throughout the operation for any grout release through the air vent ports or ground, and stop grouting immediately if grout is observed in the vicinity of the inlet and outlet as this indicates the grout has largely filled the pipe in this area.

K. Do not permit grout to enter the existing watercourse or reservoir, and implement immediate containment and removal if this occurs. The slip lined carrier pipe shall be sealed and filled with water to add pressure protection to the operation and additional weight for floatation mitigation. Spacer design including spacing shall account for additional water weight and shall be reviewed and confirmed with manufacturer.

L. The drilling of access holes from the surface to facilitate backfilling shall not be allowed.

3.5 INSPECTION

A. DSOD inspection is required prior to grouting operation to approve the pipe placement, grouting setup, headwall construction, and venting ports. ARSA Engineer shall notify DSOD and the Engineer of his/her readiness to proceed at least 72 hours prior to each backfill grouting operation. No grout shall be placed without prior approval by the ARSA Engineer and DSOD.

3.6 BACKFILLING OF ABANDONED 16-INCH CONCRETE PIPE

A. Prior to grouting, Contractor will be required to locate and delineate the section of pipe that is reported to be currently backfilled with sand by use of CCTV. The grouting operation should proceed in such a way that preserves the existing sand backfill within the pipe. Grouting shall be performed from the upstream end of the pipe. Install grout by tremie pipe from the upstream end of the 16-inch pipe to the downstream end where grout placement will begin. From the downstream end of the pipe to the upstream end, a minimum of 6 tremie pipes shall be placed into the pipe with their ends (grout injection points) spaced equally along the length of the pipe. Grouting shall start through the longest grout pipe first and proceed until an equivalent theoretical volume is placed to reach the end of the next longest grout pipe, or until excessive grouting pressures are observed. At this point, grout shall be injected through the next longest grout pipe. This process shall be repeated until all grout pipes have been used and filled and grout is observed coming though the vent pipe at the obvert of the bulkhead.

B. If the upstream end of the pipe cannot be located using the methods specified, an alternative grouting approach from the downstream end only would be necessary. In this case, at least two vent pipes shall be inserted from the downstream end of the 16-inch pipe and installed as far into the 16-inch pipe as possible. The downstream ends of the vent pipes shall penetrate through the obvert of the bulkhead so they are visible and accessible. Next at least six (6) grout pipes shall be installed with their end points evenly spaced along the accessible length of the 16-inch pipe, as determined by CCTV and placement of the vent pipes. Grouting shall start through the shortest grout pipe first and proceed until an equivalent theoretical volume is placed to reach the end of the next grout pipe, or until excessive grouting pressures are observed. At that point, grout shall be injected through the next shortest grout pipe. This process shall be repeated until all grout pipes have been used and grout is observed coming though the vent pipe at the obvert of the bulkhead.

C. If the upstream end of the pipe is located and accessible but the pipe is found to be collapsed in sections, a combination of the two previous methodologies shall be used in order to fill as much of the void inside the existing pipe as possible. In this case grout shall be injected from both ends of the pipe, in which case a minimum of 6 tremie pipes shall also be inserted from the downstream end with grout injection points spaced equally along the length of accessible length of pipe. In the case of grouting from both downstream and upstream ends of the pipe, grouting shall progress sequentially from the downstream to upstream.

D. Contractor to construct brick and mortar bulkheads at each end of the pipe sufficiently designed to withstand the grout pressures anticipated. Contractor may propose alternate bulkheads at each end of the pipe for review by the Engineer and approval from DSOD. Vent pipes and drain pipe shall be installed on the bulkheads to verify satisfactory completion of the backfilling operation. Bulkheads shall remain in place after grouting completion.

E. Pumping pressures should be limited to the pressures stated within this specification and so as not to displace the existing sand backfill within the pipe.

F. Contractor shall attempt to fill to 100% of theoretical grout volume, however, if 100% is not achievable, and the grout placed is 80% of the estimate, the pipe should be considered successfully grouted and abandoned. If less than 80% is achieved, the Contractor and Engineer shall meet to discuss reasons for lower grout take. The Engineer in their sole discretion will then determine if the lower grout take is acceptable or if additional measures are required. If grout volume exceeds 110% of the theoretical volume for backfilling, Contractor shall notify the Engineer and DSOD immediately. Grout volumes shall only exceed 110% of theoretical for the existing abandoned 16-inch pipe if leakage is expected based on perforations or voids in the existing pipe with review from the Engineer and approval from DSOD.

G. The Contractor shall confirm their proposed methodology and submit in writing for DSOD review prior to initiating the work if their work plan differs from the those specified. The Contractor will be wholly responsible for the means and methods used during construction.

3.7 FIELD AND LABORATORY QUALITY CONTROL

A. Field control tests, including compression tests shall be performed by an approved AASHTO and ASTM certified testing laboratory and paid for by the Contractor. The results shall be submitted to the Engineer for review and approval by DSOD.

B. The frequency of testing is specified herein. A greater or lesser number of tests may be made, as required by the Engineer. Assist the Engineer in obtaining additional test cylinders for the Engineer to test in the same quantities as that required for Contractor testing. Supply all materials necessary for fabricating the test cylinders for both Contractor and Engineer collection of samples.

C. Test specimens shall be collected within the host outlet pipe at or near the connection where the backfill grout is being injected.

D. Provide at or very near the point of injection, a system of valves in the line transporting the grout, which will allow easy access for collection of test specimens without disconnecting the line from the outlet.

E. Compression Tests: One set of four (4) test cylinders (3 inches by 6 inches) shall be made when backfill grout is placed. Two cylinders from the set will be tested at an age of 28 days. Compressive strength of backfill grout shall be considered satisfactory if the following requirements are met:

a. Average of the compressive strength tests must equal or exceed the specified unconfined compressive strength.

b. A strength test shall be the average of two compressive strengths of two cylinders made from the same concrete sample and tested at 28 days.

c. No individual compressive strength test value of any cylinder shall be less than 87.5% of the specified unconfined compressive strength.

2. Test cylinders shall be made in the field, cured and stored in the laboratory, and tested in accordance with ASTM C39.

3. Each set of compression test cylinders shall be marked or tagged with the date and time of day the cylinders were made, the location in the work where the backfill grout represented by the cylinder was placed, and batch number.

F. pH Testing: pH testing is to be carried out by the Contractor in accordance with EPA Test Method 9045D Soil and Waste pH using an approved AASHTO and ASTM certified testing laboratory. Testing samples shall be obtained following the sample procedure for obtaining samples for compression testing. Each sample shall be pulverized in preparation for testing. pH testing is not required if the fly ash content does not exceed 25%.

3.8 CLEANUP

Minimize spilling and prevent the setting of any grout that may escape upon finished pipe or structure surfaces. Remove any spilled grout and restore the pipe or structure surface to its original condition. No hardened grout shall be permitted in the sliplined pipe after completion of grouting operations. Properly dispose or all waste materials. Remove all grouting equipment, formwork, bulkheads and accessories from the work area.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 SCOPE

A. Provide all labor, equipment, materials and services necessary for the manufacture, transportation and placement of all concrete work for the open cut trench backfill, as shown on the Drawings or as ordered by the Engineer.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 – SUBMITTALS

B. Section 02200 – EXCAVATION, BACKFILL AND COMPACTION

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the Specifications, all work herein shall conform to or exceed the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ACI 214 – Guide to Evaluation of Strength Test Results of Concrete
2. ACI 301 – Specifications for Structural Concrete
3. ACI 304 – Guide for Measuring, Mixing, Transporting, and Placing Concrete
4. ACI 305.1 – Specification for Hot Weather Concreting
5. ACI 306.1 – Standard Specification for Cold Weather Concreting
6. ACI 309 – Guide for Consolidation of Concrete
7. ACI 318 – Building Code Requirements for Structural Concrete and Commentary
8. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures
9. ASTM C 31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field
10. ASTM C 33 – Standard Specification for Concrete Aggregates

11. ASTM C 39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

12. ASTM C 136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

13. ASTM C 138 – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

14. ASTM C 150 – Standard Specification for Portland Cement

15. ASTM C 172 – Standard Practice for Sampling Freshly Mixed Concrete

16. ASTM C 192 – Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory

17. ASTM C 494 – Standard Specification for Chemical Admixtures for Concrete

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300 – Submittals.

1. Sources of all materials and certifications of compliance with specifications for all materials.

2. Manufacturer's data on all admixtures stating compliance with required standards.

3. Concrete mix design for the concrete specified herein.

1.05 QUALITY ASSURANCE

A. Tests on materials used in the production of concrete shall be required as specified in Part 2 – Materials. These tests shall be performed by an independent testing laboratory approved by the Engineer at no additional cost to the Owner.

B. Trial concrete mixes shall be tested when required in accordance with Article 3.01 at no additional cost to the Owner.

C. Field quality control tests, as specified in Article 3.07, unless otherwise stated, will be performed by a materials testing consultant employed by the Owner. However, the Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the Specifications. Any individual who samples and tests concrete to determine if the concrete is being produced in accordance with this Specification shall be certified as a Concrete Field Testing Technician, Grade I, in accordance with ACI CP-2. Testing laboratory

shall conform to requirements of ASTM C- 1077.

PART 2 – MATERIALS

2.01 CEMENT

A. Portland Cement

1. Portland Cement shall be Type II conforming to ASTM C 150..

2.02 FLY ASH

A. Fly ash shall meet the requirements of ASTM C 618 for Class F, except that the loss on ignition shall not exceed 4%. Fly ash shall also meet the optional physical requirements for uniformity as shown in Table 3 of ASTM C 618.

2.03 WATER

A. Water used for mixing concrete shall be clear, potable and free from deleterious substances such as objectionable quantities of silty organic matter, alkali, salts and other impurities.

B. Water shall not contain more than 100 PPM chloride.

C. Water shall not contain more than 500 PPM dissolved solids.

D. Water shall have a pH in the range of 4.5 to 8.5.

E. Water shall meet requirements of ASTM C 1602.

2.04 AGGREGATES

A. All aggregates used in normal weight concrete shall conform to ASTM C 33.

B. Fine Aggregate (Sand) in the various concrete mixes shall consist of natural or manufactured siliceous sand, clean and free from deleterious substances, and graded within the limits of ASTM C 33.

C. Coarse aggregates shall consist of hard, clean, durable gravel, crushed gravel or crushed rock. Coarse aggregate shall be size #57 or #67 as graded within the limits given in ASTM C 33 unless otherwise specified.

a.

D. .

2.05 ADMIXTURES

A. Admixtures containing intentionally added chlorides shall not be used.

B. The following admixtures are required or used for water reduction, slump increase, and/or adjustment of initial set, and enhancing durability. Admixtures permitted shall confirm to the requirements of ASTM C 494. Admixtures shall be non-toxic after 30 days and shall be compatible with and made by the same manufacturer as the air-entraining admixtures.

1. Water reducing admixture shall conform to ASTM C 494, Type A and shall contain no more than 0.05% chloride ions. Acceptable products are “Eucon Series” by the Euclid Chemical Company, “Master Pozzolith Series or Master Polyheed Series” by BASF Corporation, and “Plastocrete Series” by Sika Corporation.

2. High range water reducer shall conform to ASTM C 494, Type F or G. The high range water reducer shall be added to the concrete at either the batch plant or at the job site and may be used in conjunction with a water reducing admixture. The high range water reducer shall be accurately measured and pressure injected into the mixer as a single dose by an experienced technician. A standby system shall be provided and tested prior to each day’s operation of the job site system. Concrete shall be mixed at mixing speed for a minimum of 100 mixer revolutions after the addition of the high range water reducer. Acceptable products are “Eucon 37” or Plastol 5000 by the Euclid Chemical Company, “Master Rheobuild 1000 or Master Glenium Series” by BASF Corporation, and “Daracem 100 or Advaflow Series” by W.R. Grace.

3. Workability Retaining Admixture shall conform to ASTM C 494, Type S. The admixture shall retain concrete workability without affecting time of setting or early- age strength development. Acceptable products are “MasterSure Z 60” by BASF Corporation, or equal.

C. Admixtures containing calcium chloride, thiocyanate or more than 0.05 percent chloride ions are not permitted. The addition of admixtures to prevent freezing is not permitted.

2.06 CONCRETE MIX DESIGN

A. The proportions of cement, aggregates, admixtures and water used in the concrete mixes shall be based on the results of field experience or preferably laboratory trial mixes in conformance with "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318 and ACI 350. When trial mixes are used, they shall also conform to Article 3.01 of this Section of the Specifications. If field experience records are used, concrete strength results shall be from concrete mixed with all of the ingredients proposed for use on job used in similar proportions

to mix proposed for use on job. Contractor shall submit verification confirming this stipulation has been followed. Field experience records and/or trial mix data used as the basis for the proposed concrete mix design shall be submitted to the Engineer along with the proposed mix.

B. The concrete used in the trench backfill shall conform to the following requirements. Cementitious materials refer to the total combined weight of all cement and fly ash contained in the mix.

1. Compressive Strength (28-Day): 4,000 psi (minimum)
2. Water/cementitious materials ratio, by weight: 0.5 (maximum) and 0.39 (minimum)
3. Slump range
    a. 4" nominal unless high range water reducing admixture is used
    b. 8” max if high range water reducing admixture is used.
4. Air Content: 3% Max. (non air-entrained)

PART 3 – EXECUTION

3.01 TRIAL MIXES

A. When trial mixes are used to confirm the quality of a proposed concrete mix in accordance with , "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318 and ACI 350, an independent qualified testing laboratory designated and retained by the Contractor shall test a trial batch of each of the preliminary concrete mixes submitted by the Contractor. The trial batches shall be prepared using the aggregates, cement, supplementary cementitious materials, and admixtures proposed for the project. The trial batch materials shall be of a quantity such that the testing laboratory can obtain enough samples to satisfy requirements stated below. Tests on individual materials stated in MATERIALS should already be performed before any trial mix is done. The cost of laboratory trial batch tests for each specified concrete mix will be borne by the Contractor and the Contractor shall furnish and deliver the materials to the testing laboratory at no cost to the Owner.

B. The independent testing laboratory shall prepare a minimum of fifteen (15) standard test cylinders in accordance with ASTM C 31 in addition to conducting slump (ASTM C 143), air content (C 231) and density (C 138) tests. Compressive strength test on the cylinders shall subsequently be performed by the same laboratory in accordance with ASTM C 39 as follows: Test 3 cylinders at age 7 days; test 3 cylinders at age 21 days; test 3 cylinders at age 28 days and test 3 cylinders at 56 days. The cylinders shall be carefully identified as "Trial Mix, Contract No. , Product ." If the average 28-day compressive strength of the trial mix is less than that specified, or if any single cylinder falls below the required strength by more than 500 psi, the mix shall be corrected, another trial batch prepared, test cylinders taken, and new tests performed as before. Any such additional trial batch testing required shall be performed at no

additional cost to the Owner. Adjustments to the mix shall be considered refinements to the mix design and shall not be the basis for extra compensation to the Contractor.

3.02 PRODUCTION OF CONCRETE

A. All concrete shall be machine mixed. Hand mixing of concrete will not be permitted. The Contractor may supply concrete from a ready mix plant or from a site mixed plant. In selecting the source for concrete production, the Contractor shall carefully consider its capability for providing quality concrete at a rate commensurate with the requirements of the placements so that well bonded, homogenous concrete, free of cold joints, is assured.

B. Ready-Mixed Concrete

1. At the Contractor's option, ready-mixed concrete may be used meeting the requirements for materials, batching, mixing, transporting, and placing as specified herein and in accordance with ASTM C 94.

2. Truck mixers shall be equipped with electrically-actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the resettable, recording type, and shall be mounted in the driver's cab. The counters shall be actuated at the time of starting mixers at mixing speeds.

3. Each batch of concrete shall be mixed in a truck mixer for not less than 100 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolutions of mixing.

4. Each and every concrete delivery shall be accompanied by a delivery ticket containing at least the following information:

a. Date and truck number

b. Ticket number

c. Mix designation of concrete

d. Cubic yards of concrete

e. Cement brand, type and weight in pounds

f. Weight in pounds of fine aggregate (sand)

g. Weight in pounds of coarse aggregate (stone)

h. Air entraining agent, brand, and weight in pounds and ounces

i. Other admixtures, brand, and weight in pounds and ounces

j. Water, in gallons, stored in attached tank

k. Water, in gallons, maximum that can be added without exceeding design water/cementitious materials ratio

l. Water, in gallons, actually used (by truck driver)

m. Time of loading

n. Time of delivery to job (by truck driver)

5. Any truck delivering concrete to the job site, which is not accompanied by a delivery ticket showing the above information will be rejected and such truck shall immediately depart from the job site.

C. Site Mixed Concrete

1. Scales for weighing concrete ingredients shall be accurate when in use within ±0.4 percent of their total capacities. Standard test weights shall be available to permit checking scale accuracy.

2. Operation of batching equipment shall be such that the concrete ingredients are consistently measured within the following tolerances:

a.	Cement, fly ash, or slag cement	± 1 percent
b.	Water	± 1 percent
c.	Aggregates	± 2 percent
d.	Admixtures	± 3 percent

3. Each batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates. Water shall continue for a period which may extend to the end of the first 25 percent of the specified mixing time. Controls shall be provided to prevent batched ingredients from entering the mixer before the previous batch has been completely discharged.

4. The concrete shall be mixed in a batch mixer capable of thoroughly combining the aggregates, cement, and water into a uniform mass within the specified mixing time,

and of discharging the concrete without harmful segregation. The mixer shall bear a manufacturer's rating plate indicating the rate capacity and the recommended revolutions per minute and shall be operated in accordance therewith.

5. Mixers with a rate capacity of 1 cubic yard or larger shall conform to the requirements of the Plant Mixer Manufacturers' Division of the Concrete Plant Manufacturers' Bureau.

6. Except as provided below, batches of 1 cubic yard or less shall be mixed for not less than 1 minute. The mixing time shall be increased 15 seconds for each cubic yard or fraction thereof of additional capacity.

7. Shorter mixing time may be permitted provided performance tests made in accordance with of ASTM C 94 indicate that the time is sufficient to produce uniform concrete.

8. Controls shall be provided to ensure that the batch cannot be discharged until the required mixing time has elapsed. At least three-quarters of the required mixing time shall take place after the last of the mixing water has been added.

9. The interior of the mixer shall be free of accumulations that will interfere with mixing action. Mixer blades shall be replaced when they have lost 10 percent of their original height.

10. Chemical admixtures shall be charged into the mixer as solutions and shall be measured by means of an approved mechanical dispensing device. The liquid shall be considered a part of the mixing water. Admixtures that cannot be added in solution may be weighed or may be measured by volume if so recommended by the manufacturer.

11. If two or more admixtures are used in the concrete, they shall be added separately to avoid possible interaction that might interfere with the efficiency of either admixture or adversely affect the concrete.

12. Addition of retarding admixtures shall be completed within 1 minute after addition of water to the cement has been completed, or prior to the beginning of the last three-quarters of the required mixing, whichever occurs first. Retarding admixtures shall not be used unless approved by the Engineer.

13. Concrete shall be mixed only in quantities for immediate use and within the time and mixing requirements of ASTM C 94.

3.03 CONCRETE PLACEMENT

A. No concrete shall be placed prior to approval of the concrete mix design. Concrete placement shall conform to the recommendations of ACI 304.

B. Prior to concrete placement, all reinforcement shall be securely and properly fastened in its correct position. Formwork shall be clean, oiled and form ties at construction joints shall be retightened. Construction joints shall be cleaned and roughened to ¼-inch amplitude. All bucks, sleeves, castings, hangers, pipe, conduits, bolts, anchors, wire, and any other fixtures required to be embedded therein shall be in place. Forms for openings to be left in the concrete shall be in place and anchored by the Contractor. All loose debris in bottoms of forms or in keyways shall be removed and all debris, water, snow, ice and foreign matter shall be removed from the space to be occupied by the concrete. The Contractor shall notify the Engineer in advance of placement, allowing sufficient time for a concurrent inspection and for any corrective measures which are subsequently required. DSOD approval of foundation conditions and steel reinforcement is required prior to placing concrete associated with the new outlet pipe in the open-cut trench with reinforced concrete backfill.

C. All concrete shall be placed during the daylight hours except with the consent of the Engineer. If special permission is obtained to carry on work during the night, adequate lighting must be provided.

D. When concrete arrives at the project with slump below that suitable for placing, as indicated by the Specifications, water may be added to bring the concrete within the specified slump range provided that the design water-cementitious materials ratio is not exceeded. The water shall be incorporated by additional mixing equal to at least half of the total mixing required. Water may be added only to full trucks. On-site tempering shall not relieve the Contractor from furnishing a concrete mix that meets all specified requirements.

E. Placing of concrete shall be so regulated that the pressure caused by the wet concrete shall not exceed that used in the design of the forms.

F. When placing concrete which is to be exposed, sufficient illumination shall be provided in the interior of the forms so the concrete, at places of deposit, is visible from deck and runways.

G. Concrete shall be placed so as to thoroughly embed all reinforcement, inserts, and fixtures. For placement of the initial lifts of the concrete encasements, the concrete must be placed on one side of the pipe and vibrated under and to the other side of the pipe to ensure adequate consolidation and the elimination of voids under the pipe.

H. When forms are removed, surfaces shall be even and dense, free from aggregate pockets or honeycomb. To achieve this, concrete shall be consolidated using mechanical vibration, supplemented by forking and spading by hand in the corners and angle of forms and along form surfaces while the concrete is plastic under the vibratory action. Consolidation shall conform to ACI 309.

I. Mechanical vibration shall be applied directly to the concrete, unless otherwise approved by the Engineer. Vibration shall be applied at the point of deposit and in the area of freshly placed concrete by a vertical penetration of the vibrator. Vibrators shall not be used to move concrete laterally within the forms.

J. In placing unformed concrete on slopes, the concrete shall be placed ahead of a non- vibrated slip-form screed extending approximately 2-1/2 feet back from its leading edge. The method of placement shall provide a uniform finished surface with the deviation from the straight line less than 1/8 inch in any concrete placement. Concrete ahead of the slip-form screed shall be consolidated by internal vibrators so as to ensure complete filling under the slip-form. Prior to placement of concrete on sloped walls or slabs, the Contractor shall submit a plan specifically detailing methods and sequence of placements, proposed concrete screed equipment, location of construction joints, and/or any proposed deviations from the aforementioned to the Engineer for review and approval.

K. Concrete shall not be placed during rains sufficiently heavy or prolonged to wash mortar from coarse aggregate on the forward slopes of the placement. Once placement of concrete has commenced in a block, placement shall not be interrupted by diverting the placing equipment to other uses.

3.04 ORDER OF PLACING CONCRETE

A. In order to minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints shown on the Drawings and maximum lengths as indicated on Drawings. Where required on the Drawings and wherever else practical, the placing of such units shall be done in a strip pattern in accordance with ACI 302.1. A minimum of 72 hours shall pass prior to placing concrete directly adjacent to previously placed concrete.

3.05 CONCRETE WORK IN COLD WEATHER

A. Cold weather concreting procedures shall conform to the requirements of ACI 306.1.

B. The Engineer may prohibit the placing of concrete at any time when air temperature is 40°F. or lower. If concrete work is permitted, the concrete shall have a minimum temperature, as placed, of 55°F. for placements less than 12" thick, 50°F. for placements 12" to 36" thick, and 45°F. for placements greater than 36" thick. The temperature of the concrete as placed shall not exceed the aforementioned minimum values by more than 20°F, unless otherwise approved by the Engineer.

C. All aggregate and water shall be preheated. Precautions shall be taken to avoid the possibility of flash set when aggregate or water are heated to a temperature in excess of 100°F. in order to meet concrete temperature requirements. The addition of admixtures to the concrete to prevent freezing is not permitted. All reinforcement, forms, and concrete accessories with which the concrete is to come in contact shall be defrosted by an approved method. No concrete shall be

placed on frozen ground.

3.06 CONCRETE WORK IN HOT WEATHER

A. Hot weather concreting procedures shall conform to the requirements of ACI 305.1.

B. When air temperatures exceed 85°F., or when extremely dry conditions exist even at lower temperatures, particularly if accompanied by high winds, the Contractor and his concrete supplier shall exercise special and precautionary measures in preparing, delivering, placing, finishing, curing and protecting the concrete mix. The Contractor shall consult with the Engineer regarding such measures prior to each day's placing operation and the Engineer reserves the right to modify the proposed measures consistent with the requirements of this Section of the Specifications. All necessary materials and equipment shall be on hand an in position prior to each placing operation.

C. Preparatory work at the job site shall include thorough wetting of all forms, reinforcing steel and, in the case of slab pours on ground or subgrade, spraying the ground surface on the preceding evening and again just prior to placing. No standing puddles of water shall be permitted in those areas which are to receive the concrete.

D. The temperature of the concrete mix when placed shall not exceed 95°F.

E. Temperature of mixing water and aggregates shall be carefully controlled and monitored at the supplier's plant, with haul distance to the job site being taken into account. Stockpiled aggregates shall, if necessary, be shaded from the sun and sprinkled intermittently with water. If ice is used in the mixing water for cooling purposes, it must be entirely melted prior to addition of the water to the dry mix.

F. Delivery schedules shall be carefully considered in advance to ensure that concrete is placed as soon as practical after mixing. For hot weather concrete work (air temperature greater than 85°F), discharge of the concrete to its point of deposit shall be completed within 60 minutes from the time the concrete is batched, unless workability-retaining admixtures are included and approved by the Engineer.

G. The Contractor shall arrange for an ample work force to be on hand to accomplish transporting, vibrating, finishing, and covering of the fresh concrete as rapidly as possible.

3.07 QUALITY CONTROL

A. Field Testing of Concrete

1. The Contractor shall coordinate with the Engineer's project representative the on- site

scheduling of the materials testing consultant personnel as required for concrete testing.

2. Concrete for testing shall be supplied by the Contractor at no additional cost to the Owner, and the Contractor shall provide assistance to the materials testing consultant in obtaining samples. The Contractor shall dispose of and clean up all excess material.

B. Consistency

1. The consistency of the concrete will be checked by the materials testing consultant by standard slump cone tests. The Contractor shall make any necessary adjustments in the mix as the Engineer and/or the materials testing consultant may direct and shall upon written order suspend all placing operations in the event the consistency does not meet the intent of the specifications. No payment shall be made for any delays, material or labor costs due to such eventualities.

2. Slump tests shall be made in accordance with ASTM C 143. Slump tests will be performed as deemed necessary by the materials testing consultant and each time compressive strength samples are taken.

3. Concrete with a specified nominal slump shall be placed having a slump within 1” (higher or lower) of the specified slump. Concrete with a specified maximum slump shall be placed having a slump less than the specified slump.

C. Unit Weight

1. Samples of freshly mixed concrete shall be tested for unit weight by the materials testing consultant in accordance with ASTM C 138.

2. Unit weight tests will be performed as deemed necessary by the Engineer and each time compressive strength samples are taken.

D. Air Content

1. Samples of freshly mixed concrete will be tested for entrained air content by the materials testing consultant in accordance with ASTM C 231.

2. Air content tests will be performed as deemed necessary by the materials testing consultant and each time compressive strength samples are taken.

3. In the event test results are outside the limits specified, additional testing shall occur. Admixture quantity adjustments shall be made immediately upon discovery of incorrect air entrainment.

E. Compressive Strength

1. Samples of freshly mixed concrete will be taken by the materials testing consultant and tested for compressive strength in accordance with ASTM C 172, C 31 and C 39, except as modified herein.

2. In general, one sampling shall be taken for each placement in excess of five (5) cubic yards, with a minimum of one (1) sampling for each day of concrete placement operations, or for each one hundred (100) cubic yards of concrete, or for each 5,000 square feet of surface area for slabs or walls, whichever is greater.

3. Each sampling shall consist of at least five (5) 6x12 cylinders or (8) 4x8 cylinders. Each cylinder shall be identified by a tag, which shall be hooked or wired to the side of the container. The materials testing consultant will fill out the required information on the tag, and the Contractor shall satisfy himself that such information shown is correct.

4. The Contractor shall be required to furnish labor to the Owner for assisting in preparing test cylinders for testing. The Contractor shall provide approved curing boxes for storage of cylinders on site. The insulated curing box shall be of sufficient size and strength to contain all the specimens made in any four consecutive working days and to protect the specimens from falling over, being jarred or otherwise disturbed during the period of initial curing. The box shall be erected, furnished and maintained by the Contractor. Such box shall be equipped to provide the moisture and to regulate the temperature necessary to maintain the proper curing conditions required by ASTM C 31. Such box shall be located in an area free from vibration such as pile driving and traffic of all kinds and such that all specimen are shielded from direct sunlight and/or radiant heating sources. No concrete requiring inspection shall be delivered to the site until such storage curing box has been provided. Specimens shall remain undisturbed in the curing box until ready for delivery to the testing laboratory but not less than sixteen hours.

5. The Contractor shall be responsible for maintaining the temperatures of the curing box during the initial curing of test specimens with the temperature preserved between 60°F and 80°F as measured by a maximum-minimum thermometer. The Contractor shall maintain a written record of curing box temperatures for each day curing box contains test specimens. Temperature shall be recorded a minimum of three times a day with one recording at the start of the work day and one recording at the end of the work day.

6. When transported, the cylinders shall not be thrown, dropped, allowed to roll, or be damaged in any way.

7. Compression tests shall be performed in accordance with ASTM C 39. For 6x12 cylinders, two test cylinders will be tested at seven days and two at 28 days. For 4x8 cylinders, three test cylinders will be tested at seven days, three at 28 days. The remaining cylinders will be held to verify test results, if needed.

F. Evaluation and Acceptance of Concrete

1. Evaluation and acceptance of the compressive strength of concrete shall be according to the requirements of ACI 214, ACI 318, and ACI 350.

2. The strength level of concrete will be considered satisfactory if all of the following conditions are satisfied.

    a. Every arithmetic average of any three consecutive strength tests equals or exceeds the minimum specified 28-day compressive strength for the mix.

    b. No individual compressive strength test results falls below the minimum specified strength by more than 500 psi.

3. In the event any of the conditions listed above are not met, the mix proportions shall be corrected for the next concrete placing operation.

4. In the event that condition 2B is not met, additional tests in accordance with Article 3.07, Paragraph H shall be performed.

5. When a ratio between 7-day and 28-day strengths has been established by these tests, the 7-day strengths shall subsequently be taken as a preliminary indication of the 28-day strengths. Should the 7-day test strength from any sampling be more than 10% below the established minimum strength, the Contractor shall:

    a. Immediately provide additional periods of curing in the affected area from which the deficient test cylinders were taken.

    b. Maintain or add temporary structural support as required.

    c. Correct the mix for the next concrete placement operation, if required to remedy the situation.

6. All concrete which fails to meet the ACI requirements and these specifications is subject to removal and replacement at no additional cost to the Owner.

G. When non-compliant concrete is identified, test reports shall be sent immediately to the Engineer for review.

3.08 CARE AND REPAIR OF CONCRETE

A. The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Care shall be exercised to avoid jarring forms or placing any strain on the ends of projecting reinforcing bars. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance

of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at no additional cost to the Owner.

B. Areas of honeycomb shall be chipped back to sound concrete and repaired as directed.

C. Areas of concrete in which cracking, spalling, or other signs of deterioration develop prior to final acceptance shall be removed and replaced or repaired as directed. This stipulation includes concrete that has experienced cracking due to drying or thermal shrinkage of the concrete. Structural cracks shall be repaired using an approved epoxy injection system. Non-structural cracks shall be repaired using an approved hydrophilic resin pressure injected grout system, unless other means of repair are deemed necessary and approved. All repair work shall be performed at no additional cost to the Owner.

D. Concrete which fails to meet the strength requirements as outlined in Article 3.07, Paragraph F, will be analyzed as to its adequacy based upon loading conditions, resultant stresses and exposure conditions for the particular area of concrete in question. If the concrete in question is found unacceptable based upon this analysis, that portion of the structure shall be strengthened or replaced by the Contractor at no additional cost to the Owner. The method of strengthening or extent of replacement shall be as directed by the Engineer.

END OF SECTION

Prepared by:
Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
916.773.8100
www.stantec.com

NOTICE INVITING BIDS

NOTICE IS HEREBY GIVEN that the Board of Directors of the Amador Regional Sanitation Authority ("Authority") invites and will receive sealed Bids up to but not later than **2:00 p.m. on April 10th 2025** at the City of Sutter Creek City Hall, located at 18 Main Street, Sutter Creek, CA 95685, for the furnishing to Authority of all labor, equipment, materials, tools, services, transportation, permits, utilities, and all other items necessary for **2025 HENDERSON DAM UNDER DRAIN REPAIR PROJECT** (the "Project"). At said time, Bids will be publicly opened and read aloud at the Authority Office. Bids received after said time shall be returned unopened. Bids shall be valid for a period of 90 calendar days after the Bid opening date.

The work generally includes, but is not limited to, furnishing all products, labor, equipment, material, transportation, and incidental services to construct the following:

A. Sliplining of existing 20" concrete outlet pipe using 16" DR 17 HDPE, ASTM F714 pipe for approximately 170 LF total and grouting the annulus between the host pipe and the sliplined pipe.

B. Removal and replacement of approximately 95 LF of 20" AC concrete pipe with 16" DR 17 HDPE, ASTM F714 pipe.

C. Connection of the sliplined and open-cut sections of the 16" DR 17 HDPE Pipe, and connection of the 16" DR 17 HDPE pipe to the existing 20" Ductile Iron Pipe at the concrete junction chamber.

D. Completely backfill with cement-grout an existing abandoned-in-place 16" diameter outlet pipe which proceeds beneath approximately the middle of the dam.

E. Field verification of post-installation conditions using a rover with a tilt and pan CCTV camera.

Bids must be submitted on the Authority's Bid Forms. Bidders may obtain a copy of the Contract Documents from the Authority at 18 Main Street, Sutter Creek, CA 95685, (209) 267-5647 for $50 (non-refundable). An additional non-refundable charge of $50 will be required of any bidder who requests the Contract Documents. be mailed within California (costs for out-of-state mailings will be higher). To the extent required by section 20103.7 of the Public Contract Code, upon request from a contractor plan room service, the Authority shall provide an electronic copy of the Contract Documents at no charge to the contractor plan room.

Each Bid shall be accompanied by cash, a certified or cashier's check, or Bid Bond secured from a surety company satisfactory to the Board of Directors, the amount of which shall not be less than ten percent (10%) of the submitted Total Bid Price, made payable to Amador Regional Sanitation Authority as bid security. The bid security shall be provided as a guarantee that within five (5) working days after the Authority provides the successful bidder the Notice of Award, the successful Bidder will enter into a contract and provide the necessary bonds and certificates of insurance. The bid security will be declared forfeited if the successful Bidder fails to comply within said time. No interest will be paid on funds deposited with Authority.

A MANDATORY Pre-Bid Conference is scheduled for April 1, 2025 at 10:00 AM to review the Project's existing conditions at City of Sutter Creek City Hall at 18 Main Street, Sutter Creek, CA 95685. Representatives of the Authority and consulting engineers, if any, will be present.

Questions asked by Bidders at the Pre-Bid Conference not specifically addressed within the Contract Documents shall be answered in writing, and shall be sent to all Bidders present at the Pre-Bid Conference. Bids will not be accepted from any bidder who did not attend the mandatory Pre-Bid Conference.

The successful Bidder will be required to furnish a Faithful Performance Bond and a Labor and Material Payment Bond each in an amount equal to one hundred percent (100%) of the Contract Price. Each bond shall be in the forms set forth herein, shall be secured from a surety company that meets all State of California bonding requirements, as defined in California Code of Civil Procedure Section 995.120, and that is a California admitted surety insurer.

Pursuant to Section 22300 of the Public Contract Code of the State of California, the successful Bidder may substitute certain securities for funds withheld by Authority to ensure its performance under the contract.

Pursuant to Labor Code Section 1773, Authority has obtained the prevailing rate of per diem wages and the prevailing wage rate for holiday and overtime work applicable in Amador County from the Director of the Department of Industrial Relations for each craft, classification, or type of worker needed to execute this contract. A copy of these prevailing wage rates may be obtained via the internet at: www.dir.ca.gov/dlsr/

The successful bidder shall post a copy of the prevailing wage rates at each job site. It shall be mandatory upon the Bidder to whom the Contract is awarded, and upon any subcontractors, to comply with all Labor Code provisions, which include but are not limited to the payment of not less than the said specified prevailing wage rates to all workers employed by them in the execution of the Contract, employment of apprentices, hours of labor and debarment of contractors and subcontractors.

Pursuant to Labor Code sections 1725.5 and 1771.1, all contractors and subcontractors that wish to bid on, be listed in a bid proposal, or enter into a contract to perform public work must be registered with the Department of Industrial Relations. No Bid will be accepted nor any contract entered into without proof of the contractor's and subcontractors' current registration with the Department of Industrial Relations to perform public work. If awarded a contract, the Bidder and its subcontractors, of any tier, shall maintain active registration with the Department of Industrial Relations for the duration of the Project.

This Project is subject to compliance monitoring and enforcement by the Department of Industrial Relations. In bidding on this Project, it shall be the Bidder's sole responsibility to evaluate and include the cost of complying with all labor compliance requirements under this contract and applicable law in its Bid.

Unless otherwise provided in the Instructions for Bidders, each Bidder shall be a licensed contractor pursuant to sections 7000 et seq. of the Business and Professions Code in the following classification(s) throughout the time it submits its Bid and for the duration of the contract: CLASS A LICENSE.

Substitution requests shall be made within 35 calendar days after the award of the contract. Pursuant to Public Contract Code Section 3400(b), the Authority may make findings designating that certain additional materials, methods or services by specific brand or trade name other than those listed in the Standard Specifications be used for the Project. Such findings, if any, as well

as the materials, methods or services and their specific brand or trade names that must be used for the Project may be found in the Special Conditions.

Authority shall award the contract for the Project to the lowest responsive, responsible Bidder as determined by the Authority from the BASE BID ALONE. Authority reserves the right to reject any or all bids or to waive any irregularities or informalities in any bids or in the bidding process.

For further information, contact Steven Whittlesey, ARSA Engineer, at swhittlesey@hydroscience.com or 916-518-9735.