Tahoe-Truckee Sanitation Agency

Regular Board Meeting

February 16, 2022

TAHOE-TRUCKEE SANITATION AGENCY
A Public Agency
13720 Butterfield Drive
TRUCKEE, CALIFORNIA 96161
(530) 587-2525 • FAX (530) 587-5840

Directors
Dan Wilkins: President
Blake Tresan: Vice President
S. Lane Lewis
Dale Cox
David Smelser
General Manager
LaRue Griffin

BOARD OF DIRECTORS
REGULAR MEETING
NOTICE AND AGENDA

Date: February 16, 2022
Time: 9:00 AM

This meeting will be accessible via teleconference (video and audio) only and the board room will not be accessible to the public. To participate via videoconference, join the meeting with the following link: https://us02web.zoom.us/j/82469955080. To participate via audio teleconference, join the meeting with the following call-in information: Toll-Free phone no. (888) 475-4499, access code: 824-6995-5080#.

Public comments will be accepted by the Board and should be submitted to Roshelle Chavez, Board Clerk, at rchavez@ttsa.ca.gov, by mail at 13720 Butterfield Drive, Truckee, CA 96161 (the final mail collection before the meeting will be the Tuesday before the meeting at 3:00 p.m.), and via teleconference on any item on the agenda until the close of public comment on the item.

If you wish to make a comment during the teleconference on an item, please use the Zoom meeting controls to "Raise Your Hand" if attending via video teleconference or dial *9 if attending via audio teleconference. All requests to make a comment will be called upon in the order received.

I. **Call to Order, Roll Call, and Pledge of Allegiance**

II. **AB 361 Action** Consider finding by a majority vote under Gov. Code § 54953(e)(3) that a result of the continuing COVID-19 emergency: (i) the board has reconsidered the circumstances of the state of emergency; (ii) renew prior findings that meeting in person would continue to present imminent risks to the health or safety of attendees; and (iii) the authorization for meetings to be held by teleconference pursuant to Gov. Code, § 54953, subd. (e)(1)(C) is renewed.

III. **Public Comment** Discussion items only, no action to be taken. Any person may address the Board at this time upon any subject that is within the jurisdiction of Tahoe-Truckee Sanitation Agency and that does not appear on the agenda. Any matter that requires action may be referred to staff for a report and action at a subsequent Board meeting. Please note there is a five (5) minute limit per person. In addition to or in lieu of public comment, any person may submit a written statement concerning Agency business to be included in the record of proceedings and filed with the meeting minutes. Any such statement must be provided to the recording secretary at the meeting.

IV. **Professional Achievements, Awards and Anniversaries** Acknowledgement of staff for professional achievement and other awards.

V. Consent Agenda Consent Agenda items are routine items that may be approved without discussion. If an item requires discussion, it may be removed from the Consent Agenda prior to action.

1. Ratify payment of general fund warrants.
2. Ratify approval of financial statements.

VI. Regular Agenda

1. Report from January 19, 2022 closed session meeting.
2. Approval of the minutes of the regular Board meeting on January 19, 2022.
3. Presentation of the Master Sewer Plan.
4. Approval to accept the Master Sewer Plan.
5. Approval to award the 2022 Roof Repair project.
6. Approval for the General Manager to negotiate a contract or contracts with a qualified contractor or contractors to perform the 2022 Control Room Upgrades project.
7. Approval to award the Open Channel Flow Metering Devices project.
8. Approval of Resolution No. 1-2022 approving bidding exception and authorizing purchase of used manlift.
9. Report of Cal/OSHA Inspection No. 1545120.
10. Discussion of in-person Board of Directors meeting.

VII. Management Team Report

1. Department Reports.
2. General Manager Report.

VIII. Board of Director Comment Opportunity for directors to ask questions for clarification, make brief announcements and reports, provide information to staff, request staff to report back on a matter, or direct staff to place a matter on a subsequent agenda.

IX. Closed Session

1. Closed session for public employee performance evaluation of the General Manager position.

X. Adjournment

Posted and Mailed, 02/10/22

Roshelle Chavez
Executive Assistant/Board Clerk

In compliance with the Americans with Disabilities Act, if you are a disabled person and you need a disability-related modification or accommodation to participate in this meeting, then please contact Roshelle Chavez at 530-587-2525 or 530-587-5840 (fax) or email rchavez@ttsa.net. Requests must be made as early as possible, and at least one-full business day before the start of the meeting.

Documents and material relating to an open session agenda item that are provided to the T-TSA Board of Directors less than 72 hours prior to a regular meeting will be available for public inspection and copying at the Agency's office located at 13720 Butterfield Drive, Truckee, CA.

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: LaRue Griffin, General Manager

Item: I

Subject: Call to Order, Roll Call, and Pledge of Allegiance

Background

Call to Order, Roll Call, and Pledge of Allegiance.

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: LaRue Griffin, General Manager

Item: II

Subject: AB 361 Action

Background

In light of the Governor Newsom's declaration that a state of emergency exists due to the incidence and spread of the novel coronavirus, and the pandemic caused by the resulting disease COVID-19, the Board of Directors should consider whether meeting in person would present imminent risks to the health or safety of meeting attendees.

The Centers for Disease Control indicates that COVID-19 is a highly transmissible virus that is spread when an infected person breathes out droplets and very small particles that contain the virus, and such droplets and particles are breathed in by other people. The Omicron Variant has emerged and now accounts for the majority of recent COVID-19 cases.

Although effective vaccines and boosters have been approved by the U.S. Food and Drug Administration for use, the vaccination and booster rates are slow and have not yet reached a point to significantly control community transmission. Those who become infected with COVID-19 are at risk of serious illness and death.

Conducting Board meetings by teleconference would directly reduce the risk of transmission among meeting attendees, including members of the public and Agency staff, which has the ancillary effect of reducing risk of serious illness and death as well as reducing community spread of the virus.

If the reauthorization to meet by teleconference is not approved by a majority vote, then the meeting will adjourn after this item and the remaining agenda items will be rescheduled to a future in-person meeting.

Fiscal Impact

None.

Attachments

None.

Recommendation

Management recommends the Board of Directors find that it has reconsidered the state of the COVID-19 emergency, meeting in person continues to present imminent risks to the health or safety of attendees, and the board renews the prior authorization for meetings to be held by teleconference as authorized by subdivision (e)(1)(C) of section 54943 of the Government Code.

Review Tracking

Submitted By: ________________________

LaRue Griffin
General Manager

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: LaRue Griffin, General Manager

Item: III

Subject: Public Comment

Background

Discussion items only, no action to be taken. Any person may address the Board at this time upon any subject that is within the jurisdiction of Tahoe-Truckee Sanitation Agency and that does not appear on the agenda. Any matter that requires action may be referred to staff for a report and action at a subsequent Board meeting. There is a five (5) minute limit per person.

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: Vicky Lufrano, Human Resources Administrator

Item: IV

Subject: Professional Achievements, Awards & Anniversaries

Background
Acknowledgement of staff for professional achievements, awards and anniversaries received the previous calendar month or quarter.

1-Year, 5-Year, 10-Year, 15-Year, 20-Year, Etc. Anniversaries

5 Years
- Daniel Robenko – February 2022

Fiscal Impact
None.

Attachments
None.

Recommendation
No action required.

Review Tracking

Submitted By: ______________________
Vicky Lufrano
Human Resources Administrator

Approved By: ______________________
LaRue Griffin
General Manager

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: Crystal Sublet, Finance and Administrative Manager

Item: V-1

Subject: Ratify payment of general fund warrants

Background

The Agency implemented the Caselle software program, and the report of general fund warrants is attached as prepared by Agency accounting software. It should be noted, payroll summaries are excluded from the general fund warrants and are incorporated into the financial statements.

The Finance Committee reviewed and approved payment of the general fund warrants at its February 7th meeting.

Fiscal Impact

Decrease in Agency funds per the warrant amounts.

Attachments

Report of general fund warrants.

Recommendation

Management and staff recommend the Board Directors ratify payment of the general fund warrants.

Review Tracking

Submitted By: Crystal A Sublet
Crystal Sublet
Finance and Administrative Manager

Approved By:
LaRue Griffin
General Manager

Payee	Check Number	Check Issue Date	Description	Amount	
1000 BULBS					
	88007	01/27/2022	ADVANCE 71A8071-001D 100HPS QUAD BAL	223.05	
Total 1000 BULBS:				223.05	
2G VENTURES INC					
	87961	01/27/2022	SERVICE CHARGE REFUND	51.00	M
Total 2G VENTURES INC:				51.00	
AIRGAS USA LLC					
	88008	01/27/2022	CYLINDER RENTALS	80.04	
	88008	01/27/2022	CYLINDER RENTALS	27.93	
	88008	01/27/2022	CYLINDER RENTALS	52.11	
Total AIRGAS USA LLC:				160.08	
ALESHIRE & WYNDER LLP					
	88009	01/27/2022	DECEMBER 2021 FEES	15,447.94	
Total ALESHIRE & WYNDER LLP:				15,447.94	
ALLIANT INSURANCE SERVICES INC					
	87920	01/13/2022	PUBLIC BOND RENEW WILKINS	100.00	
	87920	01/13/2022	PUBLIC BOND RENEW LEWIS	100.00	
	87920	01/13/2022	PUBLIC BOND RENEW SMELSER	100.00	
	87920	01/13/2022	PUBLIC BOND RENEW TRESAN	100.00	
	87920	01/13/2022	PUBLIC BOND RENEW COX	100.00	
	87920	01/13/2022	PUBLIC BOND RENEW GRIFFIN	788.00	
Total ALLIANT INSURANCE SERVICES INC:				1,288.00	
ALLIED ELECTRONICS					
	87921	01/13/2022	T&B LiquidTight Fittings by ABB LTC050-(100' ROLL)	303.86	
Total ALLIED ELECTRONICS:				303.86	
ALPHA ANALYTICAL INC					
	87922	01/13/2022	4Q21 PRETREATMENT	2,000.00	
	88010	01/27/2022	4Q 2021 BIOSOLIDS	350.00	
	88010	01/27/2022	DECEMBER 2021 BARIUMS	595.00	
Total ALPHA ANALYTICAL INC:				2,945.00	
ANNIE'S CLEANING SERVICE					
	87923	01/13/2022	DECEMBER 2021 JANITORIAL SVC	3,813.33	
Total ANNIE'S CLEANING SERVICE:				3,813.33	
ANTHONY SALINAS					
	87924	01/13/2022	TUITION REMIBURSEMENT	781.25	
Total ANTHONY SALINAS:				781.25	
ARAMARK WORK APPAREL					
	87925	01/13/2022	MATS	168.90	
	87925	01/13/2022	TOWELS	10.26	

Payee	Check Number	Check Issue Date	Description	Amount	
	87925	01/13/2022	SVC CHARGE	10.00	
	87925	01/13/2022	MATS	168.90	
	87925	01/13/2022	TOWELS	10.26	
	87925	01/13/2022	SVC CHARGE	10.00	
Total ARAMARK WORK APPAREL:				378.32	
AUTOSCRIBE INFOMATICS					
	88011	01/27/2022	LIMS Purchase PO	26,497.64	
Total AUTOSCRIBE INFOMATICS:				26,497.64	
AWAXX SYSTEMS INC.					
	88012	01/27/2022	Labor and material to install remote gate release buttons in the office area.	1,050.00	
Total AWAXX SYSTEMS INC.:				1,050.00	
CALCHAMBER; MEMBERSHIP					
	87963	01/27/2022	preferred membership 01/11/22-01/11/23	849.00	M
Total CALCHAMBER; MEMBERSHIP:				849.00	
CALIFORNIA STATE BOARD OF EQUALIZAT					
	1262201	01/26/2022	4TH QTR USE TAX 2021	696.00	M
	1262201	01/26/2022	4TH QTR USE TAX 2021	35.00	M
	1262201	01/26/2022	4TH QTR USE TAX 2021	2.00	M
	1262201	01/26/2022	4TH QTR USE TAX 2021	15.00	M
	1262201	01/26/2022	4TH QTR USE TAX 2021	22.00	M
Total CALIFORNIA STATE BOARD OF EQUALIZAT:				770.00	
CAROLLO					
	88013	01/27/2022	MASTER SEWER PLAN	9,175.75	
Total CAROLLO:				9,175.75	
CASHMAN EQUIPMENT CO.					
	88014	01/27/2022	Annual preventative and repair services per executed agreement. Not to exceed.	5,878.00	
Total CASHMAN EQUIPMENT CO.:				5,878.00	
CDW-G					
	87926	01/13/2022	GOV TECHSMITH SNAGIT	533.70	
	88015	01/27/2022	Samsung 970 EVO Plus 500GB PCIe NVMe M.2 Solid State Drive	86.59	
	88015	01/27/2022	Crucial - DDR4 - kit - 16 GB: 2 x 8 GB - DIMM 288-pin	86.37	
	88015	01/27/2022	Logitech S120 PC Speakers	62.52	
Total CDW-G:				769.18	
CH2M HILL					
	88016	01/27/2022	#32 HEADWORKS IMPROVEMENTS PROJECT	15,231.26	
	88016	01/27/2022	#35 2020 DIGESTION IMPRPOVEMENTS STUDY	13,334.86	
	88016	01/27/2022	#37 SCADA & INFORMATION TECHNOLOGY MASTER PLANNING SERVICES	24,565.22	
Total CH2M HILL:				53,131.34	

Payee	Check Number	Check Issue Date	Description	Amount
CHARD SNYDER & ASSOCIATES				
	87960	01/24/2022	DECEMBER ADMIN FEES	42.00 M
	87960	01/24/2022	DECEMBER ADMIN FEES	17.00 M
	87960	01/24/2022	DECEMBER ADMIN FEES	3.00 M
	87960	01/24/2022	DECEMBER ADMIN FEES	72.00 M
	87960	01/24/2022	DECEMBER ADMIN FEES	30.00 M
	87960	01/24/2022	DECEMBER ADMIN FEES	45.00 M
	87960	01/24/2022	DECEMBER ADMIN FEES	15.00 M
	87960	01/24/2022	DECEMBER ADMIN FEES	9.00 M
	87960	01/24/2022	DECEMBER ADMIN FEES	3.00 M
	1202202	01/20/2022	HRA	93.00 M
	1202202	01/20/2022	HRA	243.92 M
	1202202	01/20/2022	HRA	35.00 M
	1202202	01/20/2022	HRA	15.00 M
	1202202	01/20/2022	HRA	372.50 M
	1202202	01/20/2022	FSA	226.60 M
	1202202	01/20/2022	HRA	304.00 M
	1202202	01/20/2022	HRA	523.50 M
	1202202	01/20/2022	FSA	155.82 M
	1202202	01/20/2022	FSA	55.89 M
	1202202	01/20/2022	HRA	344.85 M
	1202202	01/20/2022	HRA	183.49 M
	1202202	01/20/2022	HRA	74.21 M
	1202202	01/20/2022	FSA	62.00 M
	1202202	01/20/2022	HRA	35.00 M
	1202202	01/20/2022	HRA	364.68 M
	1202202	01/20/2022	FSA	15.00- M
	1202202	01/20/2022	FSA	6.19 M
	1202202	01/20/2022	HRA	1,821.98 M
	1202202	01/20/2022	HRA	83.66 M
	1202202	01/20/2022	HRA	224.99 M
	1202202	01/20/2022	HRA	7.40 M
	1202202	01/20/2022	FSA	35.00 M
	1202202	01/20/2022	FSA	45.00 M
	1202202	01/20/2022	HRA	95.00 M
	1202202	01/20/2022	HRA	177.00 M
	1202202	01/20/2022	HRA	239.66 M
	1202202	01/20/2022	HRA	20.00 M
	1202202	01/20/2022	FSA	598.00 M
	1202202	01/20/2022	HRA	157.90 M
	1202202	01/20/2022	HRA	78.03 M
	1202202	01/20/2022	HRA	150.00 M
	1202202	01/20/2022	HRA	70.00 M
	1202202	01/20/2022	FSA	35.00 M
	1202202	01/20/2022	HRA	286.90 M
	1202202	01/20/2022	HRA	269.35 M
	1202202	01/20/2022	HRA	226.16 M
	1202202	01/20/2022	HRA	1,596.08 M
	1202202	01/20/2022	FSA	50.00 M
	1202202	01/20/2022	HRA	35.00 M
	1202202	01/20/2022	HRA	47.62 M
	1202202	01/20/2022	HRA	35.00 M
	1202202	01/20/2022	HRA	37.99 M
	1262202	01/26/2022	FSA	35.00 M
	1262202	01/26/2022	HRA	174.67 M
	1262202	01/26/2022	HRA	112.82 M
	1262202	01/26/2022	HRA	278.32 M

Payee	Check Number	Check Issue Date	Description	Amount
	1262202	01/26/2022	HRA	27.66 M
	1262202	01/26/2022	FSA	10.80 M
	1262202	01/26/2022	HRA	27.66 M
	1262202	01/26/2022	FSA	4.30 M
	1262202	01/26/2022	HRA	142.16 M
	1262202	01/26/2022	DCA	749.00 M
	1262202	01/26/2022	HRA	86.88 M
	1262202	01/26/2022	FSA	258.73 M
	1262202	01/26/2022	DCA	507.00 M
	1262202	01/26/2022	FSA	35.00- M
	1262202	01/26/2022	HRA	30.00 M
Total CHARD SNYDER & ASSOCIATES:				12,149.37
CLARK PEST CONTROL				
	88017	01/27/2022	JANUARY 2022 SERVICE	281.00
Total CLARK PEST CONTROL:				281.00
CORELOGIC INFORMATION SOLUTIONS, IN				
	87927	01/13/2022	DECEMBER 2021 INVOICE	491.73
Total CORELOGIC INFORMATION SOLUTIONS, IN:				491.73
CRYSTAL SUBLET				
	88018	01/27/2022	JAN 2022 PHONE	18.04
Total CRYSTAL SUBLET:				18.04
CWEA				
	88019	01/27/2022	CERTIFICATION RENEWAL	91.00
Total CWEA:				91.00
DANIEL UNDERWOOD				
	87928	01/13/2022	OIT CERT FEES REIMBURSEMENT	125.00
Total DANIEL UNDERWOOD:				125.00
DATCO SERVICES CORP.				
	87929	01/13/2022	QUARTERLY FEE	263.25
Total DATCO SERVICES CORP.:				263.25
DEPARTMENT OF MOTOR VEHICLES; DMV				
	88020	01/27/2022	Vehicle PTI service fee	10.00
Total DEPARTMENT OF MOTOR VEHICLES; DMV:				10.00
E&M ELECTRIC				
	87930	01/13/2022	Custom Onsite TIA Portal Training Class	8,800.00
	87930	01/13/2022	Custom Onsite TIA Portal Training Class.	4,400.00
	87930	01/13/2022	Onsite Fee	2,500.00
	88021	01/27/2022	Power Supply, PS307,24VDC,5A,GP - (6ES7307-1EA01-0AA0)	709.98
Total E&M ELECTRIC:				16,409.98

Payee	Check Number	Check Issue Date	Description	Amount	
EMPLOYMENT DEVELOPEMENT DEPARTMENT					
	1202201	01/20/2022	4TH QTR BALANCING	64.00	M
	1202201	01/20/2022	4TH QTR BALANCING	27.45	M
	1202201	01/20/2022	4TH QTR BALANCING	9.15	M
	1202201	01/20/2022	4TH QTR BALANCING	146.40	M
	1202201	01/20/2022	4TH QTR BALANCING	27.45	M
	1202201	01/20/2022	4TH QTR BALANCING	64.00	M
	1202201	01/20/2022	4TH QTR BALANCING	36.55	M
	1202201	01/20/2022	4TH QTR BALANCING	27.45	M
	1202201	01/20/2022	4TH QTR BALANCING	9.15	M
Total EMPLOYMENT DEVELOPEMENT DEPARTMENT:				411.60	
FEDERAL EXPRESS CORP.					
	88022	01/27/2022	ADMIN SHPPING CHARGES	60.22	
Total FEDERAL EXPRESS CORP.:				60.22	
FISHER SCIENTIFIC COMPANY					
	87931	01/13/2022	VIAL 40ML AMB BORO 125IN 144CS	425.75	
	87931	01/13/2022	Carbon Standard	145.54	
	87931	01/13/2022	250 ML DISTLG FLASK 4/PK	330.67	
	87931	01/13/2022	CARBON STD INORG 100 PPM	96.96	
	88023	01/27/2022	Iron Standard, 1mg/mL, 1000ppm, Ricca Chemical	59.95	
	88023	01/27/2022	FLT SYRNS MILX33MM	263.65	
Total FISHER SCIENTIFIC COMPANY:				1,322.52	
GARLAND-STURGES COMPANY					
	87932	01/13/2022	2022 EMPLOYEE DISHONESTY BOND	1,431.00	
Total GARLAND-STURGES COMPANY:				1,431.00	
GRAINGER INC., W.W.					
	88024	01/27/2022	16 in Blade Dia. 1/20 HP Guard Mounted Exhaust Fan, 1550 RPM	2,230.15	
	88024	01/27/2022	NASHUA Duct & Repair Tape, Tape Brand Nashua, Series 357, Imperial Tape Len	74.90	
	88024	01/27/2022	DURACELL D Battery: Everyday, Alkaline, 1.5V DC, Procell, 12 PK	8.72	
	88024	01/27/2022	DURACELL AA Battery: Everyday, Alkaline, 1.5V DC, Procell, 24 PK	6.30	
	88024	01/27/2022	DURACELL 9V Battery: Everyday, Alkaline, 9V DC, Procell, 12 PK	27.89	
	88024	01/27/2022	3M Box Sealing Tape, Clear, Acrylic Tape Adhesive, Tape Application Hand	132.77	
	88024	01/27/2022	DAYTON V-Belt: 4L, 4L230, 1 Ribs, 23 in Outside Lg, 1/2 in Top Wd, 5/16 in Thick	2.77	
	88024	01/27/2022	Tape, Duct, 48mm x 55m, 13 mil Thick, mfr# 357	74.89	
	88024	01/27/2022	Battery, D, 1.5 VDC, 24 PK, mfr# PC1300	8.72	
	88024	01/27/2022	Battery, AA, 1.5 VDC, 24 PK, mfr# PC1500BKD	6.30	
	88024	01/27/2022	Battery, 9V, 9 VDC, mfr# PC1604BKD	27.89	
	88024	01/27/2022	Tape, Clear, Acrylic, UNSPSC # 31201517	132.77	
	88024	01/27/2022	Belt, V, Outside Length 23" Top Width 1/2" Thickness 5/16", mfr# 4L230	2.77	
Total GRAINGER INC., W.W.:				2,736.84	
HACH CHEMICAL COMPANY					
	87933	01/13/2022	PH BUFFER SOLUTION 20L KIT	369.13	
	87933	01/13/2022	ALKALINITY 0.500N 10ML PK/16	137.12	
	88025	01/27/2022	Glass sample cell, 25 mm round, 10-20-25 mL marks, pk/6	70.10	
	88025	01/27/2022	Glass Beads	147.76	

Payee	Check Number	Check Issue Date	Description	Amount
Total HACH CHEMICAL COMPANY:				724.11
HUBER TECHNOLOGIES				
	87934	01/13/2022	CONTINUOUS BAGS (21-001279)	408.88
Total HUBER TECHNOLOGIES:				408.88
HUNT & SONS INC.				
	87935	01/13/2022	HEATING FUEL 90%	9,651.42
	87935	01/13/2022	HEATING FUEL 10%	1,072.38
	87935	01/13/2022	UNLEADED GASOLINE	2,038.89
	87935	01/13/2022	ON ROAD DIESEL	2,001.12
Total HUNT & SONS INC.:				14,763.81
IDEXX LABORATORIES INC.				
	87936	01/13/2022	6-Watt Fluorescent UV Lamp	253.65
Total IDEXX LABORATORIES INC.:				253.65
ILEANA VASSILIOU				
	88026	01/27/2022	DECEMBER 2021 TRAINING	514.29
	88026	01/27/2022	DECEMBER 2021 TRAINING	71.43
	88026	01/27/2022	DECEMBER 2021 TRAINING	71.43
	88026	01/27/2022	DECEMBER 2021 TRAINING	657.13
	88026	01/27/2022	DECEMBER 2021 TRAINING	71.43
	88026	01/27/2022	DECEMBER 2021 TRAINING	142.86
	88026	01/27/2022	DECEMBER 2021 TRAINING	71.43
Total ILEANA VASSILIOU:				1,600.00
J.W. WELDING SUPPLY				
	87937	01/13/2022	NITROGEN UN1066 CYLINDER NI300	25.83
	87937	01/13/2022	FUEL SURCHARGE ON HP GAS CYLINDER	7.23
	87937	01/13/2022	HELIUM ULTRA PURE	242.48
	87937	01/13/2022	FUEL SURCHARGE ON HE CYLINDER	.54
	87937	01/13/2022	DEMURRAGE	25.87
Total J.W. WELDING SUPPLY:				301.95
LHOIST NORTH AMERICA				
	87938	01/13/2022	HYDRATED LIME	9,316.63
	87938	01/13/2022	HYDRATED LIME	8,916.94
	88027	01/27/2022	HYDRATED LIME	8,630.53
	88027	01/27/2022	HYDRATED LIME	8,885.20
	88027	01/27/2022	HYDRATED LIME	8,871.05
	88027	01/27/2022	HYDRATED LIME	8,605.77
	88027	01/27/2022	HYDRATED LIME	8,867.51
	88027	01/27/2022	HYDRATED LIME	8,602.23
	88027	01/27/2022	HYDRATED LIME	8,860.44
	88027	01/27/2022	HYDRATED LIME	8,634.07
	88027	01/27/2022	HYDRATED LIME	8,750.70
Total LHOIST NORTH AMERICA:				96,941.07

Payee	Check Number	Check Issue Date	Description	Amount
LIBERTY PROCESS EQUIPMENT INC				
	87939	01/13/2022	CDQ Rotor	2,415.18
Total LIBERTY PROCESS EQUIPMENT INC:				2,415.18
LIBERTY UTILITIES				
	87940	01/13/2022	NOVEMBER 2021 ELECTRIC	22.76
	88028	01/27/2022	ELECTRIC BILL	25.14
	88028	01/27/2022	ELECTRIC BILL	25.14
	88028	01/27/2022	ELECTRIC BILL	23.61
	88028	01/27/2022	ELECTRIC BILL	17.38
Total LIBERTY UTILITIES:				114.03
LIFEWORKS				
	87962	01/27/2022	Annual renewal of employee assistance program (EAP)	2,060.45 M
Total LIFEWORKS:				2,060.45
LINDE GAS AND EQUIP INC				
	88029	01/27/2022	DECEMBER 2021 CYLINDER RENTALS	90.04
Total LINDE GAS AND EQUIP INC:				90.04
MOUNTAIN HARDWARE				
	87941	01/13/2022	SNO SHARK NO BAG	129.88
Total MOUNTAIN HARDWARE:				129.88
MSC INDUSTRIAL SUPPLY				
	87942	01/13/2022	TRIM E850 1 GAL MASTER CHEM CUTTING FLUID	108.10
Total MSC INDUSTRIAL SUPPLY:				108.10
NAPA- SIERRA				
	87943	01/13/2022	20 VGRGNK	269.55
	87943	01/13/2022	LUCAS RED-TACKY GRS	84.32
	87943	01/13/2022	21 IN TRICO ICE BLADE	38.65
	87943	01/13/2022	SKID STEER EQUIPMENT	1,558.69
	88030	01/27/2022	OIL FILTER QTY4, FUEL FILTER QTY 2, AIR FILTER QTY 3	143.31- V
	88030	01/27/2022	OIL FILTER QTY4, FUEL FILTER QTY 2, AIR FILTER QTY 3	143.31
	88030	01/27/2022	STOPLIGHT SWITCH, 17INCH TRICO ICE BLADE	36.97
	88030	01/27/2022	STOPLIGHT SWITCH, 17INCH TRICO ICE BLADE	36.97- V
	88030	01/27/2022	BOOS/PAC	215.41- V
	88030	01/27/2022	BOOS/PAC	215.41
	88030	01/27/2022	BOOSTER PAC	173.20
	88030	01/27/2022	BOOSTER PAC	173.20- V
	88030	01/27/2022	NAPA ENVIROSHIELD CABIN	34.69
	88030	01/27/2022	NAPA ENVIROSHIELD CABIN	34.69- V
	88030	01/27/2022	ENVIROSHIELD CABIN, BATTERY	141.98- V
	88030	01/27/2022	ENVIROSHIELD CABIN, BATTERY	141.98
	88030	01/27/2022	MINIATURE BULB	7.47
	88030	01/27/2022	MINIATURE BULB	7.47- V
	88030	01/27/2022	LAMP	7.91- V
	88030	01/27/2022	LAMP	7.91

Payee	Check Number	Check Issue Date	Description	Amount
Total NAPA- SIERRA:				1,951.21
NORTHSTAR CALIFORNIA				
	88046	01/27/2022	REISSUE COVID RELIEF REFUND	21,219.81 M
Total NORTHSTAR CALIFORNIA:				21,219.81
OFFICE DEPOT				
	87944	01/13/2022	1/2" BINDERS	9.22
	87944	01/13/2022	1" BINDERS	31.83
	87944	01/13/2022	1-1/2" BINDERS	34.32
	87944	01/13/2022	48"X32" YEARLY LAMINATED CALENDAR	25.97
	87944	01/13/2022	GREEN MOUNTAIN DECAF K-CUPS CARTON OF 96	100.80
	87944	01/13/2022	SECURITY COUNTER PEN	2.64
	87944	01/13/2022	MOUSE PAD	16.72
	87944	01/13/2022	LETTER SIZE SHEET PROTECTORS	18.99
	87944	01/13/2022	LETTER MANILLA FILE FOLDERS	17.50
	87944	01/13/2022	7"X8-3/4" MONTHLY PLANNER	43.28
	87944	01/13/2022	Black Toner for HP LaserJet Pro M255dw Color Printer - OD# 6773485	272.31
	87944	01/13/2022	Cyan Toner for HP LaserJet Pro M255dw Color Printer - OD# 6773816	319.94
	87944	01/13/2022	Yellow Toner for HP LaserJet Pro M255dw Color Printer - OD# 6773845	239.96
	87944	01/13/2022	Magenta Toner for HP LaserJet Pro M255dw Color Printer - OD# 6774704	239.96
	87944	01/13/2022	OD PEN MED BLUE - 12PK	14.16
	87944	01/13/2022	OF PEN FINE BLACK - 12PK	19.92
	87944	01/13/2022	OD PEN FINE BLUE - 12PK	9.96
	87944	01/13/2022	OD JUMBO PAPERCLIP	11.99
	87944	01/13/2022	OD BINDER CLIP MEDIUM	8.45
	87944	01/13/2022	OD BINDER CLIP LARGE	3.27
	87944	01/13/2022	GREEN MOUNTAIN COFFEE - COLOMBIAN	46.48
	87944	01/13/2022	GREEN MOUNTAIN COFFEE - DECAFF	47.24
	87944	01/13/2022	DONUT SHOP COFFEE - CLASSIC	48.04
Total OFFICE DEPOT:				1,582.95
PACIFIC OFFICE AUTOMATION				
	87945	01/13/2022	JANUARY 2022 INVOICE	50.77
	88031	01/27/2022	JANUARY 2022 INVOICE	164.82
Total PACIFIC OFFICE AUTOMATION:				215.59
PERS-RETIREMENT				
	1182201	01/18/2022	LOUREY REPLACEMENT BENEFIT FUND	337.32 M
	1282201	01/18/2022	LOUREY REPLACEMENT BENEFIT FUND	337.32 M
	1282201	01/18/2022	LOUREY REPLACEMENT BENEFIT FUND	337.32- V
Total PERS-RETIREMENT:				337.32
PINNACLE TOWERS INC.				
	87946	01/13/2022	JANUARY 2022 TOWER RENTAL	788.41
Total PINNACLE TOWERS INC.:				788.41
PIPE AND PLANT SOLUTIONS INC				
	87959	01/13/2022	RETENTION #1 2020 DIGITAL SCANNING OF SEWER LINE	215.93 M
	87959	01/13/2022	RETENTION #2 2020 DIGITAL SCANNING OF SEWER LINES	1,759.67 M
	87959	01/13/2022	RETENTION #3 2020 DIGITAL SCANNING OF SEWER LINES	2,148.99 M

Payee	Check Number	Check Issue Date	Description	Amount	
Total PIPE AND PLANT SOLUTIONS INC:				4,124.59	
QUADIENT					
	87947	01/13/2022	QUARTERLY METER RENTAL	173.66	
Total QUADIENT:				173.66	
RED WING BUSINESS ADVANTAGE ACCOUNT					
	88032	01/27/2022	BOOTS	202.44	
Total RED WING BUSINESS ADVANTAGE ACCOUNT:				202.44	
REXEL					
	87948	01/13/2022	AB22 HIM A3 POWERFLEX HANDHELD HIM	746.42	
	87948	01/13/2022	SVC CHARGE	11.20	
Total REXEL:				757.62	
ROCKY CANYON RESCUE					
	87967	01/27/2022	Safe Work In Confined Space Class for Trevor Shamblin and Daniel Underwood	500.00	M
Total ROCKY CANYON RESCUE:				500.00	
ROY SMITH COMPANY					
	87949	01/13/2022	LIQUID OXYGEN	4,134.06	
	87965	01/27/2022	LIQUID OXYGEN	3,390.29	M
	88033	01/27/2022	LIQUID OXYGEN	3,492.97	
	88033	01/27/2022	LIQUID OXYGEN	2,549.16	
	88033	01/27/2022	LIQUID OXYGEN	4,646.30	
	88033	01/27/2022	LIQUID OXYGEN	4,463.94	
Total ROY SMITH COMPANY:				22,676.72	
SAFEWAY INC.					
	88034	01/27/2022	DECEMBER 2021 BOARD DAY GROCERIES	158.74	
Total SAFEWAY INC.:				158.74	
SOUTHWEST GAS CORP.					
	87950	01/13/2022	NATURAL GAS 10%	197.45	
	87950	01/13/2022	NATURAL GAS 90%	1,777.12	
	88035	01/27/2022	NATURAL GAS 10%	472.02	
	88035	01/27/2022	NATURAL GAS 90%	4,248.22	
Total SOUTHWEST GAS CORP.:				6,694.81	
TAHOE FOREST HOSP. DIST./TAHOE WORX					
	88036	01/27/2022	EMPLOYEE SCREENING	507.00	
Total TAHOE FOREST HOSP. DIST./TAHOE WORX:				507.00	
TAHOE SUPPLY COMPANY LLC					
	87951	01/13/2022	MULTIFOLD TOWELS	162.63	
Total TAHOE SUPPLY COMPANY LLC:				162.63	

Payee	Check Number	Check Issue Date	Description	Amount	
TAHOE TRUCKEE DISPOSAL					
	87952	01/13/2022	DECEMBER 2021 SLUDGE	4,220.36	
	87952	01/13/2022	DECEMBER 2021 CENTRIFUGE	13,471.92	
Total TAHOE TRUCKEE DISPOSAL:				17,692.28	
TERRYBERRY COMPANY					
	87953	01/13/2022	Employee Anniversary Awards	240.00	
Total TERRYBERRY COMPANY:				240.00	
THATCHER COMPANY OF CA INC					
	87954	01/13/2022	Max 4000 gallons of 5% hydrochloric acid (HCL)	6,667.78	
	87954	01/13/2022	Fuel Surcharge	129.35	
Total THATCHER COMPANY OF CA INC:				6,797.13	
TOWN OF TRUCKEE					
	88037	01/27/2022	Cost share of Town Wide Aerial Mapping	27,758.04	
Total TOWN OF TRUCKEE:				27,758.04	
TRUCKEE FIRE PROTECT DIST					
	88038	01/27/2022	FIRE SUPPRESSION & PROTECTION SVC 7/1/21-6/30/22	246.15	
Total TRUCKEE FIRE PROTECT DIST:				246.15	
T-TIME ENTERPRISES					
	88039	01/27/2022	J321 Black/Gray 2XL w/logo & "D. Underwood" on left chest.	117.13	
Total T-TIME ENTERPRISES:				117.13	
U.S. BANK CARD DIVISION					
	1272201	01/27/2022	AMAZON BIRD, RUBBER SNAKES, SPRINKLER	114.72	M
	1272201	01/27/2022	AMAZON BIRD REPELLER, GORILLA TAPE ETC	97.17	M
	1272201	01/27/2022	AMAZON ORANGE GUARDIAN SAFETY BARRIER FENCE	38.82	M
	1272201	01/27/2022	AMAZON LOCTITE FOAMBOARD ADHESIVE	27.93	M
	1272201	01/27/2022	AMAZON SCARECROWS, OWL, EARTH MAGNETS	256.41	M
	1272201	01/27/2022	AMAZON HEINZ CLEANING VINEGAR QTY 5	74.10	M
	1272201	01/27/2022	AMAZON ACCOUNTING FOR CAPITAL ASSETS BOOK	58.76	M
	1272201	01/27/2022	HARDY DIAGNOSTICS TRYPTIC SOY AGAR	48.56	M
	1272201	01/27/2022	PK SAFETY SUPPLY PYRAMEX RATCHET HARD HAT QTY 10	113.40	M
	1272201	01/27/2022	RED TRUCK TAHOE ENGINEERING LUNCH	44.82	M
	1272201	01/27/2022	MONTHLY VERIZON BILL	73.74	M
	1272201	01/27/2022	MONTHLY VERIZON BILL	150.96	M
	1272201	01/27/2022	MONTHLY VERIZON BILL	36.87	M
	1272201	01/27/2022	MONTHLY VERIZON BILL	331.96	M
	1272201	01/27/2022	MONTHLY VERIZON BILL	36.87	M
	1272201	01/27/2022	ADOBE NOVEMBER BILL	17.99	M
	1272201	01/27/2022	ADOBE DECEMBER BILL	17.99	M
	1272201	01/27/2022	MICROSOFT ONLINE SERVICES	327.10	M
	1272201	01/27/2022	MICROSOFT ONLINE SERVICES	25.00	M
	1272201	01/27/2022	MICROSOFT ONLINE SERVICES	4.00	M
	1272201	01/27/2022	GOOGLE CHROME DEVICE MANAGEMENT	969.33	M
	1272201	01/27/2022	AMAZON WEB DECEMBER BILL	7.31	M
	1272201	01/27/2022	LOG ME IN MONTHLY BILL	84.00	M
	1272201	01/27/2022	RALEYS BOARD DAY GROCERIES	122.80	M

Payee	Check Number	Check Issue Date	Description	Amount	
	1272201	01/27/2022	TWILIO SCADA DATA API SVC	10.00	M
	1272201	01/27/2022	APPLE ROSEVILLE BATTERY FOR IPHONE 8	52.80	M
	1272201	01/27/2022	GFOA ADVERTISE PURCHASING AGENT	150.00	M
	1272201	01/27/2022	ZOOM AUDO CONFERENCE	110.00	M
	1272201	01/27/2022	FILTER BUY MERV 13 PLEATED AIR FILTERS QTY 48	721.20	M
	1272201	01/27/2022	GALLERY COLLECTION CHRISTMAS CARDS	632.46	M
	1272201	01/27/2022	DKF SOLUTIONS VERBAL JUDO ONLINE TRAINING	125.00	M
	1272201	01/27/2022	SUPERBREAKERS SIEMENS POLE CIRCUIT BREAKER	134.40	M
	1272201	01/27/2022	CAL GAS CARBON MONOXIDE 103 LITER	130.25	M
	1272201	01/27/2022	MYSAFETYSIGN-SIGN FOR EYE WASH STATION & SAFETY SHOWER QTY10	127.19	M
	1272201	01/27/2022	FALL PROTECT PROS ADJ BARREL MOUNT SLEEVE	4,152.97	M
	1272201	01/27/2022	MOUNTAIN VALLEY MEATS EMPLOYEE HOLIDAY GIFT QTY 46	2,300.00	M
Total U.S. BANK CARD DIVISION:				11,726.88	
UNIFIRST CORPORATION					
	87955	01/13/2022	UNIFORMS	106.32	
	87955	01/13/2022	UNIFORMS	13.08	
	87955	01/13/2022	UNIFORMS	70.69	
	87955	01/13/2022	UNIFORMS	66.70	
	87955	01/13/2022	UNIFORMS	24.31	
	87955	01/13/2022	UNIFORMS	8.54	
	87955	01/13/2022	UNIFORMS	106.32	
	87955	01/13/2022	UNIFORMS	13.08	
	87955	01/13/2022	UNIFORMS	70.69	
	87955	01/13/2022	UNIFORMS	66.70	
	87955	01/13/2022	UNIFORMS	24.31	
	87955	01/13/2022	UNIFORMS	8.54	
	87955	01/13/2022	UNIFORMS	109.33	
	87955	01/13/2022	UNIFORMS	13.08	
	87955	01/13/2022	UNIFORMS	72.74	
	87955	01/13/2022	UNIFORMS	67.83	
	87955	01/13/2022	UNIFORMS	24.31	
	87955	01/13/2022	UNIFORMS	14.28	
	87955	01/13/2022	UNIFORMS	109.72	
	87955	01/13/2022	UNIFORMS	15.83	
	87955	01/13/2022	UNIFORMS	73.44	
	87955	01/13/2022	UNIFORMS	69.45	
	87955	01/13/2022	UNIFORMS	27.06	
	87955	01/13/2022	UNIFORMS	8.54	
	88040	01/27/2022	UNIFORMS	106.32	
	88040	01/27/2022	UNIFORMS	13.08	
	88040	01/27/2022	UNIFORMS	70.69	
	88040	01/27/2022	UNIFORMS	66.70	
	88040	01/27/2022	UNIFORMS	24.31	
	88040	01/27/2022	UNIFORMS	8.54	
Total UNIFIRST CORPORATION:				1,474.53	
UNITED PARCEL SERVICE, UPS					
	88041	01/27/2022	SHIPPING CHARGES T-TIME	4.30	
Total UNITED PARCEL SERVICE, UPS:				4.30	
UNIVAR USA INC.					
	87956	01/13/2022	METHANOL	15,291.98	
	87956	01/13/2022	METHANOL	15,296.34	

Payee	Check Number	Check Issue Date	Description	Amount
	87956	01/13/2022	METHANOL	13,654.55
	87966	01/27/2022	METHANOL	15,291.98 M
Total UNIVAR USA INC.:				59,534.85
USA BLUE BOOK				
	88042	01/27/2022	Hach phosVer phosphate powder pillows 25 ml 100 pack	123.27
Total USA BLUE BOOK:				123.27
USDA FOREST SERVICE				
	87964	01/27/2022	PAYER CODE 0003342953 SPECIAL USES PERMIT 1/1/22-12/31/22	68.58 M
Total USDA FOREST SERVICE:				68.58
VICKY LUFRANO				
	88043	01/27/2022	JAN 2022 PHONE	18.04
Total VICKY LUFRANO:				18.04
VWR SCIENTIFIC INC				
	87957	01/13/2022	Thermo Scientific 5.ML VIALS 250/PK	215.10
	88044	01/27/2022	LE438 3-in-1 pH Electrode	489.59
	88044	01/27/2022	Grade 1 Qualitative Filter Paper	519.27
Total VWR SCIENTIFIC INC:				1,223.96
WESTERN ENV. TESTING LAB.				
	88045	01/27/2022	12/2/21 BIOSOLIDS	79.00
	88045	01/27/2022	12/6/21 BIOSOLIDS	79.00
	88045	01/27/2022	12/4/21 BIOSOLIDS	79.00
	88045	01/27/2022	12/8/21 BIOSOLIDS	79.00
Total WESTERN ENV. TESTING LAB.:				316.00
Willdan Financial Services				
	87958	01/13/2022	FYE 2020/21 SB 1029 CDIAC REPORT	250.00
Total Willdan Financial Services:				250.00
Grand Totals:				468,870.08

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: Crystal Sublet, Finance and Administrative Manager

Item: V-2

Subject: Ratify approval of financial statements

Background

Attached are the financial statements for the previous calendar month(s); each of which include (1) fund summaries, (2) end of month cash balances, (3) Local Agency Investment Fund (LAIF) statement, and (4) California Employers' Retiree Benefit Trust (CERBT) Fund statement.

Summaries of the expenditure and revenue activity are provided for Fund 10: General Fund; Fund 02: Wastewater Capital Reserve Fund; and Fund 06: Replacement, Rehabilitation and Upgrade Fund.

The end of month Combined Cash Investment table provides the end of month balances for all Agency cash accounts, which reconciles with Agency end of month fund balances.

The LAIF and CERBT statements provide a summary within the account.

The Finance Committee reviewed and approved the financial statements at its February 7th meeting.

Fiscal Impact

None.

Attachments

Report of financial statements.

Recommendation

Management and staff recommend the Board Directors ratify approval of the financial statements.

Review Tracking

Submitted By: ______________________
Crystal Sublet
Finance and Administrative Manager

Approved By: ______________________
LaRue Griffin
General Manager

Tahoe-Truckee Sanitation Agency
Fund 10: General Fund
Fiscal Year 2021 - 2022
Period Ending January 31, 2022

	Budget $	Month $	Month %	YTD $	YTD %	Notes
REVENUE						
Income from Service Charge	13,287,000.00	7,009,513.46	52.8	8,365,445.51	63.0	1,2,3
Tax Revenue - Ad Valorem	3,958,000.00	2,349,440.62	59.4	2,394,420.69	60.5	2,3
Fund Interest	40,000.00	2,918.62	7.3	5,571.12	13.9	3,4
Other Revenue	15,000.00	0.00	0.0	26,191.90	174.6	3,5
Temporary Discharge	25,000.00	0.00	0.0	766.00	3.1	3
TOTAL REVENUE	**17,325,000.00**	**9,361,872.70**	**54.0**	**10,792,395.22**	**62.3**	
EXPENDITURE						
Salaries & Wages	5,599,400.00	442,591.32	7.9	3,215,750.84	57.4	6
Employee Benefits	3,817,000.00	239,295.73	6.3	1,929,253.73	50.5	6
Director Fees	7,600.00	700.00	9.2	4,000.00	52.6	
Vehicle	51,900.00	5,649.35	10.9	19,974.24	38.5	
CSRMA Insurance	375,000.00	2,719.00	0.7	217,947.80	58.1	7
Professional Memberships	44,700.00	1,065.00	2.4	32,680.00	73.1	8
Agency Permits & Licenses	196,000.00	68.58	0.0	187,683.92	95.8	9
Office Expense	455,000.00	65,067.99	14.3	133,779.54	29.4	
Contractual Services	2,204,800.00	351,704.91	16.0	1,210,486.33	54.9	
Professional Services	990,000.00	49,685.06	5.0	266,521.38	26.9	
Conferences & Training	116,500.00	17,925.00	15.4	30,619.84	26.3	
Utilities	1,010,200.00	18,251.92	1.8	469,480.00	46.5	
Supplies, Repairs & Maintenance	1,091,500.00	19,619.23	1.8	305,053.76	27.9	
TOTAL EXPENDITURE	**15,959,600.00**	**1,214,343.09**	**7.6**	**8,023,231.38**	**50.3**	
NET INCOME (LOSS)	**1,365,400.00**			**2,769,163.84**		
Unfunded Accrued Liability	1,044,000.00			1,023,078.00	98.0	10

*58% of the fiscal year has elapsed.
**This is an unaudited status report.

Notes:
1 – TTSA collects the majority of its Sewer Service Charges on the county property tax bills of Placer County, El Dorado County and Nevada County. Placer County and Nevada County Sewer Service Charges are on the Teeter Schedule.
2 – Sewer Service Charges and Property Tax Revenue are net amounts of each County’s billing fees. Teeter Schedule 55% - 1/2022, 40% 5/2022 and 5% 7/2022.
3 – All revenue is accrued at Fiscal Year-End according to accrual-based accounting method and cash basis throughout the year.
4 – Interest on LAIF balances is received and recorded quarterly (10/2021, 1/2022, 4/2022 and 7/2022).
5 – Other Revenue includes rebates, billings and surplus items sold.
6 – Timing difference: Payroll expense is recognized on pay date, except for Fiscal Year-End in which it is accrued according to the accrual-based accounting method. Payroll Fiscal YTD includes yearly vacation payouts.
7 – CSRMA insurance includes annual property insurance. Pooled liability insurance is expected later in the year.
8 – CSDA Membership in the amount of $8,195 paid in October 2021, CASA Annual Membership in the amount of $17,100 paid in December 2021.
9 – Includes State Water Resources Control Board Annual Permit fees $177,120 in December 2021.
10 – CalPERS UAL payment of $1,023,078 was paid in July 2021.

Tahoe-Truckee Sanitation Agency
Fund 02: Wastewater Capital Reserve
Fiscal Year 2021 - 2022
Period Ending January 31, 2022

	Budget $	Month $	Month %	YTD $	YTD %	Notes
REVENUE						
Income from Connection Fees	1,990,000.00	41,549.89	2.1	1,599,228.34	80.4	
Fund Interest	100,000.00	11,326.86	11.3	23,926.28	23.9	
TOTAL REVENUE	**2,090,000.00**	**52,876.75**	**2.1**	**1,623,154.62**	**77.7**	
EXPENDITURE						
Barscreens, Washers, Compactors	2,600,000.00	15,231.26	0.6	2,049,650.31	78.8	4
Digester & Plant Heating Improvements	250,000.00	13,334.86	5.3	85,721.04	34.3	1
Effluent Flow Meter Installation	100,000.00	0.00	0.0	0.00	0.0	2
Manlift	60,000.00	0.00	0.0	0.00	0.0	2
Influent Flow Meter Installation	50,000.00	0.00	0.0	0.00	0.0	2
Operations and Maintenance Carts	25,000.00	0.00	0.0	0.00	0.0	3
Maintenance/IT Shop Improvements	0.00	0.00	0.0	2,728.50	0.0	1
SUBTOTAL EXPENDITURES	**3,085,000.00**	**28,566.12**	**0.9**	**2,138,099.85**	**69.3**	
Allocation of 73.2% of Bond Payment	2,222,810.00	287,947.96	13.0	287,947.96	13.0	
TOTAL EXPENDITURE	**5,307,810.00**	**316,514.08**	**6.0**	**2,426,047.81**	**45.7**	
NET INCOME (LOSS)	**(3,217,810.00)**			**(802,893.19)**		

*58% of the fiscal year has elapsed

Notes:
(1) Project started
(2) Project started; no expenses invoiced
(3) Project not started
(4) Project completed
(5) Project postponed to after FY22
(6) Project cancelled

Tahoe-Truckee Sanitation Agency
Fund 06: Replacement, Rehabilitation and Upgrade
Fiscal Year 2021 - 2022
Period Ending January 31, 2022

EXPENDITURE	Budget $	Month $	Month %	YTD $	YTD %	Notes
Chlorine Scrubber Replacement	1,000,000.00	0.00	0.0	7,156.00	0.7	1
Plant Coating Improvements	500,000.00	535.05	0.1	411,220.51	82.2	1,4
Wasting Pumps Upgrade	350,000.00	0.00	0.0	0.00	0.0	6
Lime System Improvements	150,000.00	0.00	0.0	0.00	0.0	5
Facility Asphalt Sealing	100,000.00	0.00	0.0	97,435.26	97.4	4
Centrifuge Rebuild	50,000.00	0.00	0.0	0.00	0.0	3
SCADA Repeater Replacement	50,000.00	0.00	0.0	0.00	0.0	2
Telephone Upgrade	50,000.00	0.00	0.0	0.00	0.0	2
Arc Flash Study/Breaker Replacement	45,000.00	0.00	0.0	0.00	0.0	2
Filter Press Pump VFD Replacement	45,000.00	0.00	0.0	0.00	0.0	3
IT Server Replacement	40,000.00	0.00	0.0	0.00	0.0	2
Odorous Air VFD Replacement	35,000.00	0.00	0.0	0.00	0.0	3
Cake Discharge VFD Replacement	35,000.00	0.00	0.0	0.00	0.0	3
Polyblend Thickener	35,000.00	0.00	0.0	0.00	0.0	3
VFD Replacements	30,000.00	0.00	0.0	0.00	0.0	2
MPPS VFD	30,000.00	0.00	0.0	0.00	0.0	3
Lab Equipment Replacement	25,000.00	0.00	0.0	0.00	0.0	2
BNR Blower Replacement	25,000.00	0.00	0.0	34,512.03	138.1	4
Portable Welder Replacement	25,000.00	0.00	0.0	0.00	0.0	2
Vehicle Replacement*	0.00	0.00	0.0	9,938.93	0.0	4
Facilities Security System**	0.00	0.00	0.0	36,850.00	0.0	1
Accounting Software Upgrade***	0.00	0.00	0.0	4,680.00	0.0	1
SUBTOTAL EXPENDITURES	**2,620,000.00**	**535.05**	**0.0**	**601,792.73**	**23.0**	
Allocation of 26.8% of Bond Payment	813,816.00	105,423.57	13.0	105,423.57	13.0	
TOTAL EXPENDITURES	**3,433,816.00**	**105,958.62**	**3.1**	**707,216.30**	**20.6**	

*58% of the fiscal year has elapsed

Notes:
(1) Project started
(2) Project started; no expenses invoiced
(3) Project not started
(4) Project completed
(5) Project postponed to after FY22
(6) Project cancelled

*Vehicle Replacement - Unit was budgeted for and expected to be received in FY21; however, the unit was not physically delivered or invoiced until FY22.
**Facilities Security System - Project is in process, was originally budgeted for FY21.
***Accounting Software Upgrade - Addition of Document Management Module.

TAHOE-TRUCKEE SANITATION AGENCY
COMBINED CASH STATEMENT
January 31, 2022

COMBINED CASH ACCOUNTS	
CASH - US BANK CHECKING	896,632.95
CASH - USB SERVICE CHARGE	634,706.33
CASH - US BANK TAX REV	11,557.57
CASH - US BANK WWCRF	50,502.47
CASH - WELLS FARGO PAYROLL	4,217.57
CASH - WELLS FARGO INVESTMENTS	905,037.75
CASH - PETTY CASH	600.00
CASH - L.A.I.F.	39,657,367.37
TOTAL COMBINED CASH	42,160,622.01
CASH ALLOCATED TO OTHER FUNDS	(42,160,622.01)
TOTAL UNALLOCATED CASH	0.00

CASH ALLOCATION RECONCILATION	FUND	January 31, 2022	January 31, 2021
ALLOCATION TO WASTWATER CAPITAL RESERVE FUND	02	18,535,478.58	17,859,331.49
ALLOCATION TO R.R. & UPGRADE FUND	06	9,196,958.99	8,327,945.92
ALLOCATION TO EMERGENCY & CONTINGENCY FUND	07	7,279,436.30	7,257,286.24
ALLOCATION TO GENERAL FUND	10	7,148,748.14	12,753,270.38
TOTAL ALLOCATION TO OTHER FUNDS		42,160,622.01	46,197,834.03
ALLOCATIONS FROM COMBINED CASH FUND - 99		(42,160,622.01)	(46,197,834.03)
ZERO PROOF IF ALLOCATIONS BALANCE		0.00	0.00

California State Treasurer
Fiona Ma, CPA

Local Agency Investment Fund
P.O. Box 942809
Sacramento, CA 94209-0001
(916) 653-3001

February 01, 2022

LAIF Home
PMIA Average Monthly Yields

TAHOE TRUCKEE SANITATION AGENCY

TREASURER
13720 BUTTERFIELD DRIVE
TRUCKEE, CA 96161

Tran Type Definitions

Account Number: 70-31-001

January 2022 Statement

Effective Date	Transaction Date	Tran Type	Confirm Number	Web Confirm Number	Authorized Caller	Amount
1/4/2022	1/4/2022	RW	1693020	1653272	MICHELLE MACKEY	-300,000.00
1/5/2022	1/5/2022	RW	1693074	1653326	MICHELLE MACKEY	-300,000.00
1/14/2022	1/13/2022	QRD	1694631	N/A	SYSTEM	20,829.74
1/14/2022	1/13/2022	RD	1695872	1653804	MICHELLE MACKEY	3,670,000.00
1/14/2022	1/13/2022	RW	1695871	1653803	MICHELLE MACKEY	-400,000.00
1/14/2022	1/13/2022	RW	1695873	1653802	MICHELLE MACKEY	-150,000.00
1/25/2022	1/25/2022	RD	1696490	1656763	MICHELLE MACKEY	4,380,000.00
1/25/2022	1/25/2022	RW	1696491	1656764	MICHELLE MACKEY	-1,000,000.00

Account Summary

Total Deposit:	8,070,829.74	Beginning Balance:	33,736,537.63
Total Withdrawal:	-2,150,000.00	Ending Balance:	39,657,367.37

CalPERS

CERBT and CEPPT Plan Portal - As Of 02/02/2022

Investment Data My Account Profile Documentation/Forms

Investment Allocation

Account: 5084675063 » Tahoe-Truckee Sanitation Agency

Investment Strategy	Unit Price	Number of Units	Balance
CERBT Strategy 1	22.484156	662,665.614	$14,899,477.24
		Total	$14,899,477.24

Download to Excel

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TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: LaRue Griffin, General Manager

Item: VI-1

Subject: Report from January 19, 2022 closed session meeting

Background

At the conclusion of the closed session discussion at the January 19, 2022 Board of Directors meeting, the meeting was adjourned without providing a report from closed session.

There was no action taken during the closed session meeting.

Fiscal Impact

None.

Attachments

None.

Recommendation

Management recommends a report from the January 19, 2022 closed session meeting.

Review Tracking

Submitted By: ______________________

LaRue Griffin
General Manager

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: Roshelle Chavez, Executive Assistant/Board Clerk

Item: VI-2

Subject: Approval of the minutes of the regular Board meeting on January 19, 2022

Background
Draft minutes from previous meeting(s) held are presented to the Board of Directors for review and approval.

Fiscal Impact
None.

Attachments
Minutes of the regular Board meeting on January 19, 2022.

Recommendation
Management and staff recommend approval of the minutes of the regular Board meeting on January 19, 2022.

Review Tracking

Submitted By: ______________________
Roshelle Chavez
Executive Assistant/Board Clerk

Approved By: ______________________
LaRue Griffin
General Manager

BOARD OF DIRECTORS
REGULAR MEETING MINUTES

January 19, 2022

I. Call to Order:

President Wilkins called the regular meeting of the Tahoe-Truckee Sanitation Agency Board of Directors to order at 9:03 AM. The meeting was conducted via videoconference. Roll call and Pledge of Allegiance followed.

Directors Present:	Dan Wilkins, TCPUD Blake Tresan, TSD S. Lane Lewis, NTPUD Dale Cox, OVPSD David Smelser, ASCWD
Staff Present:	LaRue Griffin, General Manager Roshelle Chavez, Executive Assistant/Board Clerk Vicky Lufrano, Human Resources Administrator Crystal Sublet, Finance & Administrative Manager Michael Peak, Operations Manager Jay Parker, Engineering Manager Richard Pallante, Maintenance Manager Richard P. Shanahan, Agency Counsel Paul Shouse, Maintenance Department Dean Haines, Operations Department Greg O'Hair, Operations Department Jason Hays, Operations Department
Public Present:	Jim Redmond, Public

II. AB 361 Action

MOTION by Director Lewis **SECOND** by Director Cox, find under Gov. Code § 54953, subd. (e)(1)(B) that as a result of the COVID-19 emergency: (i) meeting in person would present imminent risks to the health or safety of attendees; and (ii) the meeting is authorized to be held by teleconference pursuant to Gov. Code, § 54953, subd. (e)(1)(C); unanimously approved.

The Board approved the motion by the following roll call vote:

AYES:	Directors Tresan, Lewis, Cox, Smelser, and President Wilkins.
NOES:	None
ABSENT:	None
ABSTAIN:	None

Motion passed.

III. Public Comment.

There was no public comment. No action was taken by the Board.

IV. Professional Achievements, Awards & Anniversaries.

Mrs. Vicky Lufrano acknowledged Agency staff who obtained professional achievements, anniversaries, and safety awards. President Wilkins congratulated staff for their accomplishments, thanked them for a job well done, and for continuing to think about how we can be a better and safer operation for T-TSA.

V. Consent Agenda

1. Ratify payment of general fund warrants.

2. Ratify approval of financial statements.

MOTION by Director Lewis **SECOND** by Director Tresan to approve the consent agenda; unanimously approved.

The Board approved the motion by the following roll call vote:

AYES:	Directors Tresan, Lewis, Cox, Smelser, and President Wilkins.
NOES:	None
ABSENT:	None
ABSTAIN:	None

Motion passed.

VI. Regular Agenda

1. Report from December 15, 2021 closed session meeting.

Mr. LaRue Griffin stated there was nothing to report from the December 15, 2021 closed session meeting.

No action was taken by the Board.

DRAFT

2. Approval of the minutes of the regular Board meeting on December 15, 2021.

MOTION by Director Lewis **SECOND** by Director Smelser to approve the minutes of the regular Board meeting on December 15, 2021; unanimously approved.

The Board approved the motion by the following roll call vote:

AYES:	Directors Tresan, Lewis, Cox, Smelser, and President Wilkins.
NOES:	None
ABSENT:	None
ABSTAIN:	None

Motion passed.

3. Approval of Agency Organizational Chart.

MOTION by Director Smelser **SECOND** by Director Tresan to approve the Agency Organizational Chart; unanimously approved.

The Board approved the motion by the following roll call vote:

AYES:	Directors Tresan, Lewis, Cox, Smelser, and President Wilkins.
NOES:	None
ABSENT:	None
ABSTAIN:	None

Motion passed.

4. Approval of Agency Debt Management Policy.

MOTION by Director Lewis **SECOND** by Director Tresan to approve the Agency Debt Management Policy; unanimously approved.

The Board approved the motion by the following roll call vote:

AYES:	Directors Tresan, Lewis, Cox, Smelser, and President Wilkins.
NOES:	None
ABSENT:	None
ABSTAIN:	None

Motion passed.

5. Approval to solicit bids for the 2022 Plant Coating project.

MOTION by Director Lewis **SECOND** by Director Smelser to solicit bids for the 2022 Plant Coating project; unanimously approved.

DRAFT

The Board approved the motion by the following roll call vote:

AYES:	Directors Tresan, Lewis, Cox, Smelser, and President Wilkins.
NOES:	None
ABSENT:	None
ABSTAIN:	None

Motion passed.

6. Discussion of in-person Board of Directors meeting.

The Board of Directors requested the February 2022 regular Board of Directors meeting be held via videoconference per AB 361.

VII. Management Team Reports

3. Department Reports.

Mr. Peak provided an update on current and past projects for the operations department.

Mr. Pallante provided an update on current and past projects for the maintenance department.

Mr. Parker provided an update on current and past projects for the engineering department.

Mrs. Sublet provided an update on current and past projects for the administration department.

No action was taken by the Board.

4. General Manager Report

Mr. Griffin provided an update on the status of various ongoing projects, none of which required action by the Board.

VIII. Board of Directors Comment

Director Cox thanked Mrs. Chavez for her Zoom navigation assistance to see everyone’s smiling faces at the meeting today. He also thanked President Wilkins for doing such a great job leading the Board meetings. Finally, Director Cox thanked Directors Tresan and Lewis for their efforts on the Finance Committee, and Mrs. Sublet and Mr. Griffin for taking their time explaining Fund Accounts to him.

Director Lewis stated the implementation of the Finance Committee has been excellent. Staff bringing forth information has been helpful in streamlining Board meetings. There will be a lot of work going forward once the Master Sewer Plan is completed and the long term financial planning begins. He also stated that Mrs. Sublet is doing a great job with the Finance Committee. Director Lewis also thanked staff for the detailed tour which helped him learn a lot about the plant.

DRAFT

Director Smelser stated that ASCWD Finance Committee meeting members were paid a stipend for attending their meetings. Mr. Griffin confirmed that T-TSA Finance Committee members receive a stipend as well.

Vice President Tresan expressed a Happy New Year to all staff and to all who were responsible for digging the Agency out of the snow during the storm, as well as getting the remote services back up and running. He thanked them all for a great job.

President Wilkins asked for clarification regarding an email the Board received from a recently retired employee who had experienced problems with his PERS retiree health benefits. Mr. Griffin confirmed that staff was working with the retiree to resolve his concerns.

The Board went into closed session with legal counsel and Mr. Griffin at 10:30 AM.

IX. <u>Closed Session</u>

1. Closed session for public employee performance evaluation of the General Manager.

X. <u>Adjournment</u>

There being no further business, the meeting was adjourned at 10:37 AM.

LaRue Griffin
Secretary to the Board

Approved: ______________________

DRAFT

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: Jay Parker, Engineering Manager

Item: VI-3

Subject: Presentation of the Master Sewer Plan

Background

In 2019, the Board of Directors authorized the Agency to enter into contract with Carollo Engineers, Inc. (Carollo) for preparation of a Master Sewer Plan (Plan). The purpose of the Plan was to perform an evaluation of existing T-TSA facilities to include the Truckee River Interceptor (TRI) and the water reclamation plant (WRP), to assess existing and future regulatory requirements, assess the condition and capacity of existing facilities, estimate future flows and loads, develop and evaluate alternatives for upgrades and improvements to meet future conditions through a 25-year planning cycle, and to recommend a schedule and cost estimates for selected capital improvements accordingly.

The scope of services for the Plan required Carollo to: (1) review background data and information, (2) develop an updated hydraulic model of the TRI, (3) conduct an evaluation of TRI capacities, (4) identify recommendations to mitigate deficiencies identified for the TRI, (5) develop a hydraulic model of the WRP, (6) conduct an evaluation of WRP capacities, (7) develop a biological model of the WRP's liquids and solids treatment plant processes, (8) conduct an evaluation of the WRP operations and treatment processes, (9) identify recommendations to mitigate deficiencies identified for the WRP, (10) develop cost estimates, (11) prepare a final report and presentation to the Board of Directors, and (12) provide various project management tasks.

Carollo recently completed all tasks identified in the scope of work and have finalized the Plan. Representatives from Carollo will be presenting the principal findings of the Plan at the meeting.

Fiscal Impact

As presented in the Master Sewer Plan.

Attachments

Master Sewer Plan (Volumes 1, 2 & 3).

Recommendation

None.

Review Tracking

Submitted By: ______________________
Jay Parker
Engineering Manager

Approved By: ______________________
LaRue Griffin
General Manager

Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 1: EXECUTIVE SUMMARY REPORT

FINAL | February 2022

Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 1:
EXECUTIVE SUMMARY REPORT

FINAL | February 2022

Digitally signed by Timothy J. Loper
Contact Info: Carollo Engineers, Inc.
Date: 2022.02.08 16:31:13-08'00'

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY J. LOPER
No. 70847
CIVIL
STATE OF CALIFORNIA

Contents

Appendices

Tables

Figures

Abbreviations

AA	annual average
ADM	anaerobically digestible material
ADWF	average dry weather flow
Agency	Tahoe-Truckee Sanitation Agency
ASCWD	Alpine Springs County Water District
AWT	advanced wastewater treatment
BFE	base flood elevation
BNR	biological nitrogen removal
BOD	biological oxygen demand
BOD_5	5-day biochemical oxygen demand
BWF	base wastewater flow
C	capacity
Carollo	Carollo Engineers
CCTV	closed-caption television
CIP	capital improvement program/plan
CMMS	computerized maintenance management software/system
CMU	concrete masonry unit
COD	chemical oxygen demand
E&I	electrical and instrumentation
ENR	Engineering News-Record
FOG	fats, oils, grease
GIS	geographical information system
HOF	high occupancy flow
HPOAS	high-purity oxygen activated sludge
HVAC	heating, ventilation, and air conditioning
in	inches
LEL	lower explosive limit
LF	linear feet
LOS	levels of service
Master Plan	Master Sewer Plan
MCC	motor control center
MG	million gallons
mg/L	milligrams per liter
mgd	million gallons per day
MH	manhole
MPPS	multipurpose pump station
MW	maximum week

NCSD	Northstar Community Services District
NFPA	National Fire Protection Association
NPDES	National Pollutant Discharge Elimination System
NTPUD	North Tahoe Public Utility District
O	other
OVPSD	Olympic Valley Public Service District
PLC	programmable logic controller
PO	process optimization
PWWF	peak wet weather flow
R&R/RR	rehabilitation and replacement
RAS	return activated sludge
SAT	soil aquifer treatment
SOP	standard operating procedure
SSMP	Sanitary Sewer Master Plan
SSO	sanitary sewer overflow
TCPUD	Tahoe City Public Utility District
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TP	total phosphorus
TRI	Truckee River Interceptor
TSD	Truckee Sanitary District
TSS	total suspended solids
T-TSA/Agency	Tahoe-Truckee Sanitation Agency
TWAS	thickened waste-activated sludge
UV	ultraviolet
VFD	variable frequency drive
WaPUG	Wastewater Planning Users Group
WAS	waste activated sludge
WASSTRIP	waste activated sludge stripping to remove internal phosphorus
WRP	water reclamation plant

Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 1:
EXECUTIVE SUMMARY REPORT
FREQUENTLY ASKED QUESTIONS (FAQS)

FINAL | February 2022

Delineation of Services

Q: What is Tahoe-Truckee Sanitation Agency (T-TSA's) service area?

A: See Figure 1.1 below.

Q: Who are T-TSA's member districts?

A: T-TSA has five member districts: North Tahoe Public Utility District (NTPUD), Tahoe City Public Utility District (TCPUD), Alpine Springs County Water District (ASCWD), Olympic Valley Public Service District (OVPSD), and Truckee Sanitary District (TSD). (Northstar Community Services District [NCSD] also contributes wastewater to T-TSA, via TSD's sewer collection system, and is not considered a member district, although it is a contributing agency.)

Q: What infrastructure is T-TSA responsible for?

A: T-TSA owns, operates, and maintains the Truckee River Interceptor (TRI) and the Water Reclamation Plant (WRP).

Truckee River Interceptor

Q: Who connects directly to the TRI?

A: T-TSA's five member agencies discharge to the TRI.

Q: How is T-TSA preventing sanitary sewer overflows (SSOs) from the TRI?

A: T-TSA regularly performs digital inspections of the TRI every 3 to 4 years to video the inside of the pipe and note any observable defects. Additionally, as part of this Master Sewer Plan, a hydraulic model was developed, calibrated and various scenarios were run to confirm the hydraulic capacity of the TRI is sufficient to handle current and future peak wastewater flows without overflows. A few deficiencies were noted in this analysis for the projected future flow conditions and recommendations included in the capital improvements plan (CIP) for implementation.

Q: How reliable is the TRI?

A: Based on historic performance and the results of the condition assessment and hydraulic modeling conducted as part of this Master Sewer Plan, the TRI is a highly reliable system. A regular inspection program and implementation of the recommended projects in the CIP will provide for long term reliability of this system.

Q: What is the capacity of the TRI and is it adequate for current and future conditions?

A: The TRI has sufficient capacity to convey current peak wet weather flows (PWWF) of 21.9 million gallons per day (mgd) with a minimum of 2 feet of freeboard from the manhole rims. By 2045, the PWWF is projected to increase to 30 mgd. Similar to the existing system analysis, the TRI generally has sufficient capacity to convey future PWWFs, however there are two stretches of the TRI that do not have sufficient capacity to convey this future flow condition and are therefore included in the CIP.

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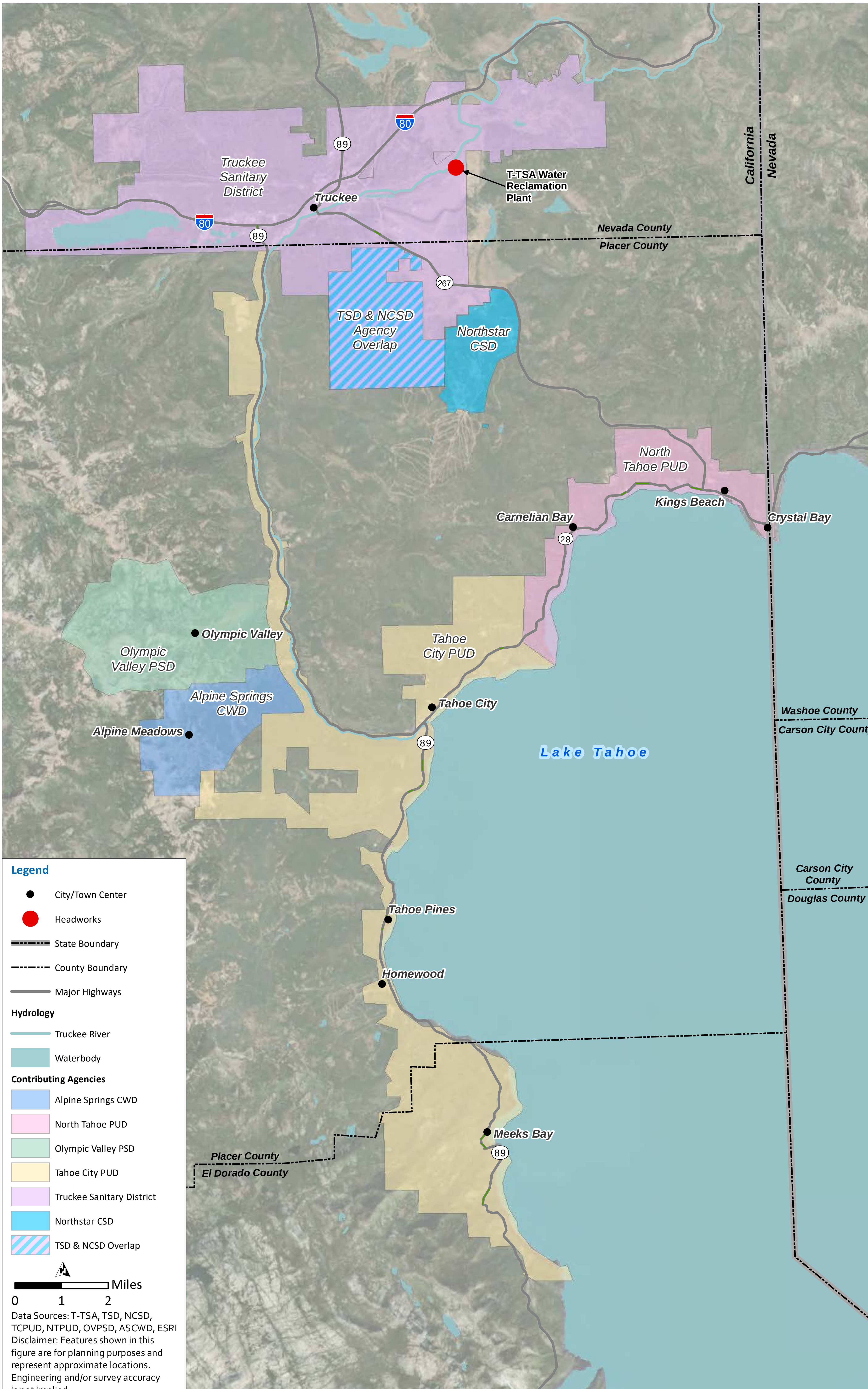

carollo

Figure 1.1 T-TSA Service Area

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Q: What does the Master Sewer Plan/WRP Master Plan (Master Plan) say about the TRI's condition?

A: Multiple sources regarding the TRI's existing condition were reviewed, with the outcome that approximately 0.8 miles (4 percent) of the TRI found no defects, 9.6 miles (49 percent) have minor to moderate defects (grades 1, 2, or 3) and 9.2 miles (47 percent) have significant defects (grades 4 or 5). The majority of the grade 4 and 5 defects were the result of suspected manufacturing defects where pipeline reinforcement is visible. Due to the nature of these defects, Carollo Engineers (Carollo) and the District have reviewed historical inspection data to determine if these defects are degrading over time. Based on this analysis, it was determined that the there is no immediate risk of failure.

Additionally, a benchmark remaining service life analysis was conducted to understand the age of gravity sewers based on pipe material and installation year. The benchmark results forecast that 16.7 miles (85 percent) of the TRI have an estimated remaining service life of 36 years or less. Therefore, an overall TRI Renewal Program is recommended to periodically replace, repair, or line TRI segments. The TRI Truckee River crossings were uniquely reviewed as the consequence of a sewer pipeline failure within the banks of the Truckee River would be extremely high; several crossings are experiencing corrosion issues. For these reasons, three TRI river crossings are recommended to be lined in the near-term (5-year) and mid-term (10-year) planning horizon of the TRI CIP. Furthermore, the CIP includes both a Visible Reinforcement Study to augment T-TSA's ongoing TRI monitoring efforts and a TRI Renewal Program to address sewer infrastructure that is susceptible to failure through rehabilitation and replacement projects.

Q: How will the Master Plan address any concerns related to the TRI's condition and capacity?

A: Any concerns related to the TRI's condition and capacity have been incorporated into the CIP for implementation within the 25 year planning horizon. These include both condition and capacity related projects.

Water Reclamation Plant/Wastewater Treatment

Q: How does T-TSA treat wastewater?

A: T-TSA uses several unit processes to treat influent wastewater. These include primary, secondary, and tertiary treatment. Primary processes are used to remove large solids and grit and include bar screens, vortex grit removal, and primary clarification. Secondary treatment is used to remove organic matter, referred to as biological oxygen demand (BOD) and includes oxygenation basins and secondary clarifiers. Tertiary, or advanced treatment processes are used to remove nutrients, including nitrogen and phosphorus, as well as small particles known as suspended solids, and includes phosphorus stripping, biological nitrogen removal, and granular media filtration processes. Tertiary treated water is then disinfected using chlorine prior to disposal to the disposal fields also known as soil aquifer treatment (SAT). Solids separated from the liquid processes are treated using anaerobic digestion and dewatering prior to hauling to a landfill. Figure 1.2 below provides a process flow diagram for the WRP treatment processes.

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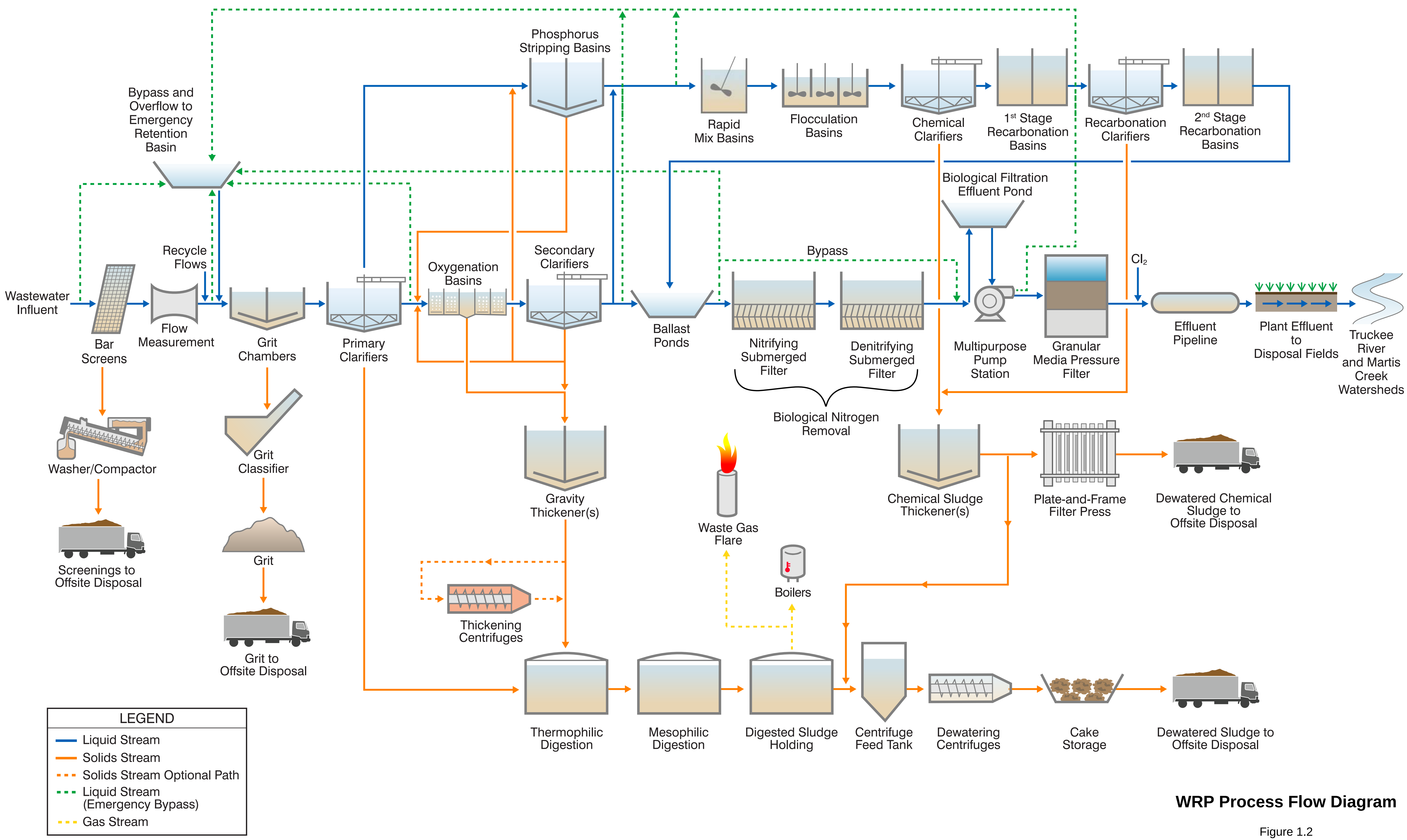

WRP Process Flow Diagram

Figure 1.2

Tahoe-Truckee Sanitation Agency
Master Sewer Plan

carollo

Tahoe-Truckee1221rf2-11384.ai

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Q: What level of treatment does T-TSA provide?

A: The treatment level provided by the WRP is considered tertiary or advanced treatment as it provides a high level of nutrient load and solids reduction prior to disposal.

Q: Does T-TSA plan to treat wastewater differently in the future? Does the Master Plan have any new "cutting edge" treatment processes?

A: Not significantly. The current processes are able to meet the current regulatory requirements under the current and future projected flow and load conditions. However, some projects which look at process optimization are included in the CIP. Additionally, changing the disinfection process from the current use of gaseous chlorine to ultraviolet disinfection or some other form of disinfection to be determined at a later date is included in the CIP.

Q: How much wastewater can T-TSA treat?

A: T-TSA can treat peak instantaneous flows of up to 15.4 mgd although several unit processes are capable of handling much higher flows. Flows in excess of this can be temporarily stored onsite or offsite at the emergency storage ponds to be treated once peak flows subside.

Q: Is there excess/remaining capacity in the treatment process?

A: Yes, the current maximum week summer flow rate is 5.45 mgd (based on 2014-2018 flow data). The projected 2045 maximum week summer flow rate is 8.13 mgd, an increase of approximately 150 percent. Most of the process components have more than 8.13 mgd of process capacity.

Q: Where does the wastewater go once it is treated?

A: The treated effluent is discharged to the effluent disposal fields also known as the soil aquifer treatment located south of the WRP.

Q: Where does T-TSA dispose of the solids separated from the wastewater?

A: T-TSA disposes of its dewatered organic sludge to either Lockwood Regional Landfill in Sparks, Nevada or to Bently Ranch in Minden, Nevada. Dewatered chemical sludge as well as grit and rags are also transported to Lockwood Regional Landfill for disposal.

Q: Will solids disposal change based on the Master Plan?

A: No, this is not anticipated to change.

Q: What happens if the WRP is unable to handle the flow coming to the facility?

A: Flows in excess of the WRP peak instantaneous flow capacity of 15.4 mgd can be temporarily stored onsite or offsite in clay lined emergency storage ponds until the flows can be treated through the plant. The emergency storage facilities have a combined maximum useable storage capacity of approximately 42 million gallons (MG).

Q: Does T-TSA generate any power onsite?

A: Emergency standby generators are available to provide power in case of power outage. However, these generators are not designed or permitted to provide full time power generation. Digester gas is utilized onsite for heating.

Q: What is T-TSA doing to ensure safety of the chlorine gas disinfection system?

A: T-TSA follows stringent safety protocols at its chorine gas storage facility. The facility is fitted with a chlorine scrubber which would prevent any chlorine gas leaks from escaping the building. Additionally alarms and automatic shut-off devices are included at this facility to prevent leaks from the containers. However, T-TSA is replacing the existing scrubber system as part of the CIP.

Master Sewer Plan

Q: What planning period was assumed?

A: This Master Sewer Plan assumed a 25-year planning horizon to 2045.

Q: Does T-TSA have a priority for the infrastructure improvements and what is it based on?

A: Yes, projects were prioritized based on several factors including condition assessment, capacity assessment, and risk. Projects required for meeting future conditions were scheduled for later in the CIP whereas immediate concerns due to condition and imminent risk of failure were prioritized early in the CIP.

Q: How do we know when our infrastructure needs to be replaced?

A: All infrastructure has an anticipated useful service life which varies based on the type of infrastructure. Some infrastructures may degrade more rapidly than anticipated either based on the condition of operation or due to deferred maintenance. Additionally, capacity needs for the systems change as the population of the service area grows and/or regulatory requirements such as those for treatment of the wastewater change. All these factors are considered when determining whether the infrastructure is due for replacement.

Q: How were future flows projected?

A: Volume 2, Chapter 3 summarizes the historical and projected wastewater flows in the TRI to the WRP. Historical flow monitoring data from the years 2014-2018, peaking factors, and future development projects were used to determine the buildout flow projections for the T-TSA. Since T-TSA covers a wide region, its member districts' development plans were included in the flow projections.

Q: Was climate change considered?

A: Although the impacts of climate change were not directly considered, they are related in that they impact the peaking factors used which are based on recent flow monitoring data. The peak flow conditions often occur due to rain-on-snow events which will likely occur more frequently with climate change. The selected design storm for the purposes of this Master Plan is a 10-year, 24-hour design storm.

Q: The Master Plan makes reference to the common storm sizes to plan and design for are in the range of 5 to 25 years. It seems like we have had a number of 100-year storms in recent history. What's the justification for not using these 100-year storms as the selected design storm?

A: A 100-year design storm by definition has a 1 percent chance of occurrence in any given year. Sizing collection systems for 100-year design storms is usually cost prohibitive and not standard industry practice.

Q: Is T-TSA looking at ways of reducing their carbon footprint?

A: Although not specifically within the scope of this Master Sewer Plan, T-TSA continues to look for ways of reducing its carbon footprint. Included in the analysis are plant optimization projects which look to reduce the amount of methanol used at the facility as well as maximizing the onsite use of methane produced by the WRP.

Q: How often does the Master Sewer Plan and CIP get updated?

A: It is recommended that the Master Seer Plan be revisited and updated every 5 to 10 years.

Q: How did you come up with assumptions for growth patterns? COVID19 influx changed things – was that taken into account?

A: Since T-TSA covers a wide region, its member districts' development plans were included in the flow projections. Much of the analysis conducted for this Master Sewer Plan occurred pre-COVID19, therefore the impacts on population were not available. However, given the transient nature of the T-TSA service area, the master plan did consider high occupancy flow (HOF) conditions. Dry weather flows are typically much higher during holiday weekends. Historical flows for holiday weekends (i.e., high occupancy days) were analyzed to determine peak day flows into the TRI. These HOF conditions are still higher than the occupancy conditions seen post-COVID19, but there is now less of a difference between average dry weather flow (ADWF) and HOF conditions.

Q: Does the Master Plan address Regulatory compliance? Will anything need to be changed for T-TSA to remain in compliance with Regulatory agencies?

A: Yes, Volume 3, Chapter 5 – Regulatory Requirements, specifically looks at future regulatory scenarios and their impacts on T-TSA operations.

Q: What future regulatory scenarios were considered?

A: The analysis included in Volume 3, Chapter 5 – Regulatory Requirements, included potential regulatory changes associated with nutrient limits, total dissolved solids, the permitting framework, and emerging contaminants.

Funding/Rates

Q: How are T-TSA's services funded?

A: T-TSA services are funded by the rate payers of its member districts.

Q: How would our rates be affected by the Master Sewer Plan?

A: Typically a rate study would be performed to determine whether the current rates are adequate for funding the CIP. A rate study is outside the scope of the Master Sewer Plan.

Q: How will future improvements be paid for by new and/or existing customers?

A: This is also determined by rate studies. Typically capacity related improvements are covered by connection fees or development fees from new customers while rehabilitation and repair projects are funded by existing customers.

Q: Construction costs appear to be spiraling upwards at an alarming rate due to labor and material shortages on account of COVID. Do the costs included in the 25-year CIP include these recent market conditions?

A: The current CIP cost estimates are in November 2021 dollars. More recent escalations in project costs are not included but can easily be derived using the Engineering News-Record (ENR) cost indices.

General

Q: Where can I get more information?

A: The entire Master Sewer Plan is available for public review.

Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 1:
EXECUTIVE SUMMARY REPORT
CHAPTER 1:
BACKGROUND AND PLANNING PARAMETERS

FINAL | February 2022

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Chapter 1

BACKGROUND AND PLANNING PARAMETERS

The purpose of the Master Plan is to identify system deficiencies and recommend improvements along with planning level cost estimates.

1.1 Introduction

The T-TSA was formed May 1, 1972 to comply with the Porter-Cologne Water Quality Control Act and to provide wastewater treatment to the communities of north and west Lake Tahoe, Truckee, and the communities along the Truckee River corridor. T-TSA owns, operates, and maintains the TRI and regional WRP.

T-TSA is designated as the regional entity to transport, treat, and dispose of wastewater from five member districts: NTPUD, TCPUD, ASCWD, OVPSD, and TSD. (NCSD also contributes wastewater to T-TSA, via TSD's sewer collection system, and is not considered a member district, although it is a contributing agency). Figure 1.1 shows the T-TSA service area.

The Master Plan was initiated in March 2019 to provide a guiding document for T-TSA over the next 25 years. The Master Plan development has been driven by principles and criteria that are consistent with the T-TSA's Mission Statement. This chapter also presents the goals and level of service objectives of the Master Plan, which provides guidance for the Master Plan team to develop recommendations.

The Master Plan is a comprehensive document that assesses all the TRI and the WRP. The Master Plan includes the following:

- An overall vision, with specific goals and objectives to achieve that vision.
- Identification and development of projects, estimated costs, and recommended timing for:
  - Repair and replacement of WRP and TRI infrastructure.
  - New WRP facilities to meet existing and future regulations.
  - Improvements to address wet weather capacity in the TRI.
  - WRP process improvements.
- A recommended CIP and schedule with cash flow requirements for the next 25 years to assist the Agency in developing future budgets and making financial decisions.

Note that the recommended CIP was developed to address needs using available information and engineering analyses performed for the Master Plan. The Master Plan did not investigate financing strategies or rate impacts. As T-TSA moves forward with implementing the CIP over the next 25 years, updates or modifications are expected in response to new information as well as financing constraints.

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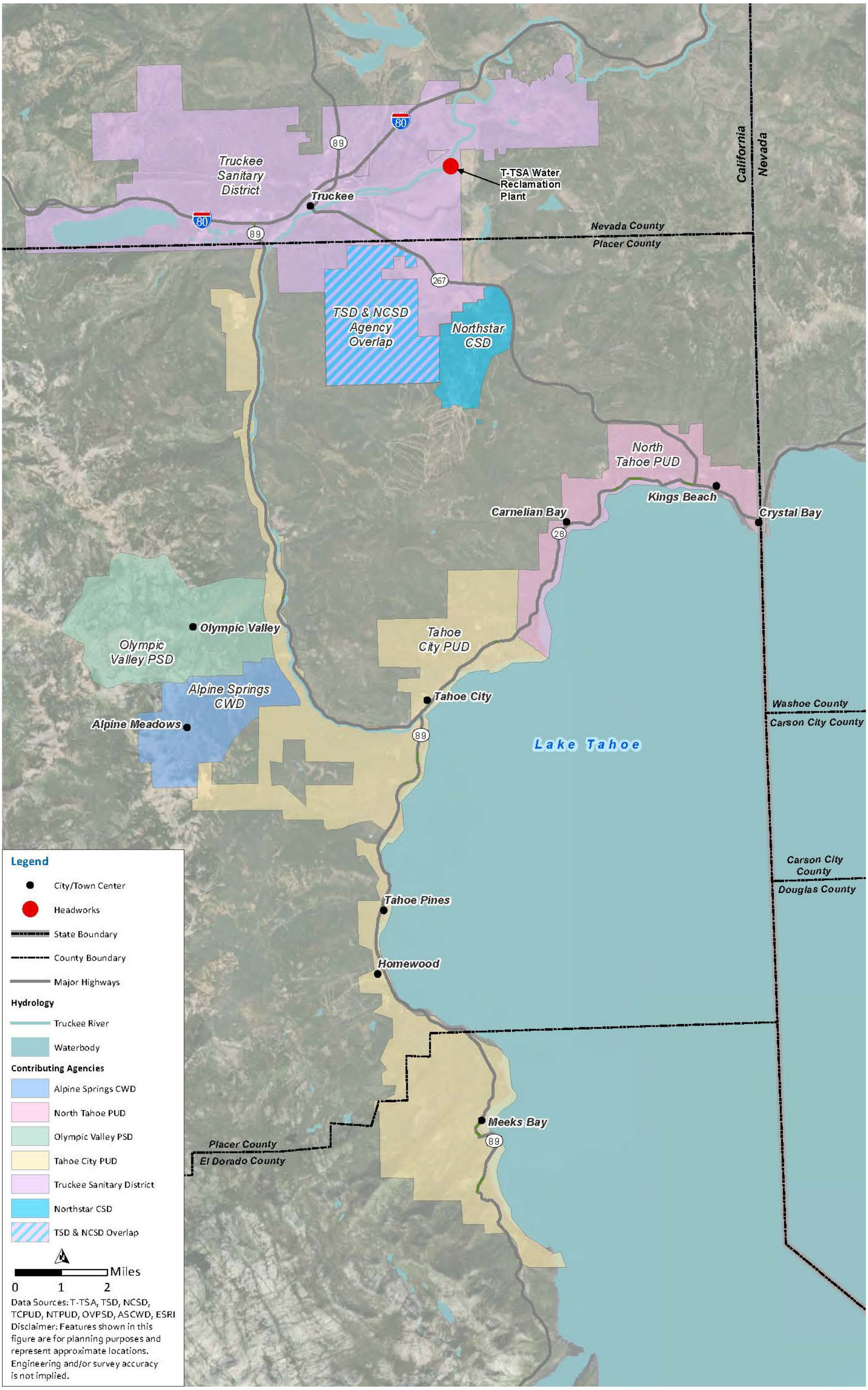

Figure 1.1 T-TSA Service Area

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1.2 T-TSA Vision, Goals, and Objectives

Levels of service (LOS) were developed to guide the analysis and development of the Master Plan and to ensure the Master Plan enables T-TSA to meet its goals and objectives. The LOS are a collection of measures intended to align the decisions related to the capital projects with the values and expectations of the Agency's customers. The LOS are based on regulations, stakeholder values and expectations, and Agency initiatives.

T-TSA's Mission Statement was used to define the following primary goals:

- Operate and maintain the wastewater treatment plant and related facilities in a sound, efficient and effective manner.
- Maintain a workplace that fosters professional growth and job satisfaction.
- Protect its assets and investments through sound financial policies and practices.
- Improve service through long-range planning and the wise use of technology.
- Lead the discussion of strategy development for regional wastewater issues for the benefit of all customers and the environment.

The primary goals were then defined into the LOS goals and implementation strategies. The LOS were developed and reviewed with T-TSA staff and the Board to be consistent with T-TSA's mission statement, and were adopted by the Board in May 2019. Table 1.1 shows the T-TSA's LOS.

Table 1.1 T-TSA LOS

Master Plan Goals	LOS Goals	Master Plan Implementation Strategies
Operate and maintain the wastewater treatment plant and related facilities in a sound, efficient, and effective manner.		
	Operate WRP in full compliance with all federal and state regulatory requirements, with no permit violations	Develop regulatory alternatives that provide direction for evaluating WRP CIP alternatives for reliable permit compliance.
		Plan, size, and recommend facility improvements to maintain functions necessary for regulatory compliance.
		Maintain system reliability during emergency events and develop standard operating procedures (SOPs) to ensure critical systems are back online within prescribed targets after catastrophic events.
		Understand, evaluate, and plan facilities to mitigate the effects of climate change.
	Manage flows to prevent plant loading complications at WRP	Use new WRP Hydraulic Model to assess the flow capacity of the WRP and identify hydraulic bottlenecks and limitations. Recommend CIP improvements to mitigate these hydraulic issues.
		Develop alternatives to provide flow diversion for Glenshire and flow equalization for all raw sewage influent flows.
		Assess load impacts for the anticipated range of scenarios and recommend CIP improvements to alleviate impacts to WRP operations.

Master Plan Goals	LOS Goals	Master Plan Implementation Strategies
	Operate TRI with no SSOs	Continue TRI Inspection Program.
		Assess TRI capacity and predict potential areas of wet weather, condition, or operational related SSOs, and recommend CIP improvements to reduce the risk of SSOs.
		Quantify Infiltration and Inflow, and develop an understanding of its impact, such that critical decisions can be made regarding management of the TRI.
		Operate TRI in accordance with Sanitary Sewer Master Plan (SSMP).
	Operate WRP as efficiently as possible	Evaluate WRP equipment and unit processes for efficiency and provide recommendations for improvements that could improve efficiency.
		Optimize operation of WRP, including the reduction in energy and chemical use, while maintaining regulatory compliance.
		Consider total life cycle costs when evaluating CIP alternatives for implementation.
		Consider the "triple bottom line" when evaluating CIP alternatives for implementation.
Maintain a workplace that fosters professional growth and job satisfaction.		
	Protect employee health and safety	Maintain a safe workplace to mitigate employee health and safety risks through proactive safety programs and training, development of SOPs and updated Operations Manuals.
		Improve safety and redundancy in WRP structures, equipment and unit processes. This including conformance to current codes (such as National Fire Protection Association [NFPA] 820), providing adequate means of isolation for equipment and pipelines, replacing obsolete equipment that could pose hazards, and ensuring that facilities are structurally sound.
		Evaluate alternatives to potentially hazardous processes to address safety concerns.
	Maintain productive and engaged staff	Provide learning and growth opportunities for staff through prescribed training and career development programs.
Protect its assets and investments through sound financial policies and practices.		
	Achieve future rate stability	Use life-cycle cost to help make decisions.
		Develop justifiable cost of service estimates.
		Develop effective CIP prioritization to align with budget limitations.
		Provide adequate reserves to meet long-term financial objectives.
	Be cost efficient and fiscally responsible	Deliver levels of service at the lowest long-term life cycle cost (WRP) and lowest capital cost (TRI), without risk to regulatory compliance, safety, or public health.

Master Plan Goals	LOS Goals	Master Plan ImplementationStrategies
		Minimize chemical expenditure and operational costs, by optimizing process operations and maintenance strategies.
		Consider fiscal optimization when making decisions.
	Implement computerized maintenance management software/system (CMMS) project as part of an ongoing Asset Management program	Use CMMS information to align present and future asset management program needs.
		Use WRP Condition Assessment, WRP Performance and Capacity Assessment, and predictive failure analysis to repair/rehabilitate/retrofit infrastructure in a cost-effective manner.
		Maintain all assets in good condition (i.e., reliable and redundant).
	Update the WRP and TRI CIPs on a regular basis	Incorporate Asset Management Policy for WRP and TRI when updating the CIP.
Improve service through long-range planning and the wise use of technology.		
	Understand Regional Growth to maintain adaptability	Collaborate with contributing agencies to understand long term planning parameters for growth and potential flow impacts.
		Collaborate with County Planning agencies.
		Develop understanding of potable water supply conditions to anticipate potential changes to flow or source water quality.
	Modify the system to adapt to climate change	Design new infrastructure to accommodate regional hydraulic and snowpack melt/runoff within the service life of the assets.
	Maximize long-term resource recovery	Identify recovery options for all resources including: fats, oils, grease (FOG), food waste/anaerobically digestible material (ADM), nutrients, sludge/Class B biosolids, and digester biogas.
Lead the discussion of strategy development for regional wastewater issues for the benefit of all customers and the environment.		
	Protect public health and the environment	Effectively and reliably contain all chemicals with no environmental releases.
		Identify projects that promote environmental stewardship.
		Evaluate and improve the odor control mitigation strategy.
	Be a good neighbor and responsible member of the community	Evaluate emission sources and consider improving to newer technologies.
		Identify projects that improve community relations.
		Participate in interdisciplinary projects where opportunities arise.
		Where possible, coordinate TRI and WRP projects with other agencies to minimize negative customer impacts, share resources, and minimize costs.

Master Plan Goals	LOS Goals	Master Plan Implementation Strategies
		Consider acceptance of hauled and piped septage from member districts.
	Be a regional leader	Create and execute agreements with member districts related to flow and load criteria.
	Provide excellent customer service	Determine how customer research results will be measured, communicated, and acted on.
		Develop and implement public outreach strategy.
	Continue public outreach program	Conduct scheduled tours.
		Participate in education outreach programs.

1.3 Existing Facilities

The nameplate, or permitted capacity of the WRP is defined based on the maximum 7-day flow rate of the plant (9.6 mgd). The original WRP was constructed in 1975 with major process capacity expansions in 1981, 1988, 1990, 1995, and 2003. Wastewater treatment at the WRP consists of screening, grit removal, primary clarification, high-purity oxygen activated sludge (HPOAS) treatment, phosphorus stripping, chemical phosphorus removal, recarbonation, biological nitrogen removal (BNR), granular media filtration, disinfection, and odor control. The final effluent from the WRP is discharged to disposal fields, via sub-surface flow. The effluent water eventually makes its way to the Truckee River and Martis Creek watersheds.

Biological solids operations consist of gravity thickening, anaerobic digestion, centrifuge dewatering, and a plate-and-frame filter press for excess chemical sludge dewatering and backup organic sludge dewatering. Chemical solids operations consist of gravity thickening, centrifuge dewatering, and a plate-and-frame filter press for excess chemical sludge dewatering and backup organic sludge dewatering. Dewatered organic sludge is transported by truck to either Lockwood Regional Landfill (owned by Waste Management) in Sparks, Nevada where it is disposed of, or to Bently Ranch in Minden, Nevada, where it is composted. Dewatered chemical sludge as well as grit and rags are also transported by truck to Lockwood Regional Landfill for disposal. All solids are hauled by a contractor.

Figure 1.2 shows a site plan of the existing WRP, and Figure 1.3 depicts the WRP treatment process flow diagram.

The TRI conveys wastewater by gravity flow from the north and west Lake Tahoe region beginning in Tahoe City following the Truckee River, and ultimately to the WRP. Wastewater from the member districts enters the TRI at various manholes; T-TSA does not allow direct customer sewer connections to the TRI. Since the majority of the TRI follows the Truckee River, much of it is located in a flood plain and the TRI crosses the Truckee River a number of times. The interceptor system consists of the TRI and its associated appurtenances, including 19.5 miles of gravity interceptor system pipe (varying in diameter from 18 to 42 inches), and 181 manholes. Figure 1.4 shows the existing T-TSA interceptor system.

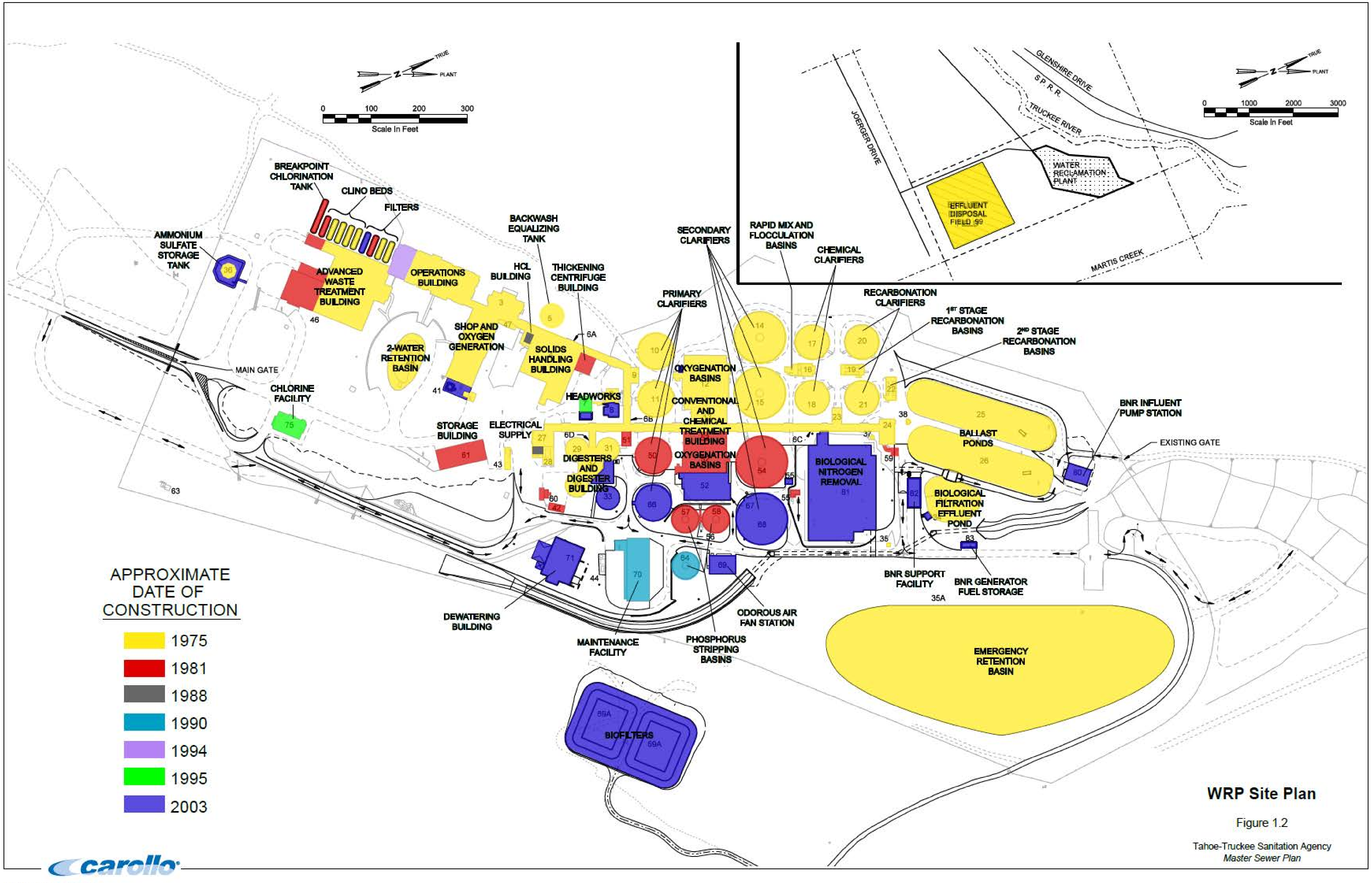

Figure 1.2 WRP Site Plan

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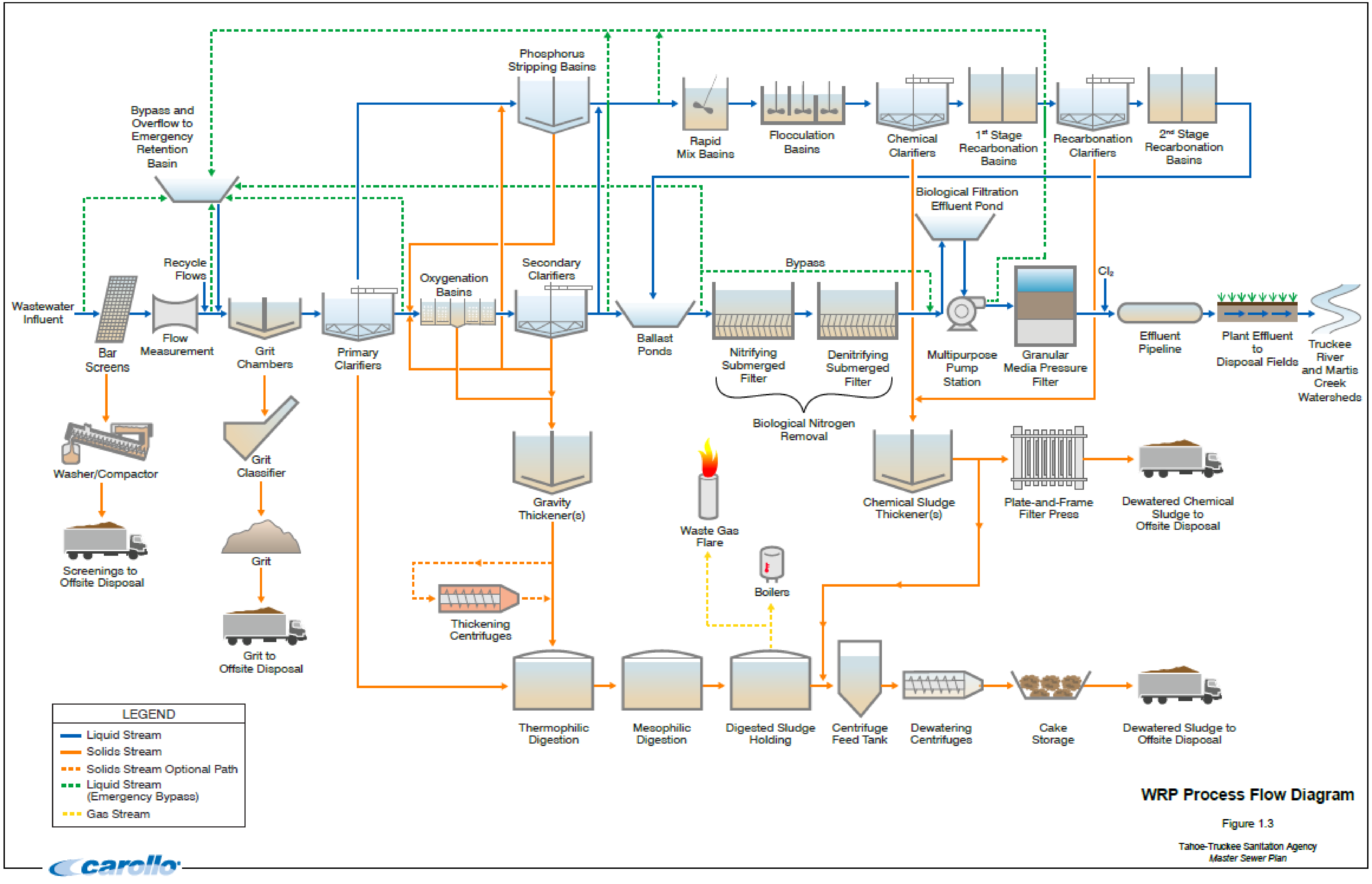

Figure 1.3 WRP Process Flow Diagram

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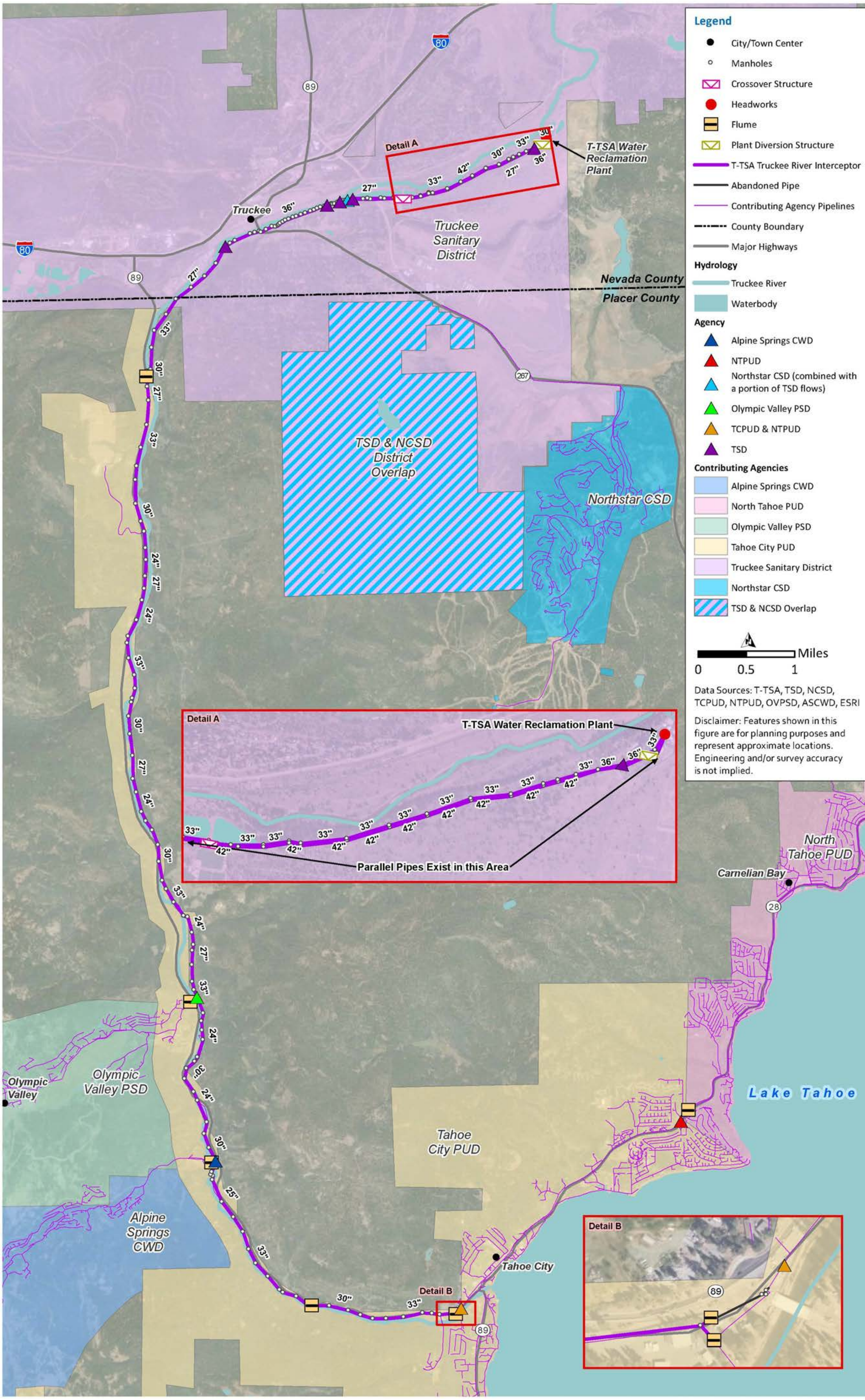

Figure 1.4 Existing Truckee River Interceptor System

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1.4 Existing and Projected Flows and Loads

Historical flow rates, peaking factors, nutrient concentrations, and the organic strength of the wastewater for several different conditions were evaluated and summarized. Based on the anticipated future land use and associated population in the service area, flow and load projections were developed for T-TSA over a 25-year planning horizon to year 2045. The flow and load projections were used to identify which facilities at the TRI and WRP need to be expanded or upgraded during the 25-year planning period of the Master Plan.

Table 1.2 summarizes the existing and future dry and PWWF for the T-TSA. As shown in Table 1.2, the ADWF is projected to increase by 49 percent to 6.30 mgd by 2045, the HOF is projected to increase approximately 52 percent to 9.77 mgd by year 2045, and the PWWF is projected to increase by 37 percent to 29.99 by year 2045.

Table 1.2 Existing and Future Flow Summary

Flow Condition	Existing	2045
Base Wastewater Flow (BWF) (mgd)	3.34	5.11
ADWF (mgd)	4.22	6.30
HOF (mgd)	6.44	9.77
PWWF (mgd)	21.87	29.99
PWWF/HOF PF	3.40	3.07

The organic loads to the WRP are also expected to increase by 53 percent.

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 1: EXECUTIVE SUMMARY REPORT
CHAPTER 2: COLLECTION SYSTEM

FINAL | February 2022

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Chapter 2

COLLECTION SYSTEM

2.1 Introduction

This chapter is an executive summary of the TRI Master Plan prepared for T-TSA. Included is a brief summary of the content, key findings, and recommendations from each chapter of the Master Plan. For more information, the reader is directed to the individual chapters. The Master Plan was developed as part of a wastewater master planning process. The TRI Master Plan is Volume 2 of the overall Master Plan, which is a comprehensive plan for all Agency assets including the TRI and the WRP. The wastewater Master Plan is organized as shown below.

- Volume 1 – Executive Summary Report.
- Volume 2 – Collection System Master Plan.
- Volume 3 – Water Reclamation Plant Master Plan.

The planning period for this Master Plan is 25 years, ending in 2045.

2.2 Existing Facilities and Condition Assessment

Volume 2, Chapter 1 provides an overview of T-TSA's collection system and TRI, and a detailed description of the associated facilities. The interceptor system consists of the TRI and its associated appurtenances, including 19.5 miles of gravity interceptor system pipe (varying in diameter from 18 to 42 inches), and 181 manholes. T-TSA is designated as the regional entity to transport, treat, and dispose of wastewater from five member districts: NTPUD, TCPUD, ASCWD, OVPSD, and TSD. (NCSD also contributes wastewater to T-TSA, via TSD's sewer collection system, and is not considered a member district, although it is a contributing agency).

Figure 2.1 shows the existing T-TSA interceptor system.

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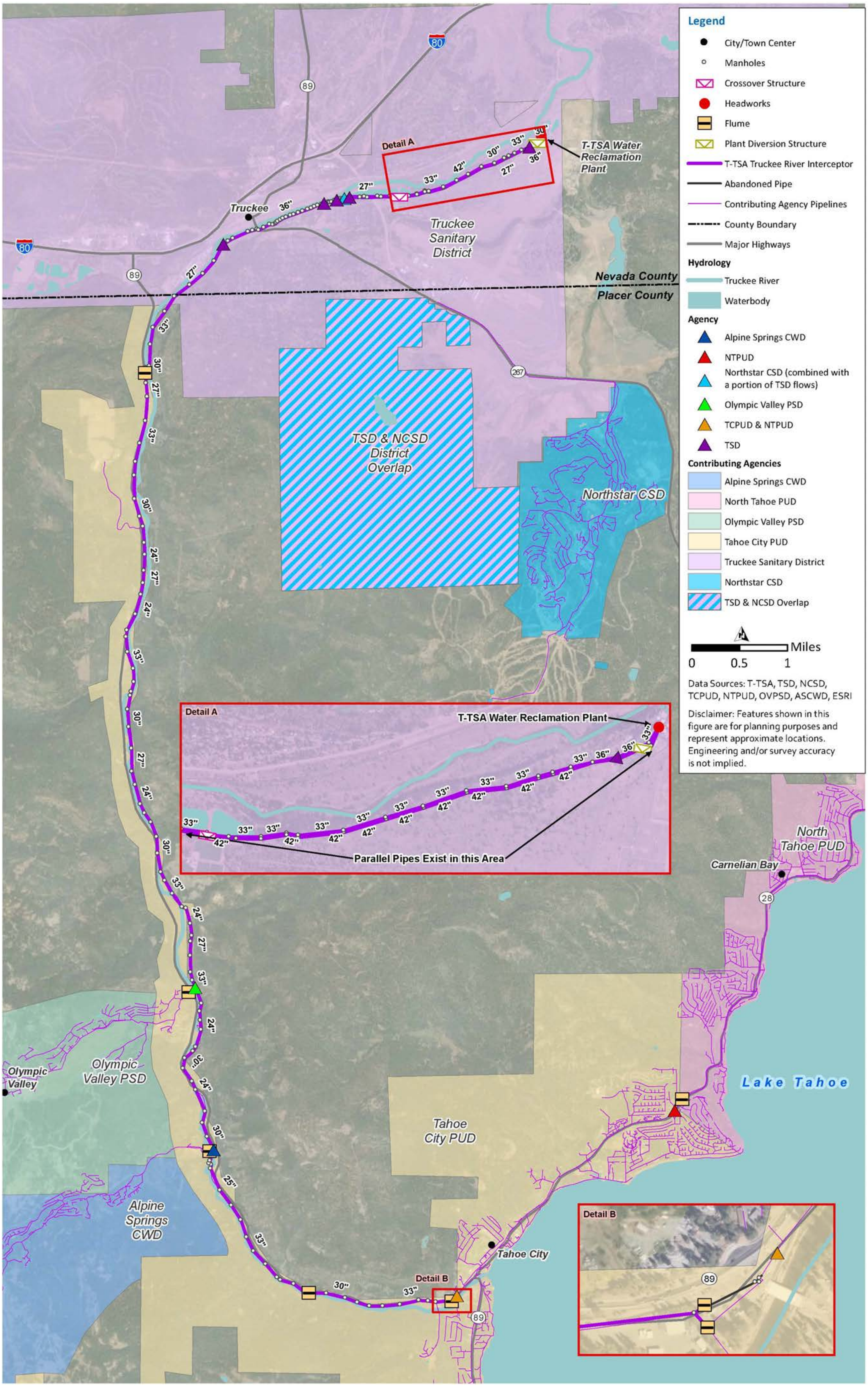

Figure 2.1 Existing Truckee River Interceptor System

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Volume 2, Chapter 2 includes a description of the condition assessment performed on the TRI and recommendations related to anticipated rehabilitation and replacement projects. The key findings and recommendations are:

- Carollo collected and reviewed T-TSA data related to the TRI, including a geographical information system (GIS) database, T-TSA's digital scans inspection data, maintenance tables, and Agency staff input.
- A central database based on TRI maintenance tables was developed to provide a single view of the TRI's condition. The developed central database utilizes individual observations and defect coding to determine the condition of each pipeline. Several "surface reinforcement visible" defects were found throughout the TRI; however Carollo's review of these locations showed no significant change in pipe condition since its inception, which was verified by conversations with Agency staff. Therefore, a prudent approach is to review pipelines with such defects, and then determine the appropriate plan to address these defects.
- TRI Truckee River crossings were uniquely reviewed as the consequence of a sewer pipeline failure within the banks of the Truckee River would be extremely high; several crossings are experiencing corrosion issues. For these reasons, three TRI river crossings are recommended to be lined in the near-term (5-year) and mid-term (10-year) planning horizon of the TRI CIP.
- A benchmark remaining service life analysis was conducted to understand the age of gravity sewers based on pipe material and installation year. The benchmark results forecast that 16.7 miles (85 percent) of the TRI have an estimated remaining service life of 36 years or less. Therefore, an overall TRI Renewal Program is recommended to periodically replace, repair, or line TRI segments.

2.3 Wastewater Flows

Volume 2, Chapter 3 summarizes the historical and projected wastewater flows in the TRI to the WRP. Historical flow monitoring data from the years 2014-2018, peaking factors, and future development projects were used to determine the buildout flow projections for the T-TSA. Since T-TSA covers a wide region, its member districts' development plans were included in the flow projections. A discussion about the design storm characteristics and main components of wastewater flow within the collection system is also provided. The key findings and recommendations are:

- The selected design storm for the purposes of this Master Plan is a 10-year, 24-hour design storm.
- The T-TSA area's current ADWF is 4.22 mgd, and is projected to increase to approximately 6.30 mgd over the 25-year planning horizon.
- Given the transient nature of the T-TSA service area, dry weather flows are typically much higher during holiday weekends. Historical flows for holiday weekends (i.e., high occupancy days) were analyzed to determine peak day flows into the TRI. The current HOF is approximately 6.44 mgd, and the HOF is projected to increase to 9.77 mgd over the planning period.
- The T-TSA area's current PWWF is estimated to be roughly 21.8 mgd. This is projected to increase to approximately 30 mgd over the 25-year planning period.

2.4 Hydraulic Model Development and Calibration

Volume 2, Chapter 4 describes the development and calibration of the T-TSA's collection system hydraulic model. A description of the T-TSA's previous hydraulic model, the advantages of the newer modeling software being used for the Master Plan, and an outline of the steps used to build the model are provided. A detailed summary of the hydraulic model calibration steps, standards, and results for both dry weather and wet weather conditions is also provided. The key findings and recommendations are:

- InfoSWMMM by Innovyze was used to assemble T-TSA's hydraulic model.
- The hydraulic model was calibrated for both dry weather and wet weather flow conditions based on the data obtained during the flow monitoring program, which occurred from 2014 to 2018.
- The results of the dry and wet weather flow calibration process were compared against the recommendation on model verification contained in the "Code of Practice for the Hydraulic Modeling of Sewer Systems" published by Wastewater Planning Users Group (WaPUG) (WaPUG 2002).
- The calibration results indicated that the model predicts conditions similar to those observed in the field for both dry and wet weather conditions.
- The model provides an accurate representation of T-TSA's collection system to a level suitable for this Master Plan and for T-TSA's future hydraulic modeling needs.

2.5 Collection System Capacity Evaluation

Volume 2, Chapter 5 summarizes the hydraulic evaluation of the TRI and associated facilities. Included is a discussion of the evaluation criteria used for the analysis of the collection system capacity. The capacity of the T-TSA's collection system facilities were evaluated for both existing and future peak flow conditions against the planning criteria established in this chapter. The key findings and recommendations are:

- The TRI has sufficient capacity to convey current PWWF without exceeding the established flow depth criterion.
- The future system evaluation verifies that the existing system improvements were appropriately sized to convey future PWWFs, and also identifies the locations of existing sewers that are inadequately sized to convey future PWWFs. The TRI generally has sufficient capacity to convey future PWWF without exceeding the established flow depth criteria, however there were two gravity main sections that were flagged as deficient.

2.6 TRI CIP Recommendations

Volume 2, Chapter 6 describes the TRI CIP recommendations in detail. Volume 2, Chapter 7 summarizes the TRI CIP recommendations, including a list of TRI projects and recommended phasing for these projects. Based on the assessments and evaluations performed as part of this master planning effort a total of seven projects were identified. These TRI improvements address aging infrastructure and future capacity needs, as well as a study related to visible reinforcement in TRI segments.

Projects were separated into three categories based on the type of improvements: capacity (C), rehabilitation and replacement (RR), and other (O). These projects were grouped into five phases as shown below:

- Phase 1: Years 2022 through 2026.
- Phase 2: Years 2027 through 2031.
- Phase 3: Years 2032 through 2036.
- Phase 4: Years 2037 through 2041.
- Phase 5: Years 2042 through 2046.

Table 2.1 summarizes the recommended CIP projects and project phasing grouped by type of improvement.

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Table 2.1 25-Year TRI CIP

Project ID	Project Name	Type of Improvement	Proposed Quantity (linear feet [LF])	Existing Size (inches [in])	Proposed Size (in)	Direct Unit Cost ($/LF)	Total Project Cost	Phase 1					Phase 2 2027-31	Phase 3 2032-36	Phase 4 2037-41	Phase 5 2042-46
								2022	2023	2024	2025	2026				
Capacity Improvements																
C-1	Gravity Main between manhole (MH) 57 and MH 62	Replace	4,290	24/27	30	$760	$7,180,000	$0	$0	$0	$0	$0	$0	$7,180,000	$0	$0
C-2	Gravity Main between MH 71 and MH 72	Replace	990	24	30	$760	$1,660,000	$0	$0	$0	$0	$0	$0	$0	$1,660,000	$0
Condition Assessment Improvements																
RR-1	River Crossing, Gravity Main between MH 33 and MH 35	Line	1,380	24	24	$830	$2,520,000	$252,000	$454,000	$1,814,000	$0	$0	$0	$0	$0	$0
RR-2	River Crossing, Gravity Main between MH 65 and MH 66	Line	220	30	30	$1,030	$500,000	$0	$0	$0	$50,000	$90,000	$360,000	$0	$0	$0
RR-3	River Crossing, Gravity Main between MH 88 and MH 89	Line	220	30	30	$1,030	$500,000	$0	$0	$0	$50,000	$90,000	$360,000	$0	$0	$0
RR-4	TRI Renewal Program	Line/Replace	Varies	Varies	Varies	Varies	$16,350,000	$0	$0	$0	$0	$0	$4,087,500	$4,087,500	$4,087,500	$4,087,500
Other Improvements																
O-1	Visible Reinforcement Study	--	--	--	--	--	$170,000	$105,000	$0	$0	$0	$0	$65,000	$0	$0	$0
Total CIP Cost						--	$28,875,000	$357,000	$454,000	$1,814,000	$100,000	$180,000	$4,872,500	$11,267,500	$5,747,500	$4,087,500
Estimated CIP Annual Cost						--	$1,155,000	$357,000	$454,000	$1,814,000	$100,000	$180,000	$974,500	$2,254,000	$1,150,000	$818,000

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 1:
EXECUTIVE SUMMARY REPORT
CHAPTER 3:
WATER RECLAMATION PLANT

FINAL | February 2022

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Chapter 3

WATER RECLAMATION PLANT

3.1 Introduction

This chapter provides an executive summary of the WRP Master Plan prepared for T-TSA. Included is a brief summary of the content, key findings, and recommendations from each chapter of the Master Plan. For more information, the reader is directed to the individual chapters. The Master Plan was developed as part of a wastewater master planning process. The WRP Master Plan is Volume 3 of the Master Plan, which is a comprehensive plan for all Agency assets including the collection system and the WRP. The Master Plan is organized as shown below.

- Volume 1 – Executive Summary Report.
- Volume 2 – Collection System Master Plan.
- Volume 3 – WRP Master Plan.

The planning period for this Master Plan is 25 years, ending in 2045.

3.2 Description of Existing Facilities

Volume 3, Chapter 1 provides an overview of T-TSA's WRP, and a detailed description of the facilities. The original plant was constructed in 1975 with major process capacity expansions in 1981, 1988, 1990, 1995, and 2003.

The WRP provides advanced treatment of all wastewater flows collected within the T-TSA service area. Wastewater treatment consists of screening, grit removal, primary clarification, HPOAS treatment, phosphorus stripping, chemical phosphorus removal, recarbonation, BNR, granular media filtration, disinfection, and odor control. The final effluent from the WRP is discharged to disposal fields, via sub-surface flow. The effluent water eventually makes its way to the Truckee River and Martis Creek watersheds, which are monitored.

Biological solids operations consist of gravity thickening, anaerobic digestion, centrifuge dewatering, and a plate-and-frame filter press for backup dewatering. Chemical solids operations consist of gravity thickening, centrifuge dewatering, and a plate-and-frame filter press for excess chemical sludge and backup organic sludge dewatering. Dewatered organic sludge is transported by truck to either Lockwood Regional Landfill (owned by Waste Management) in Sparks, Nevada where it is disposed of, or to Bently Ranch in Minden, Nevada, where it is composted. Dewatered chemical sludge as well as grit and rags are also transported by truck to Lockwood Regional Landfill for disposal. All solids are hauled by a contractor.

3.3 Flows and Loads

Volume 3, Chapter 2 summarizes the historical and projected future influent flows and loads to the WRP. The nameplate or permitted capacity of the WRP is defined based on the maximum 7-day dry weather (June 21 through September 21) flow rate of the plant (9.6 mgd). The permitted maximum instantaneous flow rate through the WRP is 15.4 mgd.

Historical flow rates, peaking factors, nutrient concentrations, and the organic strength of the wastewater for several different conditions were evaluated and summarized. Based on the anticipated future land use and associated population in the service area, flow and load projections were developed. The flow and load projections were used to identify which facilities at the WRP need to be expanded or upgraded during the 25-year planning period of the Master Plan. The key findings and recommendations are:

- The current ADWF is approximately 4.22 mgd and the HOF is approximately 6.44 mgd. As the population in the service area increases over the 25-year planning period, the ADWF is projected to increase by 49 percent to 6.30 mgd, and the HOF is projected to increase to 9.77 mgd.
- The organic loads to the WRP are also expected to increase by 53 percent.
- Based on collection system hydraulic modeling, the current PWWF to the WRP is estimated to be 21.87 mgd during a 10-year 24-hour design storm event. The PWWF to the WRP is estimated to increase to 29.99 mgd over the 25-year planning period of the Master Sewer Plan.
- The WRP is operating at higher peak flows and loads than anticipated in 2003.
- The current wastewater strength during annual average (AA) flow conditions is:
  - Total Suspended Solids (TSS) = 189 milligrams per liter (mg/L).
  - Chemical Oxygen Demand (COD) = 542 mg/L.
  - 5-Day Biochemical Oxygen Demand (BOD_5) = 265 mg/L.
  - Total Kjeldahl Nitrogen (TKN) = 53 mg/L.
  - Total Phosphorus (TP) = 5.6 mg/L.

3.4 Existing Facilities and Condition Assessment

Volume 3, Chapter 3 provides an overview of T-TSA's WRP, a description of the existing facilities, and a summary of the condition assessment performed on the WRP on April 21 to 23, 2019. The oldest parts of the WRP date back to 1975 when the plant was first constructed. A number of plant facilities remain from the original construction over 45 years ago. The following list of major plant upgrades and expansions have occurred since the plant was built:

- 1981 – Regional WRP Expansion.
- 1988 – WRP Improvements.
- 1990 – Phosphorus Stripper and Maintenance Facility.
- 1995 – Chlorine Building and Headworks Building Additions.
- 2003 – Expansion of WRP.

Figure 3.1 is a site plan of the existing WRP, which illustrates how the plant has expanded over the decades.

The intent of the visual condition assessment was to identify and prioritize repair and replacement needs for aging facilities and mitigate potential risks of failure. The assessment was based on observations from the assessment team, input from T-TSA staff, and a review of equipment data. Results from the assessment were incorporated into the 25-year CIP.

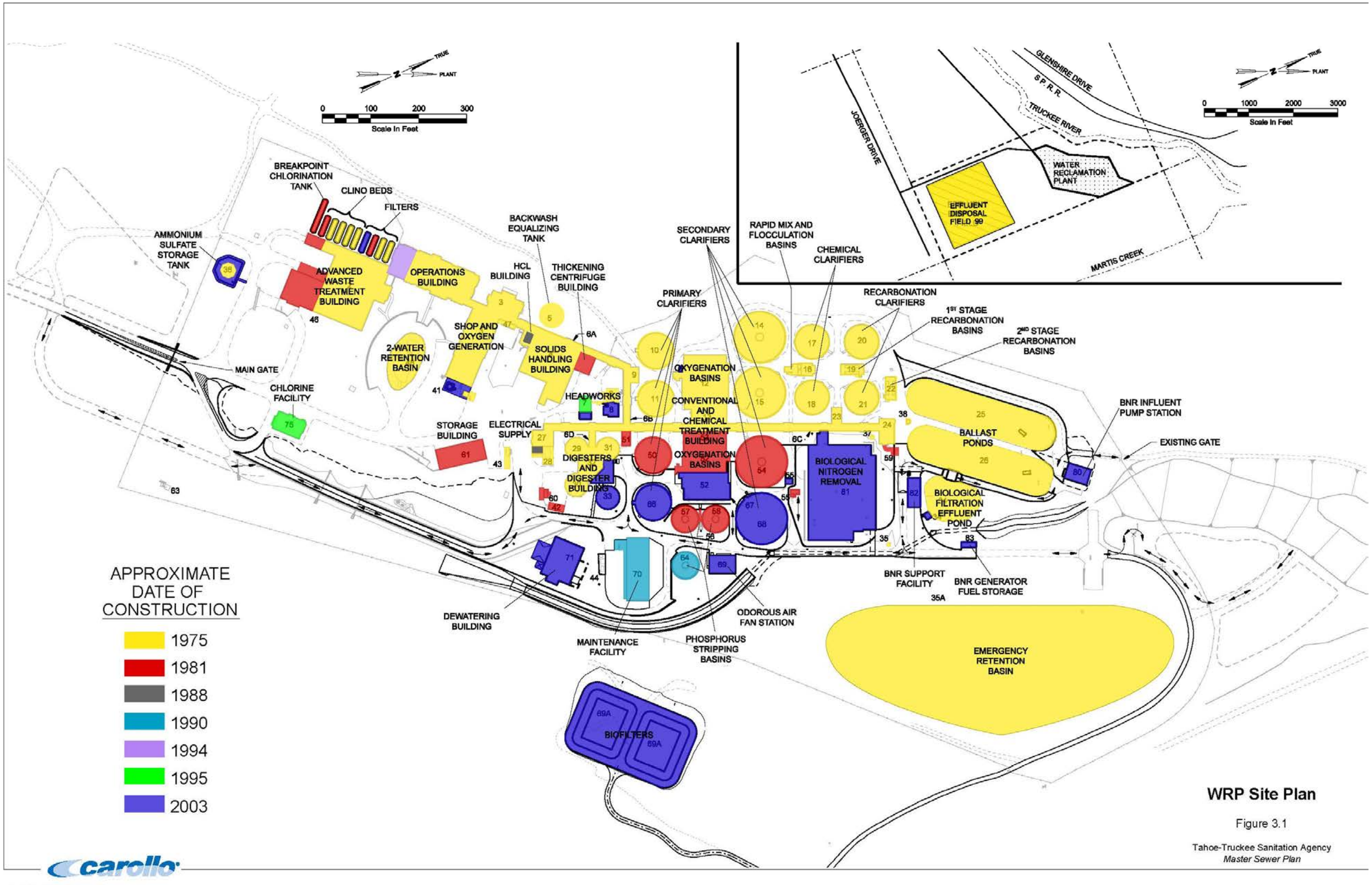

Figure 3.1 WRP Site Plan

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The condition assessment determined that overall, the WRP is performing very well for its age, and good maintenance practices are reflected in the extended service life of many of the WRP assets. Nevertheless, there were several issues noted, and many assets will require repair or replacement during the 25-year planning period. Many of these assets are from the original construction and will be 70 years old by the end of the planning period, which is well beyond the expected useful service life of most mechanical and electrical equipment as well as piping and valves. A few areas were noted as being of particular concern and these projects have been identified for implementation in the first phase of the CIP. These include concrete repairs for various facilities including primary treatment, secondary treatment, and phosphorus removal and recarbonation areas. Mechanical equipment replacement for the lime conveyance system, chlorine gas scrubber, digesters, standby generators, and the 2W system, all of which are approaching the end of the useful service life. Electrical and instrumentation equipment replacement for various areas including replacement of older motor control centers (MCCs), variable frequency drives (VFDs), and programmable logic controllers (PLCs).

3.5 Performance and Capacity Assessments

Volume 3, Chapter 4 provides a summary of the performance and capacity assessments performed for the WRP. The capacity assessment was conducted in three stages: 1) detailed hydraulic analysis was first conducted to determine the hydraulic limitations of the unit processes using Visual Hydraulics V4.2 software, 2) liquid train treatment plant modeling using BioWin™ v.6.1 software was then conducted to determine the treatment limitations of the unit processes for the liquid treatment train, and 3) solids train treatment plant modeling using Excel software was conducted to determine the treatment limitations of the unit processes for the solids treatment train.

Figure 3.2 summarizes the capacity of the major process components of the liquid treatment, solids handling, and effluent disposal processes at the WRP, with the process capacity expressed as the maximum week Summer flow (between June 21 and September 21), the flow basis used in the existing waste discharge requirements. The length of each horizontal bar represents the capacity of each process component. The performance of each unit process provides a benchmark for the planning of new facilities and assessing capacity. Overall, the performance of the WRP is adequate and meets regulatory requirements. Additionally, most unit processes are in fair shape and perform well for their age. However, the performance of some unit processes should be optimized, specifically the grit chambers and BNR.

The WRP has sufficient hydraulic and treatment process capacity to handle the rated maximum instantaneous flow rate through the WRP of 15.4 mgd and has sufficient influent wet weather equalization storage capacity to accommodate future 25-year design storm conditions. All unit processes have sufficient capacity for current demands. Most unit processes also have adequate future capacity except during future maximum week (MW) flow conditions. Denitrification and some of the solids handling processes will require additional units or operational accommodations to provide adequate capacity for this condition.

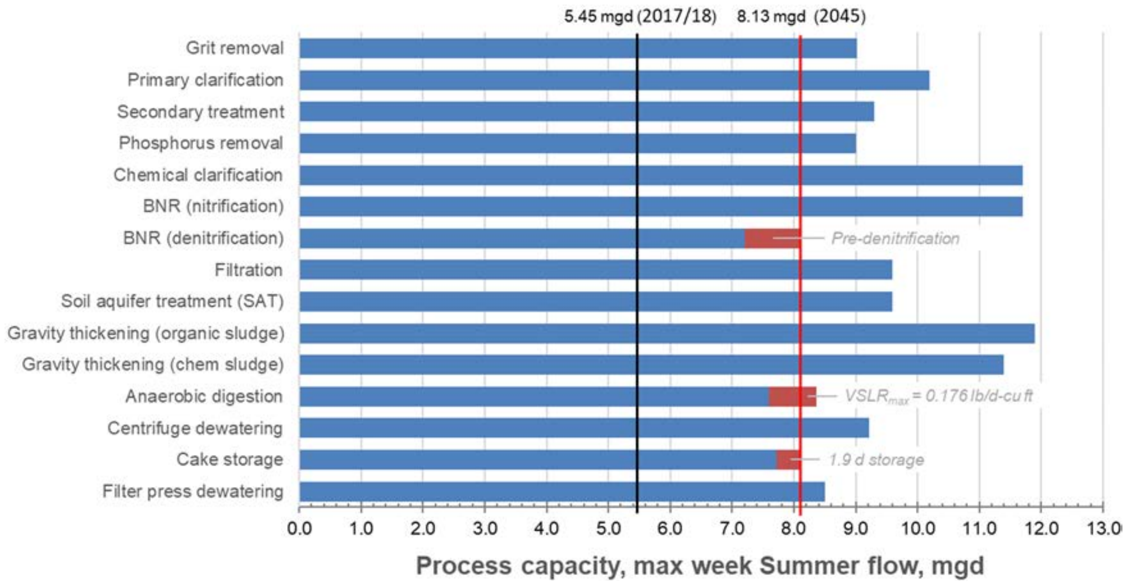

Figure 3.2 Process Capacity Summary

3.6 Regulatory Requirements

Volume 3, Chapter 5 summarizes the regulatory requirements that affect the operation of the WRP. It includes a comprehensive review of the regulations governing final effluent, solids treatment and disposal, and air emissions. It also includes a review of the potential impacts of future local, state, and federal regulations. Future regulatory scenarios were developed based on the analysis of T-TSA's existing permit requirements and identification/evaluation of future regulatory concerns based on various plans, policies, and actions by relevant regulating authorities.

Future water quality based regulatory scenarios are listed as follows:

- Existing Waste Discharge Requirements (No Change) – For this scenario it is assumed that T-TSA's waste discharge requirement would essentially not change.
- Waste Discharge Requirements with More Stringent Nutrient Limits – For this scenario it is assumed that T-TSA's waste discharge requirements would remain the same with the exception of more stringent nutrient limits to further reduce any impacts of T-TSA effluent on the Truckee River and Martis Creek, and to enhance attainment of receiving water quality objectives.
- Federal National Pollutant Discharge Elimination System (NPDES) Permit Program – This scenario assumes that T-TSA would be regulated under the Federal NPDES permitting program. It is assumed that potential new water quality based effluent limits would include metals and organics, lower disinfection byproduct limits, and limits for contaminants of emerging concern.
- Enhanced total dissolved solids (TDS) and Chloride Limits – This scenario assumes that more stringent requirements for TDS and chloride would be imposed, either under the existing permit framework or under the NPDES permit program.

It was recommended that the master plan address the following regulatory scenarios:

- Waste Discharge Requirements with More Stringent Nutrient Limits.
- Federal NPDES Permit Program.

For these scenarios both optimization of the existing treatment process and treatment plant upgrades were identified and evaluated.

3.7 WRP CIP Recommendations

Volume 3, Chapter 6 summarizes the WRP CIP recommendations which includes a list of projects and recommended phasing for these projects. Based on the assessments and evaluations performed as part of this master planning effort a total of 34 projects were identified in addition to several projects previously identified by T-TSA staff, touching almost every process area at the WRP. These WRP improvements address aging infrastructure, maintaining existing processes and equipment in good working condition, and optimizing the treatment processes to meet current and future capacity limitations and requirements. Proposed improvements related to rehabilitation are phased early in the CIP while future capacity or potential future regulatory requirements have been phased to later years in the CIP.

Projects were separated into three categories based on the type of improvements: RR, process optimization (PO), and C. These projects were grouped into five phases as shown below:

- Phase 1: Years 2022 through 2026.
- Phase 2: Years 2027 through 2031.
- Phase 3: Years 2032 through 2036.
- Phase 4: Years 2037 through 2041.
- Phase 5: Years 2042 through 2046.

Table 3.1 summarizes the recommended CIP projects and project phasing grouped by type of improvement.

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Table 3.1 Proposed Improvements

Project ID	Project Name	Type of Improvement	Description	Reason	Proposed Phase
R&R Improvements					
CIP-01	Plant Coating Improvements	Repair	Recoat various equipment and facilities.	Improve longevity. In T-TSA's existing CIP.	Phase 1
CIP-02	Lab Equipment Replacements	Replace	Replace various aged equipment as needed.	Equipment has reached end of life span. In T-TSA's existing CIP.	Phase 1
CIP-03	Lime System Improvements	Replace	Replace hydrated lime conveyance system.	The system is difficult to operate.	Phase 1
CIP-04	Chlorine Scrubber Improvements	Replace	Replace chlorine gas scrubber.	The scrubber tank leaks into the secondary containment tank.	Phase 1
CIP-06	Translucent Panel Rehabilitation	Repair	Refurbish existing Kalwall® architectural panels.	Identified in T-TSA's current CIP due to age and condition of panels.	Phase 1
CIP-09	Centrifuge Rebuild	Repair	Rebuild one dewatering centrifuge.	Centrifuges have much wear on them and need to be repaired. Identified in T-TSA's current CIP.	Phase 1
CIP-14	Communications Network Replacement	Replace	Replace communications equipment and cabling.	Equipment has reached end of life span. Identified in T-TSA's current CIP.	Phase 1
CIPR-04	Maintenance/Electrical and Instrumentation (E&I) Shop Improvements	New	Relocate mechanical and E&I shops.	Identified in T-TSA's current CIP.	Phase 1
WRP-01	Primary and Secondary Treatment Repairs	Repair/Replace	Repair concrete masonry unit (CMU) walls and areas with water damage in concrete. Install gutters.	Concrete is beginning to show signs of water freeze/thaw damage and age.	Phase 1
WRP-02	Phosphorus Removal and Recarbonation Rehabilitation	Repair/Replace	Replace floc and recarbonation gates and repair concrete in clarifiers/basins.	Major spalling is present on interior/exterior concrete. The sluice/slide gates are severely corroded.	Phase 1
WRP-03 WRP-07 WRP-09 WRP-12 WRP-13	Plant Wide Electrical Improvements	Replace/New	Replace lower explosive limit (LEL) equipment, multiple MCCs, upgrade Generator 1, and other electrical and instrumentation equipment replacements and upgrades.	Aging, obsolete equipment will make it difficult to make quick repairs and troubleshoot plant errors. Failing equipment can affect plant operations.	Phase 1 Phase 2 Phase 3 Phase 4 Phase 5
WRP-05	Harmonic Filter Replacement for Area 71	Replace	Replace harmonic filters.	Harmonic filters have not been replaced since 2006.	Phase 1
WRP-08	Condition Assessment and Inspection	Inspect	Inspection of interior of various tanks, pipelines, and pump stations that have not had recent inspections performed.	Regular inspections are important to ensure plant operations are working efficiently and effectively.	Phase 1
WRP-10	Digestion Improvements	Replace/New	Replace boilers, heat exchangers, hot water circulation system, waste gas flare, PLCs, and steam lines.	The 1975 boilers are in poor condition and are a safety concern. The heat exchangers are improperly sized and electrical equipment within the boiler room is also a safety concern.	Phase 1
WRP-14	2-Water System Improvements	Replace	Replace hydropneumatic pressure tank and install new valve vault. Cost assumes construction of new facilities.	The buried yard valves are not easily accessible.	Phase 1
WRP-15	Grit System Improvements	Repair	Repair the structural concrete surface and recoat rake arms.	Concrete spalling present and beginning signs of corrosion on rake arms.	Phase 2
WRP-16	LEL Equipment Replacement	Replace	The project includes replacing LEL equipment for Facilities 13 and 53.	The equipment is obsolete and required for safety reasons.	Phase 1
WRP-17	Primary and Secondary Treatment Rehabilitation	Repair/Replace	Repair concrete throughout area and roof decks. Replace return activated sludge (RAS) pumps with higher capacity pumps, replace drives for Clarifier mechanisms, and replace oxygenation basin mixer drives.	Mechanisms need to be regularly recoated to extend their life. Mechanism drives have reached the end of their useful service life. Concrete is beginning to erode on structures. RAS pumps are aging and have capacity limitations.	Phase 1
WRP-19	Recarbonation Improvements	Repair	Repair concrete in basin.	Major cracks, spalling and holes are present in concrete.	Phase 2
WRP-22	Thickened Waste-Activated Sludge (TWAS) Pump Replacement	Replace	Replace TWAS pumps.	Address pump condition and age.	Phase 1
WRP-23	Solids Dewatering Improvements	Repair/Replace	Upgrade dewatering polymer feed system and rebuild centrifuge.	Older polymer system is not efficient. Centrifuges have a lot of hours and will need to be rebuilt and bearings replaced periodically.	Phase 2

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Table 3.1 Proposed Improvements (continued)

Project ID	Project Name	Type of Improvement	Description	Reason	Proposed Phase
WRP-25	Filtration Rehabilitation	Repair	Recoat filtration tanks. Replace filter media.	Exterior coating is starting to degrade and showing signs of minor corrosion.	Phase 2
WRP-26	Advanced Wastewater Treatment (AWT) Improvements	Repair/Demolish	Resurface floor and structural beams, replace metal roof and demolish abandoned equipment.	Many of the AWT systems are no longer in use and are in poor condition. Portions of the building could be repurposed for future process needs.	Phase 2
WRP-27	Building Roof Replacements	Replace	Replace roof membrane/covering on plant buildings on a periodic basis.	Addresses roof leaks and limited life of roofing systems.	Phase 1-5
WRP-28	Odorous Air Treatment Improvements	Repair/Replace	Repair fans. Replace MCC-69 and biofilter media.	This work will be needed within the planning period based on the age of the facility.	Phase 5
WRP-30	Asphalt Sealing and Replacement	Repair	Seal and/or replace damaged asphalt. Cost is recurring for each Phase.	Asphalt needs to be maintained regularly to extend life.	Phase 1-5
WRP-32	Multipurpose Pump Station (MPPS) Improvements	Repair/Replace	Repair pump manifold. Replace MPPS pumps, VFDs, and soft starts.	Signs of corrosion are present on the pump manifold. Pumps and VFDs are nearing the end of their useful service life.	Phase 3
WRP-33	Miscellaneous Plant Rehabilitation	Replace	Replace sludge pumps/piping, Pump Rooms 53 and 13 mechanical equipment, flocculators, and scum pumps.	Equipment is original equipment from 1975 and is aging.	Phase 3
WRP-34	Plant Air System Upgrades	Replace	Replace plant air system tank and compressors. Address NFPA 820 compliance analysis findings.	This work is required based on the age and condition of the equipment as well as compliance with NFPA 820.	Phase 1
WRP-35	Plant-wide NFPA 820 Compliance Evaluation	Repair	This project consists of a study to evaluate compliance of various plant facilities with NFPA 820 standards.	This work is required to comply with NFPA 820 standards for fire protection.	Phase 1
WRP-36	Chemical Storage and Feed System Improvements	Replace	Removal and replacement of the sulfuric acid storage tank, removal of salt storage tanks, and replacement of various chemical feed pumps and control panels.	This work is required to replace old and obsolete equipment.	Phase 2
Capacity Improvements					
CIP-26	Odorous Air Biofilter Media Replacement	New	Replacement of biofilter media.	Identified in T-TSA's existing CIP.	Phase 1
CIP-31	Control Room Upgrades #02 and 13 - Remodel	Replace	Remodeling and updating of Control Rooms #02 and 13.	Identified in T-TSA's current CIP.	Phase 1
CIPR-01	Headworks Project	New	Install new bar screens, washer, compactors, flow diversion structures, bypass pumping, etc. Modify Headworks Building.	Identified in T-TSA's current CIP based on performance of existing equipment.	Phase 1
CIPR-03	Equipment/Vehicle Warehouse	New	Build new warehouse for storing T-TSA vehicles, heavy equipment, etc.	Identified in T-TSA's current CIP.	Phase 1
CIPR-13	Control Room Upgrades #02 and #13 - Heating, Ventilation, and Air Conditioning (HVAC)	Replace	Upgrade Control Room HVAC Equipment.	Identified in T-TSA's current CIP.	Phase 1
WRP-11	Effluent Disposal Field Expansion	New	Perform SAT Performance Evaluation Study. Construct additional effluent disposal fields.	Meet capacity for future effluent disposal.	Phase 3
WRP-18	Waste Activated Sludge (WAS) Thickening Improvements	Repair/Replace	Recoat thickener sludge collectors, replace sharples centrifuge and thickening controls. Replace digester pumps.	Equipment showing corrosion, centrifuges are old. Want to accommodate future capacity.	Phase 3
WRP-31	Offsite Flow Equalization Improvements	New	Build a new concrete lined 15 MG flow equalization basin, new inlet drain structure and piping and a new return pump station.	Provide storage of secondary effluent during a 25-year, 24-hour design storm event to provide additional operational flexibility.	Phase 4

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Table 3.1 Proposed Improvements (continued)

Project ID	Project Name	Type of Improvement	Description	Reason	Proposed Phase
Process Optimization Improvements					
WRP-04	Waste Activated Sludge Stripping to Remove Internal Phosphorus (WASSTRIP) Implementation	New	Address phosphorous production at treatment plant and find viable solution to process remaining phosphorous.	Creates additional revenue for treatment plant and provides another means to get rid of phosphorous waste.	Phase 2
WRP-06	Nitrified Effluent Recycle Pilot	New	Perform pilot study on nitrified effluent recycle.	Determine whether recycling nitrified effluent could address capacity limitations in the denitrification cells, reduce WRP's methanol consumption and reduce odors.	Phase 1
WRP-20	Flow Equalization Improvements	New	Resurface ballast ponds and construct water cannons for ballast ponds and booster pumps for Washdown System.	The basin surface needs resurfacing and staff currently clean basins using a hose, which is labor intensive and time consuming.	Phase 3
WRP-21	Biogas Storage	New	Make improvements to gas storage.	Future regulations.	Phase 4
WRP-24	BNR Structural Retrofit and Nitrified Effluent Recycle	Repair/Replace/ New	Repair cracks in BNR structure, replace BNR beads, construct Nitrified Effluent Recycle pipeline, and new base flood elevation (BFE) sump, pump, and water cannons.	There are minor cracks in structure and concrete is slowly degrading. Nitrified Effluent Recycle will mitigate the need to add new denitrification cells and could have added benefits in reducing methanol consumption. The BFE sump and water cannon improvements will provide for easier draining and cleaning of the BFE pond.	Phase 2
WRP-29	Disinfection Process Modernization	New/Demolish	Construct new ultraviolet (UV) facility or other disinfection alternative for plant effluent disinfection. Costs assume in-vessel UV system. Demolish existing chlorine gas infrastructure and provide small sodium hypochlorite for recycled water needs.	Chlorine gas is hazardous to transport and poses a potential danger to the public. Sodium hypochlorite does not appear to be an option due to the plant's stringent TDS limits.	Phase 5

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 1:
EXECUTIVE SUMMARY REPORT
CHAPTER 4:
RECOMMENDED AGENCY CIP

FINAL | February 2022

Digitally signed by Richard Luis Gutierrez
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Date: 2022.02.08 13:34:11-08'00'

REGISTERED PROFESSIONAL ENGINEER
RICHARD LUIS GUTIERREZ
No. 72248
CIVIL
STATE OF CALIFORNIA

Chapter 4

RECOMMENDED AGENCY CIP

4.1 Key Features of the Recommended 25-Year Plan

The 25-year CIP is the culmination of the master sewer planning effort. The plan addresses the T-TSA facility needs over the next 25 years for both the TRI and the WRP. Projects are grouped into the following categories for each facility:

- Condition or Rehabilitation/Repair projects.
- Capacity improvement projects.
- Optimization or process enhancement projects.
- Other projects.

A summary of the various key elements of the CIP is provided in this chapter.

4.1.1 Addresses Aging Infrastructure

Much of the agency's infrastructure was constructed over 45 years ago and will be 70 years old at the end of the 25-year planning period. Most of T-TSA's facilities are in excellent condition for their age, due in large part to the agency's diligence with regular maintenance efforts. However, the visual condition assessment conducted of the WRP infrastructure as well as review of the TRI closed-caption television (CCTV) inspection logs identified several facilities that are approaching or beyond their anticipated service life which will require repairs or replacement in the next 25 years. To address these needs, approximately two thirds of the total projects identified will focus on repair and/or replacement of aging infrastructure.

4.1.2 Reduces Risk of Overflows from the TRI

The TRI hydraulic model and capacity evaluation identified two sections of the TRI, consisting of a total of 5,280 linear feet of pipeline, as being capacity deficient under future PWWF conditions. The CIP includes upsizing of these segments of the TRI in Phases 3 and 4 of the CIP to mitigate the risk of SSOs under these future PWWF conditions.

A risk-based approach was taken in prioritizing rehabilitation of the TRI. Three river crossing segments of the TRI were identified as requiring lining to address condition concerns in these high-risk areas during Phases 1 and 2 of the CIP. The CIP also includes the TRI Renewal Program, which addresses sewer infrastructure that is susceptible to failure through R&R projects. The TRI Renewal Program consists of an annual budget to ensure T-TSA has funding to complete future R&R projects. The actual R&R projects and phasing will be based on inspections as documented and evaluated in T-TSA's new TRI Asset Management Program. Results of the structural integrity analysis performed in the proposed Visible Reinforcement Study will also be used to determine actual R&R projects and phasing.

4.1.3 Addresses Future WRP Capacity Limitations

The WRP capacity assessment found that most of the WRP processes have sufficient capacity to handle both current and future projected flows and loads with a few exceptions. Future capacity limitations associated with the WAS thickening process, effluent disposal field, and flow equalization are addressed in this CIP.

4.1.4 Optimizes Existing Treatment Processes

The CIP includes six recommended projects to optimize or improve the WRP performance and address potential future regulatory requirements. Highlights of these are provided below.

4.1.4.1 Nitrified Effluent Recycle

The CIP includes implementing a pilot project followed by full scale implementation for recycling nitrified effluent from the BNR process to the headworks or primary clarifiers. As realized at other facilities with relatively minor additions of new infrastructure, this approach will mitigate capacity deficiencies in the BNR denitrification cells, allow for a reduction in the plant's methanol consumption, and also help to reduce plant odors.

4.1.4.2 WASSTRIP Implementation

The WASSTRIP project would be implemented in two phases, a study (including a business case evaluation) and pilot plant utilizing the Ostara Reactor system, followed by full implementation assuming the study results show the process to be beneficial from a cost/benefit standpoint. The pilot study will look at potential reductions in lime usage, reduction in chemical sludge production, and creating a marketable phosphorus product.

4.1.4.3 Flow Equalization Improvements

To improve the ability to clean the ballast ponds, a Washdown System consisting of water cannons and associated booster pumps would be constructed.

4.1.4.4 Biogas Storage

It is recommended that T-TSA budget for additional gas storage improvements as future regulations may require more biogas utilization.

4.1.4.5 Disinfection Process Modernization

This project consists of replacing the existing gaseous chlorine disinfection facility with UV disinfection, or some other disinfection alternative which may be more appropriate at the time of design and construction. The primary drivers for this project are the hazardous nature of chlorine gas, operational issues related to using chlorine gas, and the plant's stringent TDS effluent limits which could make conversion to liquid sodium hypochlorite disinfection infeasible.

4.1.5 Project Implementation

The recommended CIP in Volumes 2 and 3 of the Master Plan was developed to address the anticipated needs in the 25-year planning period. The recommended project timing was established using a risk-based approach for prioritizing asset replacement needs, the anticipated timing of new regulations, and other triggers.

Similar projects were grouped or bundled into larger CIP projects. This was done to reduce the number of projects and administrative effort, while still offering opportunities for general and specialty contractors to pursue and bid on projects they are best suited to construct.

The final CIP is provided in its entirety as an attachment herein. It is representative of the most accurate information available at this time and remains consistent with the Agency's goals and objectives. The final CIP also includes projects that T-TSA identified prior to initiating the Master Sewer Plan.

The total cost of the final CIP is $143 million over 25 years. Note that project costs were developed at a planning level, which is a Class 5 estimate as defined by the Association for the Advancement of Cost Engineering. This is intended to be a conservative estimate based on the information available at the time the cost estimate was prepared. Project costs include allowances for contingency, engineering, design, permitting, and construction administration and are in November 2021 dollars (ENR value of 14,421).

As the Agency moves forward with implementing the CIP, there are a few important considerations to note:

- As the Agency moves forward with implementing specific projects, the next phase of analysis or design will provide more accurate and up-to-date information for decision making. For example, for the pipelines recommended for relining, video inspections should be performed prior to project implementation to confirm that relining is necessary.
- The need and timing for all future projects, especially those that are planned for later in the planning period will continue to be updated with new information.

4.2 5-Year CIP

For the next 5 years (fiscal years 22/23 to 26/27), a key area of focus in the CIP will be rehabilitating and replacing assets. Although T-TSA has a robust maintenance program geared towards maximizing the service life of their assets, some of them are approaching or past their useful service life and may need replacement. Replacing these assets is very important to reduce the risk of SSOs, or to prevent a process failure at the WRP and the discharge of wastewater that has not been fully treated. The total cost of the Phase 1, 5-year CIP is $40.0 million in November 2021 dollars (ENR value of 14,421).

4.3 Recommended TRI CIP

Volume 2, Chapter 7 presents the preliminary CIP for the Collection System Master Plan and a summary of the associated capital costs. The CIP is an estimate of T-TSA's capital expenses over the next 25 years to address any limitations, rehabilitation needs, and recommended improvements to the Collection System. The CIP is intended to assist the T-TSA in planning future budgets and making financial decisions.

The key findings and recommendations for the preliminary CIP for the Collection System Master Plan are:

- The T-TSA should budget approximately $28.88 million dollars to fund Collection System projects over the next 25 years. Costs presented in this Master Plan are total project costs and include construction, engineering, legal, administrative, and permitting costs and estimating contingencies. The costs are presented in November 2021 dollars (ENR value of 14,421). Costs are not escalated to future years.

- The CIP is based on:
  - Implementing projects to address capacity deficiencies identified through the capacity evaluation described in Chapter 5. These projects are referred to as capacity projects.
  - Implementing projects to address rehabilitation needs identified through the condition assessment described in Chapter 2. These projects are referred to as rehabilitation projects and include:
    - Near-Term Rehabilitation Improvements. It is recommended these improvements be implemented in the first five years of the master plan. The timing of these projects is primarily a function of the evaluated risk score of the assets.
    - Long-Term Rehabilitation Improvements. These improvements rehabilitate all other assets identified through the condition assessment as requiring replacement over the master planning period. The timing of these projects is primarily a function of the evaluated remaining useful life of the assets.
  - Conducting regular master plan updates and studies to determine the scope and planning parameters of the major CIP projects identified in the Master Plan in further detail. These include the TRI Asset Management Program and Visible Reinforcement Study.

4.4 Recommended WRP CIP

Volume 3, Chapter 7 presents the preliminary CIP for the WRP Master Plan and a summary of the associated capital costs. The CIP is an estimate of T-TSA's capital expenses over the next 25 years to address any limitations, rehabilitation needs, and recommended improvements to the WRP. The CIP is intended to assist T-TSA in planning future budgets and making financial decisions.

The key findings and recommendations for the preliminary CIP for the WRP Master Plan are:

- The Agency should budget approximately $115.7 million dollars to fund WRP projects over the next 25 years. Costs presented in this Master Plan are total project costs and include construction, engineering, legal, administrative, and permitting costs and estimating contingencies. The costs are presented in November 2021 dollars (ENR value of 14,421). Costs are not escalated to future years.
- The CIP is based on implementing the recommendations described in Volume 3, Chapter 6 to accommodate rehabilitation needs, address future capacity deficiencies, mitigate for future regulatory scenarios and provide process improvements and optimization.

Appendix 4A

FINAL 25-YEAR CAPITAL IMPROVEMENT PLAN

Engineers...Working Wonders With Water®

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : Master Sewer Plan CIP Improvements

ESTIMATE PREPARATION DATE : 12/16/2021

JOB # : 11384A.00

PREPARED BY : RLG

LOCATION : T-TSA WRP

REVIEWED BY : AG

LEGEND

CIP-##	Projects already defined within the Upgrade, Rehabilitation and Replacement Fund (Fund 06) not incorporated elsewhere
CIPR-##	Projects already defined within the Wastewater Capital Reserve Fund (Fund 02) not incorporated elsewhere
WRP-##	WRP Project
TRI-C-##	TRI Capacity Improvements Project
TRI-RR-##	TRI Rehabilitation Project
TRI-O-##	TRI Other Project

CIP Summary Table

					Fiscal Year								
Project ID	**Project**	**Type**	**Phase**	**Total**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027-31**	**2032-36**	**2037-41**	**2042-46**
CIP-01	Plant Coating Improvements	RR	Phase 1A	**480,000**	480,000								
CIP-02	Lab Equipment Replacements	RR	Phase 1A	**160,000**	80,000	26,666.67	53,333.33						
CIP-03	Lime Systems Improvements	RR	Phase 1A	**200,000**	20,000	180,000							
CIP-04	Chlorine Scrubber Improvements	RR	Phase 1A	**1,150,000**	1,150,000								
CIP-09	Centrifuge Rebuild	RR	Phase 1A	**50,000**	50,000								
CIP-31	Control Room Upgrades #02 and #13 - Remodel and Updates	C	Phase 1A	**600,000**	90,000	510,000							
CIPR-01	Headworks Project (Barscreens, Washer Compactors)	C	Phase 1A	**2,510,000**	2,510,000								
CIPR-03	Equipment/Vehicle Warehouse	C	Phase 1A	**2,100,000**	2,100,000								
TRI-RR-01	River Crossing, Gravity Main between MH 33 and MH 35	RR	Phase 1A	**2,520,000**	252,000	454,000	1,814,000						
TRI-O-01	Visible Reinforcement Study	OP	Phase 1A	**170,000**	105,000					65,000			
WRP-05	Harmonic Filter Replacement For Area 71	RR	Phase 1A	**130,000**	130,000								
WRP-08	Condition Assessment and Inspection	RR	Phase 1A	**130,000**	130,000								
WRP-10	Digestion Improvements Project	RR	Phase 1A	**7,740,000**	774,000	3,483,000	3,483,000						
WRP-14	2-Water System Improvements	RR	Phase 1A	**320,000**	32,000	144,000	144,000						
WRP-16	LEL Equipment Replacement	RR	Phase 1A	**320,000**	320,000								
WRP-30	Asphalt Sealing and Replacement Project	RR	Phase 1A	**1,700,000**	170,000			170,000		340,000	340,000	340,000	340,000
WRP_35	Plant-wide NFPA 820 Compliance Evaluation	RR	Phase 1A	**110,000**	110,000								
CIP-14	Communications Network Replacement	RR	Phase 1B	**210,000**		210,000							
CIPR-13	Control Room Upgrades #02 & #13 - HVAC	C	Phase 1B	**50,000**		50,000							
WRP-34	Plant Air System Upgrades	RR	Phase 1B	**1,710,000**		1,710,000							
CIP-06	Translucent Panel Rehab	RR	Phase 1C	**60,000**			60,000						
CIPR-04	Maintenance/E&I Shop Improvements	RR	Phase 1C	**790,000**			790,000						
WRP-01	Primary and Secondary Treatment Repairs	RR	Phase 1C	**510,000**			51,000	229,500	229,500				
WRP-02	Phosphorus Removal and Recarb Rehabilitation	RR	Phase 1C	**3,560,000**			356,000	1,602,000	1,602,000				
WRP-03	Plant Wide Electrical Improvements (Phase 1)	RR	Phase 1C	**580,000**			290,000	290,000					
WRP-06	Nitrified Effluent Recycle Pilot	OP	Phase 1C	**420,000**			42,000	378,000					
WRP-17	Primary & Secondary Treatment Rehabilitation Project	RR	Phase 1C	**10,150,000**			1,015,000	4,567,500	4,567,500				
CIP-26	Odorous Air Biofilter Media Replacement	C	Phase 1D	**50,000**				50,000					
WRP-22	TWAS Pump Replacement Project	RR	Phase 1E	**140,000**					140,000				
WRP-27	Building Roof Replacements	RR	Phase 1E	**12,570,000**					2,514,000	2,514,000	2,514,000	2,514,000	2,514,000
TRI-RR-02	River Crossing, Gravity Main between MH 65 and MH 66	RR	Phase 2	**500,000**				50,000	90,000	360,000			
TRI-RR-03	River Crossing, Gravity Main between MH 88 and MH 89	RR	Phase 2	**500,000**				50,000	90,000	360,000			
TRI-RR-04	TRI Renewal Program	RR	Phase 2	**16,350,000**						4,087,500	4,087,500	4,087,500	4,087,500
WRP-04	WASSTRIP Implementation	OP	Phase 2	**3,950,000**						3,950,000			
WRP-07	Plant Wide Electrical Improvements (Phase 2)	RR	Phase 2	**4,670,000**						4,670,000			
WRP-15	Grit System Improvements	RR	Phase 2	**2,160,000**						2,160,000			
WRP-19	Recarbonation Improvements	RR	Phase 2	**540,000**						540,000			
WRP-23	Solids Dewatering Improvements	RR	Phase 2	**510,000**						510,000			
WRP-24	BNR Structural Retrofit and Nitrified Effluent Recycle Project	OP	Phase 2	**1,150,000**						1,150,000			
WRP-25	Filtration Rehabilitation Project	RR	Phase 2	**1,230,000**						1,230,000			
WRP-26	AWT Improvements	RR	Phase 2	**1,670,000**						1,670,000			
WRP_36	Chemical Storage and Feed System Improvements	RR	Phase 2	**350,000**						350,000			
TRI-C-01	Gravity Main between MH 57 and MH 62	C	Phase 3	**7,180,000**							7,180,000		
WRP-09	Plant Wide Electrical Improvements Project (Phase 3)	RR	Phase 3	**1,330,000**							1,330,000		
WRP-11	Effluent Disposal Field Expansion Project	C	Phase 3	**6,300,000**							6,300,000		
WRP-18	WAS Thickening Improvements Project	C	Phase 3	**1,710,000**							1,710,000		
WRP-20	Flow Equalization Improvements Project	OP	Phase 3	**1,590,000**							1,590,000		
WRP-32	MPPS Improvements Project	RR	Phase 3	**2,560,000**							2,560,000		

TASK : Master Sewer Plan CIP Improvements

ESTIMATE PREPARATION DATE : 12/16/2021

JOB # : 11384A.00

PREPARED BY : RLG

LOCATION : T-TSA WRP

REVIEWED BY : AG

LEGEND

CIP-##	Projects already defined within the Upgrade, Rehabilitation and Replacement Fund (Fund 06) not incorporated elsewhere
CIPR-##	Projects already defined within the Wastewater Capital Reserve Fund (Fund 02) not incorporated elsewhere
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CIP Summary Table

					Fiscal Year								
Project ID	**Project**	**Type**	**Phase**	**Total**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027-31**	**2032-36**	**2037-41**	**2042-46**
WRP-33	Misc Plant Rehab Project	RR	Phase 3	**$ 4,090,000**							$ 4,090,000		
TRI-C-02	Gravity Main between MH 71 and MH 72	C	Phase 4	**$ 1,660,000**								$ 1,660,000	
WRP-12	Plant Wide Electrical Improvements (Phase 4)	RR	Phase 4	**$ 250,000**								$ 250,000	
WRP-21	Biogas Storage Project	OP	Phase 4	**$ 2,770,000**								$ 2,770,000	
WRP-31	Offsite Flow Equalization Improvements Project	C	Phase 4	**$ 10,490,000**								$ 10,490,000	
WRP-13	Plant Wide Electrical Improvements (Phase 5)	RR	Phase 5	**$ 2,890,000**									$ 2,890,000
WRP-28	Odorous Air Treatment Improvements Project	RR	Phase 5	**$ 390,000**									$ 390,000
WRP-29	Disinfection Process Modernization	OP	Phase 5	**$ 16,630,000**									$ 16,630,000
Total CIP Projects				**$ 144,610,000**	**$ 8,503,000**	**$ 6,767,667**	**$ 8,098,333**	**$ 7,387,000**	**$ 9,233,000**	**$ 23,956,500**	**$ 31,701,500**	**$ 22,111,500**	**$ 26,851,500**
CIP Projects Cost/yr				$ 5,784,400	$ 8,503,000	$ 6,767,667	$ 8,098,333	$ 7,387,000	$ 9,233,000	$ 4,791,300	$ 6,340,300	$ 4,422,300	$ 5,370,300

Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 2: COLLECTION SYSTEM MASTER PLAN

FINAL | February 2022

Master Sewer Plan

VOLUME 2:
COLLECTION SYSTEM MASTER PLAN

FINAL | February 2022

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Contents

Appendices

Tables

Figures

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Abbreviations

AACE	Association for the Advancement of Cost Engineering
AAF	average annual flow
ADWF	average dry weather flow
Agency	Tahoe-Truckee Sanitation Agency
ASCWD	Alpine Springs County Water District
BWF	base wastewater flow
C	capacity
Carollo	Carollo Engineers, Inc.
CEQA	California Environmental Quality Act
CIP	capital improvement program
CIPP	cured-in-place pipe
DHI	Danish Hydraulic Institute
DIP	ductile iron pipe
DS	digital scans
DWF	dry weather flow
ENR	Engineering News Record
EPA	Environmental Protection Agency
ERB	emergency retention basin
GIS	geographic information system
GWI	groundwater infiltration
HGL	hydraulic grade line
HOF	high occupancy flow
I/I	inflow and infiltration
ID	identifier
July 4th	Independence Day
LF	linear feet
Master Plan	Master Sewer Plan
MFR	multifamily residence/residential
MG	million gallons
mgd	million gallons per day
MH	manhole
NASSCO	National Association of Sewer Service Companies
NAVD88	North American Vertical Datum of 1988
NCSD	Northstar Community Services District
NOAA	National Oceanic and Atmospheric Association
NTPUD	North Tahoe Public Utility District
NYE	New Year's Eve

O	other
O&M	operation and maintenance
OVPSD	Olympic Valley Public Service District
PACP	Pipeline Assessment Certification Program
PDR	preliminary design report
PF	peaking factor
PWWF	peak wet weather flow
R&R/RR	replacement and rehabilitation
RCP	reinforced concrete pipe
RDII	rain-derived infiltration and inflow
ROW	right-of-way
RSC2	Resort at Squaw Creek Phase 2
SFR	single-family residence/residential
sq ft	square feet
SRV	surface reinforcement visible
SSO	sanitary sewer overflow
SWMM	Storm Water Management Model
TCPUD	Tahoe City Public Utility District
TDPUD	Truckee Donner Public Utility District
TM	Technical Memorandum
TRI	Truckee River Interceptor
TRPA	Tahoe Regional Planning Agency
TSD	Truckee Sanitary District
T-TSA	Tahoe-Truckee Sanitation Agency
UWMP	Urban Water Management Plan
VSVSP	Village at Squaw Valley Specific Plan
WaPUG	Wastewater Planning Users Group
WDRs	Waste Discharge Requirements
WRP	Water Reclamation Plant
WWF	wet weather flow

Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 2:
COLLECTION SYSTEM MASTER PLAN
CHAPTER 1:
DESCRIPTION OF EXISTING FACILITIES

FINAL | February 2022

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Chapter 1

DESCRIPTION OF EXISTING FACILITIES

This chapter provides an overview of Tahoe-Truckee Sanitation Agency's (T-TSA's) interceptor system, known as the Truckee River Interceptor (TRI), and a detailed description of the associated facilities.

T-TSA owns, operates, and maintains the TRI and regional Water Reclamation Plant (WRP). T-TSA is designated as the regional entity to transport, treat, and dispose of wastewater from five member districts: North Tahoe Public Utility District (NTPUD), Tahoe City Public Utility District (TCPUD), Alpine Springs County Water District (ASCWD), Olympic Valley Public Service District (OVPSD), and Truckee Sanitary District (TSD). (Northstar Community Services District (NCSD) also contributes wastewater to T-TSA, via TSD's sewer collection system, and is not considered a member district, although it is a contributing agency).

The TRI conveys wastewater by gravity flow from the north and west Lake Tahoe region through Tahoe City following the Truckee River, and ultimately to the WRP. Wastewater from the member districts enters the TRI at various manholes; T-TSA does not allow direct sewer connections to the TRI. Since the majority of the TRI follows the Truckee River, much of it is located in a flood plain and the TRI crosses the Truckee River a number of times.

The WRP is located in Martis Valley east of the Town of Truckee, California. Advanced wastewater treatment occurs at the WRP through a series of biological, chemical, and physical processes, treating the wastewater to protect the quality of groundwater and surface water.

Figure 1.1 presents the interceptor system service area for T-TSA.

1.1 Interceptor System Facilities

The interceptor system consists of the TRI and its associated appurtenances, including 19.5 miles of gravity interceptor system pipe (varying in diameter from 18 to 42 inches), and 181 manholes. T-TSA interceptor system facilities include the following:

- Interceptor Sewers: Interceptor sewers are defined as gravity sewers with diameters of 18 inches and larger.
- Special Structures: Flow diversions are defined as locations in the interceptor system where upstream flow may be split between two (or more) downstream pipelines. The amount of flow that is diverted from the main downstream pipeline is a function of the system configuration (i.e., pipeline diameters, inverts, weirs, slide gates, sluice gates, etc.). Other special structures include a crossover structure, control structures, and measuring flumes.
- River Crossings: River crossings are defined as locations where the TRI crosses the Truckee River. The TRI crosses under the Truckee River at eight locations.

Given T-TSA's unique agreement with its five member districts, T-TSA does not own or operate any gravity sewer mains or gravity sewer laterals. The TRI was constructed such that all wastewater flows via gravity; therefore T-TSA does not own or operate any sewer force mains or sewer lift stations.

Figure 1.2 shows the existing T-TSA interceptor system and Figure 1.3 shows the TRI's existing flow diversion structures.

1.1.1 Gravity Sewers

Table 1.1 presents a summary by diameter of T-TSA gravity sewers. As shown in Table 1.1, approximately 13 percent of the system is 24 inches in diameter, approximately 14 percent of the system is 27 inches in diameter, and approximately 20 percent of the system is 30 inches in diameter, with the majority (34 percent) being 33 inches in diameter.

Table 1.1 Interceptor System Gravity Pipeline Diameter Summary(1)

Pipe Diameter (inches)	Length (miles)	Percent of System (by Length) (2)
18	0.01	0.1
24	2.59	13.3
27	2.71	13.9
30	3.97	20.3
33	6.69	34.3
36	1.62	8.3
42	1.92	9.8
Total	**19.52**	**100.0**

Notes:
(1) Source: T-TSA record drawings and GIS data base.
(2) Numbers may vary slightly due to rounding.

Table 1.2 summarizes the interceptor system by pipe material. As shown in Table 1.2, the majority of the TRI (approximately 96 percent) consists of reinforced concrete pipe (RCP).

Table 1.2 Interceptor System Gravity Pipeline Material Summary(1)

Pipe Material	Length (miles)	Percent of System (by Length)
Reinforced Concrete Pipe	18.67	95.7
Cured-in-Place-Pipe	0.42	2.1
Ductile Cast Iron	0.43	2.2
Total	**19.52**	**100.0**

Notes:
(1) Source: T-TSA record drawings and GIS data base.

Carollo Engineers, Inc. (Carollo) built a geographic information system (GIS) database using information from T-TSA's maps, sewer inspection reports, and record drawings, as well as information from El Dorado County, Nevada County, Placer County, Tahoe Regional Planning Agency, and the contributing sewer agencies. Detailed information regarding T-TSA's interceptor system is compiled in the GIS database.

Figure 1.4 and Table 1.3 summarize the available data by installation decade. As shown in both Figure 1.4 and Table 1.3, the majority of the TRI was installed in the 1970s and is over 40 years old.

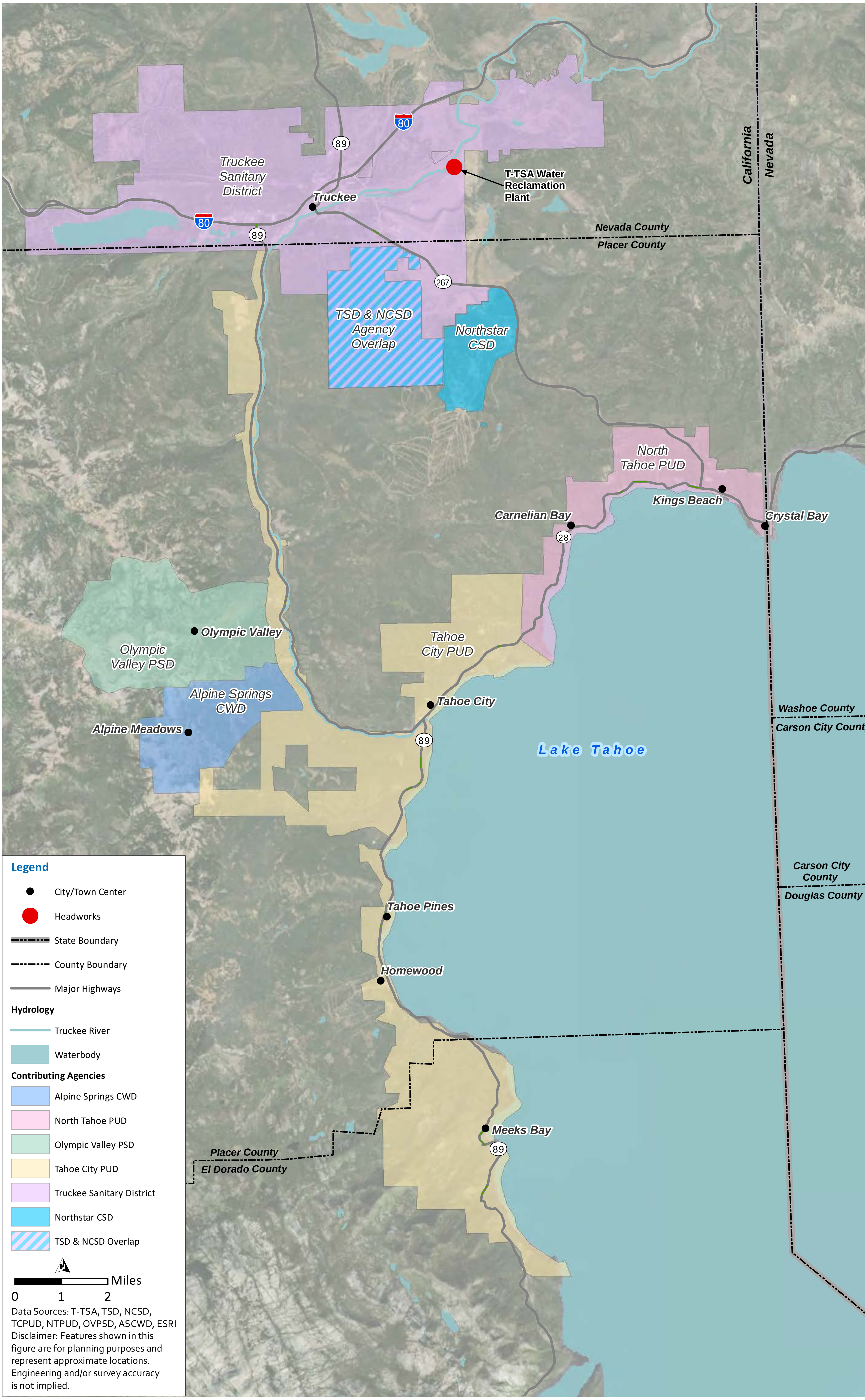

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Figure 1.1 T-TSA Service Area

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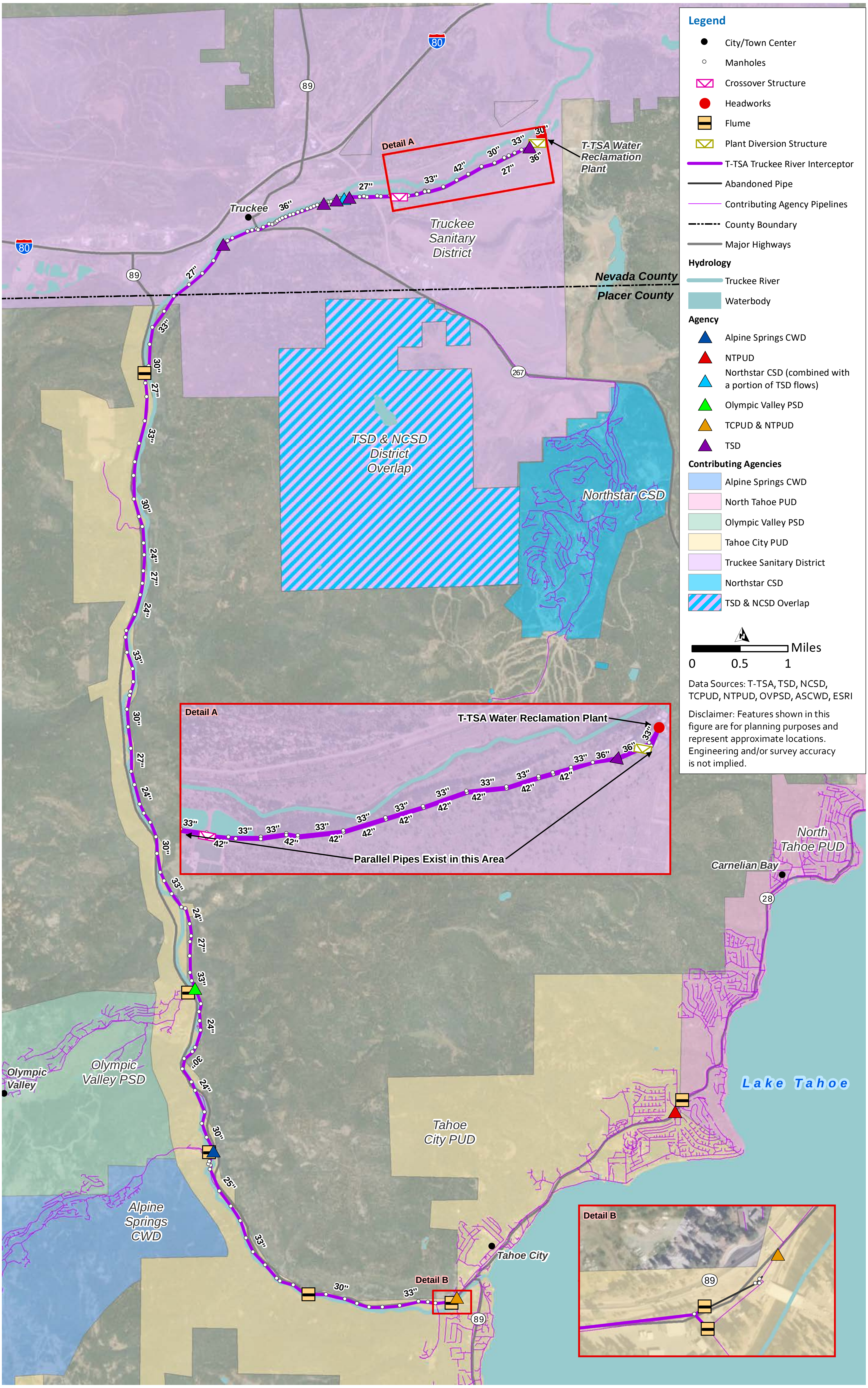

Figure 1.2 Existing Truckee River Interceptor System

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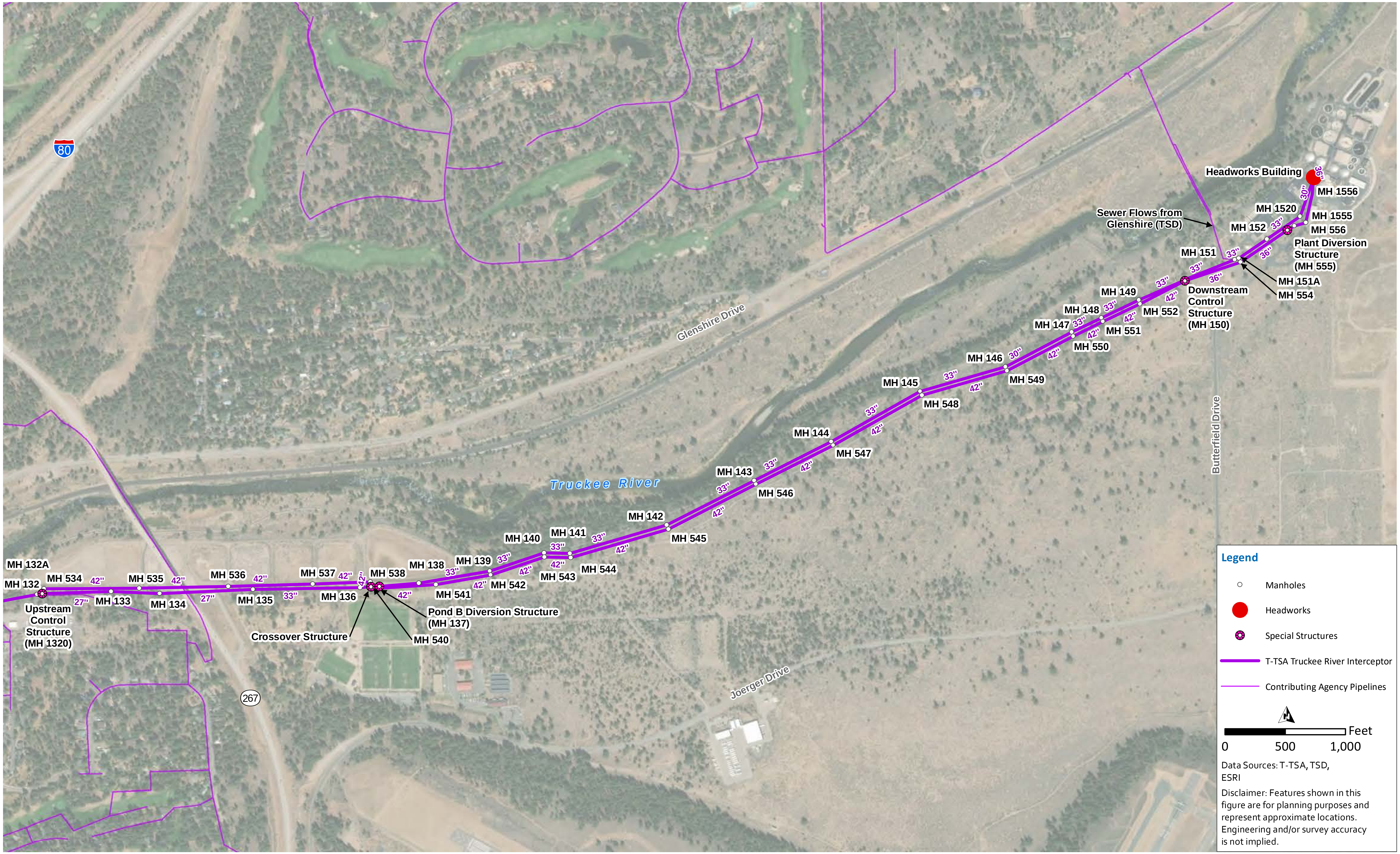

Figure 1.3 Existing TRI Flow Diversion Structures

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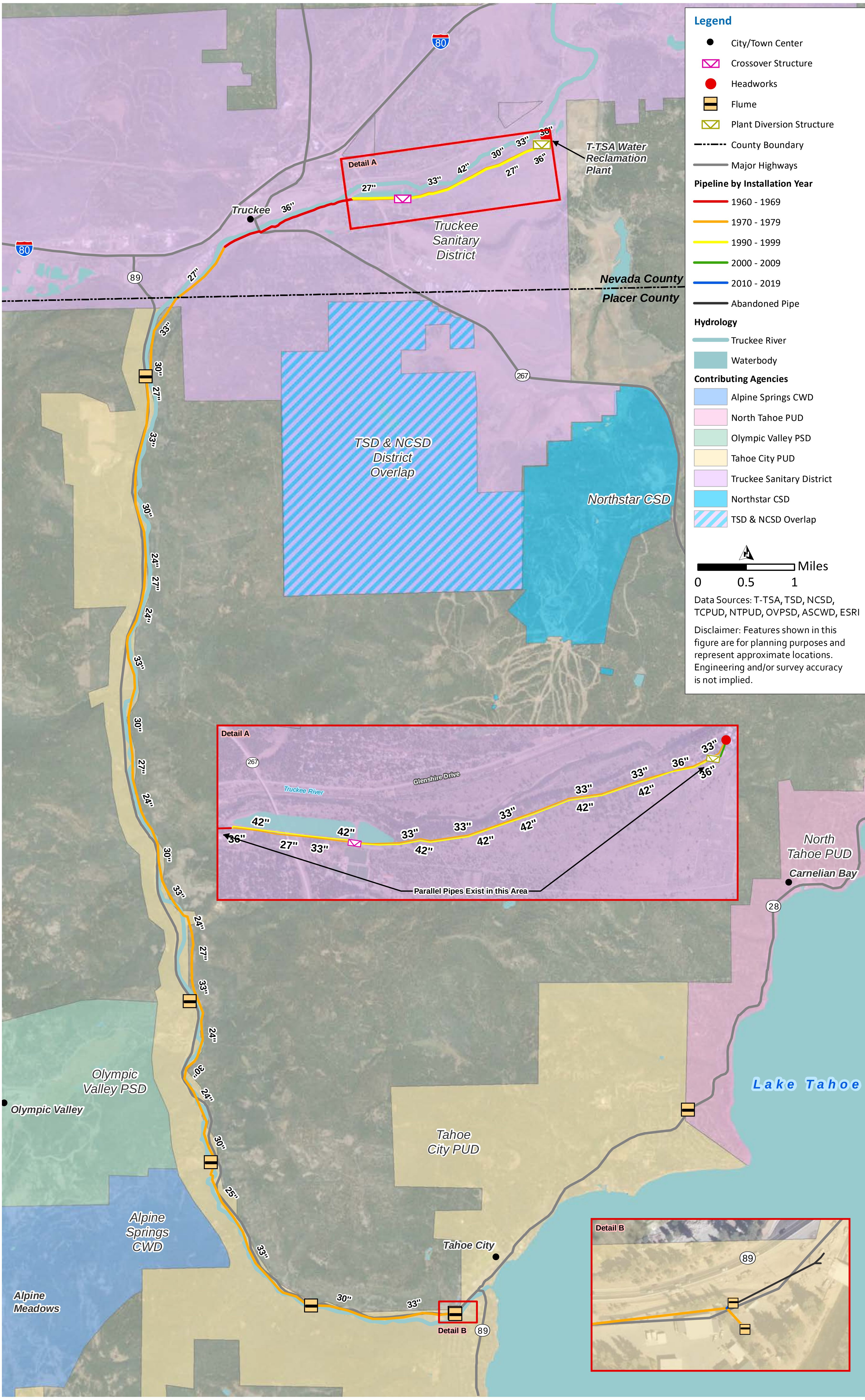

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Table 1.3 Interceptor System Pipeline Installation Date Summary(1)

Decade	Length (miles)	Percent of System (by Length)
1960 – 1969	1.42	7.3
1970 – 1979	15.85	81.1
1980 – 1989	--	--
1990 – 1999	2.11	10.8
2000 – 2009	0.09	0.5
2010 – 2019	0.07	0.4
Total	**19.54**	**100.0**

Notes:
(1) Source: T-TSA record drawings and GIS data base.

1.1.2 Special Structures

The TRI includes several important flow diversion structures on the TRI as it approaches the WRP. These flow diversion structures can be used to divert flows to emergency retention basins during high flow events.

T-TSA owns eight ponds located on the south bank of the Truckee River west of the existing subsurface disposal fields for the WRP. All of the ponds are considered to be independent storage basins, although ponds "A", 2, 3, 4, 5, and "B" may have originally been interconnected, and ponds "D-1" and "D-2" may have originally been interconnected. Flows from Pond B can be diverted to the D ponds via the Pond D Pump Station located at the southeast corner of Pond B. This pump station includes two vertical turbine pumps which pump into a discharge header that goes uphill to the D ponds.

Ponds are filled with a safe margin of freeboard and extra storage. The usable combined storage capacity of Ponds "A", 3, "B," "D-1," and "D-2" is approximately 24 million gallons (MG). Additional storage capacity is potentially available in Ponds 2, 4, and 5; however, T-TSA considers the use of these ponds as a "last-resort," given that they are unlined and in close proximity to the Truckee River. The WRP also has an onsite emergency retention basin with usable storage capacity of 7.8 MG. More information about the emergency storage basins can be found in Volume 3, Chapter 1 - Description of Existing Facilities.

Figure 1.5 shows the location of the offsite emergency storage ponds.

The following summarizes the diversion structures:

- Manhole (MH) 132A: This manhole has a 27-inch outlet pipe allowing wastewater to flow into MH 132 and subsequently to MH 1320. This manhole also contains a secondary outlet pipe to a gate valve that can be used to divert all or a portion of flow from the TRI to Pond A. The gate valve is typically fully closed.
- Upstream Control Structure (MH 1320): This structure has a 27-inch inlet pipe and a 27-inch outlet pipe, which is controlled by a sluice gate that is typically fully open. Wastewater from this structure flows to MHs 133 to 136, and subsequently to the WRP. This structure also includes a weir overflow to divert all or a portion of flow from the TRI through a parallel 42-inch interceptor to the Crossover Structure. The slide gate to the weir overflow is typically fully closed.

- Crossover Structure: This structure has a 33-inch inlet pipe controlled by a typically open slide gate and a 33-inch outlet pipe with a typically open sluice gate. Wastewater from this structure flows to the Pond B Diversion Structure (MH 137), and then onto the WRP. The Crossover Structure also has a slide gate to receive weir overflows from the Upstream Control Structure (MH 1320) via the parallel 42-inch interceptor, and a slide gate to divert flows to the Downstream Control Structure (MH 150) via the parallel 42-inch interceptor. The slide gate to the Downstream Control Structure (MH 150) is typically fully closed.
- Pond B Diversion Structure (MH 137): This structure has a 33-inch inlet pipe and a 33-inch outlet pipe, with a typically open sluice gate, allowing wastewater to flow into MHs 138 to 149, then into the Downstream Control Structure (MH 150). This structure also contains a weir overflow with a sluice gate to divert flow to Pond B. The sluice gate to Pond B is typically fully closed.
- Downstream Control Structure (MH 150): This manhole structure has one 33-inch inlet pipe controlled by a normally open slide gate, and a 33-inch outlet pipe controlled by a normally open sluice gate. Wastewater from this structure flows to MH 151 where wastewater from the Glenshire neighborhood enters the TRI. The combined wastewater then flows to MHs 151A, 152, and 1520, before entering the WRP Headworks. This structure also receives flow from the upstream Crossover Structure, via the parallel 42-inch interceptor, controlled by a slide gate. Flows can be diverted from this structure via a 36-inch outlet controlled by a normally closed sluice gate to MH 554, and then to the Plant Diversion Structure (MH 555).
- Plant Diversion Structure (MH 555): Diverted flows from the Downstream Control Structure (MH 150) enter this structure via a 36-inch inlet pipe. An 18-inch outlet pipe controlled by a typically closed sluice gate diverts flow to MH 556 and then to the WRP's Emergency Retention Basin. This structure also contains a sluice gate to a separate chamber, which has a 30-inch outlet controlled by another sluice gate where wastewater flows to MHs 1555 and 1556, and then to the WRP Headworks. The Plant Diversion Structure (MH 555) is typically only used during high flow scenarios.
- Headworks: The Headworks facility is where all flows enter the WRP for processing. Flows pass through bar screens to remove large debris, a Parshall flume for measuring, and grit chambers to remove grit and sediment before Primary Treatment. More information regarding this facility can be found in Volume 3, Chapter 1 - Description of Existing Facilities.

The location of these structures is shown in Figure 1.3, and a schematic showing these structures is shown in Figure 1.6.

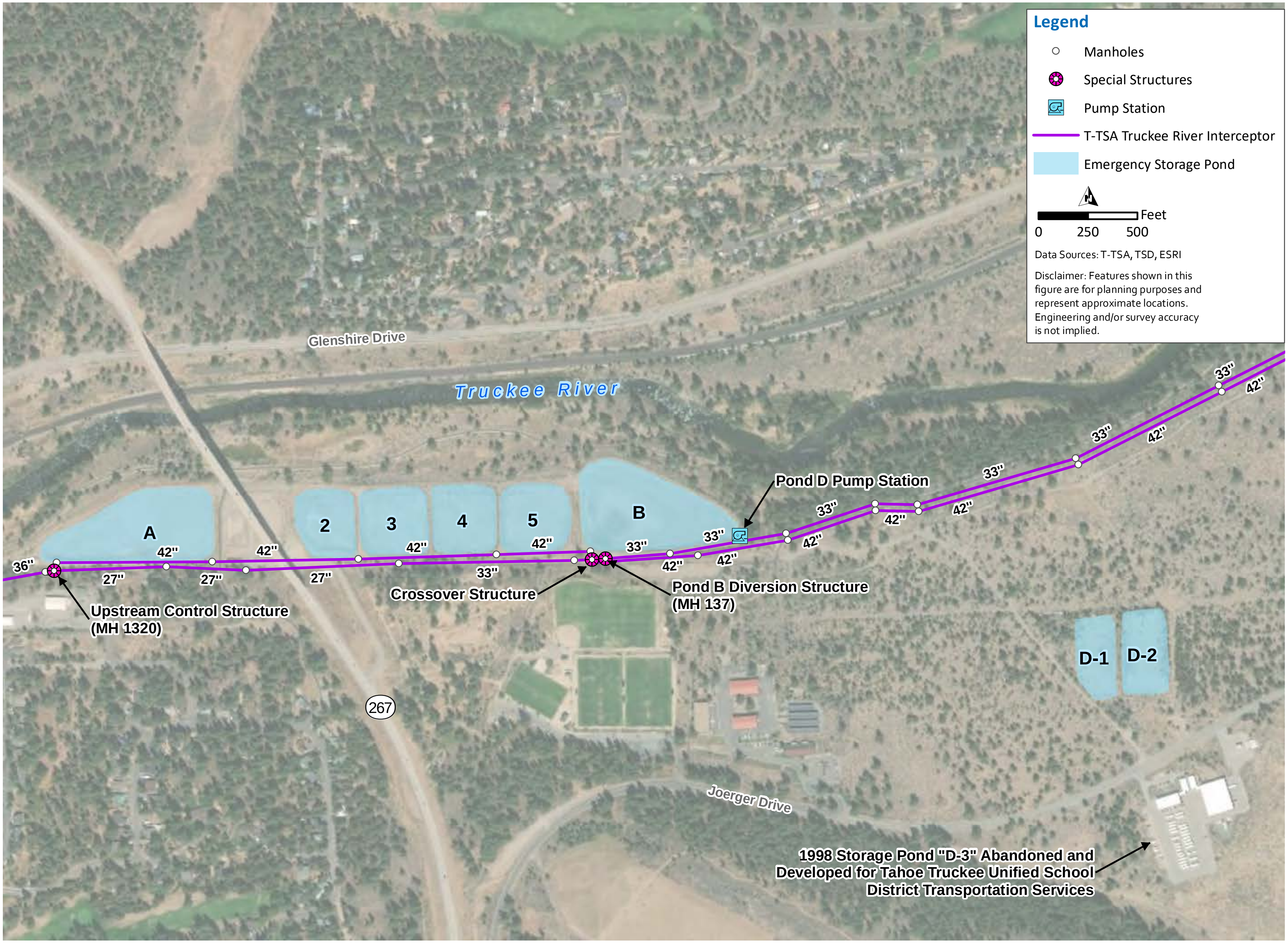

Figure 1.5 Emergency Storage Ponds

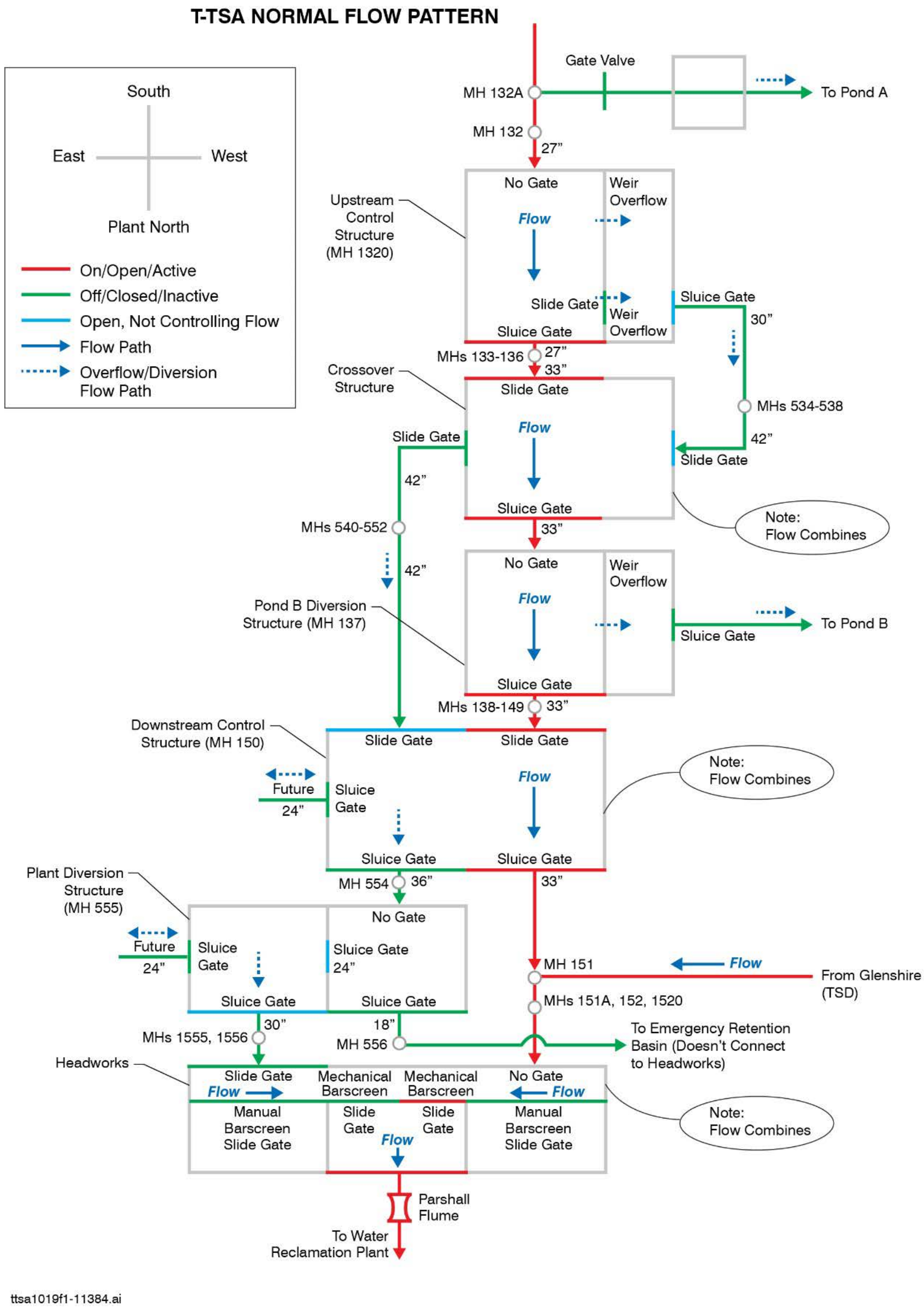

Figure 1.6 Flow Diversion Structure Schematic

Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 2: COLLECTION SYSTEM MASTER PLAN
CHAPTER 2: CONDITION ASSESSMENT AND ASSET MANAGEMENT

FINAL | February 2022

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Chapter 2

CONDITION ASSESSMENT AND ASSET MANAGEMENT

2.1 Introduction

The Tahoe-Truckee Sanitation Agency (T-TSA/Agency) provides wastewater treatment and collection for the North Lake Tahoe and Truckee region. T-TSA owns and operates the Water Reclamation Plant (WRP) located along the Truckee River in the eastern portion of the Town of Truckee near the intersection of the Truckee River and Martis Creek. Wastewater is conveyed to the WRP via the Truckee River Interceptor (TRI). The TRI flows south to north and begins in Tahoe City and follows the Truckee River and State Highway 89 to the Town of Truckee.

T-TSA has contracted with Carollo Engineers, Inc. (Carollo) to assist in developing its Master Sewer Plan (Master Plan). As a part of this Master Plan, Carollo reviewed the Agency's existing inspection data for the TRI and develop recommendations related to anticipated rehabilitation and replacement (renewal) projects. The purpose of this chapter is to share the condition assessment results with T-TSA. The condition of the TRI and its appurtenances was then used to prioritize TRI rehabilitation projects and develop annual capital cost expenditures as part of the overall Capital Improvement Program (CIP).

The primary goals of this project were to develop and implement transparent and defensible processes that will:

- Improve efficiencies in capital planning, operations, maintenance, and mission-critical support functions.
- Improve the rationale for prioritizing projects (e.g., optimize and standardize the process for considering the need, timing, and costs of CIP projects).
- Improve data collection and analysis (e.g., improve fundamental data and information mapping to support sound planning and engineering decisions).
- Optimize long-term spending priorities to account for the assets' life-cycle costs, the interdependencies of projects (eventually including between treatment and collection systems), and impacts to the customers.

2.2 Project Approach

To support long-term management of the TRI, condition assessment data were used to develop a TRI Renewal Program. The TRI Renewal Program prioritizes renewal projects within the capital program. A vital component of a Renewal Program is understanding the condition of the assets, determining remaining useful service life, and evaluating risk. In order to focus resources on the

TRI segments with the greatest needs, a data-driven decision-making process was utilized to understand the condition for individual TRI segments. The key tasks of the project included:

- Data Collection and Review – Collect data related to the TRI condition assessment and inspections. Review data, identify issues related to data quality or defect coding. Recommend a data set to be used for the condition assessment.
- Data Management – Build a central database to store inspection data. Standardize a recommended data set to better understand the condition of each TRI segment.
- Renewal Program – Use the inspection data to recommend renewal projects and develop a prioritized renewal plan.

2.2.1 NASSCO Background

Carollo was tasked with using the T-TSA's inspection data to develop a renewal program. The historical inspections identified defects along the sewer segments and assigned defect codes that were either structural or operation and maintenance (O&M) in nature. The assigned defect codes used the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) scoring system. The PACP scoring standard uses a scale of 1 through 5 to denote the condition of each segment. The descriptions of the five defect categories (codes) are summarized below:

- 5: Most Significant.
- 4: Significant.
- 3: Moderate.
- 2: Minor to Moderate.
- 1: Minor.

The defect codes help identify renewal projects and maintenance needs, as well as help prioritize projects.

2.3 Data Collection and Review

This section summarizes the data collected and reviewed. The primary source of the TRI asset data was the T-TSA geographic information system (GIS) described below. Additional sources of key information include T-TSA's digital scans (DS) inspection data, maintenance tables, desktop analysis (spreadsheet), and Agency staff input.

2.3.1 GIS Data

Carollo built a GIS database using information from T-TSA's maps, sewer inspection reports, and as-built plans, as well as information from El Dorado County, Nevada County, Placer County, Tahoe Regional Planning Agency, and the contributing sewer agencies. Detailed information regarding T-TSA's interceptor system was compiled in the GIS database.

The TRI is approximately 19.5 miles long. The diameter of the TRI ranges between 18-inch to 42-inch, with 33-inch as the most prevalent pipe diameter, accounting for approximately 34 percent of the entire length of the TRI. The TRI consists of three materials; reinforced concrete pipe (RCP) being the most prevalent pipe material, accounting for approximately 96 percent of the entire length of the TRI. A majority of the TRI was installed in the 1970s, accounting for approximately 86 percent of the entire length. See Volume 2, Chapter 1 - Description of Existing Facilities for additional details.

2.3.2 Digital Scan Inspection Data

T-TSA regularly inspects the TRI every 3 to 4 years by schedule, as illustrated in Figure 2.1. The DS inspections were conducted by Agency staff as well as inspection contractors, and used the standardized NASSCO PACP scoring system. The data included DS inspections conducted since 2012 in various file formats. Carollo reviewed the provided DS inspection data from 2013 through 2018. (T-TSA inspected the TRI in 2019 and 2020 as well; however, DS data for these years were not available at the time of Carollo's analysis and were therefore not included.) T-TSA provided external hard drives that contained data including inspection databases, shapefiles, digital scans, and reports. The data format varied depending on the year. Before 2016, inspection data consisted of scanned reports and no databases. These reports were converted using Excel and then checked for accuracy. After 2014, there were a total of three separate contractor DS databases for 2016, 2017, and 2018 inspections in multiple formats. In most cases, multiple databases were created for each inspection set. The data also included some duplicate inspections.

Some of the TRI segments have had multiple inspections since 2012. Since the data were in multiple formats, T-TSA has not been able to easily track the TRI condition over time. The DS inspections did not have a unique pipe identifier (ID) that matched with the GIS data provided. Table 2.1 summarizes the TRI segments inspected by year.

Table 2.1 Digital Scan Inspection Data(1)

Upstream Structure	Downstream Structure	Inspection Year(s)
MH-02(2)	MH-53	2014, 2019(3)
MH-53	MH-98	2013, 2016, 2018
MH-98	WRP	2014, 2017, 2020(3)

Notes:
(1) Source: T-TSA DS data (2013, 2014, 2016, 2017, 2018, 2019, 2020).
(2) The original TRI section up to MH 2 no longer exists and has been replaced by TCPUD/NTPUD joint sewerage facilities.
(3) DS data from 2019 and 2020 were not available at the time of this analysis and were therefore not used.
Abbreviations: MH = manhole.

After reviewing the DS data, Carollo determined that a central database would need to be built using the various data formats in order to collate and sort all data. DS inspections and associated condition scores were available for nearly 100 percent of the TRI. However, during the process of converting data to a uniform format, there were inconsistencies found in the scoring of pipe segments with multiple inspection years. In some cases, the most recent inspection report showed that a pipe segment was in better condition compared to historical inspection reports. Therefore, for that reason, the DS inspection data were not used to build a central database.

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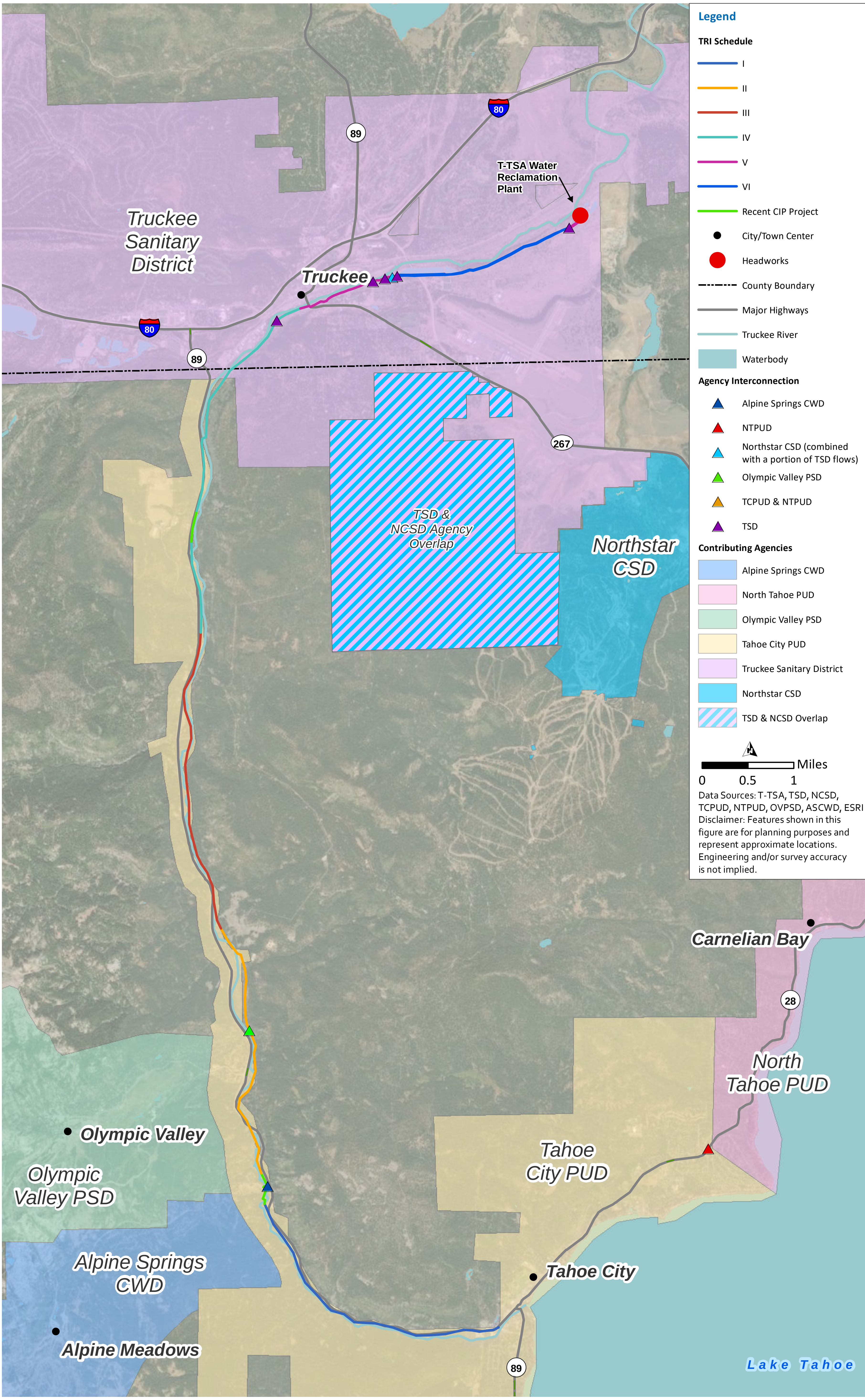

Figure 2.1 TRI by Schedule

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2.3.3 Maintenance Tables

T-TSA also provided two maintenance tables. These data included pipe segment defects for various inspection years as summarized in Table 2.2. The maintenance tables include contractor-identified defects as well as defects not identified by the contractor. Defects that were not identified by the contactor were either identified by T-TSA or other consultants. Defects that were identified by T-TSA were assigned a defect grade based on the grade of similar defects identified by the contractor.

Some of the important information tracked by the maintenance tables includes the condition (defect name), year the defect was identified, where the defect occurred along the pipe segment, defect grades, and start and finish points. The maintenance table data included repeat defects and made it difficult to identify the length of continuous defects. Furthermore, some defects were not assigned defect codes. However, the maintenance tables had the most complete set of data available and for that reason were used to build a central database.

Table 2.2 Maintenance Table Data(1)

Upstream Structure	Downstream Structure	Maintenance Table Year	Inspection Year
Flume	MH-53	2016	2012, 2013, 2014
MH-53	MH-98	2016	2013, 2016
MH-98	Headworks	2017	2014, 2017

Notes:
(1) Source: T-TSA Maintenance Tables (2016, 2017).

2.3.4 Data Review and Manipulation

The maintenance tables were used to develop a central database because they contained a complete data set. The inspection data were aggregated with the maintenance data into a complete data set to provide a single view of the TRI historical conditions scores for both O&M and structural ratings. To provide consistency, the following changes to the raw data were made.

- Defects were assigned a NASSCO PACP defect code based on the pipe condition from the maintenance table.
- Defect notes were used to assign a defect code when the maintenance table's condition was not similar to a PACP defect description. The maintenance table defect grade was assumed when the defect code grade varied based on actual conditions.
- In the case of 'Surface Other' defects, the maintenance table defect grade was used instead of the PACP grade of 0. 'Surface Other' defects were assigned PACP codes and grades based on any applicable notes in the maintenance tables if available.
- Defects with grades of 4 and 5 were reviewed to determine if the defect was a repeat defect.
- 'Continuous defects' was not used because the data format did not allow for ease of use. Instead, such continuous defects were counted as individual defects and assigned PACP codes and grades as appropriate.

The developed central database utilizes individual observations and defect coding to determine the condition of each pipeline. Figure 2.2 shows the breakdown of the peak defect score for each segment of the TRI. Approximately 0.8 miles (4 percent) of the TRI found no defects, 9.6 miles (49 percent) have minor to moderate defects (grades 1, 2, or 3) and 9.2 miles (47 percent) have significant defects (grades 4 or 5). Table 2.3 summarizes the defect grades by structural and O&M defects. The majority of the grade 4 and 5 defects were the result of suspected manufacturing defects where pipeline reinforcement is visible. Due to the nature of these defects, Carollo and the District have reviewed historical inspection data to determine if these defects are degrading over time. Based on this analysis, it was determined that the there is no immediate risk of failure.

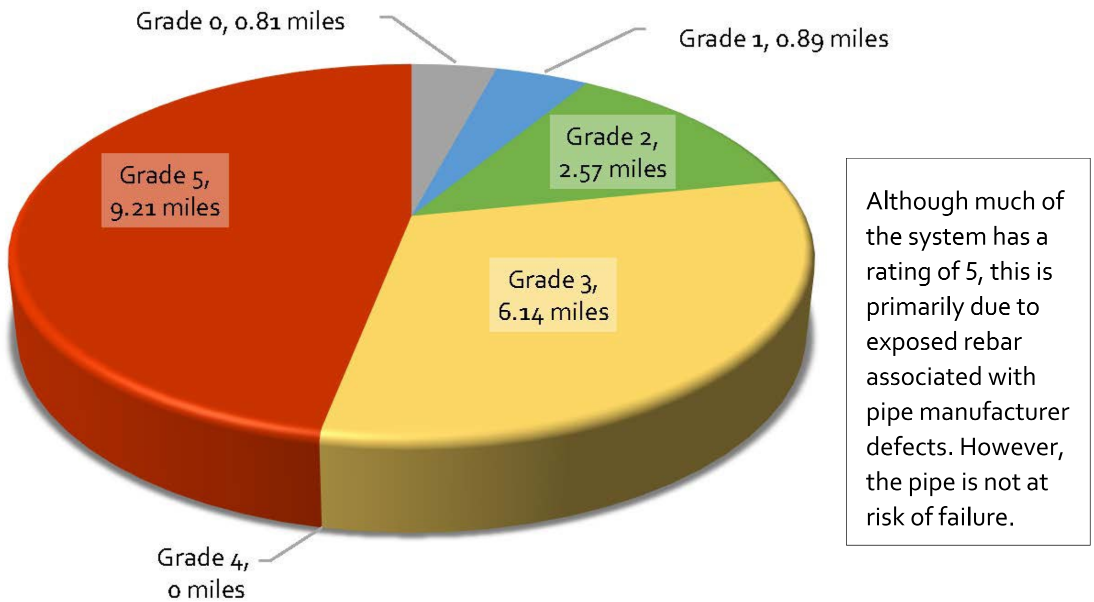

Figure 2.2 Inspection Scoring Summary

Table 2.3 Inspection Scoring Summary by Type

Defect Grade(1)	Structural Defects (miles)	Structural Defects (percent)	O&M Defects (miles)	O&M Defects (percent)
5	9.21	47.0	0.11	0.6
4	0.00	0.0	0.08	0.4
3	4.77	24.3	2.78	14.2
2	1.39	7.1	9.35	47.7
1	2.74	14.0	0.91	4.7
None	1.50	7.6	6.39	32.6

Notes:
(1) Although much of the system has a rating of 5, this is primarily due to exposed rebar associated with pipe manufacturer defects. However, the pipe is not at risk of failure.

Structural defects resulting in a defect grade of 5 were: surface reinforcement visible (69), reinforcement corroded (13), and reinforcement projecting (3). Some notable O&M defects that could impact the renewal projects include: water level sag (12) and alignment down/left/right (7).

The amount of pipe segments with surface reinforcement visible (SRV) defects raised concerns with regards to the structural integrity of these pipes. However, the SRV defects appear to be manufacturer defects. Furthermore, the PACP grades are not indicative of a failing pipeline. T-TSA's DS contractor defaulted to assigning a defect grade of 5 for an entire pipeline segment even when very little of the surface reinforcements were showing. Carollo differentiated these pipe segments by considering the pipe to be in poor condition if other aggregate codes are associated with the SRV. Carollo also reviewed a select sample of pipe segments with SRV defects and compared 2013 DS data with 2016 DS data to ascertain whether deterioration had occurred in that time frame. This review showed no significant change in pipe condition, which is why immediate replacement of these pipe segments has not been recommended in this Master Plan. Instead, this Master Plan recommends that a Visible Reinforcement Study be conducted to better understand the structural integrity of these pipe segments, and that a TRI Renewal Program be included to address sewer infrastructure that is susceptible to failure. The TRI Renewal Program would rehabilitate or replace any pipe segments with SRV defects if they are determined to be susceptible to failure during the Visible Reinforcement Study.

Given the concerns about SRV defects, tempered with the Agency's experience in operating the TRI, as well as Carollo's review of DS data for select pipe segment samples, a prudent approach is to review pipelines with SRV defects to determine the appropriate plan to address these defects. These pipelines need to be lined at some point, but maybe not immediately, as the PACP score would indicate. During the July 9, 2020 meeting, T-TSA staff noted that they plan to continue to carefully inspect these pipe segments with SRV defects when the segments are scheduled for routine DS in order to better monitor their condition and degradation. Figure 2.3 shows an example of an SRV defect, where the original rebar reinforcement in the RCP is visible.

Figure 2.3 Example: Surface Reinforcement Visible (SRV) Defect

2.4 TRI Renewal Program

Given the TRI's existing condition, replacement and rehabilitation (R&R/RR) projects are recommended to renew the TRI. The TRI Renewal Program framework used the defect coding from the data to determine the type of action needed (repair, rehabilitation, or replacement) for each pipe segment. Not all defect codes indicate the need to repair or rehabilitate a pipe. For example, excessive grease deposits require cleaning and no other actions. Also, the TRI Renewal Program considers sensitive areas such as proximity to the Truckee River and expected service life when prioritizing and recommending actions. This TRI Renewal Program can be used to develop a schedule of projects for the TRI over a 25-year period, broken into five phases and prioritized based on condition, expected service life, and other considerations:

- Phase 1: Years 2021 through 2025.
- Phase 2: Years 2026 through 2030.
- Phase 3: Years 2031 through 2035.
- Phase 4: Years 2036 through 2040.
- Phase 5: Years 2041 through 2045.

2.4.1 Truckee River Crossings

The TRI crosses under the Truckee River in a number of locations, and should these sections of the TRI fail, the consequence of a sewer pipeline failure within the banks of the Truckee River is extremely high. The TRI river crossings are ductile iron pipe (DIP). The inspections show that some of these crossings are experiencing corrosion issues, and it appears that the cement mortar lining in these pipes is gone. For these reasons, the TRI river crossings are considered to be Phase 1 renewal projects recommended to occur between 2021 and 2025. The rehabilitation projects described below were triggered because of the consequence of failure due to their location:

- *River Crossing, Gravity Main between MH 33 and MH 35 (Project RR-1):* This project includes lining of approximately 1,380 feet of 24-inch diameter pipeline between MH 33 and MH 35.
- *River Crossing, Gravity Main between MH 65 and MH 66 (Project RR-2):* This project includes lining of approximately 220 feet of 30-inch diameter pipeline between MH 65 and MH 66.
- *River Crossing, Gravity Main between MH 88 and MH 89 (Project RR-3):* This project includes lining of approximately 220 feet of 30-inch diameter pipeline between MH 88 and MH 89.

2.4.2 Estimated Service Life

Given the variance in data for this condition assessment, it is unclear which specific pipe segments are considered to be a higher priority for R&R. However, industry standards for estimated service life can be used to give a general idea of when pipelines should be replaced. The estimated service life is a measure of the number of years expected until a failure may occur and/or when a pipe may need to be rehabilitated or replaced.

A benchmark remaining service life analysis was conducted to understand the age of gravity sewers based on pipe material and installation year. Note that variables such as construction methods, operating environment (soil, slope, pressure, fluid chemistry, etc.), and inspection records were not used as part of this analysis. The assumed service life for RCP and cured-in-place pipe (CIPP) was 80 years and 50 years, respectively. The assumed service life is based on industry reported estimated life expectancies for these materials.

Table 2.4 summarizes the benchmark expected service life of the TRI by length. The benchmark results forecast that 16.7 miles (85 percent) of the TRI have an estimated remaining service life of 36 years or less. The benchmark results did not take into account the condition evaluation described above.

Table 2.4 Benchmark Estimated Remaining Service Life

Estimated Remaining Service Life (Years)	Length (miles)	Percent of TRI (%)
26	1.4	7
36	15.3	78
44	0.4	2
48	0.3	2
50	2.1	11
65	0.1	< 1

The benchmark analysis shows that the collection system will reach its expected service life outside the planning period of this Master Plan. However, if T-TSA were to follow the benchmark analysis beyond the timeframe of this Master Plan, they would see a very disproportional number of R&R projects during certain periods, resulting in significant costs in a short period of time. To prevent this from happening, it is important to flatten the curve with annual renewal projects.

It is recommended that T-TSA begin to address the aging TRI within the 25-year planning period of this Master Plan. However, the exact length of sewer associated with the TRI Renewal Program is unknown at this time since specific R&R projects have not been identified. Therefore, an overall TRI Renewal Program is recommended. The TRI Renewal Program is described below:

- *TRI Renewal Program (Project RR-4):* The TRI Renewal Program addresses sewer infrastructure that is susceptible to failure through R&R projects. The actual R&R projects and phasing should be based on current inspections. The TRI Renewal Program consists of an annual budget to ensure T-TSA has funding to complete R&R projects.

2.5 Recommendations and Conclusions

Repairing and maintaining a wastewater collection system is critical to overall system reliability and performance. To maximize flow through the TRI system and minimize overflows and pipe breakages, proper maintenance and repair of the wastewater collection system is necessary. This includes inspecting, cleaning, repairing, renewing, and replacing sewer pipelines. This also includes utilizing an asset management program to track TRI inspection data, understand the system's condition over time, and then develop specific pipeline renewal projects.

Costs for the recommended improvements were developed in Volume 2, Chapter 7 - Capital Improvement Plan after they were combined with the recommendations from the other evaluations.

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 2:
COLLECTION SYSTEM MASTER PLAN
CHAPTER 3:
HISTORIC AND FUTURE FLOWS

FINAL | February 2022

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Chapter 3

HISTORIC AND FUTURE FLOWS

This chapter provides an overview of how historic and future flows were calculated for the Tahoe-Truckee Sanitation Agency's (T-TSA's or Agency's) Master Sewer Plan (Master Plan).

3.1 Wastewater Flow Components

As a way to help the reader understand the wastewater flow components, this section describes and provides definitions of commonly used terminology in the analysis and evaluations conducted as part of this project. In general, wastewater consists of dry weather flow (DWF) and wet weather flow (WWF). DWF (or base flow) is flow generated by routine water usage in the residential, commercial, business, and industrial sectors of the collection system.

The other component of DWF is the contribution of dry weather groundwater infiltration (GWI) into the collection system. Dry weather GWI will enter the sewer system when the relative depth of the groundwater table is higher than the depth of the pipeline, and when the susceptibility of the sanitary sewer pipe allows infiltration through defects such as cracks, misaligned joints, and broken pipelines.

WWF includes storm water inflow, trench infiltration, and GWI. Trench infiltration will enter the sewer system when rainfall wets the soil in a sewer trench, but after the rain event, the trench dries out and trench infiltration no longer enters the sewer system. The storm water inflow and trench infiltration comprise the WWF component termed inflow and infiltration (I/I). Per the T-TSA's Ordinance 2-2015, storm water inflow and other drainage (including drainage from excavations, roofs, foundation drains, or surface or groundwater drains) is not permitted to be discharged to the sanitary sewer system. However, I/I can still occur due to aging infrastructure and needs to be accounted for in the overall wastewater flow. The response in the sewer system to rainfall may be seen immediately (as with inflow) or within hours after the storm (as with infiltration).

The third element of WWF is GWI, which is not specific to a single rainfall event, but rather to the effects on the system over the entire wet weather season. The depth of the groundwater table rising above the pipe invert elevation causes GWI. Sewer pipes within close proximity to a body of water can be greatly influenced by groundwater effects. As the groundwater table fluctuates over the wet weather season, this fluctuation is seen as a mounding effect in flow monitoring data. Figure 3.1 illustrates the various flow components, which are described in detail in the following sections.

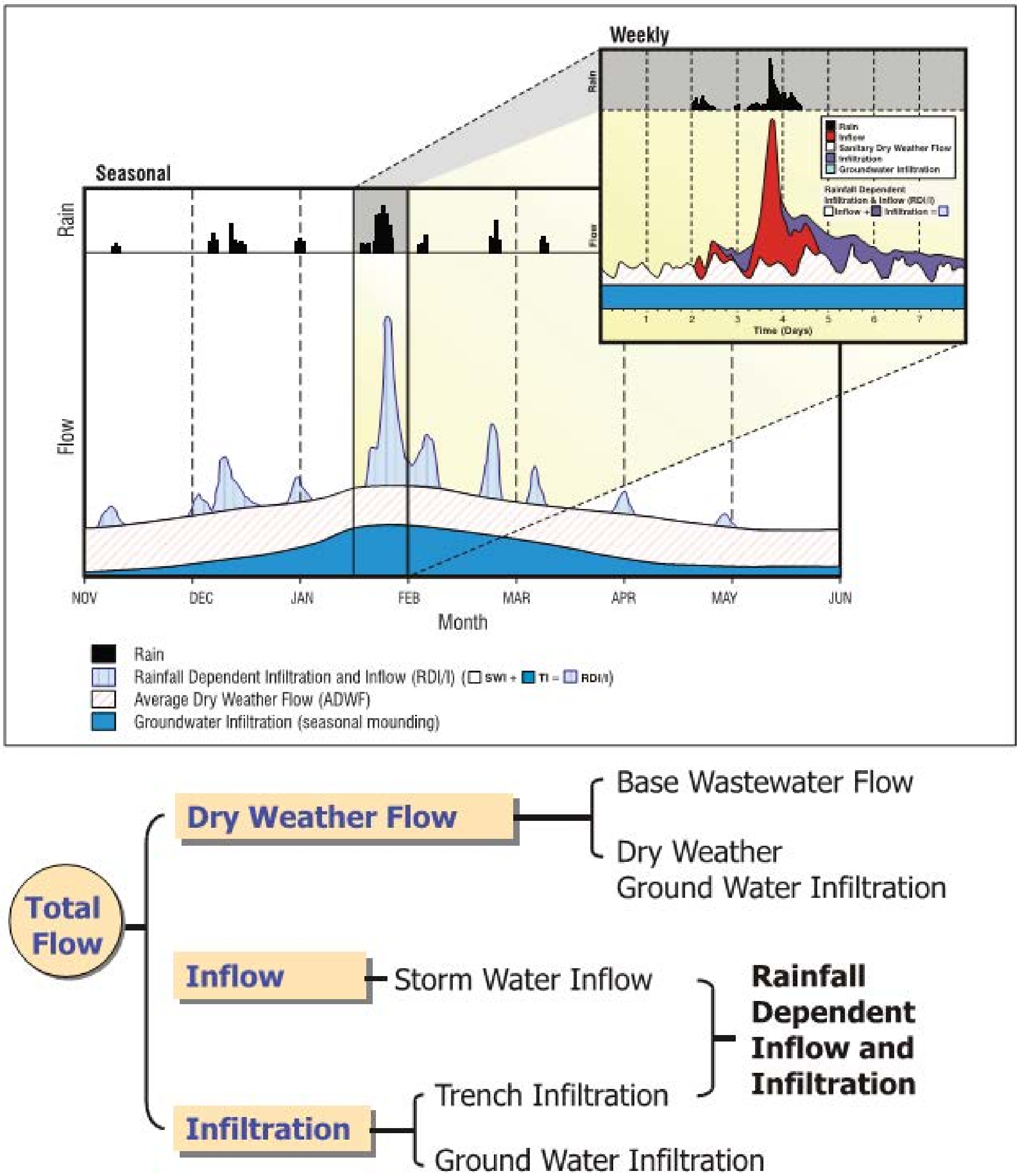

Figure 3.1 Typical Wastewater Flow Components

3.1.1 Base Wastewater Flow

The base wastewater flow (BWF) is the flow generated by the member district customers. The flow has a diurnal pattern that varies depending on the type of use. Commercial and industrial patterns, though they vary depending on the type of use, typically have more consistent higher flows during business hours and lower flows at night. Furthermore, the diurnal flow pattern experienced during a weekend may vary from the diurnal flow experienced during a weekday. For the T-TSA, the average dry weather flow (ADWF) was estimated from the Agency's plant flow data and permanent flow meter data. For the purposes of this Master Plan, the ADWF is defined as the minimum 3-month rolling average flow.

3.1.2 Average Annual Flow

The average annual flow (AAF) is the average flow that occurs on a daily basis throughout the year, including both periods of dry and wet weather conditions.

3.1.3 Average Dry Weather Flow

ADWF is the average flow that occurs on a daily basis during the dry weather season. The ADWF includes the BWF generated by residential, commercial, and industrial users, plus the dry weather GWI component. For the T-TSA, the ADWF is defined as the average of the 7-day rolling average flow from June 21st to September 21st, per T-TSA's Waste Discharge Requirements (WDRs).

3.1.4 Groundwater Infiltration

GWI, one of the components of I/I, is associated with extraneous water entering the sewer system through defects in pipes and manholes. GWI is related to the condition of the sewer pipes and manholes, as well as groundwater levels. GWI may occur throughout the year, although rates are typically higher in the late winter and early spring. Dry weather GWI (or base infiltration) cannot easily be separated from BWF by flow measurement techniques. Therefore, dry weather GWI is typically grouped with BWF.

3.1.5 Infiltration and Inflow

All wastewater collection systems have some I/I, although the characteristics and severity vary by region and individual collection system. Some of the most common sources of I/I are shown in Figure 3.2. Infiltration is defined as storm water flows that enter the sewer system by percolating through the soil and then through defects in pipelines, manholes, and joints. Examples of infiltration entry points are cracks in pipelines, misaligned joints, and root penetration. Inflow is defined as storm water that enters the sewer system via storm drain cross connections, leaky manhole covers, or cleanouts. Examples of inflow entry points are illegal roof drain and downspout connections, leaky manhole covers, and illegal storm drain connections.

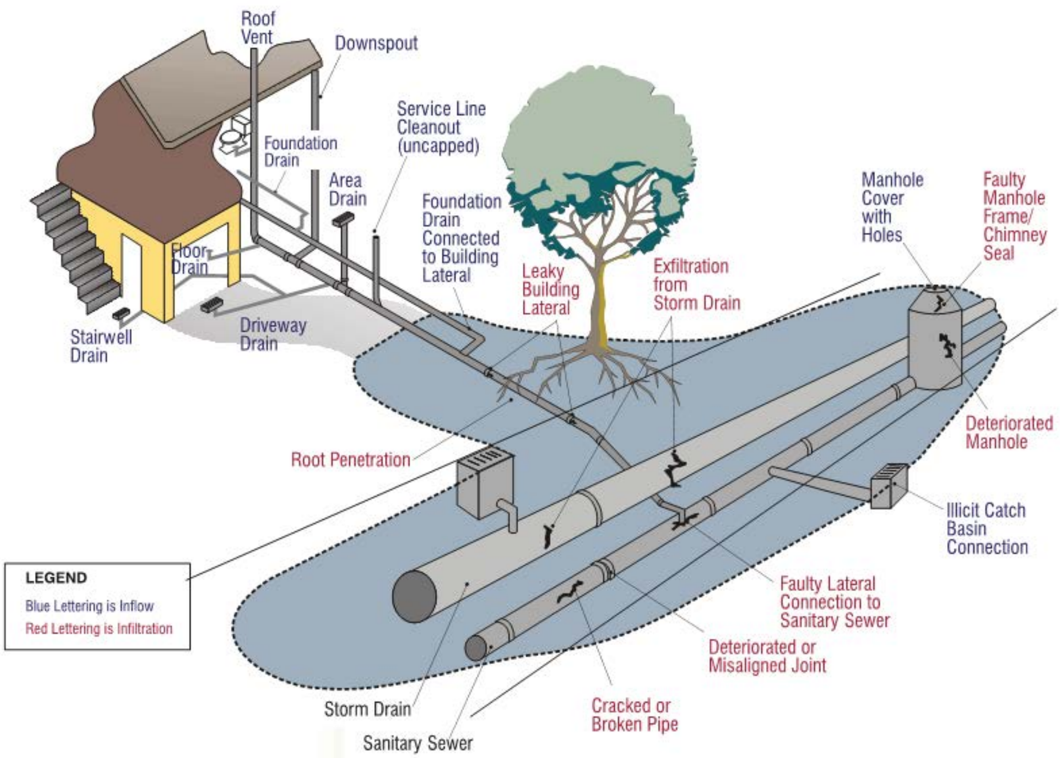

Figure 3.2 Typical Sources of Infiltration and Inflow

The adverse effects of I/I entering the sewer system is that it increases both the flow volume and peak flows, as illustrated in Figure 3.3. If too much I/I enters the sewer system such that the sewer system is operating at or above its capacity, sanitary sewer overflows (SSOs) could occur.

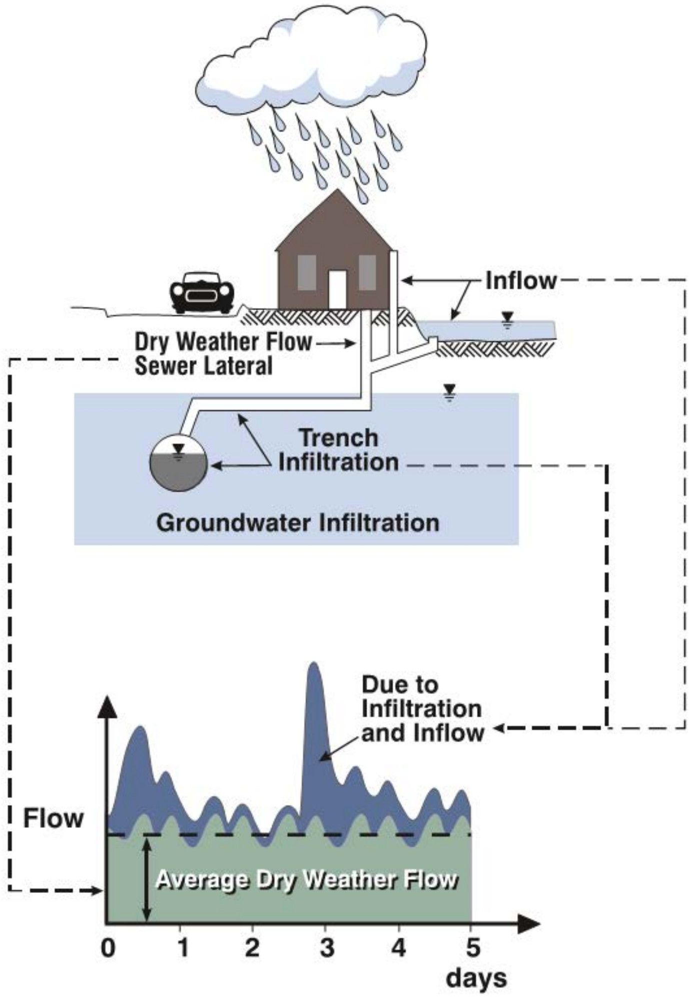

Figure 3.3 Typical Effects of Infiltration and Inflow

3.1.6 Peak Wet Weather Flow (Design Flow)

Peak wet weather flow (PWWF) is the highest observed flow that occurs following a design storm event. Wet weather I/I causes flows in the collection system to increase. PWWF is typically used for designing sewers and lift stations. Therefore, the PWWF and the "Design Flow" are synonymous and will be used interchangeably throughout this report.

3.2 Historic Wastewater Flows

T-TSA monitors flow from seven permanent flow meters on the Truckee River Interceptor (TRI), as well as the influent flow meter at the Water Reclamation Plant (WRP). During significant wet weather events, peak influent flows in excess of 15.4 million gallons per day (mgd) are diverted to the emergency retention basin (ERB) at the WRP and/or the upstream emergency storage ponds on the TRI. Flows that are diverted to the ERB are not tracked on a daily basis; however, flows pumped from the ERB to the Headworks are tracked. In addition, Truckee Sanitary District (TSD) operates several flow meters within their system, some of which were used as a reference as part of this project. Figure 3.4 shows the locations of the permanent flow meters, while Figure 3.5 shows a schematic representation of the flow meters.

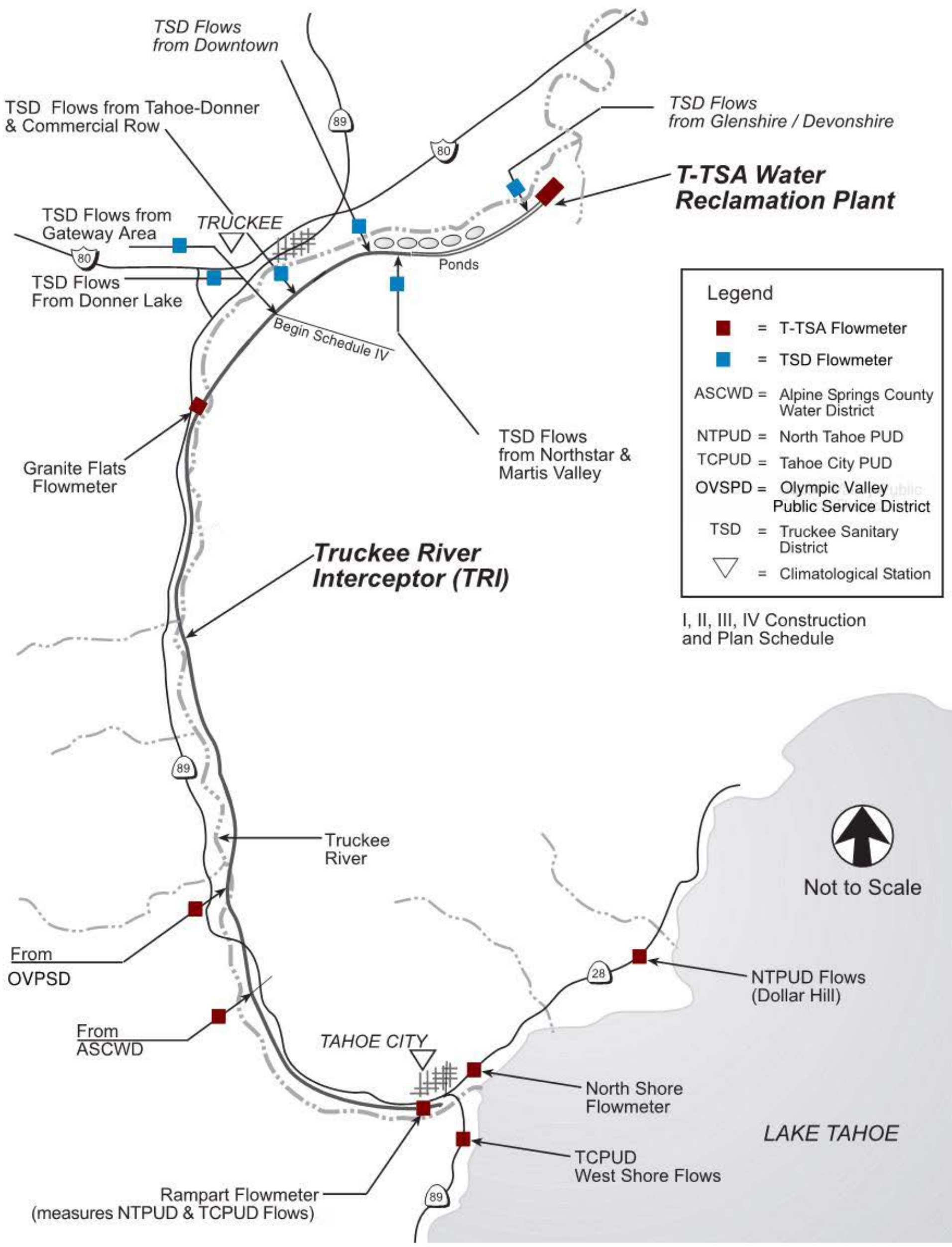

Figure 3.4 Truckee River Interceptor Permanent Flow Meter Locations

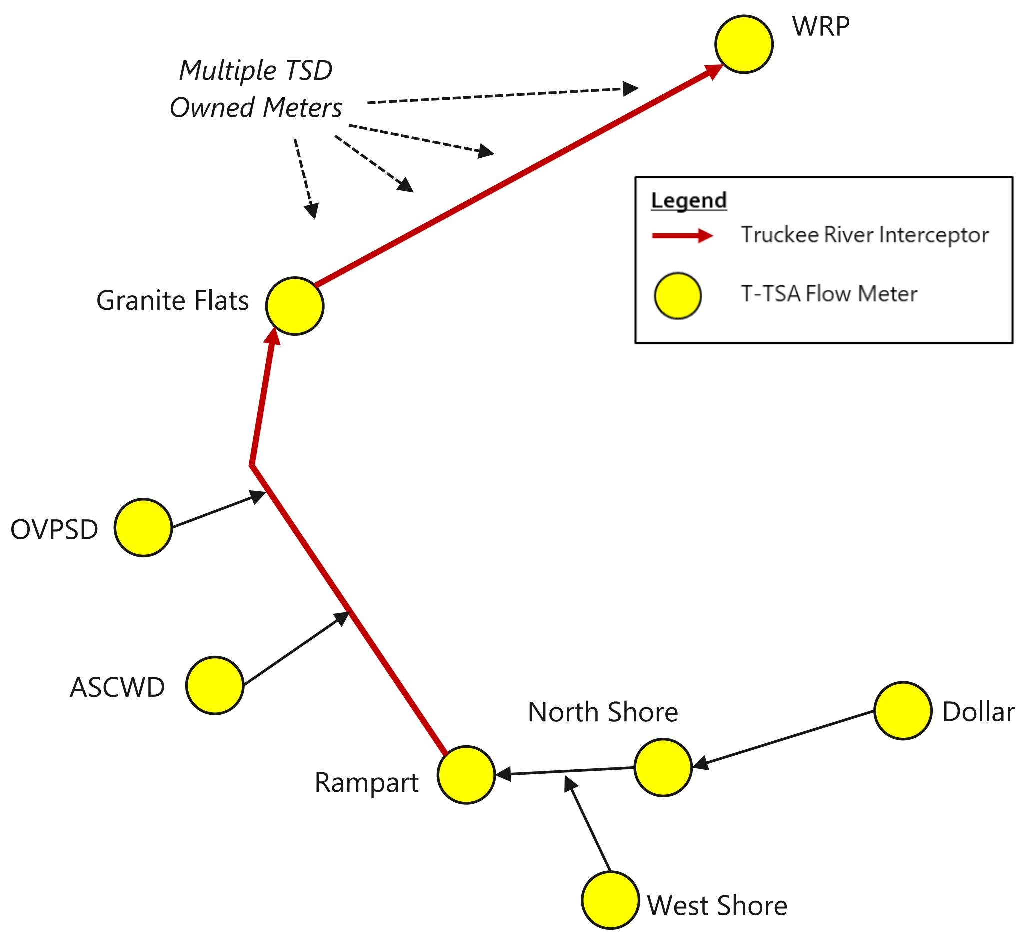

Figure 3.5 Truckee River Interceptor Permanent Flow Meter Schematic

Carollo Engineers, Inc. (Carollo) reviewed the historical permanent flow monitoring data from the years 2014 through 2018. These data were used to establish historical BWF, ADWF, peak DWF, and large historical wet weather events, which were used for wet weather model calibration (see Volume 2, Chapter 4 - Hydraulic Model Development, for additional information). T-TSA tracks data based on the water year; accordingly, the historical flow data were analyzed based on the water year. The latest full year of water year data (water year 2017/18) was used to establish the existing flows within the TRI.

Table 3.1 summarizes the 2017/18 BWF and ADWF for each member agency. As shown in Table 3.1, the existing BWF in the TRI (which is defined for the purposes of this study as the 90-day rolling average minimum flow) is estimated to be approximately 3.34 mgd. The ADWF (which is defined for the purposes of this study as the average of the 7-day rolling average flow between June 21st through September 21st of any year) for 2017/18 was 4.21 mgd. More than half of the flow to the WRP is generated by TSD customers.

As discussed in Volume 2, Chapter 1 - Description of Existing Facilities, T-TSA is designated as the regional entity to transport, treat, and dispose of wastewater from five member districts: North Tahoe Public Utility District (NTPUD), Tahoe City Public Utility District (TCPUD), Alpine Springs County Water District (ASCWD), Olympic Valley Public Service District (OVPSD), and TSD. [Northstar Community Services District (NCSD) also contributes wastewater to T-TSA, via

TSD's sewer collection system, and is not considered a member district, although it is a contributing agency]. Flows from these agencies combine in the TRI and are subsequently treated at the WRP.

Table 3.1 2017/18 BWF and ADWF

Member Agency	2017/18 Base Wastewater Flow[(1)(2)] (mgd)	2017/18 Average Dry Weather Flow[(1)(3)] (mgd)
NTPUD	0.621	0.859
TCPUD	0.517	0.807
ASCWD	0.045	0.054
OVPSD	0.154	0.187
TSD (includes NCSD)	2.007	2.305
Total	**3.34**	**4.21**

Notes:
(1) 2017/18 data is representative of the water year.
(2) BWF is the minimum 90 day rolling average flow.
(3) ADWF is the average of the 7 day rolling average flow between June 21st and September 21st.

Given the transient nature of the T-TSA service area, DWFs are typically much higher during holiday weekends. Historical flows for holiday weekends (i.e., high occupancy days) were analyzed to determine peak day flows into the TRI. Table 3.2 summarizes the 2017/18 high occupancy flows (HOF) by agency. As shown in Table 3.2, the two holidays with the highest flows are either New Year's Eve (NYE) or Independence Day (July 4th). DWFs on these days are 1.72 to 2.83 times higher than the typical BWF.

Table 3.2 High Occupancy Flow Summary

Member Agency	2017/18 BWF (mgd)	2017/18 ADWF (mgd)	2017/18 HOF (mgd)					Max. HOF (mgd)	Day of Max. HOF	HOF Peaking Factor (PF)(1)
			NYE 2017	NYE 2018	Memorial Day 2018	July 4, 2018	Labor Day 2018			
NTPUD	0.621	0.859	1.195	1.144	1.100	1.296	1.049	1.296	July 4th	2.08
TCPUD	0.517	0.807	0.986	0.904	0.877	1.203	0.882	1.203	July 4th	2.33
ASCWD	0.045	0.054	0.129	0.113	0.090	0.059	0.064	0.129	NYE	2.83
OVPSD	0.154	0.187	0.392	0.356	0.201	0.165	0.200	0.392	NYE	2.56
TSD	2.007	2.305	3.42	3.34	2.77	3.05	2.77	3.42	NYE	1.72

Notes:
(1) The HOF Peaking Factor is calculated by dividing the maximum HOF by the 2017/18 BWF.
Abbreviation: PF = peaking factor.

As previously mentioned, the WRP hourly influent flow data was also used to identify the largest storm events that occurred since 2017. As shown in Figure 3.6, the most significant wet weather events that have been recorded since 2017 occurred in January/February of 2017, where significant rain-on-snow events occurred. As shown in Figure 3.6, influent flows approached 18 mgd during these events. Note that Figure 3.6 does not show the amount of flow that was diverted to the ERB during these events. Although T-TSA diverted flows to the ERB during some of these significant rain-on-snow events, the WRP does not have the means to measure the amount of flow diversions, and therefore such diversions are not shown in this figure.

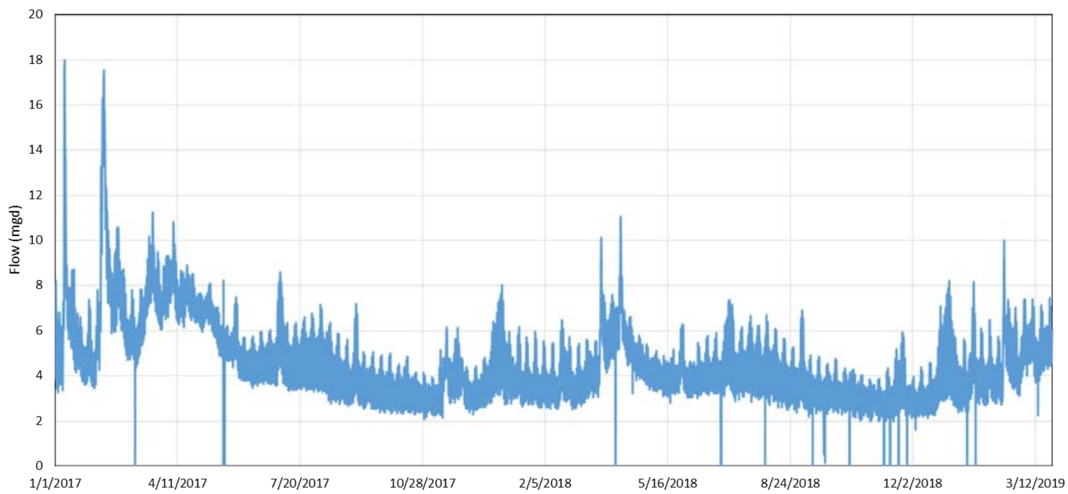

Figure 3.6 Hourly Influent WRP Flows, January 2017-March 2019

3.3 Projected Dry Weather Flows

This section summarizes the methodology used to develop future (year 2045) flow projections for each of the T-TSA contributory agencies. For more detail in how the flow projections were developed, refer to Appendix 3A - Dry Weather Flow Projection Detail.

3.3.1 North Tahoe Public Utility District

To determine how sewer flows from the NTPUD will change in the future, the most recent planning documents for this district were reviewed. These plans included, but were not limited to:

- NTPUD Main Sewer Pump Station Master Plan (Stantec Consulting, Inc., 2009).
- NTPUD Urban Water Management Plan (UWMP) (NTPUD, 2015).
- Linking Tahoe – Regional Transportation Plan and Sustainable Communities Strategy, Horizon Year 2017 – 2040 (Tahoe Regional Planning Agency (TRPA), 2017).
- Sewer Connection Historical Data (T-TSA, 2002-2019).
- Total District Water Production Requirements within the Boundaries of the Public Utility Districts Located in the California Portion of the Lake Tahoe Basin Technical Memorandum (TM) (Kennedy Jenks, 2020).

Within the NTPUD service area, full buildout has not yet been achieved. Therefore, the growth rate for this service area is needed to calculate future sewer flows. Growth rate assumptions were reviewed and compared for the various NTPUD planning documents, as shown in Table 3.3.

The selected growth rate of 0.77 percent per year was provided in the NTPUD 2015 UWMP, and appeared to be a slightly conservative, but reasonable growth rate as compared to the historical growth rate of sewer connections within the NTPUD service area.

Table 3.3 NTPUD Growth Rate Comparison

Planning Document	Average Annual Growth
NTPUD Main Sewer Pump Station Master Plan (Stantec Consulting, Inc., 2009)	0.44%
NTPUD UWMP (NTPUD, 2015)	**0.77%**
Linking Tahoe – Regional Transportation Plan and Sustainable Communities Strategy, Horizon Year 2017 – 2040 (TRPA, 2017)	3.70 %
Sewer Connection Historical Data (T-TSA, 2002-2019)	0.20% (12 SFRs)

Notes:
(1) Text in **bold** indicates selected document and value.
Abbreviations: SFRs = single-family residence/residential.

The Total District Water Production Requirements within the Boundaries of the Public Utility Districts Located in the California Portion of the Lake Tahoe Basin TM (Kennedy Jenks, 2020) provided existing and buildout water demand estimates for the major public utility districts on the California side of the Lake Tahoe Basin. These projections were used to develop a buildout wastewater flow projection by applying a return-to-sewer ratio to the future demand projections for NTPUD. To develop the return-to-sewer ratio, the 2018 baseline water production requirements (per the 2020 Kennedy Jenks TM) were compared to the 2018 BWF for NTPUD, as measured by the Dollar Hill sewer flume. The ratio of the 2018 BWF to the baseline water production yielded a return-to-sewer ratio of 0.33.

The buildout BWF for NTPUD was then calculated by multiplying the return-to-sewer ratio of 0.33 by the buildout water demand (2.53 mgd) as documented in the Total District Water Production Requirements within the Boundaries of the Public Utility Districts Located in the California Portion of the Lake Tahoe Basin TM (Kennedy Jenks, 2020). This yielded a buildout BWF of 0.85 mgd.

The 2045 BWF for NTPUD was calculated by applying a 0.77 percent per year growth to the existing BWF for NTPUD (0.62 mgd). This yielded a 2045 BWF of 0.76 mgd, which means that it is expected that buildout for NTPUD would occur after 2045. 2045 HOF for NTPUD was estimated by applying the High Occupancy PF of 2.08 cited in Table 3.2 to the projected 2045 BWF. This yielded a projected 2045 HOF for NTPUD of 1.59 mgd.

The existing ADWF (0.86 mgd) was calculated by averaging the 7-day running average between June 21st and September 21st, as measured by the Dollar Hill sewer flume. An ADWF:BWF peaking factor of 1.38 was calculated by dividing the 2017/18 ADWF by the 2017/18 BWF. This peaking factor was then applied to the BWF to project future ADWF. The 2045 ADWF was determined to be 1.06 mgd and the buildout ADWF was calculated to be 1.18 mgd.

Figure 3.7 shows the projected DWFs for NTPUD.

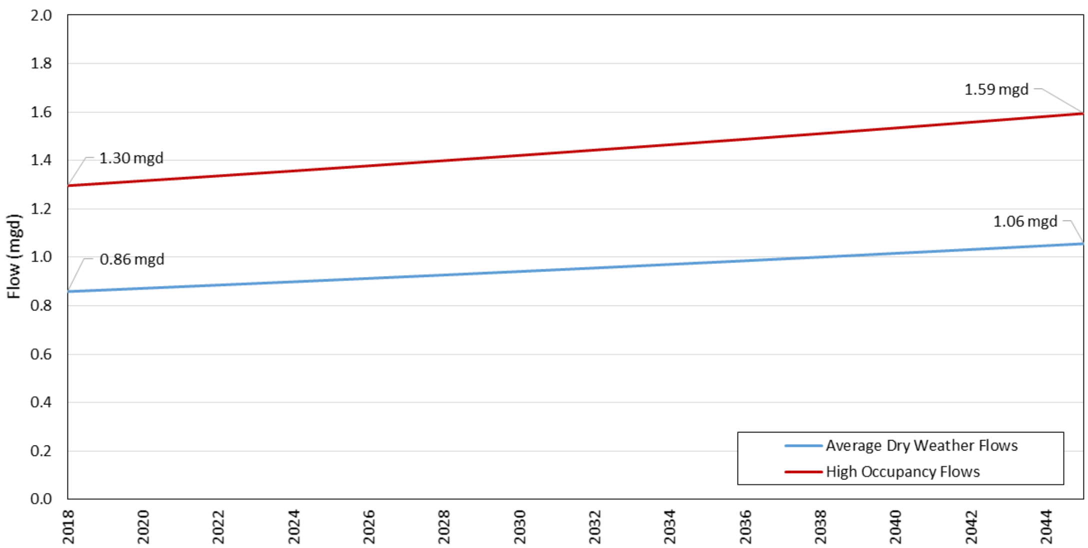

Figure 3.7 NTPUD Dry Weather Flow Projections

3.3.2 Tahoe City Public Utility District

To determine how sewer flows from TCPUD will change in the future, the most recent planning documents for this district were reviewed. These plans included, but were not limited to:

- Final Draft Preliminary Design Report (PDR) for West Lake Tahoe Regional Water Treatment Plant (Kennedy/Jenks Consultants with Auerbach Engineering Corp., 2014).
- TCPUD 2015 UWMP (TCPUD, 2015).
- Linking Tahoe – Regional Transportation Plan and Sustainable Communities Strategy, Horizon Year 2017 – 2040 (TRPA, 2017).
- Sewer Connection Historical Data (T-TSA, 2002-2019).
- Total District Water Production Requirements within the Boundaries of the Public Utility Districts Located in the California Portion of the Lake Tahoe Basin TM (Kennedy Jenks, 2020).

Within the TCPUD service area, full buildout has not yet been achieved. Therefore, the growth rate for this service area is needed to calculate future sewer flows. Growth rate assumptions were reviewed and compared for the various TCPUD planning documents, as shown in Table 3.4. The selected growth rate of 0.25 percent per year was provided in the TCPUD 2015 UWMP.

Table 3.4 TCPUD Growth Rate Comparison

Planning Document	Average Annual Growth
Final Draft PDR for West Lake Tahoe Regional Water Treatment Plant (Kennedy/Jenks Consultants with Auerbach Engineering Corp., 2014)	0.40%
TCPUD UWMP (TCPUD, 2015)	**0.25%**
Linking Tahoe – Regional Transportation Plan and Sustainable Communities Strategy, Horizon Year 2017 – 2040 (TRPA, 2017)	3.70%
Sewer Connection Historical Data (T-TSA, 2002-2019)	0.31% (24 SFRs)

Notes:
(1) Text in **bold** indicates selected document and value.

The Total District Water Production Requirements within the Boundaries of the Public Utility Districts Located in the California Portion of the Lake Tahoe Basin TM (Kennedy Jenks, 2020) provided existing and buildout water demand estimates for the major public utility districts on the California side of the Lake Tahoe Basin. These projections were used to develop a buildout wastewater flow projection by applying a return-to-sewer ratio to the future demand projections for TCPUD. To develop the return-to-sewer ratio, the 2018 baseline water production requirements (per the 2020 Kennedy Jenks TM) were compared to the 2018 BWF for TCPUD, as measured by the Rampart sewer flume (minus the measured flow for NTPUD from the Dollar Hill sewer flume). The ratio of the 2018 BWF to the baseline water production yielded a return-to-sewer ratio of 0.20.

The buildout BWF for TCPUD was then calculated by multiplying the return-to-sewer ratio of 0.20 by the buildout water demand (3.43 mgd) as documented in the Total District Water Production Requirements within the Boundaries of the Public Utility Districts Located in the California Portion of the Lake Tahoe Basin TM (Kennedy Jenks, 2020). This yielded a buildout BWF of 0.67 mgd.

The 2045 BWF for TCPUD was calculated by applying a 0.25 percent per year growth rate to the existing BWF for TCPUD (0.52 mgd). This yielded a 2045 BWF of 0.55 mgd, which means that it is expected that buildout for TCPUD would occur after 2045. 2045 HOF for TCPUD was estimated by applying the High Occupancy PF of 2.33 cited in Table 3.2 to the projected 2045 BWF. This yielded a projected 2045 HOF for TCPUD of 1.29 mgd.

The existing ADWF (0.81 mgd) was calculated by averaging the 7-day running average between June 21st and September 21st, as measured by the Rampart sewer flume (minus the measured flow for NTPUD from the Dollar Hill sewer flume). An ADWF:BWF peaking factor of 1.56 was calculated by dividing the 2017/18 ADWF by the 2017/18 BWF. This peaking factor was then applied to the BWF to project future ADWF. The 2045 ADWF was determined to be 0.86 mgd and the buildout ADWF was calculated to be 1.05 mgd.

Figure 3.8 shows the projected DWFs for TCPUD.

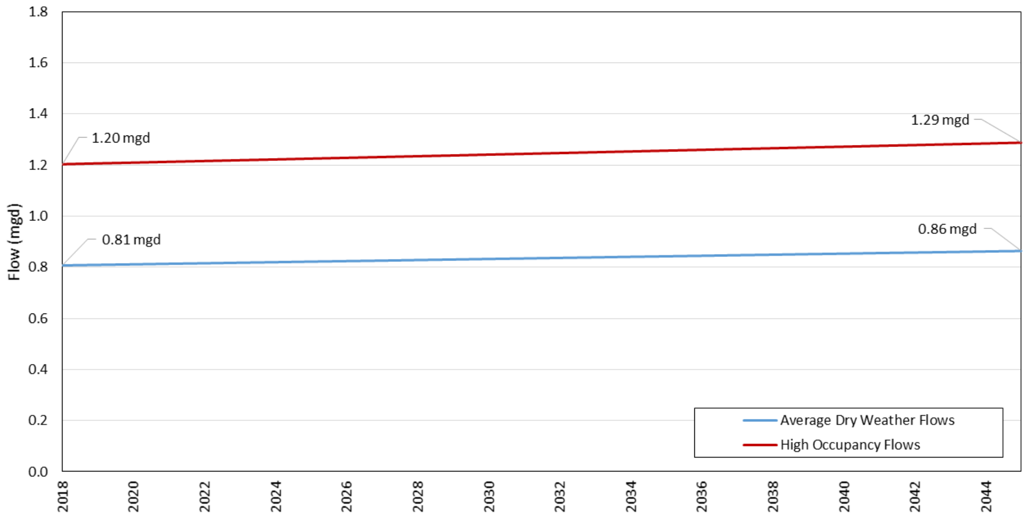

Figure 3.8 TCPUD Dry Weather Flow Projections

3.3.3 Alpine Springs County Water District

To determine how sewer flows from ASCWD will change in the future, the most recent planning documents for this district were reviewed. These plans included, but were not limited to:

- Recommended Long Range Water and Sewer Master Plan (Lumos and Associates, Inc., 2006).
- Sewer Connection Historical Data (T-TSA, 2002-2019).

Within the ASCWD service area, full buildout has not yet been achieved. Therefore, the growth rate for this service area is needed to calculate future sewer flows. Growth rate assumptions were reviewed and compared for the available ASCWD planning documents, as shown in Table 3.5. The selected growth rate of 0.34 percent per year was based on the historical sewer connection data.

Table 3.5 ASCWD Growth Rate Comparison

Planning Document	Average Annual Growth
Recommended Long Range Water and Sewer Master Plan (Lumos and Associates, Inc., 2006) - Assumes buildout in 2026; 0 percent growth after that date	0.71% (10 SFRs)
Sewer Connection Historical Data (T-TSA, 2002-2019)	**0.34% (2 SFRs)**

Notes:
(1) Text in **bold** indicates selected document and value.

Future flows for ASCWD include minor growth (roughly 2 SFR units per year) from the current service area. Additionally, two planned developments are expected to contribute flow in the future. These two developments are the White Wolf Subdivision and the Alpine Sierra

Subdivision. Carollo consulted with ASCWD staff to understand the potential timing of these developments. Based on these discussions, the following growth rate assumptions were used:

- Alpine Sierra: This project was assumed to start in year 2025 and to be completely built out by 2040. A total of 52 SFR units are expected, and 3.25 units were expected to be connected per year during those time periods.
- White Wolf: This project includes a total of 58 SFR units. This subdivision is assumed to begin connecting homes in 2035 and to be built out by 2040 (or roughly 10 SFRs per year of growth).

By 2045, it is projected that the BWF for ASCWD will increase to 0.056 mgd (compared to the existing BWF of 0.045 mgd), and the HOF is projected to increase to 0.16 mgd (compared to the existing HOF of 0.13 mgd). Continuing to project flows for ASCWD yielded a buildout BWF of 0.062 mgd.

The existing ADWF (0.054 mgd) was calculated by averaging the 7-day running average between June 21st and September 21st, as measured by the Alpine sewer flume. An ADWF:BWF peaking factor of 1.19 was calculated by dividing the 2017/18 ADWF by the 2017/18 BWF. This peaking factor was then applied to the BWF to project future ADWF. The 2045 ADWF was determined to be 0.067 mgd and the buildout ADWF was calculated to be 0.074 mgd.

Figure 3.9 shows the projected DWFs for ASCWD.

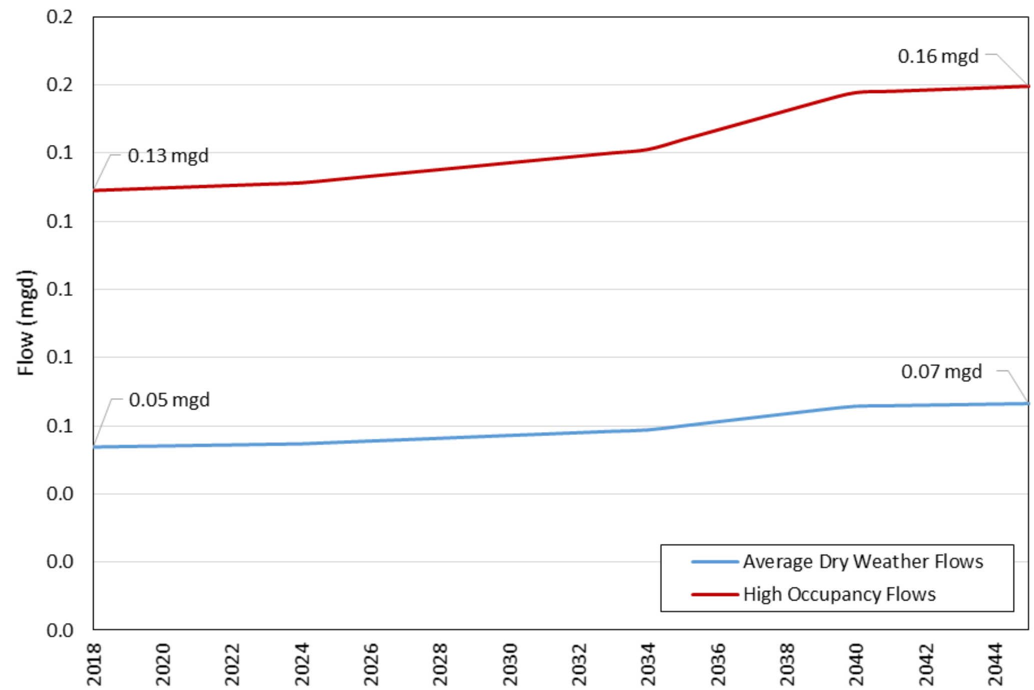

Figure 3.9 ASCWD Dry Weather Flow Projections

3.3.4 Olympic Valley Public Service District

To determine how sewer flows from OVPSD will change in the future, the most recent planning documents for this district were reviewed. These plans included, but were not limited to:

- Village at Squaw Valley Sewer Capacity Analysis TM (Farr West Engineering, 2014).
- Village at Squaw Valley Water Supply Assessment (Farr West Engineering, Hydro Metrics WRI and Todd Engineering, 2015).
- Sewer Connection Historical Data (T-TSA, 2002-2019).
- Sewer Connection Historical Data (OVPSD, 2000-2020).

Within the OVPSD service area, full buildout has not yet been achieved. Therefore, the growth rate for this service area is needed to calculate future sewer flows. Growth rate assumptions were reviewed and compared for the available OVPSD planning documents, as shown in Table 3.6. The selected growth rate of 0.23 percent per year for general development in the OVPSD service area was based on the historical sewer connection data.

Table 3.6 OVPSD Growth Rate Comparison

Planning Document	Development Type	Average Annual Growth
Village at Squaw Valley Sewer Capacity Analysis TM (Farr West Engineering, 2014)	**RSC2**	**varies 17 SFRs for RSC2**
Village at Squaw Valley Water Supply Assessment (Farr West Engineering, Hydro Metrics WRI and Todd Engineering, 2015)	**VSVSP**	**varies 2 – 7% for VSVSP**
Sewer Connection Historical Data (T-TSA, 2002-2019)	**general**	**0.23% (5 SFRs)**
Sewer Connection Historical Data (OVPSD, 2000-2019)		9 SFRs

Notes:
(1) Text in **bold** indicates selected document and value.

Future flows for OVPSD include growth associated with General Plan development within the current service area, as well as future development associated with the Village at Squaw Valley Specific Plan (VSVSP) and the Resort at Squaw Creek Phase 2 (RSC2). Carollo consulted with OVPSD staff to understand the potential timing of these developments. Based on these discussions, the following growth rate assumptions were used:

- General Plan Development: Future growth within the current service area includes three components: SFR growth, "foreseeable" multifamily residential (MFR) and commercial growth, and longer term MFR and commercial growth. Single-family residential growth was assumed to occur at a rate of approximately 5 SFRs per year. The "foreseeable" MFR and commercial growth was established based on specific developments which are expected to occur in the relative near term and are assumed to be constructed between 2025 and 2035. The longer term MFR and commercial growth is associated with specific projects that are not expected to develop in the near term, and are phased between 2030 and 2045. In total, the "foreseeable" and longer term MFR and commercial development consists of 426 condos and 195,000 square feet (sq ft) of commercial developments.

- Village at Squaw Valley: This project was assumed to start in year 2021 and to be completely built out by 2045. A total of 900 condos and 298,000 sq ft of commercial development are expected. Assumed annual growth rates for this project range from 2 percent to 7 percent, per the "Village at Squaw Valley Water Supply Assessment" planning document.
- Resort at Squaw Creek Phase 2: This project includes a total of 263 condos. This project is expected to be developed between the years 2020 and 2036, and has an assumed growth rate of 17 units per year.

By 2045, it is projected that the BWF for OVPSD will increase to 0.433 mgd (compared to the existing BWF of 0.154 mgd), and the HOF is projected to increase to 1.102 mgd (compared to the existing HOF of 0.392 mgd). Continuing to project flows for OVPSD yields a buildout BWF of 0.434 mgd.

The existing ADWF (0.187 mgd) was calculated by averaging the 7-day running average between June 21st and September 21st, as measured by the Olympic Valley sewer flowmeter. An ADWF:BWF peaking factor of 1.21 was calculated by dividing the 2017/18 ADWF by the 2017/18 BWF. This peaking factor was then applied to the BWF to project future ADWF. The 2045 ADWF was determined to be 0.526 mgd and the buildout ADWF was calculated to be 0.527 mgd.

Figure 3.10 shows the projected DWFs for OVPSD.

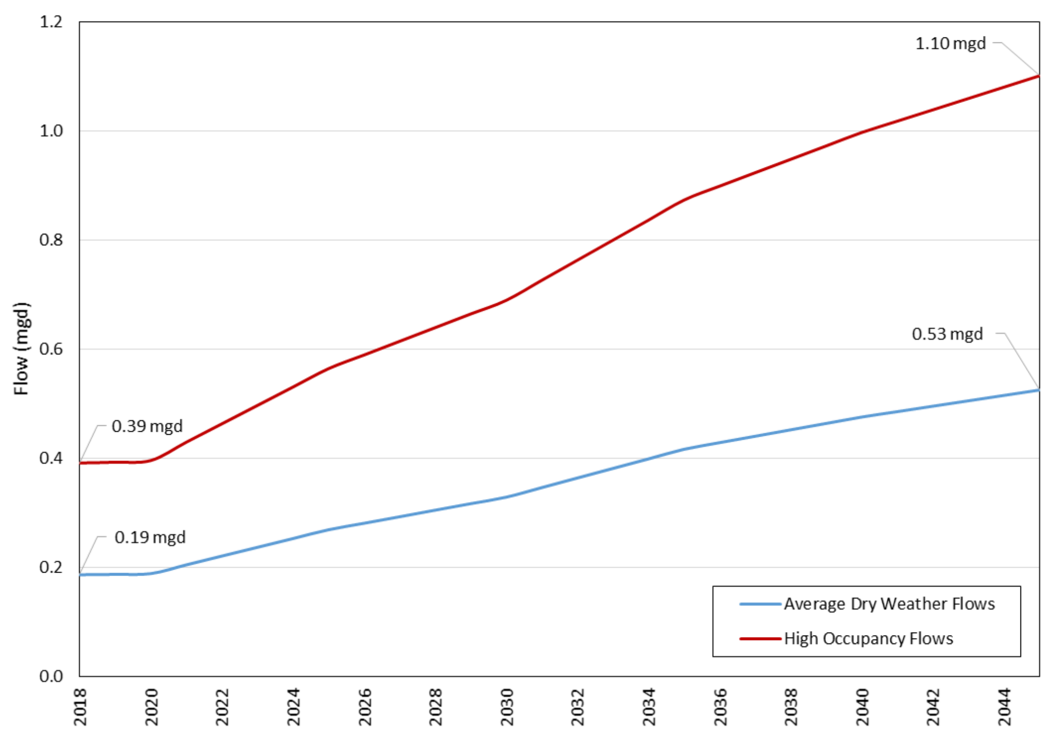

Figure 3.10 OVPSD Dry Weather Flow Projections

3.3.5 Truckee Sanitary District

To determine how sewer flows from TSD will change in the future, the most recent planning documents for this district were reviewed. These plans included, but were not limited to:

- Truckee Water System 2015 UWMP (Truckee Donner Public Utility District (TDPUD), 2016).
- Town of Truckee 2040 General Plan (Town of Truckee, 2019).
- Sewer Connection Historical Data (TSD, 2002-2019).
- Sewer Connection Historical Data (T-TSA, 2002-2019).
- TSD Sewer System Hydraulic Model Update TM (Carollo, 2019).

Within the TSD service area, full buildout has not yet been achieved. Therefore, the growth rate for this service area is needed to calculate future sewer flows. Growth rate assumptions were reviewed and compared for the various TSD planning documents, as shown in Table 3.7. The selected growth rate of 300 SFRs per year was provided based on historical connection data from TSD.

Table 3.7 TSD Growth Rate Comparison

Planning Document	Average Annual Growth
Truckee Water System 2015 UWMP (TDPUD, 2016)	2.08%
Town of Truckee 2040 General Plan (Town of Truckee, 2019)	0.39%-1.06%
Sewer Connection Historical Data (TSD, 2002-2019)	**~1.95% (300 SFRs)**
Sewer Connection Historical Data (T-TSA, 2002-2019)	1.80% (203 SFRs)

Notes:
(1) Text in **bold** indicates selected document and value.

The buildout HOF and BWF for TSD was provided by the TSD Sewer System Hydraulic Model Update TM. Based on this document, the buildout HOF of the TSD service area is estimated to be 5.53 mgd.

The 2045 BWF for TSD was calculated by applying the 300 SFR per year growth rate to the existing BWF for TSD (1.73 mgd). This yielded a 2045 BWF of 2.82 mgd, which means that it is expected that buildout for TSD would occur after 2045. 2045 HOF for TSD was estimated by applying the High Occupancy PF of 1.72 cited in Table 3.2 to the projected 2045 BWF. This yielded a projected HOF for TSD of 4.84 mgd.

The existing ADWF (1.99 mgd) was calculated by averaging the 7-day running average between June 21st and September 21st. An ADWF:BWF peaking factor of 1.15 was calculated by dividing the 2017/18 ADWF by the 2017/18 BWF. This peaking factor was then applied to the BWF to project future ADWF. The 2045 ADWF was determined to be 3.24 mgd and the buildout ADWF was calculated to be 3.70 mgd.

Figure 3.11 shows the projected DWFs for TSD.

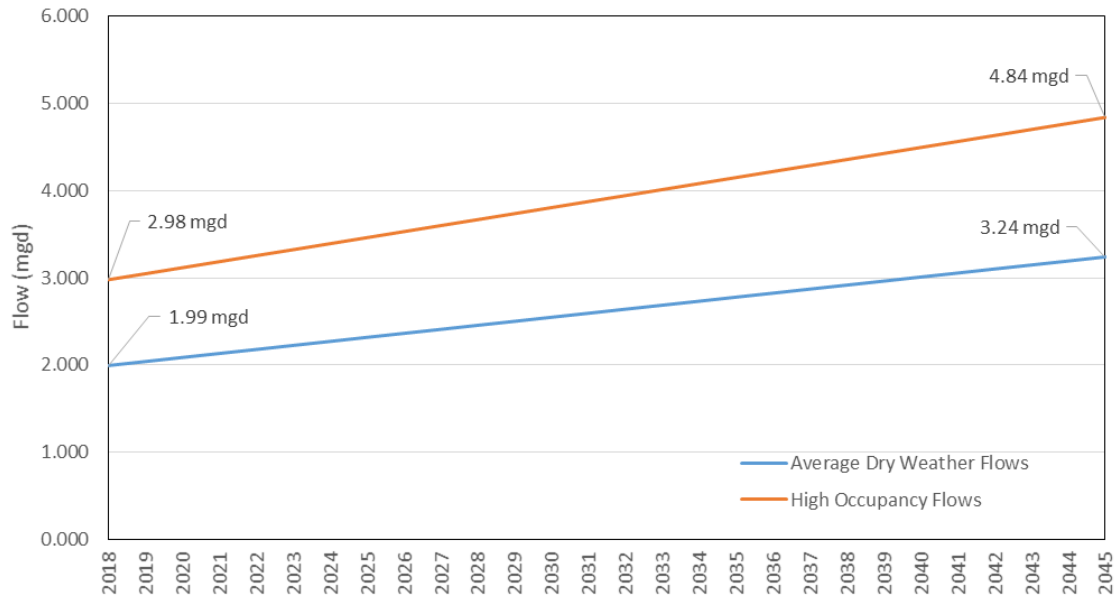

Figure 3.11 TSD Dry Weather Flow Projections

3.3.6 Northstar Community Services District

To determine how sewer flows from NCSD will change in the future, the most recent planning documents for this district were reviewed. These plans included, but were not limited to:

- Northstar Water Model Project TM (Auerbach Engineering Corp., 2004).
- NCSD Sewer Capacity Analysis (ECO:LOGIC Engineering, 2005).
- NCSD Wastewater Collection System Master Plan (ECO:LOGIC Engineering, 2008).
- NCSD Sewer Capacity Analysis – Martis Valley West (Farr West Engineering, 2015).
- Martis Valley West Parcel Project Water Supply Assessment (Stantec, 2015).
- Sewer Connection Historical Data (NCSD, 2018).
- Sewer Connection Historical Data (T-TSA, 2002-2019).

Within the NCSD service area, full buildout has not yet been achieved. Therefore, the growth rate for this service area is needed to calculate future sewer flows. Growth rate assumptions were reviewed and compared for the various NCSD planning documents, as shown in Table 3.8. The selected growth rate of 4 SFRs per year for general development in the NCSD service area was provided based on historical connection data from NCSD.

Table 3.8 NCSD Growth Rate Comparison

Planning Document	Development Type	Average Annual Growth
Northstar Water Model Project TM (Auerbach Engineering Corp., 2004)		7.12%
NCSD Sewer Capacity Analysis (ECO:LOGIC Engineering, 2005)	**Martis Valley West**	**19 SFRs 2,725 sq ft**
NCSD Wastewater Collection System Master Plan (ECO:LOGIC Engineering, 2008)		2.15%
NCSD Sewer Capacity Analysis – Martis Valley West (Farr West Engineering, 2015)		19 SFRs
Martis Valley West Parcel Project – Water Supply Assessment (Stantec, 2015)		19 SFRs
Sewer Connection Historical Data (NCSD, 2018)	**general**	**4 SFRs**
Sewer Connection Historical Data (T-TSA, 2002-2019)		2.18%

Notes:
(1) Text in **bold** indicates selected document and value.

Future flows for NCSD include single-family residential growth within the existing service area, as well as future development associated with the Martis Valley West Project. The Martis Valley West Project includes 375 SFRs, 385 condos and cabins, and 54,500 sq ft of commercial development, which is assumed to occur between 2026 and 2045. For the Martis Valley West Project, higher growth rates were assumed, as similar developments in the area have been constructed in short time frames. Annual growth rates of 19 dwelling units per year and 2,725 sq ft of commercial floor space per year were assumed for the Martis Valley West project.

The 2045 BWF for NCSD was calculated to be 0.47 mgd (compared to the existing BWF of 0.28 mgd). 2045 HOF for NCSD was estimated by applying the High Occupancy PF of 1.72 cited in Table 3.2 to the projected 2045 BWF. This yielded a projected HOF for NCSD of 0.81 mgd.

The buildout HOF and BWF for TSD, which includes NCSD, was provided by the TSD Sewer System Hydraulic Model Update TM. Based on this document, the buildout HOF of the NCSD service area is estimated to be 1.02 mgd, which is expected to occur after 2045.

The existing ADWF (0.32 mgd) was calculated by averaging the 7-day running average between June 21st and September 21st. An ADWF:BWF peaking factor of 1.15 was calculated by dividing the 2017/18 ADWF by the 2017/18 BWF. This peaking factor was then applied to the BWF to project future ADWF. The 2045 ADWF was determined to be 0.54 mgd and the buildout ADWF was calculated to be 0.67 mgd.

Figure 3.12 shows the projected DWFs for NCSD.

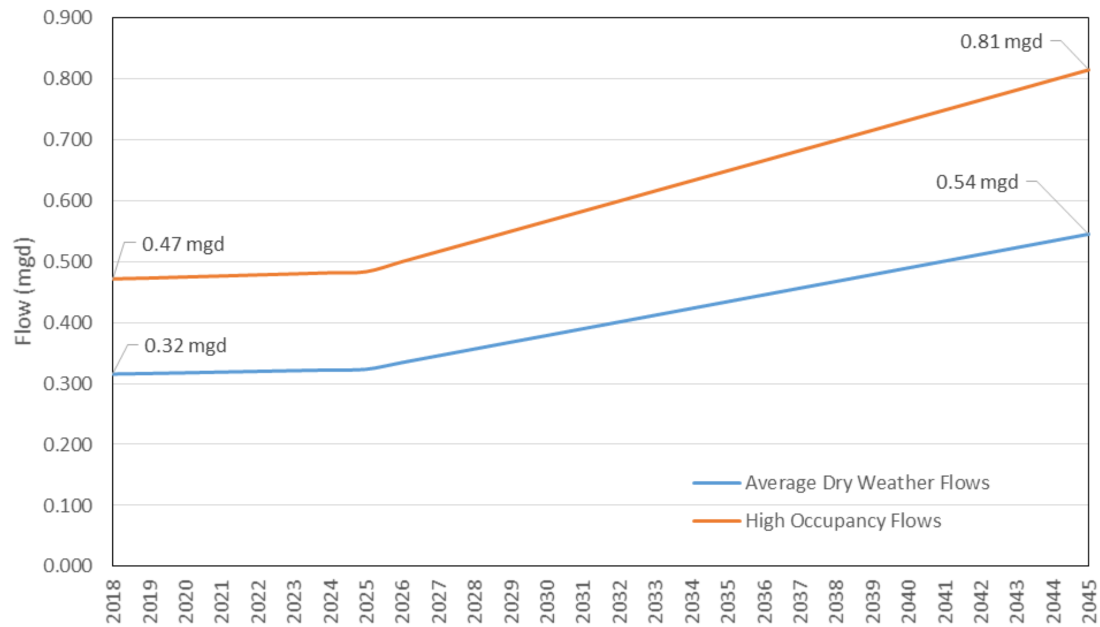

Figure 3.12 NCSD Dry Weather Flow Projections

3.3.7 Dry Weather Flow Projection Summary

Table 3.9 summarizes the total projected DWFs. As shown in Table 3.9, the total flow within the T-TSA service area is projected to increase to 6.30 mgd and 9.77 mgd for ADWF and HOF conditions, respectively. This represents roughly a 49 and 52 percent increase above existing flows for ADWF and HOF, respectively. Figure 3.13 shows the projected DWFs in a graphical format.

Table 3.9 T-TSA Dry Weather Flow Projection Summary

Member Agency	BWF (mgd)		ADWF (mgd)		HOF (mgd)	
	2018	2045	2018	2045	2018	2045
North Tahoe PUD	0.62	0.76	0.86	1.06	1.30	1.59
Tahoe City PUD	0.52	0.55	0.81	0.86	1.20	1.29
Alpine Springs CWD	0.05	0.06	0.05	0.07	0.13	0.16
Olympic Valley PSD	0.15	0.43	0.19	0.53	0.39	1.10
Truckee SD	1.73	2.83	1.99	3.24	2.95	4.81
Northstar CSD	0.28	0.48	0.32	0.54	0.47	0.81
Total	**3.34**	**5.11**	**4.22**	**6.30**	**6.44**	**9.77**

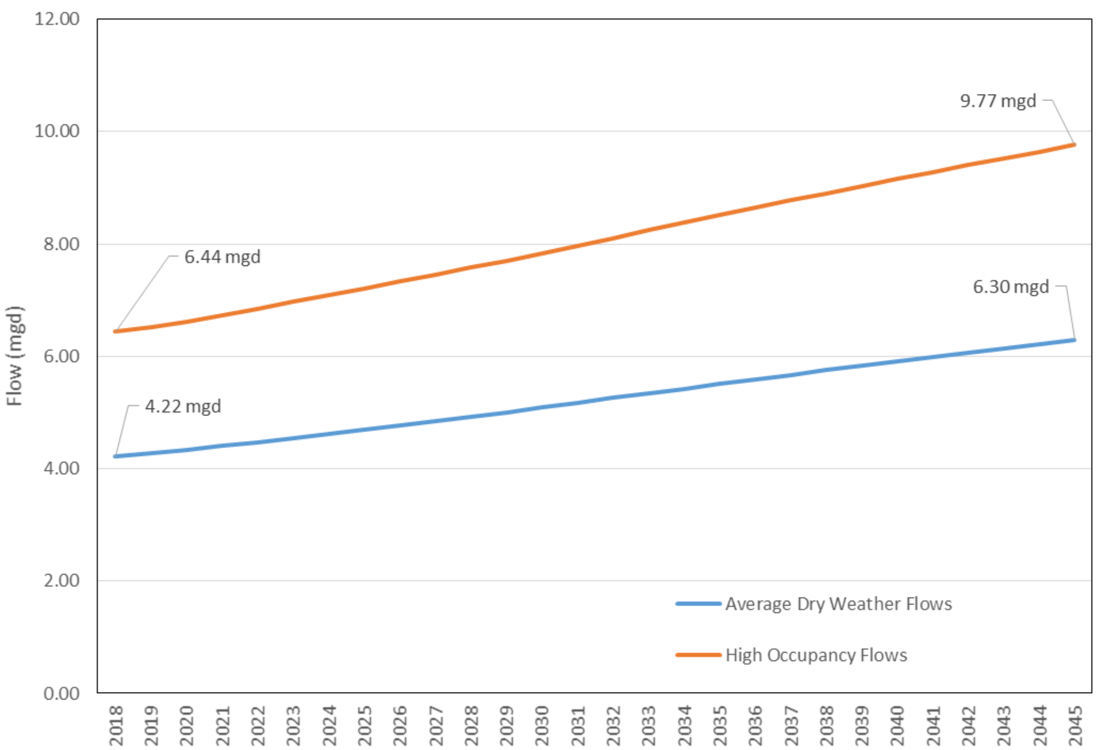

Figure 3.13 T-TSA Dry Weather Flow Projection Summary

3.4 Existing and Future Peak Wet Weather Flow Projections

This section summarizes the methodology used to develop the estimated existing and future PWWF for the T-TSA Service Area.

3.4.1 Existing Peak Wet Weather Flow

The existing PWWF was estimated by routing a design storm through the TRI hydraulic model, which was developed and calibrated as documented in Chapter 4 of this Volume.

3.4.1.1 Design Storms

Design storms are rainfall events used to analyze the performance of a collection system under extreme wet weather events. 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, 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 and is typically in hours.

Typical design storms for wastewater collection systems in California range from 5-year events to 25-year events (typically with 24-hour durations). The National Oceanic and Atmospheric Association (NOAA) Atlas 14 serves as the industry standard for determining total rainfall depth at specified frequencies and durations in California. For the purposes of this study, a 10-year, 24-hour design event was selected. It should be noted that the hydraulic model wet weather parameters were calibrated to mimic storm event responses to "rain-on-snow" events, which have historically produced the highest flows at the WRP. Therefore, the TRI hydraulic model is designed to mimic the effect of a 10-year, 24-hour rainfall event occurring at a time where a significant snow pack is on the ground.

Due to the varied terrain of the T-TSA service area, several design storms were developed for the different member agencies. The 10-year rainfall amounts for the various areas are listed in Table 3.10. As shown in Table 3.10, the 10-year, 24-hour rainfall event volumes range from 4.09 inches to 7.03 inches within the T-TSA service area.

Table 3.10 10-Year, 24-Hour Design Storm Volume

Agency Name	10-Yr, 24-Hr Rainfall Volume (inches)
TCPUD/NTPUD	4.85
ASCWD/OVPSD	7.03
TSD - Donner Lake Area	5.61
TSD - Tahoe Donner Area	4.96
TSD - Martis Valley/Glenshire Areas & NCSD	4.09

Once the 10-year, 24-hour rainfall event volumes were established, the hourly rainfall distribution was determined. The design storm rainfall distribution was based on the early January 2017 rainfall event distribution, which was the most significant rain-on-snow event that occurred in the area in recent years. The design storm distributions are shown in Figure 3.14.

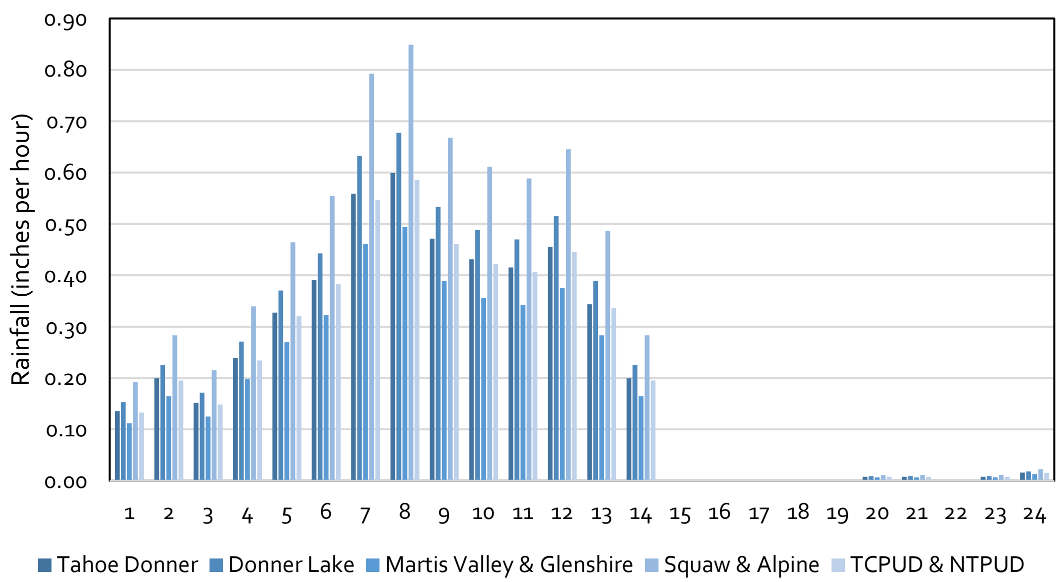

Figure 3.14 10-Year, 24-Hour Design Storms

3.4.1.2 Existing Peak Wet Weather Flow

The existing PWWF was developed by routing the 10-year, 24-hour events shown in Figure 3.14 through the hydraulic model. It should be noted that the design storm was routed on top of HOFs, which would provide the most conservative estimate of the PWWF; however, it is reasonable to assume that the design storm would occur on a high occupancy day like NYE or New Year's Day, as major rain-on-snow events have occurred on New Year's in the past. As shown in Figure 3.15, the existing PWWF at the WRP is estimated to be approximately 21.9 mgd, which equates to a PWWF/HOF PF of 3.4.

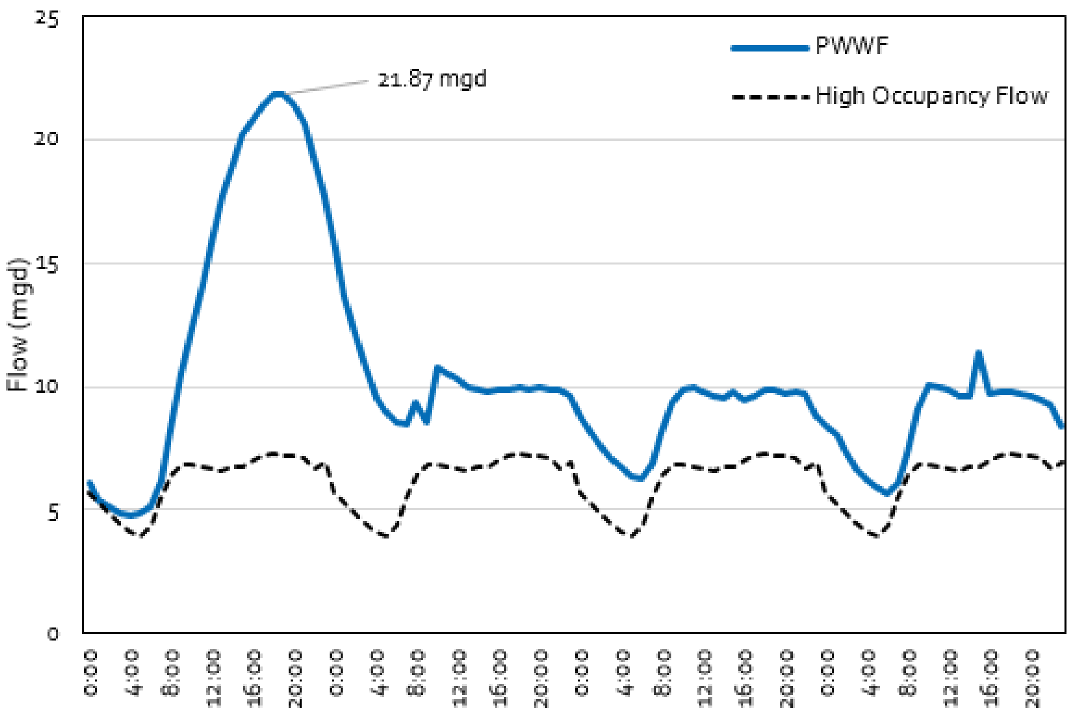

Figure 3.15 Existing Peak Wet Weather Flow

3.4.1.3 2045 Peak Wet Weather Flow

The year 2045 PWWF was estimated by adding the additional HOF projections summarized in Section 3.3 into the model. The future infiltration and inflow was assumed to increase at a rate consistent with the existing PWWF, generally. The future increase in I/I was developed for each agency by applying the existing peak I/I rate to HOF PF to the future HOF increase. The peak I/I rate PFs by agency are provided in Appendix 3B - Wet Weather Flow Projection Detail for reference. A few areas within the existing TRI showed higher than normal peak I/I rates under the existing model runs. These areas include the Northshore Area of TCPUD, ASCWD, and the Martis Valley/Glenshire Areas of TSD. For these areas, it was assumed that future construction would yield a lower rate of I/I than the existing system, and therefore an average peak I/I rate to HOF PF was assumed (see Appendix 3B - Wet Weather Flow Projection Detail for more information).

Once the future peak I/I rate assumptions were built into the model, the model was run to project the future 2045 PWWF, which, as shown in Figure 3.16, is estimated to be approximately 30.0 mgd.

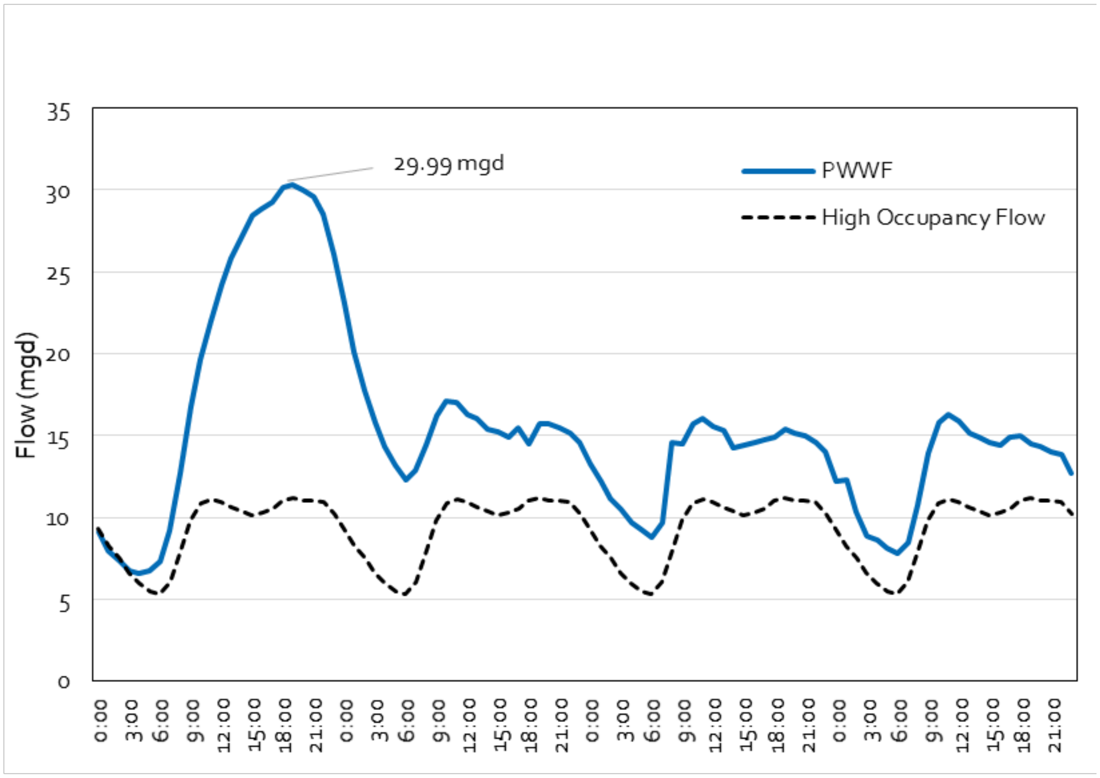

Figure 3.16 2045 Peak Wet Weather Flow

3.5 Flow Projection Summary

Table 3.11 summarizes the existing and future dry and PWWF flows for the TRI. As shown in Table 3.11, the HOF is projected to increase approximately 52 percent to 9.77 mgd by year 2045, and the PWWF is projected to increase by 37 percent to 29.99 by year 2045.

Table 3.11 Existing and Future Flow Summary

Flow Condition	Existing	2045
BWF (mgd)	3.34	5.11
ADWF (mgd)	4.22	6.30
HOF (mgd)	6.44	9.77
PWWF (mgd)	21.87	29.99
PWWF/HOF PF	3.40	3.07

3.6 References

Stantec Consulting, Inc. (2009) North Tahoe Public Utility District Main Sewer Pump Station Master Plan.

NTPUD. (2015) North Tahoe Public Utility District Urban Water Management Plan.

TRPA. (2017) Linking Tahoe – Regional Transportation Plan and Sustainable Communities Strategy, Horizon Year 2017 – 2040.

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Appendix 3A

DRY WEATHER FLOW PROJECTION DETAIL

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North Tahoe Public Utility District

Year	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical ADWF (Avg. of 7d avg btw Jun 21 & Sep 21) (mgd)	
2018	0.621	1.296	0.859	
2019	0.626	1.306	0.865	
2020	0.631	1.316	0.872	
2021	0.635	1.326	0.879	
2022	0.640	1.336	0.886	
2023	0.645	1.347	0.892	
2024	0.650	1.357	0.899	
2025	0.655	1.367	0.906	
2026	0.660	1.378	0.913	
2027	0.665	1.389	0.920	
2028	0.671	1.399	0.927	
2029	0.676	1.410	0.934	
2030	0.681	1.421	0.942	
2031	0.686	1.432	0.949	
2032	0.691	1.443	0.956	
2033	0.697	1.454	0.963	
2034	0.702	1.465	0.971	
2035	0.707	1.477	0.978	
2036	0.713	1.488	0.986	
2037	0.718	1.499	0.993	
2038	0.724	1.511	1.001	
2039	0.730	1.523	1.009	
2040	0.735	1.534	1.017	
2041	0.741	1.546	1.024	
2042	0.747	1.558	1.032	
2043	0.752	1.570	1.040	
2044	0.758	1.582	1.048	
2045	0.764	1.594	1.056	Master Plan Duration

Parameter	**Value**	**Source**
Existing BWF (mgd)	0.621	T-TSA flow meter
Existing HO Flow (mgd)	1.296	T-TSA flow meter
HO:BWF Peaking Factor	2.087	
Assumed Growth Rate (%/year)	0.77%	NTPUD 2015 Urban Water Management Plan
2018 Water Production Requirement (AFY)	1987	Table 9 of KJ Tahoe Basin Demand Analysis
Baseline Water Production Requirement (AFY)	2066	Table 13 of KJ Tahoe Basin Demand Analysis
Future Water Production Requirement (AFY)	2829	Table 32 of KJ Tahoe Basin Demand Analysis
2018 Water Production Requirement (mgd)	1.774	
Baseline Water Production Requirement (mgd)	1.844	
Future Water Production Requirement (mgd)	2.526	
Return to Sewer Ratio	0.337	
Buildout BWF (mgd)	0.850	
Buildout HO Flow (mgd)	1.775	
Buildout ADWF (mgd)	1.176	
ADWF:BWF Peaking Factor	1.383	

Tahoe City Public Utility District

Year	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical ADWF (Avg. of 7d avg btw Jun 21 & Sep 21) (mgd)	
2015	--	--	--	
2016	--	--	--	
2017	--	--	--	
2018	0.517	1.203	0.807	
2019	0.518	1.206	0.809	
2020	0.520	1.209	0.811	
2021	0.521	1.212	0.813	
2022	0.522	1.215	0.816	
2023	0.524	1.219	0.818	
2024	0.525	1.222	0.820	
2025	0.526	1.225	0.822	
2026	0.528	1.228	0.824	
2027	0.529	1.231	0.826	
2028	0.530	1.234	0.828	
2029	0.532	1.237	0.830	
2030	0.533	1.240	0.832	
2031	0.534	1.244	0.834	
2032	0.536	1.247	0.836	
2033	0.537	1.250	0.839	
2034	0.538	1.253	0.841	
2035	0.540	1.256	0.843	
2036	0.541	1.259	0.845	
2037	0.542	1.262	0.847	
2038	0.544	1.265	0.849	
2039	0.545	1.268	0.851	
2040	0.546	1.272	0.853	
2041	0.548	1.275	0.855	
2042	0.549	1.278	0.857	
2043	0.551	1.281	0.860	
2044	0.552	1.284	0.862	
2045	0.553	1.287	0.864	Master Plan Duration

Year	2015 UWMP Growth (Grey)		
2015	5741		
2016	5756	0.26%	
2017	5771	0.26%	
2018	5786	0.26%	
2019	5801	0.26%	
2020	5816	0.26%	
2021	5831	0.26%	
2022	5846	0.26%	
2023	5861	0.26%	
2024	5876	0.26%	
2025	5891	0.26%	
2026	5906	0.25%	
2027	5921	0.25%	
2028	5936	0.25%	
2029	5951	0.25%	
2030	5966	0.25%	
2031	5981	0.25%	
2032	5996	0.25%	
2033	6011	0.25%	
2034	6026	0.25%	
2035	6041	0.25%	
2036	6056	0.25%	
2037	6071	0.25%	
2038	6086	0.25%	
2039	6101	0.25%	
2040	6116	0.25%	
2041	6131	0.25%	
2042	6146	0.24%	
2043	6161	0.24%	
2044	6176	0.24%	
2045	6191	0.24%	0.25% UWMP average growth rate

Parameter	Value	Source
Existing BWF (mgd)	0.517	T-TSA flow meter
Existing HO Flow (mgd)	1.203	T-TSA flow meter
HO:BWF Peaking Factor	2.327	
Assumed Growth Rate (%/year)	0.25%	TCPUD 2015 Urban Water Management Plan
2018 Water Production Requirement (AFY)	2842	Table 9 of KJ Tahoe Basin Demand Analysis
Baseline Water Production Requirement (AFY)	2956	Table 13 of KJ Tahoe Basin Demand Analysis
Future Water Production Requirement (AFY)	3839	Table 32 of KJ Tahoe Basin Demand Analysis
2018 Water Production Requirement (mgd)	2.537	
Baseline Water Production Requirement (AFY)	2.639	
Future Water Production Requirement (mgd)	3.427	
Return to Sewer Ratio	0.196	
Buildout BWF (mgd)	0.671	
Buildout HO Flow (mgd)	1.562	
Buildout ADWF (mgd)	1.048	
ADWF:BWF Peaking Factor	1.561	

Alpine Springs County Water District

	Existing Valley + SFR Development					Alpine Sierra Subdivision			White Wolf Project			Total Flow		
		SFR Flow		Other Flow (condo, apt, comm, ski area)			Alpine Sierra Flow			White Wolf Flow				
Year	Estimated SFR	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical BWF (mgd)	High Occupancy DWF (mgd)	Alpine Sierra SFR	Typical BWF (mgd)	High Occupancy DWF (mgd)	White Wolf SFR	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical ADWF (Avg. of 7d avg btw Jun 21 & Sep 21) (mgd)
2018	496	0.032	0.092	0.013	0.037	0	0.000	0.000	0	0.000	0.000	0.045	0.129	0.054
2019	498	0.032	0.093	0.013	0.037	0	0.000	0.000	0	0.000	0.000	0.045	0.129	0.054
2020	500	0.033	0.093	0.013	0.037	0	0.000	0.000	0	0.000	0.000	0.045	0.130	0.054
2021	502	0.033	0.094	0.013	0.037	0	0.000	0.000	0	0.000	0.000	0.045	0.130	0.054
2022	504	0.033	0.094	0.013	0.037	0	0.000	0.000	0	0.000	0.000	0.046	0.130	0.054
2023	506	0.033	0.094	0.013	0.037	0	0.000	0.000	0	0.000	0.000	0.046	0.131	0.055
2024	508	0.033	0.095	0.013	0.037	0	0.000	0.000	0	0.000	0.000	0.046	0.131	0.055
2025	510	0.033	0.095	0.013	0.037	3	0.000	0.001	0	0.000	0.000	0.046	0.132	0.055
2026	512	0.033	0.095	0.013	0.037	7	0.000	0.001	0	0.000	0.000	0.046	0.133	0.056
2027	514	0.033	0.096	0.013	0.037	10	0.001	0.002	0	0.000	0.000	0.047	0.134	0.056
2028	516	0.034	0.096	0.013	0.037	13	0.001	0.002	0	0.000	0.000	0.047	0.135	0.056
2029	518	0.034	0.097	0.013	0.037	16	0.001	0.003	0	0.000	0.000	0.047	0.136	0.057
2030	520	0.034	0.097	0.013	0.037	20	0.001	0.004	0	0.000	0.000	0.048	0.137	0.057
2031	522	0.034	0.097	0.013	0.037	23	0.001	0.004	0	0.000	0.000	0.048	0.138	0.058
2032	524	0.034	0.098	0.013	0.037	26	0.002	0.005	0	0.000	0.000	0.049	0.139	0.058
2033	526	0.034	0.098	0.013	0.037	29	0.002	0.005	0	0.000	0.000	0.049	0.140	0.058
2034	528	0.034	0.098	0.013	0.037	33	0.002	0.006	0	0.000	0.000	0.049	0.141	0.059
2035	530	0.034	0.099	0.013	0.037	36	0.002	0.007	10	0.001	0.002	0.050	0.144	0.060
2036	532	0.035	0.099	0.013	0.037	39	0.003	0.007	20	0.001	0.004	0.051	0.147	0.061
2037	534	0.035	0.100	0.013	0.037	42	0.003	0.008	30	0.002	0.006	0.052	0.150	0.062
2038	536	0.035	0.100	0.013	0.037	46	0.003	0.008	40	0.003	0.007	0.053	0.152	0.064
2039	538	0.035	0.100	0.013	0.037	49	0.003	0.009	50	0.003	0.009	0.054	0.155	0.065
2040	540	0.035	0.101	0.013	0.037	52	0.003	0.010	58	0.004	0.011	0.055	0.158	0.066
2041	542	0.035	0.101	0.013	0.037	52	0.003	0.010	58	0.004	0.011	0.055	0.158	0.066
2042	544	0.035	0.101	0.013	0.037	52	0.003	0.010	58	0.004	0.011	0.055	0.158	0.066
2043	546	0.036	0.102	0.013	0.037	52	0.003	0.010	58	0.004	0.011	0.055	0.159	0.066
2044	548	0.036	0.102	0.013	0.037	52	0.003	0.010	58	0.004	0.011	0.056	0.159	0.066
2045	550	0.036	0.103	0.013	0.037	52	0.003	0.010	58	0.004	0.011	0.056	0.160	0.067

Alpine Springs County Water District

Parameter	Value	Units	Source
Existing BWF (mgd)	0.045	mgd	T-TSA flow meter
HO:BWF Peaking Factor	2.867		
SFR Q contribution	71.70%		2006 Master Plan
SFR Q	0.0323	mgd	
SFR Q / dwelling unit	65.1	gpd/dwelling unit	
assumed growth rate	2	dwelling units/year	T-TSA historical connections
assumed pop/SFR	2.54	people/dwelling unit	Town of Truckee 2040 General Plan
max SFR (minus Alpine Sierra + White Wolf)	652		2006 Master Plan, Alpine Sierra Final EIR, White Wolf NOP
Alpine Sierra assumed growth rate	3.25	dwelling units/year	Alpine Sierra Final EIR
Alpine Sierra max SFR	52		Alpine Sierra Final EIR
White Wolf assumed growth rate	10	dwelling units/year	2006 Master Plan
White Wolf max SFR	58		White Wolf NOP
Exist HO Flow	0.129	mgd	
SFR HO Flow	0.0925	mgd	
SFR HO Flow / dwelling unit	186.5	gpd/dwelling unit	
Buildout BWF (mgd)	0.062		
Buildout HO Flow (mgd)	0.179		
Buildout ADWF (mgd)	0.074		
ADWF:BWF Peaking Factor	1.19		

Olympic Valley Public Service District

	Existing Valley + SFR Development					Village at Squaw Valley Specific Plan				Resort at Squaw Creek Phase 2			General Plan Development							Total Flow		
		SFR Flow		Other Flow (condo, apt, comm)		VSVSP MFR Flow		VSVSP Comm Flow			RSC Phase 2 Flow		Foreseeable SFR Development Flow			Foreseeable MFR + Comm Flow		Remaining Dev. Flow (MFR + Comm.)				
Year	Estimated SFR	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical BWF (mgd)	High Occupancy DWF (mgd)	RSC Phase 2 condos	Typical BWF (mgd)	High Occupancy DWF (mgd)	SFR Increase	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical BWF (mgd)	HIgh Occupancy DWF (mgd)	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical ADWF (Avg. of 7d avg btw Jun 21 & Sep 21) (mgd)
2018	1857	0.131	0.334	0.023	0.058	0.000	0.000	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0.000	0.000	0.000	0.000	0.154	0.392	0.187
2019	1862	0.131	0.334	0.023	0.058	0.000	0.000	0.000	0.000	0	0.000	0.000	5	0.001	0.001	0.000	0.000	0.000	0.000	0.155	0.393	0.188
2020	1867	0.131	0.334	0.023	0.058	0.000	0.000	0.000	0.000	5	0.001	0.002	10	0.001	0.003	0.000	0.000	0.000	0.000	0.156	0.397	0.189
2021	1872	0.131	0.334	0.023	0.058	0.007	0.018	0.003	0.009	22	0.003	0.007	15	0.002	0.004	0.000	0.000	0.000	0.000	0.169	0.430	0.205
2022	1877	0.131	0.334	0.023	0.058	0.014	0.036	0.007	0.018	39	0.005	0.013	20	0.002	0.006	0.000	0.000	0.000	0.000	0.182	0.464	0.221
2023	1882	0.131	0.334	0.023	0.058	0.021	0.054	0.010	0.026	56	0.007	0.018	25	0.003	0.007	0.000	0.000	0.000	0.000	0.195	0.498	0.237
2024	1887	0.131	0.334	0.023	0.058	0.028	0.072	0.014	0.035	73	0.009	0.024	30	0.003	0.009	0.000	0.000	0.000	0.000	0.209	0.531	0.254
2025	1892	0.131	0.334	0.023	0.058	0.035	0.090	0.017	0.044	90	0.011	0.029	35	0.004	0.010	0.000	0.000	0.000	0.000	0.222	0.565	0.270
2026	1897	0.131	0.334	0.023	0.058	0.039	0.100	0.019	0.049	107	0.014	0.035	40	0.005	0.012	0.001	0.003	0.000	0.000	0.232	0.590	0.282
2027	1902	0.131	0.334	0.023	0.058	0.043	0.110	0.021	0.054	124	0.016	0.040	45	0.005	0.013	0.002	0.006	0.000	0.000	0.242	0.615	0.294
2028	1907	0.131	0.334	0.023	0.058	0.047	0.121	0.023	0.059	141	0.018	0.046	50	0.006	0.015	0.003	0.008	0.000	0.000	0.251	0.640	0.306
2029	1912	0.131	0.334	0.023	0.058	0.051	0.131	0.025	0.064	158	0.020	0.051	55	0.006	0.016	0.004	0.011	0.000	0.000	0.261	0.665	0.317
2030	1917	0.131	0.334	0.023	0.058	0.055	0.141	0.027	0.069	175	0.022	0.057	60	0.007	0.017	0.006	0.014	0.000	0.000	0.271	0.690	0.329
2031	1922	0.131	0.334	0.023	0.058	0.059	0.151	0.029	0.074	192	0.024	0.062	65	0.007	0.019	0.007	0.017	0.005	0.012	0.286	0.727	0.347
2032	1927	0.131	0.334	0.023	0.058	0.063	0.162	0.031	0.079	209	0.027	0.068	70	0.008	0.020	0.008	0.020	0.009	0.023	0.300	0.764	0.364
2033	1932	0.131	0.334	0.023	0.058	0.068	0.172	0.033	0.084	226	0.029	0.073	75	0.009	0.022	0.009	0.023	0.014	0.035	0.314	0.800	0.382
2034	1937	0.131	0.334	0.023	0.058	0.072	0.182	0.035	0.089	243	0.031	0.079	80	0.009	0.023	0.010	0.025	0.018	0.047	0.329	0.837	0.400
2035	1942	0.131	0.334	0.023	0.058	0.076	0.192	0.037	0.094	260	0.033	0.084	85	0.010	0.025	0.011	0.028	0.023	0.058	0.343	0.874	0.417
2036	1947	0.131	0.334	0.023	0.058	0.079	0.200	0.038	0.098	263	0.033	0.085	90	0.010	0.026	0.011	0.028	0.028	0.070	0.353	0.899	0.429
2037	1952	0.131	0.334	0.023	0.058	0.082	0.208	0.040	0.101	263	0.033	0.085	95	0.011	0.028	0.011	0.028	0.032	0.082	0.363	0.924	0.441
2038	1957	0.131	0.334	0.023	0.058	0.085	0.215	0.041	0.105	263	0.033	0.085	100	0.011	0.029	0.011	0.028	0.037	0.093	0.373	0.949	0.453
2039	1962	0.131	0.334	0.023	0.058	0.088	0.223	0.043	0.109	263	0.033	0.085	105	0.012	0.031	0.011	0.028	0.041	0.105	0.382	0.973	0.464
2040	1967	0.131	0.334	0.023	0.058	0.091	0.231	0.044	0.113	263	0.033	0.085	110	0.013	0.032	0.011	0.028	0.046	0.117	0.392	0.998	0.476
2041	1972	0.131	0.334	0.023	0.058	0.093	0.236	0.045	0.115	263	0.033	0.085	115	0.013	0.033	0.011	0.028	0.050	0.129	0.400	1.019	0.486
2042	1977	0.131	0.334	0.023	0.058	0.095	0.241	0.046	0.118	263	0.033	0.085	120	0.014	0.035	0.011	0.028	0.055	0.140	0.408	1.039	0.496
2043	1982	0.131	0.334	0.023	0.058	0.097	0.246	0.047	0.120	263	0.033	0.085	125	0.014	0.036	0.011	0.028	0.060	0.152	0.416	1.060	0.506
2044	1987	0.131	0.334	0.023	0.058	0.099	0.251	0.048	0.123	263	0.033	0.085	130	0.015	0.038	0.011	0.028	0.064	0.164	0.425	1.081	0.516
2045	1992	0.131	0.334	0.023	0.058	0.101	0.257	0.049	0.125	263	0.0335	0.085	135	0.0154	0.039	0.011	0.028	0.069	0.175	0.433	1.102	0.526

Olympic Valley Public Service District

Parameter	Value	Units	Source
Exist. Flow (Typical BWF)	0.154	mgd	T-TSA flow meter
HO:BWF Peaking Factor	2.545		
ADWF:BWF Peaking Factor	1.215		
SFR Q contribution	85.14%		2014 VSVSP Sewer Capacity Analysis TM
SFR typical BWF	0.131	mgd	
SFR high occupancy flow / dwelling unit	291	gpd/SFR	2014 VSVSP Sewer Capacity Analysis TM
MFR high occupancy flow / dwelling unit	285	gpd/unit	2014 VSVSP Sewer Capacity Analysis TM
commercial high occupancy flow / square foot	0.38	gpd/sf	2014 VSVSP Sewer Capacity Analysis TM
assumed growth rate	5	dwelling units/year	T-TSA historical connections (2006 - 2019)
assumed pop/SFR	2.54	people/dwelling unit	Town of Truckee 2040 General Plan
max SFR (no condos or commercial)	2001	units	2014 VSVSP Sewer Capacity project is "approved". Assume buildout by 2030
max add'l condos (general dev + VSVSP)	1,561	units	2014 VSVSP Sewer Capacity Analysis TM, 2015 VSVSP WSA
max add'l commercial (general dev + VSVSP)	492,989	sf	2014 VSVSP Sewer Capacity Analysis TM, 2015 VSVSP WSA

Resort at Squaw Creek (RSC)

RSC Phase 2 max condos	263	units	2014 VSVSP Sewer Capacity Analysis TM
RSC Phase 2 assumed growth rate	17.0	units/year	Placer County: Project is approved; assume buildout by 2035, 263 units/15 years=17.5 units per year
RSC Phase 2 max flow	85,212	gpd	2014 VSVSP Sewer Capacity Analysis TM
RSC Phase 2 MFR high occupancy flow / unit	324	gpd	2014 VSVSP Sewer Capacity Analysis TM

Village at Squaw Valley Specific Plan (VSVSP)

# Condos	Comm SF	MFR max occupancy ADWF (gpd)	Comm max occupancy ADWF (gpd)	Pool filter backwash rate (gpd)	total comm (gpd)	2014 VSVSP Sewer Capacity Analysis TM
900	297,733	256,500	113,139	12,000	125,139	

Project timing

Year	% Buildout	avg % / year	
2020	0%		2015 VSVSP Water Supply Assessment
2025	35%	7%	timing shifted back 5 years per convo with Dave Hunt, SVSPD (10/2019)
2030	55%	4%	
2035	75%	4%	
2040	90%	3%	
2045	100%	2%	

Foreseeable projects (assume buildout within 10 years, 2025-2035)

Name	# Condos	Comm SF	MFR max occupancy flow (gpd)	Comm max occupancy (gpd)	Q/year (gpd)	2014 VSVSP Sewer Capacity Analysis TM	
Squaw Valley Park / Olympic Valley Museum	0	14,500	0	5,510	551	flow/MFR	318.8 gpd
PlumpJacks	62	7,799	19,764	2,964	2,273	flow/sf	0.38 gpd
TOTAL	**62**	**22,299**		**28,238**	**2,824**		

Remaining projects (assume buildout within 15 years, 2030-2045)

Name	# Condos	Comm SF	MFR max occupancy flow (gpd)	Comm max occupancy (gpd)	Q/year (gpd)	2014 VSVSP Sewer Capacity Analysis TM	
Squaw Valley Academy	2	11,000	648	4,180	321.9		
7-11, Tahoe Dave's	74	15,490	23,814	5,886	1980.0		
Empty lot	0	12,001	0	4,560	304.0	flow/MFR	301.2 gpd
SVPSD old facility	75	25,000	12,150	9,500	1443.3	flow/sf	0.38 gpd
Mrs. Poulson compound	83	10,000	26,811	3,800	2040.7		
east of Meadows End Court	26	5,000	8,335	1,900	682.3		
Post Office	43	1,264	13,770	480	950.0		
Homestead Project, Graham's Restaurant	-7	-2,500	-1,134	-950	-138.9		
Homestead Project, 7 plex	0	-940	-324	-357	-45.4		
Homestead Project, Old Bear Pen	6	-5,220	1,944	-1,984	-2.7		
Homestead Project, empty lot	28	7,280	9,072	2,766	789.2		
Homestead Project, empty lot	18	7,020	8,748	2,668	761.1		
Empty lot, PSF water tank	15	3,738	4,658	1,420	405.2		
Empty lot, PSF water tank	3	824	1,027	313	89.3		
Sena	0	27,000	0	10,260	684.0		
Sena / SV Prep	0	56,000	0	21,280	1418.7		
TOTAL	**364**	**172,957**	**109,519**	**65,722**	**11682.7**		
			TOTAL Flows	**175,241**			

Truckee Sanitary District + Northstar Community Services District

	Existing Flow						TSD Flow Increase			Northstar Flow Increase																	Total Flow							
	TSD		Northstar CSD		Total					SFR			Condos			Martis Valley West SFR			Martis Valley West Condos			Martis Valley West Comm.			MVW Total		TSD Only			NCSD Only			Total (TSD + NCSD)	
Year	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical BWF (mgd)	High Occupancy DWF (mgd)	Number of New EDUs	Typical BWF (mgd)	High Occupancy DWF (mgd)	Increase in SFR	Typical BWF (mgd)	High Occupancy DWF (mgd)	Increase in Condos	Typical BWF (mgd)	High Occupancy DWF (mgd)	Increase in SFR	Typical BWF (mgd)	High Occupancy DWF (mgd)	Increase in Condos	Typical BWF (mgd)	High Occupancy DWF (mgd)	Increase in Comm SF	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical ADWF (Avg. of 7d avg btw Jun 21 & Sep 21) (mgd)	Typical BWF (mgd)	High Occupancy DWF (mgd)	Typical ADWF (Avg. of 7d avg btw Jun 21 & Sep 21) (mgd)	Typical BWF (mgd)	High Occupancy DWF (mgd)
2018	1.735	2.979	0.275	0.471	2.010	3.450	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0.000	0.000	1.735	2.979	1.993	0.275	0.471	0.316	2.010	3.450
2019	1.735	2.979	0.275	0.471	2.010	3.450	300	0.040	0.069	4	0.001	0.001	2	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0.000	0.000	1.776	3.048	2.040	0.275	0.473	0.316	2.051	3.520
2020	1.735	2.979	0.275	0.471	2.010	3.450	600	0.080	0.138	8	0.001	0.002	6	0.001	0.001	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0.000	0.000	1.816	3.117	2.086	0.276	0.475	0.318	2.092	3.591
2021	1.735	2.979	0.275	0.471	2.010	3.450	900	0.121	0.207	12	0.002	0.003	10	0.001	0.002	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0.000	0.000	1.856	3.186	2.132	0.277	0.476	0.319	2.133	3.662
2022	1.735	2.979	0.275	0.471	2.010	3.450	1,200	0.161	0.276	16	0.002	0.004	14	0.002	0.003	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0.000	0.000	1.896	3.255	2.178	0.278	0.478	0.320	2.175	3.732
2023	1.735	2.979	0.275	0.471	2.010	3.450	1,500	0.201	0.345	20	0.003	0.005	18	0.002	0.004	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0.000	0.000	1.936	3.324	2.224	0.279	0.480	0.321	2.216	3.803
2024	1.735	2.979	0.275	0.471	2.010	3.450	1,800	0.241	0.414	24	0.003	0.006	22	0.003	0.004	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0.000	0.000	1.977	3.393	2.270	0.280	0.481	0.322	2.257	3.874
2025	1.735	2.979	0.275	0.471	2.010	3.450	2,100	0.281	0.483	28	0.004	0.006	26	0.003	0.005	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0.000	0.000	2.017	3.462	2.317	0.281	0.483	0.323	2.298	3.945
2026	1.735	2.979	0.275	0.471	2.010	3.450	2,400	0.322	0.552	32	0.004	0.007	30	0.003	0.006	19	0.004	0.007	19	0.004	0.007	2,725	0.001	0.001	0.009	0.015	2.057	3.531	2.363	0.291	0.500	0.334	2.348	4.030
2027	1.735	2.979	0.275	0.471	2.010	3.450	2,700	0.362	0.621	36	0.005	0.008	34	0.004	0.007	38	0.008	0.015	39	0.008	0.013	5,450	0.001	0.002	0.017	0.030	2.097	3.600	2.409	0.301	0.516	0.345	2.398	4.116
2028	1.735	2.979	0.275	0.471	2.010	3.450	3,000	0.402	0.690	40	0.005	0.009	38	0.004	0.008	56	0.013	0.022	58	0.011	0.020	8,175	0.002	0.003	0.026	0.044	2.137	3.669	2.455	0.310	0.533	0.357	2.448	4.201
2029	1.735	2.979	0.275	0.471	2.010	3.450	3,300	0.442	0.759	44	0.006	0.010	42	0.005	0.008	75	0.017	0.029	77	0.015	0.026	10,900	0.002	0.004	0.035	0.059	2.178	3.738	2.501	0.320	0.549	0.368	2.498	4.287
2030	1.735	2.979	0.275	0.471	2.010	3.450	3,600	0.482	0.828	48	0.006	0.011	46	0.005	0.009	94	0.021	0.036	96	0.019	0.033	13,625	0.003	0.005	0.043	0.074	2.218	3.807	2.548	0.330	0.566	0.379	2.547	4.372
2031	1.735	2.979	0.275	0.471	2.010	3.450	3,900	0.523	0.897	52	0.007	0.012	50	0.006	0.010	113	0.025	0.044	116	0.023	0.039	16,350	0.004	0.006	0.052	0.089	2.258	3.876	2.594	0.339	0.582	0.390	2.597	4.458
2032	1.735	2.979	0.275	0.471	2.010	3.450	4,200	0.563	0.966	56	0.008	0.013	54	0.006	0.011	131	0.030	0.051	135	0.027	0.046	19,075	0.004	0.007	0.060	0.104	2.298	3.945	2.640	0.349	0.599	0.401	2.647	4.543
2033	1.735	2.979	0.275	0.471	2.010	3.450	4,500	0.603	1.035	60	0.008	0.014	58	0.007	0.012	150	0.034	0.058	154	0.030	0.052	21,800	0.005	0.008	0.069	0.119	2.338	4.014	2.686	0.359	0.615	0.412	2.697	4.629
2034	1.735	2.979	0.275	0.471	2.010	3.450	4,800	0.643	1.104	64	0.009	0.015	62	0.007	0.012	169	0.038	0.066	173	0.034	0.059	24,525	0.005	0.009	0.078	0.133	2.379	4.083	2.732	0.368	0.632	0.423	2.747	4.715
2035	1.735	2.979	0.275	0.471	2.010	3.450	5,100	0.683	1.173	68	0.009	0.016	66	0.008	0.013	188	0.042	0.073	193	0.038	0.065	27,250	0.006	0.010	0.086	0.148	2.419	4.152	2.778	0.378	0.649	0.434	2.797	4.800
2036	1.735	2.979	0.275	0.471	2.010	3.450	5,400	0.724	1.242	72	0.010	0.017	70	0.008	0.014	206	0.047	0.080	212	0.042	0.072	29,975	0.006	0.011	0.095	0.163	2.459	4.221	2.825	0.388	0.665	0.445	2.846	4.886
2037	1.735	2.979	0.275	0.471	2.010	3.450	5,700	0.764	1.311	76	0.010	0.017	74	0.009	0.015	225	0.051	0.088	231	0.046	0.078	32,700	0.007	0.012	0.104	0.178	2.499	4.290	2.871	0.397	0.682	0.456	2.896	4.971
2038	1.735	2.979	0.275	0.471	2.010	3.450	6,000	0.804	1.380	80	0.011	0.018	78	0.009	0.016	244	0.055	0.095	250	0.049	0.085	35,425	0.008	0.013	0.112	0.193	2.539	4.359	2.917	0.407	0.698	0.467	2.946	5.057
2039	1.735	2.979	0.275	0.471	2.010	3.450	6,300	0.844	1.449	84	0.011	0.019	82	0.010	0.016	263	0.059	0.102	270	0.053	0.091	38,150	0.008	0.014	0.121	0.208	2.580	4.428	2.963	0.416	0.715	0.478	2.996	5.142
2040	1.735	2.979	0.275	0.471	2.010	3.450	6,600	0.884	1.518	88	0.012	0.020	86	0.010	0.017	281	0.064	0.109	289	0.057	0.098	40,875	0.009	0.015	0.130	0.222	2.620	4.497	3.009	0.426	0.731	0.489	3.046	5.228
2041	1.735	2.979	0.275	0.471	2.010	3.450	6,900	0.925	1.587	92	0.012	0.021	90	0.010	0.018	300	0.068	0.117	308	0.061	0.104	43,600	0.009	0.016	0.138	0.237	2.660	4.566	3.055	0.436	0.748	0.501	3.096	5.313
2042	1.735	2.979	0.275	0.471	2.010	3.450	7,200	0.965	1.656	96	0.013	0.022	94	0.011	0.019	319	0.072	0.124	327	0.065	0.111	46,325	0.010	0.017	0.147	0.252	2.700	4.635	3.102	0.445	0.764	0.512	3.145	5.399
2043	1.735	2.979	0.275	0.471	2.010	3.450	7,500	1.005	1.725	100	0.013	0.023	98	0.011	0.020	338	0.076	0.131	347	0.068	0.117	49,050	0.011	0.018	0.155	0.267	2.740	4.704	3.148	0.455	0.781	0.523	3.195	5.484
2044	1.735	2.979	0.275	0.471	2.010	3.450	7,800	1.045	1.794	104	0.014	0.024	102	0.012	0.020	356	0.081	0.139	366	0.072	0.124	51,775	0.011	0.019	0.164	0.282	2.781	4.773	3.194	0.465	0.798	0.534	3.245	5.570
2045	1.735	2.979	0.275	0.471	2.010	3.450	8,100	1.085	1.863	108	0.014	0.025	106	0.012	0.021	375	0.085	0.146	385	0.076	0.131	54,500	0.012	0.020	0.173	0.297	2.821	4.842	3.240	0.474	0.814	0.545	3.295	5.656

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Truckee Sanitary District + Northstar Community Services District

Parameter	Value	Units	Source
Existing BWF (TSD + NCSD)	2.010	mgd	T-TSA flow meter
Existing High Occupancy flows (TSD + NCSD)	3.450	mgd	2019 TSD Sewer System Hydraulic Model Update TM
HO:BWF Peaking Factor	1.716		
ADWF:BWF Peaking Factor	1.149		
TSD EDUs/yr	300		TSD data (1990-2018)
TSD H.O. Flow/EDU	230	mgd/EDU	2019 TSD Sewer System Hydraulic Model Update TM
Buildout High Occupancy Flow (TSD Only)	5.527	mgd	
Existing High Occupancy Flow (TSD only)	2.979	mgd	
Buildout High Occupancy Flow (TSD + NCSD)	6.550	mgd	2019 TSD Sewer System Hydraulic Model Update TM
NCSD SFR/Year	4		NCSD email
NCSD Max SFR (minus Martis Valley West)	1,373		NCSD Residential Unit Calc
NCSD Current SFR	813		
NCSD Max Condo (minus Martis Valley West)	2,373		NCSD Residential Unit Calc
NCSD Current Condos	1,304		
NCSD Condos per year	2		
NCSD Flow per Condo	200	gpd/unit	
NCSD Assumed Commercial Growth Rate	2%		T-TSA Historical Connections, 2001-2019
NCSD Current Commercial	355,300	sf	NCSD email
NCSD Max Commercial	400,803	sf	2008 NCSD Wastewater Collection System Master Plan
NCSD H.O. Flow/SFR (includes infiltration)	389	gpd/dwelling unit	2015 NCSD Sewer Capacity Analysis - Martis Valley West
NCSD H.O. Flow per condo/townhouse (includes	339	gpd/dwelling unit	2015 NCSD Sewer Capacity Analysis - Martis Valley West
NCSD H.O. Flow per commercial (includes infiltr	0.37	gpd/sf	2015 NCSD Sewer Capacity Analysis - Martis Valley West
Existing High Occupancy Flow (NCSD only)	0.471	mgd	2019 TSD Sewer System Hydraulic Model Update TM
Buildout High Occupancy Flow (NCSD only)	1.023	mgd	2019 TSD Sewer System Hydraulic Model Update TM (Assume this includes Martis Valley West)
High Occupancy flow from buildout only (NCSD)	0.552	mgd	

Martis Valley West			
Martis Valley West max SFR	375		2015 NCSD Sewer Capacity Analysis - Martis Valley West
Martis Valley West max condo+cabins	385		2015 NCSD Sewer Capacity Analysis - Martis Valley West
Martis Valley West max commercial	54,500	sf	2015 NCSD Sewer Capacity Analysis - Martis Valley West
Martis Valley West assumed SFR growth rate	18.75	dwelling units/year	2015 NCSD Sewer Capacity Analysis - MVW (20 year development period)
Martis Valley West assumed condo growth rate	19.25	dwelling units/year	2015 NCSD Sewer Capacity Analysis - MVW (20 year development period)
Martis Valley West assumed comm growth rate	2,725	sf/year	2015 NCSD Sewer Capacity Analysis - MVW (20 year development period)

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Appendix 3B
WET WEATHER FLOW PROJECTION DETAIL

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TRI Connection	High Occupancy Flow (mgd)	Existing Peak I/I Rate[1] (mgd)	Existing Peak I/I Rate/High Occupancy Flow Peaking Factor[2]	Assumed Future Peak I/I Rate/High Occupancy Flow Peaking Factor[2]
TCPUD West Shore	0.926	1.695	1.83	1.83
TCPUD Northshore	0.277	4.342	***15.68***	***2.31***
NTPUD	1.296	2.208	1.70	1.70
Squaw	0.392	0.762	1.94	1.94
Alpine	0.129	0.352	***2.73***	***2.31***
Donner Lake	0.724	1.114	1.54	1.54
Tahoe Donner	1.507	1.912	1.27	1.27
Winter Creek	0.159	0.305	1.92	1.92
Martis Valley	0.614	2.275	***3.71***	***2.31***
Glenshire	0.416	1.031	***2.48***	***2.31***
Total	6.44	14.877	2.31	1.50

Notes:

(1) Peak I/I Rate does not include the influence of dry weather flows.

(2) Peaking factors highlishted with bold italics showed existing peak I/I rates above typical values. For future peak I/I rates, an assumed peaking factor of 2.31 was used (which is the esxiting system-wide peaking factor).

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 2:
COLLECTION SYSTEM MASTER PLAN
CHAPTER 4:
HYDRAULIC MODEL DEVELOPMENT

FINAL | February 2022

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Chapter 4

HYDRAULIC MODEL DEVELOPMENT

4.1 Introduction

The Tahoe-Truckee Sanitation Agency (T-TSA) provides wastewater treatment and collection for the North Lake Tahoe and Truckee region. Wastewater is conveyed to the Water Reclamation Plant (WRP) via the Truckee River Interceptor (TRI). The TRI flows south to north and begins in Tahoe City and follows the Truckee River and State Highway 89 to the Town of Truckee. T-TSA contracted Carollo Engineers, Inc. (Carollo) to assist in developing its Master Sewer Plan (Master Plan). As a part of this Master Plan, a hydraulic computer model of T-TSA's conveyance system was developed. This chapter provides an overview of the hydraulic model construction and calibration for the TRI.

4.2 Hydraulic Model Development

A sewer collection system hydraulic model is a simplified representation of the real sewer system. A hydraulic model can assess the conveyance capacity for a collection system and can also be used to perform "what if" scenarios to assess the impacts of future developments and land use changes. This section summarizes the hydraulic model construction.

4.2.1 Previous Hydraulic Modeling Software

T-TSA's previous hydraulic model was constructed by a previous consultant in 2014. The hydraulic model used MIKE URBAN by Danish Hydraulic Institute (DHI) hydraulic modeling software. The MIKE URBAN software application supports two computational engines for urban hydrology and open channel/closed pipe hydraulics: the Environmental Protection Agency's (EPA's) open source Storm Water Management Model (SWMM) 5 engine, and DHI's proprietary MOUSE computational engine.

4.2.2 Selected Hydraulic Modeling Software

Carollo compared and evaluated various hydraulic modeling software packages that could be used to model T-TSA's TRI in Technical Memorandum 1 - Hydraulic Modeling Software Evaluation. It was agreed that InfoSWMM by Innovyze would be used to assemble T-TSA's hydraulic model. InfoSWMM is a fully dynamic, geospatial wastewater modeling and management software application, which is built to run within ESRI's ArcGIS software platform. The hydraulic modeling engine for the InfoSWMM software package uses the EPA's 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.

4.2.3 Elements of the Hydraulic Model

The following provides an overview of the elements of a hydraulic wastewater model and the required input parameters associated with each:

- Manholes: Sewer manholes, cleanouts, as well as other locations where pipe sizes change, where pipelines intersect, or where force mains connect to gravity mains, are represented by manholes in the hydraulic model. Required inputs for manholes include diameter, sanitary loads, and ground, rim, and invert elevations. Manholes can also be used to represent locations where flows are split or diverted between two or more downstream links.
- Conduits: Gravity sewers are represented as conduits in the hydraulic model. Input parameters for conduits include length, diameter, material, friction factor (i.e., Manning's *n*), and invert elevations.
- Pressure Pipes: Force mains are represented as pressure pipes in the hydraulic model. Required input parameters are length, diameter, invert elevations, and friction factor (i.e., Hazen-Williams *C*).
- Pressure Junctions: Pressure junctions are used to connect multiple force main segments. They are needed when an individual pipe changes in diameter or material and can be used to represent a pressure gauge. Required input includes ground and node elevations. Node elevations correspond to inverts of the contiguous pressure pipes.
- Wet Wells: Required input parameters for wet wells include cross section type (circular or variable area), wet well diameter or cross sectional area, and wet well base (bottom), ground (top), maximum (high water level), and minimum (low water level) elevations.
- Pumps: Pumps are included in the hydraulic model as nodes. Input parameters for pumps include type (single point, multiple point, variable speed, etc.), pump capacity/head information, operational controls (on/off set points), ground elevation, and pump invert elevation.
- Outfalls: Outfalls represent areas where flow leaves the system. For sewer system modeling, an outfall typically represents the connection to the influent pump station at a wastewater treatment plant. Required input parameters include boundary conditions (free outfall, normal, user-defined tailwater, etc.), ground elevation, and invert elevation.
- Patterns: Diurnal patterns are used to simulate the variation in flow throughout the day. Patterns can be established for any time period, including multi-day patterns (48-hour, 72-hour, etc.).
- Flows: The following are the two types of wastewater flow sources that can be injected into individual model elements:
  - Loads. Loads simulate base sanitary wastewater flows and represent the average flow. The base flows are multiplied by a pattern that varies the flow temporally. The base flow diurnal patterns are adjusted during the dry weather calibration process. Sanitary loads can be applied to manholes, wet wells, and pressure junctions.
  - Stormwater Flows. Rain-derived infiltration and inflow (RDII) are applied in the model by assigning a unit hydrograph and a corresponding catchment to a given loading manhole. The unit hydrographs consists of several parameters that are used to adjust the volume of RDII that enters the system at a given location. These parameters are adjusted during the wet weather calibration process.

4.2.4 Hydraulic Model Construction

The TRI hydraulic model combines information on the physical and operational characteristics of the wastewater collection system, and performs calculations to solve a series of mathematical equations to simulate flows in pipes. The TRI hydraulic model is shown in Figure 4.1. The model construction process consisted of five steps, as described below:

- *Step 1:* T-TSA's previous hydraulic model (constructed with MIKE URBAN hydraulic modeling software) and geographical information system (GIS) shapefiles for the sewer collection system were obtained. Elevations are based on the North American Vertical Datum of 1988 (NAVD88) datum.
- *Step 2:* The previous hydraulic model data were exported to GIS shapefiles, and compared against T-TSA's GIS database. Based on this comparison, it was determined that the pipe diameter and invert data in the previous hydraulic model was consistent with the most recently available manhole invert and rim survey information performed by T-TSA. The MIKE URBAN model exports were then formatted to allow easy import into the InfoSWMM modeling platform.
- *Step 3:* The MIKE URBAN model exports were imported into the InfoSWMM hydraulic modeling platform. Physical and operational data for special structures in the TRI do not seamlessly transfer from MIKE URBAN to InfoSWMM. Physical and operational data for these structures, such as diversion structures, were input manually into the model based on available information. Figure 4.2 shows the locations of the special structures that were input in the TRI hydraulic model, based on as-built drawings of the TRI. The special structures shown on Figure 4.2 were modeled as a combination of storage nodes (or wet wells) with the physical dimensions of the structure, weirs, and orifices (which simulate the operation of slide gates under various flow conditions). The crossover structure and Pond B diversion were modeled as distinct structures. The flumes installed in the TRI were assumed to have a negligible impact on system hydraulics and were not explicitly included in the model. In addition, pipelines and junctions with missing inverts or invert discrepancies were reviewed and manually input or modified based on the T-TSA's as-built records and survey data. Recent T-TSA projects were reviewed to insure the model reflected the latest information. The boundary conditions at the WRP affect hydraulic conditions in the TRI. The hydraulic model of the WRP, which was updated to include T-TSA's 2020 Headworks Improvement Project, was used to update head/flow boundary conditions in the TRI model. The WRP head stage versus influent flow rate curve, shown in Figure 4.3, was included in the hydraulic model to mimic the operation of the WRP. Once all the relevant data were input into the hydraulic model, the model was reviewed to verify that the model data were input correctly and that the flow direction and size of the modeled pipelines were logical.
- *Step 4:* Dry weather wastewater flows were then allocated to the appropriate model junctions.
- *Step 5:* The hydraulic model contains certain run parameters that need to be set by the user at the beginning of the project. These include run dates, time steps, reporting parameters, output units, and flow routing method. Once the run parameters were established, the model was debugged to ensure that it ran without errors or warnings.

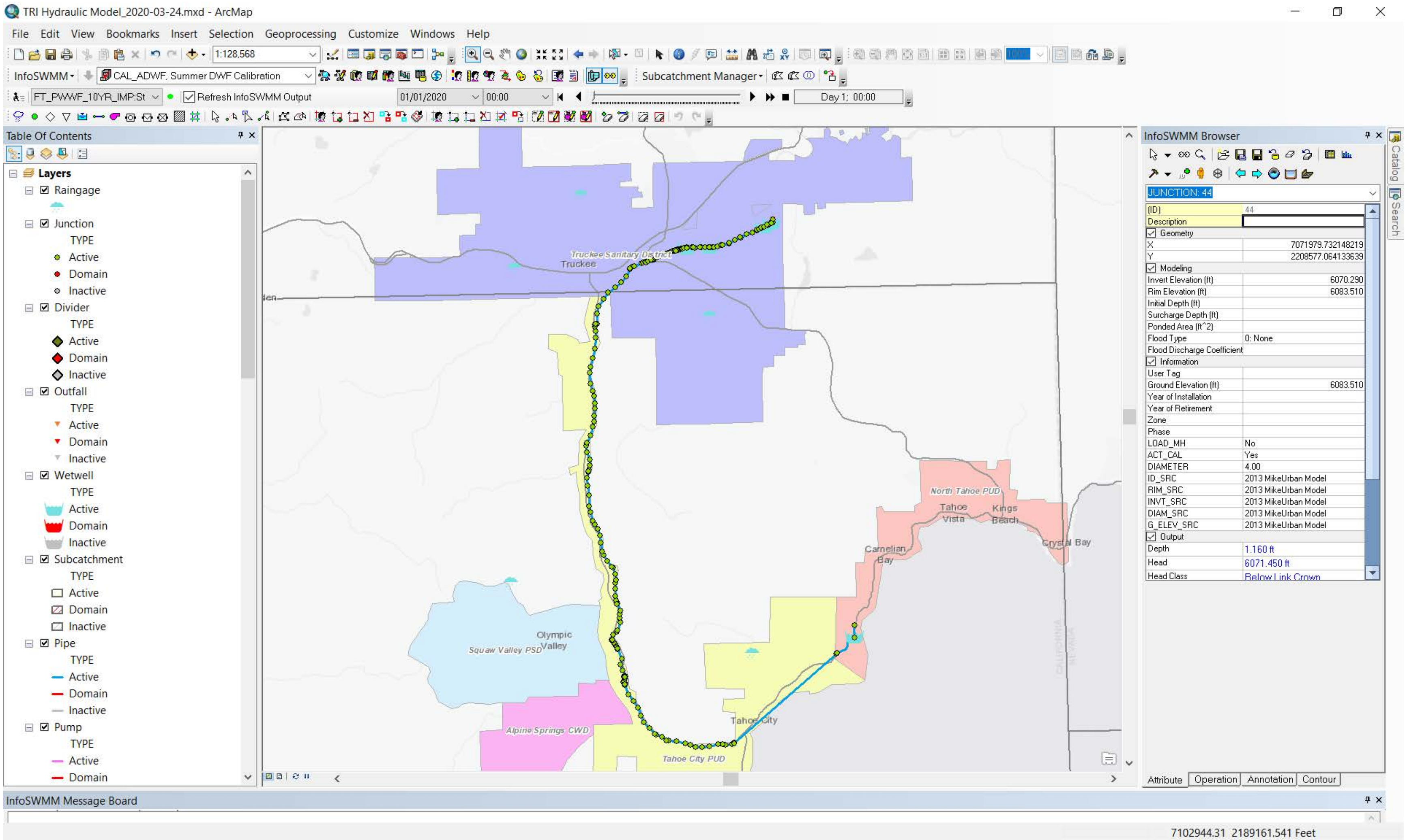


Figure 4.1 TRI Hydraulic Model

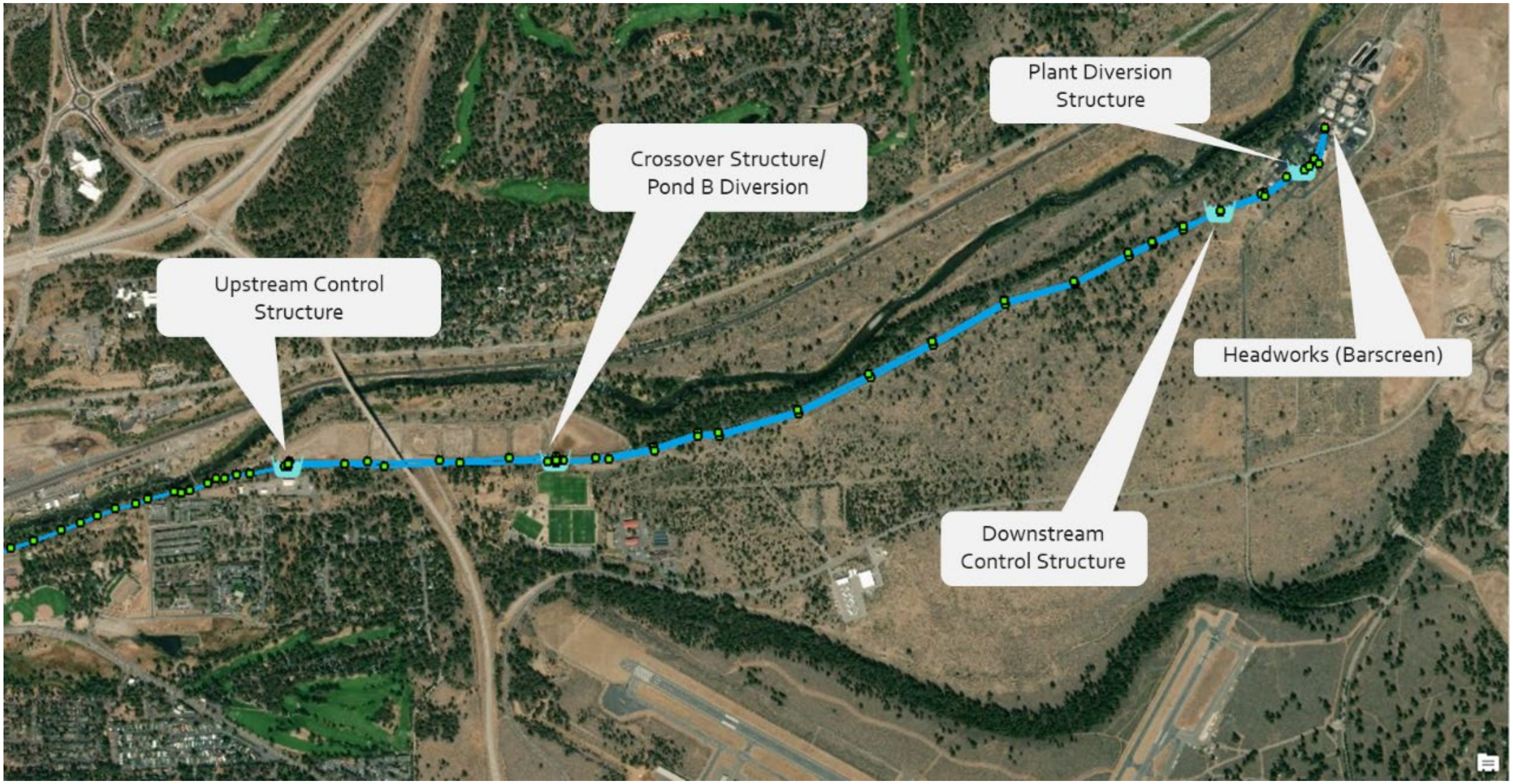


Figure 4.2 Special Structures in TRI Hydraulic Model

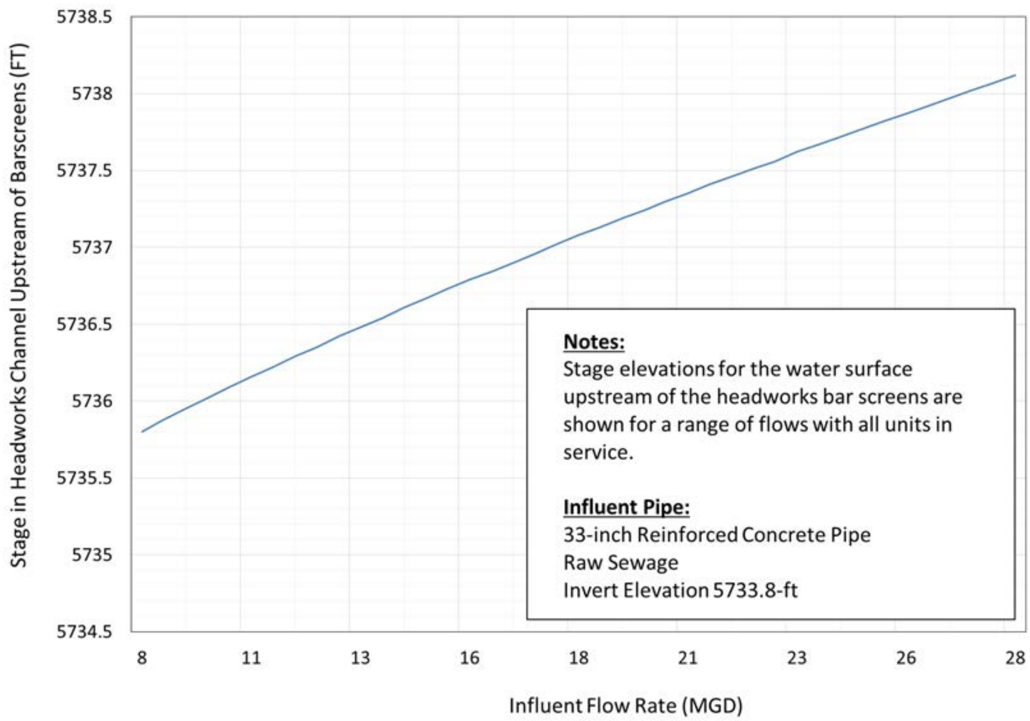


Figure 4.3 Additional Modeled Infrastructure

4.2.5 Wastewater Load Allocation

Determining the quantity of average dry weather flows (ADWFs) generated by a municipality and how they are distributed throughout the collection system is a critical component of the hydraulic modeling process. For the TRI hydraulic model, the load allocation process consisted of adding point loads representing the flow inputs of each contributing agency at the appropriate model manhole location. Modeled ADWFs were allocated based on the information presented in Volume 2, Chapter 3 of this report.

4.3 Hydraulic Model Calibration

Hydraulic model calibration is a crucial component of the hydraulic modeling effort. Calibrating the model to match data collected during the flow monitoring program ensures the most accurate results possible. The calibration process consists of calibrating to both dry and wet weather conditions. This section summarizes the overall methodology employed to calibrate the T-TSA sanitary sewer collection system hydraulic model and the calibration results, including a detailed description of each of the major components of the model calibration process.

4.3.1 Calibration Standards

The hydraulic model was calibrated in accordance with international modeling standards. The Wastewater Planning Users Group (WaPUG), a section of the Chartered Institution of Water and Environmental Management, has established generally agreed upon principles for model verification. The dry weather and wet weather calibration focused on meeting the recommendations on model verification contained in the "Code of Practice for the Hydraulic Modeling of Sewer Systems," published by the WaPUG (WaPUG 2002), as summarized below:

- Dry Weather Calibration Standards: Dry weather calibration should be carried out for two dry weather days and the modeled flows and depths should be compared to the field measured flows and depths. Both the modeled and field measured flow hydrographs should closely follow each other in both shape and magnitude. In addition to the shape, the flow hydrographs should also meet the following criteria as a general guide:
  - The timing of flow peaks and troughs should be within 1 hour.
  - The peak flow rate should be within the range of ±10 percent.
  - The volume of flow (or the average rate of flow) should be within the range of ±10 percent. If applicable, care should be taken to exclude periods of missing or inaccurate data.
- Wet Weather Calibration Standards: The model simulated flows should be compared to the field measured flows. The flow hydrographs for both events should closely follow each other in both shape and magnitude, until the flow has substantially returned to dry weather flow rates. In addition to the shape, the flow hydrographs should also meet the following criteria as a general guide:
  - The timing of the peaks and troughs should be similar with regard to the duration of the events.
  - The peak flow rates at significant peaks should be in the range of +25 percent to -15 percent and should be generally similar throughout.
  - The volume of flow (or the average flow rate) should be within the range of +20 percent to -10 percent.

4.3.2 Dry Weather Flow Calibration

A dry weather flow (DWF) calibration provides an accurate representation of typical base flow conditions. The DWF calibration process consists of several elements, as outlined below:

- Allocate Dry Weather Flow. The first step in the calibration process was to allocate the dry weather flow associated with each contributing agency, as described in Section 4.2.5. This allocation was performed based on the contributing agency flows defined in Volume 2, Chapter 3. Volume 2, Chapter 3 - Historic and Future Flows also includes a schematic of the permanent flowmeter locations.
- Create Diurnal Patterns to Match the Temporal Distribution of Flow. A diurnal curve is a pattern of hourly multipliers that are applied to the base flow to simulate the variation in flow that occurs throughout the day. Two diurnal curves were developed for each contributing agency, one representing weekday flow, and one representing weekend flow. The diurnal patterns were initially developed based on the flow monitoring data, and adjusted as part of the calibration process until the model simulated flows matched the field measured flows as closely as possible. Figure 4.4 shows the calibrated weekday and weekend diurnal pattern for the Alpine Springs County Water District (ASCWD) flowmeter. Additional diurnal patterns were developed for the remaining contributing agencies. These diurnal patterns are found on the DWF calibration sheets that are included in Appendix 4A.

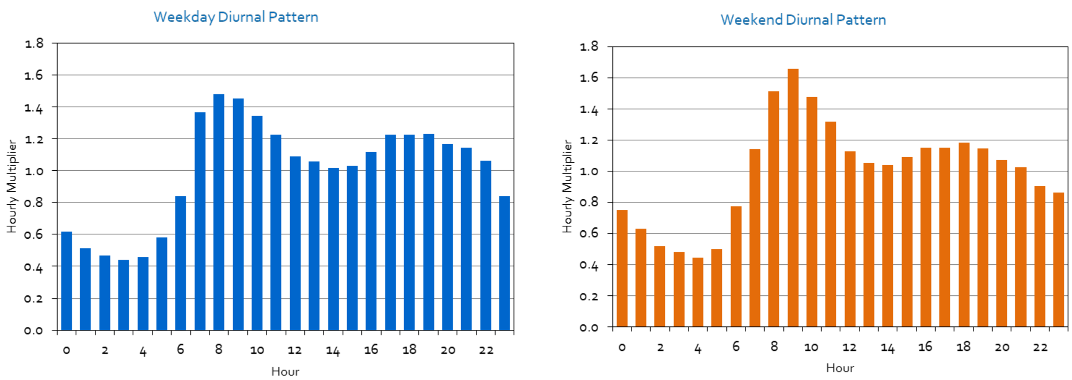
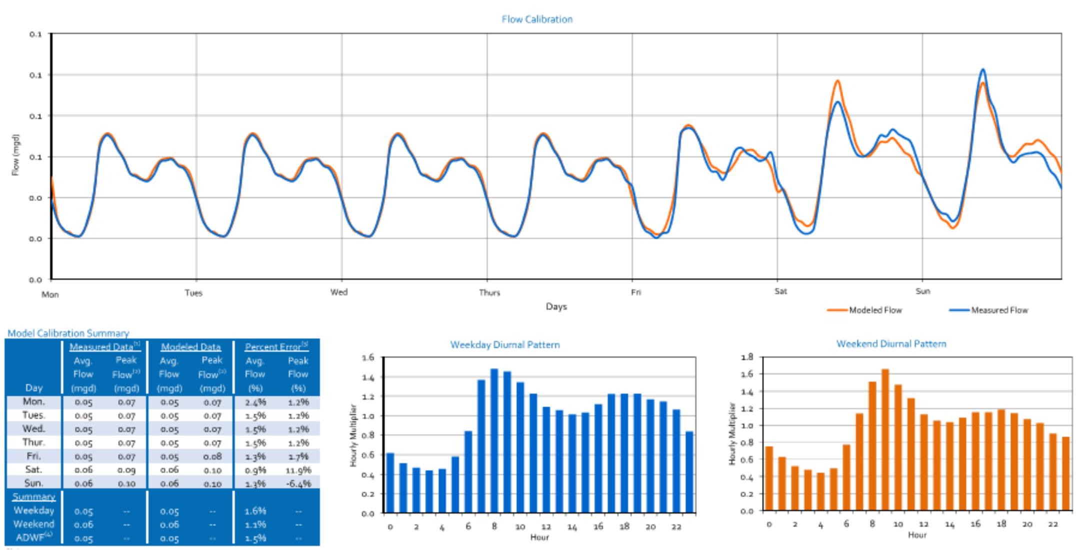


Figure 4.4 Example Weekday and Weekend ADWF Diurnal Patterns (ASCWD)

Figure 4.5 is an example DWF calibration sheet for the ASCWD flowmeter. The calibration sheets provided in Appendix 4A provide plots and tables that compare the model simulated results to the field measured results. As shown in Appendix 4A, the model was successfully calibrated to each flow monitoring site for DWF conditions.



Model Calibration Summary

Day	Measured Data[1] Avg. Flow (mgd)	Measured Data[1] Peak Flow[2] (mgd)	Modeled Data Avg. Flow (mgd)	Modeled Data Peak Flow[2] (mgd)	Percent Error[3] Avg. Flow (%)	Percent Error[3] Peak Flow (%)
Mon.	0.05	0.07	0.05	0.07	2.4%	1.2%
Tues.	0.05	0.07	0.05	0.07	1.5%	1.2%
Wed.	0.05	0.07	0.05	0.07	1.5%	1.2%
Thur.	0.05	0.07	0.05	0.07	1.5%	1.2%
Fri.	0.05	0.07	0.05	0.08	1.3%	1.7%
Sat.	0.06	0.09	0.06	0.10	0.9%	11.9%
Sun.	0.06	0.10	0.06	0.10	1.3%	-6.4%
Summary						
Weekday	0.05	--	0.05	--	1.6%	--
Weekend	0.06	--	0.06	--	1.1%	--
ADWF[4]	0.05	--	0.05	--	1.5%	--

Figure 4.5 Example DWF Calibration Sheet (ASCWD)

4.3.3 Wet Weather Calibration

The wet weather flow (WWF) calibration enables the hydraulic model to accurately simulate inflow and infiltration (I/I) entering the collection system during a large storm event. As outlined below, the WWF calibration process consists of several elements:

- Identify calibration rainfall events. For this project, the WWF calibration process consists of running model simulations of a historic rainfall event. The goal of any WWF calibration is to capture and characterize a system's response to a significant rainfall event, preferably during wet antecedent moisture conditions. For this project, the hydraulic model was calibrated against the storm events that occurred during the period of January and February 2017.

- Define RDII tributary areas. For the WWF calibration, RDII flows are superimposed on top of the DWF. The model calculates RDII by assigning "RDII Inflows" to each node in the model. RDII inflows consist of both a unit hydrograph and the total area that is tributary to the model node. The RDII tributary areas were estimated based on the approximate service area boundary for each service area. The tributary area provides a means to transform hourly rainfall depth from the rainfall hyetographs into a rainfall volume. The rainfall volume is transformed into actual RDII flows using the unit hydrograph, as described in the next step.
- Create I/I parameter database and modify to match field measured flows. The main step in the WWF calibration process involved creating a custom unit hydrograph for the study area using the "RTK Method," which is widely used in collection system master planning. Using the RTK Method, the RDII 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; and K represents the ratio of time to recession to the time to peak. Therefore, there are a total of nine separate variables associated with a unit hydrograph. Figure 4.6 shows the shape of an example unit hydrograph.

The hydrograph utilizes the R-values (percent of rainfall that enters the collection system) calculated for each basin to simulate I/I. The nine variables in each unit hydrograph were initially set based on engineering judgment and then adjusted until the model simulated flows (both peak flows and average flows) matched closely with the field measured flows.

As with the dry weather calibration, the wet weather calibration process compared the measured flow data with the model output. Comparisons were made for average and peak flows as well as the temporal distribution of flow until flows returned to their baseline levels.

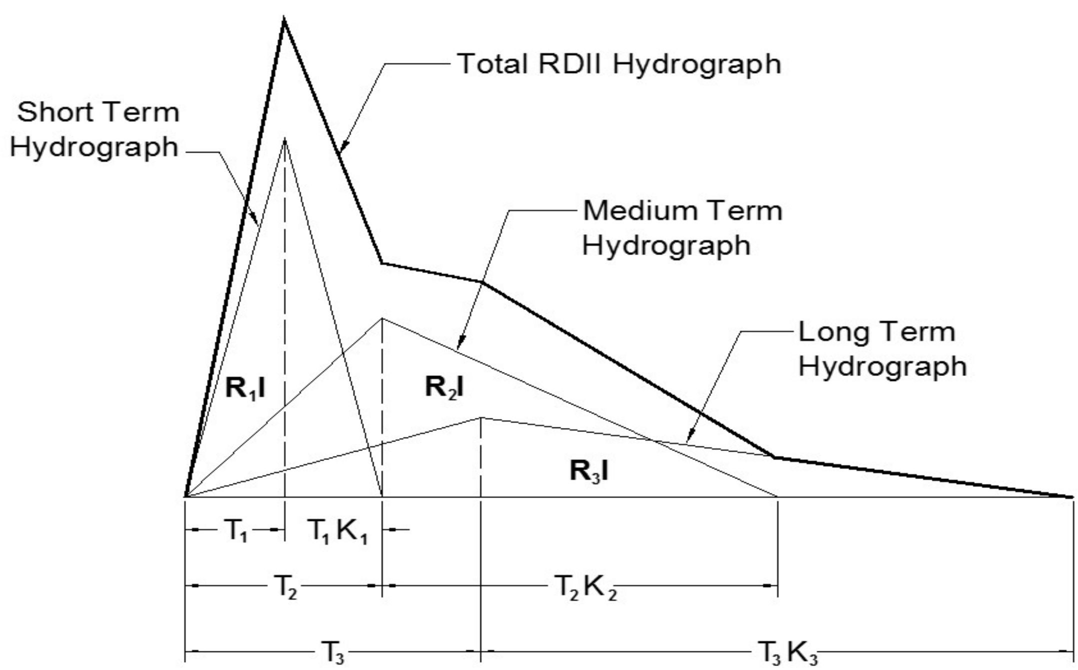


Figure 4.6 Example RDII Unit Hydrograph

Figure 4.7 is an example WWF calibration sheet for the ASCWD flowmeter. The WWF calibration sheets show figures comparing the measured data and model results. The WWF calibration sheets are included in Appendix 4B. In general, there is good correlation between the model simulated flows and the flows that were measured at each meter location. However, the West Shore (Tahoe City Public Utility District) wet weather flow calibration results show a discrepancy between the majority of the measured and modeled data, which is due to inaccuracies in the flow meter data during the selected time period. A notable finding from the wet weather calibration is that the measured flowmeter data contained periods of questionable or missing data. In these cases, an attempt was made in the model to simulate flows as they most likely existed in the field.

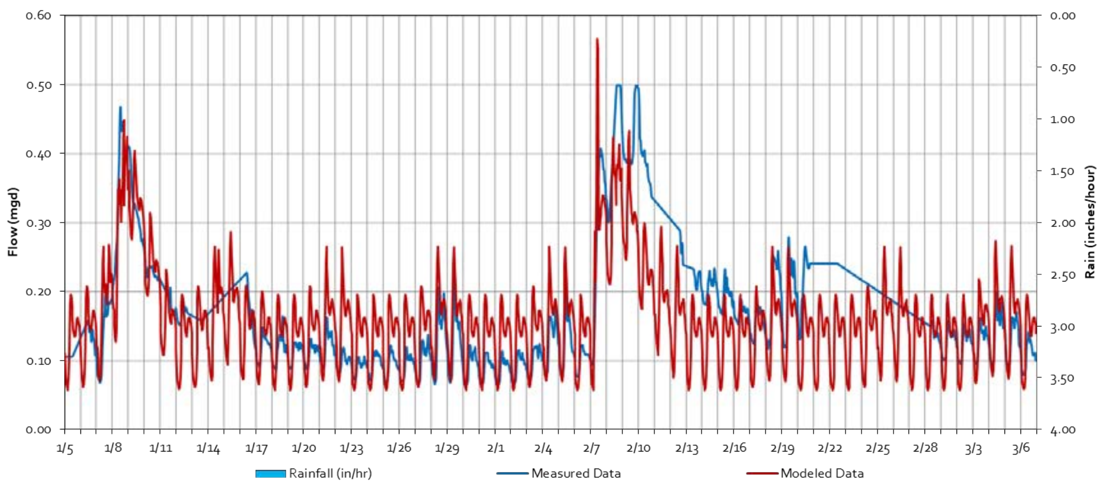


Figure 4.7 Example WWF Calibration Sheet (ASCWD)

4.3.4 Collection System Hydraulic Model Calibration Summary

In summary, the calibration results indicate the model predicts conditions similar to those observed in the field. Within a few isolated areas of the model, there are some very minor discrepancies, but the overall collection system is very well represented in the model.

Based on the results presented in this chapter, it can be concluded that the model is calibrated to dry and wet weather flow conditions. The model provides an accurate representation of T-TSA's collection system to a level suitable for this Master Sewer Plan and for T-TSA's future hydraulic modeling needs.

Appendix 4A

DRY WEATHER FLOW CALIBRATION PLOTS

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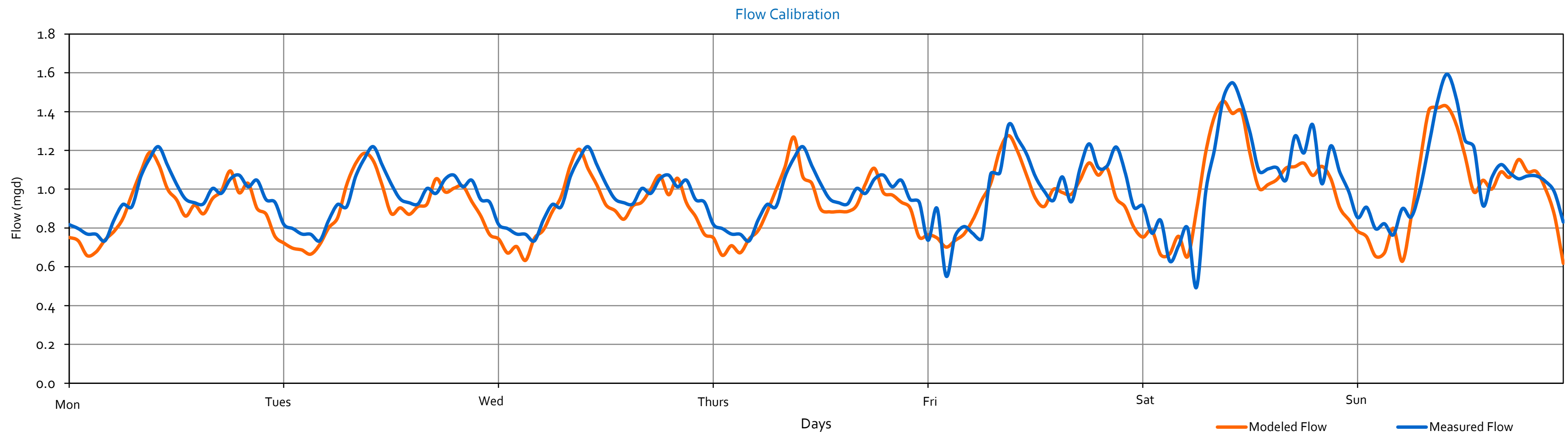
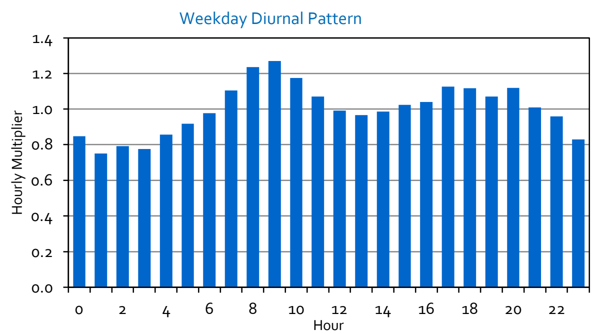
Dollar Hill (NTPUD) Flow Monitoring Site, Dry Weather Flow Calibration
Pipeline Diameter: 21"
Model Pipe ID: LINK_DH_DISCHARGE_LD_NS

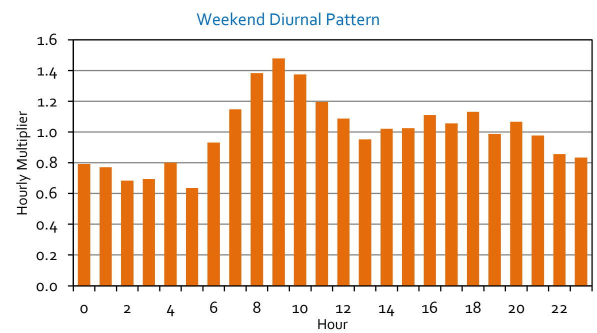


Model Calibration Summary

Day	Measured Data[1] Avg. Flow (mgd)	Measured Data[1] Peak Flow[2] (mgd)	Modeled Data Avg. Flow (mgd)	Modeled Data Peak Flow[2] (mgd)	Percent Error[3] Avg. Flow (%)	Percent Error[3] Peak Flow (%)
Mon.	0.96	1.22	0.91	1.19	-5.4%	-2.5%
Tues.	0.96	1.22	0.91	1.19	-5.4%	-2.7%
Wed.	0.96	1.22	0.91	1.21	-5.5%	-1.1%
Thur.	0.96	1.22	0.91	1.27	-5.1%	4.0%
Fri.	1.00	1.33	0.96	1.28	-3.6%	-4.2%
Sat.	1.07	1.55	1.02	1.45	-3.9%	-6.1%
Sun.	1.06	1.59	1.00	1.43	-5.2%	-10.5%
Summary						
Weekday	0.97	--	0.92	--	-5.0%	--
Weekend	1.06	--	1.01	--	-4.5%	--
ADWF[4]	0.99	--	0.95	--	-4.8%	--

Notes:
1. Source: T-TSA Hourly Flow Meter Data
2. Peak flow is the hourly average hourly peak flow.
3. Percent Error = (Modeled - Measured) /Measured x 100
4. ADWF = (5xWeekday Average + 2xWeekend Average)/7

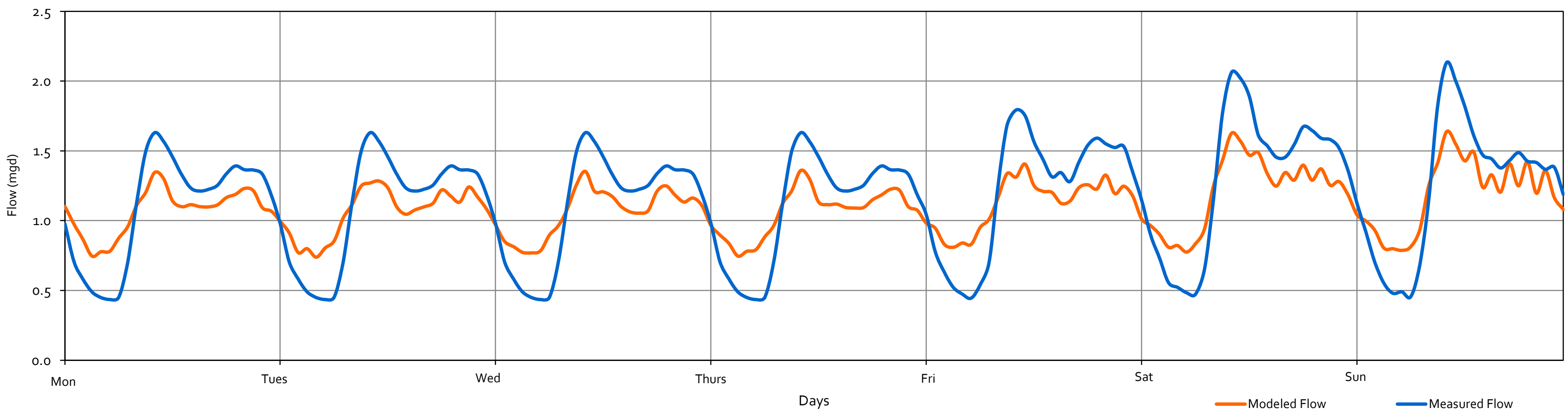




North Shore (TCPUD/NTPUD) Flow Monitoring Site, Dry Weather Flow Calibration

Pipeline Diameter: 42"
Model Pipe ID: LINK_1_2

Flow Calibration

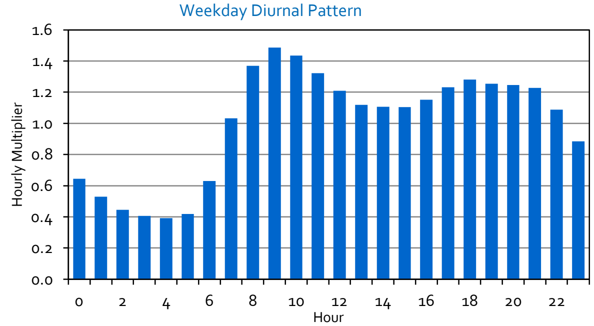


Model Calibration Summary

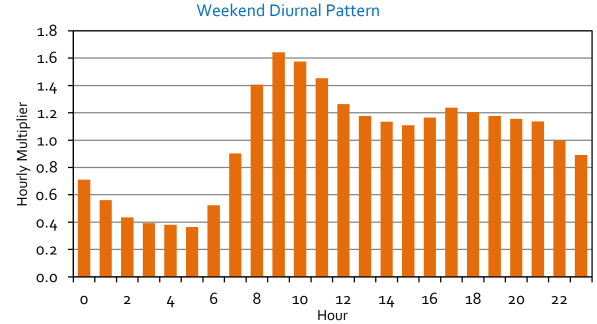
Day	Measured Data[1] Avg. Flow (mgd)	Measured Data[1] Peak Flow[2] (mgd)	Modeled Data Avg. Flow (mgd)	Modeled Data Peak Flow[2] (mgd)	Percent Error[3] Avg. Flow (%)	Percent Error[3] Peak Flow (%)
Mon.	1.10	1.63	1.07	1.35	-2.4%	-17.5%
Tues.	1.10	1.63	1.06	1.29	-3.0%	-21.2%
Wed.	1.10	1.63	1.06	1.35	-3.3%	-17.0%
Thur.	1.10	1.63	1.06	1.36	-3.2%	-16.7%
Fri.	1.21	1.79	1.13	1.41	-7.1%	-21.5%
Sat.	1.31	2.06	1.20	1.63	-7.8%	-21.1%
Sun.	1.25	2.13	1.19	1.64	-4.7%	-23.2%
Summary						
Weekday	1.12	--	1.08	--	-3.9%	--
Weekend	1.28	--	1.20	--	-6.3%	--
ADWF[4]	1.16	--	1.11	--	-4.6%	--

Notes:
1. Source: T-TSA Hourly Flow Meter Data
2. Peak flow is the hourly average hourly peak flow.
3. Percent Error = (Modeled - Measured) /Measured x 100
4. ADWF = (5xWeekday Average + 2xWeekend Average)/7

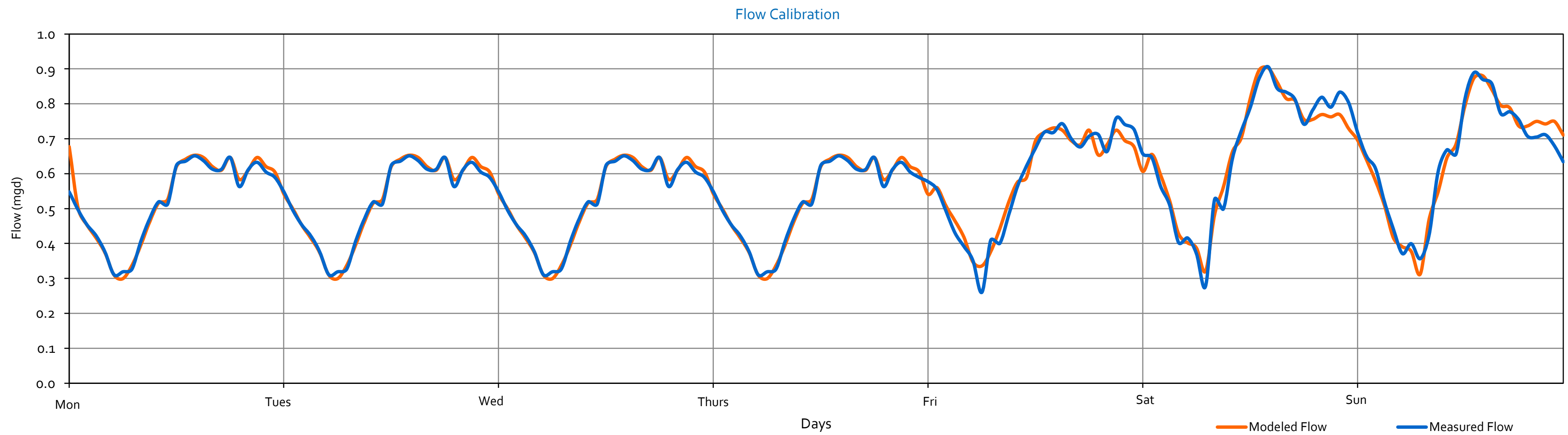
Weekday Diurnal Pattern



Weekend Diurnal Pattern



West Shore (TCPUD) Flow Monitoring Site, Dry Weather Flow Calibration
Pipeline Diameter: 24"
Model Pipe ID: LINK_LD_WS_2

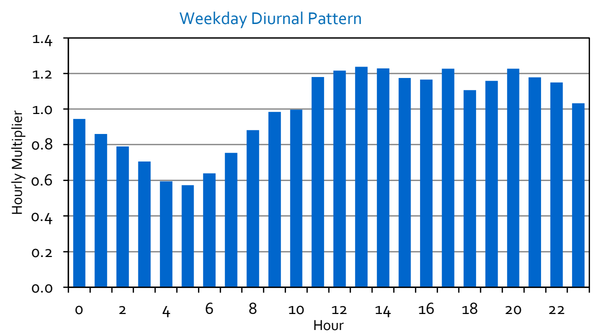


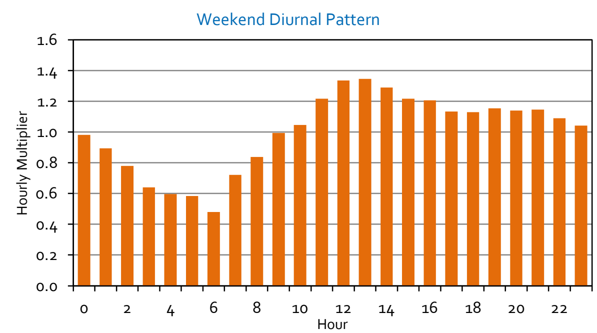
Model Calibration Summary

Day	Measured Data[1] Avg. Flow (mgd)	Measured Data[1] Peak Flow[2] (mgd)	Modeled Data Avg. Flow (mgd)	Modeled Data Peak Flow[2] (mgd)	Percent Error[3] Avg. Flow (%)	Percent Error[3] Peak Flow (%)
Mon.	0.52	0.65	0.53	0.68	1.5%	4.1%
Tues.	0.52	0.65	0.53	0.65	0.4%	0.3%
Wed.	0.52	0.65	0.53	0.65	0.4%	0.3%
Thur.	0.52	0.65	0.53	0.65	0.4%	0.3%
Fri.	0.59	0.76	0.59	0.73	0.1%	-3.7%
Sat.	0.67	0.91	0.67	0.90	-0.6%	-0.4%
Sun.	0.65	0.89	0.65	0.88	0.4%	-1.1%
Summary						
Weekday	0.54	--	0.54	--	0.5%	--
Weekend	0.66	--	0.66	--	-0.1%	--
ADWF[4]	0.57	--	0.57	--	0.3%	--

Notes:

1. Source: T-TSA Hourly Flow Meter Data
2. Peak flow is the hourly average hourly peak flow.
3. Percent Error = (Modeled - Measured) /Measured x 100
4. ADWF = (5xWeekday Average + 2xWeekend Average)/7

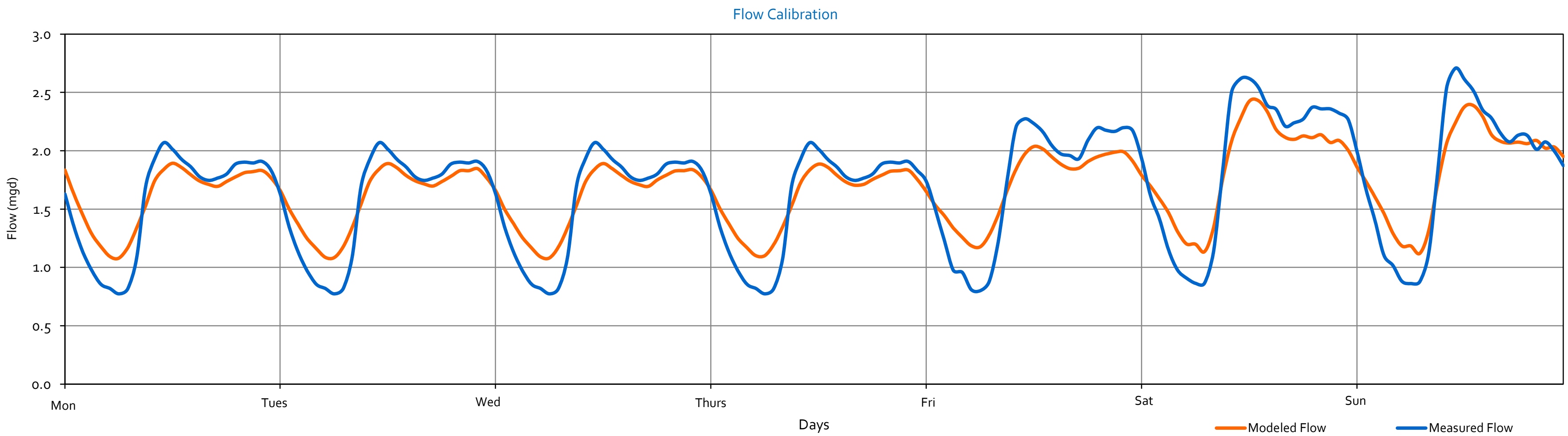




Rampart Flow Monitoring Site, Dry Weather Flow Calibration

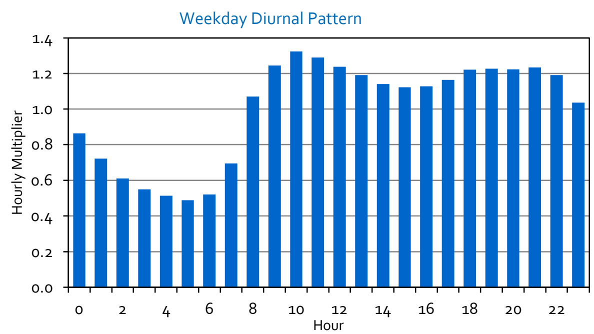
Pipeline Diameter: 30"

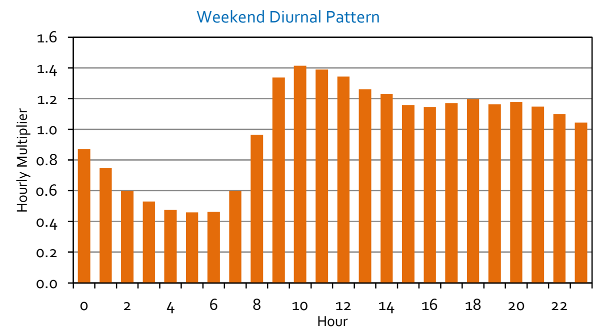
Model Pipe ID: LINK_11_12



Model Calibration Summary

Day	Measured Data[1] Avg. Flow (mgd)	Measured Data[1] Peak Flow[2] (mgd)	Modeled Data Avg. Flow (mgd)	Modeled Data Peak Flow[2] (mgd)	Percent Error[3] Avg. Flow (%)	Percent Error[3] Peak Flow (%)
Mon.	1.56	2.07	1.61	1.89	3.1%	-8.6%
Tues.	1.56	2.07	1.59	1.89	2.1%	-8.6%
Wed.	1.56	2.07	1.59	1.89	2.1%	-8.6%
Thur.	1.56	2.07	1.60	1.89	2.2%	-8.9%
Fri.	1.74	2.28	1.71	2.04	-1.3%	-10.4%
Sat.	1.92	2.62	1.87	2.43	-2.5%	-7.2%
Sun.	1.84	2.71	1.85	2.39	0.4%	-11.9%
Summary						
Weekday	1.60	--	1.62	--	1.6%	--
Weekend	1.88	--	1.86	--	-1.1%	--
ADWF[4]	1.68	--	1.69	--	0.7%	--

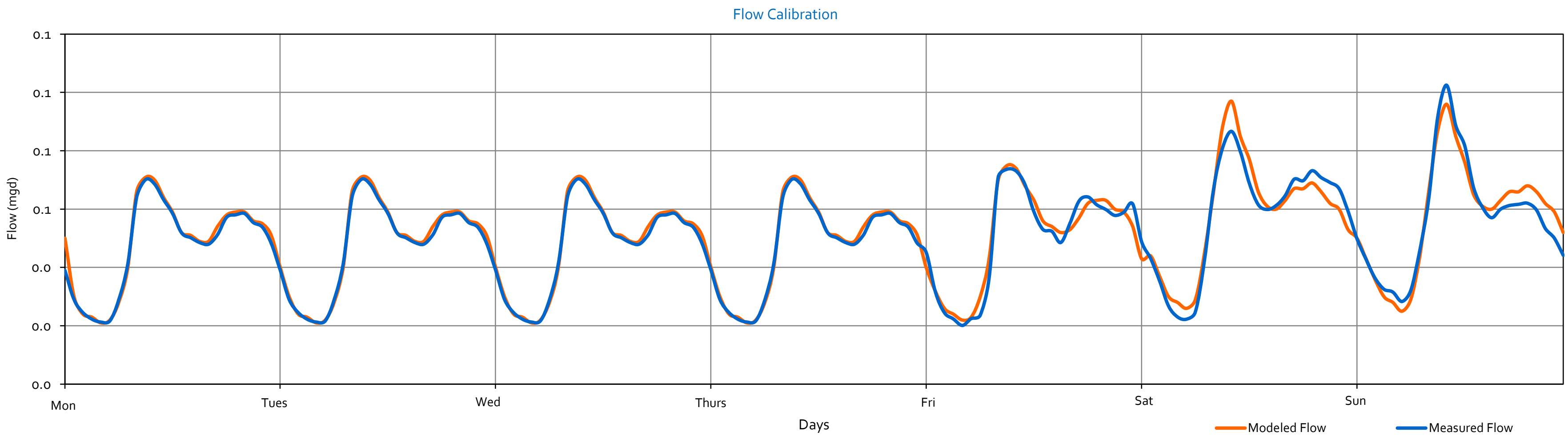




Notes:

1. Source: T-TSA Hourly Flow Meter Data
2. Peak flow is the hourly average hourly peak flow.
3. Percent Error = (Modeled - Measured) /Measured x 100
4. ADWF = (5xWeekday Average + 2xWeekend Average)/7

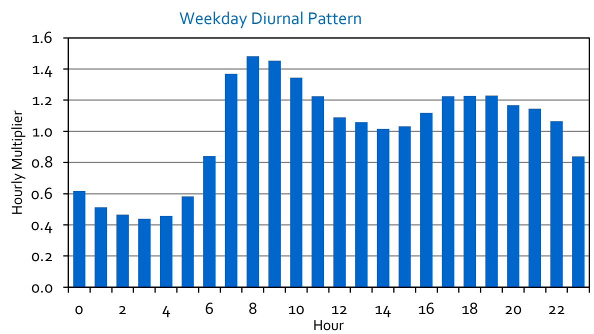
Alpine (ASCWD) Flow Monitoring Site, Dry Weather Flow Calibration
Pipeline Diameter: 24"
Model Pipe ID: LINK_237

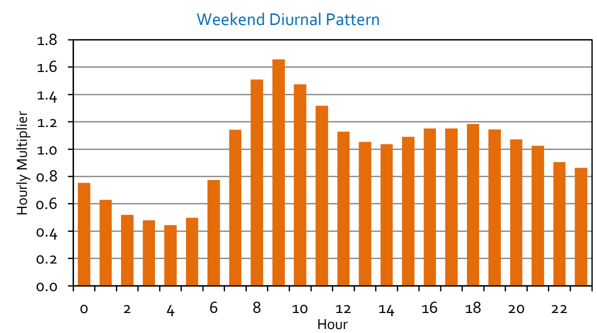


Model Calibration Summary

Day	Measured Data[1] Avg. Flow (mgd)	Measured Data[1] Peak Flow[2] (mgd)	Modeled Data Avg. Flow (mgd)	Modeled Data Peak Flow[2] (mgd)	Percent Error[3] Avg. Flow (%)	Percent Error[3] Peak Flow (%)
Mon.	0.05	0.07	0.05	0.07	2.4%	1.2%
Tues.	0.05	0.07	0.05	0.07	1.5%	1.2%
Wed.	0.05	0.07	0.05	0.07	1.5%	1.2%
Thur.	0.05	0.07	0.05	0.07	1.5%	1.2%
Fri.	0.05	0.07	0.05	0.08	1.3%	1.7%
Sat.	0.06	0.09	0.06	0.10	0.9%	11.9%
Sun.	0.06	0.10	0.06	0.10	1.3%	-6.4%
Summary						
Weekday	0.05	--	0.05	--	1.6%	--
Weekend	0.06	--	0.06	--	1.1%	--
ADWF[4]	0.05	--	0.05	--	1.5%	--

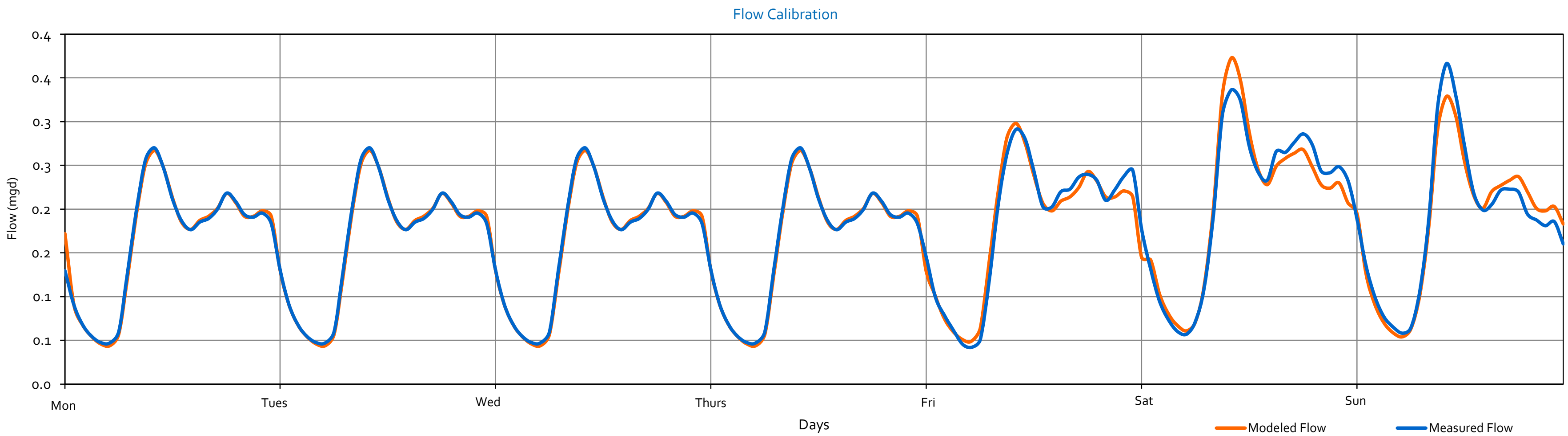
Notes:
1. Source: T-TSA Hourly Flow Meter Data
2. Peak flow is the hourly average hourly peak flow.
3. Percent Error = (Modeled - Measured) /Measured x 100
4. ADWF = (5xWeekday Average + 2xWeekend Average)/7





Olympic Valley (OVPSD) Flow Monitoring Site, Dry Weather Flow Calibration

Pipeline Diameter: 24"
Model Pipe ID: LINK_LD_SV_43

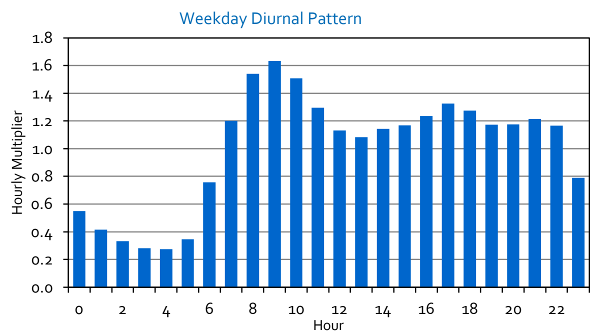


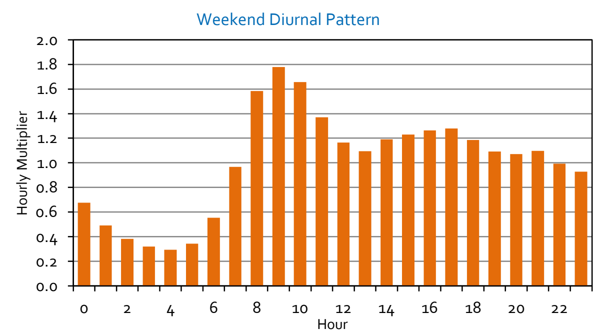
Model Calibration Summary

Day	Measured Data[1] Avg. Flow (mgd)	Measured Data[1] Peak Flow[2] (mgd)	Modeled Data Avg. Flow (mgd)	Modeled Data Peak Flow[2] (mgd)	Percent Error[3] Avg. Flow (%)	Percent Error[3] Peak Flow (%)
Mon.	0.16	0.27	0.17	0.27	0.8%	-1.1%
Tues.	0.16	0.27	0.16	0.27	-0.3%	-1.1%
Wed.	0.16	0.27	0.16	0.27	-0.3%	-1.1%
Thur.	0.16	0.27	0.16	0.27	-0.3%	-1.1%
Fri.	0.18	0.29	0.18	0.30	-0.5%	2.3%
Sat.	0.21	0.34	0.21	0.37	-0.9%	10.8%
Sun.	0.19	0.37	0.19	0.33	-0.1%	-10.3%
Summary						
Weekday	0.17	--	0.17	--	-0.2%	--
Weekend	0.20	--	0.20	--	-0.5%	--
ADWF[4]	0.18	--	0.18	--	-0.3%	--

Notes:

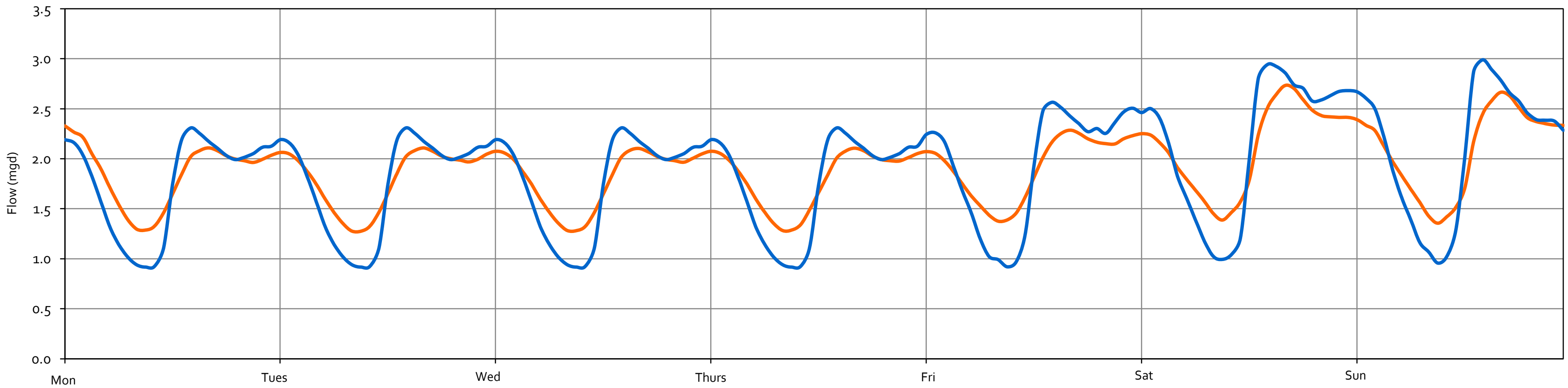
1. Source: T-TSA Hourly Flow Meter Data
2. Peak flow is the hourly average hourly peak flow.
3. Percent Error = (Modeled - Measured) /Measured x 100
4. ADWF = (5xWeekday Average + 2xWeekend Average)/7





Granite Flats Flow Monitoring Site, Dry Weather Flow Calibration
Pipeline Diameter: 27"
Model Pipe ID: LINK_86_87

Flow Calibration



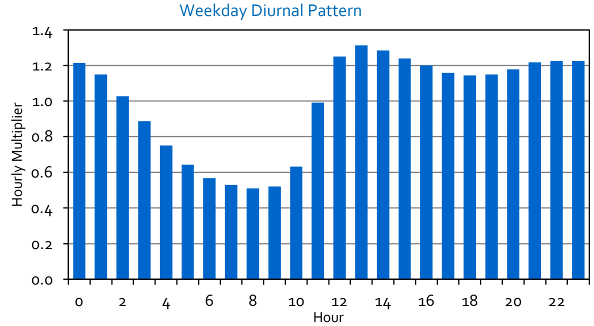
Model Calibration Summary

Day	Measured Data[1] Avg. Flow (mgd)	Measured Data[1] Peak Flow[2] (mgd)	Modeled Data Avg. Flow (mgd)	Modeled Data Peak Flow[2] (mgd)	Percent Error[3] Avg. Flow (%)	Percent Error[3] Peak Flow (%)
Mon.	1.76	2.31	1.86	2.33	5.4%	0.9%
Tues.	1.76	2.31	1.80	2.11	2.4%	-8.6%
Wed.	1.76	2.31	1.80	2.10	2.5%	-8.8%
Thur.	1.76	2.31	1.81	2.11	2.6%	-8.7%
Fri.	1.94	2.57	1.92	2.29	-1.0%	-10.8%
Sat.	2.16	2.94	2.12	2.74	-1.9%	-7.1%
Sun.	2.13	2.99	2.10	2.67	-1.2%	-10.9%
Summary						
Weekday	1.80	--	1.84	--	2.3%	--
Weekend	2.15	--	2.11	--	-1.6%	--
ADWF[4]	1.90	--	1.92	--	1.1%	--

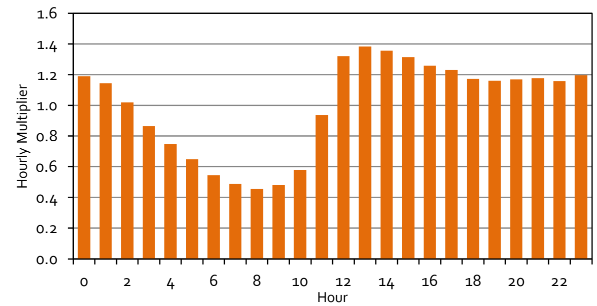
Notes:

1. Source: T-TSA Hourly Flow Meter Data
2. Peak flow is the hourly average hourly peak flow.
3. Percent Error = (Modeled - Measured) /Measured x 100
4. ADWF = (5xWeekday Average + 2xWeekend Average)/7

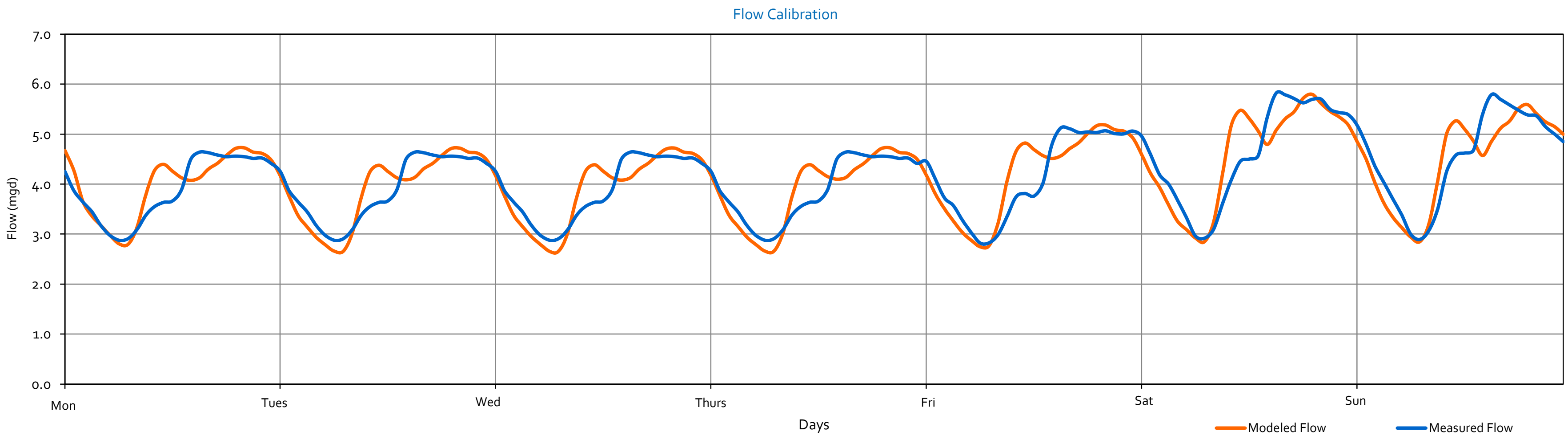
Weekday Diurnal Pattern



Weekend Diurnal Pattern



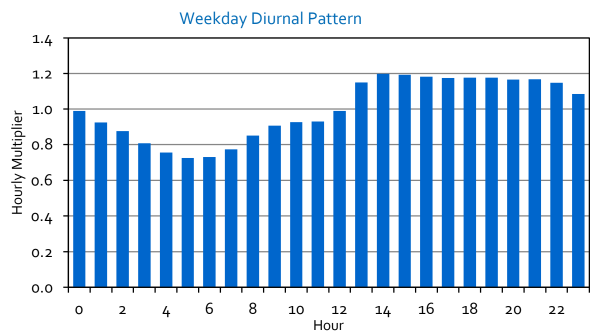
Plant Influent (WRP) Flow Monitoring Site, Dry Weather Flow Calibration
Pipeline Diameter: 36"
Model Pipe ID: LINK_HEADWORKS_DUMMY_HW

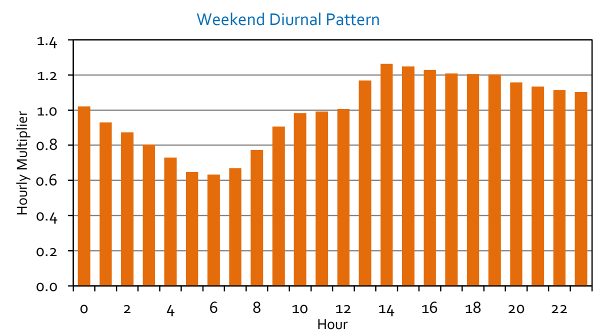


Model Calibration Summary

Day	Measured Data[1] Avg. Flow (mgd)	Measured Data[1] Peak Flow[2] (mgd)	Modeled Data Avg. Flow (mgd)	Modeled Data Peak Flow[2] (mgd)	Percent Error[3] Avg. Flow (%)	Percent Error[3] Peak Flow (%)
Mon.	3.91	4.64	4.01	4.73	2.7%	1.8%
Tues.	3.91	4.64	3.91	4.72	0.1%	1.7%
Wed.	3.91	4.64	3.91	4.72	0.1%	1.7%
Thur.	3.91	4.64	3.92	4.72	0.2%	1.8%
Fri.	4.16	5.12	4.22	5.18	1.5%	1.1%
Sat.	4.62	5.82	4.61	5.80	-0.3%	-0.4%
Sun.	4.57	5.79	4.52	5.59	-1.2%	-3.5%
Summary						
Weekday	3.96	--	4.00	--	0.9%	--
Weekend	4.60	--	4.57	--	-0.7%	--
ADWF[4]	4.14	--	4.16	--	0.4%	--

Notes:
1. Source: T-TSA Hourly Flow Meter Data
2. Peak flow is the hourly average hourly peak flow.
3. Percent Error = (Modeled - Measured) /Measured x 100
4. ADWF = (5xWeekday Average + 2xWeekend Average)/7





Appendix 4B

WET WEATHER FLOW CALIBRATION PLOTS

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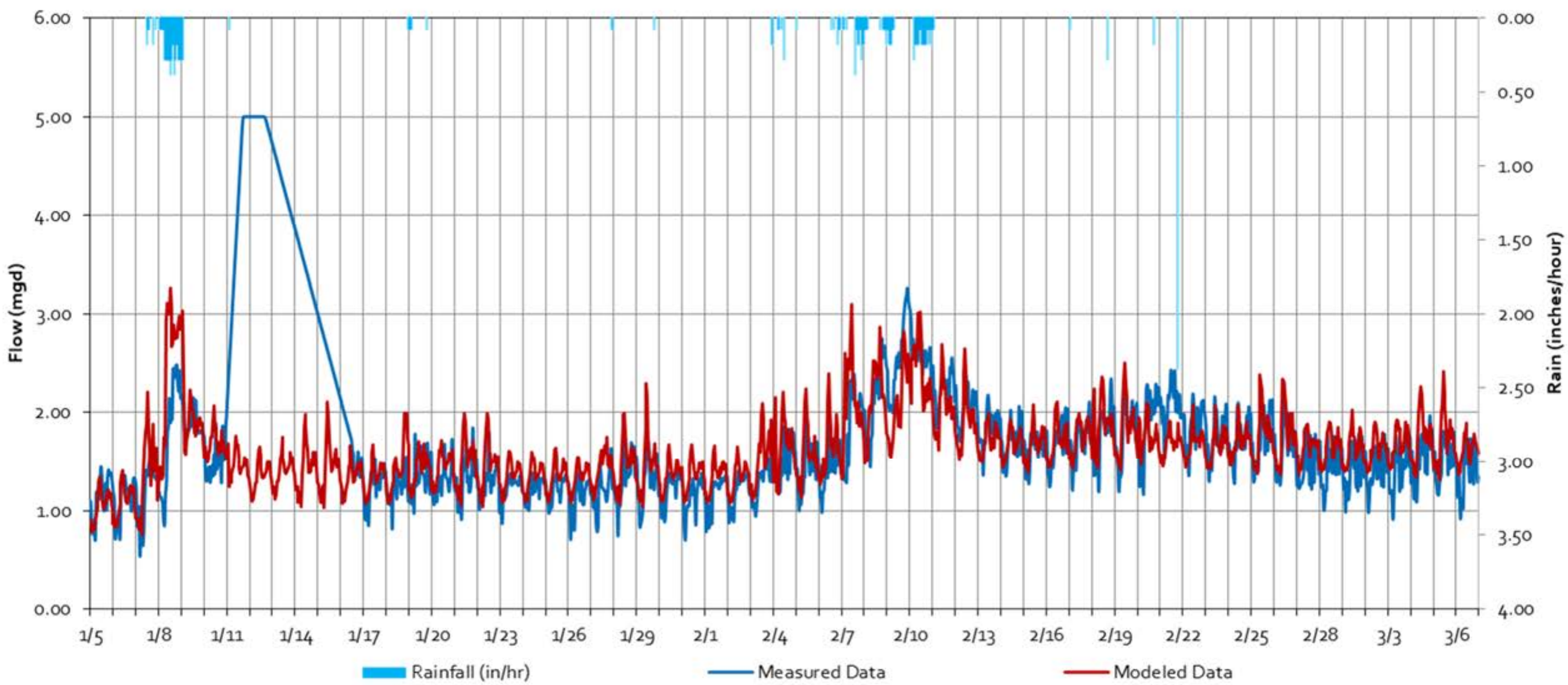
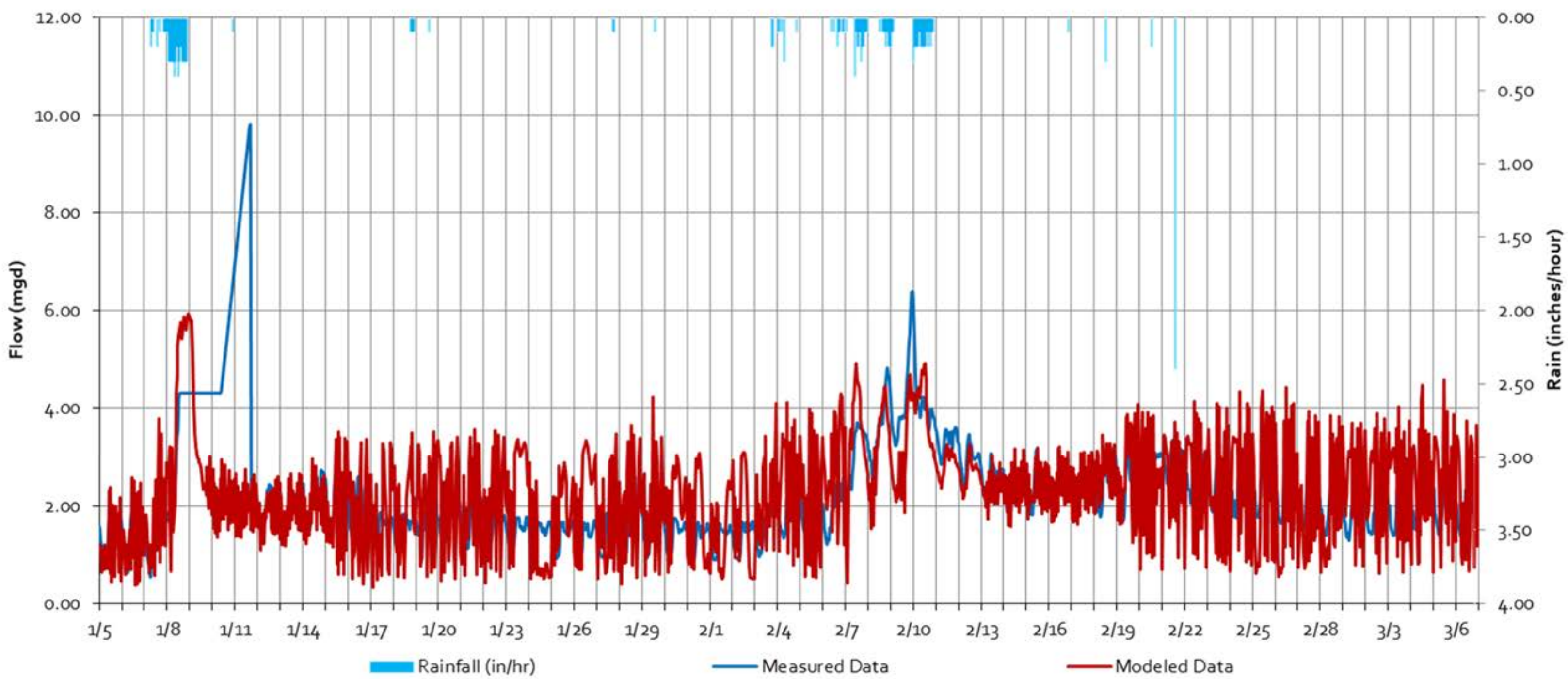
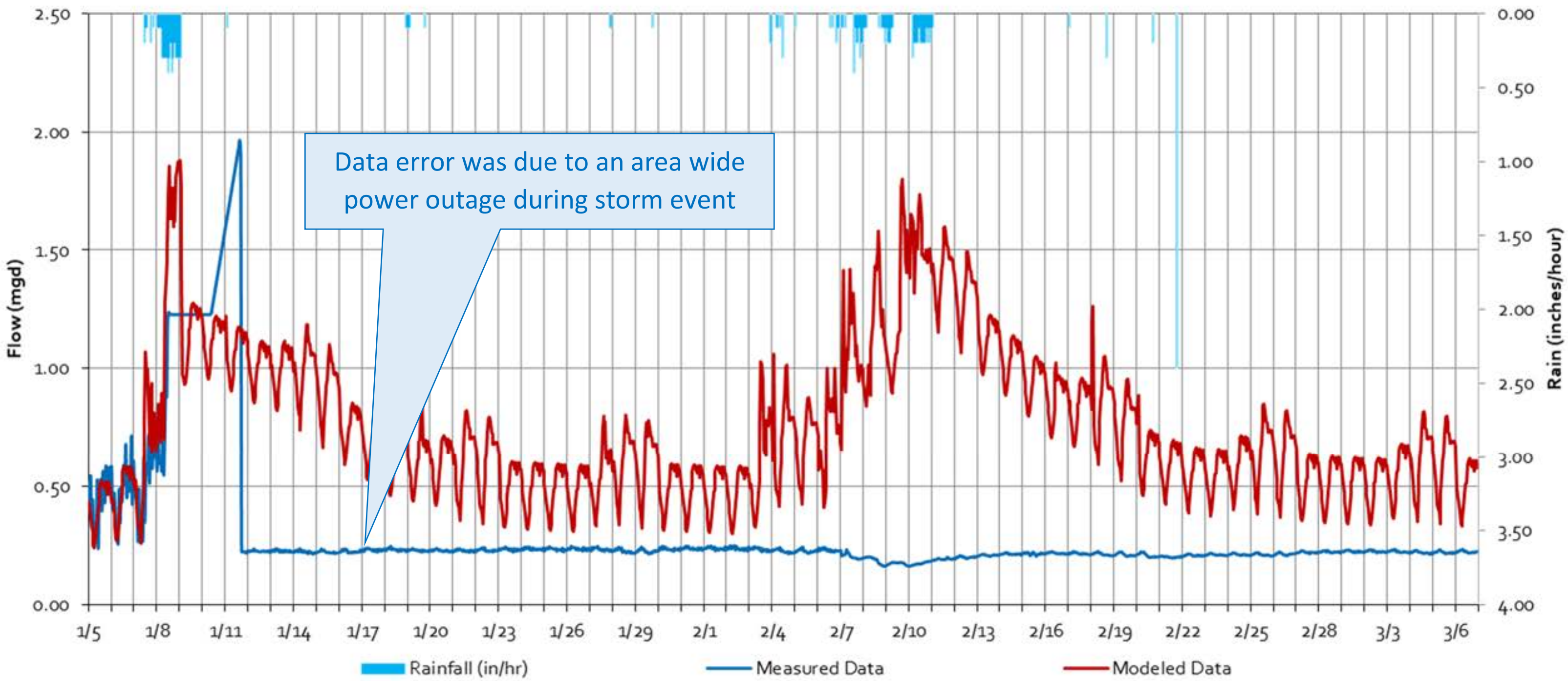
Dollar Hill (NTPUD) wet weather flow calibration results



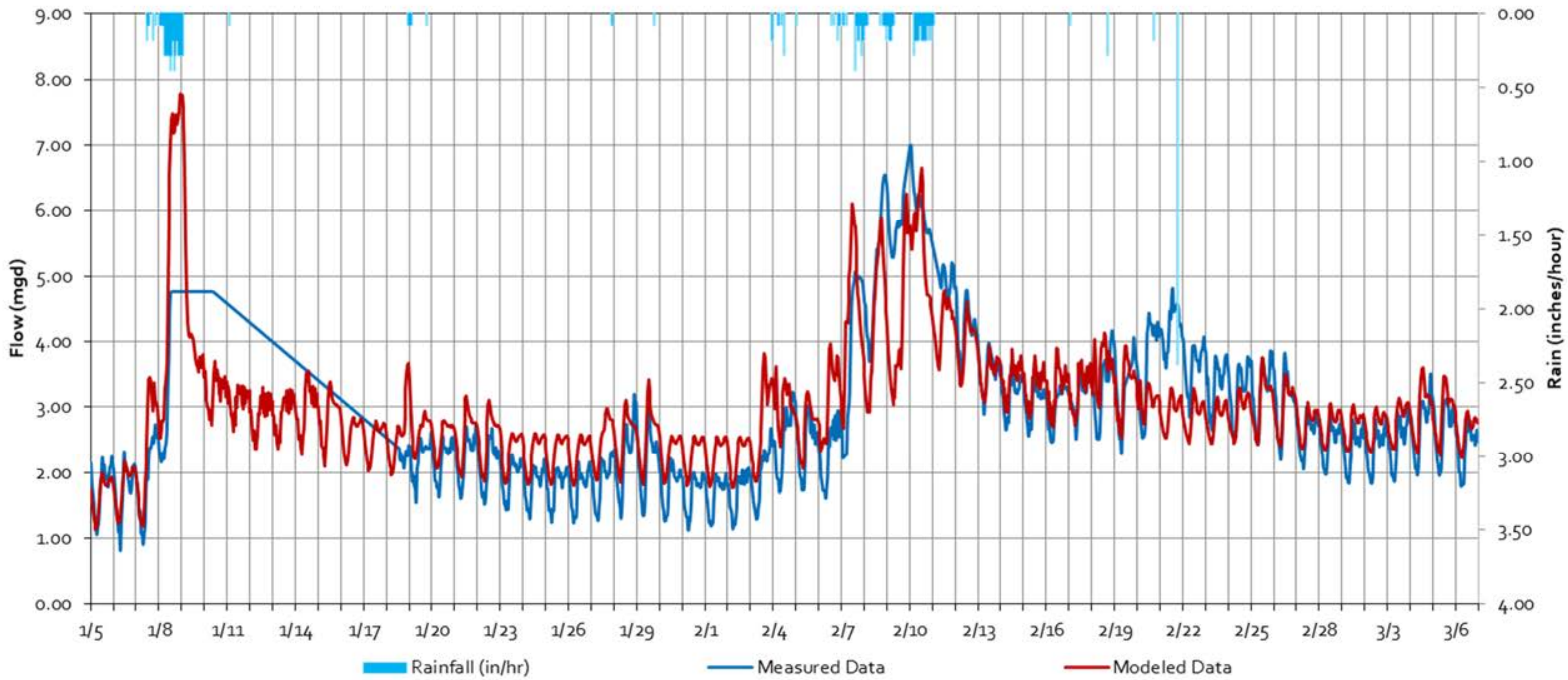
North Shore (TCPUD/NTPUD) wet weather flow calibration results



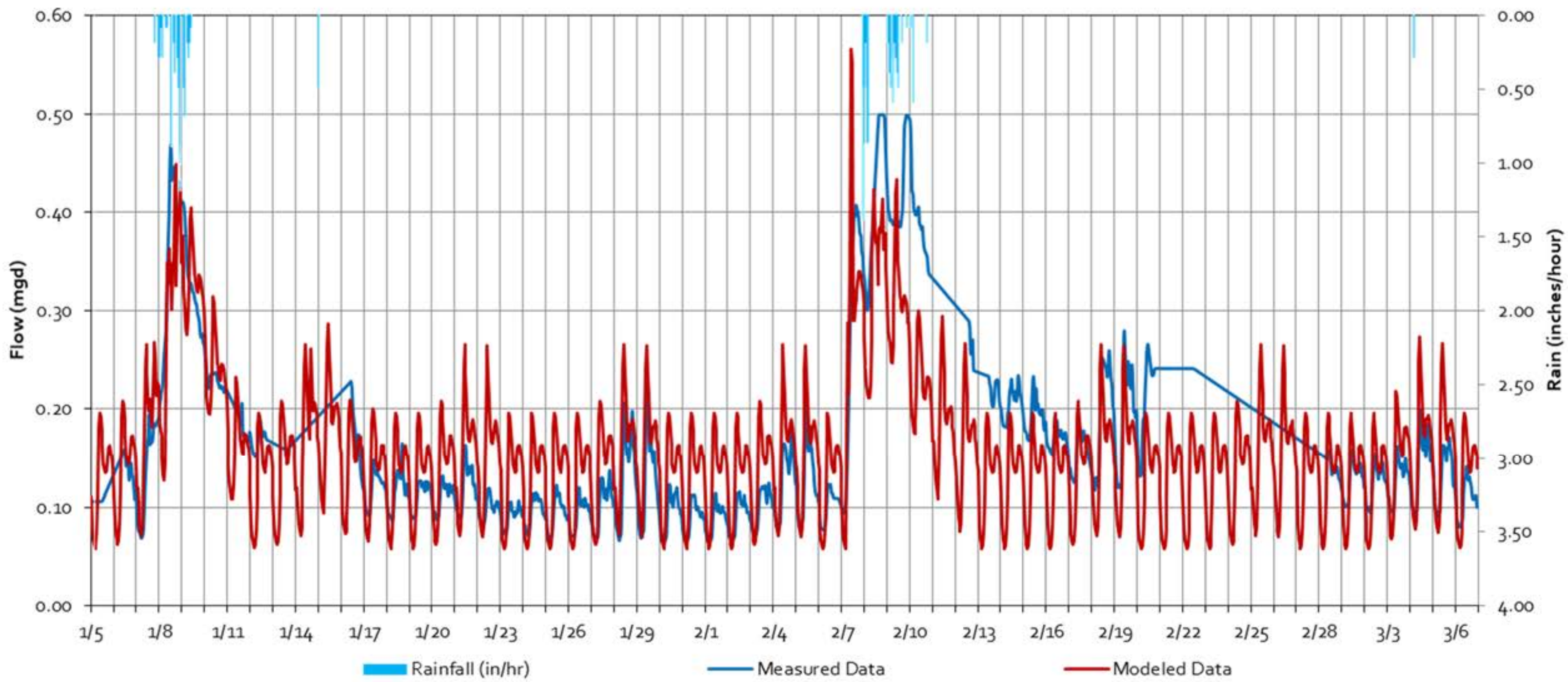
West Shore (TCPUD) wet weather flow calibration results



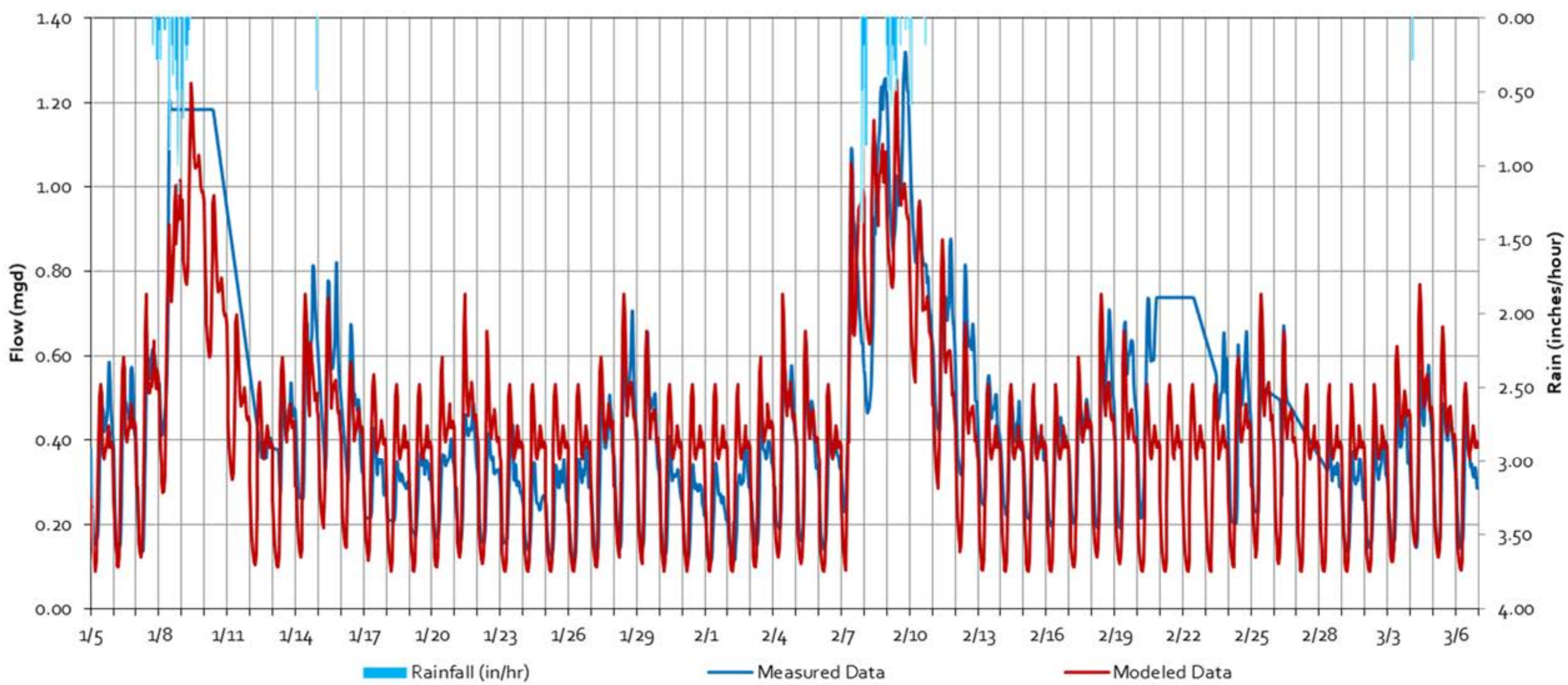
Rampart wet weather flow calibration results



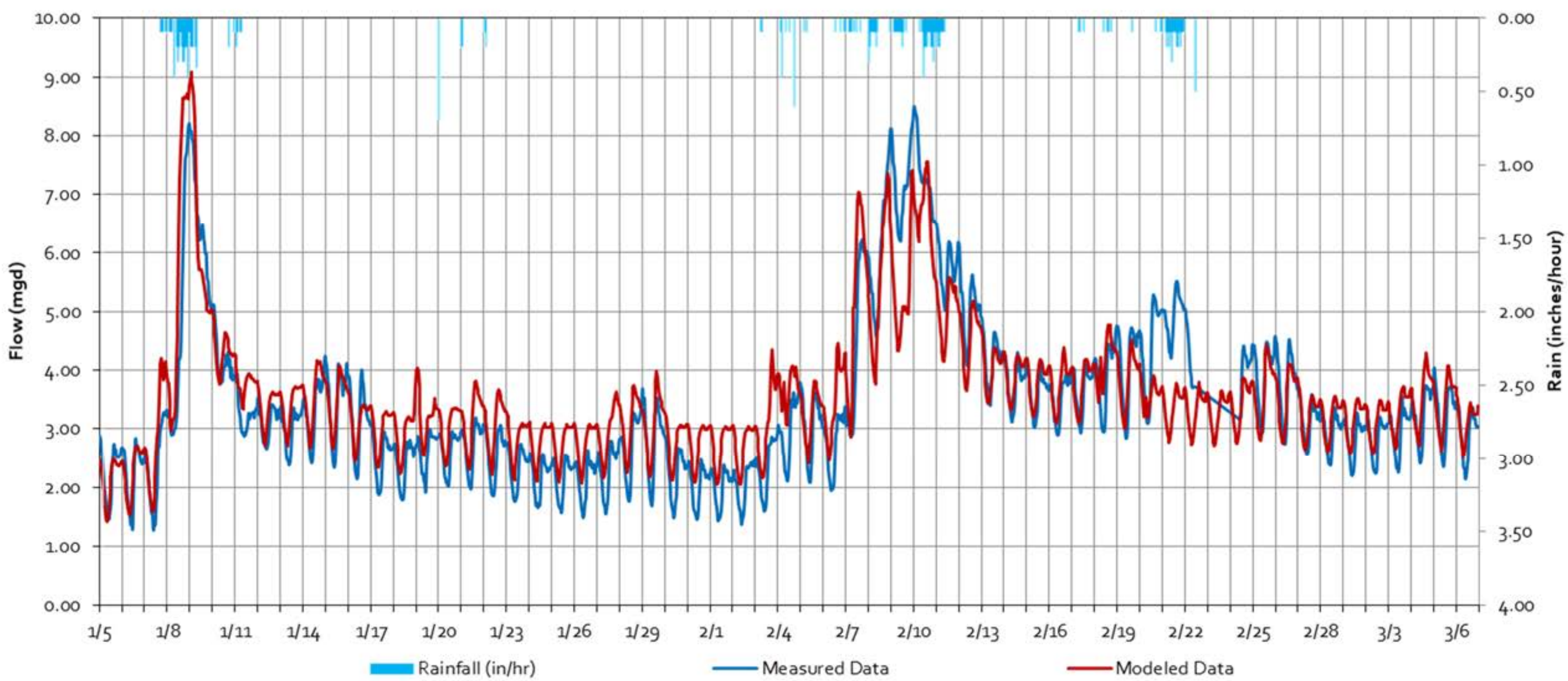
Alpine (ASCWD) wet weather flow calibration results



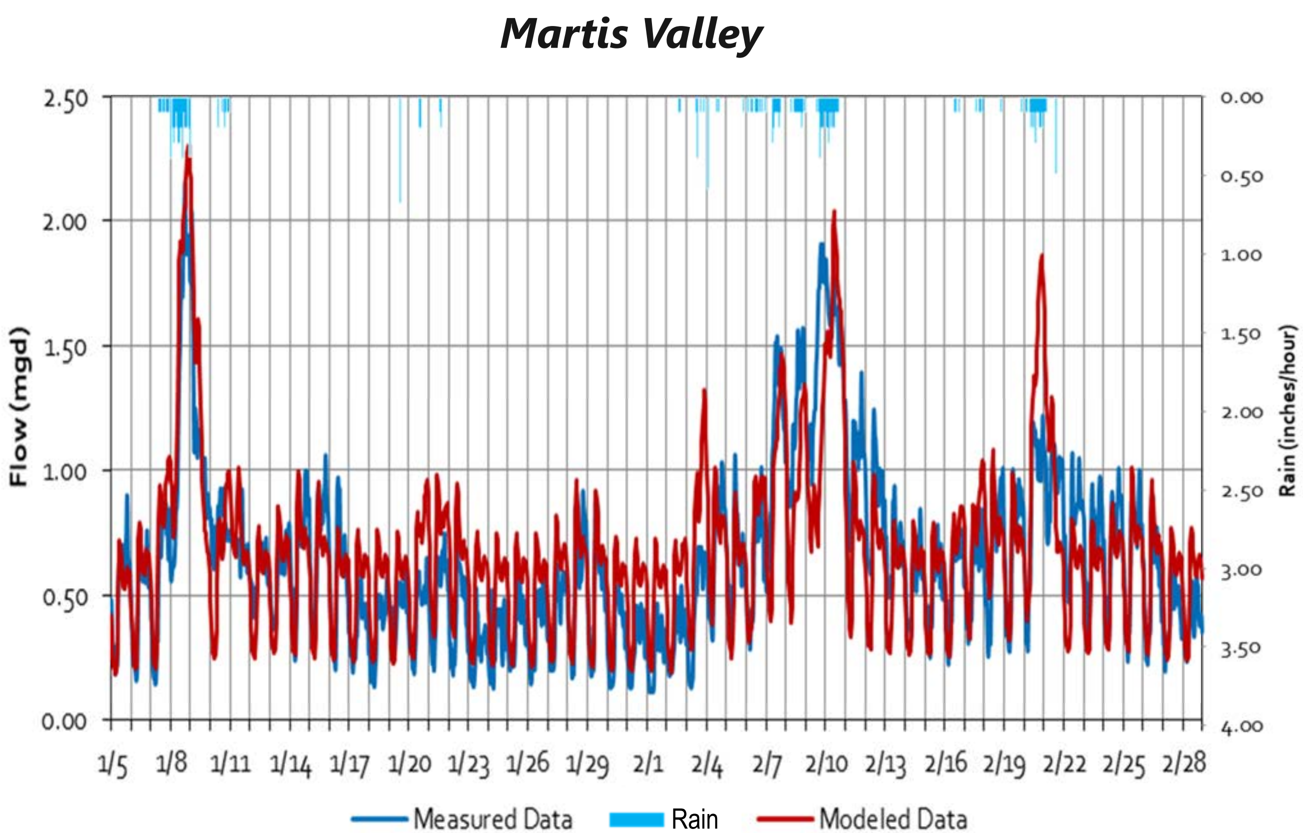
Olympic Valley (OVPSD) wet weather flow calibration results



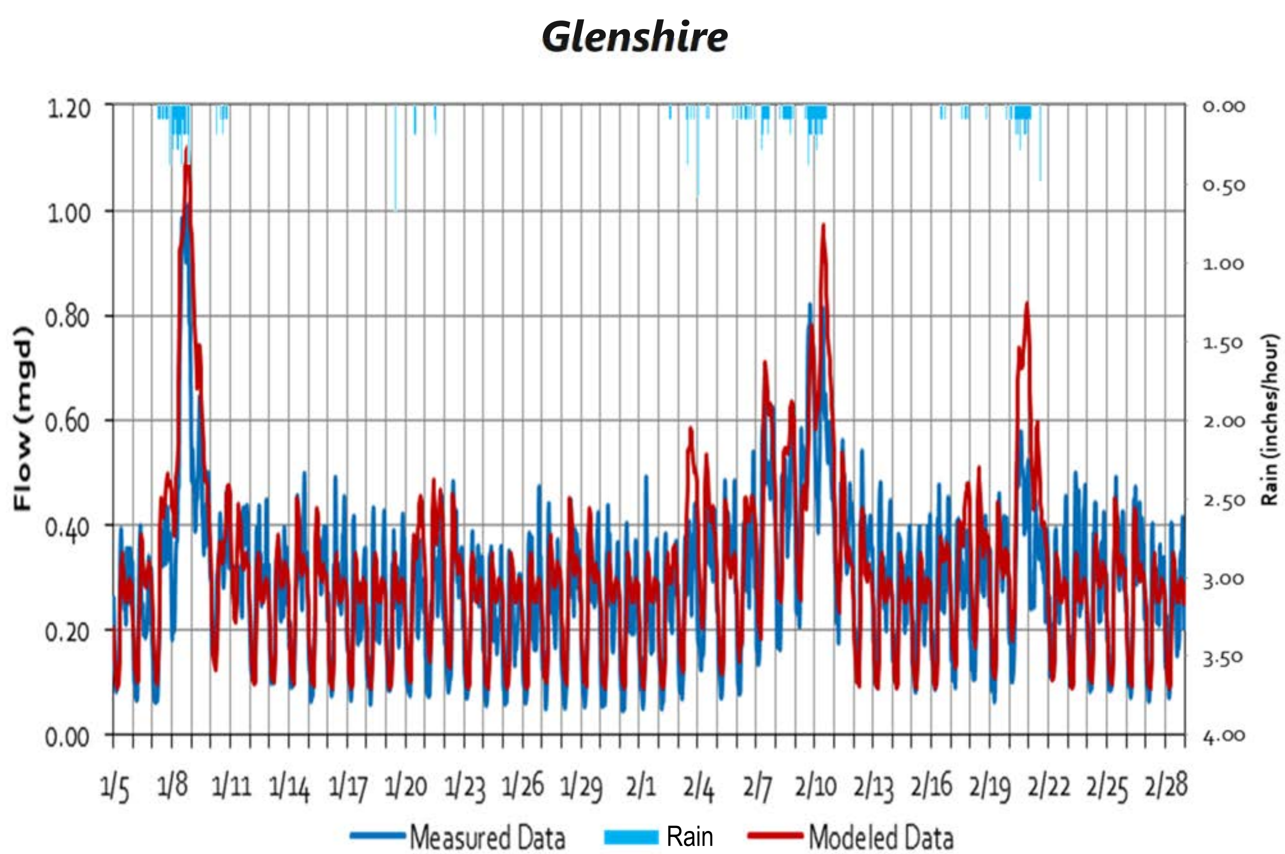
Granite Flats wet weather flow calibration results



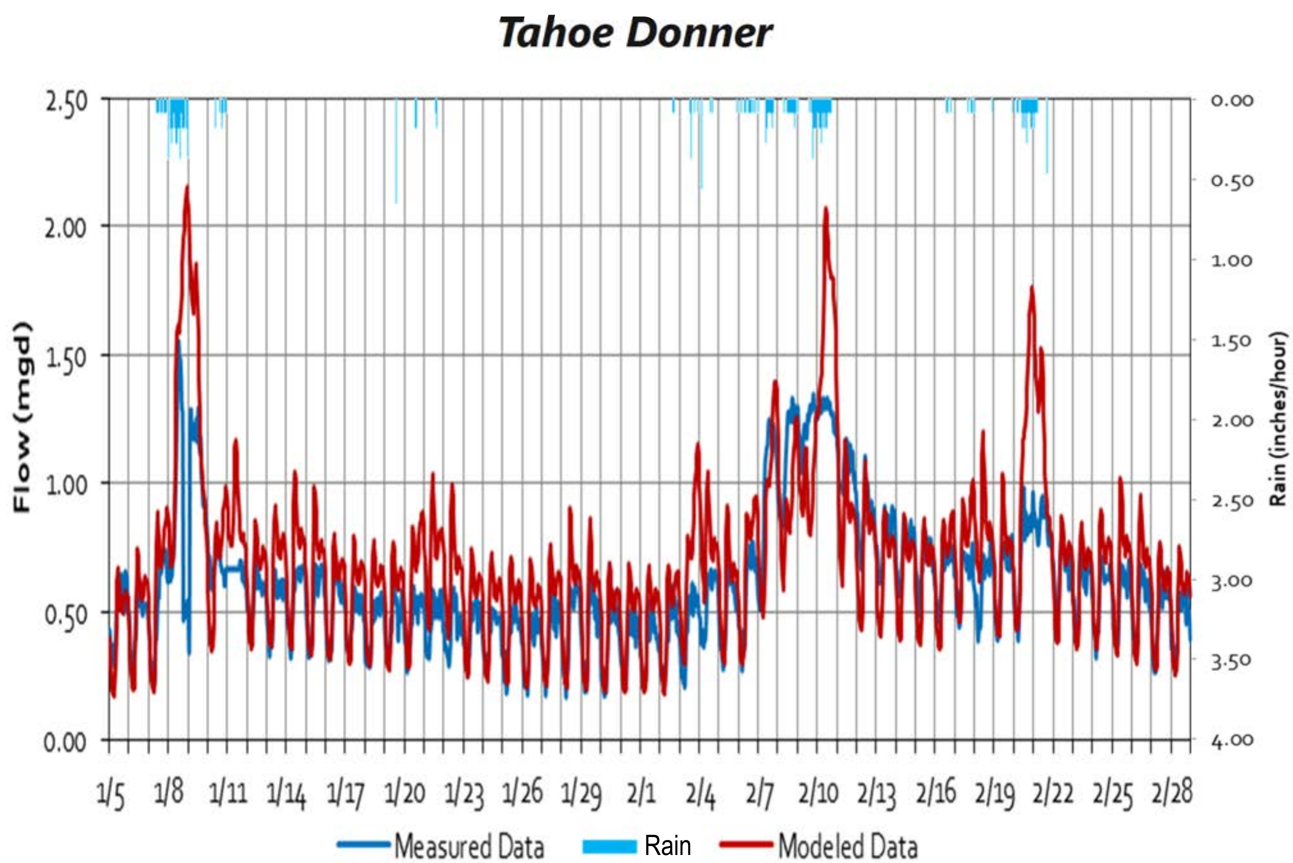
Truckee Sanitary District (TSD) flow meter data used to verify flow per connection from the District



TSD flow meter verification (continued)

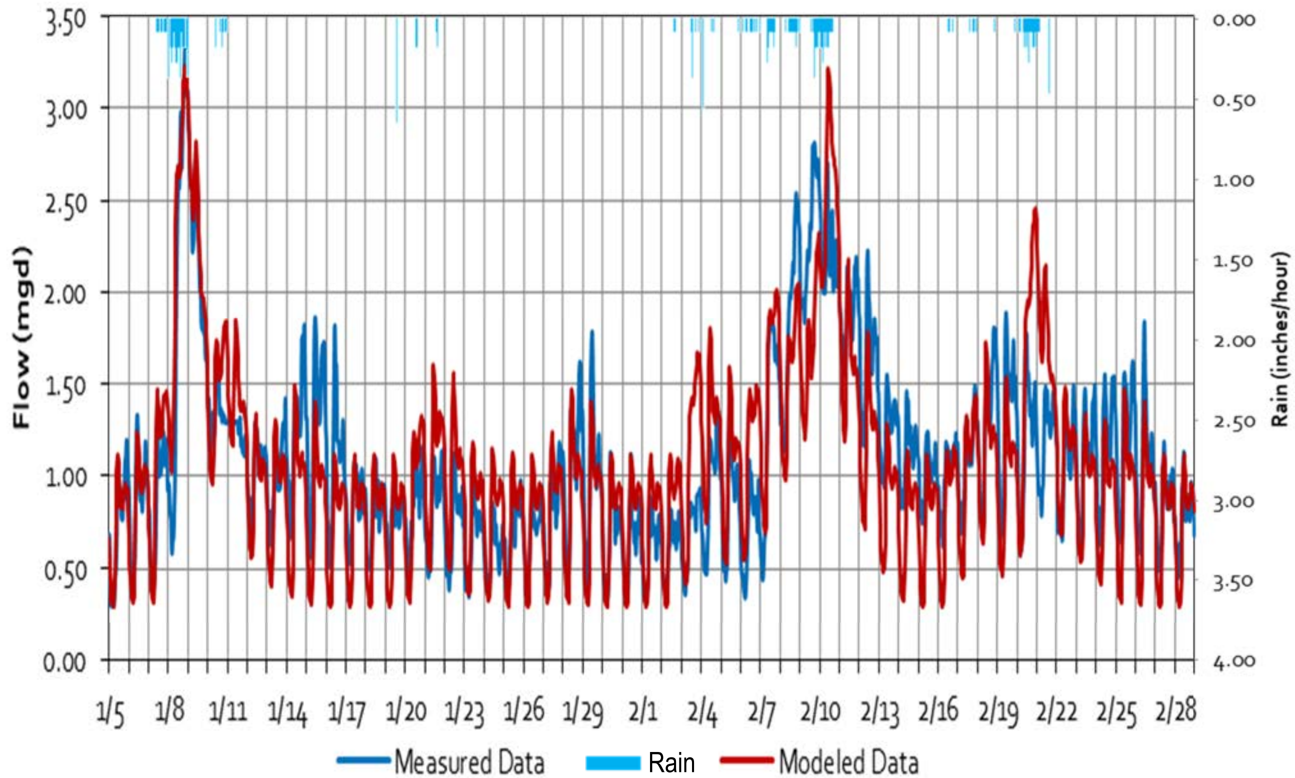


TSD flow meter verification (continued)

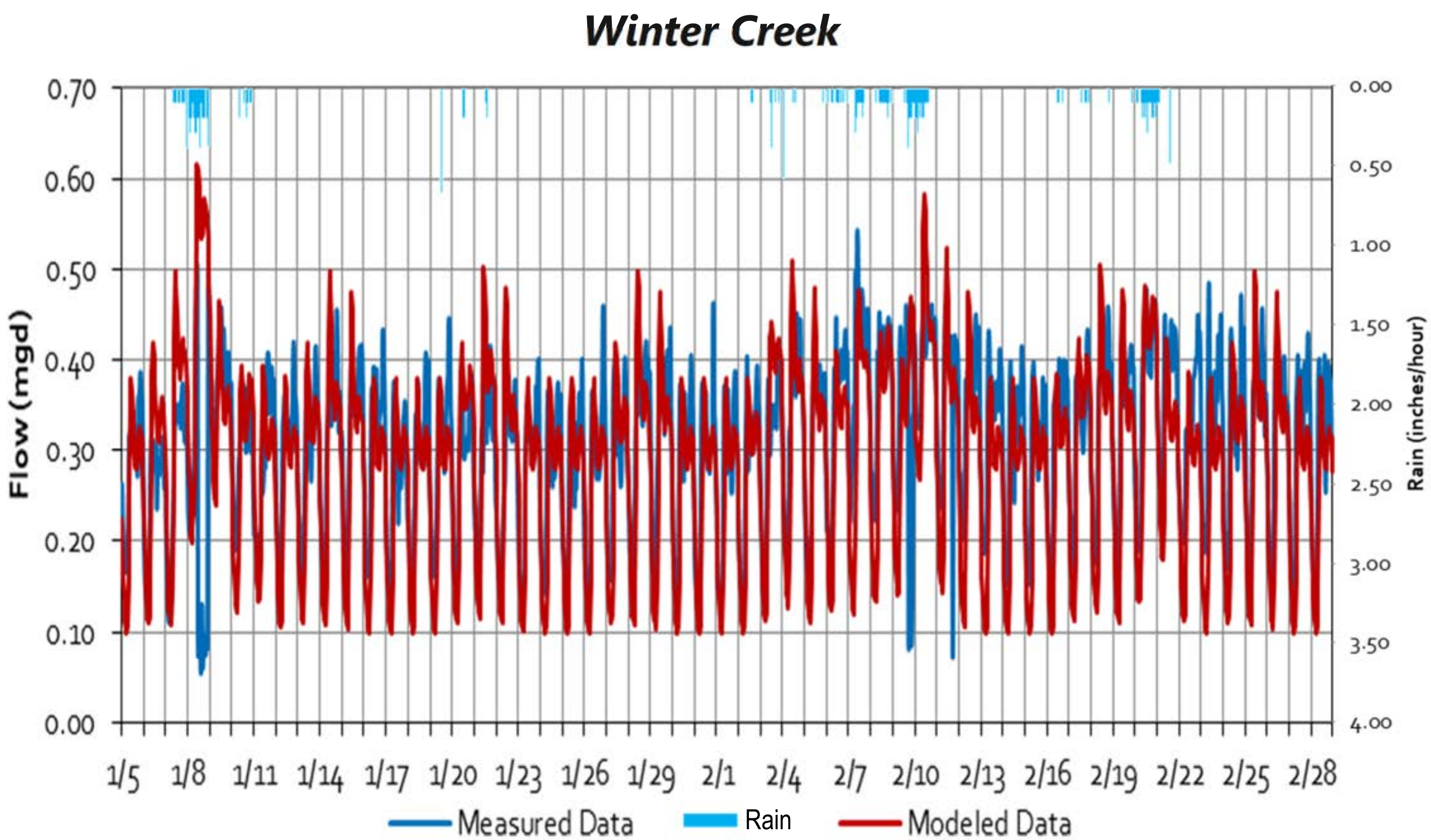


TSD flow meter verification (continued)

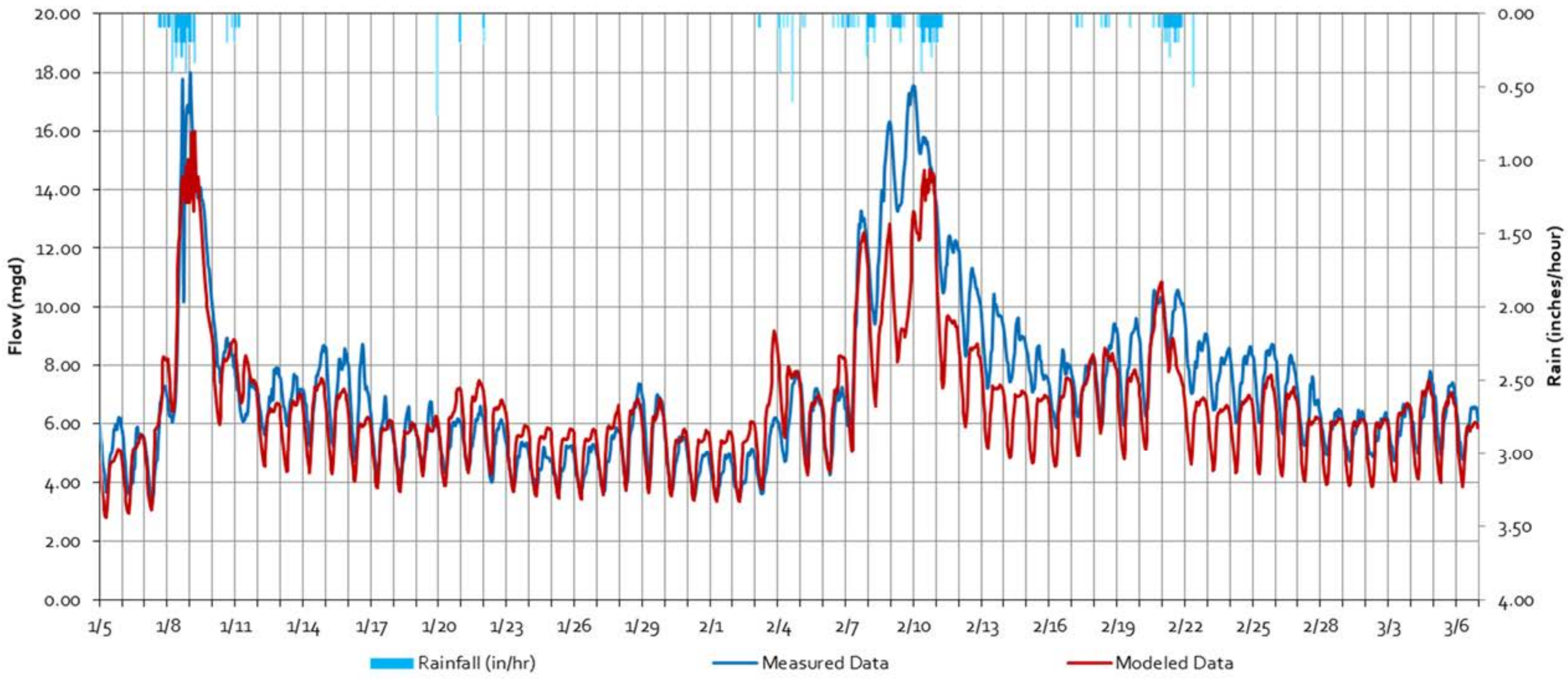
Tahoe Donner



TSD flow meter verification (continued)



WRP wet weather flow calibration results



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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 2:
COLLECTION SYSTEM MASTER PLAN
CHAPTER 5:
TRI CAPACITY EVALUATION

FINAL | February 2022

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Date: 2022.02.08 17:11:49-08'00'

REGISTERED PROFESSIONAL ENGINEER
RYAN F. ORGILL
No. 75802
CIVIL
STATE OF CALIFORNIA

Chapter 5

TRI CAPACITY EVALUATION

5.1 Introduction

The Tahoe-Truckee Sanitation Agency (T-TSA) provides wastewater treatment and collection for the North Lake Tahoe and Truckee region. Wastewater is conveyed to the Water Reclamation Plant (WRP) via the Truckee River Interceptor (TRI). The TRI flows south to north and begins in Tahoe City and follows the Truckee River and State Highway 89 to the Town of Truckee. T-TSA contracted Carollo Engineers, Inc. (Carollo) to assist in evaluation of the TRI using the calibrated hydraulic model. In addition, this chapter summarizes the evaluation criteria used to analyze the hydraulic model outputs.

5.2 Evaluation Criteria

This section presents the planning criteria and methodologies for the analysis used to evaluate the TRI and associated facilities, which are utilized to identify existing system deficiencies, and to size future improvements and expansions. The planning criteria address the collection system capacity, acceptable gravity sewer pipe slopes, and maximum allowable depth of flow, design velocities, and changes in pipe size. The TRI was evaluated against several flow conditions and evaluation parameters.

5.2.1 Gravity Sewers

Gravity sewer pipe capacities are dependent on many factors. The factors include roughness of the pipe, the chosen maximum allowable depth of flow downstream, and limiting velocity and slope. The following sections describe the factors that account for the determination of existing and future pipeline capacities in the T-TSA's collection system.

5.2.1.1 Manning's Coefficient (*n*)

The Manning's coefficient "*n*" is a friction coefficient that varies with respect to pipe material, size of pipe, depth of flow, smoothness of joints, root intrusion, and other factors. For sewer pipes, the Manning's coefficient typically ranges between 0.011 and 0.017, with 0.013 being a representative value used for system planning purposes. Due to unknown conditions of existing pipelines, a conservative Manning's "*n*" factor of 0.013 was initially used for the evaluation of all existing collection system pipelines. Pipe roughness values were adjusted during calibration. The evaluation of all proposed pipelines also used a Manning's "*n*" factor of 0.013.

5.2.1.2 Peak Flow Depth Criteria

The primary criterion used to identify pipeline capacity deficiencies or to size new sewer improvements is the peak flow depth criteria. The maximum flow depth criteria for existing sanitary sewers are established based on a number of factors, including the acceptable risk tolerance of the utility, local standards and codes, and other factors. Using a conservative flow depth criteria when evaluating existing sewers may lead to unnecessary replacement of existing pipelines. Conversely, lenient flow depth criteria could increase the risk of sanitary sewer overflows (SSOs). Ultimately, the maximum allowable flow depth criteria should be established to be as cost-effective as possible while at the same time reducing the risk of SSOs to the greatest extent possible. For the TRI, pipelines were flagged if the pipe surcharged within 2 feet of the manhole rim. The peak flow depth criteria was evaluated under high occupancy dry weather flow (DWF) plus design storm volumes for existing and future conditions.

System bottlenecks raise the hydraulic grade line of upstream sewers, leading to backwater conditions. The greater the capacity deficiency, the higher water levels will surcharge upstream of the bottleneck pipeline (or pipelines). The hydraulic model is used to determine "backwater" pipelines in order to specify which specific pipelines are the actual root causes of the capacity deficiency. Capital projects are proposed to provide greater flow capacity for the deficient sewers, which eliminates the backwater conditions that cause surcharging.

5.2.2 Design Storm for Sewer System Planning

As noted in Section 3.4 of Volume 2, Chapter 3 of this plan, the 10-year, 24-hour design storm was used for analyzing capacity of the TRI. Figure 5.1 shows the 10-year, 24-hour design storms.

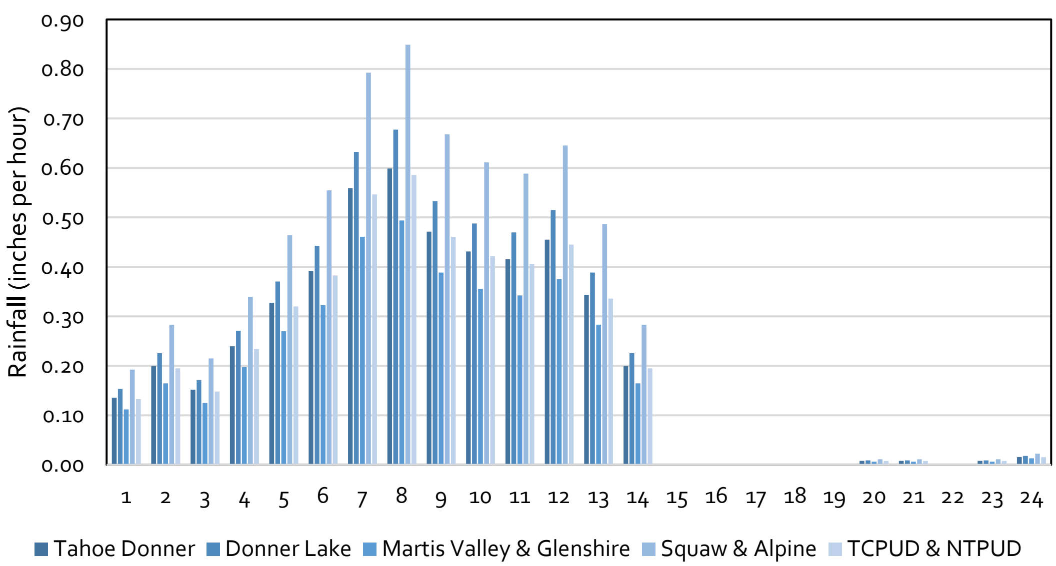

Figure 5.1 10-Year, 24-Hour Design Storms

5.3 TRI Capacity Evaluation System Analysis

Following the dry and wet weather flow calibration, which is summarized in detail in Volume 2, Chapter 4, a capacity analysis of the TRI was performed under the existing and future flow conditions described in Volume 2, Chapter 3. The capacity analysis entailed identifying areas in the TRI where flow restrictions occur or where pipe capacity is insufficient to convey peak wet weather flows PWWFs. Sewers that lack sufficient capacity to convey PWWFs create bottlenecks in the system that can potentially cause SSOs.

For the existing TRI, the PWWF was routed through the hydraulic model. In accordance with the established flow depth criteria for existing sewers, manholes where the maximum hydraulic grade line HGL is within 2 feet of the manhole rim were considered to be deficient.

Note that the pipelines that surcharge within 2 feet of the manhole rim are not necessarily deficient. In some cases, a surcharged condition within a given pipeline is due to backwater effects created by a downstream bottleneck (i.e., upstream surcharging is caused by downstream pipeline deficiencies). An illustration of backwater effects is shown in Figure 5.2. For this reason, the hydraulic model was used to identify the pipeline segments that are capacity deficient (i.e., not subject to backwater conditions).

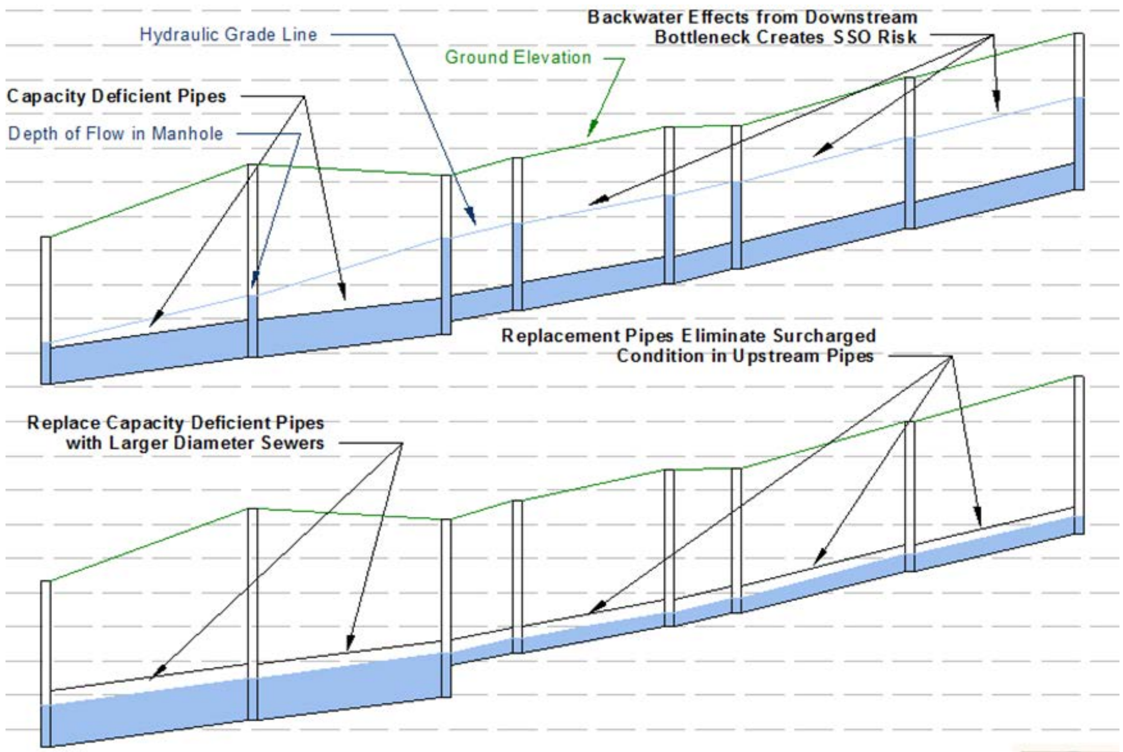

Figure 5.2 Sample Illustration of Backwater Effects in a Sewer

5.3.1 Existing TRI Evaluation

The TRI has sufficient capacity to convey current PWWFs without exceeding the established flow depth criterion.

Figure 5.3 shows the existing high occupancy DWF and PWWF hydrograph at the WRP for 2 days. As shown in Figure 5.3, the model simulated PWWF at the WRP is 21.9 million gallons per day (mgd). The TRI Remaining EDU Analysis TM provided in Appendix 5A provides additional analysis of the remaining capacity in each major segment of the TRI.

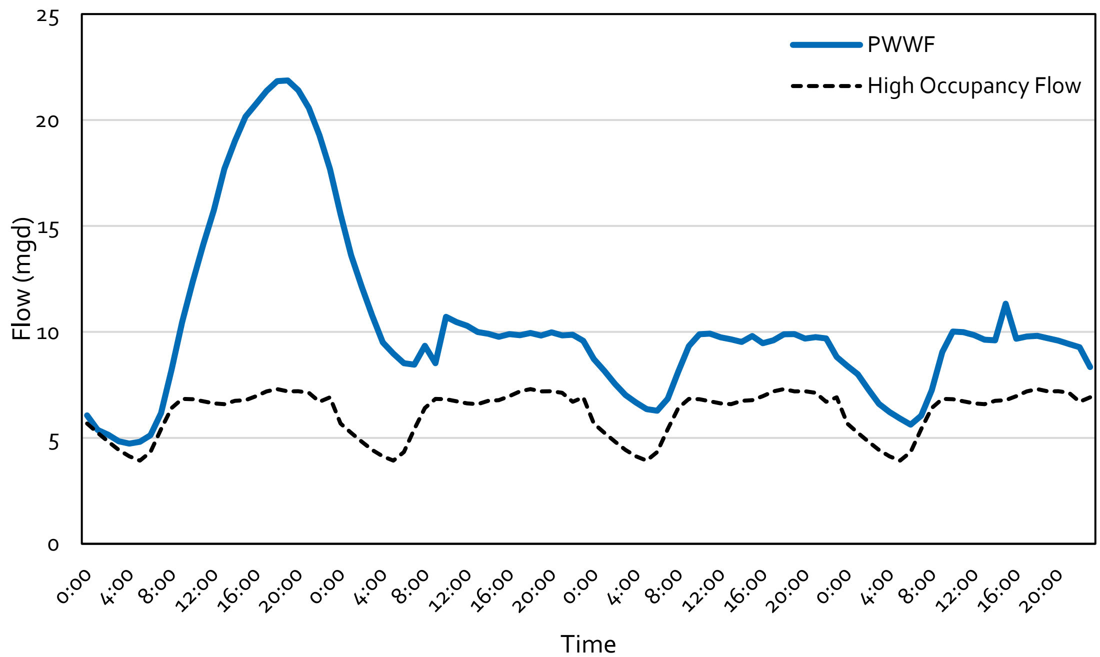

Figure 5.3 Existing PWWF Hydrograph at the WRP

5.3.2 Future (2045) TRI Evaluation

Following the completion of the existing system analysis, improvement projects and alternatives were identified in order to mitigate existing system pipeline capacity deficiencies. The recommended improvement projects are discussed in greater detail in Volume 2, Chapter 6. The analysis of the future system was performed in a manner similar to the existing system analysis. The future system evaluation verifies that the existing system improvements were appropriately sized to convey future PWWFs, and also identifies the locations of existing sewers that are inadequately sized to convey future PWWFs.

By 2045, the PWWF is projected to increase to 30.0 mgd, as shown in Figure 5.4. Similar to the existing system analysis, the TRI generally has sufficient capacity to convey future PWWFs without exceeding the established flow depth criterion, with a couple of exceptions. The pipelines that were flagged as capacity deficient under future PWWF conditions are shown on Figure 5.5 in thick red lines. Replacing a capacity limited (bottleneck) sewer will allow for higher peak flows to be carried to downstream sewers. The following stretches of gravity main were flagged as being deficient.

- *Gravity Main between MH 57 and MH 62:* This project includes the replacement of approximately 4,290 feet of 24-inch and 27-inch diameter pipeline. The flow levels of the gravity sewer cause upstream manholes to surcharge within 2 feet of the manhole rim under future PWWF conditions.
- *Gravity Main between MH 71 and MH 72:* This project includes the replacement of approximately 990 feet of 24-inch diameter pipeline. The flow levels of the gravity sewer causes upstream manholes to surcharge within 2 feet of the manhole rim under future PWWF conditions.

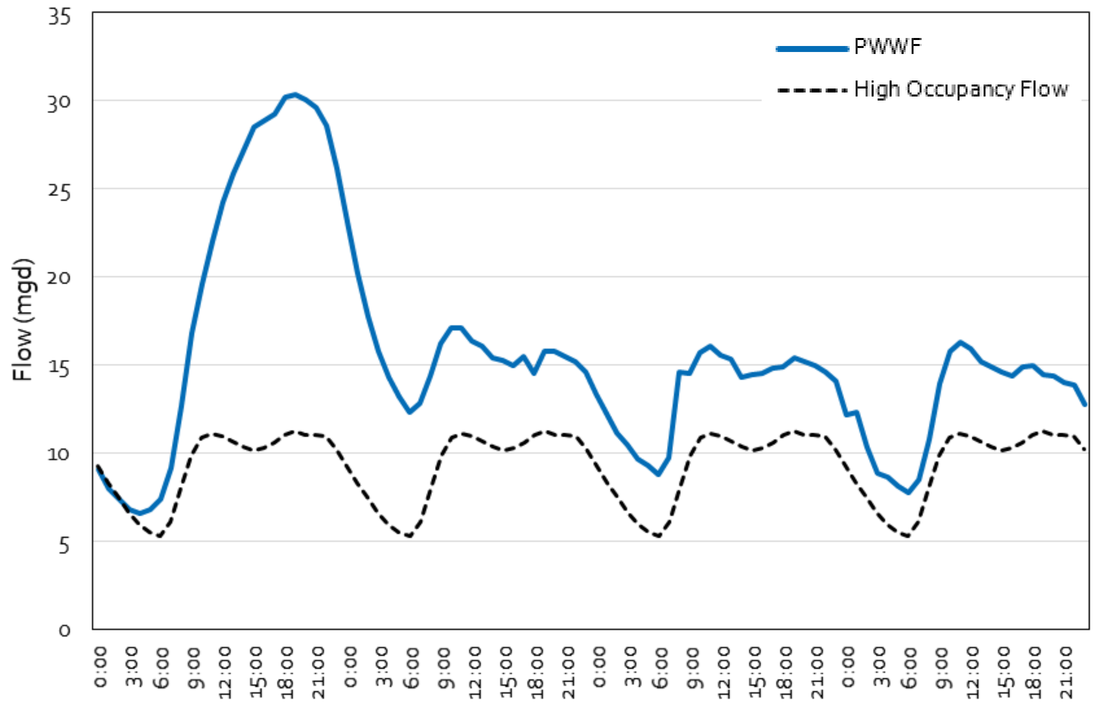

Figure 5.4 Future PWWF Hydrograph at the WRP

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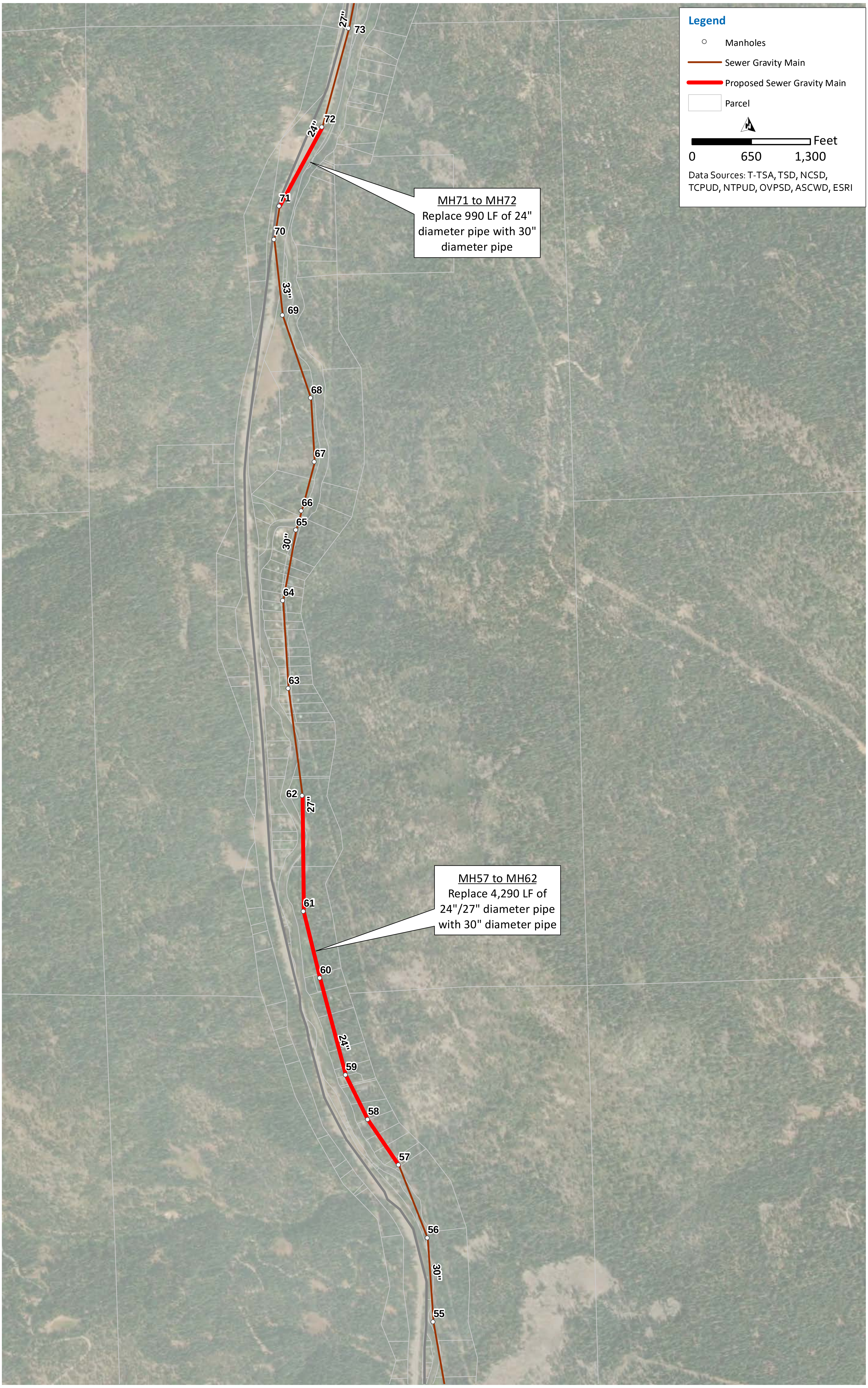

Figure 5.5 Future TRI Capacity Deficiencies

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5.4 Conclusions

Overall, the existing TRI has sufficient capacity to convey the existing and projected PWWF conditions. However, for future PWWF conditions, there are two stretches of the TRI that do not have sufficient capacity. Improvement projects and alternatives were identified in order to mitigate future system pipeline capacity deficiencies. The recommended improvement projects to mitigate the system deficiencies from Section 5.3.2 are discussed in greater detail in Volume 2, Chapter 6, TRI Recommendations.

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Appendix 5A

TRUCKEE RIVER INTERCEPTOR REMAINING EDU ANALYSIS

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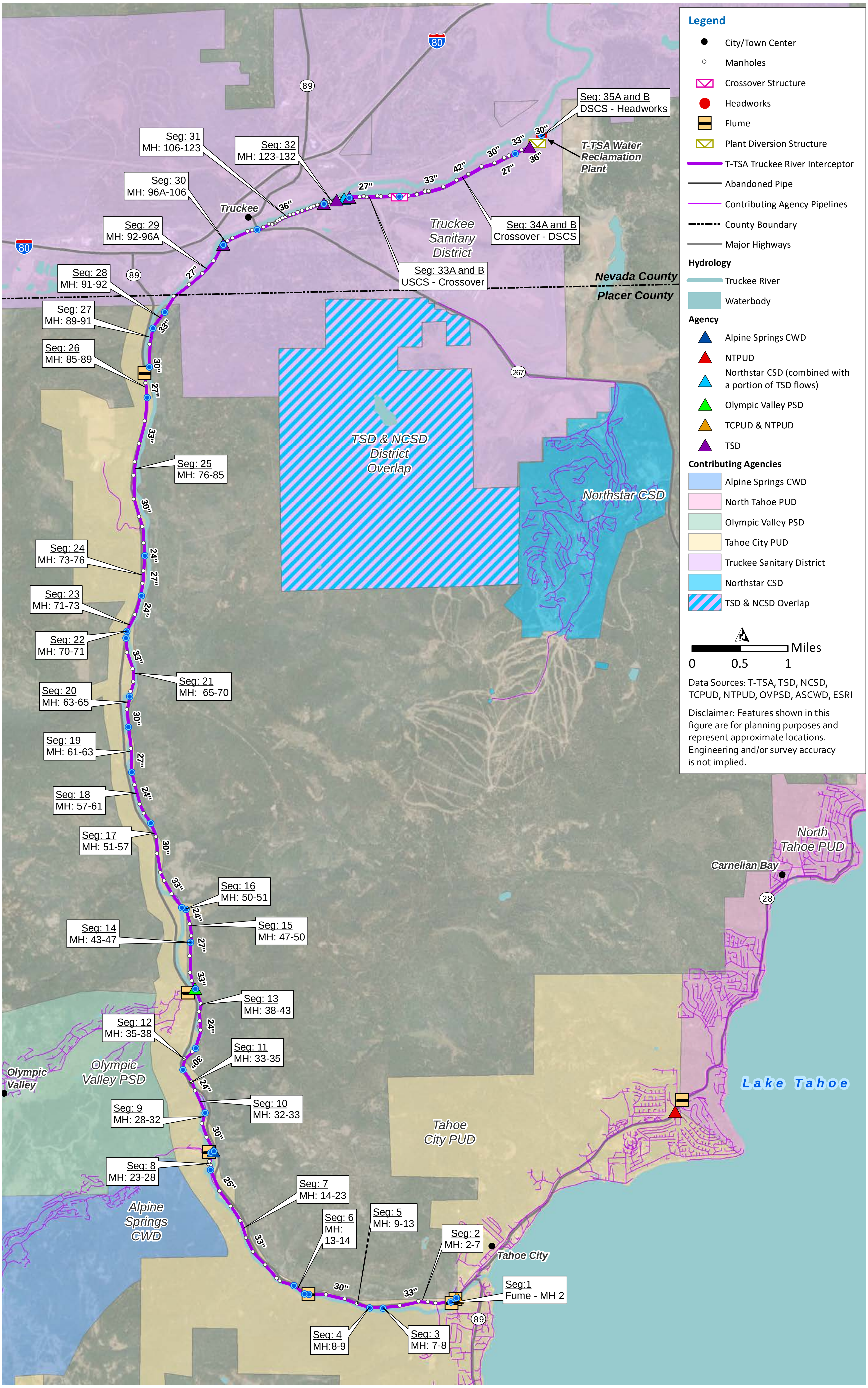

Figure A TRI Available Capacity Analysis Segments

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Estimated Remaining Available Capacity in the TRI, by Segment

Segment Number	Upstream Manhole ID	Downstream Manhole ID	Est. Remaining Available Capacity under Existing PWWFs (mgd)	Est. Remaining Available Capacity under Existing PWWFs (EDUs)(1)	Est. Remaining Available Capacity under Existing PWWFs and Improvement Projects C-1 and C-2 (mgd)	Est. Remaining Available Capacity under Existing PWWFs and Improvement Projects C-1 and C-2 (EDUs)(1)
1	WS Flume	2	1.40	2,333	2.80	4,667
2	2	7	1.40	2,333	2.80	4,667
3	7	8	1.38	2,300	2.83	4,722
4	8	9	1.38	2,297	2.84	4,733
5	9	13	1.39	2,308	2.84	4,740
6	13	14	1.39	2,308	2.87	4,777
7	14	23	1.37	2,290	2.90	4,840
8	23	28	1.37	2,290	2.78	4,640
9	28	32	1.38	2,292	2.78	4,640
10	32	33	1.37	2,283	2.80	4,667
11	33	35	1.38	2,300	2.77	4,612
12	35	38	1.37	2,283	2.77	4,610
13	38	43	1.37	2,285	2.77	4,610
14	43	47	1.38	2,307	2.76	4,603
15	47	50	1.38	2,307	2.76	4,597
16	50	51	1.39	2,308	2.76	4,597
17	51	57	1.39	2,312	2.76	4,597
18	57	61	1.39	2,312	2.76	4,597
19	61	63	1.51	2,517	2.76	4,597
20	63	65	1.51	2,517	2.76	4,597
21	65	70	1.51	2,517	2.76	4,592
22	70	71	1.51	2,517	2.75	4,590
23	71	73	1.51	2,517	2.75	4,590
24	73	76	2.75	4,585	2.76	4,592
25	76	85	2.75	4,585	2.76	4,595
26	85	89	5.20	8,667	5.20	8,667
27	89	91	5.14	8,563	5.20	8,660
28	91	92	5.27	8,783	5.28	8,792
29	92	96A	5.50	9,165	5.55	9,253
30(2)	96A	106	>10	>16,667	>10	>16,667
31(2)	106	123	>10	>16,667	>10	>16,667
32(2)	123	132	>10	>16,667	>10	>16,667
33A/33B(2)	USCS	Crossover Structure	>10	>16,667	>10	>16,667
34A/34B(2)	Crossover Structure	DSCS	>10	>16,667	>10	>16,667
35A/35/B(2)	DSCS	Headworks	>10	>16,667	>10	>16,667

Notes:

(1) Remaining Available Equivalent Dwelling Units = Remaining Available Capacity/((200 gpd/EDU)*3). Assumed a peaking factor of 3.

(2) The remaining available capacity for segments30-35A/35B varies depending on which diversion structures are in operation and which diversion ponds are operated. Carollo found that the remaining available capacity in these reaches is estimated to be at least 10 mgd.

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 2:
COLLECTION SYSTEM MASTER PLAN
CHAPTER 6:
TRI RECOMMENDATIONS

FINAL | February 2022

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Chapter 6

TRI RECOMMENDATIONS

6.1 Introduction

The Tahoe-Truckee Sanitation Agency (T-TSA/Agency) provides wastewater treatment and collection for the North Lake Tahoe and Truckee region. Wastewater is conveyed to the Water Reclamation Plant (WRP) via the Truckee River Interceptor (TRI). T-TSA contracted Carollo Engineers, Inc. (Carollo) to make recommendations based on the TRI capacity evaluation and condition assessment as discussed in Volume 2, Chapter 5 - TRI Capacity Evaluation and in Volume 2, Chapter 2 - Condition Assessment and Asset Management, respectively. These recommendations also reflect discussions with T-TSA regarding the TRI.

6.2 Project Phasing

As discussed in Volume 2, Chapter 2 - Condition Assessment and Asset Management, the TRI projects were broken into five groups. These groups were used to help prioritize the renewal projects based on the overall condition of the TRI pipeline segments. Similarly, all TRI related projects were grouped into five phases as shown below:

- Phase 1: Years 2022 through 2026.
- Phase 2: Years 2027 through 2031.
- Phase 3: Years 2032 through 2036.
- Phase 4: Years 2037 through 2041.
- Phase 5: Years 2042 through 2046.

The project phasing will be used in the capital improvement plan (CIP) of this Master Plan. Critical projects were phased in the earlier phases (years) of the 25-year CIP. Less critical projects were phased into later phases of the 25-year CIP.

6.3 TRI Improvements

The improvements recommended to address deficiencies in the TRI are provided in Figures 6.1 and 6.2. These improvements are also itemized by project in Table 6.1 with a cross-referenced numbering system. The columns used in Table 6.1 refer to the following:

- *Project ID:* Assigned number that corresponds to the Proposed Improvements Table. This is an alphanumeric number that starts with one letter indicating the type of improvement (C = Capacity; RR = Rehabilitation and Replacement; O = Other) and continues with a number.
- *Project Name:* Name of the project.
- *Type of Improvement:* Describes the type of improvement (modification, replacement, or lining) for an existing facility.
- *Description:* Summarizes the proposed improvement.
- *Reason:* Summarizes why the improvement is needed.

- *Proposed Quantity:* Estimated length or number of units for the proposed improvement, if applicable. It should be noted that the length estimates do not account for re-routing the alignment to avoid unknown conditions.
- *Existing Size:* This is the size of the existing pipeline/facility. It represents the diameter of the existing pipeline(s) (in inches).
- *Proposed Size:* This is the size of the proposed improvement. It represents the diameter of the existing pipeline(s) (in inches).
- *Proposed Phase:* This is which phase of the 25-year CIP the project is proposed to be implemented in.

The following sections describe the recommended improvements in greater detail.

6.3.1 TRI Capacity Improvements

Figure 6.1 illustrates the recommended capacity improvements to mitigate the collection system deficiencies. This section provides a detailed description of each recommended wastewater collection system improvement project. The capacity recommendations were developed to mitigate capacity deficiencies identified in Volume 2, Chapter 5 - TRI Capacity Evaluation. The following capacity improvements are recommended for the TRI:

- *Gravity Main between manhole (MH) 57 and MH 62 (Project C-1):* This project includes the replacement of approximately 4,290 feet of 24-inch and 27-inch diameter pipeline between MH 57 and MH 62. The flow levels of the gravity sewer cause upstream manholes to surcharge within 2 feet of the manhole rim under future peak wet weather flow (PWWF) conditions. To mitigate the risk of sanitary sewer overflows (SSO) occurring during PWWF conditions, it is recommended that the existing pipeline be replaced with a 30-inch diameter pipeline. The phasing of this project will depend on the rate of growth in flows in the TRI. For planning purposes, it is assumed that this project will be constructed in Phase 3 (2032-2036).
- *Gravity Main between MH 71 and MH 72 (Project C-2):* This project includes the replacement of approximately 990 feet of 24-inch diameter pipeline between MH 71 and MH 72. The flow levels of the gravity sewer cause upstream manholes to surcharge within 2 feet of the manhole rim under future PWWF conditions. To mitigate the risk of SSOs occurring during PWWF conditions, it is recommended that the existing pipeline be replaced with a 30-inch diameter pipeline. The phasing of this project will depend on the rate of growth in flows in the TRI. For planning purposes, it is assumed that this project will occur in Phase 4 (2037-2041).

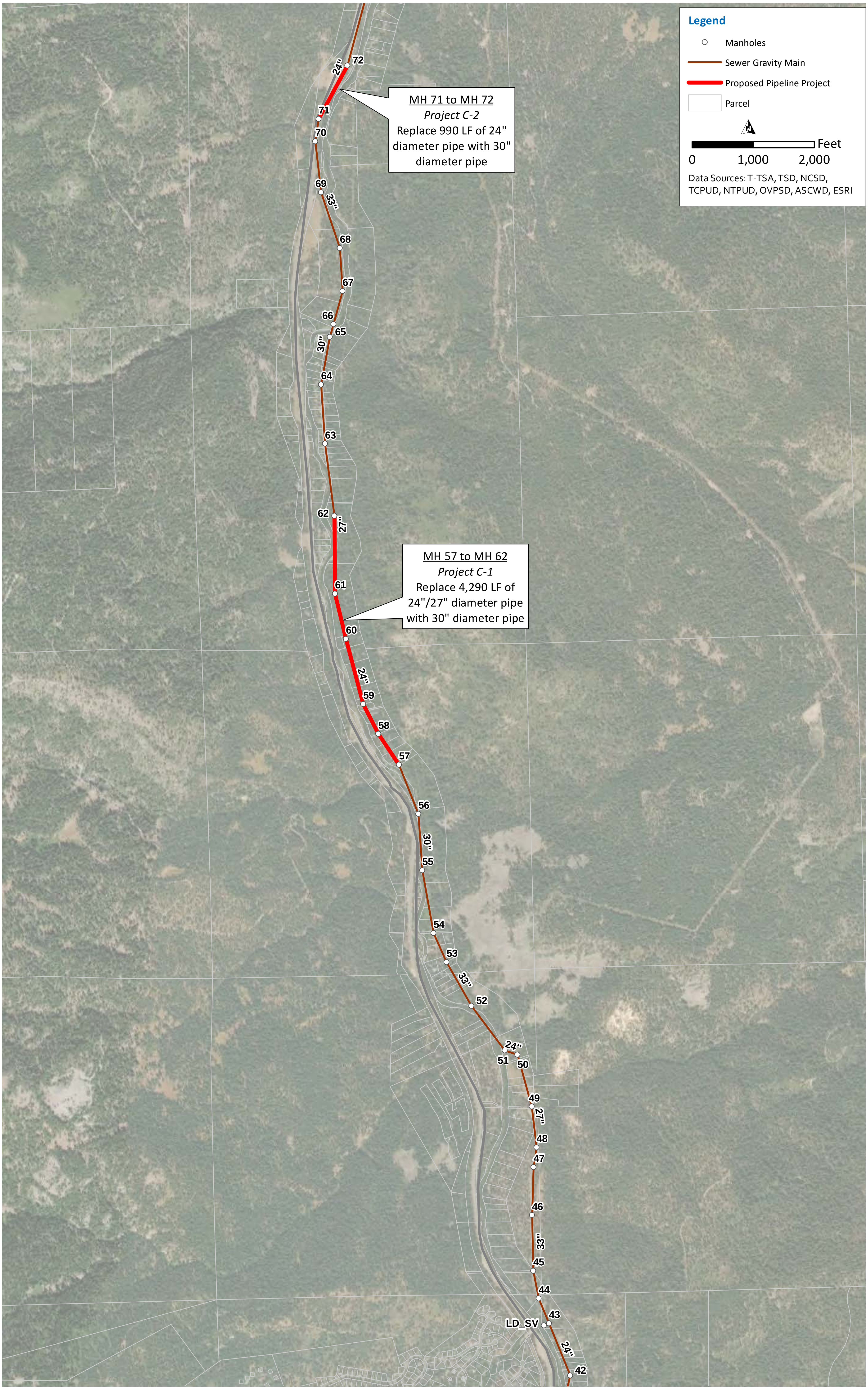

Figure 6.1 TRI Capacity Improvements

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6.3.2 TRI Condition Assessment Improvements

Figure 6.2 illustrates the recommended condition assessment improvements. This section only provides a detailed description for Phase 1 and Phase 2 condition assessment projects. It should be noted that the Phase 2 through Phase 5 projects should be updated as more information is learned regarding the rate of deterioration as monitored through T-TSA's recent implementation of improved TRI Asset Management Program processes, which includes monitoring of locations where reinforcement is visible. The proposed Visible Reinforcement Study will also inform future Phase 2 through Phase 5 projects. The condition assessment recommendations were developed to mitigate segments of the TRI that are in poor condition as identified in Volume 2, Chapter 2 - Condition Assessment and Asset Management. The following condition related improvements are recommended for the TRI:

- *River Crossing, Gravity Main between MH 33 and MH 35 (Project RR-1):* This project includes lining approximately 1,380 feet of 24-inch diameter pipeline between MH 33 and MH 35. T-TSA is concerned about TRI segments crossing under the Truckee River and plans to renew these segments. Thus it is recommended that this project occur in Phase 1 (2022-2026), specifically during the years 2022-2024.
- *River Crossing, Gravity Main between MH 65 and MH 66 (Project RR-2):* This project includes lining approximately 220 feet of 30-inch diameter pipeline between MH 65 and MH 66. T-TSA is concerned about TRI segments crossing under the Truckee River and plans to renew these segments. Thus, it is recommended that this project begin in the later part of Phase 1 (2022-2026) and be completed in early Phase 2 (2027-2031), specifically during the years 2025-2027. Additionally, given the length of this segment, it is recommended that this project be grouped with Project RR-3.
- *River Crossing, Gravity Main between MH 88 and MH 89 (Project RR-3):* This project includes lining approximately 220 feet of 30-inch diameter pipeline between MH 88 and MH 89. T-TSA is concerned about TRI segments crossing under the Truckee River and plans to renew these segments. Thus, it is recommended that this project begin in the later part of Phase 1 (2022-2026) and be completed in early Phase 2 (2027-2031), specifically during the years 2025-2027. Additionally, given the length of this segment, it is recommended that this project be grouped with Project RR-2.
- *TRI Renewal Program (Project RR-4):* The TRI Renewal Program addresses sewer infrastructure that is susceptible to failure through R&R projects. The actual R&R projects and phasing should be based on current inspections as documented and evaluated in T-TSA's new TRI Asset Management Program. Results of the structural integrity analysis performed in the proposed Visible Reinforcement Study will also be used to determine actual R&R projects and phasing. The TRI Renewal Program consists of an annual budget to ensure T-TSA has funding to complete R&R projects.

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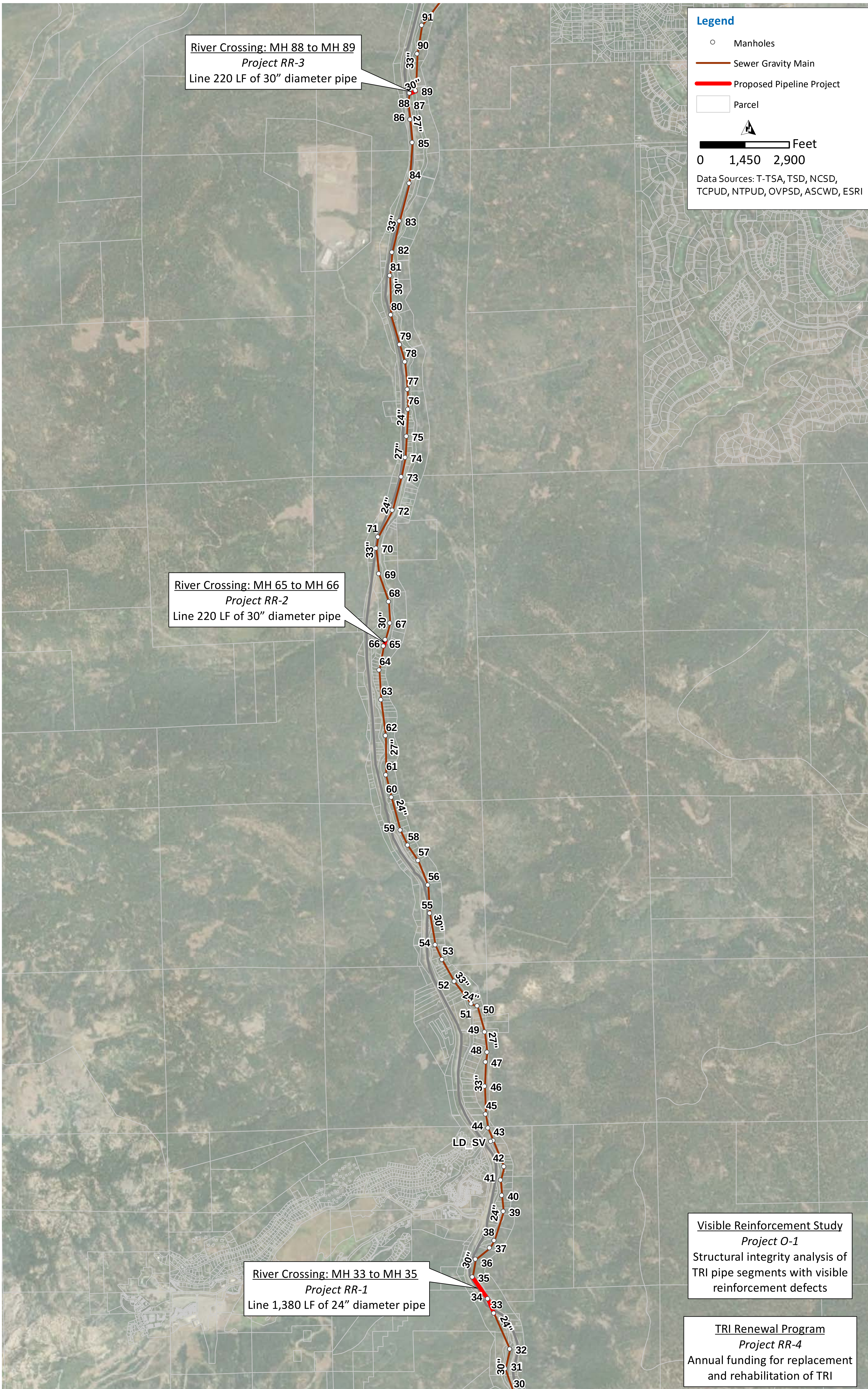

Figure 6.2 TRI Condition Assessment Improvements

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6.3.3 Other Recommendations

This section summarizes other recommendations related to the TRI. However, since T-TSA is now implementing the TRI Asset Management Program, in part due to Master Plan discussions and meetings, it is not included in the CIP. Figure 6.2 shows the Visible Reinforcement Study, which is included in the CIP.

- *TRI Asset Management Program:* The program is designed to manage data and track TRI degradation. In addition, the program will help T-TSA make decisions related to the TRI Renewal Program using a standardized method. As of fall 2020, the Agency is implementing its TRI Asset Management Program using the AIMS program and making plans to integrate the TRI Asset Management program utilizing the Lucity, Inc. software platform. Currently the Agency is implementing Lucity for treatment plant and TRI assets.
- *Visible Reinforcement Study (Project O-1):* It is recommended that a Visible Reinforcement Study be conducted to understand the structural integrity of TRI segments with visible reinforcement defects. During the July 9, 2020 meeting, T-TSA staff noted that they plan to continue to carefully inspect these pipe segments with visible reinforcement defects when the segments are scheduled to be digitally scanned, in order to better monitor their condition and degradation. A Visible Reinforcement Study, including a structural integrity analysis, is recommended to augment T-TSA's ongoing monitoring efforts. The TRI Asset Management Program will utilize information from ongoing digital scans as well as the Visible Reinforcement Study to inform the Agency's decisions regarding the TRI Renewal Program, including TRI segments with visible reinforcement defects. It is recommended that this study occur in Phase 1 (2022-2026), with a follow up study in Phase 2 (2027-2031).

6.4 Conclusion

Based on the TRI Capacity Evaluation, approximately 1 mile of the TRI is projected to require capacity upgrades within the planning period of this Master Plan. In addition, based on the TRI Condition Assessment, approximately 0.4 miles of the TRI are specifically recommended to be rehabilitated within the planning period of this Master Plan, due to the consequence of failure as a result of these segments being river crossings. It is also recommended that the Agency set aside funding for additional rehabilitation projects for the TRI under the TRI Renewal Program, although the exact length of affected sewer main is unknown at this time. This uncertainty is due to the fact that specific R&R projects have not been identified, owing to their dependence on data from the forthcoming Visible Reinforcement Study and TRI Asset Management Program.

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Table 6.1 Proposed Improvements

Project ID	Project Name	Type of Improvement	Description	Reason	Proposed Quantity	Existing Size	Proposed Size	Proposed Phase
Capacity Improvements								
C-1	Gravity Main between MH 57 and MH 62	Replace	Replace and upsize gravity sewer main to mitigate risk of SSOs	Undersized for future PWWFs	4,290 LF	24-inch & 27-inch	30-inch	Phase 3
C-2	Gravity Main between MH 71 and MH 72	Replace	Replace and upsize gravity sewer main to mitigate risk of SSOs	Undersized for future PWWFs	990 LF	24-inch	30-inch	Phase 4
Condition Assessment Improvements								
RR-1	River Crossing, Gravity Main between MH 33 and MH 35	Line	Line existing gravity sewer main under Truckee River	High consequences if sewer pipeline fails within the banks of the Truckee River	1,380 LF	24-inch	24-inch	Phase 1
RR-2	River Crossing, Gravity Main between MH 65 and MH 66	Line	Line existing gravity sewer main under Truckee River	High consequences if sewer pipeline fails within the banks of the Truckee River	220 LF	30-inch	30-inch	Phase 1-2
RR-3	River Crossing, Gravity Main between MH 88 and MH 89	Line	Line existing gravity sewer main under Truckee River	High consequences if sewer pipeline fails within the banks of the Truckee River	220 LF	30-inch	30-inch	Phase 1-2
RR-4	TRI Renewal Program	Line/Replace	Address aging and deteriorating gravity sewer main through periodical R&R projects. Actual R&R projects and phasing to be determined, based on updated inspections.	Increases estimated service life	Varies	Varies	Varies	Phase 2 through 5
Other Improvements								
O-1	Visible Reinforcement Study	n/a	Perform structural integrity analysis of TRI pipe segments with visible reinforcement defects.	Better understand the structural integrity of TRI segments with visible reinforcement defects. Use information to determine R&R projects in TRI Renewal Program.	n/a	n/a	n/a	Phase 1 and 2

Notes:
(1) Abbreviations: LF = linear feet.

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 2:
COLLECTION SYSTEM MASTER PLAN
CHAPTER 7:
CAPITAL IMPROVEMENT PLAN

FINAL | February 2022

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Chapter 7

CAPITAL IMPROVEMENT PLAN

7.1 Introduction

This chapter presents the Tahoe-Truckee Sanitation Agency (T-TSA/Agency) capital improvement program (CIP) for the Truckee River Interceptor (TRI). This chapter includes a summary of the capital costs and a basic assessment of the possible financial impacts on T-TSA. This chapter is organized to assist the T-TSA in making financial decisions. The CIP is based on the TRI Recommendations as described in Volume 2, Chapter 6 - TRI Recommendations. It should be noted that although this CIP covers the entire 25-year planning period, it is highly recommended that the CIP be updated every 5 to 10 years to ensure that it remains current and relevant to the Agency.

7.2 Capital Improvement Projects

The capacity upgrades and other system capital improvements set the foundation of the T-TSA's TRI CIP. The cost estimates presented in this study are opinions developed from bid tabulations, cost curves, information obtained from previous studies, and Carollo Engineers, Inc. (Carollo) experience on other projects. The costs are based on current (November 2021) dollars (Engineering News Record (ENR) value of 14,421) and do not include any escalation.

7.3 Cost Estimating Accuracy

The cost estimates presented in the CIP have been prepared for general master planning purposes and for guidance in project evaluation and implementation. All project costs shown in this CIP are in November 2021 dollars; future costs will need to be adjusted for inflation. Final costs of a project will depend on actual labor and materials costs, competitive market conditions, final project scope, implementation schedule, and other variable factors such as preliminary alignment generation, investigation of alternative routings, and detailed utility and topography surveys.

The Association for the Advancement of Cost Engineering (AACE) defines an Order of Magnitude Estimate, deemed appropriate for master plan studies as an approximate estimate made without detailed engineering data. It is normally expected that an estimate of this type would be accurate within plus 50 percent to minus 30 percent. This section presents the assumptions used in developing order of magnitude cost estimates for recommended facilities.

7.4 Construction Unit Costs

The construction costs are representative of sewer collection system facilities under normal construction conditions and schedules. Costs have been estimated for public works construction.

All gravity sewer main replacement unit costs presented in this section include pipeline costs, excavation, and other appurtenances (e.g., manholes (MH), etc.). Given the size, location, and layout of the TRI, bypass pumping is assumed to be needed for all TRI pipeline projects. According to T-TSA, bypass pumping is a large cost for any project. As such, the gravity sewer unit costs also include bypass pumping. The unit costs are for "typical" field conditions with construction in stable soil at a depth ranging between 10 feet to 15 feet. For some projects, site conditions were unknown, such as in the case of river crossings. Therefore, for river crossing projects, a higher unit cost was used to account for this special condition.

Sewer pipeline improvements range in size from 18 inches to 42 inches in diameter. Unit costs for the construction of pipelines and associated appurtenances are shown in Table 7.1. These costs are based off similar projects completed by Carollo and have also been compared with recent T-TSA TRI project costs. The construction cost estimates are based upon these unit costs.

Table 7.1 Gravity Sewer Unit Costs

Diameter (inches)	Replacement Unit Cost ($/LF)	Line Unit Cost ($/LF)	River Crossing Unit Cost(1) ($/LF)
18	$440	$430	$620
24	$620	$580	$830
27	$690	$650	$930
30	$760	$720	$1,030
33	$860	$790	$1,130
36	$960	$860	$1,230
42	$1,160	$1,000	$1,430

Notes:
(1) River Crossing Unit costs are based on pipe lining (rehabilitation) methods.
Abbreviations: LF = linear feet.

7.5 Project Costs and Contingencies

Project cost estimates are calculated based on elements such as the project location, size, length, and other factors. Allowances for project contingencies consistent with an "Order of Magnitude" estimate are also included in the project costs prepared as part of this study, as outlined in this section.

7.5.1 Total Direct Cost

The Total Direct Cost is the unit cost times the quantity, and includes the cost of materials, labor, and equipment for a given element of work.

7.5.2 Baseline Construction Cost

The Baseline Construction Cost is the Total Direct Cost plus an estimating contingency that reflects the level of detail and development of the estimate. Contingency costs must be reviewed on a case-by-case basis because they can vary considerably with each project. Consequently, it is appropriate to allow for uncertainties associated with the preliminary layout of a project. Factors such as unexpected construction conditions, the need for unforeseen mechanical items, and variations in final quantities are a few of the items that can increase project costs for which it is wise to make allowances in the preliminary estimates. Since knowledge about site-specific conditions of each proposed project is limited at the master planning stage, a 30 percent contingency was applied to the Total Direct Cost to account for unknown site conditions such as unforeseen conditions, environmental mitigations, and other factors, which is typical for master planning projects.

7.5.3 Total Construction Cost

The Total Construction Cost consists of a sum of the Baseline Construction Cost and Indirect Costs. Indirect Costs include all costs that are not readily seen in the end product, but are costs included in the contractors' bids. Examples of Indirect Costs include overhead, profit, risk, taxes, and inflation.

For these planning level estimates, a 25 percent contingency was used to account for the general contractor's general conditions, overhead, and profit. In addition, the local 8.25 percent sales tax was applied to 50 percent of the Baseline Construction Cost to cover sales tax on materials and equipment.

7.5.4 Capital Improvement Cost

Other project construction contingency costs include costs associated with project engineering, construction phase professional services, and project administration. Engineering services associated with new facilities include preliminary investigation and reports, right-of-way (ROW) acquisition, foundation explorations, preparation of drawings and specifications during construction, surveying and staking, sampling and testing of materials, and start-up services. Construction phase professional services cover items such as construction management, engineering services during construction, materials testing, and inspection during construction. Finally, there are project administration costs, which cover items such as legal fees, environmental/California Environmental Quality Act (CEQA) compliance requirements, permitting compliance, financing expenses, administrative costs, and interest during construction. The cost of these items can vary, but for the purpose of this study, it is assumed that these costs will equal approximately 25 percent of the Total Construction Cost. No land acquisition costs were assumed as part of the TRI CIP, as the alignment of the TRI is not proposed to change.

As shown in the following example calculation of the Capital Improvement Cost, the total cost of all project construction contingencies (construction, engineering services, construction management, and project administration) is 210 percent of the Total Direct Cost. Calculation of the 210 percent is the overall mark-up on the Total Direct Cost to arrive at the Capital Improvement Cost. It is not an additional contingency.

Example:

Total Direct Cost	**$1,000,000**
Construction Contingency (30%)	$300,000
Baseline Construction Cost	**$1,300,000**
Contractor Cost (25%)	$325,000
50% Sales Tax (8.25%)	$54,000
Total Construction Cost	**$1,679,000**
Engineering (10%)	$168,000
Construction Management (5%)	$84,000
Legal & Permitting (10%)	$168,000
Capital Improvement Cost	**$2,099,000**

7.6 CIP

A summary of the capital project costs for the TRI is presented in Table 7.2. The table identifies the projects, provides a brief description of each project, identifies facility sizes (e.g., pipe diameter and length), provides capital improvement costs, and shows the probable phase in which the projects would be implemented. The columns used in this table refer to the following:

- *Project ID:* Assigned number that corresponds to the 25-Year TRI CIP Table. This is an alphanumeric number that starts with one letter indicating the type of improvement (C = Capacity, RR = Rehabilitation and Replacement, O = Other) and continues with a number.
- *Project Name:* Provides a descriptive name for each project.
- *Type of Improvement:* Describes the type of improvement (modification, replacement, or lining) for an existing facility.
- *Proposed Quantity:* Estimated length or number of units for the proposed improvement, if applicable. It should be noted that the length estimates do not account for re-routing the alignment to avoid unknown conditions.
- *Existing Size:* This is the size of the existing pipeline/facility. It represents the diameter of the existing pipeline(s) (in inches).
- *Proposed Size:* This is the size of the proposed improvement. It represents the diameter of the existing pipeline(s) (in inches).
- *Direct Unit Cost:* This is the estimated direct cost per unit of pipeline.
- *Total Project Cost:* This is the estimated total CIP project cost.
- *Phase:* This is which phase of the 25-year CIP the project is proposed to be implemented in. Projects proposed to be implemented in Phase 1 (2022-26) are shown in more detail, specifically showing which year is proposed for implementation.

The implementation timeframe was based on the priority of each project to correct existing deficiencies or to address future capacity needs. Implementation timeframes were also based on feedback from T-TSA staff, who noted that TRI projects have historically taken 3 years to implement, from permitting and design, to completion.

Table 7.2 25-Year TRI CIP

Project ID	Project Name	Type of Improvement	Proposed Quantity (LF)	Existing Size (inches)	Proposed Size (inches)	Direct Unit Cost ($/LF)	Total Project Cost	Phase 1					Phase 2 2027-31	Phase 3 2032-36	Phase 4 2037-41	Phase 5 2042-46
								2022	2023	2024	2025	2026				
Capacity Improvements																
C-1	Gravity Main between MH 57 and MH 62	Replace	4,290	24/27	30	$760	$7,180,000	$0	$0	$0	$0	$0	$0	$7,180,000	$0	$0
C-2	Gravity Main between MH 71 and MH 72	Replace	990	24	30	$760	$1,660,000	$0	$0	$0	$0	$0	$0	$0	$1,660,000	$0
Condition Assessment Improvements																
RR-1	River Crossing, Gravity Main between MH 33 and MH 35	Line	1,380	24	24	$830	$2,520,000	$252,000	$454,000	$1,814,000	$0	$0	$0	$0	$0	$0
RR-2	River Crossing, Gravity Main between MH 65 and MH 66	Line	220	30	30	$1,030	$500,000	$0	$0	$0	$50,000	$90,000	$360,000	$0	$0	$0
RR-3	River Crossing, Gravity Main between MH 88 and MH 89	Line	220	30	30	$1,030	$500,000	$0	$0	$0	$50,000	$90,000	$360,000	$0	$0	$0
RR-4	TRI Renewal Program	Line/Replace	Varies	Varies	Varies	Varies	$16,350,000	$0	$0	$0	$0	$0	$4,087,500	$4,087,500	$4,087,500	$4,087,500
Other Improvements																
O-1	Visible Reinforcement Study	--	--	--	--	--	$170,000	$105,000	$0	$0	$0	$0	$65,000	$0	$0	$0
Total CIP Cost						--	$28,875,000	$357,000	$454,000	$1,814,000	$100,000	$180,000	$4,872,500	$11,267,500	$5,747,500	$4,087,500
Estimated CIP Annual Cost						--	$1,155,000	$357,000	$454,000	$1,814,000	$100,000	$180,000	$974,500	$2,254,000	$1,150,000	$818,000

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7.7 25-Year CIP

The proposed capital improvements are prioritized based on their urgency to mitigate existing deficiencies and other factors. The capital improvements were phased into one of the following phases:

- Phase 1: Years 2022 through 2026. This phase includes projects that are targeted as the highest priority improvements.
- Phase 2: Years 2027 through 2031. This phase generally includes medium high priority improvements.
- Phase 3: Years 2032 through 2036. This phase generally includes medium priority improvements.
- Phase 4: Years 2037 through 2041. This phase generally includes medium low priority improvements.
- Phase 5: Years 2042 through 2046. This phase includes lower priority improvements that are based on industry anticipated life assumptions for infrastructure.

Each project is itemized by phase in Table 7.2. Per conversations with the Agency, a 3-year timeframe for TRI pipeline projects has been included in the CIP, to account for permitting and access complexities. It should be noted that the CIP phasing included in the 25-year CIP, and summarized in Table 7.2, is based on the project prioritization factors described in Volume 2, Chapter 6 - TRI Recommendations, and represents the preferred implementation schedule for the proposed improvements. Funding availability may limit the T-TSA's ability to implement the proposed projects according to the implementation schedule included in Table 7.2.

The 25-year TRI CIP is summarized by phase and project type in Table 7.3. As shown in Table 7.3 and graphically in Figure 7.2, out of the total $28.9 million in capital projects, $2.9 million are targeted for implementation in Phase 1, and an additional $21.9 million are targeted for Phases 2 through 4. The remaining $4.1 million of capital improvements has been included in Phase 5.

Table 7.3 and Figure 7.1 show the distribution of capital costs by project type. As shown in Figure 7.1, gravity main condition assessment projects account for the largest portion of the capital improvement project costs at 69 percent. Capacity projects account for roughly 31 percent of the total TRI CIP cost.

Table 7.3 25-Year TRI CIP Summary(1)

Improvement Type	Total CIP Cost	Phase 1 (2022-2026)	Phase 2 (2027-2031)	Phase 3 (2032-2036)	Phase 4 (2037-2041)	Phase 5 (2042-2046)
Capacity	$8.83	$0	$0	$7.18	$1.66	$0
Condition Assessment	$19.87	$2.80	$4.81	$4.09	$4.09	$4.09
Other	$0.17	$0.11	$0.07	$0	$0	$0
Total CIP	**$28.88**	**$2.91**	**$4.87**	**$11.27**	**$5.75**	**$4.09**

Notes:
(1) Costs shown are in millions of dollars.

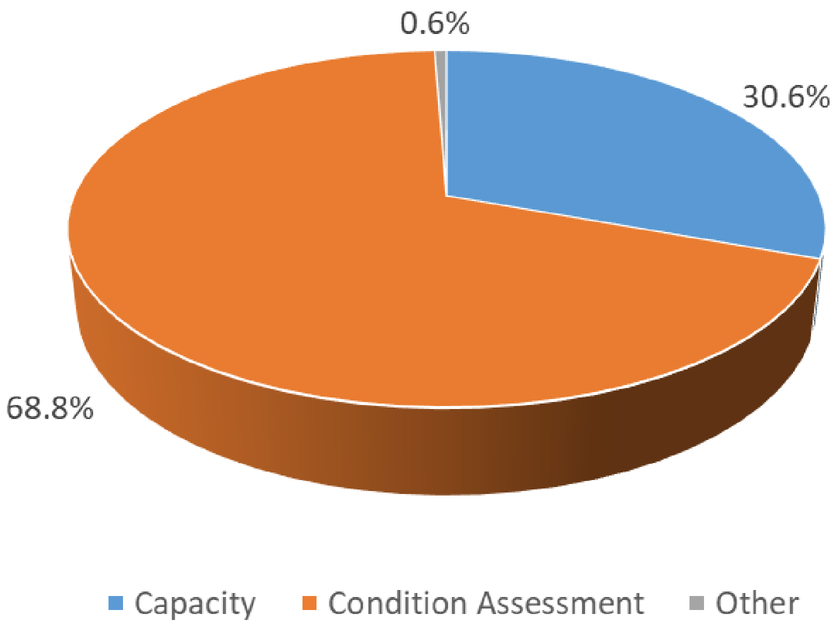

Figure 7.1 25-Year TRI CIP by Project Type

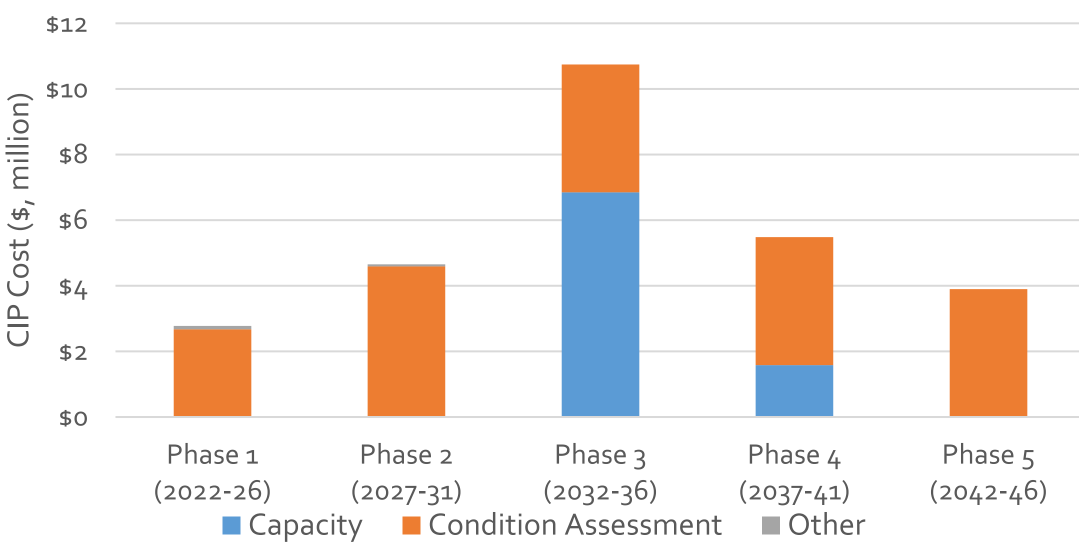

Figure 7.2 25-Year TRI CIP by Project Phase

Appendix 7A

DETAILED TRI CIP COST ESTIMATES

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25-Year TRI CIP

ID	Description	Type	Quantity	Existing Size	Proposed Size	Direct Unit Cost ($/LF)	Total Project Cost (Nov 2021) ($)	Phase 1 ($)					Phase 2 ($)					Phase 3 ($)	Phase 4 ($)	Phase 5 ($)
								2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032-36	2037-41	2042-46
Capacity Improvements			(ft)	(in)	(in)		$8,830,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$7,180,000	$1,660,000	$0
C-1	Gravity Main between MH 57 and MH 62	Replace	4,290	24/27	30	$760	$7,180,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$7,180,000	$0	$0
C-2	Gravity Main between MH 71 and MH 72	Replace	990	24	30	$760	$1,660,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,660,000	$0
Condition Assessment Improvements			(ft)	(in)	(in)		$19,870,000	$252,000	$454,000	$1,814,000	$100,000	$180,000	$720,000	$1,021,875	$1,021,875	$1,021,875	$1,021,875	$4,087,500	$4,087,500	$4,087,500
RR-1	River Crossing, Gravity Main between MH 33 and MH 35	Line	1,380	24	24	$830	$2,520,000	$252,000	$454,000	$1,814,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
RR-2	River Crossing, Gravity Main between MH 65 and MH 66	Line	220	30	30	$1,030	$500,000	$0	$0	$0	$50,000	$90,000	$360,000	$0	$0	$0	$0	$0	$0	$0
RR-3	River Crossing, Gravity Main between MH 88 and MH 89	Line	220	30	30	$1,030	$500,000	$0	$0	$0	$50,000	$90,000	$360,000	$0	$0	$0	$0	$0	$0	$0
RR-4	TRI Renewal Program	Line/Replace	Varies	Varies	Varies	Varies	$16,350,000	$0	$0	$0	$0	$0	$0	$1,021,875	$1,021,875	$1,021,875	$1,021,875	$4,087,500	$4,087,500	$4,087,500
Other Improvements							$170,000	$105,000	$0	$0	$0	$0	$65,000	$0	$0	$0	$0	$0	$0	$0
O-1	Visible Reinforcement Study	--	--	--	--	--	$170,000	$105,000	$0	$0	$0	$0	$65,000	$0	$0	$0	$0	$0	$0	$0
Total CIP Cost							$28,875,000	$357,000	$454,000	$1,814,000	$100,000	$180,000	$785,000	$1,021,875	$1,021,875	$1,021,875	$1,021,875	$11,267,500	$5,747,500	$4,087,500
Estimated CIP Annual Cost							$1,155,000	$357,000	$454,000	$1,814,000	$100,000	$180,000	$785,000	$1,021,875	$1,021,875	$1,021,875	$1,021,875	$2,254,000	$1,150,000	$818,000

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Master Sewer Plan

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Contents

Appendices

Tables

Figures

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Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
%	percent
%TS	percent total solids
2W	"two water" utility water
AA	annual average
AACE	Association for the Advancement of Cost Engineering
AAF	annual average flow
AAL	annual average loads
AB	Assembly Bill
AB 32	Global Warming Solutions Act
AC	alternating current
ADC	alternative daily cover
ADMM	average daily maximum month
ADMMF	average daily maximum month flow
ADMML	average daily maximum month load
ADWF	average dry weather flow
ADWL	average dry weather load
Agency	Tahoe-Truckee Sanitation Agency
AGR	Agricultural Water Supply
AHF	active harmonic filters
APLR	Annual Pollutant Loading Rate
ARRP	ammonia removal and recovery process
ASCWD	Alpine Springs County Water District
ATCM	Airborn Toxic Control Measure
AWT	advanced wastewater treatment
BFE	biological filtration effluent
BNR	biological nitrogen removal
BOD	biochemical oxygen demand
BOD_5	5-day biochemical oxygen demand
Btu	British thermal units
C&CT	Conventional and Chemical Treatment
CAA	Clean Air Act
CA-DWR	California Department of Water Resources
CalRecycle	California Department of Resources Recycling and Recovery
CAPCOA	California Air Pollution Control Officers Association

CAPs	criteria air pollutants
CARB	California Air Resources Board
CASA	California Association of Sanitation Agencies
Carollo	Carollo Engineers, Inc.
CCL	Ceiling Concentration Limit
CCR	California Code of Regulations
CDFA	California Department of Food and Agriculture
CEC	Contaminants of Emerging concern
CEQA	California Environmental Quality Act
cf	cubic feet
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CFU	colony form unit
cfs	cubic feet per second
CFD	computational fluid dynamics
CH_4	methane
CI	Compression-Ignition
CIP	capital improvement program
CIPP	cured-in-place pipe
clino	clinoptilolite
CMU	concrete masonry unit
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
COD	chemical oxygen demand
COLD	Cold Freshwater Habitat
COMM	Commercial and Sport Fishing
CPLR	Cumulative Pollutant Loading Rate
CT	contact time
CTR	California Toxics Rule
CWA	Clean Water Act
CWEA	California Water Environment Association
d	day
d/wk	days per week
DC	direct current
DDW	Division of Drinking Water
DEP	Department of Environmental Protection
DI	deionized
DO	dissolved oxygen

DS	dry solids
DWF	dry weather flow
DWQ	Division of Water Quality
EDC	endocrine-disrupting chemicals
EPA	Environmental Protection Agency
EQ	Exceptional Quality
EPWWF	equalized peak wet weather flow
ERB	emergency retention basin
ERCs	Emission Reduction Credits
$FeCl_3$	ferric chloride
ffCOD	flocculated/filtered chemical oxygen demand
fps	feet per second
FRP	fiberglass reinforced plastic
FRSH	Freshwater Replenishments
ft	feet
g/bhp-hr	gram per brake horsepower-hour
GHG	greenhouse gas
gpd	gallons per day
gpd/sq ft	gallons per day per square foot
gph	gallons per hour
gpm	gallons per minute
GWR	Groundwater Recharge
HAc	acetic acid
HC	hydrocarbon
hr	hour
h/d	hours per day
HOF	high occupancy flow
hp	horsepower
HPOAS	high-purity oxygen activated sludge
HRT	hydraulic residence time
H_2S	hydrogen sulfide
HW	hot water
I&E	instrumentation and electrical
I/I	inflow and infiltration
IND	Industrial Service Supply
IT	information technology
kgal/d	thousand gallons per day
klb/d	thousand pounds per day

kW	kilowatt
kWh	kilowatt-hour
lb/h	pounds per hour
lb/d/sq ft	pounds per day per square foot
lb/cfd	pounds per cubic foot per day
LEL	lower explosive limit
LOX	liquid oxygen
LRWQCB	Lahontan Regional Water Quality Control Board
m^3	cubic meter(s)
MCC	motor control center
MEC	maximum effluent concentration
MW	maximum week
MG	million gallons
mgd	million gallons per day
mg/L	milligrams per liter
mgP/L	milligrams of phosphorus per liter
MIGR	Migration of Aquatic Organisms
ML	mixed liquor
mL	milliliter
mL/g	milliliters per gram
MMBtu	million British thermal units
MPN	most probable number
MPPS	multipurpose pump station
MPN	most probable number
mt	metric ton
MUN	Municipal and Domestic Water Supply
MW	maximum week
N	nitrogen
NCSD	Northstar Community Service District
NFPA	National Fire Protection Association
NGVD 29	National Geodetic Vertical Datum 1929
NH_3-N	un-ionized ammonia
N_2O	nitrous oxide
NO_3-N	nitrate nitrogen
NO_2-N	nitrite nitrogen
N_2O	nitrous oxide
NDEP	Nevada Division of Environmental Protection
NDMA	N-Nitrosodimethylamine

NH_{3}-N	ammonia nitrogen
NMHC+NOx	non-methane hydrocarbon plus nitrogen oxides
NO_{3}-N	nitrate nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	nonpoint source pollution
NSAQMD	Northern Sierra Air Quality Management District
NSPS	Standards of Performance for Stationary Compression-Ignition Internal Combustion Engines
NTR	National Toxics Rule
NTU	nephelometric turbidity unit
NTPUD	North Tahoe Public Utility District
O&M	operations and maintenance
OP	organophosphorus
OSHA	Occupational Safety and Health Administration
OVPSD	Olympic Valley Public Service District
P	phosphorus
PBDE	polybrominated diphenyl ethers
PCL	Pollutant Concentration Limit
PFAS	perfluoralkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFRP	processes to further reduce pathogens
PIS	Plant Information System
PLC	programmable logic controller
PM	particulate matter
POPs	persistent organic pollutants
Porter-Cologne	Porter-Cologne Water Quality Act
POW	Hydropower Generation
ppb	parts per billion
PPCP	pharmaceutical and personal care products
ppd	pounds per day
ppm	parts per million
PSA	pressure swing adsorption
PSRP	processes that significantly reduct pathogens
psi	pounds per square inch
PVC	polyvinyl chloride
PWWF	peak wet weather flow
Q	flow

RARE	Rare, Threatened, or Endangered Species
RAS	return activated sludge
ROW	right of way
SAT	soil aquifer treatment
SCADA	supervisory control and data acquisition
scfm	standard cubic feet per minute
scf/lb	standard cubic feet per pound
SLR	solids loading rate
SOR	surface overflow rate
sq ft	square foot (feet)
SRT	solids retention time
SU	stripper underflow
SVI	sludge volume index
T-TSA	Tahoe-Truckee Sanitation Agency
TCPUD	Tahoe City Public Utility District
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TM	technical memorandum
TN	total nitrogen
TP	total phosphorus
TPAD	temperature phased anaerobic digestion
TRI	Truckee River Interceptor
TS	total solids
TSD	Truckee Sanitary District
TSS	total suspended solids
TTHMs	total trihalomethanes
TWAS	thickened waste activated sludge
UPWWF	unequalized peak wet weather flow
UV	ultraviolet
VFA	volatile fatty acids
VFD	variable frequency drive
VS	volatile solids
VSR	volatile solids reduction
VSLR	volatile solids loading rate
VSS	volatile suspended solids
WAS	waste activated sludge
WASSTRIP	waste activated sludge stripping to remove internal phosphorus
WC	water column

WDR	waste discharge requirement
WEF	Water Environment Federation
WRP	Water Reclamation Plant
WY	water year
WY2018	water year 2018
wk	week
yd^3	cubic yards
yr	year

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 3:
WATER RECLAMATION PLANT MASTER PLAN
CHAPTER 1:
DESCRIPTION OF EXISTING FACILITIES

FINAL | February 2022

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Chapter 1

DESCRIPTION OF EXISTING FACILITIES

This chapter provides an overview of Tahoe-Truckee Sanitation Agency's (T-TSA's) Water Reclamation Plant (WRP), and a detailed description of the facilities.

The WRP provides advanced treatment of all wastewater flows collected within the T-TSA service area. The WRP is capable of treating a maximum 7-day average flow during the summer months of 9.6 million gallons per day (mgd) and has a peak instantaneous flow capacity of 15.4 mgd (based on permit limit). An in-depth assessment of current WRP performance and capacity is described in Volume 3, Chapter 4 - WRP Performance and Capacity Assessment. Wastewater treatment consists of screening, grit removal, primary clarification, high-purity oxygen activated sludge (HPOAS) treatment, phosphorus stripping, chemical phosphorus removal, recarbonation, biological nitrogen removal (BNR), granular media filtration, disinfection, and odor control. The final effluent from the WRP is discharged to disposal fields, via sub-surface flow. The effluent water eventually makes its way to the Truckee River and Martis Creek watersheds, which are monitored.

Biological solids operations consist of gravity thickening, anaerobic digestion, centrifuge dewatering, and a plate-and-frame filter press for backup dewatering. Chemical solids operations consist of gravity thickening, centrifuge dewatering, and a plate-and-frame filter press for excess chemical sludge and backup organic sludge dewatering. Dewatered organic sludge is transported by truck to either Lockwood Regional Landfill (owned by Waste Management) in Sparks, Nevada where it is disposed of, or to Bently Ranch in Minden, Nevada, where it is composted. Dewatered chemical sludge as well as grit and rags are also transported by truck to Lockwood Regional Landfill for disposal. All solids are hauled by a contractor.

Figure 1.1 is a site plan of the existing WRP, which shows these processes and illustrates how the plant has expanded over the decades. The original plant was constructed in 1975 with major process capacity expansions in 1981, 1988, 1990, 1995, and 2003.

The treatment facilities and processes are described in detail below, and Figure 1.2 depicts the WRP treatment process flow diagram. Specific design criteria for the treatment facilities is included in Appendix 1A - Existing Facilities Design Data.

1.1 Preliminary Treatment and Influent Facilities

Preliminary treatment is used to store and equalize excess flows, and to remove large debris, rags, and grit prior to primary treatment. T-TSA's preliminary treatment and influent facilities include:

- Emergency Retention Basin
- Offsite Emergency Storage
- Headworks
- Grit Removal

1.1.1 Emergency Retention Basin

During wet weather periods when influent flows exceed the treatment capabilities of the plant, or in the event of a process failure, excess flow can be bypassed for emergency storage in an onsite emergency retention basin (ERB). The ERB receives gravity flows from the emergency bypass line. Operations may divert flow to this emergency bypass line in a variety of locations: 1) at the plant diversion structure, 2) downstream of the Parshall flume, 3) upstream of the oxygenation basins, 4) upstream of the rapid mix basins, 5) at the secondary effluent distribution box, 6) from the BNR influent channel, and/or 7) upstream of the filters. Figure 1.2 shows the emergency bypass flows as part of the WRP treatment process flow diagram.

The sloping bottom of the ERB as well as the first 9.5 feet (ft) of the basin is lined with impermeable bentonite clay, and the upper 1.2 ft of the basin is unlined. In the event of emergency flow diversion to the ERB, it is filled to a maximum of 7.8 million gallons (MG). However, the ERB has a total capacity of 15.4 MG to the top of the clay liner, and a capacity of 18 MG to the bottom of the spillway, should that be needed in an emergency scenario.

When the plant can accommodate additional flow, utility pumps in the multipurpose pump station return the stored wastewater to the WRP headworks for treatment. The ERB bypass structure houses gates and piping that are used to divert flows to and from the ERB.

1.1.2 Offsite Emergency Storage

During wet weather periods when influent flows exceed 15.4 mgd, excess flow is diverted prior to treatment at the WRP. Initially, the onsite ERB is utilized for excess flows, but when the ERB capacity is exceeded, flows are diverted prior to entering the WRP for emergency storage in up to eight offsite ponds (Ponds "A", 2, 3, 4, 5, "B", "D-1," and "D-2"). These ponds are located on the south bank of the Truckee River west of the existing subsurface disposal fields for the WRP. Figure 1.3 shows the location of the emergency storage ponds.

All of the ponds are considered to be independent storage basins, although ponds "A", 2, 3, 4, 5, and "B" may have originally been interconnected, and ponds "D-1" and "D-2" were originally interconnected. Ponds "A", 3, and "B" are lined with bentonite, while the other ponds are unlined. All ponds are constructed with sloped berms.

In the event of flow diversion, the onsite ERB would be utilized first, and then Ponds "B", "A", and 3, in that order. Next, Ponds "D-1" and "D-2" would be utilized, as they are further away from the Truckee River. Flows from Pond B can be diverted to the D ponds via the Pond D Pump Station located at the southeast corner of Pond B. This pump station includes two vertical turbine pumps which pump into an 8-inch force main that goes uphill to the D ponds. Ponds are filled with a safe margin of freeboard, typically about 75 percent of total capacity.

The usable combined storage capacity of Ponds "A", 3, "B", "D-1", and "D-2" is approximately 24 MG. Additional storage capacity is potentially available in Ponds 2, 4, and 5; however, T-TSA considers the use of these ponds as a "last resort," given that they are unlined and in close proximity to the Truckee River. Some mechanical equipment is installed for Ponds "A" and "B" (e.g., metering facilities, drain sumps, transfer pumps), but the other ponds have no permanent mechanical equipment installed, due to their infrequent use.

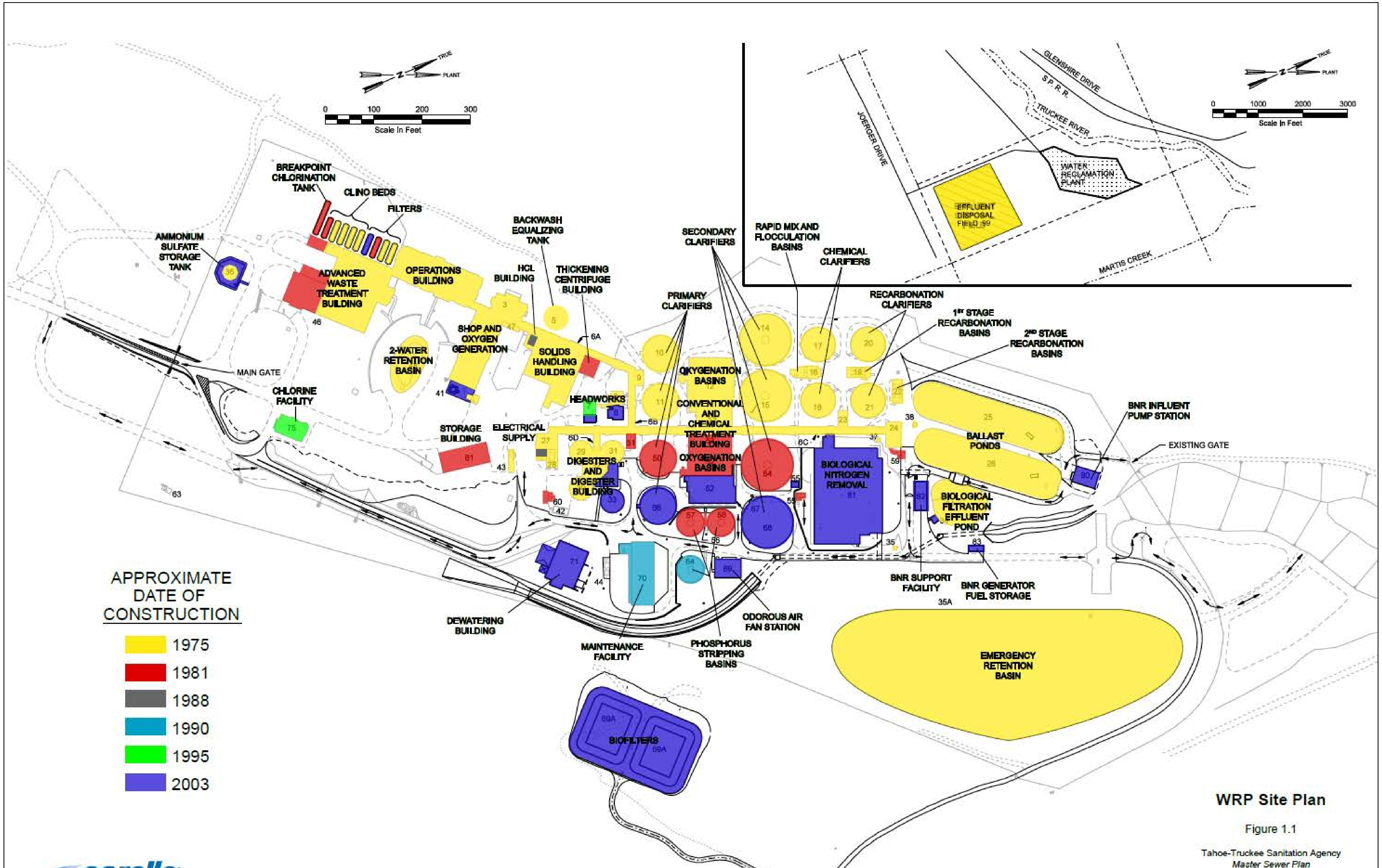

Figure 1.1 WRP Site Plan

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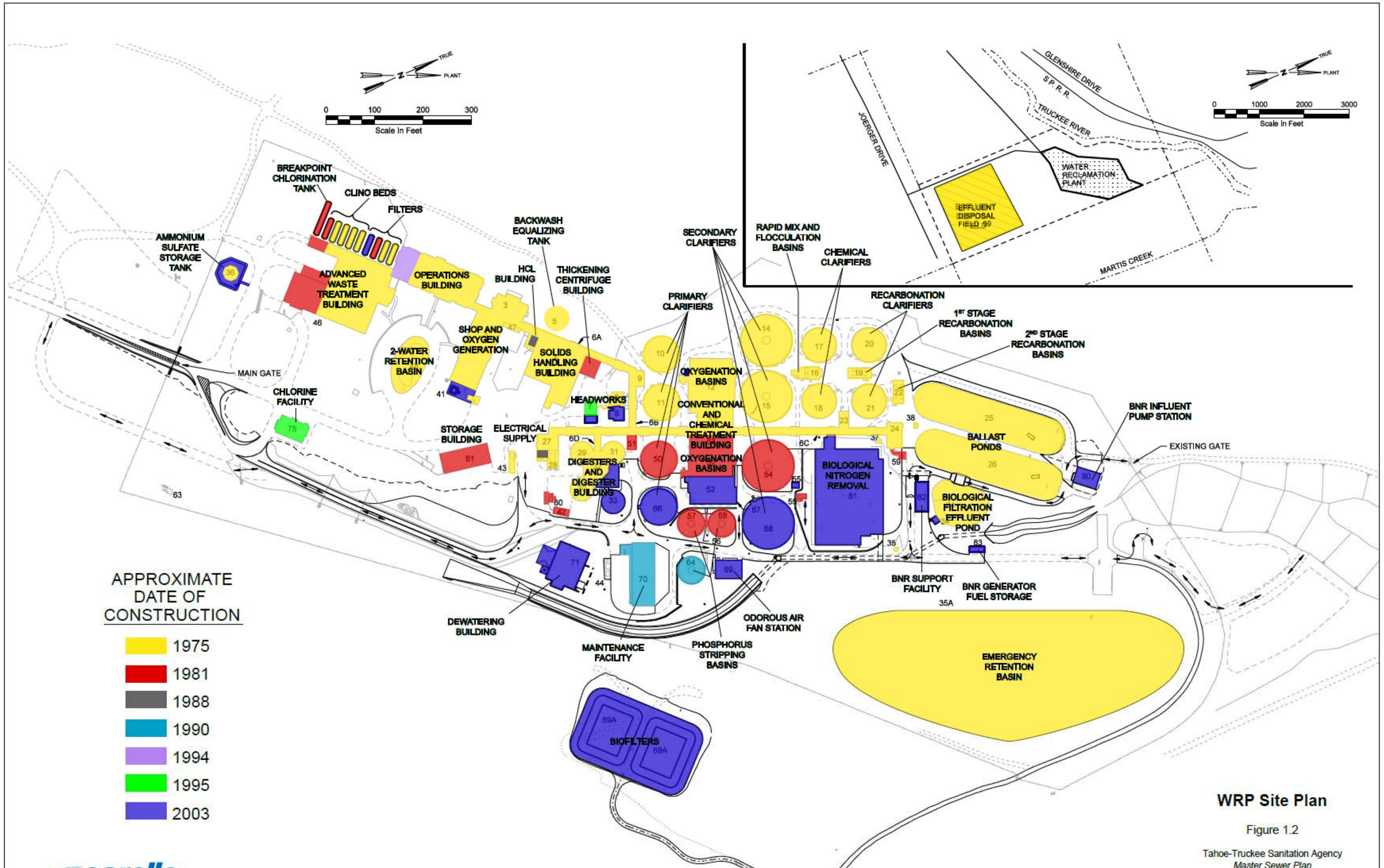

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Figure 1.2 WRP Process Flow Diagram

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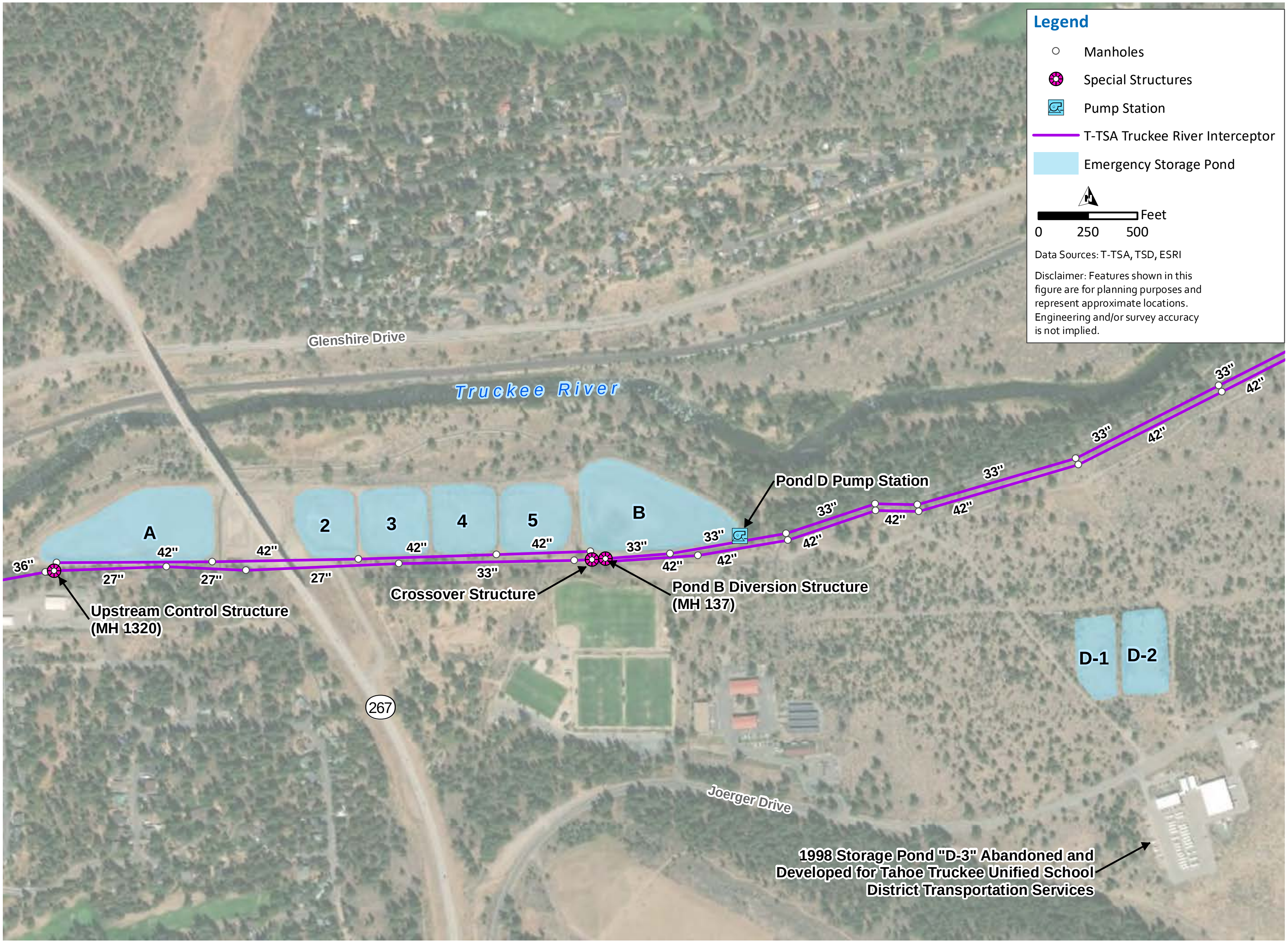
Legend
Manholes
Special Structures
Pump Station
T-TSA Truckee River Interceptor
Emergency Storage Pond
Feet
0 250 500
Data Sources: T-TSA, TSD, ESRI
Disclaimer: Features shown in this figure are for planning purposes and represent approximate locations. Engineering and/or survey accuracy is not implied.
Glenshire Drive
Truckee River
A
2
3
4
5
B
D-1
D-2
Pond D Pump Station
Crossover Structure
Pond B Diversion Structure (MH 137)
Upstream Control Structure (MH 1320)
267
Joerger Drive
1998 Storage Pond "D-3" Abandoned and Developed for Tahoe Truckee Unified School District Transportation Services
36"
42"
27"
33"

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When incoming flows drop below 15.4 mgd, wastewater stored in Pond B is returned to the Truckee River Interceptor (TRI) using a submersible pump located in a wet well at the southwest corner of Pond B. For all other ponds, stored wastewater is returned to the TRI using a portable engine-driven pump and lay-flat hosing. Wastewater then flows to the WRP via the TRI.

Given the current piping configuration at the WRP, influent flows from the east (i.e., Glenshire neighborhood) cannot be diverted to these ponds, but may be diverted to the ERB located at the WRP as described above. A flow diversion structure schematic is provided in Figure 1.6 of Volume 2, Chapter 1 - Description of Existing Facilities for further reference.

1.1.3 Headworks

Raw wastewater collected from the T-TSA service area enters the WRP via the TRI at the headworks structure. At the headworks structure, the wastewater influent passes through two mechanically cleaned bar screens that remove floating trash, rags, sticks, leaves, and other debris. Screenings are compacted and washed with a spiral screw type washer compactor. There is also a bypass channel with a manual bar screen that is used if the mechanical screens are overloaded or out of service. The mechanical screens, washer compactors, and grit classifier equipment are all located within Headworks Building 7.

During weekends and other periods of high loading, ferric chloride is added to the raw wastewater upstream of the headworks to improve downstream primary treatment performance and decrease secondary treatment phosphorus and/or chemical oxygen demand (COD) loads.

Downstream of the bar screens, the screened influent passes through a Parshall flume, which measures all influent to the WRP. Plant process return streams are pumped to the headworks downstream of the Parshall flume where they combine with the screened wastewater prior to grit removal.

1.1.4 Grit Removal

Downstream of the Parshall flume, the screened influent is split between two detritor-type grit chambers. As the wastewater enters, its velocity is slowed and gravity causes sand, grit, gravel, and other non-organic heavy particles to settle and be pumped to the grit classifiers. Polymer can be added to the wastewater as it leaves the grit chambers to support advanced primary treatment, but this feature is rarely used. Grit disposal consists of a dual cyclone separation process and a grit classifier, after which the washed inorganic grit is discharged to a hopper for disposal. The grit is transported by truck to Lockwood Regional Landfill.

Following grit removal, the wastewater flows by gravity to the primary treatment facilities.

1.2 Primary Treatment Facilities

Primary treatment removes scum and settleable organic and inorganic solids from the screened influent downstream of the grit removal facility. Primary treatment is split into two sides, each with two primary clarifiers, two primary sludge pumps, and two scum pumps.

Primary treatment facilities include:

- Primary Clarifier Splitter Channels
- Primary Clarifiers
- Primary Sludge Pump Stations

1.2.1 Primary Clarifier Splitter Channels

The primary clarifier splitter channels distribute the gravity flow from the grit removal facility to the four primary clarifiers.

1.2.2 Primary Clarifiers

The primary clarifiers are circular center-feed, peripheral-withdrawal type clarifiers, which are covered due to the climate conditions at T-TSA.

Suspended solids gradually settle to the bottom of the clarifiers as primary sludge. Clarifier rake arms collect settled sludge within the primary clarifiers, which is pumped by the primary sludge pump station. Skimmer arms collect floatable scum in the primary clarifiers, which flows by gravity to scum pits, and is removed by pumps located in the primary sludge pump stations.

Fermentation occurs in the primary clarifier sludge blanket, resulting in pH as low as 5.5, which provides some volatile fatty acids (VFAs) that are needed for elutriation in the PhoStrip® process.

The primary effluent flows over effluent weirs by gravity to the biological treatment processes and is split between the phosphorus stripping basins (~8 percent) and the oxygenation basins (~92 percent).

1.2.3 Primary Sludge Pump Stations

Each clarifier has its own dedicated sludge pump and scum pump. In total, the two primary sludge pump stations contain four sludge pumps and four scum pumps. However, pump suction headers are manifolded so that primary scum pumps can act as backup for primary sludge pumps.

Primary sludge can be pumped to either the gravity thickener or directly to the anaerobic digesters. The scum is normally pumped directly to the anaerobic digesters.

1.3 Secondary Treatment Facilities

Secondary treatment is provided using a HPOAS process. The activated sludge process removes most of the remaining biochemical oxygen demand (BOD) that passes through primary treatment. Heterotrophic bacteria in the oxygenation basins oxidize organics (i.e., remove BOD) using dissolved oxygen (DO), and form flocculated sludge, referred to as "mixed liquor."

The mixed liquor suspended solids are settled in the secondary clarifiers. A portion of the settled solids from the secondary clarifiers, referred to as return activated sludge (RAS), is returned to the oxygenation basins. A fraction of the RAS flow is also conveyed to the phosphorus stripping process. The remaining settled solids that are not returned to either the oxygenation basins or sent to the phosphorus stripping process are removed from the system and are referred to as waste activated sludge (WAS). WAS is sent to the solids handling process for treatment and disposal. Typically, WAS is wasted from the mixed liquor effluent channel. However, the WRP also has the option to waste a portion of the RAS from the secondary clarifiers. In either case, the RAS/WAS pumping rates are used to control sludge age in the activated sludge system.

Secondary Treatment facilities include:

- Oxygenation Basins
- Secondary Clarifiers
- Secondary Effluent Distribution Box
- RAS and WAS Pumping Systems

1.3.1 Oxygenation Basins

There is a total of eight oxygenation basins consisting of two separate structures, Side 1 and Side 2. Oxygenation Basins 1 thru 4 are part of Side 1, and Basins 5 thru 8 are part of Side 2. Primary effluent is mixed with RAS and some plant return flows in two mixing chambers – one upstream of the Side 1, and one upstream of the Side 2 oxygenation basins. The flow then passes over weirs and enters the flow distribution channel where it passes through submerged gates to the first stage of the oxygenation basins in service. Flows to the two sides of the oxygenation basins are controlled at the primary clarifier splitter channels. The actual flow split between the pairs of oxygenation basins on either particular side is controlled by fixed overflow weirs at the inlet of the basins. The oxygenation basin effluent weirs balance flows between the two trains in a pair. The oxygenation basins provide biological treatment by maintaining a population of microorganisms (mixed liquor) that break down or consume soluble, colloidal, and particulate organic matter present in the primary effluent. Each oxygenation basin consists of three separate covered stages in series separated by baffle walls.

The oxygenation basins also receive sludge from the phosphorus stripping basins. Due to the cycle of anaerobic conditions in the phosphorus stripping basins and aerobic conditions in the oxygenation basins, microbes in the phosphorus stripping basins release phosphorus, and when they are returned to the oxygenation basins, they uptake five times as much phosphorus as normal.

The oxygenation basins are supplied with high purity oxygen via a liquid oxygen (LOX) system, which includes two storage tanks and a water bath vaporizer. An atmospheric vaporizer is also in place but is not used. In the event the LOX system is out of service or cannot meet the demand, oxygen is provided from a backup onsite pressure swing adsorption (PSA) generator system which separates nitrogen and other impurities from the air to produce a relatively high purity oxygen onsite.

DO is monitored by DO probes in the first stage of the oxygenation basins. DO control is through the Supervisory Control and Data Acquisition (SCADA) system, based on readings from the DO probes, which have associated setpoints. The gaseous oxygen feed valves are modulated to maintain the pure oxygen airflow rate necessary to meet the target DO concentration.

Each oxygenation stage is equipped with a surface-mounted mixer for entraining oxygen into the wastewater and keeping the basin completely mixed and solids in suspension. The liquid (mixed liquor) flows through submerged orifices in the baffle wall to the second stage, and then through submerged orifices in the baffle wall to the third stage. Gas flows through openings at the top of the baffle walls. One end of the third stage headspace is vented to the atmosphere at a controlled rate.

Mixed liquor flows from the third stage of the oxygenation basins to the secondary clarifiers for settling. To ensure continued treatment and an active population of microorganisms in the oxygenation basins, some of the settled mixed liquor is returned to the aeration basins as RAS.

1.3.2 Secondary Clarifiers

Mixed liquor flows from the oxygenation basins into a channel that distributes the flow to the secondary clarifiers via a central influent feed column in each clarifier. The four secondary clarifiers are circular center-feed, peripheral-withdrawal type clarifiers, which settle and remove the mixed liquor solids using a sludge collector mechanism with rake arms and multiple suction pipes for settled sludge withdrawal (commonly known as an "organ pipe"-style sludge collector mechanism). Scum or floatables are collected by rotating surface scum skimmer arms affixed to the sludge collector mechanism and deposited into a scum trough (Side 2 only). The deposited scum is pumped to the organic sludge gravity thickener.

Suspended solids gradually settle to the bottom of the clarifiers as secondary sludge, and each rotating sludge collector arm has multiple scrapers that direct the settled sludge to a series of draft tubes mounted around the center column. Settled sludge is then educted through these tubes to the return sludge collection box. Orifices within the return sludge collection box provide an outlet for the RAS to flow into the RAS suction line, which is located within the influent column. The siphoned RAS then flows by gravity through the RAS suction line to the RAS pumps.

1.3.3 Secondary Effluent Distribution Box

The clarified liquid portion of the effluent flows over effluent v-notch weirs to the secondary effluent distribution box. A portion of the secondary effluent (from Side 1 of the secondary treatment train) may be conveyed to chemical treatment before passing onto downstream processes. If needed, secondary effluent from Side 2 can also be conveyed to chemical treatment, which would require the installation of stop logs and repositioning of valves.

1.3.4 RAS and WAS Pumping Systems

Some of the solids (activated sludge) settled in the secondary clarifiers are continuously returned to the oxygenation basins. The RAS pumps pull settled solids from each of the secondary clarifiers. RAS pumps convey the sludge to the oxygenation basins and the phosphorus stripping basins. The pumps are variable speed and return sludge at a rate equal to a preset percentage of the plant influent flow.

The WAS pumps convey excess solids generated in the secondary treatment process to the sludge thickening facilities. Solids retention time (SRT) can be controlled either by mixed liquor or settled sludge wasting; currently mixed liquor wasting controls SRT. The WAS pumps are constant speed and operate based on a preset percent of the time.

1.4 Phosphorus Removal

The purpose of the phosphorus removal process is to generate a concentrated phosphorus-rich sidestream that is directed to chemical treatment for phosphorus removal. This reduces the amount of flow that must pass through chemical treatment and thereby reduces the overall cost of phosphorus removal. A small portion of the clarified primary effluent, aka elutrient, facilitates the phosphorus stripping process. Phosphorus removal is provided using the PhoStrip® process.

A hydrated lime slurry is added to the rapid mix basin to raise the pH and precipitate the phosphorus as hydroxyapatite [$Ca_{10}(OH)_2(PO_4)_6$]. The pH is lowered in the first stage recarbonation basins to first precipitate residual dissolved Ca^{2+} as $CaCO_3$, which settles out in the recarbonation clarifiers. Although the chief purpose of the lime treatment process is to remove phosphorus, it is also used to add alkalinity to downstream processes (i.e., BNR) and may be used, albeit rarely, to reduce suspended solids that are carried over from the secondary clarifiers.

The main purpose of the recarbonation system is to inject carbon dioxide (CO_2) gas into the wastewater to lower the high pH resulting from lime treatment. Furthermore, the two-stage system with intermediate settling in the recarbonation clarifiers provides for maximum removal of calcium carbonate, reducing both calcium and total dissolved solids (TDS) in the treated wastewater. The intermediate settling step also provides an additional minor reduction of phosphorus and reduces the total carbon dioxide demand.

Phosphorus removal facilities include:

- Phosphorus Stripping Basins
- Rapid Mix Basins
- Flocculation Basins
- Chemical Clarifiers
- First Stage Recarbonation Basins
- Recarbonation Clarifiers
- Second Stage Recarbonation Basins
- Chemical Sludge Pump Station

The chemical treatment trains consist of pairs of rapid mix basins, flocculation basins, chemical clarifiers, first stage recarbonation basins, recarbonation clarifiers, and second stage recarbonation basins. Typically, only one train is operated at a time, with the exception of the second stage recarbonation basins, in which both trains are in operation regardless of whether only one train of the first stage recarbonation basins and recarbonation clarifiers is in use.

Clarified effluent from the phosphorus removal process flows by gravity to the ballast ponds, where it is combined with clarified effluent from the secondary clarifiers. Chemical sludge removed during this process is pumped by the chemical sludge pump station.

1.4.1 Phosphorus Stripping Basins

The WRP has three phosphorus stripping basins. Elutrient (clarified primary effluent) is pumped to the in-service phosphorus stripping basin(s). A portion of the RAS from the secondary clarifiers is diverted to the phosphorus stripping basins, based on sludge blanket depth and detention time. Anaerobic conditions in the phosphorus stripping basins cause the microbes to release phosphorus. A portion of the microbe-containing sludge from the phosphorus stripping basins is returned to the oxygenation basins, where the microbes in the oxygenation basins then uptake five times as much phosphorus as normal.

The phosphorous-rich overflow from the stripping basins flows by gravity to the rapid mix basins.

1.4.2 Rapid Mix Basins

Supernatant from the phosphorus stripping basins, which can also be combined with a portion of clarified secondary effluent, passes through one of the two rapid mix basins. Hydrated lime slurry is added at the inlet of the rapid mix basins to increase the alkalinity and raise the pH to ~11.2. Each of the rapid mix basins contains a mechanical mixer which rapidly disperses the lime slurry throughout the supernatant. Calcium added to the rapid mix basins precipitates the phosphorus as hydroxyapatite [$Ca_{10}(OH)_2(PO_4)_6$] in both the rapid mix basins and the chemical clarifiers.

1.4.3 Flocculation Basins

The high pH wastewater from the rapid mix basins then flows into one of the two parallel flocculation basins where the water is slowly mixed in each chamber through a tapered flocculation process. The purpose of the flocculation basins is to gently mix and agglomerate the coagulated precipitates into large floc particles for better settling in the chemical clarifiers. Each flocculation basin is equipped with two vertical paddle mixers. Polymer can be added at either the influent or effluent end of both basins.

After the flocculation basins, the floc-containing water flows by gravity to the chemical clarifiers.

1.4.4 Chemical Clarifiers

Two chemical clarifiers provide settling of the flocculated precipitates from the flocculation basins, as well as the associated phosphorus. Supernatant from the chemical clarifiers flows by gravity to the first stage recarbonation basins. Chemical solids that settle to the bottom of the clarifiers are scraped to a sludge sump by the clarifier scraper mechanism. The chemical sludge is removed from this sump by pumps in the chemical sludge pump station.

1.4.5 First Stage Recarbonation Basins

Two first stage recarbonation basins receive the overflow from the chemical clarifiers through slide gates at the inlet distribution box. In these basins, pH is controlled using CO_2 from stack gas. When stack gas is insufficient, bulk CO_2 is used. The CO_2 is entrained into the process water through coarse bubble diffusers. The pH is adjusted downward to ~9.5 before the chemically treated water flows by gravity to the recarbonation clarifiers.

1.4.6 Recarbonation Clarifiers

Water from the first stage recarbonation basins flows to the two recarbonation clarifiers. Here calcium carbonate ($CaCO_3$) settles out. Clarifier overflow is conveyed by gravity to the second stage recarbonation basins.

1.4.7 Second Stage Recarbonation Basins

Two second stage recarbonation basins receive the water from the recarbonation clarifiers. In the second stage recarbonation basins, pH is controlled using CO_2 as described above for the first stage recarbonation basins. The pH is lowered even further (to approximately 7 or 8) if needed to optimize control of the downstream BNR process before flowing to the ballast ponds.

1.4.8 Chemical Sludge Pump Station

The chemical sludge pump station contains six pumps - three that pump chemical sludge, and three that pump recarbonation sludge. The sludge pumps are utilized to pump chemical sludges that have precipitated in the chemical and recarbonation clarifiers. Normally, a single pump draws from the sludge sump of each clarifier. The pumps can operate either continuously or on a timed cycle. Chemical sludge is then pumped to the chemical sludge gravity thickeners.

1.5 Flow Equalization

Flow equalization at the WRP is utilized to average diurnal flow variations received at the WRP and to allow a reasonably constant flow rate to downstream processes via the BNR influent pump station and the multipurpose pump station. Secondary effluent and effluent from the phosphorus removal process are blended in a ballast pond upstream of the BNR process. BNR effluent is sent to the biological filtration effluent pond, and then to a ballast pond (typically) upstream of the filtration process.

Flow equalization includes:

- Ballast Ponds
- BNR Influent Pump Station
- Biological Filtration Effluent Pond
- Multipurpose Pump Station

Effluent from the BNR process is pumped via the multipurpose pump station to the filtration process. During high flow periods, a portion of the flows can be bypassed around the BNR process and sent directly to the filtration process.

1.5.1 Ballast Ponds

One of two concrete-lined ballast ponds receive secondary effluent and effluent from the phosphorus removal process. The ballast pond distribution box diverts flows to the appropriate ballast pond, as determined by the position of the ballast pond influent sluice gates. The other ballast pond is used to store BNR effluent before it is pumped to the filtration process. The total combined storage capacity of both ballast ponds is 2.4 MG.

1.5.2 BNR Influent Pump Station

The BNR influent pump station contains three pumps, typically with two of the pumps acting as a backup. The BNR influent pump station pumps the combined secondary and phosphorus removal effluent from a ballast pond to the BNR process, specifically to the influent channel of the nitrification filters.

1.5.3 Biological Filtration Effluent Pond

A concrete-lined biological filtration effluent pond receives effluent from the BNR process. The biological filtration effluent distribution box can send flow to the biological filtration effluent pond or divert flow to the multipurpose pump station (to facilitate cleaning of the pond). In typical operations, the biological filtration effluent pond fills up and flows over a spillway to Ballast Pond 26 for storage of BNR effluent. (In the original facility, the biological filtration effluent pond was used as the chemical sludge holding basin, but during the 2003 WRP expansion, it was converted to store biological filtration effluent.)

1.5.4 Multipurpose Pump Station

The multipurpose pump station contains the following pumping systems:

- Filter supply pumps supply BNR effluent to the filtration process and consist of five pumps. The two higher capacity pumps are equipped with variable speed drives and the three smaller pumps have constant speed drives. These pumps typically convey BNR effluent from Ballast Pond 26, but also have the ability to pull directly from the biological filtration effluent pond.

- Utility pumps return flow from the ballast ponds or the ERB to the headworks for retreatment. The utility pumps also serve as dewatering/drain pumps as they can dewater basins throughout the plant by pumping the basin contents to the headworks downstream of the influent Parshall flume.
- Plant waste pumps return flow from the plant waste wet well to the headworks, either upstream or downstream (typically) of the influent Parshall flume.
- A dewatering pump dedicated to the biological filtration effluent pond can dewater this pond by pumping its contents to the headworks downstream of the influent Parshall flume.

1.6 Biological Nitrogen Removal (BNR)

Nitrogen removal is provided via a BNR process, which removes nitrogen from the combined secondary and phosphorus removal effluent via nitrifying and denitrifying bacteria.

BNR treatment facilities include:

- Nitrification
- Denitrification

BNR is achieved by the Biostyr® process, which involves a biological reactor with up-flow filtration through submerged buoyant media made of polystyrene beads. The media provides a large surface area for attachment of biofilm. The biofilm achieves biological treatment of soluble contaminants and behaves as a filter for suspended solids removal. The Biostyr® facility at T-TSA is a total nitrogen removal system, consisting of eight nitrification filters and four denitrification filters.

The influent wastewater is first pumped to a common feed channel above the Biostyr® cells where it flows down to the individual cells by gravity. Upon entering the Biostyr® cells, the wastewater flows upward through the filter media. Since the polystyrene beads are buoyant, filtration takes place in a direction that compacts the media rather than expanding it, thus enhancing the capture of the suspended material. Biological treatments are mediated by the active biomass attached on the media surface. The reactors include a precast concrete slab with multiple filter nozzles to retain the buoyant polystyrene media.

Due to the total suspended solids (TSS) retention and the biological growth, both the nitrification and denitrification filters build up hydraulic resistance and require periodic backwashing. The backwash is accomplished by down-flow flushing using the treated water stored in the effluent channel and air scouring using air supplied by the air grids. The backwash phases are fully automated and are triggered either when pre-set time limits have expired (i.e., triggering normal backwashes) or when the head loss across the filter exceeds a pre-set limit (i.e., triggering mini backwashes). Backwashes can be scheduled to take place during certain periods of the day. The spent backwash water generated from backwash of both nitrification and denitrification cells is collected and stored in a common waste backwash storage tank. The equalized spent backwash water is then pumped back to the headworks downstream of the influent Parshall flume at a constant flow rate.

Air grids located below the filter beds provide the oxygen needed for the biological activities during filtration (nitrification reactors only), scouring air during backwash, and intermittent air injections to nitrification cells in idle mode to keep biomass alive.

1.6.1 Nitrification

Water from the ballast ponds (combined secondary effluent and phosphorus removal effluent) is pumped to the nitrification filters' influent channel via the BNR influent pump station.

In the submerged nitrification filters, a process air grid is located below the filter media, so the entire filter bed is aerated. As the wastewater flows through the filter, nitrification occurs, thereby removing ammonia from the wastewater by converting it to nitrate.

The number of cells in filtration can be controlled using the constant load method based on both filtration velocity and ammonia volumetric load. The cells that are not in filtration are defined as being in idle mode. The idle cells are regularly rotated with the cells in filtration. Rotating cells help to maintain a larger population of active biomass available to the cells in filtration when feeding the filters at high loading rates.

For the nitrification filters, process air during filtration, scouring air during backwash, and maintenance air during idle periods are all provided by a dedicated air grid and blower to each cell. Constant airflow is provided intermittently during backwashes for air scouring and during idle phases to keep biomass alive. The process airflow rate during filtration is controlled using a dual-loop cascade algorithm based on the influent ammonia loading and/or DO measurements.

Effluent from nitrification flows by gravity to the denitrification influent channel.

1.6.2 Denitrification

For the submerged denitrification cells, methanol is injected into the influent stream (i.e., the nitrification effluent) to provide a carbon source for the denitrification process, which removes nitrate from the water by converting it to nitrogen gas. The methanol dosage is controlled based on influent nitrate and DO loads and is trimmed based on the effluent nitrate concentrations.

The number of cells in filtration for the denitrification filters is also controlled using the constant load method based on both filtration volumetric loading rate and nitrate loads. The idle cells are also regularly rotated with the cells in filtration. Instead of intermittent aeration used in the nitrification cells, the denitrification idle cells are periodically fed with the nitrification effluent to keep denitrifiers alive.

The effluent from denitrification flows by gravity to the biological filtration effluent distribution box and pond. From there, the pond typically fills up and flows over a spillway into Ballast Pond 26 and is then pumped to the filtration process by the multipurpose pump station.

1.7 Filtration

After water has passed through the BNR process, it is pumped to the filtration system. The filtration system is used to provide additional removal of TSS and to increase the effectiveness of chlorine disinfection.

The filtration system includes:

- Filters
- Backwash Water Disposal System

The effluent from the filters then flows through the effluent pipeline to the disposal fields.

1.7.1 Filters

The filter supply pumps feed four down-flow closed pressure-vessel filters, operated in parallel. The filters are the dual media type which provide fine-to-coarse filtration in the direction of flow. The filter media is made up of anthracite coal and silica sand, supported by a pea gravel underdrain. Each filter is approximately 10 ft in diameter by 40 ft long. Typically, two filters are in service, although during high flow periods, all four filters may be in operation.

Alum can be fed to the filter influent to aid in filtration efficiency, although it has not been needed or utilized for many years. Chlorine may also be injected to control biological growth in the filters.

1.7.2 Backwash Water Disposal System

When the head loss increases due to an accumulation of suspended solids in the filter media, the filters are backwashed with filtered effluent water. In addition to the backwashing action achieved by reversing the flow through the filter, added cleaning is achieved by the use of rotary hydraulic surface wash devices.

When a filter is returned to service after a backwash cycle, the filter effluent turbidity can be higher than desired. Therefore, following backwash, the filter is operated in the rinse-to-waste cycle for a specified duration of time.

The backwash equalization tank is used to store filter backwash and filter rinse waters. Normally, water is returned from the tank slowly and uniformly to the headworks in order to prevent a hydraulic surge in the WRP. Other locations where this water may be discharged are to the ERB or the first stage recarbonation basin.

Numerous indicators and controls are provided in SCADA to aid in filter operation. The filter backwash cycles are automated and sequenced by a preset program. Although the sequence must be initiated manually by the operator, an alarm will be sent to SCADA for high head loss conditions.

1.8 Ion Exchange

The WRP has an ion exchange process for ammonia removal, which was part of the original facility process train. However, the ion exchange process became obsolete once the BNR process was placed into service and has not been used since 2006. The ion exchange process consists of five clinoptilolite (clino) beds, a regenerant system for the clino bed media, and an ammonia removal and recovery process (ARRP) located within the advanced waste treatment (AWT) building.

The ion exchange process includes:

- Clino Beds (not currently in use)
- Regenerant Basins (not currently in use)
- Regenerant Clarifiers (not currently in use)
- ARRP Towers (not currently in use)
- Filtrate Stripping System (used as needed)

1.8.1 Clino Beds

Five clino beds are located outdoors in steel vessels and were designed to operate in parallel in two basic cycles: 1) a service cycle to capture the ammonium ions on the beds, and 2) a regeneration cycle that elutriates the captured ammonium ions from the beds to a regenerant solution.

Clino bed regeneration was designed to remove the ammonium ions from the exchange sites on the clinoptilolite media. Using periodic regeneration, the clino beds were able to effectively and continuously remove ammonia nitrogen from the wastewater. The ammonium ions were removed and recovered from the spent regenerant during the ARRP, which allowed the regenerant solution to be reused.

1.8.2 Ammonia Removal and Recovery Process (ARRP)

The original ARRP was designed to strip ammonia from the ion exchange clino regenerant and recover the ammonia as NH_4SO_4 to be used as a nitrogen fertilizer. A filtrate stripping system was later added to remove ammonia in the filtrate generated through the plate-and-frame filter press dewatering of the combined organic and chemical sludge. The filtrate ammonia was treated similar to the ammonia in the clino regenerant stream.

Filtrate/centrate stripping has not been used since 2006, but if needed, could be used again if the plate-and-frame filter press were used for organic sludge dewatering. Centrate stripping (from Dewatering Building 71) has not been used since approximately 2014 but remains available for future use if needed. The entire ARRP is not presently in operation, as discussed above.

1.8.2.1 Regenerant Basins

Four regenerant basins, consisting of large subsurface concrete basins underneath the AWT building structure, are also part of the ARRP.

1.8.2.2 Regenerant Clarifiers

Two regenerant clarifiers, along with two regenerant supply pumps, are also part of the ARRP. The clarifiers are located within the AWT building and consist of steel tanks with sludge collector mechanisms.

1.8.2.3 Ammonia Removal and Recovery Process (ARRP) Towers

The original ARRP included six towers and was subsequently expanded to ten towers; five stripper towers contain random packed media up to 9 ft in height, and five absorber towers contain random packed media up to 3 ft in height. Two stripper pumps and two absorber pumps are also included in the ARRP tower system.

1.8.2.4 Filtrate Stripping System

The filtrate stripping system was designed to remove ammonia from the filtrate produced from the plate-and-frame filter press dewatering process.

1.9 Disinfection Facilities

Prior to final discharge from the WRP, treated effluent from the filters is disinfected with chlorine solution formed from gaseous chlorine. Chlorine may also be added to the wastewater at other locations in the treatment process: headworks for odor control, RAS and/or stripper sludge underflow to control filamentous growth, conventional and chemical treatment effluent to improve water quality in unusual situations, and finally to the multipurpose pump station and the filters to control biological growth.

Disinfection facilities include:

- Chlorine Facility
- Effluent Pipeline
- Breakpoint Chlorination Tank
- 2-Water System (2W)
- Disposal Fields

After disinfection, the final treated effluent is sent to the effluent disposal fields.

1.9.1 Chlorine Facility

The chlorine facility is housed in Building 75 where the 1-ton gaseous chlorine cylinders are delivered and stored. The building also contains the chlorinators, chlorine gas scrubber system, and associated alarm system.

Chlorine gas is metered by four chlorinators. A primary chlorinator supplies chlorine solution for plant effluent disinfection, and a secondary chlorinator can supply chlorine to the other application points as required. Of the remaining two chlorinators, one is a backup to the two main chlorinators, and one is used to chlorinate filter influent and for sludge bulking control. The chlorinators draw from four gaseous chlorine cylinders, which are manifolded together in pairs and utilize a Powell valve closure system for added safety.

1.9.2 Effluent Pipeline

Effluent from the filters flows to the effluent pipeline, where chlorine is injected. Filter effluent travels approximately 1,900 ft through the 30-inch diameter steel pipeline to the effluent disposal fields.

Chlorine residual is measured by a continuous analyzer, which takes a sample from the plant effluent pipeline approximately 30 seconds after the point of chlorine injection. Flows from the effluent pipeline are measured via a flow meter. A portion of the disinfected effluent is recycled for use as chlorinated utility water (2W) within the plant.

1.9.3 Breakpoint Chlorination Tank

Breakpoint chlorination was included in the original treatment facilities to assist the ion exchange ammonia removal system by giving operators the ability to remove additional ammonia prior to disposal. (Chlorine is added at a ratio of approximately 10:1 to the ammonia nitrogen concentration.) The breakpoint chlorination tank is not presently in use.

1.9.4 2-Water System

Disinfected recycled water is used for the No. 2-water (2W), also referred to as utility water. The 2W system is critical to WRP operations, including supplying crucial cooling water, seal water for pumps, washdown water, spray water, freeze control, and landscape irrigation. The 2-Water retention basin located near the main entrance to the T-TSA Operations Building also provides a landscape element and a conversation starter for guests and visitors.

In unusual circumstances, T-TSA can also use an onsite well to supplement the 2W needs around the WRP. Piping and appurtenances associated with the onsite well are referred to as the

3W system. The onsite well was previously used to supply potable water to the WRP facilities; however potable water is now supplied by Truckee Donner Public Utility District.

1.9.5 Disposal Fields

As a final polishing step, the treated effluent, still under pressure, is disposed of via the soil aquifer treatment (SAT) system. The eight subsurface disposal fields are located about 1,500 ft south of the WRP. Typically, four of the eight fields are in service at any given time, and operation of the fields is rotated. The total flow is distributed approximately equally among the fields in service by the hydraulic design of the piping. Effluent is distributed to the individual disposal fields by perforated piping. Effluent to each of the eight fields is metered through magnetic flow meters located in vaults throughout the disposal fields with radio communication to SCADA. Cleanouts are also provided throughout the fields.

Until 2012, this system also provided some amount of nitrogen removal; however, due to unknown causes, nitrogen removal is no longer occurring to a significant degree within the SAT, and the subsurface flow through the fields is considered to be a final effluent polishing step.

Eventually, the treated effluent flows downgradient to the Truckee River and Martis Creek watersheds where it is returned to the environment, supporting downstream environmental flows, drinking water, and agricultural irrigation. Observation wells are located throughout the disposal site to monitor groundwater levels and groundwater quality.

1.10 Solids Handling

Solids are byproducts of the primary, secondary, and advanced treatment processes. The WRP produces both organic and chemical sludge. Organic sludge includes primary sludge, scum, and WAS. Primary sludge is the readily settleable solids captured in the primary clarifiers. Scum are the floatables skimmed from the primary and secondary treatment processes. Primary sludge and scum have undergone practically no decomposition and are highly unstable and putrescible. WAS is the excess sludge produced in the HPOAS process, which occurs in the oxygenation basins. It too is unstable and without further decomposition will become septic with offensive odors. Chemical sludge is a byproduct of lime addition for phosphorus removal and consists of precipitated calcium phosphate compounds and calcium carbonate.

WAS from the secondary treatment process is thickened with a gravity thickener and blended with raw primary sludge and scum in the digesters. Anaerobic digestion stabilizes the organic sludge, reduces the sludge volume, and produces digester gas. Digested organic sludge is then dewatered and trucked off site for disposal. Chemical sludge is thickened with gravity thickeners; a portion of the thickened chemical sludge is blended with digested organic sludge before centrifuge dewatering and the remainder is dewatered separately using a plate-and-frame filter press.

Solids handling facilities include:

- Organic Sludge (WAS) Thickening in Gravity Thickeners
- Organic Sludge (WAS or Thickened Waste Activated Sludge (TWAS)) Thickening in Centrifuges
- Chemical Sludge Thickening in Gravity Thickeners
- Organic Sludge Digestion
- Sludge Dewatering

1.10.1 Organic Sludge (WAS) Thickening in Gravity Thickeners

WAS produced in the oxygenation basins is pumped to the organic sludge gravity thickener for thickening prior to being fed to the digesters. Primary sludge can also be diverted to the organic sludge gravity thickener (via the organic sludge distribution box) for further concentrating if necessary before being pumped to the digesters, but this is not normally required, as primary sludge is generally adequately thickened in the primary clarifiers. The WRP has three gravity thickeners; one is typically used for WAS thickening and two are used for chemical sludge thickening, although T-TSA has the flexibility to use two for WAS and one for chemical sludge.

The purpose of organic sludge thickening is to improve the digester operation, providing for a more concentrated food source for the microorganisms, greater solids and hydraulic detention times in the digesters, greater solids breakdown (stabilization), and for less pumping time to the digesters. This allows the digesters to be operated with longer hydraulic detention times, which can produce a more stable digested sludge than would be experienced with the less concentrated WAS.

TWAS is pumped from the thickener to the organic sludge digestion process by two TWAS pumps. Supernatant that overflows from the thickener is recycled to the oxygenation basins. Scum is removed from the interior of the thickener by a skimmer arm, deposited in a scum box adjacent to the thickener, and then pumped to the digester using the TWAS pumps. Primary sludge is thickened in the primary clarifiers and pumped separately to the organic sludge digestion process. TWAS and primary sludge are blended, then combined with recirculated and heated sludge from the digesters.

1.10.2 Organic Sludge (WAS or TWAS) Thickening in Centrifuges

In the event that the organic sludge gravity thickener is out of service, or if additional thickening is required, the organic sludge (WAS) can also be thickened using one of two thickening centrifuges: an older Sharples unit from 1981 and a newer Centrysis unit from 2003. After 7 years of not operating the thickening centrifuges, T-TSA started operating the Centrysis centrifuge in January 2020 to further thicken TWAS from the gravity thickener and reduce the hydraulic loading to anaerobic digestion. T-TSA plans to continue operating the thickening centrifuge during peak flow periods every year. WAS is injected with polymer before passing through the thickening centrifuges. Thickened sludge is pumped from the thickening centrifuges to the digesters by the three cake pumps.

1.10.3 Chemical Sludge Thickening in Gravity Thickeners

Chemical sludge is thickened by gravity settling to remove excess liquid prior to dewatering. The chemical sludge gravity thickeners are located inside Solids Handling Building 4. As previously mentioned, there are three gravity thickeners at the WRP; one is typically used for WAS thickening and two are typically used for chemical sludge thickening, although T-TSA has the flexibility to use two for WAS and one for chemical sludge. The chemical sludge thickeners also provide storage of chemical sludges. Chemical sludge is produced at two points in the treatment process - the chemical clarifiers and the recarbonation clarifiers. These sludges are pumped to the chemical sludge distribution box and pumped to the two thickeners in series. Thickener No. 6 is currently used for thickening, and thickened sludge is pumped to Thickener No. 4. Thickened sludge is drawn from Thickener No. 4 by the filter press feed pumps for the plate-and-frame filter press. Thickened sludge is drawn from Thickener No. 6 by the chemical sludge transfer pump for the dewatering centrifuges. Thickener supernatant is routed to the rapid mix basins.

1.10.4 Organic Sludge Digestion

Organic sludge digestion stabilizes the sludge and reduces the sludge volume by converting a portion of the organic material to digester gas. Primary sludge, scum, and WAS are processed in the digesters.

A temperature-phased anaerobic digestion (TPAD) system is used for organic sludge digestion. The TPAD system is broken into three phases. The first phase consists of thermophilic digestion, the second phase operates in a range between mesophilic and thermophilic digestion, and the third phase uses a final holding digester. The first and second phase digesters can be shifted to operate at either thermophilic or mesophilic temperatures, although only one of the digesters (Digester 33) was designed to operate at thermophilic temperatures with the appropriate insulation and heating systems. All digesters are covered, but the holding digester (Digester 31) has a floating cover for digester gas storage. In the current TPAD configuration, sludge is fed to first phase Digester 33 and heated to 127 degrees Fahrenheit (°F), then pumped and split between second phase Digesters 29 and 30, where the second phase digester sludge has an average temperature of 110 °F to 111 °F. Finally, the sludge flows by gravity to holding Digester 31, where it has an average temperature of 102 °F.

Biosolids produced at the WRP are Class B biosolids.

1.10.4.1 First Phase Digester

Thickened organic sludge enters the first phase thermophilic digester (Digester 33) through the inlet pipe after blending with heated recirculated sludge. The organic sludge includes raw primary sludge, raw primary scum, and TWAS. The first phase digester treats sludge under thermophilic conditions at 127 °F. The first phase digester is insulated and has its own associated sludge recirculation system, heat exchanger, and hydraulic mixing system. The first phase digester has a fixed cover and a moisture separator to remove water from digester gas.

1.10.4.2 Second Phase Digesters

Sludge from the first phase digester is pumped and split between the two second phase digesters (Digesters 29 and 30). The second phase digesters treat sludge at an average temperature of 110 °F to 111 °F, in a range between mesophilic and thermophilic. The system is equipped for cooling sludge after the thermophilic phase. However, active cooling has resulted in struvite issues in the past, so sludge is currently not actively cooled. Each of the second phase digesters also has its own associated sludge recirculation system, heat exchanger, and hydraulic mixing system. The second phase digesters have fixed covers. The second phase digesters are not insulated, as they were not originally designed for thermophilic operations.

1.10.4.3 Holding Digester

Sludge flows by gravity (or may be pumped) from the second phase digesters to the holding digester (Digester 31), for storage prior to dewatering along with some additional solids digestion. The holding digester has an average temperature of 102 °F; it arrives at this value without active heating or cooling. The sludge is drawn off the bottom of the holding digester and pumped to the sludge dewatering facilities. The holding digester also includes its own associated sludge recirculation system, heat exchanger, and mixing system to keep the centrifuge feed sludge consistent in quality. The holding digester has a floating cover allowing for gas storage.

Digested sludge is pumped from the holding digester to centrifuges in the dewatering building or to the ready tank if using the plate-and-frame filter press as a backup dewatering option for organic sludge.

1.10.4.4 Digester Gas

Digesters 29, 30, and 33 are all equipped with foam-gas separators. The gas from these digesters is then combined with digester gas from the holding digester, Digester 31. Digester 33 is also equipped with a moisture separator to avoid water accumulation in digester gas piping. The digester gas cleaning system provides hydrogen sulfide (H_2S) removal using an iron sponge system; there is also some limited moisture removal, but no siloxane removal. The iron sponge system consists of two square tanks located on the roof of the digester building. Ferric chloride ($FeCl_3$) can also be added upstream of the digestion process or to the first phase thermophilic digester to assist with H_2S removal.

Digester gas is used to fire boilers, which requires the use of gas booster pumps to pressurize the gas upstream of the boilers. Excess digester gas, determined by the height of the floating cover on the holding digester, is burned off using the waste gas flare, typically on a seasonal basis (more gas is produced in the warmer months).

1.10.4.5 Sludge Heating Equipment

Sludge is heated and recirculated to the digesters to maintain the respective temperatures of each digester. Each digester has a dedicated sludge heating and recirculation system, including a heat exchanger, recirculation sludge pump, and other ancillary equipment. A hot water boiler is dedicated to Digester 33, and three additional steam boilers provide backup heating to Digester 33 and main heating for the other digesters as well as some buildings.

Digester sludge is withdrawn from the digester, passed through an external heat exchanger, and injected back into the digester. The heat exchanger warms the recirculated sludge to the appropriate temperature to maintain each digester at its optimum temperature. For Digester 33, recirculated heated sludge is mixed with raw feed sludge in the inlet pipe, and the mixture is discharged back to the center of the digester.

Hot water is supplied to the sludge heat exchangers by the hot water systems located in the digester building. Within the hot water systems, the hot water return is heated by steam from the plant boilers. This is accomplished with a shell-and-tube type heat exchanger with boiler steam in the shell and hot water return in the tubes. Each hot water system has a centrifugal re-circulation pump to re-circulate hot water.

The hot water boiler dedicated to Digester 33 runs on a mixture of natural gas, fuel oil, and digester gas, and has difficulty operating with digester gas as its sole fuel source or when the digester gas content exceeds 60 percent. The steam boilers for the second phase (Digester 29 and 30) and the holding (Digester 31) digesters are fueled by digester gas and fuel oil but cannot operate with natural gas as a fuel source. Steam from the steam boilers is also used to heat some of the original WRP buildings and utility corridors.

1.10.5 Sludge Dewatering

The purpose of sludge dewatering is to concentrate digested organic and chemical sludge so that the sludge can be more economically trucked for land disposal. Digested organic sludge and a portion of the thickened chemical sludge are dewatered in one of two dewatering centrifuges in the dewatering building. The remaining portion of the thickened chemical sludge is dewatered in a plate-and-frame filter press. In the event that the centrifuges are out of service, the digested organic sludge can also be dewatered using the plate-and-frame press.

1.10.5.1 Organic Sludge and Chemical Sludge Dewatering in Centrifuges

Digested organic sludge and a portion of the thickened chemical sludge are dewatered in one of two dewatering centrifuges. The digested organic sludge is pumped from the holding digester, and a portion (about 50 percent by weight) of the thickened chemical sludge is pumped from one of two chemical sludge gravity thickeners by the chemical sludge transfer pump. The digested organic sludge and thickened chemical sludge are combined at a ratio of approximately 1:1 by weight and are blended in the centrifuge feed tank. The combined sludge is sent to the dewatering centrifuges. The square sludge feed tank has a sloped bottom to the feed pumps and is equipped with a top-mounted impeller mixer to mix sludges and to keep solids in suspension.

One of two dewatering centrifuges receives the combined sludge, and an emulsion polymer is injected at the centrifuge feed along with the sludge. Dewatered sludge leaves the centrifuge via a screw conveyor, which transports the sludge to a cake hopper. Each centrifuge has a dedicated screw conveyor. Cake from the hopper is discharged into a truck for off-site disposal, with operator supervision. A load scale on the hopper is used to weigh the solids off-loaded to the trucks. Ventilation fans convey foul air from the dewatering building to the odorous air building.

The emulsion polymer system includes polymer totes, an emulsion/polymer blend unit, a polymer aging tank, a polymer feed tank, and polymer feed pumps. A hot water boiler, which uses natural gas, may be used for heating polymer dilution water to an optimal temperature for enhancing activation of the polymer.

A square centrate tank receives and stores centrate from the dewatering centrifuges. Centrate can be sent to various locations throughout the WRP using centrate pumps installed in the dewatering building, although it is typically returned to a centrate holding tank in the AWT building for equalization prior to metering it back to the headworks. In the event that BNR is overloaded or temporarily out of service, ammonia may be stripped from the centrate prior to recycling to headworks. Alternatively, centrate may be routed directly to the headworks downstream of the influent Parshall flume.

Cake from the dewatering building is hauled to Lockwood Regional Landfill where it is disposed, and/or to Bently Ranch, where it is composted. The remaining dewatered chemical sludge is transported to Lockwood Regional Landfill for disposal.

1.10.5.2 Chemical Sludge Dewatering in Plate-and-Frame Filter Press

The remaining portion of the thickened chemical sludge (about 50 percent) is dewatered in a plate-and-frame filter press, typically operated 1 or 2 times per week for periods of 2.5 to 3 hours. The plate-and-frame filter press system includes two filter feed pumps, the plate-and-frame filter press itself, a hydraulic press, a filtrate storage tank, a filtrate measuring weir, a control panel, and an acid storage and wash tank. The plate-and-frame filter press is a Shriver unit from 1974 consisting of thirty-two to forty-six 69-inch by 52-inch 1.25-inch-thick chambers, with a total volume of up to 119 ft^3. The number of chambers in operation can be varied by moving the head plate. This allows for the WRP operators to control the weight of sludge in the chemical sludge bin.

Thickened chemical sludge is pumped from both chemical sludge gravity thickeners by one of two filter feed pumps to the plate-and-frame filter press. The plate-and-frame filter press dewaters chemical sludge in a batch operation. After the plate-and-frame filter press dewaters the chemical sludge, the cake is dropped into a chemical sludge bin (requiring operator initiation and monitoring), where it is combined with grit and rags removed at the headworks, and then trucked offsite for disposal.

When dewatering chemical sludge using the filter press, filtrate is returned to the rapid mix basins. When processing digested organic sludge using the filter press, filtrate from the dewatering process flows into a filtrate tank and is then conveyed to the AWT building for ammonia stripping prior to recycling to the headworks.

Calcium carbonate buildup in the filter press is removed periodically by washing with dilute acid. Five percent hydrochloric acid from the acid storage tank is pumped through the filter press.

In the event that both centrifuges are out of service, the plate-and-frame filter press can be used for organic sludge dewatering. In this operational mode, the organic sludge ready tank would be used to hold the conditioned digested organic sludge before dewatering with the plate-and-frame filter press in a batch operation. (Although the organic sludge ready tank is currently out of service, it is available as a backup dewatering option if needed.) Ferric chloride and lime slurry would be added to the organic sludge ready tank and combined with the organic sludge, conditioning it for dewatering in the plate-and-frame filter press. Operators would then pre-coat the cloths of the plate-and-frame filter press with chemical sludge to minimize sticking of the organic sludge, and then the plate-and-frame filter press would be used to dewater the organic sludge. When organic sludge is dewatered in the filter press alone, the cake solids concentration is reduced from approximately 45 to 55 percent with chemical sludge to 25 percent without.

Dewatered sludges from the plate-and-frame filter press are hauled to Lockwood Regional Landfill.

1.11 Odorous Air Treatment

Odor control systems are used throughout the plant to control offensive odors generated in the processing of wastewater flows.

Odorous air treatment includes:

- Odorous Air Fan Station
- Biofilters

1.11.1 Odorous Air Fan Station

The odorous air fan station houses two odorous air fans, which draw air from the solids handling building, the digester building, the phosphorous stripping basins, and the dewatering building via fiberglass reinforced plastic piping throughout the WRP. From the odorous air fan station, the odorous air is sent to biofilters. A project is currently planned to connect the headworks facility to the odorous air system.

1.11.2 Biofilters

The odorous air is forced through two biofilter beds containing Bohn Biofilter soil media. The soil biofilter beds scrub the foul organic gases before they diffuse to the atmosphere. Humidification and irrigation systems are utilized to keep the biofilter beds damp and to keep the biofilms attached to the biofilter media alive. Leachate from the biofilter beds is collected and pumped back to the headworks for treatment in the WRP.

1.12 Support Systems

Plant facilities include several support systems comprising of potable water supply, fire suppression, sewer collection, storm water drainage collection, fuel systems, electrical distribution and standby power, chemical feed systems, and instrumentation and controls. Plant facilities also include buildings for administrative and operations staff, including an onsite laboratory, as well as maintenance and storage buildings for both WRP and TRI equipment as well as T-TSA vehicles.

Potable water and some fire suppression water is provided by Truckee Donner Public Utility District. Building 81 includes a foam fire suppression system, which uses 2W and a fire pump. Fire hydrants around the WRP are also connected to the 2W system. The potable water and fire suppression systems also include storage tanks, piping, and booster pumps. Sewer collection for facilities onsite (sinks, showers, toilets) includes piping that routes to the plant waste wet well (Building 37). From here, plant waste is pumped to the headworks to be treated with other incoming wastewater. Storm water is collected and infiltrated onsite to rock sumps, using a variety of piping, culverts, storm drain manholes, structures, and grading.

The fuel systems at the WRP include natural gas (supplied by Southwest Gas), fuel oil (a.k.a. diesel), and gasoline. Included with these systems are above grade fuel storage tanks, a gasoline pump station, a fuel oil storage tank dedicated to the organic sludge digestion process and the electrical supply building generator, a diesel fuel tank dedicated to the generator system in BNR, and associated piping and pumps.

The electrical distribution system includes electrical supply buildings, an electrical substation, and overhead and underground electrical distribution lines. In addition to the external power supply from the Truckee Donner Public Utility District, the WRP also has resources for emergency onsite power, which consist of two standby generators; a 1,500-kilowatt (kW) generator dedicated to BNR and other facilities at the far north end of the plant, and a 1,000-kW generator that provides emergency power to the remaining WRP. The generator for the majority of the WRP is cooled with plant water, while the generator in BNR is air-cooled. Some auxiliary telemetry sites receive power from Liberty Utilities, based on their location within the service area of the electrical energy providers.

The bulk chemical storage and feed systems include sodium hydroxide, ferric chloride, hydrated lime, hydrochloric acid, chlorine, alum, liquid oxygen, carbon dioxide, methanol, polymer, sulfuric acid, soda ash, ammonium sulfate (not currently in use), and salt (not currently in use).

The instrumentation and controls system consists of local programmable logic controllers (PLC) for most processes in the WRP, which are connected to a system-wide SCADA system. The TRI flow meters' telemetry sites generally communicate with the WRP's SCADA system via cellular service, but a couple of the sites, including the disposal field metering vaults, use radio communication. T-TSA's communication needs are provided by underground telephone lines (AT&T), cellular telephones (Verizon), and external overhead internet cable (AT&T).

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Appendix 1A

EXISTING FACILITIES DESIGN DATA

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Plant Capacity in Raw Sewage Loads (Design Year 2015)	**CRITERIA**	**UNITS**	**CRITERIA**	**UNITS**	**NOTES**
Flow					
Average Annual	8	mgd			
Maximum Month	8.3	mgd			
Maximum Week	9.6	mgd			Permit limit for June 21 to September 21, 7 day average
Peak Instantaneous	15.4	mgd			Permit limit, max instantaneous
BOD					
Average Annual	200	mg/L	13,300	ppd	
Maximum Month	250	mg/L	17,300	ppd	
Maximum Week	280	mg/L	22,400	ppd	
TSS					
Average Annual	170	mg/L	11,300	ppd	
Maximum Month	200	mg/L	13,800	ppd	
Maximum Week	230	mg/L	18,400	ppd	
Primary Treatment					
Screening					
Process Flows					Raw sewage flows
Maximum Week	9.7	mgd			
Peak Instantaneous	15.5	mgd			
Mechanically Cleaned Screens					2020 Project will replace screens.
Number	2	--			
Clear Opening Width	3/8	in.			
Capacity, each	12	mgd			
Manually Cleaned Screen					
Number	2	--			
Clear Opening Width	1 1/2	in.			
Capacity, each	17.3	mgd			
Screenings Compactor					
Type	Spiral Screw	--			
Number	2	--			
Capacity	2	yd^3/hr			
Influent Flow Measurement					
Type	Parshall Flume	--			Recycle flows introduced downstream of flume
Number	1	--			
Capacity	21.4	mgd			
Grit Removal					
Process Flows					
Maximum Week	12.0	mgd			
Peak Instantaneous	17.8	mgd			
Grit Chambers					
Type	Detritor	--			
Number	2	--			
Chamber capacity, each	9.3	mgd			
Chamber surface area, each	400	sq. ft.			
Flow-through velocity @ Peak Instantaneous	0.35	ft/sec			
Overflow Velocity					
Maximum Week	15,000	gpd/sq. ft.			
Peak Instantaneous	22,250	gpd/sq. ft.			
Minimum Particle Size Removed	0.15	mm	100	MESH	
Grit Pumps					
Type	Centrifugal, Recessed Impeller	--			
Number	4	--			
Capacity, each	200	gpm			
Horsepower, each	10	hp			
Grit Classifier					
Type	Dual Cyclone and Classifier	--			
Number	1	--			
Horsepower, each	0.5	hp			
Primary Clarification					
Process Flows					
Maximum Week	12.0	mgd			
Peak Instantaneous	17.8	mgd			
Primary Clarifiers					
Number	4	--			Typically running all 4 at a time to maximize COD removal.
Diameter	60	ft			
Sidewater Depth	10	ft			

Plant Capacity in Raw Sewage Loads (Design Year 2015)	CRITERIA	UNITS	CRITERIA	UNITS	NOTES
Clarifier Volume, each	229,000	gal			
Overflow Rate, each					
One Unit Out of Service					
Maximum Week	1,415	gpd/sq. ft.			
Peak Instantaneous	2,098	gpd/sq. ft.			
All Units in Service					
Maximum Week	1,061	gpd/sq. ft.			
Peak Instantaneous	1,574	gpd/sq. ft.			
BOD Removal					
With Advanced Primary Treatment	50	%			Assumes that advanced primary treatment is provided during the maximum week loading period and on weekends.
Without Advanced Primary Treatment	30	%			
TSS Removal					
With Advanced Primary Treatment	70-80	%			Assumes that advanced primary treatment is provided during the maximum week loading period and on weekends. (78% TSS Removal typ.)
Without Advanced Primary Treatment	60	%			40-60 % TSS Removal typ.
Volatile Solids Content of Primary Sludge	75	%			pH 4.5-5.5 typ. (Fermentation occurring)
Primary Sludge Pumps					1.0 - 1.5 ft sludge blanket on bottom
Type	Progressive Cavity	--			positive displacement pumps
Number	4	--			
Capacity, each	80	gpm			
Horsepower, each	5	hp			
Primary Scum Pumps					Pumps scum to digesters daily
Type	Progressive Cavity	--			positive displacement pumps
Number	4	--			
Capacity, each	80	gpm			
Horsepower, each	5	hp			
Secondary Treatment					
Process Flows					
Maximum Week	14.5	mgd			
Peak Instantaneous	20.3	mgd			
Oxygenation					
Oxygenation Basins					
Type	High Purity Oxygen	--			
Number	8	--			Currently running only 2 trains in shoulder season. Additional trains in service during peak flow times.
Stages per Basin	3	--			
Basin Volume, each	115,000	gal			
Detention Time					
One Basin Out of Service					
Maximum Week	1.1	hrs			
Peak Instantaneous	0.82	hrs			
All Basins in Service					
Maximum Week	1.5	hrs			
Peak Instantaneous	1.1	hrs			
Mean Cell Residence Time	2	day			
BOD Loading					
Maximum Week	11,200	ppd			
Maximum Month	12,100	ppd			
Influent Mixing					
Type	Submersible	--			
Number	2	--			
Basin Oxygen Dissolution					8 trains, 3 mixers per train
Type	Surface Aeration	--			Vertical Overhung
Number, First Stage (15 hp)	8	--			
Number, Second and Third Stage (7.5 hp)	16	--			
Oxygen Requirements					
Oxygen Required at Maximum Week	14,250	ppd			Assumes that advanced primary treatment is provided during the maximum week loading period and on weekends.
Oxygen Required at Maximum Month	15,400	ppd			
Oxygen Generation					
Type	Pressure Swing Adsorption (PSA)	--			Used as backup.
Capacity	8,000	ppd			
Liquid Oxygen Storage					
Number of Tanks	2	--			
Capacity, each	112,000	lb			
Minimum Feed Rate, each	8,000	ppd			
Storage Available at Maximum Month	14.5	day			

Plant Capacity in Raw Sewage Loads (Design Year 2015)	CRITERIA	UNITS	CRITERIA	UNITS	NOTES
Secondary Clarification					
Process Flows (with RAS)					
Maximum Week	14.5	mgd			
Peak Day	20.3	mgd			
Secondary Clarifiers					(EIMCO) Organ-Pipe Clarifier Mechanisms
Number	4	--			
Diameter	100	ft			
Sidewater Depth	12	ft			
Overflow Rates					130-200 mL/g SVI typ.
One Unit Out of Service					
Maximum Week with Recycle	454	gpd/sq. ft.			
Peak Instantaneous with Recycle	700	gpd/sq. ft.			
All Units in Service					
Maximum Week with Recycle	340	gpd/sq. ft.			
Peak Instantaneous with Recycle	525	gpd/sq. ft.			
RAS/WAS Pumping					
Volatile Solids Content of RAS/WAS					
RAS Pumps	75	%			
Type	Centrifugal Non-Clog, Variable Speed	--			
Number	6	--			
Pumps in Service	4	--			One pump operating per in-service clarifier
Capacity, each	5	@ 1,200 gpm	1	@ 1,050 gpm	
Normal Return Rate	30-50	% of Raw Sewage Flow			Stated return rate is to head of O_2 basins
WAS Pumps					Existing WAS pumps pull from O_2 basin ML effluent channel to control SRT in oxygenation basins. WAS can be metered to gravity thickeners from RAS discharge.
Type	Centrifugal Non-Clog, Constant Speed	--			
Number	3	--			
Pumps in Service	2	--			
Capacity, each	2	@ 105 gpm			
Capacity, each	1	@ 110 gpm			
Horsepower, each	3	hp			
Type	Progressive Cavity				
Capacity, each	1	@ 35 gpm			
Horsepower, each	3	hp			
Phosphorus Removal					
Process Flows at Maximum Week					
RAS	1.0	mgd			
Supernatant	1,200	gpm			
Elutrient	0.8	mgd			
Type of Process	PhoStrip®	--			
Number of PHOSTRIP Units	3	--			
Diameter of PHOSTRIP Units	55	ft			
Sidewater Depth	20	ft			
Overflow Rate (2 Units in Service)	274	gpd/sq. ft.			
Stripper Sludge Pumps					Sludge blanket depth 16-18 ft typ.
Type	Centrifugal Non-Clog, Variable Speed	--			30-60 hr SRT typ
Number	2	--			
Capacity, each	1,050	gpm			
Rapid Mix Basins					
Number of Basins	2	--			
Basin Dimensions	10 X 10 X 10	ft			
Horsepower per Basin	5	hp			
Basins in Service	1	--			
Detention Time	16	min			
Assumed Lime Dose	250	mg/L			Hydrated lime use for P precipitation as hydroxyapatite
Flocculation Basins					
Number of Basins	2	--			
Basin Dimensions	11 X 22 X 11	ft			
Agitation	Mechanical	--			
Horsepower per Basin	1	@ 1 hp	1	@ 2 hp	
Basins in Service	1	--			
Detention Time	44	min			
Chemical Clarifiers					
Number	2	--			
Diameter	65	ft			
Sidewater Depth	10	ft			

Plant Capacity in Raw Sewage Loads (Design Year 2015)	CRITERIA	UNITS	CRITERIA	UNITS	NOTES
Clarifiers in Service	1	--			
Overflow Rate	392	gpd/sq. ft.			
Chemical Sludge Pumps					
Type	Centrifugal Non-Clog, Constant Speed with timer	--			
Number	2	--			
Capacity, each	2	@ 115 gpm			
Horsepower, each	2	@ 5 hp			
Type	Progressive Cavity				
Number	1	--			
Capacity, each	1	@ 120 gpm			
Horsepower, each	1	@ 10 hp			
Pumps in Service	1	--			
Maximum Sludge Accumulation	3,200	ppd			
Sludge Underflow @ 1% Solids	27	gpm			
Recarbonation					
First Stage Recarbonation Basins					
Number	2	--			1 in service
Basin Dimensions	9' W x 33' L	ft			
Sidewater Depth	12	ft			
Recarbonation Pumps					
Type	Centrifugal Non-Clog, Constant Speed with timer	--			
Number	3	--			
Capacity, each	115	gpm			
Horsepower, each	5	hp			
Recarbonation Clarifiers					
Number	2	--			
Diameter	65	ft			
Sidewater Depth	10	ft			
Clarifiers in Service	1	--			
Overflow Rate	392	gpd/sq. ft.			
Second Stage Recarbonation Basins					
Number	2	--			2 in service
Basin Dimensions	9' W x 33' L	ft			
Sidewater Depth	12	ft			
Flow Equalization					
Ballast Ponds					SE and chemical effluent combine at ponds and feed to BNR through multipurpose pumping station
Number	2	--			
Volume	1.2	mg			
Biological Filtration Effluent Pond					SE and chemical effluent combine at ponds and feed to BNR through multipurpose pumping station
Number	1	--			
Volume	333,000	gal			
Biological Nitrogen Removal (BNR)					
Equalized Process Flows					
Average Annual	9.6	mgd			
Maximum Week	12.0	mgd			
Maximum Day	13.7	mgd			
Nitrogen in Raw Sewage	43	mg/L	3,440	ppd	
Nitrogen Removed by BNR	2,300	ppd			
Nitrogen Removed with Organic Sludge	400	ppd			
Nitrogen Removed by Filtrate Stripping	0	ppd			Filtrate stripping used only as an emergency backup. Designed for 340 lb/day.
Nitrogen in Plant Effluent	400	ppd			
BNR Influent Pumps					
Type	Vertical Turbine, Variable Speed	--			
Number	3	--			
Capacity, each	6,200	gpm			
Horsepower, each	100	hp			
Nitrification					
Type of Process	Submerged Biological Aerated Filtration	--			
Media Type	Styrofoam Beads	--			
Number of Nitrification Filters	8	--			Currently running 5 of 8 cells, 3 cells mothballed
Filter Area, Each	940	sq. ft.			
Media Depth	10.5	ft			Due to media loss, down to 9.5 to 10 feet now (2019)

Plant Capacity in Raw Sewage Loads (Design Year 2015)	CRITERIA	UNITS	CRITERIA	UNITS	NOTES
Average Hydraulic Loading Rate	1.27	gpm/sq. ft			
Maximum Hydraulic Loading Rate	1.80	gpm/sq. ft			
Air Delivery, per Filter	0.48	scfm/sq. ft			
Backwash Requirements					
Period Between Backwashes	56-72	hrs			Spring: 56 hr backwash cycle; Summer: 72 hr backwash cycle
Duration of Backwash	18	min			
Volume per Filter Backwash	120,000	gal			Volume varies depending on settings
Sludge Produced	1,300	ppd dry			
Dentrification					
Type of Process	Submerged Biological Filtration	--			
Media Type	Styrofoam Beads	--			
Number of Denitrification Filters	4	--			Typically use 3 or 4 denitrification filters
Filter Area, Each	704	sq. ft.			
Media Depth	8 - 9.5	ft			
Average Hydraulic Loading Rate	3.95	gpm/sq. ft			
Maximum Hydraulic Loading Rate	5.59	gpm/sq. ft			
Maximum Methanol Required	48.6	gph			Provision to route P-rich Phostrip® tank supernatant to filter influent for biomass nutrient demand
Backwash Requirements					Water Champ mixer to introduce methanol
Period Between Backwashes (Denitrification)	40-48	hrs			
Duration of Backwash	11	min			
Volume per Filter Backwash	90,000	gal			
Sludge Produced	2,400	ppd dry			
Backwash System					
Backwash Supply Source	Cell Effluent	--			
Backwash Wastewater Tank	364,400	gal			
Backwash Recycle Input	Headworks	--			
Filtration					
Equalized Process Flows					
Average Annual	8.9	mgd			
Maximum Week	10.6	mgd			
Peak Day	12.3	mgd			
Filter Supply Pumps (Multi-Purpose Pump Station)					
Type	Vertical Turbine, Constant & Variable Speed	--			
Number, Constant Speed	3	--			
Number, Variable Speed	2	--			
Capacity, each	3	@ 2,000 gpm	2	@ 4,100 gpm	
Horsepower, each	3	@ 125 hp	2	@ 150 hp	
Filters					
Number	4	--			1-4 in service depending on flows
Diameter	10	ft			
Length	40	ft			
Media Type	Dual Media	--			anthracite coal, sand, pea gravel
Media Depth	52	in.			
Filter Operation					
Surface Loading at Maximum Week					
One Filter Out of Service	6.1	gpm/sq. ft			
All Filters in Service	4.6	gpm/sq. ft			
Filter Backwash Requirements					
Supply Source	Filtered Effluent	--			
Number of Filters Backwashed at Once	1	--			Half a filter at a time
Head Loss to Backwash - Maximum	24	ft			
Backwash Rate - Maximum	18	gpm/sq. ft			
Backwash Duration - Maximum	20	min per Half Filter			
Backwash Flow Volume - Maximum	120,000	gal per Filter			
Backwash Water Disposal System					
Backwash Equalizing Tanks					
Number, Existing	1	--			
Number, Future	1	--			
Tank Capacity, each	200,000	gal			
Diameter	40	ft			
Backwash Recycle Input	Headworks	--			
Filter Surface Wash					
Supply Source	2-W System	--			
Flow Rate	100	gpm			

Plant Capacity in Raw Sewage Loads (Design Year 2015)	CRITERIA	UNITS	CRITERIA	UNITS	NOTES
Ammonia Recovery System					Used from 1975-2007, until BNR was in place and commissioned.
Ammonia Removal and Recovery Process (ARRP) Towers					
Number	10	--			
Diameter	12	ft			
Height (Stripper Tower)	23.17	ft			
Height (Absorber Tower)	17.17	ft			
Media Height (Stripper Tower)	9	ft			
Media Height (Absorber Tower)	3	ft			
ARRP Stripper Pumps					
Number	2	--			
Capacity, each	340	gpm			
Horsepower, each	15	hp			
ARRP Absorber Pumps					
Number	2	--			
Capacity, each	280	gpm			
Horsepower, each	10	hp			
Regenerant Clarifiers					
Number	2	--			
Diameter	20	ft			
Height	10.75	ft			
Regenerant Supply Pumps					
Number	3	--			
Capacity, each	1,300	gpm			
Horsepower, each	30	hp			
Regenerant Basins					
Number	4	--			
Capacity, each	175,000	gal			
Ion Exchange for Nitrogen Removal					
Nitrogen Removal Capacity	1,290	ppd			Used from 1975-2007, until BNR was in place and commissioned.
Clinoptilolite (Clino) Beds					
Number	5	--			
Diameter	10	ft			
Length	40	ft			
Media Depth	4	ft			
Chlorination					Dechlorination not necessary with groundwater injection
Breakpoint Chlorination Tank					May have used before 1995, but has not been used since then.
Number	1	--			
Diameter	9	ft			
Length	50	ft			
Chlorinators					
Type	Gas	--			
Number	4	--			
Capacity	2	@2000 ppd			
	1	@1000 ppd			
	1	@200 ppd			
Maximum Dosage	24.5	mg/L			
Chlorine Containers					
Number	8	--			WRP has capacity to store up to 16, but typically stores 8
Capacity, each	1	ton			
Effluent Pipeline					No CT requirement in permit. CT achieved in pipe from filters to disposal fields.
Material	Steel	--			
Number	1	--			
Diameter	30	in.			
Length	~ 1900	ft			
2-Water Retention Basin					
Material	Concrete-Lined	--			
Number	1	--			
Capacity of Hydro-Pneumatic Tank	4,100	gal			
Capacity of Retention Basin	50,000	gal			Per T-TSA, estimated to be 50,000 - 60,000 gal
2-Water Supply Pumps					
Type	Self Priming Centrifugal	--			
Number	4	--			

Plant Capacity in Raw Sewage Loads (Design Year 2015)	**CRITERIA**	**UNITS**	**CRITERIA**	**UNITS**	**NOTES**
Capacity, each	500	gpm			
Horsepower, each	40	hp			
Effluent Disposal Fields (Soil Aquifer Treatment)					Used as a polishing step
Disposal Fields					
Number, Existing	8	--			Typ. 4 in service at a time, rotating usage
Number, Future	8	--			
Number of Fields in Service at One Time	4-8	--			
Flow per Field @ Maximum Week	1.2	mgd			
Emergency Retention Basins					
Capacity at Plant (Emergency Retention Basin)	15.4	MG			
Capacity at Truckee Ponds	24	MG			
Capacity at Truckee Ponds, Future	11	MG			
Emergency Bypass Line Capacity	11.5	mgd			
Solids Handling System					
Primary Sludge from Primary Treatment					
Total Solids Loading at Maximum Month	11,800	ppd Dry			
Total Solids Loading at Maximum Week	18,700	ppd Dry			
Volatile Solids Content of Primary Sludge	75	%			
Volatile Solids Loading at Maximum Month	8,800	ppd Dry			
Volatile Solids Loading at Maximum Week	14,000	ppd Dry			
WAS from Secondary Treatment					
Total Solids Loading at Maximum Month	10,000	ppd Dry			
Total Solids Loading at Maximum Week	9,400	ppd Dry			
Volatile Solids Content of WAS	80	%			
Volatile Solids Loading at Maximum Month	8,000	ppd Dry			
Volatile Solids Loading at Maximum Week	7,500	ppd Dry			
Organic Sludge Thickening					
Number	1	--			
Diameter	25	ft			
Volume	46,000	gal			
Overflow Rate at Maximum Week	87	gpm/sq. ft			
Minimum Concentration of Thickened Solids	2	%			
TWAS Pumps					
Type	Progressive Cavity				
Number	2	--			
Capacity, each	2	@ 125 gpm			
Horsepower, each	10	hp			
Thickening Centrifuges					
Number of Centrifuges	2	--			
Flow Range, each	20-120	gpm			
Minimum Concentration of Thickened Solids	5.5	%			
Horsepower, each	40	hp			
Maximum Flow	100	gpm			
Maximum Solids Loading	1 @ 1,200	lb/h			Sharples Centrifuge
Maximum Solids Loading	1 @ 1,485	lb/h			Centrisys Centrifuge
Thickenig Centrifuge Cake Pumps					
Type	Progressive Cavity				
Number	3	--			
Capacity, each	2	@ 37 gpm			Sharples Centrifuge
Horsepower, each	2	@ 1.5 hp			Sharples Centrifuge
Capacity, each	1	@ 20 gpm			Centrisys Centrifuge
Horsepower, each	1	@ 7.5 hp			Centrisys Centrifuge
Organic Sludge Digestion					
Type of Process	Temperature Phased Anaerobic Digestion (TPAD)	--			
Overall Volatile Solids Loading Rate					
At Maximum Month	0.15	VS/cu. ft. per day			
At Maximum Week	0.19	VS/cu. ft. per day			
Overall Volatile Solids Destruction	70	%			
Number of Thermophilic Digesters	1	--			
Number of Mesophilic Digesters	2	--			
Number of Holding Digesters	1	--			
Digester Diameter	45	ft			
Digester Sidewater Depth	23.3	ft			
Digester Volume, each	277,000	gal			
First Phase Digester (#33)					

Plant Capacity in Raw Sewage Loads (Design Year 2015)	CRITERIA	UNITS	CRITERIA	UNITS	NOTES
Operating Temperature	122-140	°F			Typ. 128 F
Solids Retention Time at Maximum Month	5.5	day			
Solids Retention Time at Maximum Week	4.2	day			
Second Phase Digesters (#29, #30)					
Operating Temperature	95-100	°F			#29 typ. 111 F, #30 typ. 109 F
Solids Retention Time at Maximum Month	11	day			
Solids Retention Time at Maximum Week	8.4	day			
Holding Digester (#31)					
Operating Temperature	-	°F			Typ. 104 F
Solids Retention Time at Maximum Month	10.6	day			
Solids Retention Time at Maximum Week	10.6	day			
Number of Boilers	4	--			
Heating Capacity, each	3	@1600 MBH	1	@4000 MBH	
Organic Sludge Dewatering					
Type of Process	High Solids Centrifuge Dewatering	--			
Solids Loading Rate at Maximum Week					
Dry Solids	15,200	ppd			
Minimum Concentration of Digested Sludge	2.8	%			
Conditioning Chemicals Required at Maximum Week					
Polymer (40 LBS/Dry Ton of Digested Sludge)	303	ppd Active Polymer			
Polymer Totes, Volume	250	gal			
Centrifuge Feed Tank					
Number of Tanks	1	--			
Capacity	17,500	gal			
Number of Centrifuges	2	--			Centrisys & Sharpels
Number of Centrifuges, Future	1	--			
Centrifuge Performance					The Solids Handling Reports show that the current dewatering centrifuge feed is approx. 53% chemical sludge and 47% digested organic sludge on a TS load basis.
Flow Rate, each	20-120	gpm Digested Sludge			
Minimum Concentration of Dewatered Solids	27	%			50:50 digested sludge:chemical sludge centrifuge feed (typ.)
Minimum Solids Capture Efficiency	92	%			
Dewatered Solids Storage					
Number of Hoppers	2	--			
Number of Hoppers, Future	1	--			
Hopper Storage Volume, each	60	yd^3			
Hopper Storage Capacity, each	50	wet tons			
Capacity, each	100,000	lbs			Typically only 80,000 - 85,000 lbs used.
Dewatered Solids Loadout					
Discharge Type	Rotary External Drive	--			
Discharge Rate Range	0.2-2	wet tons/min			
Centrate Tank					
Number of Tanks	1	--			
Capacity	18,700	gal			
Chemical Sludge Thickening					
Type	Gravity	--			
Flow to Thickeners at Maximum Week	0.56	mg			
Chemical Sludge Loading at Maximum Week	5,800	ppd as $CaCO_3$			
Number	2	--			
Diameter	25	ft			
Overflow Rate at Maximum Week	570	gpd/sq. ft.			
Minimum Concentration of Thickened Solids	5	%			
Digested Sludge Ready Tank					Backup dewatering system. Only used if centrifuge dewatering system out of service and plate-and-frame filter press had to be used for digested sludge dewatering.
Number	1	--			
Volume	7,000	gal			
Chemical Solids Dewatering					
Type of Process	Plate-and-Frame Filter Press	--			
Number of Presses	1	--			
Size of Press	83 - 119	cu. ft.			
Number of Chambers	32 - 46	--			
Chamber Dimensions, each	69" H x 53" W	in.			
Chamber Thickness, each	1.25	in.			
Solids to Dewater at Maximum Week					
Volume	8,800	gpd			
Solids Loading	5,800	ppd			
Minimum Concentration of Dewatered Solids	35	%			Cake TS 35-40% DS typ. (Due to chemical sludge)

Plant Capacity in Raw Sewage Loads (Design Year 2015)	**CRITERIA**	**UNITS**	**CRITERIA**	**UNITS**	**NOTES**
Filtered Flow at Maximum Week	7,500	gpd			
Filtrate Stripping System					Not in operation. Emergency use only.
Nitrogen Removed	340	ppd			
Organic Sludge Filtrate Flow at Maximum Week	70,600	gpd			
Diameter of Filtrate Clarifier	20	ft			
Number of Strippers	1	--			
Odorous Air Treatment					
Process Flows	17,610	ac ft/min			
Odorous Air Transport Piping					
Material for Piping to Odorous Air Fan Station	Fiberglass	--			
Diameter for Piping to Odorous Air Fan Station	48	in			
Material for Piping to Soil Filter Beds	Fiberglass	--			
Diameter for Piping to Soil Filter Beds	30	in			
Facilities with Odorous Air Treatment					
Headworks Buillding 7 (Pending 2020 project)					Screening project will include odor control piping from Headworks
Solids Handling Buillding 4					
Digester Buillding 32					
Phosphorus Stripping Basins 56, 57, 58, 64					
Dewatering Buillding 71					
Odorous Air Fans					
Type	Centrifugal FRP, Variable Speed	--			
Number	2	--			
Capacity, each	19,610	ac ft/min			
Maximum Pressure Drop	0.49	psi			originally written as 13.6 IN WC
Horsepower, each	75	hp			
Type of Process	Soil Biofilter	--			
Soil Filter Beds					
Media Type	Inorganic Soil	--			Bohn biofilters
Number	2	--			
Depth	4	ft			
Active Bed Volume, each	25,200	cu. ft.			
Loading Rate	1.4	cfm/sq. ft.			
Detention Time	2.9	min			

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 3:
WATER RECLAMATION PLANT MASTER PLAN
CHAPTER 2:
FLOW AND LOAD PROJECTIONS

FINAL | February 2022

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Chapter 2

FLOW AND LOAD PROJECTIONS

2.1 Introduction

This chapter summarizes the historical and projected influent flows and loads to Tahoe-Truckee Sanitation Agency's (T-TSA/Agency's) Water Reclamation Plant (WRP). Daily data from October 2013 through September 2018 (reflecting water years 2014 through 2018) was reviewed to evaluate historical influent flows and loads to the WRP. Historical flow rates, peaking factors, organic strength, and nutrient concentrations of the wastewater for several different conditions were evaluated and summarized. Based on the anticipated future land use in the service area, flow and load projections were also developed. The flow and load projections were used to identify which facilities at the WRP need to be expanded or upgraded during the 25-year planning period of the Master Sewer Plan.

2.2 Key Findings and Recommendations

The key findings and recommendations are:

- The current base wastewater flow (BWF) (which is defined for the purposes of this study as the 90-day rolling average minimum flow) is approximately 3.34 million gallons per day (mgd) and the high occupancy flow (HOF) is approximately 6.44 mgd. As the population in the service area increases over the 25-year planning period, the BWF is projected to increase by 53 percent to 5.11 mgd, and the HOF is projected to increase to 9.77 mgd.
- The organic loads to the WRP are also expected to increase by 53 percent.
- Based on collection system hydraulic modeling, the current peak wet weather flow (PWWF) to the WRP is estimated to be 21.87 mgd during a 10-year 24-hour design storm event. The PWWF to the WRP is estimated to increase to 29.99 mgd over the 25-year planning period of the Master Sewer Plan. Increases in PWWF are expected due to population growth coupled with aging sewer collection systems in the contributing agencies' service areas. Planned improvements to T-TSA's Truckee River Interceptor (TRI) will eliminate hydraulic limitations, resulting in wet weather flows that will reach the WRP faster and will be greater in magnitude.
  - Although BWF is projected to increase by 53 percent, PWWF is projected to increase by only 33 percent. This is due to excessively high existing PWWF peaking factors for some of the member agencies and an assumption that future PWWF peaking factors would be lower. (For future flow conditions, the 10-year 24-hour design storm with low inflow and infiltration (I/I) conditions would result in no increase in I/I flows associated with the increase in BWF baseline flows. However, the selected 10-year 24-hour design storm with high I/I conditions assumed that I/I flows in the future would be generally consistent with existing peaking factors, with the exception of some areas that had excessively high peaking factors for existing flows. For those areas, a typical I/I rate peaking factor was assumed in order to not be

overly conservative. Volume 2, Chapter 3 - Historic and Future Flows describes this in further detail.)

- The WRP is operating at higher peak flows and loads than anticipated in 2003.
- The current wastewater strength during annual average (AA) flow conditions is:
  - Total Suspended Solids (TSS) = 189 milligrams per liter (mg/L)
  - Chemical Oxygen Demand (COD) = 542 mg/L
  - 5-Day Biochemical Oxygen Demand (BOD_5) = 265 mg/L
  - Total Kjeldahl Nitrogen (TKN) = 53 mg/L
  - Total Phosphorus (TP) = 5.6 mg/L

2.3 Permitted Capacity

Although the nameplate, or permitted capacity of the WRP is defined based on the maximum 7-day flow rate[1] of the plant (9.6 mgd), the WRP must be able to handle the associated daily and seasonal variations in influent flow and load. The permitted maximum instantaneous flow rate through the WRP is 15.4 mgd[1].

Capacity limitations for various processes often occur during the peak flow and load conditions, and not during average flow and load conditions. For reference, Table 2.1 summarizes the definitions of various flow and load conditions and their relevance to wastewater planning.

2.4 Historical Influent Flow and Load

The WRP receives all wastewater flows collected within the T-TSA service area. The T-TSA service area collects wastewater from six contributing agencies: North Tahoe Public Utility District (NTPUD), Tahoe City Public Utility District (TCPUD), Alpine Springs County Water District (ASCWD), Olympic Valley Public Service District (OVPSD), Truckee Sanitary District (TSD) and Northstar Community Services District (NCSD). The Agency's service area is composed primarily of open space (57 percent) and residential land use (33 percent), of which single family residences account for 32 percent. The major economic driver in the T-TSA service area is tourism and visitor services, resulting in a resort community with high-occupancy flows occurring over winter holiday periods (Christmas through New Year's Eve) and summer holiday periods (Independence Day and Labor Day). The WRP has been designed to accommodate lower flows and loads during "off-season" times with low visitor populations as well as high-occupancy flows and loads during the aforementioned holiday periods.

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[1] The WRP operates under Revised Waste Discharge Requirements (WDRs) issued by the California Regional Water Quality Control Board Lahontan Region. As a condition of the WDRs, certain flow limitations are imposed on the WRP:

- From June 21st through September 21st of any year, the flow of wastewater to the treatment and disposal facilities during any 7 consecutive days shall not exceed an arithmetic average of 9.6 mgd.
- The maximum instantaneous flow rate of wastewater through the treatment facilities shall not exceed 15.4 mgd.

For more information on the WDRs and other permitting details, see Volume 3, Chapter 5 - Regulatory Requirements.

2.4.1 Data Collection

Influent flow is measured at the WRP with a Parshall flume located downstream of the influent bar screens. Plant process return streams (e.g., plant waste, biological nitrogen removal (BNR) filtration backwash water, filter backwash water) are pumped to the WRP headworks, typically downstream of the Parshall flume. During wet weather conditions when the influent flow exceeds the permitted WRP maximum instantaneous flow rate of wet weather treatment capacity of 15.4 mgd, excess flows are diverted to the onsite emergency retention basin, and when that basin approaches 50 percent capacity (7.8 million gallons (MG)), flows are diverted upstream of the WRP to offsite emergency storage ponds. Typically, high flows are diverted downstream of the Parshall flume, upstream of the oxygenation basins. However, flow diversions upstream of the Parshall flume can also be utilized during very high flow conditions, as described above. Thus, the flow recorded at the headworks via the Parshall flume does not always capture the hourly or instantaneous peak flow received at the influent sewer of the WRP, but only the flow that is sent through the WRP treatment process. However, it is important to note that given all diverted flow is eventually returned to the headworks from the emergency retention basin and offsite emergency storage ponds, the total volume of flow received at the WRP is recorded.

The recorded BWF and AA flow (AAF) are representative of actual influent flows to the influent sewer. The recorded AAF, max month flows, and max week flows presented in this chapter are representative of influent flows that likely would have been equalized, not necessarily the actual flows in the influent sewer.

As described in Technical Memorandum (TM) 2 - Wastewater Characterization Sampling Plan, a significant amount of performance data is currently collected as part of routine operations at the WRP (see Table 2.1 of TM2 - Wastewater Characterization Sampling Plan).

These data include analyses of many of the constituents needed to determine the raw sewage filterable COD, particulate COD, biodegradable COD, unbiodegradable COD, TKN, and TP wastewater fractions for process modeling. Specifically, 24-hour flow-weighted composite samples are collected at the headworks and analyzed for TSS, COD, BOD_5, TKN, nitrite nitrogen (NO_2-N), nitrate nitrogen (NO_3-N), TP, organophosphorus (OP), pH, total dissolved solids (TDS), and chloride. Daily influent loads are calculated for each day a sample is collected based on the average daily influent flow and sample concentration. (Tests for filterable COD, particulate COD, biodegradable COD, unbiodegradable COD, TKN, and TP are not conducted on a routine basis and were only conducted to support the efforts of the Wastewater Characterization Sampling Plan.)

Table 2.1 Wastewater Flow and Load Definitions

Term	Definition	Purpose
BWF	**Base Wastewater Flow** The average flow occurring on a daily basis during the dry weather season.	Scheduling liquid unit process downtime.
BWL	**Base Wastewater Load** The average load occurring during the dry season, defined as the 90-day average load that coincides with the BWF time period.	Scheduling liquid unit process downtime and sizing of wastewater treatment facilities.
AAF or AAL	**Average Annual Flow or Load** The average flow or load occurring on a daily basis over the course of the year, including both periods of dry and wet weather conditions.	Sizing of sludge lagoons or for performing economic analysis of alternatives.
ADMMF	**Average Daily Maximum Month Flow** The average daily flow occurring during the maximum flow month of the year. This is calculated as the maximum 30-day average for the year.	Sizing of secondary treatment and flow equalization facilities.
ADMML	**Average Daily Maximum Month Load** The average daily organic or suspended solids load occurring during the maximum load month of the year. This is calculated as the maximum 30-day average for the year. The maximum monthly load does not necessarily occur during the same period as the maximum monthly flow.	Sizing of secondary treatment facilities, sludge thickening facilities and anaerobic digesters.
Max Week Flow or Load	**Maximum Week Flow or Load** The maximum single week flow or load recorded for the year.	For T-TSA, the WRP rated capacity is based on a consecutive 7-day flow rate during the Summer season (June 21 through September 21).
Max Day Flow or Load	**Maximum Day Flow or Load** The maximum single day flow or load recorded for the year.	Sizing of hydraulic facilities, secondary treatment facilities, process aeration, and biological nutrient removal facilities.
HOF	**High Occupancy Flow** The maximum flow that occurs during periods of high occupancy. High occupancy periods have historically occurred during holidays, either New Years' Eve or July 4th.	For T-TSA, sizing of hydraulic facilities, secondary treatment facilities, process aeration, and biological nutrient removal facilities.
PWWF	**Peak Wet Weather Flow** The highest observed flow that occurs following a design storm event.	Sizing of hydraulic facilities, specifically the headworks and wet weather flow equalization facilities.

Although influent samples are not regularly analyzed for ammonia, the plant measures ammonia at the nitrification filter influent, nitrification filter effluent, denitrification filter effluent, filtration effluent, and final effluent. The nitrification filter influent samples are reasonably representative of influent ammonia to the WRP; however, the WRP influent ammonia values are likely slightly higher than these samples. Although ammonia removal is not expected in the primary clarifiers, the high purity oxygen activated sludge (HPOAS) process (upstream of the nitrification filter influent) removes some ammonia through biomass uptake. This is supported by the results of a 2-week wastewater characterization sampling program conducted from June 22, 2019 through July 8, 2019. (This sampling program was conducted to measure the concentration of a wider range of constituents than are typically monitored at the WRP, in order to define wastewater fractions needed for inputs into the WRP process model. For more information regarding the WRP process model developed using the BioWin software program, see Volume 3, Chapter 4 - Performance and Capacity Assessment.) Additionally, T-TSA regularly measures influent TKN, which provides a conservative estimate of the influent nitrogen load. Ammonia load from centrate return to headworks will likely increase the ammonia concentration above the influent ammonia concentration.

2.4.2 Raw Data

Daily influent flow and load data were evaluated for TSS, COD, BOD_5, TKN and TP from the 2014 to 2018 water years (October 2013 through September 2018). Since the assessment of capacity must consider the effects of variations in flow and load, data are summarized using the definitions in Table 2.1. To help discern trends in the data, averages were calculated from October 2013 through September 2018. Of note, the state of California experienced a persistent drought from December 2011 through March 2017, and the 2012 through 2014 water years were the driest in California history. However, residential wastewater generation is not as affected by water conservation requirements enacted as a result of the drought, and therefore the flows and loads from this time frame are considered to be valid for calculating both historical and projected values.

Figures 2.1 and 2.2 illustrate the historical daily average and recycle flows to the WRP as measured at the influent Parshall flume. In Figure 2.1, the trendlines represent a 28-day moving average, which reflects the average daily maximum month (ADMM) flow. In Figure 2.2, the trendlines represent a 7-day moving average, which reflects the peak week flow. Figure 2.3 illustrates the influent TSS load, and the trendline represents a 28-day moving average, which reflects the ADMM TSS load. Figure 2.4 illustrates the influent COD and BOD_5 loads. In Figure 2.4, the COD trendline represents a 28-day moving average, which reflects the ADMM load. However, for BOD_5, there is no trendline as this data was not collected on the same frequency as COD. Figure 2.5 illustrates the influent TKN and TP loads. In Figure 2.5, the trendlines represent a 28-day moving average, which reflects the ADMM loads of both TKN and TP.

Table 2.2 shows the historical flows and loads from October 2013 through September 2018. For more information on the methodology used to project sewer flows, see Volume 2, Chapter 3 - Historic and Future Flows.

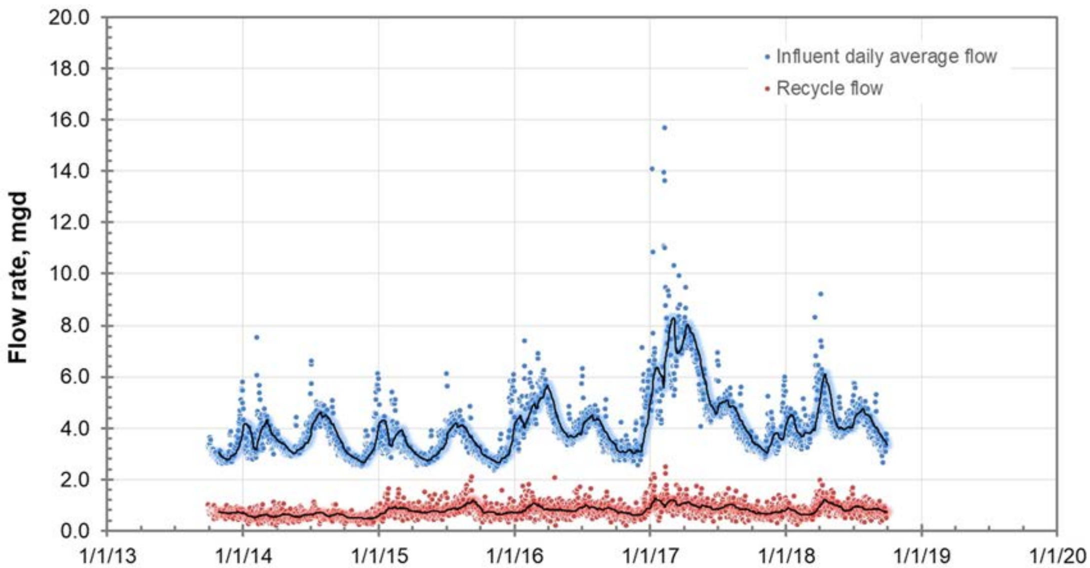

Figure 2.1 Daily Influent Flow – ADMM

In Figure 2.1, the trendlines represent a 28-day moving average, which reflects the ADMMF.

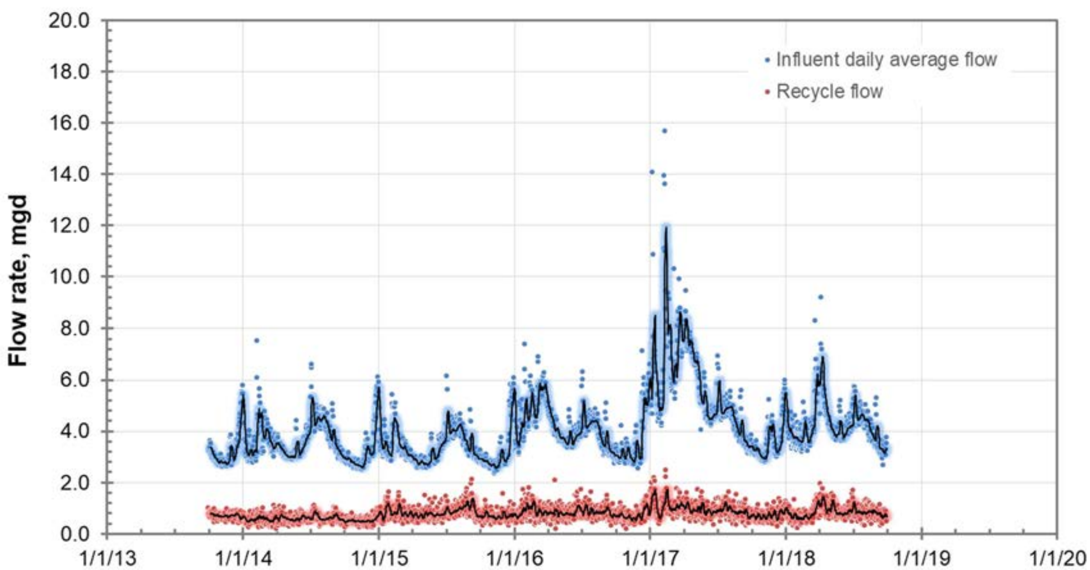

Figure 2.2 Daily Influent Flow – Peak Week Flow

In Figure 2.2, the trendlines represent a 7-day moving average, which reflects the peak week flow.

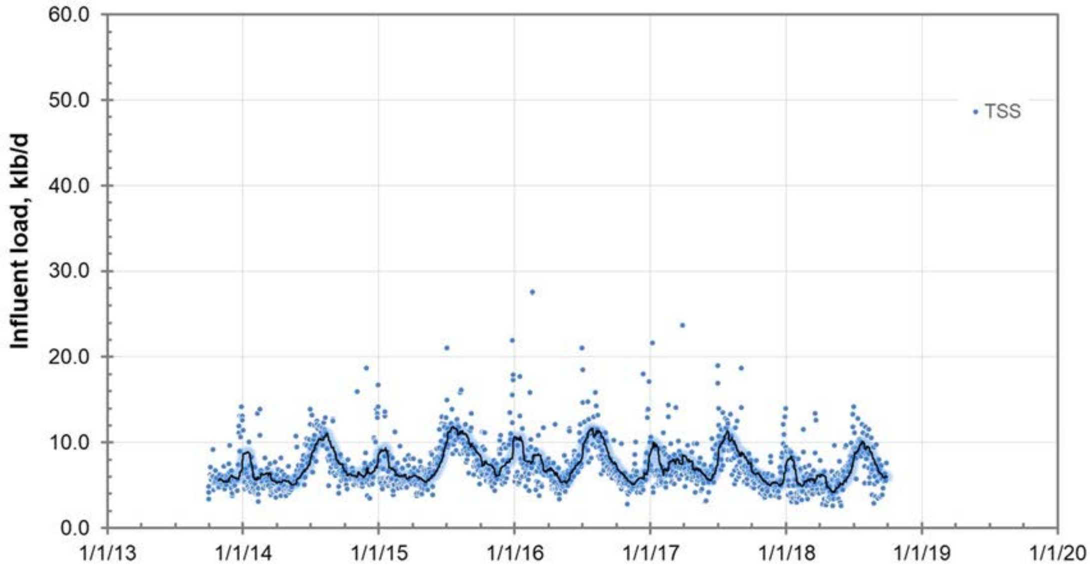

Figure 2.3 Influent TSS Load – ADMM

The trendline in Figure 2.3 represents a 28-day moving average, which reflects the ADMM TSS load.

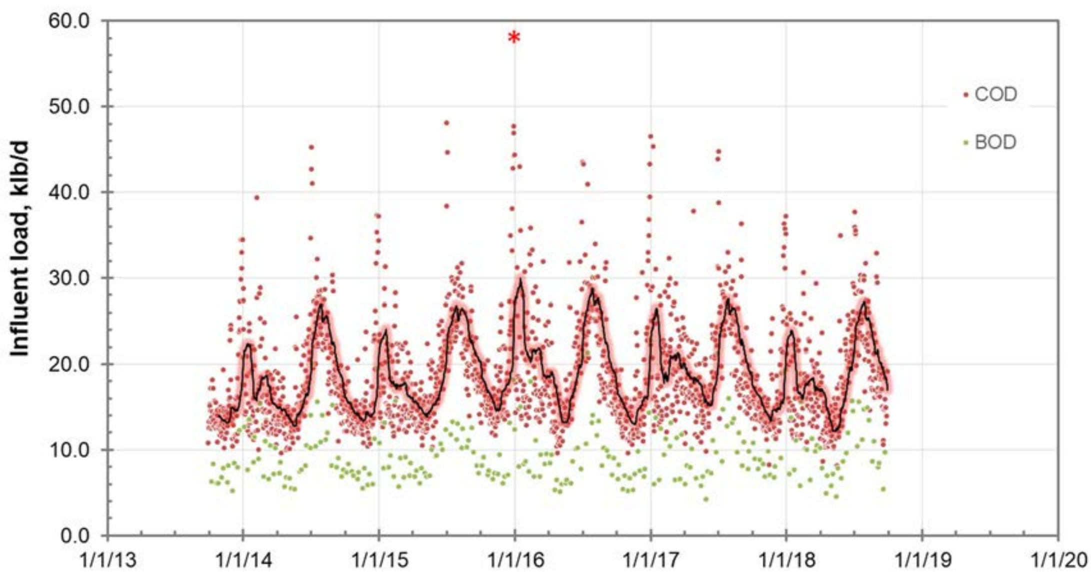

Figure 2.4 Influent COD and BOD_5 Load – ADMM

In Figure 2.4, the COD trendline represents a 28-day moving average, which reflects the ADMM load. However, for BOD_5, there is no trendline as this data was not collected on the same frequency as COD. The asterisk indicates that one (or more) daily average COD load(s) exceed the maximum y-axis value on that date(s). The data may be outliers due to non-representative samples, analytical errors, etc. Although the data may be outliers, rather than delete them, the figure scale was kept as shown to represent the other data in a reasonable fashion.

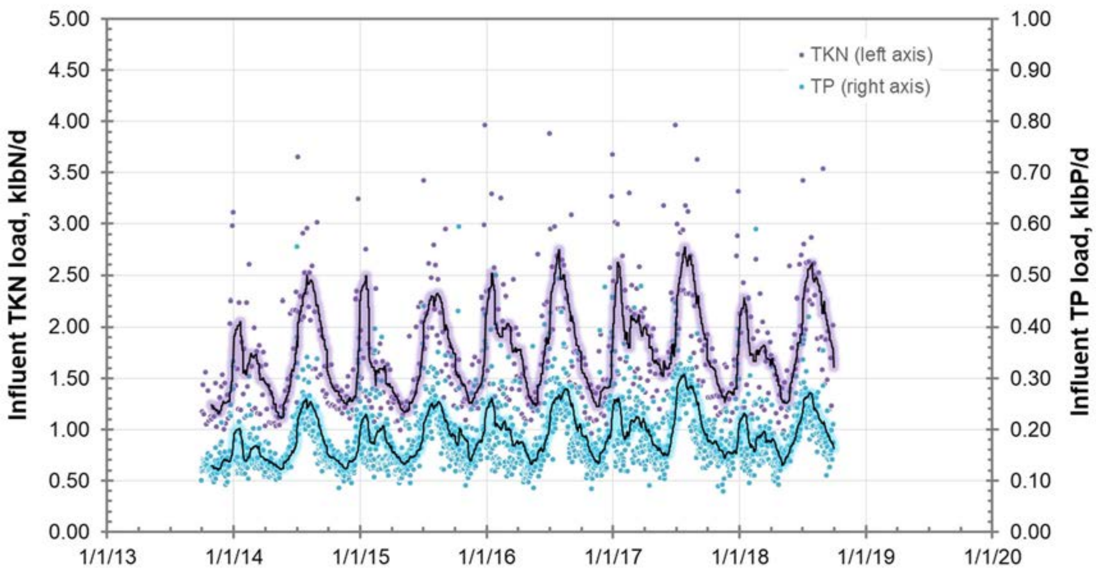

Figure 2.5 Influent TKN and TP Load – ADMM

In Figure 2.5, the trendlines represent a 28-day moving average, which reflects the ADMM loads of both TKN and TP.

Table 2.2 Historical (October 2013 – September 2018) Flow and Loads

Condition	Water Year					Average
	2014	2015	2016	2017	2018	
BWF						
Flow (mgd)	3.05	2.91	2.85	3.10	3.34	3.06
PWWF						
Flow (mgd)(1)	--	--	--	--	21.87	--
AA						
Flow (mgd)	3.58	3.38	3.97	5.27	4.09	4.06
TSS (thousand pounds per day [klb/d])	6.93	7.68	8.07	7.55	6.33	7.31
COD (klb/d)	17.60	18.44	20.18	19.45	18.17	18.77
BOD_5 (klb/d)(2)	9.47	9.38	9.56	9.58	9.86	9.57
TKN (klb/d)	1.64	1.65	1.81	1.90	1.78	1.76
TP (klb/d)	0.17	0.18	0.20	0.21	0.19	0.19
ADMM						
Flow (mgd)	4.63	4.32	5.66	8.31	6.12	5.81
TSS (klb/d)	11.10	11.80	11.69	11.38	10.10	11.22
COD (klb/d)	27.03	26.79	29.92	27.58	27.24	27.71
BOD_5 (klb/d)(2)	14.21	15.61	16.46	14.30	15.79	15.27
TKN (klb/d)	2.50	2.49	2.74	2.77	2.61	2.62
TP (klb/d)	0.26	0.25	0.28	0.31	0.27	0.27
Max Week (6/21 – 9/21 only)						
Flow (mgd)	5.30	4.79	5.20	5.98	5.40	5.34
TSS (klb/d)	11.74	14.24	14.86	14.52	11.92	13.46
COD (klb/d)	33.40	32.84	34.94	34.26	32.49	33.59
BOD_5 (klb/d)(2)	20.04	21.81	21.24	21.13	15.68	19.98
TKN (klb/d)	2.90	2.73	3.41	3.48	3.06	3.12
TP (klb/d)	0.32	0.29	0.33	0.38	0.32	0.33
Max Week						
Flow (mgd)	5.40	5.70	5.88	11.93(3)	6.93	7.17
TSS (klb/d)	12.85	14.24	16.97	14.52	12.16	14.15
COD (klb/d)	33.40	34.65	47.64	37.96	34.48	37.62
BOD_5 (klb/d)(2)	20.75	21.81	21.24	22.75	19.30	21.17
TKN (klb/d)	3.05	4.16	3.48	3.48	3.11	3.45
TP (klb/d)	0.32	0.32	0.38	0.38	0.33	0.35

Notes:
(1) Source: T-TSA collection system hydraulic model, based on 10-year 24-hour design storm. PWWF only developed for 2018 water year, as historical values do not represent the true peak hour flow for larger events involving offsite or onsite flow diversion.
(2) BOD_5 loads are measured twice per week, while other loads are measured daily.
(3) Although this value is greater than 9.6 mgd, this flow did not occur during the WDRs time frame of concern, (June 21st through September 21st), and therefore this value does not indicate a violation of the WDRs.

2.4.3 Peaking Factors

Using the data summarized in Table 2.2 as well as the statistical analysis described in Appendix 2A, influent flow and load peaking factors were developed. Peaking factors represent the various peak conditions as a ratio to the annual average flow or load. The individual peaking factors for each condition are summarized in Table 2.3 and represented graphically in Figure 2.6. In general, the peaking factors are similar for the various constituents evaluated, and within the expected range for a municipal water reclamation plant. Of interest is that peaking factors for flow rate, TSS load, and BOD_5 load (indicated in red text) are higher than the design data peak week and peak month values from the 2003 WRP drawings; however, as shown in Volume 3, Chapter 4 - Performance and Capacity Assessment, the WRP has continued to perform well, meeting permit conditions defined by the WDRs.

Table 2.3 Historical Peaking Factors (October 2013 – September 2018)

Condition	Peak Day(1)	Peak Week(1)	Peak Week (2003 Design Data)(2)	Peak 14-Day(1)	Peak Month(1)	Peak Month (2003 Design Data)(2)	Base Wastewater(1)
Flow Rate	2.05	1.75	1.20	1.62	1.46	1.04	0.83
TSS Load	2.62	2.11	1.63	1.90	1.66	1.22	0.78
COD Load	2.26	1.88	--	1.72	1.54	--	0.81
BOD_5 Load	2.40	1.97	1.68	1.79	1.59	1.30	0.79
TKN Load	2.25	1.88	--	1.72	1.53	--	0.81
TP Load	2.39	1.97	--	1.79	1.58	--	0.79

Notes:
(1) Values have been normalized to the annual average.
(2) Source: Expansion of Water Reclamation Plant Drawings, CH2MHILL, October 2003.

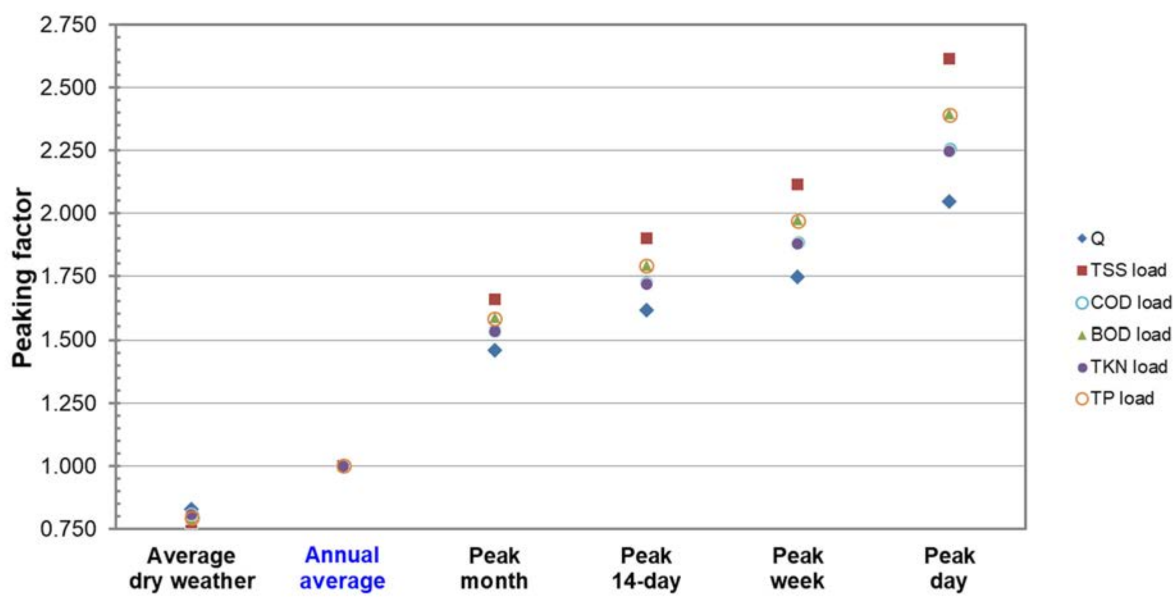

Figure 2.6 Historical Peaking Factors (October 2013 – September 2018)

Another way of looking at existing and future peaking factors is to compare high occupancy dry weather flow (DWF) with PWWF for both existing (2018) and future (2045) conditions as shown in Table 2.4. Although this work was done to review the TRI's ability to handle existing and future flows, since flows are treated at the WRP, these peaking factors are also important to consider. Per standard practice and decision by T-TSA, a 10-year 24-hour design storm was selected, with high I/I conditions in 2045. These peaking factors are within the expected range for a regional WRP with a non-compact service area. (Volume 2, Chapter 3 - Historic and Future Flows describes this in more detail).

Table 2.4 Flow Peaking Factors

Scenario	HOF (mgd)	PWWF (mgd)	PWWF/HOF Peaking Factor
Existing 10-year design storm	6.44	21.87	3.40
Future 10-year design storm, High I/I	9.77	29.99	3.07

2.5 Flow and Load Projections

This section summarizes the flow and load projections. Flow projections were developed for each of T-TSA's member districts, due to unique circumstances for each of these districts, and then compiled to create overall flow projections for T-TSA. Both BWF and high occupancy DWF projections were developed for each member district using growth rate assumptions and buildout availability unique to each district. PWWF projections were developed with the calibrated TRI hydraulic model. The PWWF projection was developed assuming T-TSA will implement recommended collection system projects that will eliminate hydraulic bottlenecks. However, since the collection systems in T-TSA's service area are owned and operated by other agencies and T-TSA only has direct control over the TRI, the PWWF projection was developed assuming high infiltration and inflow (I/I). Refer to Chapter 7 of the Collection System Master Plan (Volume 2) for the recommended collection system projects. See the Collection System Master Plan for more information about the hydraulic model, and Volume 2, Chapter 3 - Historic and Future Flows for information about the planning criteria, growth rate assumptions, and buildout availability used.

AA flows were developed using the BWF projections, as the original WRP design data reference AA rather than BWF. The increase in 2045 AA flows are assumed to be proportional to the increase in 2045 BWF. Assuming the strength of the wastewater will not change, AA loads were developed using the AA flow projections and the average concentration from Water Year (WY) 2014 to WY 2018. Future load concentrations are assumed to be similar to existing load concentrations, as the majority of the land use contributing to the wastewater collection system in the T-TSA service area is currently residential and is projected to be residential.

Flow and load projections for other conditions were developed using the average of the peaking factors from WY 2014 to WY 2018 identified in Table 2.3. Table 2.5 summarizes the flow and load projections for the 25-year planning period of the Master Sewer Plan.

Table 2.5 Flow and Load Projections

Item	Current (2018 Water Year)	Peaking Factor[1]	25-Year Planning Period (2045 Projections)[2]
BWF			
Flow, mgd	3.34	0.83	5.11
HOF			
Flow, mgd	6.44	1.70 – 2.83[3]	9.77
PWWF[4]			
Flow, mgd	21.87	6.55 (PWWF/BWF) 3.40 (PWWF/HOF)	29.99
AA			
Flow, mgd	4.02	--	6.16
TSS, klb/d)	6.33	--	9.68
COD, klb/d	18.20	--	27.84
BOD_5, klb/d[5]	8.88	--	13.58
TKN, klb/d	1.78	--	2.72
TP, klb/d	0.19	--	0.29
ADMM			
Flow, mgd	5.88	1.46	8.99
TSS, klb/d	10.51	1.66	16.08
COD, klb/d	28.03	1.54	42.88
BOD_5, klb/d[5]	13.67	--	20.92
TKN, klb/d	2.72	1.53	4.17
TP, klb/d	0.30	1.58	0.45
Max Week (6/21 – 9/21 only)			
Flow, mgd	5.31	1.32	8.13
TSS, klb/d	11.71	1.85	17.92
COD, klb/d	32.40	1.78	49.56
BOD_5, klb/d[5]	15.80	--	24.18
TKN, klb/d	3.15	1.77	4.82
TP, klb/d	0.33	1.75	0.50
Max Week			
Flow, mgd	7.04	1.75	10.77
TSS, klb/d	13.36	2.11	20.43
COD, klb/d	34.22	1.88	52.35
BOD_5, klb/d[5]	16.69	--	25.54
TKN, klb/d	3.35	1.88	5.12
TP, klb/d	0.37	1.97	0.56

Notes:
(1) Average WY 2018 flows and loads were used to project the 2045 conditions.
(2) 2045 flows and loads calculated based on 2045 BWF: 2018 BWF ratio of 1.53.
(3) HO peaking factors vary by agency. See Volume 2, Chapter 3 - Historic and Future Flows for further description.
(4) Source: T-TSA collection system hydraulic model, based on 10-year 24-hour design storm, assuming high I/I for future conditions.
(5) Projected BOD_5 loads were calculated using a COD:BOD_5 ratio of 2.05.

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Appendix 2A

STATISTICAL EVALUATION

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T-TSA Flow and Load Statistical Evaluation

Influent flow and load peaking factors were estimated using historical influent daily average flow rate and constituent concentrations from the 5 most recent water years, WY2014 through WY2018 (October 1, 2013 through September 30, 2018). This approach assumes that the overall variability of the influent flow rate and constituent loads over this 5-year period is representative of future conditions.

The historical data are plotted as a log-normal probability plot, which shows the fraction of the data, on the x-axis, less than a given value, on the y-axis. The x-axis values are plotted using a normal probability scale and the y-axis values are plotted on a logarithmic scale. Data from a log-normal distribution fall on a straight line in this type of plot, where the slope of the line represents the variability of the data.

Environmental data tend to be log-normally distributed, so log-normal probability plots were used to estimate influent flow and load peaking factors for averaging periods of interest (e.g., annual average, peak month, and peak week). The log-normal probability plots of historical daily average influent flow rate and constituent loads were created using KaleidaGraph v4.5.3 (Synergy Software, Reading, PA).

Historical daily average influent flow rates are represented by the data points in Figure 2A.1. The straight line represents the best-fit log-normal distribution, described by the equation shown in the figure. The peaking factor for any averaging period is represented by exponential term in the equation. The number in the exponent, 0.274, is proportional to the variability or "slope" of the distribution. The function norm(x) in the exponent is the inverse of the standard normal cumulative distribution at a cumulative probability, x. So, the peaking factor for a given cumulative probability, x, is e (base of the natural logarithm) raised to the product of the slope and norm(x).

The annual average, peak month, and peak week averaging periods are represented by the 50th percentile (x = 0.50), 92nd percentile (x = 0.916), and 98th percentile (x = 0.979), respectively. The value of norm(x) for the annual average, peak month, and peak week conditions is 0.00, 1.38, and 2.04, respectively. The calculated influent flow rate peaking factor for the annual average, peak month, and peak week conditions is 1.00, 1.46, and 1.75, respectively.

In Figure 2A.1, although the deviation of the log-normal distribution from the historical data at the upper and lower ends of the distribution is noticeable, it is not significant. In fact, this is to be expected for flow data, which exhibit a higher degree of variability than the load values shown in Figures 2A.2 and 2A.3. Specifically, for sewer flows, the amount of water entering the sewer collection system includes not only wastewater, but also inflow and infiltration (I/I), and in years with high amounts of precipitation, the I/I will contribute more water to the sewer collection system. Conversely in drought years, very little I/I will make its way to the sewer collection system and subsequently to the WRP.

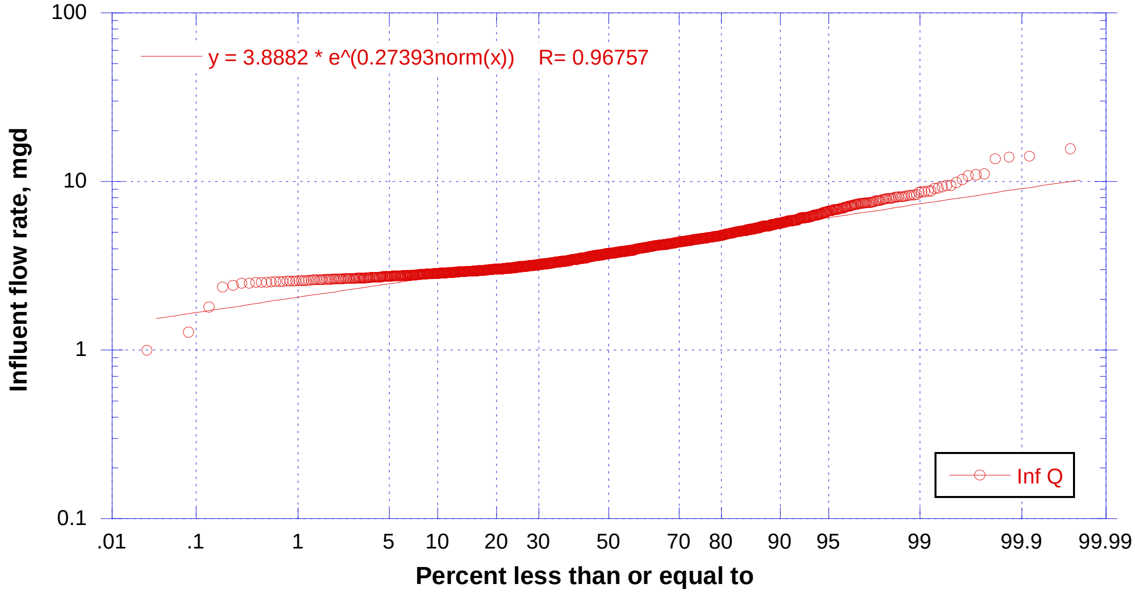

Figure 2A.1 Influent Flow Rate Cumulative Probability Distribution, WY 2014 - WY 2018

Historical daily average influent TSS, COD, and BOD loads are represented by the data points in Figure 2A.2. The slope of each distribution is greater than that of the daily average influent flow rate, which indicates higher peaking factors. The slope of best-fit log-normal distribution for the influent TSS load is 0.367. The calculated daily average influent TSS load peaking factor for the annual average, peak month, and peak week conditions is 1.00, 1.66, and 2.11, respectively.

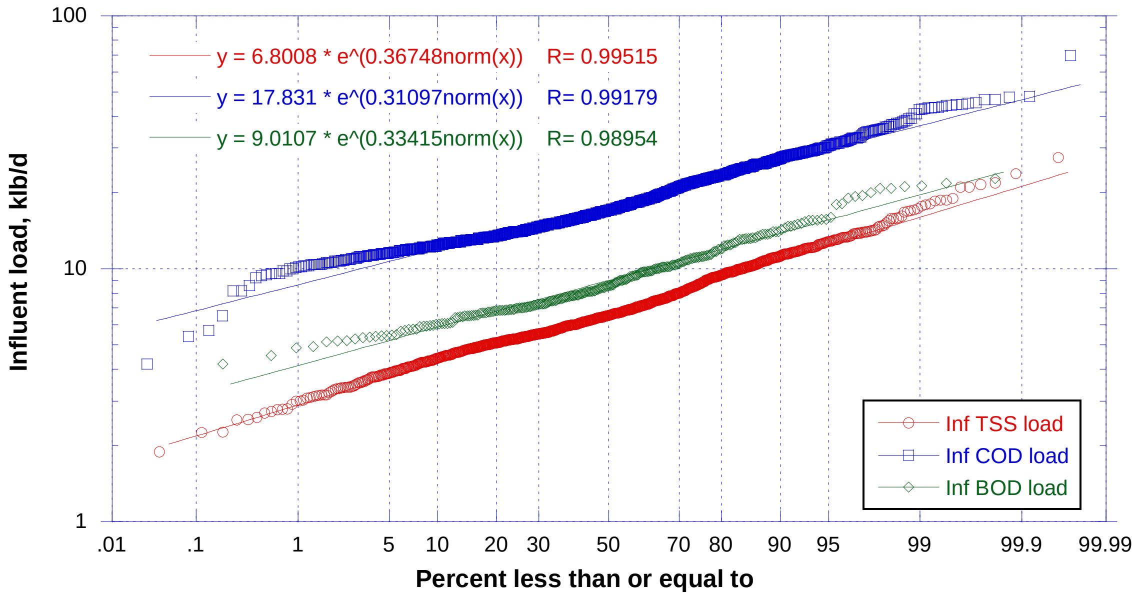

Figure 2A.2 Influent TSS, COD, and BOD Load Cumulative Probability Distribution, WY 2014 - WY 2018

The slope of best-fit log-normal distribution for the influent COD load is 0.311. The calculated daily average influent COD load peaking factor for the annual average, peak month, and peak week conditions is 1.00, 1.54, and 1.88, respectively.

The slope of best-fit log-normal distribution for the influent BOD load is 0.334. The calculated daily average influent BOD load peaking factor for the annual average, peak month, and peak week conditions is 1.00, 1.59, and 1.97, respectively.

Historical daily average influent TKN and TP load are represented by the data points in Figure 2A.3. The slope of best-fit log-normal distribution for the influent TKN load is 0.310. The calculated daily average influent TKN load peaking factor for the annual average, peak month, and peak week conditions is 1.00, 1.53, and 1.88, respectively.

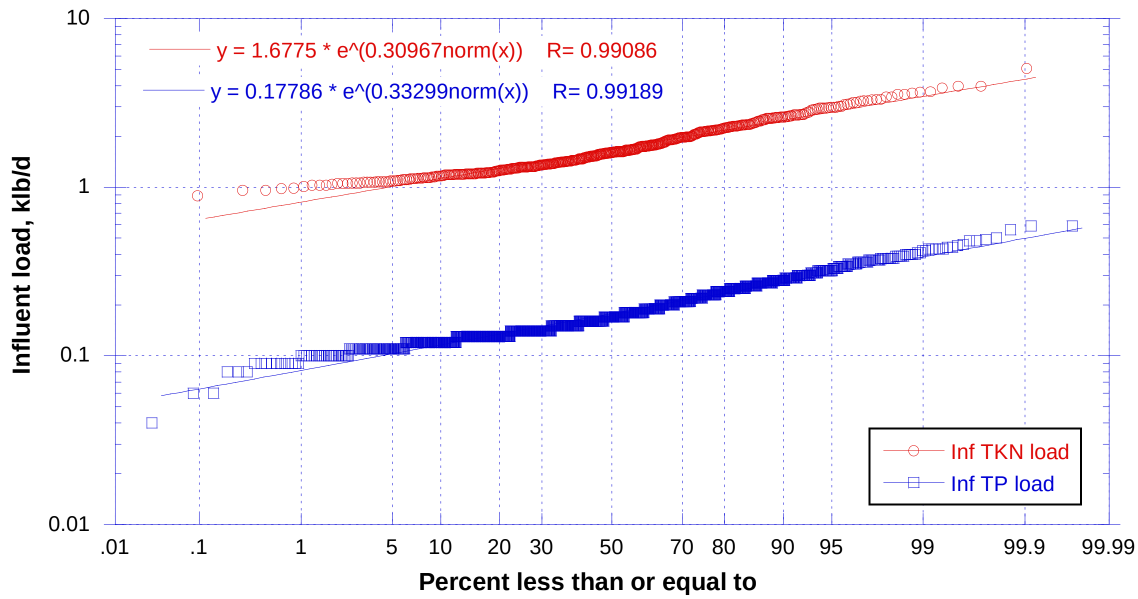

Figure 2A.3 Influent TKN and TP Load Cumulative Probability Distribution, WY 2014 - WY 2018

The slope of best-fit log-normal distribution for the influent TP load is 0.333. The calculated daily average influent TP load peaking factor for the annual average, peak month, and peak week conditions is 1.00, 1.58, and 1.97, respectively.

The peaking factors for flow rate, TSS load, COD load, BOD load, TKN load and TP load are summarized in Table 2A.1.

Table 2A.1 Peaking Factor Summary

Condition	P(i)	Z(i)	Peaking Factor					
			Flow Rate	TSS Load	COD Load	BOD Load	TKN Load	TP Load
Base wastewater	0.2454	-0.6891	0.83	0.78	0.81	0.79	0.81	0.79
Annual average	0.5000	0.0000	1.00	1.00	1.00	1.00	1.00	1.00
Peak month	0.9162	1.3797	1.46	1.66	1.54	1.59	1.53	1.58
Peak 14-day	0.9600	1.7502	1.62	1.90	1.72	1.79	1.72	1.79
Peak week	0.9791	2.0360	1.75	2.11	1.88	1.97	1.88	1.97
Peak day	0.9956	2.6159	2.05	2.62	2.26	2.40	2.25	2.39

Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 3:
WATER RECLAMATION PLANT MASTER PLAN
CHAPTER 3:
CONDITION ASSESSMENT

FINAL | February 2022

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Chapter 3

CONDITION ASSESSMENT

This chapter provides a summary of the condition assessment of the Tahoe-Truckee Sanitation Agency's (T-TSA/Agency's) Water Reclamation Plant (WRP).

The purpose of the condition assessment was to evaluate the main components of the WRP in order to develop a capital improvement program (CIP) for the 25-year planning period. The recommendations from the condition assessment will be combined with other recommendations to develop a CIP that encompasses the projects to repair and replace aging facilities, as well as increase system capacity to accommodate anticipated growth and mitigate risk of failure to meet WDR reporting requirements.

The main objectives of the condition assessment included:

1. Review the Agency's asset inventory to develop a list of condition assessment targets within the WRP.
2. Facilitate pre-assessment workshops to gather input from plant operations and maintenance staff about issues and other priority areas.
3. Conduct 3 days of visual assessments alongside T-TSA staff with a team of structural, mechanical, and electrical engineers to assess the WRP.
4. Develop recommendations for rehabilitation and repair activities and costs based on the visual assessment and discussions with Agency staff. Cost estimates for the recommendations will be developed and incorporated into the overall 25-year CIP.

This chapter includes an overview of the WRP and its main process areas, a description of the assessment method, summary of the findings for each process area, and recommendations for improvement projects.

3.1 Facility Overview

The WRP treatment facilities and processes are described in detail in Chapter 1 of this report volume, including a treatment process flow diagram. The oldest parts of the WRP date back to 1975 when the plant was first constructed. A number of plant facilities remain from the original construction nearly 45 years ago. The following list of major plant upgrades and expansions have occurred since the plant was built:

- 1981 – Regional Water Reclamation Plant Expansion.
- 1988 – Water Reclamation Plant Improvements.
- 1990 – Phosphorus Stripper & Maintenance Facility.
- 1995 – Chlorine Building and Headworks Building Additions.
- 2003 – Expansion of Water Reclamation Plant.

Figure 3.1 is a site plan of the existing WRP, which illustrates how the plant has expanded over the decades. Table 3.1 lists the areas of the plant and the general year of construction. Individual components within these areas may have been replaced or upgraded since originally installed. This list also includes the areas of the plant included in the assessment.

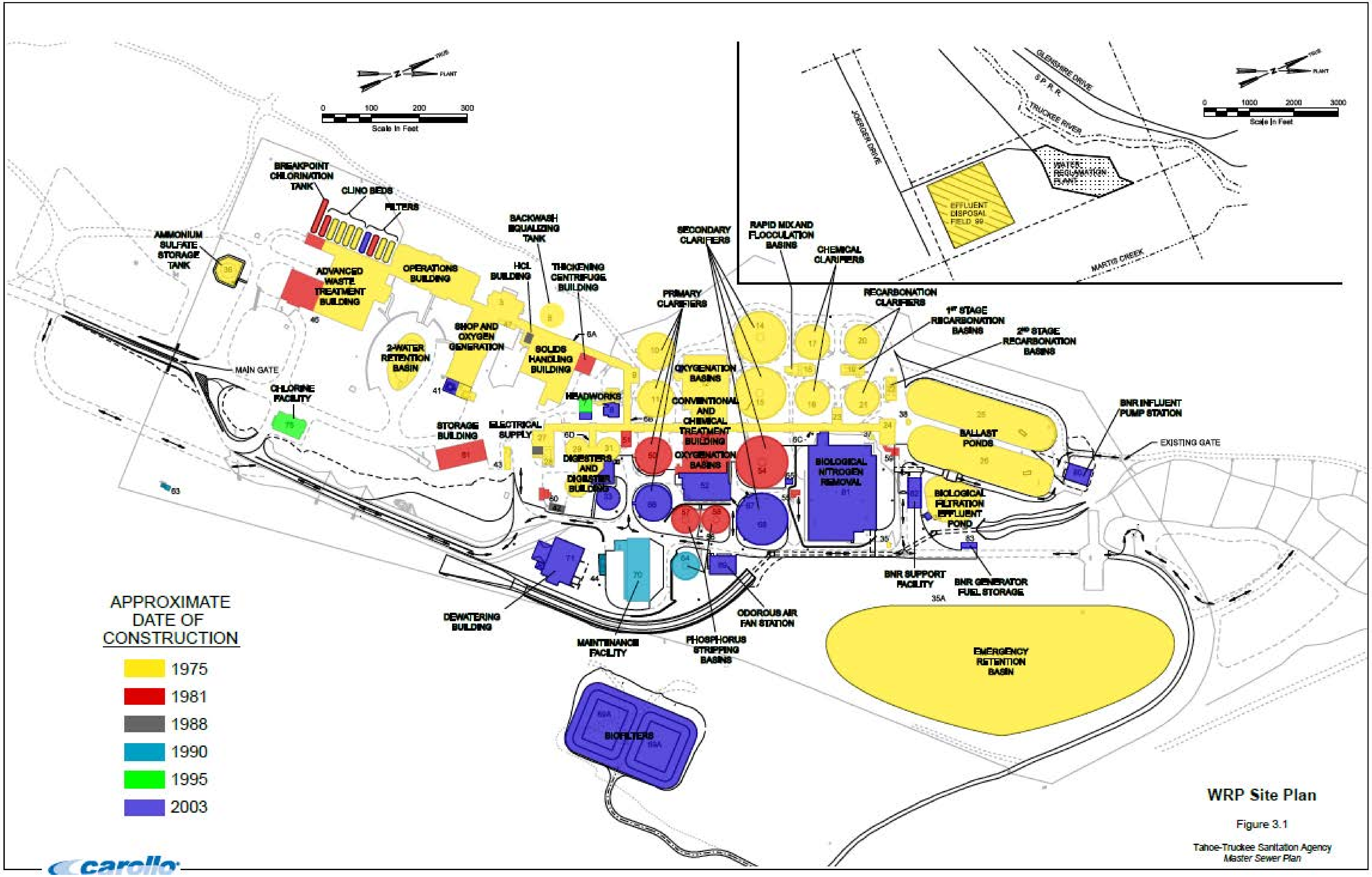

Figure 3.1 WRP Site Plan

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Table 3.1 WRP Process Area List

Process Areas(2)	Facility/Area (Area Number)	Construction Year(s)(1)
Preliminary Treatment and Influent	• Headworks (7) • Grit Chambers (8)	• 1975, 1995, 2003 • 1975, 2003
Primary Treatment	• Primary Clarifiers (10, 11, 50, 66) • Primary Sludge Pump Station (9, 51)	• 1975, 1981, 2003 • 1975, 1981
Secondary Treatment	• Oxygenation Basins (12, 52) • Return Activated Sludge (RAS) and Waste Activated Sludge (WAS) Systems (13, 53) • Secondary Clarifiers (14, 15, 54, 68) • Secondary Effluent Distribution Box (55DB) • Secondary Effluent Valve Vault (55VV)	• 1975, 1981, 2003 • 1975, 1981 • 1975, 1981, 2003 • 1981, 2003 • 2003
Phosphorus Removal and Recarbonation	• Rapid Mix and Flocculation Basin (16) • Chemical Clarifiers (17, 18) • Recarbonation Basin and Clarifiers (19-22) • Chemical Sludge Pump Station (23) • Phosphorus Stripping Basins (56-58, 64)	• 1975 • 1975 • 1975 • 1975 • 1981, 1990
Flow Equalization	• Ballast Ponds (25, 26, 38) • Biological Filtration Effluent Pond (34) • Emergency Retention Basin (35, 35A)	• 1975 • 1975 • 1975
Biological Nitrogen Removal (BNR)	• BNR Influent Pump Station (80) • BNR Facility (81) • BNR Support Facility (82)	• 2003 • 2003 • 2003
Filtration	• Multipurpose Pump Station (24) • Filters (2) • Backwash Water Tank (5)	• 1975 • 1975, 1981, 2003 • 1975
Disinfection	• Chlorine Contact Pipeline • Breakpoint Chlorination Tank (2) • Chlorine Facility (75)	• 1975 • 1981 • 1995
Ammonia Recovery System	• Ammonia Removal and Recovery Process (ARRP) Towers (2) • Regenerant Clarifiers (2) • Regenerant Basins (2) • Ion Exchange/Clino (2) • Filtrate Stripping System (2) • Ammonium Sulfate Storage Tank (36)	• 1975, 1981 • 1975 • 1975 • 1975, 1981 • 1981 • 1975
Solids Handling	• Solids Handling Building (4) • Digesters (29, 30, 31, 33) • Digester Control Building (32) • Dewatering Building (71)	• 1975, 1981 • 1975, 2003 • 1975, 2003 • 2003
Odorous Air Treatment	• Odorous Air Fan Station (69) • Biofilters (69A)	• 2003 • 2003
Plant Building	• Operations Building (1) • Shop Building (3) • Maintenance Facility (70) • Storage Building (61) • Corridors (6)	• 1975, 1995 • 1975 • 1990 • 1981 • 1975

Process Areas[2]	Facility/Area (Area Number)	Construction Year(s)[1]
Site Pump Stations (PS)	• 2-Water System (48) • Plant Waste PS (37) • Gasoline PS (44) • Dewatering PS (59)	• 1975 • 1975 • 1975 • 1981
Chemical Storage	• Liquid Oxygen (LOX) (41) • Carbon Dioxide (43) • Engine Generator Fuel Storage (83) • Diesel Fuel, Boilers, Generators (42) • Diesel Fuel, Vehicles (45) • Gasoline (44) • Sulfuric Acid (2) • Sodium Hydroxide (2) • Sodium Chloride (2) • Alum (2) • Soda Ash (2) • Hydrochloric Acid (4) • Ferric Chloride (4) • Hydrated Lime (4) • Polymer (71) • Methanol (82)	• 1975, 2003 • 1975 • 2003 • 1988 • -- • 1990 • 1975 • 1975 • 1975 • 1975 • 1975 • 1988 • 1975 • 1975, 2003 • 2003 • 2003
Electrical System	• Electrical Supply Building (27) • Electrical Substation (28) • Generators • Communications/Supervisory Control and Data Acquisition (SCADA) Network	• 1975 • 1975 • 1975, 1981, 2003 • 2003

Notes:
(1) Year represents general year of area construction, installation, or overhaul based on review of record drawings and input from staff.
(2) Not all areas listed were visually inspected.

3.2 Condition Assessment Methodology

The intent of the visual condition assessment is to identify and prioritize repair and replacement needs for aging facilities and mitigate potential risks of failure. The assessment is based on observations from the assessment team, input from T-TSA staff, and a review of equipment data. Results from the assessment will be incorporated into the overall CIP.

The visual condition assessment was conducted on April 21, 2019 through April 23, 2019. The assessment was conducted by Carollo Engineers, Inc.'s (Carollo) condition assessment lead David Baranowski, and discipline engineers Richard Gutierrez (Mechanical), Kiko Antunovich (Structural), Daniel Robinson (Electrical), and Coral Taylor (Process). The assessment team was accompanied by T-TSA staff Jay Parker, Richard Pallante, Michael Peak, Greg O'Hair, Paul Shouse, and Bob Gray.

Prior to the assessment, the Carollo team held a pre-assessment meeting with T-TSA staff. The pre-assessment workshop was to review plant facilities, develop a target list of priorities, and review and gather data and input from plant operations and maintenance staff prior to going into the field. The Carollo team asked questions about each process area related to known issues, condition or operational concerns, underperforming equipment, past failures, and potential improvements.

The assessment team used a condition scoring system to rate the plant areas and equipment. The scoring system is intended to standardize the assessment process across various disciplines. Table 3.2 lists the general definitions used to score the plant.

Table 3.2 Condition Scoring System

Condition Score	Basic Description	Recommended Action	Estimated Remaining Life
1 (Excellent)	New or almost new equipment in excellent condition. Fully functional as designed with no visible defects or wear.	Requires only normal preventative maintenance	> 75% of useful life remaining
2 (Good)	Fully functional for current operating conditions, shows signs of only minor wear. May have been very recently overhauled or rebuilt.	Normal preventative maintenance & Needs minor corrective maintenance	~ 50% (30%-75%) of useful life remaining
3 (Fair)	Normal or slightly excessive wear but functionally sound.	Needs significant corrective maintenance	~ 30% of useful life remaining
4 (Poor)	Functions but only with a high degree of maintenance. Does not function as needed for current operating conditions. Near the end of its design life.	Requires major rehabilitation	10% or less of useful life remaining
5 (Very Poor)	Asset has failed or will likely fail imminently. Virtually unserviceable.	Fails to perform at or near its design capacity and no replacement parts are available	No useful life remaining or requires immediate replacement/ rehabilitation

Notes:
(1) Assessed item receives the score that corresponded to the most appropriate description from any of the columns.

In addition, each member of the assessment team was given a list of assets (equipment or structures) for them to assess. This list was created based on a review of T-TSA's equipment list provided prior to the assessment. Field forms were also developed for each assessment member to use in the field. Copies of the form templates and asset lists are included in Appendix 3A.

3.3 Findings and Observations

The findings and observations from the visual condition assessment are organized by process areas and/or facilities. A summary table is provided in each process area within TM03. This table generalizes the condition of all the assets in that area. Additional details and findings to support the findings follow the table.

Due to the large number of individual pieces of equipment, scores are not reported for each item. Instead, a generalized score for the various equipment classes was developed. Individual items in poor condition requiring replacement are noted specifically in the findings.

This chapter serves to summarize the findings and recommendations from TM03. Further details can be found in TM03.

The general overall condition scores for each process area are outlined below in Table 3.3.

Table 3.3 Process Equipment Condition Summary

Process Area	Structural Equipment Condition	Mechanical Equipment Condition	Electrical Equipment Condition
Headworks	3	4	n/a
Grit Chambers	4	3-5	n/a
Primary Clarifiers	4	4	n/a
Primary Sludge PS	4	4	4
Oxygenation Basins (1-4)	4	3	4
Oxygenation Basins (5-8)	2	2	4
RAS/WAS PS	4	3	3
Secondary Clarifiers	3	4	n/a
Rapid Mix & Flocculation	4	4	n/a
Chemical Clarifiers	2	3	n/a
Recarbonation	4	4	n/a
Phosphorous Stripping Basins	2	4	n/a
Flow Equalization	3	2	n/a
BNR	2	2	3
Multipurpose Pump Station (MPPS)	2	4	4
Filters	3	3	n/a
Disinfection	3	3	4
Advanced Waste Treatment (AWT)	4	4	4
Solids Handling	4	4	4
Digestion	3	4	4
Dewatering	1	3	3
Odorous Air	2	2	4

3.4 Recommendations and Conclusions

The recommended improvement projects and activities are summarized in Table 3.4. The recommendations are grouped by major process area and consider the observations from related areas and equipment. These recommendations are based only on the observed condition of the equipment and do not consider the regulatory or process evaluations being conducted in parallel as part of this project. Costs for these improvements will be developed once they are combined with the recommendations from the other evaluations in Chapter 7 of this report volume.

Each improvement recommendation was given an estimated timing. The recommended improvement timing is based on the experience and judgement of the assessment team and input from T-TSA staff. In general, improvements are grouped into three timing categories:

- 0-5 years: Near-term projects to address equipment past, or quickly nearing, the end of expected life or repairs needed to prevent a major failure. This also includes projects related to potential safety operational hazards.
- 6-10 years: Mid-term project to address equipment approaching the end of expected life within the next 10 years.
- 11-25 years: Long-term project to address potential issues within the planning period, preventative measures such coatings, or improvements to the plant's operations.

These improvements and their timing are preliminary. The final recommendations and timing will be determined once the results of the condition assessment are combined with the results from other evaluations of this project, e.g., SCADA and IT Master Plan.

Table 3.4 Recommended Improvement Projects and Timing

Process Area	Timing	Improvement Recommendation
Preliminary Treatment and Influent	0-5 Years	• Grit chamber hydraulic computational fluid dynamics (CFD) analysis to address short circuiting. • Grit chamber gate condition inspections. • Inspect condition of headworks influent gates.
	6-10 Years	• Grit chamber concrete repairs (internal and external) with structural mortar and epoxy inject cracks. • Replace/remove deflector vanes and improve grit chamber hydraulics (based on CFD analysis). • Replace grit chamber gates. • Recoat grit chamber mechanisms. • Alternatively consider redesign of the grit process with more efficient grit removal equipment.
Primary Treatment	0-5 Years	• Clarifier roof connection concrete repairs. Repair existing damage, slope tops of walls, apply chemical/biological resistant coating to interior surfaces. • Address dome ventilation issues. • Inspect domes. Repair dome leaks (if found). • Repair wall of Clarifier 3 with exposed rebar. • Potential replacement of sludge pump motor to address National Fire Protection Association (NFPA) 820 concerns as determined by future compliance study. • Repair water intrusion damage to CMU wall(s) of primary pump station. Investigate solutions such as installing gutters. • Replace conduits and lighting. • Recoat Clarifier No.1 Mechanism.
	6-10 Years	• Replace Clarifier mechanism drive units 1, 2, and 3 • Recoat mechanisms for Clarifier 4.
	11-25 Years	• Replace primary sludge pumps, valves, and piping. • Replace scum pumps (except Clarifier 4).

Process Area	Timing	Improvement Recommendation
Secondary Treatment	0-5 Years	• Repair oxygenation basin concrete around handrail posts and other areas with freeze/thaw spalling. • Repair water intrusion damage to CMU walls of Conventional & Chemical Treatment (C&CT) building. Investigate solutions such as installing gutters. • Replace lower explosive limit (LEL) equipment in Control Panel (CP)-13 and CP-53. • Replace programmable logic controllers (PLCs) in CP-13 and CP-53.
	6-10 Years	• Recoat mixer motors and frames. • Repair influent splitter box mixed liquor inlet area and replace with grated covers. • Repair and resurface oxygenation basin 1-4 roof deck. Add deck drains and slope the surface. • Repair concrete in secondary effluent distribution box. • Recoat Clarifier mechanism 1 and 2 and replace drives. • Repair cracks in all clarifier walls with structural mortar and epoxy injection. • Coat exposed galvanized conduit to prevent further corrosion on oxygenation basins. • Replace motor control centers (MCCs) 13-1, 13-2, 53-1, 53-2, and variable frequency drives (VFDs) in 53. • Replace all PLCs at the C&CT building. Replace Facility 13 RAS VFD panels.
	11-25 Years	• Replace pump room 53 mechanical equipment due to age and replace piping to fix operational issues. • Replace pump room 13 mechanical equipment due to age. • Replace WAS pumps due to capacity deficiencies. • Replace Facility 53 VFD panels.
Phosphorus Removal and Recarbonation	0-5 Years	• Rehabilitate entire Rapid Mix and Flocculation Basin. Replace non-functioning rapid mix gates. Repair and resurface concrete. Repair concrete cracks. • Replace elutrient pipes. • Repair concrete at stair connection to Chemical Clarifier 1. • First stage basin concrete repair. • Repair concrete walls and replace bottom grouting of recarbonation clarifiers. • Repair water intrusion damage to CMU wall of chemical sludge pump station. • Repair second stage recarbonation basin guardrail. • Rehabilitate Phosphorous Stripping Basins. Repair concrete damage. Repair and recoat all sludge collector mechanisms and drives.
	6-10 Years	• Repair concrete in second stage recarbonation basin. • Replace coarse bubble diffusers in second stage recarbonation basin. • First stage basin concrete repair and gate replacement.
	11-25 Years	• Replace all mixers and flocculators.

Process Area	Timing	Improvement Recommendation
Flow Equalization	11-25 Years	• Line offsite emergency storage ponds. • Install water cannons for ballast ponds. • Construct BFE sump and install pump. • Resurface ballast ponds.
Biological Nitrogen Removal (BNR)	0-5 Years	• Address blower performance issues. Conduct analysis for replacement of equipment. Replace blower equipment. • Replace PLCs 80-A, 81-A, B, and C. • Rehabilitate pilot facility.
	6-10 Years	• Structural retrofit to increase access opening size for backwash tank. Replenish BNR beads. • Repair cracks in structure interior gallery walls with epoxy injection. • Replace PLC CP-82D.
	11-25 Years	• Influent Pump Rehabilitation. • Replace MCCs 80-1,2, and 3. • Replace MCCs 81-1, 81-2, 81-3, and 81-4.
Filtration	0-5 Years	• Inspect interior of filter tanks. • Inspect condition of pipeline interior from MPPS to filters. • Inspect the condition of the MPPS wet well.
	6-10 Years	• Rehabilitate Filter Tanks. • Add backwash initiation automation to filter controls. • Install secondary power feed to MPPS. • Replace MPPS electrical cabinet and control panel. • Recoat backwash equalization (EQ) tank.
	11-25 Years	• Install redundant pipeline between MPPS and filters. • Replace MPPS pumps and address corrosion of pump manifold in utility tunnel. Replace isolation valves.
Disinfection	0-5 Years	• Install permanent flow meter on chlorine contact pipeline. • Inspect chlorine contact pipeline • Replace chlorine scrubber
	6-10 Years	• Replace chlorine building roof.
	11-25 Years	• Chlorine facility replacement, depending on selected disinfection alternative. • Replace MCC 75. • Replace PLC (CP75C).
Ammonia Recovery System	0-5 Years	• Inspect filtrate clarifier (centrate equalization) tank and stripper tower feed tank in near future and recoat interior. • Replace PLC CP2A. • Replace control panel CP2C, CP2G, and related DC drives (if Clino system is kept).
	6-10 Years	• AWT building repairs (roof, beam corrosion, water intrusion, floor erosion). • Demolish abandoned/unused AWT equipment (exact equipment to be determined in Master Sewer Plan, Vol. 3, Ch. 6 performance evaluation). • Replace MCCs 2-1 and 2-2.
	11-25 Years	• Replace PLC CP2F.

Process Area	Timing	Improvement Recommendation
Solids Handling	0-5 Years	• Replace old digester boilers and heat exchangers. (May require replacing control building). • Replace VFDs 04630 and 04656. • Replace Dewatering VFDs (71152/511/512), harmonic filters (AHF71-1/2) and filter press feed pump VFDs (AFD-04512/14, and Digester 33 chopper pump VFD. • Replace PLCs CP71A, B, and C, Solids Buildings PLC CP4, and Digester 32 PLCs (CP-32A-01, CP-32C). • Flare improvements.
	6-10 Years	• Replace filter press. • Rebuild Centrisys thickening centrifuge. • Remove or replace the Sharples centrifuge pending outcome of performance analysis. • Rebuild dewatering centrifuge. • Digester insulation. • Replace TWAS pumps. • Replace MCCs 4, 4-1, and 4-2, and PLC CP-4. • Replace TWAS VFDs and AFDs which are obsolete. • Replace equipment in Thickener Room that does not meet area classification.
	11-25 Years	• Recoat thickener tank sludge collectors. • Replace thickening centrifuges. • Remove polymer tanks from Thickening Centrifuge Room. • Replace MCCs 71-1, -2, and -3. • Replace digester mixing pumps. • Replace thickening centrifuge controls.
Odorous Air	6-10 Years	• Replace PLC CP69A and AFDs 69010 and 69020.
	11-25 Years	• Replace MCC 69. • Rehabilitate fans. • Replace biofilter media.

Process Area	Timing	Improvement Recommendation
General Plan Facilities	0-5 Years	• Replace "2-water" (2W) system. Replace and relocate electrical panel in retention basin vault. • Replace and relocate switchboard (SWBD) / Panel / Transformer 1A. Replace admin communication closet network equipment (SCADA, human machine interface (HMI) servers, switches, panels). • Conduct space planning study to look into future admin, operations, and maintenance needs for expansion. • Repair or replace storage building/warehouse standing seam metal roof. • Replace steam lines in utility tunnel to prevent further corrosion of other piping and appurtenances. • Inspect LOX tank and carbon dioxide storage tank interior condition for corrosion and recoat if necessary. • Site pump station inspections and rehabilitations. (Inspect site pump station wet wells. Recoat as needed. Replace pumps and rails. Replace corroded hatches.) • Upgrade Vehicle Maintenance Facility 70HVAC system. • Conduct plant-wide NFPA 820 analysis study.
	6-10 Years	• Replace Dewatering (Drain Sump) Pump Station. • Address corrosion of structural supports in utility tunnel. • Asphalt sealing (every 3-4 years). • Replace knife switch at Facility 28. • Demolish PSA system in conjunction with AWT demo. • Replace failed Generator 1 (Cummins) and generator control panel CP-27E. • Install seamless power transfer for Generator 3. • Plant-wide upgrades of equipment and ventilation systems based on NFPA 820 analysis results
	11-25 Years	• Replace 12 kV transformer in Facility 28. • Replace MMC-3 and 3A. • Asphalt sealing (every 3-4 years).

Appendix 3A

CONDITION ASSESSMENT TECHNICAL MEMORANDUM 03 (TM-03)

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

Technical Memorandum 3
WATER RECLAMATION PLANT CONDITION ASSESSMENT

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

Technical Memorandum 3
WATER RECLAMATION PLANT CONDITION ASSESSMENT

FINAL | February 2022

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Contents

Appendices

Tables

Figures

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Abbreviations

ARRP	Ammonia Removal and Recovery Process
AWT	Advanced Wastewater Treatment
BFE	biological filtration effluent
BNR	biological nitrogen removal
C&CT	Conventional and Chemical Treatment
Carollo	Carollo Engineers, Inc.
CFD	computational fluid dynamics
CIP	Capital Improvement Program
CIPP	cured-in-place pipe
clino	clinoptilolite
CMU	concrete masonry unit
ERB	Emergency Retention Basin
FRP	fiberglass reinforced plastic
hp	horsepower
LEL	lower explosive limit
LOX	liquid oxygen
MCC	motor control center
MPPS	Multipurpose Pump Station
O&M	operation and maintenance
PLC	programmable logic controller
PSA	pressure swing absorption
RAS	return activated sludge
SRT	solids retention time
SU	stripper underflow
T-TSA	Tahoe-Truckee Sanitation Agency
TM	technical memorandum
VFD	variable frequency drive
WAS	waste activated sludge
WRP	Water Reclamation Plant

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Technical Memorandum 3

WATER RECLAMATION PLANT CONDITION ASSESSMENT

This technical memorandum (TM) covers the condition assessment of the Tahoe-Truckee Sanitation Agency (T-TSA) Water Reclamation Plant (WRP). The condition assessment evaluated the main components of the WRP in order to develop a Capital Improvement Program (CIP) for the 25-year planning period.

The main objectives of the condition assessment included:

1. Review the Agency's asset inventory to develop a list of condition assessment targets within the WRP.
2. Facilitate a pre-assessment workshop to gather input from plant operations and maintenance (O&M) staff about issues and other priority areas.
3. Conduct three days of visual assessments alongside T-TSA staff with a team of structural, mechanical, and electrical engineers to assess the WRP.
4. Develop recommendations for rehabilitation and repair activities and costs based on the visual assessment and discussions with Agency staff. Cost estimates for the recommendations will be developed and incorporated into the overall 25-year CIP.

This TM includes an overview of the WRP and its main process areas, a description of the assessment method, summary of the findings for each process area, and recommendations for improvement projects. A summarized version of this TM will be included as a chapter of the Water Reclamation Plant Master Plan report.

3.1 Facility Overview

The WRP treatment facilities and processes are described in detail in Chapter 1 of this report volume, including a treatment process flow diagram. The oldest parts of the WRP date back to 1975 when the plant was first constructed. A number of plant facilities remain from the original construction nearly 45 years ago. The following list of major plant upgrades and expansions have occurred since the plant was built:

- 1981 - Regional Water Reclamation Plant Expansion.
- 1988 - Water Reclamation Plant Improvements.
- 1990 - Phosphorus Stripper and Maintenance Facility.
- 1995 - Chlorine Building and Headworks Building Additions.
- 2003 - Expansion of Water Reclamation Plant.

Figure 3.1 is a site plan of the existing WRP, which illustrates how the plant has expanded over the decades. Table 3.1 lists the areas of the plant and the general year of construction. Individual components within these areas may have been replaced or upgraded since originally installed. This list also includes the areas of the plant included in the assessment.

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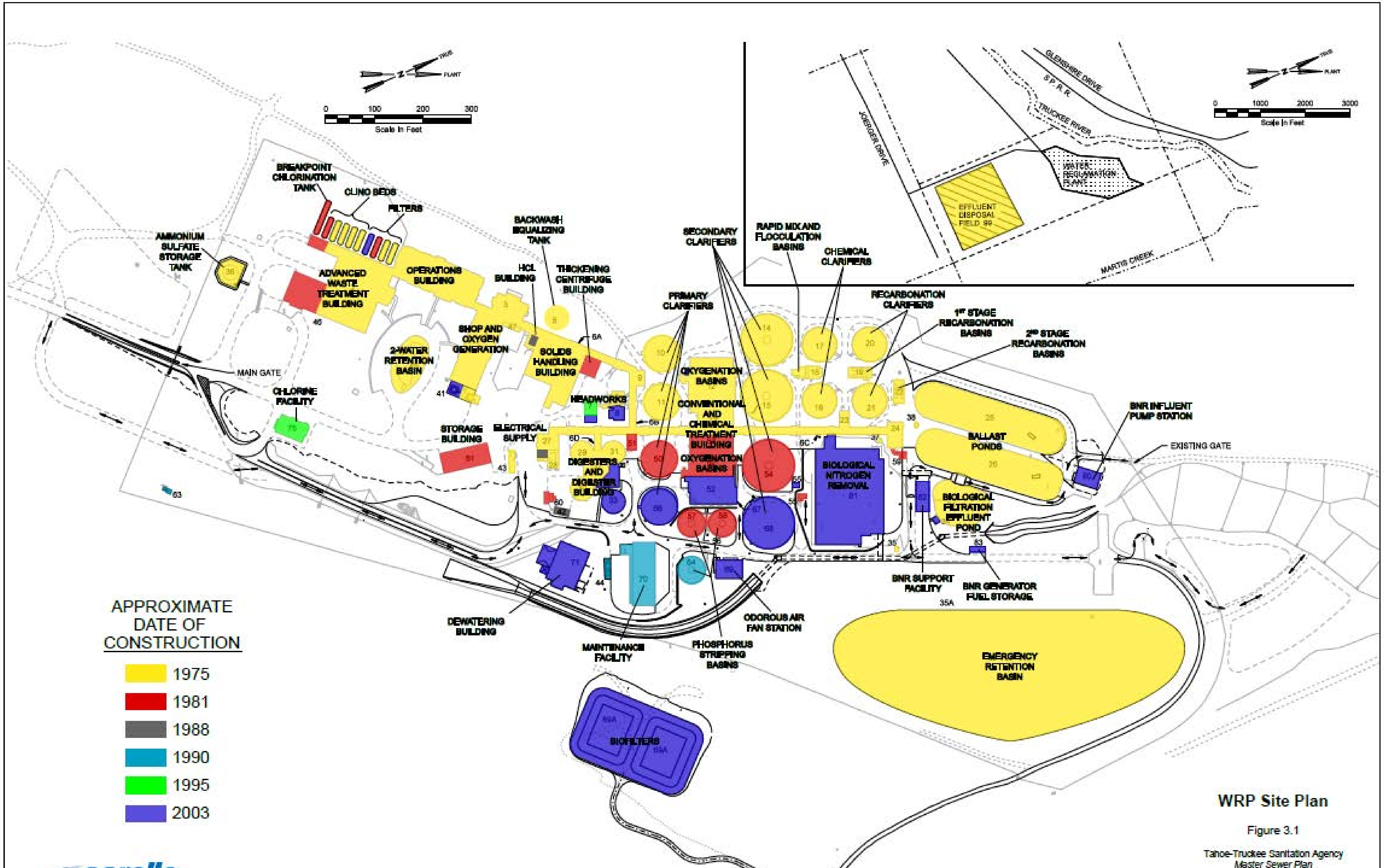

Figure 3.1 WRP Site Plan

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Table 3.1 WRP Process Area List

Process Areas	Facility/Area (Area Number)	Construction Year(s)
Preliminary Treatment and Influent	• Headworks (7) • Grit Chambers (8)	• 1975, 1995, 2003 • 1975, 2003
Primary Treatment	• Primary Clarifiers (10, 11, 50, 66) • Primary Sludge Pump Station (9, 51)	• 1975, 1981, 2003 • 1975,1981
Secondary Treatment	• Oxygenation Basins (12, 52) • RAS and WAS Systems (13, 53) • Secondary Clarifiers (14, 15, 54, 68) • Secondary Effluent Distribution Box (55DB) • Secondary Effluent Valve Vault (55VV)	• 1975, 1981, 2003 • 1975, 1981 • 1975, 1981, 2003 • 1981, 2003 • 2003
Phosphorus Removal and Recarbonation	• Rapid Mix and Flocculation Basin (16) • Chemical Clarifiers (17, 18) • Recarbonation Basin and Clarifiers (19-22) • Chemical Sludge Pump Station (23) • Phosphorus Stripping Basins (56-58, 64)	• 1975 • 1975 • 1975 • 1975 • 1981, 1990
Flow Equalization	• Ballast Ponds (25, 26, 38) • Biological Filtration Effluent Pond (34) • Emergency Retention Basin (35, 35A)	• 1975 • 1975 • 1975
Biological Nitrogen Removal (BNR)	• BNR Influent Pump Station (80) • BNR Facility (81) • BNR Support Facility (82)	• 2003 • 2003 • 2003
Filtration	• Multipurpose Pump Station (24) • Filters (2) • Backwash Water Tank (5)	• 1975 • 1975, 1981, 2003 • 1975
Disinfection	• Chlorine Contact Pipeline • Breakpoint Chlorination Tank (2) • Chlorine Facility (75)	• 1975 • 1981 • 1995
Ammonia Recovery System	• ARRP Towers (2) • Regenerant Clarifiers (2) • Regenerant Basins (2) • Ion Exchange/Clino (2) • Filtrate Stripping System (2) • Ammonium Sulfate Storage Tank (36)	• 1975, 1981 • 1975 • 1975 • 1975, 1981 • 1981 • 1975
Solids Handling	• Solids Handling Building (4) • Digesters (29, 30, 31, 33) • Digester Control Building (32) • Dewatering Building (71)	• 1975, 1981 • 1975, 2003 • 1975, 2003 • 2003
Odorous Air Treatment	• Odorous Air Fan Station (69) • Biofilters (69A)	• 2003 • 2003
Plant Building	• Operations Building (1) • Shop Building (3) • Maintenance Facility (70) • Storage Building (61) • Corridors (6)	• 1975, 1995 • 1975 • 1990 • 1981 • 1975

Process Areas	Facility/Area (Area Number)	Construction Year(s)
Site Pump Stations	• 2-Water System (48) • Plant Waste PS (37) • Gasoline PS (44) • Dewatering PS (59)	• 1975 • 1975 • 1975 • 1981
Chemical Storage	• LOX (41) • Carbon Dioxide (43) • Engine Gen Fuel Storage (83) • Diesel Fuel, Boilers, Generators (42) • Diesel Fuel, Vehicles (45) • Gasoline (44) • Sulfuric Acid (2) • Sodium Hydroxide (2) • Sodium Chloride (2) • Alum (2) • Soda Ash (2) • Hydrochloric Acid (4) • Ferric Chloride (4) • Hydrated Lime (4) • Polymer (71) • Methanol (82)	• 1975, 2003 • 1975 • 2003 • 1988 • -- • 1990 • 1975 • 1975 • 1975 • 1975 • 1975 • 1988 • 1975 • 1975, 2003 • 2003 • 2003
Electrical System	• Electrical Supply Building (27) • Electrical Substation (28) • Generators • Comms/SCADA Network	• 1975 • 1975 • 1975, 1981, 2003 • 2003

Notes:
(1) Year represents general year of area construction, installation, or overhaul based on review of record drawings and input from staff.
(2) Not all areas listed were visually inspected.

3.2 Condition Assessment Methodology

The intent of the visual condition assessment is to identify and prioritize repair and replacement needs for aging facilities and mitigate potential risks of failure. The assessment is based on observations from the assessment team, input from T-TSA staff, and a review of equipment data. Results from the assessment will be incorporated into the overall CIP.

The visual condition assessment was conducted on May 21, 2019 through May 23, 2019. The assessment was conducted by Carollo Engineers, Inc.'s (Carollo) condition assessment lead, David Baranowski, and discipline engineers Ricky Gutierrez (mechanical), Kiko Antunovich (structural), Daniel Robinson (electrical and instrumentation), Rashi Gupta (solids), Christine Polo (solids), Tim Loper (process), and Coral Taylor (process). The assessment team was accompanied by T-TSA staff Jay Parker, Richard Pallante, Michael Peak, Greg O'Hair, Paul Shouse, and Bob Gray.

Prior to the assessment, the Carollo team held a pre-assessment meeting with T-TSA staff. The goals of the pre-assessment workshop were to review plant facilities, develop a target list of priorities, and review and gather data and input from plant O&M staff prior to going into the field. The Carollo team asked questions about each process area related to known issues, condition or operational concerns, underperforming equipment, past failures, and potential improvements.

The assessment team used a condition scoring system to rate the plant areas and equipment. The scoring system is intended to standardize the assessment process across various disciplines. Table 3.2 lists the general definitions used to score the plant.

In addition, each member of the assessment team was given a list of assets (equipment or structures) for them to assess. This list was created based on a review of T-TSA's equipment list provided prior to the assessment. Field forms were also developed for each assessment member to use in the field. Copies of the form templates are included in Appendix 3A.

Table 3.2 Condition Scoring System

Condition Score	Basic Description	Recommended Action	Estimated Remaining Life
1 (Excellent)	New or almost new equipment in excellent condition. Fully functional as designed with no visible defects or wear.	Requires only normal preventative maintenance.	> 75% of useful life remaining.
2 (Good)	Fully functional for current operating conditions, shows signs of only minor wear. May have been very recently overhauled or rebuilt.	Normal preventative maintenance & needs minor corrective maintenance.	~ 50% (30%-75%) of useful life remaining.
3 (Fair)	Normal or slightly excessive wear, but functionally sound.	Needs significant corrective maintenance.	~ 30% of useful life remaining.
4 (Poor)	Functions, but only with a high degree of maintenance. Does not function as needed for current operating conditions. Near the end of its design life.	Requires major rehabilitation.	10% or less of useful life remaining.
5 (Very Poor)	Asset has failed or will likely fail imminently. Virtually unserviceable.	Fails to perform at or near its design capacity and no replacement parts are available.	No useful life remaining or requires immediate replacement / rehabilitation.

Notes:
(1) Assessed item receives the score that corresponded to the most appropriate description from any of the columns.

3.3 Findings and Observations

The findings and observations from the visual condition assessment are organized by process areas and/or facilities. A summary table is provided for each process area. This table generalizes the condition of all the assets in that area. Additional details and findings to support the findings follow the table.

Due to the large number of individual pieces of equipment, scores are not reported for each item. Instead a generalized score for the various equipment classes was developed. Individual items in poor condition are noted specifically in the findings.

3.3.1 Headworks

The headworks building (Facility 7) dates back to 1975, but the interior has gone through multiple upgrades since; most recently in 2003. A new project, the 2020 Headworks

Improvements Project, is currently underway to upgrade many elements within the headworks area including new bar screens, screenings washer compactors, and odor control. The findings and observations about this area reflect the current condition, but are cognizant of things that will soon be replaced.

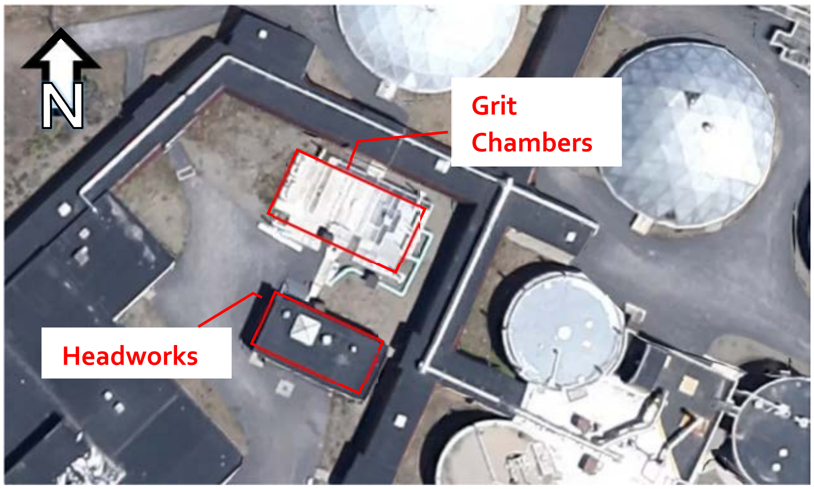


Figure 3.2 Headworks and Grit Chamber Areas Overview

Table 3.3 summarizes the condition findings for this area.

Table 3.3 Headworks Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	3	15-20 years	Condition of influent gates is unknown.
Mechanical	4	5 years	Most equipment approaching the end of useful life, but already planned for replacement.
Electrical/ Instrumentation	n/a	n/a	No electrical equipment in this area.

The following bullets summarize the key findings from the assessment team:

- The current project does not include any improvements to the below-grade structure. The concrete structure contains three gates for diversion of influent, two of which are being replaced as part of the 2020 Headwork Improvements Project. Additionally, the concrete channels will be modified and/or reconstructed as part of the 2020 work and a new Upstream Diversion Structure added. Gates are regularly exercised, and no issues were noted.
- Influent flow equalization is in the current CIP for Phase 4 implementation to allow operations to mitigate high flows and loads into the plant. There are offsite emergency storage basins as well as the Emergency Retention Basin (ERB), but only three of the emergency storage basins (Pond "A", 3, and "B") and the ERB are clay-lined. The remaining basins are unlined.
- The top of the stairs outside the north doorway is cracking. These stairs will be demolished and replaced with a fabricated stairway and landing in the 2020 Headworks Improvements Project.

- Partial replacement of the roof is already planned as part of the 2020 Headworks Improvements Project.
- There is no major electrical equipment in this area.

The following photos were taken during the field assessment.

Spalling Concrete on North Stairs

Grit Classifier

3.3.2 Grit Chambers

The original 1975 construction of the grit chambers (Facility 8) included the west set. The east set were added in 2003 along with additional flow splitting weirs.

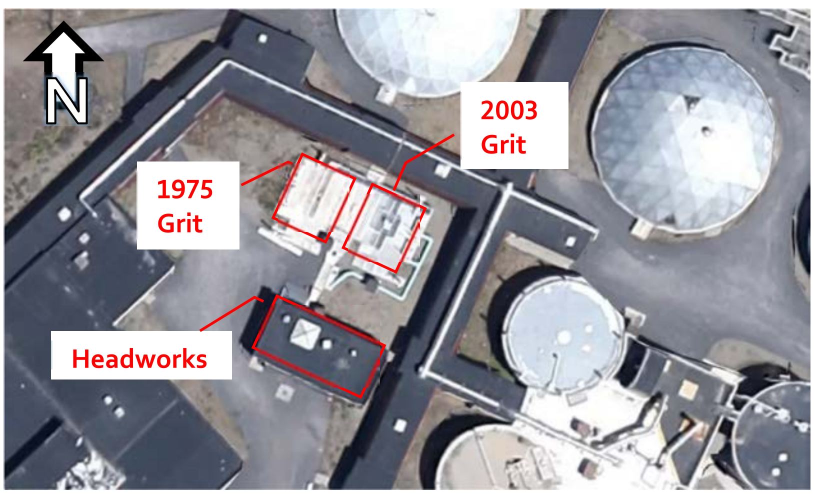


Figure 3.3 Headworks and Grit Chamber Areas Overview

Table 3.4 summarizes the condition findings for this area.

Table 3.4 Grit Chambers Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	4	5 years	1975 concrete structure in need of repair.
Mechanical	3-5	5-15 years	Age varies widely. Older equipment in bad condition. Newer equipment in okay condition.
Electrical/ Instrumentation	n/a	n/a	No electrical equipment in this area.

The following bullets summarize the key findings from the assessment team:

- This facility has an issue settling grit during high flows. Computational fluid dynamics (CFD) modeling of this area can be used to find ways to improve flow distribution and performance during high flows.
- The 1975 mechanical equipment is showing corrosion, especially the flow control deflector vanes (however these vanes are not currently used). The new mechanical components are in fair or good condition. Gates are generally in good shape, flow split gates are newer (2003). The self-driven centrifugal grit pumps were replaced in 2012. The 1975 equipment is all going to need replacement in the next few years.
- Grit classifier is located in the headworks building. It is not being replaced as part of the 2020 Headworks Improvements Project.
- The internal rake arms are in okay condition, according to staff. Upon a follow up condition assessment, it was determined the internal rake arms need to be recoated within the next 5 years.
- Structural issues include concrete spalling on 1975 structure and under the walkway on the north side; concrete cracking at top of tank walls; exposed aggregate on surface of concrete; and spalling and cracking of pipe and equipment concrete pads. These issues can be repaired with structural mortar and epoxy injection.
- Photos taken by T-TSA staff inside the chambers in 2016 show exposed aggregate on the walls, minor concrete delamination, and some corrosion on the gates. Additional inspection is needed to determine the severity of the damage and needed repairs, but it likely will require rehabilitation within the next 10 to 15 years.
- There is no major electrical equipment in this area.

The following pictures were taken during the field assessment.

Corroded 1975 Deflector Vane

2003 Deflector Vanes

Cracking Concrete

Exposed Concrete Aggregate

3.3.3 Primary Clarifiers

The four primary clarifiers were installed between 1975 and 2003: Clarifiers 1 and 2 are original 1975 construction (Facilities 10 and 11), Clarifier 3 was added in 1981 (Facility 50), and Clarifier 4 was added in 2003 (Facility 66). All of the clarifiers are covered with a metal dome. The age of the dome is assumed to match that of the clarifier.

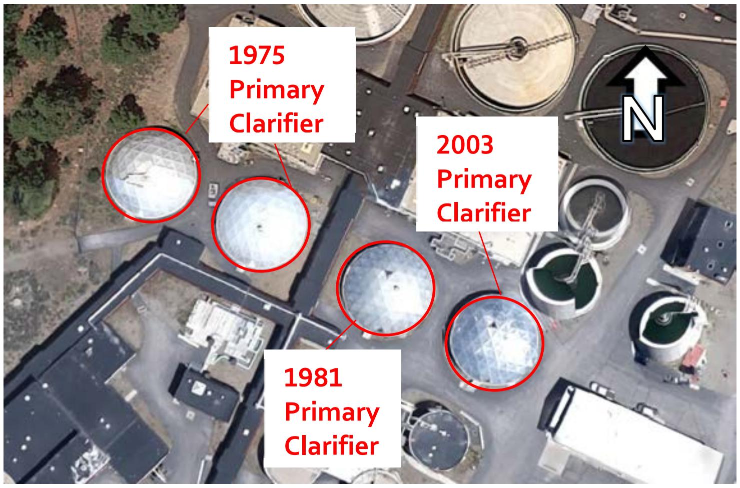


Figure 3.4 Primary Clarifier Overview

Table 3.5 summarizes the condition findings for this area.

Table 3.5 Primary Clarifiers Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	4	3-5 years	Repair concrete around roof connections.
Mechanical	4	6-10 years	Clarifier 4 sludge collector mechanism in poor condition.
Electrical/ Instrumentation	n/a	n/a	No electrical equipment in this area.

The following bullets summarize the key findings from the assessment team:

- The mechanism for Primary Clarifier No.1 was recoated in 2016 and Clarifiers Nos 2 and 3 where recoated in 2018. Primary Clarifier No.4 mechanism has not been recoated since it was installed in 2005. Continuing to recoat the clarifiers on a regular schedule, about every 15 years, is expected to extend the life of the mechanisms.
- Condensation was on the dome interiors of all four clarifiers. We received varying opinions from staff regarding the normalcy of this occurring; some claimed it was frequent, others pointed to the recent snow event and rain during the assessment. The domes are ventilated by a fan in the center of dome. All fans were operating during the assessment. The condensation is presumed to be the cause of the erosion of the concrete where the dome connections sit atop the building wall. Perform a follow-up ventilation study to determine what changes, if any, are necessary to reduce the condensation.
- Primary Clarifier 1
  - The concrete around the roof connections at top of clarifier wall is starting to erode. Biological growth was found at many of the roof connections, likely caused by condensation that collects at these locations.
  - Drive and mechanism are original, but in fair condition. Mechanism will likely need recoating within 10 years. Localized areas of corrosion had been painted over. Consider replacing drive due to age.

- Primary Clarifier 2
  - The concrete around the roof connections at top of clarifier wall is starting to erode. Biological growth was found at many of the roof connections, likely caused by condensation that collects at these locations.
  - Drive and mechanism are original, but in fair condition. Mechanism will likely need recoating within 15 years. Consider replacing drive due to age.
  - Dripping was observed from the dome roof that was believed to be leaking. The location of the potential leaks couldn't be found because of condensation on the dome.
- Primary Clarifier 3
  - The concrete around the roof connections at top of clarifier wall is starting to erode. Biological growth was found at many of the roof connections, likely caused by condensation that collects at these locations.
  - Rebar is visible next to an opening in the exterior wall, under the roof connection. See the photo below.
  - Mechanism will likely need recoating within 15 years.
- Primary Clarifier 4
  - The sludge collector mechanism, especially the drive, is significantly corroded. The entire drive, mechanism, and bridge needs to be recoated in near future. According to staff, recoating is already planned.
  - Concrete around roof connections at top of clarifier concrete showing signs that they will eventually start eroding. It is not as advanced as the other three clarifiers.
- The sludge and scum pumps are assumed to be the same age as clarifiers. The pumps for Clarifiers 1, 2, and 3 are nearing or past their expected life. The pumps will likely need replacement in the not too distant future.
- The lighting and conduits in the clarifiers are in poor condition. Safety rules have made it difficult to make repairs. Replacement of all corroded conduits and lights is recommended based on condition.

The following pictures were taken during the field assessment.

Concrete Cracking and Biological Growth at Roof Connection (Internal)

Concrete Cracking and Moisture at Roof Connection (External)

Exposed Rebar in Clarifier 3

Clarifier No.4 Mechanism Drive

3.3.4 Primary Sludge Pump Stations

The plant has two pump stations for primary sludge. Facility 9 was built in 1975 and serves Clarifiers 1 and 2. Facility 51 was built in 1981 and serves Clarifiers 3 and 4. Both stations are located inside buildings adjacent to the clarifiers.

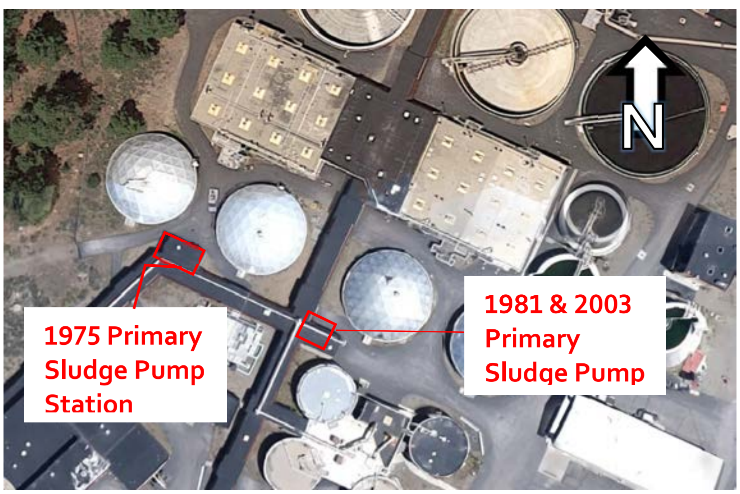


Figure 3.5 Primary Sludge Pump Station Overview

Table 3.6 summarizes the condition findings for this area.

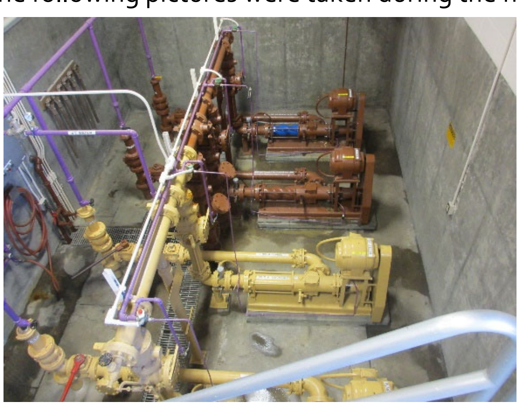
Table 3.6 Primary Sludge Pump Station Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	4	15-25 years	Water intrusion damage on CMU wall.
Mechanical	4	10 years	Nearing end of expected life. Still operational.
Electrical/ Instrumentation	4	5 years	Reached end of expected life. Still operational.

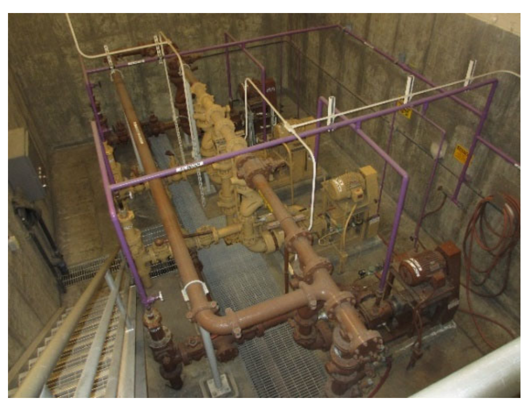
The following bullets summarize the key findings from the assessment team:

- Facility 9 houses four progressing cavity pumps (Moyno). The pumps, valves, piping, and pump controls are original 1975 construction. The pumps appear to be in good condition and no operational or maintenance issues were noted. Consider replacing in the midterm due to age.
- Facility 51 was built in 1981, but the pumps were installed in two stages: half in 1981 (two pumps) and the other half in 2003 (two pumps). The pump control panel is from 1981 and is nearing the end of its expected life.
- Facility 51 houses a condensate receiving tank below the stairs, which supports the heating systems for the buildings at the plant. The tank was installed in the early 1990s by plant staff. The system causes the room to be hot and moist. The tank is located here because it is a low point in the system. The condition of the tank interior is unknown. The insulation on the pipes is deteriorated and portions of the pipes are severely corroded.
- The paint of Facility 51 is bubbling on one masonry wall. We believe the cause of the moisture issue is due to water intrusion from the wall exterior from poor roof drainage. This issue was also observed in other locations around the plant. An investigation is needed into the root cause and proper remedy, such as installing gutters to direct roof drainage way from the walls.
- The electrical gear in these facilities may not be properly classified per current NFPA 820 standards. A more detailed investigation of the building ventilation system is needed as part of a separate NFPA 820 analysis to determine what type of classification these areas need and what other safety concerns may need to be addressed.

The following pictures were taken during the field assessment.



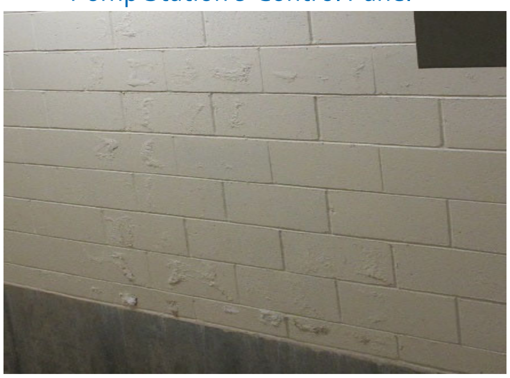
Pump Station 9 Equipment



Pump Station 51 Equipment

Pump Station 9 Control Panel

Condensate Tank



Peeling Paint on CMU Wall

Corroded Pipe Under Insulation

3.3.5 Oxygenation Basins

The two oxygenation structures consist of four basins each. The west basin (Facility 12) was part of the original 1975 construction and included Basins 1 to 4. The east basin (Facility 52) was built in two stages: Basins 5 and 6 in 1981 and Basins 7 and 8 in 2003.

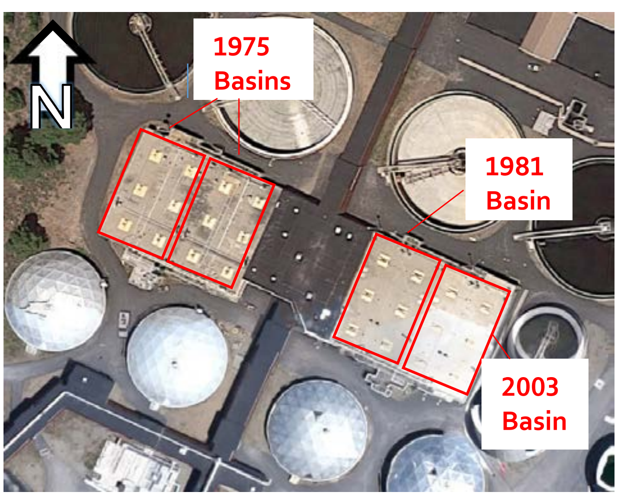


Figure 3.6 Oxygenation Basin Overview

Table 3.7 summarizes the condition findings for this area.

Table 3.7 Oxygenation Basins 1-4 Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	4	5 years	Concrete repairs needed in many areas.
Mechanical	3	10 years	Mixers are old, but can be rebuilt. Need paint.
Electrical/ Instrumentation	4	1-2 years	LEL equipment is obsolete.

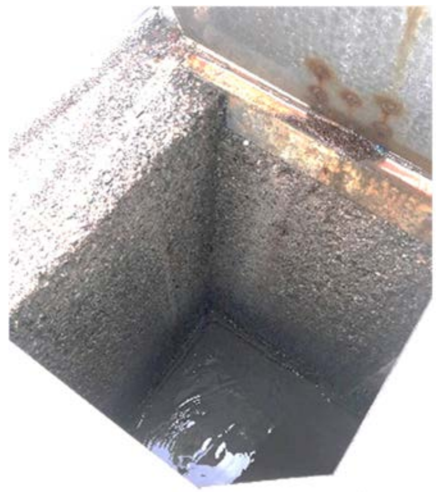
The following bullets summarize the key findings from the assessment team:

- Basins 1 through 4:
  - The roof deck has large areas of concrete delamination and aggregate showing. The deck is not sloped and does not have drains, which allows water to pool. The deck can get icy and slick, which is a safety hazard, but walkways have been added to address this issue. Repair the concrete and add deck drains similar to Facility 52.
  - Concrete spalling around edges of structure, exterior walls, and around guard posts due to freezing and thawing. The guardrails are not properly anchored, which is a safety concern. This cracking is mostly superficial and is not affecting the structural integrity of the main structure.
  - Gates are operational and in good condition. Most of the exposed piping was recently recoated. Rust is visible on exposed conduits and brackets. Coating of exposed galvanized conduit will prevent further corrosion.
  - Twelve mixers are original to the structure, some are 7.5 horsepower (hp) and some are 15 hp units. Components have been replaced over the years, but the mixers are largely original. Most mixers have peeling paint and some minor corrosion on the motors and frames. Mixer drives all work well according to T-TSA, and they are expected to be maintained well into the future without needing complete replacement. Per a recent internal inspection by T-TSA, no corrosion was visible on stainless steel mixer blades.
  - The lower explosive limit (LEL) equipment is obsolete and should be replaced as soon as possible. The cabinets and auxiliary equipment require excess maintenance and due to their obsolescence should be included in the 2021/22 plan.
  - Based on a review of photos taken inside the structure by T-TSA (photos dated 2016 and 2017):
    - Basin 1 has minor concrete wear to overflow weir, caulking peeling off in three locations.
    - Basin 2 has some cracking occurring throughout, caulking peeling off around bolts. The observed steel was in fair condition.
    - Basin 3 has a crack in the ceiling that was sealed. There appear to be some wall cracks and some minor spalling around the columns that warrant a closer inspection. In areas around the weirs, there is some exposed aggregate. The observed steel was in fair condition.

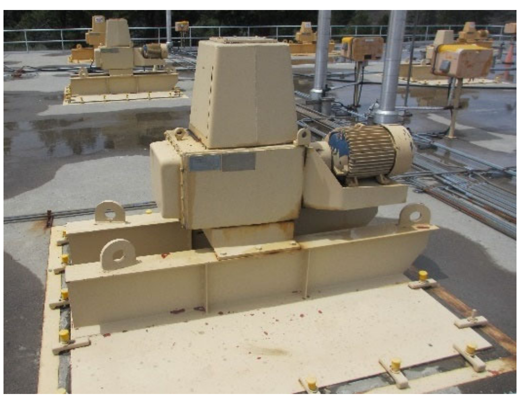
- Influent splitter box
  - Flow splitting weirs were added in 2003 to fix flow distribution issues. Weirs are in fair condition based on what was observed.
  - The corner of the box where mixed liquor enters has exposed aggregate. It is assumed that hydrogen sulfide gas is building up below the solid metal covers. The same area on the other structure (Facility 52) has open grate covers and does not have exposed aggregate.
  - Based on a review of photos taken inside the structure by T-TSA, the concrete appears to be in good condition. Steel supports for the gates appear to have some corrosion. The photos were not dated.

The following pictures were taken during the field assessment.

Influent Splitter Box Area



RAS Inlet Corner of Splitter Box



Mixer Motor and Frame

Surface Cracking on Roof Deck

Exterior Wall Surface Delamination

Cracking at Corners

Table 3.8 summarizes the condition findings for this area.

Table 3.8 Oxygenation Basins 5-8 Condition Summary

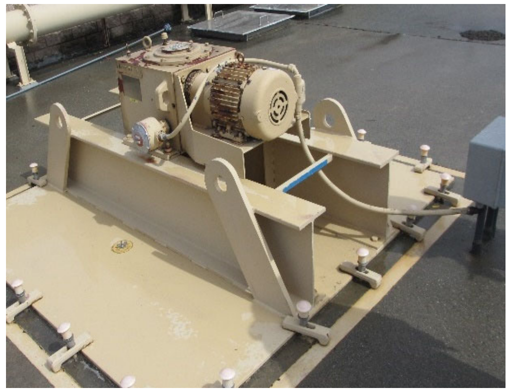
Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	2	25 years	---
Mechanical	2	15 years	In need of paint.
Electrical/ Instrumentation	4	1-2 years	LEL equipment is obsolete.

The following bullets summarize the key findings from the assessment team:

- Basins 5 through 8
  - These basins were installed in 1981 and expanded in 2003. This structure does not exhibit the same cracking and spalling issues as the other oxygenation basin structure. Minor cracking of grout was observed in a few areas. The epoxy in the construction joints is deteriorating and weeds are growing in some of the joints.
  - The shared wall between this basin and the Conventional & Chemical Treatment (C&CT) building shows signs of leaking. This is covered under the C&CT section.
  - The mixed liquor influent has grated covers and a submersible mixer which is not used. Concrete condition looks good.
  - The LEL equipment is obsolete and should be replaced as soon as possible. Additionally, the cabinets and auxiliary equipment require excess maintenance and due to their obsolescence should be included in the 2021/22 plan.
  - Some mixers have peeling paint and some minor corrosion on the motors and frames, similar to the other structure. Recoating of equipment is needed in the near term.
  - Based on a review of photos taken inside the structure by T-TSA:
    - Influent channel concrete appears to be in good condition. Photos were not dated.

- Basin 5 concrete has exposed aggregate around columns and minor spalling around hatches. Observed steel appeared in good condition. Photos from 1997.
- Basin 6 had some exposed aggregate on the walls. Photographed steel appeared in good condition. Photos from 1997.
- Basin 7 and 8 concrete and steel appeared in good condition. Photos not dated.

Growth in Construction Joints



Mixer Motor and Frame

3.3.6 RAS/WAS Pumping (C&CT Building)

The C&CT building is located between the two oxygenation basin structures. The building has two sides, separated by a plant corridor. Facility 13 is adjacent to Oxygenation Basins 1 through 4 and was constructed in 1975. Facility 53 is adjacent to Oxygenation Basins 5 through 8 and was constructed in 1981, with modifications made in 2003 when Basins 7 and 8 were added.

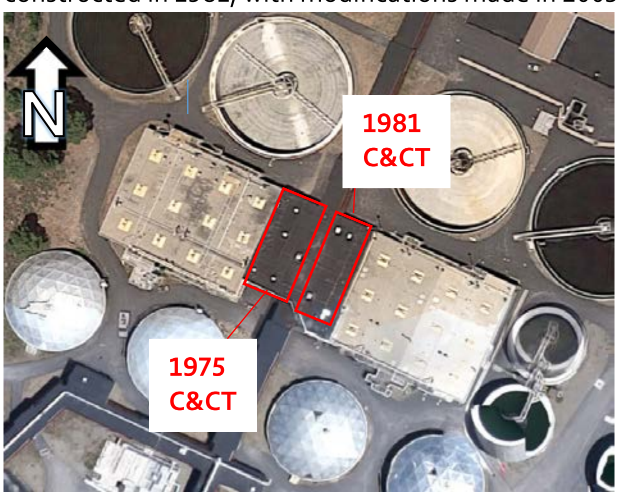


Figure 3.7 RAS/WAS Pump Station Area Overview

Table 3.9 summarizes the condition findings for this area.

Table 3.9 RAS/WAS Pump Station Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	4	5-10 years	Repair damage from and prevent future water intrusion in CMU walls.
Mechanical	3	10-20 years	No major issues noted.
Electrical/ Instrumentation	3	10 years	Replace all programmable logic controllers (PLCs) at the C&CT building. Replace Facility 13 RAS VFD panels.

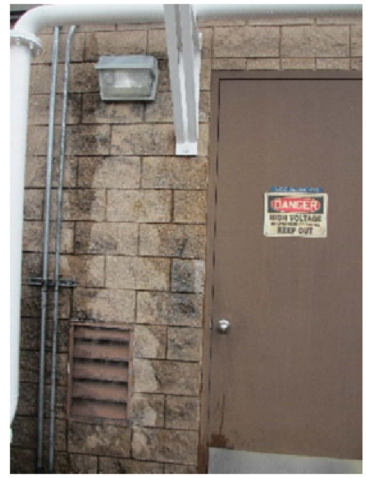
The following bullets summarize the key findings from the assessment team:

- The motor control center (MCC) room located in the southwest corner of the C&CT building is adjacent to Oxygenation Basin 4. The southern wall of the building has water intrusion through the concrete masonry unit (CMU) wall, similar to other CMU buildings at the plant.
- The eastern wall of the C&CT building is shared with Oxygenation Basin 5. The basin wall is concrete, but the portion of the building that extends above the basin is CMU. The CMU portion has water intrusion that can be seen from Pump Room 53.
- Staff noted that the roof of the building leaks; however the roof was subsequently repaired in fall 2019.
- Pump Room 53 equipment:
  - All equipment is from 1981 installation. Pumps are in good condition with no issues noted.
  - Items found to be in fair condition, but likely need to be replaced within the 25-year planning period including the purge blower, small diffuser aeration blower, Gorman Rupp WAS pump, Moyno PD drain pump, submersible scum pumps (2003 install), elutrient pumps, and RAS pump.
  - Stripper underflow (SU) pumps are original, but have been rebuilt since 1975. Staff noted an issue with these pumps maintaining prime due to knife gate isolation valves which are non-bonneted and not right for the application. There is insufficient room in the building and piping configuration to replace with plug valves. Adding a smaller 3-inch bypass with a flowmeter to the discharge piping may fix flow control issues noted with these pumps.
- Pump Room 13 equipment:
  - Equipment in the room is similar to what is in Pump Room 53. The equipment is in fair condition, but original 1975 construction.
  - WAS pumps are in good condition. The pump capacity was noted to be deficient to meet desired solids retention time (SRT). Cleaning WAS lines helped the problem. Consider upsizing the pumps when they are replaced.

- The following observations were made about the electrical and instrumentation equipment in this area:
  - MCCs 13-1 and 13-2 are located in a room with water intrusion. These MCCs are from 1976 and in need of rehabilitation to address corrosion of equipment and enclosure. Replacement of these is not expected for another 10 years.
  - MCCs 53-1 and 53-2 are from 1981 and 2003. Both are in fair condition and replacement of these is not expected for 10 years.
  - Control Panels 13A, B, C, and D were installed in 1976 and their PLCs were replaced in 2009 (2003 for CP-13D). All units are in fair condition and replacement is not expected for another 10 years, with the exception of the LEL equipment in CP-13D. The LEL equipment is obsolete and should be replaced soon.
  - Control Panels 53A, B, C, and D are from 1981 and in poor condition. Issues with corrosion of the equipment and enclosure were observed. The LEL equipment is obsolete and should be replaced soon. The PLCs are expected to last 5 to 10 years. The variable frequency drive (VFD) controls for the RAS pumps in Facility 13 were just replaced. There is a potential safety concern since the panels are not appropriately rated for the area classification, therefore they should be replaced in the near future. T-TSA plans to conduct a plant-wide study related to NFPA 820 standards compliance.
  - The VFDs in Facility 53 are from 2007 and have no noted issues. However, it is likely that this equipment will need to be replaced within the 25-year planning period as it will have reached the end of its useful life.
  - The building lighting is not energy efficient. Upgrade to LEDs during next major equipment overhaul.

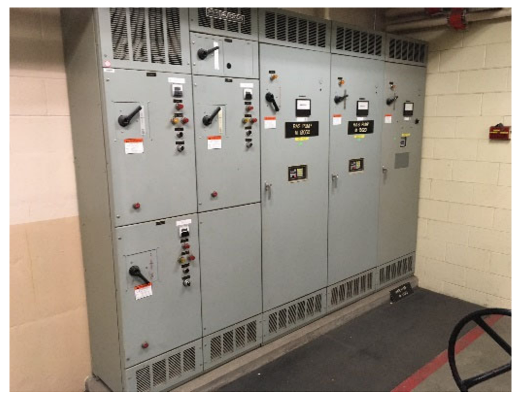
The following pictures were taken during the field assessment.

Leaking Wall in Pump Room (53)



Leaking Wall of MCC Room (13)

Control Panel 13D



Facility 13 RAS Pump VFDs

3.3.7 Secondary Clarifiers

The four secondary clarifiers were installed between 1975 and 2003. Clarifiers 1 (Facility 14) and 2 (Facility 15) were original 1975 construction, Clarifier 3 (Facility 54) was added in 1981, and Clarifier 4 (Facility 68) was added in 2003 (construction finished and brought online in 2006).

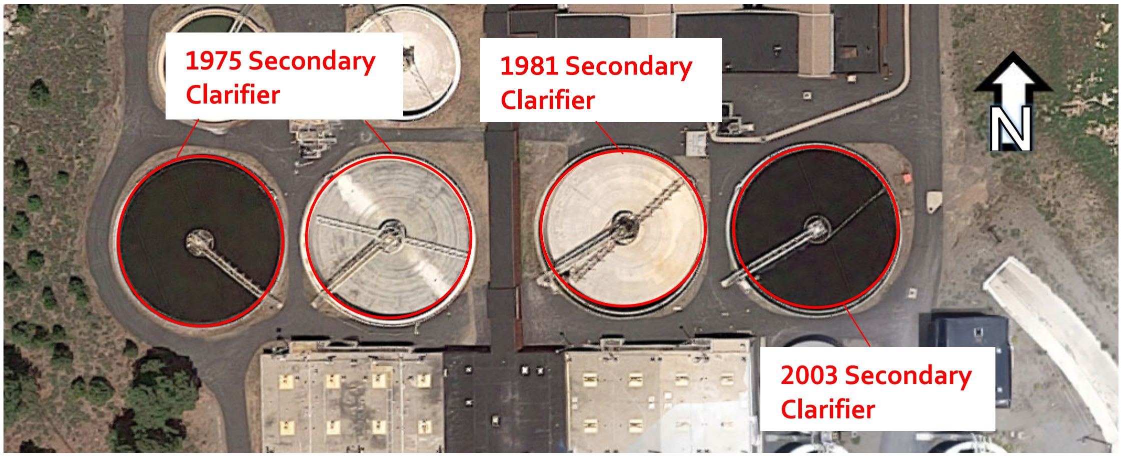


Figure 3.8 Secondary Clarifiers Overview

Table 3.10 summarizes the condition findings for this area.

Table 3.10 Secondary Clarifiers Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	3	25 years	Concrete repairs needed to address cracking and spalling.
Mechanical	4	5 years	Mechanism 1, 2, and 3 in need of recoating. Drives for Clarifiers 1 and 2 need replacement.
Electrical/ Instrumentation	n/a	n/a	No electrical in this area.

The following bullets summarize the key findings from the assessment team:

- Clarifiers 1 and 2 are in fair condition. Some concrete spalling and cracking was observed on the wall of Clarifier 1. Clarifier 2 had damage to its exterior concrete launder wall that has since been repaired. The mechanism drives are original and have been refurbished over the years but they will likely need replacement in the near future due to their age. Some corrosion is visible on mechanisms that can be addressed by recoating. Neither clarifier has scum removal. T-TSA coated Clarifier 2 in summer 2021 and is planning on coating Clarifier 1 in 2022.
- Clarifier 3 had an issue with the rake arm but it now appears to have been corrected. The mechanism has large areas of visible corrosion including the drive unit and rake arm. Issues with sealing at the bottom of the clarifier mechanism were noted by staff. There are also significant areas of exposed aggregate in the secondary clarifier internal walls. A project was completed in 2020 to rehabilitate this clarifier.
- Clarifier 4 is the newest clarifier. Some cracking was observed on exterior walls, which seems premature for the structure’s age. Mechanism and drive are in good condition.

- The secondary effluent distribution box (Facility 55DB) was constructed in 1981 and the secondary effluent valve vault (55VV) and control valves were added in 2003. They include weirs, valving, and bypass gates for bypass to ERB and chemical treatment. The concrete surface is rough inside the splitter box with exposed aggregate at and below the weir level. The concrete inside the valve vault was in good condition. The mechanical equipment was noted to be functioning well.

The following pictures were taken during the field assessment.

Clarifier 1 Wall Cracks

Clarifier 2 Wall Damage

Clarifier 3 Drive

Clarifier 4 Wall Cracks

Effluent Splitter Box Concrete Aggregate

Effluent Valve Vault

3.3.8 Rapid Mix and Flocculation Basin

The rapid mix and flocculation basin (Facility 16) was part of the original 1975 construction as part of the phosphorus removal system. The structure was repurposed in 1981 with the addition of phosphorus strippers.

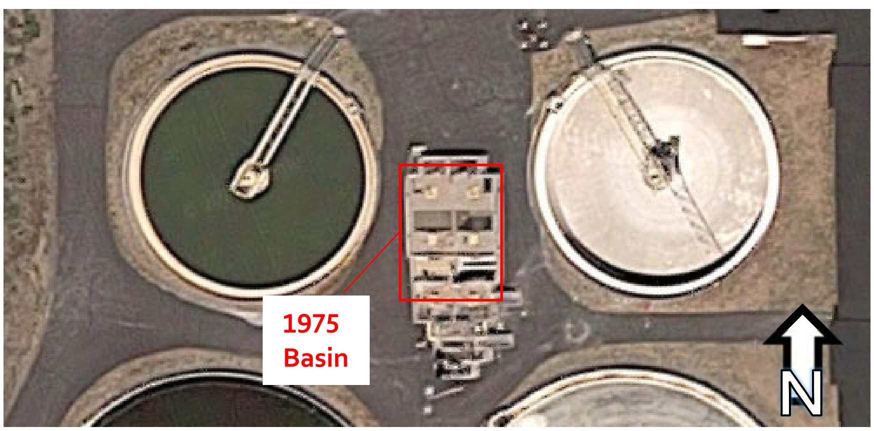


Figure 3.9 Rapid Mix and Flocculation Overview

Table 3.11 summarizes the condition findings for this area.

Table 3.11 Rapid Mix and Flocculation Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	4	0-5 years	Poor concrete condition and handrail connections.
Mechanical	4	0-5 years	Some gates are non-functioning. All items corroded.
Electrical/ Instrumentation	n/a		No major electrical in this area.

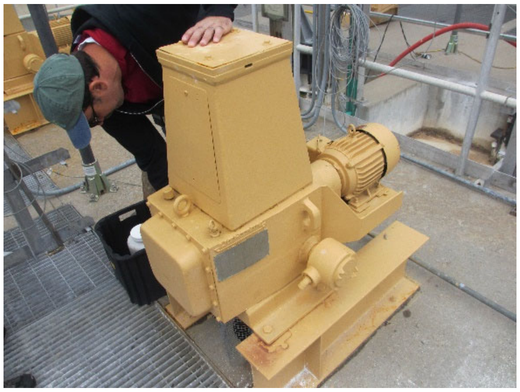
The following bullets summarize the key findings from the assessment team:

- Major spalling, cracking and holes were observed on the interior and exterior concrete. Visible aggregate on surfaces. There is potential for rebar to be corroded due to the amount of missing material. The worst areas are in the splitter box area where chemicals are added, but the issues exist throughout the entire basin. Significant rehabilitation of this structure is needed.
- Corrosion at bolts and connections of handrail posts, some bolts exposed and not anchored. This poses a safety risk.
- The sluice and slide gates are corroded, some severely. Some are no longer functional, according to staff. Many of the gates in this area need to be completely replaced.
- There are two mixers in the rapid mix basin which are both from 1975. One mixer rocks/wobbles as it operates and has broken part of its baseplate. It is believed that the high amount of solids in the basin attach to the mixer blade, causing it to become unbalanced. Staff replaced the blades with plastic versions, which has helped the lime fall off better.
- Flocculation basins are also from 1975 and include four flocculators in two basins. These flocculators are in fair condition.

The following pictures were taken during the field assessment.

Sluice Gate

Cracking in Exterior Wall



Rocking Rapid Mix Mixer

Concrete Wall Damage

3.3.9 Chemical Clarifiers

The two chemical clarifiers (Facilities 17 and 18) were constructed in the original 1975 plant construction.

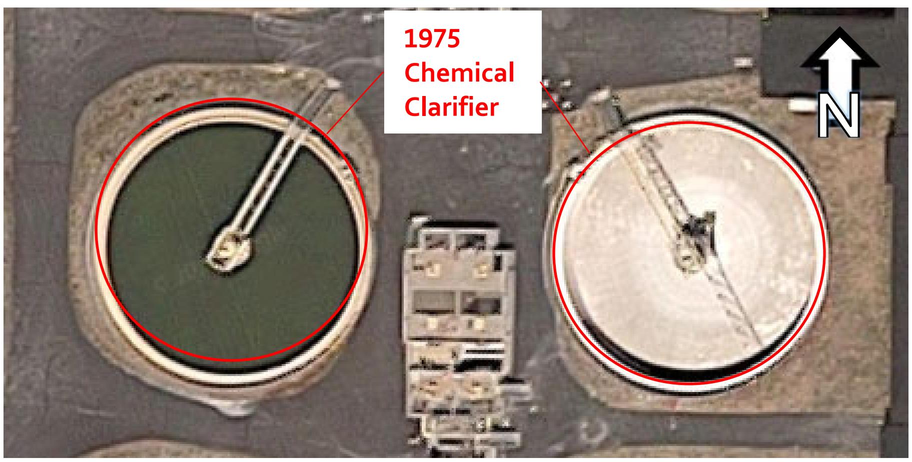


Figure 3.10 Chemical Clarifier Overview

Table 3.12 summarizes the condition findings for this area.

Table 3.12 Chemical Clarifier Condition Summary

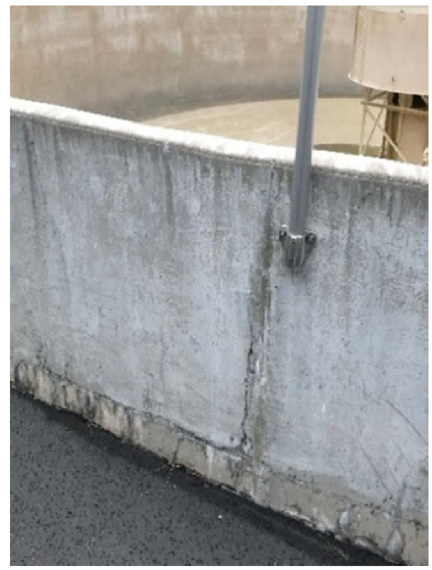
Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	2	11-25 years	Concrete issues at stair connection to Clarifier 1.
Mechanical	3	15 years	Recently recoated.
Electrical/ Instrumentation	n/a	n/a	No major electrical in this area.

The following bullets summarize the key findings from the assessment team:

- Mechanisms have been recoated within the past 2 years. The suction lines were relined as well using cured-in-place pipe (CIPP).
- Floors have recently been re-grouted.
- Minor spalling and cracking observed around the concrete tank walls.
- The concrete is cracked and spalled at the connection of the stairs to Chemical Clarifier 1.

The following pictures were taken during the field assessment.

Spalling at Stair Connection



Concrete Cracking of Tank Wall

3.3.10 Recarbonation Basins (First and Second Stage) and Clarifiers

The recarbonation system was part of the original 1975 construction. This area includes the first stage basin (Facility 19), two clarifiers (Facilities 20 and 21), the second stage basin (Facility 22), and the chemical sludge pump station (Facility 23).

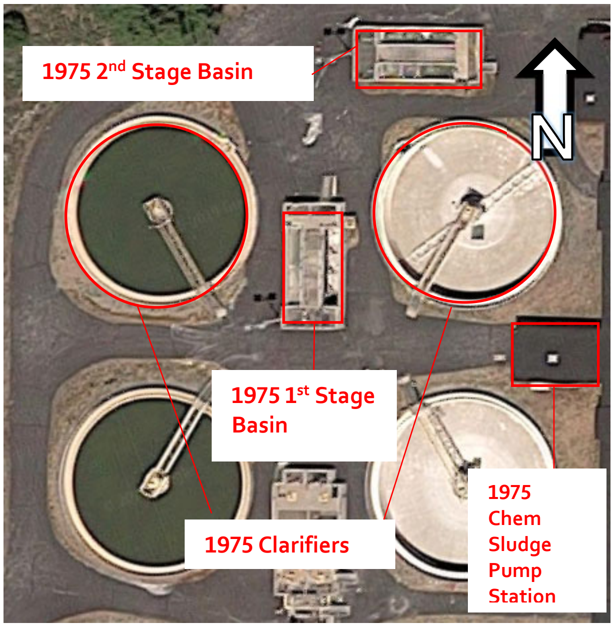


Figure 3.11 Recarbonation Basins and Clarifiers Overview

Table 3.13 summarizes the condition findings for this area.

Table 3.13 Recarbonation Basins and Clarifiers Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	4	10 years	Concrete cracking. Rebar may be affected.
Mechanical	4	10-15 years	Gate corrosion.
Electrical/ Instrumentation	n/a	n/a	No major electrical in this area.

The following bullets summarize the key findings from the assessment team:

- First stage recarbonation basin
  - Major spalling, cracking, and holes in concrete. May need to replace corroding rebar.
  - Guardrail anchors spalling.
  - Gates are old cast iron Waterman sluice gates and have operational issues. However, they have been recently repaired and placed on an exercise program. They will need to be replaced within the next 10-15 years.
- Recarbonation clarifiers
  - Some cracking of concrete wall noted. Re-grouting of clarifier bottom is needed.
  - Based on a review of photos taken inside the clarifiers by T-TSA (photos dated 2016), the concrete and steel appear to be in good condition, except some exposed aggregate in the sump of Clarifier 2.
- Second stage recarbonation basin
  - Minor concrete spalling and minor cracking throughout the structure. No significant damage.
  - Piping and wall mounts in the basin have varying levels of corrosion.

- Embedded guardrail posts are causing concrete cracking. Guardrails may be loose. Bolt guardrails to side of tank or repair anchors.
- The coarse bubbler diffusers are old and are no longer effective.

- Chemical sludge pump station
  - The south CMU wall is leaking, similar to others around the plant.
  - The chemical sludge and recarbonation pumps were replaced about 2 years ago.

The following pictures were taken during the field assessment.

First Stage Basin Concrete Cracking

Second Stage Basin Cracking

3.3.11 Phosphorous Stripping Basins

Two phosphorous stripping basins (Facilities 57 and 58) were added in 1981. A third basin (Facility 64) was added in 1990. Flow is controlled to the three basins by the stripper distribution box (Facility 56) that was added in 1981. Weir launder covers were added in 2003.

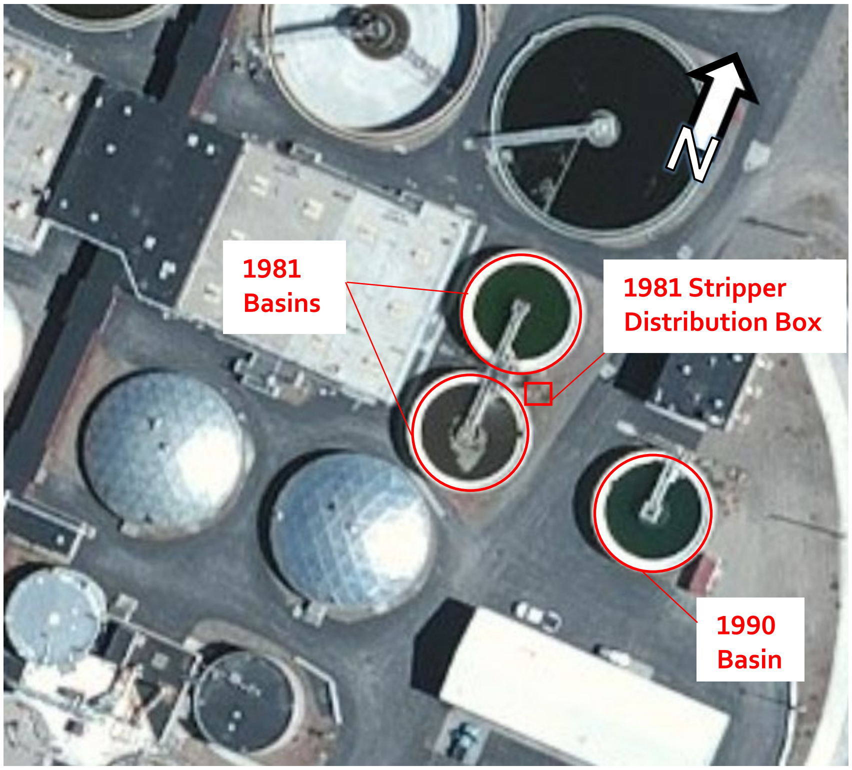


Figure 3.12 Phosphorous Stripping Basins Overview

Table 3.14 summarizes the condition findings for this area.

Table 3.14 Phosphorous Stripping Basins Condition Summary

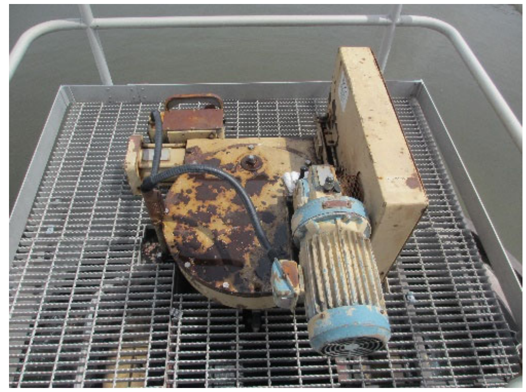
Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	2	25 years	Cracking on top of Basin 64 wall.
Mechanical	4	5 years	Hole in elutrient piping. Mechanism corroded.
Electrical/ Instrumentation	n/a	n/a	No electrical in this area.

The following bullets summarize the key findings from the assessment team:

- The stripper distribution box is corroded and needs recoating.
- Elutrient pipes to Basins 57 and 58 have severe corrosion, including holes in the pipes. Mechanisms and drives have significant corrosion visible and both need recoating soon. Minor cracks and leaks were observed on exterior walls of the basins.
- Basin 64 has significant concrete damage on top of the structure wall. Cracks were found on the east tank wall. Mechanism shows some corrosion, but not as bad as the other two basins.

The following pictures were taken during the field assessment.

Hole in Elutrient Pipe



Mechanism Drive Corrosion

Cracking at Top of Basin 64 Wall

Corrosion Inside Basin 64 Box

3.3.12 Flow Equalization

Flow equalization facilities are located at the north end of the plant. The following facilities were built as part of the original plant construction: ballast ponds (Facilities 25 and 26), ballast pond distribution box (Facility 38), biological filtration effluent (BFE) pond (Facility 34), ERB (Facility 35A), and the ERB bypass structure (Facility 35). A BFE distribution box was added in 2003.

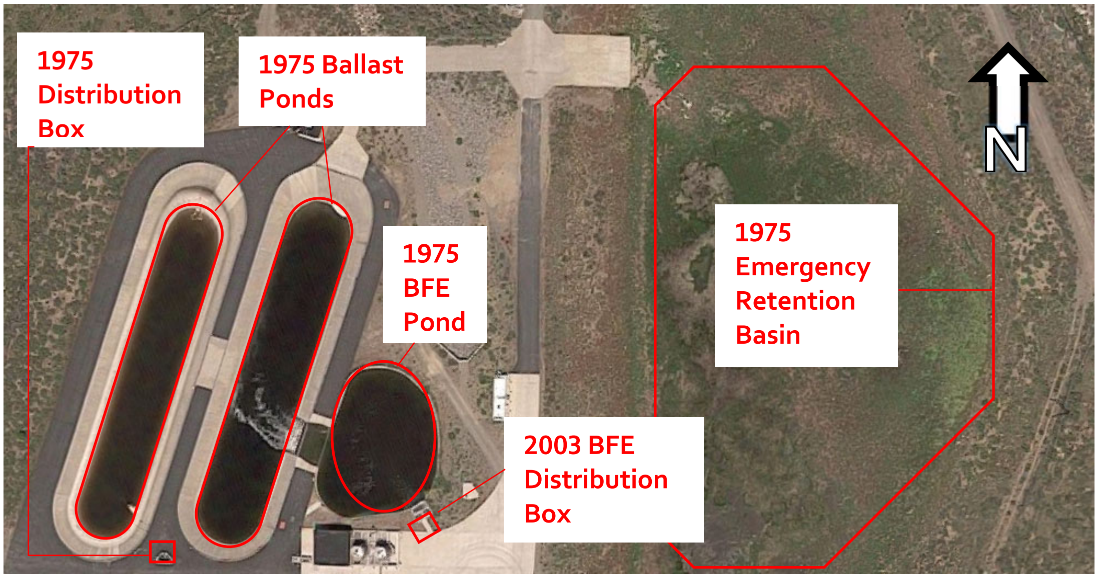


Figure 3.13 Flow Equalization Facilities Overview

Table 3.15 summarizes the condition findings for this area.

Table 3.15 Flow Equalization Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	3	15 years	Resurface ballast ponds.
Mechanical	2	20 years	Basin appurtenances in good condition.
Electrical/ Instrumentation	n/a		No major electrical in this area.

The following bullets summarize the key findings from the assessment team:

- Ballast ponds
  - A 2019 project fixed concrete cracks and joint repairs.
  - The basin surface will need to be resurfaced.
  - These basins are cleaned out frequently by staff using only a hose. Water cannons would reduce the time it takes for basin wash down.
- BFE pond
  - The pond was not designed for its current use. The pond does not have a sump that can be used to drain. A permanent sump or drain system is needed.
  - Minor cracking. Concrete repair will eventually be needed.
- ERB
  - No issues were observed. The assessment team did not enter the ERB. Assessment performed from a distance.

The following pictures were taken during the field assessment.

Ballast Ponds

Ballast Pond Joint

BFE

ERB

3.3.13 Biological Nitrogen Removal

The Biological Nitrogen Removal (BNR) building (Facility 81) was constructed in 2003. The building includes the nitrifying and denitrifying basins and the pumping and blower systems. The BNR influent pump station (Facility 80) is located north of the ballast ponds. BNR support facility (Facility 82), located adjacent to the BFE pond, contains two outdoor methanol storage tanks and a building that contains a chemical pump station and fire suppression system.

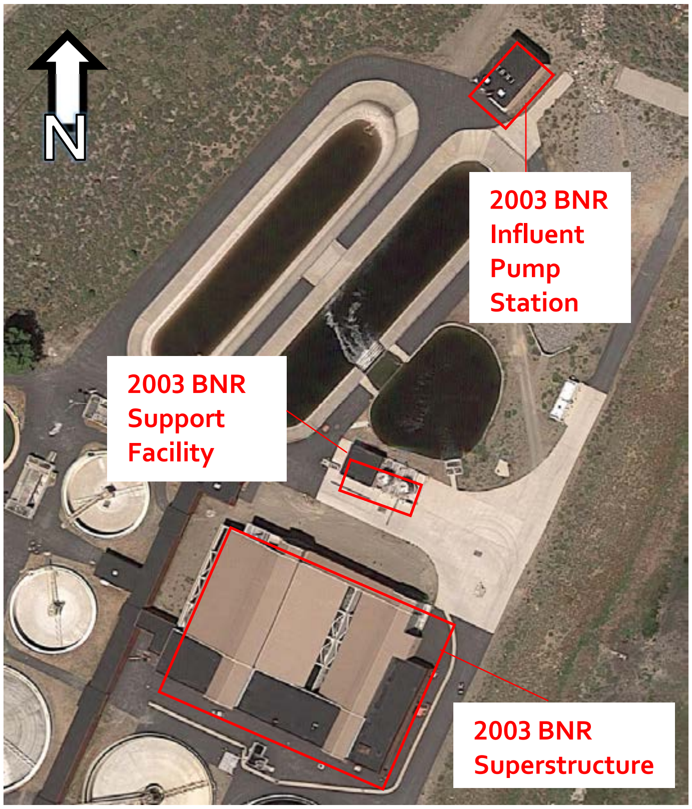


Figure 3.14 BNR Overview

Table 3.16 summarizes the condition findings for this area.

Table 3.16 BNR Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	2	25+ years	Minor cracks.
Mechanical	2	15-25 years	Blowers had operational issues which were recently addressed.
Electrical/ Instrumentation	3	0-10 years 15-25 years	Replace PLCs. Replace MCCs 80-1, 80-2, 80-3, 81-1, 81-2, 81-3, 81-4.

The following bullets summarize the key findings from the assessment team:

BNR Influent PS

- The structure and equipment are 15 years old and have no condition issues.
- Staff indicated they cleaned the wet well about 2 years ago and the structure and inlet gates were in good condition.
- The Robicon VFDs will be replaced later this year.
- CP80A BNR Influent Remote IO panel is from 2006 and in fair condition, but will likely need replacement in about 10 years.

- MCCs 80-1, 80-2, and 80-3 are from 2006. No issues were noted however this equipment will reach the end of its useful life before the end of the 25 year planning period and therefore should be planned for replacement in 15-25 years.
- Each pump has a discharge strainer. Staff noted that these have caused operational challenges.

Nitrifying and Denitrifying Basin Structure

- Minor wall cracks on north side of facility top level, near windows. Weep holes throughout bottom story at base of tanks. Seal with epoxy injection.
- Getting a lot of air entrainment in the nitrified effluent causing operational issues. Concrete surface is slowly degrading.
- Blower VFDs replaced in 2017.
- Backwash tank is very difficult to remove beads that build up from backwashes.
- Pilot system is offline. T-TSA would like to get it operational to allow for testing of other operational strategies or testing of different carbon sources. Needed upgrades include new analyzers.
- Main switchgear, MCCs 81-1, 81-2, 81-3, and 81-4 were installed in 2006 and are in good condition. However, this equipment will reach the end of its useful life before the end of the 25 year planning period and therefore should be planned for replacement in 15-25 years.
- PLCs CP81-B and 81-C are from 2006, but have obsolescence concerns. PLC CP81-A is from 2006 and in good condition. Replace these PLCs within 5 years.

BNR Support Facility

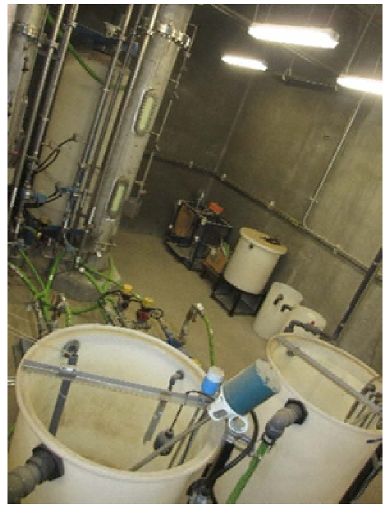
- Methanol storage and feed facility was constructed in 2003. Everything is functional. There are three methanol feed pumps and only one runs at a time.
- PLC CP-82D is from 2006 and in good condition. Plan for replacement in 10 years. The VFDs will be replaced by T-TSA staff as part of an ongoing project.

The following pictures were taken during the field assessment.

BNR Influent Pumps

BNR Blowers

BNR Support Facility



BNR Pilot Facility

3.3.14 Multipurpose Pump Station

The Multipurpose Pump Station (MPPS) (Facility 24) was built during the original 1975 plant construction.

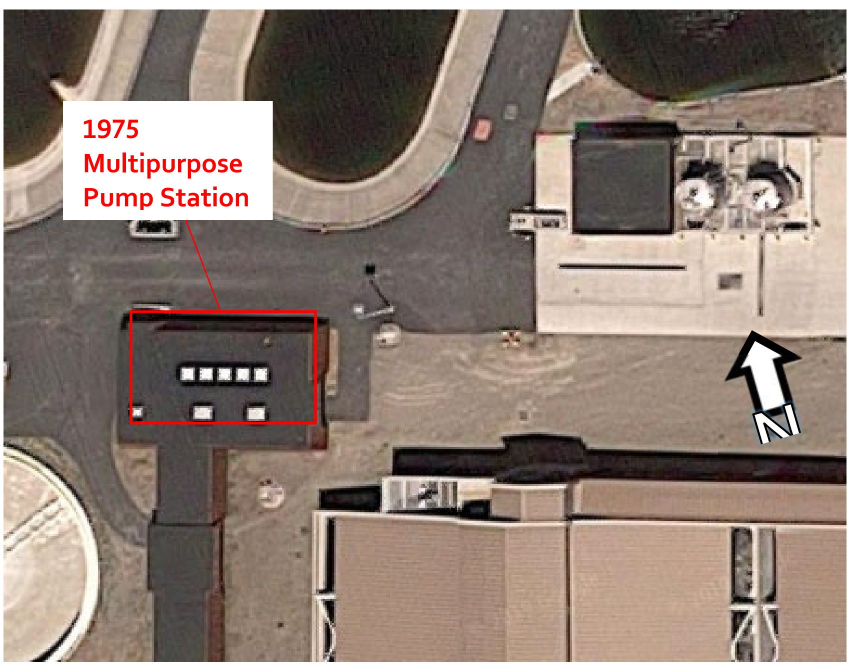


Figure 3.15 MPPS Overview

Table 3.17 summarizes the condition findings for this area.

Table 3.17 MPPS Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	2	25 years	No issues observed or noted.
Mechanical	4	5-10 years	Pumps from 1975. Nearing or past expected life.
Electrical/ Instrumentation	4	1-2 years 20-25 years	Lacks backup power supply. Replace VFDs 24104, 24105, and soft starts

The following bullets summarize the key findings from the assessment team:

- This is a very critical facility for plant operations. There is no redundant way to get flow to the filters or out of the plant. The facility has only one power source. Additional power sources should be evaluated, such as tying into a generator or switchboard SWBD-27.
- MCCs 24-1 and 24-2 are from 1975 and are in fair condition. However, due to obsolescence concerns, replacement is recommended within 10 years. Upgrades related to an additional power supply may necessitate replacing these units earlier.
- PLC CP-24C is from 2007 and in good condition. Plan for replacement of the PLC in 10 years.
- Pump VFDs 24104 and 24105 were recently replaced. Pump soft starts are from 2007 and in good condition, and should last another 15 years.
- The pipeline from the MPPS to the filters is original. The condition of the line is not known, although the portions of the exterior that were observed appeared to be in good condition. Perform a pipeline condition assessment in the next few years. Consider installing a redundant pipe in the future to mitigate the risk of a failure of this pipe.
- T-TSA performed an internal inspection of the MPPS wet well in 2015. Staff noted some aggregate showing and they think there may be some leakage into the pipe chase (utility tunnel). Perform another inspection in about 5 years to evaluate changes in the condition. Any repair work needed in the wet well would be a significant effort requiring bypass pumping.
- Five vertical turbine pumps (two large and three small) are in fair and good condition. The large pumps were installed in the 1990s. The smaller pumps are from 1975 and are likely in need of another rebuild or replacement in the mid-term.
- The room also contains the pumps for the plant waste and utility water pump stations. These pumps appear to be from 1975 and have likely exceeded their expected life.

The following pictures were taken during the field assessment.

MPPS Pumps

MPPS Cabinet and Control Panel

3.3.15 Granular Media Pressure Filters

The granular media pressure filters consist of four metal filter tanks ranging in age from 1975 to 2003. Tanks 1 and 2 are from 1975, Tank 3 is from 1981, and Tank 4 is from 2003. The tanks are located outside the AWT building, next to the clino beds and chlorine break tank. Filters 1, 2, and 3 were rehabilitated between 2009 and 2011. Filter 4, commissioned in 2004, has not yet been rehabilitated.

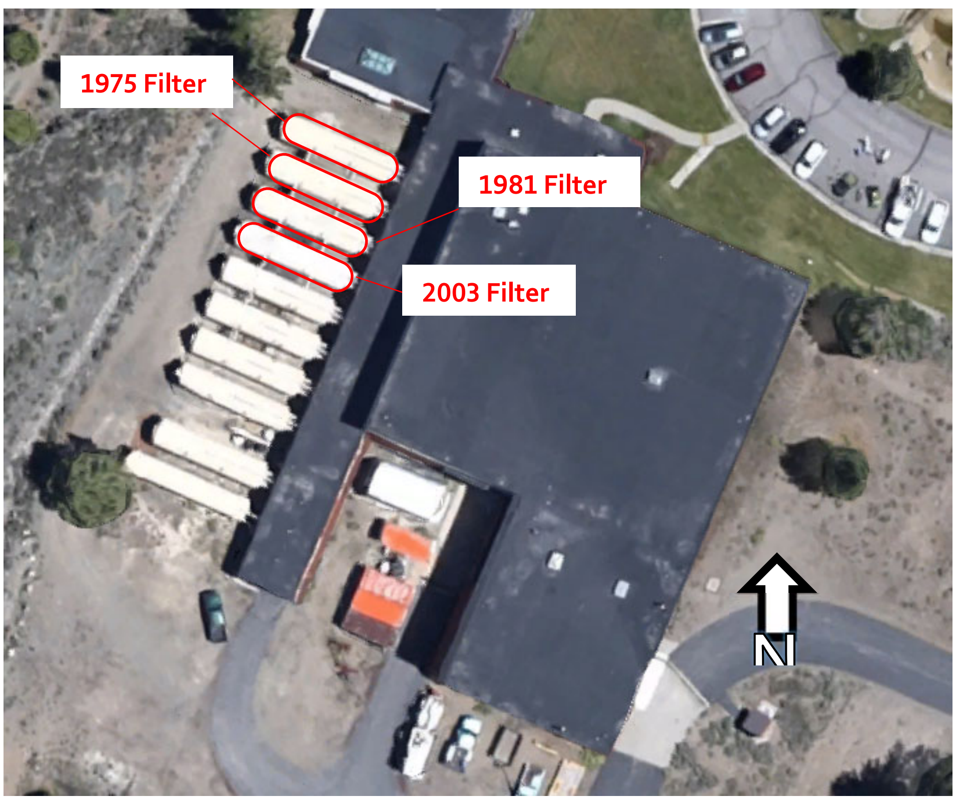


Figure 3.16 Filters Overview

Table 3.18 summarizes the condition findings for this area.

Table 3.18 Filters Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	3	20 years	Minor exterior coating degradation.
Mechanical	3	20 years	No issues observed.
Electrical/ Instrumentation	n/a	n/a	Add automation to filter controls.

The following bullets summarize the key findings from the assessment team:

- T-TSA inspected interior condition of the various filters in the span between 2009 and 2011. Welding and recoating performed at that time. Stainless steel Johnson screens replaced the older PVC underdrain system that was problematic. Surface wash system has no known issues.
- Exterior coating is starting to degrade and minor corrosion spots speckle the filter tanks. Recoating will be needed over the next 6 to 10 years.
- Initiation of backwash is a manual process. This was intended to be fully automated, but operation was complicated while BNR was being installed. Now that BNR is fully operational, staff would like to add some form of automatic initiation.
- The indoor filter piping is in good condition. Corrosion on the inlet/outlet pipes should be monitored over time. Valve actuators have been rebuilt as needed. A lot of them were replaced during the 2003 expansion.
- The backwash equalization tank is a welded steel tank constructed in 1975. It was recoated in 2011. At that time, a visual inspection of the interior was performed. The exterior is in good condition with very little corrosion. The tank is inspected and cleaned out every 5 to 6 years.

The following pictures were taken during the field assessment.

Filter 1

Minor Filter Pipe Corrosion

Indoor Filter Piping

Backwash Equalization Tank

3.3.16 Disinfection

The disinfection facilities include the chlorine contact pipeline constructed in 1975, breakpoint chlorination tank constructed in 1981, and the chlorine building (Facility 75) constructed in 1995.

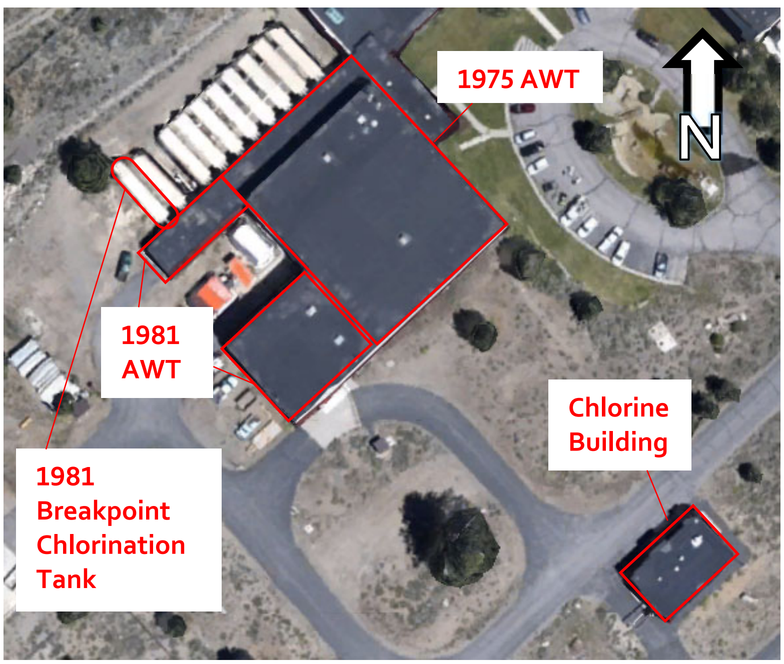


Figure 3.17 Disinfection Overview

Table 3.19 summarizes the condition findings for this area.

Table 3.19 Disinfection Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	3	0-5 years	Chlorine building roof leaks.
Mechanical	3	0-5 years	Pipeline internal condition is unknown. Scrubber leaks and needs to be replaced.
Electrical/ Instrumentation	4	0-5 years 10-15 years	Strap-on flow meter is inaccurate. Replace MCC 75 and PLC CP 75C.

The following bullets summarize the key findings from the assessment team:

- Strap-on flow meter is only flow measurement device on the line. Install permanent flow meter in the near future.
- A single pipeline goes from filters to effluent disposal fields. The condition is not known and it has never been inspected.
- Breakpoint chlorination tank has not been used in the last 15 years. No condition issues are known.
- The chlorine building houses chlorine gas cylinders and the chlorine feed equipment. The building roof is 20 years old. Coating of the steel panel roof is peeling.
- The chlorine scrubber tank has leaked in the past into the secondary containment tank. The tank has been repaired but is nearing its useful life expectancy. The scrubber tank needs to be replaced in the next few years.
- Based on the age of the equipment, a replacement of all the mechanical and electrical components will be needed long term (11 to 25 years).
- The PLC (CP 75C) was installed around 2003. It is in good condition. MCC 75 is from 1996. It is in good condition. Plan to replace in 10 to 15 years.

Strap on Flow Meter

Breakpoint Chlorination Tank

Chlorine Building

Chlorine Scrubber

3.3.17 Advanced Wastewater Treatment Building

The Advanced Wastewater Treatment (AWT) building (Facility 2) includes multiple treatment systems, including the Ammonia Removal and Recovery Process (ARRP), the ion exchange system, and other ancillary systems (like the 2W pumps). The facility was originally constructed in 1975, with additions in 1981.

Inside the AWT building are the following:

- ARRP towers.
- Regenerant clarifiers.
- Regenerant basins.
- Chemical storage and feed systems.

The ion exchange system, often referred to as the clinoptilolite (clino) beds, includes five outdoor pressure tanks adjacent to the filter tanks.

Many of the AWT systems are no longer in use. Some are kept around for emergency operation (backup to BNR), while others are abandoned in place. Many assets can be removed from this building because they are no longer needed or in poor condition. The performance and capacity evaluation of the master plan will determine the exact facilities to be demolished or remain. The comments in this section will focus on the condition observations.

Figure 3.18 AWT Overview

Table 3.20 summarizes the condition findings for this area.

Table 3.20 AWT Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	4	5-10 years	Repairs needed to AWT building structure and roofing system.
Mechanical	4	10 years	Equipment of various ages and operating status.
Electrical/ Instrumentation	4	10 years	MCCs from 1975.

The following bullets summarize the key findings from the assessment team:

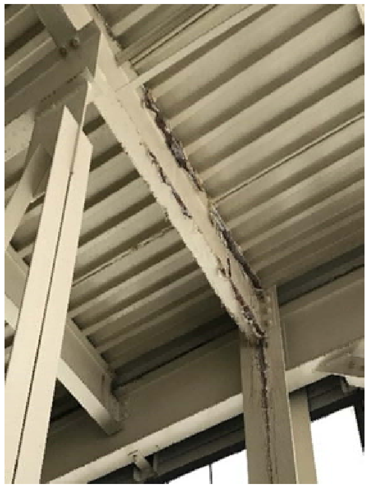
- The AWT building has a number of issues.
  - Roof drains are not working properly and leaking onto some of the beams causing corrosion. The wood overhang on southwest entrance has holes from woodpeckers: Replace the roofing and repair the leaks.
  - The construction joint connecting the 1981 and 1975 buildings has a clear gap between buildings. Exterior concrete is spalling around joint.
  - The east and west CMU walls have similar water infiltration as other buildings and needs to be fixed.
  - Past leaks from process pipes have eroded part of the floor in the newer (1981) portion of the building. Several floor drains, pipe clamps, and anchor bolts are corroded.

- The AWT has a number of electrical and controls issues:
  - PLC CP2A controls the filters and the clino tanks. There are concerns about the PLC's technology, obsolescence, and availability of spare parts. Near term replacement of this PLC is recommended.
  - Control panel CP2C is in poor condition and should be replaced in the near term. The panel is from 1975, has concerns of obsolescence, is corroded, and has reached the end of its useful service life.
  - DC drives need replacing if the clino system is put back in operation (M02242 and M02243).
  - MCCs 2-1 and 2-2 are from 1975 and in fair condition. Although they are nearing the end of their useful service life, they are expected to last another 10 years. The MCCs should be replaced sooner if there are upgrades to this process area.
  - PLC CP2F was installed in 2016. The PLC has not had any issues. PLC replacement schedules will be determined as part of a separate SCADA and IT Master Plan.
- There are a total of five sets of fiberglass reinforced plastic (FRP) absorber and stripper tanks, referred to as the ARRP towers. Three are from 1975 and two are from 1981. All towers are empty and out of service. T-TSA would like to keep the two 1981 tank systems operational in the event that centrate ammonia stripping is required in the future. The tanks appear to be in fair condition. However, an internal inspection would be necessary to accurately determine their condition. Areas of deterioration and scale buildup were observed on some ducting, likely due to leaks.
- Six carbon column tanks penetrate the AWT building floor. The exterior of the tanks appears to be in good condition. The piping and valving in the AWT basement also appear to be in good condition. All tanks and piping are from 1975. A more detailed inspection of the tanks would be needed prior to being put into continuous service.
- The regeneration system consists of two metal clarifier tanks, a constant head box, a carbon furnace, and carbon regeneration tanks.
  - The furnace is obsolete and can no longer function.
  - The steel carbon furnace regeneration tanks are in poor condition. Corrosion was found on the tanks and piping. These tanks are no longer in use and staff would like to see them demolished.
  - The two regeneration clarifiers and constant head box are in poor condition. The metal tanks have areas of heavy corrosion. One of the tanks had a leak that was repaired. One clarifier mechanism does not work. The drives and pumps are from 1975 and would need to be replaced if this system were to be put back in service.
- Five clino tanks are located outdoors, next to the filter tanks. The tanks are not in service.
  - Staff believe the tanks were last inspected in the 1990s.
  - The tank exteriors have localized areas of corrosion and the coating is deteriorated. Any tanks that remain should have an internal inspection, repairs to exterior corrosion, and new exterior and possibly interior recoating.
  - Spalling and cracking was observed around the concrete supports.
- The four chemical storage and feed systems along with their secondary containment areas are in fair condition. The tanks are FRP and plastic and vary in age. No major issues

were noted or observed with the tanks. The containment areas have small areas of coating failures. Recoating and spot repairs is planned for the near future.

- The outdoor ammonium sulfate tank is from 1975. The tank appears to be in good condition. Some corrosion is apparent on steel reinforcing bands. Tank recoating is recommended in the future.

The following pictures were taken during the field assessment.



AWT Building Beam Corrosion

Stripper Duct Damage

Clino Support Cracks

Chemical Containment Coating Failure

AWT Building Floor Acid Erosion

3.3.18 Solids Handling Facilities

The solids handling facilities consist of the solids handling building from 1975, four digesters (three from 1975 and one from 2003), the digester control building from 1975 and expanded in 2003, and the dewatering building from 2003.

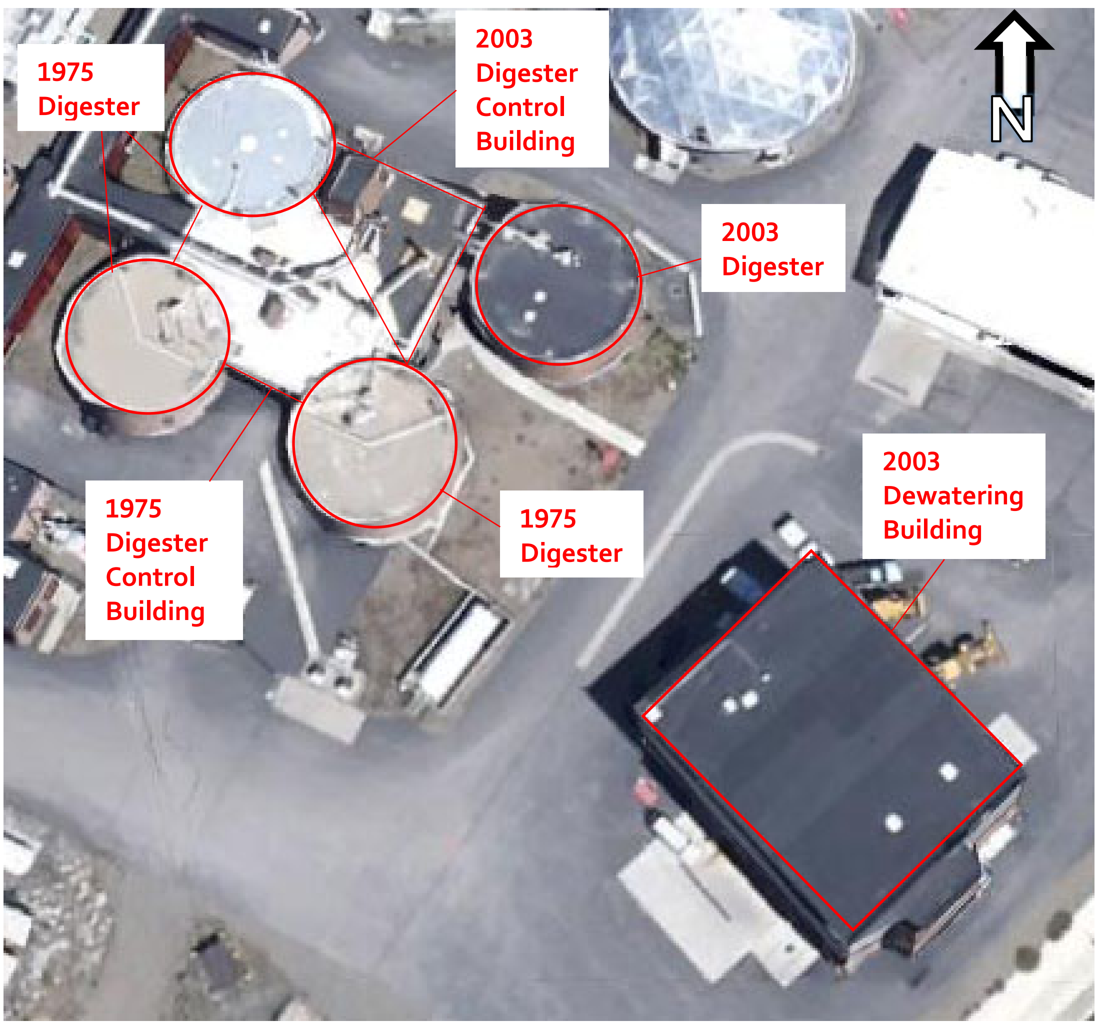


Figure 3.19 Solids Handling Facilities Overview

3.3.18.1 Solids Handling Building / Thickening Centrifuge Control Building

The Solids Handling Building (Facility 4) was constructed in 1975 and was upgraded in 1981. The building has multiple areas: thickening centrifuge room, thickener room, plate and frame filter press room, and the pump and tank room.

Table 3.21 summarizes the condition findings for this area.

Table 3.21 Solids Handling Building Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	4	10 years	Repair damage to building wall. Fix roof drainage issues.
Mechanical	4	10 years	Rebuild Centrisys centrifuge. Remove or replace the Sharples centrifuge pending outcome of performance analysis.
Electrical/ Instrumentation	4	5-10 years	Replace VFDs and AFDs which are obsolete. Replace MCCs 4-1 and 4-2 Replace equipment in Thickener Room that does not meet area classification.
		20-25 years	Replace MCC-4

The following bullets summarize the key findings from the assessment team:

- Building
  - Exterior CMU walls are damaged from water intrusion in multiple areas. This is likely due to a roof drainage issue. A project is currently underway to address this problem.
  - The roof of the thickening centrifuge room is leaking. Staff are aware and have plans to fix it.
  - Spalling concrete around equipment pads and on thickener tanks.
  - Corrosion on building rafters in thickener room.
- Thickener Room
  - Sludge collectors are original equipment from 1975, but have not had issues and have been recoated at regular intervals. Some corrosion was visible on the sludge collector mechanisms. Most recent coating was about 8 years ago.
  - Thickener scum box interiors have spalling concrete and aggregate showing.
  - Limited space to move around the room, especially around the scum pumps.
  - The gates in the distribution box are stuck, but are not needed to operate the thickeners.
  - There are concerns regarding the NFPA 820 classification of the room. The TWAS pumps have DC motors that are brushed and a potential ignition source and nothing in room is currently explosion proof. Replace pumps and electrical components that do not meet area classification.

- Thickening Centrifuge Room
  - Sharples centrifuge is old, but rarely used. The Centrisys model is used more often. No operational or maintenance issues noted. The Centrisys unit will require rebuilding in the next 5-10 years. T-TSA would like to remove the Sharples unit from service if it is deemed unnecessary pending the performance analysis.
  - Roof is leaking. The MCCs are covered in tarps to protect them from water. Roof repair already planned.
  - Two polymer tanks are in poor condition. The tanks are no longer used and therefore do not require replacement.
- Plate and Frame Filter Press
  - The press is from 1975. The unit is still operational, but the expected life is 10 years or less. Concrete is cracking at the frame supports.
  - Hydraulic power unit has had past issues and many parts have been replaced. The unit is old, but parts are still available.
- Hydrated Lime Conveyance System
  - The lime conveyance system was installed in 2003. The system is difficult to operate and is messy. Replacement of the conveyance system is assumed to be included in the already planned lime improvements project.
- Electrical and Controls
  - MCCs 4-1 and 4-2 are from 1975 but are in fair condition. There is some corrosion on the units and concerns about obsolescence. Replacement is recommended within the next 10 years. MCC 4 is from 2006 and is in good condition but will need to be replaced within the 25-year planning period.
  - CP4 is from 1975, but the PLC was replaced in 2010. The unit is in fair condition. PLC replacement schedules will be determined as part of a separate SCADA and IT Master Plan.
  - The thickening centrifuge room control equipment is in need of replacement. The units are not rated for a classified area. A future NFPA 820 analysis will determine what improvements are required for compliance. There are also concerns of obsolescence and availability of spare parts for the following: CP4E, VFDs 4650 and 4652, 4608, and 4610.
  - VFDs 04630 and 04656 should be replaced within the next 5 years. The units are from 2006, but there are concerns with spare parts and obsolescence. The drives for the filter press feed pumps are also from 2006 but are in fair condition. Replace AFDs 04512 and 04514 within the next 10 years.

The following pictures were taken during the field assessment.

Solids Handling Building CMU Wall Damage

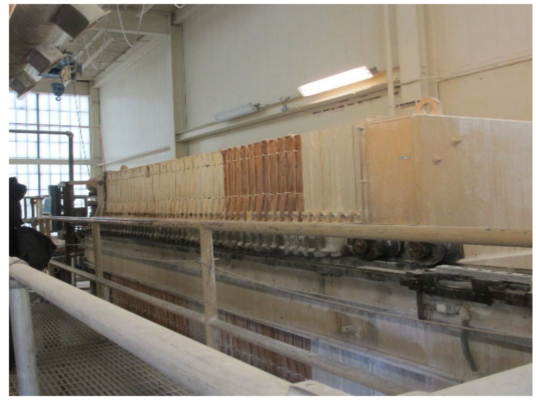
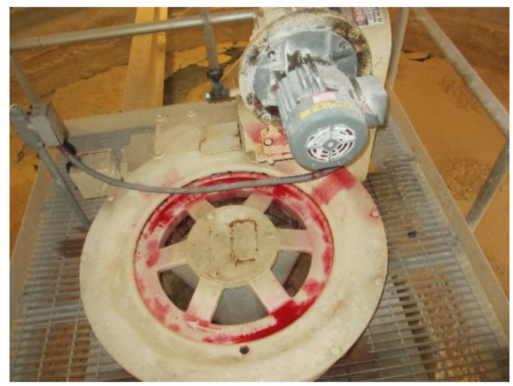


Plate and Frame Filter Press

Thickening Centrifuges



Thickener Drive Unit

3.3.18.2 Digesters and Control Buildings

Digesters 29, 30, and 31 were constructed in 1975 along with the Digester Control Building (Facility 32). Digester 33 was added in 2003 along with expansion of the control building.

Table 3.22 summarizes the condition findings for this area.

Table 3.22 Digestion Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	3	15 years	Cracking throughout.
Mechanical	4	5 years	Boilers in poor condition require replacement.
Electrical/ Instrumentation	4	5 years	NFPA 820 classification issues require relocation of either boilers or electrical gear.

The following bullets summarize the key findings from the assessment team:

Control Building

- The Control Building is in poor condition. The following issues were observed:
  - Cracking throughout main floor, especially around digesters. Major spalling and holes in concrete.
  - Digester walls show signs of leakage visible inside the control building.
  - Joint seals between the Digesters and building walls are wearing down.
  - Control building roof is leaking. Extensive repairs scheduled for this summer on roof.
  - CMU damage near rain gutters. Similar to water intrusion of other buildings.
- The Digester Building is a classified area per NFPA 820 because it shares a wall with three of the digesters. This classification means that the replacement boilers should not be located inside the building with the electrical gear. There is significant work required for this building to satisfy NFPA 820 (relocation of either the boilers or electrical gear outside of building).
- Control panel CP32A-01 is located in this classified area. It is from 1975 and is grandfathered in. The PLC was replaced in 2010 and should be replaced within the next 10 years. PLC CP32C is from 2006 and also needs to be replaced within the next 10 years. The cabinet lacks conduit seals.
- Old 1975 boilers are in poor condition and one of the biggest safety and reliability concerns at the plant. Should be replaced in near future.
- Newer boiler (Hurst) was installed in 2003 and is in good condition.
- The heat exchangers for Digesters 29 and 30 are not properly sized for thermophilic digestion. Replace and upsize heat exchanger(s) for thermophilic digestion, if needed. Three units located in lower level are from 1975 and should be replaced due to age and inefficiency.
- Vaughan Rotamix pumps for digester mixing. Installed in 1996 to 2006. Pumps are all in good condition.

Digesters

- Digesters 29 and 30 are in good condition. All equipment on top of digesters was replaced in 2003. The exterior finish is crumbling near the drain spout. This is probably the same issue occurring with the CMU buildings; however, this is only an architectural finish on the concrete digester and therefore only an aesthetic issue.
- Digester 31 has a floating cover, which has caused operational issues. The cover can only be dropped to a certain level before gas leaks out. Snow load on the cover causes it to sink. Operators have to shovel off snow, which can be dangerous as the cover can be slippery. The cover was recoated in 2005 to 2006.
- Digester 33 is in good condition. No issues were noted for the digester tank. The VFD for the chopper pump is from 2005 and will need to be replaced in the next 11-25 years.
- The flare is located between Digesters 31 and 33. New regulations require flares be located 50 feet from anything, which it is not. The flare is heavily corroded. It is unclear if spare parts are available anymore. Flare improvements will be driven by the regulatory and performance evaluations of the master plan.

The following pictures were taken during the field assessment.

1975 Boilers

Older Digester and Boiler Control Panels

Heat Exchanger

Crumbling Digester No.33 Architectural Finish

Dewatering Building

The Dewatering Building (Facility 71) was constructed in 2003. It dewaters a blend of organic and chemical sludges. The building contains the dewatering centrifuges, polymer system, cake hoppers, and truck loading bay.

Table 3.23 summarizes the condition findings for this area.

Table 3.23 Dewatering Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	1	25 years	No issues observed or reported.
Mechanical	3	5-10 years	Centrifuge rebuilds coming due.
Electrical/ Instrumentation	3	0-5 years 10-15 years 20-25 years	Replace harmonic filters AHF71-1 and 2. Cake discharge VFDs are obsolete. Replace MCCs 71-1,2, and 3.

The following bullets summarize the key findings from the assessment team:

- No operational or maintenance issues noted. Includes shafted screw conveyors, bridge cranes, and centrifuges.
- Centrifuges have a total of 12,000 hours on each machine since startup. Units were rebuilt after 5 years of operation under original contract warranty, but they did not look bad at that time. New scroll bearings were also installed at that time. One of the dewatering centrifuges was rebuilt in 2020. The other will be rebuilt when required.
- Modified the discharge from the cake hopper. Discharge chute was plugging up/bridging. Did not anticipate such high percentage solids of cake due to additional chemical sludge. Worked with hopper manufacturer to modify with a foil that breaks up the cake into chunks.
- Polymer feed pumps, tanks, and blending units are from 2003. Older Polyblend system is not very efficient and may need retrofitting in near-term. Includes a Lightning Mixer in centrifuge feed tank where chemical and biological sludges are mixed. Tank is concrete and T-lock lined.
- MCCs 71-1, 2, and 3 are from 2006 and are in good condition but will likely require replacement within the 25-year planning period as they will be nearing the end of their useful life.
- Centrifuge and cake discharge VFDs (CSP71151 and 71152, VFD71511 and 71512). Harmonic filters (AHF71-1 and 2), and PLCs 71A, B, and C are from 2006. The centrifuge VFDs were recently replaced. The harmonic filters are in immediate need of replacement.

The following pictures were taken during the field assessment.

Dewatering Centrifuge

Cake Hopper

3.3.19 Odorous Air Fan Station and Biofilters

The odorous air system was installed in 2003. It includes the building (Facility 69) and the biofilters (69A).

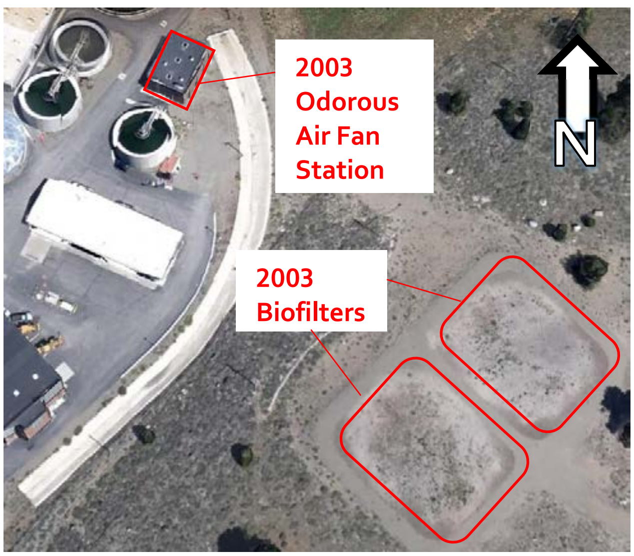


Figure 3.20 Odorous Air Overview

Table 3.24 summarizes the condition findings for this area.

Table 3.24 Odorous Air Condition Summary

Asset Class	General Condition	Estimated Remaining Life	Additional Comments
Structural	2	25 years	Building in good condition.
Mechanical	2	20 years	Fans in good condition.
Electrical/ Instrumentation	4	10 years	Replace MCC 69.

The following bullets summarize the key findings from the assessment team:

- The building is in good condition. The building is used for storage of parts and equipment.
- Fans are all fiberglass construction and are in good condition. Fans are inspected regularly, have full redundancy as only one fan runs at a time. Sometimes have had vibration issues due to buildup on fan blades, but overall operate well.
- VFDs are older Robicon drives that are obsolete.
- MCC 69 and PLC CP69A installed in 2003. In good condition. Replace MCC 69 within next 10 years.
- The assessment team did not visit the biofilter. Staff said there were no issues to report.

The following pictures were taken during the field assessment.

Odor Fan

Odor Fan VFDs

3.3.20 General Plant Facilities

The general plant facilities are facilities and equipment that do not fit into one of the process areas. The general plant facilities are grouped into four categories:

- Buildings.
- Site pump stations.
- Electrical and controls.
- Chemical storage and feed facilities.

The following summarizes the condition findings for this area. Condition scores were not given to these categories because they span a wide range of facilities that makes them difficult to generalize.

3.3.20.1 Building

The plant has five additional facilities to those covered in the previous sections. A more detailed building planning evaluation is needed to determine the long-term goals for the entire facility.

- Operations Building (Facility 1) is from 1975 and was remodeled in 1994.
  - Currently maxed out in terms of office space, total plant staff is about 50. The current CIP includes some remodel but no plans for expansion of facilities. The bathroom in Building 1 is not ADA compliant; however all the bathrooms in Building 3 are ADA compliant and serve as the site's ADA facilities.

  - The chiller controls and compressors are at the end of their useful life.
  - Laboratory meets current needs but could use an upgrade.
- Shop Building (Facility 3) is from 1975 and was remodeled in 1994.
  - The shop building includes a wide variety of rooms, including the old PSA system, the lunch room, first responders' room, maintenance shop, maintenance office, instrumentation and electrical shop, locker rooms and showers. Staff would prefer to reorganize these rooms to better fit their current needs.
  - In general, all rooms are tight and packed to their capacity.
- Maintenance Facility (Facility 70) is from 1990.
  - Staff refers to this building as their vehicle maintenance building. It also serves as a painting room, lubricant storage, paint storage, and general storage area. The building contains vehicle lifts, monorail, and a restroom. Staff noted the HVAC has issues and needs upgrades in the near future. Staff would like to repurpose one side of the building into a machine/weld shop and general mechanic area and relocate the vehicles to a new building. The building currently houses a vactor truck, hose reels, and other vehicles.
- Storage Building (Facility 61) is from 1981.
  - Storage is an issue at the plant. However, storage for this building is adequate for its use which is primarily storage of spare parts and shelf spare equipment. Staff would prefer a similarly sized building for vehicle storage.
  - Metal roof is leaking and needs some work. Otherwise, the building is in good condition.
- Building corridors and utility trenches (Corridors 6A, B, C, and D) are from 1975.
  - Hanta virus was found in the upper corridors in 1992 so all insulation and paneling was removed. The old ceiling framing is still in place, but all tiles are removed.
  - A corridor lighting and ceiling removal project was conducted in summer of 2020 to address lighting needs in the corridors.
  - Portions of the roof are leaking.
  - The utility tunnel is located below parts of the corridor. The tunnel is at or near capacity for pipes. The MPPS wet well may be leaking into the wall it shares with the utility tunnel. Otherwise, the tunnel is in good condition.
  - The steam lines in the pipe gallery leak, which causes corrosion of other pipes. Replace or seal these pipes.

3.3.20.2 Plant Roads

Due to the harsh environment and wear associated with snow removal activities, T-TSA currently seals and repairs the plant roads at 3-4 year intervals to maintain them in good condition. This practice should continue so that roads are maintained in good condition for access to plant facilities. A recurring project should be included in the CIP to account for road maintenance.

3.3.20.3 Site Pump Stations

The plant has four pump stations located around the site. In general, all stations are old and in need of rehabilitation, including inspection of the wet wells to determine the need for repairs or coating, replacement of pumps and rails, replacement of piping and valves, and replacement or repair of corroded hatches.

The following bullets summarize the key findings from the assessment team:

- 2-Water (2W) Pump Station (Facility 2) is from 1975.
  - Pumps and tanks associated with this system are housed in the older side of the AWT Building. The system is critical to plant operations as the emergency generators and air compressors use 2W for cooling. Plant utilizes 3W as a backup to 2W. However, the 3W tank is also old (1975), but it was tested and checked recently and is in sound condition.
  - The pump station is in need of replacement in the next 5 years.
  - Staff expressed concerns over the 2W pressure tank condition. . The tank has areas of concern that the staff have marked in order to monitor. The tank will continue to be inspected on a regular basis and maintained accordingly.
  - Pumps have across-the-line starters, no VFDs. Seals on pumps fail frequently. Pumps have priming issues. At max demand need all four pumps running, therefore reliability is a concern. An analysis of 2W system demands is recommended to address reliability concerns.
  - The 2W retention basin is located in the middle of the parking lot. It is a concrete- lined shallow basin. A concrete vault with two hatches is located at the east end of the retention basin. The hatch components are heavily corroded. The vault is a confined space that houses a control panel. The panel should be relocated out of the vault so it is accessible.
- Plant Dewatering Pump Station (Facility 59) is from 1975.
  - The station is located between the MPPS building (Facility 24), the BNR building (Facility 81), and the BNR support facility (Facility 82).
  - The inlet gates will not seat correctly causing water to leak into the wet well. The underside of the hatch is corroded. The submersible pump has been replaced, but only once in the last 15 years. The station will likely require an overhaul in the next 10 years.
  - Staff indicated the station can overflow if the valve is left open during primary clarifier draining. There was discussion as to whether draining the ERB can do the same. The rim elevation may need to be raised to prevent future overflows/flooding.
- Plant Waste Wet Well (Facility 37) is from 1975.
  - The wet well is located to the south of the MPPS building and the pumps are located inside the MPPS building. The station captures all plant sinks and drains.
  - The station is in need of an overhaul in the next 10 years.
  - Staff indicated that the location of this station blocks access to the open space between the MPPS and the BNR buildings. Relocation of this station should be considered as part of a space planning study.
- Sewage Pump Station adjacent to Facility 44 is from 1990.
  - The station is located between the dewatering building (Facility 71) and the maintenance facility (Facility 70), next to the gas pump, and captures the drains from these facilities.
  - The station is in need of an overhaul in the next 10 years. There are signs of corrosion on submersible pump rails and hatch.

The following pictures were taken during the field assessment.

2W Pump Station

Plant Dewatering Pump Station

Plant Waste Pump Station

Sewage Pump Station adjacent to Facility 44

3.3.20.4 Electrical and Controls Equipment

The electrical and controls equipment includes the electrical distribution network, SCADA system, and emergency power generators.

The following bullets summarize the key findings from the assessment team:

- Transformer 1A, panel 1A, and the server room switchboard are from 1975. There are concerns with obsolescence, the location of the equipment, and its exposure to heat. The items are recommended to be replaced and relocated in the next 5 years.
- The network equipment, located in the admin building communication closet, consists of servers, switches, air conditioner, the business network, HMI network, and SCADA network. There are concerns over obsolescence, spare parts availability, and technology. An upgrade of the system will be needed in the next 5 to 10 years.
- The communications equipment, located in the maintenance server room, is from 2002 and currently in good condition. However, the system is approaching the end of its useful life and will need to be replaced in the next 5 to 10 years.

- The Electrical Supply Building (Facility 27) includes the Electrical Substation (Facility 28), Generators 1 and 2, and Switchgear 27.
  - Switchgear 27 is from 1975, but well maintained and the interior feeders and breakers are newer, installed in 2019. The control panels CP27A, C, and D are from 2003. CP27G was replaced this year.
  - Facility 28 contains a 2500 KVA transformer from 2005. It is in good condition and is expected to last 25 more years.
  - Generator 1 is a Cummins 750 KW from 1975 and Generator 2 is a CAT 1000 KW from 1981. The generators are cooled with plant water, not radiators. The cooling system tends to leak. Generator 1 recently failed and cannot be repaired. It will need to be replaced. Generator 2 will need replacement over the next 6 to 10 years.
  - The generator control panel CP27E is from 2005. There are concerns with the panel's obsolescence, technology, and spare parts availability. Replace the panel in the next 5 to 10 years.
- Generator 3 is a 1500 KW CAT from 2006, installed as part of the BNR project. The generator is in good condition. However, it lacks the ability to seamlessly transfer power, which results in power needing to be cut before it can be cut over. Staff is working with a CAT representative to fix an issue with the load bank.
- The emergency power systems supply power to separate parts of the plant. Connecting the power systems would allow one generator to power all parts of the plant.
- MCC-3 is from 1975 and MCC-3A is from 1981. Both MCCs are in fair condition. Rehabilitation or replacement of these MCCs is expected within the next 11 to 25 years.

3.3.20.5 Chemical Storage Facilities

- Liquid Oxygen (LOX) Tanks (Facility 41)
  - One tank is from 1975 and the second tank was installed in 2003. The older tank was inspected a few years ago and was given 10 years of remaining life. Inspect the tank again and get an updated life estimate.
- Pressure Swing Absorption (PSA) system (located inside Facility 3) is from 1975.
  - The PSA system is still functional, but does not operate. It is a backup to the LOX tanks. Everything is still functional, but it is old, expensive to maintain, and difficult to operate. It may not be worth the investment to keep the system operational.
  - The system consists of two very large compressors that pump directly to fluidized beds. The compressors were second hand when installed, so they are likely older than 1975. Compressor parts are still available. They are exercised quarterly.
  - Compressor Control Panel CP-3A is in poor condition. The controls use drum logic, which very few people know how to work on. If the system is going to be kept, then the control panel needs to be replaced.
  - Evaluate PSA system to determine if it is worth maintaining or if it should be demolished.
  - Assess the life span of older LOX storage tank. It is likely that replacement of the older LOX storage tank and associated valves will be needed which should be done prior to demolishing the PSA system.

- Carbon Dioxide Tank (Facility 43) is from 1975.
  - Serves as backup system to stack gas for pH control. Some work has been done on piping and vaporizers recently. Tank has never been inspected as far as plant staff knows.
- Generator Fuel Storage (Facility 83) is from 2003.
  - The tank was installed with Generator 3. The exterior coating is exhibiting some cracking and needs to be recoated.
- Diesel Fuel, Boilers and Generators (Facility 42).
  - This facility was constructed in 1988. No issues were noted related to this facility.
- Diesel Fuel, Vehicles (Facility 45).
  - This facility was constructed in 2010. No issues were noted related to this facility.
- Gasoline (Facility 44).
  - This facility was constructed in 1990. No issues were noted related to this facility.
- Sulfuric Acid (Facility 2) – Reference Section 3.3.17.
- Sodium Hydroxide (Facility 2) – Reference Section 3.3.17.
- Sodium Chloride (Facility 2) – Reference Section 3.3.17.
- Alum (Facility 2) – Reference Section 3.3.17.
- Soda Ash (Facility 2) – Reference Section 3.3.17.
- Hydrochloric Acid (Facility 4) – Reference Section 3.3.17.
- Ferric Chloride (Facility 4) – Reference Section 3.3.17.
- Hydrated Lime (Facility 4) – Reference Section 3.3.18.1.
- Polymer (Facility 71) – Reference Section 3.3.18.2.
- Methanol (Facility 82) – Reference Section 3.3.13.

3.4 Recommendations and Conclusions

The recommended improvements are summarized in Table 3.25. The recommendations are grouped by major process area and consider the observations from related areas and equipment. These recommendations are based only on the observed condition of the equipment and do not consider the regulatory or process evaluations being conducted in parallel as part of this project. Costs for these improvements will be developed once they are combined with the recommendations from the other evaluations in Chapter 9 of this report volume.

Each improvement recommendation was given an estimated timing. The recommended improvement timing is based on the experience and judgement of the assessment team and input from T-TSA staff. In general, improvements are grouped into three timing categories:

- 0 to 5 years: Near-term projects to address equipment past, or quickly nearing, the end of expected life or repairs needed to prevent a major failure. This also includes projects related to potential safety operational hazards.
- 6 to 10 years: Mid-term project to address equipment approaching the end of expected life within the next 10 years.
- 11 to 25 years: Long-term project to address potential issues within the planning period such as equipment that is likely to exceed its useful life within this timeframe and preventative measures such as recoating.

These improvements and their timing are preliminary. The final recommendations and timing will be determined once the results of the condition assessment are combined with the results from other evaluations of this project as part of the overall Capital Improvements Program (CIP).

Table 3.25 summarizes the condition findings for this area.

Table 3.25 Recommended Improvement Projects and Timing

Process Areas	Timing	Improvement Recommendations
Preliminary Treatment and Influent	• 0-5 Years	• Grit chamber hydraulic CFD analysis to address short circuiting. • Grit chamber gate condition inspections. • Inspect condition of headworks influent gates.
	• 6-10 Years	• Grit chamber concrete repairs (internal and external) with structural mortar and epoxy inject cracks. • Replace/remove deflector vanes and improve grit chamber hydraulics (based on CFD analysis). • Replace grit chamber gates. • Recoat grit chamber mechanisms. • Alternatively consider redesign of the grit process with more efficient grit removal equipment.
Primary Treatment	• 0-5 Years	• Clarifier roof connection concrete repairs. Repair existing damage, slope tops of walls, apply chemical/biological resistant coating to interior surfaces. • Address dome ventilation issues. • Inspect domes. Repair dome leaks (if found). • Repair wall of Clarifier 3 with exposed rebar. • Potential replacement of sludge pump motor to address NFPA 820 concerns as determined by future compliance study. • Repair water intrusion damage to CMU wall(s) of primary pump station. Investigate solutions such as installing gutters. • Replace conduits and lighting. • Recoat Clarifier No.1 mechanism.
	• 6-10 Years	• Replace Clarifier mechanism drive units 1, 2, and 3. Recoat mechanisms for Clarifier 4.
	• 11-25 Years	• Replace primary sludge pumps, valves, and piping. • Replace scum pumps (except Clarifier 4).
Secondary Treatment	• 0-5 Years	• Repair oxygenation basin concrete around handrail posts and other areas with freeze/thaw spalling. • Repair water intrusion damage to CMU walls of C&CT building. Investigate solutions such as installing gutters. • Replace LEL equipment in CP-13 and CP-53. • Replace PLCs in CP-13 and CP-53.
	• 6-10 Years	• Recoat mixer motors and frames. • Repair influent splitter box ML inlet area and replace with grated covers. • Repair and resurface oxygenation basin 1-4 roof deck. Add deck drains and slope the surface. • Repair concrete in secondary effluent distribution box. • Recoat Clarifier mechanism 1 and 2 and replace drives.

Process Areas	Timing	Improvement Recommendations
		• Repair cracks in all clarifier walls with structural mortar and epoxy injection. • Coat exposed galvanized conduit to prevent further corrosion on oxygenation basins. • Replace MCCs 13-1, 13-2, 53-1, 53-2, and VFDs in 53. • Replace all programmable logic controllers (PLCs) at the C&CT building. Replace Facility 13 RAS VFD panels.
	• 11-25 Years	• Replace pump room 53 mechanical equipment due to age and replace piping to fix operational issues. • Replace pump room 13 mechanical equipment due to age. • Replace WAS pumps due to capacity deficiencies. • Replace Facility 53 VFD panels.
Phosphorus Removal and Recarbonation	• 0-5 Years	• Rehabilitate entire Rapid Mix and Flocculation Basin. Replace non-functioning rapid mix gates. Repair and resurface concrete. Repair concrete cracks. • Replace elutrient pipes. • Repair concrete at stair connection to Chemical Clarifier 1. • First stage basin concrete repair. • Repair concrete walls and replace bottom grouting of recarbonation clarifiers. • Repair water intrusion damage to CMU wall of chemical sludge pump station. • Repair second stage recarbonation basin guardrail. • Rehabilitate Phosphorous Stripping Basins. Repair concrete damage. Repair and recoat all sludge collector mechanisms and drives.
	• 6-10 Years	• Repair concrete in second stage recarbonation basin. • Replace coarse bubble diffusers in second stage recarbonation basin. • First stage basin concrete repair and gate replacement.
	• 11-25 Years	• Replace all mixers and flocculators.
Flow Equalization	• 11-25 Years	• Line offsite emergency storage ponds. • Install water cannons for ballast ponds. • Construct BFE sump and install pump. • Resurface ballast ponds.
Biological Nitrogen Removal (BNR)	• 0-5 Years	• Address blower performance issues. Conduct analysis for replacement of equipment. Replace blower equipment. • Replace PLCs 80-A, 81-A, B, and C. • Rehabilitate pilot facility.
	• 6-10 Years	• Structural retrofit to increase access opening size for backwash tank. Replenish BNR beads. • Repair cracks in structure interior gallery walls with epoxy injection. • Replace PLC CP-82D.
	• 11-25 Years	• Influent Pump Rehabilitation. • Replace MCCs 80-1,2, and 3. • Replace MCCs 81-1, 81-2, 81-3, and 81-4.

Process Areas	Timing	Improvement Recommendations
Filtration	• 0-5 Years	• Inspect interior of filter tanks. • Inspect condition of pipeline interior from MPPS to filters. • Inspect the condition of the MPPS wet well.
	• 6-10 Years	• Rehabilitate Filter Tanks. • Add backwash initiation automation to filter controls. • Install secondary power feed to MPPS. • Replace MPPS electrical cabinet and control panel. • Recoat backwash EQ tank.
	• 11-25 Years	• Install redundant pipeline between MPPS and filters. • Replace MPPS pumps and address corrosion of pump manifold in utility tunnel. Replace isolation valves.
Disinfection	• 0-5 Years	• Install permanent flow meter on chlorine contact pipeline. • Inspect chlorine contact pipeline. • Replace chlorine scrubber.
	• 6-10 Years	• Replace chlorine building roof.
	• 11-25 Years	• Chlorine facility replacement, depending on selected disinfection alternative. • Replace MCC 75. • Replace PLC (CP75C).
Ammonia Recovery System	• 0-5 Years	• Inspect filtrate clarifier (centrate equalization) tank and stripper tower feed tank in near future and recoat interior. • Replace PLC CP2A. • Replace control panel CP2C, CP2G, and related DC drives. (if Clino system is kept).
	• 6-10 Years	• AWT building repairs (roof, beam corrosion, water intrusion, floor erosion). • Demolish abandoned/unused AWT equipment (exact equipment to be determined in Master Sewer Plan, Volume 3, Chapter 6 performance evaluation). • Replace MCCs 2-1 and 2-2.
	• 11-25 Years	• Replace PLC CP2F.
Solids Handling	• 0-5 Years	• Replace old digester boilers and heat exchangers (may require replacing control building). • Replace VFDs 04630 and 04656. • Replace Dewatering VFDs (71152/511/512), harmonic filters (AHF71-1/2) and filter press feed pump VFDs (AFD-04512/14, and Digester 33 chopper pump VFD. • Replace PLCs CP71A, B, and C, Solids Buildings PLC CP4, and Digester 32 PLCs (CP-32A-01, CP-32C). • Flare improvements.
	• 6-10 Years	• Replace filter press. • Rebuild Centrisys thickening centrifuge. • Remove or replace the Sharples centrifuge pending outcome of performance analysis. • Rebuild dewatering centrifuge. • Digester insulation. • Replace TWAS pumps.

Process Areas	Timing	Improvement Recommendations
		• Replace MCCs 4, 4-1, and 4-2, and PLC CP-4. • Replace TWAS VFDs and AFDs which are obsolete. • Replace equipment in Thickener Room that does not meet area classification.
	• 11-25 Years	• Recoat thickener tank sludge collectors. • Replace thickening centrifuges. • Remove polymer tanks from Thickening Centrifuge Room. • Replace MCCs 71-1, -2, and -3. • Replace digester mixing pumps. • Replace thickening centrifuge controls.
Odorous Air	• 6-10 Years	• Replace PLC CP69A and AFDs 69010 and 69020.
	• 11-25 Years	• Replace MCC 69. • Rehabilitate fans. • Replace biofilter media.
General Plant Facilities	• 0-5 Years	• Replace 2W system. Replace and relocate electrical panel in retention basin vault. • Replace and relocate SWBD/Panel/Transformer 1A. Replace admin communication closet network equipment (SCADA, HMI, servers, switches, panels). • Conduct space planning study to look into future admin, operations, and maintenance needs for expansion. • Repair or replace storage building/warehouse standing seam metal roof. • Replace steam lines in utility tunnel to prevent further corrosion of other piping and appurtenances. • Inspect LOX tank and carbon dioxide storage tank interior condition for corrosion and recoat if necessary. • Site pump station inspections and rehabilitations. (Inspect site pump station wet wells. Recoat as needed. Replace pumps and rails. Replace corroded hatches.) • Upgrade Vehicle Maintenance Facility 70 HVAC system. • Conduct plant-wide NFPA analysis study.
	• 6-10 Years	• Replace Dewatering (Drain Sump) Pump Station. • Address corrosion of structural supports in utility tunnel. • Asphalt sealing (every 3-4 years). • Replace knife switch at Facility 28. • Demolish PSA system in conjunction with AWT demo. • Replace failed Generator 1 (Cummins) and generator control panel CP-27E. • Install seamless power transfer for Generator 3. Plant-wide upgrades of equipment and ventilation systems based on NFPA 820 analysis results.
	• 11-25 Years	• Replace 12 kV transformer in Facility 28. • Replace MMC-3 and 3A. • Asphalt sealing (every 3-4 years).

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Appendix 3A

CONDITION ASSESSMENT FORM TEMPLATE

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TTSA WRP Assessment Info

Assessment Purpose – Identify CIP projects to repair and replace aging facilities and mitigate potential risks of failure for the 25-year planning period.

Ranking/Scoring Guidelines

Use the score for the description that best describes the equipment, structure, system, etc.

Rank/ Score	Basic Description	Recommended Action	Estimated Remaining Life
1 (Good)	New or almost new equipment in excellent condition. Fully functional as designed with no visible defects or wear.	Requires only normal preventative maintenance	**> 75%** of useful life remaining
2	Fully functional for current operating conditions, shows signs of only minor wear. May have been very recently overhauled or rebuilt.	Normal preventative maintenance + Needs minor corrective maintenance	**~ 50% (30%-75%)** of useful life remaining
3 (OK)	Normal or slightly excessive wear but functionally sound.	Needs significant corrective maintenance	**~ 30%** of useful life remaining
4	Functions but only with a high degree of maintenance. Does not function as needed for current operating conditions Near the end of its design life.	Requires major rehabilitation	**10% or less** of useful life remaining
5 (Bad)	Asset has failed or will likely fail imminently. Virtually unserviceable.	Fails to perform at or near its design capacity and no replacement parts are available	**No** useful life remaining or **requires immediate replacement/rehabilitation**

More detailed information for each discipline engineer on the following pages.

Electrical

Main focus areas:

- MCCs and Switchboards
- VFDs
- PLCs
- Control Panels
- Generators
- NFPA 820 concerns
- Obsolescence or reliability of equipment

Electrical equipment has a relatively short lifecycle. Keep that in mind when looking at the major equipment.

- Will it likely need to be replaced someone in the next 25 years?
- Will this technology no longer be used in 25 years?
- When they replace it, should they replace it with something else?

Structural

Main focus areas:

- Concrete tanks and structures
- Buildings and roofs
- Non-concrete tanks
- Seismic concerns
- Safety concerns
- Corrosion concerns

Replacement of structures is typically rare, so your focus is on rehabilitation needs of these facilities:

- Concrete leak and/or crack repair
- Concrete resurfacing or relining

Mechanical

Main focus areas:

- Major equipment
- Large valves and gates
- Systems of assets (HVAC, chemical, hydraulic, spray water, etc.)

Mechanical systems may need rehabilitation (overhaul, component replacement) within 25 years. Keep this in mind for each process area.

TTSA WRP

Facility / Equipment Description

Facility: ______________________

Date of Inspection ________

Process Area: ______________________

Equipment: ______________________

Type: [MCC] [SWBD] [PLC] [Generator] [Other] ____________

General Findings

	(Good)			(Bad)		(n/a)	Comments:
Overall Condition	1	2	3	4	5	0	

Installation Year ________ Age ________ Remaining Life ________

25-Year CIP Recommendations

	ASAP!	5 Years	10 Years	25 Years
Replacement				
Rehabiliation				
Repair				
Other				

Detailed Findings

				Comments
Corrosion of equipment?	[Yes]	[No]	[N/A]	
Corrosion of enclosure?	[Yes]	[No]	[N/A]	
Obsolescence concerns?	[Yes]	[No]	[N/A]	
Spare parts concerns?	[Yes]	[No]	[N/A]	
Technology concerns?	[Yes]	[No]	[N/A]	
Conduit seal issues?	[Yes]	[No]	[N/A]	
NFPA 820 concens?	[Yes]	[No]	[N/A]	[Potentially]
Safety concerns (arc flash)?	[Yes]	[No]	[N/A]	[Potentially]

Manufacturer:

Model / Series:

Serial/Part Number:

Asset Tag:

Current Rating:

Voltage:

Sections:

Phase:

Main Bus Amps:

TTSA WRP

Facility / Structure Description

Facility: ____________________

Date of Inspection ________

Process Area: ____________________

Structure: ____________________

Other: ____________________

General Findings

	(Good)			(Bad)		(n/a)	Comments:
Overall Condition	1	2	3	4	5	0	

Construction Year ________ Age ________ Remaining Life ________

25-Year CIP Recommendations

	ASAP!	5 Years	10 Years	25 Years
Replacement				
Rehabiliation				
Repair				
Other				

Detailed Findings

					Comments
Spalling concrete?	[Yes]	[No]	[N/A]		
Major cracks?	[Yes]	[No]	[N/A]		
Evidence of tank leakage?	[Yes]	[No]	[N/A]		
Visible rebar?	[Yes]	[No]	[N/A]		
Excessive corrosion?	[Yes]	[No]	[N/A]		
Coating issues?	[Yes]	[No]	[N/A]		
Visible structural deformations?	[Yes]	[No]	[N/A]		
Foundation settling evident?	[Yes]	[No]	[N/A]		
Joint sealant replacement?	[Yes]	[No]	[N/A]		
Damaged members?	[Yes]	[No]	[N/A]		
Roofing age or leakage concerns?	[Yes]	[No]	[N/A]		
Seismic concerns?	[Yes]	[No]	[N/A]	[Potentially]	
Safety concerns?	[Yes]	[No]	[N/A]	[Potentially]	

TTSA WRP

Facility / Equipment Description

Facility: ______________________

Date of Inspection

Process Area: ______________________

________ Equipment: ______________________

Type: ______________________

General Findings

	(Good)			(Bad)		(n/a)	Comments:
Overall Condition	1	2	3	4	5	0	

Installation Year ________ Age ________ Remaining Life ________

25-Year CIP Recommendations

	ASAP!	5 Years	10 Years	25 Years
Replacement				
Rehabiliation				
Repair				
Other				

Detailed Findings

					Comments
Operational issues?	[Yes]	[No]	[N/A]		
Corrosion issues?	[Yes]	[No]	[N/A]		
Paint/coating issues?	[Yes]	[No]	[Not Running]		
Base/support issues?	[Yes]	[No]	[N/A]		
Vibration/noise issues?	[Yes]	[No]	[N/A]		
Leaks?	[Yes]	[No]	[N/A]		
Reliability concerns?	[Yes]	[No]	[N/A]		
Spare parts concerns?	[Yes]	[No]	[N/A]		
NFPA 820 concens?	[Yes]	[No]	[N/A]	[Potentially]	
Safety concerns?	[Yes]	[No]	[N/A]	[Potentially]	

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 3:
WATER RECLAMATION PLANT MASTER PLAN
CHAPTER 4:
PERFORMANCE AND CAPACITY ASSESSMENT

FINAL | February 2022

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Chapter 4

PERFORMANCE AND CAPACITY ASSESSMENT

4.1 Introduction

This chapter summarizes the performance and capacity assessment of Tahoe-Truckee Sanitation Agency's (T-TSA/Agency's) Water Reclamation Plant (WRP), which was conducted to identify current and future capital improvement needs at the WRP.

Historical treatment performance of the WRP was evaluated by reviewing daily operating data from October 2013 through September 2018. Discussions were also held with staff to identify operational issues, and a condition assessment site visit in May 2019 provided additional information on WRP performance. Condition assessment details are further described in Volume 3, Chapter 3 - Condition Assessment and in Technical Memorandum (TM) 03 - Water Reclamation Plant Condition Assessment. To facilitate development of a plant process model, additional operating data was also collected through a 2-week wastewater characterization sampling program executed from June 22, 2019 through July 8, 2019. This is described in further detail in Appendix 4A TM 02 Wastewater Characterization Sampling Plan. Volume 3, Chapter 2 Flow and Load Projections also describes historical and projected flows and loads to the WRP. The results of the WRP performance assessment were used to identify process improvement needs and to establish recommended design operating criteria.

The capacity assessment evaluated the treatment and hydraulic capacity of each major unit process. Appendix 4B - TM 04 WRP Hydraulic Capacity further details the hydraulic capacity analysis of each major unit process on the liquid treatment train side of the WRP. The results of the WRP capacity assessment were used to identify capital improvement needs, and to explore mitigating the impacts of future higher flows by modifying WRP operations. Ultimately, the results of both the performance and capacity assessments were incorporated in the 25-year capital improvement plan (CIP) for the Master Sewer Plan.

An understanding of the WRP's current treatment performance is critical to determining the treatment capacity of the WRP. Based on historical load and performance, recommended criteria for assessing capacity were developed for each major treatment process. The recommended criteria serve as the basis for the process capacity assessment. Appendix 4C - TM05 - Detailed Unit Process Load, Treatment Performance, and Capacity Analysis contains detailed information, tables, and graphs related to the loads, performance, and capacity analysis for each of the major unit processes at the WRP. Information from TM 05 has been summarized in this chapter.

4.2 Key Findings and Recommendations

The key findings of the performance assessment are:

- The plant achieves excellent nitrogen (N) and phosphorus (P) removal throughout the year.

- The primary total suspended solids (TSS) and biochemical oxygen demand (BOD) removal is less than shown in the 2003 design data with ferric chloride addition.
- Grit removal:
  - Grit accumulation in the downstream processes, particularly the primary digesters, suggests grit removal is inadequate. This appears to be caused by influent flow short circuiting at higher flow conditions. Staff have also mentioned that the deflector vanes in the original 1975 grit chamber no longer move and have not improved the hydraulic conditions. A computational fluid dynamic (CFD) model is recommended to analyze existing flow patterns and to design appropriate improvements; future improvements to address short circuiting and grit accumulation in downstream processes will be determined based on the CFD results.
- Recarbonation:
  - During the site condition assessment, it was noted that recarbonation was only occurring in the second stage recarbonation basin, due to the low volume of the treated phosphorus stripper overflow relative to the secondary effluent volume. However, since that time, operations staff has moved pH control to the first stage to help minimize chemical sludge build up in the Ballast Ponds, which has also improved the operation of the basins. So far, there has been no significant need to adjust pH of the blended stripper overflow/secondary effluent.
- Biological nitrogen removal (BNR):
  - The BNR blowers are showing signs of age and do not have the turndown that would be optimal for aeration efficiency. Turndown is at 65 percent and output is around 430 cubic feet per minute (cfm). The output should be in the range of 700 to 800 cfm for backwash and within 200 to 600 cfm for normal operations.
- Disposal fields:
  - The disposal fields have been in service since the WRP's original construction in 1975. It is anticipated that the hydraulic capacity of the disposal fields may diminish in the future, and/or that the fields may eventually clog, bind, or fail in some way. Therefore, it is recommended that the disposal fields be replaced and/or supplemented to provide final effluent polishing in the future.
- Waste activated sludge (WAS) gravity thickener:
  - Thickeners and building are in good condition.
  - The equipment and operational issues identified from discussions with operators during site visits include:
    - The thickened waste activated sludge (TWAS) pumps and associated drives are old and installed in a space constrained area, making it difficult to access parts of the pumps, piping, and valves. The pump motors are direct current (DC), but staff would prefer replacement with alternating current (AC), assuming that AC drives can provide similar turndown to the existing DC drives.
  - The WAS gravity thickener has generally been performing well, with better than typical overflow TSS and capture rate, and typical TWAS percent total solids (%TS) concentration, sludge blanket, and pH. This good performance is despite the low WAS %TS concentration fed to the gravity thickeners which results in higher hydraulic loads than recommended. However, a slight reduction in TWAS %TS concentration is observed during higher hydraulic loads.

- To reduce the hydraulic load on the gravity thickeners, improve gravity thickener performance, and reduce the hydraulic load on the anaerobic digesters downstream, it is recommended that T-TSA consider an operational modification to waste solids from the secondary clarifier underflow rather than the mixed liquor channel. Either mixed liquor wasting or settled sludge (RAS) wasting can be used for activated sludge solids retention time (SRT) control. The downstream thickening solids load is the same for both methods, but the thickening hydraulic load is higher with mixed liquor wasting because of the higher settled sludge suspended solids concentration compared to the mixed liquor suspended solids (MLSS) concentration. Mixed liquor wasting, also known as hydraulic SRT control, is more straightforward, as the waste mixed liquor flow rate is simply the aeration basin volume divided by the target SRT. The equivalent settled sludge (RAS) wasting flow rate can be calculated as the product of the hydraulic SRT control flow rate and the term R/(R+1), where R is the return sludge flow ratio, Q_{RAS}/Q. For example, with a return sludge flow ratio of 0.50, the settled sludge wasting flow rate is one third the equivalent mixed liquor wasting flow rate for a given SRT. It should be noted that the plant can switch to RAS wasting without detrimental impacts to secondary treatment performance. Wasting pumps may also need to be upsized to address existing capacity limitations. Other options are to add polymer to the gravity thickeners or use two of the three gravity thickeners for WAS thickening.
- Reported TWAS total solids (TS) load is 36 percent higher than WAS TS load. Calibrating the TWAS and WAS flow meters to rectify this inconsistency is recommended.
- The annual average (AA) overflow rate (391 gallons per day per square foot [gpd/sq ft]) is higher than the recommended range of 100-200 gpd/sq ft. Poor solids settleability can result in high overflow rates that can cause excessive solids carryover. Despite the high overflow rate, however, solids settleability is adequate. Settleability should be tracked to ensure solids characteristics do not change in the future.

- WAS/TWAS thickening centrifuges:
  - According to discussions with operating staff, the cake pump and cake tank, as well as the polymer feed system would need to be either upgraded and improved or replaced by a new system, to run either centrifuge efficiently.
  - T-TSA operated the Centrisys thickening centrifuge during 2 months in 2017 and 3 months in 2020 at about 10 percent of the centrifuge's rated capacity. The centrifuge performed well, producing cake at 6.5 and 7.9 percent in 2007 and 2020 respectively. The average 2020 centrate concentration is higher than the recommended maximum, but this could be due to some possible outliers in the July 2020 data.
- Chemical sludge gravity thickeners:
  - Thickeners and building are in good condition.
  - There is no data available for the flow or concentration of chemical sludge fed to the gravity thickeners. The only data available pertaining to the chemical sludge thickener is the sludge blanket depth, the feed pH, and thickened chemical sludge concentration. T-TSA conducted a special sampling which included measurements of the chemical sludge gravity thickener overflow TSS. From the limited data

available, the gravity thickener is performing generally well, with a high thickened sludge concentration of 12 percent TS and a low overflow TSS.

- Anaerobic digestion:
  - WRP staff noted several issues with the equipment and operations of the anaerobic digestion system:
    - Numerous possible issues affect all parts of the heating system, including the hot water and steam boilers, the heat exchangers, the water conditioning system, and the hot water piping and pumps. In addition, there is limited space in the control building for maintenance, and issues with fire code compliance.
    - Struvite precipitation occurs with cooling after the thermophilic stage, so cooling is not practiced.
    - Digester gas issues including poor moisture removal and difficult iron sponge media change-out.
    - The waste gas flare is old, has limited turndown, issues with the igniter, and antiquated controls. If any modifications or upgrades are made, the flare would need to comply with more recent air emission regulations and standards for safe distance from buildings and tanks.
    - Snow accumulation on cover increases the gas pressure within the system. Snow has to be manually removed as needed.
  - The performance of the anaerobic digestion system was evaluated for two operating modes. During the **"parallel thermo/meso mode,"** the digestion process had stable operations. During the **"temperature phased anaerobic digestion (TPAD) mode,"** the digestion process data shows some periods when typically recommended operational parameters were exceeded in the thermophilic digester, which could result in digester instability. The anaerobic digesters have performed well in terms of volatile solids reduction (VSR) and biogas yield during both operating conditions.
- Organic sludge and chemical sludge dewatering in centrifuges:
  - Equipment and operational issues identified from discussions with operators during site visits include:
    - Incomplete utilization of cake hoppers: only using 80 to 85 percent of the weight-bearing capacity of the hoppers, because cake cones on the top making it impossible to fully fill the hoppers.
    - The hopper was modified with a foil to assist with loadout of sludge.
    - The liner in the centrate tank partially failed and required patch repairs of the polyvinyl chloride (PVC) liner.
  - The dewatering centrifuges are generally operating well, with high capture rate and cake TS concentration. The polymer feed is lower than typical, which is probably due to the chemical sludge.
- Chemical sludge dewatering in plate-and-frame filter press:
  - Equipment and operational issues identified from discussions with operators during site visits include:
    - No redundancy.
    - Several locations around the press with concrete deterioration require repair.
    - Control instruments are antiquated.

    - Press can only be used reliably for chemical sludge on its own, or with chemical sludge as a "coating" on the cloths because organic sludge binds the cloths. When blinded, the press cannot perform as needed and the cloths become difficult to clean.
    - Operators would like a separate system for rags and grit disposal, so that they are not dependent on running a chemical sludge load through the filter press to dispose of rags and grit.
  - The chemical sludge feed flow to the press is not measured, so the capture rate could not be calculated.
  - The dewatered chemical sludge TS concentration varied widely from 57 to 32 %TS. This was because the filter press cloths needed be acid washed and replaced. Staff has now implemented preventative maintenance that includes acid washing the cloths every year and replacing the cloths every 5 to 7 years. Ever since this preventative maintenance was established, performance has improved.

The key findings of the capacity assessment are:

- The WRP has sufficient hydraulic capacity to reliably handle the rated wet weather design capacity of 15.4 million gallons per day (mgd) with one main process treatment train out of service.
- The primary clarifiers are the limiting unit process for the conventional treatment hydraulics, with a capacity of approximately 24 mgd with all four primary clarifiers in service.
- There is currently excess influent wet weather equalization storage capacity to accommodate future 25-year design storm conditions.
- A 53 percent increase to influent flows and loads is projected in 2045; since the WRP is currently using only 50 percent of its facilities for average flows, there is sufficient liquid stream process capacity for the Master Plan period.
- T-TSA can pass a higher peak flow through the WRP hydraulically and process-wise than current flows have seen.
- The primary and secondary treatment facilities have the capacity to handle the projected 53 percent increase in flow and loads over the next 25 years as only half of the oxygenation reactors are used currently.
- The phosphorus stripping facilities have the capacity to handle the projected 53 percent increase in phosphorus load over the next 25 years as only one third of the stripping tanks are used currently.
- The nitrifying submerged filters have the capacity to handle the projected 53 percent increase in nitrogen load over the next 25 years as five out of eight nitrifying submerged filters are used currently.

- The capacity of the denitrifying submerged filters may be improved through two different approaches. The first approach is tighter control of nitrifying submerged filter aeration air flow to reduce dissolved oxygen carryover, which compromises denitrification capacity and increases methanol demand. The second approach is to recycle a portion of the nitrified effluent to the plant headworks, where bacteria and soluble biodegradable carbon in the raw sewage will remove the nitrate through denitrification.
- Primary sludge, WAS, and chemical sludge pumps:
  - The primary sludge and primary scum pumps have sufficient capacity for current and future flows.
  - Capacity assessment for the WAS pumps was evaluated for two conditions:
    - Wasting from the mixed liquor at 0.14 %TS (current operation): the duty WAS pump capacity of 255 gallons per minute (gpm) is exceeded at future maximum week (MW) flow, and additional capacity will be needed.
    - Wasting from the secondary clarifier underflow at 0.44 %TS: WAS pumps have sufficient capacity for future flows.
  - The chemical sludge and recarbonation sludge pumps have sufficient capacity for current and future flows.
- WAS gravity thickener:
  - The overflow rate is exceeded for current and future flows, indicating additional capacity is needed. The mass loading rate is exceeded only for the future MW TS load.
  - When additional WAS thickening capacity is needed, T-TSA has the option of switching one of the two chemical thickeners for use as a second WAS thickener.
- WAS thickening centrifuges:
  - Three scenarios were evaluated for the centrifuge capacity assessment to capture all possible operating modes:
    - Thickening WAS at 0.14 %TS wasted from the mixed liquor channel: one centrifuge does not have sufficient capacity, even assuming 24 hours per day (hr/d), 7 days per week (d/wk) operations.
    - Thickening WAS at 0.44 %TS wasted from the secondary clarifier underflow: one centrifuge has enough capacity, but it would need to operate more than 8 hr/d, 5 d/wk.
    - Further thickening TWAS after it has been thickened in the gravity thickeners at 2.85 %TS (current operation): one centrifuge has enough capacity on a 24 hr/d, 7 d/wk operating schedule under all conditions evaluated.
  - The centrifuge feed pumps and TWAS pumps have sufficient capacity for current and future flows.
- Chemical sludge gravity thickeners:
  - Even with only one gravity thickener in service, the system has plenty of capacity for all current and future evaluated conditions.
- Anaerobic digestion:
  - For both the **"parallel thermo/meso mode"** and the **"TPAD mode"** of operation, the anaerobic digestion system has enough capacity to meet the 15-day SRT requirement in all conditions evaluated except for future MW. A strategy to reduce the hydraulic loading to the digesters is to use the thickening centrifuge to increase

the digester feed concentration, particularly during MW flows. During future MW conditions, by year 2039, it will be necessary to use the backup thickening centrifuges to achieve 15-day SRT in the digesters. If the thickening centrifuges produce a TWAS concentration of 5.5 %TS, then the digesters have sufficient capacity in all future conditions evaluated.

  - The existing digesters have enough capacity to operate in either "**parallel mesophilic mode"** or in **"parallel thermo/meso mode"** through 2045, assuming a slight exceedance of the maximum mesophilic volatile solids loading rate (VSLR) is manageable during MW flows. In **"TPAD mode"** since all the VS load is first fed to the single primary digester, the maximum recommended VSLR of 0.4 pounds per cubic foot per day (lb/cfd) is exceeded significantly during the future MW condition. If T-TSA desires to continue operating in **"TPAD mode,"** then building an additional digester is recommended to avoid volatile solids (VS) overload. If digesters are operated in **"TPAD mode,"** additional capacity would be needed by 2022 to avoid exceeding the maximum recommended VSLR during MW condition.
- Organic sludge and chemical sludge dewatering in centrifuges:
  - Assuming 8 hr/d, 7 d/wk operations, one centrifuge and one centrifuge feed pump have sufficient capacity for all the conditions evaluated, except for the future MW flow. During future MW conditions, the operating schedule would need to be extended by a few hours.
  - The cake storage hopper has less than 3 days storage during current MW conditions and during future AA and MW conditions. T-TSA may need to ask the hauler to operate on Saturdays.
- Chemical sludge dewatering in plate-and-frame filter press:
  - For the current operations scenario, where ~50 percent of the chemical sludge is dewatered in the filter press, the press and feed pumps have sufficient capacity to dewater the chemical sludge through future conditions. For the worst case scenario, where the press is used to dewater all of the chemical and organic sludge, the press has sufficient capacity but would need to operate over 40 hours a week. To reduce overtime, it may be possible to install additional chambers to increase the capacity per cycle, however, additional chemical sludge bins would likely be needed to avoid overloading the bins.

Recommendations to improve WRP performance include the following:

- Analyze existing flow patterns using a CFD model and design appropriate improvements for the grit chamber.
- Optimize primary clarifier ferric chloride feed (dose, weekly schedule).
- Install oxygenation reactor vent oxygen meter.
- Modify secondary clarifier mechanisms to original "organ pipe" configuration.
- Evaluate sidestream phosphorus removal through struvite precipitation (e.g., Ostara).
- Evaluate waste activated sludge stripping to remove internal phosphorus (WASSTRIP) performance.
- Evaluate combined lime/caustic addition to reduce chemical sludge quantity.
- Install water cannons to reduce time spent cleaning the ballast ponds.
- Modify nitrifying submerged biological filter aeration air blowers and air distribution system to minimize nitrified effluent dissolved oxygen (DO) concentration.

- Implement pre-denitrification to reduce methanol consumption by recycling a portion of the nitrified effluent to the headworks if feasible.
- Abandon original ion exchange process, including the ammonia removal and recovery process. This will allow for beneficial re-use of the existing advanced waste treatment (AWT) building by providing space for future processes to be housed in this location, affording the benefit of cost savings to T-TSA. Specifically, the proposed future Disinfection Process Modernization Project is planned to be housed in the AWT.
- WAS gravity thickener:
  - Replace TWAS pumps and associated drives for ease of maintenance. Replace DC drives with AC.
  - Consider wasting WAS from the secondary clarifier underflow rather than the mixed liquor channel. This would have several benefits including reducing the hydraulic load on the gravity thickeners, improve gravity thickener performance, and possibly reducing the hydraulic load on the anaerobic digesters downstream.
  - Check the accuracy of the TWAS and WAS flow meters to sort out the mass balance discrepancy.
- WAS thickening centrifuges:
  - Upgrade or replace polymer feed system associated with thickening centrifuges, so that it can be available for redundancy.
- Chemical sludge gravity thickeners:
  - Begin measuring TS concentration of chemical sludge to gravity thickeners, thickened chemical sludge, and thickener overflow on a weekly basis.
- Anaerobic digestion:
  - Operate the thickening centrifuges during MW flow conditions to reduce the hydraulic load on the anaerobic digesters to ensure 15-day SRT is met.
  - Since TPAD has not resulted in significant performance increases relative to **"parallel thermo/meso mode,"** consider switching operations **to "parallel thermo/meso mode"** or **"parallel mesophilic mode**" to reduce the risk of VS overload and digester instability or upset.
  - Invest in digester heating and flare upgrade project, which involves a new digester control building with all new equipment (boilers, heat exchangers, etc.) and piping, and a new waste gas flare.
  - Evaluate digester gas treatment needed to protect boilers.
- Chemical sludge dewatering in plate-and-frame filter press:
  - Continue filter press preventative maintenance that includes acid washing the cloths every year and replacing the cloths every 5 to 7 years.
  - Repair/replace conveyance system for hydrated lime, upgrade plate-and-frame filter press, and replace hydraulic unit.
- Support Systems:
  - Replace the recently failed 1975 Cummins 750-kW generator with a new air-cooled 1,500-kW generator and new switch gear.
  - Analyze existing 2-water system, replace pressure tank, add valve vault for buried valves, and consider dechlorinating 2-water before its use throughout the plant.
  - Replace the existing sulfuric acid storage with smaller storage facilities, possibly with 250-gallon totes; remove the salt storage tanks. Additionally, the pumps and

control panels associated with the chemical feed systems should be replaced as they age and performance is compromised.
    - Replace the air tank for the plant air systems.
- General
    - Perform a plant-wide NFPA 820 evaluation to identify deficient areas and required capital improvements.

4.3 Overall WRP Capacity Assessment

This section summarizes the results of the capacity analysis. Capacities were estimated for each unit process and are dependent on a range of parameters including flow, influent wastewater characteristics, hydraulic limitations, loading rates, volumes, process configurations and limitations, and desired redundancy.

The capacity assessment was conducted in three stages: 1) detailed hydraulic analysis was first conducted to determine the hydraulic limitations of the unit processes using Visual Hydraulics V4.2 software, 2) liquid train treatment plant modeling using BioWin™ v.6.1 software was then conducted to determine the treatment limitations of the unit processes for the liquid treatment train, and 3) solids train treatment plant modeling using Excel software was conducted to determine the treatment limitations of the unit processes for the solids treatment train. The findings from the hydraulic capacity analysis are presented in further detail in the Water Reclamation Plant Hydraulic Capacity TM04 in Appendix 4B. The findings from the liquid and solids treatment modeling are presented in further detail in Appendix 4C - TM05 - Detailed Unit Process Load, Treatment Performance, and Capacity Analysis.

Figure 4-1 summarizes the capacity of the major process components of the liquid treatment, solids handling, and effluent disposal processes at the WRP, with the process capacity expressed as the maximum week Summer flow (between June 21 and September 21), the flow basis used in the existing WDRs. The length of each horizontal bar represents the capacity of each process component using the criteria summarized in Table 4-1.

The black vertical line on the figure represents the current maximum week Summer flow rate of 5.45 mgd and the red vertical line represents the projected 2045 maximum week Summer flow rate of 8.13 mgd, an increase of approximately 150 percent. Most components provide more than 8.13 mgd of process capacity. As discussed in TM-5, pre-denitrification is recommended to provide sufficient denitrification process capacity, a slightly higher maximum volatile solids loading rate (VSLR) with parallel mesophilic digestion is recommended to provide sufficient anaerobic digestion capacity, and a slightly lower dewatered cake storage duration is recommended to provide sufficient cake storage capacity.

The projected maximum week Summer flow rate increase of 2.68 mgd corresponds to 13,400 equivalent dwelling units (EDUs) based on 200 gpd per EDU as used in the existing WDRs. The annual maximum week Summer flow rate can be used to calculate remaining EDUs as flow increases in the future.

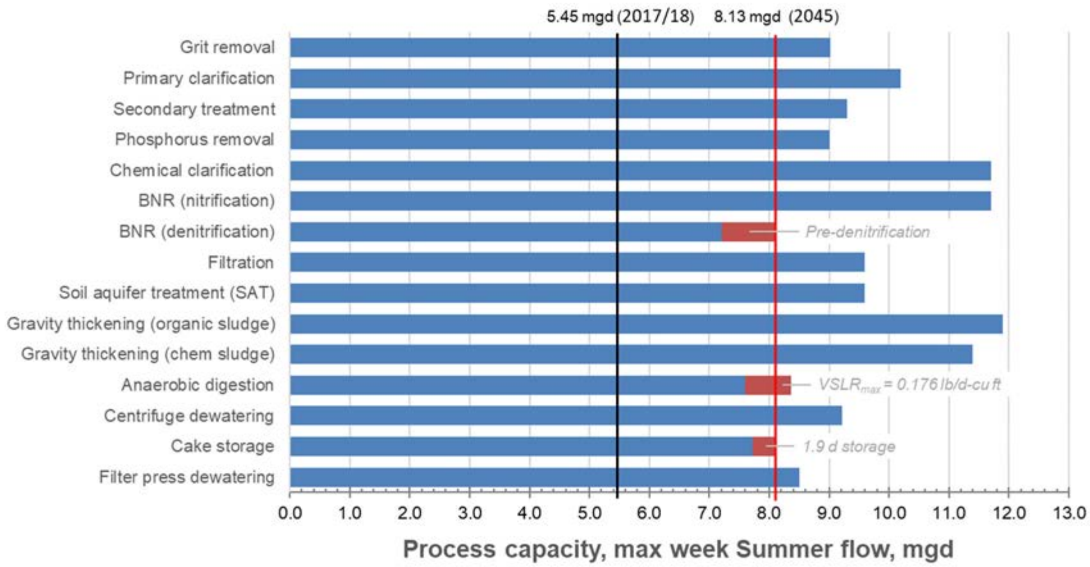

Figure 4.1 Process Capacity Summary

Additional denitrification capacity through pre-denitrification is needed at 7.2 mgd, additional anaerobic digestion capacity through increased VSLR is needed at 7.6 mgd, and additional cake storage capacity through reduced storage duration is needed at 7.7 mgd.

4.4 Overall WRP Performance

This section summarizes the overall treatment performance of the WRP. The overall treatment performance of the WRP is based on historical compliance with conventional pollutant requirements in the WRP's Waste Discharge Requirements (WDRs). The discharge requirements included in the WDRs, as well as all other permits regulating the WRP are described in detail in Volume 3, Chapter 5 - Regulatory Requirements. Overall WRP performance for water year 2018 (WY2018) is shown below in Table 4.2.

Table 4.1 WRP Process Capacity Summary

Parameter	Units	2003 Design Data(1)	Current Loading(9)	Operating Conditions Notes	Projected 2045 Conditions	Capacity Criterion(2)	Capacity Assessment for 2045 Conditions	Recommended Process Expansion/Modification
General								
Flow rate								
• Annual average	mgd	8.0	--		6.16	--		
• Maximum month	mgd	8.3	--		8.99	--		
• Maximum week	mgd	9.6	--		8.13 (Jun 21 – Sep 21) 10.8 (Sep 22 – Jun 20)	--		
• Peak instantaneous	mgd	15.4	--		15.4 (EPWWF)(3) 30.0 (UPWWF)(3)	--		
Grit Removal								
Surface overflow rate (SOR), maximum week	gpd/sq ft	15,000	14,100	Limited by max week SOR, 2 of 2 units in service		--	Sufficient capacity	None required
SOR, peak instantaneous	gpd/sq ft	22,250	--			--		
Primary Clarification								
SOR, maximum week	gpd/sq ft	1,061 (1,415)(4)	1,127	Limited by max week SOR, 4 of 4 units in service		800 – 1,200	Sufficient capacity	None required
SOR, peak instantaneous	gpd/sq ft	1,574 (2,098)(4)	--			2,000 – 2,500		
Secondary Treatment								
Oxygenation basins								
• Hydraulic residence time (HRT), maximum week	hour (hr)	1.5 (1.1)(4)	--			--	Sufficient capacity	None required
• HRT, peak instantaneous	hr	1.1 (0.82)(4)	--			--		
• Solids residence time	d	5	--			3 – 10		
Secondary clarifiers								
• Return sludge flow fraction	%	40 – 60	--			25 – 50	Sufficient capacity	None required
• SOR, maximum week	gpd/sq ft	340 (454)(4)	439	Limited by max week SOR, 3 of 4 units in service		400 – 700		
• SOR, peak instantaneous	gpd/sq ft	525 (700)(4)	--			1,000 – 1,600		
• Solids loading rate (SLR), maximum week	pounds per day per square foot (lb/d/sq ft)	--	--	Limited by peak instantaneous SLR (24.0 mgd, 6.92 mgd RAS, 7 of 8 oxygenation reactors in service, 3 of 4 clarifiers in services)		20 – 30		
• Solids loading rate, peak instantaneous	lb/d/sq ft	--	--			40 – 50		
Phosphorus Removal								
Phosphorus stripping tanks								
• HRT, maximum week	hr	6.5	6.9	2 of 3 units in service		--	Sufficient capacity	None required
Chemical Clarifiers								
• SOR, maximum week	gpd/sq ft	392	477	1 of 2 units in service		--	Sufficient capacity	None required

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Parameter	Units	2003 Design Data(1)	Current Loading(9)	Operating Conditions Notes	Projected 2045 Conditions	Capacity Criterion(2)	Capacity Assessment for 2045 Conditions	Recommended Process Expansion/Modification
Biological Nitrogen Removal (BNR)								
• Nitrification	Nitrification	Nitrification	Nitrification	Nitrification	Nitrification	Nitrification	Nitrification	Nitrification
• Nitrogen loading rate, maximum week	kgN/m3-d	0.53(7)	0.65	All cells in service		1.5	Sufficient capacity	None required
Denitrification								
• Nitrogen loading rate, maximum week	kgN/m^3-d	1.67(7)	1.25	All cells in service		1.2 – 1.5	Additional capacity needed	Nitrified effluent recycle to headworks can be used to mitigate denitrification capacity deficit
Filtration								
Filters								
• Hydraulic loading rate, maximum week flow	gpm/sq ft	4.6 (6.1)(7)	4.6	3 of 4 units in service		--	Sufficient capacity	None required
• Gravity thickeners (organic sludge)								
• SOR, maximum week	gpd/sq ft	87	530	809	100 – 200	Capacity limited by SOR	A chemical sludge gravity thickener can be switched to organic sludge thickening, or settled sludge wasting for SRT control can be used to mitigate gravity thickener SOR	
• Solids loading rate, maximum week	lb/d/sq ft	19.1	6.17	9.42	2.5 – 7.4			
Anaerobic digestion								
• VSLR, TPAD mode, maximum week	lb/d/d		0.38	0.57	0.40	Digester capacity limited by VSLR and HRT	Digesters can be operated in parallel mode to mitigate high digester VSLR in single digester. During peak loading conditions, closely monitor VFA concentrations and pH. T-TSA's digesters can possibly handle higher organic loads than typical due to their high alkalinity from the chemical sludge. Thickening centrifuge can be used to reduce hydraulic load to digesters during maximum week condition.	
• VSLR, Parallel mode, maximum week	lb/d/d		0.13	0.19	0.16			
• HRT, maximum week (4 digesters in service)	d	15	21.3	14.0	15			
Gravity thickeners (chemical sludge)								
• SOR, maximum week, one thickener in service	gpd/sq ft	570	98	150	982	Sufficient capacity, even with only one thickener in service.	None required	
• Solids loading rate, maximum week, one thickener in service	lb/d/sq ft	11.8	28	43	25 – 61			
Centrifuge dewatering								

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Parameter	Units	2003 Design Data(1)	Current Loading(9)	Operating Conditions Notes	Projected 2045 Conditions	Capacity Criterion(2)	Capacity Assessment for 2045 Conditions
Centrifuge dewatering							
• Feed flow rate @ 8 hr/d, 7 d/wk	gpm	100 – 150	115	176	175	Dewatering centrifuge limited by hydraulic capacity	Dewatering centrifuge can be operated more than 56 hr/week to mitigate centrifuge hydraulic load
• Solids loading rate @ 8 hr/d, 7 d/wk	lb dry solids (DS)/hr		1,511	2,307	2,430		
Cake storage							
• Storage capacity, annual average	d	4.4	4.4	2.9	3	Additional cake storage or hauling needed	Additional cake storage can be added or 6 day/week landfill hauling can be used to mitigate cake storage deficit
• Storage capacity, maximum week	d	2.5	2.5	1.6	3		
Plate-and-frame filter press (chemical sludge dewatering)							
• Dewatered chemical sludge volume(8), annual average	cubic yards per day (yd^3/d)		3.8	5.8	--	Sufficient capacity	None required
• Dewatered chemical sludge volume(8), maximum week	yd^3/d		7.6	11.6	--		

Notes:
(1) Source: Expansion of Water Reclamation Plant Drawings, CH2MHILL, October 2003.
(2) Source: Design of Water Resource Recovery Facilities, MOP 8, Sixth Edition, 2018.
(3) Unequalized peak wet weather flow (UPWWF) is differentiated from equalized peak wet weather flow (EPWWF), in that EPWWF is the peak flow rate after flows are equalized in the WRP onsite emergency retention basin and/or in the offsite upstream equalizing ponds.
(4) Value in parentheses represents one unit out of service.
(5) One stripping tank out of service.
(6) Source: Biostyr® System O&M Manual, Krüger, April 2005.
(7) Value in parentheses represents one filter in backwash.
(8) Assuming 50% of chemical sludge dewatered in plate-and-frame filter press, per current operations.
(9) Based on maximum week flow between 6/21 and 9/21, and compared to 2045 maximum week flow of 8.13 mgd unless otherwise noted.

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Table 4.2 WRP Performance Summary, WY 2018

Parameter / Averaging Period	Units	Design Data(1)	WY2018
Raw Sewage			
Flow rate	mgd		
• Annual average		8.0	4.09
• Maximum month		8.3	6.12
• Maximum week		9.6	6.93(2)
• Peak instantaneous		15.4	11.1
TSS load	thousand pounds per day (klb/d)		
• Annual average		11.3	6.33
• Maximum month		13.8	10.1
• Maximum week		18.4	12.2
TSS concentration	milligrams per liter (mg/L)		
• Annual average		170	186
• Maximum month		200	198
• Maximum week		230	211
5-day biochemical oxygen demand (BOD_5) load(3)	klb/d		
• Annual average		13.3	9.86
• Maximum month		17.3	15.8
• Maximum week		22.4	19.3
BOD_5 concentration(3)	mg/L		
• Annual average		200	289
• Maximum month		250	310
• Maximum week		280	334
Chemical oxygen demand (COD) load(16)	klb/d		
• Annual average		n/a	20.2
• Maximum month		n/a	32.4
• Maximum week		n/a	39.6
COD concentration(16)	mg/L		
• Annual average		n/a	592
• Maximum month		n/a	636
• Maximum week		n/a	685
Nitrogen load(4)	klbN/d		
• Maximum week		3.44	3.11
Nitrogen concentration(4)	mgN/L		
• Maximum week		43	53.8
Grit Removal			
Minimum particle size removed	millimeters	0.15 (100 mesh)	--
Primary Clarification			
Conventional			
• TSS removal	%	60	--
• BOD_5 removal	%	30	--
Advanced primary treatment(5)			
• TSS removal	%	70	--
• BOD_5 removal	%	50	--
Annual average(6)			
• TSS removal	%	63 – 64	60
• BOD_5 removal	%	36 – 39	--(7)
Primary sludge volatile solids fraction	%	75	91.7
Secondary Treatment			
Oxygenation			
• BOD_5 loading, maximum month	klb/d	12.1	9.42
• BOD_5 loading, maximum week(5)	klb/d	11.2	11.90(3)
• Solids residence time	d	5	2.5
• Oxygen requirements, maximum month	klb/d	15.4	5.59
• Oxygen requirements, maximum week(5)	klb/d	14.3	6.78
Secondary clarification			
• SOR(6) maximum week	gpd/sq ft	340 / 454	441
• SOR(6) peak instantaneous	gpd/sq ft	535 / 700	585
Return activated sludge (RAS)/WAS pumping			
• RAS/WAS volatile solids fraction	%	75	87.4(8)
Phosphorus Removal			
Stripper tanks			
• SOR	gpd/sq ft	274	449(9)
Rapid mix basins			
• Lime dose (as $CaCO_3$)	mg/L	250	390
• Lime dose (as $CaCO_3$)	klb/d	2.71	3.50
Chemical clarifier			
• SOR	gpd/sq ft	392	415

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Parameter / Averaging Period	Units	Design Data(1)	WY2018
Biological Nitrogen Removal (BNR)			
Nitrogen removed by BNR	klbN/day	2.30	1.69
Nitrification			
• Hydraulic loading rate, average	gpm/sq ft	1.27	1.07
• Hydraulic loading rate, maximum	gpm/sq ft	1.80	1.85
• Specific air delivery, per filter	standard cubic feet per minute (scfm)/sq ft	0.48	0.50
• Air delivery, per filter	scfm	451	467
• Backwash sludge production	klb DS/d	1.30	--(10)
Dentrification			
• Hydraulic loading rate, average	gpm/sq ft	3.95	1.31
• Hydraulic loading rate, maximum	gpm/sq ft	5.59	2.21
• Maximum methanol required	gal/hr	48.6	50.8
• Backwash sludge production	klb DS/d	2.40	--(10)
Filtration			
Filter operation			
• SOR, assuming 2 filters in service	gpd/sq ft	4.6 / 6.1	7.7
Solids Handling System			
Primary sludge production			
• Total solids load, maximum month	klb/d	11.8	8.43
• Total solids load, maximum week	klb/d	18.7	10.4
• Volatile solids load, maximum month	klb/d	8.80	7.67
• Volatile solids load, maximum week	klb/d	14.0	9.55
Organic sludge thickening			
• SOR, maximum week	gpd/sq ft	87	530
Organic sludge digestion			
• Volatile solids loading rate, maximum month	pounds per day per cubic foot (lb/d/cu ft)	0.15	0.07(11)
• Volatile solids loading rate, maximum week	lb/d/cu ft	0.19	0.13(11)
• Overall volatile solids reduction	%	60	65
• Hydraulic retention time (HRT), thermophilic digester, maximum month	d	5.5	30.2(11)
• HRT, thermophilic digester, maximum week	d	4.2	16.0(11)
• HRT, mesophilic digester, maximum month	d	11.0	30.2(11)
• HRT, mesophilic digester, maximum week	d	8.4	16.0(11)
Organic sludge dewatering			
• Solids load, maximum week	klb/d	15.2	12.5(12)
• Polymer dose	lb/dry ton	40	18.1
• Dewatered sludge concentration, minimum	%DS	27	23
• Solids capture efficiency	%	92	99.6
Chemical sludge thickening			
• Solids load, as $CaCO_3$	klb/d	5.80	--(13)
• Surface overflow rate, maximum week	gpd/sq ft	570	--(13)
• Thickened solids concentration, minimum	%DS	8.0	7.1
Chemical solids dewatering			
• Feed sludge solids, maximum week	klb/d	5.80	--(14)
• Feed sludge volume	gallons per day	8,800	--(14)
Filtrate stripping system			
• Nitrate removed	klbN/d	0.34	--(15)

Notes:
(1) Source: Expansion of Water Reclamation Plant Drawings, CH2MHILL, October 2003.
(2) Maximum 7-day moving average flow rate between Jun 21 and Sep 21 = 5.25 mgd.
(3) Raw sewage BOD_5 is measured twice per week.
(4) Raw sewage nitrogen load and concentration based on total Kjeldahl nitrogen (TKN).
(5) Advanced primary treatment assumed for maximum week loading period and on weekends.
(6) Values with all units in service and one unit out of service.
(7) Primary effluent BOD is not measured.
(8) Reported value is TWAS volatile solids fraction.
(9) Supernatant only.
(10) BNR backwash solids concentration is not measured.
(11) Parallel thermophilic/mesophilic operation.
(12) 51% thickened chemical sludge and 49% organic (digested sludge).
(13) Chemical clarifier sludge and recarbonation clarifier sludge solids concentration and flow rate are not measured.
(14) Plate-and-frame filter press feed solids load and flow rate are not measured.
(15) Filtrate stripping system not used during WY2018.
(16) COD loads and concentrations were not included in the 2003 Design Data.

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Operations and performance of the T-TSA WRP unit processes were evaluated for this planning study using the 12-month period from October 1, 2017 through September 30, 2018 (WY2018).

Figure 4.2, Figure 4.3, and Figure 4.4 show daily average influent flow rate, TSS load, chemical oxygen demand (COD) load, BOD_5 load, total Kjeldahl nitrogen (TKN) load, and total phosphorus (TP) load. A 28-day and 7-day moving average trendline are shown for each constituent to visually indicate peak month and peak week flow and load conditions.

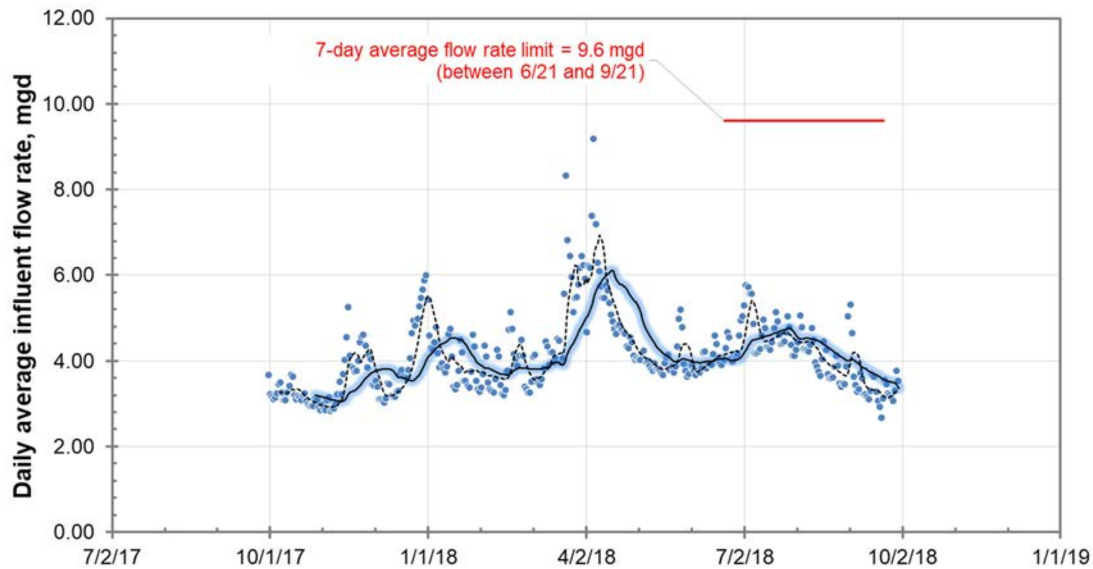

Figure 4.2 Influent Flow Rate, WY2018

The solid highlighted trendline represents a 28-day moving average value. The dashed trendline represents a 7-day moving average value.

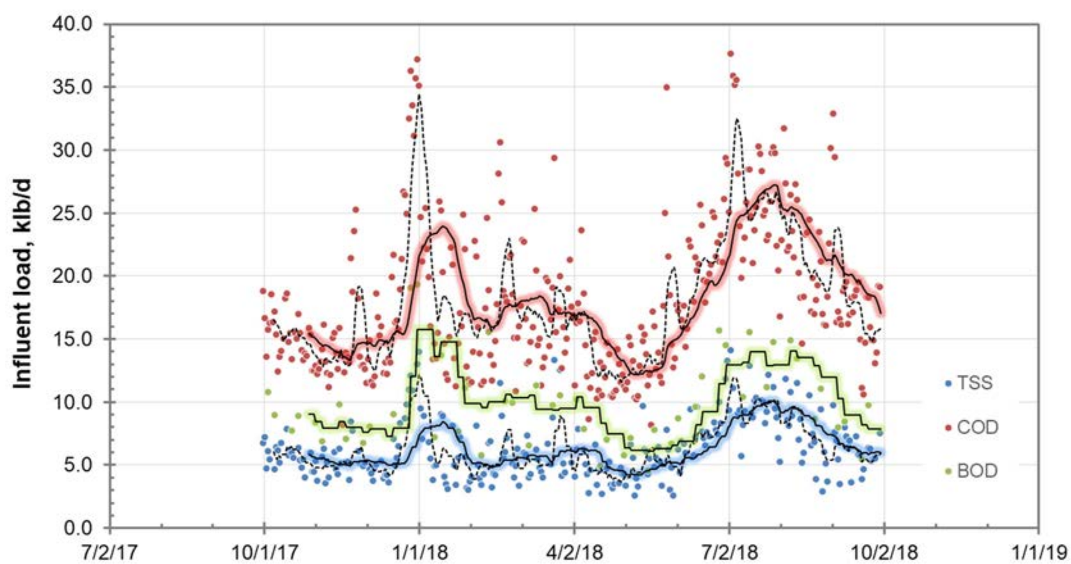

Figure 4.3 Daily Average Plant Influent TSS, COD, and BOD Load, October 2017 – September 2018

The solid highlighted trendlines represents a 28-day moving average value. The dashed trendlines represents a 7-day moving average value.

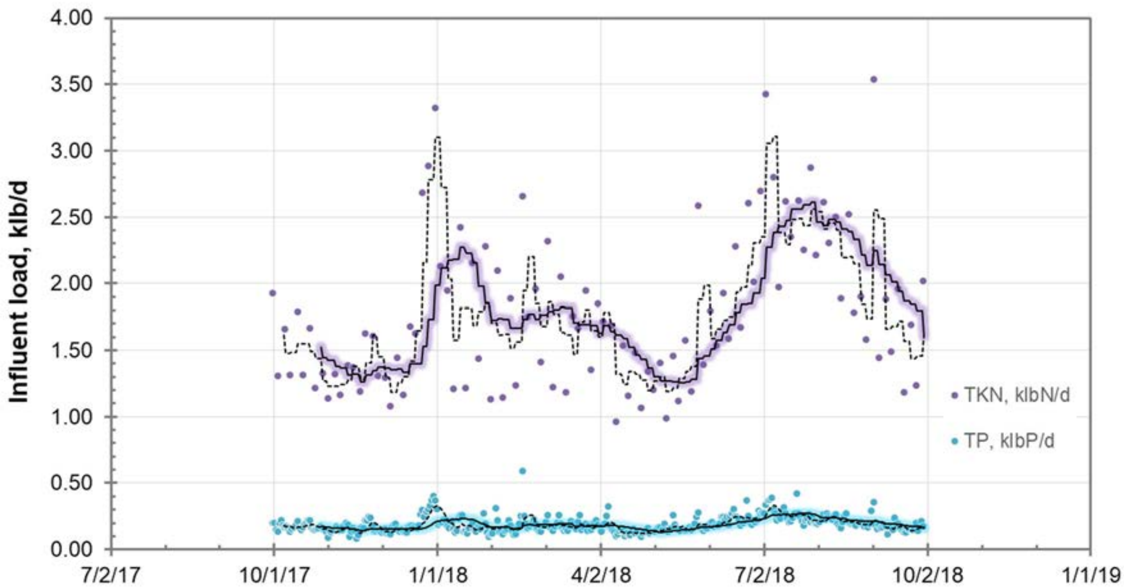

Figure 4.4 Daily Average Plant Influent TKN and TP Load, WY2018

The solid highlighted trendlines represents a 28-day moving average value. The dashed trendlines represents a 7-day moving average value.

Daily average final effluent TSS, COD, and TP concentrations are shown in Figure 4.5, Figure 4.6, and Figure 4.7, respectively. A 28-day moving average trendline is shown in each figure to compare WY2018 performance to final effluent discharge limits, indicated by the horizontal red lines in each figure.

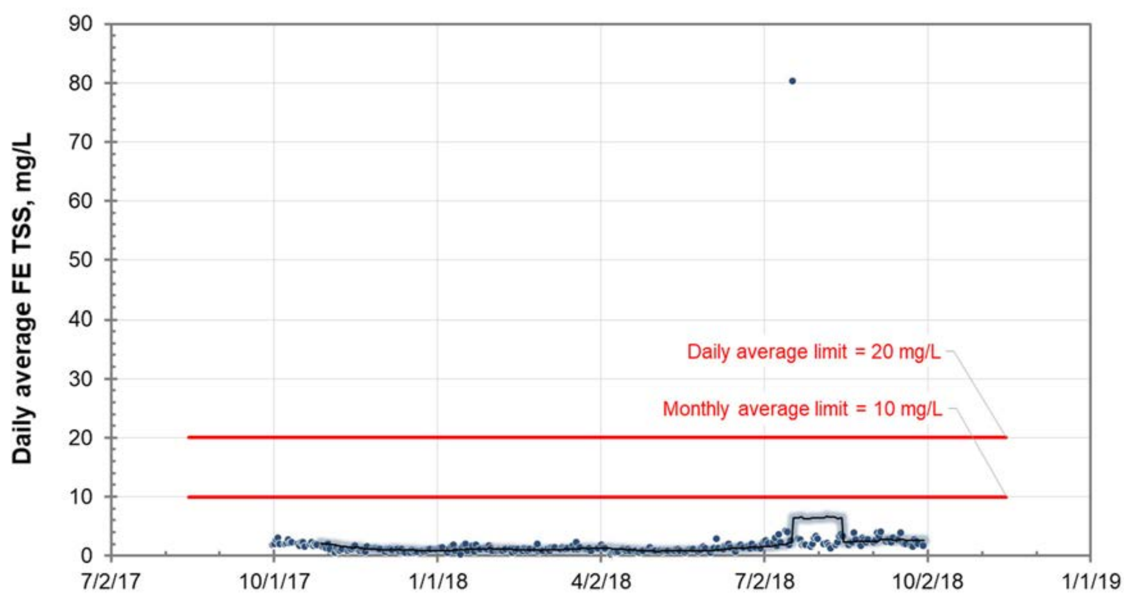

Figure 4.5 Daily Average Final Effluent TSS Concentration, WY2018

The solid highlighted trendline represents a 28-day moving average value.

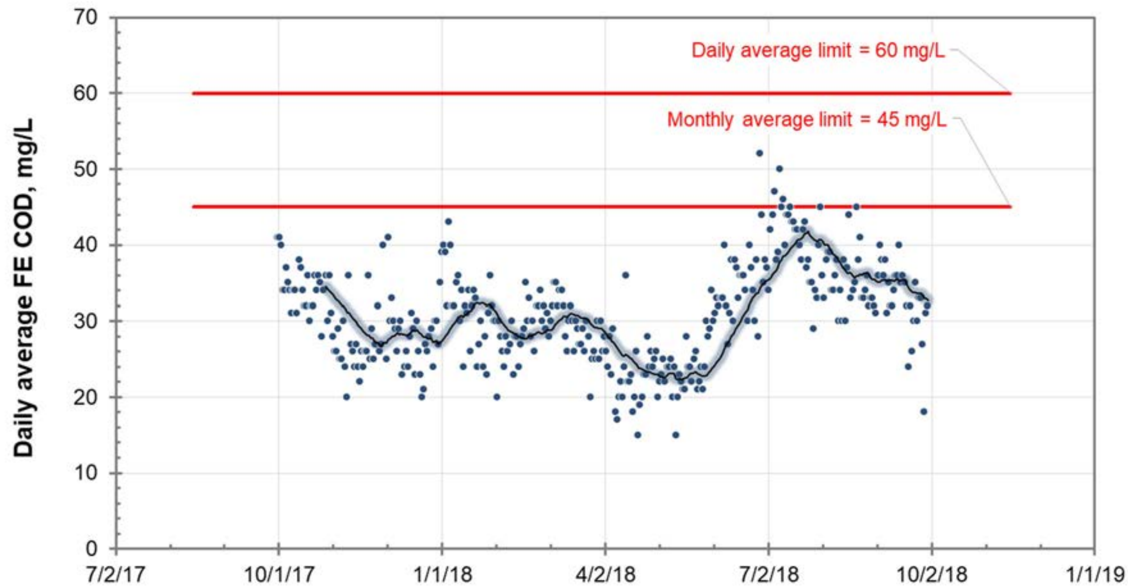

Figure 4.6 Daily Average Final Effluent COD Concentration, WY2018

The solid highlighted trendline represents a 28-day moving average value.

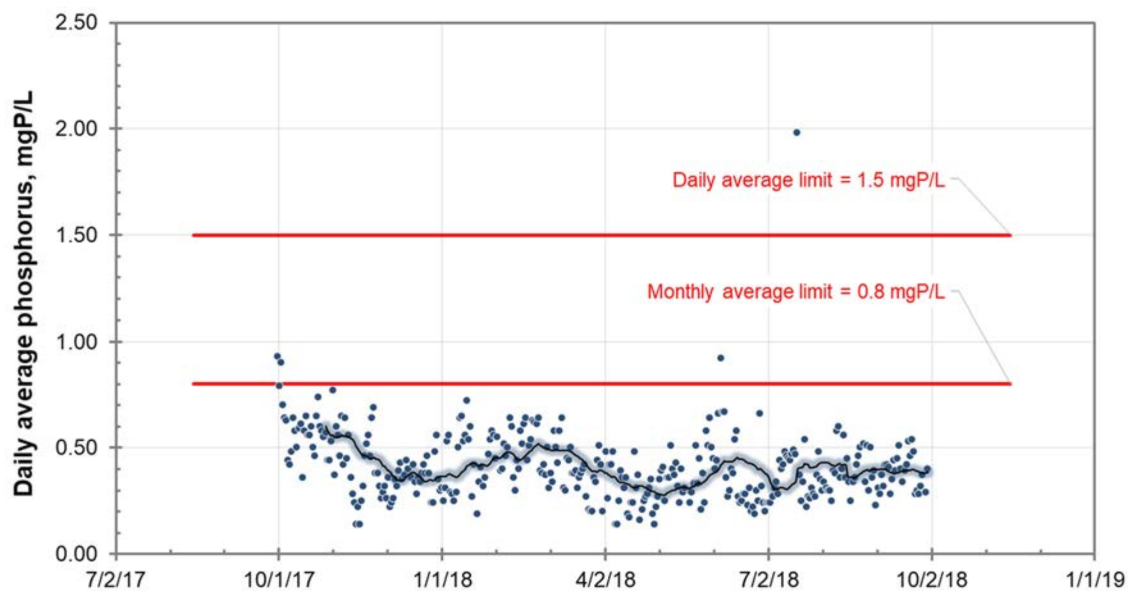

Figure 4.7 Daily Average Final Effluent TP Concentration, WY2018

The solid highlighted trendline represents a 28-day moving average value.

Figure 4.8 shows overall total nitrogen (TN) and TP removal across all liquid treatment processes during WY2018. TN removal picked up over the first quarter of the water year and averaged approximately 97 percent after January 1, 2018. Nitrogen discharge limits are applied at Well 31, after the final effluent passed through the soil aquifer treatment system. TP removal averaged approximately 92 percent during WY2018.

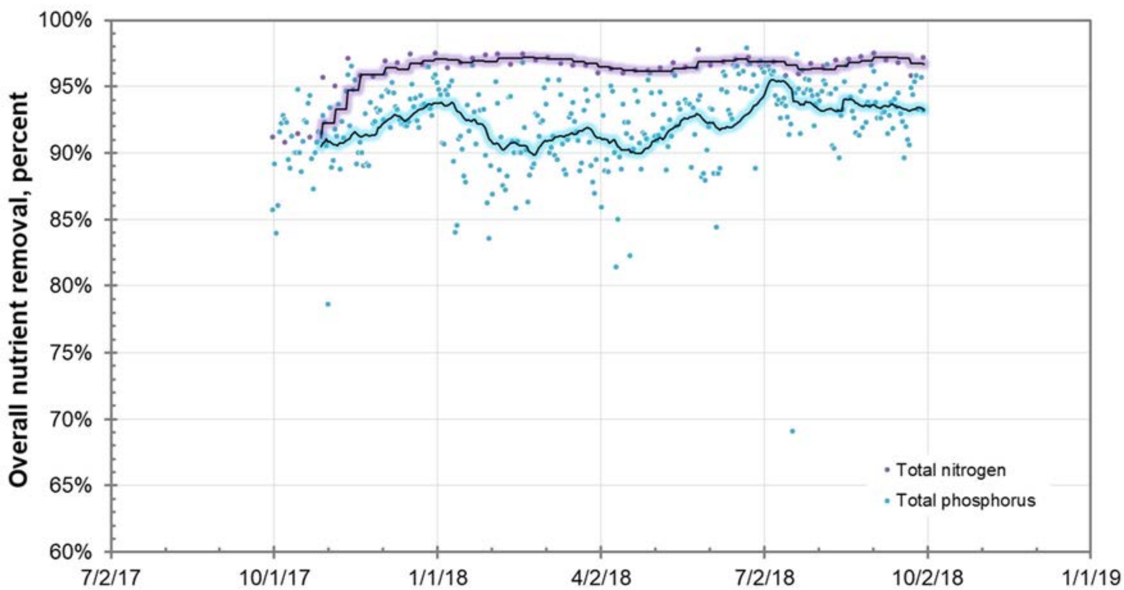

Figure 4.8 Overall Nutrient Removal, WY2018

The solid highlighted trendline represents a 28-day moving average value.

4.4.1 WDRs Conventional Pollutants

Conventional pollutants regulated in the WDRs include the TSS, COD, un-ionized ammonia (NH_3-N), TN, TKN, nitrate nitrogen (NO_3-N), TP, pH, total coliform bacteria, fecal coliform bacteria, DO, turbidity, total trihalomethanes (TTHMs), total dissolved solids (TDS), chloride, sulfate, total iron, and boron. These permit requirements are listed in Table 5.2 of Volume 3, Chapter 5 - Regulatory Requirements.

Figures 4.2 and 4.3 show the daily influent flow rate and daily effluent BOD_5 and TSS concentrations, respectively. Each figure shows the running 30-day and 7-day average compilations of the daily data. The 30-day and 7-day running averages represent the monthly and weekly average of the data respectively. Table 4.3 summarizes the overall performance of the WRP with respect to conventional pollutants in the WDRs.

Table 4.3 Overall WRP Waste Discharge Requirements Compliance, WY2018

Parameter / Averaging Period	Units	Treated Wastewater		Percolated treated wastewater (Well 31 [MG-5-TO])	
		WDRs[1]	WY2018	WDRs[1]	WY2018
Flow rate	mgd				
• 7-day average[2]		9.6	5.25	--	--
• Instantaneous		15.4	11.1	--	--
Total suspended solids	mg/L				
• Monthly average		10	2.8	--	--
• Daily average		20	4.2	--	--
Chemical oxygen demand	mg/L				
• Monthly average		45	42	15	<11
• Daily average		60	52	40	<11
Un-ionized ammonia	mgN/L				
• Daily average		--	--	0.20	<0.1
Total nitrogen[3]	mgN/L				
• Annual average		--	--	3.0	1.14
• 6-month average		--	--	2.0	1.77
Total phosphorus	mgP/L				
• Annual average		--	--	0.3	0.05
• Monthly average		0.8	0.60	--	--
• Daily average		1.5	0.93	--	--
pH	standard units				
• Instantaneous		--	--	6.5 – 8.5	6.4 – 6.9

Parameter / Averaging Period	Units	Treated Wastewater		Percolated treated wastewater (Well 31 [MG-5-TO])	
		WDRs[1]	WY2018	WDRs[1]	WY2018
• Total coliform	most probable number (MPN)/100 mL				
• 7-day geometric mean		23	6[4]	--	--
• Consecutive sample geometric mean		240	10[4]	--	--
Fecal coliform					
• 7-day geometric mean	MPN/100 mL	--	--	2.2	<2
Dissolved oxygen	mg/L				
• Instantaneous		>0.5	1.6	--	--
Turbidity	Nephelometric turbidity unit (NTU)				
• Daily average		10	3.7	--	--
Total trihalomethanes	mg/L				
• Annual average		50	--[5]	--	--
Total dissolved solids	mg/L				
• Annual average		--	--	306	292
Chloride	mg/L				
• Annual average		--	--	100	68

Notes:

(1) Per WDRs Order No. R6T-2002-0030, WDID No. 6A290011000.

(2) Between June 21 and September 21.

(3) Sum of TKN and NO_3-N.

(4) Calculated using value of 2 MPN/100 mL for reported value of <2 MPN/100 mL.

(5) Data not included in Plant Information System (PIS) database from T-TSA.

4.5 Future Influent Flow and Load Conditions

The plant influent average dry weather flow rate at the 2045 planning horizon is projected to increase by 53 percent over the 2018 value, assuming the per capita wastewater generation rate remains the same over the next 25 years. Likewise, the plant influent average annual constituent loads are projected to increase by 53 percent over the 2018 values, assuming the per capita load for each constituent remains the same. Peaking factors to estimate future flow and load conditions are based on recent plant influent data and are assumed to remain the same over the next 25 years. Volume 3, Chapter 2, Flow and Load Projections discusses this in more detail.

4.6 Wrap Up

The performance of each unit process provides a benchmark for the planning of new facilities and assessing capacity. Overall, the performance of the WRP is adequate and meets regulatory requirements. Additionally, most unit processes are in fair shape and perform well for their age. However, the performance of some unit processes could be optimized, specifically the grit chambers and BNR.

The WRP has sufficient capacity to handle the rated wet weather design flow of 15.4 mgd and has enough influent wet weather equalization storage capacity to accommodate future 25-year design storm conditions. With the exception of the WAS gravity thickener, all unit processes have sufficient capacity for current demands. When additional WAS thickening capacity is needed, T-TSA has the option of switching one of the two chemical thickeners for use as a second WAS thickener. Most unit processes have adequate future capacity except during future MW flows. Many unit processes will require additional units or accommodations to ensure adequate capacity for this condition. However, if needed during high flow events, the WRP basins can be utilized for storage as an operational option.

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Appendix 4A

TECHNICAL MEMORANDUM 2 WASTEWATER CHARACTERIZATION SAMPLING PLAN

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

Technical Memorandum 2
WASTEWATER CHARACTERIZATION SAMPLING PLAN

FINAL | February 2022

Tahoe-Truckee Sanitation Agency
Master Sewer Plan

Technical Memorandum 2
WASTEWATER CHARACTERIZATION SAMPLING PLAN

FINAL | February 2022

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Contents

Appendices

Tables

Figures

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Abbreviations

BOD	biochemical oxygen demand
Carollo	Carollo Engineers, Inc.
COD	chemical oxygen demand
DI	deionized
ffCOD	flocculated/filtered chemical oxygen demand
HPOAS	high-purity oxygen activated sludge
PIS	Plant Information System
T-TSA	Tahoe-Truckee Sanitation Agency
TKN	total Kjeldahl nitrogen
TSS	total suspended solids
VSS	volatile suspended solids
WRP	Water Reclamation Plant

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Technical Memorandum 2

WASTEWATER CHARACTERIZATION SAMPLING PLAN

2.1 Introduction

This memorandum outlines the recommended wastewater characterization sampling plan for the Tahoe-Truckee Sanitation Agency (T-TSA) Water Reclamation Plant (WRP). The wastewater characterization sampling plan is designed to gather data to calibrate a dynamic process model that will be used for the WRP Master Plan. The calibrated model will be used to assess the existing plant capacity, identify process requirements at future flows and loads, and evaluate treatment configurations to meet stringent organic carbon, nitrogen, phosphorus and other final effluent discharge criteria.

The recommended wastewater characterization sampling plan includes 2 weeks (14 consecutive days) of wastewater characterization sampling during the spring dry weather flows, as well as supplemental sampling over the July 4th holiday to capture changes in influent load. It is intended that all samples will be collected by T-TSA staff and analyzed by the WRPs laboratory. In addition, T-TSA will provide automated samplers as needed to conduct the sampling. (Automated samplers are only expected to be needed for the diurnal influent sampling.)

2.2 Background and Objectives

The BioWin™ process simulator uses chemical oxygen demand (COD), rather than biochemical oxygen demand (BOD), to define the wastewater organic strength. Accordingly, sampling data will be used to partition the raw sewage COD among filterable, particulate, biodegradable, and unbiodegradable fractions. Characterizing these different fractions is important to accurately simulate diurnal process oxygen demand and daily average sludge production.

The proposed 2-week sampling includes daily composite samples and diurnal grab samples on two days; a weekend day and a weekday. The proposed supplemental sampling over the July 4th holiday includes only diurnal grab samples collected from the plant influent.

The daily composite samples will be used to determine the raw sewage COD, total Kjeldahl nitrogen (TKN), and phosphorus filterable, particulate, biodegradable, and unbiodegradable fractions. The diurnal grab samples will be used to define diurnal loading curves that will be used for dynamic simulation of high-purity oxygen activated sludge (HPOAS) process oxygen demands, nitrification aeration air demands, and denitrification methanol demands.

2.3 Current Sampling Practices

A significant amount of performance data are currently collected as part of routine operations at the WRP. These data include analyses of many of the constituents needed to determine the raw sewage filterable, particulate, biodegradable, and unbiodegradable COD, TKN, and phosphorus wastewater fractions for process modeling. Table 2.1 summarizes the raw sewage constituents and other constituents throughout the plant that are currently analyzed, and whether they are analyzed by the plant laboratory, by operations staff, or continuously measured using in-line probes. The existing sampling locations throughout the plant are indicated on the process flow diagram in Figure 2.1.

2.4 Sampling Plan

Based on the significant performance data collected already, the proposed sampling plan includes only those sampling locations or constituents not already sampled or analyzed.

It is recommended that daily composite samples be collected over a 2-week dry weather period. Table 2.2 summarizes sampling locations, sample preparation, and constituents to be analyzed for daily composite and daily grab samples.

In addition, it is recommended that diurnal samples be collected during two, 24-hour periods during the 2-week dry weather period. Diurnal sampling should occur on both a weekday and a weekend day to capture any differences in weekly activity patterns. Diurnal sampling should also occur over the July 4th holiday from 12:00 AM July 3 - 12:00 PM July 7 on a daily basis to capture peak dry weather conditions. Table 2.3 summarizes sampling locations, timing of sample collection, sample preparation, and constituents to be analyzed for diurnal grab samples. Each sampler should be set up with a minimum of 12 bottles to collect an aliquot every 10 - 15 minutes over a 24-hour period. The 12 sample bottles will correspond to successive 2-hour periods throughout the day.

2.5 Methods

Descriptions of the analytical methods required for the wastewater sampling plan can be found in Standard Methods for the Examination of Water and Wastewater, 22nd edition (APHA et al., 2012) or in Methods for Chemical Analysis. Method numbers are shown in Tables 2.2 and 2.3.

Online temperature and pH meters should be used where available. Otherwise, temperature and pH should be measured on grab samples obtained when the composite or grab sample is collected.

Sample preparation (filtration) should occur immediately after collection before samples are analyzed in-house or shipped to an outside laboratory. Some tests are performed on both unfiltered and filtered samples. Two types of filters are used. For filterable COD, filterable BOD, and filterable TKN, 1.2- to 1.5-micron glass fiber filters are used (these are the same filters used for TSS/VSS analysis in the laboratory). For soluble ammonia, nitrite, and oxidized nitrogen, 0.45-micron filters are used.

Table 2.1 Current WRP Sample Locations and Constituents Analyzed

Sample Location	Description	Type	TSS	TS	VS	COD	VFA	TOC/ DOC	BOD	TKN	NH3-N	NO2-N	NO3-N	TP	OP	pH	Alkalinity	DO	Temperature	SSV30/ SVI	TDS	Chloride
A1	Influent	**24 hour Composite**	L			L			L	L		L	L	L	L	L					L	L
B1	Headworks Effluent	**24 hour Composite**				L																
B2	Headworks Effluent	Continuous														P						
C1	Primary 1 and 2 Effluent	Hand composite (3 per day)				L																
C2	Primary 1 Effluent	Grab	O													O						
C3	Primary 2 Effluent	Grab	O													O						
C4	Primary 3 and 4 Effluent	Hand composite (3 per day)				L																
C5	Primary 3 Effluent	Grab	O													O						
C6	Primary 4 Effluent	Grab	O													O						
C7	Primary Effluent 1,2,3,4	Hand composite (3 per day)							L	L				L	L	L						
D1	Primary 1 Sludge	Grab		O	O											O						
D2	Primary 2 Sludge	Grab		O	O											O						
D3	Primary 3 Sludge	Grab		O	O											O						
D4	Primary 4 Sludge	Grab		O	O											O						
E1	Mixed Liquor Trains 1-4	Grab	O												O					O		
E2	Mixed Liquor Trains 5&6	Grab	O												O					O		
E3	Mixed Liquor Trains 7&8	Grab	O												O					O		
F1	Secondary 1 Effluent	Grab	O			L									O	O						
F2	Secondary 2 Effluent	Grab	O			L									O	O						
F3	Secondary 3 Effluent	Grab	O			L									O	O						
F4	Secondary 4 Effluent	Grab	O			L									O	O						
F5	Secondary 1,2,3,4	Hand composite (3 per day)								L		L	L	L	L	L	O				L	L
G1	RAS from Sec 1	Grab	O												O							
G2	RAS from Sec 2	Grab	O												O							
G3	RAS from Sec 3	Grab	O												O							
G4	RAS from Sec 4	Grab	O												O							
H1	Secondary 1 Core sample	Grab	O																			
H2	Secondary 2 Core sample	Grab	O																			
H3	Secondary 3 Core sample	Grab	O																			
H4	Secondary 4 Core sample	Grab	O																			
I	Pho-Strip Underflow (sludge)	Grab	O												O							
J1	Stipper 57 15 ft Core	Grab	O																			
J2	Stipper 58 15 ft Core	Grab	O																			
J3	Stipper 64 15 ft Core	Grab	O																			
K1	Stripper 57 Effluent	Grab													O	O						
K2	Stripper 58 Effluent	Grab													O	O						
K3	Stripper 64 Effluent	Grab													O	O						
K4	Stripper 57,58,64	Hand composite (3 per day)												L								
L1	Chem Clar 1 Eff	Grab													O	O						
L2	Chem Clar 2 Eff	Grab													O	O						
M1	Recarb Clar 1 Eff	Grab													O	O						
M2	Recarb Clar 2 Eff	Grab													O	O						
M3	Recarb Clar 1&2 Eff	Hand composite (3 per day)												L	L	L						
N1	Nitrification Influent	Grab									O				O	O	O					
N2	Nitrification Influent	**24 hour composite**	L			L				L	L	L	L	L	L	L	L					
N3	Nitrification Influent	Continuous									P					P			P			
O1	Nitrification Effluent	Grab									O					O	O					
O2	Nitrification Effluent	**24 hour composite**	L			L				L	L	L	L	L	L	L	L					
O3	Nitrification Effluent	Continuous									P	P	P			P		P				
P1	Denitrification Effluent	Grab									O				O	O						
P2	Denitrification Effluent	**24 hour composite**	L			L				L	L	L	L	L	L	L	L					
P3	Denitrification Effluent	Continuous									P	P	P			P			P			
Q1	MPPS (Filter Influent)	Grab													O	O						
Q2	MPPS (Filter Influent)	**24 hour composite**	L											L	L	L						
Q3	MPPS (Filter Influent)	Continuous														P						
R1	Filter Effluent	Grab									O											
R2	Filter Effluent	**24 hour composite**																				
R3	Filter Effluent	Continuous									P	P	P						P			
S1	Final Effluent	Grab															L	L	L			
S2	Final Effluent	**24 hour composite**	L			L		L		L	L	L	L	L	L	L					L	L
S3	Final Effluent	Continuous														P						
T1	TWAS 02	Grab		O	O											O						
T2	TWAS 04	Grab		O	O											O						
U1	Digester 29	Grab		O	O		O									O	O					
U2	Digester 30	Grab		O	O		O									O	O					
U3	Digester 33	Grab		O	O		O									O	O					
U4	Digester 31	Grab		O	O		O									O	O					
V1	Dig to to Centrifuge Feed Tank	Grab		O																		
V2	Chem Sludge to Feed Tank	Grab		O																		
V3	Cent Feed Tank Sludge	Grab		O												O						
W	Dewatering Centrifuge Cake	Grab		O																		
X	Dewatering Centrate	Grab		O																		

L = Sample run by Laboratory
O=Sample run by Operators
P=Sample run by Analyzer or Probe

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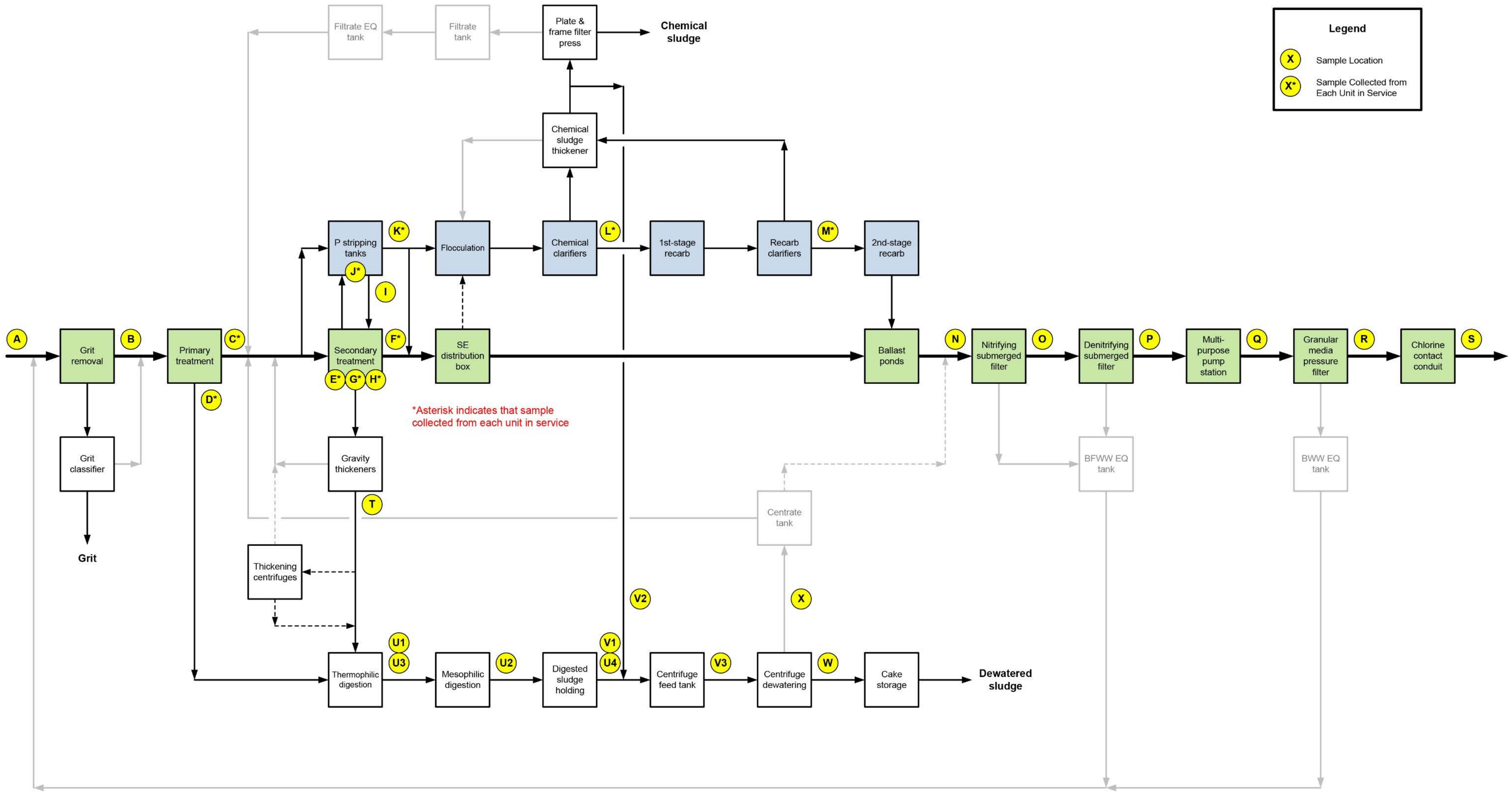

Figure 2.1 Existing WRP Sampling Locations

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Table 2.2 Daily Composite Sample Locations and Constituents

Sample Location	TSS[9]	VSS[9]	sCOD[5]	ffCOD[8]	sBod[5]	sTKN[5]	NO2-N[6]	N03-N	Alk	Mg^{2+}	Ca^{2+}
Liquid Stream											
Plant Influent		•	•	•	•	•			•	•	•
Primary Effluent									•		
O2 Tanks (Mixed Liquor)		•									
Secondary Effluent			•	•			•				
Nitrifying Submerged Filter Backwash	•							•			
Denitrifying Submerged Filter Backwash	•	•									
Gravity Thickener Overflow (WAS)	•										
Gravity Thickener Overflow (Chem Sludge)	•										
Filter Press Filtrate	•										
Analytical Method[3]	SM 2540 D	SM 2540 E	SM 5220 B, C, OR D[4]	SM 5220 B, C, OR D[4]	SM 5210 B	SM 4500-N(org) B or C	SM 4500-NO2- B[7]	SM 4500-NO3-E	SM 2320 B	SM 3500-Mg; SM 3111 B; or SM 3120 B	SM 3500-Ca B; SM 3111 B or D; or SM 3120 B

Notes:
(1) Sampling included herein that is currently conducted by T-TSA should be considered part of the execution of this plan.
(2) Composite sampling will be flow-paced where possible and time-weighted elsewhere. Time-weighted samplers will be programmed with a non-uniform, time-weighted frequency to simulate the approximate flow characteristics.
(3) Listed references are "Standard Methods for the Examination of Water and Wastewater, 22nd edition".
(4) HACH8000 is acceptable for COD using ranges 3-150 mg/L and 20-1500 mg/L.
(5) Filtered through 1.2 - 1.5 micron glass fiber filter (the same as those typically used to measure plant TSS/VSS). Filtration should occur immediately after collection before samples are shipped.
(6) Filtered through 0.45 micron Millipore filter. Filtration should occur immediately after collection before samples are shipped to an outside lab. Prior to filtration, filters should be triple rinsed with DI water.
(7) HACH8507 is acceptable for nitrite analysis.
(8) Sample preparation per Maiais et al., 1993.
(9) Samples only needed 3x per week, with sample collected 1x per shift.
(10) Abbreviations - TSS = total suspended solids, VSS = volatile suspended solids, COD = chemical oxygen demand, BOD = five-day biochemical oxygen demand, TKN = total Kjeldahl nitrogen, NO2-N = nitrite nitrogen, NO3-N – nitrate nitrogen, Alk = alkalinity, Mg2+ = magnesium, Ca2+ = calcium, ff = flocculated/filtered, s = soluble

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Table 2.3 Diurnal Grab Sample Locations and Constituents

Sample Location	TSS	VSS	COD	TKN	TP	Alk
Liquid Stream						
Plant Influent	•	•	•	•	•	•
Analytical Method(2)	SM 2540 D	SM 2540 E	SM 5220 B, C, or D(3)	SM 4500-N_{org} B or C	SM 4500-P J and D, or SM 4500-P J and E	SM 2320 B

Notes:
(1) Collected every 2 hours during a minimum of two, 24-hour periods, for 1 weekend day and 1 week day.
(2) Listed references are "Standard Methods for the Examination of Water and Wastewater, 22nd edition".
(3) HACH8000 is acceptable for COD using ranges 3-150 mg/L and 20-1500 mg/L.
(4) Abbreviations – TSS = total suspended solids, VSS = volatile suspended solids, COD = chemical oxygen demand, TKN = total Kjeldahl nitrogen, TP = total phosphorus, Alk = alkalinity.

The flocculated/filtered COD (ffCOD) sample preparation should be performed in accordance with the procedure outlined in Mamais, Jenkins, and Pitt (1993). A summary of the procedure is as follows:

> *Add 1 ml of a 100 g/L zinc sulfate solution to a 100 ml sample and mix vigorously with a magnetic stirrer for about one minute. The pH of the sample should then be adjusted to 10.5 with 6M sodium hydroxide (NaOH) solution while mixing gently, then allowed to settle quiescently for a few minutes. Clear supernatant should then be withdrawn with a pipette and passed through a 0.45-µm Millipore filter. The COD of the filtrate should then be determined to quantify the ffCOD of the sample.*

A copy of this reference is included in Appendix 2A. The Millipore filter should be triple rinsed with deionized (DI) water before sample filtration to remove any starch binder that could bias the measured filtrate COD concentration. This sample preparation procedure is designed to flocculate any colloidal material so that the ffCOD concentration represents the "true" soluble COD concentration.

2.6 Plant Data Requirements

T-TSA has provided Carollo Engineers, Inc., (Carollo) with access to available operations and performance data in the on-line Plant Information System (PIS) database. We will access these data to download relevant data for the proposed 2-week wastewater characterization sampling campaign. These data will be combined into a comprehensive operations and performance data set that will be used for process simulator calibration.

2.7 References

APHA, AWWA and WEF. *Standard Methods for the Examination of Water and Wastewater, 22nd edition. American Public Health Association, American Water Works Association, and Water Environment Federation*, Washington, D.C. 2012.

Mamais, D., Jenkins, D., and Pitt, P. "*A Rapid Physical-Chemical Method for the Determination of Readily Biodegradable Soluble COD in Municipal Wastewater:" Water Research 27(1):* 195-197. 1993.

Appendix 2A

FLOCCULATED FILTERED COD (FFCOD) SAMPLE PREPARATION PROCEDURE (MAMAIS, JENKINS, AND PITT, 1993)

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RAPID COMMUNICATION

A RAPID PHYSICAL-CHEMICAL METHOD FOR THE DETERMINATION OF READILY BIODEGRADABLE SOLUBLE COD IN MUNICIPAL WASTEWATER

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(First received June 1992; accepted in revised form September 1992)

Abstract—A rapid physical-chemical method has been developed for the determination of the readily biodegradable portion of influent soluble COD. The method involves removal by flocculation and precipitation of colloidal matter that normally passes through 0.45 μm membrane filters. Results from four domestic wastewaters demonstrated that the physical-chemical method and the biological method (Ekama *et al.*, 1984) gave virtually identical results. The physical-chemical method was used successfully to measure the quantity of truly soluble organic matter removed in the anaerobic zone of bench-scale enhanced biological phosphorus removal activated sludge systems.

Key words—readily biodegradable COD, municipal wastewater, flocculation, activated sludge modeling

INTRODUCTION

The mathematical modeling of biological wastewater treatment processes and the design and operation of selector systems and nutrient removal plants require a reliable and accurate estimate of the readily biodegradable portion of influent wastewater COD (Ss). Readily biodegradable organic matter consists of simple organic molecules such as volatile fatty acids (VFA) and low molecular weight carbohydrates that can pass through the cell membrane and be metabolized within minutes (Henze *et al.*, 1987).

Currently, reliable measurements of Ss utilize a time-consuming biological method (Ekama *et al.*, 1984). The purpose of this paper is to present an alternative physical-chemical (flocculation) method for the determination of Ss. The validity of the method was assessed by comparing results obtained in parallel tests of the flocculation method and the biological method. In addition the method was successfully applied to continuous-flow enhanced biological phosphorus removal (EBPR) systems to determine the amount of truly soluble COD removed under anaerobic conditions.

RATIONALE OF FLOCCULATION METHOD

The flocculation method for determining Ss (Ssfloc) is based on the rationale that membrane filtration of a sample that has been flocculated (in this case by precipitating $Zn(OH)_{2(s)}$ at pH 10.5) will produce a filtrate containing only truly soluble organic matter. The colloidal particles normally present in filtrates through membranes of 0.45 μm nominal pore diameter will be removed during the flocculation step preceding filtration. Ekama *et al.* (1984) and the IAWPRC Task Group on Activated Sludge Modeling (1986) proposed that influent Ss is related to the truly soluble influent COD by the equation:

$$Ss = CODsol - Si \qquad (1)$$

where

Ss = influent readily biodegradable soluble COD
CODsol = influent total truly soluble COD
Si = influent non-readily biodegradable soluble COD.

The flocculation method determines CODsol (flocCODsol) in equation (1). To derive a value of Ss from CODsol, an estimate of Si must be obtained. Influent Si is considered equal to the truly soluble effluent COD of an activated sludge system treating the influent at an MCRT of greater than 3 days (Ekama *et al.*, 1984). When the wastewater of interest is already being treated in an activated sludge plant (laboratory pilot plant or full-scale) Si is determined by performing a flocCODsol measurement on the effluent. When measuring Ss(floc) for a wastewater for which a treatment plant does not exist, effluent Si is determined by performing a flocCODsol analysis on the effluent of a 24hr fill-and-draw activated sludge system (MCRT > 3 days) fed with the wastewater of interest. This type of activated sludge system is much simpler to run than the continuous flow unit required for the biological method of determining Ss.

EXPERIMENTAL MATERIALS AND METHODS

Analytical Methods

Parallel Ss measurements were made by the biological and flocculation methods. Since the biological method is the currently accepted technique for measuring Ss it was used as the standard for assessing the validity of the flocculation method. A variety of domestic wastewaters containing Ss levels in the range 0–200 mg/l was tested. These samples included primary effluent from the Southeast (SE) and Richmond Sunset (RS) treatment plants in San Francisco, CA, raw City of Richmond, CA wastewater from Richmond Field Station (RFS), and primary effluent from the San Francisco Southeast plant supplemented with the centrate from an

Table 1: Average COD values of four types of wastewater tested, (mg/l)

COD value	SE Primary Effluent	RS Primary Effluent	RFS, Raw Wastewater	SE Primary Effluent + acid digester centrate
Influent soluble	122	105	92	185
Effluent soluble	50	61	51	69
Influent flocculated, CODsol	98.5	84	63	163
Effluent flocculated, Si	37	52	40.5	53
Influent, Ss	64.5	31.5	22	119
Influent, Ss(floc)	61.5	32	22.5	110

SE = San Francisco, CA, Southeast plant; RS = San Francisco, CA, Richmond Sunset plant; RFS = Richmond, CA Richmond Field Station

acid anaerobic sludge digester.

Chemical Oxygen Demand (COD)—All COD analyses were by the dichromate method Standard Methods, (1985), Section 508A.

Biological Method—A continuous-flow (3.4 l aeration basin, 1.4 l secondary clarifier) bench-scale activated sludge system was operated at an MCRT of 2.5 days in a semibatch mode (feed on 12 hr - feed off 12 hr). The value of Ss was estimated by measuring the step change in oxygen uptake rates (OUR) after the end of the feed period as described by Ekama *et al.* (1984). A heterotrophic yield value of 0.67 g biomass/g substrate (COD/COD basis) was used (IAWPRC, 1986; Kappeler *et al.*, 1991).

Flocculation Method—Samples were flocculated by adding 1 ml of a 100 g/l zinc sulfate solution to a 100 ml wastewater sample and then mixing vigorously with a magnetic stirrer for approximately 1 min. The pH of the mixed sample was then adjusted to approximately 10.5 with 6 M sodium hydroxide solution and the sample allowed to settle quiescently for a few minutes. (Standard Methods, (1985), Section 417B). Clear supernatant (20-30 ml) was withdrawn with a pipette and passed through a 0.45 μm membrane filter. The COD of the supernatant filtrate was determined. This COD was termed the flocculated soluble COD (flocCODsol). The coefficient of variation of flocCODsol measurements was 4%.

Laboratory Procedure

An acid anaerobic sludge digester was operated at a 4.0 day MCRT, an average pH of 5.8 and 37°C on a feed consisting of 40% primary and 60% waste activated sludge (TS basis) to provide effluent with a high readily biodegradable organic matter content. Average digester effluent VFA and CODsol concentrations were 2600 mg/l and 5900 mg/l respectively.

Two identical continuous-flow bench-scale EBPR activated sludge systems, immersed in water baths for temperature control were operated on settled Richmond, CA domestic wastewater supplemented with 50 mg/l sodium acetate as acetic acid (Mamais and Jenkins, 1992).

RESULTS AND DISCUSSION

Evaluation of flocculation method

The readily biodegradable COD content of wastewater samples was determined using both the biological and flocculation methods in parallel on 32 SE primary effluent samples, 14 RS primary effluent samples, 10 RFS raw wastewater samples and 11 SE primary effluent samples supplemented with acid anaerobic sludge digester centrate. Average values of influent and effluent CODsol and flocCODsol and Ss for the four types of wastewater tested are shown in Table 1. Biological and flocculation Ss values were virtually identical for all wastewaters tested. SE primary effluent wastewater supplemented with acid anaerobic sludge digester centrate had the highest Ss due to its high VFA content; RFS raw wastewater taken during a rainy period had the lowest Ss values.

To demonstrate the equivalence of the two methods all Ss(floc) and Ss values obtained in this study are plotted against each other in Figure 1. The variables follow a linear relationship with a correlation coefficient of 0.965. Based on a linear regression analysis, assuming a zero intercept, Ss(floc) is equal to 1.025 Ss. A t-test carried out on the differences between each pair of measurements showed that both methods are identical at the 5% significance level (Chatfield, 1978).

Application of flocculation method to EBPR activated sludge systems

The effectiveness of the flocculation method for measuring Ss was tested using two continuous flow bench-scale

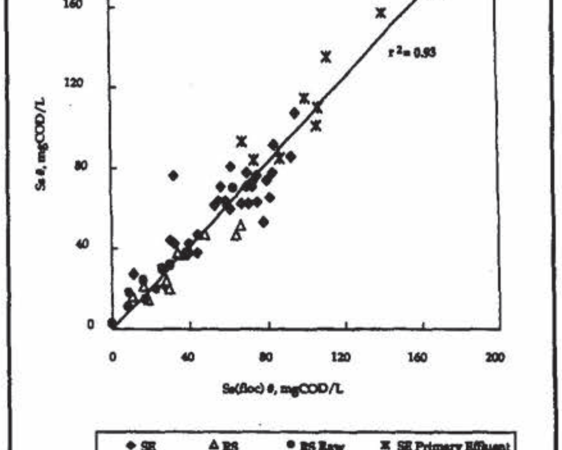

Fig. 1. Relationship of Ss(floc)to Ss for a variety of domestic wastewaters.

Table 2. Average anaerobic zone soluble COD removal

Soluble COD Method	Anaerobic CODsol removal, mg/l		CODsol removed to Psol released ratio	
	EBPR[a]	EBPR[b]	EBPR[a]	EBPR[b]
Membrane filtration, (CODsol)	55	74	28	5.3
$Zn(OH)_2$ flocculation (flocCODsol)	4	29	2	2

[a]MCRT = 2.0 days; T = 20°C; Psol removal = 20%; TP in VSS = 2.7%
[b]MCRT = 2.5 days; T = 20°C; Psol removal = 90%; TP in VSS = 6.9%

EBPR activated sludge systems under conditions of excellent and very poor EBPR. Influent and effluent soluble COD was measured using membrane filtration and the flocculation method. Soluble COD and soluble P (Psol) mass balances were conducted for the anaerobic zone and the CODsol removed to Psol release ratios determined using both methods. Table 2 shows that in the absence of EBPR the CODsol removed to Psol release ratio determined by the membrane filtration method was 28 mgCOD/mgP; when the COD was measured by the flocculation method the ratio was 2 mgCOD/mgP. The higher ratio obtained by the filtration method is attributed to the adsorption of a significant amount of colloidal material on the activated sludge flocs. No anaerobic flocCODsol removal was obtained in the absence of EBPR indicating that all of the influent colloidal matter was removed in the samples treated by $Zn(OH)_2$ flocculation. During periods of EBPR the overall anaerobic CODsol removed to Psol released ratio determined by membrane filtration averaged approximately 5.5 mgCOD/mgP, a value significantly higher than those reported in the literature (Wentzel *et al.*, 1985). The average anaerobic CODsol removed to Psol release ratio of 2 mgCOD/mgP, determined by the flocculation method, was in excellent agreement with the literature values reported for soluble substrates (Wentzel *et al.*, 1985; Comeau *et al.*, 1987).

CONCLUSIONS

A novel rapid physical-chemical method – the flocculation method – has been developed for the determination of the readily biodegradable portion of influent soluble COD. The flocculation method is based on two assumptions:

1) influent total truly soluble COD consists of a readily biodegradable fraction and a non-biodegradable fraction (IAWPRC, 1986) and;

2) the non-readily biodegradable influent soluble COD is equal to the truly soluble effluent COD from an activated sludge plant treating the influent at an MCRT > 3 days (Ekama *et al.*, 1984).

The validity of the flocculation method was assessed by comparing it with the biological method developed by Ekama *et al.* (1984). Results from four domestic wastewaters demonstrated that the two methods gave virtually identical results. The $Zn(OH)_2$ flocculation method is fast and simple compared to the biological method especially when the wastewater is already being treated in an activated sludge system of some type. The flocculation method was used successfully to determine the quantity of truly soluble organic matter removed in the anaerobic zone of an EBPR plant.

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Appendix 4B

TECHNICAL MEMORANDUM 4 WATER RECLAMATION PLANT HYDRAULIC CAPACITY

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

Technical Memorandum 4
WATER RECLAMATION PLANT HYDRAULIC CAPACITY

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

Technical Memorandum 4
WATER RECLAMATION PLANT HYDRAULIC CAPACITY

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Contents

Technical Memorandum 4 - Water Reclamation Plant Hydraulic Capacity

Tables

Figures

-This Page Intentionally Left Blank-

Abbreviations

AAF	average annual flow
Agency	Tahoe-Truckee Sanitation Agency
BFE	biological filtration effluent
BNR	biological nitrogen removal
Carollo	Carollo Engineers, Inc.
ERB	Emergency Retention Basin
ft	feet
MG	million gallons
mgd	million gallons per day
NGVD 29	National Geodetic Vertical Datum 1929
RAS	return activated sludge
T-TSA	Tahoe-Truckee Sanitation Agency
TM	technical memorandum
TRI	Truckee River Interceptor
WRP	water reclamation plant

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Technical Memorandum 4

WATER RECLAMATION PLANT HYDRAULIC CAPACITY

4.1 Introduction

This technical memorandum (TM) summarizes the hydraulic capacity analysis for the Tahoe-Truckee Sanitation Agency (T-TSA/Agency) Water Reclamation Plant (WRP). The TM includes a hydraulic capacity assessment for each major unit process and the hydraulic profile of the WRP. Hydraulic bottlenecks and recommendations for alleviating them are also described herein where applicable. Hydraulic calculations were performed using a steady state hydraulic model. The model was constructed using the physical dimensions of process facilities and hydraulic control structures, pipe sizes, weir crest elevations, and top-of-concrete elevations based on record drawings provided by T-TSA. The Headworks area modifications for the project currently in progress were modeled based on design drawings.

4.2 Key Findings and Recommendations

The key findings and recommendations are:

- The WRP has sufficient hydraulic capacity to reliably handle the rated wet weather design capacity of 15.4 million gallons per day (mgd) with one treatment train out of service.
- The primary clarifiers are the limiting unit process for the conventional treatment hydraulics, with a capacity of approximately 24 mgd with all four primary clarifiers in service.
- There is currently excess influent wet weather equalization storage capacity to accommodate future 10-year design storm conditions.

4.3 Hydraulic Model Setup and Development

A steady state hydraulic model for the WRP was constructed using Visual Hydraulics V4.2 software. The model is based on the physical dimensions of process facilities and hydraulic control structures, pipe sizes, weir crest elevations, and top-of-concrete elevations collected from WRP record drawings. The model results were compared to the hydraulic profiles developed by a previous consultant (CH2MHill 2003), and as the calibration profile in Figure 4.1 shows, they provide similar results for the 8 mgd average annual flow (AAF) and 15.4 mgd (Peak Instantaneous) flow conditions.

The hydraulic model was used to calculate the water surface elevation, or hydraulic profile, through each unit process for various flow scenarios. Using empirical methods, hydraulic calculations determine head losses as a function of the flow rate through the physical hydraulic features in the WRP. The hydraulic model for the plant is comprised of two gravity flow segments. The first segment begins with the maximum water surface elevation at the downstream end of the biological nitrogen removal (BNR) treatment train (the biological filtration effluent [BFE] Pond) and continues upstream to the BNR influent channel. The second segment begins with the maximum water surface elevation at the Ballast Ponds as the downstream hydraulic control point, and continues upstream to the plant influent pipeline at the Headworks. Only gravity flows were modeled. Pump station firm capacities were checked, but the pumped systems were not modeled.

The model uses the following criteria and assumptions:

- Elevations are based on the National Geodetic Vertical Datum 1929 (NGVD 29) datum. Since the TRI hydraulics are based on the North American Vertical Datum of 1988 (NAVD88) an adjustment of +4 ft is required to adjust the NGVD29 elevations to the NAVD88 datum.
- Return activated sludge (RAS) rate is set at 40 percent of plant influent flow.
- Process return flow rate to the Headworks is set at 10 percent of plant influent flow.
- The flow through the chemical treatment processes was set at 8 percent of the plant influent flow, with a maximum flow of 1.3 mgd.
- For the model scenario used to calibrate to the existing plant hydraulic profile (CH2MHill, 2003) one treatment train was assumed to be out of service.
- Not all parallel trains were modeled; however for each process the most conservative hydraulic path was modeled, i.e., the path with the highest hydraulic loss.
- The total head loss through connecting piping, channels, and appurtenances included entrance, exit, contraction and enlargement, friction, minor, weir, and free-fall losses. All minor losses included velocity head.
- Friction losses in piping were obtained by using the Manning's Equation. It was assumed that all piping was free from obstructions or damage that would restrict hydraulic capacity.
- In open channels, the depth of flow and resulting head loss was determined using the Chezy-Manning's equation through an iterative analysis.
- Flow splits were equally distributed between similar unit processes (primary clarifiers, aeration basins, and oxygenation basins). For example, one quarter of the total plant flow was sent to each of the primary clarifier for scenarios where all trains were assumed to be in service.

After the model was constructed, four separate flow scenarios were modeled as follows:

1. Rated AAF Condition of 8 mgd with one train out of service.
2. Future high occupancy flow (HOF) Condition of 9.8 mgd with all trains in service.
3. Current rated Peak Instantaneous Flow Condition of 15.4 mgd with one train out of service.
4. Maximum hydraulic capacity prior to submerging weirs at the Primary Clarifiers with all trains in service.

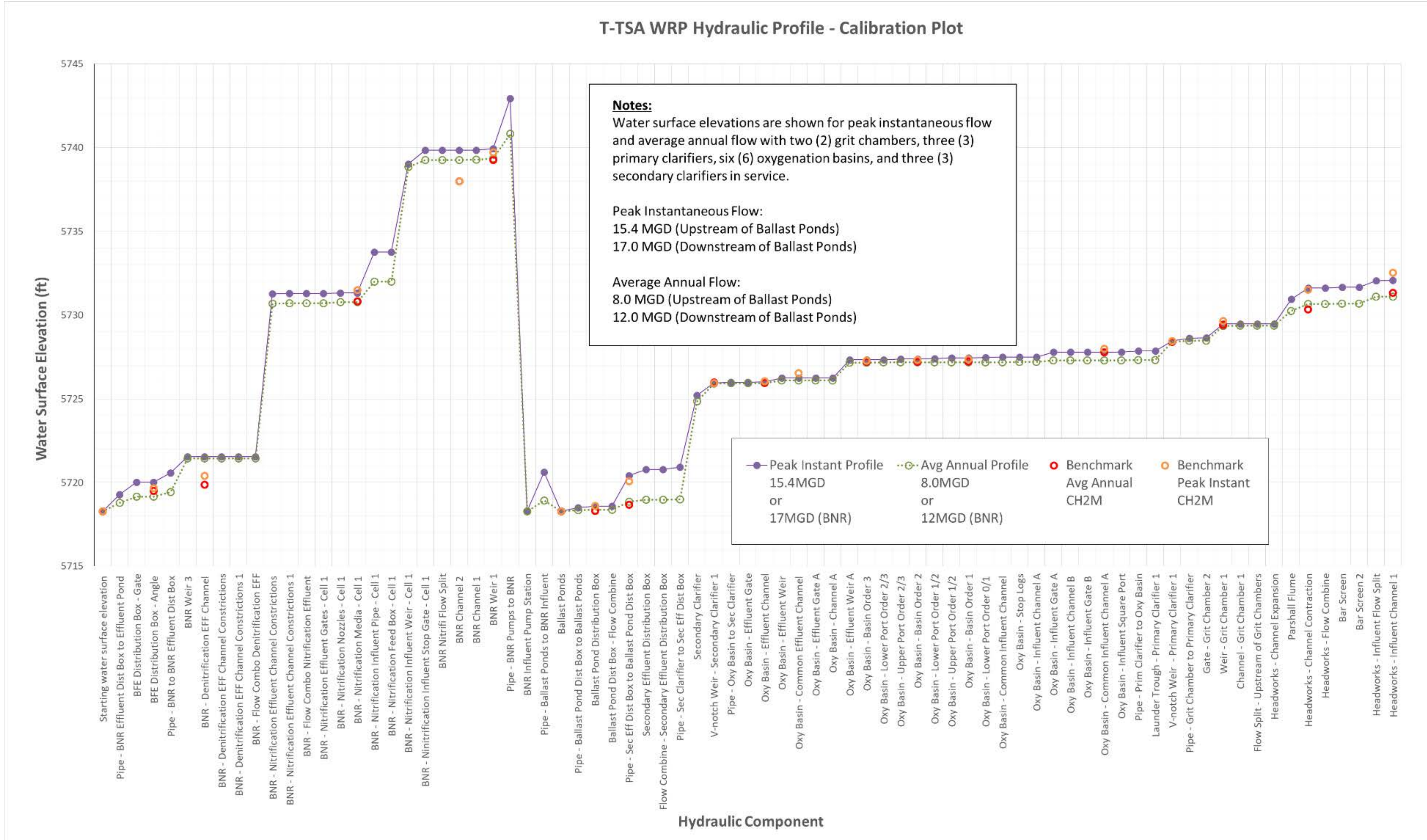

Figure 4.1 Calibration Profile

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4.4 Results

Results of the hydraulic capacity assessment and hydraulic profile calculations are summarized in this section.

4.4.1 Hydraulic Capacity

To determine the hydraulic capacity of each process unit, various flow rates were simulated using the hydraulic model. For each major unit process, the flow rate or capacity corresponding to the following conditions was determined:

- Effluent Weir is Submerged (i.e., downstream water surface elevation reaches weir crest). This condition was used to establish the hydraulic capacity of the primary splitter box, the primary clarifiers and the secondary clarifiers.
- Freeboard (i.e., water surface elevation is one foot below structure top of concrete). For most processes, this criterion was be used to establish hydraulic capacity. In general, one foot is the recommended minimum freeboard for safe and reliable operation.

For each flow scenario modeled, these criteria were checked for each process to confirm that the condition did not result in exceeding the hydraulic capacity of the unit process. Table 4.1 provides a summary of results for each of the four flow scenarios modeled, including the critical hydraulic elevations for each scenario.

The hydraulic analysis indicates that the WRP has sufficient hydraulic capacity to reliably handle the original wet weather design flow capacity of 15.4 mgd with one treatment process train out of service. Furthermore, with all units in service, it appears that the plant can hydraulically handle flows of up to 24 mgd before the primary clarifier effluent weirs become submerged (the hydraulic limiting factor).

It is important to note that process loading criteria typically used for wastewater treatment process design and operation were not considered as part of this analysis. Process capacity was evaluated separately. Therefore, the process treatment capacity may in fact be less than the hydraulic capacities identified in this TM and be the limiting factor.

4.4.2 Hydraulic Profile

A hydraulic profile of the WRP at the projected HOF condition of 9.8 mgd and the maximum hydraulic throughput condition of 24 mgd is presented in Figure 4.2.

Table 4.1 Hydraulic Profile Flow Scenario Results

Flow Scenario[(1)]	No. Units in Service	Plant Influent Flow Rate (mgd)	RAS Rate (mgd)[(7)]	Headworks Return (mgd)	Chemical Treatment Flow Rate (mgd)	Critical Elevation at Headworks Influent Channel[(3)] Max Elev. = 5,735.80 ft	Critical Elevation at Grit Chamber Effluent Weir[(4)] Max Elev. = 5,729.15ft	Critical Elevation at Primary Clarifier Launder[(5)] Max Elev. = 5,728.29 ft	Critical Elevation at Secondary Clarifier Launder[(6)] Max Elev. = 5,725.86 ft
Average Annual – Current	3	8	3.2	1	0.6	5,731.13	5,728.47	5,727.33	5,724.85
HOF – Projected	4	9.8	3.9	1	0.8	5,731.39	5,728.50	5,727.43	5,724.90
Peak Instantaneous – Current	3	15.4	6.2	1	1.3	5,732.13	5,728.65	5,727.87	5,725.20
Peak Instantaneous – Max Allowable at Clarifiers[(2)]	4	24	9.6	2	1.3	5,733.40	5,728.81	5,728.21	5,725.74

Notes:
(1) Maximum instantaneous flows permitted through the plant are currently 15.4 mgd.
(2) Maximum process design flow limit for BNR is 17.0 mgd.
(3) Elevations shown for water surface upstream of bar screens in feet (ft).
(4) Elevations shown for water surface downstream of grit chamber effluent weir in feet.
(5) Elevations shown for water surface in Primary Clarifier Launder Trough in feet.
(6) Elevations shown for water surface in Secondary Clarifier Launder Trough in feet.
(7) RAS flow assumed as 40% flow for all scenarios.

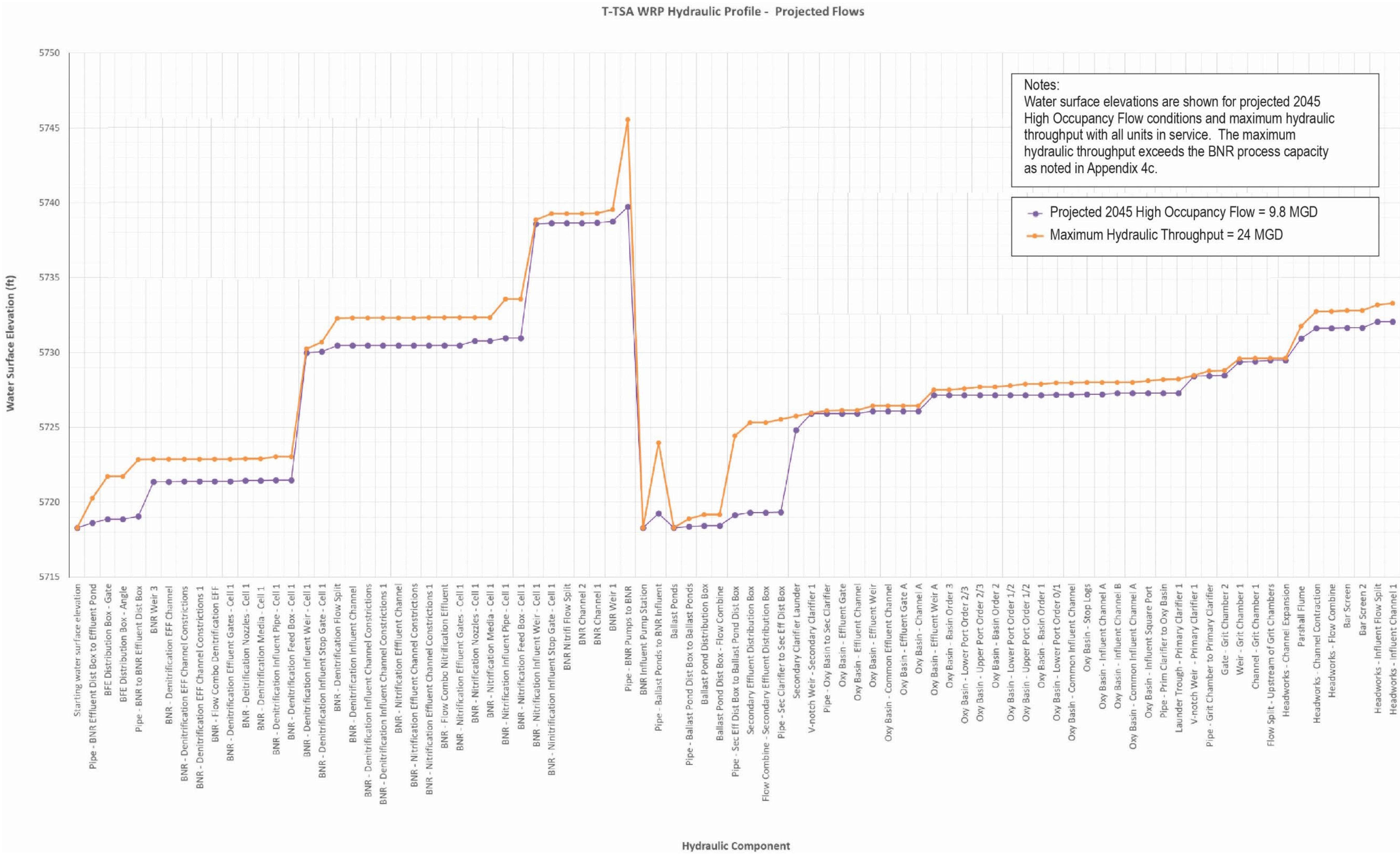

Figure 4.2 Hydraulic Profile of Projected HOF and Maximum Hydraulic Throughput

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4.4.3 Influent Flow Equalization Storage Capacity Analysis

The capacity of the influent flow equalization storage facilities was analyzed based on a future (2045), 10-year, 24-hour design storm event which was also used to model the Truckee River Interceptor (TRI) system. Assuming the plant is limited to its current rated maximum hydraulic throughput of 15.4 mgd, the analysis shows that approximately 13.4 million gallons (MG) of influent flow would need to be diverted during this 24-hour storm event (reference Figure 4.3). The Emergency Retention Basin (ERB) at the plant has a capacity of 15.4 MG which is more than adequate to handle these flows. Additionally, offsite storage at Ponds "A", 3, "B", "D-1" and "D-2" provide approximately 24 MG of additional capacity in storage basins. Therefore, influent storage capacity appears to be sufficient. Currently, during wet weather events, the plant can shave primary or secondary effluent peak flows to the ERB and return it back to the Headworks. However, if more could be processed through the entire secondary process, with secondary effluent stored in the ERB, this could help avoid having to return flows to the Headworks and instead stored flow could be sent to BNR once the peak subsides. This would require a new concrete lined storage basin or converting the ERB to a lined secondary effluent storage basin, and providing the infrastructure necessary to divert and return secondary effluent flows. The benefit would be minimizing odor issues and solids deposition in the ERB and offsite storage ponds due to the storage of raw influent and maximizing the plant secondary process throughput capacity.

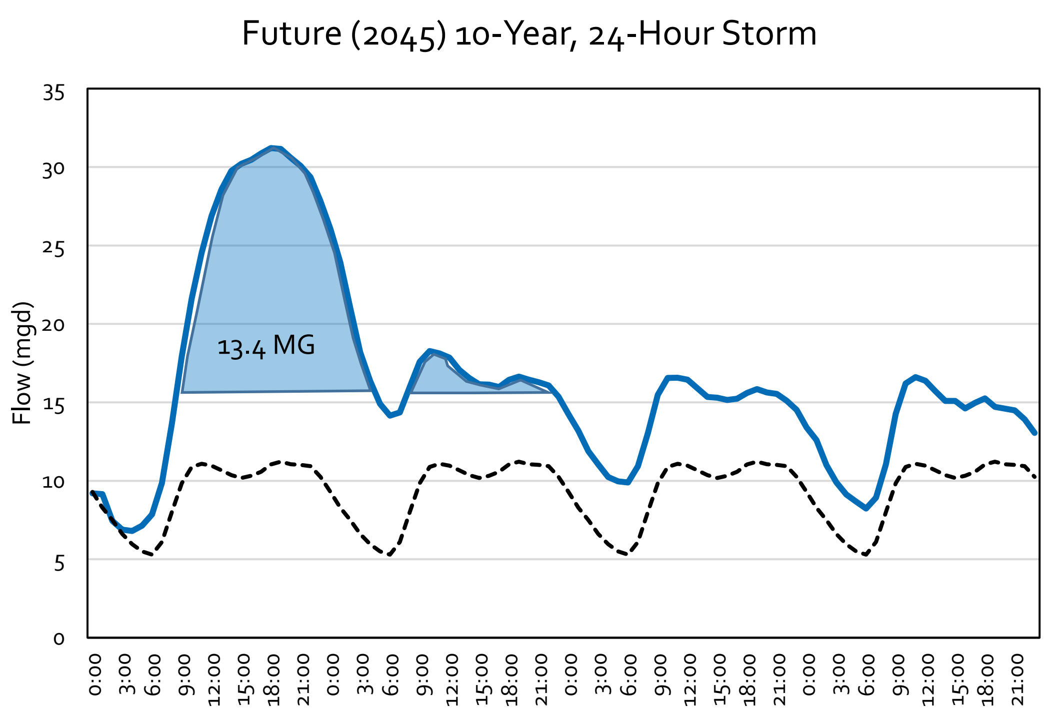

Figure 4.3 Plant Influent Flow Hydrograph for Future (2045) 10-Year, 24-Hour Storm Event

4.5 References

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Appendix 4C

TECHNICAL MEMORANDUM 5 DETAILED UNIT PROCESS LOAD, TREATMENT PERFORMANCE, AND CAPACITY ANALYSIS

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

Technical Memorandum 5
DETAILED UNIT PROCESS LOAD, TREATMENT PERFORMANCE, AND CAPACITY ANALYSIS

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

Technical Memorandum 5
DETAILED UNIT PROCESS LOAD, TREATMENT PERFORMANCE, AND CAPACITY ANALYSIS

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Contents

Tables

Figures

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Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
%	percent
2W	two water
AA	annual average
AWT	advanced wastewater treatment
ARRP	ammonia removal and recovery process
BNR	biological nitrogen removal
BOD	biochemical oxygen demand
Btu	British thermal units
Carollo	Carollo Engineers, Inc.
cu ft	cubic feet
cfm	cubic feet per minute
cfs	cubic feet per second
COD	chemical oxygen demand
CT	contact time
DO	dissolved oxygen
d/wk	days per week
ERB	emergency retention basin
$FeCl_3$	ferric chloride
ft	feet
gpd/sq ft	gallons per day per square foot
gpm	gallons per minute
hr	hour
H_2S	hydrogen sulfide
HAc	acetic acid
hp	horsepower
h/d	hours per day
HPOAS	high-purity oxygen activated sludge
HRT	hydraulic residence time
kgal/d	thousand gallons per day
klb/d	thousand pounds per day
lb/h	pounds per hour
lb/d/sq ft	pounds per day per square foot
lb/cfd	pounds per cubic foot per day
LOX	liquid oxygen
mgd	million gallons per day

mg/L	milligrams per liter
mL/g	milliliter per gram
MMBtu	million British thermal units
MW	maximum week
NFPA	National Fire Protection Association
NTU	nephelometric turbidity unit
ppm	parts per million
psi	pounds per square inch
scf/lb	standard cubic feet per pound
SLR	solids loading rate
SOR	surface overflow rate
sq ft	square feet
SRT	solids residence time
SVI	sludge volume index
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TM	technical memorandum
TP	total phosphorus
TPAD	temperature phased anaerobic digestion
TS	total solids
TSS	total suspended solids
T-TSA	Tahoe-Truckee Sanitation Agency
VFA	volatile fatty acids
VS	volatile solids
VSR	volatile solids reduction
VSLR	volatile solids loading rate
WAS	waste activated sludge
WDRs	Waste Discharge Requirements
WC	water column
WEF	Water Environment Federation
WRP	water reclamation plant
WY2018	2018 water year
yd^3	cubic yards

Technical Memorandum 5

DETAILED UNIT PROCESS LOAD, TREATMENT PERFORMANCE, AND CAPACITY ANALYSIS

5.1 Introduction

This section summarizes the historical process load, treatment performance, and capacity of all major processes at the Tahoe-Truckee Sanitation Agency's (T-TSA's) Water Reclamation Plant (WRP). The historical load and performance of each unit process was compared to the original design criteria and industry accepted operating and performance criteria. The performance of each unit process provides a benchmark for the planning of new facilities and assessing capacity. In some cases, historical performance confirms that original design criteria are appropriate for assessing unit process capacity. In others, above or below average performance warrants using criteria different from the original design for assessing capacity. For each unit process, recommended criteria are provided for use in the capacity assessment.

Additional discussion and analysis of the liquid treatment train capacity is provided in Technical Memorandum (TM) 4 WRP Hydraulic Capacity. Additional discussion and analysis of the historical and projected WRP flows and loads are provided in Volume 3, Chapter 2 - Flow and Load Projections.

The following sections review key findings for each unit process.

5.2 Preliminary Treatment and Influent Facilities

5.2.1 Grit Removal

Figure 5.1 summarizes grit tank surface overflow rate during WY2018. WRP staff have experienced problems with grit accumulation in the downstream processes, specifically in the primary digesters, suggesting grit removal is inadequate. Staff have also mentioned that the deflector vanes in the original 1975 grit chamber no longer move, resulting in short circuiting during higher flows leading to the downstream grit accumulation. A computational fluid dynamic (CFD) model is recommended to analyze existing flow patterns and to design appropriate improvements; future improvements to address short circuiting and grit accumulation in downstream processes will be determined based on the CFD results.

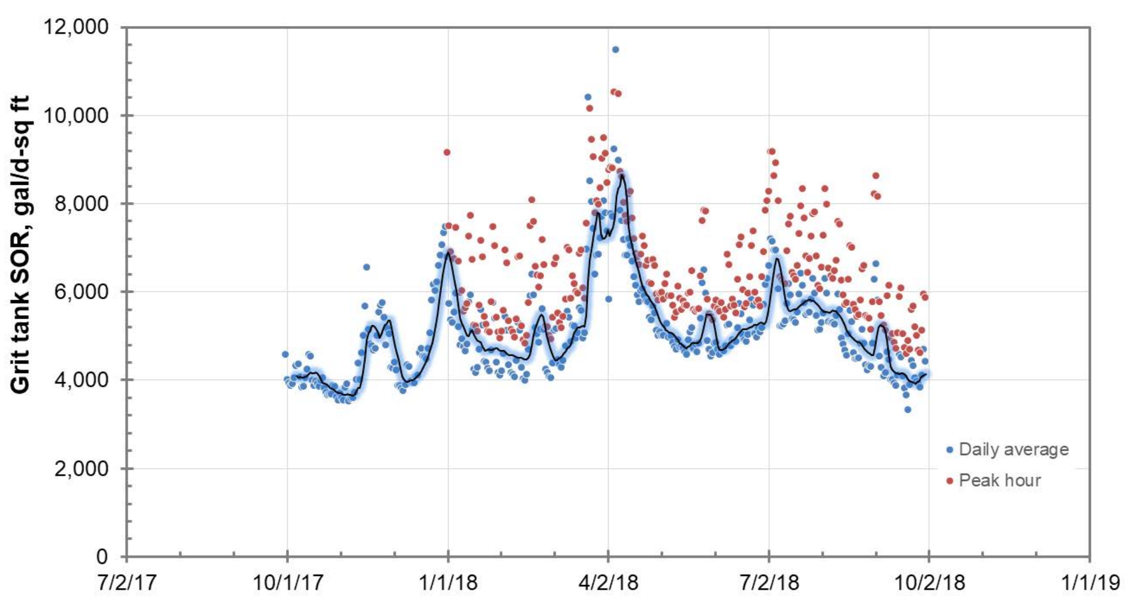

Figure 5.1 Grit Tank Surface Overflow Rate, WY2018

The solid highlighted trendline represents a 7-day moving average value.

5.3 Primary Treatment Facilities

5.3.1 Primary Clarifiers

5.3.1.1 Performance

Two to four clarifiers were in service during the 2018 water year (WY2018). (The water year convention is utilized by the USGS as well as throughout this document, as it allows for the graphical display of both winter and summer peaks in a single plot, while a calendar year display would cut the winter holiday peaks in half. T-TSA's WDRs focus on dry weather flow between June 21 and September 21, which can be seen in the water plots.) Two clarifiers were in service from October 2017 through December 2017 and throughout most of July 2018. Three clarifiers were in service from mid-April 2018 through early July 2018 and from early July 2018 through September 2018. All clarifiers were in service from January 2018 through early April 2018, except for a short period at the end of January 2018. Per T-TSA operators, all primary clarifiers have been put online to reduce chemical oxygen demand (COD) loads to the downstream oxygenation basins.

Surface overflow rate is the key parameter used to design primary clarifiers. Figure 5.2 summarizes primary clarifier operation during WY2018, specifically daily average surface overflow rate (SOR).

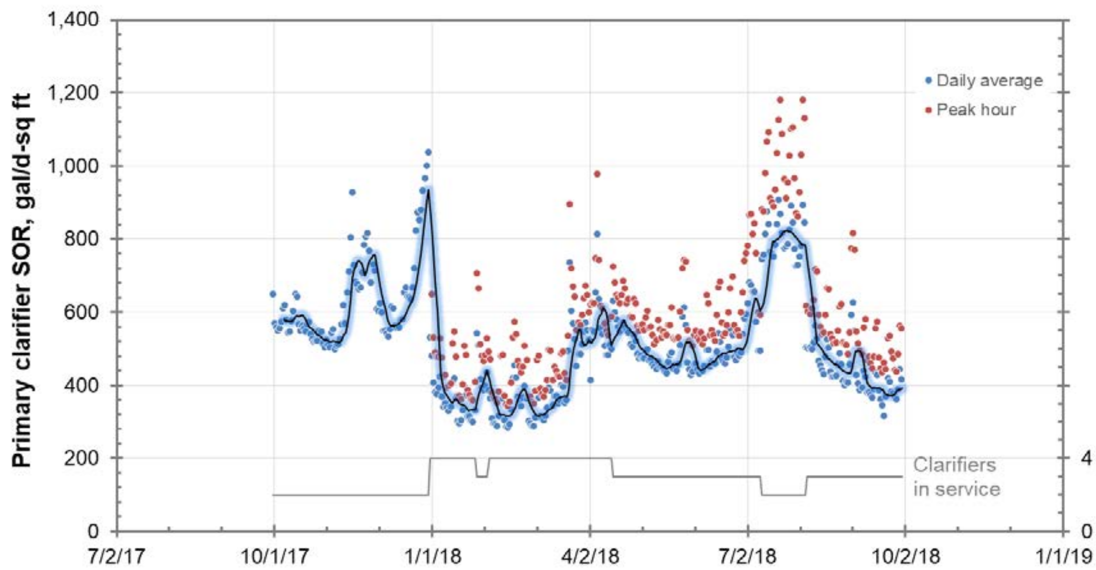

Figure 5.2 Primary Clarifier Surface Overflow Rate, WY2018

The solid highlighted trendline represents a 28-day moving average value.

Ferric chloride is added to the primary influent to maintain target suspended solids removals given the typically weekly influent loading pattern. The calculated daily average ferric chloride dose for each day of the week is shown in Figure 5.3. The figure shows that the ferric chloride dose is typically highest on Saturday, Sunday, and Monday, corresponding to the higher daily average influent suspended solids loads.

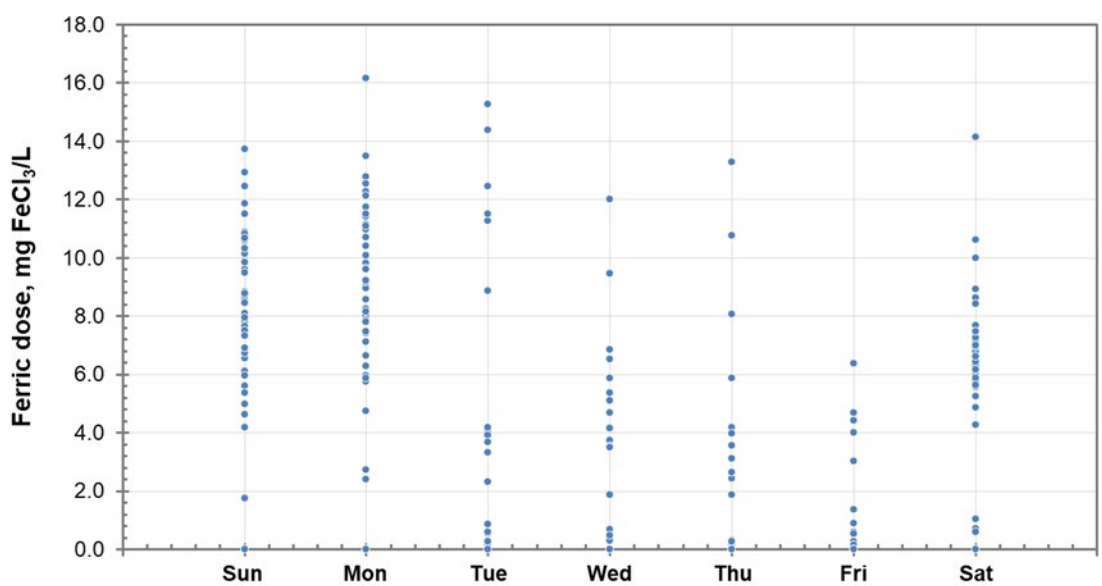

Figure 5.3 Primary Influent Ferric Chloride Dose, WY2018

The daily average primary total suspended solids (TSS), COD, biochemical oxygen demand (BOD), total Kjeldahl nitrogen (TKN), and total phosphorus (TP) removals are shown in

Figure 5.4 and Figure 5.5. Average primary suspended solids removal was 60 percent for WY2018. Primary removal of COD, BOD, TKN, and TP reflects the proportion of particulate and soluble fractions of each constituent. Average primary COD removal was 44 percent, BOD removal was 42 percent, TKN removal was negligible, and TP removal was 16 percent.

During the WRP Condition Assessment in May 2019, some scum was noted in the primary clarifier troughs, and per WRP staff, the scum pits are pumped daily.

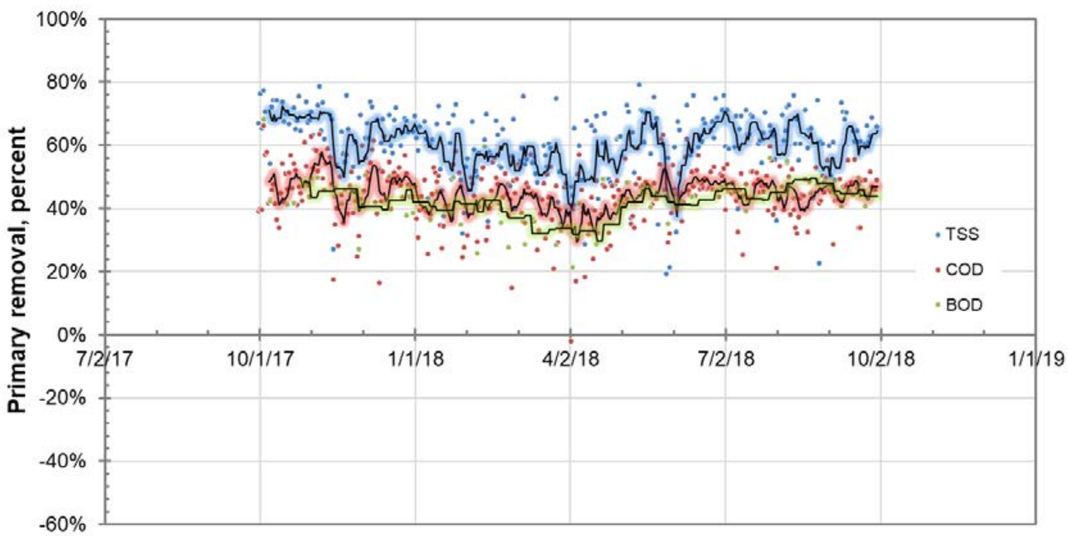

Figure 5.4 Primary TSS, COD, and BOD Removal, WY2018

The solid highlighted trendlines represent a 28-day moving average value.

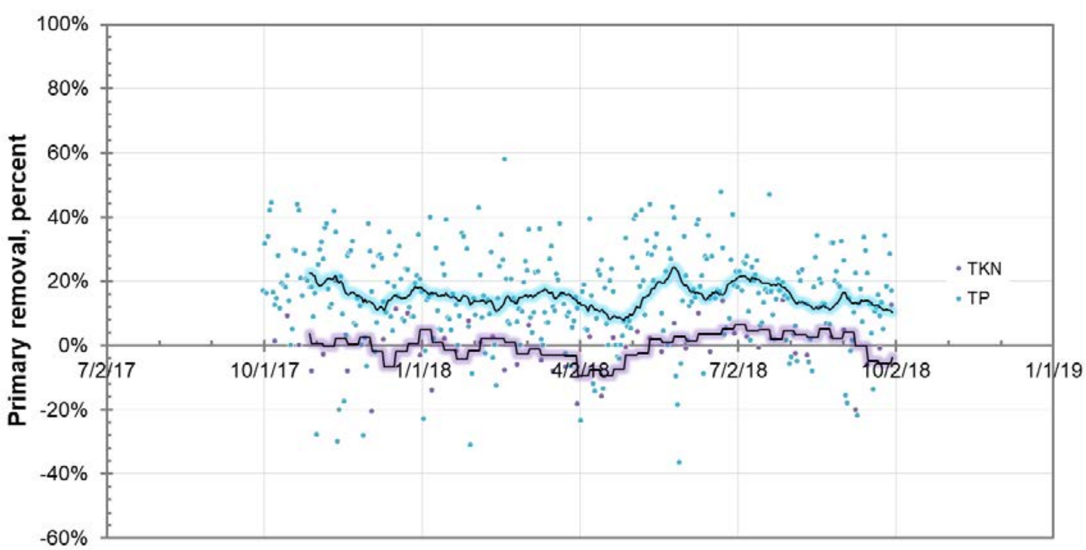

Figure 5.5 Primary TKN and TP Removal, WY2018

The solid highlighted trendlines represent a 28-day moving average value.

5.4 Secondary Treatment Facilities

5.4.1 High-Purity Oxygen Activated Sludge (HPOAS)

The calculated solids residence time (SRT) of the HPOAS system during WY2018 is shown in Figure 5.6.

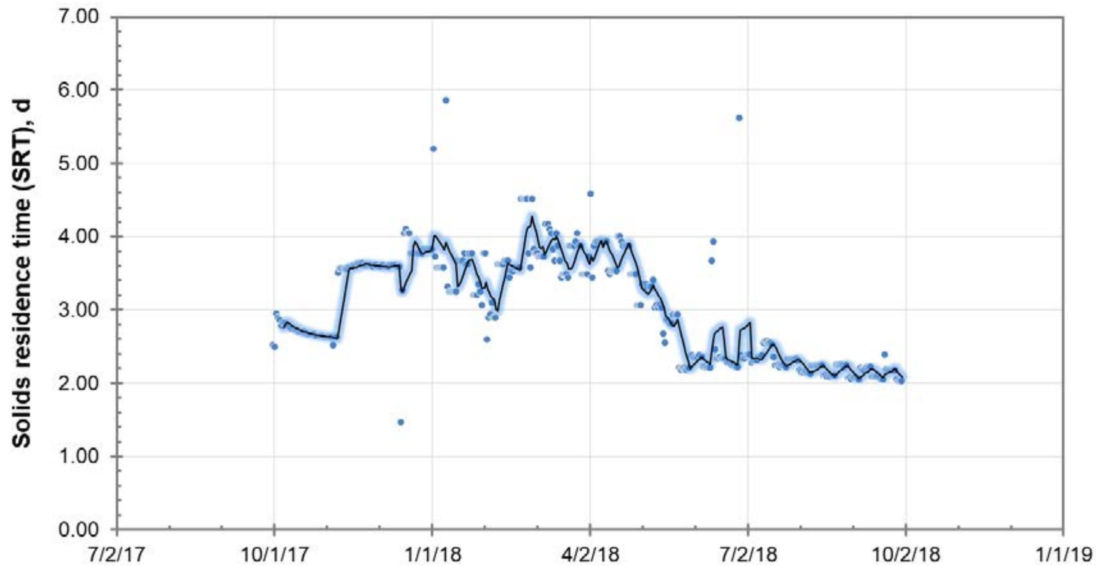

Figure 5.6 Solids Residence Time, WY2018

The solid highlighted trendline represents a 28-day moving average value.

5.4.2 Oxygenation Basins

5.4.2.1 Description

During WY2018, four of eight oxygenation basins were in service. During the WRP Condition Assessment performed in May 2019, WRP staff noted that the influent mixers are not typically used as they do not appear to improve operations significantly, and can result in RAS overflow to the ERB.

5.4.2.2 Performance

The mixed liquor dissolved oxygen (DO) concentration in each oxygenation tank in service is shown in Figure 5.7 and Figure 5.8 for train 1 through 4 (side 1) and train 5 through 8 (side 2), respectively.

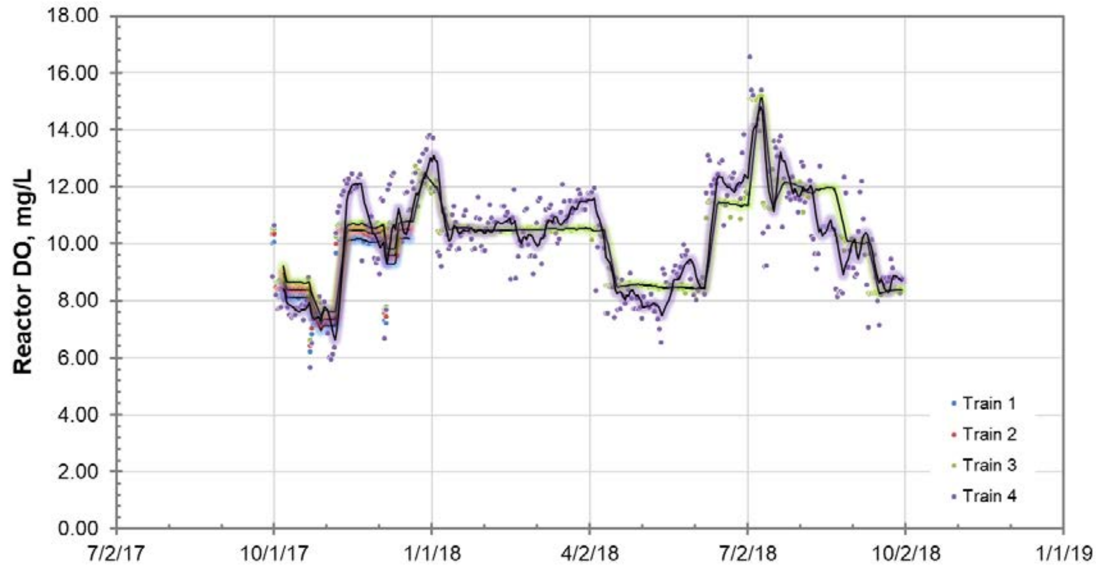

Figure 5.7 Side 1 Oxygenation Reactor DO Concentration, WY2018

The solid highlighted trendlines represent a 7-day moving average value.

Figure 5.8 Side 2 Oxygenation Reactor DO Concentration, WY2018

The solid highlighted trendline represents a 7-day moving average value.

The liquid oxygen (LOX) consumed is shown in Figure 5.9.

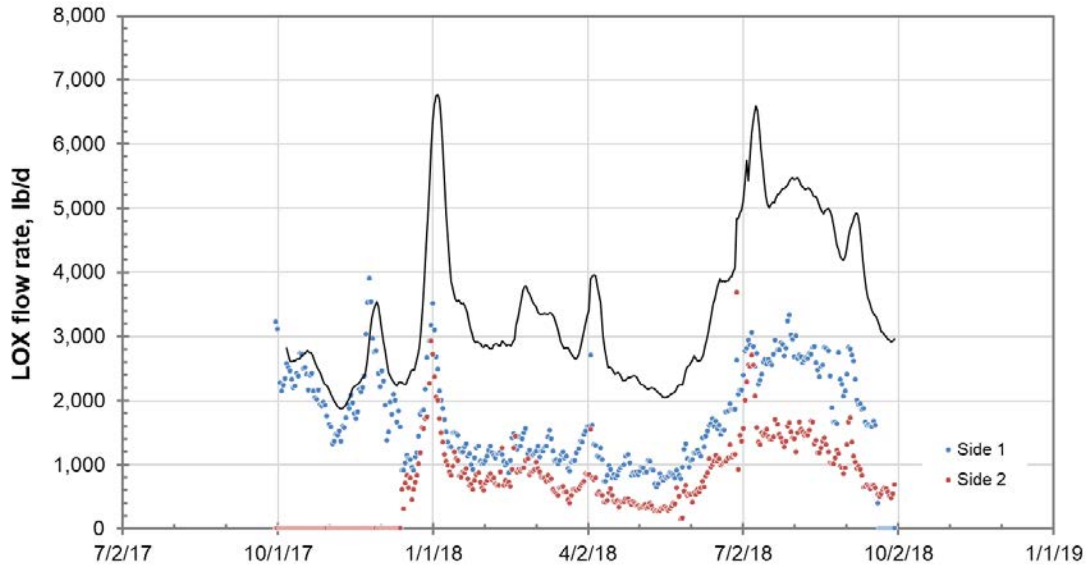

Figure 5.9 Oxygenation Reactor LOX Feed Rate, WY2018

The solid highlighted trendline represents a 28-day moving average value.

The mixed liquor settling characteristics, as measured by the sludge volume index (SVI) are plotted in Figure 5.10. The figure shows SVI values for WY2018. The horizontal red line in the figure represents the 90th percentile SVI, 125 milliliter per gram (mL/g), which is used as measure of the reliable sludge settleability in evaluating secondary clarifier capacity.

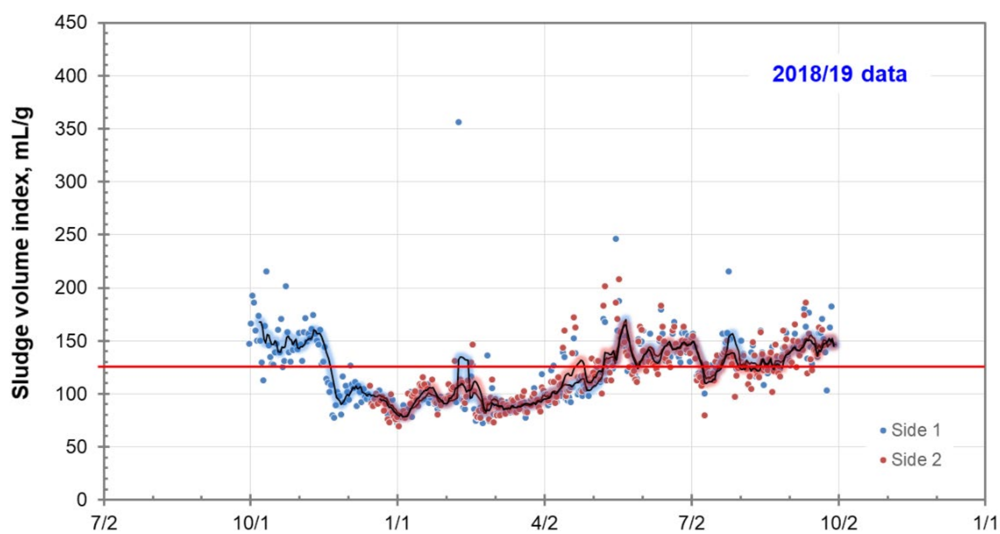

Figure 5.10 Sludge Volume Index, WY2019

The solid highlighted trendlines represent a 28-day moving average value.

5.4.3 Secondary Clarifiers

Two or three of the four secondary clarifiers are typically in service year round with all four in service during extreme wet weather events. During the WRP Condition Assessment in May 2019, algae and scum were noted in some of the secondary clarifier weirs, algal growth was noted in the secondary effluent distribution box, and WRP staff noted that WAS pumps can't get to the desired SRT when all four oxygen trains are in service on one side.

5.4.3.1 Performance

Figure 5.11 shows the daily average secondary clarifier SOR and Figure 5.12 shows the secondary clarifier solids loading rate (SLR) for WY2018.

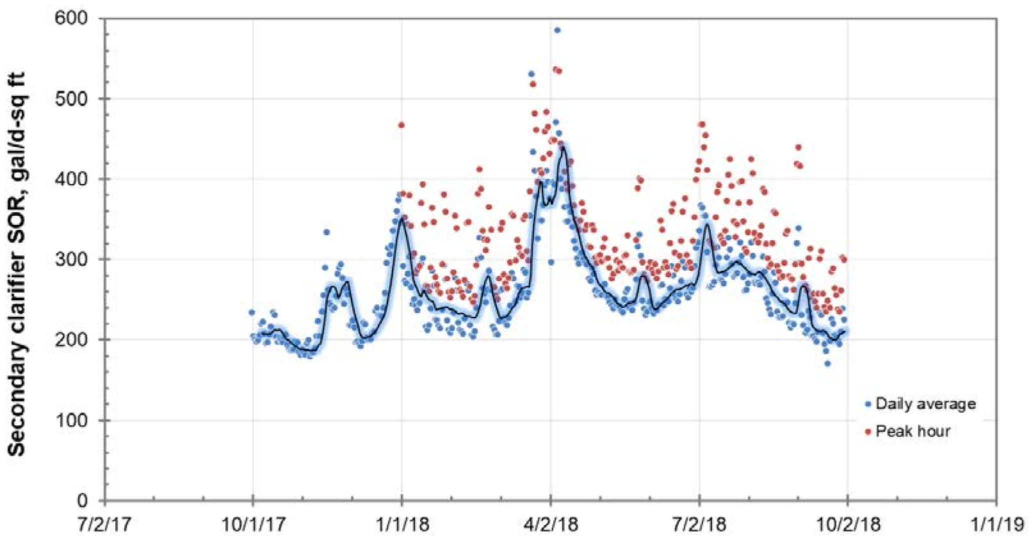

Figure 5.11 Secondary Clarifier Surface Overflow Rate, WY2018

The solid highlighted trendlines represent a 7-day moving average value.

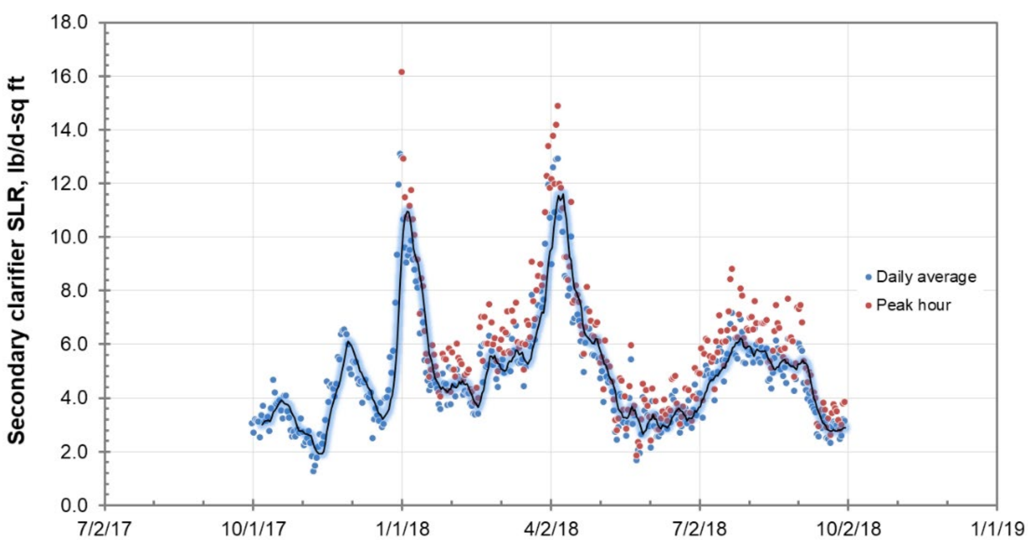

Figure 5.12 Secondary Clarifier Solids Loading Rate, WY2018

The solid highlighted trendline represents a 7-day moving average value.

Figure 5.13 shows the return sludge flow fraction, calculated as the RAS flow rate divided by the plant flow rate, for WY2018.

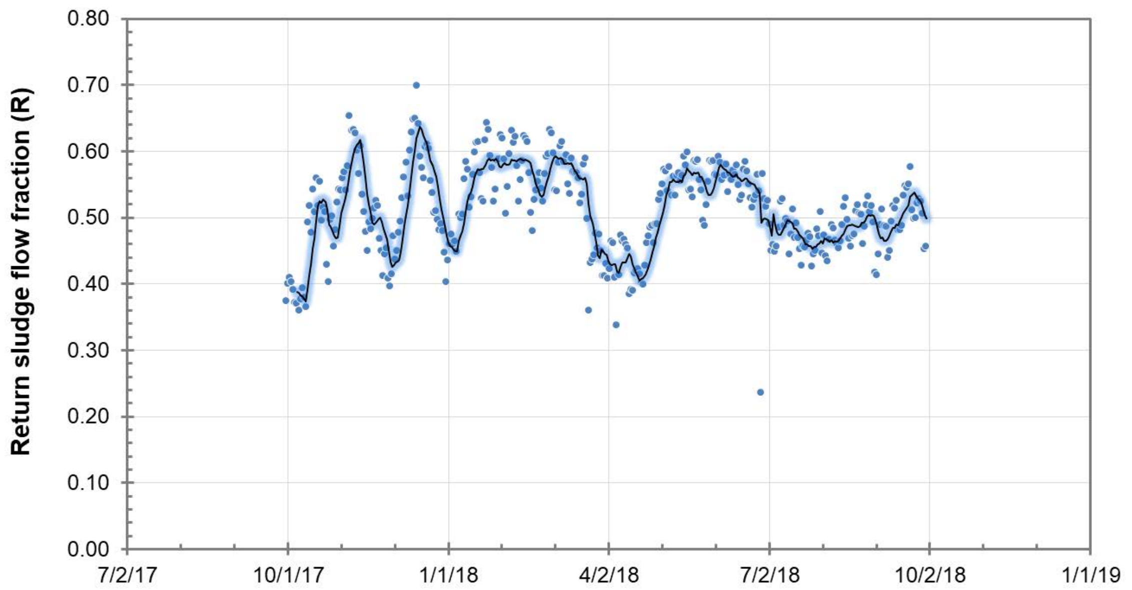

Figure 5.13 Return Activated Sludge Flow Fraction, WY2018

The solid highlighted trendline represents a 7-day moving average value.

5.5 Phosphorus Removal

Typically, only one train, consisting of rapid mix basins, flocculation basins, chemical clarifiers, first stage recarbonation basins, recarbonation clarifiers, and second stage recarbonation basins, is operated at a time. During the WRP Condition Assessment in May 2019, it was noted that recarbonation was only occurring in the second stage recarbonation basin, due to the low volume of the treated phosphorus stripper overflow relative to the secondary effluent volume. However, since that time, operations staff has moved pH control to the first stage to help minimize chemical sludge build up in the Ballast Ponds which has also improved the operation of the basins. So far, there has been no significant need to adjust pH of the blended stripper overflow/secondary effluent.

During that same condition assessment, lime build up and algal growth were noted on the walls of the recarbonation basins and clarifiers. Calcium build up was also noted on the rapid mix basin mixer blades, necessitating cleaning approximately every three months. Flocculation basins are cleaned annually to address lime buildup.

5.5.1 Phosphorus Stripping Basins

Figure 5.14 shows the phosphorus stripping tank hydraulic residence time for WY2018. T-TSA typically operates one stripping basin at a time from fall through the spring. During the summer, the plant operators can bring a second basin in service if required by process demands.

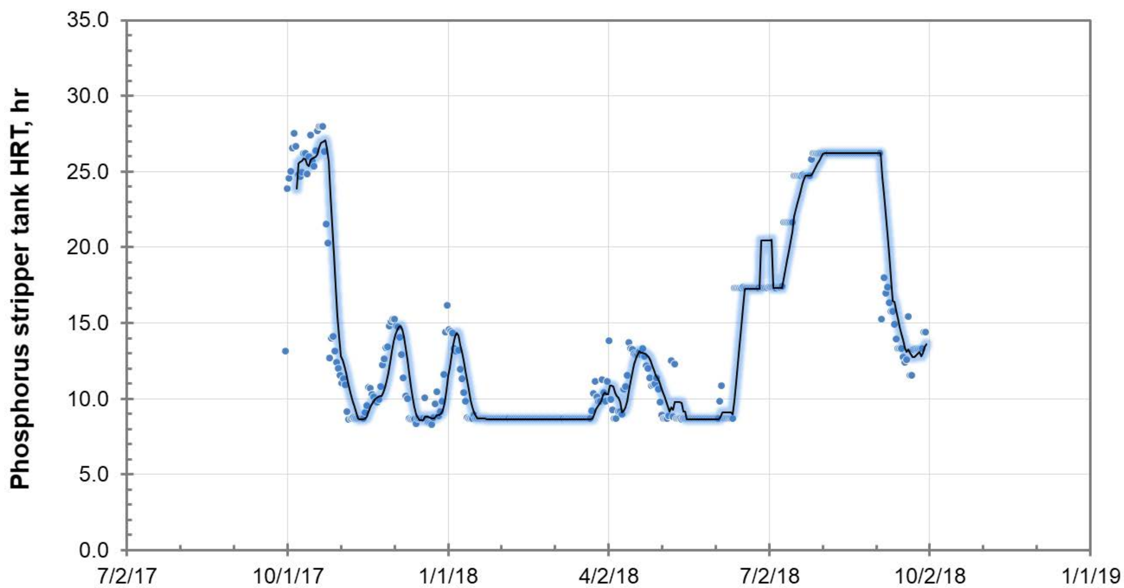

Figure 5.14 Phosphorus Stripper Tank Hydraulic Residence Time, WY2018

The solid highlighted trendline represents a 7-day moving average value.

5.5.2 Flocculation Basins

During WY2018, 1 of 2 flocculation basins were in service.

5.5.3 Chemical Clarifiers

During WY2018, 1 of 2 chemical clarifiers were in service. Figure 5.15 shows the chemical clarifier surface overflow rate for WY2018.

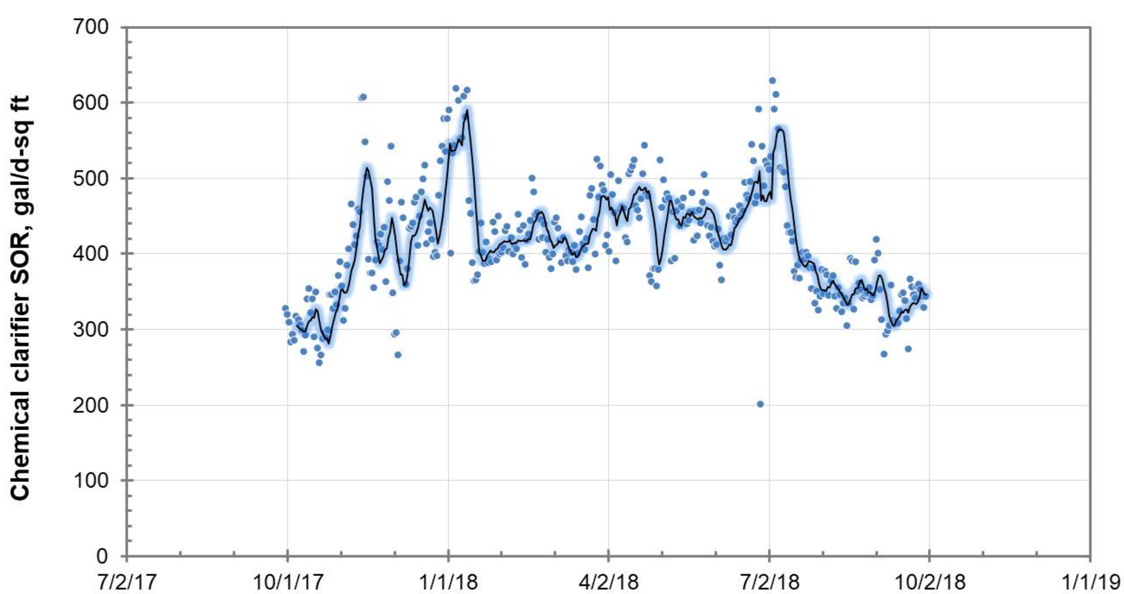

Figure 5.15 Chemical Clarifier Surface Overflow Rate, WY2018

The solid highlighted trendline represents a 7-day moving average value.

5.5.4 Recarbonation Basins and Clarifiers

During WY2018, 1 of 2 recarbonation basins were in service, and 1 of 2 recarbonation clarifiers were in service.

5.6 Flow Equalization

5.6.1 Ballast Ponds

While ballast ponds are cleaned out regularly by staff, the process is done by hand with a hose and is thus labor intensive. It is recommended to continue weekly cleaning in the summer and bi-weekly cleaning in the winter. Additionally, it is recommended to invest in water cannons to reduce time spent cleaning the ballast ponds.

5.6.2 Biological Filtration Effluent Pond

During the condition assessment site visit in May 2019, it was observed that there is not an efficient way to clean the biological nitrogen removal (BNR) Filtration Effluent Pond No. 34. It is recommended to invest in water cannons and clean this pond bi-weekly in the summer.

5.7 Biological Nitrogen Removal

5.7.1 Nitrification

During the condition assessment site visit in May 2019, the following performance and operational concerns were noted:

- There is some biological growth on the walls of the nitrifying cells.
- Staff reported nitrification head loss throughout the spring.
- The blowers are showing signs of aging and inefficiency. The staff has voiced concerns over turndown and volume of air moved by the blowers. Currently, turndown is at 65 percent and output is at 430 cubic feet per minute (cfm). The output should be in range of 700-800 cfm for backwash and within 200-600 cfm for normal operations.

5.7.1.1 Performance

Four of eight nitrifying submerged filter cells were in service during WY2018.

Figure 5.16 shows the nitrification loading rate, as ammonia and as TKN, for WY2018. Figure 5.17 shows that the weekly average nitrification efficiency of the nitrifying submerged filters was greater than 97 percent during WY2018. Figure 5.18 shows the daily average nitrification air flow rate during WY2018.

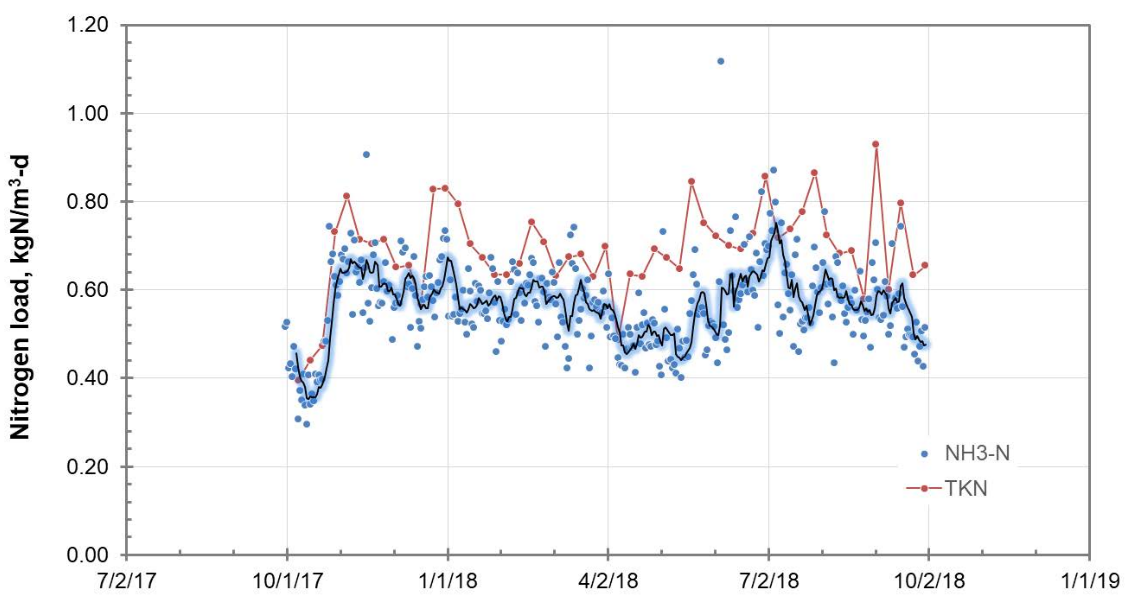

Figure 5.16 Nitrification Loading Rate, WY2018

The solid highlighted trendline represents a 7-day moving average value.

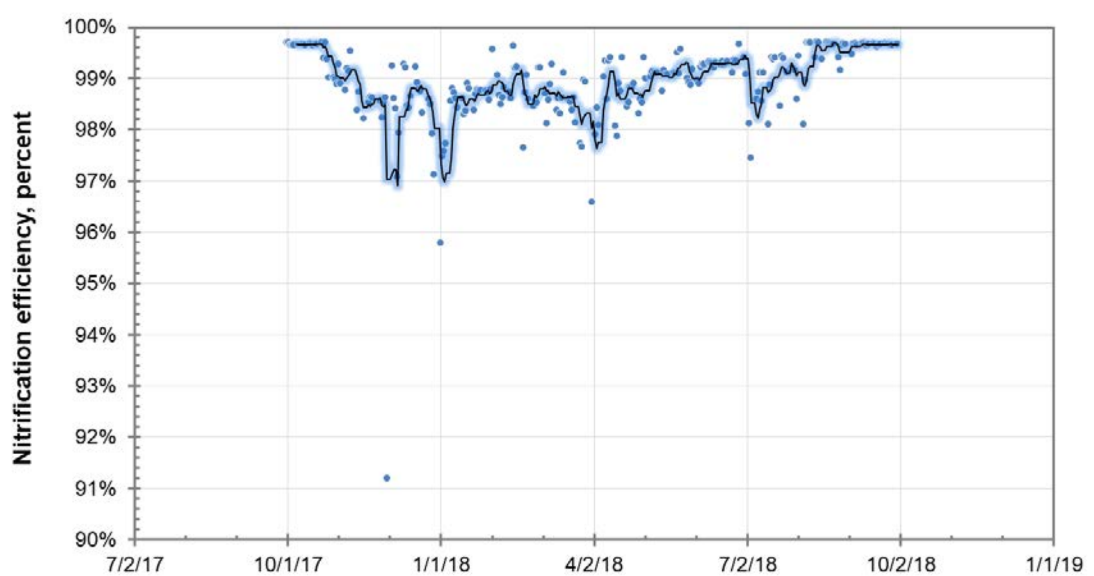

Figure 5.17 Nitrification Efficiency, WY2018

The solid highlighted trendline represents a 28-day moving average value.

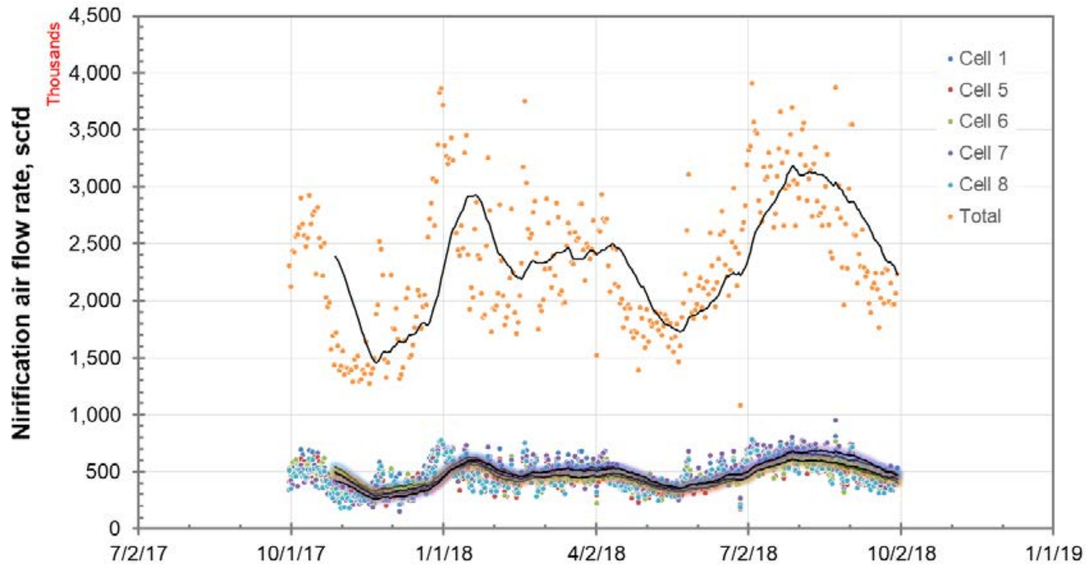

Figure 5.18 Daily Average Nitrification Air Flow Rate, WY2018

The solid highlighted trendlines represent a 28-day moving average value.

The nitrified effluent DO concentration varied between approximately 6.0 and 8.0 milligrams per liter (mg/L) during WY2018, as shown in Figure 5.19.

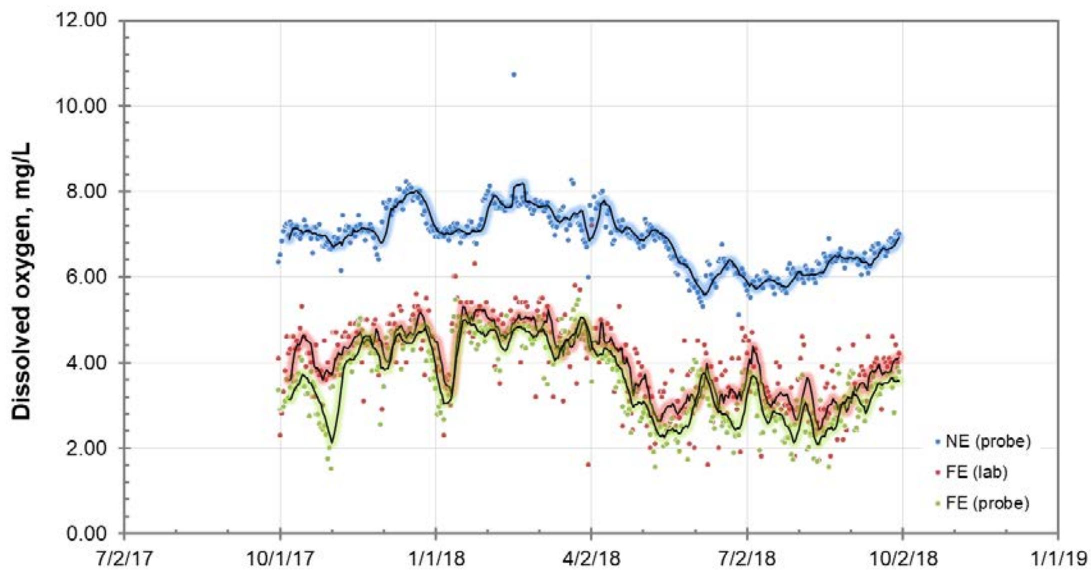

Figure 5.19 Nitrified Effluent DO Concentration, WY2018

The solid highlighted trendlines represent a 28-day moving average value.

Nitrified effluent DO is close to saturation, so the drop over the weir upstream of the denitrifying filters has a minimal impact on oxygen carryover, which is illustrated in Figure 5.20.

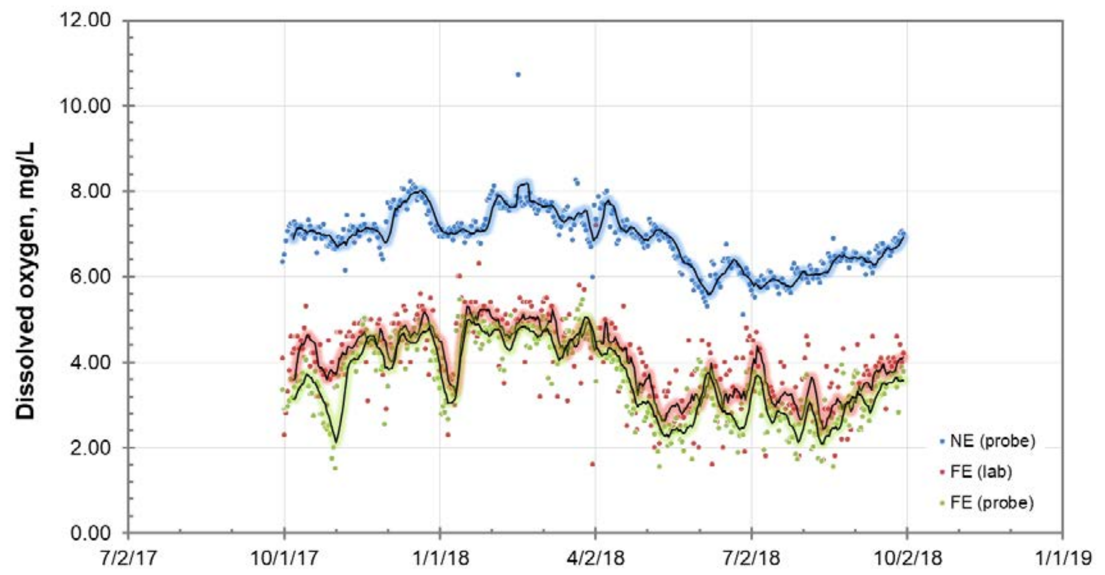

Figure 5.20 Dissolved Oxygen Surface Saturation Concentration

The solid highlighted trendlines represent a 7-day moving average value.

5.7.2 Denitrification

Figure 5.21 shows the denitrification loading rate, as oxidized nitrogen, for WY2018. During WY2018, all four denitrifying filters were in service, although during low flow times of the year, the amount of denitrifying cells in service can be reduced to two or three. During the condition assessment site visit in May 2019, the following performance and operational concern was noted:

- There are no redundant denitrification cells.

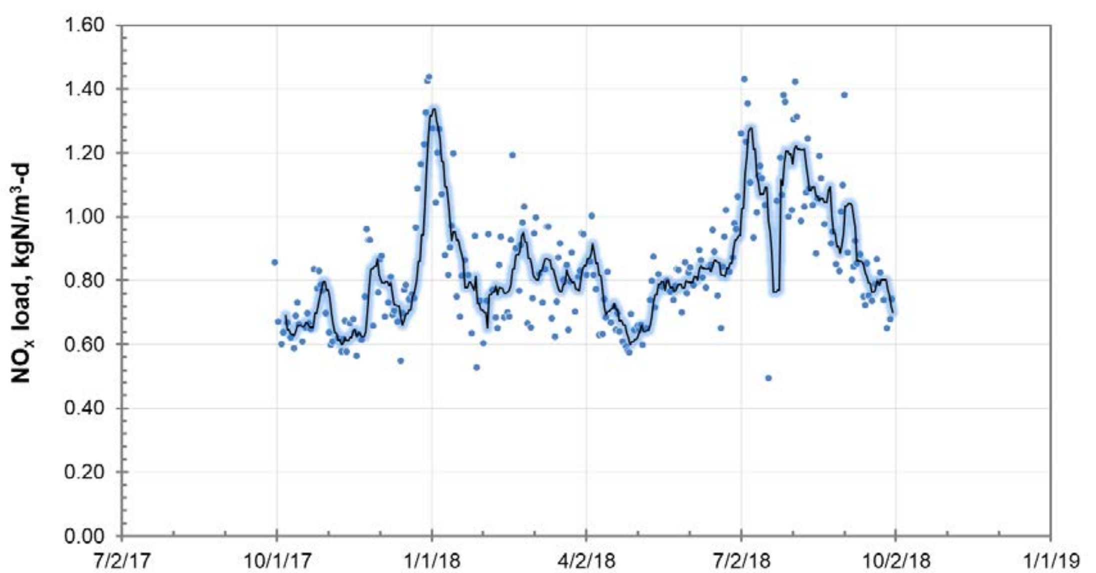

Figure 5.21 Denitrification Loading Rate, WY2018

The solid highlighted trendline represents a 7-day moving average value.

Capacity of the denitrifying submerged filters may be improved through two different approaches. One approach involves tighter control of nitrifying submerged filter aeration air flow to reduce dissolved oxygen carryover, which compromises denitrification capacity and increases methanol demand. The second approach is to recycle a portion of the nitrified effluent to the plant headworks, where bacteria and soluble biodegradable carbon in the raw sewage will remove the nitrate through denitrification.

5.7.2.1 Performance

Daily average denitrification efficiency during WY2018, shown in Figure 5.22, was more variable than nitrification efficiency, but the weekly average denitrification efficiency still exceeded 95 percent.

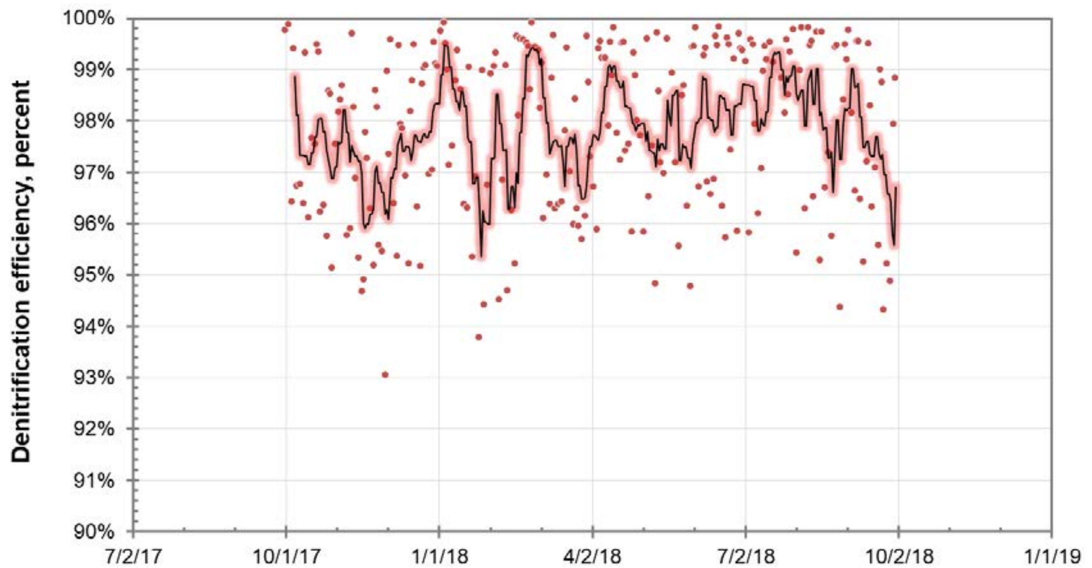

Figure 5.22 Denitrification Efficiency, WY2018

The solid highlighted trendline represents a 28-day moving average value.

The daily average methanol consumption and the change in nitrate nitrogen (NO3-N) concentration across the denitrifying submerged filters were used to calculate the specific methanol dose as mass of COD per mass of NO3-N removed. The results, shown in Figure 5.23, show that the weekly average specific dose is not significantly different from the stoichiometric dose of 4.76 pounds (lb) COD/lb NO3-N removed. The relatively high nitrified effluent DO concentration does not have a significant effect on methanol consumption.

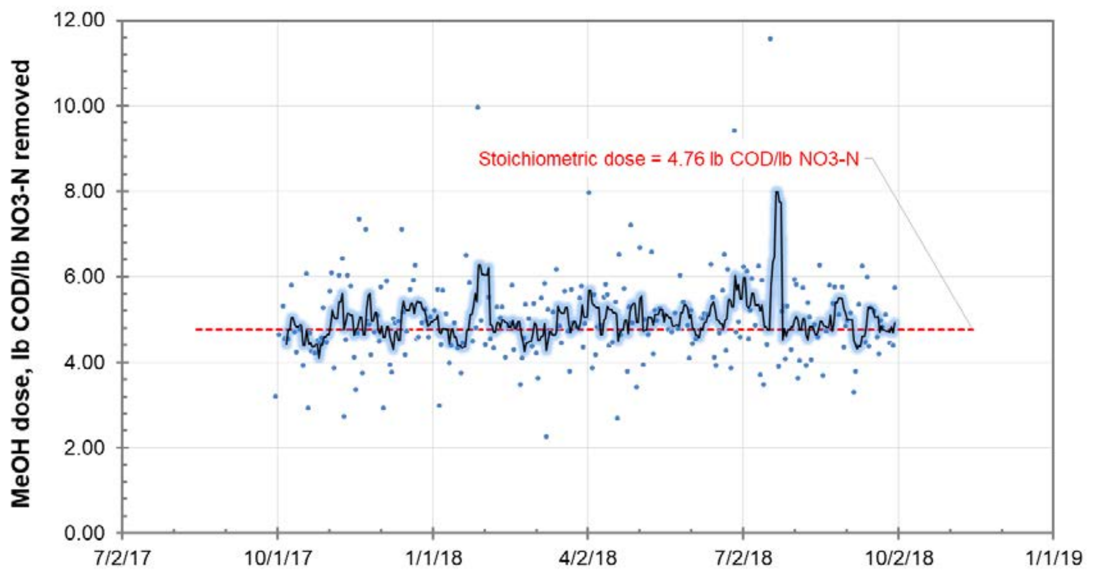

Figure 5.23 Denitrification Methanol Dose, WY2018

The solid highlighted trendline represents a 7-day moving average value.

5.8 Filtration

Figure 5.24 shows the filter surface loading rate for WY2018, assuming all four filters in service.

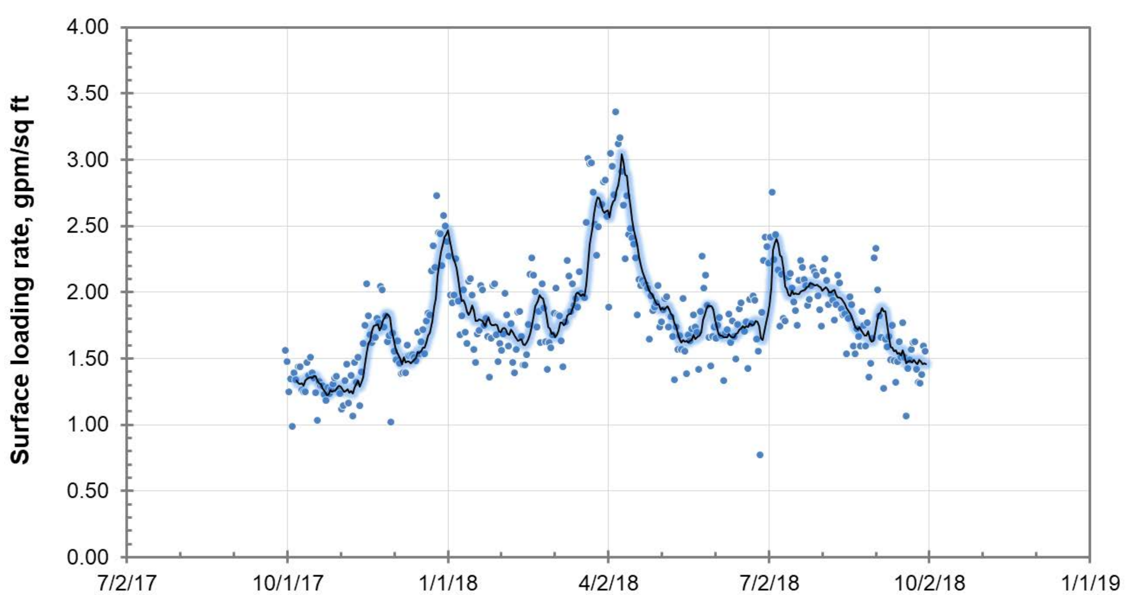

Figure 5.24 Filter Surface Loading Rate, WY2018

The solid highlighted trendline represents a 7-day moving average value.

5.8.1 Backwash Water Disposal System

When a filter is returned to service after a backwash cycle, the filter effluent turbidity is higher than desired. Therefore, following backwash, the filter is operated in the rinse-to-waste cycle for approximately 10 minutes until the filter effluent turbidity returns to normal

(< 0.5 nephelometric turbidity unit [NTU]). A chlorinated backwash is used in the summer to quell bacterial growth.

In addition to the filters, the filter backwash tank (advanced wastewater treatment [AWT] backwash tank) traps anthracite coal inside the tank during the backwash cycle. It is recommended that the tank continue to be cleaned every 5-6 years to prevent build-up.

5.8.2 Backwash Volumes

Figure 5.25 illustrates the gallons per backwash in the filtration backwash process for both BNR nitrification/denitrification and the granular media filters.

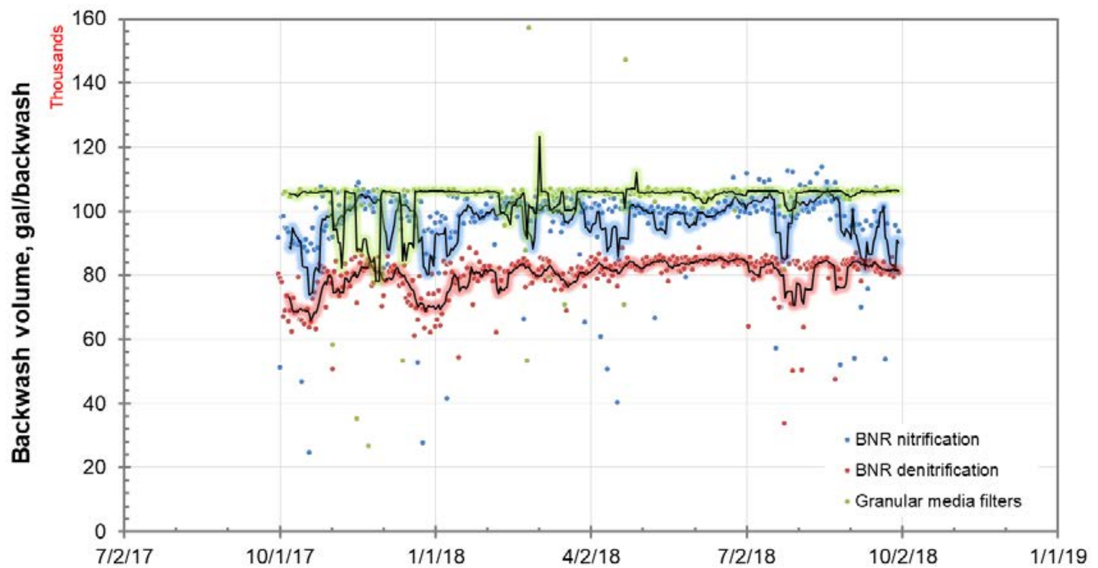

Figure 5.25 BNR and Final Effluent Filtration Waste Backwash Volume, WY2018

The solid highlighted trendlines represent a 28-day moving average value.

5.9 Ion Exchange

The existing ion exchange process was part of the WRP's original 1975 facility process train, designed to provide ammonia removal. The ion exchange process consists of five clinoptilolite (clino) beds, a regenerant system for the clino bed media, and an ammonia removal and recovery process (ARRP) located within the advanced waste treatment (AWT) building. However, the ion exchange process became obsolete once the BNR process was placed into service and has not been used since 2006. In order for the ion exchange process to be used for an extended time period, T-TSA staff would have to expend significant time and effort to make it usable and bring it back online.

Review of the existing WDRs shows that the permit was written to keep the ion exchange process in place until the BNR process demonstrated successful operation. The BNR process has provided consistent nitrogen removal since 2006; therefore, the ion exchange process can be taken out of service.

Abandonment and removal of the obsolete and unused ion exchange process and associated ARRP is recommended. This will allow for beneficial re-use of the existing AWT building, by providing space for future processes to be housed in this location, with the benefit of cost savings to T-TSA. Specifically, the proposed future Disinfection Process Modernization Project is planned to be housed in the AWT if feasible.

5.10 Disinfection Facilities

5.10.1 Effluent Disinfection

The single effluent pipeline is in service year-round. Chlorine concentrations at the chlorine injection point range from 4.5 to 7 parts per million (ppm).

5.10.2 Disposal Fields

The soil aquifer treatment (SAT) system and associated disposal fields are in service year-round. Typically, four of the eight fields are in service at any given time, and operation of the fields is rotated. This SAT system currently provides some final effluent polishing. The BNR process was designed to provide the maximum practicable nitrogen reduction, independent of additional removals that may be achieved in the SAT system. However, per the WDRs, operational measures shall be employed to maximize the overall performance of the BNR and SAT systems in concert with one another, to minimize nitrogen discharged to the Truckee River and Martis Creek watersheds. The disposal fields have all been in service since the WRP's original construction in 1975. It is possible that the hydraulic capacity of the disposal fields may diminish in the future, and/or that the fields may eventually clog, bind, or fail to function as originally intended. Therefore, it is recommended that the disposal fields be replaced and/or supplemented to provide final effluent polishing in the future when it is determined to be necessary.

5.11 Solids Handling

The solids handling facilities include sludge pumping, waste activated sludge (WAS) thickening in gravity thickeners, supplementary WAS thickening in centrifuges, chemical sludge thickening in gravity thickeners, organic sludge stabilization via anaerobic digestion, organic sludge and chemical sludge dewatering in centrifuges, and chemical sludge dewatering in a plate-and-frame filter press. The following sections summarize the performance and capacity assessment for each of these solids processes.

5.11.1 Solids Flows and Loads

The capacity assessment is based on the current and future flows and loads presented in Volume 3, Chapter 2, Flow and Load Projections.

The current flows and loads are based on the one-year period from October 1, 2017 through September 30, 2018 (WY2018). Annual average (AA) flows and loads were calculated from the data, and concentrations (percent total solids [%TS], percent volatile solids [%VS], etc.) were back-calculated from the AA flows and loads. The maximum week (MW) flows represent the maximum 7-day running average value. The MW characteristics (%TS, %VS, etc.) were assumed to be the same as the AA, and the loads were calculated from that.

The future flows and loads were calculated by applying a growth percentage of 52.7 percent (see Volume 3, Chapter 2, Flow and Load Projections) to both AA and MW flows and loads. We assumed that solids characteristics (%TS, %VS, etc.) will remain the same in the future. The loads were then calculated from the projected flows and concentrations, as shown in Table 5.1.

Table 5.1 Solids Flows and Loads

Parameter	Units	Primary Sludge	WAS	TWAS	Digester Feed	Digested Sludge	Chemical Sludge(3)	Thickened Chemical Sludge	Thickened Chemical Sludge to Centrifuge	Centrifuge Feed	Dewatered Organic and Chemical Sludge	Thickened Chemical Sludge to Filter Press	Dewatered Chemical Sludge
AA Flow	kgal/d(4)	12.7	192	12.8	25.5	27.5	27.8	6.33	3.49	31.0		2.84	0.77
AA Mass Flow	wet klb/d(5)							52.8	29.1	258.2	18.0	23.7	6.4
AA TS concentration	%TS	4.84	0.14	2.85	3.84	1.45	3.00(1)	11.9	11.9	2.62	32.9	11.9	43.9
AA TS load	klb/d(5)	5.11	2.24	3.05	8.16	3.32	6.97	6.27	3.46	6.77	5.91	2.81	2.81
AA VS concentration	%	91.6		87.6	90.1	75.6							
AA VS load	klb/d(5)	4.68		2.67	7.35	2.51							
MW Flow	kgal/d(4)	23.7	260	25.3	48.2	48.2	55.7	12.7	7.1	55.2		5.67	1.54
MW Mass Flow	wet klb/d(5)										31.9	47.3	12.8
MW to AA Ratio(2)	-	1.87	1.35	1.98	1.89	1.75	2.00(1)	2.00(1)	2.02	1.78	1.78	2.00(1)	2.00(1)
MW TS load	klb/d(5)	9.56	3.03	6.02	15.4	5.82	13.93	12.54	7.0	12.1	10.5	5.62	5.62
MW TS load	klb/d(5)	8.75		5.28	13.9	4.40							

Notes:
(1) Values in blue were assumed because data was missing.
(2) When daily flow data was not available, we assumed a MW to AA ratio of 2 to be conservative.
(3) The chemical sludge and recarbonation sludge flows are not measured, so they were back-calculated from the thickened chemical sludge flow, assuming a 90 percent capture rate and an average chemical sludge and recarbonation sludge solids concentration of 3%TS.
(4) kgal/d = thousand gallons per day.
(5) klb/d = thousand pounds per day.

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5.11.2 Primary Sludge and Primary Scum Pumps

5.11.2.1 Description

The primary sludge and primary scum pumps pump sludge and scum from the primary clarifiers to either the gravity thickeners or directly to the anaerobic digesters. Two primary sludge pump stations contain a total of four sludge pumps and four scum pumps. The pump suction headers are manifolded so that the scum pumps can act as backup for the primary sludge pumps and vice versa.

5.11.2.2 Original Design Criteria

Table 5.2 summarizes the original design criteria for the primary sludge and primary scum pumps.

Table 5.2 Primary Sludge and Primary Scum Pumps Design Criteria

Parameter	Units	Value
Primary Sludge Pumps		
Year Installed		2 in 1975, 1 in 1981, 1 in 2003
Number		4
Type		Progressive cavity
Capacity, each	gpm	80
Horsepower, each	hp	5
Primary Scum Pumps		
Year Installed		2 in 1975, 1 in 1981, 1 in 2003
Number		4
Type		Progressive cavity
Capacity, each	gpm	80
Horsepower, each	hp	5

5.11.2.3 Capacity Assessment

Table 5.3 compares the pump capacity to the current and future flows. The primary sludge and primary scum pumps have sufficient capacity for all conditions evaluated, and no expansion is needed based on the capacity assessment.

Table 5.3 Primary Sludge and Primary Scum Pumps Capacity Assessment

Parameter	Units	Capacity	Current AA	Current MW	Future AA	Future MW
Primary Sludge and Primary Scum Flow	gpm	80.7	8.8	6.4	13.4	25.1

5.11.3 WAS Pumps

5.11.3.1 Description

The WAS pumps convey excess solids generated in the secondary treatment process to the gravity thickeners. SRT can be controlled either by mixed liquor or settled sludge wasting; currently mixed liquor wasting controls SRT. The WAS pumps are constant speed and operate based on a preset percent of the time.

5.11.3.2 Original Design Criteria

Table 5.4 summarizes the original design criteria for the WAS pumps.

Table 5.4 WAS Pumps Design Criteria

Parameter	Units	Value
Year Installed		2 in 1975, 2 in 1981
Number		3
Type		Centrifugal non-clog, constant speed
Capacity, each	gpm	2 @ 105 (1975), 1 @ 110 (1981)
Horsepower, each	hp	3 (1978 & 1981)
Number		1
Type		Progressive cavity
Capacity, each	gpm	35
Horsepower, each	hp	3

5.11.3.3 Capacity Assessment

Table 5.5 compares the pump capacity to the current and future flows. Values in red bold font exceed the maximums, indicating additional capacity may be needed. Two flow conditions were evaluated: 1) the current operation of wasting WAS from the mixed liquor channel at an average solids concentration of 0.14 percent TS; and 2) the alternative operation of wasting WAS from the secondary underflow at an average concentration of 0.44 percent TS. For the mixed liquor wasting condition, the duty WAS pump capacity of 255 gpm is exceeded at future MW flow. This means additional capacity will be needed. For the secondary clarifier underflow wasting condition, the WAS pumps have sufficient capacity for both current and future flows. No expansion is needed.

Table 5.5 WAS Pumps Capacity Assessment

Parameter	Units	Capacity	Current AA	Current MW	Future AA	Future MW
WAS Flow, Mixed Liquor	gpm	225	133	181	204	276
WAS Flow, Secondary Underflow	gpm	255	42	57	65	88

Notes:
(1) Values in red indicate capacity exceedances.
(2) Duty capacity based on assuming one large pump (110 gpm) is out of service.

5.11.4 Chemical Sludge and Recarbonation Sludge Pumps

5.11.4.1 Description

The chemical sludge pump station contains six pumps: three that pump chemical sludge and three that pump recarbonation sludge. The recarbonation sludge pumps are utilized to pump chemical sludge that has precipitated in the recarbonation clarifiers. Normally, a single pump draws from the sludge sump of each clarifier. The pumps can operate either continuously or on a timed cycle. Chemical sludge is then pumped to the chemical sludge gravity thickeners.

Table 5.6 summarizes the original design criteria for the chemical sludge pumps.

Table 5.6 Chemical Sludge and Recarbonation Sludge Pumps Design Criteria

Parameter	Units	Value
Chemical Sludge Pumps		
Year Installed		2011 & 2014
Number		2
Type		Centrifugal non-clog, constant speed with timer
Capacity, each	gpm	115
Horsepower, each	hp	5
Number		1
Type		Progressive cavity
Capacity, each	gpm	120
Horsepower, each	hp	10
Recarbonation Sludge Pumps		
Year Installed		2015
Number		3
Type		Centrifugal non-clog, constant speed with timer
Capacity, each	gpm	115
Horsepower, each	hp	5

5.11.4.2 Capacity Assessment

Table 5.7 compares the pump capacity to the current and future flows. The chemical sludge and recarbonation sludge flows are not measured, so they were back-calculated from the thickened chemical sludge flow, assuming a 90 percent capture rate and an average chemical sludge and recarbonation sludge solids concentration of 3 percent TS. The chemical sludge and recarbonation sludge pumps have sufficient capacity for all conditions evaluated and no expansion is needed.

Table 5.7 Chemical Sludge and Recarbonation Sludge Pumps Capacity Assessment

Parameter	Units	Capacity	Current AA	Current MW	Future AA	Future MW
Chemical and recarbonation sludge flow	gpm	575	19.3	38.7	29.5	59.0

Notes:
(1) Duty capacity based on assuming the largest pump (120 gpm) is out of service.

5.11.5 Organic Sludge (WAS) Thickening in Gravity Thickeners

5.11.5.1 Description

The WRP currently uses one of its three gravity thickeners (Thickener #2) for WAS thickening. T-TSA has the flexibility to switch to two for WAS and one for chemical sludge, if needed. Primary sludge can also be diverted to the organic sludge (WAS) gravity thickener (via the organic sludge distribution box), if needed, but this is not normally required. There are no chemical feed systems associated with the gravity thickeners. Thickened WAS (TWAS) and scum are pumped from the thickener to either the digesters or the thickening centrifuges by two TWAS pumps. Thickener overflow flows by gravity to the oxygenation basins.

5.11.5.2 Original Design Criteria

The gravity thickeners and TWAS pumps were constructed/installed in 1975. Table 5.8 summarizes the original design criteria for the organic sludge (WAS) gravity thickener, and the TWAS pumps.

Table 5.8 WAS Gravity Thickener and TWAS Pumps Design Criteria

Parameter	Units	Value
WAS Gravity Thickener		
Year Constructed		1975
Number		1
Diameter	feet	25
Surface area, each	square feet	491
TWAS Pumps		
Year Installed		1975
Number		2
Type		Progressive cavity
Capacity, each	gpm	125
Horsepower, each	hp	10

5.11.5.3 Performance Assessment

The gravity thickeners are in relatively good condition. The building housing the units and the mechanisms were recoated about 10 years ago and appear in good condition. The equipment and operational issues identified from discussions with operators during site visits include:

- The TWAS pumps and associated drives are old and installed in a constrained area, making it difficult to access parts of the pumps, piping, and valves. The pump motors are currently direct current (DC), but staff would prefer replacement with alternating current (AC), assuming that AC drives can provide similar turndown to the existing DC drives.

Key parameters for gravity thickener loading and operation are the WAS, TWAS, and overflow solids concentration, the solids capture rate, the sludge blanket depth, the thickener pH, the overflow rate (flow divided by gravity thickener surface area), and the mass loading rate (dry solids load divided by gravity thickener surface area).

Table 5.9 summarizes the gravity thickener influent and effluent flow and loads. Figure 5.26, Figure 5.27, and Figure 5.28 show the WAS and TWAS flows, TS concentrations, and calculated TS loads. The WAS flow is measured continuously by a flow meter, the WAS TS concentration is measured daily, and the TWAS TS concentration is measured weekly. T-TSA conducted a special sampling over the last two weeks of June 2019, which included measurements of the WAS gravity thickener overflow TSS, shown in Figure 5.29.

The gravity thickener has been performing well. The gravity thickener overflow TSS concentration is lower than the values observed at other facilities, signifying good solids capture. The thickener receives WAS from the mixed liquor channels at an average concentration of 0.15 percent TS (1,500 mg/L), which is lower than the typical range of 0.5-1.5 percent TS. The gravity thickener produces TWAS at an average concentration of 2.9 percent solids, at the upper end of the typical range of 2 to 3 percent solids for WAS thickening. While this average TWAS concentration indicates good performance for gravity thickeners, a decrease in performance is observed at higher hydraulic loads. From June to September 2018 the WAS flows increased, and the TWAS TS concentration decreased, indicating poorer settleability. Lower TWAS TS concentration adds hydraulic loading on the digestion process. To reduce the hydraulic load on the gravity thickeners, improve gravity thickener performance, and reduce the hydraulic load on the anaerobic digesters downstream, we recommend T-TSA consider an operational modification to waste WAS from the secondary clarifier underflow rather than the mixed liquor channel. T-TSA staff have indicated that the wasting pumps may also need to be upsized to address existing capacity limitations.

Either mixed liquor wasting or settled sludge (RAS) wasting can be used for activated sludge SRT control. The downstream thickening solids load is the same for both methods, but the thickening hydraulic load is higher with mixed liquor wasting because of the higher settled sludge suspended solids concentration compared to the MLSS concentration. Mixed liquor wasting, also known as hydraulic SRT control, is more straightforward, as the waste mixed liquor flow rate is simply the aeration basin volume divided by the target SRT. The equivalent settled sludge (RAS) wasting flow rate can be calculated as the product of the hydraulic SRT control flow rate and the term R/(R+1), where R is the return sludge flow ratio, Q_{RAS}/Q. For example, with a return sludge flow ratio of 0.50, the settled sludge wasting flow rate is 1/3 the equivalent mixed liquor wasting flow rate for a given SRT. It should be noted that the plant can switch to RAS wasting without detrimental impacts to secondary treatment performance.

The reported TWAS TS load is 36 percent higher than the WAS TS load. This is likely due to inaccuracies in the data, which could be caused by inaccuracies in the WAS and TWAS flow meter readings (which in turn could be due to installation or other issues with the mag meters), or that TWAS TS concentration is only measured once a week. Another potential reason for this discrepancy is that there could be some settling in the mixed liquor channel. The mixed liquor/WAS TS concentration is measured from a dip sample from the top of the mixed liquor channel, which may be a lower concentration than what the WAS pump receives at the bottom of the channel. T-TSA staff conducted additional sampling to determine whether settling was occurring in the mixed liquor channel. Five samples were collected at the top of the mixed liquor channel and at the WAS pump for both side 1 and side 2. The WAS pump TS concentration was found to be 1 percent higher compared to the TS concentration at the top of the mixed liquor channel on side 1. The concentration was 0.6 percent lower on side 2, indicating little to no settling and that the mixed liquor channels are well mixed. This minor difference does not explain the 36 percent difference between the WAS and TWAS TS load, so data inaccuracies, flow meter calibration, or sampling frequency are considered more likely causes for this discrepancy.

Table 5.9 WAS Gravity Thickener Flows and Loads

Parameter	Units	WAS	TWAS	Overflow	Reference Values
Flow	kgal/d	192	12.8	179	
TS concentration(1)	%TS	0.14	2.9		0.5-1.5 typical for WAS; 2-3 typical for TWAS(2)
TSS concentration	mg/L			45.7	140 – 2,500 at other facilities(3)(4)
TS load(3)	klb/d	2.24	3.05	0.068	

Notes:
(1) WAS and TWAS TS concentrations back-calculated from flows and loads.
(2) Source: Table 21.3 from Water Environment Federation (WEF) Manual of Practice 8 – Design of Water Resource Recovery Facilities, Sixth Edition, 2018.
(3) Thickener overflow flow calculated from balance of WAS and TWAS. TS load calculated from TSS concentration and flow. The reported TWAS TS load is higher than the WAS TS load, which is likely due to errors or inaccuracies in the data.
(4) Source: Table 21.1 from WEF Manual of Practice 8 – Design of Water Resource Recovery Facilities, Sixth Edition, 2018.

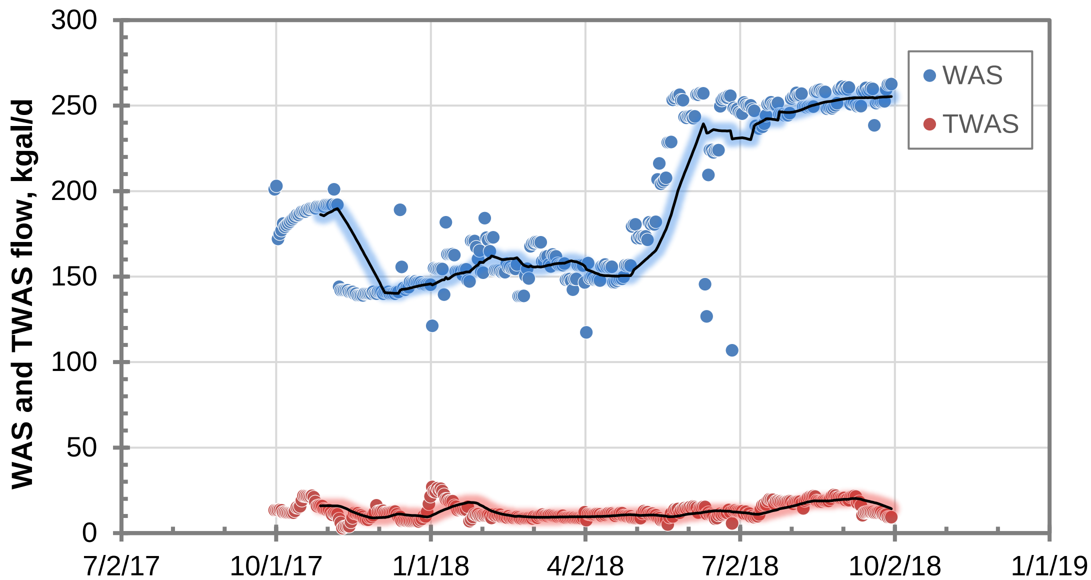

Figure 5.26 WAS and TWAS Flow

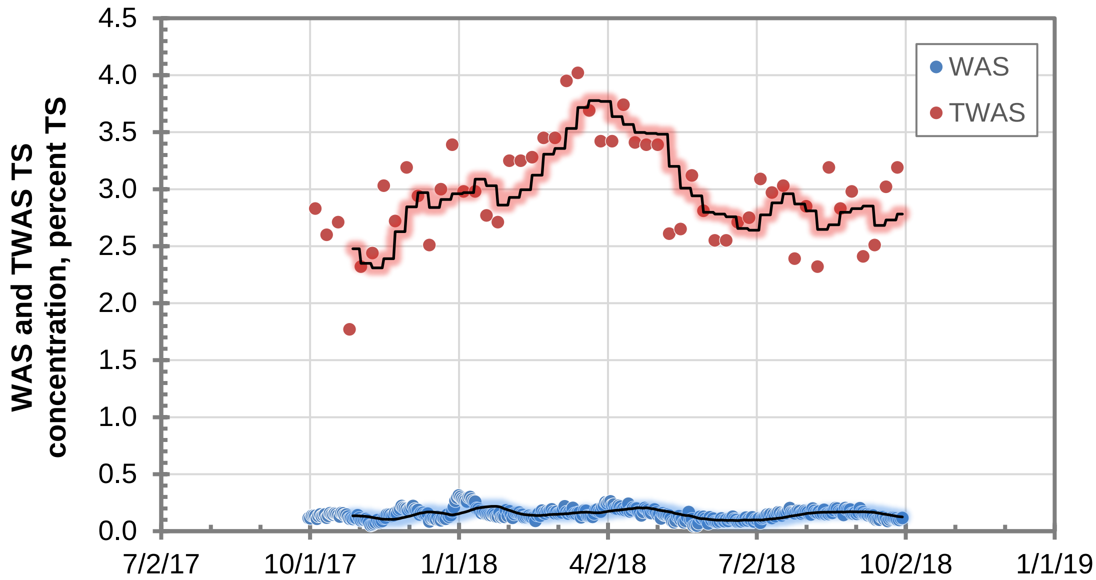

Figure 5.27 WAS and TWAS TS Concentration

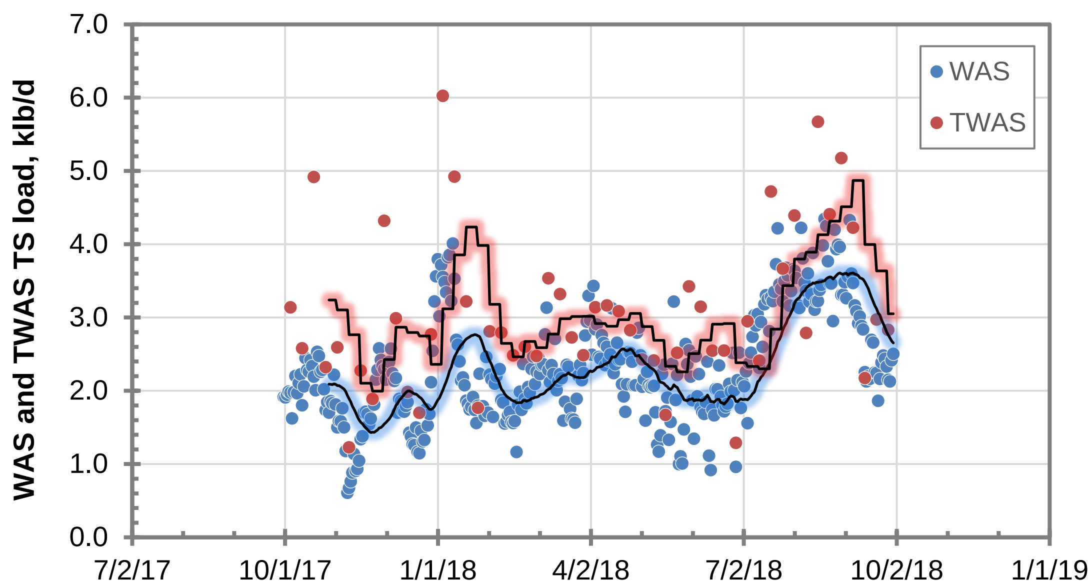

Figure 5.28 WAS and WAS TS Load

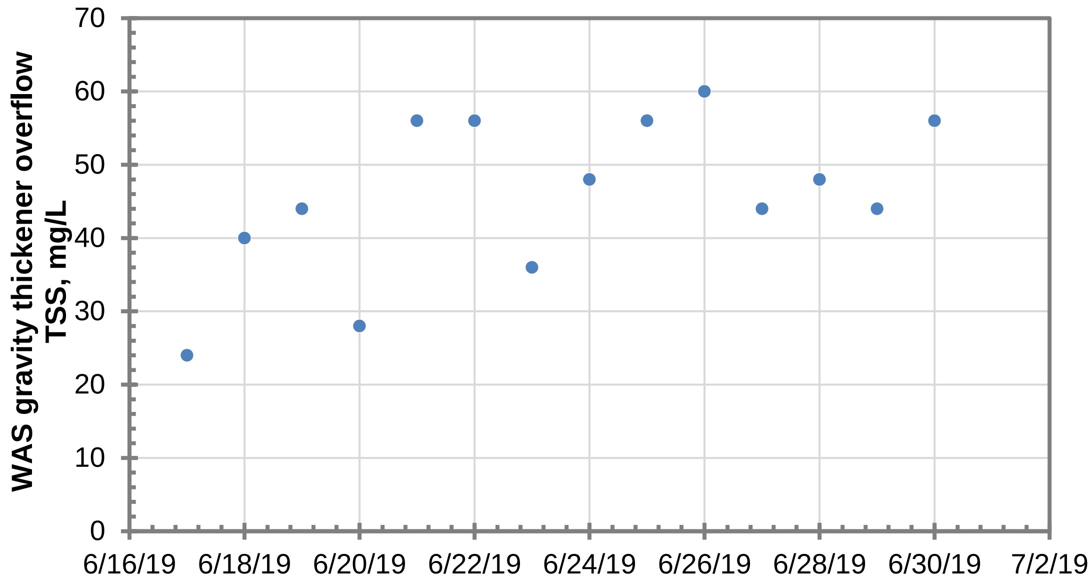

Figure 5.29 WAS Gravity Thickener Overflow TSS

Table 5.10 summarizes the WAS gravity thickener performance parameters. Figure 5.30 and Figure 5.31 show the sludge blanket depth and the TWAS pH, respectively. The blanket depth is measured daily and the pH is measured weekly. Per Figure 5.30, sludge blanket levels typically range from four to six feet and within this range, the thickener functions well. The typically neutral pH illustrated in Figure 5.31 indicates that the sludge is not fermenting, and this is likely also contributing to good thickener solids capture.

The AA overflow rate of 391 gallons per day per square foot (gpd/sq ft) is higher than the recommended range of 100 to 200 gpd/sq ft (Table 21.2 from WEF Manual of Practice 8 – Design of Water Resource Recovery Facilities, Sixth Edition, 2018). If solids have poor settleability, high overflow rates can cause excessive solids carryover. However, based on the performance data presented above, the existing process is functioning well, and solids easily settle within the gravity thickener. If solids characteristics change in the future and negatively impact settleability, additional measures may be necessary to maintain acceptable performance at these high hydraulic loading rates. Potential solutions in those circumstances are to add polymer to the WAS gravity thickener to increase the solids capture rate, to place one of the two chemical clarifiers (Clarifier 04) into service as a WAS gravity thickener, or to waste WAS from the secondary clarifier underflow, which has an average TSS concentration of 0.44 percent solids. The mass loading rate is the key parameter for design of gravity thickeners. The AA mass loading rate of 4.55 pounds per day per square foot (lb/d/sq ft) is within the recommended range of 2.5 to 7.4 lb/d/sq ft (Table 21.3 from WEF Manual of Practice 8 – Design of Water Resource Recovery Facilities, Sixth Edition, 2018).

The capture rate can be calculated based on a mass balance between the WAS and TWAS or between the WAS and thickener overflow TS loads. Because the reported TWAS TS load is higher than the reported WAS load, as mentioned previously, the calculated capture rate is over 100 percent. When calculated based on a mass balance between the WAS and the gravity thickener overflow TS loads, the capture rate is 96.9 percent. This value is more realistic than the value calculated from reported WAS and TWAS characteristics.

Table 5.10 WAS Gravity Thickener Performance Parameters – Annual Average Values

Parameter	Units	Value	Reference Values
Overflow rate(1)	gpd/sq ft	391	Range of 100 - 200(2)
Mass loading rate(1)	lb/d/sq ft	4.55	Range of 2.5 - 7.4(3)
Sludge blanket depth	ft	4.8	
TWAS pH	standard units	6.5	
Solids capture rate, calculated from reported WAS and TWAS characteristics(4)	percent	>100	
Solids capture rate, calculated from reported WAS and overflow characteristics	percent	96.9	

Notes:
(1) Calculated based on thickener surface area of 491 sq ft (25 ft diameter).
(2) Source: Table 21.2 from WEF Manual of Practice 8 – Design of Water Resource Recovery Facilities, Sixth Edition, 2018.
(3) Source: Table 21.3 from WEF Manual of Practice 8 – Design of Water Resource Recovery Facilities, Sixth Edition, 2018.
(4) Reported TWAS TS load is higher than WAS TS load resulting in capture rate over 100 percent, which is not physically possible. Value calculated from overflow rate is more realistic.

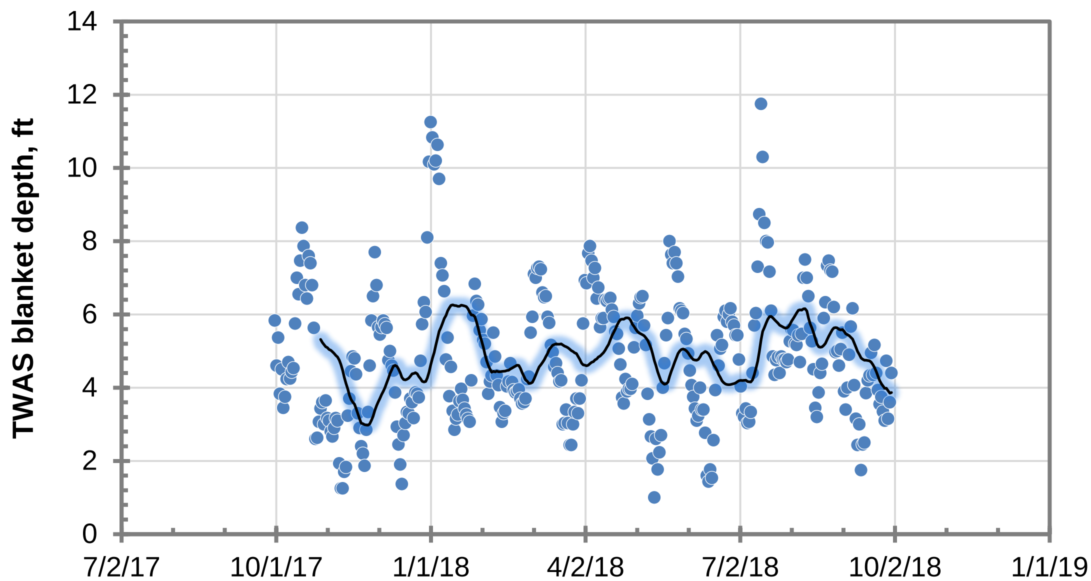

Figure 5.30 Organic Sludge Gravity Thickener Blanket Depth

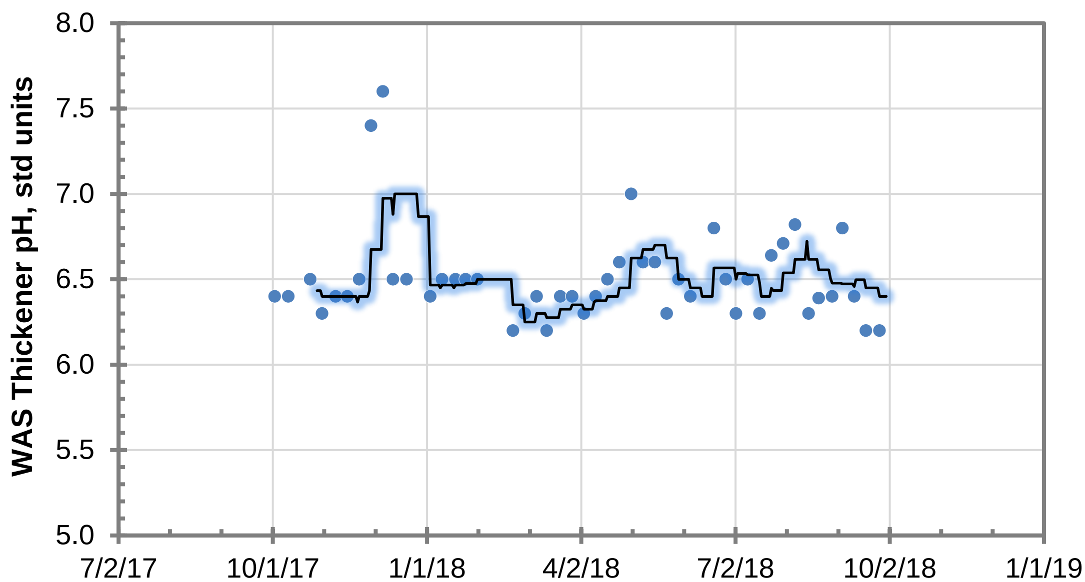

Figure 5.31 Organic Sludge Gravity Thickener pH

5.11.5.4 Capacity Assessment

The two key parameters for a gravity thickener capacity assessment are the overflow rate and the mass loading rate. These rates are calculated as the WAS flow and TS load divided by the gravity thickener surface area of 491 sq ft. A review of design criteria flows and overflow and mass loading rates from the 2003, 1981, and 1975 design drawings and design reports, shows that the design overflow rate ranged from 290 to 690 gpd/sq ft and the design mass loading rate ranged from 9.6 to 20 lb/d/sq ft. These values are higher than the recommended maximums from WEF MOP 8, as shown on Table 5.11. The MOP 8 recommended maximums are used as a basis for this capacity assessment.

Table 5.11 WAS Gravity Thickener Design Criteria – Overflow Rate and Mass Loading Rate

Parameter	Units	2003 Drawings	1981 Drawings	1975 Drawings (Final)	1975 Drawings (Initial)	WEF MOP 8
Plant influent design flow, max week	mgd(2)	9.6	7.4	9.66	4.83	
Number of thickeners assumed		2	1	2	1	
Overflow Rate, max week	gpd/sq ft	287	690	290	290	Max. of 100 – 200(1)
Mass loading rate, max week	lb/d/sq ft	9.6	20	20	20	Max. of 2.5 - 7.4(3)

Notes:
(1) Source: Table 21.2 from WEF Manual of Practice 8 – Design of Water Resource Recovery Facilities, Sixth Edition, 2018.
(2) mgd = million gallons per day.
(3) Source: Table 21.3 from WEF Manual of Practice 8 – Design of Water Resource Recovery Facilities, Sixth Edition, 2018.

Table 5.12 compares the calculated overflow rate and mass loading rate to the recommended maximums from MOP 8. Values in red bold font exceed the maximums, indicating additional capacity may be needed.

The overflow rate for all the evaluated conditions is higher than the recommended maximum, indicating that additional capacity is needed. This high overflow rate may cause excessive solids carryover. Potential solutions are to add polymer to the WAS gravity thickener to increase the solids capture rate, or to waste WAS from the secondary clarifier underflow, which has an average TSS concentration of 0.44 percent solids. The mass loading rate for the current AA, MW loadings, and the future AA loading are within the recommended maximum. The future MW TS load exceeds the recommended maximum mass loading rate.

The TWAS flow for all the conditions evaluated is less than the capacity of one pump, indicating the pumps have adequate capacity and no expansion is needed.

Table 5.12 WAS Gravity Thickener and TWAS Pumps Capacity Assessment

Parameter	Units	Capacity	Current AA	Current MW	Future AA	Future MW
WAS Gravity Thickener						
WAS flow	kgal/d		192	260	293	397
WAS TS load	klb/d		2.24	3.03	3.41	4.62
Overflow rate	gpd/sq ft	200	391	530	597	809
Mass loading rate	lb/d/sq ft	7.4	4.55	6.17	6.95	9.42
TWAS Pumps						
TWAS flow	gpm	125	8.9	17.6	13.6	26.9

Notes:
(1) Values in red indicate capacity exceedance

5.11.6 Organic Sludge (WAS or TWAS) Thickening in Centrifuges

5.11.6.1 Description

In the event the organic sludge gravity thickener is out of service, WAS can also be thickened using one of two thickening centrifuges: an older Sharples unit from 1981 and a newer Centrisys unit from 2003. Alternatively, the centrifuges can also be used to further thicken the TWAS from the gravity thickener. After seven years of not operating the thickening centrifuges, T-TSA started operating the Centrisys centrifuge in January 2020 to further thicken TWAS from the gravity thickener and reduce the hydraulic loading to anaerobic digestion. T-TSA plans to continue operating the centrifuge during peak flow periods every year. The original dry polymer feed system is inoperable. T-TSA staff installed an emulsion polymer feed system, which is currently in use, but needs to be upgraded. The emulsion polymer is injected to the WAS or TWAS before feeding the thickening centrifuge. Thickened sludge is pumped from the thickening centrifuge to the digesters by the three centrifuge cake pumps, two dedicated to the Sharples centrifuge and one serving the Centrisys centrifuge.

5.11.6.2 Original Design Criteria

The first backup thickening centrifuge and associated polymer system were installed in 1981, and the second backup centrifuge was installed in 2003. Table 5.13 summarizes the original design criteria for the centrifuges and their associated centrifuge cake pumps.

Table 5.13 Backup Thickening Centrifuges Design Criteria

Parameter	Units	Sharples	Centrisys
Thickening Centrifuges			
Year Installed		1981	2003
Number		1	1
Flow range, each	gpm	20 - 120	
Minimum concentration of thickened solids	%TS	5.5%	
Model[1]			CS18-4
Horsepower, each	hp	40	40
Maximum flow[1,2]	gpm	100	100
Maximum solids loading[1,2]	lb/h[3]	1,200	1,485
Thickening Centrifuge Cake Pumps			
Year Installed		1981	2006
Number		2	1
Type		Progressive cavity	Progressive cavity
Capacity, each	gpm	37	20
Horsepower, each	hp	1.5	7.5

Notes:
(1) Source: Conversation with Centrisys, January 8, 2020.
(2) Source: Conversation with Sharples, February 7, 2020.
(3) lb/h = pounds per hour.

5.11.6.3 Performance Assessment

According to discussions with operating staff, the cake pump and cake tank, as well as the polymer feed system would need to be either upgraded and improved, or replaced by a new system to run either centrifuge efficiently. While the Centrisys centrifuge can be and has been operated, the existing system is inadequate.

T-TSA operated the Centrisys thickening centrifuge during two months in 2017 and three months in 2020. Table 5.14 summarizes the key thickening centrifuge operation and performance data from those two periods. Figure 5.32 and Figure 5.33 show the feed and TWAS cake TS concentration, and the centrate TS concentrations, respectively.

Thickening centrifuges are typically hydraulic loading limited, so the key loading parameter is the flow or hydraulic loading rate. T-TSA currently operates the centrifuge when needed to reduce the hydraulic load to the digesters. The centrifuge is needed during periods of higher digester loading which are typically in late January through March and July through August. When the centrifuge is run, it operates on a continuous 24 hours per day (h/d), 7 days per week (d/wk) schedule and may be run for up to a month straight. The centrifuge is run at a low feed rate flow to maintain a steady loading to the digesters. At a 24 hr/d operating schedule, the feed flow is at about 10 percent of the maximum of 100 gpm. Note that while this performance assessment reflects how the centrifuge performs at a low loading rate, it does not necessarily represent how the centrifuge would perform at a higher loading rate closer to its rated capacity.

The key performance parameters for the thickening centrifuge are the cake and centrate solids concentration, capture rate, and polymer usage. The cake TS concentration for both periods is well above the minimum design criteria of 5.5 percent TS and above the typical range of 5 to 6 percent TS, indicating excellent centrifuge performance. This is likely because of the high concentration in the feed since the WAS is pre-thickened in gravity thickeners and because of the low hydraulic loading rate. The centrate TS concentration in 2007 was lower than the maximum recommended value of 500 mg/L; however, in 2020 it was about twice as much. The 2020 average is affected by a few very high data points in July 2020, which are possibly outliers. The change in centrate TS concentration could also likely be explained by a change in polymer dose; however, polymer data was not provided.

Table 5.14 Thickening Centrifuge Loading and Performance Parameters

Parameter	Units	2007 Average	2020 Average	Reference Values
Feed flow or hydraulic loading rate(1)	gpm	7.5	9.9	100
Feed TS concentration	%TS	2.7	3.3	0.4-1.5(2)
TWAS cake TS concentration	%TS	6.5	7.9	5-6(2)
Centrate TS concentration	mg/L	160	967	<500(2)
Capture rate(3)	%	99	97	>90 with polymer(4)

Notes:
(1) Based on 24 hr/d operating schedule.
(2) Source: Table 21.11 from WEF Manual of Practice 8 – Design of Water Resource Recovery Facilities, Sixth Edition, 2018.
(3) Capture rate calculated based on centrate TS load.
(4) Source: page 1674 from WEF Manual of Practice 8 – Design of Water Resource Recovery Facilities, Sixth Edition, 2018.

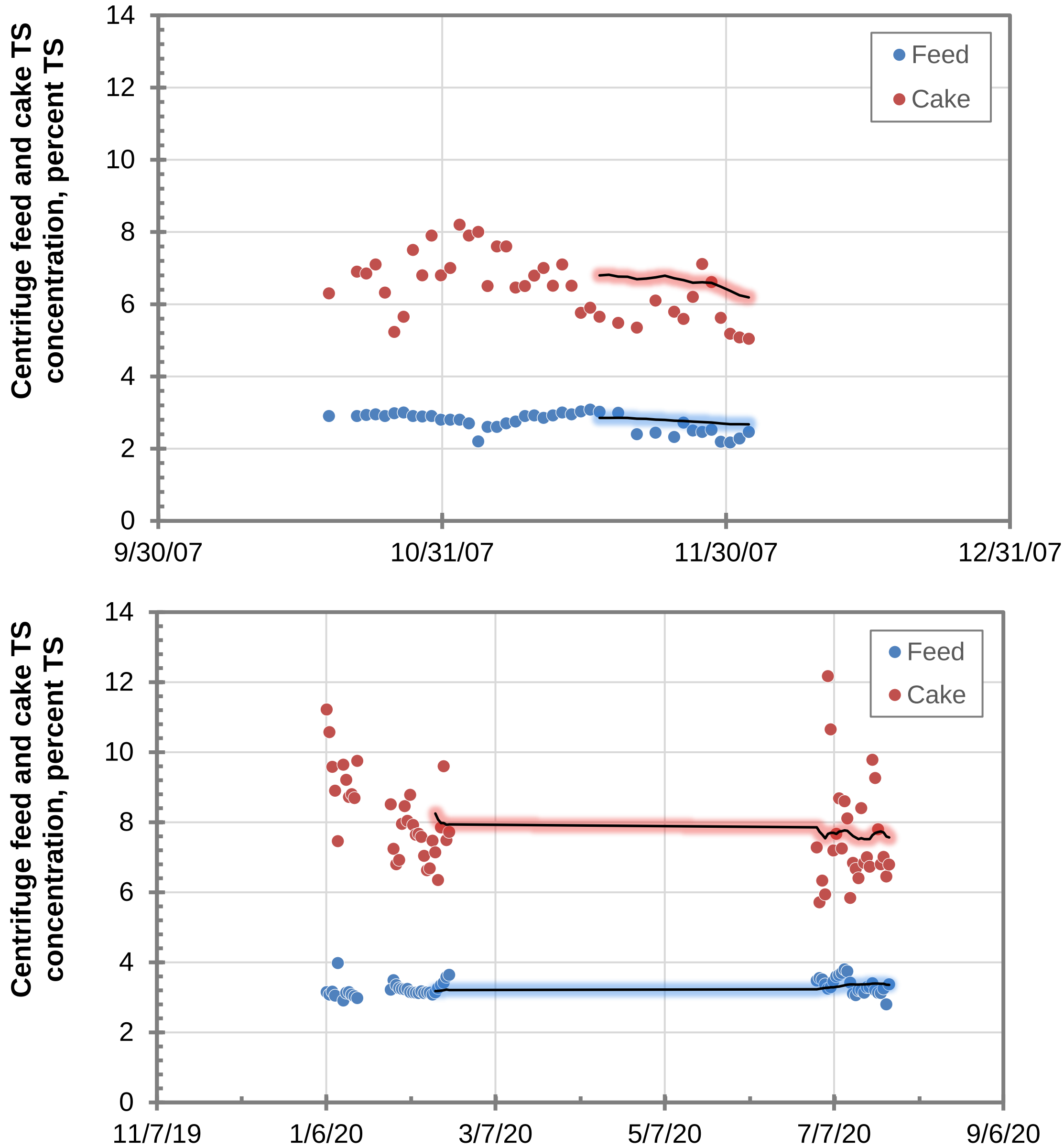

Figure 5.32 Feed and TWAS Cake TS Concentration

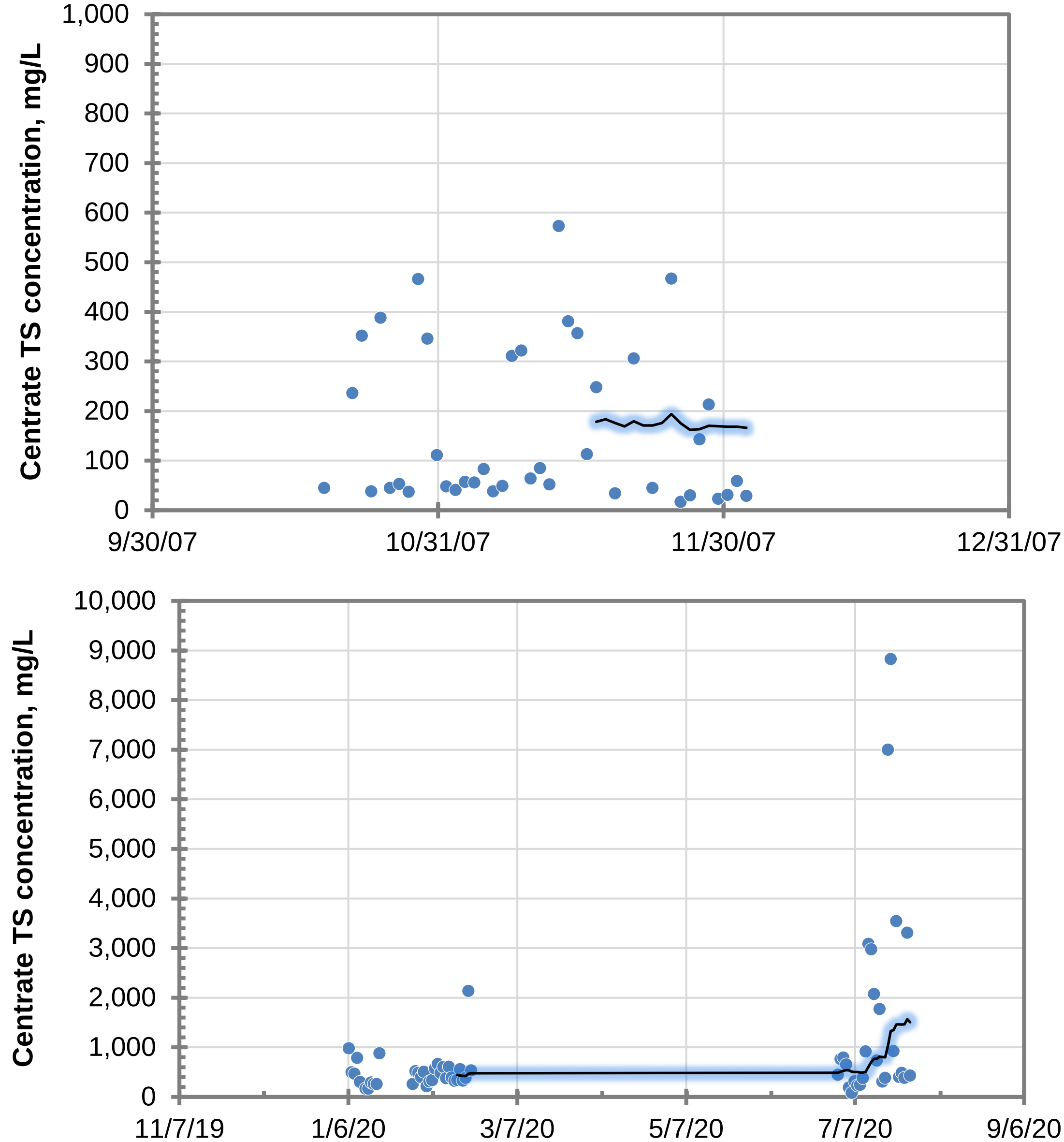

Figure 5.33 Centrate TS Concentration (Note Difference in y-Axis Between 2007 and 2020 Data)

5.11.6.4 Capacity Assessment

Table 5.15 compares the current and projected WAS and TWAS flows and loads at various operating schedules to the original design criteria for the backup centrifuges and associated pumps. Values in red bold font exceed the design criteria, indicating additional capacity may be needed. Note that T-TSA currently operates the centrifuge continuously, on a 24 hours per day (h/d), 7 days per week (d/wk) schedule at a low feed rate flow to maintain a steady loading to the digesters.

The two key parameters for centrifuge capacity assessment are the hydraulic loading and solids loading rates. Three scenarios were evaluated for the centrifuge capacity assessment to capture all possible operating modes: thickening WAS at 0.14 percent TS wasted from the mixed liquor channel, thickening WAS at 0.44 percent TS wasted from the secondary clarifier underflow, and further thickening TWAS after it has been thickened in the gravity thickeners at 2.85 percent TS (current operation).

One centrifuge does not have sufficient hydraulic capacity to thicken WAS wasted from the mixed liquor channel, even assuming 24 hours per day (h/d), 7 days per week (d/wk) operations. One centrifuge has enough capacity to thicken WAS wasted from the secondary clarifier underflow, but it would need to operate more than 8 h/d, 5 d/wk. Thus, if the gravity thickeners needed to be out of service for repair or maintenance, the existing Centrisys centrifuge could be used to provide backup WAS thickening, but it would need to be operated on an extended schedule and WAS would need to be wasted from the secondary clarifier underflow.

If used to further thicken TWAS coming off of the gravity thickeners at 2.85 percent TS, one centrifuge has enough hydraulic and solids loading capacity on an 24 h/d, 7 d/wk operating schedule under all conditions evaluated. One centrifuge would also have enough capacity on an 8 h/d, 5 d/wk operating schedule, under all conditions evaluated, except for MW. At the future MW condition, the operating schedule would need to be extended by a few hours.

The centrifuge cake pumps have sufficient hydraulic capacity on a 24 h/d, 7 d/wk operating schedule under all conditions evaluated. If an 8 hr/d, 5 d/wk operating schedule is used, the pump capacity would be exceeded under current MW and future AA and MW conditions. The centrifuge cake pump flow was calculated assuming a centrifuge cake thickness of 5.5 percent TS, and the centrifuge cake pump capacity assumes one duty pump at 20 gpm.

Table 5.15 Backup Thickening Centrifuges and Associated Pumps Capacity Assessment

Parameter	Units	Capacity	Current AA	Current MW	Future AA	Future MW
Centrisys Centrifuge – Thickening WAS wasted from mixed liquor @0.14 %TS						
WAS flow @ 24 h/d, 7 d/wk	gpm	100	133	181	204	276
WAS flow @ 8 h/d, 5 d/wk	gpm	100	560	759	855	1,159
WAS TS load @ 24 h/d, 7 d/wk	lb/h	1,485	93	126	142	193
WAS TS load @ 8 h/d, 5 d/wk	lb/h	1,485	391	530	597	809
Centrisys Centrifuge – Thickening WAS wasted from secondary clarifiers @0.44 %TS						
WAS flow @ 24 h/d, 7 d/wk	gpm	100	42	57	65	88
WAS flow @ 8 h/d, 5 d/wk	gpm	100	178	241	272	369
Centrisys Centrifuge – Further Thickening TWAS from Gravity Thickener						
TWAS flow @ 24 h/d, 7 d/wk	gpm	100	9	18	14	27

Parameter	Units	Capacity	Current AA	Current MW	Future AA	Future MW
TWAS flow @ 8 h/d, 5 d/wk	gpm	100	37	74	57	113
TWAS TS load @ 24 h/d, 7 d/wk	lb/h	1,485	127	251	194	383
TWAS TS load @ 8 h/d, 5 d/wk	lb/h	1,485	533	1,054	814	1,609
Thickening Centrifuge Cake Pumps						
TWAS flow @ 24 h/d, 7 d/wk operation	gpm	20	5	9	7	14
TWAS flow @ 8 h/d, 5 d/wk operation	gpm	20	19	38	30	58

Notes:
(1) Values in red indicate capacity exceedances.

5.11.7 Chemical Sludge Thickening in Gravity Thickeners

5.11.7.1 Description

The WRP currently uses two of its three gravity thickeners (Thickener Nos. 4 and 6) for chemical sludge thickening. The WRP has the flexibility to switch to two for WAS and one for chemical sludge, if needed. Chemical sludge is produced at two points in the treatment process: chemical clarifiers and recarbonation clarifiers. These sludges are pumped to the chemical sludge distribution box and pumped to the two thickeners in series. Thickener No. 6 is currently used for thickening and thickened sludge is pumped to Thickener No. 4 where chemicals are added to condition the pH for optimal filter press dewaterability (if the pH is too low, the sludge does not dewater well). Thickened and conditioned sludge is then drawn from Thickener No. 6 by the filter press feed pumps. Thickener supernatant is routed to the rapid mix basins.

5.11.7.2 Original Design Criteria

The gravity thickeners were constructed in 1975. Table 5.16 summarizes the original design criteria for the two chemical sludge gravity thickeners.

Table 5.16 Chemical Sludge Gravity Thickeners Design Criteria

Parameter	Units	Value
Chemical Sludge Gravity Thickeners		
Year Constructed		1975
Number		2
Diameter	ft	25
Surface area, each	sq ft	491

5.11.7.3 Performance Assessment

The gravity thickeners are in relatively good condition. The building housing the units and the mechanisms were recoated about 10 years ago and appear in good condition. No equipment and operational issues were identified from discussions with operators during site visits.

Similar to the organic sludge gravity thickener, key loading and operation parameters are the feed and thickened chemical sludge solids concentration, the solids capture rate, the sludge blanket depth, the thickener pH, the overflow rate (flow divided by gravity thickener surface area), and the mass loading rate (dry solids load divided by gravity thickener surface area). There is no data available for the flow or concentration of chemical sludge fed to the gravity thickeners. The only data available pertaining to the chemical sludge thickener is the sludge blanket depth, the feed pH, and thickened chemical sludge concentration. In addition, T-TSA conducted a special sampling over the last two weeks of June 2019, which included measurements of the chemical sludge gravity thickener overflow TSS.

Table 5.17 summarizes the chemical sludge gravity thickener performance parameters. The thickener produces thickened chemical sludge at an average concentration of 12 percent solids. Figure 5.34 shows the sludge blanket depth, measured daily. Figure 5.35 shows the feed chemical sludge pH. Figure 5.36 shows the thickened chemical sludge solids concentration, measured weekly. Figure 5.37 shows the thickener overflow TSS, measured over a two week period.

Table 5.17 Chemical Sludge Gravity Thickeners Performance Parameters – Annual Average Values

Parameter	Units	Value
Sludge blanket depth, Thickener No. 4	ft	2.5
Sludge blanket depth, Thickener No. 6	ft	5.8
Feed pH	standard units	11.3
Thickened chemical sludge TS concentration	%TS	12.1
Thickener overflow TSS	mg/L	48.0

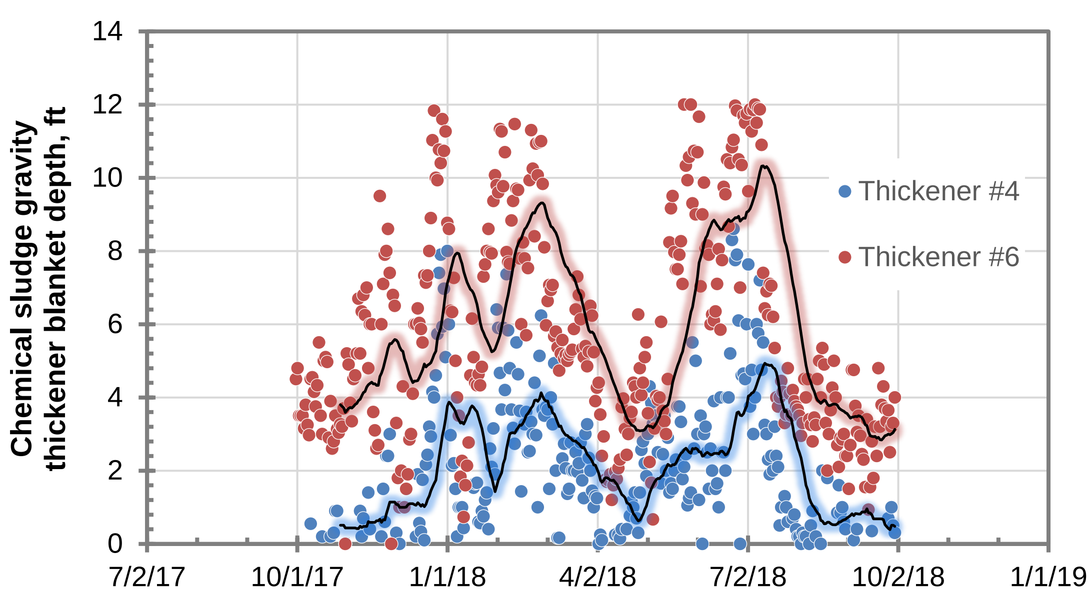

Figure 5.34 Chemical Sludge Gravity Thickeners Sludge Blanket Depth

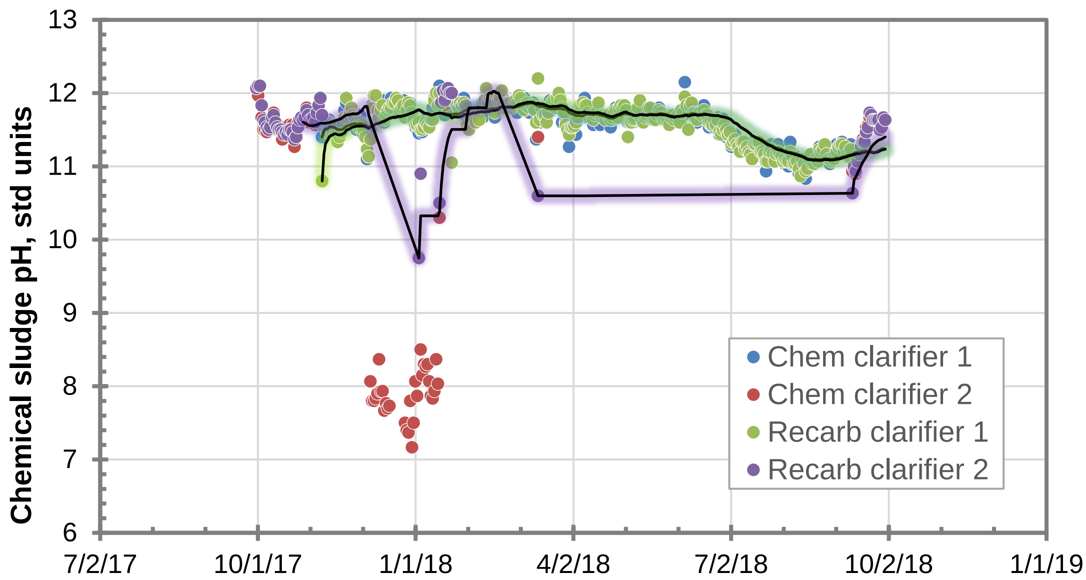

Figure 5.35 Feed Chemical Sludge pH

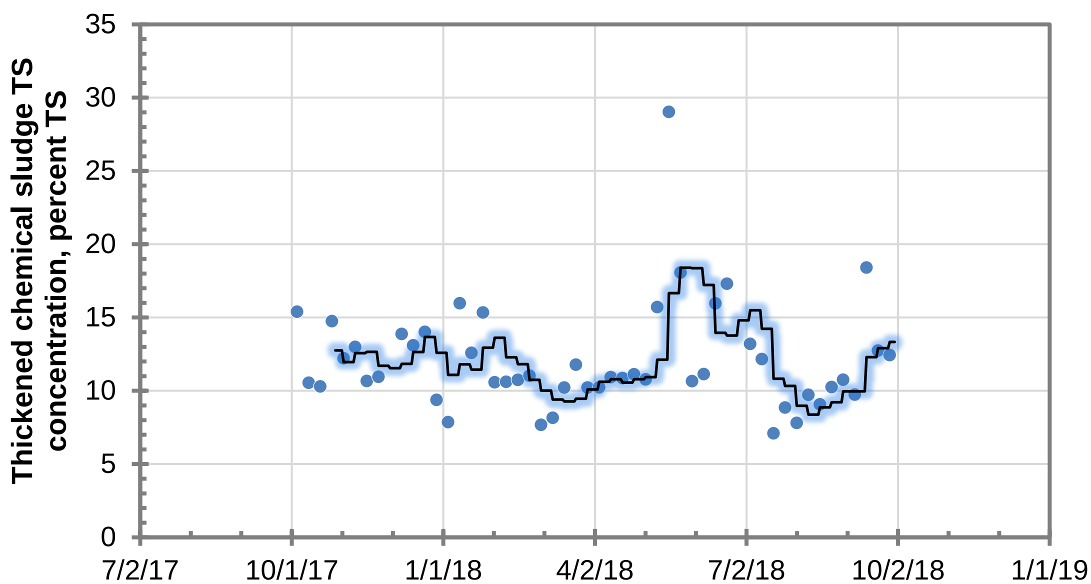

Figure 5.36 Thickened Chemical Sludge Solids Concentration

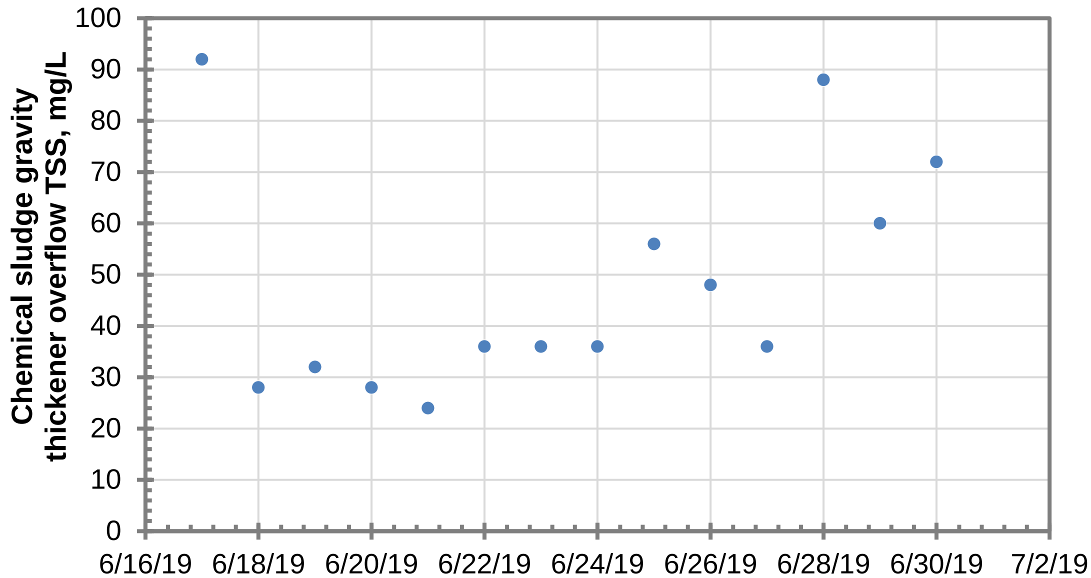

Figure 5.37 Thickened Chemical Sludge Solids Concentration

5.11.7.4 Capacity Assessment

The two key parameters for a gravity thickener capacity assessment are the overflow rate and the mass loading rate. The mass loading rate is calculated as the chemical sludge flow and TS load divided by the gravity thickener surface area. A review of design criteria flows and overflow and mass loading rates from the 2003, 1981, and 1975 design drawings and design reports, shows that the design overflow rate ranged from 298 to 570 gpd/sq ft and the design mass loading rate ranged from 6 to 38 lb/d/sq ft. These values are both lower than the recommended maximums from WEF MOP 8, as shown in Table 5.18. The MOP 8 recommended maximums are used as a basis for this capacity assessment.

Table 5.18 Chemical Sludge Gravity Thickeners Design Criteria – Overflow Rate and Mass Loading Rate

Parameter	Units	2003 Drawings	1975 Drawings (Final)	1975 Drawings (Initial)	WEF MOP 8
Plant influent design flow, max week	mgd	9.6	9.66	4.83	
Number of thickeners assumed		2	2	3	
Overflow Rate, max week	gpd/sq ft	570	298	398	Max. of 982(1)
Mass loading rate, max week	lb/d/sq ft	5.9	29	38	Max. of 25 – 61(2)

Notes:
(1) Source: Table 21.2 from WEF Manual of Practice 8 – Design of Water Resource Recovery Facilities, Sixth Edition, 2018.
(2) Source: Table 21.3 from WEF Manual of Practice 8 – Design of Water Resource Recovery Facilities, Sixth Edition, 2018.

Because flow and concentration data was not available for the chemical sludge fed to the gravity thickeners, the chemical sludge TS load to the gravity thickeners was back-calculated by assuming a 90 percent capture in the gravity thickeners, and the flow was calculated by assuming a chemical sludge concentration of 3 percent TS. Table 5.19 compares the calculated overflow rate and mass loading rates for the current and future flow and loading conditions, assuming only one gravity thickener in service, to the recommended maximums from MOP 8. Even with only one gravity thickener in service, the system has plenty of capacity for all current and future evaluated conditions.

Table 5.19 Chemical Sludge Gravity Thickeners Capacity Assessment

Parameter	Units	Capacity	Current AA	Current MW	Future AA	Future MW
Chemical Sludge Gravity Thickeners						
Chemical sludge flow(2)	kgal/d		28	48	43	74
Chemical sludge TS load(1)	klb/d		7.0	13.9	10.6	21.3
Overflow rate, one thickener	gpd/sq ft	982	57	98	87	150
Mass loading rate, one thickener	lb/d/sq ft	61	14	28	22	43

Notes:
(1) Chemical sludge TS load back-calculated from thickened chemical sludge TS flow, assuming a 90 percent capture rate in the gravity thickeners.
(2) Chemical sludge flow was back-calculated assuming 3 %TS.

5.11.8 Organic Sludge Digestion

5.11.8.1 Description

Primary sludge, primary scum, and TWAS are digested anaerobically. Anaerobic digestion stabilizes the material and reduces the sludge mass by converting a portion of the organic material to digester gas. In 2003, the anaerobic digestion system was upgraded from mesophilic digestion to temperature phased anaerobic digestion (TPAD). The original drivers for this upgrade were that operators did full-scale testing that showed improved performance with thermophilic digestion, and that T-TSA wanted to have the option to add batch tanks to produce Class A biosolids.

Over the last five years, the anaerobic digestion system has been operated in two operating modes, referred here as "parallel thermo/meso mode" and "TPAD mode". From January 23, 2019, to March 10, 2019, plant staff performed a gradual transition to the current "TPAD mode".

- "Parallel thermo/meso mode": During the October 2017 to September 2018 evaluation period, Digesters 33, 29, and 30 were operated in "parallel thermo/meso mode". In this mode, flow is split evenly between the three digesters, and Digesters 33 and 29 are operated at thermophilic temperatures, while Digester 30 is operated at mesophilic temperatures. When operating in this mode, the holding digester heat exchanger was used to supplement Digester 29 heating to achieve thermophilic temperature, since Digester 29 was not originally designed to operate in thermophilic temperature. Flow from the three digesters then goes to holding Digester 31; flow from Digesters 29 and 30 flows by gravity, while flow from Digester 33 is pumped.

- "TPAD mode": In the current "TPAD mode", sludge is fed to thermophilic Digester 33 as the first phase, and then pumped and split between mesophilic Digesters 29 and 30 as the second phase. Sludge from the mesophilic digesters then flows by gravity to holding Digester 31.

The "parallel thermo/meso" and TPAD operating modes can be observed in Figure 5.38, which shows the feed ratio to each digester. During the first period, all three digesters receive 33 percent of the flow, so the lines overlap. During the TPAD period, Digester 33 receives 100 percent of the flow, and Digester 29 and 30 receive 0 percent.

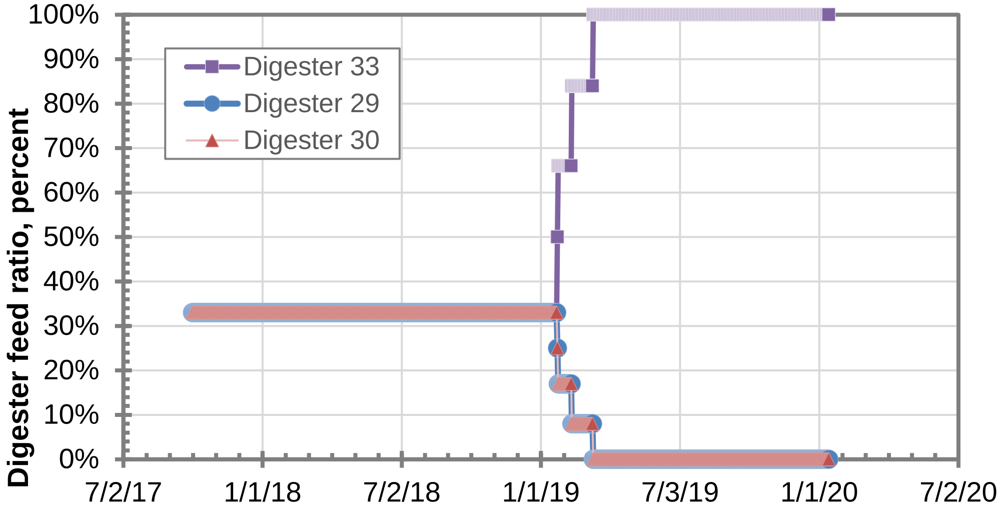

Figure 5.38 Digester Feed Ratio Showing Two Distinct Operating Modes and Transition Period

Based on conversations with WRP staff, the digestion system had been operated on "parallel thermo/meso mode" rather than "TPAD mode" to try to address issues with foaming due to Nocardia growth.

In the current TPAD mode, some of the first and second phase digesters can be shifted to operate at either thermophilic or mesophilic temperatures, although only one of the digesters (Digester 33) was designed to operate at thermophilic temperatures with the appropriate insulation and heating system. When operated in TPAD mode, the WRP may produce Class A biosolids by obtaining site specific approval or by adding a batch phase to the process.

All four digesters can be mixed and heated. The hydraulic pump-based mixing system operates sufficiently, with pumps having been recently rebuilt and nozzles replaced. The plant has not experienced significant struvite issues within the mixing system, and the associated valves are regularly exercised. Each digester has its own associated heating and recirculation system, including a heat exchanger, recirculation sludge pump, and other ancillary equipment. A hot water boiler is dedicated to Digester 33, and three additional steam boilers can provide backup heating to Digester 33 and primary heating for the other digesters as well as some buildings. The Hurst hot water boiler can be fired from either digester gas, natural gas or fuel oil. It may also be run using a blend of digester gas and natural gas. Even though the burner was originally designed to be able to run on 100 percent digester gas, it has had issues maintaining the flame when running on fuel mixtures containing over 60 percent digester gas. The steam boilers use either fuel oil or digester gas.

The digested sludge is pumped from the holding digester to the sludge dewatering facilities. All digesters other than Digester 31 have fixed concrete covers. Digester 31 has a floating gas holder cover which was recoated in 2005-2006 and again in 2020. The floating cover provides limited low pressure digester gas storage. Digester gas is piped from all digesters to the holding Digester 31.

Digester gas is cleaned and used to fire boilers, and excess gas is flared. The digester gas cleaning system consists of an iron sponge for hydrogen sulfide (H_2S) removal, and some limited moisture removal, but no siloxane removal. Ferric chloride ($FeCl_3$) can also be added upstream of the digestion process or to the first phase thermophilic digester to assist with H_2S removal. The flare and digester gas fueled boiler operate based on the floating cover level.

5.11.8.2 Original Design Criteria

The anaerobic digesters and original equipment for digester heating and digester gas handling were constructed/installed in 1975. Digesters 29 and 30 were designed as primary digesters, with gas mixing, heating, and fixed covers. Digester 31 was originally designed as a secondary digester, un-heated and not mixed, and with a floating gas-holder cover. Digester 31 has since been equipped with mixing and heating equipment. The sizing criteria used for sizing the digesters was a volatile solids loading rate (VSLR) of 0.20 lb/cfd in the primary digester, requiring a volume of 37,000 cubic feet (cu ft). The second primary digester was considered a standby primary.

In 2003, an additional digester was constructed, and the system was retrofitted to enable TPAD mode operations. Digester 33 was designed as a thermophilic digester with pumped mixing, heating with a dedicated boiler and heat exchanger designed for thermophilic temperatures, and with a fixed cover. All of the digesters have been retrofitted with hydraulic mixing systems; Digester 29 in 2001, Digester 30 in 2002, Digester 33 in 2005, and Digester 31 in 2006.

Table 5.20 summarizes the original design criteria for the anaerobic digesters and associated equipment.

Table 5.20 Anaerobic Digestion and Associated Equipment Design Criteria

Parameter	Units	Value
Anaerobic Digestion		
Year Constructed		1975, 2003
Number		4
Diameter	ft	45
Side water depth	ft	23.3
Volume, each	gal	277,000
Volume, each	cu ft	37,000
Mixing		hydraulic pump-based mixing
Heating		All digesters equipped with their own heat exchanger and recirculation pump. 1 newer boiler supplies Digester 33. 3 older boilers supply the other digesters. The 3 older boilers may also supply Digester 33 via the TIGERFLOW heat exchanger system.

Parameter	Units	Value
Covers		Holding digester 31 has a floating gas holding cover. Other digesters have fixed concrete covers.
Heating Equipment: Boilers, Heat Exchangers, and Recirculation Pumps		
Year Installed		1975
Number of steam boilers		3
Fuel used		Digester gas, fuel oil
Capacity, each	MMBtu/hr(1)	1,600
Year Installed		2003
Number of hot water boilers		1
Fuel used		Digester gas, natural gas, fuel oil
Capacity, each	MMBtu/hr(1)	4,000
Number of heat exchangers		4
Capacity, each	Btu/hr(2)	3 @ 740,000 serving Digesters 29, 30 and 31 and 1 @ 2,500,000 serving Digester 33
Delta T	F	10
Number of recirculation pumps		4
Type		Recessed impeller
Capacity, each	gpm	150
Horsepower, each	hp	5
Digester Feed Transfer Pumps		
Number		3 (2 duty, 1 standby)
Type		Progressive cavity
Capacity, each	gpm	20
Horsepower, each	hp	3

Notes:
(1) MMBtu = million British thermal units.
(2) Btu – British thermal units.

5.11.8.3 Performance Assessment

WRP staff noted several issues with the equipment and operations of the anaerobic digestion system. These include:

- T-TSA has experienced foaming issues in the digesters when the SRT in the secondary treatment system has been too high resulting in Nocardia growth. This master plan does not recommend going back to the long SRT mode of operation for a HPOAS system for two reasons: to prevent foaming issues and because operating at a lower SRT provides additional secondary treatment capacity.
- The control building is a classified space per the current National Fire Protection Association (NFPA) 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities. Compliance with this Standard for any boiler upgrades may necessitate a new boiler building. Since the existing boilers cannot be replaced in kind, a future project will likely require relocating the boilers and associated equipment to a new building. Some items may remain in the current building. We recommend performing a plant-wide NFPA 820 evaluation to identify deficient areas and required capital improvements.

- Limited space in control building for equipment maintenance and replacement.
- Issues with controls for the heating system and boilers. The boiler system has old controls that make modulation difficult.
- Two of the older steam boilers are in poor condition. However, staff believe that replacing the boilers cannot be completed in the existing building due to concerns about classification and a new building may be required. For this reason, boiler replacement is currently being investigated in a separate study (the Digestion Improvements Study).
- The newer Hurst hot water boiler that heats Digester 33 cannot run on 100 percent digester gas. Even though the burner was originally designed to be able to run on 100 percent digester gas, it has had issues maintaining the flame when running on fuel mixtures containing over 60 percent digester gas.
- The low pressure firetube steam boilers use either digester gas or Fuel Oil No. 2 and cannot use natural gas. There are plant wide issues with condensate return in the steam system. Steam is currently used for building heat in addition to digestion. Staff are open to the idea of using hot water for building heat rather than steam.
- The hot water system needs better conditioning for quality and to remove contaminants and scaling potential.
- The heat exchangers are old, and exhibit corrosion damage, including pitting. Only one heat exchanger (Digester 33) is sufficiently sized for the heat transfer necessary to maintain thermophilic temperatures. The remaining heat exchangers are not properly sized for thermophilic digestion or TPAD. Plant staff piped two heat exchangers in parallel to allow Digester 29 to operate at thermophilic temperatures, but staff would prefer a single replacement heat exchanger that is sized appropriately for thermophilic operations. Digester 30 cannot operate at thermophilic temperatures with the current heating system. Staff prefer having flexibility to operate in mesophilic or thermophilic modes.
- Cooling after the thermophilic stage resulted in struvite precipitation issues, so cooling is not practiced.
- The floating cover on holding Digester 31 has operational limitations and presents potential safety hazards during wet or winter conditions. If the liquid level is drawn down to a certain level, digester gas can escape because the water seal breaks. Snow accumulates on top of the cover, pushing it down unevenly. Operators have to shovel snow off the cover. The cover has a non-slip coating to address safety slipping hazards. Staff would prefer to fix the cover in place and provide separate gas storage at grade.
- The sludge heating recirculation pumps and piping are old and may need to be replaced due to age.
- There is some struvite buildup on valves. Staff experimented with adding ferric to digesters. This lowered the H_2S concentration and iron sponge media usage, but did not help with struvite precipitation. To avoid buildup, operators are exercising valves more frequently.
- The hydrogen sulfide in the digester gas is currently removed with an iron sponge system situated on the roof of the digester control building. The iron sponge media change-out requires a vacuum truck.
- Digester 33 has a moisture separator and condensate trap, but the other digester gas lines sometimes contain moisture.

- The flare is old and staff is not sure if spare parts can be obtained. Flare controls are antiquated. The igniter has been problematic and moisture in the digester gas lines impacts operations when present.
- The existing flare is old and needs to be replaced and upgraded. A new flare would be built in compliance with current codes and regulations.

The key operational parameters for digesters are the VSLR, the hydraulic residence time (HRT) and temperature. Key performance parameters include the digester feed and digested sludge flow, TS and VS concentrations and loads, the volatile solids reduction (VSR) and biogas production, the digester pH, volatile fatty acids (VFA) concentration, alkalinity, and VFA to alkalinity ratio.

The performance analysis was performed for the two distinct anaerobic digestion operating modes. The figures below show the full period from October 1, 2017 to January 14, 2020, which includes the January 23, 2019, to March 10, 2019, transition period. The tables below are duplicated to show average performance values during the following periods:

- October 1, 2017 to September 30, 2018: 1-year period consistent with rest of performance assessment. This period operated in "Parallel thermo/meso mode" where the flow was split evenly between Digesters 33, 29, and 30, then stored in Digester 31.
- March 10, 2019 to January 14, 2020: ~10 month period of "TPAD mode" where the flow was transported to primary Digester 33, then split between secondary Digesters 29 and 30, then stored in Digester 31.

Table 5.21 and Table 5.22 summarize the digester feed and digested sludge flow and loads for the two operating modes. Figure 5.39, Figure 5.40, Figure 5.41, Figure 5.42, and Figure 5.43 show the primary sludge, TWAS, digester feed, digested sludge flows, TS concentrations, VS concentrations, TS loads, and VS loads, respectively. The primary sludge and TWAS flows increase during the winter and summer peaks while the TS and VS concentrations have remained relatively consistent. Corresponding to the peaks in flow, the TS and VS loads also increase during the winter and summer peaks. The reported digested sludge flow is about 10 percent higher than the digester feed flow likely due to flow meter errors or inaccuracies. Based on conversations with WRP staff, the digester sludge flow is likely more accurate because it is based on one flow meter, compared to the digester feed flow, which is based on the sum of one TWAS flow meter and two primary sludge flow meters. For this reason, the digester sludge flow is used to calculate the SRT in both the performance assessment and the capacity assessment.

Table 5.21 Digester Feed and Digested Sludge Flows and Loads **(Parallel Thermo/Meso Mode)**

Parameter	Units	Primary Sludge(1)(3)	TWAS(3)	Digester Feed(2)	Digested Sludge(3)
Flow	kgal/d	12.7	12.8	25.5	27.5
TS concentration	%TS	4.84	2.85	3.84	1.45
VS concentration	%VS	91.6	87.6	90.1	75.6
TS load	klb/d	5.11	3.05	8.16	3.32
VS load	klb/d	4.68	2.67	7.35	2.51

Notes:
(1) Primary sludge flow is measured after primary sludge and primary scum are combined, while primary sludge TS and VS concentrations are measured before primary scum is combined. For this reason, the primary sludge TS and VS load may be an overestimate.
(2) Digester feed flow and loads calculated as sum of primary sludge and TWAS flows and loads. Digester feed TS and VS concentrations back-calculated from flow and loads.
(3) Primary sludge, TWAS, and digested sludge TS and VS concentrations back-calculated from flow and loads.

Table 5.22 Digester Feed and Digested Sludge Flows and Loads **(TPAD Mode)**

Parameter	Units	Primary Sludge(1)(3)	TWAS(3)	Digester Feed(2)	Digested Sludge(3)
Flow	kgal/d	12.1	11.3	23.4	31.8
TS concentration	%TS	4.53	3.40	3.94	1.35
VS concentration	%VS	88.5	84.0	86.6	74.8
TS load	klb/d	4.58	3.20	7.70	3.57
VS load	klb/d	4.06	2.69	6.67	2.67

Notes:
(1) Primary sludge flow is measured after primary sludge and primary scum are combined, while primary sludge TS and VS concentrations are measured before primary scum is combined. For this reason, the primary sludge TS and VS load may be an overestimate.
(2) Digester feed flow and loads calculated as sum of primary sludge and TWAS flows and loads. Digester feed TS and VS concentrations back-calculated from flow and loads.
(3) Primary sludge, TWAS, and digested sludge TS and VS concentrations back-calculated from flow and loads.

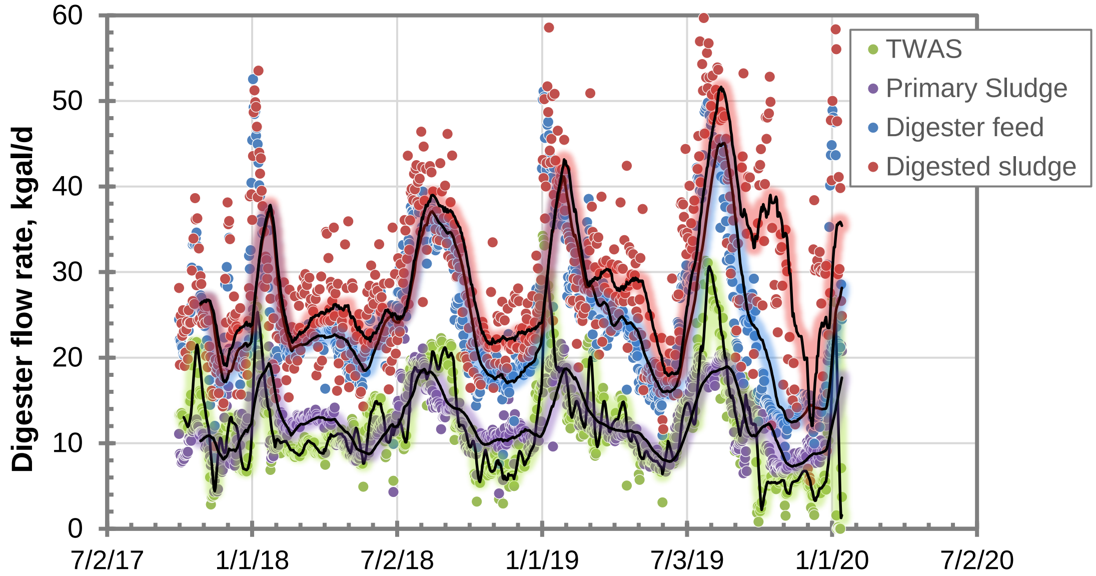

Figure 5.39 Primary Sludge, TWAS, Digester Feed, and Digested Sludge Flows

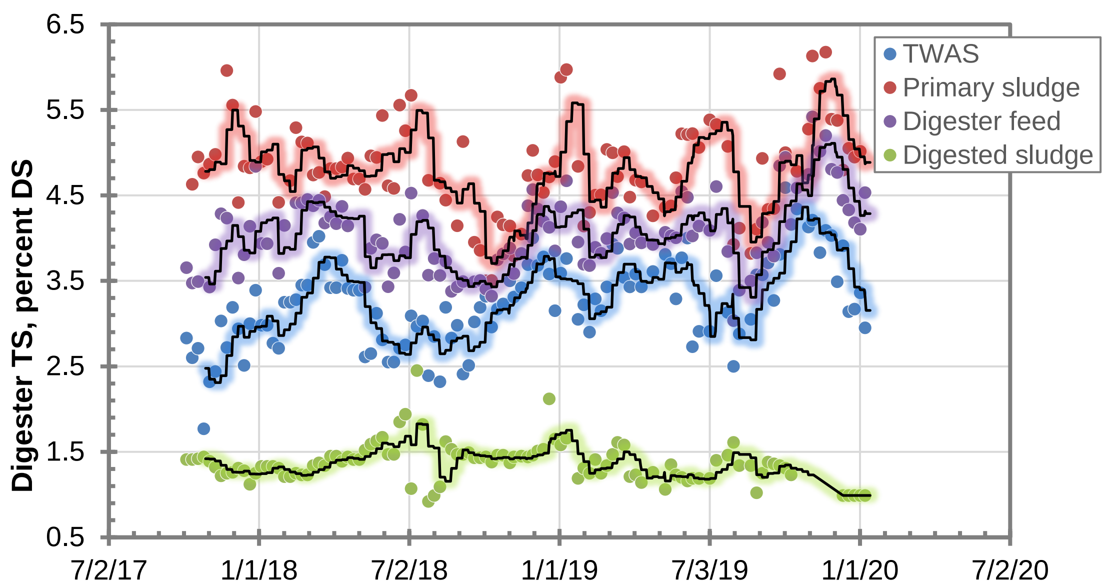

Figure 5.40 Primary Sludge, TWAS, Digester Feed, and Digested Sludge TS Concentrations

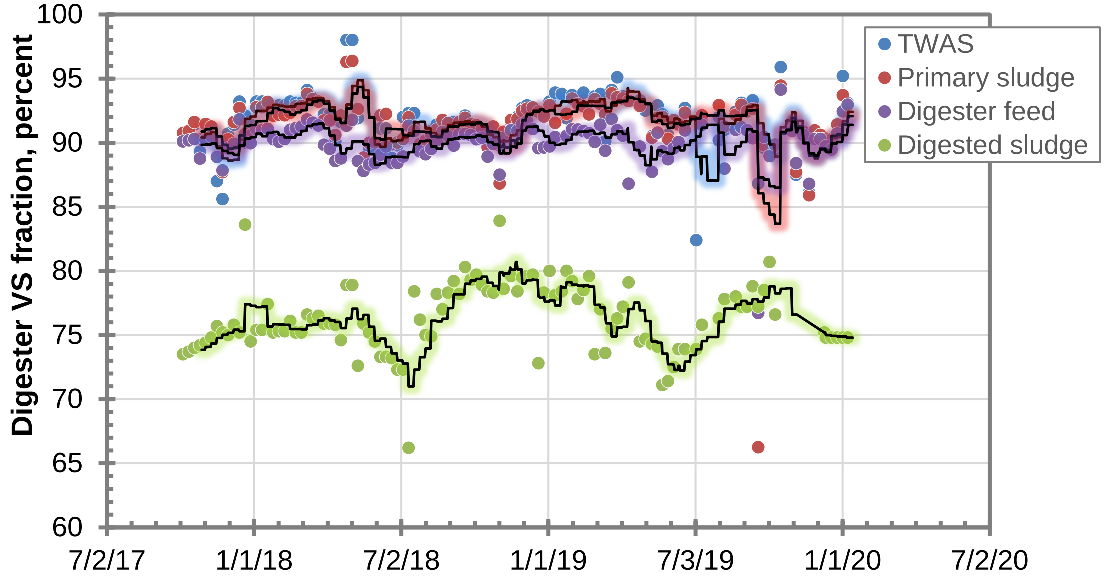

Figure 5.41 Primary Sludge, TWAS, Digester Feed, and Digested Sludge VS Concentrations

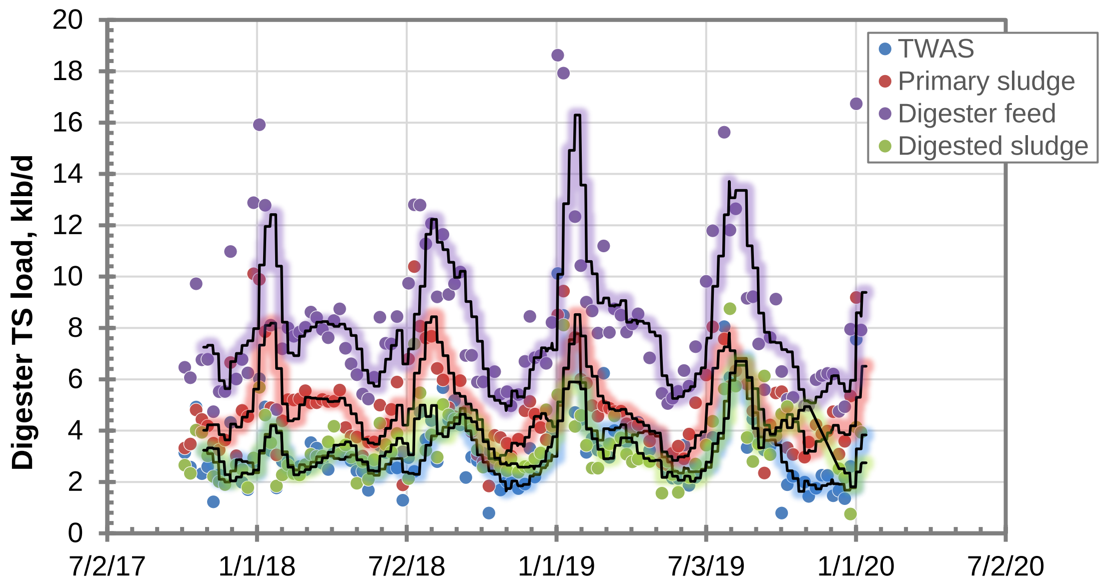

Figure 5.42 Primary Sludge, TWAS, Digester Feed, and Digested Sludge TS Loads

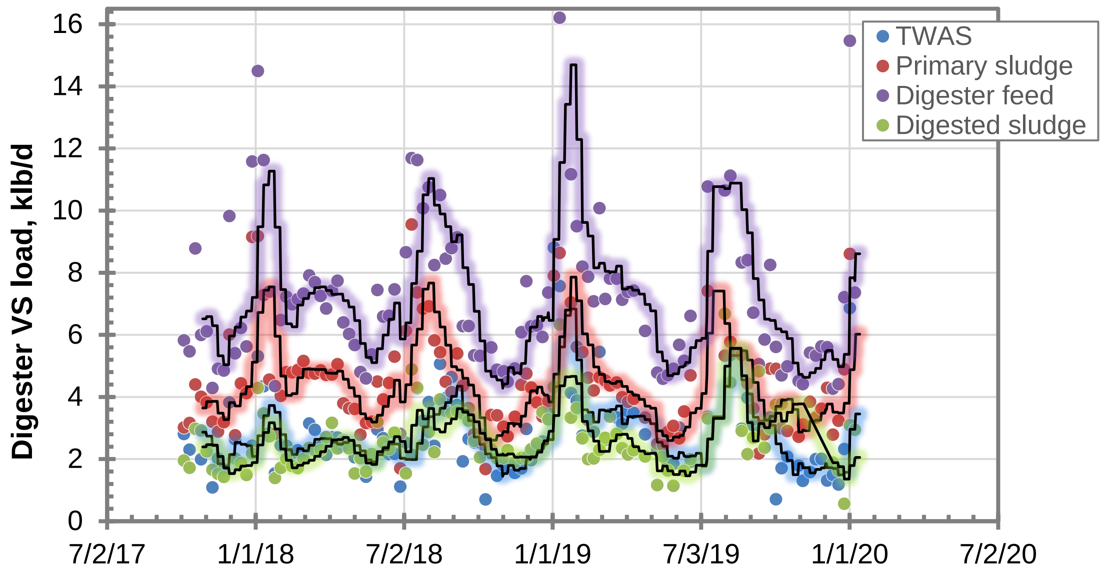

Figure 5.43 Primary Sludge, TWAS, Digester Feed, and Digested Sludge VS Loads

Table 5.23 and Table 5.24 summarize the two key digester loading parameters (SRT and VSLR), the operating temperature, and several parameters that are indicators of digester health including pH, VFA and alkalinity concentrations, and VFA to alkalinity ratio. Values in red bold are outside the recommended operating ranges, indicating that a modification in operations may be needed to improve performance. Figure 5.44, Figure 5.45, Figure 5.46, Figure 5.47, Figure 5.48, Figure 5.49, and Figure 5.50 show these parameters as well.

For both the **"parallel thermo/meso mode"** and the **"TPAD mode"** the SRT required to meet Class B biosolids is 15 days. According to the 2002 "Update of Project Report for Expansion of Regional Water Reclamation Plant", the TPAD system was designed to have a minimum detention time in the thermophilic digester of 5 days, followed by 10 days detention time in the mesophilic digesters. The design temperatures are 50 to 60 degrees Celsius (°C) (122 to 140 degrees Fahrenheit [°F]) in the thermophilic digester, and 35°C (95°F) in the mesophilic digesters. The required temperatures in the digesters have been consistently achieved in Digesters 33, 31 and 30. As shown by the variability in temperature for that digester in Figure 5.44, maintaining thermophilic temperatures in Digester 29, however, has been more difficult to achieve consistently.

Digester pH, VFA concentration, alkalinity, and VFA/Alkalinity ratio are indicators of the health and stability of the digestion process. Anaerobic digestion consists of three steps: hydrolysis, acidogenesis, and methanogenesis. In the acidogenesis step, acid formers break complex organic compounds into short-chained organic acids or VFAs. High digester loadings can result in a quick increase in VFA concentration, decrease in alkalinity, and decrease in pH, which can lead to digestion failure.

For both the "parallel thermo/meso mode" and the "TPAD mode" the average SRT is well above (approximately double) the minimum required.

During the "parallel thermo/meso mode", the digestion process had stable operations. In this mode, the VSLR is split amongst the three primary digesters, resulting in a relatively low VSLR of 0.066 lb/cfd, substantially lower than the typically recommended design sustained values for mesophilic digestion of 0.12 to 0.16 lb/cfd, and the upper limit of 0.20 lb/cfd (MOP 8, 2018, Table 23.4 and Page 1818) and the design sustained values for thermophilic digestion of 0.2 to 0.4 lb/cfd (Solids Process Design and Management, Table 10.2). In all four digesters, the VFA concentration is relatively low, the alkalinity is on the high end of the typical range and the VFA/alkalinity ratio is well within a healthy operating range. The pH is within or slightly above the typical range. The high pH and high alkalinity, likely caused by the lime treatment upstream, may make the digesters more resilient to high organic loadings.

During the "TPAD mode", the digestion process data shows some periods when typically recommended operational parameters were exceeded in the thermophilic digester, which could result in digester instability. The average VSLR on the thermophilic digester during this period was 0.18 lb/cfd, which is below the recommended maximum sustained value of 0.2 to 0.4 lb/cfd for thermophilic digesters. However, during several weeks in the 2019 summer peak, the VSLR was about 0.3 lb/cfd, and more recently during the 2019/2020 winter peak, the VSLR exceeded 0.4 lb/cfd. The VSLR is generally higher for "TPAD mode" because the single first phase thermophilic digester receives the full organic load. This high organic loading correlates to an observed increase in VFA concentrations and drop in pH, and a drop in digester gas methane content, as highlighted in Figure 5.51, Figure 5.52, and Figure 5.53, respectively. The average VFA concentration in the thermophilic digester during the "TPAD mode" period of 1,815 mg/L as acetic acid (HAc) exceeded the typical range for thermophilic digesters of 400 to 1,200 mg/L as HAc, and even with the high alkalinity, the VFA/alkalinity ratio of 0.394 exceeded the recommended maximum of 0.3. In general, while the TPAD thermophilic digester operated at higher than recommended parameters, it still performed adequately. An increase in VFA concentrations is an early sign of potential digester instability. Other indicators include a drop in pH, a drop in digester gas production, a drop in digester gas methane content, or a variation in the H_2S concentration.

The temperature in the second phase mesophilic digesters is above the recommended mesophilic temperature range. Anaerobic microbes are ideally suited for the thermophilic temperature range and the mesophilic temperature range. The temperature zone in between mesophilic and thermophilic is not ideal for microbial growth, and operating in that zone may cause digester instability.

Table 5.23 Digester Loading and Performance Parameters (**Parallel Thermo/Meso Mode**)

Parameter	Units	Primary - Thermo (Digester 33)	Primary - Thermo (Digester 29)	Primary - Meso (Digester 30)	Holding Digester (Digester 31)	Reference Values
Temperature	°C	54.7	53.9	37.8	NA	50 to 56 thermophilic 35 to 40 mesophilic(1)
Temperature	°F	130	129	100	NA	122 to 133 thermophilic 95 to 104 mesophilic(1)
SRT	days	30.2	30.2	30.2	10.9	> 4 to 6 thermophilic > 6 to 12 mesophilic(1)
VSLR	lb/cfd	0.066	0.066	0.066	NA	< 0.2 to 0.4 sustained, thermophilic(2) <0.12 to 0.16 sustained, 0.20 maximum, mesophilic(3)
pH	standard units	7.9	7.8	7.6	7.8	7.0 to 7.7 thermophilic 6.8 to 7.2 mesophilic(2)
VFA concentration	mg/L as HAc	135	137	38	69	400 to 1,200 thermophilic <200 mesophilic(2) 50 to 300 mesophilic(3)
Alkalinity	mg/L as $CaCO_3$	5,330	5,410	5,103	5,408	2,500 to 5,000(3)
VFA/Alkalinity ratio	-	0.025	0.027	0.007	0.014	< 0.3(3)

Notes:
(1) Source: Table 10.2 in WEF "Solids Process Design and Management", 2012.
(2) Source: Page 384 in WEF "Solids Process Design and Management", 2012.
(3) Source: Table 23.4 and page 1818 in MOP 8 "Design of Water Resource Recovery Facilities", 2018.

Table 5.24 Digester Loading and Performance Parameters (**TPAD Mode**)

Parameter	Units	First Phase – Thermo (Digester 33)	Second Phase – Meso (Digester 29)	Second Phase – Meso (Digester (30)	Holding Digester (Digester 31)	Reference Values
Temperature	°C	52.9	44.0	43.1	38.9	50 to 56 thermophilic 35 to 40 mesophilic[(2)]
Temperature	°F	127	111	110	102	122 to 133 thermophilic 95 to 104 mesophilic[(2)]
SRT	days	8.7	17.4	17.4	8.7	> 4 to 6 thermophilic > 6 to 12 mesophilic[(2)]
VSLR	lb/cfd	0.180	NA	NA	NA	< 0.2 to 0.4[(3)]
pH	standard units	7.6	7.8	7.8	7.7	7.0 to 7.7 thermophilic 6.8 to 7.2 mesophilic[(3)]
VFA concentration	mg/L as HAc	1,815	169	163	141	400 to 1,200 thermophilic <200 mesophilic[(3)] 50 to 300 mesophilic[(4)]
Alkalinity	mg/L as $CaCO_3$	4,936	6,016	5,762	5,819	2,500 to 5,000[(4)]
VFA/Alkalinity ratio	-	0.394	0.028	0.031	0.035	< 0.3[(4)]

Notes:
(1) Values in red bold are outside the recommended operating ranges, indicating that a modification in operations may be needed to improve performance.
(2) Source: Table 10.2 in WEF "Solids Process Design and Management", 2012.
(3) Source: Page 384 in WEF "Solids Process Design and Management", 2012.
(4) Source: Table 23.4 in MOP 8 "Design of Water Resource Recovery Facilities", 2018.

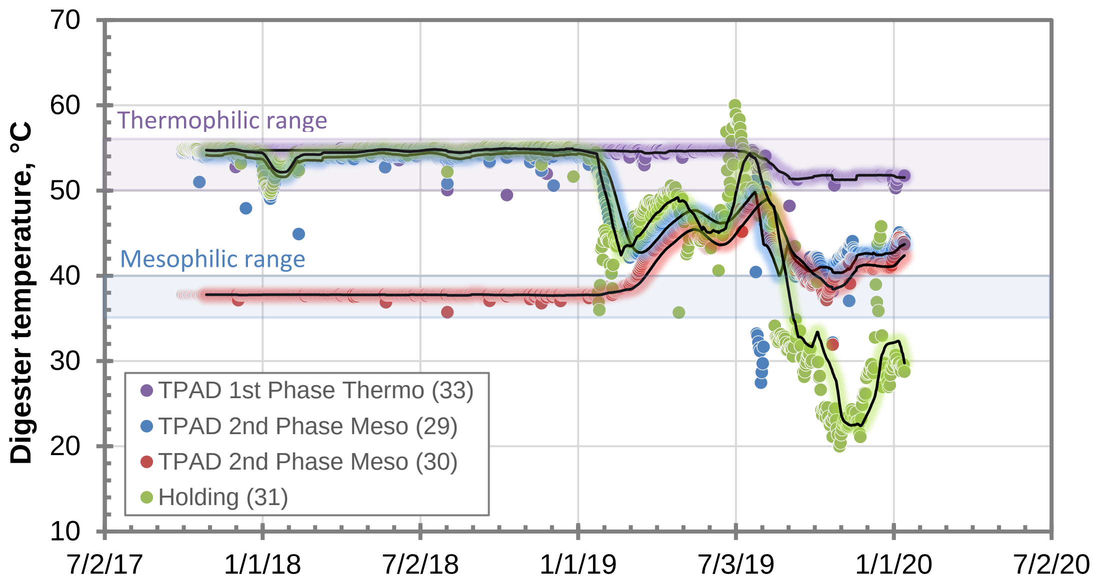

Figure 5.44 Digester Temperature

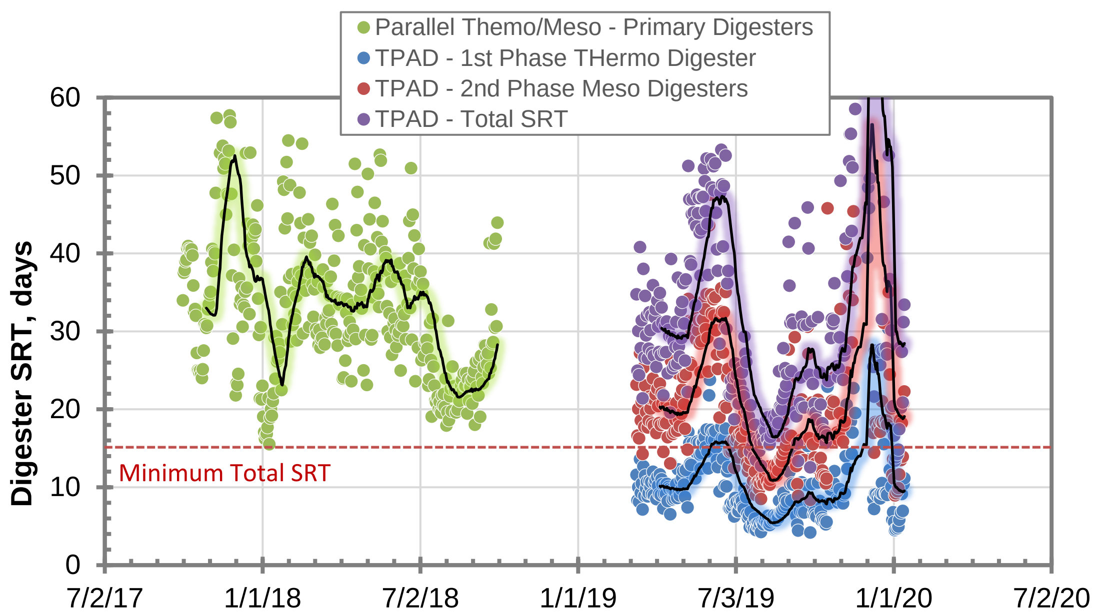

Figure 5.45 Digester SRT

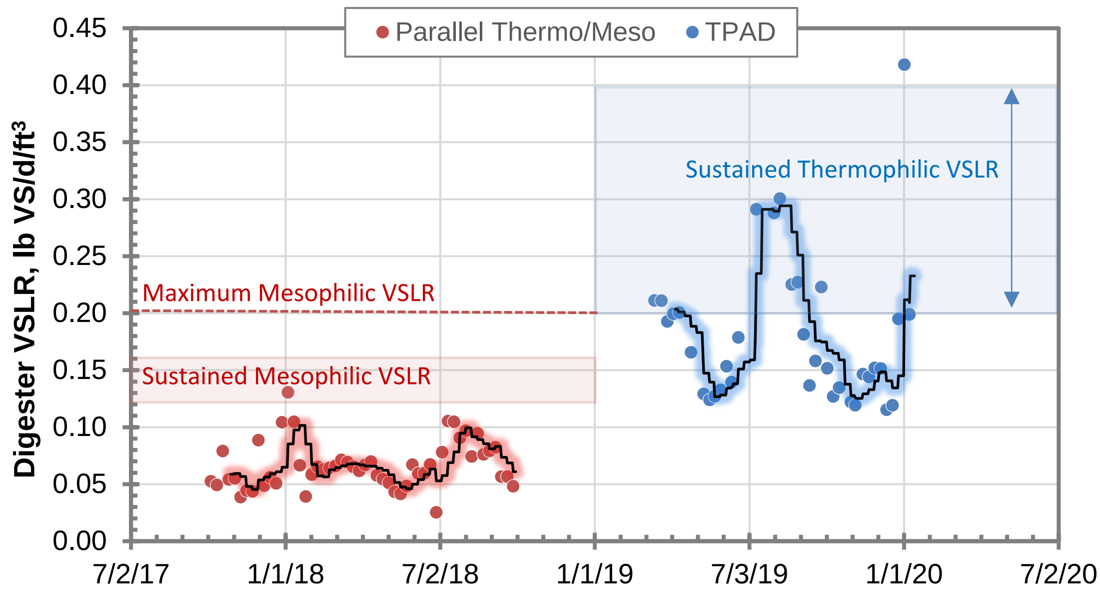

Figure 5.46 Digester VSLR

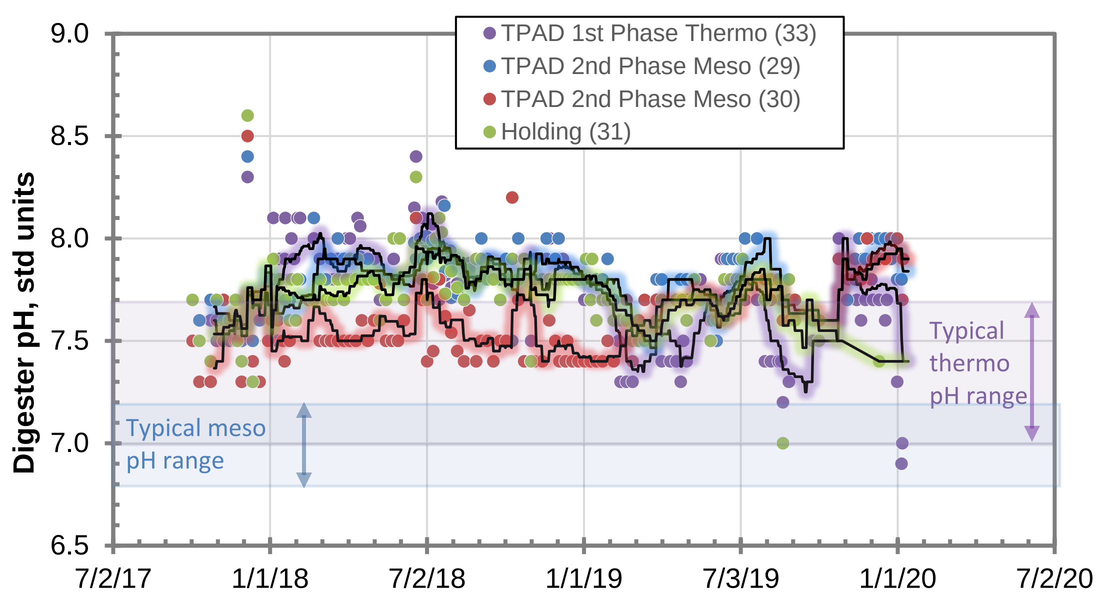

Figure 5.47 Digester pH

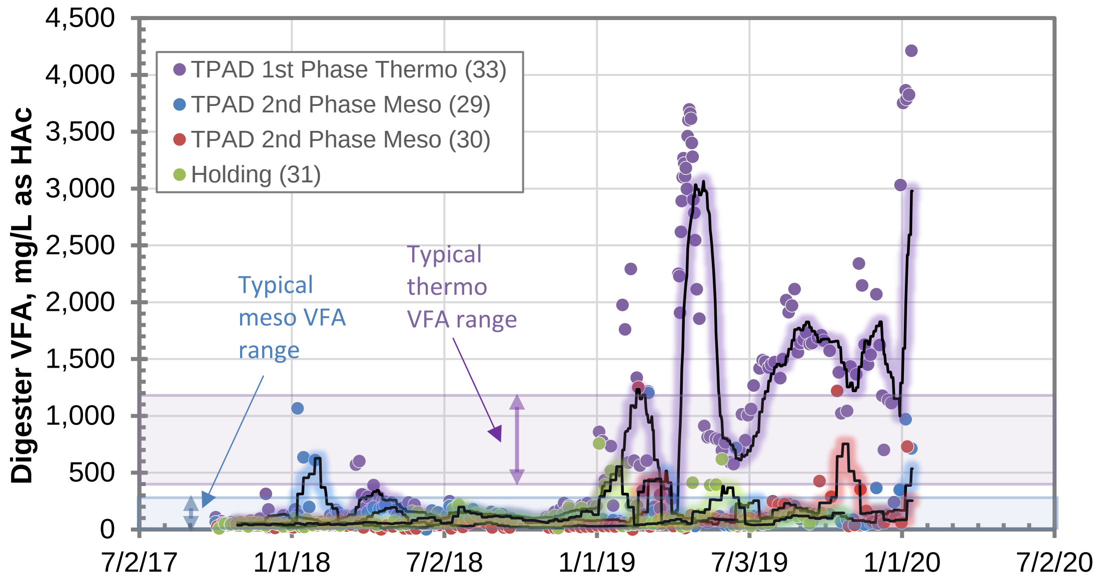

Figure 5.48 Digester VFA Concentration

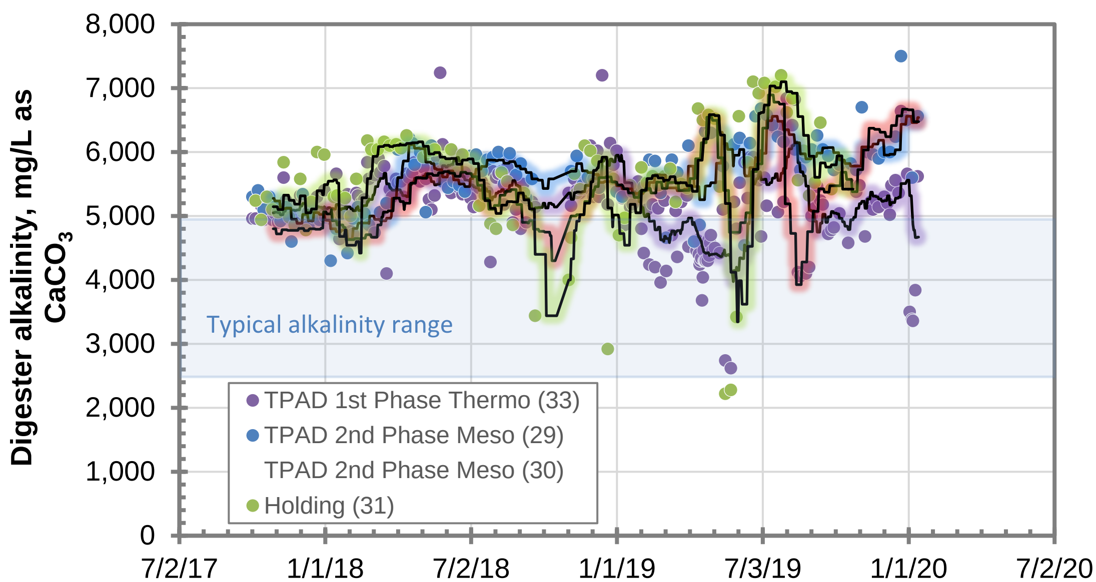

Figure 5.49 Digester Alkalinity

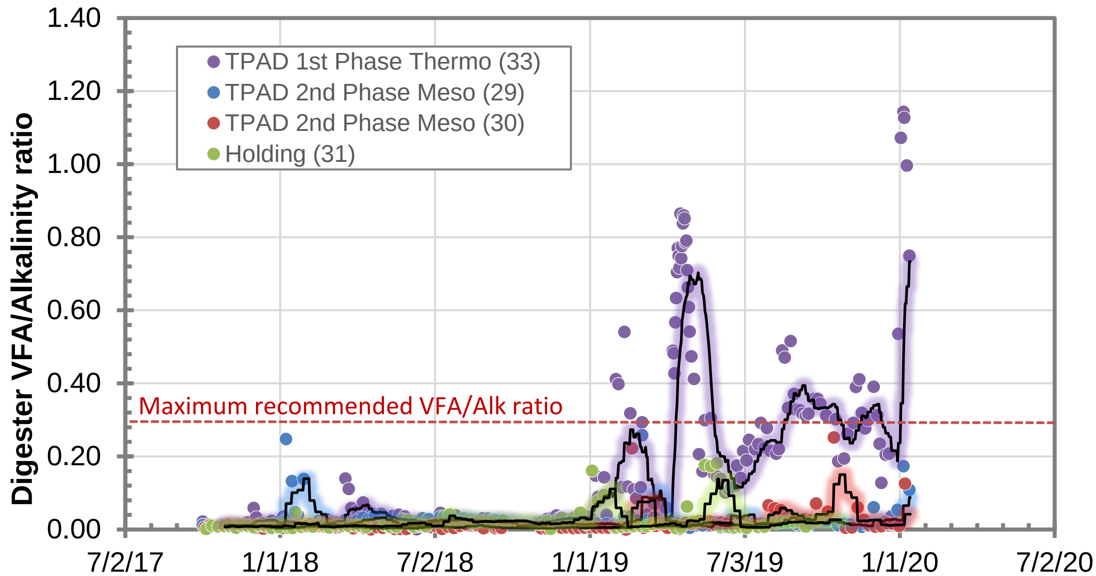

Figure 5.50 Digester VFA/Alkalinity Ratio

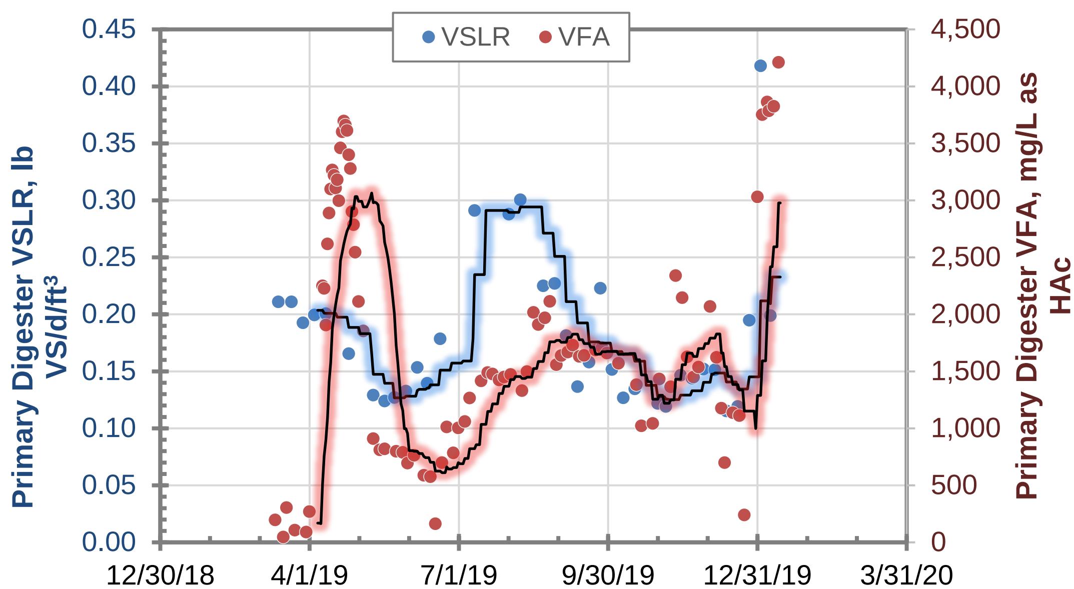

Figure 5.51 Impact of VSLR on VFA During TPAD Mode

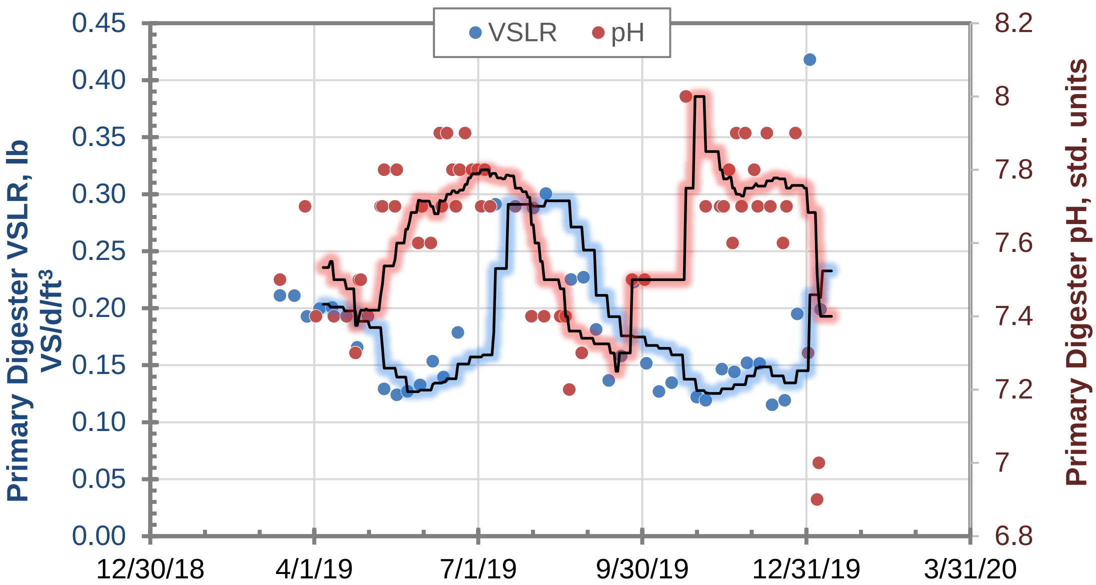

Figure 5.52 Impact of VSLR on pH During TPAD Mode

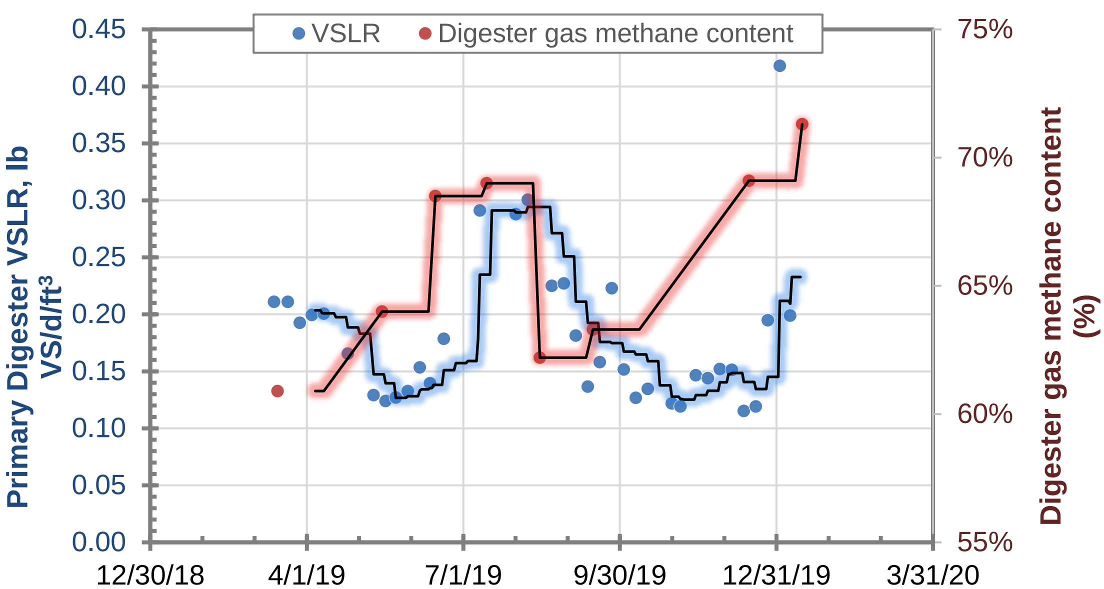

Figure 5.53 Impact of VSLR on Digester Gas Methane Content During TPAD Mode

Table 5.25 and Figure 5.54, Figure 5.55, and Figure 5.56 show the volatile solids reduction (VSR) and digester gas production and use performance parameters. The VSR is calculated using both methods, the mass balance equation (VSR = [VSin – VSout]/VSin) which compares VS loads in and out of the digestion process, and the Van Kleeck equation (VSR = [%VSin - %VSout]/[%VSin - %VSin*%VSout]) which is based on VS concentrations in and out of the digestion process. The Van Kleeck equation assumes fixed solids are conserved during the digestion process. Both methods are acceptable for compliance.

During both the "parallel thermo/meso mode" and the "TPAD mode", the anaerobic digesters have performed adequately, achieving an average VSR higher than the design value of 60 percent and a digester gas yield slightly higher than the typical value of 15 standard cubic feet per pound (scf/lb) VSR. There was no noticeable difference in digester performance during the two operating modes.

During August and September 2019, the calculated mass balance VSR and digester gas values did not make sense due to a discrepancy in digester feed and digested sludge flows. These values were removed from the graphs and the average calculation. During October to November 2019, holding Digester 31 was put out of service for digester cleaning and all the digester gas was flared.

Table 5.25 Digester VSR and Digester Gas Performance Parameters

Parameter	Units	Parallel Thermo/Meso	TPAD	Reference values
VSR - Van Kleeck	%	65.2%	65.5%	60 design criterion
VSR - Mass Balance	%	65.5%	65.8%	60 design criterion
Digester gas methane content	%		65.9%	
Digester gas to boiler	scfd	61,575	54,033	
Digester gas to flare	scfd	14,225	17,500	
Total digester gas production	scfd	75,799	71,532	
Digester gas to boiler	%	81%	76%	
Digester gas yield - Van Kleeck	scf/lb VSR	15.7	16.5	15 typical
Digester gas yield - Mass Balance	scf/lb VSR	15.9	16.4	15 typical

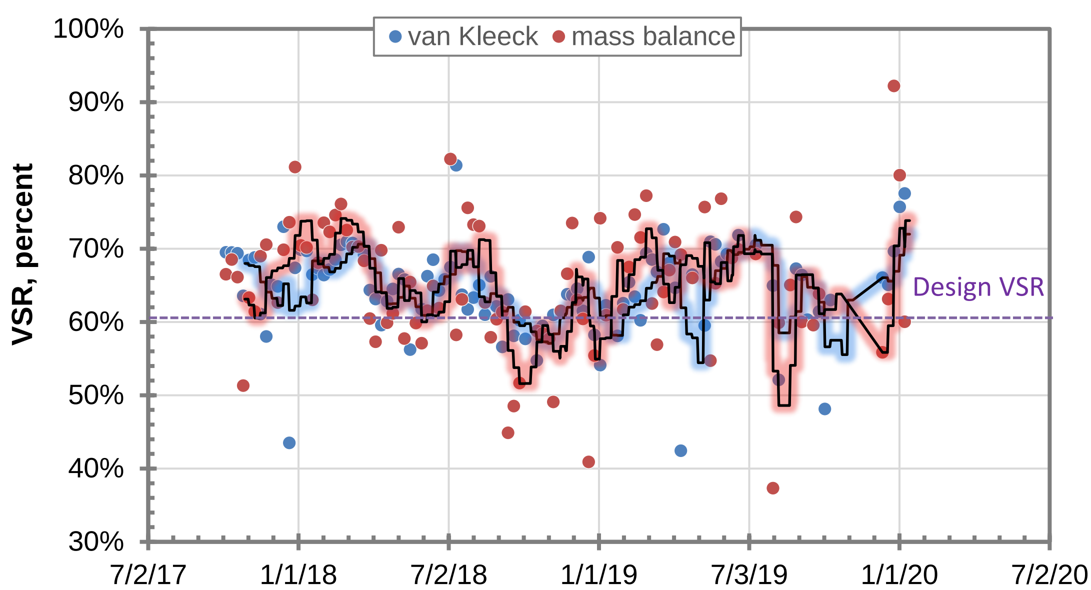

Figure 5.54 Digester Volatile Solids Reduction (VSR)

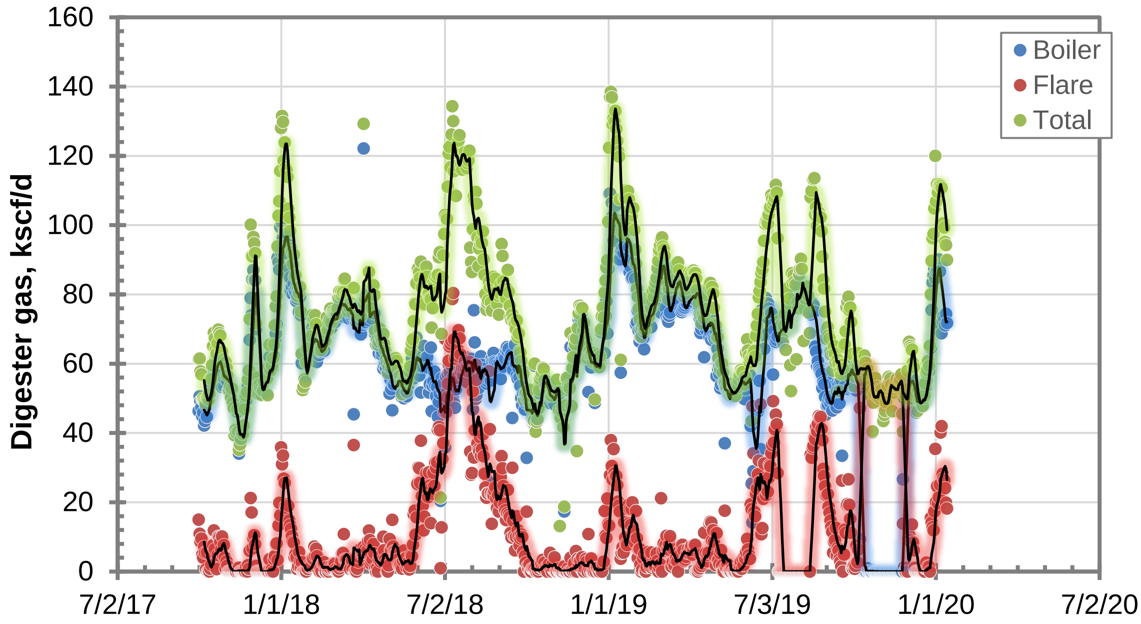

Figure 5.55 Digester Gas Production and Use

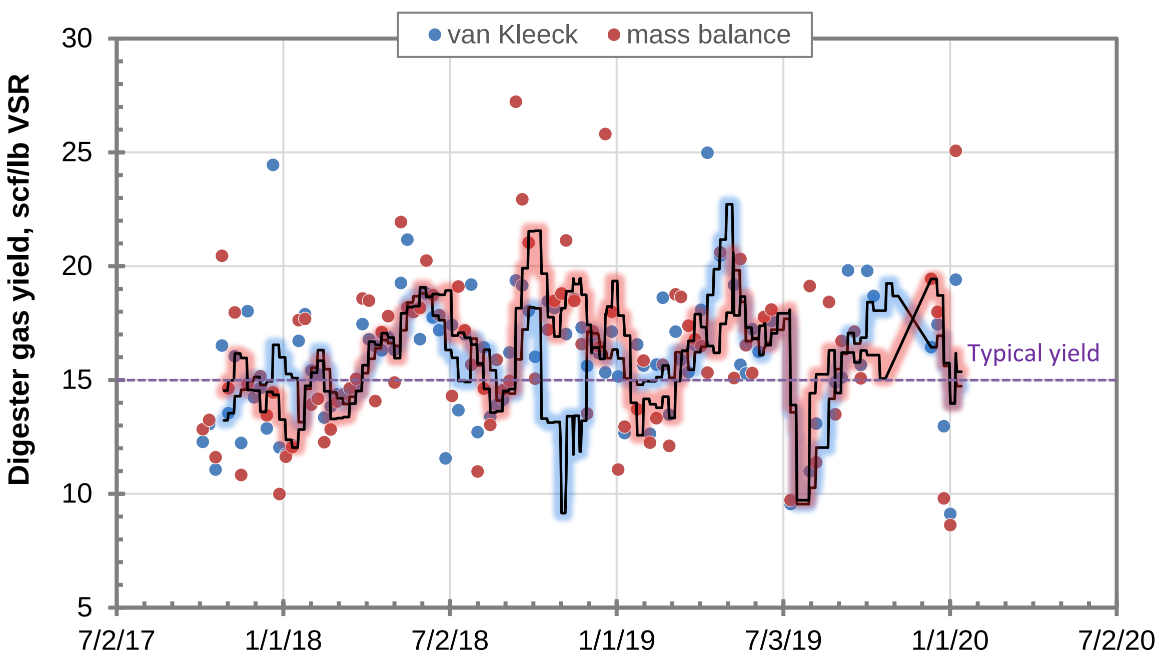

Figure 5.56 Digester Gas Yield

Figure 5.57 presents monthly natural gas and fuel oil data in boilers as well as monthly digester gas used in boilers and flared. Data on individual boiler fuel usage was not available. The Hurst hot water boiler, dedicated to thermophilic Digester 33, uses a mixture of digester gas, natural gas, and fuel oil. Even though the burner was originally designed to be able to run on 100 percent digester gas, it has had issues maintaining the flame when running on fuel mixtures containing over 60 percent digester gas. The steam boilers, which supply the other digesters and some buildings, use either fuel oil or digester gas. The total fuel used in boilers divided by the boiler efficiency (typically 80 percent) was used to estimate the actual digester and building heat demand, shown as a grey line in the graph. The heat demand is highest in January and February, and lower than expected in November and December. On average for 2019, not counting October and November when the gas holding digester was out of service, about 84 percent of the fuel used in the boilers was digester gas, and only about 13 percent of the digester gas was flared.

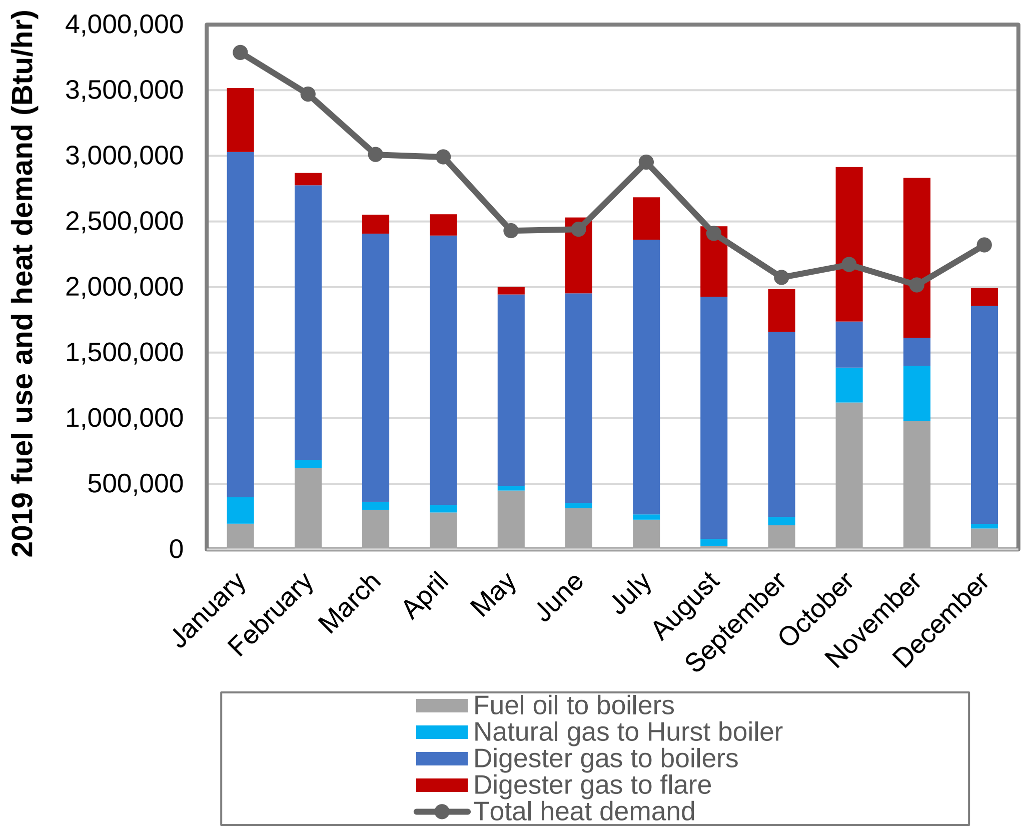

Figure 5.57 2019 Fuel Usage in Boilers and Heat Demand

5.11.8.4 Capacity Assessment

Table 5.26 compares the current and future digester feed flows and loads to the original design criteria. Values in red bold exceed the criteria, indicating additional capacity may be needed.

The two key capacity parameters for digesters are the VSLR and the HRT.

For both the "parallel thermo/meso mode" and the "TPAD mode" the SRT required to meet Class B biosolids is 15 days. The SRT was calculated assuming one digester out of service during the AA condition, and all digesters in service during the MW condition. The SRT was analyzed for two scenarios, assuming TWAS at 2.85 percent TS (TWAS fed directly from the gravity thickener to the digesters) and assuming TWAS at 5.5 percent TS (operating thickening centrifuge to increase TWAS concentration). For the scenario where TWAS is fed directly from the gravity thickener to the digesters, the digesters have enough capacity to meet the 15-day SRT requirement in all conditions evaluated except for future MW. During future MW conditions, by year 2039, it will be necessary to use the backup thickening centrifuges to achieve 15-day SRT in the digesters. For the scenario where the thickening centrifuge is used to produce a TWAS concentration of 5.5 percent TS, the digesters have sufficient capacity for all the conditions evaluated. It is recommended that the thickening centrifuge be used to reduce the hydraulic loading to the digesters, particularly during MW flows.

During the "parallel thermo/meso mode", the VSLR is split amongst the three primary digesters, and a maximum VSLR of 0.16 lb/cfd (MOP 8, 2018, Table 23.4) is recommended for stable mesophilic digester operations. Three anaerobic digesters have enough capacity in all conditions evaluated, except for future MW loads, when the VSLR is 0.19 lb/cfd. If the WRP starts experiencing increases in VFA concentration or decreases in pH, additional digester capacity may be needed. It is possible that the T-TSA digesters may be able to handle higher organic loads than what is typically recommended for municipal sludge digesters due to their high alkalinity, which is likely caused by the lime treatment. The existing digesters have enough capacity to operate in either parallel mesophilic mode or in parallel thermo/meso mode through 2045, assuming a slight exceedance of the maximum mesophilic VSLR is manageable during MW flows. In parallel thermo/meso mode, T-TSA also has the option of splitting the flow differently to feed a higher load to the two thermophilic digesters which are able to handle higher organic loads.

During the "TPAD mode", all of the VSLR goes to the single primary digester, and a maximum of 0.2 to 0.4 lb/cfd (Solids Process Design and Management, Table 10.2) is recommended for thermophilic digesters. The primary digester has enough capacity in all conditions evaluated, except for future MW loads, when the VSLR is 0.57 lb/cfd. The WRP has already experienced some elevated VFA concentrations and VFA to alkalinity ratios while operating in TPAD mode. If T-TSA desires to continue operating in "TPAD mode", then building an additional digester is recommended to avoid exceeding the 0.4 lb/cfd limit during MW loads. Otherwise, if T-TSA operates in "parallel thermo/meso mode", then additional capacity may not be needed.

The digester feed transfer pumps are used to pump sludge from Digesters 29 and 30 (second phase mesophilic) to Digester 31 (holding). The capacity of the digester feed transfer pump is exceeded in the future MW condition. However, additional pumping capacity may not be needed because T-TSA also has the option to passive overflow from Digesters 29 and 30 to Digester 31.

Table 5.26 Anaerobic Digestion and Associated Equipment Capacity Assessment

Parameter	Units	Capacity	Current AA	Current MW	Future AA	Future MW
Anaerobic Digestion						
Digested sludge flow[1], TWAS at 2.85%TS	kgal/d		27.5	51.9	38.9	73.6
SRT (3 digesters @ AA and 4 digesters @ MW)	days	15.0	30.2	21.3	19.8	14.0
Digested sludge flow, TWAS at 5.5%TS	kgal/d		20.8	39.3	31.8	60.1
SRT (3 digesters @ AA and 4 digesters @ MW)	days	15.0	39.9	28.2	26.1	18.4
Digester feed VS load	klb/d		7.35	13.9	11.2	21.2
VSLR, TPAD mode, first phase digester	lb/cfd	0.40[2]	0.20	0.38	0.30	0.57
VSLR, Parallel mode	lb/cfd	0.16[3]	0.07	0.13	0.10	0.19
Digester Feed Transfer Pumps						
Digested sludge flow[1]	gpm	40	17.7	33.5	27.0	51.1

Notes:
(1) In the process data evaluated, the digested sludge flow was about 10 percent higher than the digester feed flow, likely due to flow meter errors. As discussed in the performance assessment section, the digested sludge flow is likely more accurate because it is based on a single flow meter rather than three. Because of this, the digested sludge flow is used as a basis for the capacity assessment, specifically for the SRT calculation.
(2) Source: Solids Process Design and Management, Table 10.2.
(3) Source: Table 23.4 from WEF Manual of Practice 8 – Design of Water Resource Recovery Facilities, Sixth Edition, 2018.
(4) Values in red indicate capacity exceedances.

5.11.9 Organic Sludge and Chemical Sludge Dewatering in Centrifuges

5.11.9.1 Description

Digested organic sludge and about 50 percent of the thickened chemical sludge are dewatered in one of two dewatering centrifuges, typically operated 5 h/d, 7 d/wk. The digested organic sludge is pumped from the holding digester by one of two digested sludge transfer pumps, and the thickened chemical sludge is pumped from the gravity thickeners by the chemical sludge transfer pump. The digested organic sludge and thickened chemical sludge are combined at a ratio of approximately 1:1 by dry weight and are blended in the centrifuge feed tank. The rectangular sludge feed tank has a sloped bottom to the feed pumps, and is equipped with an impeller mixer.

Emulsion polymer is injected at the centrifuge feed along with the sludge. The emulsion polymer system includes a bulk neat polymer storage tank, polymer totes, blend unit, aging tank, feed tank, and polymer feed pumps. Polymer is injected at the centrifuge feed. A hot water boiler, which uses natural gas, may be used for heating polymer dilution water during the winter.

Dewatered sludge leaves the centrifuge via a screw conveyor, which transports the sludge to a cake hopper. Each centrifuge has a dedicated screw conveyor and cake hopper with crossover capabilities. Cake from the hopper is discharged into a truck for off-site disposal or composting. Dewatered sludge is then hauled by a contractor to Lockwood Regional Landfill, where it is disposed, and/or Bently Ranch, where it is composted.

A rectangular tank receives and stores centrate from the dewatering centrifuges. From here it can be sent to various locations throughout the WRP using centrate pumps installed in the dewatering building. In the event that BNR was overloaded or temporarily out of service, ammonia may be stripped from the centrate prior to recycling to headworks using the ammonia stripping tank located in AWT. Operators periodically acid wash the system to remove built up calcium from the feed tanks and centrate line.

5.11.9.2 Original Design Criteria

The centrifuge dewatering system was constructed in 2003, except for the digested sludge transfer pumps, which were installed in 1975. Table 5.27 summarizes the original design criteria for the centrifuge feed tank, the centrifuge feed pumps, the two centrifuges, the emulsion polymer system, the screw conveyors, the cake hoppers, and the centrate tank.

Table 5.27 Dewatering Centrifuges and Associated Equipment Design Criteria

Parameter	Units	Value
Dewatering Centrifuges		
Year Installed		2003
Number		2
Manufacturer and Model(1)		Centrisys CS21-4
Flow rate, each	gpm	100 – 150
Maximum flow rate, each(1)	gpm	175
Maximum solids loading, each(1)	dry lb/hr	2,430
Polymer System		
Polymer dose	lb active/ dry ton	40
Polymer required at MW	lb active/day	303
Cake hoppers and loadout		
Number of hoppers		2
Hopper storage volume, each	cubic yards	60
Hopper storage capacity, each	wet tons	50
Usable hopper storage capacity, total(2)	wet tons	80
Discharge type		Rotary external drive
Discharge rate range	wet tons/min	0.2 - 2
Digested sludge transfer pumps		
Year installed		1975
Number		2 (one standby)
Type		Progressive cavity
Capacity, each	gpm	150
Horsepower, each	hp	7.5

Notes:
(1) Source: Conversation with manufacturer, 8-Jan-2020.
(2) Only 80-85 percent of the weight-bearing capacity of the hoppers is usable because cake cones on the top making it impossible to fully fill the hoppers.

5.11.9.3 Performance Assessment

Equipment and operational issues identified from discussions with operators during site visits include:

- Incomplete utilization of cake hoppers: only using 80-85 percent of the weight-bearing capacity of the hoppers because cake cones on the top making it impossible to fully fill the hoppers.
- The hopper was modified to assist with loadout of sludge.
- The liner in the centrate tank partially failed and required patch repairs of the new PVC liner.

Key loading and operation parameters for the dewatering centrifuges and associated equipment are the feed and dewatered sludge flow and solids concentration, the hydraulic and solids loading rate, the solids capture rate, and the polymer dosage.

Table 5.28 summarizes the centrifuge feed and dewatered sludge and centrate flows and loads. Figure 5.58, Figure 5.59, Figure 5.60, Figure 5.61, and Figure 5.62 show the digested sludge, chemical sludge, total centrifuge feed, and dewatered sludge flows, TS concentrations, and TS loads, as well as the digested sludge fraction in the centrifuge feed. The dewatered sludge mass flow data is reported on a daily basis from the measurements at the centrifuge outlet, and on a monthly basis.

The dewatered sludge TS concentration is higher than the 15 to 20 percent TS, typical of anaerobically digested primary sludge and WAS (Table 22.2 in MOP 8, 2018), due to the combination with the chemical sludge. WRP staff stated that with organic sludge alone, the dewatering centrifuges can achieve 25 to 27 percent TS, which is also higher than typical, showing good performance of the dewatering centrifuges.

Table 5.28 Digester Feed and Digester Sludge Flows and Loads

Parameter	Units	Digested Sludge	Chemical Sludge	Centrifuge Feed	Dewatered Sludge	Centrate
Flow	kgal/d	27.5	3.5	31.0		
Total mass flow	wet klb/d	229(1)	29(1)	258(1)	18.0(2)	240(3)
TS concentration	%TS	1.35	12.10	2.65	33.26	0.0125
TS load	klb/d	3.32	3.46	6.77	5.91(2)(5)	0.03(4)
Fraction	percent	48	52			

Notes:
(1) Calculated from flow assuming 8.34 lb/gal density.
(2) Calculated from 12 cumulative load data points per year.
(3) Calculated from difference between centrifuge feed and dewatered sludge.
(4) Calculated from mass flow and TS concentration.
(5) The capture rate between the dewatered sludge and centrifuge feed TS load is 87percent; however when calculated based on the centrate, the capture rate is 99.6 percent, which is more typical of centrifuge dewatering .A more detailed analysis of the capture rate and the likely cause of this discrepancy is covered in more detail in Table 4-23 and the paragraphs preceding it.

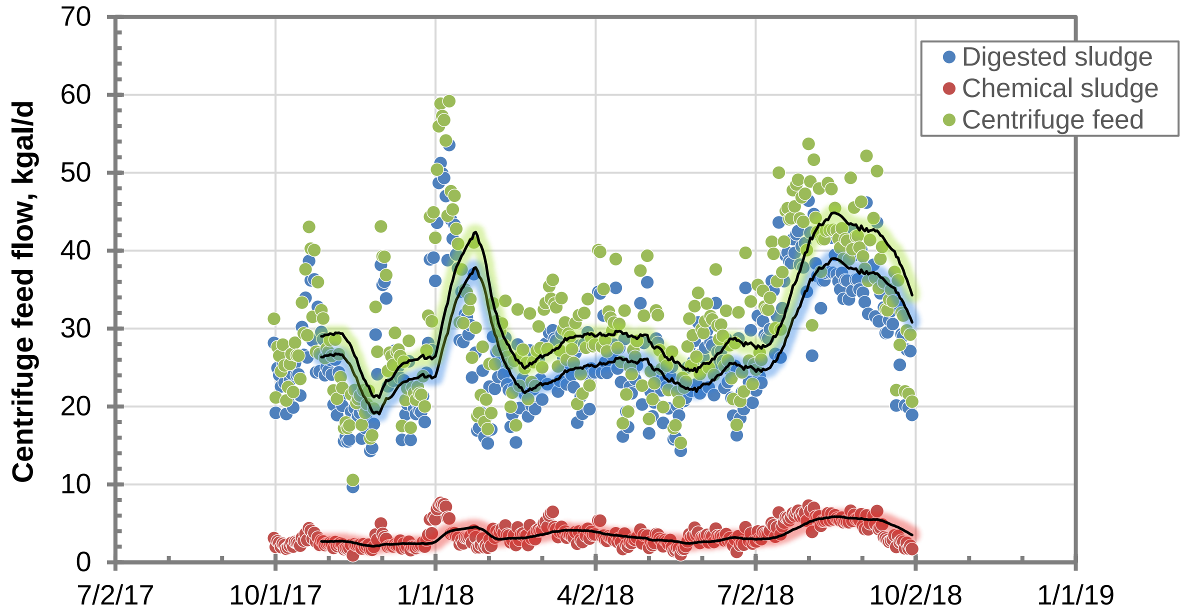

Figure 5.58 Digested Sludge, Chemical Sludge, and Total Centrifuge Feed Flow

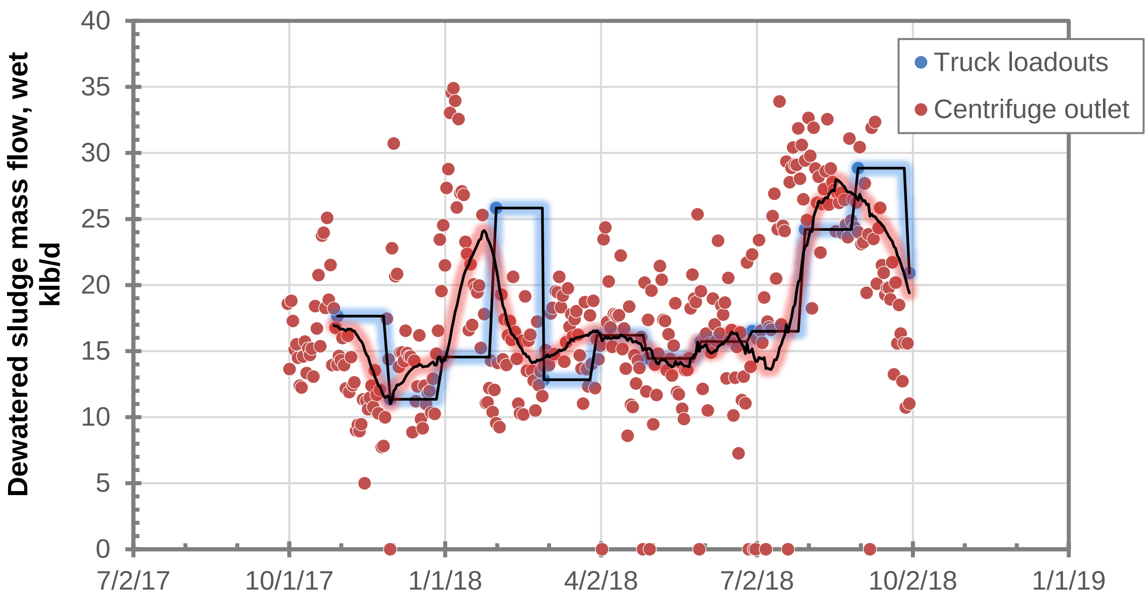

Figure 5.59 Dewatered Sludge Mass Flow

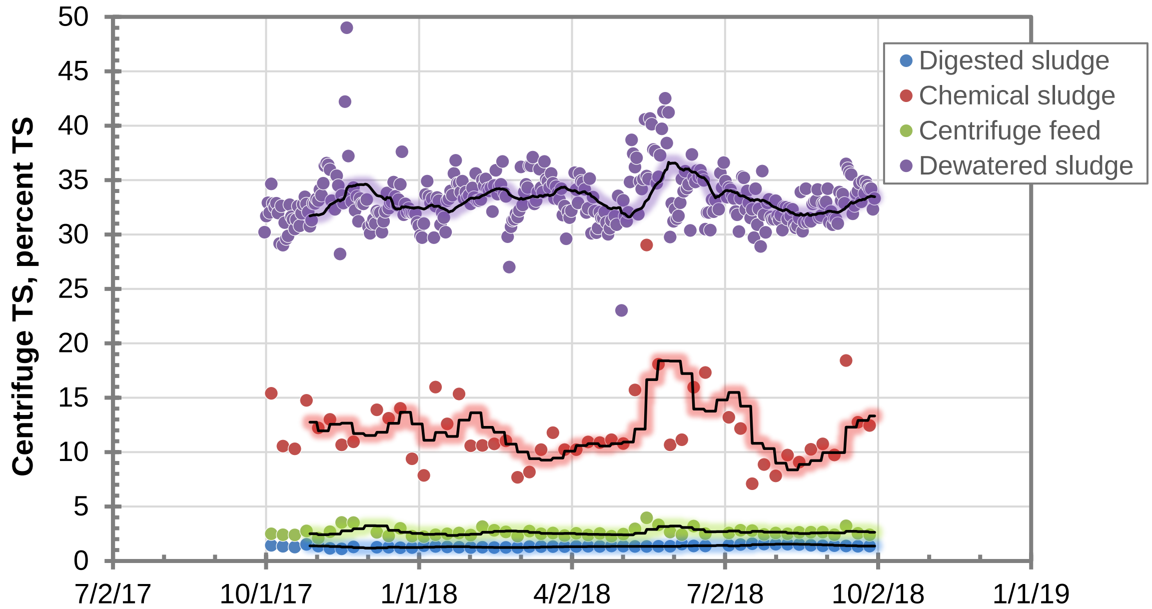

Figure 5.60 Centrifuge Feed and Dewatered Sludge TS Concentrations

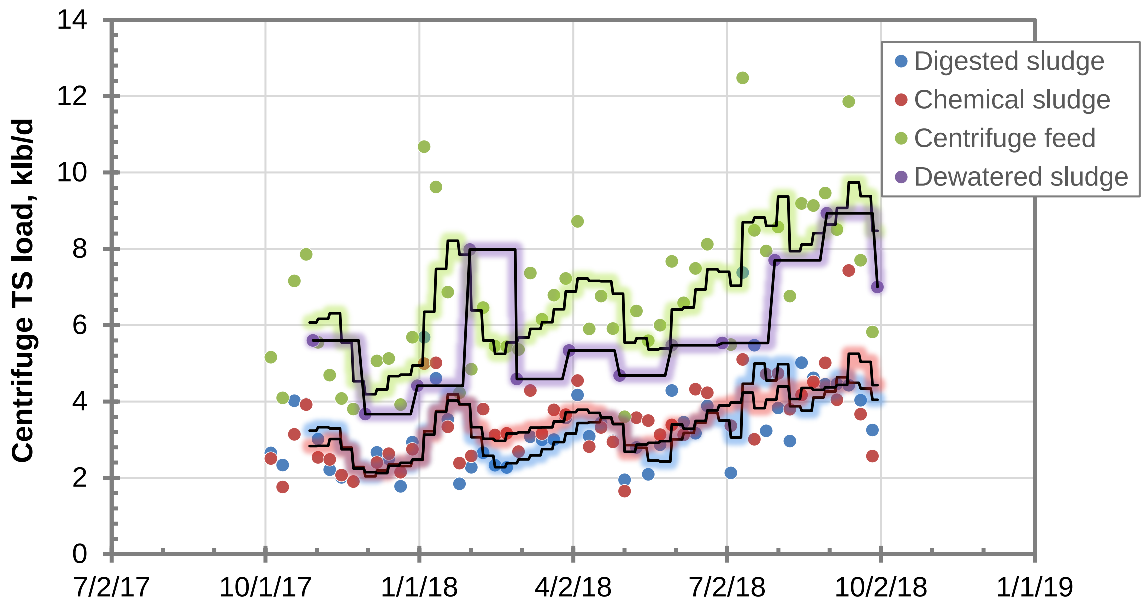

Figure 5.61 Centrifuge Feed and Dewatered Sludge TS Loads

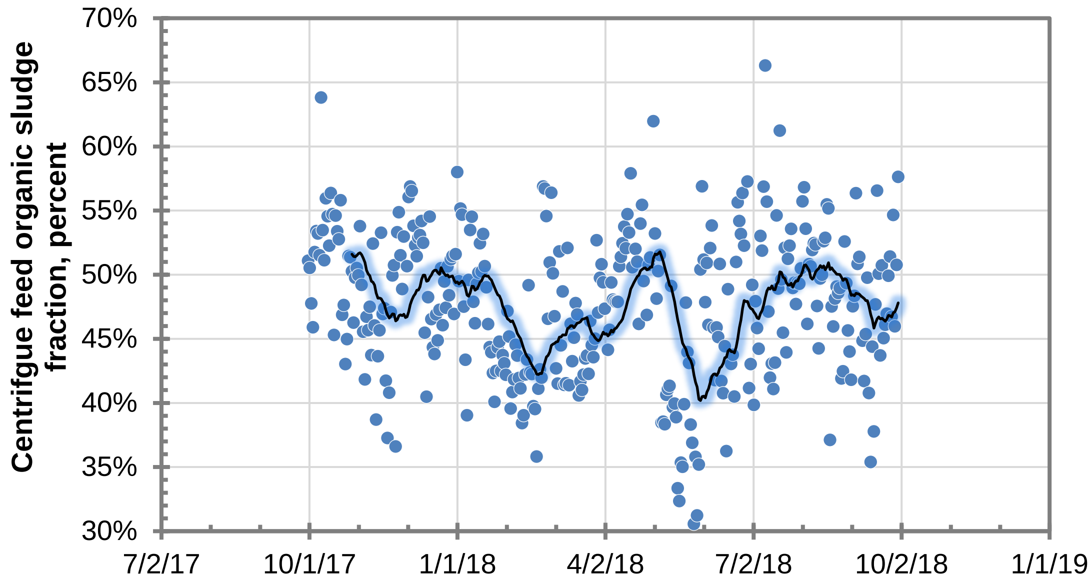

Figure 5.62 Centrifuge Feed Organic Sludge Fraction (by TS Load)

Table 5.29 summarizes the dewatering centrifuge performance parameters. Figure 5.63 shows the centrifuge feed pH, and Figure 5.64, Figure 5.65, and Figure 5.66 show the polymer dosage relative to the centrate TSS concentration, the cake TS concentration, and the solids capture, respectively. The solids capture rate calculated based on mass balance of the centrifuge feed and dewatered cake TS load is 87 percent, which is substantially lower than the capture rate provided in the data. However, when calculated from a mass balance between the centrifuge feed and the centrate, the value matches quite closely. Possible reasons for this discrepancy are inaccuracies or errors in the TS concentration measurements due to uncalibrated flow meters or scales, the fact that those values are only measured once per week, and/or the centrifuge feed flow or cake mass. Solids capture rate should target 95 percent. Dewatering centrifuges using polymer typically achieve more than 90 percent capture, usually target a minimum of 95 percent, and can achieve greater than 99 percent capture. Based on the centrate TSS, the WRP centrifuges are achieving exceptional capture.

The polymer dosage at the WRP is substantially lower than the 40 lb/dry ton design criterion when dewatering a 50:50 mix of organic sludge and chemical sludge. Based on conversations with operators during site visits, the dewatering centrifuges use 50 to 60 lb active/dry ton of polymer when dewatering organic sludge only, which is higher than the range typically observed at BNR plants of 30 to 45 lb active/dry ton.

Table 5.29 Dewatering Centrifuges Performance Parameters

Parameter	Units	Value	Reference values
Centrifuge feed pH	standard units	8.2	
Solids capture rate, from data	percent	99.5	90+ typical, 95 target, 99+ achievable(1)
Solids capture rate, calculated from mass balance between centrifuge feed and dewatered sludge	percent	87.2	
Solids capture rate, calculated from mass balance between centrifuge feed and centrate	percent	99.6	
Polymer dosage	lb active/dry ton	18.1	40 design criterion

Notes:
(1) Source: Page 1735 and Table 22.2 in MOP 8 "Design of Water Resource Recovery Facilities", 2018.

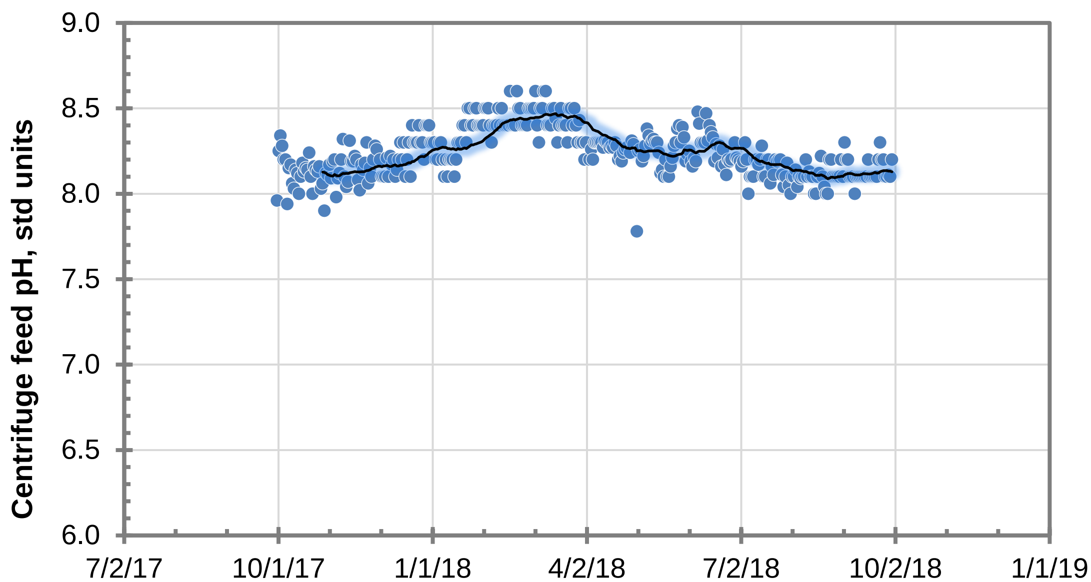

Figure 5.63 Centrifuge Feed pH

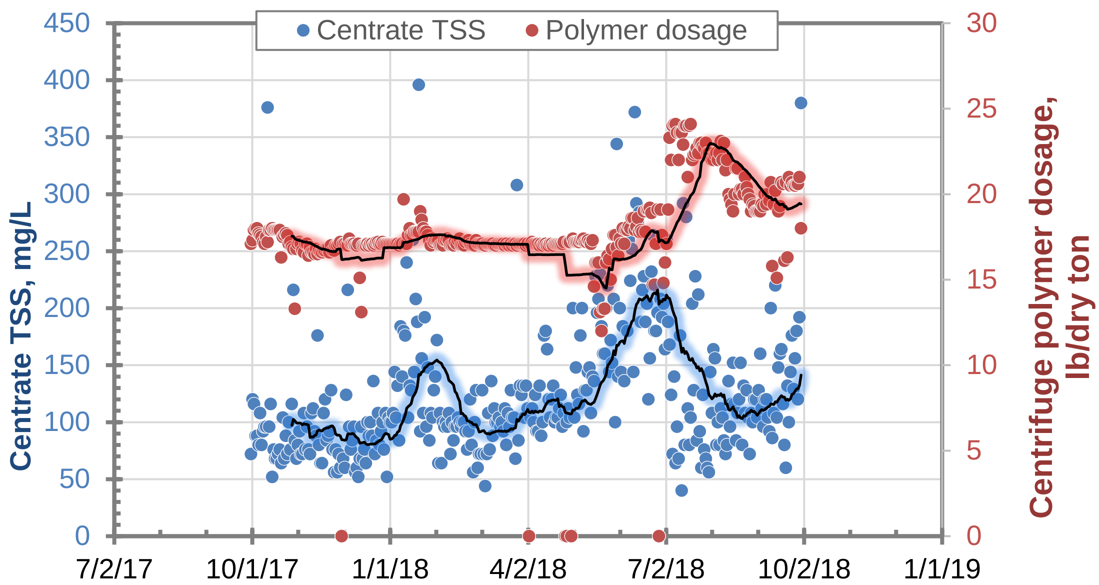

Figure 5.64 Centrifuge Polymer Dosage and Centrate TSS

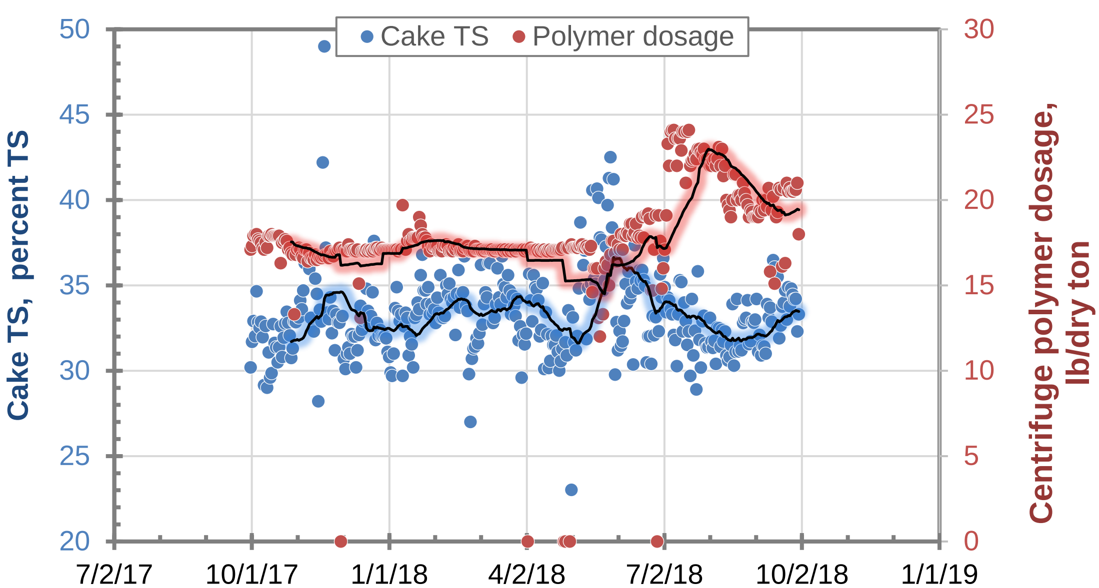

Figure 5.65 Centrifuge Polymer Dosage and Cake TS Concentration

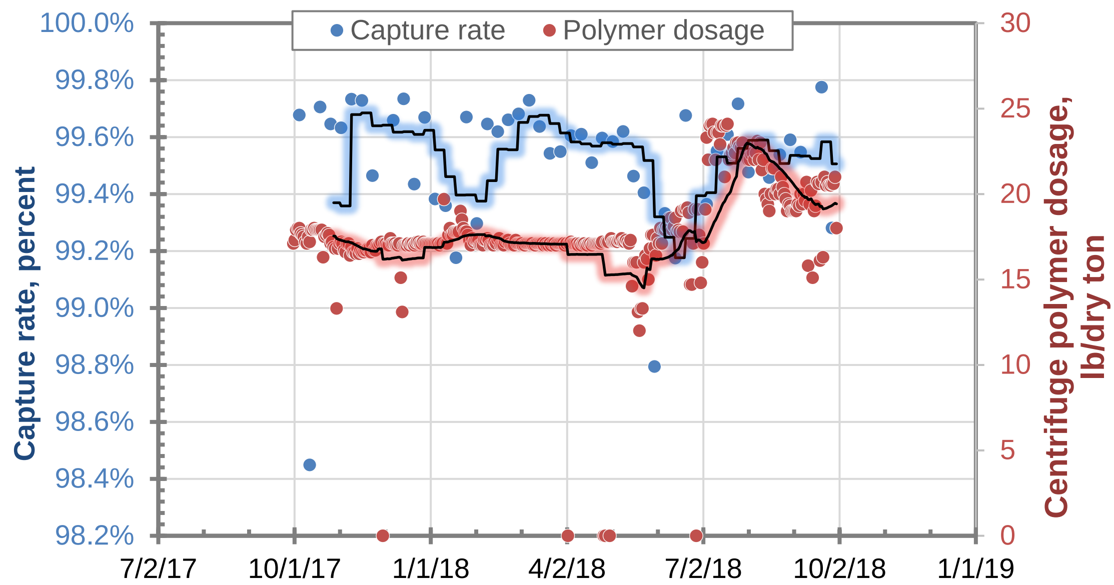

Figure 5.66 Centrifuge Polymer Dosage and Cake TS Concentration

5.11.9.4 Capacity Assessment

Table 5.30 compares the current and future centrifuge feed and cake flows and loads to the original design criteria for the dewatering centrifuges, and associated centrifuge feed pumps, and cake hoppers and loadout.

The two key parameters for centrifuge capacity assessment are the hydraulic loading and solids loading rates. Assuming eight hour per day seven day per week operations, one centrifuge and one centrifuge feed pump have sufficient capacity for all the conditions evaluated, except for the future MW flow. During future MW conditions, the operating schedule would need to be extended by a few hours.

It is recommended that cake storage hoppers have at least two days of storage to store cake during the weekend; with three to four days being ideal to store during long weekends or holidays. The cake storage hopper has less than three days storage during current MW conditions and during future AA and MW conditions. By 2032, the MW storage capacity is less than 2 days. T-TSA has managed this in the past by asking the hauler to operate on Saturdays. As long as this is a possible management strategy, no additional cake storage capacity should be needed.

Table 5.30 Dewatering Centrifuges and Associated Equipment Capacity Assessment

Parameter	Units	Capacity	Current AA	Current MW	Future AA	Future MW
Centrifuges						
Flow @ 24 hr/d, 7 d/wk	gpm	150	21	38	33	59
Flow @ 8 hr/d, 7 d/wk	gpm	150	64	115	98	176
TS load @ 24 hr/d, 7 d/wk	lb/hr	2,430	282	504	431	769
TS load @ 5 hr/d, 7 d/wk	lb/hr	2,430	847	1,511	1,293	2,307
Centrifuge Feed Pumps						
Flow @ 24 hr/d, 7 d/wk	gpm	150	21	38	33	59
Flow @ 8 hr/d, 7 d/wk	gpm	150	64	115	98	176
Cake Storage Hoppers						
Cake production	wet tons/d		18	32	27	49
Storage capacity (based on 80 wet tons)	days		4.4	2.5	2.9	1.6

Notes:
(1) Values in red indicate capacity exceedances.

5.11.10 Chemical Sludge Dewatering in Plate-and-Frame Filter Press

5.11.10.1 Description

The remaining portion (about 50 percent) of the thickened chemical sludge is dewatered in a plate-and-frame filter press, typically operated 1 or 2 times per week for periods of 2.5-3 hours. The plate-and-frame filter press system includes two filter feed pumps, the plate-and-frame filter press itself, a hydraulic press, a filtrate storage tank, and a control panel. The plate-and-frame filter press is a Shriver unit from 1974 consisting of 32 to 46, 69-inch by 52-inch, 1.25-inch thick chambers, with a total volume of up to 119 cu ft. The number of chambers in operation can be varied by moving the head plate; this allows for the WRP operators to control the weight of sludge in the chemical sludge bin.

Thickened chemical sludge is pumped from both chemical sludge gravity thickeners by one of two filter feed pumps to the plate-and-frame filter press. The plate-and-frame filter press dewaters chemical sludge in a batch operation, typically using only 70 percent of its capacity, due to weight limitations. Chemical sludge is pumped into the press chambers until it reaches the design pressure of 100 psi. After the plate-and-frame filter press dewaters the chemical sludge, the cake is dropped into a chemical sludge bin (requiring Operator initiation and monitoring), where it is combined with grit and rags, and then trucked off site for disposal. The dewatered chemical sludge bins are hauled by a contractor to Lockwood Regional Landfill for disposal.

In the event that both centrifuges are out of service, the filter press can be used for organic sludge dewatering. When dewatering chemical sludge, filtrate is returned to rapid mix. When processing organic sludge, filtrate flows into a filtrate tank, and is then conveyed to AWT for ammonia stripping prior to recycling to headworks.

5.11.10.2 Original Design Criteria

Table 5.31 summarizes the original design criteria for the plate-and-frame filter press, and all its associated equipment, including two filter feed pumps, a hydrated lime system, a ferric chloride system, a chemical sludge cake bin and truck offloading system, a filtrate storage tank, a filtrate measuring weir, and an acid storage and wash tank.

Table 5.31 Plate-and-Frame Filter Press and Associated Equipment Original Design Criteria

Parameter	Units	Value
Plate-and-Frame Filter Press		
Year Constructed		1975
Number		1
Number of chambers		32-46
Chamber height	inches	69
Chamber width	inches	53
Chamber thickness	inches	1.25
Filter press volume	cu ft	83-119
Filter press volume	yd^3 (1)	3.08-4.42
Press cycle time, chemical	hour	1
Press cycle time, organic	hour	2.5
Ready Tank		
Number		1
Active Volume	cu ft	340
Filtrate Tank		
Number		1
Active Volume	gals	8,400
Feed Pumps		
Number		2
Type		Variable speed,
Capacity, each	gpm	220
Horsepower, each	hp	50

Notes:
(1) yd^3 = cubic yards

5.11.10.3 Performance Assessment

Equipment and operational issues identified from discussions with operators during site visits include:

- There is only one plate-and-frame filter press, so the lack of redundancy is a concern. Should the press become unavailable or parts become more difficult to obtain, the plant's chemical sludge processing would be endangered.
- There are several locations around the press with concrete deterioration that require repair.

- The press control instruments are antiquated.
- The plate-and-frame filter press can only be used reliably for chemical sludge on its own, or with chemical sludge as a "coating" on the cloths because organic sludge binds the cloths. When binded, the press cannot perform as needed and the cloths become difficult to clean.
- Operators would like a separate system for rags and grit disposal, so that they are not dependent on running a chemical sludge load through the filter press to dispose of rags and grit.

Key loading and operational parameters for the plate-and-frame filter press and associated equipment are the feed and dewatered chemical sludge flow and solids concentration, the hydraulic and solids loading rate, and the solids capture rate.

Table 5.32 shows the filter press feed and dewatered chemical sludge mass flow and TS concentration. Figure 5.67 and Figure 5.68 show the dewatered chemical sludge mass flow and TS concentrations. The chemical sludge feed flow to the press in Table 5.32 is not measured, but was back-calculated assuming 100 percent capture. The daily mass flow in Figure 5.67 was back-calculated from monthly totals.

The dewatered sludge TS concentration varied widely during the year evaluated from 57 percent to 32 percent TS. Based on conversations with T-TSA staff, this was because the filter press cloths needed be acid washed and replaced. Staff has now implemented preventative maintenance that includes acid washing the cloths every year and replacing the cloths every 5 to 7 years. Ever since this preventative maintenance was established, performance has been pretty consistent, with dewatered chemical sludge concentrations ranging from 45 to 55 percent TS.

Table 5.32 Plate-and-Frame Filter Press Feed and Dewatered Cake Mass Flows and Concentrations

Parameter	Units	Thickened Chemical Sludge(2)	Dewatered Chemical Sludge
Total mass flow	wet klb/d	24.5	6.4
TS concentration	%TS	12.1	46.2
TS load	klb/d	2.96	2.96(1)

Notes:
(1) Calculated from total mass flow and concentration.
(2) Back-calculated from dewatered chemical sludge, assuming 100 percent capture rate.

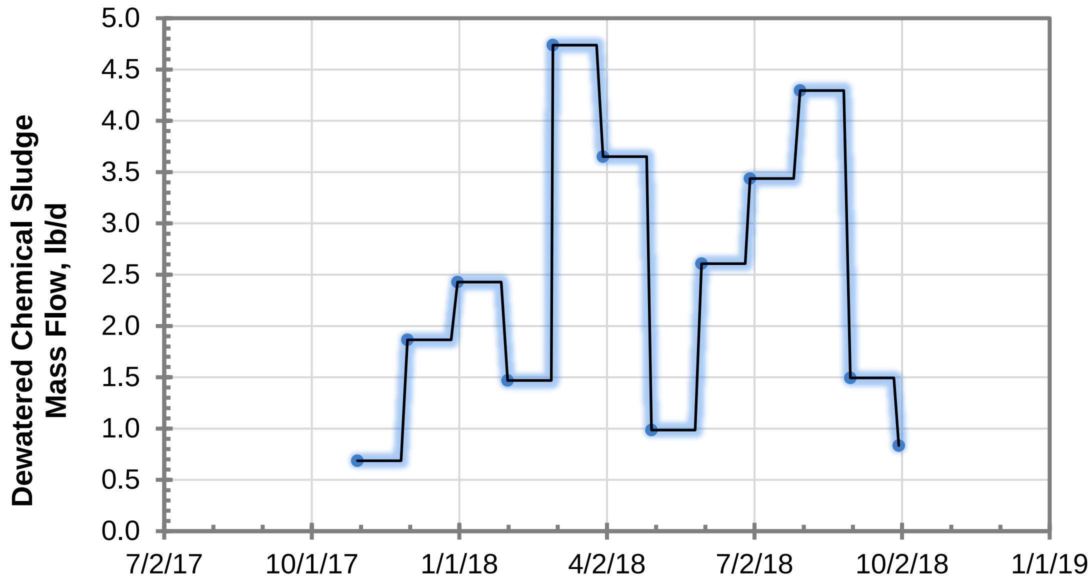

Figure 5.67 Dewatered Chemical Sludge Mass Flow

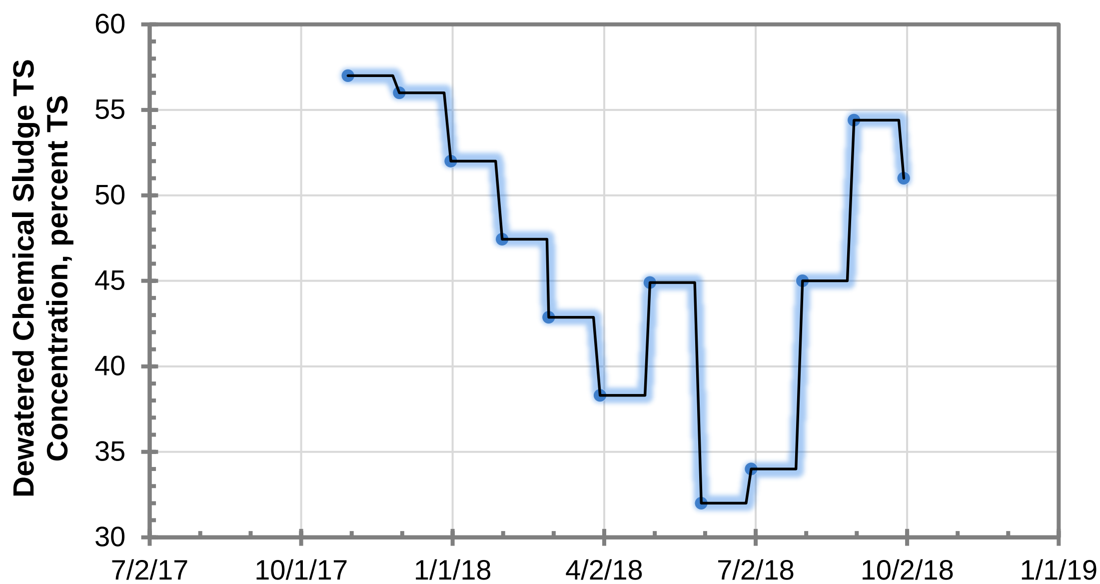

Figure 5.68 Dewatered Chemical Sludge TS Concentration

5.11.10.4 Capacity Assessment

Table 5.33 compares the current and future filter press feed and cake flows and loads to the original design criteria for the filter press, and associated feed pumps. Values in red bold indicate that the capacity is exceeded and either an expansion or a change in operations is needed.

The key parameter for filter press capacity assessment is the total filter press volume of 4.42 yd^3. For chemical sludge, only about 70 percent of the volume, or 3.08 yd^3, can be used because of weight limitations. The number of loads and total press cycle time were calculated for two scenarios: current operations whereby about 50 percent of the chemical sludge is dewatered in the filter press, and a worst case scenario in which both centrifuges are out of service and all of the chemical sludge and organic sludge is dewatered in the filter press.

For the current operations scenario, the filter press and feed pumps have sufficient capacity to dewater the chemical sludge through future conditions.

For the worst case scenario where the press is used to dewater all of the chemical and organic sludge, the press cycle time for all conditions exceeds 40 hours a week and would require overtime operations. To reduce overtime, it may be possible to install additional chambers to increase the capacity per cycle.

The feed pumps have enough capacity in all flow conditions and operational scenarios evaluated.

Table 5.33 Filter Press and Associated Equipment Capacity Assessment

Parameter	Units	Capacity	Current AA	Current MW	Future AA	Future MW
Filter Press (50 percent of chemical sludge)						
Dewatered chemical sludge flow	kgal/d		0.77	1.5	1.2	2.3
Dewatered chemical sludge volume	yd^3/day		3.8	7.6	5.8	11.6
Loads per day			1.2	2.5	1.9	3.8
Press cycle time	hr/day		2.0	3.0	2.0	4.0
Press cycle time	hr/week		14	21	14	28
Feed pumps (50 percent of chemical sludge)						
Thickened chemical sludge flow	kgal/d		2.8	5.7	4.3	8.7
Thickened chemical sludge flow to filter press	gpm	450	47	47	36	48
Filter Press (100 percent of chemical sludge and organic sludge)						
Chemical sludge flow, loads per day, and cycle time						
Dewatered chemical sludge flow	kgal/d		1.7	3.4	2.6	5.2
Dewatered chemical sludge volume	yd^3/day		8.5	17.0	13.0	25.9
Loads per day, chemical sludge(1)			2.8	5.5	4.2	8.4
Press cycle time, chemical sludge(2)	hr/day		3.0	6.0	5.0	9.0
Press cycle time, chemical sludge	hr/week		21	42	35	63

Parameter	Units	Capacity	Current AA	Current MW	Future AA	Future MW
Organic sludge flow, loads per day, and cycle time						
Dewatered organic sludge flow(3)	kgal/d		1.1	2.0	1.7	3.0
Dewatered organic sludge volume	yd^3/day		5.6	9.9	8.6	15.1
Loads per day, organic sludge(4)			1.3	2.2	1.9	3.4
Press cycle time, organic sludge(5)	hr/day		5.0	7.5	5.0	10.0
Press cycle time, organic sludge	hr/week		35	53	35	70
Total loads per day, and cycle time						
Loads per day, total			5.0	9.0	7.0	13.0
Press cycle time, total	hr/day		8.0	13.5	10.0	19.0
Press cycle time, total	hr/week		56	95	70	133
Feed pumps (100 percent of chemical sludge and organic sludge)						
Thickened chemical sludge flow	kgal/d		6.3	12.7	9.7	19.3
Thickened chemical sludge flow to filter press	gpm	450	53	53	54	64
Digested sludge flow	kgal/d		27	13	42	19
Digested sludge flow to filter press	gpm	450	183	42	140	64

Notes:
(1) Chemical sludge loads per day based on cake volume and using 32 chambers, equivalent to 3.08 yd^3 filter press capacity.
(2) Chemical sludge cycle time based on 1 hr per cycle.
(3) Dewatered organic sludge flow and volume calculated assuming 35%TS.
(4) Organic sludge loads per day based on cake volume and using 46 chambers, equivalent to 4.42 yd^3 filter press capacity.
(5) Chemical sludge cycle time based on 2.5 hr per cycle.
(6) Values in red indicate capacity exceedances.

5.12 Support Systems

Per discussion with T-TSA staff, some of the plant can be ran off the 1,000 kW generator. A steam system is used for heating many of the original buildings on site. During the condition assessment site visit in May 2019, it was noted that several of the support systems have deficiencies:

- The BNR Standby Generator No. 3 (1,500 kW) does not currently have a seamless transfer. It is recommended the load bank be replaced if further assessments show that replacement is warranted.

- The 1981 Caterpillar 1,000 kW generator is cooled using chlorinated plant water. The chlorinated effluent is hard on the lines. It is recommended that cooling be done through a closed-loop system or changed to air-cooled. The 1975 Kato 750 kW generator recently failed. It is recommended that a new air-cooled 1,500 kW generator along with new switch gear be installed to replace the 1981 Caterpillar 1,000 kW generator and the recently failed 1975 Kato 750 kW generator.
- Condensate return is a challenge.
- Reliability is a concern with existing 2-water system, specifically with regards to the existing pressurized tank. Typical operations yield a chlorine concentration of 5 to 8 ppm (although it has been as high as 12 ppm in the past); high chlorine concentrations can lead to corrosion in the 2-water system and in the equipment utilizing 2-water. Dechlorinating the 2-water should be considered, and a valve vault added to address issues with buried valve accessibility.
- The WRP has various chemical storage and feed systems, some of which are no longer used to the same extent as processes have changed over the years. Specific recommendations to update the chemical storage and feed systems are that the sulfuric acid storage could be much smaller, possibly using 250 gal totes; the caustic storage tanks can remain for WRP usage; and the salt storage tanks can be removed. Additionally, the pumps and control panels associated with the chemical feed systems should be replaced as they age and performance is compromised.
- The plant air systems provide instrument air for valves and other pneumatic systems. The compressors are newer (~15 years old) and there have been no operational concerns with them. However, the plant air system tank is nearing the end of its service life and should be replaced.

5.13 Conclusion

Key findings and recommendations from this TM are summarized in Chapter 4.

Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 3:
WATER RECLAMATION PLANT MASTER PLAN
CHAPTER 5:
REGULATORY REQUIREMENTS

FINAL | February 2022

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Chapter 5

REGULATORY REQUIREMENTS

5.1 Introduction

This chapter summarizes regulatory requirements that affect the operation of the existing water reclamation plant (WRP) facilities. This includes a comprehensive review of the regulations governing final effluent, solids treatment and use/disposal, and air emissions. In addition, potential impacts of future regulations are considered. The Master Sewer Plan provides a strategic plan for critical plant projects that will be implemented over the next 25 years. Recommendations for these projects were developed to meet existing regulatory requirements with the flexibility to meet potential future regulatory requirements. Assessment of current and future regulatory requirements is critical to the development of appropriate alternatives.

This chapter provides a summary of:

- Tahoe-Truckee Sanitation Agency's (T-TSA/Agency's) current operating permits.
- Existing federal, state, and regional regulatory requirements governing: 1) the discharge of treated wastewater, 2) solids treatment and use/disposal, and 3) applicable air quality compliance requirements (odor and air emissions, greenhouse gas emissions, etc.).
- Applicable new and emerging regulatory issues.

5.2 Summary of Findings and Conclusions

Future regulatory scenarios were developed based on the analysis of T-TSA's existing permit requirements and identification/evaluation of future regulatory concerns based on various plans, policies, and actions by relevant regulating authorities.

It is recommended that the master plan addresses the following future regulatory conditions related to the discharge of treated wastewater:

- Waste Discharge Requirements with More Stringent Nutrient Limits – For this scenario it is assumed that T-TSA's waste discharge requirements would remain the same with the exception of more stringent nutrient limits to further reduce any impacts of T-TSA effluent on the Truckee River and Martis Creek, and to enhance attainment of receiving water quality objectives.
- Federal National Pollutant Discharge Elimination System (NPDES) Permit Program – This scenario assumes that T-TSA would be regulated under the Federal NPDES permitting program. It is assumed that potential new water quality based effluent limits would include metals and organics, lower disinfection byproduct limits, and limits for contaminants of emerging concern (CECs).
- Enhanced Total Dissolved Solids (TDS) and Chloride Limits – This scenario assumes that more stringent requirements for TDS and chloride would be imposed, either under the existing permit framework or under the NPDES permit program.

For these scenarios both optimization of the existing treatment process and treatment plant upgrades will be identified and evaluated at the planning level. While there is potential for more stringent TDS and chloride limits, it is anticipated that if more stringent limits were to be imposed, then this would occur in the latter part of the planning horizon or beyond the planning horizon. Therefore, it is recommended that this master plan include a conceptual level evaluation of process upgrades to achieve more stringent TDS and chloride limits.

With respect to biosolids disposal, the regulations in California for landfilling of biosolids are becoming increasingly restrictive. Since T-TSA currently disposes of biosolids in Nevada and regulations in that state do not appear to be changing in the near future, the Agency is somewhat shielded from these regulations. However, California's regulations may impact T-TSA as they will likely lead other nearby agencies to look to Nevada for disposal which could increase competition and cost for disposal. To mitigate this issue, it is recommended that T-TSA maintain the approach of diversified biosolids management. Additionally, starting in the third quarter of 2019, T-TSA will be required to report the types, quantities, and destinations of their biosolids to California Department of Resources Recycling and Recovery (CalRecycle). However, neither of these issues should impact capital improvement recommendations associated with this master plan.

For air quality compliance issues, it is anticipated that additional emissions monitoring and more restrictive emissions limits for toxic air contaminants (TACs) may limit onsite biogas management options, which is closely linked to the anaerobic digestion process. Additionally, any modifications to the existing waste gas flare will most likely trigger new permitting through the Northern Sierra Air Quality Management District (NSAQMD). Therefore, the Master Sewer Plan will need to consider these factors.

5.3 Overview of Existing Water Quality Regulations

5.3.1 Regulatory Setting

T-TSA is located within the Truckee River Hydrologic Unit. Discharge activities occur within the California portion of the Truckee River watershed. The Truckee River watershed is a unique system that spans the jurisdictional boundaries of two states, California and Nevada, and a federally recognized tribe. California, Nevada, and the Pyramid Lake Paiute Tribe have the authority to implement the Clean Water Act (CWA), the primary federal statute regulating the protection of the nation's water.

In California, the Porter-Cologne Water Quality Control Act (Porter-Cologne) is the principal law governing water quality regulation. Key elements of the Porter-Cologne Act include:

- Regional Water Board Authority to regulate discharges primarily through issuance of NPDES permits for point source discharges and waste discharge requirements (WDRs) for nonpoint source pollution (NPS) discharges.
- Requirements for adoption of regional water quality control plans (Basin Plans) that contain the guiding policies of water pollution management in California.

The California section of the Truckee River watershed is under the jurisdiction of the Lahontan Regional Water Quality Control Board (LRWQCB). The Lahontan Basin Plan designates beneficial uses for water bodies and establishes water quality objectives [inclusive of the California State Water Resources Control Board (SWRCB) Antidegradation Policy], waste discharge prohibitions, and other implementation measures to protect those beneficial uses.

The Lahontan Basin Plan also includes Total Maximum Daily Loads (TMDLs), which are adopted as Basin Plan amendments.

While SWRCB and LRWQCB regulations and policies are directly applicable to T-TSA, the regulations and policies of downstream agencies are indirectly applicable, as California water quality standards for the Truckee River are supposed to be protective of downstream beneficial uses.

Water quality standards for the Truckee River in Nevada are established and enforced by the Nevada Division of Environmental Protection (NDEP) and the Pyramid Lake Paiute Tribe Environmental Department. The boundary of Pyramid Lake Paiute Tribe lands defines the jurisdictional boundary between these two agencies. In addition to establishing/enforcing water quality standards, the NDEP and the Pyramid Lake Paiute Tribe Environmental Department are responsible for developing TMDLs, as needed.

T-TSA discharge requirements have been developed with consideration of groundwater objectives, surface water quality standards/objectives, and TMDLs, specifically:

- Waste discharge requirements must consider the beneficial uses to be protected and the water quality objectives established to be protective of beneficial uses.
- TMDLs establish waste load allocations which put mass limits on point sources that can be written into permits.

Changes in groundwater and surface water objectives/standards and/or TMDLs have the potential to influence future permit requirements.

5.3.2 Existing T-TSA Waste Discharge Requirements

5.3.2.1 Facility Background

The T-TSA owns and operates the Martis Valley WRP. The T-TSA is designated as the regional entity to transport, treat, and dispose of wastewater from the North Tahoe Public Utility District, Tahoe City Public Utility District, Alpine Springs County Water District, Olympic Valley Public Service District, and the Truckee Sanitary District. The current waste discharge requirements, Order No. R6T-2002-0030, WDID No. CA6A290011000 (Permit), were adopted on May 9, 2002. Appendix 5A includes the current permit.

The WRP is permitted for maximum dry weather and instantaneous flows as follows:

- Not to exceed an arithmetic mean flow over any consecutive 7-day period of 9.6 million gallons per day (mgd). This applies from June 21 through September 21 of any given year.
- Not to exceed an instantaneous maximum flow of 15.4 mgd.

The WRP has emergency wastewater storage facilities capable of preventing treatment and disposal facility overloading or unauthorized discharges due to excessive flows or system breakdowns. These facilities have a combined volume of 24 million gallons. These facilities are used to store excess raw wastewater upstream of the headworks when influent flows exceed the plant's treatment capacity of 15.4 mgd. When influent flows subside, the stored wastewater is routed back to the headworks of the WRP for full treatment.

The WRP provides tertiary level treatment and the effluent is discharged to subsurface disposal fields. The WRP disposal fields are shown in Figure 5.1.

5.3.2.2 Beneficial Uses and Water Quality Standards

The T-TSA effluent is discharged to the ground waters of the Martis Valley Groundwater Basin via subsurface disposal fields. As described in the Permit, previous studies (models and tracer studies), have indicated that the plant effluent discharged to the subsurface disposal system will migrate from the disposal site toward the Truckee River and Martis Creek, a tributary of the Truckee River. The beneficial uses of the Martis Valley Groundwater Basin, the Truckee River, and Martis Creek are summarized in Table 5.1

Table 5.1 Summary of Beneficial Uses

Beneficial Uses	Abbreviation	Groundwater	Surface Waters	
		Martis Valley Groundwater Basin	Truckee River	Martis Creek
Municipal and Domestic Water Supply	MUN	✓	✓	✓
Agricultural Water Supply	AGR	✓	✓	✓
Freshwater Replenishment	FRSH	✓	✓	
Industrial Service Supply	IND		✓	
Groundwater Recharge	GWR		✓	✓
Hydropower Generation	POW		✓	
Water Contact Recreation	REC1		✓	✓
Non-Contact Water Recreation	REC2		✓	✓
Commercial and Sport Fishing	COMM		✓	✓
Cold Freshwater Habitat	COLD		✓	✓
Wildlife Habitat	WILD		✓	✓
Rare, Threatened. or Endangered Species	RARE		✓	✓
Migration of Aquatic Organisms	MIGR		✓	✓
Spawning, Reproduction, and Development	SPWN		✓	✓

T-TSA's permit limits are primarily based on the beneficial uses and associated water quality standards of the California portion of the Truckee River, Martis Creek and the Martis Valley Groundwater Basin. Water quality objectives have been established for the Martis Groundwater Basin, Truckee River, and Martis Creek, based on the beneficial uses of these waters.

The Permit requires that the treated wastewater effluent does not cause a violation of water quality objectives for the waters of the Martis Valley Ground Water Basin. The complete list of groundwater quality objectives is included in the Permit (Appendix 5A). The objectives are primarily associated with the MUN and AGR beneficial uses of the Martis Valley Ground Water Basin. Key objectives include:

- Bacteria – Median concentration of coliforms over any 7-day period shall be less than 1.1 most probable number (MPN) per 100 milliliters (mL).
- Chemical Constituents – Concentrations shall not exceed primary and secondary drinking water standards.

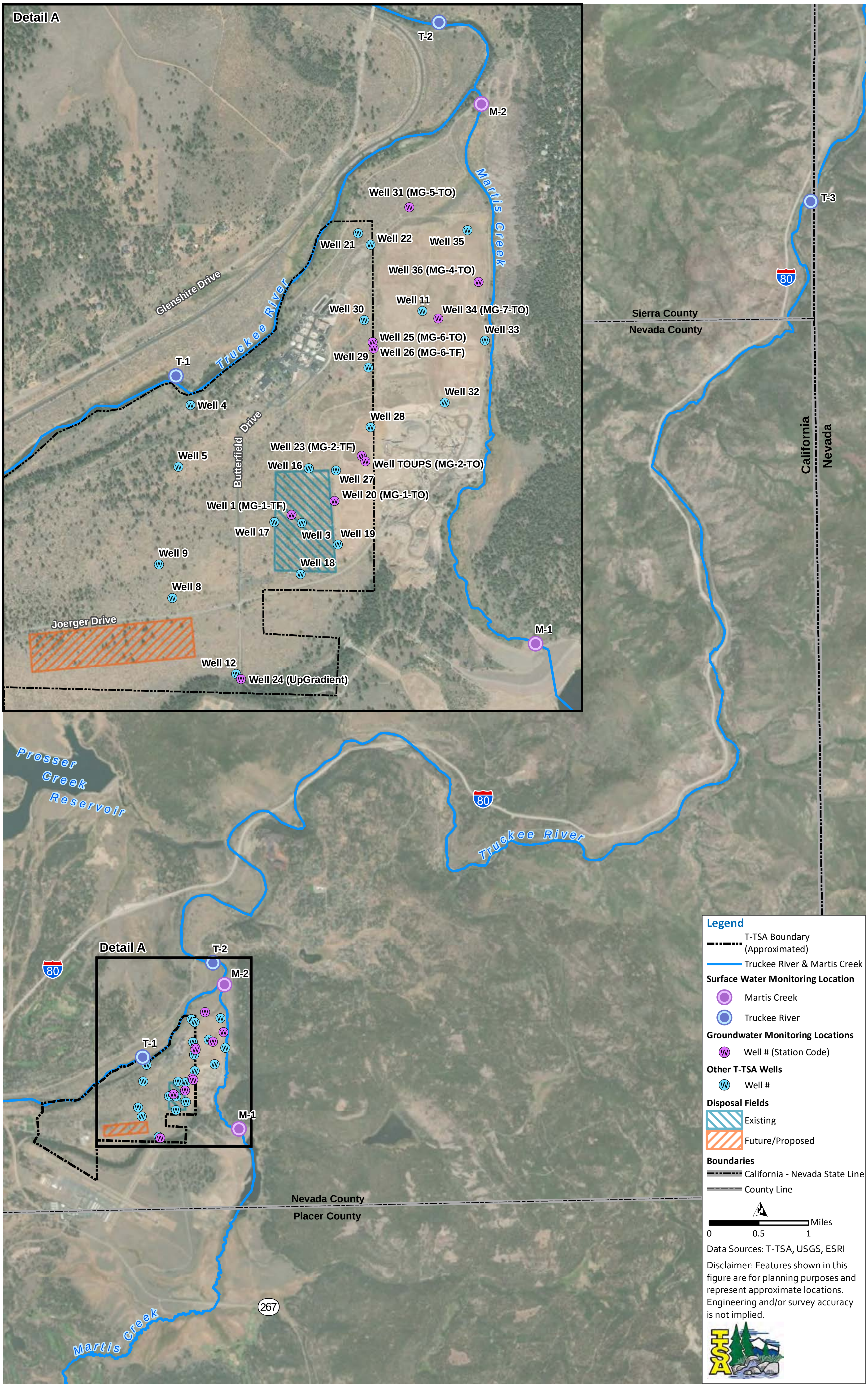

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Figure 5.1 Monitoring Locations

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The Permit also requires that the treated wastewater effluent does not violate water quality objectives for surface waters for the Truckee River Hydrologic Unit. The complete list of groundwater quality objectives is included in the Permit (Appendix 5A). Key objectives include:

- Turbidity.
- Algal Growth Potential.
- Biostimulatory Substances.
- Species Composition.
- Dissolved Oxygen.
- Temperature.
- Toxicity.
- Pesticides.
- Bacteria.
- Radioactivity.
- Chemical Constituents.
- Non-Degradation of Aquatic Communities and Populations.
- Unionized Ammonia.

T-TSA's permit limits are also indirectly based on downstream standards and beneficial uses. The linkage to the portions of the river under the NDEP and the Pyramid Lake Paiute Tribe is that the California water quality standards for the Truckee River are also required to be protective of downstream beneficial uses. Important beneficial uses downstream of the California/Nevada Stateline, include:

- RARE – For the purpose of supporting habitat necessary for the survival and successful maintenance of plant or animal species established as rare, threatened, or endangered. In particular, the Lahontan cutthroat trout (threatened species) and Cui-ui (endangered species).
- MUN – Water supply for the Truckee Meadows region.

5.3.2.3 TMDLs

TMDLs on the Truckee River include:

- Sediment TMDL – This TMDL was established in 2008 and addresses sediment-related water quality objectives for the reach of the Truckee River from the outflow at Lake Tahoe to the California/Nevada state line. T-TSA is **not** named as a responsible party in the TMDL.
- Total Nitrogen (TN), Total Phosphorus (TP), and TDS TMDLs – These TMDLs were established in 1994 for the lower Truckee River to be protective of Lower River beneficial uses. T-TSA is **not** named as a responsible party in the TMDL; however, the WRP contributes to the background TN, TP, and TDS loads at the California/Nevada Stateline. While the TMDLs are not directly applicable to T-TSA effluent disposal, the T-TSA loads for TN, TP, and TDS contribute to the background load of the TMDLs (defined as the McCarran sampling station on the Truckee River located west of the City of Reno). Therefore, the Lower River TN, TP, and TDS TMDLs are a consideration of the LRWQCB and can inform permit conditions. The LRWQCB coordinates with the NDEP on the applicability of the Nevada TMDLs for the Truckee River to the river reaches in California, to establish consistent standards for the river in both states (LRWQCB 2005).

5.3.2.4 Permit Effluent Limits

The discharge specifications in the Permit generally include:

- Effluent Limits – Effluent that is available for percolation.
- Receiving Water Limits – Downgradient receiving water sites for the Truckee River (T-2) and Martis Creek (M-2).
- Groundwater Limits at Well 31 – Groundwater well located downgradient of the subsurface disposal fields.

Specific locations for the Permit requirements are shown above in Figure 5.1. The permit limits are summarized in Table 5.2. T-TSA is required to meet several mass loading limits at Well 31. The loading limits for total phosphorus, total nitrogen, total dissolved solids, and chloride are presented in Table 5.3.

5.4 Assessment of Future Water Quality Regulations

Future regulatory requirements are challenging to predict; however, there are some regulatory developments that are underway or have been mentioned in previous planning documents that provide some insight into potential regulatory changes. It is critical that T-TSA continues to monitor/track and engage as a stakeholder in regulatory processes that may lead to changes in water quality standards and permit limits.

Key issues that warrant close attention include:

- Nutrients.
- TDS.
- Permitting Framework.
- Emerging Contaminants.

5.4.1 Nutrients

There is historical and current information that suggests the potential for more stringent nutrient limits in the future, including:

- Concerns raised by the LRWQCB in previous reports.
- LRWQCB permit required studies.
- Proposed additions to the 303(d) list (LRWQCB Resolution R6T-2019-0276).
- Possibility of changes in Lower River standards and TMDLs.

Table 5.2 Permit Requirements (Order No. R6T-2002-0030)

		Treated Effluent						Percolated Treated Wastewater (Well 31 (MG-5-TO))							Receiving Water Limits			
Constituent	Units	Annual average[1]	Monthly average[2]	7-day average	Maximum[3]	Instantaneous	Sampling frequency	Annual average	6-month average	Monthly average[2]	7-day average	Maximum[3]	Instantaneous	Sampling frequency	Truckee River, below Martis Creek[4]	Truckee River, Stateline[4]	Martis Creek[4]	Sampling frequency
Flow rate	mgd			9.6[5]		15.4	continuous											
Total suspended solids	milligrams per liter (mg/L)		10		20		24-hr comp, 1x/week											
Chemical oxygen demand	mg/L		45		60		24-hr comp, 2x/week			15		40		grab, 1x/week				
Un-ionized ammonia	milligrams of nitrogen per liter (mgN/L)									--		0.20		(calculated based on 1x/week grab of ammonia nitrogen (NH_3-N), pH, and temperature)				
Total nitrogen	mgN/L							3.0[6]	2.0[7]			--		(calculated based on 1x/week grab of TKN and nitrate nitrogen [NO_3-N])	0.40	0.40	1.45	(calculated based on 1x/month grab of TKN and NO_3-N)
Total Kjeldahl nitrogen (TKN)	mgN/L						24-hr comp, 3x/week							grab, 1x/week	0.20	0.32	0.45	grab, 1x/month
Nitrate nitrogen	mgN/L						24-hr comp, 3x/week							grab, 1x/week	0.20	0.08	1.00	grab, 2x/month
Total phosphorus	milligrams of phosphorus per liter (mgP/L)		0.8		1.5		24-hr comp, 2x/week	0.3[1]				--		grab, 1x/week	0.05	0.05	0.05	grab, 1x/month
pH	std units												6.5 - 8.5	grab, 1x/week				grab, 1x/month
Total coliform	MPN/ 100 mL			23[8]			grab, daily											grab, 1x/month
Fecal coliform	MPN/ 100 mL									--	2.2[9]			grab, 1x/week				grab, 1x/month
Dissolved oxygen	mg/L					>0.5	grab, daily											grab, 1x/month
Turbidity	Nephelo-metric turbidity units (NTU)		--		10		24-hour comp, daily											

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		Treated Effluent						Percolated Treated Wastewater (Well 31 (MG-5-TO))							Receiving Water Limits			
Constituent	Units	Annual average (1)	Monthly average (2)	7-day average	Maximum (3)	Instantaneous	Sampling frequency	Annual average	6-month average	Monthly average (2)	7-day average	Maximum (3)	Instantaneous	Sampling frequency	Truckee River, below Martis Creek (4)	Truckee River, Stateline (4)	Martis Creek (4)	Sampling frequency
Total trihalomethanes	parts per billion (ppb)	50					24-hr comp, 4x/year											
Total dissolved solids	mg/L														80	75	150	grab, 1x/month
Chloride	mg/L														10	8	25	grab, 1x/month
Sulfate	mg/L														5	5	8	grab, 1x/month
Total iron	mg/L														0.29	0.30	0.40	grab, 1x/month
Boron	mg/L														--	1.0 (10)		grab, 1x/month

Notes:
(1) Annual Average = Arithmetic mean of all measurements made during a calendar year.
(2) Monthly Average = Arithmetic mean of measurements made during a month.
(3) Maximum = The highest daily 24-hour composite measurement during the monitoring period.
(4) Arithmetic mean of monthly means, except where noted.
(5) Average of any seven consecutive days shall not exceed 9.6 mgd - Applicable from June 21 through September 21.
(6) Average of monthly averages from Jan 1 to December 31.
(7) Average of monthly averages from May 1 to October 31.
(8) 7-day mean of no more than 23 MPN/100 mL and shall have a mean of any two consecutive samples of no more than 240 MPN/100 mL.
(9) Mean of 7-day average.
(10) Maximum limitation.

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Table 5.3 2002 Permit Mass Load Permit Requirements

Constituent	Percolated treated wastewater (Well 31 (MG-5-TO))		
	Units(1)	Annual average(2)	6-month average(3)
Total Phosphorus (as P)	ppd	24	-
Total Nitrogen			
May 1 - October 31	ppd	-	128
Yearly Average	ppd	204	-
Total Dissolved Solids	ppd	Average Annual Flow *360 mg/L*8.345 or 24,514, whichever is less	
Chloride	ppd	Average Annual Flow *100 mg/L*8.345 or 6,809, whichever is less	

Notes:
(1) ppd = pounds per day.
(2) Average of monthly averages for calendar year.
(3) Average of monthly averages from May 1-October 31.

LRWQCB Reports. The LRWQCB Watershed Management Initiative is part of a Strategic Plan that guides the water resource protection efforts of the State and Regional Water Boards. The LRWQCB prepared the Watershed Management Initiative Chapter (LRWQCB 2005) as part of this effort. The Truckee River Watershed is one of the focus watersheds, and the threats to water quality are identified.

The LRWQCB identified concerns over the potential impacts of T-TSA effluent on the Truckee River and Martis Creek:

> *"Although T-TSA provides advanced treatment, nutrient loading to the Truckee River and Martis Creek is still a concern, and increased nitrate loading has been documented downstream of the T-TSA plant. The phosphorus absorption capability of T-TSA's leach field may soon be reached."*

While the last update to the Watershed Management Initiative Chapter was over a decade ago, and likely before the biological nitrogen removal system was performing as designed, it highlights a LRWQCB concern about nutrient levels in the Truckee River and specifically the potential impact of T-TSA's effluent discharge practices on nutrient levels in the river.

In addition, the LRWQCB (2005) notes concerns about changes in water quality as a result of changes in instream flows. The Truckee River Operating Agreement (TROA), implemented in December 2015, governs flow management and consumptive use of Truckee River waters. Because flow and water quality are intrinsically linked, there is a concern that changes in instream flows will affect the assimilative capacity of the river for nutrients. Changes in assimilative capacity could lead to violations of water quality objectives.

It is difficult to assess the impacts/benefits of TROA on Truckee River water quality to date. The Truckee River Watershed Council conducts annual monitoring/reporting on a number of locations in the watershed, and the California Department of Water Resources (CA DWR) published a report for water year 2017. Since 2016 was the first year of TROA implementation, there is a limited dataset on water quality pre- and post-TROA. CA DWR (2017) compared water year 2017 to water year 2011 (pre-TROA with similar hydrology) and did not find any noticeable changes in water quality resulting from the implementation of TROA. Truckee River Watershed Council (2018) reported some adverse impacts on the biological community of Prosser Creek after TROA, but no specific impacts were noted for the main stem of the Truckee River.

LRWQCB Permit Required Studies. The Permit included a requirement for T-TSA to conduct the Martis Creek Watershed Phosphorus Study, based on concerns regarding assimilative capacity for phosphorus. The objective of the study was to identify phosphorus sources and control measures that could be implemented in the watershed to reduce loading to the creek and to increase assimilative capacity for future T-TSA discharges (i.e., from the planned increase in capacity of T-TSA from 7.4 mgd to 9.6 mgd [7-day average summer flows]). The Martis Creek Watershed Phosphorus Study (CH2M Hill, 2004) identified soils with high phosphorus content as a key contributor to phosphorus loads to Martis Creek. The study also found that the BMPs implemented for erosion and phosphorus control, in the developed regions of the watershed, were effective.

While this study focuses on the land based processes that may contribute to phosphorus loadings to Martis Creek, the requirement for T-TSA to conduct this study (per the T-TSA Permit) highlights the LRWQCB concern regarding phosphorus concentrations and assimilative capacity of Martis Creek.

Proposed 303(d) Listings. CWA Sections 303(d) and 305(b) require states to assess the quality of their surface waters on a regular basis. The purpose of these assessments is to identify water bodies that are "impaired" and do not meet water quality standards (LRWQCB, 2018). The 2018 Integrated Report for the Lahontan Water Board (LRWQCB, 2018) includes 303(d) listing recommendations. The LRWQCB will consider adoption of a Resolution recommending these changes to the SWRCB for inclusion on the statewide 2018 303(d) list, and ultimately to the United States Environmental Protection Agency for approval. The LRWQCB held a public hearing on the 2018 Integrated Report in November 2019. According to the SWRCB website, the 2014/2016 Integrated Report is the current report, and the 2018 Integrated Report is in progress (i.e., not yet adopted by the SWRCB).

The 2018 Integrated Report for the Lahontan Water Board includes the following recommendations for Martis Creek and the Truckee River, within the reaches that are receiving waters for T-TSA effluent disposal fields:

- Martis Creek: List Martis Creek on the 303(d) list for phosphorus, with an expected TMDL completion date of 2031.
- Truckee River: List Truckee River on the 303(d) list for nitrate, with an expected TMDL completion date of 2031.

If the 2018 Integrated Report (inclusive of the recommended 303(d) List) is approved by the SWRCB and the United States Environmental Protection Agency (EPA), then TMDLs will be required for phosphorus and nitrate. The development of phosphorus and nitrate TMDLs may lead to more stringent nutrient requirements in T-TSA's permit limits.

In response to the recommendations in the 2018 Integrated Report, T-TSA has submitted a request to the SWRCB for review and comment on the listing decision for nitrate (See Appendix 5B T-TSA Letter to the SWRCB, December 19, 2019). The T-TSA letter specifically requests review of the averaging period used to assess attainment of the nitrate standard. The primary issue is that the listing decision appears to be based on monthly mean values, rather than the arithmetic mean of monthly means (the average of monthly values over the period of record) as specified in the Basin Plan.

Lower River (Reaches of Truckee River in Nevada) Conditions. Nutrient limits in T-TSA's permit could also be modified in the future based on changes in the Lower River TN and TP TMDLs and Lower River water quality standards. Water quality objectives for the California portion of the Truckee River need to be protective of Lower River beneficial uses. More stringent Lower River standards can have a cascading effect on upstream standards and the alignment of standards at the California/Nevada Stateline.

Nevada's most recent 303(d)/305(b) Integrated Report from 2014. The NDEP is currently working on the 2018 rendition of the Nevada Integrated Report (LRWQCB, 2018). Changes in 303(d) listings in Nevada may require development of new TMDLs that could affect permitting requirements in California.

Prediction of specific nutrient thresholds is not feasible, but it is possible that more stringent nutrient limits could be imposed on T-TSA in the future.

5.4.2 TDS and Chloride

More stringent TDS and chloride limits in the future may be possible. The most likely driver for a regulatory change would be changes in Lower River (reaches of the Truckee River in Nevada) standards and TMDLs.

Lower River (Reaches of Truckee River in Nevada) Conditions**.** TDS has been a regulatory issue and driver for previous process changes at T-TSA. The Cities of Reno and Sparks, along with the Pyramid Lake Paiute Tribe, succeeded in reaching a settlement with T-TSA on discharge standards to the Truckee River. The settlement agreement led to T-TSA's replacement of an ion-exchange process with biological nitrogen removal (BNR) to further reduce nutrient and TDS loads to the upper Truckee River.

TDS limits in T-TSA's permit could also be modified in the future based on changes in the Lower River TDS TMDL and Lower River water quality standards. Water quality objectives for the California portion of the Truckee River need to be protective of Lower River beneficial uses. More stringent Lower River standards can have a cascading effect on upstream standards and the alignment of standards at the California/Nevada Stateline.

Prediction of specific TDS and chloride thresholds is not feasible, but it is possible that more stringent TDS and chloride limits could be imposed on T-TSA in the future.

5.4.3 Permitting Framework

T-TSA effluent is discharged to groundwater in the Martis Valley Groundwater Basin, via subsurface disposal fields. Historically, the appropriate permitting framework for the effluent discharge to groundwater has been relatively straightforward. T-TSA's effluent discharge has been regulated by the LRWQCB under the authority of the SWRCB based on the following conditions:

- The effluent is discharged to groundwater.
- The Clean Water Act (CWA) permitting requirements (i.e., the NPDES permitting program), do not apply to discharges to groundwater.

However, there are ongoing lawsuits and long-term debates among governmental agencies on clarification to the CWA. Depending on the outcomes of the lawsuits and resolution on the jurisdiction of the CWA, there is potential that T-TSA would be regulated under the federal NPDES program. A NPDES permit would potentially have more water quality based effluent limits and more stringent effluent limits, as compared to T-TSA's current permit.

5.4.3.1 Regulatory Uncertainty

The current CWA jurisdictional debate is focused on the Clean Water Rule (2015), issued by the EPA and Army Corps of Engineers during the Obama Administration, and the direction by the Trump Administration to revise or rescind the rule. In response, the EPA and Army Corps of Engineers issued proposed regulations redefining "waters of the U.S." in December 2018. The comment period on this rule was closed in April 2019.

In an attempt to provide some clarification, the EPA recently issued an Interpretative Statement (April 2019) clarifying the application of Clean Water Act permitting requirements to groundwater. The EPA concluded that releases of pollutants to groundwater, regardless of whether that groundwater is hydrologically connected to surface water, are categorically excluded from the Act's permitting requirements because Congress explicitly left regulation of discharges to groundwater to the states and to the EPA under other statutory authorities (https://www.epa.gov/npdes/releases-point-source-groundwater). While this statement provides guidance on this issue, the EPA notes that this interpretation is applicable to portions of the country outside the Fourth and Ninth Circuit Courts of Appeal. California is in the Ninth Circuit Court of Appeal.

The relevant Ninth Circuit case on this topic is the Hawai'i Wildlife Fund versus County of Maui, 886 F.3d. 737 (9th Cir. 2018). The County of Maui's Lahaina Wastewater Reclamation Facility treats municipal wastewater and injects the effluent, via underground injection control (UIC) wells, into a groundwater basin. The summary of the Ninth Circuit Court decision states:

> *"The panel concluded that the County's four discrete wells were "point sources" from which the County discharged "pollutants" in the form of treated effluent into groundwater, through which the pollutants then entered a "navigable water," the Pacific Ocean. The wells therefore were subject to National Pollutant Discharge Elimination System regulation. Agreeing with other circuits, the panel held that the Clean Water Act does not require that the point source itself convey the pollutants directly into the navigable water. The panel held that the County was liable under the Act because it discharged pollutants from a point source, the pollutants were fairly traceable from the point source to a navigable water such that the discharge was the functional equivalent of a discharge into the navigable water, and the pollutant levels reaching navigable water were more than de minimis. The panel rejected the argument that the County's effluent injections were disposals of pollutants into wells and therefore exempt from the NPDES permitting requirements."*

The U.S. Supreme Court recently granted a petition for writ of certiorari in the Ninth Circuit case (Hawaii Wildlife Fund v. County of Maui, 886 F.3d. 737 (9th Cir. 2018)). The case was argued on November 6, 2019 (U.S. Supreme Court Dockett 18-260). The Supreme Court issued a decision on April 23, 2020 (County of Maui v. Hawaii Wildlife Fund, 140 S. Ct. 1462 (2020) ("Maui"). The Supreme Court decision stated that a NPDES permit is required for a discharge of pollutants from a point source that reach navigable waters after traveling through groundwater if that discharge is the "functional equivalent of a direct discharge from the point source into navigable waters." Maui, 140 S. Ct. at 1468. The Supreme Court defined seven factors that may be relevant for determining "functional equivalence" including:

- transit time.
- distance traveled.
- nature of the material through which the pollutant travels.
- extent to which the pollutant is diluted or chemically changed as it travels.
- amount of pollutant entering the navigable waters relative to the amount of the pollutant that leaves the point source.
- manner by or area in which the pollutant enters the navigable waters.
- degree to which the pollutant (at that point) has maintained its specific identity.

On January 14, 2021, EPA issued a guidance document titled "Applying the Supreme Court's County of Maui v. Hawaii Wildlife Fund Decision in the Clean Water Act Section 402 National Pollutant Discharge Elimination System Permit Program" (EPA, 2021a). The memo provided guidance to the regulated communities and permitting authorities, including the EPA, on applying the *Maui* decision on a case-by-case basis in the NPDES permit program (EPA, 2021a). One important element of the guidance document was inclusion of an additional factor (i.e., in addition to the seven factors outlined in the *Maui* decision) for the regulated community and permitting authorities to consider when evaluating whether and how to perform a "functional equivalent" analysis (EPA, 2021a). This additional factor was the design and performance of the system or facility from which the pollutant is released (EPA, 2020). The basis for this additional factor was that the design and performance of the system or facility from which the pollutant is released can inform the scope and extent of the "functional equivalent" analysis and inform the factors identified in the Maui decision (EPA, 2020). On September 16, 2021, the EPA rescinded the guidance document based on several factors: 1.) Inconsistency with the Clean Water Act or the Supreme Court decision in Maui v. Hawaii Wildlife Fund, and 2.) Lack of proper deliberations within the EPA or with federal partners (EPA, 2021b). The EPA Office of Water is evaluating next steps to follow the recission of the guidance (EPA, 2021b). EPA (2021b) states that in the interim, the Supreme Court's decision provides the guiding principles regarding when a discharge to groundwater is jurisdictional under the Clean Water Act that permit writers can use to implement the decision.

It will be important for T-TSA to track the any EPA future guidance and direction on applying the *Maui* decision.

5.4.3.2 NPDES Discharge Permit

If in the future, T-TSA were regulated under the NPDES permitting program, it is anticipated that the discharge would potentially be subject to:

- an increased number of water quality based effluent limits.
- a change in the permit point of compliance.
- more stringent effluent limits.
- increased monitoring.
- increased reporting
- 5-year permit renewal requirements.

T-TSA's current permit recognizes that the facility discharges to the Martis Valley Ground Water Basin, and that there is a hydrologic connection between the subsurface disposal system and both the Truckee River and Martis Creek. As such, the current permit already includes receiving water limitations based on Truckee River and Martis Creek water quality objectives. If in the future, T-TSA was regulated under the NPDES permitting program, then the changes in permit conditions may occur as a result of:

- Requirements to comply with National Toxics Rule (NTR) and California Toxics Rule (CTR) criteria.
- Requirements related to aquatic toxicity.
- Future development of CEC criteria for aquatic life and municipal supply beneficial uses.
- Changes to permit point of compliance.

The implications of these potential regulatory requirements are discussed as follows:

NTR and CTR Criteria

For a NPDES permit, NTR and the CTR criteria apply (per the State Implementation Policy [SIP] for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California), and water quality based effluent limits are developed from these criteria as well as from water quality objectives specified in the Basin Plan. CTR and NTR criteria are summarized as follows:

- CTR – The CTR specifies numeric aquatic life criteria for 23 priority toxic pollutants and numeric human health criteria for 57 priority toxic pollutants. These criteria apply to all inland surface waters and enclosed bays and estuaries. Human health criteria are further identified as for "water and organisms" or for "organisms only." The CTR criteria applicable to "water and organisms" apply to this receiving water because MUN is specified as a beneficial use for the receiving water.
- NTR – The NTR establishes numeric aquatic life criteria for selenium and numeric human health criteria for 33 toxic organic pollutants.

Many wastewater treatment plants in California have been challenged by water quality based effluent limits derived from the CTR, NTR, and Basin Plan water quality objectives. Depending on whether or not dilution is granted, WRPs can generally be challenged by effluent limits for disinfection byproducts, salts, nutrients, organics, and trace metals.

Potential changes in permit limits associated with NTR and CTR criteria include:

- Disinfection by-products – The current permit includes a total trihalomethane limit of 50 ppb. Specific trihalomethanes, more stringent trihalomethane limits, and/or limits for other disinfection byproducts [e.g., N-Nitrosodimethylamine (NDMA)] may be imposed.
- Trace metals – The current permit includes receiving water limits for total iron. Additional metals and/or more stringent limits may be imposed.
- Organics – Additional permit limits may be imposed.

Toxicity

The current Permit does not include numeric limits for chronic and acute toxicity. In the future, if T-TSA was regulated under the NPDES permitting program, then specific effluent toxicity limits may be imposed. Toxicity testing is used in addition to chemical analysis to determine the toxic effects of pollutants in a water sample. The SWRCB is currently developing Toxicity Provisions to establish numeric water quality objectives for both acute and chronic toxicity, and a program of implementation to protect aquatic life beneficial uses. The First Revised Draft Toxicity Provisions was released in July 2019. These provisions are planned for SWRCB consideration in Summer 2020.

Potential changes in permit limits associated with toxicity requirements include:

- Numeric limits for chronic and acute toxicity.
- Use of the Test of Significant Toxicity (TST) as the statistical method to determine toxicity.

Contaminants of Emerging Concern

Another potential impact of future regulation under the NPDES permitting program may be regulations on CECs, based on the municipal supply and aquatic beneficial uses. CECs are substances that have been detected at low levels in surface waters and the environment and may potentially cause deleterious effects on aquatic life and the environment at relevant concentrations. CECs include:

- Persistent organic pollutants (POPs) such as polybrominated diphenyl ethers (PBDEs; used in flame retardants, furniture foam, plastics, etc.) and other organic contaminants. Specific concerns are perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS). The California Division of Drinking Water (DDW) has established drinking water notification levels for PFOS and PFOA, at 13 parts per trillion and 14 parts per trillion, respectively.
- Pharmaceuticals and personal care products (PPCPs), including a wide suite of human prescribed drugs, over-the-counter medications, bactericides, sunscreens, and synthetic musks.
- Veterinary medicines such as antimicrobials, antibiotics, antifungals, growth promoters, and hormones.
- Endocrine-disrupting chemicals (EDCs), including synthetic estrogens and androgens, naturally occurring estrogens, as well as many other compounds capable of modulating normal hormonal functions and steroidal synthesis in aquatic organisms.
- Nanomaterials such as carbon nanotubes or nano-scale particulate titanium dioxide.

Monitoring requirements (in wastewater permits) for these trace pollutants are increasing, including requirements to analyze constituents at lower detection limits. It is likely that at some point in the future, water quality criteria followed by new effluent limits will be added to permits for selected constituents.

While not imminent, it is likely that a future T-TSA permit may include:

- CEC monitoring and reporting requirements.
- Limits for CECs – Based on establishment of water quality criteria to be protective of aquatic life and municipal water supply beneficial uses. Limits for PFOA and PFOS are anticipated.

Nutrients, TDS, and Chloride

For T-TSA, the TDS, chloride, and nutrient receiving water limits in the existing permit are already established based on the Truckee River and Martis Creek water quality objectives. Other than the risks of more stringent TDS, chloride and nutrient effluent limits described previously, it is not anticipated that a change to regulation under the NPDES permitting program would lead to further stringent permit limits.

Point of Compliance

It is possible that if T-TSA were to be regulated under the NPDES permitting program then the permit point of compliance may change to the treated effluent prior to discharge to the disposal fields. A change in the point of compliance may have impacts on attainment of future permit limits with respect to:

- Meeting disinfection requirements (i.e., attainment of bacteriological standards).
- Meeting potential future requirements for chlorine levels.
- Attainment of nitrogen limits.

5.4.3.3 NPDES Discharge Permit Process

If required to be regulated under the NPDES program, T-TSA would be mandated to obtain a new NPDES permit. For a new permit, this process may take several years and it would be advised for T-TSA to submit their Report of Waste Discharge (ROWD) to the LRWQCB approximately 2 years in advance rather than the required 6 months in advance. The ROWD is part of the permit application and for a new and/or complex permit it is recommended that more time be allowed for LRWQCB review. The key steps in the process to obtain a new NPDES permit include:

- Submit a completed ROWD to the LRWQCB at least 180 days before the proposed start of discharge that would be subject to new regulatory requirements.
- LRWQCB review for completeness.
- LRWQCB coordinates with the EPA to determine whether to permit or prohibit the discharge.
- LRWQCB preparation of a draft permit for review and public comment.
- EPA final review of the draft permit.
- LRWQCB issues "Notice of Public Hearing".
- LRWQCB adopts the permit.

As part of the ROWD, T-TSA could choose to prepare a reasonable potential analysis (RPA), per the SIP. The purpose of an RPA is to determine whether a pollutant has reasonable potential to exceed a water quality objective. The RPA is based on a comparison between maximum effluent concentration (MEC) and corresponding water quality objectives. There are three triggers in determining reasonable potential:

- Trigger 1 is activated if the MEC is greater than or equal to the lowest applicable water quality objective (with adjustment for pH, hardness, etc., if needed). If the MEC is greater than or equal to the adjusted water quality objective, then that pollutant has reasonable potential, and a Water Quality Based Effluent Limit (WQBEL) is required.
- Trigger 2 is activated if the observed maximum ambient background concentration (B) is greater than the adjusted water quality objective (B > water quality objective) and the pollutant is detected in any of the effluent samples.
- Trigger 3 is activated if a review of other information determines that a WQBEL is required to protect beneficial uses, even though both MEC and B are less than the water quality objective.

In addition, T-TSA could choose to prepare a dilution study as part of the ROWD. Water quality based effluent limits in a permit can take dilution effects into account. There may be potential for T-TSA to obtain dilution credit under a NPDES permitting framework. To obtain dilution credit, a dilution study (modeling and/or tracer studies) would need to be conducted, reviewed by the LRWQCB, and then an approved dilution credit would be established.

5.5 Assessment of Wastewater Solids Regulations

To determine the appropriate types of regulations T-TSA must consider, the types of solids/biosolids streams T-TSA manages must be understood. Solids processed at T-TSA consist of screenings and grit; primary sludge (PS) and thickened secondary or waste activated sludge (TWAS), collectively called organic sludge; and thickened chemical sludge, a byproduct of the phosphorous removal and recarbonation process. The screenings and grit are predominantly comprised of inert and/or non-organic material and are disposed of at Lockwood Regional Landfill in Sparks, Nevada. The PS and TWAS are pumped to T-TSA's temperature-phased anaerobic digestion (TPAD) system for stabilization to create a stabilized product defined by the EPA as biosolids. The biosolids are then mixed with the thickened chemical sludge in an approximately 1 to 1 ratio, on a weight basis, and dewatered before disposal or end use at both the Lockwood Regional Landfill and the Bently Ranch in Minden, Nevada. The remaining thickened chemical sludge is sent to Lockwood Regional Landfill for disposal. T-TSA sends organic biosolids to both Lockwood Regional Landfill and Bently Ranch. The Agency sends organics to the former to maintain the availability of multiple disposal options, and sends solids to the latter to promote beneficial reuse.

Anaerobic digestion is one of the many processes that meet the stabilization standards set by the EPA that define a biosolids product suitable for beneficial use (EPA Title 40 Code of Federal Regulations Part 503). Biosolids contain many properties that promote beneficial use including macronutrients (nitrogen, phosphorus, and potassium), secondary and micronutrients (calcium, magnesium, zinc, and copper), and organic matter.

Federal, state, and local regulations determine whether biosolids from municipal wastewater treatment plants can be beneficially used or must be disposed. At the federal level, biosolids regulations are well established, with few changes anticipated in the planning horizon. In contrast, at the state level, anticipated changes to California's biosolids regulations will influence biosolids management options, making the development and execution of a flexible management program essential.

A summary of relevant federal, state, and local regulations is provided in the following sections.

5.5.1 Federal Regulations

Federal, state, and local agencies are responsible for regulating beneficial use/disposal of biosolids. Each agency's required level of treatment varies based on the beneficial use/disposal methods employed. However, key minimum guidelines are established by the EPA that must be implemented by state and local governments. In California, state and local agencies have developed additional rules, guidelines, and criteria for biosolids management.

In order to implement a long-term biosolids program required by the Water Quality Act of 1987, the EPA initiated two rulemakings resulting in the promulgation of 40 Code of Federal Regulations (CFR) Part 503 (the Rule or Regulation), *Standards for the Use or Disposal of Sewage Sludge*. The regulation establishes requirements, procedures, operational standards, and management practices for:

- Biosolids management in NPDES permits.
- Implementing federal biosolids permit programs if a state so chooses.
- Granting state biosolids management programs primacy over federal programs.
- Land application of sewage sludge (which is biosolids in this context) for beneficial use.
- Surface disposal in a monofill, surface impoundment, or other dedicated site.
- Incineration of sewage sludge with or without auxiliary fuel.

5.5.1.1 40 CFR 503 Regulations

40 CFR 503 establishes biosolids quality standards based on three parameters: pathogen reduction (PR), vector attraction reduction (VAR), and pollutant (metals) concentration.

Pathogen reduction alternatives are designed to reduce the concentration of pathogens (organisms capable of causing diseases) in biosolids, and are categorized into two major categories: Class A and Class B. Class A PR technologies reduce pathogens to undetectable levels[1], allowing products to be used in markets with both low public contact (agricultural land and land reclamation sites) and high public contact (public parks, plant nurseries, roadsides, golf course, and home gardens). In contrast, Class B PR technologies significantly reduce pathogens, but require additional "processing" through environmental exposure, so these products may only be used in low-public access areas. The 40 CFR 503 Class A and Class B PR requirements for land applied biosolids are summarized in Table 5.4. For a product to be classified as Class A or Class B, it must meet each of the major bullets outlined in Table 5.4.

[1] Based on 1992 testing standards

Table 5.4 EPA 40 CFR 503 Pathogen Reduction Requirements for Class A and Class B

Class A	Class B
Either fecal coliform density in the sewage sludge is less than 1,000 MPN(1)/gram of total solids (dry weight basis), or the density of *Salmonella* species bacteria in the sewage sludge is less than 3 MPN per 4 grams of total solids (dry weight basis). Sewage sludge must be treated and/or meet one of the following alternatives before use or disposal. For more details on each treatment alternative, refer to 40 CFR 503.32(a): • Thermally treated. • High pH-high temperature treatment. • Treatment to reduce enteric virus to less than 1 PFU(2) per 4 grams of total dry solids and viable helminth ova to less than one per four grams of total dry solids. • Processes to further reduce pathogens (PFRP) include treatment by composting, heat drying, heat treatment, thermophilic aerobic digestion, beta ray irradiation, gamma ray irradiation, or pasteurization. Specific operating conditions for each process has been specified in 40 CFR 503.32(a). • Use of processes equivalent to the above (subject to authority approval).	Comply with site restrictions of land application as specified in 40 CFR 503.32(b)(2), (b)(3), or (b)(4). In summary, these restrictions limit access to animals and the public on sites where Class B material was applied. Sewage sludge must be treated and/or meet one of the following alternatives before use or disposal. For more details on each treatment alternative, refer to 40 CFR 503.32(b): • Geometric mean of seven samples of treated sewage sludge collected at the time of use or disposal shall meet a fecal coliform density of 2 million CFU(3) or MPN/gram of total solids (dry weight basis). • Processes that significantly reduce pathogens (PSRP) which include aerobic digestion, air drying, anaerobic digestion, composting, or lime stabilization. Specific operating conditions for each process has been specified in 40 CFR 503.32(b). • Use of processes equivalent to the above (subject to authority approval).

Notes:
(1) MPN = most probable number.
(2) PFU = plaque forming unit.
(3) CFU = colony forming unit.

Vector attraction reduction options are designed to reduce the transport of pathogens by vectors (i.e., flies, mosquitoes, fleas, rodents, and birds) from biosolids to other animals or humans. VAR includes process methods (i.e., chemical or biological reduction [Options 1-8]) or barrier methods (i.e., physically blocking biosolids from vectors [Options 9-10]). Vector attraction reduction requirements are summarized in Table 5.5.

Table 5.5 EPA 40 CFR 503 Vector Attraction Reduction Requirements

Alternative No. in 40 CFR 503.33(b)	Description
1	Mass of volatile solids shall be reduced by a minimum of 38 percent.
2	If No. 1 cannot be met, vector attraction reduction can be demonstrated by reducing volatile solids by a minimum of 17 percent by digesting a portion of previously digested sewage sludge (biosolids) anaerobically in the laboratory in a bench-scale unit for 40 additional days at a temperature between 30 and 37 degrees Celsius.
3	If No. 1 cannot be met, vector attraction reduction can be demonstrated by reducing volatile solids by a minimum of 15 percent by digesting a portion of previously digested sewage sludge aerobically in the laboratory in a bench-scale unit for 30 additional days at a temperature of 20 degrees Celsius.
4	Specific oxygen uptake rate for sewage sludge treated in an aerobic process is less than or equal to 1.5 milligrams of oxygen per hour per gram of total solids (dry weight basis) at a temperature of 20 degrees Celsius.
5	Sewage sludge shall be treated in an aerobic process for 14 days or longer. During that time the temperature of sewage sludge shall be higher than 40 degrees Celsius, with an average of 45 degrees Celsius or higher.
6	The pH of sewage sludge shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for 2 hours, and then at 11.5 or higher for an additional 22 hours at 25 degrees Celsius.
7	The percent solids of material that does not contain unstabilized solids (generated in a primary wastewater treatment process) shall be equal to or greater than 75 percent based on moisture content and total solids prior to mixing with other materials.
8	The percent solids of material that contains unstabilized solids shall be equal to or greater than 90 percent based on moisture content and total solids prior to mixing with other materials.
9	Treated sewage sludge that is injected below the surface of the land requires: No significant amount of treated sewage sludge shall be present on the land surface within one hour after it is injected. When the treated sewage sludge is injected below the surface of the land is Class A with respect to pathogens, it shall be injected below the land surface within eight hours after being discharged from the pathogen reduction process.
10	Treated sewage sludge applied to the land surface or placed on a surface disposal site shall be incorporated into the soil within six hours after application to or placement on the land. When treated sewage sludge that is incorporated into the soil is Class A with respect to pathogens, it shall be applied to or placed on the land within eight hours after being discharged from the pathogen treatment process.

Biosolids must also meet metal concentration limits in order to be beneficially used, referred to as Ceiling Concentration Limits. If land applying, the biosolids must meet either the pollutant concentration limits, cumulative pollutant loading rate limits[2], or annual pollutant loading rate[3] limits. Table 5.6 summarizes the pollutant limits required by 40 CFR 503 to beneficially use biosolids.

In addition to the requirements above, 40 CFR 503 provides guidance on best practices for land application of biosolids, provides site restrictions for each type of biosolids, and sets the requirements for monitoring, recordkeeping, and reporting. These apply to both the supplier and application of biosolids (which could be a third party).

Table 5.6 EPA 40 CFR 503 Metal Concentration Limits

Pollutant	EPA CCL(1), milligrams per kilogram (mg/kg) dry weight basis	EPA PCL(2) - EQ(3), mg/kg dry weight basis	EPA CPLR(4) Limit, kg per hectare	EPA APLR(5) Limit, kg per hectare
Arsenic	75	41	41	2.0
Cadmium	85	39	39	1.9
Chromium	3,000	1,200	3,000	150
Copper	4,300	1,500	1,500	75
Lead	840	300	300	15
Mercury	57	17	17	0.85
Molybdenum	75	-	-	-
Nickel	420	420	420	21
Selenium	100	36	36	5
Zinc	7,500	2,800	2,800	140
Applicable to:	Land applied material	Bulk and bagged material	Bulk material	Bagged material

Notes:
(1) CCL: Ceiling Concentration Limit.
(2) PCL: Pollutant Concentration Limit.
(3) EQ: Exceptional Quality.
(4) CPLR: Cumulative Pollutant Loading Rate.
(5) APLR: Annual Pollutant Loading Rate.

[2] Per Section 503.11 of 40 CFR 503, it is maximum amount of an inorganic pollutant that can be applied to an area of land.
[3] Per Section 503.11 of 40 CFR 503, it is the maximum amount of a pollutant that can be applied to a unit area of land during a 365 day period.

Class B Biosolids

Class B biosolids are treated with processes intended to significantly reduce, but not eliminate pathogens. As such, biosolids may be land applied, but land appliers must also follow application and pollutant load restrictions for Class B biosolids with regard to public contact, animal forage, and production of crops for human consumption. For example:

- Class B biosolids may only be applied to sites where there is no possibility of contact with the general public. These sites include specific types of agriculture, landfills, etc.
- Crop harvesting, animal grazing, and public access are restricted for a defined period of time until environmental conditions have further reduced pathogens.

Class B biosolids can be produced through the requirements defined in Table 5.4 and must also meet VAR and pollutant standards previously defined (Tables 5.5 and 5.6). As mentioned in Table 5.4, there are three alternatives to meeting pathogen reduction requirements. One of these alternatives is to use one of the processes to significantly reduce pathogens (PSRPs).

The PSRPs include mesophilic anaerobic digestion. To meet Class B standards, the mesophilic anaerobic digestion process must be operated between 15 days at 35 to 55 degrees Celsius and 60 days at 20 degrees Celsius. T-TSA meets these requirements and thus produces Class B biosolids.

Class A Biosolids

Class A biosolids are treated with technologies designed to reduce pathogens to nearly undetectable levels and, therefore, may be beneficially used where contact with the general public is possible (i.e., nurseries, gardens, golf courses, etc.). Class A biosolids can be produced through any of the six defined requirements in 40 CFR 503 (Table 5.4) and must also meet VAR and pollutant standards previously defined (Tables 5.5 and 5.6).

The PFRPs include thermophilic anaerobic digestion, static aerated pile composting, heat drying, and pasteurization. To meet Class A standards, the thermophilic anaerobic digestion process must be operated at 50 degrees Celsius or higher for 30 minutes or longer. Composting operations are required to operate at 55 degrees Celsius or higher for 3 days. Heat drying must reduce the moisture content of the biosolids to 10 percent or lower. Pasteurization processes must maintain the temperature of the biosolids at 70 degrees Celsius for 30 minutes or longer.

If desired, T-TSA has the ability to meet Class A biosolids requirements since they have thermophilic anaerobic digestion, although T-TSA would need to install additional infrastructure to utilize this option and to meet the 30 minute minimum requirement for producing Class A biosolids.

Exceptional Quality Biosolids

Biosolids that meet the high-quality pollutant concentrations limits of Table 5.6, one of the Class A PR requirements of Table 5.4, and one of options 1 through 8 of the VAR alternatives in Table 5.5, may be identified as EQ biosolids. EQ biosolids may be used and distributed in bulk or bag form and are not subject to general requirements and management practices with the exception of monitoring, recordkeeping, and reporting to substantiate that quality criteria have been met.

5.5.1.2 Biannual Reviews of 40 CFR Part 503

The Clean Water Act requires biannual review of 40 CFR Part 503. Since promulgation of the regulation in 1993, there have been no major changes or new pollutants added. However, as part of the 2009 Targeted National Sewage Sludge Survey, the EPA found nine pollutants of potential concern. These nine chemicals are barium, beryllium, manganese, silver, 4-chloroaniline, fluoranthene, pyrene, nitrate, and nitrite. Limits for these compounds could be included in Part 503 in the future. In addition, molybdenum limits could be introduced for EQ, CPLR, and APLR conditions.

5.5.1.3 40 CFR 258 Regulations

In addition to the regulations set forth to govern sewage sludge use and disposal, 40 CFR Part 258 *Solid Waste Disposal Facility Criteria* was promulgated in October 1991 to control the disposal of sewage sludge classified as solid waste. Sewage sludge is exempt from the definition of solid waste unless the sludge is co-disposed with household solid waste. 40 CFR Part 258 sets forth criteria for landfills with respect to: location, design, operation, groundwater monitoring, and closure with the intent of protection of ground and surface water from contamination. The main requirement of co-disposed sludge is that it must meet the Paint Filter Liquids Test (EPA Method 9095A). This method determines the presence of free liquids in a sample. Well-dewatered, unstabilized wastewater solids and biosolids, such as in the case of T-TSA's biosolids, typically pass this test.

5.5.1.4 Non-Hazardous Waste

Biosolids must be tested at a frequency that is based on the amount generated to demonstrate they are non-hazardous. T-TSA satisfies these requirements and has demonstrated their biosolids are non-hazardous.

5.5.2 California State Regulations

The beneficial use or disposal of biosolids is primarily regulated by California's SWRCB, the Division of Water Quality (DWQ), and the nine Regional Water Boards. As required under the Porter-Cologne Act, the SWRCB, along with its nine Regional Water Boards, is principally concerned with protecting existing and future beneficial uses of water, but also addresses the use or disposal of sewage sludge (and biosolids). T-TSA is regulated under the Lahontan Regional Water Quality Control Board.

The SWRCB's General WDRs for the *Discharge of Biosolids to Land for Use as a Soil Amendment in Agriculture, Silviculture, Horticulture, and Land Reclamation Activities (General Order)* covers the use of biosolids as a soil amendment. In order for such a discharge to be allowed, the biosolids must meet the treatment and testing requirements, and must demonstrate capability to be beneficially used and legally as a soil amendment as specified under 40 CFR 503. The Regional Water Quality Control Boards have the option of adopting the State's General Order, which provides additional management requirements. The General Order is intended to help streamline the regulatory process for such discharges, but may not be appropriate for all sites using biosolids due to site-specific conditions or locations. Such sites are not precluded from being issued individual WDRs.

CalRecycle oversees and regulates California's solid waste disposal including co-disposal issues and biosolids use as a daily covering material at landfills. The main regulation dealing with land discharge of biosolids (and incineration ash) is the California Code of Regulations (CCR) Title 23, Division 3, Chapter 15. Other regulations and guidelines include Title 22, Division 4.5, Chapter 11; California Water Environment Association's (CWEA) Manual of Good Practice for Agricultural Land Application of Biosolids; and the California Environmental Quality Act (CEQA). A summary of recent legislation that will impact beneficial use of biosolids is found in Table 5.7.

Traditionally, CalRecycle's role in biosolids beneficial use has been to define biosolids management practices that are considered landfill diversion for municipalities attempting to meet the 50 percent landfill diversion target set by Assembly Bill (AB) 939. Historically, both landfill alternative daily cover (ADC) and land application have qualified as landfill diversion. However, when proposed Organic Waste Reduction Regulations under Senate Bill (SB) 1383 become effective in 2022, landfill ADC will be considered disposal and no longer qualify as diversion (see Table 5.7 for a summary of SB 1383). With these new regulations in place, land application will continue to qualify as landfill diversion. Currently, incineration is not considered landfill diversion; however, the proposed regulations under SB 1383 tentatively provide an opportunity to go through a process to verify whether other biosolids treatment options (such as incineration) qualify as diversion.

5.5.3 Nevada State Regulations

Nevada has few biosolids regulations at the state level and the state's biosolids regulations are generally not more restrictive than the Federal 40 CFR Part 503 rule. Nevada does require additional monitoring of Class B land application sites with annual monitoring of crop yield. Nitrogen is the basis for the agronomic loading rate for land application. Nevada does not require formal nutrient management plans and does not require monitoring for phosphorus in biosolids. There are currently no legislative or regulatory activities at the state level that are likely to impact biosolids management in the foreseeable future. There could be changes made in the future; however, the process for changing or updating these regulations is a minimum two-year process.

5.5.4 Local Agency Regulations

At a local level, counties across California have developed, or are developing or amending, ordinances governing biosolids land application. The stringency of these county regulations ranges from requiring high minimum insurance to banning biosolids land application.

Figure 5.2 summarizes the current status of County ordinances affecting the use (specifically, land application) of biosolids. However, the future viability of these ordinances is uncertain given the language in the proposed Organic Waste Reduction Regulations under SB 1383 (see Section 5.5.2).

T-TSA's service area is located in three counties: Nevada, Placer, and El Dorado County. As shown in Figure 5.2, all three of these counties require a conditional use permit for biosolids land application. However, the nearby Sierra County allows Class B land application.

Table 5.7 Recently Adopted State Legislation Impacting Biosolids Management Operations and/or Use

Legislative Bill	Summary	Impact to T-TSA	Status
AB 876 (2015)	Requires entity to track and annually report the amount of organic waste in cubic yards (yd^3) it will generate over the next 15 years, the additional organic waste recycling facility capacity that will be needed to process that waste, and identify new or expanded organic waste recycling facilities (such as T-TSA anaerobic digesters) capable of reliably meeting that additional need.	T-TSA may be identified as a recycling facility if accepting external organic waste.	First report was due: August 2017
AB 1826 (2014)	As of April 1, 2016, requires a business (commercial or public entity) or residential dwelling of five or more units, generating a certain amount (starts at 8 yd^3 and over time decreases to 2 yd^3 of organic waste per week to arrange for recycling services. This bill requires phased implementation for the reduction of organic waste production and creates market certainty for the diversion of organic waste from businesses and multifamily dwellings to a recycling service (e.g., anaerobic digesters at wastewater treatment plants).	May experience entities that produce organic waste seeking to send their organic waste to T-TSA.	Phased Implementation 2016 - 2020
SB 1383 (2016)	Requires the reduction of short-lived climate pollutants (including methane) to achieve *statewide* greenhouse gas (GHG) reduction targets by 2030. Requires a regulation be developed and adopted by end of 2018, to accomplish 50 percent diversion of organics (including T-TSA solids and biosolids) from landfills by 2020 relative to 2014 levels and 75 percent diversion by 2025. May require wastewater treatment plants to identify new options for biosolids management where land application and ADC is not an option.	May see increased competition for land application and composting as other agencies' biosolids are diverted from landfills.	Final regulation: January 2020 50% statewide diversion: 2020 75% statewide diversion: 2025
AB 1594 (2014)	States green waste will no longer qualify for diversion credit when used as ADC at a landfill. Green waste that is mixed with biosolids for use as ADC currently receives diversion credit under AB 939, but will no longer be able to do so for the green waste portion beginning in 2020. As a result, it is expected that landfills will not accept biosolids (if not mixed with green waste) for ADC since they need the combination to achieve a workable moisture content.	With green waste no longer receiving diversion credit for use as ADC, may limit the amount of biosolids used as ADC.	Effective: 2020

Legislative Bill	Summary	Impact to T-TSA	Status
AB 341 (2011)	Sets a goal that 75 percent of solid waste generated (including organics) be source reduced, recycled, or composted by the year 2020. Provides a platform for state agencies to consider wastewater treatment plants as part of the solution to achieve this goal.	May see increased competition for land application and composting as other agencies' biosolids are diverted from landfills.	Deadline: 2020
SB 970 (2016)	Requires CalRecycle, when awarding a grant for organics composting or anaerobic digestion, to consider the amount of GHG emissions reductions that may result from the project and the amount of organic material that is diverted from landfills as a result of the project. This bill allows for larger grant awards to be given to large-scale regional integrated projects that provide cost-effective organic waste diversion and maximize environmental benefits.	More funding may be available for regional projects that provide cost-effective organic waste diversion that maximize environmental benefits.	Determined Per Project
AB 901 (2015)	Changes disposal and recycling reporting to CalRecycle. Waste, recycling (including wastewater treatment plants), and compost facilities, as well as exporters, brokers, and transporters of recyclables or compost will be required to submit information directly to CalRecycle on the types, quantities, and destinations of materials that are disposed of, sold, or transferred inside or outside of the state. CalRecycle is given enforcement authority to collect this information.	T-TSA will be required to report the types, quantities, and destinations of their biosolids to CalRecycle starting in Q3 of 2019. The regulation will outline how to comply with the reporting requirement.	Regulation Adoption: Spring 2019 First Reports: Q3 2019
Healthy Soils Initiative (2015)	Collaboration of state agencies and departments, led by the California Department of Food and Agriculture (CDFA), to promote the development of healthy soils on California's farm and ranchlands (e.g., through land application of biosolids) building adequate soil organic matter that can increase carbon sequestration and reduce overall GHG emissions.	T-TSA may see additional incentive for land application of biosolids through the Healthy Soils Initiative.	Developing Key Actions

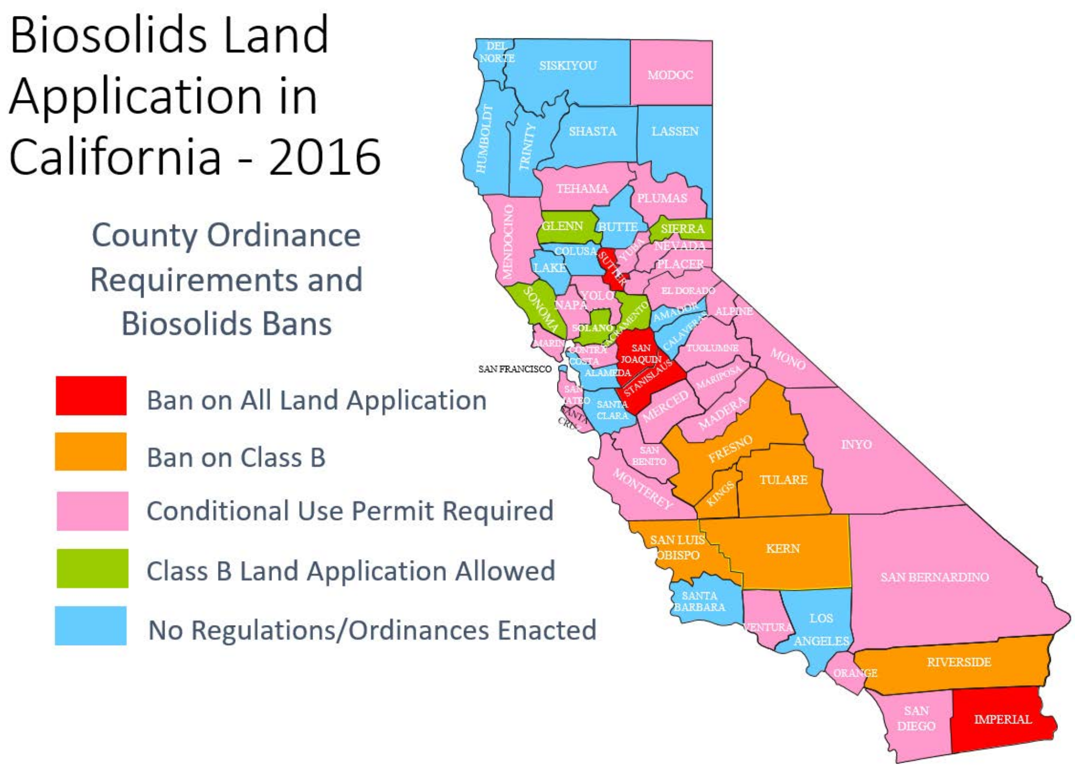

Figure 5.2 County Ordinance Requirements for Biosolids Land Application

5.5.5 Future Regulatory Considerations

This section summarizes the potential for changes to existing regulations, development of new regulations already underway, and the potential for newly introduced regulations that may impact biosolids management. Additionally, there are various California Senate Bills and Assembly Bills that have recently been adopted that will shape the future of biosolids management and use. These bills and their potential impact are described below and summarized above in Table 5.7.

5.5.5.1 Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA)

There is growing concern over PFOS and PFOA, fluorinated organic chemicals that are part of a larger family of compounds referred to as perfluoroalkyl substances (PFAS). These substances are synthetic compounds that are water and lipid-resistant. Because they deter water, grease, and oil, they are useful in a variety of manufacturing processes and industrial applications, ranging from pizza boxes to stain-resistant carpets to Teflon® pans and flame retardants. Over time, PFOS and PFOA have been detected in the soil, air, water, household dust, etc. Elevated exposure to PFAS compounds has been associated with infant birth weights, effects on the immune system, cancer, and thyroid hormone disruption (EPA, 2019).

Currently there is no approved EPA method to test for PFOS and PFOA on non-drinking water matrices. However, Maine recently began requiring all biosolids that are beneficially used to be tested for PFOA and PFOS using a modified version of the EPA's drinking water test: EPA Method 537. Maine initiated this testing requirement in reaction to public outcry of a farm that received biosolids and other residuals that had elevated concentrations of PFOS; of note, Maine's Department of Environmental Protection (DEP) has acknowledged that the biosolids are likely not the predominant source of PFOS. Maine's limits for PFOA and PFOS in beneficially used biosolids are 2.5 ppb, and 5.2 ppb, respectively. Notably, these levels are lower than the concentration levels detected in most biosolids products tested to date (NEBRA, 2019). Maine's DEP states materials will have to meet the screening limits for PFOA and PFOS or additional loading rate calculations and determinations of acceptable risk will need to be demonstrated by the biosolids generator. It is expected that California's State Water Resources Control Board will require testing of soils amended with biosolids and that additional requirements will be developed in the near future.

5.5.5.2 Land Application

As previously noted, regulation governing treatment of biosolids products is primarily the role of EPA (via 40 CFR 503) and the SWRCB (via the General Order). However, in California, local regulations (generally at the county level) have significantly limited beneficial use of biosolids (particularly land application of Class B and non-compost products, see Figure 5.2).

However, recent legislation and litigation may modify local limitations.

- In 2012, California adopted AB 845 stating that counties cannot pass ordinances banning importation of biosolids or any other solid waste based on its origin.
- Measure E in Kern County (banning importation and land application of Class B biosolids) was overturned in 2017 and a settlement was reached in 2018. Development of an environmental impact report is underway to determine the minimum treatment level required for biosolids products to be land applied in Kern County.
- In the summer of 2018, Measure X in Imperial County was overturned. This measure, like Measure E, sought to ban the importation of biosolids from other counties.
- The rulings to overturn Measures E and X are consistent with state regulations under development (specifically, SB 1383 anticipated to be adopted by January 2020) to disallow prohibitive or restrictive local ordinances and are leading to other county ordinances being reviewed.

As a result of these important changes in biosolids regulations and ordinances, the main pressure on biosolids land application in the current regulatory environment may no longer be the prevalence of local restrictions, but rather the anticipated pressure on land application outlets if landfill ADC is restricted or eliminated. Such an outcome may increase competition for biosolids land application, and drive up prices in available outlets.

Land application of biosolids will likely continue in the future; however, the biosolids markets could become very competitive and may require long hauling distances. In addition, biosolids tipping fees may increase.

5.5.5.3 Landfill Alternative Daily Cover

The following adopted and developing legislation is changing the future viability of biosolids used as ADC:

- In 2014, AB 1594 was adopted and requires that green waste no longer qualify for diversion credit when used as ADC at a landfill. This bill may *indirectly* affect an agency's biosolids use/disposal program when it is fully implemented on January 1, 2020. Agencies that mix green waste with biosolids for use as ADC at landfills currently receive diversion credit under AB 939, but will no longer be able to do so for the green waste portion. It is expected that landfills will not accept biosolids (if not mixed with green waste) for ADC since they need the mixture for achieving a workable moisture content.
- In 2016, SB 1383 was adopted and requires the reduction of short-lived climate pollutants (specifically, methane) to achieve GHG emission reduction targets for 2030. Since landfills represent 20 percent of the state's total methane emissions (a potent GHG) as a result of anaerobic degradation of organics, regulations are being developed requiring 75 percent diversion of organic waste sent to landfills by 2025. The definition of organic waste includes sludges, biosolids, and digestate, and ADC of biosolids will be considered disposal once the regulation becomes effective. These regulations are expected to be adopted by January 18, 2020, become effective in 2022, and enforceable in 2024. CalRecycle, the State Water Board, and the California Air Resources Board (CARB) see co-digestion of food waste and fats, oils, and grease with sewage sludge at municipal wastewater treatment plants as a key strategy for achieving reductions in methane emissions across the state more cost-effectively.

CalRecycle is expected to incorporate language in the regulations being developed under SB 1383 specific to biosolids and help develop alternative routes (such as more extensive land application) for biosolids end-uses. Termination of landfill ADC will place capacity and price pressure on existing biosolids markets, such as compost and land application, increasing competition among utilities for available biosolids outlets.

5.5.5.4 End Use/Disposal Reporting Requirements

The state is also encouraging an increase in tracking and reporting of organic waste disposal (including sludge, biosolids, and digestate) and recycling (reduction in organic waste disposal and production). Legislation pertaining to reporting includes the following:

- AB 1826 requires businesses and residential dwellings (of 5 units or more) generating 8 yd^3 or more of organic waste per week to arrange for recycling services. This phased implementation bill decreases the 8 yd^3 diversion cap over time through 2020. This bill will reduce organic waste production and create market certainty for the diversion of organic waste from businesses and multifamily dwellings to a recycling service, such as municipal wastewater treatment plant anaerobic digesters.
- AB 876 requires a county or regional agency to track and annually report the amount of organic waste it will generate over a 15-year period, the additional organic waste recycling facility capacity that will be needed to process that organic waste, and identify new or expanded organic waste recycling facilities (such as municipal wastewater

treatment plant anaerobic digesters) capable of safely meeting that additional need. The first annual reports required by this legislation were due in August 2017.

- The final regulation developed under AB 901 was formally adopted March 5, 2019. The legislation and regulation changes how disposal and recycling is reported to CalRecycle. Waste, recycling, and compost facilities, as well as exporters, brokers, and transporters of recyclables or compost will be required to submit information directly to CalRecycle on the types, quantities, and destinations (i.e., county) of materials that are disposed of, sold, or transferred inside or outside of the state. CalRecycle also gains enforcement authority to collect this information. Facilities producing biosolids and transporting them offsite are expected to report and register in the Recycling and Disposal Reporting System (RDRS) by April 30, 2019. Recordkeeping will begin the third quarter of 2019 (July 1 - September 30), with the first reporting due no later than December 31, 2019.

5.6 Assessment of Air Quality Regulations

The federal Clean Air Act (CAA) creates a comprehensive national framework designed to protect ambient air quality by limiting air emissions for both stationary and mobile sources. While the CAA deals primarily with "conventional" air pollutants, it also addresses emissions of 188 toxic materials defined as "hazardous air pollutants".

The CAA requires EPA to set national ambient air quality standards to protect human health and welfare. Agencies at the federal, state, and local levels have jurisdiction over air pollution and odor control at wastewater treatment plants. At the federal level, the major agencies are the EPA and the Occupational Safety and Health Administration (OSHA). At the state level, CARB is the applicable agency. In addition, California Occupational Safety and Health Administration (Cal-OSHA) requirements for indoor air quality may apply. At the local level, it is NSAQMD. These agencies issue air quality permits for the modification of existing facilities or the construction and/or operation of new facilities, and to establish new source pollutant levels and treatment requirements. CARB has developed State air quality standards that are generally more stringent than federal standards.

At T-TSA, stationary sources of air contaminants are predominantly derived from three standby diesel engine generators and five boilers. Permits to operate identify these stationary sources and two other T-TSA sources: paint spray booth and chlorine handling system. Other sources of air contaminants are derived from wastewater treatment processes and associated fugitive emissions.

The following sections provide summaries of the federal, state, and local air quality standards applicable to T-TSA operations.

5.6.1 State Regulations

T-TSA currently operates three standby diesel generators that range in size from 750 to 1500 kilowatts (kW), one of which has recently failed (750 kW unit). Any new or replacement engines would need to comply with the Airborne Toxic Control Measure (ATCM) for Stationary Compression-Ignition (CI) Engines. Subsequent to the adoption of the original ATCM in 2004, the EPA promulgated new federal "Standards of Performance for Stationary Compression-Ignition Internal Combustion Engines" (New Source Performance Standards [NSPS]). In October 2010, CARB approved amendments to the ATCM to closely align California's requirements with those in the federal NSPS. The amended ATCM became effective May 19, 2011.

The ATCM requires a 0.15 gram per brake horsepower-hour (g/bhp-hr) particulate matter (PM) emission limit for all new emergency standby stationary compression ignition engines greater than or equal to 50 horsepower (hp). Annual maintenance and testing hours are limited to no more than 50 hours per calendar year. Local air districts may impose more limited hours. New emergency standby engines are required to meet the applicable non-methane hydrocarbon plus nitrogen oxides (NMHC+NOx), hydrocarbon (HC), and carbon monoxide (CO) Tier 2 or Tier 3 non-road CI engine emission standards, and Tier 4 standards that do not require add-on controls. Table 5.8 shows emission limits for engine sizes comparable to those currently in use at T-TSA.

Table 5.8 ATCM Emission Standards for New Stationary Emergency Standby Diesel-Fueled CI Engines(1)

Maximum Engine Power	Particulate Matter g/bhp-hr (grams per kilowatt-hour [g/kW-hr])	Non-Methane Hydrocarbon plus Nitrogen Oxides g/bhp-hr (g/kW-hr)	Carbon Monoxide g/bhp-hr (g/kW-hr)
100 ≤ hp < 175 (75 ≤ kW < 130)	0.15 (0.20)	3.0 (4.0)	3.7 (5.0)
175 ≤ hp < 750 (130 ≤ kW < 560)	0.15 (0.20)	3.0 (4.0)	2.6 (3.5)
hp > 750 (kW > 560)	0.15 (0.20)	4.8 (6.4)	2.6 (3.5)

Notes:
(1) May be subject to additional emission limitations as specified in current applicable T-TSA rules, regulations, or policies. Applicable to model years 2008 and later.

5.6.2 Local Regulations

T-TSA is also subject to local NSAQMD regulations. The NSAQMD activities include rule development and enforcement, monitoring of air quality, a permit system for stationary sources, air quality planning, protection of the public from adverse effects of criteria air pollutants (CAPs) and TACs, and responses to public requests for information regarding air quality issues.

The NSAQMD administers rules and regulations that apply to stationary sources that emit air contaminants in the Northern Sierra region. Generally, new and existing stationary sources are governed by requirements in the following Regulation Sections: 2 (Prohibitions), 4 (Authority to Construct), and 5 (Permit to Operate).

5.6.2.1 Current Permit

T-TSA currently holds a permit to operate from the NSAQMD. The existing permit allows operation of numerous stationary sources, including three standby diesel engines, five boilers, one paint spray booth, and one chlorine handling system. Appendix 5C contains the Permits to Operate from the NSAQMD.

5.6.2.2 Requirements for New and Modified Sources

Rule 401 and 501 outline the permitting process that governs the construction, replacement, operation, or alteration of any source that emits or may emit contaminants. The process involves an Authority to Construct, followed by a Permit to Operate. Any new or modified source is required to comply with new source review requirements, including application of Best Available Control Technology for Toxics (T-BACT), and emission offsets. The modification or replacement of any onsite stationary combustion units would trigger this permitting process.

As described in Rule 427, T-BACT is the level of emission control or reduction for new and modified sources of emissions that have the potential to emit 10 or more tons per year of any hazardous air pollutant or 25 or more tons per year of any combination of hazardous air pollutants. T-BACT is intended to reduce emissions to the maximum extent possible considering technological and economic feasibility. The California Air Pollution Control Officers Association (CAPCOA) maintains a clearinghouse for statewide T-BACT determinations.

As discussed in Rule 411 and 412, Emission Offsets, or Emission Reduction Credits (ERCs), are generated by reducing emissions beyond what is required by regulation, or by curtailing or shutting down a source. ERCs may be used to provide offsets for emission increases from a new or modified source. The ERCs may be banked and the banking certificates may be traded or sold to another facility for use as offsets for that facility. These credits can be very valuable and consideration should be given to retaining them for future projects.

5.6.3 Greenhouse Gas Emissions

5.6.3.1 State and Federal Mandatory Reporting

CARB adopted the Global Warming Solutions Act (also referred to as AB 32) in September 2006. This Act requires public and private agencies statewide to reduce GHG emissions to 1990 levels by year 2020. During Governor Brown's inauguration in January 2015, he declared the need for a 2030 emissions reduction target to set the state on track for achieving the 2050 goal of 80 percent below 1990 levels. As a result, Senate Bill 32 was adopted in 2016 requiring the state to implement a 2030 target of reducing emissions by 40 percent below 1990 levels and developing programs to meet that target. The GHGs regulated under both AB 32 and SB 32 that are relevant to wastewater treatment plants are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). The legislation does not target wastewater treatment process emissions specifically, but it does cover electricity generating units and onsite general stationary combustion sources.

California is reportedly on track to meet or exceed the AB 32 target of reducing GHG emissions to 1990 levels by 2020. Building on this success, Governor Brown identified key climate change strategy pillars in his January 2015 inaugural address. The pillars include: 1) reducing today's petroleum use in cars and trucks by up to 50 percent; 2) increasing electricity derived from renewable sources from one-third to 50 percent; 3) doubling the energy efficiency savings achieved at existing buildings and making heating fuels cleaner; 4) reducing the release of methane, black carbon, and other short-lived climate pollutants; 5) managing farm and rangelands, forests, and wetlands so they can store carbon. In addition, Governor Brown issued an Executive Order B-55-18 in 2018 to establish statewide carbon neutrality by 2045.

Wastewater treatment plants and landfills may play an important role in implementing the pillars and Executive Order. CARB identified diverting organics from landfills to anaerobic digestion and composting as key strategies to reduce methane emissions from landfills by generating more renewable energy at wastewater treatment plants and using composted biosolids to sequester carbon and promote healthy soils.

CARB lists two thresholds against which wastewater treatment facilities must check if they are required to report. The reporting thresholds shown in Table 5.9 include emissions from both fossil fuel (i.e., natural gas and diesel) and non-fossil fuel or biogenic (i.e., biogas) sources.

Table 5.9 Greenhouse Gas Emissions Threshold for Reporting Years 2011 and Beyond

Unit Type	Threshold
Electricity Generating Unit	≥ 10,000 mt[1] CO_{2e}[2] per year
General Stationary Combustion	≥ 10,000 mt[1] CO_{2e}[2] per year

Notes:
(1) mt: metric ton.
(2) CO_{2e}: carbon dioxide equivalent emissions.

In addition, the EPA's Mandatory GHG Reporting Rule (Reporting Rule) was adopted October 30, 2009. The Reporting Rule explicitly states that centralized domestic wastewater treatment systems are not required to report emissions; however, any stationary combustion of fossil fuels taking place at a wastewater treatment facility may be considered a "large" source of GHGs if they emit a total of 25,000 mt or more of CO_2 equivalent (CO_2e) emissions per year.

Pursuant to AB 32, GHG estimates are based on CARB's Regulation for the Mandatory Reporting of GHG Emissions (Title 17, CCR, sections 95100-95157). To align itself with the EPA's GHG Reporting Rule, CARB's regulation incorporated by reference certain requirements in the EPA's Final Rule on Mandatory Reporting of GHGs (Title 40, Code of Federal Regulations (CFR), Part 98). Specifically, section 95100(c) of CARB's regulation incorporated those requirements promulgated by EPA as published in the Federal Register.

While T-TSA's standby diesel generators are not included in the emissions threshold calculation (since they are for emergency use), emissions from T-TSA's five boilers are. However, GHG emissions from these sources should not exceed the reporting thresholds for CARB and EPA.

5.6.3.2 State Cap-and-Trade Program

In addition to mandatory reporting of GHGs, CARB adopted a GHG cap-and-trade program that became effective in January 2012. This program states that agencies emitting 25,000 mt or more of fossil fuel-based (i.e., natural gas and diesel) CO_2e emissions per year beginning in 2011 or any subsequent year will be capped and required to pay for allowances and eventually reduce their emissions over time. T-TSA GHG emissions are estimated to be well below 10,000 mt of CO_2e per year, which is far below the cap-and-trade threshold. Therefore, T-TSA is not expected to exceed the threshold in the near future.

5.7 Cross-Media Impacts

The interconnection of regulations to the various areas impacted by wastewater treatment is an important consideration. Representatives from various air districts, Regional Water Boards, Caltrans, and the EPA came to an agreement to develop a cross-media checklist for use during the development of regulations. The California Association of Sanitation Agencies (CASA) has been coordinating the efforts to develop the checklist. The components of the cross-media checklist include biosolids, compost processing, recycled water, AB 32 (regulating GHG emissions), CEQA, regulatory processes, development of Water Quality Control Plans (referred to as Basin Plans) and water quality standards/ regulations, and impact assessments to air, water, and land media.

5.8 Future Regulatory Scenarios

Future regulatory scenarios were developed based on the analysis of T-TSA's existing permit requirements and identification/evaluation of future regulatory concerns based on various plans, policies, and actions by relevant regulating authorities. The potential future regulatory issues and typical approaches for addressing these issues are summarized in Table 5.10.

Table 5.10 Potential Future Regulatory Issues and Approaches

Topic	Issue	Approach
Nutrients	More stringent receiving water limitations	Process Optimization
Metals, organics, CECs, and disinfection by-products	NTR/CTR criteria imposed in a Federal NPDES permit	Advanced oxidation and conversion to UV disinfection
TDS and chloride	More stringent receiving water limitations	Partial treatment by membrane filtration and reverse osmosis (reference Appendix 5D)
Biosolids	Landfilling of biosolids is becoming increasingly restricted and land application of Class B biosolids may become less restrictive (i.e., the County Ordinance banning land application may be lifted if the regulations under SB 1383 require it).	Maintain diversified biosolids management to decrease risk and look for ways to increase reliability of T-TSA's biosolids management.
Air Emissions	New emissions monitoring and more restrictive emissions limits for TACs may limit onsite biogas management options, which is closely linked to the anaerobic digestion process. Additionally, any modifications to the existing waste gas flare will most likely trigger permitting through the NSAQMD.	Plan for increasingly stringent emissions requirements and need for emissions control equipment for the digesters and stationary combustion units. Plan for new permitting requirements associated with the waste gas flare.
Greenhouse Gases (GHG)	Wastewater treatment plants are not directly required to report GHG emissions, but may need to report general stationary combustion emissions.	Monitor GHG emissions regulations and comply when necessary. Implement energy efficiency and green energy projects.

Future water quality based regulatory scenarios are listed as follows:

- Existing Waste Discharge Requirements (No Change) – For this scenario it is assumed that T-TSA's waste discharge requirement would essentially not change.
- Waste Discharge Requirements with More Stringent Nutrient Limits – For this scenario it is assumed that T-TSA's waste discharge requirements would remain the same with the exception of more stringent nutrient limits to further reduce any impacts of T-TSA effluent on the Truckee River and Martis Creek, and to enhance attainment of receiving water quality objectives.
- Federal NPDES Permit Program – This scenario assumes that T-TSA would be regulated under the Federal NPDES permitting program. It is assumed that potential new water quality based effluent limits would include metals and organics, lower disinfection byproduct limits, and limits for CECs.
- Enhanced TDS and Chloride Limits – This scenario assumes that more stringent requirements for TDS and chloride would be imposed, either under the existing permit framework or under the NPDES permit program.

It is recommended that the master plan addresses the following regulatory scenarios:

- Waste Discharge Requirements with More Stringent Nutrient Limits
- Federal NPDES Permit Program

For these scenarios both optimization of the existing treatment process and treatment plant upgrades will be identified and evaluated. While there is potential for more stringent TDS and chloride limits, it is anticipated that if more stringent limits were to be imposed then this would occur in the latter part of the planning horizon or beyond the planning horizon. Therefore, it is recommended that this master plan includes a conceptual level evaluation of process upgrades to achieve more stringent TDS and chloride limits.

5.9 References

CH2M Hill 2004. Martis Creek Watershed Phosphorus Study

Lahontan Regional Water Quality Control Board (2005) Watershed Management Initiative Chapter
https://www.waterboards.ca.gov/lahontan/water_issues/programs/watershed_management/

Lahontan Regional Water Quality Control Board (2019) Basin Plan
https://www.waterboards.ca.gov/lahontan/water_issues/programs/basin_plan/

Lahontan Regional Water Quality Control Board (2018) Integrated Report and Meeting (November 20, 2019)

EPA/OW. "Discharges that are Functionally Equivalent to a Direct Discharge and Thus Subject to NPDES Permitting under Section 402 of the Clean Water Act". Maui, 140 S. Ct. at 1468 (April 23, 2020)
https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202010&RIN=2040-AG05

EPA (2021a). Guidance Document "Applying the Supreme Court's County of Maui v. Hawaii Wildlife Fund Decision in the Clean Water Act Section 402 National Pollutant Discharge Elimination System Permit Program"

EPA (2021b) recission of the January 2021 Guidance Document "Applying the Supreme Court's County of Maui v. Hawaii Wildlife Fund Decision in the Clean Water Act Section 402 National Pollutant Discharge Elimination System Permit Program" https://www.epa.gov/system/files/documents/2021-09/maui-rescission-memo_final-09.15.2021.pdf

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Appendix 5A

WASTE DISCHARGE REQUIREMENTS ORDER NO. R6T-2002-0030 WDID NO. 6A290011000

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

BOARD ORDER NO. R6T-2002-0030
WDID NO. 6A290011000

REVISED WASTE DISCHARGE REQUIREMENTS

FOR

TAHOE-TRUCKEE SANITATION AGENCY MARTIS VALLEY WASTEWATER TREATMENT PLANT AND ASSOCIATED MAINTENANCE ACTIVITIES

Nevada County

The California Regional Water Quality Control Board, Lahontan Region (Regional Board) finds:

1. Discharger

   On January 10, 2002, the Tahoe-Truckee Sanitation Agency (TTSA) submitted a completed revised Report of Waste Discharge for the expansion of the Martis Valley Wastewater Treatment Plant. For the purpose of this Order, the Tahoe-Truckee Sanitation Agency (TTSA), as the operator, facility owner, and landowner, is referred to as the "Discharger".

2. Facility

   For purposes of this Order, the land, buildings and equipment associated with the operations of the Martis Valley Wastewater Treatment Plant, and associated routine maintenance activities, are referred to as the "Facility".

3. Facility Location

   The Facility is located at 13720 Joerger Drive, within the town limits of the Town of Truckee, Nevada County APN 49-010-20, as shown in Attachment "A", which is made a part of this Order. The Facility location is within Sections 7 and 12, T17N, R17E, MDB&M, which is within the Truckee River Hydrologic Unit. The Truckee River borders the northern side of the Facility and Martis Creek is located east of the Facility.

4. Order History

   Regulation of the Facility began with the adoption of waste discharge requirements (WDRs) under Board Order No. 6-74-44, adopted April 25, 1974. The Board revised those WDRs under Board Order No. 6-77-27 adopted May 12, 1977. At the request of TTSA, the Board revised WDRs in 1981 by adopting Board Order No. 6-81-61, authorizing a 2.57 million gallons per day (MGD) maximum 7-day average flow capacity increase (from 4.83 to 7.4 MGD) upon completion of a proposed treatment facility expansion. The Board again revised

WDRs under Board Order No. 6-81-71 on September 17, 1981, authorizing the treatment facility capacity to be immediately increased from 4.83 to 5.83 MGD. The 1.0 MGD increase in capacity was part of the proposed 2.57 MGD capacity increase mentioned above, and occurred before the proposed treatment facility expansion was completed. The Board then updated the WDRs on February 19, 1987 by adopting Board Order No. 6-87-21, and again updated the WDRs on April 11, 1990 by adopting Board Order No. 6-90-27. The Board amended the WDRs on October 3, 1996, by adopting Board Order 6-90-27A1.

5. Reason for Action

The Regional Board is revising the WDRs to permit an increase in Facility capacity and change in treatment methods for nitrogen removal, and to modify the monitoring and reporting program in response to these changes. The revised WDRs also serve as an update as part of a statewide program to periodically review and update WDRs, and also to incorporate changes to conform to the revised Basin Plan.

6. TTSA as a Regional Entity

The TTSA is designated as the regional entity to transport, treat and dispose wastewater from the North Tahoe Public Utility District (NTPUD), Tahoe City Public Utility District (TCPUD), Alpine Springs County Water District (ASCWD), Squaw Valley Public Services District (SVPSD), Truckee Sanitary District (TSD) and the Truckee River Canyon area. Reference to member entities of the TTSA in the Lake Tahoe Basin specifically includes NTPUD and TCPUD which are subject to the requirements of the California-Nevada Interstate Water Compact, referenced in Finding No. 19. ASCWD, SVPSD, TSD and the Truckee River Canyon Area are not within the Lake Tahoe Basin; and therefore, are not subject to the California-Nevada Interstate Water Compact.

7. Description of Existing Facility

The wastewater treatment facility provides tertiary level treatment. The treatment processes consist of influent screening, grit removal, primary sedimentation, pure oxygen activated sludge, biological phosphorus removal, chemical treatment, mixed media filtration, ion exchange ammonia removal, and final chlorination. Organic sludge is digested anaerobically, dewatered and transported to a landfill. Waste chemical sludge is dewatered and also transported to a landfill. The Discharger is considering alternative disposal sites for sludge, which will be subject to Regional Board staff review and approval. Emergency storage of wastewater is provided at the former TSD wastewater treatment ponds.

8. Existing Facility Capacity

The TTSA is capable of transporting, treating and disposing of a maximum 7-day average municipal wastewater flow, during the summer months of 7.4 MGD.

9. Description of and Capacity of Proposed Expansion

The proposed expansion of the Facility will be capable of transporting, treating and disposing of a maximum 7-day average flow during the summer months of 9.6 MGD. The proposed expansion will include numerous replacement, upgraded, modified and additional components and units to provide additional capacity and improve treatment, as described as Alternative 3 in the *Draft Project Report* dated April 1999 and modified by the *Updated Project Report* dated January 2002. The proposed expansion will also replace the existing ion-exchange nitrogen removal system with a Biological Nitrogen Removal (BNR) system for the full 9.6 MGD capacity of the enlarged plant. The existing ion exchange process shall only be operated if there is a process upset during the startup of the new BNR process. Following a three-month period of successful operation of the new BNR process, the ion exchange process will only be operated as a standby unit for emergencies. Additional treatment provided by the Soil Aquifer Treatment (SAT) process will also be acknowledged. The expansion will also incorporate enlargement and improvements to the Truckee River Interceptor (TRI) and the emergency storage facilities at the former TSD Sewage Treatment Lagoons.

The proposed expansion also identifies additional improvements which will not be constructed immediately, but rather at a later date when needed. Among these improvements are an additional disposal field and a spray irrigation system, which will require subsequent approval by the Regional Board.

10. Point of Effluent Disposal

Plant effluent is discharged to subsurface disposal trenches, the boundaries of which are shown on Attachment "A", which is made a part of this Order. The disposal field is located in a portion of the SE/4, Section 7, T17N, R17E, MDB&M and are within the Truckee River Hydrologic Unit.

A second disposal field will be constructed when needed for additional disposal capacity. The location of the proposed second disposal field is also shown on Attachment "A". A pilot project operated in 1991 demonstrated the technical feasibility of disposing effluent by a spray irrigation system from April through November. The proposed location of a full-scale effluent spray irrigation system is also shown on Attachment "A". The Discharger does not intend to construct the full-scale effluent spray irrigation system until a later date when needed to meet effluent limitations. The proposed location of a full-scale spray irrigation system is also shown on Attachment "A". Other than small volumes used for plant irrigation, the three areas shown on Attachment "A" are the only designated disposal sites.

11. Site Hydrogeology

Soils investigations of the effluent disposal areas indicate that they are located over permeable glacial outwash (Tahoe outwash) deposits 70 to 100 feet thick. The sites are further underlain by the relatively impermeable clayey deposit of the Truckee Formation. Ground water elevations in both disposal areas are known to be at least 40 feet below the ground surface.

Hydrogeologic investigations, a mathematical simulation model, and bromide tracer studies indicate that plant effluent discharged to the subsurface disposal system will migrate from the disposal site toward the Truckee River and Martis Creek, a tributary of the Truckee River. The Truckee River and Martis Creek are both within a half mile of the disposal sites.

Additional studies have been conducted by TTSA to demonstrate and quantify the ability of the aquifer to remove nitrogen, phosphorus and bacteriological constituents in treated effluent.

12. Lahontan Basin Plan

The Regional Board adopted the *Water Quality Control Plan for the Lahontan Region* (Basin Plan) on March 31, 1995. This Order implements the Basin Plan, as amended.

13. Receiving Waters

The Facility discharges to ground waters of the Martis Valley Ground Water Basin. Studies indicate that plant effluent discharged to the subsurface disposal system will migrate from the disposal site toward the Truckee River and Martis Creek, which are within a half mile of the disposal site.

14. Beneficial Uses of Ground Water

The beneficial uses of ground waters of the Martis Valley Ground Water Basin, as set forth and defined in the Basin Plan, are:

a. municipal and domestic water supply;
b. agricultural supply; and
c. freshwater replenishment.

15. Beneficial Uses of Surface Water

The beneficial uses of the Truckee River, as set forth and defined in the Basin Plan, are:

a. municipal and domestic water supply;
b. agricultural supply;
c. industrial service supply;
d. ground water recharge;
e. freshwater replenishment;
f. hydropower generation;
g. water contact recreation;
h. non-contact water recreation;
i. commercial and sport fishing;
j. cold freshwater habitat;
k. wildlife habitat;
l. rare, threatened, or endangered species;

m. migration of aquatic organisms; and
n. spawning, reproduction, and development.

The beneficial uses of Martis Creek, as set forth and defined in the Basin Plan, are:

a. municipal and domestic supply
b. agricultural supply;
c. ground water recharge;
d. water contact recreation;
e. non-contact water recreation;
f. commercial and sport fishing;
g. cold freshwater habitat;
h. wildlife habitat;
i. rare, threatened, or endangered species;
j. migration of aquatic organisms; and
k. spawning, reproduction, and development.

16. Control Measures for the Lake Tahoe Basin

The "Control Measures for the Lake Tahoe Basin" is incorporated within Chapter 5 of the Basin Plan. This Chapter incorporates control measures that were previously included in the *Lake Tahoe Basin Water Quality Plan*. Included in these control measures are prohibitions of the discharge or threatened discharge of solid or liquid waste, including earthen materials from any new subdivision, new development in stream environment zones, new development not in conformance with land capability, new development not offset by implementation of remedial erosion control measures, to ground or surface waters or to stream environment zones in the Lake Tahoe Basin. To implement those and other provisions necessary to protect the water quality of the Lake Tahoe Basin, the control measures require that the Regional Board, in establishing WDRs for sewerage agencies servicing the Lake Tahoe Basin, to include the following:

a. Conditions shall be set in WDRs to prohibit the sewerage agencies from providing any connection serving new development which is not in accordance with the Plan.

b. Conditions shall be set in WDRs to require the development of raw sewage overflow preventative maintenance and spill response programs.

c. Conditions shall be set in WDRs to require the submission of annual reports providing updated estimates of available sewage treatment capacity within the respective sewerage systems.

d. Conditions shall be set in WDRs to require the determination of which structures in the Lake Tahoe Basin are not connected to a sewerage collection, treatment and export system.

17. Martis Creek Watershed Phosphorus Study

The receiving water objectives for Martis Creek allow minimal assimilative capacity for additional phosphorus. The proposed project may cause phosphorus levels in Martis Creek to exceed receiving water limitations. The current mean of monthly means phosphorus concentration above TTSA's influence upon the creek is 0.05 mg/l, which is also the receiving water limitation for the entire creek. The TTSA projects that with or without the proposed expansion, by 2010 this concentration may be elevated to 0.06 mg/l. To identify phosphorus sources and assess control measures that could be imposed within the Martis Creek watershed to reduce phosphorus loading to the creek and provide additional assimilative capacity for future TTSA discharges, the TTSA will provide funding for and ensure the completion of a study to identify existing and future sources of phosphorus within the watershed, potential control measures that could be implemented, and a monitoring plan to evaluate the effect of such control measures upon Martis Creek thoughout its watershed.

18. Consideration of Water Rights

Section 174 of the California Water Code states in part:

"It is also the intention of the Legislature to combine the water rights and the water pollution and water quality functions of state government to provide for consideration of water pollution and water quality, and availability of unappropriated water whenever applications for appropriation of water are granted or waste discharge requirements or water quality objectives are established."

19. California-Nevada Interstate Compact

The California-Nevada Interstate Water Compact concerning the waters of the Lake Tahoe, Truckee River, Carson River and Walker River Basins was approved by the Legislatures of California and Nevada in 1970 and 1971, respectively. The United States Congress has not ratified the Compact. However, the states of California and Nevada are using the Compact as a guideline for allocation of water between the two states in those watersheds.

20. California Environmental Quality Act Compliance

An Environmental Impact Report for the proposed expansion of the Facility was adopted by the TTSA on December 19, 2000 in accordance with the provisions of the California Environmental Quality Act (Public Resources Code, §21000 et seq.). The Regional Board has considered the CEQA document and subsequent addendum to that document prepared by the lead agency. The following significant effects of the proposed expansion were identified in the CEQA document:

a. Potential temporary significant short-term impact (increase in dust and noise) on local residential land uses adjoining TTSA facility during construction. Pursuant to CEQA, a Mitigation Monitoring Plan (MMP) has been prepared, summarizing mitigation that will be implemented to bring this potentially significant impact to nonsignificant levels, and also describes the duration that the mitigation will be implemented for and includes the responsible parties for ensuring the success of the mitigation. The contractor will be responsible for implementation of the mitigation, and TTSA will be responsible for monitoring. The Regional Board is not responsible for implementation and monitoring of mitigation measures associated with this potentially significant impact.

b. Potential temporary significant short-term impact (increase in dust and noise near residential land adjoining construction areas) during TSD ponds and TRI modifications. Pursuant to CEQA, a Mitigation Monitoring Plan (MMP) has been prepared, summarizing mitigation that will be implemented to bring this potentially significant impact to nonsignificant levels. The MMP also describes the duration that the mitigation will be implemented for and includes the responsible parties for ensuring the success of the mitigation. The contractor will be responsible for implementation of the mitigation, and TTSA will be responsible for monitoring. The Regional Board is not responsible for implementation and monitoring of mitigation measures associated with this potentially significant impact.

21. Public Notification

The Regional Board has notified the Discharger and all known interested parties of its intent to adopt updated waste discharge requirements for the Facility.

22. Consideration of Public Comments

The Regional Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED that the Discharger shall comply with the following:

I. REVIEW PROCEDURES FOR NEW PROJECTS

A. The TTSA shall submit to the Regional Board staff all projects which meet any of the following four criteria:

1. Require a building permit
2. Require a grading permit
3. Have a soil disturbance of more than 1,000 square feet
4. Propose soil disturbance within a stream environment zone

B. No projects submitted for review per Review Procedure A. above may commence prior to the Executive Officer or the Regional Board approving the measures and facilities proposed for siltation and erosion control.

C. During any emergency where the public health or welfare is threatened, the TTSA is authorized to take corrective action and shall use Best Management Practices for control of siltation and erosion as the situation demands; Regional Board staff shall be notified as soon as practical.

II. DISCHARGE SPECIFICATIONS

A. Effluent Limitations

1. The discharge to waters of the State shall not contain trace elements, pollutants, contaminants, or combinations therof, in concentrations which are toxic to humans or to aquatic or terrestrial plant or animal life.

2. Treated wastewater made available for percolation shall not contain concentrations of parameters in excess of the following limits:

	Effluent Limitations	
Constituent	Monthly average[a]	Maximum[b]
Suspended Solids	10 mg/l	20 mg/l
Turbidity	---	10 NTU
Total Phosphorus	0.8 mg/l	1.5 mg/l
Chemical Oxygen Demand	45 mg/l	60 mg/l

[a]The "monthly average" is the arithmetic mean of measurements made during a month.
[b]The "daily maximum" is the highest daily 24-hour composite measurement during the monitoring period.

3. All treated wastewater made available for percolation shall have a dissolved oxygen concentration greater than 0.5 mg/l.

4. Treated wastewater made available for percolation shall have a total trihalomethanes concentration of less than 50 ppb, measured as an arithmetic mean of all samples taken during a calendar year.

5. Treated wastewater made available for percolation shall have a 7-day mean of no more than 23 total coliform organisms, and shall have a mean of any two consecutive samples of no more than 240 total coliform organisms.

6. Effective immediately and continuing until completion of the treatment plant expansion, or until completion of BNR for the existing rated capacity if expansion does not occur, treated wastewater made available for percolation shall not contain concentrations in excess of the following limits:

	Effluent Limitations	
Constituent	Annual average[c]	Maximum[b]
Total Dissolved Solids	600 mg/l	---
Chloride	200 mg/l	---

[b]The "daily maximum" is the highest daily 24-hour composite measurement during the monitoring period.
[c]The "Annual Average" is the arithmetic mean of all measurements made during a calendar year.

7. Effective immediately and continuing until four years after the completion of the treatment plant expansion, or until four years after the completion of BNR for the existing rated capacity if expansion does not occur, treated wastewater made available for percolation shall not contain concentrations in excess of the following limits:

	Effluent Limitations	
Constituent	Monthly average[a]	Maximum[b]
Total Nitrogen (as N)	9 mg/l	12 mg/l

[a]The "monthly average" is the arithmetic mean of measurements made during a month.
[b]The "daily maximum" is the highest daily 24-hour composite measurement during the monitoring period.

The TTSA shall use all existing wastewater treatment facilities capable of reducing the monthly average total nitrogen concentration below 9.0 mg/l in all treated wastewater made available for percolation. If objectionable alterations in the species composition of any surface waters occur in the biomass and/or objectionable alterations in the species composition of any surface waters occur as a result of percolating wastewater effluent, the TTSA shall reduce effluent nitrogen concentrations below the Effluent Limitation of 9.0 mg/l. The reduction shall be made within 30 days after being notified by the Regional Board.

B. Flow Limitations

1. Effective immediately, and continuing until the completion of the treatment plant expansion, the following flow limitations of the facility shall be effective:

   a. From June 21 through September 21 of any year, the flow of wastewater to the treatment and disposal facilities during any seven (7) consecutive days shall not exceed an arithmetic average of 7.4 MGD.

   b. The maximum instantaneous flow rate of wastewater through the treatment facilities shall not exceed 13.0 MGD.

2. Immediately after the completion of the treatment plant expansion, the following flow limitations of the facility shall be effective:

   a. From June 21 through September 21 of any year, the flow of wastewater to the treatment and disposal facilities during any seven (7) consecutive days shall not exceed an arithmetic average of 9.6 MGD.

   b. The maximum instantaneous flow rate of wastewater through the treatment facilities shall not exceed 15.4 MGD.

3. The TTSA and its member entities in the Lake Tahoe Basin shall not issue sewer connection permits to a new development unless the Regional Board has determined that the new development is consistent with the Lake Tahoe Basin Water Quality Plan. A determination by the TRPA of consistency can be relied upon by the TTSA and its member entities in the Lake Tahoe Basin unless the Regional Board specifies in writing otherwise. TTSA and its member entities in the Lake Tahoe Basin shall notify the Regional Board of any such determination made by the TRPA before issuing a sewer connection permit.

4. TTSA shall submit annual reports providing updated estimates of available sewage collection export and treatment capacity within its system. TTSA shall also submit in the same report, updated estimates of available sewage collection and export capacity within the individual systems of its member entities. These reports shall be submitted to the Regional Board not later than April 1 of each year, providing the following information for the previous calendar year:

   a. The effective capacity of each key element of the collection, treatment, export and disposal systems.

   b. Current high flows.

c. An allocation of capacity among: (1) current users; (2) projects for which connection permits have been issued; (3) capacity currently used or to be reserved for public agencies; (4) projects for which will-serve letters or similar commitments have been issued; and (5) available capacity, listed in terms for total flow and single family dwelling unit equivalents. Available capacity is determined as the differences between items 1-4 and the effective capacity of the most limiting component of the wastewater system.

d. The number of additional connection permits or service commitments to be issued in the coming year, and the flow projected from these units.

e. The number of subdivided vacant residential, commercial or public service lots within its boundary which are not located in subdivisions where onsite domestic wastewater disposal has been approved indefinitely by all appropriate agencies.

f. Any proposed actions, including time schedules and financial plans, which will provide increases in effective capacity.

C. Receiving Water Limitations

1. The discharge shall not cause the following receiving water limitations for the Truckee River Hydrologic Unit to be exceeded:

Constituent	Units	Truckee River below Martis Cr [1/]	Truckee River at Stateline [1/]
Total Dissolved Solids	mg/l	80	75
Chloride	mg/l	10	8
Sulfate	mg/l	5	5
Total Iron	mg/l	0.29	0.30
Nitrate Nitrogen	mg/l as N	0.20	0.08
Total Kjeldahl Nitrogen	mg/l as N	0.20	0.32
Total Nitrogen	mg/l as N	0.40	0.40
Total Phosphorus	mg/l as P	0.05	0.05
Boron	mg/l	---	1.0 [2/]

[1/] Arithmetic mean of monthly means
[2/] Maximum limitation

2. The discharge shall not cause the following receiving water limitations for Martis Creek to be exceeded:

Constituent	Units	Mean [3/]
Total Dissolved Solids	mg/l	150
Chloride	mg/l	25
Sulfate	mg/l	8
Total Iron	mg/l	0.40
Nitrate Nitrogen	mg/l as N	1.00
Total Kjeldahl Nitrogen	mg/l as N	0.45
Total Nitrogen	mg/l as N	1.45
Total Phosphorus	mg/l as P	0.05

[3/] Arithmetic mean of monthly means

3. Effective immediately, and continuing for the life of the project, ground water containing treated wastewater which was made available for percolation (as measured at Well 31) shall not contain concentrations of parameters in excess of the following limits prior to entering Martis Creek and/or the Truckee River:

	Effluent Limitations	
Constituent	Monthly average[a]	Maximum[b]
Chemical Oxygen Demand	15 mg/l	40 mg/l
Un-ionized Ammonia (as N)	---	0.20 mg/l
Total Phosphorus (as P)	0.3 mg/l[c]	---
Fecal Coliform Bacteria	---	2.2 MPN/100 ml[d]

[a]The "monthly average" is the arithmetic mean of measurements made during a month.
[b]The "daily maximum" is the highest daily 24-hour composite measurement during the monitoring period.
[c]Annual Average
[d]2.2 – mean of 7-day average

4. Effective immediately, and continuing for the life of the project, ground water containing treated wastewater which was made available for percolation (as measured at Well 31) shall have a pH of not less than 6.5 units nor greater than 8.5 units.

5. Beginning four years after completion of the treatment plant expansion, or four years after completion of BNR for the existing rated capacity if expansion does not occur, ground water containing treated wastewater which was made available for percolation (as measured at Well 31) shall not contain concentrations of total

for percolation (as measured at Well 31) shall not contain concentrations of total nitrogen in excess of the following limits prior to entering Martis Creek and/or the Truckee River:

Constituent	Monthly Average[a]	Daily maximum[b]
Total Nitrogen (as N)		
May 1-October 31	2.0[e]	---
Annual Average (Jan 1-December 31)	3.0[e]	---

[a]The "monthly average" is the arithmetic mean of measurements made during a month.
[b]The "daily maximum" is the highest daily 24-hour composite measurement during the monitoring period.
[e]Average of monthly averages for monitoring period. Note that in addition to the concentration requirements, the discharge shall not exceed the mass loading as shown below.

6. Effective immediately, and continuing for the life of the project, ground water containing treated wastewater which was made available for percolation (as measured at Well 31) shall not exceed the following mass loading prior to entering Martis Creek and/or the Truckee River:

Constituent	Mass Loading Limitation (lbs/day)
Total Phosphorus (as P)	24 lbs/day (12-month average)[f]
Total Nitrogen (as N)	
May 1- October 31	128 lbs/day (6-month average)[f]
Yearly Average	204 lbs/day (12-month average)[f]

[f]Average of monthly averages for six month period or for calendar year

7. On or before completion of the treatment plant expansion, or completion of BNR for the existing rated capacity if expansion does not occur, treated wastewater which was made available for percolation (as measured at Well 31) shall not exceed the following mass loadings prior to entering Martis Creek and/or the Truckee River:

Constituent	Mass Loading Limitation (lbs/day)
Total Dissolved Solids	AAF[g] x 415 mg/l x 8.345 (annual average)
Chloride	AAF[g] x 115 mg/l x 8.345 (annual average)

[g]AAF = average annual flow

8. Beginning with completion of the treatment plant expansion, or with the completion of BNR for the existing rated capacity if expansion does not occur, and continuing for the next four years, ground water containing treated wastewater which was made available for percolation (as measured at Well 31) shall not exceed the following mass loading prior to entering Martis Creek and/or the Truckee River:

Constituent	Mass Loading Limitation (lbs/day)
Total Dissolved Solids	AAF[g] x (35 x (9.6-M7DADF[h])/2.2+360) x 8.345 or AAF[g] x 395 mg/l x 8.345, whichever is less (annual average)
Chloride	AAF[g] x (15 x (9.6-M7DADF[h])/2.2+100) x 8.345 or AAF[g] x 115 mg/l x 8.345, whichever is less (annual average)

[g]AAF = average annual flow
[h]M7DADF = maximum 7-day average dry weather flow

9. Beginning four years after completion of the treatment plant expansion, or four years after completion of BNR for the existing rated capacity if expansion does not occur, ground water containing treated wastewater which was made available for percolation (as measured at Well 31) shall not exceed the following mass loadings prior to entering Martis Creek and/or the Truckee River:

Constituent	Mass Loading Limitation (lbs/day)
Total Dissolved Solids	AAF[g] x 360 mg/l x 8.345 or 24,514, whichever is less (annual average)
Chloride	AAF[g] x 100 mg/l x 8.345 or 6,809, whichever is less (annual average)

[g]AAF = average annual flow

10. Effective immediately and continuing throughout the life of the project, the discharge of treated wastewater effluent to ground waters shall not cause a violation of the following water quality objectives for waters of the Martis Valley Ground Water Basin:

a. Tastes and Odors – The taste and odor of ground waters shall not be altered.

b. Bacteria – In ground waters designated as MUN, the median concentration of coliform organisms over any seven-day period shall be less than 1.1/100 milliliters.

c. Radioactivity – Ground waters designated as MUN shall not contain concentrations of radionuclides in excess of the limits specified in Table 4 of Section 64443 (Radioactivity) of Title 22 of the California Code of Regulations which is incorporated by reference into the Basin Plan. This incorporation-by-reference in prospective including future changes to the incorporated provisions as the changes take effect.

d. Chemical Constituents – Ground waters designated as MUN shall not contain concentrations of chemical constituents in excess of the maximum contaminant level or secondary maximum contamination level based upon drinking water standards specified in the following provisions of Title 22 of The California Code of Regulations which are incorporated by reference into the Basin Plan: Table 64431-A of Section 64431 (Inorganic Chemicals), Table 64431-B of Section 64431 (Flouride), Table 64444-A of Section 64444 (Organic Chemicals, Contaminant Levels-Consumer Acceptance Limits), and Table 64449-B of Section 64449 (Secondary Maximum Contaminant Levels-Ranges). This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

Ground waters designated as AGR shall not contain concentrations of chemical constituents in amounts that adversely affect the water for beneficial uses (i.e., agricultural purposes).

Ground waters shall not contain concentrations of chemical constituents in amounts that adversely affect the water for beneficial uses.

11. The operation of the facility shall not cause a violation of the following water quality objectives for surface waters of the Truckee River Hydrologic Unit:

a. Turbidity – The turbidity shall not be raised above 3 Nephelometric Turbidity Units (NTU) mean of monthly means. (This objective is approximately equal to the State of Nevada standard of 5 NTU sample mean).

b. Floating Material – Waters shall not contain floating material, including solids, liquids, foams and scum, in concentrations that cause nuisance or adversely affect the water for beneficial uses.

For natural high quality waters, the concentrations of floating material shall not be altered to the extent that such alterations are discernable at the 10 percent significance level.

c. Suspended Materials – Waters shall not contain suspended material in concentrations that cause a nuisance or adversely affect the beneficial uses.

For natural high quality waters, the concentrations of suspended material shall not be altered to the extent that such alterations are discernable at the 10 percent significance level.

d. Settleable Material – Waters shall not contain substances in concentrations that result in deposition of material that causes nuisance or that adversely affects the water for beneficial uses. For natural high quality waters, the concentrations of settleable material shall not be raised by more than 0.1 milliliter per liter.

e. Color – The color shall not exceed an eight (8) Platinum Cobalt Unit mean of monthly means (approximately equivalent to the State of Nevada standard of a twelve (12) Platinum Cobalt Unit sample mean).

f. Tastes and Odors – The taste and odor shall not be altered.

g. Algal Growth Potential – The mean monthly algal growth potential shall not be altered to the extent that such alterations are discernible at the 10 percent significance level. This objective does not apply to Martis Creek; however, nuisance and pollution levels of algal growth shall not be discernible at these stations.

h. Biostimulatory Substances – The concentrations of biostimulatory substances shall not be altered in an amount that could produce an increase in aquatic biomass to the extent that such increases in aquatic biomass are discernible at the 10 percent significance level. See pg. 3-9 of Basin Plan for additional language.

i. Species Composition – The species composition of aquatic organisms shall not be altered to the extent that such alterations are discernible at the 10 percent significance level. See pg. 3-9 of Basin Plan for additional language.

j. pH – Changes in normal ambient pH levels shall not exceed 0.5 pH units.

k. Dissolved Oxygen – The dissolved oxygen concentrations shall not be depressed by more than 10 percent, below 80 percent saturation, or below 7.0 mg/l, whichever is more restrictive.

l. Bacteria – Waters shall not contain concentrations of coliform organisms attributable to anthropogenic sources, including human and livestock waste. The fecal coliform concentration during any 30-day period shall not exceed a log mean of 20/100 ml, nor shall more than 10 percent of all samples collected during any 30-day period exceed 40/100 ml.

m. Temperature – The natural receiving water temperature shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such an alteration in temperature does not adversely affect the water for beneficial uses.

n. Toxicity – All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal or aquatic life.

o. Pesticides – Pesticide concentrations, individually or collectively, shall not exceed the lowest detectable levels, using the most recent detection procedures available. There shall not be a an increase in pesticide concentrations found in bottom sediments. There shall be no detectable increase in bioaccumulation of pesticides in aquatic life.

Waters designated as MUN shall not contain concentrations of pesticides or herbicides in excess of the limiting concentrations specified in Table 64444-A of Section 6444 (Organic Chemicals) of Title 22 of the California Code of Regulations which is incorporated by reference into the Basin Plan. This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

Pesticides are defined here and in the Basin Plan to include insecticides, herbicides, rodenticides, fungicides, piscides, and all other economic poisons. An economic poison is any substance intended to prevent, repel, destroy, or mitigate the damage from insects, rodents, predatory animals, bacteria, fungi or weeds capable of infesting or harming vegetation, humans or animals.

p. Oil and Grease – Water shall not contain oils, greases, waxes or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect the water for beneficial uses.

q. Sediment – The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect the water for beneficial uses.

r. Radioactivity – Radionuclides shall not be present in concentrations which are deleterious to human, plant, animal, or aquatic life nor which result in the accumulation of radionuclides in the food web to an extent which presents a hazard to human, plant, animal, or aquatic life.

Waters designated as MUN shall not contain concentrations of radionuclides in excess of the limits specified in Table 4 of Section 64443 (Radioactivity) or Title 22 of the California Code of Regulations which is incorporated by reference into the Basin Plan. This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

s. Non-degradation of Aquatic Communities and Populations – All wetlands shall be free from substances attributable to wastewater or other discharges that produce adverse physiological responses in humans, animals, or plants; or which lead to the presence of undesirable or nuisance aquatic life. All wetlands shall be free from activities that would substantially impair the biological community as it naturally occurs due to physical, chemical and hydrological processes.

t. Chlorine, Total Residual – For the protection of aquatic life, total chlorine residual shall not exceed either a median value of 0.002 mg/l or a maximum value of 0.003 mg/l. Median values shall be based on daily measurements taken within any six-month period.

u. Chemical Constituents - Waters designated as MUN shall not contain concentrations of chemical constituents in excess of the maximum contaminant level or secondary maximum contamination level based upon drinking water standards specified in the following provisions of Title 22 of The California Code of Regulations which are incorporated by reference into the Basin Plan: Table 64431-A of Section 64431 (Inorganic Chemicals), Table 64431-B of Section 64431 (Flouride), Table 64444-A of Section 64444 (Organic Chemicals, Contaminant Levels-Consumer Acceptance Limits), and Table 64449-B of Section 64449 (Secondary Maximum Contaminant Levels-Ranges). This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

Waters designated as AGR shall not contain concentrations of chemical constituents in amounts that adversely affect the water for beneficial uses (i.e., agricultural purposes).

v. Un-Ionized Ammonia - The neutral, un-ionized ammonia species (NH_3^o) is highly toxic to freshwater fish. The fraction of toxic NH_3^o to total ammonia species ($NH_4^+ + NH_3^o$) is a function of temperature and pH. Tables 3-1 to 3-4 of the Basin Plan were derived from USEPA ammonia criteria for freshwater. Ammonia concentrations shall not exceed the values listed in these tables. For temperature and pH values not explicitly in these tables, the most conservative value neighboring the actual value may be used or criteria can be calculated from numerical formulas developed by the USEPA. Waters shall not contain concentrations of chemical constituents in amounts that adversely affect the water for beneficial uses.

D. Emergency Storage

1. The TTSA shall continue to provide emergency wastewater storage facilities capable of preventing treatment and disposal facility overloading or unauthorized discharges due to excessive flows or system breakdowns.

2. Emergency storage facilities shall have a capacity of at least 24 million gallons in addition to what is normally stored in the 15 million gallon emergency retention basin during routine treatment procedures.

3. Emergency storage facilities shall be sealed to prevent percolation of wastewater. The offsite ponds "A" and "B" have been lined with one foot of bentonite clay and shall be maintained as necessary to ensure the liner integrity.

4. All stored sewage shall be pumped to wastewater treatment and disposal facility.

5. The discharge of untreated or partially treated wastewater to emergency storage facilities is prohibited, except when any of the following conditions occur:

   a. Loss of electrical power at the wastewater treatment facility.

   b. Major equipment failure at the wastewater treatment facility.

   c. Wastewater treatment process upset.

d. Excessive infiltration/inflow into sewage facilities.

e. Any other emergency that could threaten the public health.

f. Implementing collection system, treatment plant and/or disposal system maintenance programs.

6. When additional emergency storage is determined to be necessary by the discharger, improvements shall be made to the offsite ponds to increase their storage capacity.

E. Full-Scale Effluent Spraying System

The discharger does not intend to operate a full-scale effluent spray irrigation system at this time. If the system is to be in operation, operations shall comply with the following requirements:

1. Before commencing operation of the effluent spray irrigation system, the Discharger shall install ground water monitoring wells and collect at least twelve months of monitoring data to characterize pre-project quality and water levels. The monitoring wells shall later be incorporated into the compliance monitoring program for the effluent spraying system.

2. At least 120 days prior to construction of the effluent spray irrigation system, the Discharger shall submit to Regional Board staff final plans, a program for initial start-up of the system and proposed modifications to the compliance monitoring program. The Executive Officer must approve these plans prior to construction of the system. The Monitoring program will be modified at that time.

3. Effluent shall not drift on to any access road.

4. Surface flow of effluent shall not migrate beyond the Discharger's property.

5. This office shall be notified at least 24 hours in advance of the beginning of each spraying season.

6. The effluent spraying system shall not result in a pollution or nuisance in either Martis Creek or the Truckee River.

F. Pretreatment of Industrial Wastewaters

1. The Discharger shall perform pretreatment functions, as described in 40 CFR Part 403, to include the following:

a. Implement the necessary legal authorities as provided for in 40 CFR 403.8 (f)(1).

b. Establish a waste hauler permit system that regulates waste haulers discharging to the TTSA treatment plant, to be approved by the Executive Officer.

c. Develop a local pretreatment program, according to 40 CFR 403.5, to include the following minimum requirements:

(1) Conduct an industrial waste survey to identify all industrial dischargers that might be subject to the pretreatment program.

(2) Determine the character and volume of pollutants contributed to the TTSA facility by these industries.

(3) Conduct a technical evaluation to determine the maximum allowance treatment plant headworks (influent) loading for at least cadmium, chromium, copper, lead, nickel, and zinc.

(4) Identify any additional pollutants of concern.

(5) Implement a system to assure these loadings will not be exceeded.

d. Perform ongoing industrial inspections and monitoring as necessary to ensure compliance with any applicable pretreatment regulations.

2. The Discharger shall submit annually a report to the Regional Board describing the Discharger's pretreatment activities over the previous twelve months. In the event that the Discharger is not in compliance with any conditions or requirements of this Board Order, then the Discharger shall also include the reasons for non-compliance and state how and when the Discharger shall comply with such conditions are requirements. This annual report is due on July 1 of each year and shall contain, but not be limited to, the attached Appendix "A" titled, "Requirements for Pretreatment Annual Report", which becomes a part of this Order.

G. Best Management Practices

1. Prior to any disturbance of existing soil conditions, the Discharger shall install temporary erosion control facilities to prevent transport of eroded earthen materials and other wastes off the property.

2. Vehicle use shall be prevented in unpaved areas not subject to construction.

3. There shall be no significant modification of existing drainage ways or existing stream channel geometry except for the purpose of stabilization or enhancement of water quality improvement effects. All modifications of the

bed, channel, or bank of a stream require a prior written agreement with the California Department of Fish and Game.

4. All soil disturbance activities shall cease and temporary erosion control measures immediately installed if adverse weather conditions threaten the transport of disturbed soils from the project site.

5. All disturbed areas shall be adequately restabilized or revegetated. Revegetated areas shall be continually maintained until vegetation becomes established.

6. Stormwater runoff collection, pretreatment, and/or infiltration disposal facilities shall be designed, installed, and maintained to preclude a discharge of stormwater runoff for at least a 20-year 1-hour design storm (approximately 0.75" of rainfall) from all impervious surfaces. If site conditions do not allow for adequate on-site disposal, all site runoff must be treated to meet Effluent Limitations and the Receiving Water Limitations.

7. Stormwater runoff in excess of the design storm shall only be discharged to a storm drain or stabilized drainage, and must meet the Effluent Limitations

8. Surface flows from the project site shall be controlled so as to not cause downstream erosion at any point.

9. Stormwater runoff handling and disposal facilities shall be cleaned and renovated annually.

10. All disturbed soils and surplus waste earthen materials shall be removed from the project site and deposited only at a legal point of disposal, or restabilized on-site in accordance with erosion control plans previously reviewed by the Executive Officer.

11. At no time shall waste earthen materials be placed in surface water drainage courses, or in such a manner as to allow the discharge of such matter to adjacent undisturbed land or to any surface water drainage course.

12. All loose piles of soil, silt, clay, sand, debris or other earthen material shall be protected in a reasonable manner to prevent any discharge to waters of the state.

13. Any dewatering of trenches shall be done in a manner so as to eliminate the discharge of soil, silt, clay, sand or other waste earthen materials from the site to nearby surface waters.

14. Any damage or break in existing water or sewer lines shall be repaired as soon as possible and measures must be implemented to prevent erosion or sedimentation into any drainage way.

15. Fresh concrete or grout shall not be allowed to contact or enter surface waters.

16. The Discharger shall immediately clean up and transport to a legal site any spilled petroleum products to the maximum extent practicable.

H. General Requirements and Prohibitions

1. There shall be no discharge, bypass or diversion of raw or partially treated sewage, sewage sludge, grease, or oils from the transport, storage, treatment or disposal facilities to adjacent land areas or surface waters.

2. The discharge of wastewater except to the designated disposal sites is prohibited.

3. All facilities used for transport, storage, treatment, or disposal of waste shall be adequately protected against overflow, washout or inundation from a storm or flood having a recurrence interval of once in 100 years.

4. All waste organic and chemical sludges shall only be discharged at a legal point of disposal.

5. Where any numeric or narrative water quality objective contained in the Basin Plan is already being violated, the discharge of waste which causes further degradation or pollution is prohibited.

6. The surfacing of wastewater effluent at the designated subsurface disposal site, or within a 50-foot wide zone surrounding the designated subsurface disposal site, is prohibited. This prohibition does not apply to the surfacing of wastewater effluent encountered outside the 50-foot wide zone surrounding the designated subsurface disposal site. This prohibition also does not apply to maintenance activities authorized by this Board Order that are located on the designated subsurface disposal site or within the 50-foot wide zone surrounding the designated subsurface disposal site. All other activities proposed within the designated subsurface disposal site or within the 50-foot wide zone surrounding the designated subsurface disposal site, which may encounter wastewater effluent, shall be submitted for review by Regional Board staff and approval by the Executive Officer.

7. Neither the treatment nor the discharge shall cause a pollution or nuisance as defined in Section 13050 of the California Water Code, or a threatened pollution.

III. PROVISIONS

A. Recission of Board Order No. 6-90-27

Board Order No. 6-90-27 and Board Order 6-90-27A1 are hereby rescinded.

B. Monitoring and Reporting

Pursuant to Section 13267(b) of the California Water Code, the Discharger shall comply with Monitoring and Reporting Program No. 2002-(TENTATIVE).

C. Standard Provisions

The Discharger must comply with the "Standard Provisions for Waste Discharge Requirements", included in Attachment "B", which is made part of this order.

D. Right to Revise Waste Discharge Requirements

In accordance with Section 13263(e) of the California Water Code, the Regional Board reserves the right to review and revise all or any portion of these waste discharge requirements. Such action may be initiated on the Regional Board's own motion or in response to an application by any person affected by the discharge, for good cause, including the possibility that land uses in the area may change.

E. Wastewater Treatment Plant Operator Certificate

The Discharger's wastewater treatment plant shall be supervised by persons possessing a wastewater treatment plant operator certificate of appropriate grade pursuant to Chapter 3, Subchapter 14, Title 23, California Code of Regulations.

F. Addition of Biological Nitrogen Removal

TTSA shall initiate construction of full Biological Nitrogen Removal (BNR) for the existing rated capacity of 7.4 mgd by June 15, 2004, if the plant expansion is delayed or abandoned; provided that a total grant of $11.6 million has been committed and made available to TTSA by the State of California for this purpose. The BNR process shall be designed for maximum practicable nitrogen reduction, independent of additional removals that can be achieved in the soil aquifer treatment (SAT) system. Operational measures shall be employed to maximize the overall performance of the BNR and SAT systems in concert with one another, to minimize nitrogen discharged to the Truckee River.

G. Martis Creek Watershed Phosphorus Study

Prior to **January 1, 2003**, the Discharger shall submit a workplan for a study to identify existing and future sources of phosphorus within the Martis Creek watershed, potential control measures that could be implemented, and a monitoring plan to evaluate the effect of such control measures upon Martis Creek throughout its watershed. The workplan shall describe the study and include a time schedule for its completion by **June 30, 2004**. Though the study will involve and require the participation of other public agencies and private entities, the Discharger shall provide funding for and ensure the completion of the study.

H. Sewage Overflow Preventative Maintenance and Spill Response Programs

Member entities of the TTSA in the Lake Tahoe Basin shall develop sewage overflow preventative maintenance and spill response programs as specified in their waste discharge requirements. The TTSA shall maintain and update as necessary a sewage overflow preventative maintenance and spill response program for interceptor sewerlines which it maintains. The program for the interceptor shall be updated, and resubmitted to the Board for review and approval, at least once every three years, with the next report due no later than January 1, 2003.

I. Toxic Effluent Standards and Prohibitions

If a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Federal Water Pollution Control Act or amendments thereto, for toxic pollutants contained in wastewater, the Board may revise or modify this Order in accordance with such toxic pollutant guidelines and so notify the discharger.

J. Required Connection to Sewer System in Lake Tahoe Basin

Member entities of the TTSA in the Lake Tahoe Basin shall continue to require the connection to the sewer system of any building from which waste is discharged, in accordance with Section 13950 of the California Water Code and as specified in their respective waste discharge requirements.

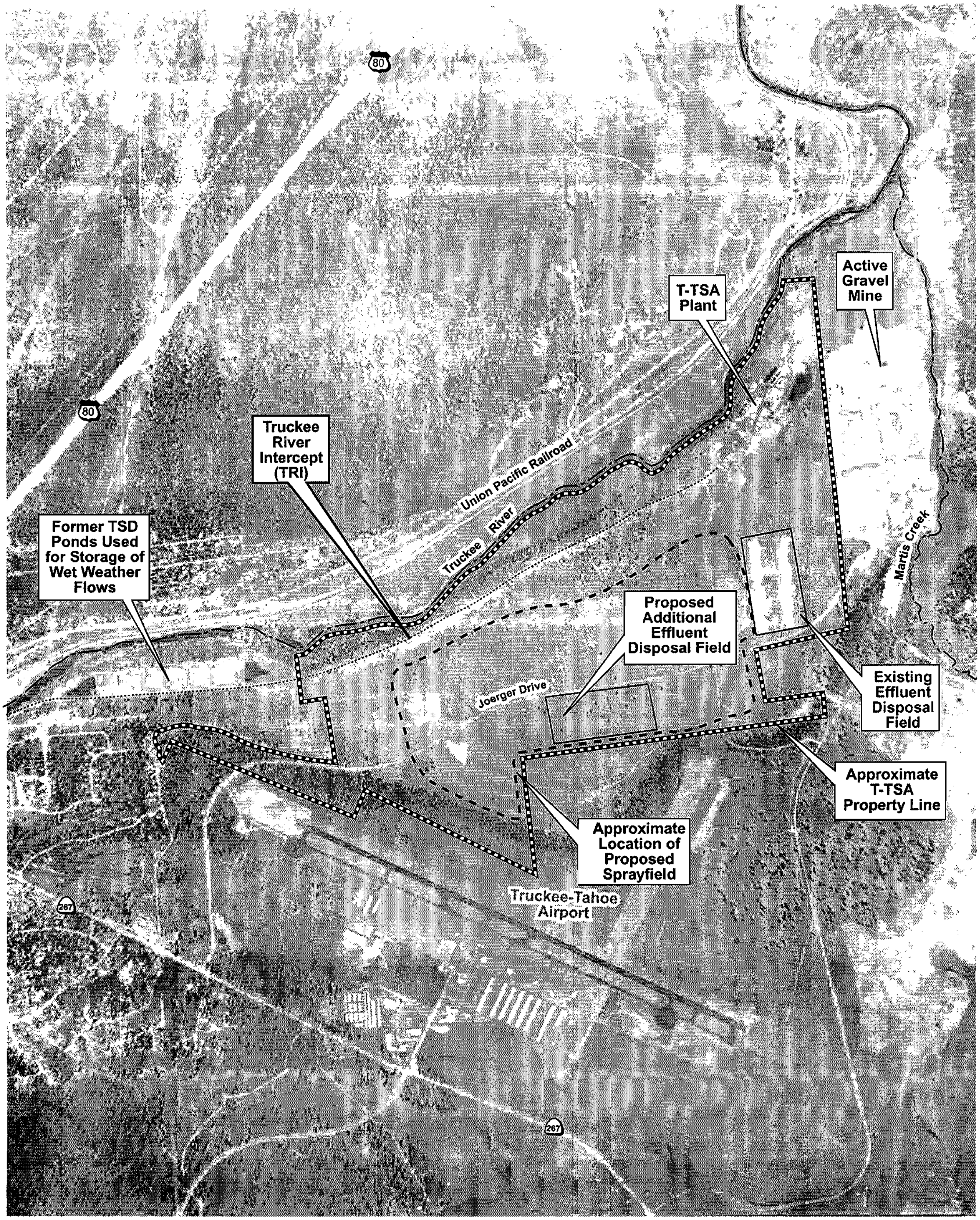
I, Harold J. Singer, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Lahontan Region, on May 9, 2002.

Harold J. Singer

HAROLD J. SINGER
EXECUTIVE OFFICER

Attachment: A. Location Map
B. Standard Provisions for Waste Discharge Requirements

TJP/cgT: TTSA2002.WDR



Attachment A
Location of Existing and Proposed Facilities
Tahoe-Truckee Sanitation Agency
Martis Valley Wastewater Treatment Plant

CH2MHILL

TTSA W122000001SAC attachment_a.fh10 04.24.02 dfacile

ATTACHMENT "B"

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

STANDARD PROVISIONS
FOR WASTE DISCHARGE REQUIREMENTS

1. Inspection and Entry

The discharger shall permit Regional Board staff:

a. to enter upon premises in which an effluent source is located or in which any required records are kept;

b. to copy any records relating to the discharge or relating to compliance with the waste discharge requirements;

c. to inspect monitoring equipment or records; and

d. to sample any discharge.

2. Reporting Requirements

a. Pursuant to California Water Code 13267(b), the discharger shall immediately notify the Regional Board by telephone whenever an adverse condition occurred as a result of this discharge; written confirmation shall follow within two weeks. An adverse condition includes, but is not limited to, spills of petroleum products or toxic chemicals, or damage to control facilities that could affect compliance.

b. Pursuant to California Water Code Section 13260 (c), any proposed material change in the character of the waste, manner or method of treatment or disposal, increase of discharge, or location of discharge, shall be reported to the Regional Board at least 120 days in advance of implementation of any such proposal. This shall include, but not be limited to, all significant soil disturbances.

c. The owner(s) of, and discharger upon, property subject to waste discharge requirements shall be considered to have a continuing responsibility for ensuring compliance with applicable waste discharge requirements in the operations or use of the owned property. Pursuant to California Water Code Section 13260(c), any change in the ownership and/or operation of property subject to the waste discharge requirements shall be reported to the Regional Board. Notification of applicable waste discharge requirements shall be furnished in writing to the new owners and/or operators and a copy of such notification shall be sent to the Regional Board.

d. If a discharger becomes aware that any information submitted to the Regional Board is incorrect, the discharger shall immediately notify the Regional Board, in writing, and correct that information.

e. Reports required by the waste discharge requirements, and other information requested by the Regional Board, must be signed by a duly authorized representative of the discharger. Under Section 13268 of the California Water Code, any person failing or refusing to furnish technical or monitoring reports, or falsifying any information provided therein, is guilty of a misdemeanor and may be liable civilly in an amount of up to one thousand dollars ($1000) for each day of violation.

f. If the discharger becomes aware that their waste discharge requirements are no longer needed (because the project will not be built or the discharge will cease) the discharger shall notify the Regional Board in writing and request that their waste discharge requirements be rescinded.

3. Right to Revise Waste Discharge Requirements

The Board reserves the privilege of changing all or any portion of the waste discharge requirements upon legal notice to and after opportunity to be heard is given to all concerned parties.

4. Duty to Comply

Failure to comply with the waste discharge requirements may constitute a violation of the California Water Code and is grounds for enforcement action or for permit termination, revocation and reissuance, or modification.

5. Duty to Mitigate

The discharger shall take all reasonable steps to minimize or prevent any discharge in violation of the waste discharge requirements which has a reasonable likelihood of adversely affecting human health or the environment.

6. Proper Operation and Maintenance

The discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the discharger to achieve compliance with the waste discharge requirements. Proper operation and maintenance includes adequate laboratory control, where appropriate, and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems that are installed by the discharger, when necessary to achieve compliance with the conditions of the waste discharge requirements.

7. Waste Discharge Requirement Actions

The waste discharge requirements may be modified, revoked and reissued, or terminated for cause. The filing of a request by the discharger for waste discharge requirement modification, revocation and reissuance, termination, or a notification of planned changes or anticipated noncompliance, does not stay any of the waste discharge requirements conditions.

8. Property Rights

The waste discharge requirements do not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

9. Enforcement

The California Water Code provides for civil liability and criminal penalties for violations or threatened violations of the waste discharge requirements including imposition of civil liability or referral to the Attorney General.

10. Availability

A copy of the waste discharge requirements shall kept and maintained by the discharger and be available at all times to operating personnel.

11. Severability

Provisions of the waste discharge requirements are severable. If any provision of the requirements is found invalid, the remainder of the requirements shall not be affected.

12. Public Access

General public access shall be effectively excluded from treatment and disposal facilities.

13. Transfers

Providing there is no material change in the operation of the facility, this Order may be transferred to a new owner or operation. The owner/operator must request the transfer in writing and receive written approval from the Regional Board Executive Officer.

14. Definitions

a. "Surface waters" as used in this Order, include, but are not limited to, live streams, either perennial or ephemeral, which flow in natural or artificial water courses and natural lakes and artificial impoundments of waters. "Surface waters" does not include artificial water courses or impoundments used exclusively for wastewater disposal.

b. "Ground waters" as used in this Order, include, but are not limited to, all subsurface waters being above atmospheric pressure and the capillary fringe of these waters.

15. Storm Protection

All facilities used for collection, transport, treatment, storage, or disposal of waste shall be adequately protected against overflow, washout, inundation, structural damage or a significant reduction in efficiency resulting from a storm or flood having a recurrence interval of once in 100 years.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

MONITORING AND REPORTING PROGRAM NO. 2002-0030
FOR

TAHOE-TRUCKEE SANITATION AGENCY
MARTIS VALLEY WASTEWATER TREATMENT PLANT AND
ASSOCIATED MAINTENANCE PROJECTS

Nevada County

This monitoring and reporting program includes five areas of monitoring:

1. Water rights monitoring
2. Collection system flow monitoring
3. Plant influent and effluent monitoring
4. Receiving waters monitoring; both ground and surface waters
5. Maintenance projects monitoring.

This program shall take effect immediately.

WATER RIGHTS MONITORING

MONITORING

The Tahoe-Truckee Sanitation Agency (TTSA) shall provide annual reports on the total monthly water use within the water service district boundaries of member entities in the Lake Tahoe Basin for the prior calendar year. These reports shall include the following information on a monthly basis:

1. Total water diversion for use (MG)
2. Number and Type of water users served by each water system or subsystem
3. Unit water use rates (gpd)

These reports shall include all water use within the member entities water service areas, for purposes of municipal use, domestic use, agricultural use, irrigation use, and industrial use, excepting use on federal and state owned lands. The data provided in these reports shall be based on direct measurements to the greatest extent practicable, but may rely upon estimating techniques such as those employed in the State Water Resources Control Board's "Report on Water Use and Water Rights, Lake Tahoe Basin" or other similar methods.

REPORTING

The Discharger shall submit annual monitoring reports not later than June 15th for the previous calendar year. The first such report shall be due not later than June 15, 2002. In reporting the data, the Discharger shall arrange the data such that the diversion, period of diversion, amounts, numbers of users, and rate of use are readily discernible.

FLOW MONITORING WITHIN COLLECTION SYSTEM

FLOW MEASUREMENT

Flow monitoring of member districts shall be initiated immediately upon connection of each district to regional system. Flow meters capable of accurately measuring flow shall be installed at all points where an individual district discharges to the regional interceptor.

Flow shall be monitored for:

1. Total daily flow (MG)
2. Daily peak flow rate (MGD)

The Truckee River Canyon is exempt for individual flow monitoring requirements.

CALIBRATION

Each meter shall be calibrated semi-annually under the supervision of a registered civil engineer and the report of the calibration shall be prepared by him/her and submitted within 15 days after calibration.

REPORTING

The Discharger shall submit monthly monitoring reports no later than the 15th day following each monthly monitoring period. The Discharger shall: (1) compute a running seven-day average flow, (2) identify the maximum daily flow and its date, and (3) identify the peak flow rate and its date. In reporting the data, the Discharger shall arrange the data such that the subject district, date, and flow are readily discernible.

TREATMENT PLANT MONITORING

Treatment plant monitoring will consist of measurement of influent flow and composition and detailed analyses of effluent quality.

FLOW MONITORING

A flow meter capable of accurately measuring influent shall be installed downstream of all significant wastewater contributors and above the first unit operation of the treatment plant. The calibration requirements noted in "Collection System Flow Monitoring" above shall apply to this meter also.. Additional accurate flow meters shall be installed as appropriate to enable flow measurement within the treatment plant. The following flows shall be monitored:

1. Total daily influent flow (MG)
2. Peak daily influent flow rate (MGD)
3. Total daily flow of effluent to disposal site (MG)
4. Total daily flow to emergency retention basin (MG)

5. Total daily flow from emergency retention basin to the treatment works (MG)
6. Total daily flow (MG) to and from the emergency storage facilities.

INFLUENT MONITORING

Influent samples shall be collected at the headworks of the plant prior to any treatment process. The following shall constitute the program for monitoring of influent water quality:

Parameter	Units	Sample Type	Frequency
Influent COD	mg/l	24-hour composite	2/week[1/]
Influent Total Suspended Solids	mg/l	24-hour composite	2/week[1/]
Influent BOD_5	mg/l	24-hour composite	Weekly[2/]
Influent Total Nitrogen	mg/l	24-hour composite	Weekly[2/]
Influent Total Phosphorus	mg/l	24-hour composite	Weekly

EFFLUENT MONITORING

Effluent samples shall be collected at the effluent sampler on the effluent line. The following shall constitute the program for monitoring of effluent water quality:

Parameter	Units	Sample Type	Frequency
Turbidity	NTU (range of values)	Continuous [2,3/]	---
pH	pH Units	Continuous [4/]	---
Chlorine Residual	mg/l (range of values)	Continuous [4/]	---
Temperature	°C	Grab	Daily
Turbidity	NTU	24-hour composite	Daily
Dissolved Oxygen	mg/l	Grab	Daily
Total Coliform Organisms	MPN/100 ml or MPC/100 ml	Grab	Daily
COD	mg/l	24-hour composite	2/week
Total Organic Carbon	mg/l	24-hour composite	2/week
Total Phosphorus	mg/l-P	24-hour composite	2/week
Nitrate	mg/l	24-hour composite	3/week
Total Kjeldahl-N	mg/l-N	24-hour composite	3/week
Total Suspended Solids	mg/l	24-hour composite	Weekly
Alkalinity	mg/l $CaCO_3$	Grab [3/]	Weekly
Chlorine Residual	mg/l	Grab	Weekly
Chloride	mg/l	24-hour composite	Weekly
Trihalomethanes	mg/l	24-hour composite	Quarterly
Phenols	mg/l	24-hour composite	Quarterly
Sulfate	mg/l	24-hour composite	Quarterly
Total Dissolved Solids	mg/l	24-hour composite	Quarterly
Sodium	mg/l	24-hour composite	Quarterly
Calcium	mg/l	24-hour composite	Quarterly
Iron	mg/l	24-hour composite	Quarterly

Arsenic	mg/l	24-hour composite	Annually
Barium	mg/l	24-hour composite	Annually
Boron	mg/l	24-hour composite	Annually
Cadmium	mg/l	24-hour composite	Annually
Hexavalent Chromium	mg/l	24-hour composite	Annually
Lead	mg/l	24-hour composite	Annually
Selenium	mg/l	24-hour composite	Annually
Silver	mg/l	24-hour composite	Annually
Copper	mg/l	24-hour composite	Annually
Manganese	mg/l	24-hour composite	Annually
Zinc	mg/l	24-hour composite	Annually
Nickel	mg/l	24-hour composite	Annually
Strontium	mg/l	24-hour composite	Annually
Magnesium	mg/l	24-hour composite	Annually

1/ Every Sunday and Wednesday
2/ Alternating Sunday and Wednesday
3/ May be taken at overlow from second stage recarbonation basin
4/ Use of continuous recording probe is essential
5/ Sample may be taken prior to chlorination

MASS LOADS

The Discharger shall calculate for each calendar year total annual mass loads for the following constituents discharged from the treatment plant:

1. Total Dissolved Solids
2. Chloride
3. Total Phosphorus (as P)
4. Total Nitrogen (as N)
5. Total Nitrogen (as N), mass load for period May 1 through October 31

REPORTING

The Discharger shall submit monthly monitoring reports not later than the 15th day of the following month. Each report shall contain the results of appropriate daily, weekly, quarterly, or annual sampling as noted above. Turbidity and pH shall be reported in terms of a daily range of values. The Discharger shall compute and report the 30-day monthly mean and the monthly maximum value for those parameters listed in Section II.A.2 of Board Order No. R6T-2002-(PROPOSED). In reporting the data, the Discharger shall arrange the parameter name, units, date, measured value and computed value so as to be readily discernible and clearly illustrate compliance.

RECEIVING WATER MONITORING

SURFACE WATERS

Station Code7/	Description8/
T-1	Near Polaris; N614, 240, E2, 527, 680

T-2	Just above old Highway 40 bridge; N619, 620, E2, 531, 800
T-3	Just above California-Nevada State Line
M-1	Below dam and above influence of TTSA discharge
M-2	Just above confluence with Truckee River, N16, 360, E2, 535, 280

[7/] T=Truckee River Station, M= Martis Creek Station
[8/] Coordinates based on California Grid

All samples shall be grab samples and shall be taken in accordance with the following schedule for Martis Creek and the Truckee River:

Parameter	Units	Station	Frequency
Temperature	°C	All Stations	2/month
Nitrate	mg/l as N	All Stations	2/month
Total Kjeldahl-N	mg/l as N	All Stations	Monthly
Total Phosphorus	mg/l as P	All Stations	Monthly
Ortho-phosphate	mg/l as P	All Stations	Monthly
Total Coliforms	MPN/100ml or MPC/100ml	All Stations	Monthly [9/]
Fecal Coliforms	MPN/100ml or MPC/100ml	All Stations	Monthly
Total Iron	mg/l	All Stations	Monthly
Dissolved Oxygen	mg/l	All Stations	Monthly
Alkalinity	mg/l $CaCO_3$	All Stations	Monthly
pH	pH units	All Stations	Monthly
Dissolved Organic Carbon	mg/l	All Stations	Monthly
Chloride	mg/l	All Stations	Monthly
Total Dissolved Solids		All Stations	Monthly
Un-Ionized Ammonia	mg/l as N	All Stations	Quarterly
Trihalomethanes	mg/l	T-2, T-3, M-2	Quarterly
Periphyton	gr.dry wt./m^2 and gr. Ash free dry wt./m^2	All Stations	2/month (May-Oct)
Periphyton	percent composition[10/]	All Stations	2/month (May-Oct)
Benthic Invertebrates[11/]	numbers	All Stations	Monthly (June-Oct)

[9/] 2/week during any period when emergency storage facilities contain sewage
[10/] Relative percentages (from cell counts) of algae in major groups [Chlorophyta, Chrysophyta
(separate diatoms from other Chrysophyta), Cyanophyta]
[11/] Invertebrates to be identified to phylam level (insects to order level). Number of individuals/m^2 in each group to be reported. Insect diversity to be computed based on numbers of individuals in each order.

GROUND WATERS

FINAL MONITORING AT WELL MG-5-TO

Samples of ground water containing treated effluent shall be collected at monitoring well MG-5-TO (Well 31). The following shall constitute the program for monitoring of ground water containing treated effluent at Well MG-5-TO:

Parameter	Units	Sample Type	Frequency
Static Water Level	feet MSL	---	Weekly
COD	mg/l	grab	Weekly
Total Organic Carbon	mg/l	grab	Weekly
Nitrate Nitrogen	mg/l as N	grab	Weekly
Total Kjeldahl-N	mg/l as N	grab	Weekly
Un-ionized Ammonia	mg/l as N	grab	Weekly
Total Phosphorus	mg/l as P	grab	Weekly
Total Fecal Coliform	MPN/100 ml	grab	Weekly
Chlorine Residual	mg/l	grab	Weekly
Chloride	mg/l	grab	Weekly
pH	pH units	grab	Weekly
Alkalinity	mg/l as $CaCO_3$	grab	Weekly
Temperature	o C	grab	Weekly
Total Dissolved Solids	mg/l	grab	Weekly
Trihalomethanes	mg/l	grab	Quarterly
Purgeable Halocarbons [14/]	ug/l	grab	Annually
Purgeable Aromatics [15/]	ug/l	grab	Annually

ADDITIONAL GROUND WATER MONITORING

The following additional ground water monitoring sampling stations are to be maintained:

Station Code[12/]	Location [13/]
MG-1-TO	East edge of disposal area 17N/17E-7R1M (Well 20)
MG-1-TF	East edge of disposal area 17N/17E-7R1M (Well 1)
MG-2-TO	Martis Valley near Martis Creek, 17N/17E-7J1M (Toups Well)
MG-2-TF	Martis Valley near Martis Creek, 17N/17E-7J1M (Well 23)
MG-4-TO	Martis Valley near Martis Creek, 17N/17E-8F1 (Well 36)
MG-5-TO	Martis Valley near Truckee River, 17N/17ESN1 (Well 31)
MG-6-TO	Martis Valley near Truckee River, 17N/17E (Well 25)
MG-6-TF	Martis Valley near Truckee River, 17N/17E (Well 26)
MG-7-TO	Martis Valley near Martis Creek, 17N/17E (Well34)
Upgradient	A specific upgradient well site (Well 24)

[12/]MG=Martis Valley ground water body; TO= Tahoe Outwash; TF=Truckee Formation
[13/]Well Location System, U.S. Geological Survey

For those monitoring wells with suffix "TO", the casing shall only extend to a depth at which the top of the Truckee Formation is encountered and shall be perforated to within 20 feet of the ground surface.

For those monitoring wells with the suffix "TF", the casing shall extend to at least 20 feet below the first clay layer encountered below the Tahoe Outwash and shall be sealed above this depth and perforated below. Exact casing and perforation depths shall be determined in the field by a registered civil engineer or a certified engineering geologist. Well construction shall conform to applicable ordinances of the County of Nevada and *Water Well Standards for the State of California* (DWR Bulletin No. 74).

Sampling of the wells shall be conducted by drawing the appropriate sample volume from the upper 3 feet of ground water encountered in each well.

All samples shall be grab samples and shall be drawn according to the following schedules:

Sampling of Stations MG-1-TO, MG-2-TO, MG-4-TO, MG-6-TO AND MG-7-TO

Parameter	Units	Frequency
Static Water Level	feet MSL	Monthly
Nitrate Nitrogen	mg/l as N	Monthly
Total Kjeldahl Nitrogen	mg/l as N	Monthly
Total Phosphorus	mg/l as P	Monthly
Total Organic Carbon	mg/l	Monthly
pH	pH units	Monthly
Temperature	^oC	Monthly
Chloride	mg/l	Monthly
Total Dissolved Solids	mg/l	Monthly
Alkalinity	mg/l as $CaCO_3$	Quarterly
Trihalomethanes	mg/l	Quarterly
Un-Ionized Ammonia	mg/l as N	Quarterly
Total Fecal Coliforms	MPN/100ml or MFC/100ml	Semi-annually (Sta. MG-1-TO and MG-2-TO)
Purgeable Halocarbons[14/]	ug/l	Annually
Purgeable Aromatics[15/]	ug/l	Annually

[14/]EPA method 601 for samples from wells MG-1-TO, MG-2-TO and the designated upgradient well
[15/]EPA method 602 plus xylene for samples from wells MG-1-TP, MT-2-TO and the designated upgradient well

Sampling of Stations MG-1-TF, MG-2-TF and MG-6-TF

Parameter	Units	Frequency
Static Water Level	feet MSL	Monthly
Nitrate	mg/l as N	Semi-annually
Total Organic Carbon	mg/l	Semi-annually
PpH	pH units	Semi-annually

Temperature	°C	Semi-annually
Chloride	mg/l	Semi-annually
Total Dissolved Solids	mg/l	Semi-annually
Trihalomethanes	mg/l	Semi-annually
Total Fecal Coliform	MPN/100ml or MFC/100ml	Semi-annually

REPORTING

Monthly monitoring reports shall be submitted by the Discharger not later than the 15th day of the following month. In reporting the data, the Discharger shall arrange the data such that the station code, date, measured value, and applicable standard are clearly discernible.

MAINTENANCE PROJECTS

POST-CONSTRUCTION PHASE

An inspection of all maintenance project sites shall be made by the Discharger twice each year, about every six months when not covered by snow. The purpose of these inspections is to discover potential erosion and surface runoff problems on project sites so that corrective measures may be immediately undertaken.

Any erosion or surface runoff problems found as a result of these inspections shall be clearly described and the corrective measures proposed by the Discharger shall be included in the monitoring report. In the event that no such problems are found on the subject property, a statement certifying this condition must be included for each semiannual inspection.

GENERAL

1. The Discharger shall comply with "General Provisions for Monitoring and Reporting", dated September 1, 1994, which is attached to and made a part of this Monitoring and Reporting Program.

2. All analyses shall be performed in accordance with the lastest edition of *Standard Methods for the Examination of Water and Wastewater* or the *Manual of Methods for Chemical Analysis for Water and Waste* unless otherwise noted, in a laboratory certified to perform such analyses by the California Department of Health, or approved by the Executive Officer.

3. In monthly monitoring reports, the Discharger shall note and explain any unusual occurrence such as failure to any treatment unit or non-compliance with any waste discharge requirement, effluent limitations or receiving water limitation.

4. The February monitoring report of each year shall include trend analyses for the previous calendar year and a comparison of annual means (mean of monthly means) with annual means from previous years to extend back to pre –discharge. Trend analyses will be provided for all surface water parameters at all surface water stations. The trend analyses for

ground waters will be performed for all ground water parameters at wells MG-2, MG-4 and 5-TO. The trend analysis shall include an assessment of any changes to ground water flow direction and gradients, and a discussion of seasonal, spatial and temporal trends if any. If appropriate to make the information understandable, this report shall include summary data tables, graphs, maps of constituent levels and appended analytical reports. The report shall identify any violation of permit limitations shown by this data. Additionally, trend analysis shall be provided to reflect the changes in monthly and annual mean flows through the plant and from each member entity.

5. All monitoring reports will be reviewed and signed by a registered civil engineer who is routinely responsible for conducting this Monitoring and Reporting Program.

6. A detailed QA/QC program shall be established to include, but not be limited to, duplicate analysis, split sample analysis by an alternative laboratory and an analysis of spike samples. Details and results of the QA/QC program shall be reported annually with the first report due by July 1, 2002.

Ordered by: Harold J. Singer Dated May 8, 2002
HAROLD J. SINGER
EXECUTIVE OFFICER

Attachments: A. General Provisions for Monitoring and Reporting
B. Map of Monitoring Locations

TJP/cgT: TTSA2002PROP.MRP

ATTACHMENT "A"
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

GENERAL PROVISIONS
FOR MONITORING AND REPORTING

1. SAMPLING AND ANALYSIS

   a. All analyses shall be performed in accordance with the current edition(s) of the following documents:

      i. Standard Methods for the Examination of Water and Wastewater

      ii. Methods for Chemical Analysis of Water and Wastes, EPA

   b. All analyses shall be performed in a laboratory certified to perform such analyses by the California State Department of Health Services or a laboratory approved by the Regional Board Executive Officer. Specific methods of analysis must be identified on each laboratory report.

   c. Any modifications to the above methods to eliminate known interferences shall be reported with the sample results. The methods used shall also be reported. If methods other than EPA-approved methods or Standard Methods are used, the exact methodology must be submitted for review and must be approved by the Regional Board Executive Officer prior to use.

   d. The discharger shall establish chain-of-custody procedures to insure that specific individuals are responsible for sample integrity from commencement of sample collection through delivery to an approved laboratory. Sample collection, storage, and analysis shall be conducted in accordance with an approved Sampling and Analysis Plan (SAP). The most recent version of the approved SAP shall be kept at the facility.

   e. The discharger shall calibrate and perform maintenance procedures on all monitoring instruments and equipment to ensure accuracy of measurements, or shall insure that both activities will be conducted. The calibration of any wastewater flow measuring device shall be recorded and maintained in the permanent log book described in 2.b, below.

   f. A grab sample is defined as an individual sample collected in fewer than 15 minutes.

   g. A composite sample is defined as a combination of no fewer than eight individual samples obtained over the specified sampling period at equal intervals. The volume of each individual sample shall be proportional to the discharge flow rate at the time of sampling. The sampling period shall equal the discharge period, or 24 hours, whichever period is shorter.

2. OPERATIONAL REQUIREMENTS

a. Sample Results

Pursuant to California Water Code Section 13267(b), the discharger shall maintain all sampling and analytical results including: strip charts; date, exact place, and time of sampling; date analyses were performed; sample collector's name; analyst's name; analytical techniques used; and results of all analyses. Such records shall be retained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge, or when requested by the Regional Board.

b. Operational Log

Pursuant to California Water Code Section 13267(b), an operation and maintenance log shall be maintained at the facility. All monitoring and reporting data shall be recorded in a permanent log book.

3. REPORTING

a. For every item where the requirements are not met, the discharger shall submit a statement of the actions undertaken or proposed which will bring the discharge into full compliance with requirements at the earliest time, and shall submit a timetable for correction.

b. Pursuant to California Water Code Section 13267(b), all sampling and analytical results shall be made available to the Regional Board upon request. Results shall be retained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge, or when requested by the Regional Board.

c. The discharger shall provide a brief summary of any operational problems and maintenance activities to the Board with each monitoring report. Any modifications or additions to, or any major maintenance conducted on, or any major problems occurring to the wastewater conveyance system, treatment facilities, or disposal facilities shall be included in this summary.

d. Monitoring reports shall be signed by:

i. In the case of a corporation, by a principal executive officer at least of the level of vice-president or his duly authorized representative, if such representative is responsible for the overall operation of the facility from which the discharge originates;

ii. In the case of a partnership, by a general partner;

iii. In the case of a sole proprietorship,by the proprietor; or

iv. In the case of a municipal, state or other public facility, by either a principal executive officer, ranking elected official, or other duly authorized employee.

e. Monitoring reports are to include the following:

i. Name and telephone number of individual who can answer questions about the report.

ii. The Monitoring and Reporting Program Number.

iii. WDID Number 6A265300900.

f. Modifications

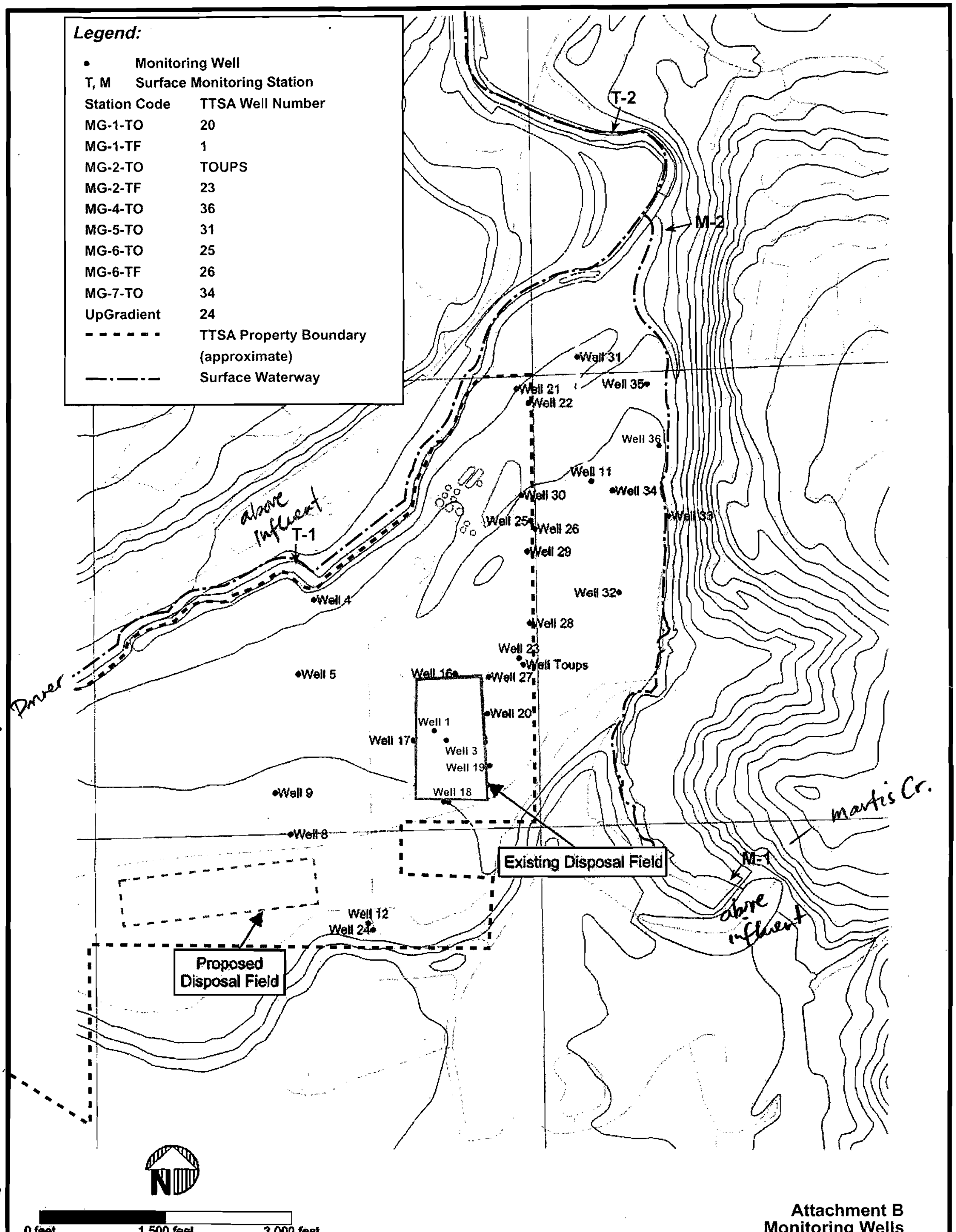
This Monitoring and Reporting Program may be modified at the discretion of the Regional Board Executive Officer.

4. <u>NONCOMPLIANCE</u>

Under Section 13268 of the Water Code, any person failing or refusing to furnish technical or monitoring reports, or falsifying any information provided therein, is guilty of a misdemeanor and may be liable civilly in an amount of up to one thousand dollars ($1,000) for each day of violation.

T:FORMS/M&R PROVISIONS

T-3 near stateline



Attachment B
Monitoring Wells
T-TSA Water Reclamation Plant Expansion

CH2MHILL

TTSA W122000001SAC

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Appendix 5B

T-TSA LETTER TO SWRCB (DECEMBER 17, 2019)

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TAHOE-TRUCKEE SANITATION AGENCY

A Public Agency
13720 Butterfield Drive
TRUCKEE, CALIFORNIA 96161
(530) 587-2525 • FAX (530) 587-5840

Directors
Dale Cox: President
Dan Wilkins: Vice President
Jon Northrop
Blake Tresan
S. Lane Lewis
General Manager
LaRue Griffin

VIA EMAIL

17 December 2019

Surface Water Quality Assessment Unit
State Water Resources Control Board, Division of Water Quality
P.O. Box 100
Sacramento, CA 95812-2000
WQAssessment@waterboards.ca.gov

RE: Comments on Truckee River Listing Recommendations – Nitrogen, Nitrate, List on 303(d)

To Whom It May Concern:

This letter is to submit a request for review in writing and comment on the *Surface Water Quality Assessment: Lahontan Regional Water Quality Control Board Clean Water Act Sections 305(b) and 303(d) 2018 Integrated Report For The Lahontan Region Staff Report* (Report). The Tahoe-Truckee Sanitation Agency (T-TSA) would like to provide comment on Decision ID 101596 Nitrogen, Nitrate on the Truckee River Farad monitoring location near the CA/NV state line.

T-TSA's ability to meet its Waste Discharge Requirements (WDR) and the Water Quality Objectives (WQOs) set for the Truckee River and Martis Creek are dependent in part on the annual pattern of stream flows that flow past T-TSA's discharge locations. Changes in flow will cause changes in the concentration of various background water quality characteristics above T-TSA, which varies inversely with flow for some constituents. When evaluating T-TSA's potential impacts on water quality and beneficial uses of the Truckee River and Martis Creek, the seasonal and annual variations in water quality due to varying hydrological conditions should be considered.

Although current Basin Plan objectives were set using the average river conditions method, the Basin Plan specified that comparisons to the WQOs be made using the arithmetic-mean-of-monthly-means method. The arithmetic-mean-of-monthly-means is the average of the monthly variations over a long period of time. This method reflects long-term average water quality based on every month of many years under vastly different hydrological conditions.

According to the Report, Decision 101596, Final Listing Decision: List on 303(d) list (TMDL required list), a conclusion point states:

> *"This conclusion is based on the staff findings that....3). 2 of 18 samples exceed the objective and this exceeds the allowable frequency listed in Table 3.1 of the Listing Policy"*

T-TSA's has interpreted that 2 of the 18 samples is not the arithmetic-mean-of-monthly-means for the period of record as required per the existing WDR. The Report conclusion appears to be based on the monthly mean instead of the arithmetic-mean-of-monthly-means.

In fact, based on T-TSA's testing records, the current arithmetic-mean-of-monthly-means for the period of record is 0.031 mg/l, which is below the 0.08 mg/l set by the Lahontan Regional Water Quality Control Board. T-TSA requests the Lahontan Regional Water Control Board reconsider its findings and conclusion as it pertains to Nitrate Nitrogen.

Thank you for the opportunity to comment. If you have any questions, please do not hesitate to contact me.

Sincerely,

Michael Peak

Michael Peak
Operations Manager, CPO

Appendix 5C

AIR QUALITY PERMITS TO OPERATE

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NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT Gretchen Bennitt, Executive Director

DISTRICT HEADQUARTERS
200 Litton Drive, Suite 320
Grass Valley, CA 95945
(530) 274-9360 / FAX: (530) 274-7546
Email: office@myairdistrict.com Web: www.myairdistrict.com

NORTHERN OFFICE
257 E. Sierra, Unit E
PO Box 2227
Portola, CA 96122
(530) 832-0102 / FAX: (530) 832-0101

RECEIVED
APR 0 1 2019
Tahoe-Truckee Sanitation Agency

March 26, 2019

Tahoe-Truckee Sanitation Agency
Attn: LaRue Griffin, General Manager/Treasurer
13720 Butterfield Drive
Truckee, CA 96161

Dear LaRue Griffin:

Enclosed are the Permits to Operate for the specified equipment at the Tahoe-Truckee Sanitation facility, located at 13720 Butterfield Dr, Truckee, CA 96161. These permits are valid for one year.

Also **enclosed is a Statement of Charges** for the permits to operate and for calculated emissions. There is also an engineering evaluation fee. **These fees are due and payable within 30 days.** ✓paid

Please note that Permit #96-73-10 for the Hydrochloric Acid Storage and Handling Systems and Permit #96-73-12 for the Carbon Regeneration Furnace have been retired. This is because it is the NSAQMD's understanding that you have switched from a 35% hydrochloric acid solution to a 5% hydrochloric acid solution, which is less hazardous, and also that the carbon regeneration furnace is no longer used. Please contact me if either of those things change.

In order to replace the Bryan boiler with a new boiler, you will need to obtain an Authority to Construct/Permit to Operate from our office. Application forms are on our web site (www.myairdistrict.com/index/permits).

Please read your permit conditions very carefully. These permits have been issued, subject to conditions, per District Rule 505: Conditional Approval, which are intended to assure the compliance of any equipment within the standards of local, state and federal regulations and laws. Note that it is your responsibility to make sure all operators are familiar with all of the permit conditions. These permits must be posted near the permitted equipment, and all operators must have easy access to all pages of the permit.

If there are any questions regarding this matter, please contact Sam Longmire of our Main Office at (530) 274-9360.

Sincerely,

Gretchen Bennitt

Gretchen Bennitt,
Executive Director

NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT Gretchen Bennitt, Executive Director

DISTRICT HEADQUARTERS
200 Litton Drive, Suite 320
Grass Valley, CA 95945
(530) 274-9360 / FAX: (530) 274-7546
Email: office@myairdistrict.com Web: www.myairdistrict.com

NORTHERN OFFICE:
257 E. Sierra, Unit E
PO Box 2227
Portola, CA 96122
(530) 832-0102 / FAX: (530) 832-0101

March 26, 2019

STATEMENT OF CHARGES

Tahoe-Truckee Sanitation Agency
Attn: LaRue Griffin, General Manager/Treasurer
13720 Butterfield Drive
Truckee, CA 96161

PROJECT: Tahoe-Truckee Sanitation Agency

Permit to Operate Fees:

Base Fees:	($138.03 X 11)			$1,518.33
TSP:	0.07	Tons @ $	42.80/Ton	$3.00
NOx:	0.31	Tons @ $	44.13/Ton	$13.68
SOx:	0.08	Tons @ $	33.08/Ton	$2.65
VOC:	0.03	Tons @ $	44.13/Ton	$1.32
CO:	0.21	Tons @ $	12.38/Ton	$2.60

Evaluation Fees:
0 Hours X $117.94/hour $ 0

TOTAL $1,541.58

**In order to avoid a 50% fee increase, fees are due and payable within 30 days.
Total if paid after April 28, 2019: $2,312.37.**

Please make payment to: Northern Sierra AQMD
200 Litton Drive, Suite 320
Grass Valley, CA 95945

THANK YOU

NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT Gretchen Bennitt, Executive Director

DISTRICT HEADQUARTERS
200 Litton Drive, Suite 320
Grass Valley, CA 95945
(530) 274-9360 / FAX: (530) 274-7546
Email: office@myairdistrict.com Web: www.myairdistrict.com

NORTHERN OFFICE
257 E. Sierra, Unit E
PO Box 2227
Portola, CA 96122
(530) 832-0102 / FAX: (530) 832-0101

PERMIT TO OPERATE

Issued on: March 26, 2019

Permit No. 96-73-01

Valid from: February 4, 2019 through February 3, 2020

By: [signature]
Gretchen Bennitt, Executive Director

GRANTED TO: Tahoe-Truckee Sanitation Agency
13720 Butterfield Dr.
Truckee, CA 96161

FACILITY LOCATION: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

Under the provisions of District Regulation, authorization is hereby granted to operate the following equipment subject to the conditions listed below:

BOILER #1
2.009 MM BTU BOILER BY BURNHAM CORPORATION
MODEL #4FL-345A-SPL-G-GP
MODEL #JB 1C-07-R7795C-M-MP, SERIAL 35482793308JRM
AND IMPINJET GAS SCRUBBER BY SLY MANUFACTURING, MODEL #220

POST A COPY OF THIS PERMIT IN A CONSPICUOUS PLACE AT SITE

THIS PERMIT HAS BEEN ISSUED, SUBJECT TO THE FOLLOWING CONDITIONS. PERFORMING WORK UNDER THIS PERMIT SHALL BE DEEMED ACCEPTANCE OF THE CONDITIONS SO SPECIFIED.

GENERAL PERMIT CONDITIONS APPLICABLE TO ALL PERMITS

1. This permit, or a readable reproduction, shall be posted in a conspicuous location at the facility where the permitted device is operating.

2. Operating staff at the facility where this permit is posted shall be advised of, and be familiar with, all conditions contained in this permit.

3. Operation under this permit is deemed acceptance of all permit conditions, as specified.

4. The permittee shall maintain compliance at all times with all applicable District, State of California, and Federal laws, rules, regulations, and permit conditions governing air pollution. Whenever there is a conflict of District, State and/or Federal laws, rules, regulations, or permit conditions, the more stringent shall apply. Nothing in these Conditions shall be construed to allow the violation of any law or of any rule or regulation of the Northern Sierra Air Quality Management District, the State of California, or the U.S. Environmental Protection Agency by the permittee.

5. Failure to comply with any condition of this permit constitutes grounds for, and may result in, revocation or suspension of this permit, either by the Executive Director, or the Air Pollution Control Hearing Board.

6. The District reserves the right to amend this permit upon annual renewal, in order to ensure compliance with any District, State, or Federal laws, rules, regulations governing air pollution.

7. If any condition on this permit is found invalid, such finding shall not affect the validity of the remaining conditions.

8. The permittee shall provide access to District personnel for the purpose of inspection during the time the facility is in operation. The "Right of Entry" pursuant to California Health and Safety Code Section 41510 shall apply:

   A. To enter upon the premises where the source is located or in which any records are required to be kept under the terms and conditions of this Permit to Operate.
   B. To inspect and sample emissions from any equipment listed within this Permit to Operate.

9. This permit is not transferable, either from one location to another, from one piece of equipment to another, or from one person to another, except on the written approval of the Executive Director. In the event that control of this facility will be assumed by another person, company, corporation, or other entity, the District shall be notified of such transfer of control by the submittal of a written notification a minimum of thirty (30) days prior to the actual transfer date. In the event of any changes of ownership, or control of facilities herein permitted to be operated, this Permit to Operate shall be binding upon all subsequent owners and operators, pending District action. The operator shall notify the succeeding owner and operator of the existence of this Permit to operate and its conditions by letter, a copy of which shall be forwarded to the District.

10. The operator(s) or owner(s) of this facility shall comply with all applicable requirements pursuant to California Health and Safety Code, Part 6, Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB 2588), Sections 44300 through 44394. The operator will collect and submit all information required for emissions from this source category. Emissions inventory data will be submitted in compliance with State requirements guidance and local prioritization recommendations. This inventory report shall be submitted to the District within one year of the date operations at the facility commence.

11. Any new equipment additions or modifications to the facility beyond normal maintenance and repair must be reported to the Northern Sierra AQMD prior to the installation of the equipment. Such additions/modifications are subject to Authority to Construct requirements. An application for an Authority to Construct shall be filed with the District prior to: a modification as defined by District Rule 102; replacement of equipment (with other than identical) for which a Permit to Operate has been granted; building, erecting, installing, or operating any equipment for which an Authority to Construct is required pursuant to California Health and Safety Code, Section 42300, and District Rule 401.

OPERATIONAL PERMIT CONDITIONS

12. All air pollution control devices required in permits to operate shall be operated at all times that associated emitting devices are in operation.

13. All equipment, facilities and systems installed or used to achieve compliance with the terms and conditions of this Permit to Operate shall be maintained in good working order and be operated as efficiently as possible, so as to minimize air pollutant emissions. Manufacturers' recommended maintenance procedures shall be adhered to at all times. THE PERMITTEE shall develop a maintenance program for equipment listed herein to preclude a violation of the California Health and Safety Code and District Rules and Regulations.

14. The operator shall notify the District of any occurrence which constitutes a malfunction or breakdown of equipment resulting in excessive emissions as defined in District Rule 516. Such notification shall be provided by telephone communication within 2 hours of the occurrence during normal business hours, or within the first two hours of the next District business day, if otherwise. In no event shall the permittee allow the equipment to operate in a malfunctioning state for more than 48 hours unless an emergency variance has been granted. The shutdown or non-operable status of permitted control devices, including monitoring and control subsystems, shall be subject to breakdown reporting.

15. Visible emissions from ANY AND ALL emission points shall not meet or exceed 20% opacity (or Ringelmann 1), per District Rule 202, for a period or periods aggregating more than three (3) minutes in any one (1) hour.

16. The operator shall not discharge from any source whatsoever such quantities of air contaminants or other materials which cause injury, detriment, nuisance or annoyance to any considerable number of persons, or to the public, or which cause to have a natural tendency to cause injury or damage to business or property, per District Rule 205, Nuisance.

17. In the event of any violation of District Rules and Regulations, the permittee shall cease operation of violating equipment or take action to end such violation, pursuant to all the requirements of District Rule 516, Upset and Breakdown Conditions, if applicable.

18. Operation of this equipment must be conducted in compliance with all data and specifications, limited to the maximum rates and schedules of operation, and the specified process materials of approved plans and specifications, submitted with the application under which this permit is issued, unless otherwise prescribed by conditions. Any operation of equipment or discharge of emissions to the atmosphere not identified by application submittals made to the District or exceeding the limits of the operation pursuant to which this permit is granted, shall be deemed a violation.

19. Initial operation of permitted equipment shall not commence without prior notification of the District.

20. Exceeding any emission limit or production rate established by the Permit to Operate conditions is prohibited without prior application for, and the subsequent granting of, a permit modification pursuant to District Rule 505 - Conditional Approval, unless specifically allowed by a granted variance, or due to an upset, breakdown, or scheduled maintenance per District Rule 516.

PERMIT CONDITIONS SPECIFIC TO DIESEL EXTERNAL COMBUSTION BOILERS

21. All diesel fuel used shall be No. 2 Diesel (or better) having a sulfur content of 0.05% (500 parts per million) or less, per section 2281 of Title 13, California Code of Regulations (CCR), and an aromatic hydrocarbon content of less than 10% by volume, per section 2282 of Title 13.

22. A totalizer that will measure the daily hours of operation on diesel fuel shall be installed and maintained in good operating condition in locations accessible to District inspectors. Measurement of the diesel fuel consumption shall be derived by subtracting the measured fuel usage from day tanks that supply both the IC engines and the ground equipment from the measured amount of fuel pumped from the 10,000 gallon storage tank.

23. Operation Limits: Operation of the external combustion boiler under this permit is limited to the lesser of 35,040 hours per year (combined total for all four boilers) or 585,052 gallons of fuel (combined total for all four boilers) without prior approval from the Executive Director.

24. Recordkeeping Requirements: The applicant shall maintain records of boiler operating hours and number of operating days, and records for the number of gallons and type of fuel used. These records shall be maintained for a period of two (2) years, and made available to District inspectors upon request.

25. Emission limits: The annual air pollution emissions (from diesel usage), for the four boilers combined, allowed under this permit to operate shall not exceed the following quantities:

Total Suspended Particulate (TSP):	0.59 tons/yr
Nitrogen Oxides (NOx):	4.50 tons/yr
Sulfur Oxides (SOx):	2.08 tons/yr
Volatile Organic Compounds (VOC):	0.09 tons/yr
Carbon Monoxide (CO):	1.45 tons/yr

PERMIT CONDITIONS SPECIFIC TO METHANE INTERNAL COMBUSTION BOILERS

26. All methane burned in the boilers shall be generated on site.

27. A totalizer that will measure the daily hours of operation on digester gas shall be installed and maintained in good operating condition in locations accessible to District inspectors.

28. Production Limits: Operation of the external combustion boiler under this permit is limited to 151,000,000 cf/yr (combined total for all four boilers) without prior approval from the Executive Director.

29. Recordkeeping Requirements: The applicant shall maintain records of boiler daily operating hours and the number of operating days, and records for the number of cubic feet of fuel burned. Also, a daily log of the total digester gas produced shall be maintained. These records shall be maintained for a period of two (2) years, and made available to District inspectors upon request.

30. Emission limits: The annual air pollution emissions (from methane usage), for the four boilers combined, allowed under this permit to operate shall not exceed the following quantities:

Total Suspended Particulate (TSP):	0.44 tons/yr
Nitrogen Oxides (NOx):	0.92 tons/yr
Sulfur Oxides (SOx):	2.55 tons/yr
Volatile Organic Compounds (VOC):	0.06 tons/yr
Carbon Monoxide (CO):	1.99 tons/yr

NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT Gretchen Bennitt, Executive Director

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PERMIT TO OPERATE

Issued on: March 26, 2019

Permit No. 96-73-02

Valid from: February 4, 2019 through February 3, 2020

By: [signature]
Gretchen Bennitt, Executive Director

GRANTED TO: Tahoe-Truckee Sanitation Agency
13720 Butterfield Dr.
Truckee, CA 96161

FACILITY LOCATION: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

Under the provisions of District Regulation, authorization is hereby granted to construct and operate the following equipment subject to the conditions listed below:

BOILER #2
2.009 MM BTU BOILER BY BURNHAM CORPORATION
MODEL #4FL-345A-SPL-G-GP
MODEL #JB 1C-07-R7795C-M-MP, SERIAL 35482793308JRM
AND IMPINJET GAS SCRUBBER BY SLY MANUFACTURING, MODEL #220

THIS PERMIT HAS BEEN ISSUED, SUBJECT TO THE FOLLOWING CONDITIONS. PERFORMING WORK UNDER THIS PERMIT SHALL BE DEEMED ACCEPTANCE OF THE CONDITIONS SO SPECIFIED.

Permit Conditions #1 through 30 of the current Permit to Operate 96-73-01 apply to this permit in its entirety, unless otherwise noted below.

POST A COPY OF THIS PERMIT IN A CONSPICUOUS PLACE AT SITE

NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT Gretchen Bennitt, Executive Director

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PERMIT TO OPERATE

Issued on: March 26, 2019 Permit No. 96-73-03

Valid from: February 4, 2019 through February 3, 2020

By: [signature]
Gretchen Bennitt, Executive Director

GRANTED TO: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

FACILITY LOCATION: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

Under the provisions of District Regulation, authorization is hereby granted to construct and operate the following equipment subject to the conditions listed below:

BOILER #3
2.009 MM BTU BOILER BY BURNHAM CORPORATION
MODEL #4FL-345A-SPL-G-GP
MODEL #JB 1C-07-R7795C-M-MP, SERIAL 35482793308JRM
AND IMPINJET GAS SCRUBBER BY SLY MANUFACTURING, MODEL #220

THIS PERMIT HAS BEEN ISSUED, SUBJECT TO THE FOLLOWING CONDITIONS. PERFORMING WORK UNDER THIS PERMIT SHALL BE DEEMED ACCEPTANCE OF THE CONDITIONS SO SPECIFIED.

Permit Conditions #1 through 30 of the current Permit to Operate 96-73-01 apply to this permit in its entirety, unless otherwise noted below.

POST A COPY OF THIS PERMIT IN A CONSPICUOUS PLACE AT SITE

NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT Gretchen Bennitt, Executive Director

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PERMIT TO OPERATE

Issued on: March 26, 2019 Permit No. 05-73-04

Valid from: February 4, 2019 through February 3, 2020

By: [signature]
Gretchen Bennitt, Executive Director

GRANTED TO: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

FACILITY LOCATION: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

Under the provisions of District Regulation, authorization is hereby granted to construct and operate the following equipment subject to the conditions listed below:

BOILER #4
3.38 MM BTU HURST SERIES 100 BOILER, SERIAL# FB505-30-5M
WITH HOT WEISHAUPT BURNER, MODEL #RGL30/2-A.ZM-NR, SERIAL # 4555011

THIS PERMIT HAS BEEN ISSUED, SUBJECT TO THE FOLLOWING CONDITIONS. PERFORMING WORK UNDER THIS PERMIT SHALL BE DEEMED ACCEPTANCE OF THE CONDITIONS SO SPECIFIED.

Permit Conditions #1 through 30 of the current Permit to Operate 96-73-01apply to this permit in its entirety, unless otherwise noted below.

POST A COPY OF THIS PERMIT IN A CONSPICUOUS PLACE AT SITE

PERMIT CONDITIONS SPECIFIC TO NATURAL GAS COMBUSTION BOILERS

1. A totalizer that will measure the daily hours of operation on natural gas shall be installed and maintained in good operating condition in locations accessible to District inspectors.

2. Production Limits: Operation of the external combustion boiler under this permit is limited to 35,736,000 cf/yr (combined total for boilers four and five) without prior approval from the Executive Director.

3. Recordkeeping Requirements: The applicant shall maintain records of boiler daily operating hours and the number of operating days, and records for the number of cubic feet of fuel burned. These records shall be maintained for a period of two (2) years, and made available to District inspectors upon request.

4. Emission limits: The annual air pollution emissions (from natural gas usage), for boilers four, five and six combined, allowed under this permit to operate shall not exceed the following quantities:

Total Suspended Particulate (TSP):	0.15 tons/yr
Nitrogen Oxides (NOx):	0.94 tons/yr
Sulfur Oxides (SOx):	0.01tons/yr
Volatile Organic Compounds (VOC):	0.11 tons/yr
Carbon Monoxide (CO):	1.59 tons/yr

NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT Gretchen Bennitt, Executive Director

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PERMIT TO OPERATE

Issued on: March 26, 2019 Permit No. 05-73-05

Valid from: February 4, 2019 through February 3, 2020

By: [signature]
Gretchen Bennitt, Executive Director

GRANTED TO: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

FACILITY LOCATION: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

Under the provisions of District Regulation, authorization is hereby granted to construct and operate the following equipment subject to the conditions listed below:

BOILER #5
1.0 MM BTU BOILER BY GASMASTER INDUSTRIES. INC.
MODEL #GMI-1M-L
WITH LOW NOX BURNER

THIS PERMIT HAS BEEN ISSUED, SUBJECT TO THE FOLLOWING CONDITIONS. PERFORMING WORK UNDER THIS PERMIT SHALL BE DEEMED ACCEPTANCE OF THE CONDITIONS SO SPECIFIED.

Permit Conditions #1 through 20 of the current Permit to Operate 96-73-01and Permit Conditions #1 through 4 of the current Permit to Operate 05-73-04 apply to this permit in its entirety, unless otherwise noted below.

POST A COPY OF THIS PERMIT IN A CONSPICUOUS PLACE AT SITE

NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT Gretchen Bennitt, Executive Director

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PERMIT TO OPERATE

Issued on: March 26, 2019

Permit No. 05-73-06

Valid from: February 4, 2019 through February 3, 2020

By: [signature]
Gretchen Bennitt, Executive Director

GRANTED TO: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

FACILITY LOCATION: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

Under the provisions of District Regulation, authorization is hereby granted to construct and operate the following equipment subject to the conditions listed below:

BOILER #6
1.4 MM BTU BOILER BY Bryan.
MODEL #CL180-W-GI

THIS PERMIT HAS BEEN ISSUED, SUBJECT TO THE FOLLOWING CONDITIONS. PERFORMING WORK UNDER THIS PERMIT SHALL BE DEEMED ACCEPTANCE OF THE CONDITIONS SO SPECIFIED.

Permit Conditions #1 through 20 of the current Permit to Operate 96-73-01and Permit Conditions #1 through 4 of the current Permit to Operate 05-73-04 apply to this permit in its entirety, unless otherwise noted below.

POST A COPY OF THIS PERMIT IN A CONSPICUOUS PLACE AT SITE

NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT Gretchen Bennitt, Executive Director

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PERMIT TO OPERATE

Issued on: March 26, 2019 Permit No. 96-73-07

Valid from: February 4, 2019 through February 3, 2020

By: [signature]
Gretchen Bennitt, Executive Director

GRANTED TO: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

FACILITY LOCATION: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

Under the provisions of District Regulation, authorization is hereby granted to construct and operate the following equipment subject to the conditions listed below:

STANDBY DIESEL GENERATOR
CATERPILLAR MODEL #3512, SERIAL # 24Z02387

POST A COPY OF THIS PERMIT IN A CONSPICUOUS PLACE AT SITE

THIS PERMIT HAS BEEN ISSUED, SUBJECT TO THE FOLLOWING CONDITIONS. PERFORMING WORK UNDER THIS PERMIT SHALL BE DEEMED ACCEPTANCE OF THE CONDITIONS SO SPECIFIED.

Permit Conditions #1 through 20 of the current Permit to Operate 96-73-01 apply to this permit in its entirety, unless otherwise noted below.

PERMIT CONDITIONS SPECIFIC TO DIESEL INTERNAL COMBUSTION ENGINES

21. All diesel fuel used shall be No. 2 Diesel (or better) having a sulfur content of 0.05% (500 parts per million) or less, per section 2281 of Title 13, California Code of Regulations (CCR), and an aromatic hydrocarbon content of less than 10% by volume, per section 2282 of Title 13, CCR.

22. Measurement of the gallons per hour consumed by the engine shall be made by the following method:

    A. A totalizer that will measure the daily hours of operation shall be installed and maintained in good operating condition in locations accessible to District inspectors for indicating daily total operating hours.

    B. A flow meter that will measure the daily number of gallons of diesel that is pumped into the day tank shall be installed and maintained in good operating condition in a location that is accessible to District inspectors for indicating daily total gallons pumped into the day tank.

    C. Ground equipment will be filled with diesel that is only pumped from the day tank using a metered pump.

    D. The IC engine diesel consumption shall be the difference between the total number of gallons pumped into the day tank during a 24 hour period minus the metered amount removed for the ground equipment during the same time period. The difference will then be divided by the number of hour of operation that occurred during the given 24 hour time period.

23. Record Keeping Requirements: The applicant shall maintain records of engine operating hours and number of operating days, and records for the number of gallons and type of fuel used. These records shall be maintained for a period of two (2) years, and made available to District inspectors upon request.

24. Production Limits: Operation of the internal combustion engines under this permit is limited to the lesser of 500 hours per year for the Caterpillar model #3512 standby generator, the Cummins KTA 2300 standby generator and 150 hours per year for the Caterpillar model #3512 B standby generator or combined 40,045 gallons of fuel per year without prior approval from the Executive Director.

25. Emission Limits: Total combined annual air pollution emissions for all three IC engines allowed under Permit to Operate #'s 96-73-06, 96-73-07 and 05-73-08 shall not exceed the following quantities:

Total Suspended Particulate (TSP):	0.52 tons/yr
Nitrogen Oxides (NOx):	14.54 tons/yr
Sulfur Oxides (SOx):	0.24 tons/yr
Total Organic Gases (TOG):	0.47 tons/yr
Carbon Monoxide (CO):	3.80 tons/yr

NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT Gretchen Bennitt, Executive Director

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PERMIT TO OPERATE

Issued on: March 26, 2019 Permit No. 96-73-08

Valid from: February 4, 2019 through February 3, 2020

By: [signature]
Gretchen Bennitt, Executive Director

GRANTED TO: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

FACILITY LOCATION: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

Under the provisions of District Regulation, authorization is hereby granted to construct and operate the following equipment subject to the conditions listed below:

STANDBY DIESEL GENERATOR
CUMMINGS KTA 2300
SERIAL # 33100136

THIS PERMIT HAS BEEN ISSUED, SUBJECT TO THE FOLLOWING CONDITIONS. PERFORMING WORK UNDER THIS PERMIT SHALL BE DEEMED ACCEPTANCE OF THE CONDITIONS SO SPECIFIED.

Permit Conditions #1 through 20 of the current Permit to Operate 96-73-01 and Permit Conditions #21 through 25 of the current Permit to Operate 96-73-04 apply to this permit in its entirety, unless otherwise noted below

POST A COPY OF THIS PERMIT IN A CONSPICUOUS PLACE AT SITE

NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT Gretchen Bennitt, Executive Director

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PERMIT TO OPERATE

Issued on: March 26, 2019 Permit No. 05-73-09

Valid from: February 4, 2019 through February 3, 2020

By: [signature]
Gretchen Bennitt, Executive Director

GRANTED TO: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

FACILITY LOCATION: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

Under the provisions of District Regulation, authorization is hereby granted to construct and operate the following equipment subject to the conditions listed below:

STANDBY DIESEL GENERATOR
CATERPILLAR MODEL #3512B

THIS PERMIT HAS BEEN ISSUED, SUBJECT TO THE FOLLOWING CONDITIONS. PERFORMING WORK UNDER THIS PERMIT SHALL BE DEEMED ACCEPTANCE OF THE CONDITIONS SO SPECIFIED.

Permit Conditions #1 through 20 of the current Permit to Operate 96-73-01 and Permit Conditions #21 through 25 of the current Permit to Operate 96-73-04 apply to this permit in their entirety, unless otherwise noted below

POST A COPY OF THIS PERMIT IN A CONSPICUOUS PLACE AT SITE

NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT Gretchen Bennitt, Executive Director

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PERMIT TO OPERATE

Issued on: March 26, 2019 Permit No. 96-73-11

Valid from: February 4, 2019 through February 3, 2020

By: [signature]
Gretchen Bennitt, Executive Director

GRANTED TO: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

FACILITY LOCATION: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 96161

Under the provisions of District Regulation, authorization is hereby granted to construct and operate the following equipment subject to the conditions listed below:

BINKS PAINT SPRAY BOOTH

Consisting of the Items on Page 2:

POST A COPY OF THIS PERMIT IN A CONSPICUOUS PLACE AT SITE

A. 1 Binks Paint Spray Booth, Model # PFA 8-7TLH, 7'9" Wide, 7'0" High, 6'2" Overall Depth

B. 1 - 24" diameter double ring exhaust fan (model # 30-4206), fan capacity 7400 CFM @ 0.25" static pressure.

C. 1 - 1.5 HP totally enclosed ball bearing motor (230 volt, 60 cycle, 3 phase).

D. 1 - 1.5 HP combination starter/disconnect switch (model # 29-83222).

E. 1 - 18" diameter dbl ring exhaust fan (model # 30-1620), fan capacity 3750 CFM @ 0.25" static pressure.

F. 1 - 0.75 HP explosion proof ball bearing motor (115 volt, 60 cycle, 1 phase).

G. 1 - 0.75 HP combination starter/disconnect switch (model # 29-83222).

H. 1 - 18" x 18" auto shutter (model # 29-49).

I. 2 rows of Andreae filters, 3'0" high by 7'8" long.

J. Binks Mach 1 HVLP Model #18 Air Atomization Spray Gun

THIS PERMIT HAS BEEN ISSUED, SUBJECT TO THE FOLLOWING CONDITIONS. PERFORMING WORK UNDER THIS PERMIT SHALL BE DEEMED ACCEPTANCE OF THE CONDITIONS SO SPECIFIED.

Permit Conditions #1 through 20 of the current Permit to Operate 96-73-01 apply to this permit in its entirety, unless otherwise noted below.

PERMIT CONDITIONS SPECIFIC TO SPRAY BOOTHS

21. If the permittee changes products used in coating, then MSDS sheets and usage information shall be submitted to the District for approval prior to use.

22. A spray booth with filter system must be used to control exhaust particulates. Filters shall be replaced on a regular basis, as needed. A minimum of at least one complete set of spare filters shall be available at all times for each spray booth under permit.

23. Spray coating operations shall only be conducted within the spray booth enclosure having filters in good condition. The spray booth shall be equipped with a manometer to measure the pressure drop across the filter. The manometer shall be maintained in good working order. The manometer reading during operation shall not exceed 0.25 inches of water.

24. Only HVLP type spray guns shall be used for all coating applications. All HVLP guns will meet or exceed South Coast AQMD standards for HVLP spray guns.

25. All containers of VOC-containing materials shall be kept closed when not being used. No solvent materials shall be dumped or allowed to drain or evaporate.

26. Production Limits: Use of top coat materials will be limited to 50 gallons per year. If the permittee plans to utilize more coating materials than authorized by these limits, then he/she shall obtain prior approval from the District.

27. Emissions Limits: Spray coating usage shall not exceed a rate of 1.0 gallon per any hour, and the Volatile Organic Compound (VOC) content of coatings and solvents, as determined by EPA Method 24A, shall not exceed maximum VOC content of 1000 g/l (8.35 lbs/gallon). Spray coating and solvent usage shall not exceed 5 gallons in any day. Total annual actual emissions shall not exceed the following maximum emissions limits:

Total Suspended Particulate (TSP):	0.19 tons/yr
Volatile Organic Compounds (VOC):	0.19 tons/yr

28. Recordkeeping Requirements: The applicant shall maintain consumption records for all materials containing volatile organic compounds (VOCs). A separate record for each such material shall be maintained, including the VOC content of each material. An annual report shall be submitted at the end of each calendar year, summarizing consumption. Samples of forms are available from the District upon request. Consumption records shall be maintained for a period of two (2) years and made available to District inspectors upon request. Purchase orders and invoices for VOC-containing materials shall be maintained for a period of two (2) years and made available to the District upon request for confirming the general accuracy of the reports submitted.

NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT Gretchen Bennitt, Executive Director

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Permit to Operate

Issued on: March 26, 2019

Permit No. 96-73-13

Valid from: February 4, 2019 through February 3, 2020

By: [signature]
Gretchen Bennitt, Executive Director

GRANTED TO: Tahoe-Truckee Sanitation Agency
13720 Butterfield Drive
Truckee, CA 9616

FACILITY LOCATION: 13720 Butterfield Drive
Truckee, CA 9616

Under the provisions of District Regulation, authorization is hereby granted to construct and operate the following equipment subject to the conditions listed below:

CHLORINE HANDLING SYSTEM

Consisting of the Items on Page 2:

POST A COPY OF THIS PERMIT IN A CONSPICUOUS PLACE AT SITE

A. 18 - 1 Ton, Department of Transportation Approved, Chlorine Gas Containers

B. 4 Chlorinators.

C. 4 Fixed throat Chlorine Injectors.

D. 4 - 1 Ton floor mounted scales with hold down straps.

E. 3 Stage Caustic Scrubber, 3,800 gallon of 20% Sodium Hydroxide capacity, rated for 3,000 cfm.

F. Chloralert Chlorine gas detector, model # 17CA1010

THIS PERMIT TO OPERATE HAS BEEN ISSUED, SUBJECT TO THE FOLLOWING CONDITIONS. PERFORMING WORK UNDER THIS PERMIT TO OPERATE SHALL BE DEEMED ACCEPTANCE OF THE CONDITIONS SO SPECIFIED.

Permit Conditions #1 through 20 of the current Permit to Operate 96-73-01 apply to this Permit to Operate in its entirety, unless otherwise noted below.

21. Storage containers shall be vented to the Caustic Scrubber.

22. Records of monthly and annual use rates of Chlorine shall be kept on site for the most recent twelve month period, and made available to District Staff upon request.

23. Printouts of alarms from emergency venting shall be kept and made available to the District staff.

25. The Chlorine Detector shall be calibrated according the manufacturer recommendations.

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Appendix 5D

CONCEPTUAL ANALYSIS AND COST OF RO TREATMENT FOR REMOVAL OF TDS AND CHLORIDE

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FINAL PROJECT MEMORANDUM

MASTER SEWER PLAN

Tahoe-Truckee Sanitation Agency

Date: December 23, 2021

Project No.: 11384A00

Prepared By:	Dylan Uecker and Elisa Garvey
Reviewed By:	Richard Gutierrez
Subject:	Conceptual Analysis and Cost of RO Treatment for Removal of TDS and Chloride

Purpose

The purpose of this memo is to document the conceptual treatment process, cost, and approximate footprint for partial treatment of the Tahoe-Truckee Sanitation Agency's (T-TSA's) Water Reclamation Plant (WRP) effluent for removal of total dissolved solids (TDS) and chloride.

Background

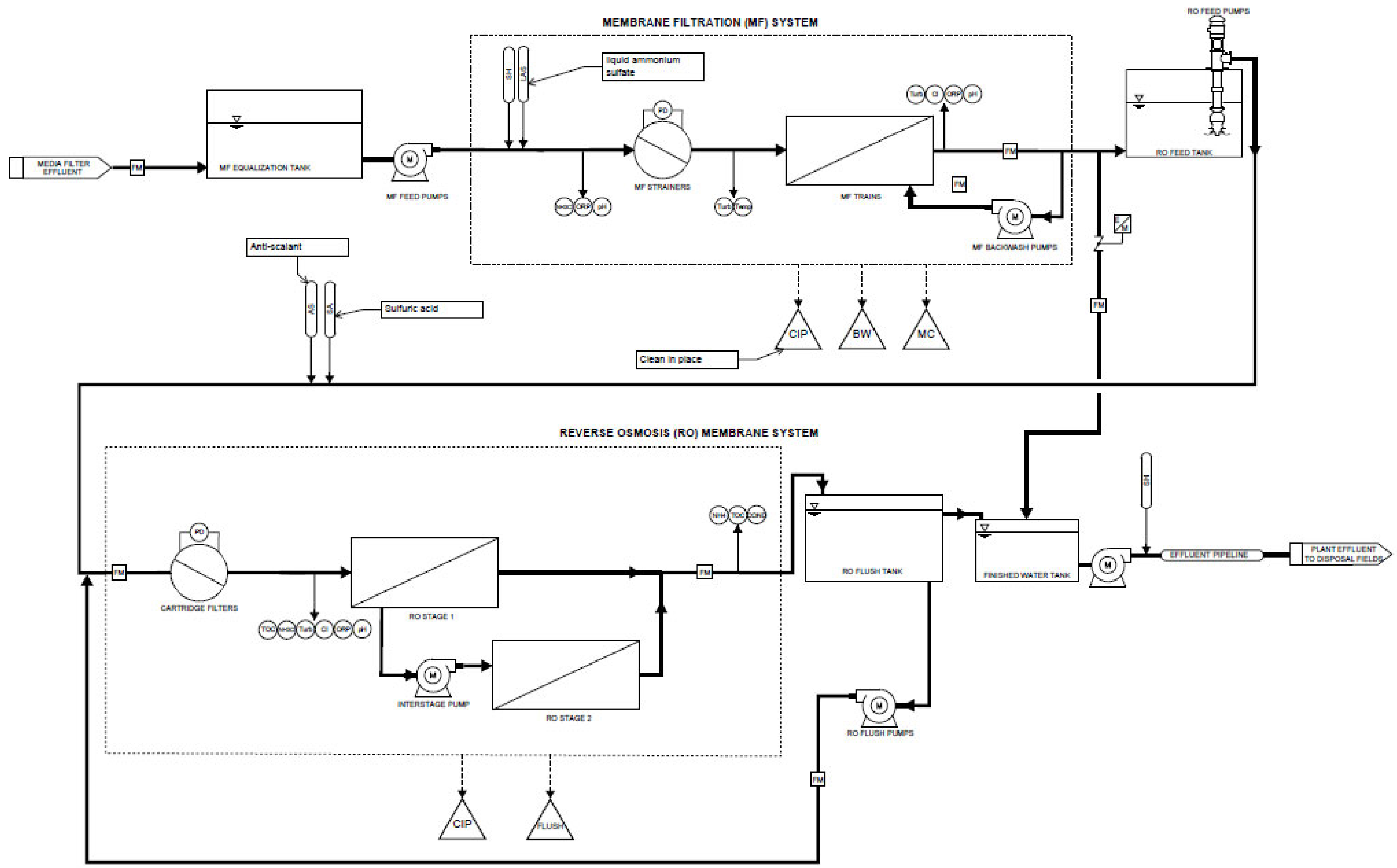
As described in Chapter 5, the Master Sewer Plan addresses the following future regulatory conditions related to the discharge of treated wastewater:

- Waste Discharge Requirements with More Stringent Nutrient Limits – For this scenario it is assumed that T-TSA's waste discharge requirements would remain the same with the exception of more stringent nutrient limits to further reduce any impacts of the WRP effluent on the Truckee River and Martis Creek, and to enhance attainment of receiving water quality objectives.
- Federal National Pollutant Discharge Elimination System (NPDES) Permit Program – This scenario assumes that T-TSA would be regulated under the Federal NPDES permitting program. It is assumed that potential new water quality based effluent limits would include metals and organics, lower disinfection byproduct limits, and limits for contaminants of emerging concern (CECs).
- Enhanced Total Dissolved Solids (TDS) and Chloride Limits – This scenario assumes that more stringent requirements for TDS and chloride would be imposed, either under the existing permit framework or under the NPDES permit program.

The Master Sewer Plan includes optimization of the existing treatment process and treatment plant upgrades required for the first two future regulatory scenarios listed above. With respect to the third regulatory scenario, Enhanced Total Dissolved Solids (TDS) and Chloride Limits, it is anticipated that if more stringent TDS and chloride limits were to be imposed, then this would occur in the latter part of the planning horizon or beyond the planning horizon. Therefore, a conceptual level evaluation of process upgrades to achieve more stringent TDS and chloride limits is provided herein but is not included within the Master Sewer Plan planned capital improvements.

Treatment Process

The proposed treatment process for TDS and chloride removal is reverse osmosis (RO). It is likely that Membrane Filtration (MF) will be needed as a pretreatment step before the RO system. The MF system is used to eliminate TOC and the potential for biological fouling. A process flow schematic for these treatment process trains is provided in Figure 1. The RO process generates a concentrate waste stream that is approximately 20 percent of the RO process feed flow. It is assumed that the RO concentrate will be hauled offsite for disposal. The feasibility and cost of concentrate disposal are not included in this memorandum as these are highly variable and will need to be evaluated further if and when the project is implemented.



PROCESS ABBREVIATIONS LEGEND

AS Anti Scalant
BW Backwash
CIP Clean in Place
FM Flow Meter
MC Maintenance Clean
MF Membrane Filtration
PD Pressure Differential Instrument
RO Reverse Osmosis
SA Sulfuric Acid

Figure 5D.1 Conceptual Process Flow Diagram for Membrane Filtration and Reverse Osmosis Treatment Trains

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RO Process Capacity

In a partial treatment configuration, a portion of the WRP effluent is treated through the new Advanced Water Purification Facility (AWPF) process and the remaining WRP effluent bypasses the process. The RO permeate and bypass flows are then combined to meet the TDS and chloride loading goals. Attainment of water quality targets for the combined flow (bypass and permeate) dictate the portion of the WRP effluent that requires RO treatment.

A relatively simple mass balance approach is used to estimate the flow that requires RO treatment. The following assumptions were made for this analysis:

- The portion of the WRP effluent that requires RO treatment is based on attainment of TDS and chloride water quality targets.
- The assumed TDS water quality limit is 306 milligrams per liter (mg/L). This limit was calculated based on the TDS Waste Load Allocation of 24,514 pounds per day (lbs/day), and an assumed future flow of 9.6 million gallons per day (mgd) (the rated capacity of the WRP).
- The assumed chloride water quality limit is 85 mg/L. This limit was calculated based on the chloride Waste Load Allocation of 6,809 lbs/day, and an assumed future flow of 9.6 mgd.
- For planning purposes, it is assumed that the water quality targets for the partial RO process are 80 percent of the estimated limits. The TDS and chloride targets are 245 mg/L and 68 mg/L respectively.
- Because the assumed point of compliance is Well 31, the RO process feed flow concentrations are estimated based on Well 31 data (January 1, 2014 through December 31, 2018).
- The 95th percentile concentrations for TDS and chloride are 346 mg/L and 88 mg/L, respectively.
- The RO recovery is assumed to be 80 percent.
- The RO removal efficiency for both TDS and chloride is 95 percent.

Table 1 presents the key parameters and results of the mass balance calculations. TDS is the limiting parameter in the analysis (i.e., 36 percent of the total flow needs to be treated by RO to meet the TDS water quality target, while 28 percent of the total flow needs to be treated by RO to meet the chloride water quality target). The estimated required RO capacity is 3.5 mgd, based on attainment of the TDS water quality target.

Table 5D 1 Summary of Calculations to Estimate RO Capacity

Parameter	Units	TDS	Chloride
Water Quality Target	mg/L	245	68
95th Percentile Concentration	mg/L	346	88
RO Removal Efficiency	%	95%	95%
RO Recovery	%	80%	80%
Total Flow (rated capacity of the WRP)	mgd	9.6	9.6
RO process flow percentage	%	36%	28%
RO process flow (capacity)	mgd	3.5	2.7
Blended Concentration Estimate	mg/L	245	68

Conceptual Layout

A conceptual layout of the proposed 3.5 mgd MF/RO facility was developed based on recent similar projects designed by Carollo Engineers, Inc. (Carollo) and is presented in Figure 2. The size of the facility is approximately 23,000 square feet including the main process area, electrical rooms, control room, blower room, chemical storage, and an RO feed tank. The layout assumes five MF trains and two RO trains. For estimated purposes it was assumed that these facilities would be constructed within a new building structure.

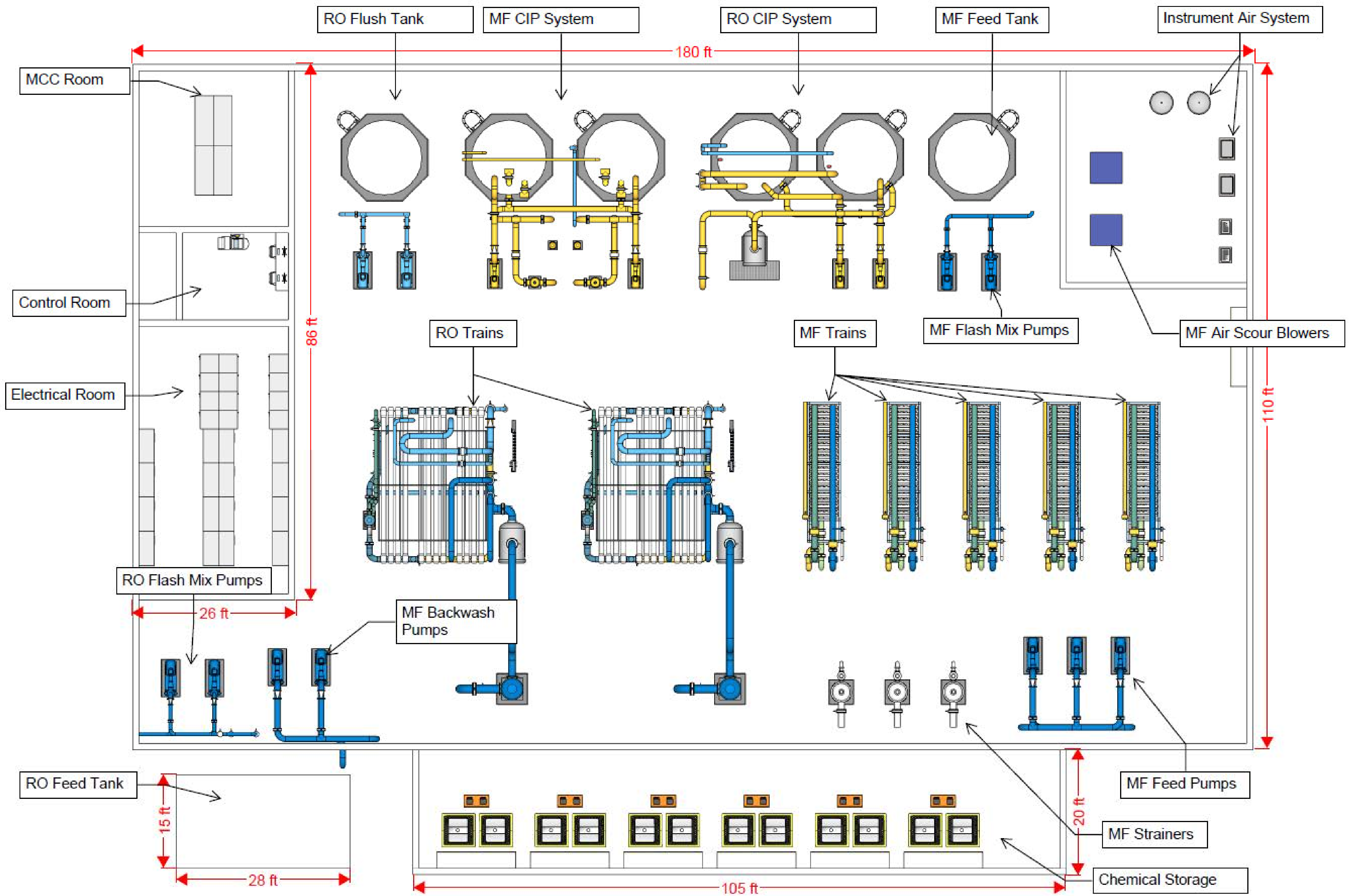

Figure 5D.2 Conceptual Facility Layout Plan for Membrane Filtration and Reverse Osmosis Treatment Trains

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Cost Estimate

The cost estimate for the RO process is based on opinions developed from bid tabulations, cost curves, information obtained from previous studies, and Carollo's experience on other projects.

The development of the RO cost estimate is consistent with the development of the cost estimates in the CIP. Additional detail and information on the use, accuracy and contingencies of the cost estimates are provided in Volume 3, Chapter 7 of the Master Sewer Plan. Key information and assumptions include:

- The project cost is show in November 2021 dollars (ENR value of 14,421).
- Future costs will need to be adjusted for inflation.
- Final costs of a project will depend on actual labor and materials costs, competitive market conditions, final project scope, implementation schedule, and other variable factors such as preliminary alignment generation, investigation of alternative routings, and detailed utility and topography surveys.
- The Association for the Advancement of Cost Engineering (AACE) defines an Order of Magnitude Estimate, deemed appropriate for master plan studies as an approximate estimate made without detailed engineering data. It is normally expected that an estimate of this type would be accurate within plus 50 percent to minus 30 percent.

Table 2 provides the estimated cost for implementation of the RO Project in November 2021 dollars. The specific assumptions for project cost contingencies applied to this project are described in detail in Volume 3, Chapter 7 of the Master Sewer Plan.

Table5D.2 Estimated Project Cost

Element	Cost (July 2021 U.S. Dollars)
Direct Cost	$28,000,000
I&C Allowance (15%)	$4,200,000
Total Direct Cost	**$32,200,000**
Contingency (30%)	$9,660,000
Contractor General Conditions, Overhead and Profit (25%)	$10,465,000
Sales Tax on 50% of Total Direct Cost (8.25%)	$2,158,000
Construction Cost Subtotal	**$54,483,000**
Engineering, Management, and Legal (25%)	$13,621,000
Escalation from July to November 2021 Dollars (4.79%)	**$3,262,000**
Project Cost (rounded)	**$71,370,000**

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 3:
WATER RECLAMATION PLANT MASTER PLAN
CHAPTER 6:
WRP RECOMMENDATIONS

FINAL | February 2022

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Chapter 6

WRP RECOMMENDATIONS

6.1 Introduction

The Tahoe-Truckee Sanitation Agency (T-TSA/Agency) provides wastewater treatment and collection for the North Lake Tahoe and Truckee region. Wastewater is conveyed to the Water Reclamation Plant (WRP) via the Truckee River Interceptor (TRI). T-TSA contracted Carollo Engineers, Inc. (Carollo) to make recommendations for capital improvement plan (CIP) projects based on the results of the analysis and assessments described in other chapters as follows:

- WRP performance and capacity evaluation as discussed in Volume 3, Chapter 2 - WRP Flow and Load Projections as well as in Volume 3, Chapter 4 - WRP Performance and Capacity Assessment.
- WRP condition assessment recommendations as discussed in Volume 3, Chapter 3 - WRP Condition Assessment.
- The impact of various regulations as discussed in Volume 3, Chapter 5 - Regulatory Requirements.

Projects were identified and developed to address the facility's needs determined through the condition, performance and capacity assessments and regulatory review. This chapter includes descriptions and site layouts for the proposed project recommendations.

These recommendations also reflect discussions and feedback from T-TSA regarding the WRP.

6.1.1 Recommendations Development

Various workshops were held with the Agency to discuss various aspects of the Master Sewer Plan, which included some WRP project alternatives and recommendations. Workshop attendees included T-TSA management as well as operations and maintenance staff. These workshops are noted below.

- Regulatory Scenarios workshop; August 18, 2019.
- Condition Assessment workshop; September 18, 2019.
- Flow Projection & Capacity Assessment workshop; February 27, 2020.
- CIP Review workshop; May 21, 2020.
- CIP Refinement workshop; September 2, 2020.
- CIP Refinement workshop; March 4, 2021.

The primary objectives of those workshops were to:

- Discuss the regulatory scenarios that should be considered for future planning and agree on drivers that could affect regulations.
- Review the results of the WRP condition assessment, including the key findings and recommended improvement projects to address aged infrastructure and equipment, and increase WRP operational efficiency.

- Review the results of the master plan flow and development projections, including key findings related to current and future capacity limitations, as well as some suggestions for resolving any deficiencies.
- Review and confirm future needs for the WRP. Future needs were identified through the flows and loads, condition, performance, and capacity assessments (Chapters 2, 3, and 4), and a review of regulatory requirements (Chapter 5).
- Identify potential projects that could be considered for addressing current and future needs.
- Review proposed projects, costs, and phasing for the master sewer WRP CIP and receive T-TSA feedback.

Recommendations were identified and developed to address the WRP needs that were determined through the condition, performance and capacity assessments, and regulatory review. Through the performance and capacity assessments, some facilities and processes were identified as not having the existing capacity to accommodate buildout flows and loads within the planning period while meeting current WRP requirements. Additionally, through the condition assessment, several assets were identified as requiring rehabilitation within the 25-year planning period of the Master Sewer Plan. Furthermore, the regulatory requirements review identified potential future regulatory requirements that may necessitate additional liquids and solids treatment as well as air emissions control at the WRP. As a result, WRP alternatives were developed to accommodate potential future regulatory scenarios, maximizing the use of existing assets and minimizing rehabilitation costs.

6.2 Project Phasing

All WRP related projects were broken into five groups. These groups were used to help prioritize the rehabilitation and replacement projects based on the condition of the specific WRP process areas and anticipated timing of capacity needs, regulatory requirements, and process optimization needs. These projects were grouped into five phases as shown below:

- Phase 1: Years 2022 through 2026.
- Phase 2: Years 2027 through 2031.
- Phase 3: Years 2032 through 2036.
- Phase 4: Years 2037 through 2041.
- Phase 5: Years 2042 through 2046.

The project phasing will be used in the CIP of this Master Plan. Critical projects were phased in the earlier phases (years) of the 25-year CIP. Less critical projects were phased into later phases of the 25-year CIP. Phase 1 projects were then further broken out into implementation over individual years. This was an iterative process working with T-TSA staff in an effort to balance WRP needs with available resources and ability to deliver projects.

6.3 WRP Improvements

WRP improvements were grouped into three areas: rehabilitation and replacement, capacity, and process optimization. Specific recommendations recommended to address deficiencies and optimize processes at the WRP are described in the sections below and shown in Figures 6.1, 6.2, 6.3, and 6.4. These improvements are also itemized by project in Table 6.1 with a cross-referenced numbering system. Improvements that had previously been identified by T-TSA, per their existing 5-year CIP, are also included in Table 6.1, but are not described in the sections below. These previously identified improvements are demarcated by Project IDs that begin with "CIP" or "CIPR". CIP projects are those previously included in the Upgrade, Rehabilitation, and Replacement Fund (Fund 06). CIPR projects are those previously included in the Wastewater Capital Reserve Fund (Fund 02). The columns used in Table 6.1 refer to the following:

- *Project ID:* Assigned number that corresponds to the Proposed Improvements table. This is an alphanumeric number that starts with WRP or CIP and continues with a number. Projects with the CIP or CIPR designation were previously identified by T-TSA and included in prior CIPs. Projects with the WRP designation are plant projects that were identified as part of this master planning effort.
- *Project Name:* Provides a descriptive name for each project.
- *Type of Improvement:* This is an indication of the type of improvement and includes the categories of repair, replace (in kind), new, inspect, and demolish.
- *Description:* Summarizes major elements of the proposed improvements (more detailed summaries may be found elsewhere in the Master Plan).
- *Reason:* Summarizes why the improvement is needed.
- *Proposed Phase:* Designates the phase of the 25-year CIP in which the project is proposed to be implemented.

The following sections describe the proposed improvements in greater detail.

6.3.1 Rehabilitation and Replacement Improvements

Figure 6.1 illustrates the relative locations for the recommended rehabilitation and replacement improvements projects. The rehabilitation and replacement improvements projects were developed to address WRP infrastructure that is in poor condition, obsolete, or has exceeded its useful service life, as defined in Volume 3, Chapter 3 - Condition Assessment. Improvements were grouped into projects based on timing of improvements, plant process area impacted, and work of similar type.

The following rehabilitation and replacement improvements projects are recommended for the WRP:

- Primary and Secondary Treatment Repairs (Project WRP-01): The project consists primarily of structural concrete and roof repairs within the Primary and Secondary treatment process areas and some ancillary electrical improvements. These improvements include the following:
  - Improving ventilation for the four Primary Clarifier Domes and addressing water intrusion issues associated with the domes and walls surrounding the clarifiers.
  - Lighting and conduit improvements within the Primary Clarifiers to address corrosion issues.
  - Repairing concrete damage on the Primary Clarifier enclosure structure walls and at the Oxygenation Basins.
  - The Primary Sludge Pump Station (Building 51) and the Chemical and Conventional Treatment (C&CT) Buildings 13 and 53 exhibit water damage on the exterior walls which will require repairing the concrete masonry unit (CMU) walls and installing gutters to prevent further water damage.

- Phosphorus Removal and Recarbonation Rehabilitation (Project WRP-02): The majority of the recarbonation rehabilitation project involves repairing and/or resurfacing concrete walls and surfaces as well as replacement of aging mechanical equipment such as gates and mixers. The Rapid Mix/Flocculation Basins, Chemical and Recarbonation Clarifiers, Recarbonation Basins, and Phosphorous Stripping Basins all require repairs and resurfacing within the basins or along the walls. The Recarbonation Clarifiers also require replacement of the basin bottom grout. Other improvements consist of replacing slide gates at the Flocculation Basin and the First Stage Recarbonation Basin, replacing handrails at the second stage Recarbonation Basin, and replacing the rapid mixers.
- Plant Wide Electrical Improvements (Projects WRP-03, WRP-07, WRP-09, WRP-12, WRP-13): Plant Wide Electrical Improvements are broken into five separate projects involving miscellaneous electrical and/or instrumentation improvements. The phasing is based on criticality of the equipment replacement with respect to timing. The five projects consist of the following elements:
  - *Phase 1 Improvements (Project WRP-03):* Replace and relocate Switchboard 1A, Panel 1A, and Transformer 1A.
  - *Phase 2 Improvements (Project WRP-07):* Install secondary power feed to the Multipurpose Pump Station (MPPS) and replace the MPPS electrical cabinet and control panel. Generators 1 and 2 will be replaced with an air-cooled 1500-kilowatt (kW) generator and a seamless power transfer for Generator 3 will be installed. Several motor control centers (MCCs) will be replaced (MCC 24-1, MCC 24-3, MCC 2-1, MCC 2-2, MCC 4, MCC 4-1, MCC 4-2, MCC 13-1, MCC 13-2, MCC 53-1, and MCC 53-2). The switchgear in Building 27 and the transformer in Building 28 will also be replaced.
  - *Phase 3 Improvements (Project WRP-09):* This project includes replacement of MCCs (MCC 3, MCC 3A, MCC 71-1, MCC 71-2, MCC 71-3, and MCC 75).
  - *Phase 4 Improvements (Project WRP*-12): This project includes replacement of two variable frequency drives (VFDs) at the C&CT Facility 53.
  - *Phase 5 Improvements (Project WRP*-13): This project Includes replacement of the BNR Facility MCCs 80-1, 80-1, 80-3, 81-1, 81-2, 81-3, and 81-4. It also includes replacement of the BNR Facility 4000 Amp Switchgear 81-1 and 81-2.
- Harmonic Filter Replacement for Area 71 (Project WRP-05): The project consists of replacement of two active harmonic filters (AHF) in Area 71 (AHF 71-1 and AHF 71-2).
- Condition Assessment and Inspection (Project WRP-08): Several inspections are recommended to assess the condition of various infrastructure components that were not accessible during the condition assessment conducted as part of this master planning effort and which have not been inspected in recent years. These inspections include: inspection of Filter Tank interiors, inspection of the interior of the pipeline from the MPPS to the Filters, inspection of the MPPS Wet Well, inspection of the Effluent Pipeline, inspection of the Filtrate Clarifier Tank and Stripper Tower Feed Tank, continued regular inspection of the Liquid Oxygen (LOX) Tank and Carbon Dioxide Storage Tank, and inspection of miscellaneous site pump station wet wells.

- Digestion Improvements (Project WRP-10): This project involves replacement of the three existing boilers, two heat exchangers, hot water (HW) circulation system and recirculation pumps, the waste gas flare, two Digester 32 programmable logic controllers (PLCs), and the steam lines in the utility tunnel. Additionally, the Digester Gas Treatment System needs to be upgraded and the electrical gear relocated to a new Electrical/Controls Building to comply with National Fire Protection Association (NFPA) 820 requirements. The project also includes installation of a permanent flow meter on the Effluent Pipeline to replace the existing portable strap-on flow meter.
- 2-Water System Improvements (Project WRP-14): The project includes replacement of the hydropneumatic pressure tank associated with the 2-water (2W) system and addition of a new valve vault for buried yard valves.
- Grit System Improvements (Project WRP-15): The project includes recoating of the Grit System rake arms and concrete surface rehabilitation within the grit basins. The project also includes conducting computational fluid dynamics (CFD) modeling of the grit basin hydraulics to identify potential performance enhancements and structural modifications to implement these enhancements.
- Lower Explosive Limit (LEL) Equipment Replacement (Project WRP-16): The project includes replacing LEL equipment for Facilities 13 and 53. This includes replacing a total of 16 LEL sensors including heated enclosure, sensor, sample pump, and the main gas guard panel at the C&CT Building.
- Primary & Secondary Treatment Rehabilitation (Project WRP-17): The project consists of structural and mechanical rehabilitation improvements associated with the Primary and Secondary Treatment process areas. Primary structural projects include repairing oxygenation basin roof decks and adding deck drains to mitigate ponding of water on the structure deck; repairing concrete at the Secondary Effluent Distribution Box, mixed liquor (ML) Splitter Box, and all Secondary Clarifiers; and replacing the checker plate with grating at the ML Splitter Box inlet area to mitigate corrosion issues. The majority of mechanical repairs are to the Primary and Secondary Clarifiers, specifically replacing drives and recoating mechanisms. Additionally, the sludge collector mechanisms/drives need to be replaced for the Chemical Clarifiers, the return activated sludge (RAS) pumps will need to be upgraded to a higher capacity to meet future demand conditions, and the Oxygenation Basin mixer drives need to be recoated.
- Recarbonation Improvements (Project WRP-19): The project consists of concrete repairs within the Second Stage Recarbonation Basins.
- TWAS Pump Replacement (Project WRP-22): The project includes replacement of the thickened waste activated sludge (TWAS) pumps to address reliability and condition of equipment.
- Solids Dewatering Improvements (Project WRP-23): The project consists of rebuilding one of the dewatering centrifuges and upgrading the Dewatering Polymer Feed System.
- Filtration Rehabilitation (Project WRP-25): To prevent further corrosion, it is recommended to recoat the interior and exterior of all four pressure filter tanks, the Centrate Equalization Tank, the Stripper Tower Feed Tank, and the Backwash Equalization Tank. Additionally, the filter media should be replaced for all four pressure filters as part of this project.

- AWT Improvements (Project WRP-26): This project consists of structural repairs to the Advanced Waste Treatment (AWT) Building including concrete floor resurfacing, coating of the building structural steel beams, and replacement of the standing seam metal roof. Additionally, it is recommended that obsolete facilities be demolished to make room for future plant facilities and avoid additional expenditures on obsolete and unused process equipment and infrastructure. The facilities recommended to be demolished include the carbon regeneration system, sulfuric acid storage tanks, and salt storage tanks, as well as pressure swing adsorption (PSA) system located in Building 3. The existing clinoptilolite (clino) beds could be repurposed for use as redundant pressure filters.
- Building Roof Replacements (Project WRP-27): This project consists of replacing the membrane roofing for various plant buildings. The project assumes one-fifth of the WRP's building roofs, approximately 22,700 square feet (sf), is replaced on a 5-year recurrence interval to cover re-roofing of all WRP buildings every 25 years.
- Odorous Air Treatment Improvements (Project WRP-28): This project includes replacement of the biofilter media, foul air fan rehabilitation, and replacement of MCC 69.
- Asphalt Sealing and Replacement (Project WRP-30): T-TSA historically seals and/or replaces the asphalt around the WRP roads and parking areas every few years. The project is listed as recurring every 3 to 4 years.
- MPPS Improvements (Project WRP-32): This project includes replacement of the 10 existing pumps within the MPPS, replacement of MPPS VFDs 24104 and 24105, replacement of three soft starters for MPPS fixed speed pumps, and rehabilitation of the steel pump discharge manifold located within the utility tunnel corridor.
- Miscellaneous Plant Rehabilitation (Project WRP-33): This project includes replacement of the four Phosphorus Removal system flocculating mixers, replacement of three of the four primary sludge pumps and associated valves and piping, and replacement of three of the four primary scum pumps (Primary Clarifier No.4 sludge and scum pumps not included). Aging mechanical equipment in Pump Rooms 53 and 13 will also be replaced as part of this project, which includes a total of 18 pumps and six blowers.
- Plant Air System Upgrades (Project WRP-34): This project includes replacement of the plant air system tank and compressors based on age and condition. The project also includes upgrades to various plant air systems based on the results of the National Fire Protection Association (NFPA 820) analysis as described in WRP-35. Assumptions were made as to the potential scope of this project to serve as a placeholder for potential costs given that the analysis has not yet been performed.
- Plant-wide NFPA 820 Compliance Evaluation (Project WRP-35): This project includes a plant-wide NFPA 820 compliance analysis with recommendations for plant improvements required to achieve compliance.
- Chemical Storage and Feed System Improvements (Project WRP-36): This project includes improvements to various plant chemical storage and feed systems based on process changes. It includes replacement of the sulfuric acid storage with totes, removal of the salt storage tanks, and replacement of the various chemical feed pumps and control panels.

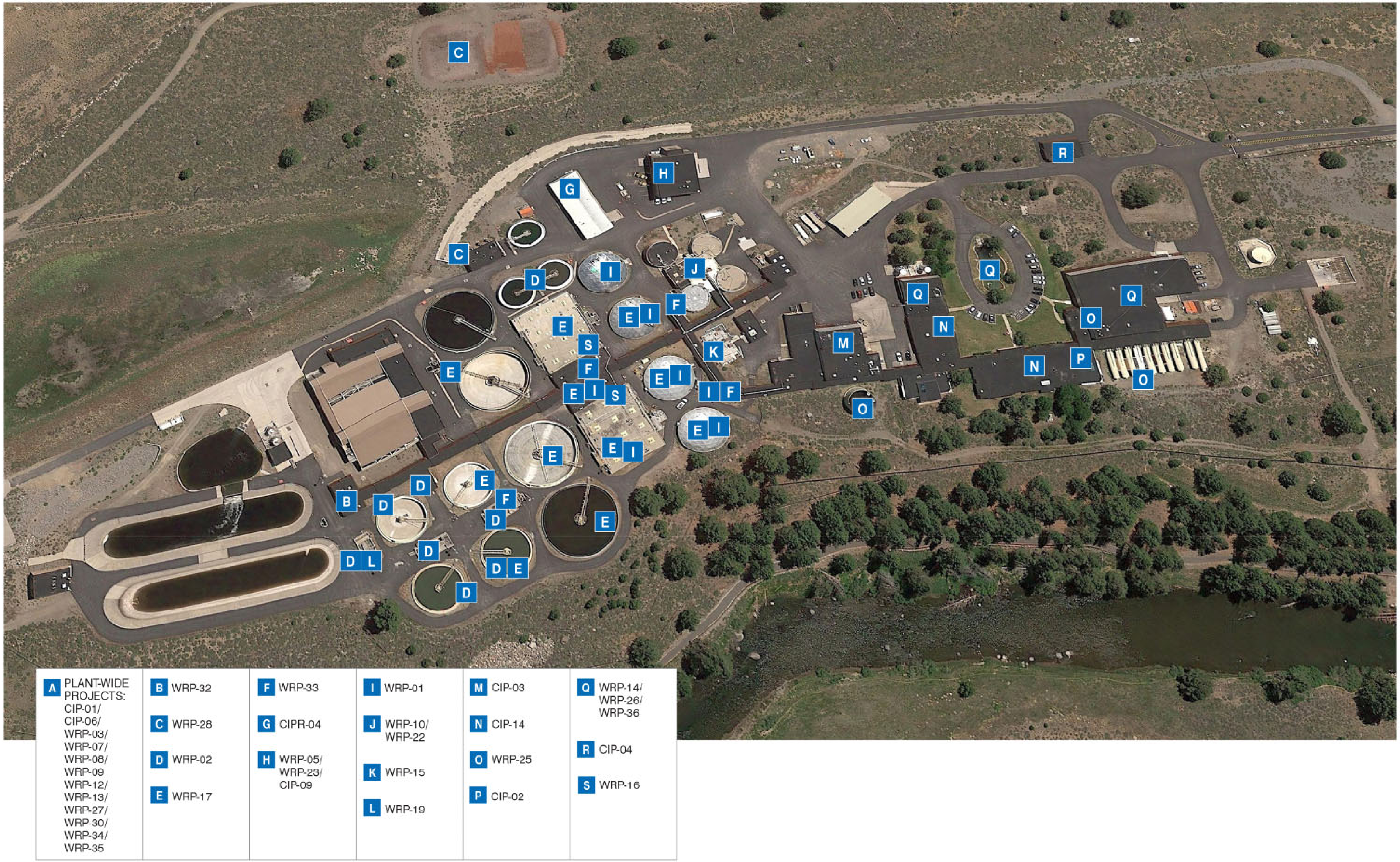

Figure 6.1 WRP Rehabilitation and Replacement Improvements

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6.3.2 Capacity Improvements

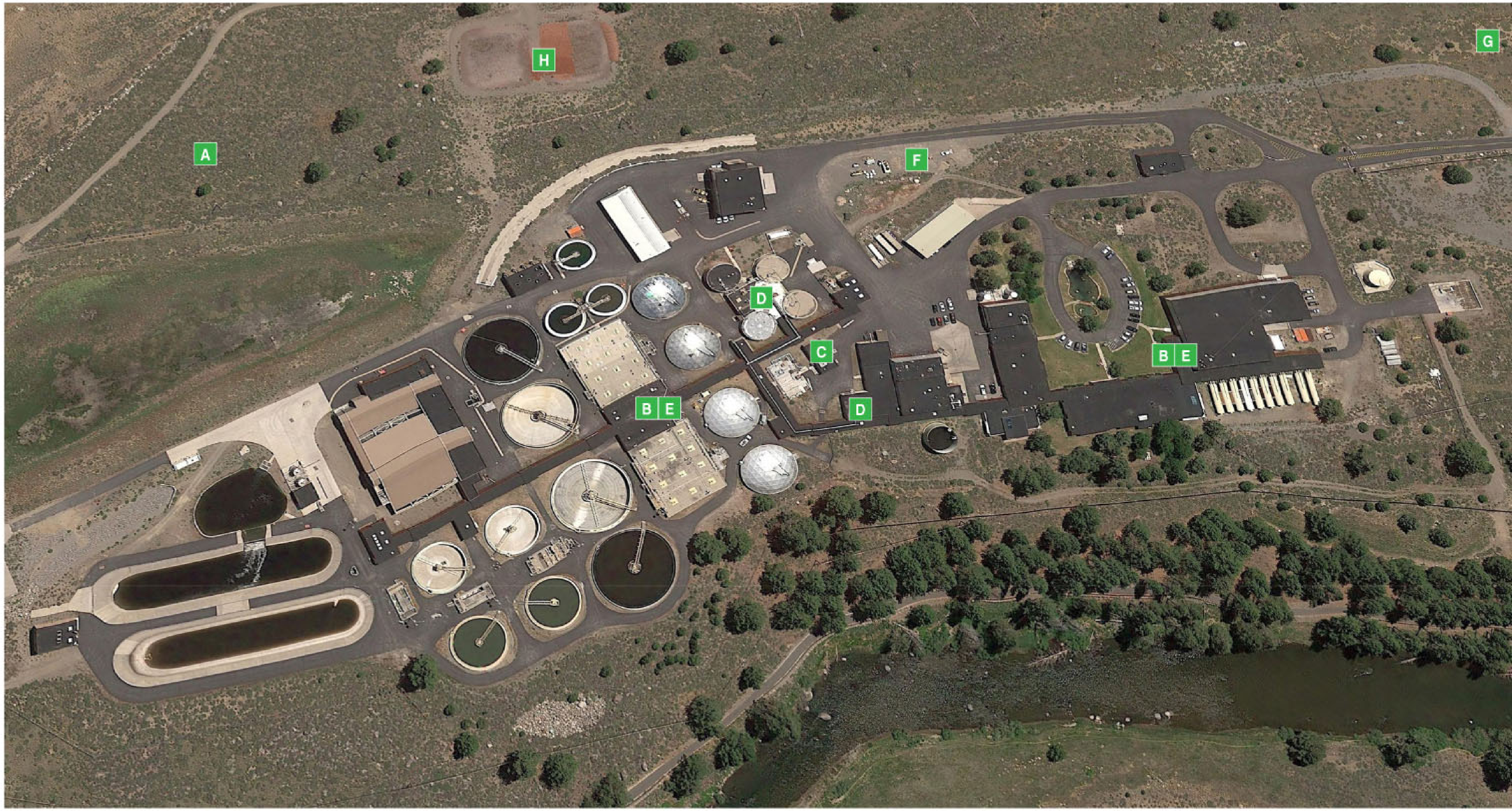
Figure 6.2 illustrates the recommended capacity improvements to mitigate WRP deficiencies. This section provides a detailed description of each recommended WRP capacity improvement project. The capacity recommendations were developed in Volume 3, Chapter 2 - Flow and Load Projections and in Volume 3, Chapter 4 - Performance and Capacity Assessment. The following capacity improvements are recommended for the WRP:

- Effluent Disposal Field Expansion (Project WRP-11): This project includes an initial soil aquifer treatment (SAT) Performance Evaluation Study to determine the need for additional disposal field capacity. The costs for the project assume that the study is followed by the construction of additional effluent disposal fields to provide polishing and meet capacity for future wastewater flows. The project assumes the new disposal fields will be similar in size and configuration to the existing effluent disposal fields (approximately 720,000 square feet).
- WAS Thickening Improvements (Project WRP-18): Although the Thickening Centrifuge is used infrequently and the Sharples Centrifuge currently acts as a backup, future conditions will likely require additional operation of the waste activated sludge (WAS) thickening centrifuges as discussed in Volume 3, Chapter 4 - Performance and Capacity Assessment. If this occurs, it is recommended that the Sharples Centrifuge and its controls be replaced based on operational issues noted during the Condition Assessment effort. A new polymer feed system for the replacement centrifuge would also be included. This project also involves recoating of the sludge collector mechanisms in both gravity thickeners, replacing four digester mixing pumps, and replacing three digester feed and transfer pumps.
- Offsite Flow Equalization Improvements (Project WRP-31): Based on TM04 WRP Hydraulic Capacity, the WRP has enough hydraulic capacity to handle the original wet weather design capacity of 15.4 million gallons per day (mgd) and sufficient influent storage capacity to comfortably handle a 25-year design storm event. Additionally, the WRP hydraulic model shows that it is possible to treat up to 24 mgd through the conventional treatment processes before the primary clarifier effluent weirs become submerged, although the biological nitrogen removal (BNR) process is limited to 17 mgd. For this reason, the addition of an additional flow equalization pond to allow for diversion and storage of secondary effluent could help maximize the hydraulic throughput through the plant and reduce the amount of raw influent that needs to be diverted and stored. This project would consist of a new 15-million gallon (MG) concrete lined storage basin located east of the emergency retention basin (ERB), inlet and return piping, an inlet/drain structure, and a return pump station to return flows to the BNR process. The storage volume of 15 MG was selected to allow for storage of a 25-year, 24-hour design storm event, minimizing the need for raw influent diversions and storage.

6.3.3 Process Optimization Improvements

Figure 6.3 illustrates the recommended process optimization improvements to improve WRP performance and address future potential regulatory requirements. This section provides a detailed description of each recommended WRP process optimization project. The process optimization recommendations were developed using information from Volume 3, Chapter 2 Flow and Load Projections; from Volume 3, Chapter 4 - Performance and Capacity Assessment; and from Volume 3, Chapter 5 - Regulatory Requirements. The following process optimization improvements are recommended for the WRP:

- WASSTRIP Implementation (Project WRP-04): The Waste Activated Sludge Stripping to Remove Internal Phosphorus (WASSTRIP) project would be implemented in two phases; Phase 1 would involve a study (including a business case evaluation) and pilot system utilizing the Ostara™ Reactor process, followed by Phase 2 which would be full-scale implementation assuming the study results show the process to be beneficial from a cost/benefit standpoint. The pilot study will look at post-struvite options to reduce lime usage and create a marketable phosphorus product, as well as producing less chemical sludge. The process involves removing phosphorus from the treatment system by adding magnesium in a controlled pH setting. This allows nutrients to crystallize into fertilizer granules which can be dried and sold for distribution.
- Nitrified Effluent Recycle Pilot (Project WRP-06): This project consists of a study, business case evaluation, and pilot project to determine whether recycling nitrified effluent to the headworks or primary clarifiers could address capacity limitations in the denitrification cells, allow for a reduction in the WRP's methanol consumption, and also reduce odors. The outcome of this project will determine whether the nitrified effluent recycle work proposed in WRP-24 will be implemented or not.
- Flow Equalization Improvements (Project WRP-20): To improve the ability to clean the ballast ponds, a Washdown System consisting of water cannons and associated booster pumps would be constructed. Additionally, the ballast ponds' concrete liners would be rehabilitated to repair cracks and deteriorated concrete as part of this project.
- Biogas Storage (Project WRP-21): Although there are no current plans to expand the gas utilization facilities, it is recommended that the plant budget for additional gas storage improvements as future regulations may require more biogas utilization.
- BNR Structural Retrofit and Nitrified Effluent Recycle (Project WRP-24): Minor improvements are recommended to improve the BNR system. These recommendations include epoxy injection of cracks in the BNR structure, replacing the BNR media in both the nitrification and denitrification reactors, and installation of a new biological filtration effluent (BFE) sump pump as well a water cannons to allow for cleaning of the BFE pond. The project also includes costs for construction of a nitrified effluent recycle pipeline pending the outcome of the pilot study recommended as part of Project WRP-06.
- Disinfection Process Modernization (Project WRP-29): This project consists of replacing the existing gaseous chlorine disinfection facility with ultraviolet (UV) disinfection, or some other disinfection alternative which may be more appropriate at the time of design and construction. The primary drivers for this project are the hazardous nature of chlorine gas, operational issues related to using chlorine gas, and the plant's stringent total dissolved solid (TDS) effluent limits which could make conversion to liquid sodium hypochlorite disinfection infeasible. The costs for the systems are based on in-vessel UV system installed within the existing AWT Building. This assumes that obsolete equipment within the existing AWT Building is demolished as discussed in WRP-26. Figure 6.4 shows a preliminary layout of this project located within the existing AWT building. The project costs also include abandonment of the existing chlorine gas facility and installation of a new sodium hypochlorite storage and feed facility within this building to service the 2W system residual disinfection needs.



A WRP-31	C CIPR-01	E CIP-31	G WRP-11
B CIPR-13	D WRP-18	F CIPR-03	H CIP-26

Figure 6.2 WRP Capacity Improvements

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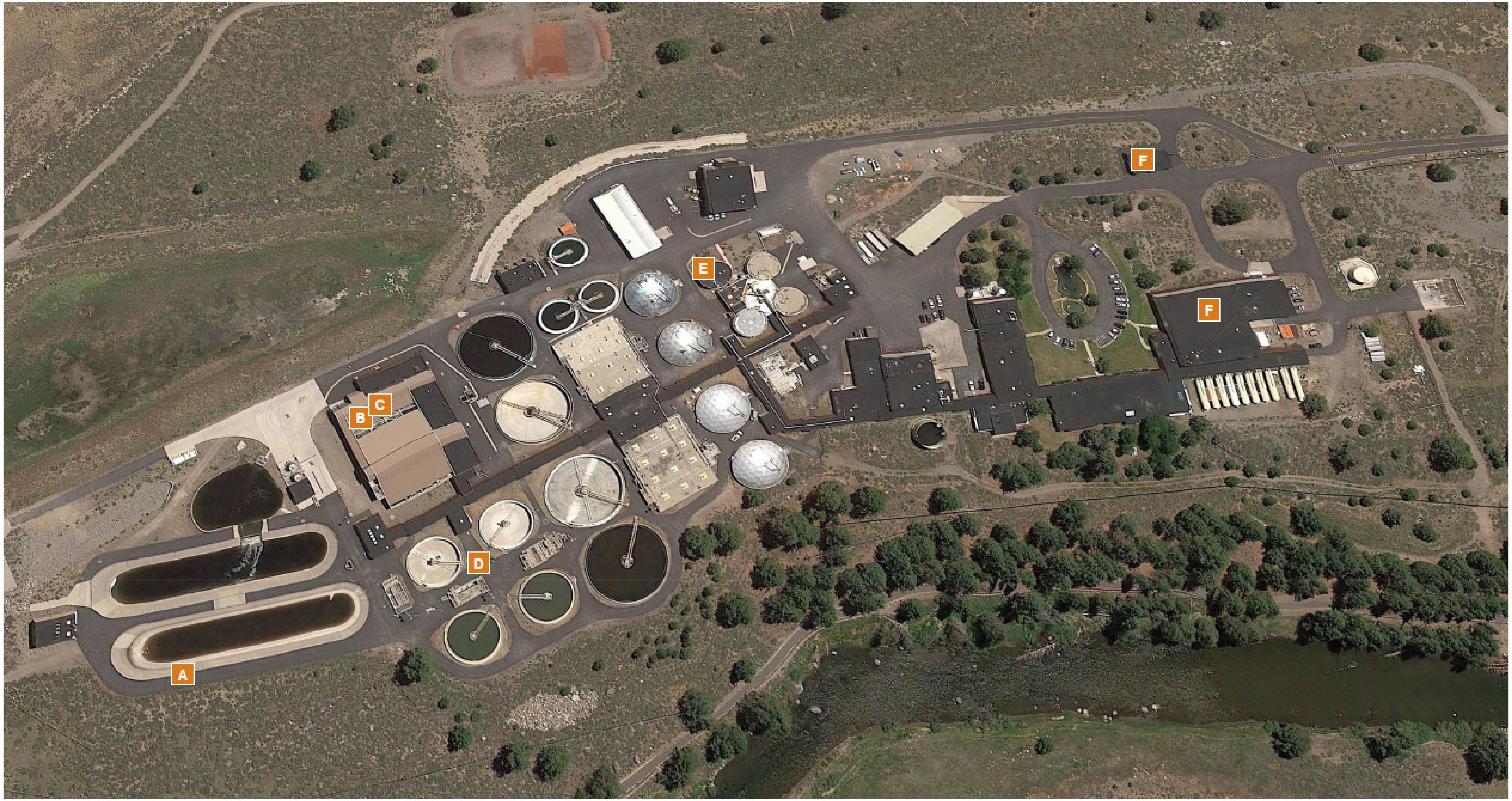

A WRP-20	C WRP-24	E WRP-21
B WRP-06	D WRP-04	F WRP-29

Figure 6.3 WRP Process Optimization Improvements

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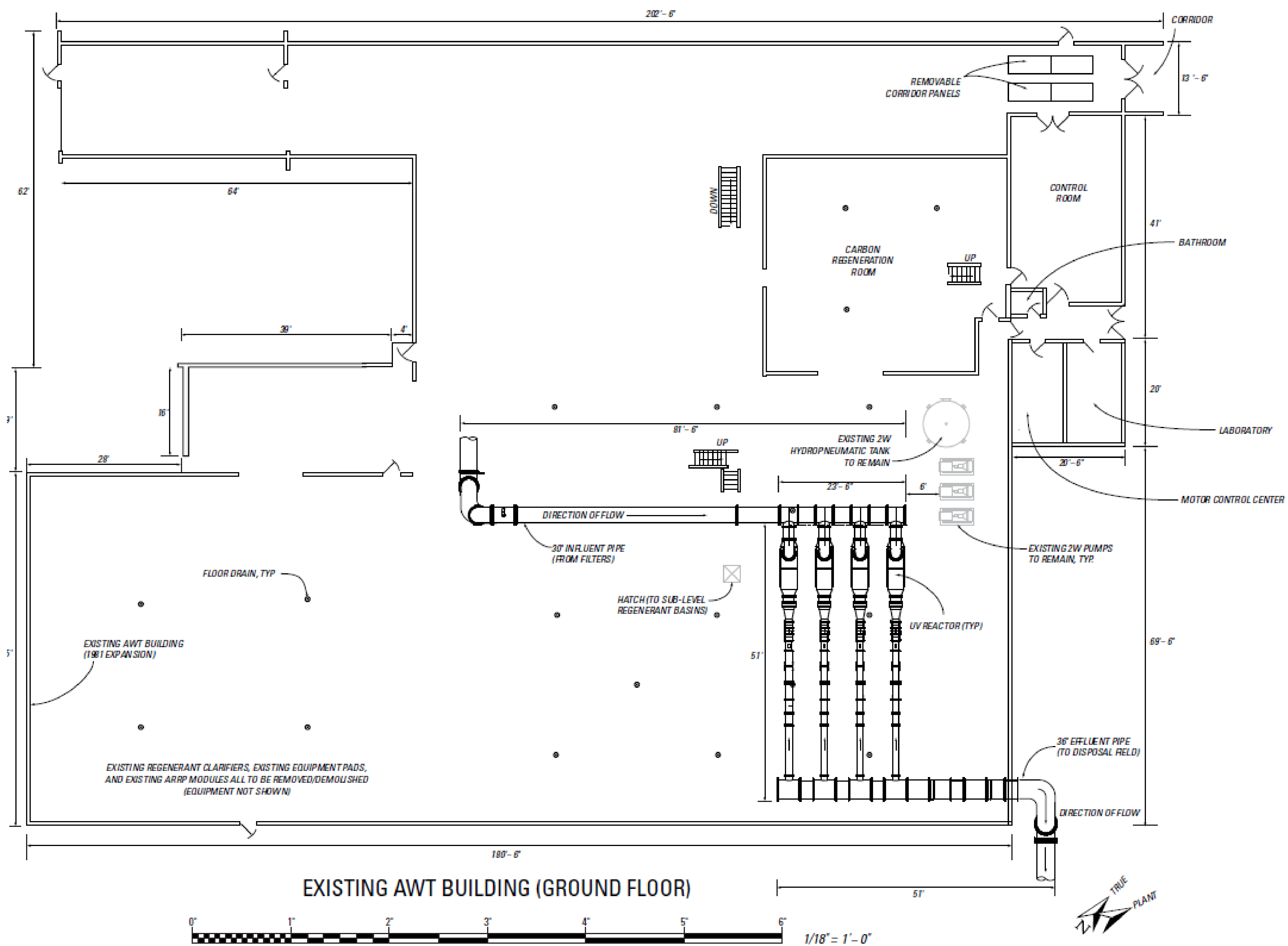

Figure 6.4 Disinfection Conversion to UV Project Preliminary Layout Within the Existing AWT Building

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6.4 Conclusion

Based on the assessments and evaluations performed as part of this master planning effort, as well as workshops and feedback from T-TSA staff, a number of proposed improvements are recommended throughout the WRP, touching almost every process area. The WRP has been in operation since 1975, with two major additions in 1981 and 2003. Since then, T-TSA staff has been diligently maintaining the WRP infrastructure. However, much of it is nearing the end of its expected service life. Additionally, there have been many new developments in water treatment and resource recovery over the last two decades. WRP improvements are proposed to address aging infrastructure, as well as to enhance the treatment at the WRP, while maintaining existing processes and equipment as much as possible. Proposed improvements related to future capacity or potential future regulatory requirements have been phased to later years in the CIP, due to the lack of immediate urgency as well as the uncertainty related to their need.

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Table 6.1 Proposed Improvements

Project ID	Project Name	Type of Improvement	Description	Reason	Proposed Phase
Rehabilitation & Replacement Improvements					
CIP-01	Plant Coating Improvements	Repair	Recoat various equipment and facilities.	Improve longevity. In T-TSA's existing CIP.	Phase 1
CIP-02	Lab Equipment Replacements	Replace	Replace various aged equipment as needed.	Equipment has reached end of life span. In T-TSA's existing CIP.	Phase 1
CIP-03	Lime System Improvements	Replace	Replace hydrated lime conveyance system.	The system is difficult to operate and messy.	Phase 1
CIP-04	Chlorine Scrubber Improvements	Replace	Replace chlorine gas scrubber.	The scrubber tank leaks into the secondary containment tank.	Phase 1
CIP-06	Translucent Panel Rehabilitation	Repair	Refurbish existing Kalwall® architectural panels.	Identified in T-TSA's current CIP due to age and condition of panels.	Phase 1
CIP-09	Centrifuge Rebuild	Repair	Rebuild two dewatering centrifuges.	Centrifuges have much wear on them and need to be repaired. Identified in T-TSA's current CIP.	Phase 1
CIP-14	Communications Network Replacement	Replace	Replace communications equipment and cabling.	Equipment has reached end of life span. Identified in T-TSA's current CIP.	Phase 1
CIPR-04	Maintenance/E&I Shop Improvements	New	Relocate mechanical and instrumentation and electrical (E&I) shops.	Identified in T-TSA's current CIP.	Phase 1
WRP-01	Primary and Secondary Treatment Repairs	Repair/Replace	Repair CMU walls and areas with water damage in concrete. Install gutters.	Concrete is beginning to show signs of water freeze/thaw damage and age.	Phase 1
WRP-02	Phosphorus Removal and Recarbonation Rehabilitation	Repair/Replace	Replace floc and recarbonation gates and repair concrete in clarifiers/basins.	Major spalling is present on interior/exterior concrete. The sluice/slide gates are severely corroded.	Phase 1
WRP-03 WRP-07 WRP-09 WRP-12 WRP-13	Plant Wide Electrical Improvements	Replace/New	Replace LEL equipment, multiple MCCs, upgrade Generator 1, and other electrical and instrumentation equipment replacements and upgrades.	Aging, obsolete equipment will make it difficult to make quick repairs and troubleshoot plant errors. Failing equipment can affect plant operations.	Phase 1 Phase 2 Phase 3 Phase 4 Phase 5
WRP-05	Harmonic Filter Replacement for Area 71	Replace	Replace harmonic filters.	Harmonic filters have not been replaced since 2006.	Phase 1
WRP-08	Condition Assessment and Inspection	Inspect	Inspection of interior of various tanks, pipelines, and pump stations that have not had recent inspections performed.	Regular inspections are important to ensure plant operations are working efficiently and effectively.	Phase 1
WRP-10	Digestion Improvements	Replace/New	Replace boilers, heat exchangers, HW circulation system, waste gas flare, PLCs, and steam lines.	The 1975 boilers are in poor condition and are a safety concern. The heat exchangers are improperly sized and electrical equipment within the boiler room is also a safety concern.	Phase 1

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Project ID	Project Name	Type of Improvement	Description	Reason	Proposed Phase
Rehabilitation & Replacement Improvements (continued)					
WRP-14	2-Water System Improvements	Replace	Replace hydropneumatic pressure tank and install new valve vault. Cost assumes construction of new facilities.	2W hydropneumatic tank is aging. The buried yard valves are not easily accessible.	Phase 1
WRP-15	Grit System Improvements	Repair	Repair the structural concrete surface and recoat rake arms.	Concrete spalling present and beginning signs of corrosion on rake arms.	Phase 2
WRP-16	LEL Equipment Replacement	Replace	The project includes replacing LEL equipment for Facilities 13 and 53.	The equipment is obsolete and required for safety reasons.	Phase 1
WRP-17	Primary & Secondary Treatment Rehabilitation	Repair/Replace	Repair concrete throughout area and roof decks. Replace RAS pumps with higher capacity pumps, replace drives for Clarifier mechanisms, and replace oxygenation basin mixer drives.	Mechanisms need to be regularly recoated to extend their life. Mechanism drives have reached the end of their useful service life. Concrete is beginning to erode on structures. RAS pumps are aging and have capacity limitations.	Phase 1
WRP-19	Recarbonation Improvements	Repair	Repair concrete in basin.	Major cracks, spalling and holes are present in concrete.	Phase 2
WRP-22	TWAS Pump Replacement	Replace	Replace TWAS pumps.	Address condition and reliability concerns.	Phase 1
WRP-23	Solids Dewatering Improvements	Repair/Replace	Upgrade dewatering polymer feed system and rebuild centrifuge.	Older polymer system is not efficient. Centrifuges have a lot of hours and will need to be rebuilt and bearings replaced periodically.	Phase 2
WRP-25	Filtration Rehabilitation	Repair	Recoat filtration tanks. Replace filter media.	Exterior coating is starting to degrade and showing signs of minor corrosion.	Phase 2
WRP-26	AWT Improvements	Repair/Demolish	Resurface floor and structural beams, replace metal roof and demolish abandoned equipment.	Many of the AWT systems are no longer in use and are in poor condition. Portions of the building could be repurposed for future process needs.	Phase 2
WRP-27	Building Roof Replacements	Replace	Replace roof membrane/covering on plant buildings on a periodic basis.	Addresses roof leaks and limited life of roofing systems.	Phase 1-5
WRP-28	Odorous Air Treatment Improvements	Repair/Replace	Repair fans. Replace MCC-69 and biofilter media.	This work will be needed within the planning period based on the age of the facility.	Phase 5
WRP-30	Asphalt Sealing and Replacement	Repair	Seal and/or replace damaged asphalt. Cost is recurring for each Phase.	Asphalt needs to be maintained regularly to extend life.	Phase 1-5
WRP-32	MPPS Improvements	Repair/Replace	Repair pump manifold. Replace MPPS pumps, VFDs, and soft starts.	Signs of corrosion are present on the pump manifold. Pumps and VFDs are nearing the end of their useful service life.	Phase 3
WRP-33	Miscellaneous Plant Rehabilitation	Replace	Replace sludge pumps/piping, Pump Rooms 53 & 13 mechanical equipment, flocculators, and scum pumps.	Equipment is original equipment from 1975 and is aging.	Phase 3
WRP-34	Plant Air System Upgrades	Replace	Replace plant air system oxygen tank and compressors. Address NFPA 820 compliance analysis findings.	This work is required based on the age and condition of the equipment as well as compliance with NFPA 820.	Phase 1
WRP-35	Plant-wide NFPA 820 Compliance Evaluation	Repair	This project consists of a study to evaluate compliance of various plant facilities with NFPA 820 standards.	This work is required to comply with NFPA 280 standards for fire protection.	Phase 1
WRP-36	Chemical Storage and Feed System Improvements	Replace	Removal and replacement of the sulfuric acid storage tank, removal of salt storage tanks, and replacement of various chemical feed pumps and control panels.	This work is required to replace old and obsolete equipment.	Phase 2

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Project ID	Project Name	Type of Improvement	Description	Reason	Proposed Phase
Capacity Improvements					
CIP-26	Odorous Air Biofilter Media Replacement	New	Replacement of biofilter media.	Identified in T-TSA's existing CIP.	Phase 1
CIP-31	Control Room Upgrades #02 and 13 - Remodel	Replace	Remodeling and updating of Control Rooms #02 and 13.	Identified in T-TSA's current CIP.	Phase 1
CIPR-01	Headworks Project	New	Install new bar screens, washer, compactors, flow diversion structures, bypass pumping, etc. Modify Headworks Building.	Identified in T-TSA's current CIP based on performance of existing equipment.	Phase 1
CIPR-03	Equipment/Vehicle Warehouse	New	Build new warehouse for storing T-TSA vehicles, heavy equipment, etc.	Identified in T-TSA's current CIP.	Phase 1
CIPR-13	Control Room Upgrades #02 & #13 - HVAC	Replace	Upgrade Control Room HVAC Equipment.	Identified in T-TSA's current CIP.	Phase 1
WRP-11	Effluent Disposal Field Expansion	New	Perform SAT Performance Evaluation Study. Construct additional effluent disposal fields.	Meet capacity for future effluent disposal.	Phase 3
WRP-18	WAS Thickening Improvements	Repair/Replace	Recoat Thickener sludge collectors, replace Sharples centrifuge and thickening controls. Replace Digester pumps.	Equipment showing corrosion, centrifuges are old. Want to accommodate future capacity.	Phase 3
WRP-31	Offsite Flow Equalization Improvements	New	Build a new concrete lined 15 MG flow equalization basin, new inlet drain structure and piping and a new return pump station.	Provide storage of secondary effluent during a 25-year, 24-hour design storm event to provide additional operational flexibility.	Phase 4
Process Optimization Improvements					
WRP-04	WASSTRIP Implementation	New	Address phosphorous production at treatment plant and find viable solution to process remaining phosphorous.	Creates additional revenue for treatment plant and provides another means to get rid of phosphorous waste.	Phase 2
WRP-06	Nitrified Effluent Recycle Pilot	New	Perform pilot study on nitrified effluent recycle.	Determine whether recycling nitrified effluent could address capacity limitations in the denitrification cells, reduce WRP's methanol consumption and reduce odors.	Phase 1
WRP-20	Flow Equalization Improvements	New	Resurface ballast ponds and construct water cannons for ballast ponds and booster pumps for Washdown System.	The basin surface needs resurfacing and staff currently clean basins using a hose, which is labor intensive and time consuming.	Phase 3
WRP-21	Biogas Storage	New	Make improvements to gas storage.	Future regulations.	Phase 4
WRP-24	BNR Structural Retrofit and Nitrified Effluent Recycle	Repair/Replace/New	Repair cracks in BNR structure, replace BNR beads, construct Nitrified Effluent Recycle pipeline, and new BFE sump, pump, and water cannons.	There are minor cracks in structure and concrete is slowly degrading. Nitrified Effluent Recycle will mitigate the need to add new denitrification cells and could have added benefits in reducing methanol consumption. The BFE sump and water cannon improvements will provide for easier draining and cleaning of the BFE pond.	Phase 2
WRP-29	Disinfection Process Modernization	New/Demolish	Construct new UV facility or other disinfection alternative for plant effluent disinfection. Costs assume in-vessel UV system. Demolish existing chlorine gas infrastructure and provide small sodium hypochlorite for recycled water needs.	Chlorine gas is hazardous to transport and poses a potential danger to the public. Sodium hypochlorite does not appear to be an option due to the plant's stringent TDS limits.	Phase 5

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Tahoe-Truckee Sanitation Agency
Master Sewer Plan

VOLUME 3:
WATER RECLAMATION PLANT MASTER PLAN
CHAPTER 7:
CAPITAL IMPROVEMENT PLAN

FINAL | February 2022

Digitally signed by Richard Luis Gutierrez
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Date: 2022.02.08 13:47:48-08'00'

REGISTERED PROFESSIONAL ENGINEER
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Chapter 7

CAPITAL IMPROVEMENT PLAN

7.1 Introduction

This chapter presents the Tahoe-Truckee Sanitation Agency (T-TSA/Agency) Capital Improvement Plan (CIP) for the Water Reclamation Plant (WRP). This chapter includes a summary of the capital costs and a basic assessment of the possible financial impacts on T-TSA. This chapter is organized to assist the T-TSA in making financial decisions. The CIP is based on the WRP Recommendations as described in Volume 3, Chapter 6. It should be noted that although this CIP covers the entire 25-year planning period, it is highly recommended that the CIP be updated every 5 to 10 years to ensure that it remains current and relevant to the Agency.

7.2 Capital Improvement Projects

Facility rehabilitation, capacity upgrades and other system capital improvements set the foundation for T-TSA's WRP CIP. The cost estimates presented in this study are opinions developed from bid tabulations, cost curves, information obtained from previous studies, and Carollo Engineers, Inc. (Carollo) experience on other projects. The costs are based on current (November 2021) dollars (ENR value of 14,421) and do not include any escalation.

7.3 Cost Estimating Accuracy

The cost estimates presented in the CIP have been prepared for general master planning purposes and for guidance in project evaluation and implementation. All project costs shown in this CIP are in November 2021 dollars; future costs will need to be adjusted for inflation. Final costs of a project will depend on actual labor and materials costs, competitive market conditions, final project scope, implementation schedule, and other variable factors such as preliminary alignment generation, investigation of alternative routings, and detailed utility and topography surveys.

The Association for the Advancement of Cost Engineering (AACE) defines an Order of Magnitude Estimate, deemed appropriate for master plan studies as an approximate estimate made without detailed engineering data. It is normally expected that an estimate of this type would be accurate within plus 50 percent to minus 30 percent. This section presents the assumptions used in developing order of magnitude cost estimates for recommended facilities.

7.4 Project Costs and Contingencies

Project cost estimates are calculated based on elements such as the project location, size, length, and other factors. Allowances for project contingencies consistent with an Order of Magnitude estimate are also included in the project costs prepared as part of this study, as outlined in this section.

7.4.1 Total Direct Cost

The Total Direct Cost includes the cost of materials, labor, and equipment for a given element of work.

7.4.2 Baseline Construction Cost

The Baseline Construction Cost is the Total Direct Cost plus an estimating contingency that reflects the level of detail and development of the estimate. Contingency costs must be reviewed on a case-by-case basis because they can vary considerably with each project. Consequently, it is appropriate to allow for uncertainties associated with the preliminary layout of a project. Factors such as unexpected construction conditions, the need for unforeseen mechanical items, and variations in final quantities are a few of the items that can increase project costs, for which it is wise to make allowances in preliminary estimates. Since knowledge about site-specific conditions of each proposed project is limited at the master planning stage, a 30 percent contingency was applied to the Total Direct Cost to account for unknown site conditions such as unforeseen conditions, environmental mitigations, and other factors, which is typical for master planning projects.

7.4.3 Total Construction Cost

The Total Construction Cost consists of a sum of the Baseline Construction Cost and Indirect Costs. Indirect Costs include all costs that are not readily seen in the end product, but are costs included in the contractors' bids. Examples of indirect costs include overhead, profit, risk, taxes, and inflation.

For these planning level estimates, a 25 percent contingency was used to account for the general contractor's general conditions, overhead, and profit. In addition, the local 8.25 percent sales tax was applied to 50 percent of the Baseline Construction Costs to cover sales tax on materials and equipment.

7.4.4 Capital Improvement Cost

Other project construction contingency costs include costs associated with project engineering, construction phase professional services, and project administration. Engineering services associated with new facilities include preliminary investigation and reports, right-of-way (ROW) acquisition, foundation explorations, preparation of drawings and specifications during construction, surveying and staking, sampling and testing of materials, and start-up services. Construction phase professional services cover items such as construction management, engineering services during construction, materials testing, and inspection during construction. Finally, there are project administration costs, which cover items such as legal fees, environmental/California Environmental Quality Act (CEQA) compliance requirements, permitting compliance, financing expenses, administrative costs, and interest during construction. The cost of these items can vary, but for the purpose of this study, it is assumed that these costs will equal approximately 25 percent of the Total Construction Cost.

As shown in the following example calculation of the Capital Improvement Cost, the total cost of all project construction contingencies (construction, engineering services, construction management, and project administration) is 210 percent of the Total Direct Cost. Calculation of the 210 percent is the overall mark-up on the Total Direct Cost to arrive at the Capital Improvement Cost. It is not an additional contingency.

Example:

Total Direct Cost	**$1,000,000**
Construction Contingency (30%)	$300,000
Baseline Construction Cost	**$1,300,000**
Contractor Cost (25%)	$325,000
50% Sales Tax (8.25%)	$54,000
Total Construction Cost	**$1,679,000**
Engineering Cost (10%)	$168,000
Construction Management (5%)	$84,000
Legal & Permitting (10%)	$168,000
Capital Improvement Cost	**$2,099,000**

7.5 CIP

A summary of the capital project costs for the WRP are presented in Table 7.1. The table identifies the projects, capital improvement costs, and phasing, and organizes them by type of project (Rehabilitation and Replacement Improvements, Capacity Improvements, and Process Optimization Improvements). The columns used in this table refer to the following:

- *Project ID:* Assigned number that corresponds to the 25-Year WRP CIP table. This is an alphanumeric number that starts with WRP, CIP or CIPR and continues with a number. Projects with the CIP or CIPR designation were previously identified by T-TSA and included in prior CIPs. CIP projects are those previously included in the Upgrade, Rehabilitation, and Replacement Fund (Fund 06). CIPR projects are those previously included in the Wastewater Capital Reserve Fund (Fund 02). Projects with the WRP designation are plant projects that were identified as part of this master planning effort.
- *Project Name:* Provides a descriptive name for each project.
- *Type of Improvement:* This is an indication of the type of improvement and includes the categories of repair, replace (in kind), new, inspect, and demolish.
- *Total CIP Cost:* This is the estimated total project cost.
- *Phase:* This is the phase of the 25-year CIP in which the project is proposed to be implemented. Projects proposed to be implemented in Phase 1 (2022 to 2026) are shown in more detail, specifically showing the year in which implementation is proposed.

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Table 7.1 25-Year WRP CIP

Project ID	Project Name	Type of Improvement	Total CIP Cost	Phase 1					Phase 2	Phase 3	Phase 4	Phase 5
				2022/23	2023/24	2024/25	2025/26	2026/27	2027-31	2032-36	2037-41	2042-46
Rehabilitation & Replacement Improvements												
CIP-01	Plant Coating Improvements	Repair	$480,000	$480,000	$0	$0	$0	$0	$0	$0	$0	$0
CIP-02	Lab Equipment Replacements	Replace	$160,000	$80,000	$26,667	$53,333	$0	$0	$0	$0	$0	$0
CIP-03	Lime Systems Improvements	Repair/Replace	$200,000	$20,000	$180,000	$0	$0	$0	$0	$0	$0	$0
CIP-04	Chlorine Scrubber Improvements	Repair/Replace	$1,150,000	$1,150,000	$0	$0	$0	$0	$0	$0	$0	$0
CIP-06	Translucent Panel Rehabilitation	Repair	$60,000	$0	$0	$60,000	$0	$0	$0	$0	$0	$0
CIP-09	Centrifuge Rebuild	Repair	$50,000	$50,000	$0	$0	$0	$0	$0	$0	$0	$0
CIP-14	Communications Network Replacement	Replace	$210,000	$0	$210,000	$0	$0	$0	$0	$0	$0	$0
CIPR-04	Maintenance/E&I Shop Improvements	New	$790,000	$0	$0	$790,000	$0	$0	$0	$0	$0	$0
WRP-01	Primary and Secondary Treatment Repairs	Repair/Replace	$510,000	$0	$0	$51,000	$229,500	$229,500	$0	$0	$0	$0
WRP-02	Phosphorus Removal and Recarbonation Rehabilitation	Repair/Replace	$3,560,000	$0	$0	$356,000	$1,602,000	$1,602,000	$0	$0	$0	$0
WRP-03	Plant Wide Electrical Improvements (Phase 1)	Replace/New	$580,000	$0	$0	$290,000	$290,000	$0	$0	$0	$0	$0
WRP-07	Plant Wide Electrical Improvements (Phase 2)	Replace/New	$4,670,000	$0	$0	$0	$0	$0	$4,670,000	$0	$0	$0
WRP-09	Plant Wide Electrical Improvements (Phase 3)	Replace/New	$1,330,000	$0	$0	$0	$0	$0	$0	$1,330,000	$0	$0
WRP-12	Plant Wide Electrical Improvements (Phase 4)	Replace/New	$250,000	$0	$0	$0	$0	$0	$0	$0	$250,000	$0
WRP-13	Plant Wide Electrical Improvements (Phase 5)	Replace/New	$2,890,000	$0	$0	$0	$0	$0	$0	$0	$0	$2,890,000
WRP-05	Harmonic Filter Replacement for Area 71	Replace	$130,000	$130,000	$0	$0	$0	$0	$0	$0	$0	$0
WRP-08	Condition Assessment and Inspection	Inspect	$130,000	$130,000	$0	$0	$0	$0	$0	$0	$0	$0
WRP-10	Digestion Improvements	Replace/New	$7,740,000	$774,000	$3,483,000	$3,483,000	$0	$0	$0	$0	$0	$0
WRP-14	2-Water System Improvements	Replace	$320,000	$32,000	$144,000	$144,000	$0	$0	$0	$0	$0	$0
WRP-15	Grit System Improvements	Repair	$2,160,000	$0	$0	$0	$0	$0	$2,160,000	$0	$0	$0
WRP-16	LEL Equipment Replacement	Replace	$320,000	$320,000	$0	$0	$0	$0	$0	$0	$0	$0
WRP-17	Primary & Secondary Treatment Rehabilitation	Repair/Replace	$10,150,000	$0	$0	$1,015,000	$4,567,500	$4,567,500	$0	$0	$0	$0
WRP-19	Recarbonation Improvements	Repair	$540,000	$0	$0	$0	$0	$0	$540,000	$0	$0	$0

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Project ID	Project Name	Type of Improvement	Total CIP Cost	Phase 1					Phase 2	Phase 3	Phase 4	Phase 5
				2022/23	2023/24	2024/25	2025/26	2026/27	2027-31	2032-36	2037-41	2042-46
Rehabilitation & Replacement Improvements												
WRP-22	TWAS Pump Replacement	Replace	$140,000	$0	$0	$0	$0	$140,000	$0	$0	$0	$0
WRP-23	Solids Dewatering Improvements	Repair/Replace	$510,000	$0	$0	$0	$0	$0	$510,000	$0	$0	$0
WRP-25	Filtration Rehabilitation	Repair	$1,230,000	$0	$0	$0	$0	$0	$1,230,000	$0	$0	$0
WRP-26	AWT Improvements	Repair/Demolish	$1,670,000	$0	$0	$0	$0	$0	$1,670,000	$0	$0	$0
WRP-27	Building Roof Replacements	Replace	$12,570,000	$0	$0	$0	$0	$2,514,000	$2,514,000	$2,514,000	$2,514,000	$2,514,000
WRP-28	Odorous Air Treatment Improvements	Repair/Replace	$390,000	$0	$0	$0	$0	$0	$0	$0	$0	$390,000
WRP-30	Asphalt Sealing and Replacement	Repair	$1,700,000	$170,000	$0	$0	$170,000	$0	$340,000	$340,000	$340,000	$340,000
WRP-32	MPPS Improvements	Repair/Replace	$2,560,000	$0	$0	$0	$0	$0	$0	$2,560,000	$0	$0
WRP-33	Miscellaneous Plant Rehabilitation	Replace	$4,090,000	$0	$0	$0	$0	$0	$0	$4,090,000	$0	$0
WRP-34	Plant Air System Upgrades	Repair/Replace	$1,710,000	$0	$1,710,000	$0	$0	$0	$0	$0	$0	$0
WRP-35	Plant-wide NFPA 820 Compliance Evaluation	Repair	$110,000	$110,000	$0	$0	$0	$0	$0	$0	$0	$0
WRP-36	Chemical Storage and Feed System Improvements	Repair/Replace	$350,000	$0	$0	$0	$0	$0	$350,000	$0	$0	$0
Subtotal Rehab & Replacement Improvements Costs			$65,410,000	$3,446,000	$5,753,667	$6,242,333	$6,859,000	$9,053,000	$13,984,000	$10,834,000	$3,104,000	$6,134,000
Capacity Improvements												
CIP-26	Odorous Air Expansion	New	$50,000	$0	$0	$0	$50,000	$0	$0	$0	$0	$0
CIP-31	Control Room Upgrades for Facilities #02 and #13, Remodel and Updates to Control Rooms	Replace	$600,000	$90,000	$510,000	$0	$0	$0	$0	$0	$0	$0
CIPR-01	Headworks Project	New	$2,510,000	$2,510,000	$0	$0	$0	$0	$0	$0	$0	$0
CIPR-03	Equipment/Vehicle Warehouse	New	$2,100,000	$2,100,000	$0	$0	$0	$0	$0	$0	$0	$0
CIPR-13	Control Room Upgrades, HVAC systems for Facilities #02 & #13	Replace	$50,000	$0	$50,000	$0	$0	$0	$0	$0	$0	$0
WRP-11	Effluent Disposal Field Expansion	New	$6,300,000	$0	$0	$0	$0	$0	$0	$6,300,000	$0	$0
WRP-18	WAS Thickening Improvements	Repair/Replace	$1,710,000	$0	$0	$0	$0	$0	$0	$1,710,000	$0	$0
WRP-31	Offsite Flow Equalization Improvements	New	$10,490,000	$0	$0	$0	$0	$0	$0	$0	$10,490,000	$0
Subtotal Capacity Improvements Costs			$23,810,000	$4,700,000	$560,000	$0	$50,000	$0	$0	$8,010,000	$10,490,000	$0

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Project ID	Project Name	Type of Improvement	Total CIP Cost	Phase 1					Phase 2	Phase 3	Phase 4	Phase 5
				2022/23	2023/24	2024/25	2025/26	2026/27	2027-31	2032-36	2037-41	2042-46
Process Optimization Improvements												
WRP-04	WASSTRIP Implementation	New	$3,950,000	$0	$0	$0	$0	$0	$3,950,000	$0	$0	$0
WRP-06	Nitrified Effluent Recycle	New	$420,000	$0	$0	$42,000	$378,000	$0	$0	$0	$0	$0
WRP-20	Flow Equalization Improvements	New	$1,590,000	$0	$0	$0	$0	$0	$0	$1,590,000	$0	$0
WRP-21	Biogas Storage	New	$2,770,000	$0	$0	$0	$0	$0	$0	$0	$2,770,000	$0
WRP-24	BNR Structural Retrofit and Nitrified Effluent Recycle	Repair/Replace/ New	$1,150,000	$0	$0	$0	$0	$0	$1,150,000	$0	$0	$0
WRP-29	Disinfection Process Modernization	New/Demolish	$16,630,000	$0	$0	$0	$0	$0	$0	$0	$0	$16,630,000
Subtotal Process Optimization Improvements Costs			$26,510,000	$0	$0	$42,000	$378,000	$0	$5,100,000	$1,590,000	$2,770,000	$16,630,000
Total CIP Cost			**$115,730,000**	**$8,146,000**	**$6,313,667**	**$6,284,333**	**$7,287,000**	**$9,053,000**	**$19,084,000**	**$20,434,000**	**$16,364,000**	**$22,764,000**

Notes:
(1) IT = information technology.
(2) P = phosphorus.
(3) AWT = advanced waste treatment.
(4) MPPS = multipurpose pump station.
(5) TWAS = thickened waste activated sludge.
(6) WAS = waste activate sludge.
(7) WASSTRIP = Waste Activated Sludge Stripping to Remove Internal Phosphorus.
(8) BNR = biological nitrogen removal.
(9) UV = ultraviolet.

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7.5.1 25-Year CIP Phasing

The proposed capital improvements are prioritized based on their urgency to mitigate existing deficiencies and other factors. The capital improvements were phased into one of the following phases:

- Phase 1: Years 2022 through 2026. This phase includes projects that are targeted as the highest priority improvements.
- Phase 2: Years 2027 through 2031. This phase generally includes medium high priority improvements.
- Phase 3: Years 2032 through 2036. This phase generally includes medium priority improvements.
- Phase 4: Years 2037 through 2041. This phase generally includes medium low priority improvements.
- Phase 5: Years 2042 through 2046. This phase includes lower priority improvements that are based on industry anticipated life assumptions for equipment and infrastructure.

Each project is itemized by phase in Table 7.1. It should be noted that the CIP phasing included in the 25-year CIP and summarized in Table 7.1 is based on the project prioritization factors described in Volume 3, Chapter 6 - WRP Recommendations, and represents the preferred implementation schedule for the proposed improvements. Funding availability may limit the T-TSA's ability to implement the proposed projects according to the implementation schedule included in Table 7.1.

The 25-year WRP CIP is summarized by phase and project type in Table 7.2. As shown in Table 7.2 and graphically in Figure 7.2, out of the total $115.7 million in capital projects, $37.1 million is targeted for implementation in Phase 1, and an additional $19.1 million is targeted for Phase 2. The remaining $59.6 million of capital improvements has been identified for Phases 3 through 5. The primary reason for the higher number of projects in Phase 1 is due to the age of most of the facility approaching 50 years, resulting in the need to replace a substantial amount of mechanical equipment as well as significant structural repairs throughout the plant.

Table 7.2 and Figure 7.1 show the distribution of capital costs by project type. As shown in Figure 7.1, rehabilitation and replacement projects account for the largest portion of the capital improvement project costs at 56.5 percent, and process optimization and capacity improvement projects account for 22.9 percent and 20.6 percent of the total WRP CIP cost, respectively.

Table 7.2 25-Year WRP CIP Summary

Improvement Type	Total CIP Cost	Phase 1 (2022-2026)	Phase 2 (2027-2031)	Phase 3 (2032-2036)	Phase 4 (2037-2041)	Phase 5 (2042-2046)
Rehab and Replacement	$65.41	$31.24	$13.63	$10.83	$3.10	$6.13
Process Optimization	$26.51	$0.42	$5.10	$1.59	$2.77	$16.63
Capacity	$23.81	$5.31	$0	$8.01	$10.49	$0
Total CIP	**$115.73**	**$36.97**	**$18.73**	**$20.43**	**$16.36**	**$22.76**

Notes:
(1) Costs shown are in millions of dollars.

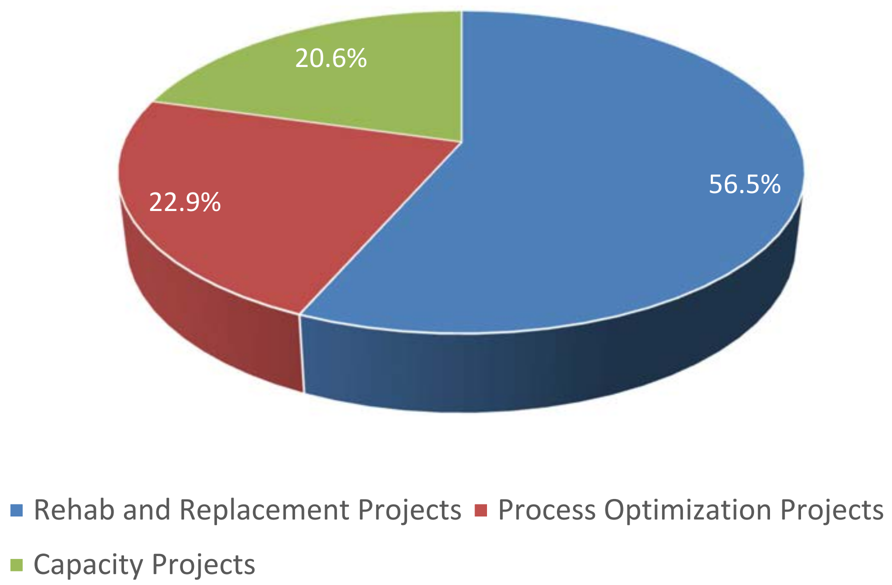

Figure 7.1 25-Year WRP CIP by Project Type

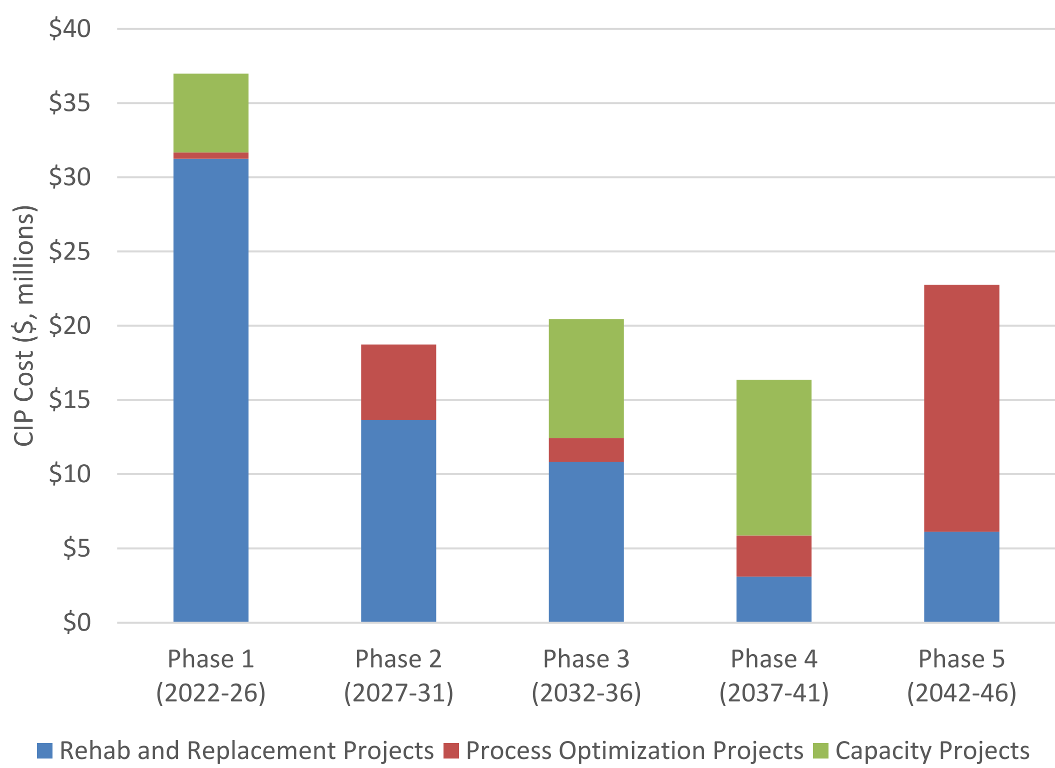

Figure 7.2 25-Year WRP CIP by Project Phase

Appendix 7A

DETAILED WATER RECLAMATION PLANT CAPITAL IMPROVEMENT PLAN AND COST ESTIMATES

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TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements

ESTIMATE PREPARATION DATE : 12/16/2021

JOB # : 11384A.00

PREPARED BY : RLG

LOCATION : T-TSA WRP

REVIEWED BY : AG

LEGEND

CIP_##	Projects already defined within the Upgrade, Rehabilitation and Replacement Fund (Fund 06) not incorporated elsewhere
CIPR_##	Projects already defined within the Wastewater Capital Reserve Fund (Fund 02) not incorporated elsewhere
WRP_##	New project identified and as part of this Master Sewer Plan

WRP CIP Summary Table

Project ID	Project	Type	Total	2022/23	2023/24	2024/25	2025/26	2026/27	2027-31	2032-36	2037-41	2042-46
			$ 115,270,000	**$ 8,036,000**	**$ 6,313,667**	**$ 6,284,333**	**$ 7,287,000**	**$ 9,053,000**	**$ 19,084,000**	**$ 20,434,000**	**$ 16,364,000**	**$ 22,764,000**
				Fiscal Year								
CIP_01	Plant Coating Improvements	RR	**$ 480,000**	$ 480,000								
CIP_02	Lab Equipment Replacements	RR	**$ 160,000**	$ 80,000	$ 26,666.67	$ 53,333.33						
CIP_03	Lime Systems Improvements	RR	**$ 200,000**	$ 20,000	$ 180,000							
CIP_04	Chlorine Scrubber Improvements	RR	**$ 1,150,000**	$ 1,150,000								
CIP_06	Translucent Panel Rehab	RR	**$ 60,000**			$ 60,000						
CIP_09	Centrifuge Rebuild	RR	**$ 50,000**	$ 50,000								
CIP_14	Communications Network Replacement	RR	**$ 210,000**		$ 210,000							
CIP_26	Odorous Air Biofilter Media Replacement	C	**$ 50,000**				$ 50,000					
CIP_31	Control Room Upgrades #02 and #13 - Remodel and Updates	C	**$ 600,000**	$ 90,000	$ 510,000							
CIPR_01	Headworks Project (Barscreens, Washer Compactors)	C	**$ 2,510,000**	$ 2,510,000								
CIPR_03	Equipment/Vehicle Warehouse	C	**$ 2,100,000**	$ 2,100,000								
CIPR_04	Maintenance/E&I Shop Improvements	RR	**$ 790,000**			$ 790,000						
CIPR_13	Control Room Upgrades #02 & #13 - HVAC	C	**$ 50,000**		$ 50,000							
WRP_01	Primary and Secondary Treatment Repairs	RR	**$ 510,000**			$ 51,000	$ 229,500	$ 229,500				
WRP_02	Phosphorus Removal and Recarb Rehabilitation	RR	**$ 3,560,000**			$ 356,000	$ 1,602,000	$ 1,602,000				
WRP_03	Plant Wide Electrical Improvements (Phase 1)	RR	**$ 580,000**			$ 290,000	$ 290,000					
WRP_04	WASSTRIP Implementation	OP	**$ 3,950,000**						$ 3,950,000			
WRP_05	Harmonic Filter Replacement For Area 71	RR	**$ 130,000**	$ 130,000								
WRP_06	Nitrified Effluent Recycle Pilot	OP	**$ 420,000**			$ 42,000	$ 378,000					
WRP_07	Plant Wide Electrical Improvements (Phase 2)	RR	**$ 4,670,000**						$ 4,670,000			
WRP_08	Condition Assessment and Inspection	RR	**$ 130,000**	$ 130,000								
WRP_09	Plant Wide Electrical Improvements Project (Phase 3)	RR	**$ 1,330,000**							$ 1,330,000		
WRP_10	Digestion Improvements Project	RR	**$ 7,740,000**	$ 774,000	$ 3,483,000	$ 3,483,000						
WRP_11	Effluent Disposal Field Expansion Project	C	**$ 6,300,000**							$ 6,300,000		
WRP_12	Plant Wide Electrical Improvements (Phase 4)	RR	**$ 250,000**								$ 250,000	
WRP_13	Plant Wide Electrical Improvements (Phase 5)	RR	**$ 2,890,000**									$ 2,890,000
WRP_14	2-Water System Improvements	RR	**$ 320,000**	$ 32,000	$ 144,000	$ 144,000						
WRP_15	Grit System Improvements	RR	**$ 2,160,000**						$ 2,160,000			
WRP_16	LEL Equipment Replacement	RR	**$ 320,000**	$ 320,000								
WRP_17	Primary & Secondary Treatment Rehabilitation Project	RR	**$ 10,150,000**			$ 1,015,000	$ 4,567,500	$ 4,567,500				
WRP_18	WAS Thickening Improvements Project	C	**$ 1,710,000**							$ 1,710,000		
WRP_19	Recarbonation Improvements	RR	**$ 540,000**						$ 540,000			
WRP_20	Flow Equalization Improvements Project	OP	**$ 1,590,000**							$ 1,590,000		
WRP_21	Biogas Storage Project	OP	**$ 2,770,000**								$ 2,770,000	
WRP_22	TWAS Pump Replacement Project	RR	**$ 140,000**					$ 140,000				
WRP_23	Solids Dewatering Improvements	RR	**$ 510,000**						$ 510,000			
WRP_24	BNR Structural Retrofit and Nitrified Effluent Recycle Project	OP	**$ 1,150,000**						$ 1,150,000			
WRP_25	Filtration Rehabilitation Project	RR	**$ 1,230,000**						$ 1,230,000			
WRP_26	AWT Improvements	RR	**$ 1,670,000**						$ 1,670,000			
WRP_27	Building Roof Replacements	RR	**$ 12,570,000**					$ 2,514,000	$ 2,514,000	$ 2,514,000	$ 2,514,000	$ 2,514,000
WRP_28	Odorous Air Treatment Improvements Project	RR	**$ 390,000**									$ 390,000
WRP_29	Disinfection Process Modernization	OP	**$ 16,630,000**									$ 16,630,000
WRP_30	Asphalt Sealing and Replacement Project	RR	**$ 1,700,000**	$ 170,000			$ 170,000		$ 340,000	$ 340,000	$ 340,000	$ 340,000
WRP_31	Offsite Flow Equalization Improvements Project	C	**$ 10,490,000**								$ 10,490,000	
WRP_32	MPPS Improvements Project	RR	**$ 2,560,000**							$ 2,560,000		
WRP_33	Misc Plant Rehab Project	RR	**$ 4,090,000**							$ 4,090,000		
WRP_34	Plant Air System Upgrades	RR	**$ 1,710,000**		$ 1,710,000							
WRP_35	Plant-wide NFPA 820 Compliance Evaluation	RR	**$ 110,000**	$ 110,000								
WRP_36	Chemical Storage and Feed System Improvements	RR	**$ 350,000**						$ 350,000			
	Total WRP Projects		**$ 115,730,000**	**$ 8,146,000**	**$ 6,313,667**	**$ 6,284,333**	**$ 7,287,000**	**$ 9,053,000**	**$ 19,084,000**	**$ 20,434,000**	**$ 16,364,000**	**$ 22,764,000**
	WRP Projects Cost/yr		$ 4,629,200	$ 8,146,000	$ 6,313,667	$ 6,284,333	$ 7,287,000	$ 9,053,000	$ 3,816,800	$ 4,086,800	$ 3,272,800	$ 4,552,800
	Subtotal Rehab & Replacement Improvements Costs		$ 65,410,000	$ 3,446,000	$ 5,753,667	$ 6,242,333	$ 6,859,000	$ 9,053,000	$ 13,984,000	$ 10,834,000	$ 3,104,000	$ 6,134,000
	Subtotal Capacity Improvements Costs		$ 23,810,000	$ 4,700,000	$ 560,000	$ -	$ 50,000	$ -	$ -	$ 8,010,000	$ 10,490,000	$ -
	Subtotal Process Optimization Improvements Project Costs		$ 26,510,000	$ -	$ -	$ 42,000	$ 378,000	$ -	$ 5,100,000	$ 1,590,000	$ 2,770,000	$ 16,630,000
	Total TRI Projects (see separate CIP Summary Table for Projects)		**$ 1,103,000**	$ 357,000	$ 454,000	$ 1,814,000	$ 100,000	$ 180,000	$ 785,000	$ 1,021,875	$ 1,021,875	$ 1,021,875
	TRI Projects Cost/yr		$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -	$ -
	Total CIP Cost/yr		$ 4,629,200	**$ 8,146,000**	**$ 6,313,667**	**$ 6,284,333**	**$ 7,287,000**	**$ 9,053,000**	**$ 3,816,800**	**$ 4,086,800**	**$ 3,272,800**	**$ 4,552,800**

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: CIP_03
TITLE : Lime Systems Improvements

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Improvements**					
	Replace Hydrated Lime Conveyance System	1	LS	$82,000	$82,000	
	Total					**$82,000**
	ITEMIZED SUBTOTAL					**$82,000**
	Allowances					
	Electrical and Instrumentation Allowance	10	%		$8,000	
						$8,000
	TOTAL DIRECT COST					**$90,000**
	Contingency	30	%			$27,000
	SUBTOTAL					**$117,000**
	Contractor General Conditions, Overhead, and Profit	25	%			$29,250
	SUBTOTAL					**$146,250**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$6,033
	CONSTRUCTION COST SUBTOTAL					**$152,283**
	Engineering, Management, and Legal	25	%			$38,070.70
	SUBTOTAL					**$190,354**
	Escalation to November 2021 Dollars	4.79	%			**$9,118**
	PROJECT COST (Nov 2021 Dollars)					**$200,000**

Notes:

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MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: CIP_04
TITLE : Chlorine Scrubber Improvements

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1						
	Replace Chlorine Scrubber	1	LS	$515,000	$515,000	
	Total					**$515,000**
	ITEMIZED SUBTOTAL					**$515,000**
	TOTAL DIRECT COST					**$515,000**
	Contingency	30	%			$154,500
	SUBTOTAL					**$669,500**
	Contractor General Conditions, Overhead, and Profit	25	%			$167,375
	SUBTOTAL					**$836,875**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$34,521
	CONSTRUCTION COST SUBTOTAL					**$871,396**
	Engineering, Management, and Legal	25	%			$217,849.02
	SUBTOTAL					**$1,089,245**
	Escalation to November 2021 Dollars	4.79	%			**$52,175**
	PROJECT COST (Nov 2021 Dollars)					**$1,150,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_01
TITLE : Primary and Secondary Treatment Repairs

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Primary Clarifier Dome Ventilation and Concrete Repairs**					
	Dome Ventilation Improvements	4	EA	$10,000	$40,000	
	Repair Dome Water Intrusion	4	EA	$10,000	$40,000	
	Repair PC Cover Walls	400	SF	$65	$26,000	
	Replace lighting and conduit for PCs	4	EA	$10,000	$40,000	
	Total					**$146,000**
2	**Oxygenation Basin Repairs**					
	Repair Freeze/Thaw Concrete Spalling on Oxygenation Basins	200	SF	$65	$13,000	
	Total					**$13,000**
3	**Primary Sludge PS Water Damage Repair**					
	Repair CMU walls	1000	SF	$25	$25,000	
	Install gutters	1	LS	$10,000	$10,000	
	Total					**$35,000**
4	**C&CT Building Water Damage Repair**					
	Repair CMU walls	1000	SF	$25	$25,000	
	Install gutters	1	LS	$10,000	$10,000	
	Total					**$35,000**
	ITEMIZED SUBTOTAL					**$229,000**
	TOTAL DIRECT COST					**$229,000**
	Contingency	30	%			$68,700
	SUBTOTAL					**$297,700**
	Contractor General Conditions, Overhead, and Profit	25	%			$74,425
	SUBTOTAL					**$372,125**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$15,350
	CONSTRUCTION COST SUBTOTAL					**$387,475**
	Engineering, Management, and Legal	25	%			$96,868.79
	SUBTOTAL					**$484,344**
	Escalation to November 2021 Dollars	4.79	%			**$23,200**
	PROJECT COST (Nov 2021 Dollars)					**$510,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK :	WRP CIP Improvements	**ESTIMATE PREPARATION DATE :**	12/23/2021
JOB # :	11384A.00	**PREPARED BY :**	RLG
LOCATION :	T-TSA WRP	**REVIEWED BY :**	AG
PROJECT ID:	WRP_02		
TITLE :	Phosphorus Removal and Recarb Rehabilitation		

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Rapid Mix and Flocculation Basin**					
	Replace Slide Gates 30" Diameter	5	EA	$40,000	$200,000	
	Repair and Resurface Concrete	5088	SF	$65	$330,720	
	Concrete Crack Repair Epoxy Injection	100	LF	$50	$5,000	
	Replace Rapid Mixers	2	EA	$15,000	$30,000	
	Total					**$565,720**
2	**Chemical Clarifiers**					
	Repair concrete at Clarifier No.1 stairs	50	SF	$65	$3,250	
	Chemical Sludge PS CMU Wall Repair	200	SF	$25	$5,000	
	Total					**$8,250**
3	**Recarbonation Clarifiers**					
	Remove and Replace Clarifier Bottom Grout for both Clarifiers	41	CY	$700	$28,677	
	Repair and Resurface Concrete Walls	4084	SF	$65	$265,465	
	Concrete Crack Repair Epoxy Injection	100	LF	$50	$5,000	
	Total					**$299,141**
4	**Recarbonation Basins**					
	Replace handrail and second stage Recarb Basin	180	LF	$120	$21,600	
	Repair and Resurface Concrete at First Stage Basin	4428	SF	$65	$287,820	
	Replace Gates at First Stage Basin 30"	2	EA	$40,000	$80,000	
	Total					**$389,420**
4	**Phosphorus Stripping Basins**					
	Repair and Resurface Concrete	5088	SF	$65	$330,720	
	Concrete Crack Repair Epoxy Injection	100	LF	$50	$5,000	
	Total					**$335,720**
	ITEMIZED SUBTOTAL					**$1,598,000**
	Allowances					
	Pipe Supports Allowance	1	LS		$2,000	
	EI&C Allowance	1	LS		$5,000	
						$7,000
	TOTAL DIRECT COST					**$1,605,000**
	Contingency	30	%			$481,500
	SUBTOTAL					**$2,086,500**
	Contractor General Conditions, Overhead, and Profit	25	%			$521,625
	SUBTOTAL					**$2,608,125**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$107,585
	CONSTRUCTION COST SUBTOTAL					**$2,715,710**
	Engineering, Management, and Legal	25	%			$678,927.54
	SUBTOTAL					**$3,394,638**
	Escalation to November 2021 Dollars	4.79	%			**$162,603**
	PROJECT COST (Nov 2021 Dollars)					**$3,560,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_03
TITLE : Plant Wide Electrical Improvements (Phase 1)

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Misc Electrical Improvements**					
	Replace and relocate SWBD/Panel/Transformer 1A.	1	LS	$260,000	$260,000	
	Total					**$260,000**
	ITEMIZED SUBTOTAL					**$260,000**
	TOTAL DIRECT COST					**$260,000**
	Contingency	30	%			$78,000
	SUBTOTAL					**$338,000**
	Contractor General Conditions, Overhead, and Profit	25	%			$84,500
	SUBTOTAL					**$422,500**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$17,428
	CONSTRUCTION COST SUBTOTAL					**$439,928**
	Engineering, Management, and Legal	25	%			$109,982.03
	SUBTOTAL					**$549,910**
	Escalation to November 2021 Dollars	4.79	%			**$26,341**
	PROJECT COST (Nov 2021 Dollars)					**$580,000**

Notes:

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MASTER SEWER PLAN

TASK :	WRP CIP Improvements	**ESTIMATE PREPARATION DATE :**	12/23/2021
JOB # :	11384A.00	**PREPARED BY :**	RLG
LOCATION :	T-TSA WRP	**REVIEWED BY :**	AG
PROJECT ID:	WRP_04		
TITLE :	WASSTRIP Implementation		

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**WAS Strip Pilot Project**					
	WASSTRIP study, incl business case eval (look at post-struvite options - adding lime, FeCl3), lime addtion, sludge removal, etc	1	LS	$156,000	$156,000	
	WASSTRIP pilot system	1	LS	$78,000	$78,000	
	Total					**$234,000**
2	**WAS Strip Implementation**					
	Waste Activated Sludge Stripping to Remove Internal Phosphorus (WASSTRIP)/struvite precipitation - route centrate to Ostara reactor, supl mgOH stripping system, effluent through chem precip, polish remain P (lower lime dose) - will affect chem solids (minimize) - reduce lime, create marketable P product	1	LS	$1,248,000	$1,248,000	
	Total					**$1,248,000**
	ITEMIZED SUBTOTAL					**$1,482,000**
	Allowances					
	Site Civil & Piping Allowance	10	%		$148,000	
	Electrical and Instrumentation Allowance	10	%		$148,000	
						$296,000
	TOTAL DIRECT COST					**$1,778,000**
	Contingency	30	%			$533,400
	SUBTOTAL					**$2,311,400**
	Contractor General Conditions, Overhead, and Profit	25	%			$577,850
	SUBTOTAL					**$2,889,250**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$119,182
	CONSTRUCTION COST SUBTOTAL					**$3,008,432**
	Engineering, Management, and Legal	25	%			$752,107.89
	SUBTOTAL					**$3,760,539**
	Escalation to November 2021 Dollars	4.79	%			**$180,130**
	PROJECT COST (Nov 2021 Dollars)					**$3,950,000**

Notes:

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MASTER SEWER PLAN

TASK :	WRP CIP Improvements	**ESTIMATE PREPARATION DATE :**	12/23/2021
JOB # :	11384A.00	**PREPARED BY :**	RLG
LOCATION :	T-TSA WRP	**REVIEWED BY :**	AG
PROJECT ID:	WRP_05		
TITLE :	Harmonic Filter Replacement For Area 71		

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Improvements**					
	Replace harmonic filters (AHF71-1/2)	2	EA	$26,000	$52,000	
	Total					**$52,000**
	ITEMIZED SUBTOTAL					**$52,000**
	Allowances					
	Electrical and Instrumentation Allowance	10	%		$5,000	
						$5,000
	TOTAL DIRECT COST					**$57,000**
	Contingency	30	%			$17,100
	SUBTOTAL					**$74,100**
	Contractor General Conditions, Overhead, and Profit	25	%			$18,525
	SUBTOTAL					**$92,625**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$3,821
	CONSTRUCTION COST SUBTOTAL					**$96,446**
	Engineering, Management, and Legal	25	%			$24,111.45
	SUBTOTAL					**$120,557**
	Escalation to November 2021 Dollars	4.79	%			**$5,775**
	PROJECT COST (Nov 2021 Dollars)					**$130,000**

Notes:

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TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_06
TITLE : Nitrified Effluent Recycle Pilot

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Nitrified Effluent Recycle**					
	Nitrified effluent recycle study, business case eval	1	LS	$52,000	$52,000	
	Nitrified effluent recycle demonstration (use mostly unused bypass pipeline to ERBs)	1	LS	$104,000	$104,000	
	Total					**$156,000**
	ITEMIZED SUBTOTAL					**$156,000**
	Allowances					
	Piping Allowance	10	%		$16,000	
	Electrical and Instrumentation Allowance	10	%		$16,000	
						$32,000
	TOTAL DIRECT COST					**$188,000**
	Contingency	30	%			$56,400
	SUBTOTAL					**$244,400**
	Contractor General Conditions, Overhead, and Profit	25	%			$61,100
	SUBTOTAL					**$305,500**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$12,602
	CONSTRUCTION COST SUBTOTAL					**$318,102**
	Engineering, Management, and Legal	25	%			$79,525.47
	SUBTOTAL					**$397,627**
	Escalation to November 2021 Dollars	4.79	%			**$19,046**
	PROJECT COST (Nov 2021 Dollars)					**$420,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

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TASK :	WRP CIP Improvements	**ESTIMATE PREPARATION DATE :**	12/23/2021
JOB # :	11384A.00	**PREPARED BY :**	RLG
LOCATION :	T-TSA WRP	**REVIEWED BY :**	AG
PROJECT ID:	WRP_07		
TITLE :	Plant Wide Electrical Improvements (Phase 2)		

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Electrical Improvements**					
	Replace MCC 24-1 and MCC 24-2	2	EA	$100,000	$200,000	
	Replace MCC 2-1 and MCC 2-2	2	EA	$100,000	$200,000	
	Replace MCCs 4, 4-1, and 4-2	3	EA	$100,000	$300,000	
	Replace MCCs 13-1, 13-2, 53-1, 53-2	4	EA	$100,000	$400,000	
	Install secondary power feed to MPPS.	1	LS	$100,000	$100,000	
	Replace MPPS electrical cabinet and control panel.	1	LS	$75,000	$75,000	
	Replace Generator 1 and generator control panel CP-27E.	1	LS	$550,000	$550,000	
	Install seamless power transfer for Generator 3.	1	LS	$30,000	$30,000	
	Replace Transformer in Bldg 28	1	EA	$50,000	$50,000	
	Replace Switchgear in Bldg 27	1	EA	$200,000	$200,000	
	Total					**$2,105,000**
	ITEMIZED SUBTOTAL					**$2,105,000**
	TOTAL DIRECT COST					**$2,105,000**
	Contingency	30	%			$631,500
	SUBTOTAL					**$2,736,500**
	Contractor General Conditions, Overhead, and Profit	25	%			$684,125
	SUBTOTAL					**$3,420,625**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$141,101
	CONSTRUCTION COST SUBTOTAL					**$3,561,726**
	Engineering, Management, and Legal	25	%			$890,431.45
	SUBTOTAL					**$4,452,157**
	Escalation to November 2021 Dollars	4.79	%			**$213,258**
	PROJECT COST (Nov 2021 Dollars)					**$4,670,000**

Notes:

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TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_08
TITLE : Condition Assessment and Inspection

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Condition Assessments**					
	Inspect interior of filter tanks.	1	LS	$10,000	$10,000	
	Inspect condition of pipeline interior from MPPS to filters.	1	LS	$6,000	$6,000	
	Inspect the condition of the MPPS wet well.	1	LS	$6,000	$6,000	
	Inspect chlorine effluent pipeline.	1	LS	$6,000	$6,000	
	Inspect filtrate clarifier (centrate equalization) tank and stripper tower feed tank .	1	LS	$10,000	$10,000	
	Inspect LOX tank and carbon dioxide storage tank interior condition for corrosion and recoat if necessary.	1	LS	$10,000	$10,000	
	Site pump station inspections. Inspect site pump station wet wells.	1	LS	$10,000	$10,000	
	Total					**$58,000**
	ITEMIZED SUBTOTAL					**$58,000**
	TOTAL DIRECT COST					**$58,000**
	Contingency	30	%			$17,400
	SUBTOTAL					**$75,400**
	Contractor General Conditions, Overhead, and Profit	25	%			$18,850
	SUBTOTAL					**$94,250**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$3,888
	CONSTRUCTION COST SUBTOTAL					**$98,138**
	Engineering, Management, and Legal	25	%			$24,534.45
	SUBTOTAL					**$122,672**
	Escalation to November 2021 Dollars	4.79	%			**$5,876**
	PROJECT COST (Nov 2021 Dollars)					**$130,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_09
TITLE : Plant Wide Electrical Improvements Project (Phase 3)

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Electrical Improvements**					
	Replace MCC 75.	1	EA	$100,000	$100,000	
	Replace MCCs 71-1, -2, and -3.	3	EA	$100,000	$300,000	
	Replace MCC-3 and 3A.	2	EA	$100,000	$200,000	
	Total					**$600,000**
	ITEMIZED SUBTOTAL					**$600,000**
	TOTAL DIRECT COST					**$600,000**
	Contingency	30	%			$180,000
	SUBTOTAL					**$780,000**
	Contractor General Conditions, Overhead, and Profit	25	%			$195,000
	SUBTOTAL					**$975,000**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$40,219
	CONSTRUCTION COST SUBTOTAL					**$1,015,219**
	Engineering, Management, and Legal	25	%			$253,804.69
	SUBTOTAL					**$1,269,023**
	Escalation to November 2021 Dollars	4.79	%			**$60,786**
	PROJECT COST (Nov 2021 Dollars)					**$1,330,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_10
TITLE : Digestion Improvements Project

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Digester Heating Improvements**					
	Replace Boilers	3	EA	$312,000	$936,000	
	Replace Heat Exchangers	2	EA	$41,600	$83,200	
	Replace HW circulation System and recirc pumps	1	LS	$104,000	$104,000	
	Replace Waste Gas Flare	1	LS	$31,200	$31,200	
	New Electrical/Controls Building to relocate electrical gear outside of Boiler Room	1	LS	$1,560,000	$1,560,000	
	Replace Digester 32 PLCs (CP-32A-01, CP-32C)	2	EA	$10,400	$20,800	
	Replace steam lines in utility tunnel to prevent further corrosion of other piping and appurtenances.	1	LS	$41,600	$41,600	
	Upgrade digester gas treatment system.	1	LS	$78,000	$78,000	
	Total					**$2,854,800**
2	**Other Improvments**					
	Install permanent flow meter on chlorine contact pipeline.	1	EA	$52,000	$52,000	
	Total					**$52,000**
	ITEMIZED SUBTOTAL					**$2,906,800**
	Allowances					
	Site Civil & Piping Allowance	10	%		$291,000	
	Electrical and Instrumentation Allowance	10	%		$291,000	
						$582,000
	TOTAL DIRECT COST					**$3,488,800**
	Contingency	30	%			$1,046,640
	SUBTOTAL					**$4,535,440**
	Contractor General Conditions, Overhead, and Profit	25	%			$1,133,860
	SUBTOTAL					**$5,669,300**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$233,859
	CONSTRUCTION COST SUBTOTAL					**$5,903,159**
	Engineering, Management, and Legal	25	%			$1,475,789.66
	SUBTOTAL					**$7,378,948**
	Escalation to November 2021 Dollars	4.79	%			**$353,452**
	PROJECT COST (Nov 2021 Dollars)					**$7,740,000**

Notes:

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MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_11
TITLE : Effluent Disposal Field Expansion Project

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Disposal Field**					
	4" Perforated PVC Pipe	31,200	LF	$ 16.00	$499,200	
	Trench excavation	12,600	CY	$ 8.00	$100,800	
	Spoils Offhaul	12,600	CY	$ 11.00	$138,600	
	Drain Rock Backfill	12,600	CY	$ 61.00	$768,600	
	Clearing and Grubbing	720,000	SF	$ 0.11	$79,200	
	Meter Vaults	8	EA	$ 25,500	$204,000	
	Cleanouts, all inclusive wye, riser, and cover	450	EA	$ 1,000	$450,000	
	12" PVC header Piping	1,200	LF	$26	$31,200	
	Total					**$2,271,600**
	ITEMIZED SUBTOTAL					**$2,271,600**
	Allowances					
	Piping Fittings Allowance	10	%		$227,000	
	Electrical and Instrumentation Allowance	15	%		$341,000	
						$568,000
	TOTAL DIRECT COST					**$2,839,600**
	Contingency	30	%			$851,880
	SUBTOTAL					**$3,691,480**
	Contractor General Conditions, Overhead, and Profit	25	%			$922,870
	SUBTOTAL					**$4,614,350**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$190,342
	CONSTRUCTION COST SUBTOTAL					**$4,804,692**
	Engineering, Management, and Legal	25	%			$1,201,172.98
	SUBTOTAL					**$6,005,865**
	Escalation to November 2021 Dollars	4.79	%			**$287,681**
	PROJECT COST (Nov 2021 Dollars)					**$6,300,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_12
TITLE : Plant Wide Electrical Improvements (Phase 4)

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Plantwide Electrical Improvements**					
	Replace VFD's for C&CT Facility 53	2	EA	$55,000	$110,000	
	Total					**$110,000**
	ITEMIZED SUBTOTAL					**$110,000**
	TOTAL DIRECT COST					**$110,000**
	Contingency	30	%			$33,000
	SUBTOTAL					**$143,000**
	Contractor General Conditions, Overhead, and Profit	25	%			$35,750
	SUBTOTAL					**$178,750**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$7,373
	CONSTRUCTION COST SUBTOTAL					**$186,123**
	Engineering, Management, and Legal	25	%			$46,530.86
	SUBTOTAL					**$232,654**
	Escalation to November 2021 Dollars	4.79	%			**$11,144**
	PROJECT COST (Nov 2021 Dollars)					**$250,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_13
TITLE : Plant Wide Electrical Improvements (Phase 5)

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Plantwide Electrical Improvements**					
	Replace BNR Facility MCC 80-1, 80-2, and 80-3	3	EA	$100,000	$300,000	
	Replace BNR Facility MCC 81-1, 81-2, 81-3, and 81-4	4	EA	$100,000	$400,000	
	Replace BNR Facility 4000 Amp Switchgear 81-1 and 81-2	2	EA	$300,000	$600,000	
	Total					**$1,300,000**
	ITEMIZED SUBTOTAL					**$1,300,000**
	TOTAL DIRECT COST					**$1,300,000**
	Contingency	30	%			$390,000
	SUBTOTAL					**$1,690,000**
	Contractor General Conditions, Overhead, and Profit	25	%			$422,500
	SUBTOTAL					**$2,112,500**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$87,141
	CONSTRUCTION COST SUBTOTAL					**$2,199,641**
	Engineering, Management, and Legal	25	%			$549,910.16
	SUBTOTAL					**$2,749,551**
	Escalation to November 2021 Dollars	4.79	%			**$131,703**
	PROJECT COST (Nov 2021 Dollars)					**$2,890,000**

Notes:

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MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_14
TITLE : 2-Water System Improvements

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
2	**2W System Improvements**					
	New hydropneumatic pressure tank	1	EA	$100,000	$100,000	
	New valve vault	1	LS	$10,000	$10,000	
	Total					**$110,000**
	ITEMIZED SUBTOTAL					**$110,000**
	Allowances					
	Site Civil & Piping Allowance	10	%		$11,000	
	Electrical and Instrumentation Allowance	20	%		$22,000	
						$33,000
	TOTAL DIRECT COST					**$143,000**
	Contingency	30	%			$42,900
	SUBTOTAL					**$185,900**
	Contractor General Conditions, Overhead, and Profit	25	%			$46,475
	SUBTOTAL					**$232,375**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$9,585
	CONSTRUCTION COST SUBTOTAL					**$241,960**
	Engineering, Management, and Legal	25	%			$60,490.12
	SUBTOTAL					**$302,451**
	Escalation to November 2021 Dollars	4.79	%			**$14,487**
	PROJECT COST (Nov 2021 Dollars)					**$320,000**

Notes:

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MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_15
TITLE : Grit System Improvements

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Grit Chambers**					
	CFD Analysis of Grit Basin Hydraulics	1	LS	$50,000	$50,000	
	Structural Concrete Surface Repairs	1123	SF	$65	$72,964	
	Recoat Rake Arms	2	EA	$50,000	$100,000	
	Structural modifications to improve performance	1	LS	$750,000	$750,000	
	Total					**$972,964**
	ITEMIZED SUBTOTAL					**$972,964**
	Allowances					
	Electrical and Instrumentation Allowance	0	%		$0	
						$0
	TOTAL DIRECT COST					**$972,964**
	Contingency	30	%			$291,889
	SUBTOTAL					**$1,264,854**
	Contractor General Conditions, Overhead, and Profit	25	%			$316,213
	SUBTOTAL					**$1,581,067**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$65,219
	CONSTRUCTION COST SUBTOTAL					**$1,646,286**
	Engineering, Management, and Legal	25	%			$411,571.56
	SUBTOTAL					**$2,057,858**
	Escalation to November 2021 Dollars	4.79	%			**$98,571**
	PROJECT COST (Nov 2021 Dollars)					**$2,160,000**

Notes:

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TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_16
TITLE : LEL Equipment Replacement

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Oxygenation Basin Repairs**					
	Replace all LEL equipment in CP-13 and CP-53.	16	EA	$5,000	$80,000	$80,000
	Replace main gas guard panel at C&CT	1	EA	$50,000	$50,000	$50,000
	Sample pump replacement	1	EA	$10,000	$10,000	$10,000
	ITEMIZED SUBTOTAL					**$140,000**
	TOTAL DIRECT COST					**$140,000**
	Contingency	30	%			$42,000
	SUBTOTAL					**$182,000**
	Contractor General Conditions, Overhead, and Profit	25	%			$45,500
	SUBTOTAL					**$227,500**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$9,384
	CONSTRUCTION COST SUBTOTAL					**$236,884**
	Engineering, Management, and Legal	25	%			$59,221.09
	SUBTOTAL					**$296,105**
	Escalation to November 2021 Dollars	4.79	%			**$14,183**
	PROJECT COST (Nov 2021 Dollars)					**$320,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_17
TITLE : Primary & Secondary Treatment Rehabilitation Project

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Structural Improvements**					
	Repair Oxygenation Basins 1-4 Roof Deck and add overlay to improve drainage	13566	SF	$65	$881,790	
	Repair Secondary Effluent Distribution Box Concrete	748	SF	$65	$48,620	
	Add deck drains to Oxygenation Basins 1-4	8	EA	$10,000	$80,000	
	Repair ML Splitter Box Inlet Area Concrete	2160	SF	$65	$140,400	
	ML Splitter Box Inlet Area, Replace Checker Plate with Grating	382	SF	$104	$39,728	
	Repair cracked concrete with Epoxy Injection for all Secondary Clarifiers	2,000	LF	$55	$110,000	
	Total					**$1,300,538**
2	**Mechanical Improvements**					
	Recoat Oxygenation Basin Mixer Drives	24	EA	$1,000	$24,000	
	Replace RAS Pumps with higher capacity pumps	3	EA	$32,000	$96,000	
	Recoat Secondary Claifier 1 and 2 Mechanisms	2	EA	$80,000	$160,000	
	Replace Drives for Secondary Clarifier Mechanisms 1 and 2	2	EA	$130,900	$261,800	
	Replace Drives for Primary Clarifier Mechanisms 1,2 and 3	3	EA	$130,900	$392,700	
	Recoat Primary Clarifier Mechanism 1	1	EA	$80,000	$80,000	
	Replace Sludge Collector Mechanisms and Drives for Chemical Clarifiers	4	EA	$462,000	$1,848,000	
	Total					**$2,862,500**
	ITEMIZED SUBTOTAL					**$4,163,038**
	Allowances					
	Electrical and Instrumentation Allowance	10	%		$416,000	
						$416,000
	TOTAL DIRECT COST					**$4,579,038**
	Contingency	30	%			$1,373,711
	SUBTOTAL					**$5,952,749**
	Contractor General Conditions, Overhead, and Profit	25	%			$1,488,187
	SUBTOTAL					**$7,440,937**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$306,939
	CONSTRUCTION COST SUBTOTAL					**$7,747,875**
	Engineering, Management, and Legal	25	%			$1,936,968.85
	SUBTOTAL					**$9,684,844**
	Escalation to November 2021 Dollars	4.79	%			**$463,904**
	PROJECT COST (Nov 2021 Dollars)					**$10,150,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_18
TITLE : WAS Thickening Improvements Project

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**WAS Thickening Improvements**					
	Replace Thickening Centrifuge Controls	1	LS	$25,000	$25,000	
	Replace Sharples Centrifuge	1	EA	$255,000	$255,000	
	Replace Centrifuge Polymer Feed System	1	EA	$50,000	$50,000	
	Recoat Sludge Collector Mechanisms on Gravity Thickeners	2	EA	$55,000	$110,000	
	Total					**$440,000**
2	**Digester Pump Improvements**					
	Replace Digester Mixing Pumps	4	EA	$31,000	$124,000	
	Replace Digester Feed and Transfer Pumps	3	EA	$26,000	$78,000	
	Total					**$202,000**
	ITEMIZED SUBTOTAL					**$642,000**
	Allowances					
	Piping Allowance	10	%		$64,000	
	Electrical and Instrumentation Allowance	10	%		$64,000	
						$128,000
	TOTAL DIRECT COST					**$770,000**
	Contingency	30	%			$231,000
	SUBTOTAL					**$1,001,000**
	Contractor General Conditions, Overhead, and Profit	25	%			$250,250
	SUBTOTAL					**$1,251,250**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$51,614
	CONSTRUCTION COST SUBTOTAL					**$1,302,864**
	Engineering, Management, and Legal	25	%			$325,716.02
	SUBTOTAL					**$1,628,580**
	Escalation to November 2021 Dollars	4.79	%			**$78,009**
	PROJECT COST (Nov 2021 Dollars)					**$1,710,000**

Notes:

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MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_19
TITLE : Recarbonation Improvements

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Second Stage Recarbonation Basin Improvements**					
	Repair concrete in basin	3733	SF	65	$242,639	
	Total					**$242,639**
	ITEMIZED SUBTOTAL					**$242,639**
	TOTAL DIRECT COST					**$242,639**
	Contingency	30	%			$72,792
	SUBTOTAL					**$315,430**
	Contractor General Conditions, Overhead, and Profit	25	%			$78,858
	SUBTOTAL					**$394,288**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$16,264
	CONSTRUCTION COST SUBTOTAL					**$410,552**
	Engineering, Management, and Legal	25	%			$102,637.98
	SUBTOTAL					**$513,190**
	Escalation to November 2021 Dollars	4.79	%			**$24,582**
	PROJECT COST (Nov 2021 Dollars)					**$540,000**

Notes:

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TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROIECT ID: WRP_20
TITLE : Flow Equalization Improvements Project

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Structural Improvements**					
	Resurface ballast ponds	49,878	SF	$10.40	$518,731	
	Total					**$518,731**
2	**Mechanical Improvements**					
	Water cannons for ballast ponds	4	EA	$10,400	$41,600	
	Booster Pumps for Washdown System	2	EA	$31,000	$62,000	
	Total					**$103,600**
	ITEMIZED SUBTOTAL					**$622,331**
	Allowances					
	Site Civil & Piping Allowance	10	%		$62,000	
	Electrical and Instrumentation Allowance	5	%		$31,000	
						$93,000
	TOTAL DIRECT COST					**$715,331**
	Contingency	30	%			$214,599
	SUBTOTAL					**$929,931**
	Contractor General Conditions, Overhead, and Profit	25	%			$232,483
	SUBTOTAL					**$1,162,413**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$47,950
	CONSTRUCTION COST SUBTOTAL					**$1,210,363**
	Engineering, Management, and Legal	25	%			$302,590.69
	SUBTOTAL					**$1,512,953**
	Escalation to November 2021 Dollars	4.79	%			**$72,470**
	PROJECT COST (Nov 2021 Dollars)					**$1,590,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_21
TITLE : Biogas Storage Project

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Biogas Utilization**					
	Gas Storage Improvements	1	LS	$1,040,000	$1,040,000	
	Total					**$1,040,000**
	ITEMIZED SUBTOTAL					**$1,040,000**
	Allowances					
	Site Civil & Piping Allowance	10	%		$104,000	
	Electrical and Instrumentation Allowance	10	%		$104,000	
						$208,000
	TOTAL DIRET COST					**$1,248,000**
	Contingency	30	%			$374,400
	SUBTOTAL					**$1,622,400**
	Contractor General Conditions, Overhead, and Profit	25	%			$405,600
	SUBTOTAL					**$2,028,000**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$83,655
	CONSTRUCTION COST SUBTOTAL					**$2,111,655**
	Engineering, Management, and Legal	25	%			$527,913.75
	SUBTOTAL					**$2,639,569**
	Escalation to November 2021 Dollars	4.79	%			**$126,435**
	PROJECT COST (Nov 2021 Dollars)					**$2,770,000**

Notes:

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TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_22
TITLE : TWAS Pump Replacement Project

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Mechanical Equipments Replacement**					
	Replace TWAS Pumps	2	EA	$26,000	$52,000	
	Total					**$52,000**
	ITEMIZED SUBTOTAL					**$52,000**
	Allowances					
	Site Civil & Piping Allowance	10	%		$5,000	
	Electrical and Instrumentation Allowance	10	%		$5,000	
						$10,000
	TOTAL DIRECT COST					**$62,000**
	Contingency	30	%			$18,600
	SUBTOTAL					**$80,600**
	Contractor General Conditions, Overhead, and Profit	25	%			$20,150
	SUBTOTAL					**$100,750**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$4,156
	CONSTRUCTION COST SUBTOTAL					**$104,906**
	Engineering, Management, and Legal	25	%			$26,226.48
	SUBTOTAL					**$131,132**
	Escalation to November 2021 Dollars	4.79	%			**$6,281**
	PROJECT COST (Nov 2021 Dollars)					**$140,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

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TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_23
TITLE : Solids Dewatering Improvements

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Mechanical Equipments Replacement**					
	Upgrade Dewatering Polymer Feed System	1	LS	$156,000	$156,000	
	Rebuild Centrifuge	1	EA	$52,000	$52,000	
	Total					**$208,000**
	ITEMIZED SUBTOTAL					**$208,000**
	Allowances					
	Electrical and Instrumentation Allowance	10	%		$21,000	
						$21,000
	TOTAL DIRECT COST					**$229,000**
	Contingency	30	%			$68,700
	SUBTOTAL					**$297,700**
	Contractor General Conditions, Overhead, and Profit	25	%			$74,425
	SUBTOTAL					**$372,125**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$15,350
	CONSTRUCTION COST SUBTOTAL					**$387,475**
	Engineering, Management, and Legal	25	%			$96,868.79
	SUBTOTAL					**$484,344**
	Escalation to November 2021 Dollars	4.79	%			**$23,200**
	PROJECT COST (Nov 2021 Dollars)					**$510,000**

Notes:

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MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_24
TITLE : BNR Structural Retrofit and Nitrified Effluent Recycle Project

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**BNR Improvements**					
	Repair cracks in BNR structure	500	LF	$55	$27,500	
	Install BFE sump and pump.	1	EA	$90,000	$90,000	
	Water cannons for BFE pond	3	EA	$10,400	$31,200	
	Replace BNR Beads	1	LS	$50,000	$50,000	
	Total					**$198,700**
2	**Biostyr Recycle**					
	Nitrified Effluent Recycle Pipeline	770	LF	$300	$231,000	
	Total					**$231,000**
	ITEMIZED SUBTOTAL					**$429,700**
	Allowances					
	Site Civil & Piping Allowance	10	%		$43,000	
	Electrical and Instrumentation Allowance	10	%		$43,000	
						$86,000
	TOTAL DIRECT COST					**$515,700**
	Contingency	30	%			$154,710
	SUBTOTAL					**$670,410**
	Contractor General Conditions, Overhead, and Profit	25	%			$167,603
	SUBTOTAL					**$838,013**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$34,568
	CONSTRUCTION COST SUBTOTAL					**$872,581**
	Engineering, Management, and Legal	25	%			$218,145.13
	SUBTOTAL					**$1,090,726**
	Escalation to November 2021 Dollars	4.79	%			**$52,246**
	PROJECT COST (Nov 2021 Dollars)					**$1,150,000**

Notes:

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MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_25
TITLE : Filtration Rehabilitation Project

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Rehabilitation Improvements**					
	Recoat Interior and Exterior of Filter Tanks	4	EA	$26,000	$104,000	
	Replace Filter Media	4	EA	$20,800	$83,200	
	Recoat Centrate Equalization Tank	1	LS	$104,000	$104,000	
	Recoat Stripper Tower Feed Tank	1	LS	$104,000	$104,000	
	Recoat Backwash Equalization Tank	1	LS	$156,000	$156,000	
	Total					**$551,200**
	ITEMIZED SUBTOTAL					**$551,200**
	TOTAL DIRECT COST					**$551,200**
	Contingency	30	%			$165,360
	SUBTOTAL					**$716,560**
	Contractor General Conditions, Overhead, and Profit	25	%			$179,140
	SUBTOTAL					**$895,700**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$36,948
	CONSTRUCTION COST SUBTOTAL					**$932,648**
	Engineering, Management, and Legal	25	%			$233,161.91
	SUBTOTAL					**$1,165,810**
	Escalation to November 2021 Dollars	4.79	%			**$55,842**
	PROJECT COST (Nov 2021 Dollars)					**$1,230,000**

Notes:

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MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_26
TITLE : AWT Improvements

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**AWT Building Repairs**					
	Resurface Floor	4536	SF	$6.24	$28,305	
	Coat Structure Steel Beams	1	LS	$156,000	$156,000	
	Replace standing seam metal roof	4536	SF	$17	$77,112	
	Total					**$261,417**
2	**Demolition or Repurposing of AWT Facilities**					
	Demolish abandoned/unused AWT equipment (exact equipment to be determined in performance evaluation)	1	LS	$208,000	$208,000	
	Repurpose clino beds and appurtenances.	1	LS	$52,000	$52,000	
	Demolish PSA system in conjunction with AWT demo.	1	LS	$104,000	$104,000	
	Total					**$364,000**
	ITEMIZED SUBTOTAL					**$625,417**
	Allowances					
	Site Civil & Piping Allowance	10	%		$63,000	
	Electrical and Instrumentation Allowance	10	%		$63,000	
						$126,000
	TOTAL DIRECT COST					**$751,417**
	Contingency	30	%			$225,425
	SUBTOTAL					**$976,842**
	Contractor General Conditions, Overhead, and Profit	25	%			$244,210
	SUBTOTAL					**$1,221,052**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$50,368
	CONSTRUCTION COST SUBTOTAL					**$1,271,420**
	Engineering, Management, and Legal	25	%			$317,855.11
	SUBTOTAL					**$1,589,276**
	Escalation to November 2021 Dollars	4.79	%			**$76,126**
	PROJECT COST (Nov 2021 Dollars)					**$1,670,000**

Notes:

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MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_27
TITLE : Building Roof Replacements

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Misc Building**					
	Replace roof membrane and covering	113,401	SF	$50	$5,670,050	
	Total					**$5,670,050**
	ITEMIZED SUBTOTAL					**$5,670,050**
	TOTAL DIRECT COST					**$5,670,050**
	Contingency	30	%			$1,701,015
	SUBTOTAL					**$7,371,065**
	Contractor General Conditions, Overhead, and Profit	25	%			$1,842,766
	SUBTOTAL					**$9,213,831**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$380,071
	CONSTRUCTION COST SUBTOTAL					**$9,593,902**
	Engineering, Management, and Legal	25	%			$2,398,475.45
	SUBTOTAL					**$11,992,377**
	Escalation to November 2021 Dollars	4.79	%			**$574,435**
	PROJECT COST (Nov 2021 Dollars)					**$12,570,000**

Notes:

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TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_28
TITLE : Odorous Air Treatment Improvements Project

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Odorous Air Improvements**					
	Replace MCC 69.	1	EA	$100,000	$100,000	
	Rehabilitate fans.	2	EA	$21,000	$42,000	
	Replace biofilter media.	1	LS	$32,000	$32,000	
	Total					**$174,000**
	ITEMIZED SUBTOTAL					**$174,000**
	TOTAL DIRECT COST					**$174,000**
	Contingency	30	%			$52,200
	SUBTOTAL					**$226,200**
	Contractor General Conditions, Overhead, and Profit	25	%			$56,550
	SUBTOTAL					**$282,750**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$11,663
	CONSTRUCTION COST SUBTOTAL					**$294,413**
	Engineering, Management, and Legal	25	%			$73,603.36
	SUBTOTAL					**$368,017**
	Escalation to November 2021 Dollars	4.79	%			**$17,628**
	PROJECT COST (Nov 2021 Dollars)					**$390,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_29
TITLE : Disinfection Process Modernization

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**UV Facility**					
	New UV Facility and Demolition of Chlorine Gas Facility	1	LS	$6,000,000	$6,000,000	
	Sodium Hypochlorite System for 2W	1	LS	$1,500,000	$1,500,000	
	Total					**$7,500,000**
	ITEMIZED SUBTOTAL					**$7,500,000**
	TOTAL DIRECT COST					**$7,500,000**
	Contingency	30	%			$2,250,000
	SUBTOTAL					**$9,750,000**
	Contractor General Conditions, Overhead, and Profit	25	%			$2,437,500
	SUBTOTAL					**$12,187,500**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$502,734
	CONSTRUCTION COST SUBTOTAL					**$12,690,234**
	Engineering, Management, and Legal	25	%			$3,172,558.59
	SUBTOTAL					**$15,862,793**
	Escalation to November 2021 Dollars	4.79	%			**$759,828**
	PROJECT COST (Nov 2021 Dollars)					**$16,630,000**

Notes:

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MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_30
TITLE : Asphalt Sealing and Replacement Project

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Asphalt Sealing and Replacement**					
	Asphalt sealing and replacement	1	LS	$73,000	$73,000	
	Total					**$73,000**
	ITEMIZED SUBTOTAL					**$73,000**
	TOTAL DIRECT COST					**$73,000**
	Contingency	30	%			$21,900
	SUBTOTAL					**$94,900**
	Contractor General Conditions, Overhead, and Profit	25	%			$23,725
	SUBTOTAL					**$118,625**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$4,893
	CONSTRUCTION COST SUBTOTAL					**$123,518**
	Engineering, Management, and Legal	25	%			$30,879.57
	SUBTOTAL					**$154,398**
	Escalation to November 2021 Dollars	4.79	%			**$7,396**
	PROJECT COST (Nov 2021 Dollars)					**$170,000**

Notes:

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MASTER SEWER PLAN

TASK :	WRP CIP Improvements	**ESTIMATE PREPARATION DATE :**	12/23/2021
JOB # :	11384A.00	**PREPARED BY :**	RLG
LOCATION :	T-TSA WRP	**REVIEWED BY :**	AG
PROJECT ID:	WRP_31		
TITLE :	Offsite Flow Equalization Improvements Project		

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Offsite Flow Equalization**					
	New concrete lined 15 MG Flow Equalization Basin	1	LS	$ 3,900,000	$3,900,000	
	Inlet and Return Piping	2000	LF	$312	$624,000	
	Inlet/Drain Structure	1	LS	$52,000	$52,000	
	Return Pump Station	1	LS	$156,000	$156,000	
	Total					**$4,732,000**
	ITEMIZED SUBTOTAL					**$4,732,000**
	TOTAL DIRECT COST					**$4,732,000**
	Contingency	30	%			$1,419,600
	SUBTOTAL					**$6,151,600**
	Contractor General Conditions, Overhead, and Profit	25	%			$1,537,900
	SUBTOTAL					**$7,689,500**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$317,192
	CONSTRUCTION COST SUBTOTAL					**$8,006,692**
	Engineering, Management, and Legal	25	%			$2,001,672.97
	SUBTOTAL					**$10,008,365**
	Escalation to November 2021 Dollars	4.79	%			**$479,401**
	PROJECT COST (Nov 2021 Dollars)					**$10,490,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_32
TITLE : MPPS Improvements Project

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**MPPS Improvements**					
	Rehab Pump manifold to address corrosion issues	1	LS	$52,000	$52,000	
	Replace MPPS Pumps	10	EA	$78,000	$780,000	
	Replace MPPS VFDs 24104 and 24105	2	EA	$55,000	$110,000	
	Replace MPPS Soft Starts	3	EA	$35,000	$105,000	
	Total					**$1,047,000**
	ITEMIZED SUBTOTAL					**$1,047,000**
	Allowances					
	Electrical and Instrumentation Allowance	10	%		$105,000	
						$105,000
	TOTAL DIRECT COST					**$1,152,000**
	Contingency	30	%			$345,600
	SUBTOTAL					**$1,497,600**
	Contractor General Conditions, Overhead, and Profit	25	%			$374,400
	SUBTOTAL					**$1,872,000**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$77,220
	CONSTRUCTION COST SUBTOTAL					**$1,949,220**
	Engineering, Management, and Legal	25	%			$487,305.00
	SUBTOTAL					**$2,436,525**
	Escalation to November 2021 Dollars	4.79	%			**$116,710**
	PROJECT COST (Nov 2021 Dollars)					**$2,560,000**

Notes:

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MASTER SEWER PLAN

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TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_33
TITLE : Misc Plant Rehab Project

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Mechanical Improvements**					
	Replace three primary sludge pumps, valves, and piping.	1	LS	$208,000	$208,000	
	Replace pump room 53 mechanical equipment due to age and replace piping to fix operational issues. Total of 12 pumps and 2 blowers	1	LS	$728,000	$728,000	
	Replace pump room 13 mechanical equipment due to age. Total of 6 pumps and 4 blowers.	1	LS	$520,000	$520,000	
	Replace all P-removal flocculators.	4	EA	$31,200	$124,800	
	Replace primary scum pumps (except Primary Clarifier 4).	3	EA	$31,200	$93,600	
	Total					**$1,674,400**
	ITEMIZED SUBTOTAL					**$1,674,400**
	Allowances					
	Electrical and Instrumentation Allowance	10	%		$167,000	
						$167,000
	TOTAL DIRECT COST					**$1,841,400**
	Contingency	30	%			$552,420
	SUBTOTAL					**$2,393,820**
	Contractor General Conditions, Overhead, and Profit	25	%			$598,455
	SUBTOTAL					**$2,992,275**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$123,431
	CONSTRUCTION COST SUBTOTAL					**$3,115,706**
	Engineering, Management, and Legal	25	%			$778,926.59
	SUBTOTAL					**$3,894,633**
	Escalation to November 2021 Dollars	4.79	%			**$186,553**
	PROJECT COST (Nov 2021 Dollars)					**$4,090,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK :	WRP CIP Improvements	**ESTIMATE PREPARATION DATE :**	12/23/2021
JOB # :	11384A.00	**PREPARED BY :**	RLG
LOCATION :	T-TSA WRP	**REVIEWED BY :**	AG
PROJECT ID:	WRP_34		
TITLE :	Plant Air System Upgrades		

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Mechanical Improvements**					
	Replace Oxygen Tank	1	LS	$100,000	$100,000	
	Replace compressors	2	EA	$20,000	$40,000	
	Plantwide HVAC system improvements for NFPA 820 Compliance	1	LS	$500,000	$500,000	
	Total					**$640,000**
	ITEMIZED SUBTOTAL					**$640,000**
	Allowances					
	Piping Allowance	10	%		$64,000	
	Electrical and Instrumentation Allowance	10	%		$64,000	
						$128,000
	TOTAL DIRECT COST					**$768,000**
	Contingency	30	%			$230,400
	SUBTOTAL					**$998,400**
	Contractor General Conditions, Overhead, and Profit	25	%			$249,600
	SUBTOTAL					**$1,248,000**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$51,480
	CONSTRUCTION COST SUBTOTAL					**$1,299,480**
	Engineering, Management, and Legal	25	%			$324,870.00
	SUBTOTAL					**$1,624,350**
	Escalation to November 2021 Dollars	4.79	%			**$77,806**
	PROJECT COST (Nov 2021 Dollars)					**$1,710,000**

Notes:

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_35
TITLE : Plant-wide NFPA 820 Compliance Evaluation

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**NFPA 820 Study**					
	NFPA 820 Study	1	LS	$75,000	$75,000	
	Total					**$75,000**
	ITEMIZED SUBTOTAL					**$75,000**
	TOTAL DIRECT COST					**$75,000**
	Contingency	30	%			$22,500
	SUBTOTAL					**$97,500**
	Contractor General Conditions, Overhead, and Profit	0	%			$0
	SUBTOTAL					**$97,500**
	Sales Tax on 50% of Total Direct Cost	0	%			$0
	CONSTRUCTION COST SUBTOTAL					**$97,500**
	Engineering, Management, and Legal	0	%			$0.00
	SUBTOTAL					**$97,500**
	Escalation to November 2021 Dollars	4.79	%			**$4,670**
	PROJECT COST (Nov 2021 Dollars)					**$110,000**

Notes:

Engineers...Working Wonders With Water®

TAHOE-TRUCKEE SANITATION AGENCY
MASTER SEWER PLAN

TASK : WRP CIP Improvements
JOB # : 11384A.00
LOCATION : T-TSA WRP
PROJECT ID: WRP_36
TITLE : Chemical Storage and Feed System Improvements

ESTIMATE PREPARATION DATE : 12/23/2021
PREPARED BY : RLG
REVIEWED BY : AG

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Mechanical Improvements**					
	Demolish sulfuric acid and salt tanks	1	LS	$50,000	$50,000	
	Replace sulfuric acid tanks with totes	1	LS	$20,000	$20,000	
	Replace chemical feed pumps and controls	1	LS	$50,000	$50,000	
	Total					**$120,000**
	ITEMIZED SUBTOTAL					**$120,000**
	Allowances					
	Piping Allowance	15	%		$18,000	
	Electrical and Instrumentation Allowance	15	%		$18,000	
						$36,000
	TOTAL DIRECT COST					**$156,000**
	Contingency	30	%			$46,800
	SUBTOTAL					**$202,800**
	Contractor General Conditions, Overhead, and Profit	25	%			$50,700
	SUBTOTAL					**$253,500**
	Sales Tax on 50% of Total Direct Cost	8.25	%			$10,457
	CONSTRUCTION COST SUBTOTAL					**$263,957**
	Engineering, Management, and Legal	25	%			$65,989.22
	SUBTOTAL					**$329,946**
	Escalation to November 2021 Dollars	4.79	%			**$15,804**
	PROJECT COST (Nov 2021 Dollars)					**$350,000**

Notes:

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TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: Jay Parker, Engineering Manager

Item: VI-4

Subject: Approval to accept the Master Sewer Plan

Background

In 2019, the Board of Directors authorized the Agency to enter into contract with Carollo Engineers, Inc. (Carollo) for preparation of a Master Sewer Plan (Plan). The purpose of the Plan was to perform an evaluation of existing T-TSA facilities to include the Truckee River Interceptor (TRI) and the water reclamation plant (WRP), to assess existing and future regulatory requirements, assess the condition and capacity of existing facilities, estimate future flows and loads, develop and evaluate alternatives for upgrades and improvements to meet future conditions through a 25-year planning cycle, and to recommend a schedule and cost estimates for selected capital improvements accordingly.

The scope of services for the Plan required Carollo to: (1) review background data and information, (2) develop an updated hydraulic model of the TRI, (3) conduct an evaluation of TRI capacities, (4) identify recommendations to mitigate deficiencies identified for the TRI, (5) develop a hydraulic model of the WRP, (6) conduct an evaluation of WRP capacities, (7) develop a biological model of the WRP's liquids and solids treatment plant processes, (8) conduct an evaluation of the WRP operations and treatment processes, (9) identify recommendations to mitigate deficiencies identified for the WRP, (10) develop cost estimates, (11) prepare a final report and presentation to the Board of Directors, and (12) provide various project management tasks.

Carollo recently completed all tasks identified in the scope of work and have finalized the Plan.

Fiscal Impact

None.

Attachments

None.

Recommendation

Management and staff recommend approval to accept the Master Sewer Plan.

Review Tracking

Submitted By: ______________________
Jay Parker
Engineering Manager

Approved By: ______________________
LaRue Griffin
General Manager

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: Jay Parker, Engineering Manager

Item: VI-5

Subject: Approval to award the 2022 Roof Repair project

Background
The 2022 Roof Repair project builds on the recent projects of 2018 and 2019. These projects entail repairing roof areas that have reached the end of their life cycles and need to be replaced. The focus of this phase is to rehabilitate sections of roofing over the following facilities: Building No. 2 (AWT), Building No. 3 (Maintenance), Building No. 4 (Acid Building), Facility 6A (Corridor), and Facility 6C (Corridor). If awarded by the Board, field work is slated to occur between June 13, 2022 and September 9, 2022.

One bid for the project was received on January 20, 2022 as follows:

- CentiMark Corporation (CentiMark), Roseville, CA: $420,316

After review of the bid, it was determined the bid is responsive with minor irregularities that could be waived by the Board.

Fiscal Impact
The total bid price of $420,316 is lower than the engineer's estimate of $575,000.

Attachments
None.

Recommendation
Management and staff recommend the minor bid irregularities be waived and award the bid for the 2022 Roof Repair project to CentiMark Corporation and approve a contract amount up to $460,000 ($420,316.00 bid plus approximately 10% contingency).

Review Tracking

Submitted By: ______________________
Jay Parker
Engineering Manager

Approved By: ______________________
LaRue Griffin
General Manager

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: Jay Parker, Engineering Manager

Item: VI-6

Subject: Approval for the General Manager to negotiate a contract or contracts with a qualified contractor or contractors to perform the 2022 Control Room Upgrades project

Background

The 2022 Control Room Upgrades project involves a partial remodel to the control rooms, labs, and bathrooms situated in Advanced Waste Treatment and Chemical & Conventional Treatment sections of the water reclamation plant. Work includes new flooring, baseboards, backerboards, paint, cabinetry, countertops, sinks, toilets, and other minor work. Field work is slated to occur between September 19, 2022 and November 4, 2022.

The Board of Directors approved the advertisement and solicitation of bids for the project at the December 15, 2021 meeting. Unfortunately, the Agency did not receive any bids from the initial solicitation. Subsequently, the Agency solicited bids a second time and no bidders attended the mandatory pre-bid conference. Therefore, there will be no bids accepted as pre-bid conference attendance is mandatory to submit a bid.

In accordance with Agency Ordinance No. 3-2015, if "*no responsive bids are received by the bid deadline, the Contracting Agent (T-TSA) may authorize the work by negotiating and approving a contract or contracts with a qualified contractor or contractors.*"

Fiscal Impact

The engineer's construction cost estimate for this project is $149,000.

Attachments

None.

Recommendation

Management and staff recommend approval for the General Manager to negotiate a contract or contracts with a qualified contractor or contractors to perform the 2022 Control Room Upgrades project.

Review Tracking

Submitted By: ______________________
Jay Parker
Engineering Manager

Approved By: ______________________
LaRue Griffin
General Manager

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: Paul Shouse, Electrical and Instrumentation Supervisor

Item: VI-7

Subject: Approval to award the Open Channel Flow Metering Devices project

Background

In January 2022, the Agency solicited proposals for the procurement of open channel flow meter devices and onsite consultation services. The purpose of the procurement is to provide the Agency with more accurate influent flow measurement equipment that will be installed at more suitable locations than the existing device. The flow meters will utilize technology that is able to ensure a higher degree of accuracy during the challenging flow conditions that the Agency can experience.

The scope of the procurement is to include (2) Hach Flo-Dar AV sensors, (2) Hach data loggers, and onsite installation and startup consultation services.

One vendor submitted a proposal for the procurement and consultation services: Utility Systems Science and Software, Inc. ($38,375.64). Upon review by staff, the bid received from Utility Systems Science and Software, Inc. was determined to be the lowest responsible and responsive bid.

Fiscal Impact

The total bid price of $38,375.64 is lower than the budgeted estimate of $50,000.

Recommendation

Management and staff recommend approval to award the Open Channel Flow Metering Devices project to Utility Systems Science and Software and approve a contract amount up to $42,500 ($38,375.64 bid plus approximately 10% contingency).

Review Tracking

Submitted By: ______________________
Paul Shouse
Electrical and Instrumentation Supervisor

Approved By: ______________________
LaRue Griffin
General Manager

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: LaRue Griffin, General Manager

Item: VI-8

Subject: Approval of Resolution No. 1-2022 approving bidding exception and authorizing purchase of used manlift

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Background

The Agency maintains and services various facilities that require the use of a manlift to reach higher elevations. In the past, the Agency has rented a manlift for such work. Over the past years, the Agency has had difficulty obtaining a manlift rental as they are often rented out to other customers. The Agency wishes to purchase a used manlift so it will be available when needed.

The Agency procurement policy generally requires a bidding process for equipment purchases, whether for new or used equipment. In soliciting the purchase of a used manlift, it would be impractical and difficult to prepare a notice inviting bids with an equipment description that would facilitate fair apples-to-apples bidding because, unlike vendors selling new equipment, there would not be a group of vendors offering similar used equipment and ready to prepare and submit competitive bids.

Section 5(b)(5) of the procurement policy provides the following bidding exception: “Bidding will not be required for purchases in the following situations: … (v) the Board of Directors finds and determines by resolution that the nature of the purchase is such that competitive proposals would be unavailing or would not produce an advantage and the solicitation of competitive bids therefore would be undesirable, impractical, or impossible.”

Agency staff have determined that it would not be practicable to obtain a good used manlift through the procurement policy bidding procedure and recommends an exception under section 5(b)(5) that would authorize an open market solicitation and purchase of a used manlift.

Fiscal Impact

$60,000 is allocated for purchase of a used manlift in the annual budget.

Attachments

Resolution No. 1-2022.

Recommendation

Management recommends approval of Resolution No. 1-2022 approving bidding exception and authorizing purchase of a used manlift.

Review Tracking

Submitted By: ______________________

LaRue Griffin
General Manager

RESOLUTION NO. 1-2022

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE TAHOE-TRUCKEE SANITATION AGENCY APPROVING BIDDING EXCEPTION AND AUTHORIZING PURCHASE OF USED MANLIFT

BE IT RESOLVED by the Board of Directors of the Tahoe-Truckee Sanitation Agency as follows:

1. Recitals. This resolution is adopted with reference to the following background recitals:

a. Agency staff desire to purchase a used manlift for various Agency projects and work. The 2021-22 budget includes a $60,000 expense item for this purchase. The Agency procurement policy (Ord. No. 3-2015) generally requires a bidding process for equipment purchases, whether for new or used equipment.

b. In soliciting the purchase of a used manlift, it would be impractical and difficult to prepare a notice inviting bids with an equipment description that would facilitate fair apples-to-apples bidding because, unlike vendors selling new equipment, there would not be a group of vendors offering similar used equipment and ready to prepare and submit competitive bids.

c. Agency Ordinance No. 3-2015, section 5(b)(5) provides the following bidding exception: "Bidding will not be required for purchases in the following situations: … (v) the Board of Directors finds and determines by resolution that the nature of the purchase is such that competitive proposals would be unavailing or would not produce an advantage and the solicitation of competitive bids therefore would be undesirable, impractical, or impossible."

d. Agency staff have determined that it would not be practicable to obtain a good used manlift through the procurement policy bidding procedure. The Agency General Manager therefore recommends that the Board of Directors approve a bidding exception under section 5(b)(5) that would authorize an open market solicitation and purchase of a used manlift.

2. Board Finding and Authorization. The Board finds and determines that, for the reasons set forth in the recitals, the nature of the used manlift purchase is such that bidding and competitive proposals would be unavailing and would not produce an advantage; therefore, the solicitation of competitive bids would be undesirable and impractical. The Board authorizes the General Manager, or his designee, to purchase a used manlift on the open market or through the Internet by seeking the most favorable terms and price either through negotiation or comparative pricing as deemed most appropriate in the circumstances, up to a price not to exceed $60,000.

PASSED AND ADOPTED by the Board of Directors of the Tahoe-Truckee Sanitation Agency on this 16th day of February 2022, at Truckee, California, by the following roll call vote:

AYES:
NOES:
ABSTAIN:
ABSENT:

By: ______________________
Dan Wilkins, President
Board of Directors
TAHOE-TRUCKEE SANITATION AGENCY

Attest:

____
Secretary of the Board of Directors
TAHOE-TRUCKEE SANITATION AGENCY

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: LaRue Griffin, General Manager

Item: VI-9

Subject: Report of Cal/OSHA Inspection No. 1545120

Background

On July 29, 2021, Cal/OSHA arrived at the Agency to perform an inspection of the Agency as part of their Program Quality Verification process to ensure regulatory compliance. The Cal/OSHA visit commenced with a 2-day inspection where they interviewed 2 employees and performed various site inspections within the plant. After the 2-day inspection, Cal/OSHA requested numerous documents which included Agency safety policies and programs.

On October 19, 2021, Cal/OSHA revisited the Agency and performed another day of site inspections that included 2 additional staff interviews. Cal/OSHA requested additional documentation after the site visit similar to the initial inspection visit. There were also 2 more staff interviews following this inspection.

On January 24, 2022, the Agency received a *Citation and Notification of Penalty* from Cal/OSHA which cited 6 violations with a total monetary penalty of $9,410.

On February 2, 2022, the Agency participated in an informal conference with Cal/OSHA where the violations were discussed. As a result, Cal/OSHA provided an amended *Citation and Notification of Penalty*. The amended *Citation and Notification of Penalty* reduced the number of violations from 6 to 5, changed a violation type from "Serious" to "General", and reduced the total monetary penalty from $9,410 to $3,430.

The following is a summary of the violations listed in the amended *Citation and Notification of Penalty*:

1. **Citation 1 Item 1**
   - *Description Summary:* Access to Employee Exposure and Medical Records
   - *Violation type:* Regulatory
   - *Amount:* $135
   - *Status:* The violation was corrected during the inspection to the satisfaction of Cal/OSHA

2. **Citation 1 Item 2**
    - *Description Summary:* Respiratory Protection (Medical Evaluation)
    - *Violation type:* General
    - *Amount:* $135
    - *Status:* The violation was corrected during the inspection to the satisfaction of Cal/OSHA

3. **Citation 1 Item 3**
    - *Description Summary:* Process Safety Management of Acutely Hazardous Materials
    - *Violation type:* General
    - *Amount:* $410
    - *Status:* The violation was corrected during the inspection to the satisfaction of Cal/OSHA

4. **Citation 2 Item 1**
    - *Description Summary:* Respiratory Protection
    - *Violation type:* Serious
    - *Amount:* $2,475
    - *Status:* The violation was corrected during the inspection to the satisfaction of Cal/OSHA

5. **Citation 3 Item 1**
    - *Description Summary:* Emergency Eyewash and Shower Equipment
    - *Violation type:* General
    - *Amount:* $275
    - *Status:* The violation was corrected during the inspection to the satisfaction of Cal/OSHA

Unfortunately, the Agency was not aware of Cal/OSHA's interpretations of various building and safety codes. The Agency has made the necessary changes to abate all of the listed violations to the satisfaction of Cal/OSHA. In addition, it has updated its safety policies and programs to include the appropriate procedures to remain safe and compliant with the regulations, as well as provide the necessary training accordingly.

Fiscal Impact
The Agency has paid the penalty amount of $3,430.

Attachments
Citation and Notification of Penalty

Recommendation
No action required.

Review Tracking

Submitted By: ______________________________
LaRue Griffin
General Manager

State of California
Department of Industrial Relations
Division of Occupational Safety and Health
Process Safety Management - North Non-Refinery
1855 Gateway Blvd, Suite 350
Concord, CA 94520
Phone: (925) 602-2665 Fax: (925) 602-2668

AMENDED

CITATION AND NOTIFICATION OF PENALTY

To:
Tahoe-Truckee Sanitation Agency
and its successors
13720 Butterfield Dr
Truckee, CA 96161

Inspection #: 1545120
Inspection Date (s): 07/29/2021 - 01/24/2022
Issuance Date: 02/02/2022
CSHO ID: P7970
Optional Report #: 02-022
Reporting ID: 0950673

Inspection Site:
13720 Butterfield Dr
Truckee, CA 96161

The violation(s) described in this Citation and Notification of Penalty is (are) alleged to have occurred on or about the day(s) the inspection was made unless otherwise indicated within the description given below.

This Citation and Notification of Penalty (hereinafter Citation) is being issued in accordance with California Labor Code Section 6317 for violations that were found during the inspection/ investigation. **This Citation or a copy must be prominently posted upon receipt by the employer at or near the location of each violation until the violative condition is corrected or for three working days, whichever is longer**. Violations of Title 8 of the California Code of Regulations or of the California Labor Code may result in some instances in prosecution for a misdemeanor.

YOU HAVE A RIGHT to contest this Citation and Notification of Penalty by filing an appeal with the Occupational Safety and Health Appeals Board. To initiate your appeal, you **must** contact the Appeals Board, in writing or by telephone, or online, within 15 working days from the date of receipt of this Citation. If you miss the 15 working day deadline to appeal, the Citation and Notification of Penalty becomes a final order of the Appeals Board, not subject to review by any court or agency.

Informal Conference - You may request an informal conference with the manager of the district office which issued the Citation within 10 working days after receipt of the Citation. However, if the citation is appealed, you may request an informal conference at any time prior to the day of the hearing. Employers are encouraged to schedule a conference at the earliest possible time to assure an expeditious resolution of any issues. At the informal conference, you may discuss the existence of the alleged violation(s), classification of the violation(s), abatement date or proposed penalty.

Be sure to bring to the conference any and all supporting documentation of existing conditions as well as any abatement steps taken thus far. If conditions warrant, we can enter into an agreement which resolves this matter without litigation or contest.

APPEAL RIGHTS

The Occupational Safety and Health Appeals Board (Appeals Board) consists of three members appointed by the Governor. The Appeals Board is a separate entity from the Division of Occupational Safety and Health (Cal/OSHA or the Division) and employs experienced administrative law judges to hear appeals fairly and impartially. To initiate an appeal from a Citation and Notification of Penalty, you must contact the Appeals Board in writing, or by telephone, or online via the Board's OASIS system, within 15 working days from the date of receipt of a Citation.

After you have initiated your appeal, you must then file a completed appeal form with the Appeals Board, at the address listed below, or online via the Board's OASIS system, for each contested Citation. Failure to file a completed appeal form with the Appeals Board may result in dismissal of the appeal. Appeal forms are available to print online at: https://www.dir.ca.gov/oshab/appealform.pdf. You may also file the appeal through the Board's online OASIS system at: https://www.dir.ca.gov/oshab/. Hard copies can also be picked up from district offices of the Division, or from the Appeals Board:

Occupational Safety and Health Appeals Board
2520 Venture Oaks Way, Suite 300
Sacramento, CA 95833
Telephone: (916) 274-5751 or (877) 252-1987
Fax: (916) 274-5785

If the Citation you are appealing alleges more than one item, you must specify on the appeal form which items you are appealing. The appeal form also asks you to identify the grounds for your appeal. Among the specific grounds for an appeal are the following: the safety order was not violated, the classification of the alleged violation (e.g., serious, repeat, willful) is incorrect, the abatement requirements are unreasonable or the proposed penalty is unreasonable.

Important: You must notify the Appeals Board, not the Division, of your intent to appeal within 15 working days from the date of receipt of the Citation. Otherwise, the Citation and Notification of Penalty becomes a final order of the Appeals Board not subject to review by any court or agency. An informal conference with Cal/OSHA or the Division **does not** constitute an appeal and **does not** stay the 15 working day appeal period. If you have any questions concerning your appeal rights, call the Appeals Board, at (916) 274-5751 or (877) 252-1987.

PENALTY PAYMENT OPTIONS

Penalties are due within 15 working days of receipt of this Citation and Notification of Penalty unless contested. If you are appealing any item of the Citation, remittance is still due on all items that are not appealed. Enclosed for your use is a Penalty Remittance Form for payment.

If you are paying electronically, please have the Penalty Remittance Form on-hand when you are ready to make your payment. The company name, inspection number, and Citation number(s) will be required in order to ensure that the payment is accurately posted to your account. Please go to: **www.dir.ca.gov/dosh/CalOSHA_PaymentOption.html** to access the secure payment processing site. **Additionally, you must also mail the Penalty Remittance Form to the address below.**

If you are paying by check, return one copy of the Citation, along with the Notice of Proposed Penalties Sheet and the Penalty Remittance Form and mail to:

Department of Industrial Relations
Cal/OSHA Penalties
P. O. Box 516547
Los Angeles, CA 90051-0595

Cal/OSHA does not agree to any restrictions, conditions or endorsements put on any check or money order for less than the full amount due, and will cash the check or money order as if these restrictions, conditions, or endorsements do not exist.

NOTIFICATION OF CORRECTIVE ACTION

For violations which you do not contest, you should notify the Division of Occupational Safety and Health promptly by letter that you have taken appropriate corrective action within the time frame set forth on this Citation and Notification of Penalty. Please inform the district office listed on the Citation by submitting the Cal/OSHA 160 form with the abatement steps you have taken and the date the violation was abated, together with adequate supporting documentation, e.g., drawings or photographs of corrected conditions, purchase/work orders related to abatement actions, air sampling results, etc. The adjusted penalty for general violations has already been reduced by 50% on the presumption that the employer will correct the violations by the abatement date. The adjusted penalty for serious violations, if any, has already been reduced by 50% because abatement of those violations has been completed.

Note: Return the Cal/OSHA 160 form to the district office listed on the Citation and as shown below:

Division of Occupational Safety and Health
Process Safety Management - North Non-Refinery
1855 Gateway Blvd, Suite 350
Concord, CA 94520
Telephone: (925) 602-2665
Fax: (925) 602-2668

EMPLOYEE RIGHTS

Employer Discrimination Unlawful - The law prohibits discrimination by an employer against an employee for filing a complaint or for exercising any rights under Labor Code Section 6310 or 6311. An employee who believes that he/she has been discriminated against may file a complaint no later than six (6) months after the discrimination occurred with the Division of Labor Standards Enforcement.

Employee Appeals - An employee or authorized employee's representative may, within 15 working days of the issuance of a citation, special order, or order to take special action, appeal to the Occupational Safety and Health Appeals Board the reasonableness of the period of time fixed by the Division of Occupational Safety and Health (Division) for abatement. An employee appeal may be filed with the Appeals Board or with the Division. No particular format is necessary to initiate the appeal, but the notice of appeal must be in writing.

If an Employee Appeal is filed with the Division, the Division shall note on the face of the document the date of receipt, include any envelope or other proof of the date of mailing, and promptly transmit the document to the Appeals Board. The Division shall, no later than 10 working days from receipt of the Employee Appeal, file with the Appeals Board and serve on each party a clear and concise statement of the reasons why the abatement period prescribed by it is reasonable.

Employee Appeal Forms are available from the Appeals Board, or from a district office of the Division.

Employees Participation in Informal Conference - Affected employees or their representatives may notify the District Manager that they wish to attend the informal conference. If the employer objects, a separate informal conference will be held.

DISABILITY ACCOMMODATION

Disability accommodation is available upon request. Any person with a disability requiring an accommodation, auxiliary aid or service, or a modification of policies or procedures to ensure effective communication and access to the programs of the Division of Occupational Safety and Health, should contact the Disability Accommodation Coordinator at the local district office or the Statewide Disability Accommodation Coordinator at 1-866-326-1616 (toll free). The Statewide Coordinator can also be reached through the California Relay Service, by dialing 711 or 1-800-735-2929 (TTY) or 1-800-855-3000 (TTY - Spanish).

Accommodations can include modifications of policies or procedures or provision of auxiliary aids or services. Accommodations include, but are not limited to, an Assistive Listening System (ALS), a Computer-Aided Transcription System or Communication Access Realtime Translation (CART), a sign-language interpreter, documents in Braille, large print or on computer disk, and audio cassette recording. Accommodation requests should be made as soon as possible. Requests for an ALS or CART should be made no later than five (5) days before the hearing or conference.

State of California
Department of Industrial Relations
Division of Occupational Safety and Health
Process Safety Management - North Non-Refinery
1855 Gateway Blvd, Suite 350
Concord, CA 94520
Phone: (925) 602-2665 Fax: (925) 602-2668

Inspection #: 1545120
Inspection Dates: 07/29/2021 - 01/24/2022
Issuance Date: 02/02/2022
CSHO ID: P7970
Optional Report #: 02-022

Citation and Notification of Penalty

Company Name: Tahoe-Truckee Sanitation Agency
Establishment DBA:
and its successors
Inspection Site: 13720 Butterfield Dr
Truckee, CA 96161

Citation 1 Item 1 Type of Violation: **Regulatory**

CCR8 3204(d)(1)(A)
3204. Access to Employee Exposure and Medical Records.
(d) Preservation of Records.
(1) Unless a specific occupational safety and health regulation provides a different period of time, each employer shall assure the preservation and retention of records as follows:
(A) Employee Medical Records. The medical record for each employee shall be preserved and maintained for at least the duration of employment plus thirty (30) years,...

Prior to and during the course of the inspection, including, but not limited to, on July 29, 2021, the employer did not preserve and maintain the medical records for each employee for at least the duration of employment plus thirty (30) years. There were no medical records preserved and maintained for two employees using respirators voluntarily.

Date By Which Violation Must be Abated: **Corrected During Inspection**
Proposed Penalty: **$135.00**

State of California
Department of Industrial Relations
Division of Occupational Safety and Health
Process Safety Management - North Non-Refinery
1855 Gateway Blvd, Suite 350
Concord, CA 94520
Phone: (925) 602-2665 Fax: (925) 602-2668

Inspection #: 1545120
Inspection Dates: 07/29/2021 - 01/24/2022
Issuance Date: 02/02/2022
CSHO ID: P7970
Optional Report #: 02-022

Citation and Notification of Penalty

Company Name: Tahoe-Truckee Sanitation Agency
Establishment DBA:
and its successors
Inspection Site: 13720 Butterfield Dr
Truckee, CA 96161

Citation 1 Item 2 Type of Violation: **General**

CCR8 5144(c)(2)(B):
5144. Respiratory Protection.
(c) Respiratory protection program. This subsection requires the employer to develop and implement a written respiratory protection program with required worksite-specific procedures and elements for required respirator use. The program must be administered by a suitably trained program administrator. In addition, certain program elements may be required for voluntary use to prevent potential hazards associated with the use of the respirator. The Small Entity Compliance Guide contains criteria for the selection of a program administrator and a sample program that meets the requirements of this subsection. Copies of the Small Entity Compliance Guide will be available from the Occupational Safety and Health Administration's Office of Publications, Room N 3101, 200 Constitution Avenue, NW, Washington, DC, 20210 (202-219-4667).
(2) Where respirator use is not required:
(B) In addition, the employer must establish and implement those elements of a written respiratory protection program necessary to ensure that any employee using a respirator voluntarily is medically able to use that respirator, and that the respirator is cleaned, stored, and maintained so that its use does not present a health hazard to the user. Exception: Employers are not required to include in a written respiratory protection program those employees whose only use of respirators involves the voluntary use of filtering facepieces (dust masks).

THIS CITATION AMENDS CITATION NO. 1, ITEM 2, ORIGINALLY ISSUED ON 01/21/2022, TO REDUCE THE PROPOSED PENALTY. ORIGINALLY $205, THE NEW PROPOSED PENALTY FOR THIS ITEM IS $135. ALL OTHER ASPECTS OF THE CITAITON AND PENALTY REMAIN UNCHANGED AND EFFECTIVE. THIS AMENDED CITAITON SHALL BE POSTED FOR AT LEAST THREE WORKING DAYS OR UNTIL THE VIOLATIVE CONDITON IS ABATED, WHICHEVER IS LONGER. THE WORDING OF THE CITATION REMAINS AS BELOW:

Prior to and during the course of the inspection, including, but not limited to, on July 29, 2021, the employer did not, where respirator use was not required, implement those elements of a written respiratory protection program necessary to ensure that an employee using a respirator voluntarily is medically able to use that respirator.

Date By Which Violation Must be Abated: **Corrected During Inspection**

Proposed Penalty: **$135.00**

State of California
Department of Industrial Relations
Division of Occupational Safety and Health
Process Safety Management - North Non-Refinery
1855 Gateway Blvd, Suite 350
Concord, CA 94520
Phone: (925) 602-2665 Fax: (925) 602-2668

Inspection #: 1545120
Inspection Dates: 07/29/2021 - 01/24/2022
Issuance Date: 02/02/2022
CSHO ID: P7970
Optional Report #: 02-022

Citation and Notification of Penalty

Company Name: Tahoe-Truckee Sanitation Agency
Establishment DBA:
and its successors
Inspection Site: 13720 Butterfield Dr
Truckee, CA 96161

Citation 1 Item 3 Type of Violation: **General**

CCR8 5189(d)(3)(B):
5189. Process Safety Management of Acutely Hazardous Materials.
(d) Process Safety Information. The employer shall develop and maintain a compilation of written safety information to enable the employer and the employees operating the process to identify and understand the hazards posed by processes involving acutely hazardous, flammable and explosive material before conducting any process hazard analysis required by this regulation. The employer shall provide for employee participation in this process. Copies of this safety information shall be made accessible and communicated to employees involved in the processes, and include:
(3) Information pertaining to the equipment in the process.
(B) The employer shall document that the equipment complies with the criteria established in subsection (d)(3)(A) in accordance with recognized and generally accepted good engineering practices.

Reference:
Chlorine Institute Pamphlet 155 Water and wastewater Operators chlorine Handbook, ed.2 January 2008:
Section 7.7 EXITS AND WINDOWS
Exit doors and doors leading to an exit door should be clearly marked. All exit doors should open outward to the outdoors and should be equipped with anti-panic hardware that allows for easy opening. Each room should contain at least one window so the interior can be viewed without entering the building. All windows should be made of fire-resistant, non-shattering material. Local fire and building codes also should be reviewed.

Prior to and during the course of the inspection, including, but not limited to, on October 19, 2021, the employer did not document that the equipment complies with the criteria established in subsection (d)(3)(A) in accordance with recognized and generally accepted good engineering practices. The exit door of the chlorinator room was not equipped with panic hardware that allows for easy opening, Chlorine Institute Pamphlet 155 section 7.7

Date By Which Violation Must be Abated:	**Corrected During Inspection**
Proposed Penalty:	**$410.00**

State of California
Department of Industrial Relations
Division of Occupational Safety and Health
Process Safety Management - North Non-Refinery
1855 Gateway Blvd, Suite 350
Concord, CA 94520
Phone: (925) 602-2665 Fax: (925) 602-2668

Inspection #: 1545120
Inspection Dates: 07/29/2021 - 01/24/2022
Issuance Date: 02/02/2022
CSHO ID: P7970
Optional Report #: 02-022

Citation and Notification of Penalty

Company Name: Tahoe-Truckee Sanitation Agency
Establishment DBA:
and its successors
Inspection Site: 13720 Butterfield Dr
Truckee, CA 96161

Citation 2 Item 1 Type of Violation: **Serious**

CCR8 5144(d)(2):
5144. Respiratory Protection.
(d) Selection of respirators. This subsection requires the employer to evaluate respiratory hazard(s) in the workplace, identify relevant workplace and user factors, and base respirator selection on these factors. The subsection also specifies appropriately protective respirators for use in IDLH atmospheres, and limits the selection and use of air-purifying respirators.
(2) Respirators for IDLH atmospheres.
(A) The employer shall provide the following respirators for employee use in IDLH atmospheres:
1. A full facepiece pressure demand SCBA certified by NIOSH for a minimum service life of thirty minutes, or
2. A combination full facepiece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply.
(B) Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.
(C) All oxygen-deficient atmospheres shall be considered IDLH.
Exception: If the employer demonstrates that, under all foreseeable conditions, the oxygen concentration can be maintained within the ranges specified in Table II (i.e., for the altitudes set out in the table), then any atmosphere-supplying respirator may be used.

THIS CITATION AMENDS CITATION NO. 2, ITEM 1, ORIGINALLY ISSUED ON 01/21/2022, TO REDUCE THE PROPOSED PENALTY. ORIGINALLY $4950.00, THE NEW PROPOSED PENALTY FOR THIS ITEM IS $2475.00. ALL OTHER ASPECTS OF THE CITAITON AND PENALTY REMAIN UNCHANGED AND EFFECTIVE. THIS AMENDED CITAITON SHALL BE POSTED FOR AT LEAST THREE WORKING DAYS OR UNTIL THE VIOLATIVE CONDITON IS ABATED, WHICHEVER IS LONGER. THE WORDING OF THE CITATION REMAINS AS BELOW:

Prior to and during the course of the inspection, including, but not limited to, on October 19, 2021, the employer did not provide respirators for IDLH atmospheres, where the employer cannot identify or reasonably estimate the employee exposure, to employees working in the chlorine storage room where they are necessary to protect their health during reasonably foreseeable emergency situations as stated in (c)(1)(D). Chlorine can be released during mishap while employees are performing their routine works.

Date By Which Violation Must be Abated:	**Corrected During Inspection**
Proposed Penalty:	**$2475.00**

State of California
Department of Industrial Relations
Division of Occupational Safety and Health
Process Safety Management - North Non-Refinery
1855 Gateway Blvd, Suite 350
Concord, CA 94520
Phone: (925) 602-2665 Fax: (925) 602-2668

Inspection #: 1545120
Inspection Dates: 07/29/2021 - 01/24/2022
Issuance Date: 02/02/2022
CSHO ID: P7970
Optional Report #: 02-022

Citation and Notification of Penalty

Company Name: Tahoe-Truckee Sanitation Agency
Establishment DBA:
and its successors
Inspection Site: 13720 Butterfield Dr
Truckee, CA 96161

Citation 3 Item 1 Type of Violation: **General**

CCR T8§ 5162(a)
5162. Emergency Eyewash and Shower Equipment
(a) Plumbed or self-contained eyewash or eye/facewash equipment which meets the requirements of sections 5, 7, or 9 of ANSI Z358.1-1981, Emergency Eyewash and Shower Equipment, incorporated herein by this reference, shall be provided at all work areas where, during routine operations or foreseeable emergencies, the eyes of an employee may come into contact with a substance which can cause corrosion, severe irritation or permanent tissue damage or which is toxic by absorption. Water hoses, sink faucets, or showers are not acceptable eyewash facilities. Personal eyewash units or drench hoses which meet the requirements of section 6 or 8 of ANSI Z358.1-1981, hereby incorporated by reference, may support plumbed or self-contained units but shall not be used in lieu of them.

Reference:
ANSI Z358.1-1981 section 5, 5.4.5: Each eyewash location shall be identified with highly visible sign. The area around or behind the eyewash, or both, shall be painted a bright color and shall be lighted.
CCR 8 5162(b): An emergency shower which meets the requirements of section 4 or 9 of ANSI Z358.1-1981, incorporated herein by reference, shall be provided at all work areas where, during routine operations or foreseeable emergencies, area of the body may come into contact with a substance which is corrosive or severely irritating to the skin or which is toxic by skin absorption.
ANSI Z358.1-1981 section 4, 4.6.2: Each emergency shower location shall be identified with a highly visible sign. The area or behind the emergency shower, or both, shall be painted a bright color and shall be well lighted.

THIS CITATION AMENDS CITATION NO. 3, ITEM 1, ORIGINALLY ISSUED ON 01/21/2022, TO CHANGE THE CLASSIFICATION FROM A SERIOUS VIOLATION TO A GENERAL AND TO REDUCE THE PROPOSED PENALTY, ORIGINALLY $ 3710.00, THE NEW PROPOSED PENALTY FOR THIS ITEM IS $275.00. ALL OTHER ASPECTS OF THE CITATION REMAIN UNCHANGED AND EFFECTIVE. THIS AMENDED CITATION SHALL BE POSTED FOR AT LEAST THREE WORKING DAYS OR UNTIL THE VIOLATIVE

CONDITION IS ABATED, WHICHEVER IS LONGER. THE WORDING OF THE CITATION REMAINS AS BELOW:

Prior to and during the course of the inspection, including, but not limited to, on October 19, 2021, the employer did not identify with highly visible sign each eyewash and shower location, and paint a bright color the area around or behind an emergency eyewash and shower location, including but not limited to, at the chlorine building where, during routine operations or foreseeable emergencies, the eyes and area of the body of an employee may come into contact with a substance which can cause corrosion, irritation or permanent tissue damage.

Date By Which Violation Must be Abated:	**Corrected During Inspection**
Proposed Penalty:	**$275.00**

Michael K. Boyle
Compliance Officer / District Manager

State of California
Department of Industrial Relations
Division of Occupational Safety and Health
Process Safety Management - North Non-Refinery
1855 Gateway Blvd, Suite 350
Concord, CA 94520
Phone: (925) 602-2665 Fax: (925) 602-2668

NOTICE OF PROPOSED PENALTIES

Company Name: Tahoe-Truckee Sanitation Agency
Establishment DBA:
and its successors
Inspection Site: 13720 Butterfield Dr, Truckee, CA 96161
Mailing Address: 13720 Butterfield Dr, Truckee, CA 96161
Issuance Date: 02/02/2022
Reporting ID: 0950673
CSHO ID: P7970

Summary of Penalties for Inspection Number 1545120

Citation 1 Item 1, Regulatory	$135.00
Citation 1 Item 2, General	$135.00
Citation 1 Item 3, General	$410.00
Citation 2 Item 1, Serious	$2475.00
Citation 3 Item 1, General	$275.00
TOTAL PROPOSED PENALTIES:	**$3430.00**

Penalties are due within 15 working days of receipt of this notification unless contested. If you are appealing any item of this citation, remittance is still due on all items that are not appealed. Enclosed for your use is a Penalty Remittance Form.

If you are paying electronically: Please have this form on-hand when you are ready to make your payment. The company name, reporting ID and Citation number(s) will be required to ensure that the payment is accurately posted to your account. Please go to: **www.dir.ca.gov/dosh/CalOSHA_PaymentOption.html** to access the secure payment processing site. **Additionally, you must also mail the Penalty Remittance Form to the address below.**

If you are paying by check: Mail this Notice of Proposed Penalties, the Penalty Remittance Form, along with a copy of the Citation and Notification of Penalty to:

DEPARTMENT OF INDUSTRIAL RELATIONS
CAL/OSHA PENALTIES
P. O. BOX 516547
LOS ANGELES, CA 90051-0595

Cal/OSHA does not agree to any restrictions, conditions or endorsements put on any check or money order for less than the full amount due, and will cash the check or money order as if these restrictions, conditions or endorsements do not exist.

DEPARTMENT OF INDUSTRIAL RELATIONS
DIVISION OF OCCUPATIONAL SAFETY AND HEALTH – CAL/OSHA
Accounting Office - Cashiering Unit
Phone (415) 703-4310 or (415) 703-4308

PENALTY REMITTANCE FORM

CIVIL PENALTY INFO	**INSPECTION NO.:**	1545120	**REPORTING ID:**	0950673
COMPANY NAME:	Tahoe-Truckee Sanitation Agency		**FEIN/SEIN:**	UNKNOWN
ESTABLISHMENT DBA:				
CONTACT PERSON:	Mike Smith			
PHONE NO.:	(530) 587-2525		**FAX NO.:**	UNKNOWN
SITE ADDRESS:	13720 Butterfield Dr, Truckee, CA 96161			
MAILING ADDRESS:	13720 Butterfield Dr, Truckee, CA 96161			

CITATION INFORMATION:

Penalties are due within 15 working days of receipt of this notification unless contested. If you are appealing any item of this Citation, remittance is still due on all items that are not appealed.

PAYMENT INSTRUCTIONS:

For check or money order: please make check or money order payable to Department of Industrial Relations. Write the inspection number and total amount enclosed on the payment coupon below and on the check or money order.

For credit card or EFT payment, go to: www.dir.ca.gov/dosh/CalOSHA_PaymentOption.html

----- Detach here and return bottom portion with check or money order payment -----

PAYMENT COUPON

California Department of Industrial Relations

Inspection No.: 1545120

Amount Enclosed: $ ___________

Mail payment to:

DEPARTMENT OF INDUSTRIAL RELATIONS
CAL/OSHA PENALTIES
P.O. BOX 516547
LOS ANGELES, CA 90051-0595

For credit card or EFT payment, go to:
www.dir.ca.gov/dosh/CalOSHA_PaymentOption.html

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: LaRue Griffin, General Manager

Item: VI-10

Subject: Discussion of in-person Board of Directors meeting

Background
This agenda item was created to have a discussion to determine if the Board would like to hold an in-person meeting with each Director having the option to participate via teleconference, under the current Brown Act regulations or hold a teleconference meeting in accordance with AB 361 at the next upcoming Board meeting.

Fiscal Impact
None.

Attachments
None.

Recommendation
Management recommends the next Board of Directors meeting be held in accordance with AB 361 due to the continued infection rate of the Omicron variant of COVID-19.

Review Tracking

Submitted By: ____________________
LaRue Griffin
General Manager

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: LaRue Griffin, General Manager

Item: VII-1

Subject: Department Reports

Background
Department reports for previous and current month(s).

Fiscal Impact
None.

Attachments
1. Operations Department Report.
2. Maintenance Department Report.
3. Engineering Department Report.
4. Administrative Department Report.

Recommendation
No action required.

Review Tracking

Submitted By: ______________________
LaRue Griffin
General Manager

TAHOE-TRUCKEE SANITATION AGENCY
OPERATIONS DEPARTMENT REPORT

Date: February 16, 2022

To: Board of Directors

From: Michael Peak, Operations Department Manager

Subject: Operations Department Report

Compliance:

- All plant waste discharge requirements were met for the month.

Operations:

- Plant performed well through the month.
- Caustic was added to the final effluent to maintain a 7.0 pH set point.

Operations Work Orders:

- Completed this month: 2
- Pending: 4

Laboratory:

- Staff performed necessary laboratory testing.
- Shift operator training for weekend testing completed for DOCs.
- The Laboratory Information Management System (LIMS) has been purchased.
  - Services agreement in place.
  - Install schedule initiated.
- Schedule established for The NELAC Institute (TNI) systems implementation.

Laboratory Corrective Actions:

- Completed this month: 0
- Pending: 0

Plant Data:

Influent Flow Description	MG
Monthly average daily (1)	3.68
Monthly maximum instantaneous (1)	7.61
Maximum 7- day average	4.66

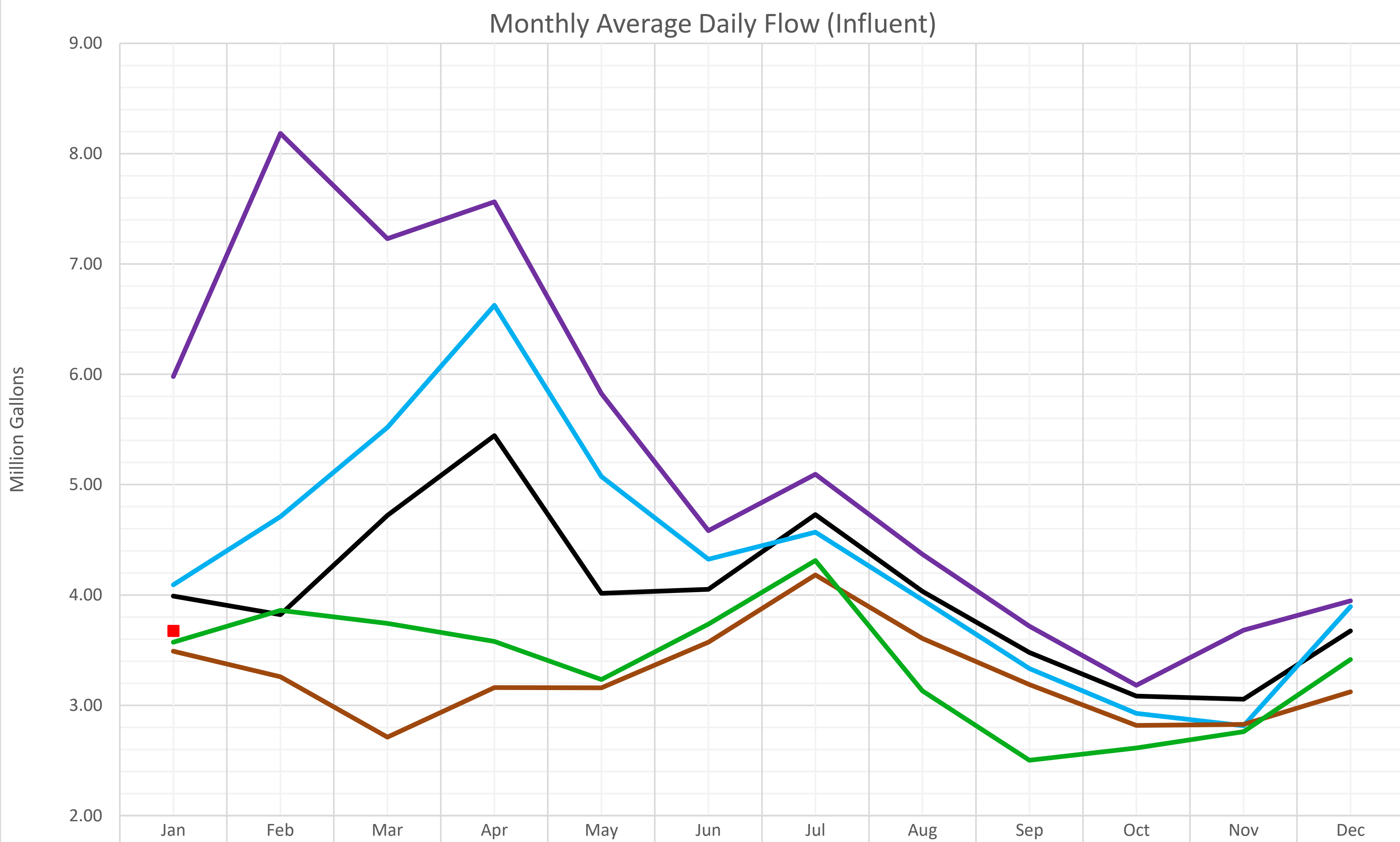
Effluent Limitation Description [2]	WDR Monthly Average		WDR Daily Maximum	
	Recorded	***Limit***	***Recorded***	***Limit***
Suspended Solids (mg/l)	1.7	10.0	3.7	20.0
Turbidity (NTU)	NA	NA	1.8	10.0
Total Phosphorus (mg/l)	0.53	0.80	0.78	1.50
Chemical Oxygen Demand (mg/l)	30	45	42	60

Notes:
1. Flows are depicted in the attached graph.
2. Effluent table data per WDR reportable frequency. Attached graphs depict all recorded data.

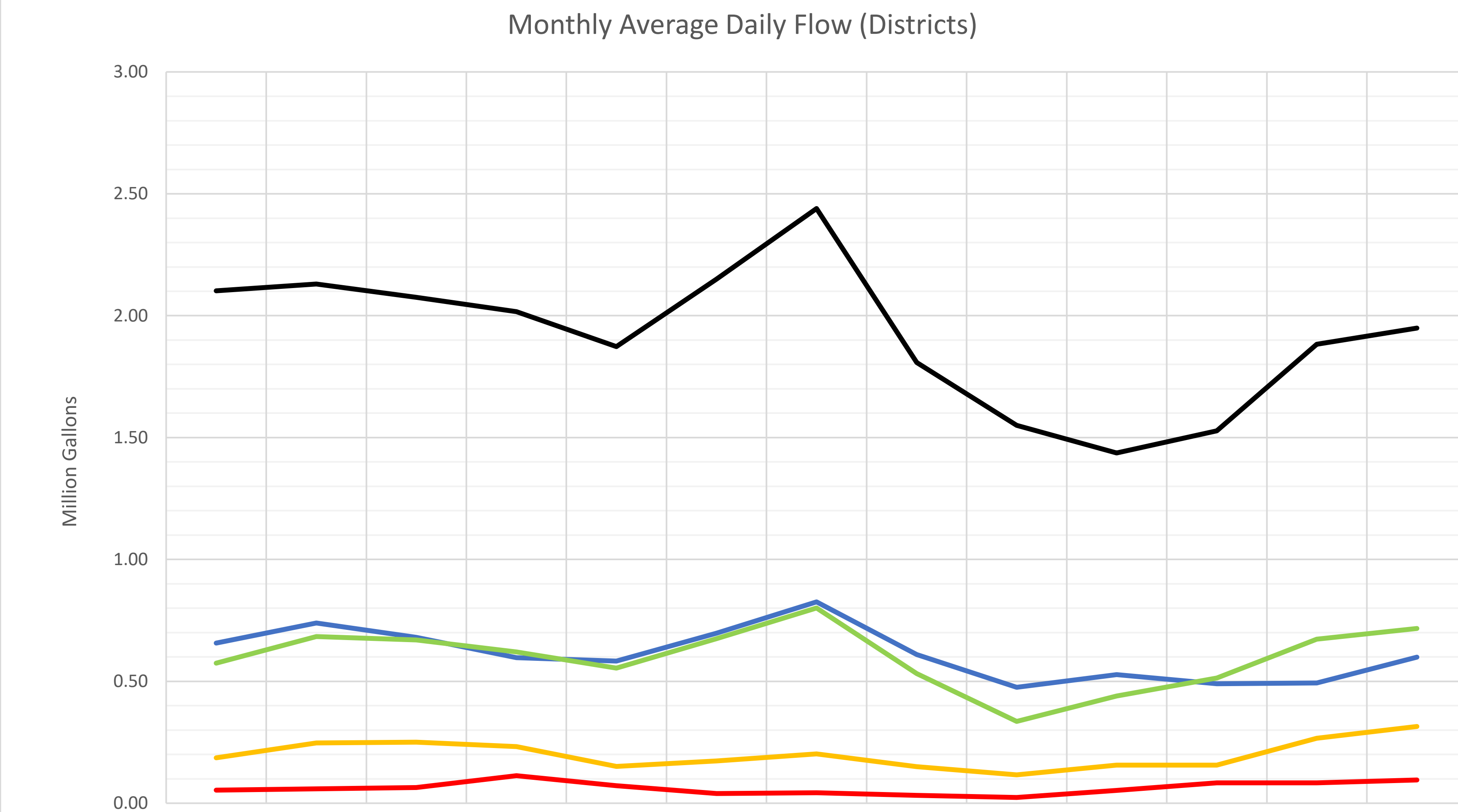
Review Tracking:

Submitted By: ______________________
Michael Peak
Operations Manager

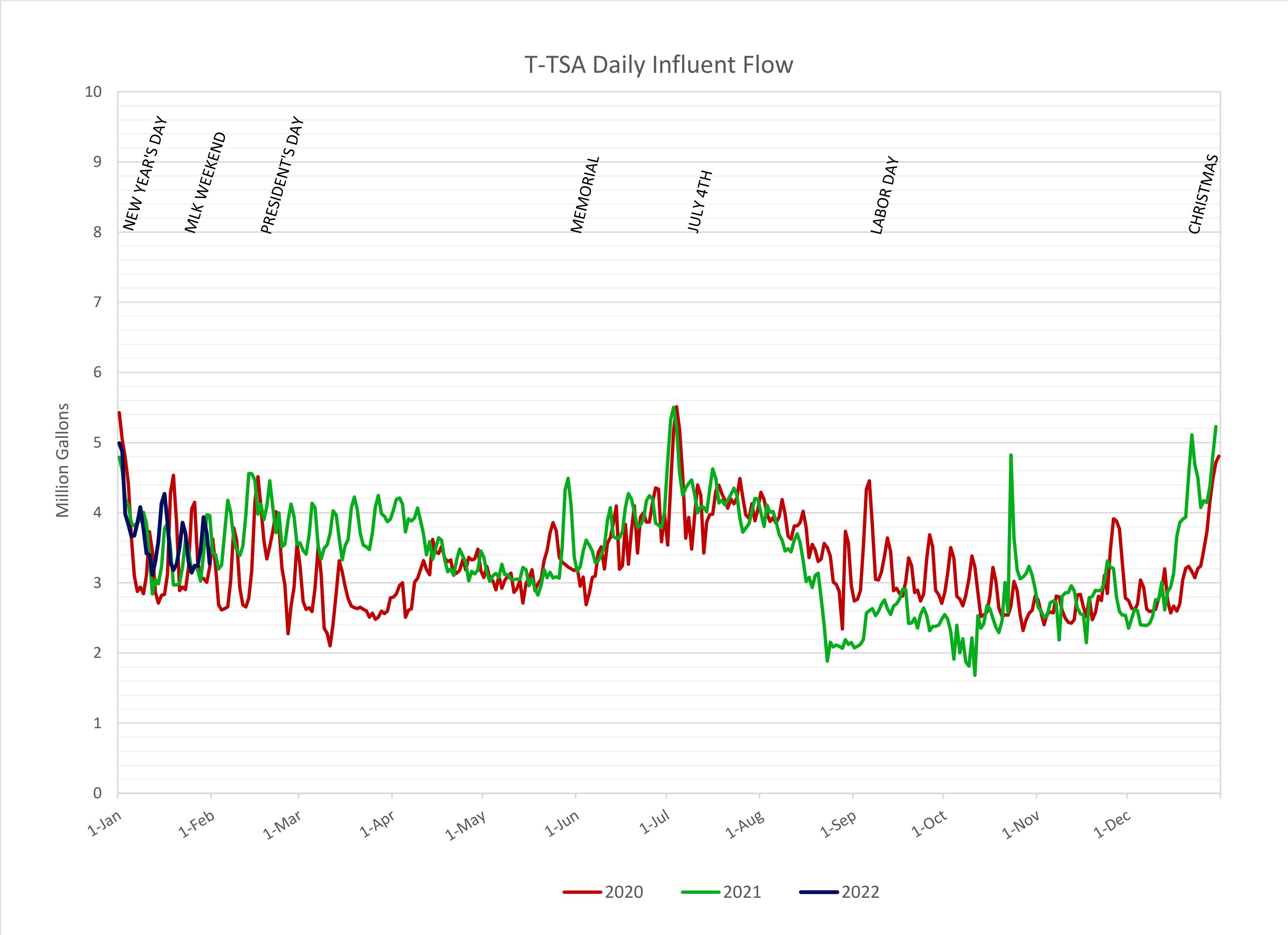
Approved By: ______________________
LaRue Griffin
General Manager



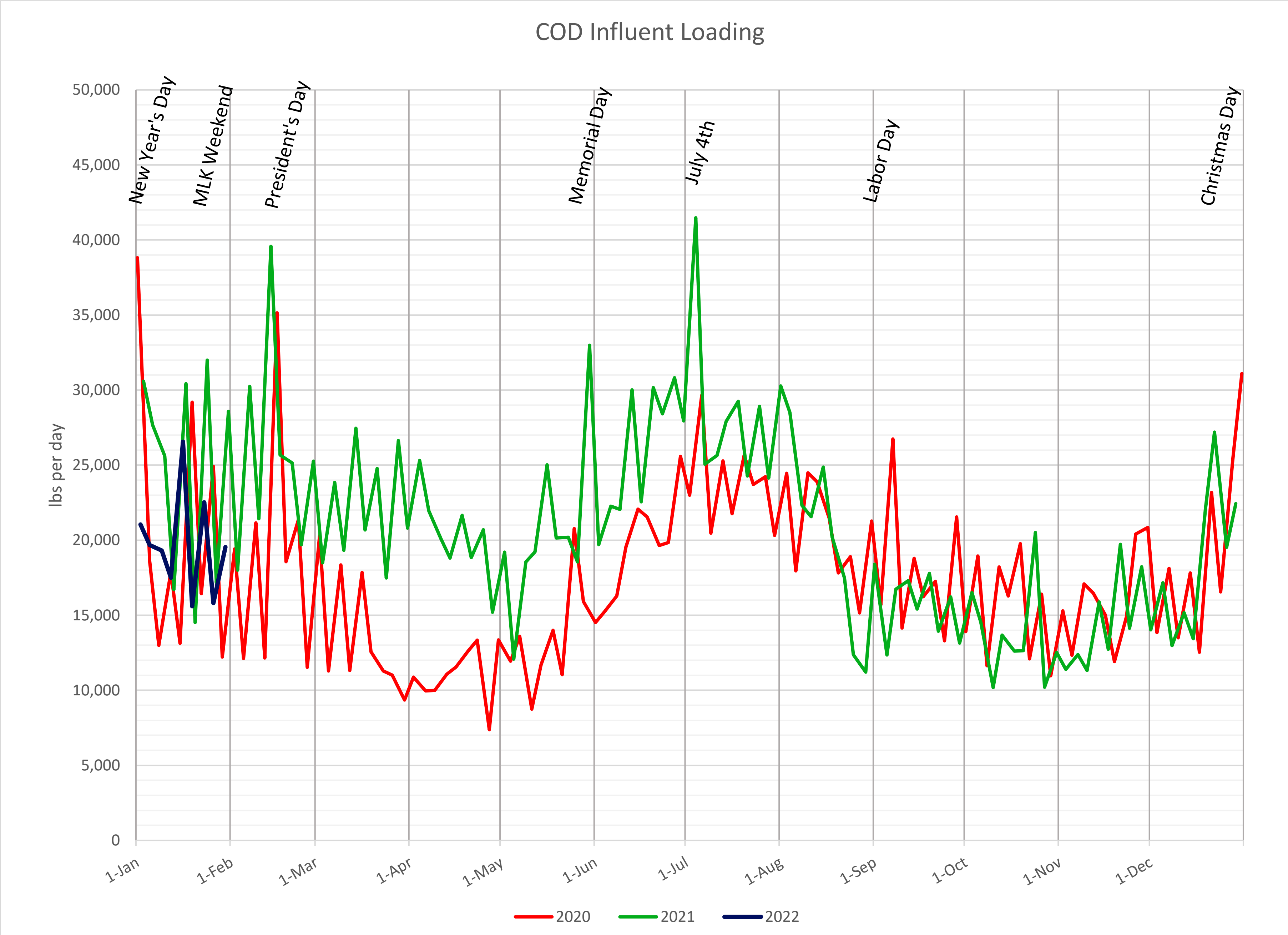
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	5.98	8.18	7.23	7.56	5.83	4.58	5.09	4.37	3.72	3.18	3.68	3.95
2018	3.99	3.82	4.72	5.44	4.02	4.05	4.73	4.03	3.48	3.08	3.06	3.67
2019	4.09	4.71	5.52	6.63	5.07	4.32	4.57	3.96	3.33	2.93	2.81	3.89
2020	3.49	3.26	2.71	3.16	3.16	3.57	4.18	3.61	3.19	2.82	2.83	3.12
2021	3.57	3.86	3.74	3.58	3.23	3.74	4.31	3.13	2.50	2.61	2.76	3.41
2022	3.68											



	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22
NTPUD	0.66	0.74	0.68	0.60	0.58	0.70	0.83	0.61	0.48	0.53	0.49	0.49	0.60
TCPUD	0.57	0.68	0.67	0.62	0.55	0.68	0.80	0.53	0.34	0.44	0.51	0.67	0.72
ASCWD	0.05	0.06	0.06	0.11	0.07	0.04	0.04	0.03	0.02	0.05	0.08	0.08	0.10
OVPSD	0.19	0.25	0.25	0.23	0.15	0.17	0.20	0.15	0.12	0.16	0.16	0.27	0.31
TSD	2.10	2.13	2.08	2.02	1.87	2.15	2.44	1.81	1.55	1.44	1.53	1.88	1.95

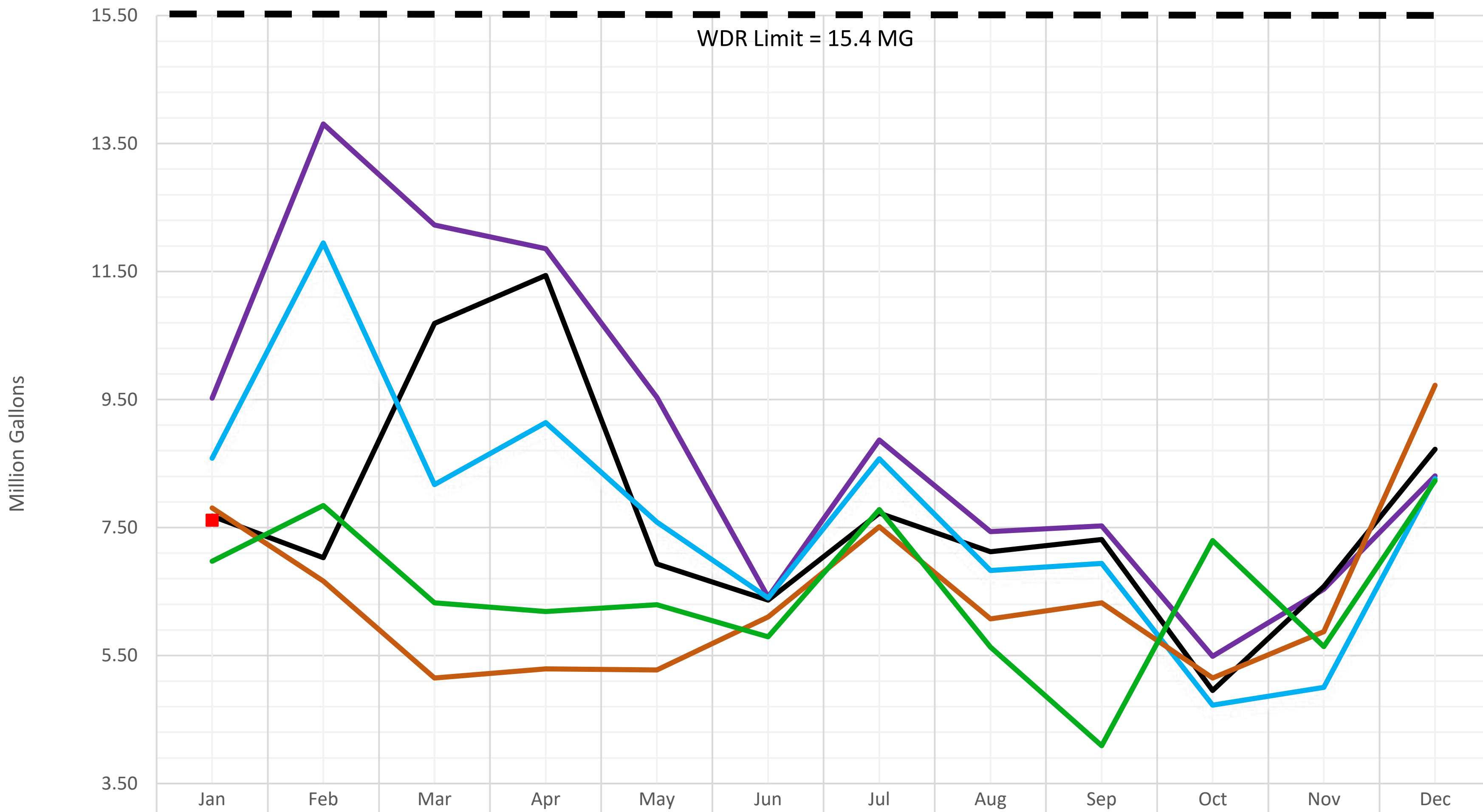


T-TSA Daily Influent Flow
Million Gallons
10
9
8
7
6
5
4
3
2
1
0
NEW YEAR'S DAY
MLK WEEKEND
PRESIDENT'S DAY
MEMORIAL
JULY 4TH
LABOR DAY
CHRISTMAS
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
2020
2021
2022



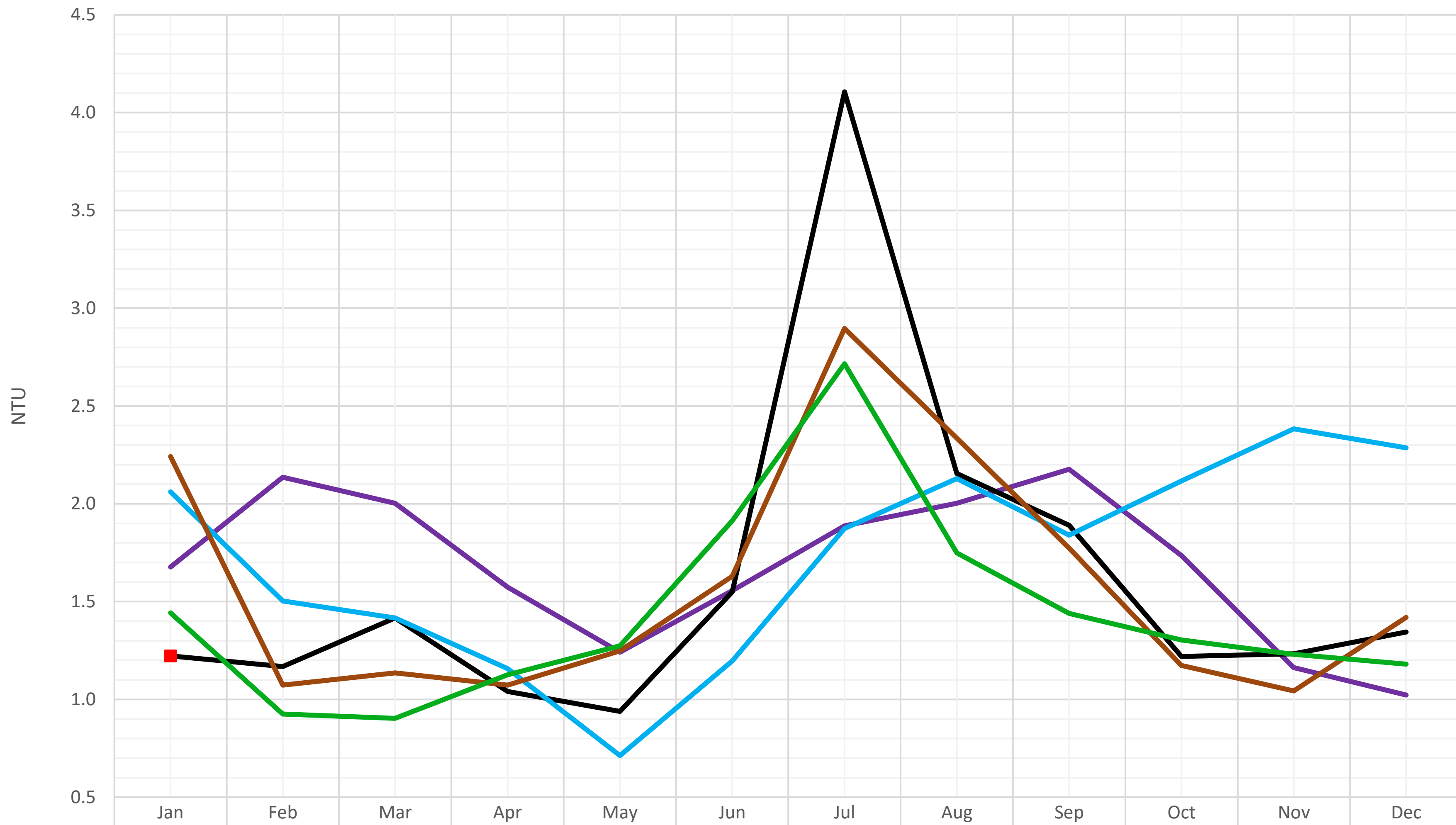
COD Influent Loading
lbs per day
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
New Year's Day
MLK Weekend
President's Day
Memorial Day
July 4th
Labor Day
Christmas Day
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
2020
2021
2022

Monthly Maximum Instantaneous Flow (Influent)



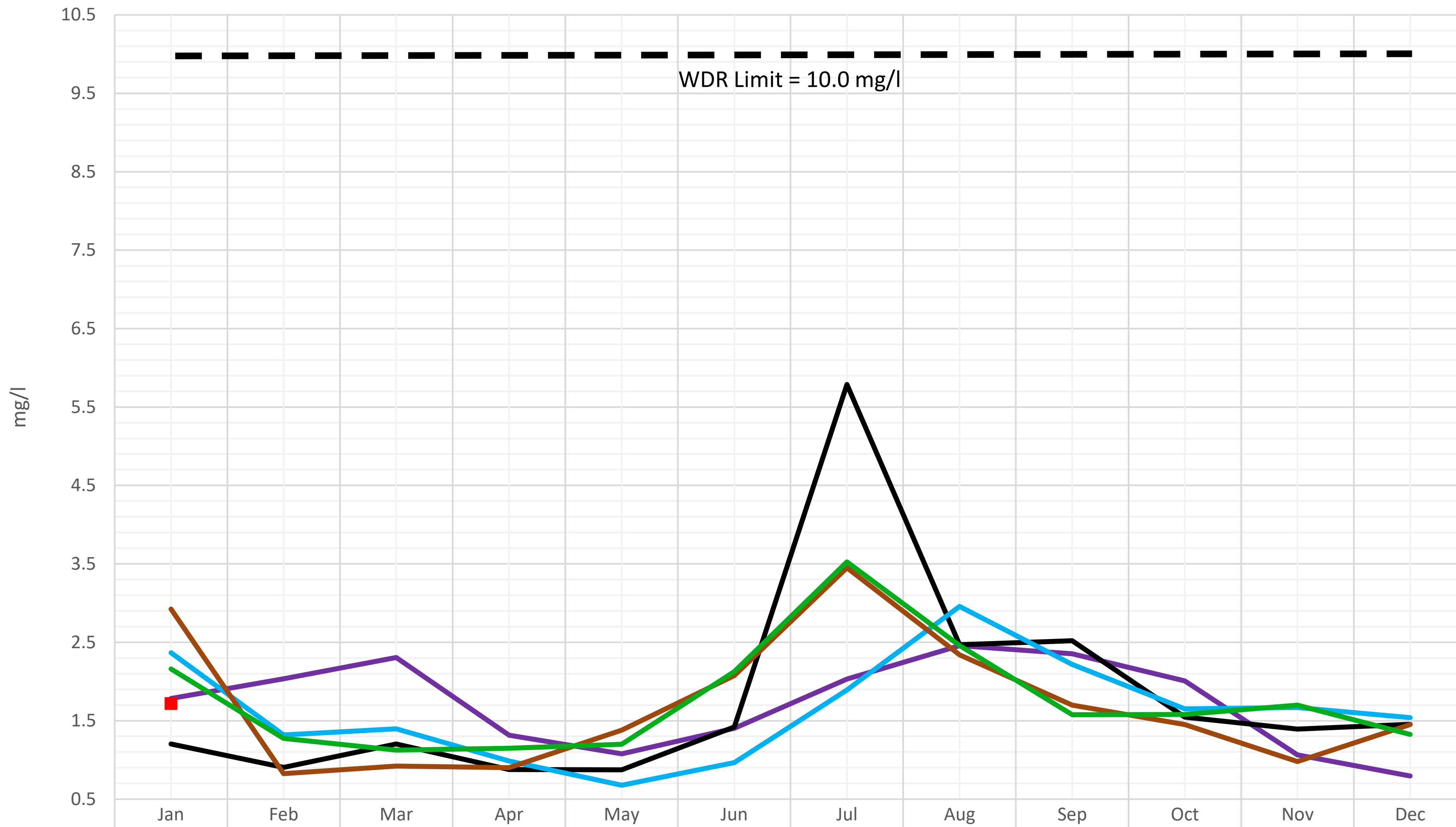
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	9.52	13.81	12.23	11.86	9.54	6.41	8.87	7.44	7.53	5.49	6.53	8.31
2018	7.68	7.03	10.69	11.44	6.93	6.37	7.73	7.12	7.31	4.95	6.58	8.72
2019	8.58	11.95	8.17	9.14	7.59	6.40	8.57	6.83	6.94	4.73	5.00	8.26
2020	7.81	6.66	5.15	5.29	5.27	6.10	7.51	6.07	6.33	5.15	5.87	9.72
2021	6.98	7.84	6.33	6.19	6.29	5.79	7.78	5.63	4.09	7.30	5.64	8.23
2022	7.61											

Monthly Average Daily Turbidity (Effluent)



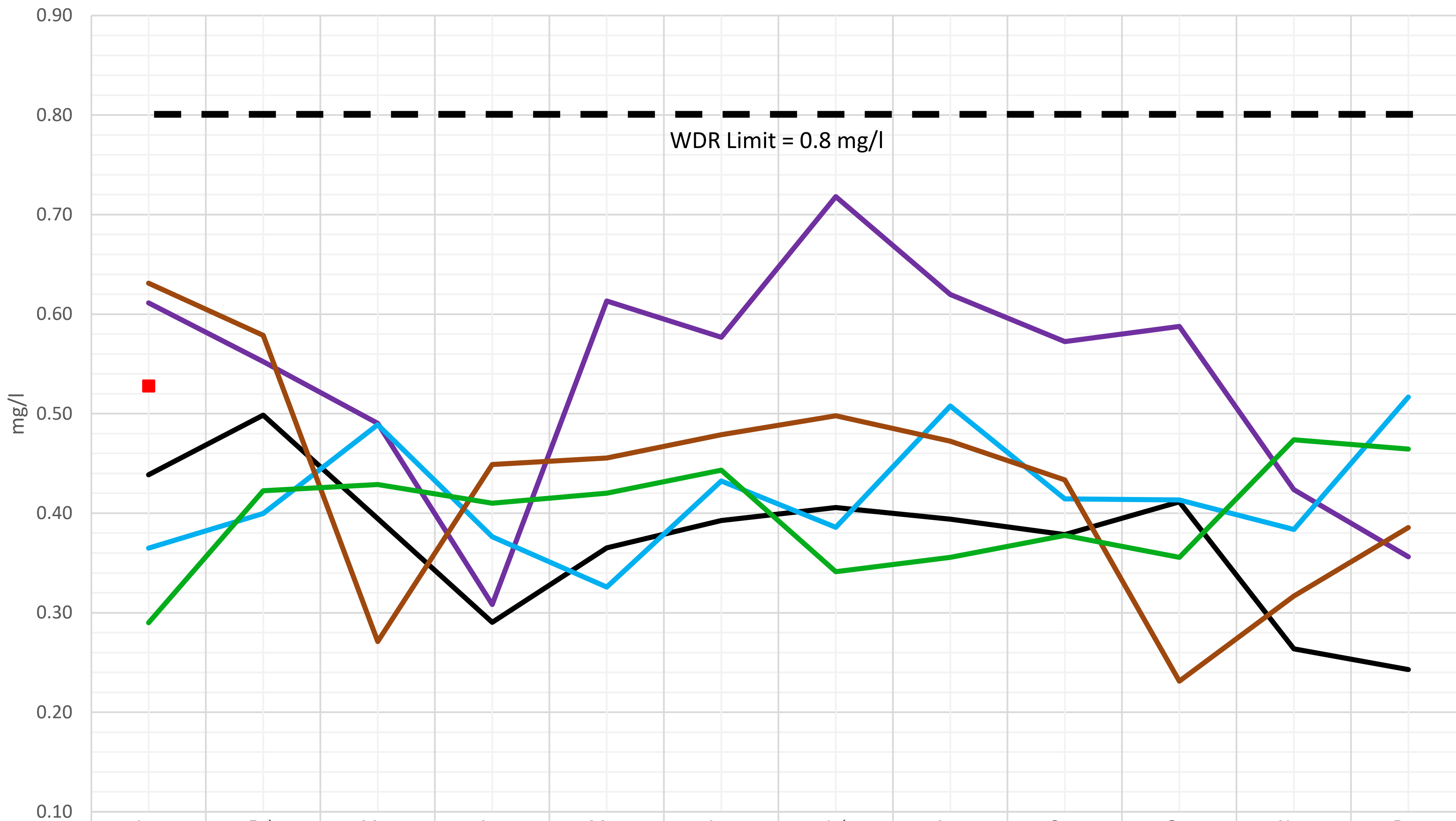
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	1.7	2.1	2.0	1.6	1.2	1.6	1.9	2.0	2.2	1.7	1.2	1.0
2018	1.2	1.2	1.4	1.0	0.9	1.6	4.1	2.2	1.9	1.2	1.2	1.3
2019	2.1	1.5	1.4	1.2	0.7	1.2	1.9	2.1	1.8	2.1	2.4	2.3
2020	2.2	1.1	1.1	1.1	1.2	1.6	2.9	2.3	1.8	1.2	1.0	1.4
2021	1.4	0.9	0.9	1.1	1.3	1.9	2.7	1.7	1.4	1.3	1.2	1.2
2022	1.2											

Monthly Average Daily Suspended Solids (Effluent)

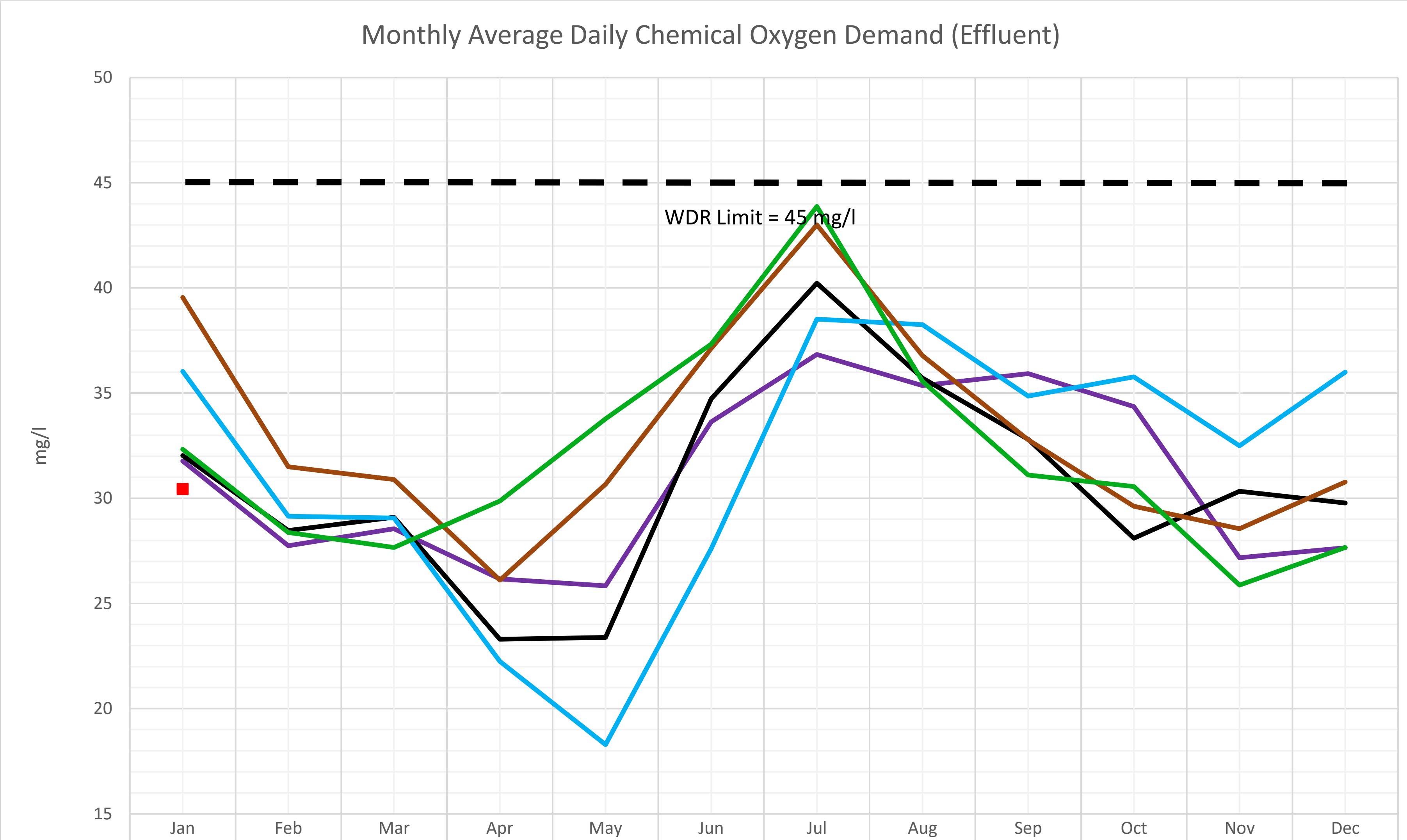


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	1.8	2.0	2.3	1.3	1.1	1.4	2.0	2.5	2.4	2.0	1.1	0.8
2018	1.2	0.9	1.2	0.9	0.9	1.4	5.8	2.5	2.5	1.5	1.4	1.5
2019	2.4	1.3	1.4	1.0	0.7	1.0	1.9	3.0	2.2	1.7	1.7	1.5
2020	2.9	0.8	0.9	0.9	1.4	2.1	3.5	2.3	1.7	1.5	1.0	1.5
2021	2.2	1.3	1.1	1.2	1.2	2.1	3.5	2.5	1.6	1.6	1.7	1.3
2022	1.7											

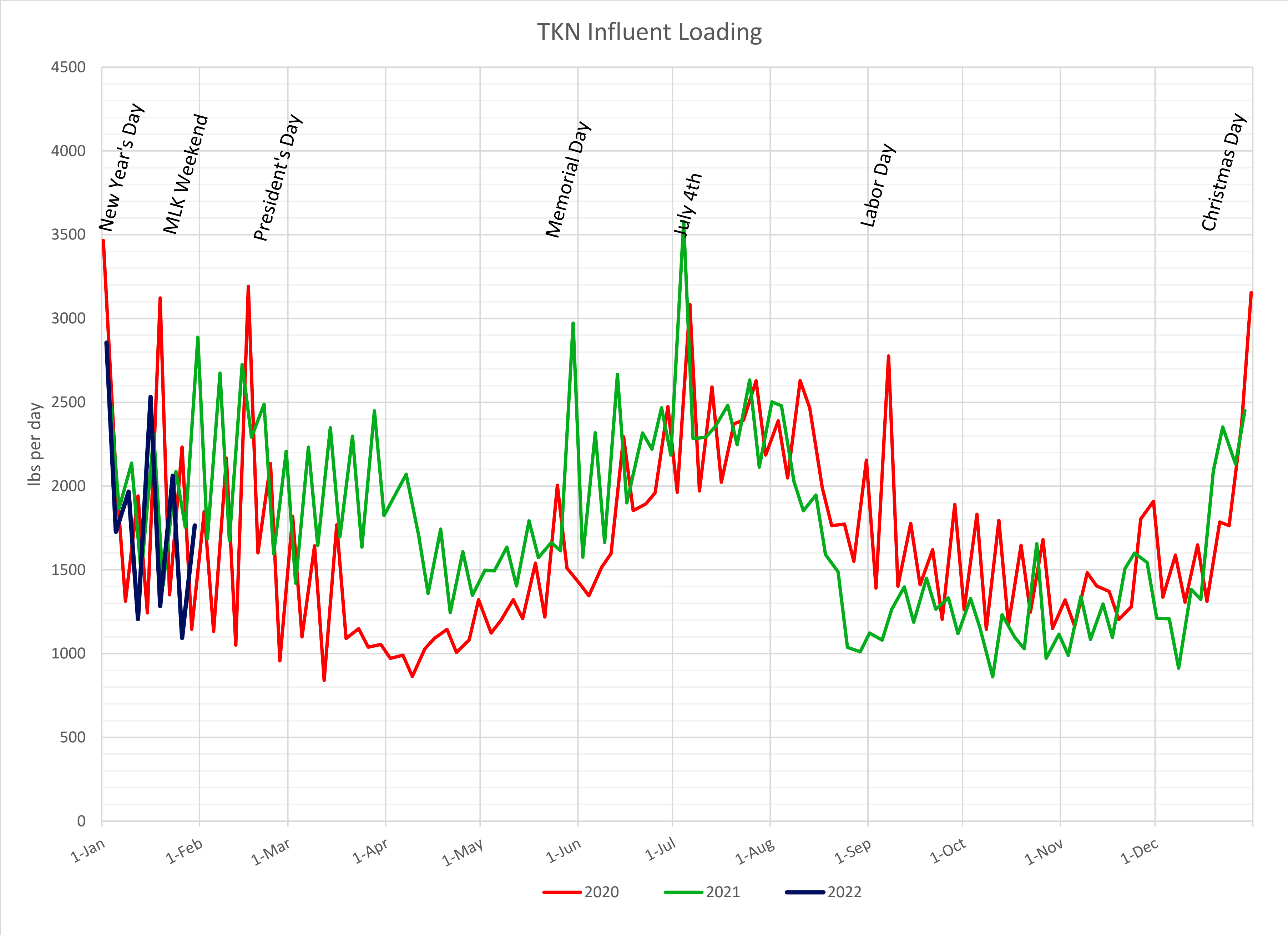
Monthly Average Daily Total Phosphorus (Effluent)



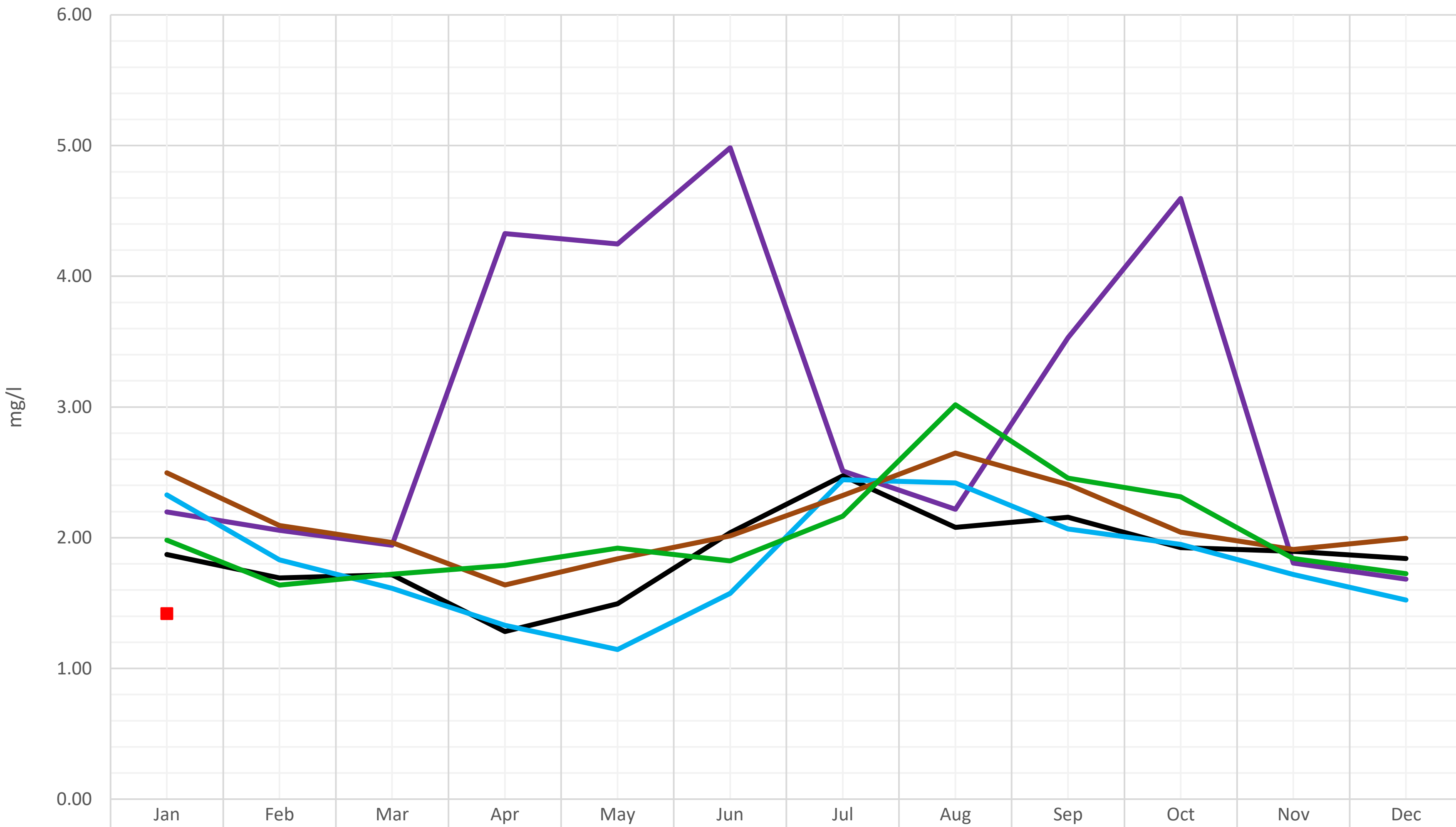
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	0.61	0.55	0.49	0.31	0.61	0.58	0.72	0.62	0.57	0.59	0.42	0.36
2018	0.44	0.50	0.39	0.29	0.37	0.39	0.41	0.39	0.38	0.41	0.26	0.24
2019	0.36	0.40	0.49	0.38	0.33	0.43	0.39	0.51	0.41	0.41	0.38	0.52
2020	0.63	0.58	0.27	0.45	0.46	0.48	0.50	0.47	0.43	0.23	0.32	0.39
2021	0.29	0.42	0.43	0.41	0.42	0.44	0.34	0.36	0.38	0.36	0.47	0.46
2022	0.53											



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	32	28	29	26	26	34	37	35	36	34	27	28
2018	32	28	29	23	23	35	40	36	33	28	30	30
2019	36	29	29	22	18	28	39	38	35	36	33	36
2020	40	32	31	26	31	37	43	37	33	30	29	31
2021	32	28	28	30	34	37	44	36	31	31	26	28
2022	30											

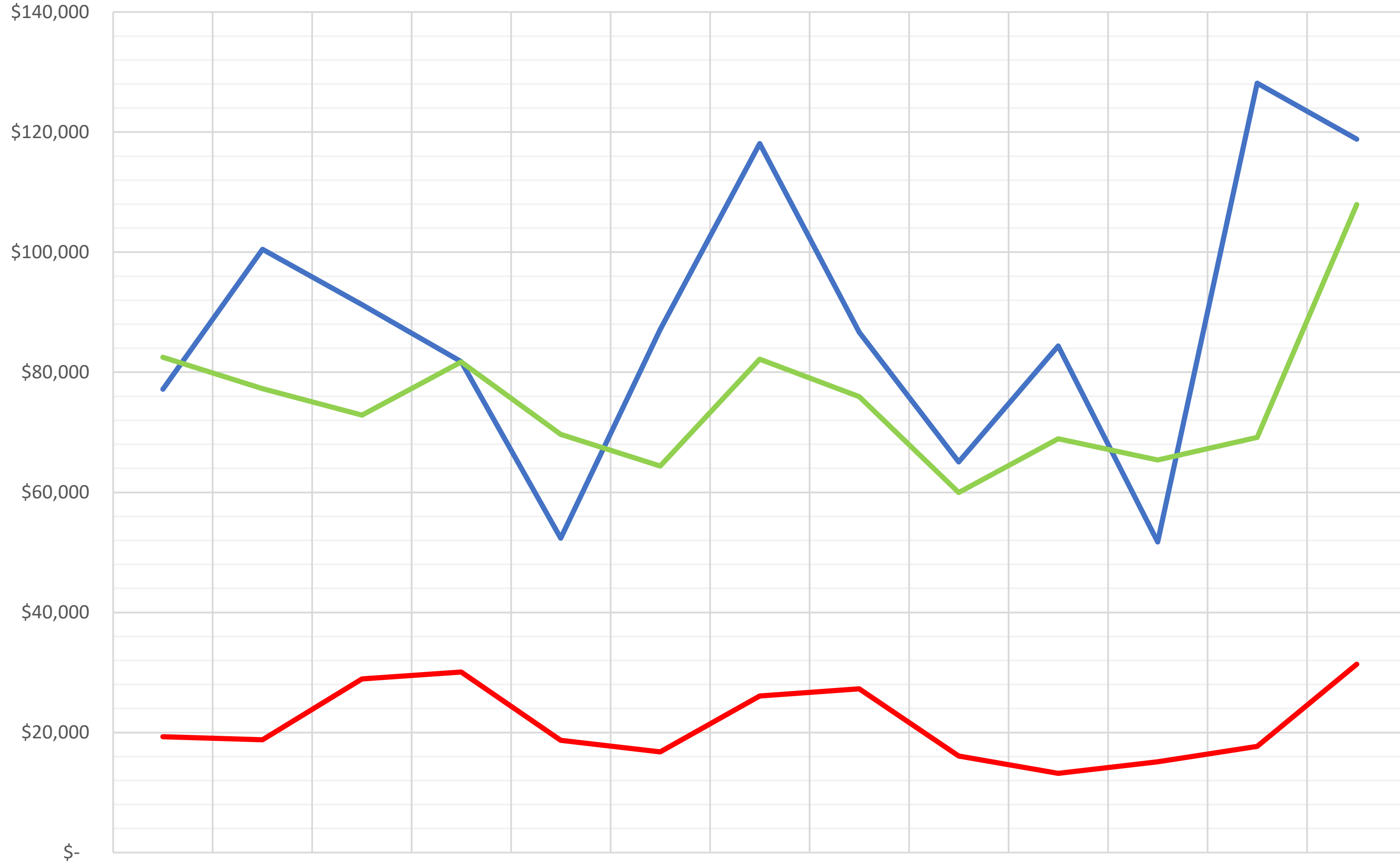

TKN Influent Loading
lbs per day
4500
4000
3500
3000
2500
2000
1500
1000
500
0
New Year's Day
MLK Weekend
President's Day
Memorial Day
July 4th
Labor Day
Christmas Day
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
2020
2021
2022

Monthly Average Daily Total Nitrogen (Effluent)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	2.20	2.06	1.94	4.33	4.25	4.98	2.51	2.22	3.53	4.60	1.81	1.68
2018	1.87	1.69	1.72	1.28	1.50	2.04	2.47	2.08	2.16	1.92	1.90	1.84
2019	2.33	1.83	1.61	1.33	1.14	1.57	2.44	2.42	2.07	1.95	1.72	1.52
2020	2.50	2.09	1.96	1.64	1.84	2.01	2.32	2.65	2.41	2.04	1.91	2.00
2021	1.98	1.64	1.72	1.79	1.92	1.82	2.17	3.02	2.46	2.31	1.84	1.73
2022	1.42											

Chemical, Power and Sludge Disposal Costs



	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22
Chemical	$77,169	$100,486	$91,278	$81,758	$52,348	$87,109	$118,100	$86,660	$65,076	$84,387	$51,738	$128,152	$118,832
Power	$82,480	$77,270	$72,881	$81,705	$69,645	$64,361	$82,199	$75,956	$59,970	$68,936	$65,393	$69,150	$107,937
Sludge Disposal	$19,302	$18,781	$28,938	$30,061	$18,691	$16,768	$26,075	$27,293	$16,092	$13,197	$15,117	$17,692	$31,373

TAHOE-TRUCKEE SANITATION AGENCY
MAINTENANCE DEPARTMENT REPORT

Date: February 16, 2022

To: Board of Directors

From: Richard Pallante, Maintenance Manager

Subject: Maintenance Report

♦ **Project support:** In the month of January, Maintenance staff provided support for the following projects:

- Headworks Improvements project.
- 2021 Plant Painting project.
- Plant Security Camera project.
- Lucity CMMS project.
- Final Effluent Flow Meter project.

♦ **Plant Maintenance activities:** Maintenance staff performed tasks on the following items:

- Maintenance shop floor coating and shop move.
- Snow removal for pond access.
- Stripper #58 electrical for 2021 Plant Painting project.
- MPPS LED lighting upgrade.
- BNR influent pump strainer inspection.
- Logically implementation.
- BNR Blower cabinet fan modifications.
- SCADA/IT Master Plan.
- Thickening polymer system demo.
- AWT panel demo and modification.

♦ **Work Orders**

- Completed this month: Mechanical-12, Fleet-30, Electrical & Instrumentation-24, IT-24.
- Pending: Mechanical-177, Fleet-58, Electrical & Instrumentation-40, IT-21.

Review Tracking:

Submitted By: ______________________
Richard Pallante
Maintenance Manager

Approved By: ______________________
LaRue Griffin
General Manager


Stripper #58 Electrical


AWT Panel Demo and Modification


Pond Access Snow Removal


BNR Influent Pump Strainer

TAHOE-TRUCKEE SANITATION AGENCY
ENGINEERING DEPARTMENT REPORT

Date: February 16, 2022

To: Board of Directors

From: Jay Parker, Engineering Manager

Subject: Engineering Report

- **Projects:** In the month of January, Engineering staff continued working on the following projects:
  - Master Sewer Plan
  - Digestion Improvements Study
  - 2020 Headworks Improvements Project
  - 2021 Chlorine Scrubber Improvements Project
  - 2021 Digital Scanning of Sewer Lines Project
  - 2022 Digital Scanning of Sewer Lines Project
  - 2022 Control Room Upgrades Project
  - 2022 Filter Influent Condition Assessment Project
  - 2022 Plant Coating Project
  - 2022 Plant Improvements Project
  - 2022 Roof Repair Project
  - 2022 Sewer Manhole Adjustment Project

- **Work Orders:**
  - Engineering:
    - Completed this month: 0
    - Pending: 0
  - Safety:
    - Completed this month: 2
    - Pending: 5

Review Tracking:

Submitted By: ______________________
Jay Parker
Engineering Manager

Approved By: ______________________
LaRue Griffin
General Manager

TAHOE-TRUCKEE SANITATION AGENCY
ADMINISTRATIVE DEPARTMENT REPORT

Date: February 16, 2022

To: Board of Directors

From: Crystal Sublet, Finance and Administrative Manager

Subject: Administrative Report

- Finance
  - Completed monthly A/P, A/R, payroll, general ledger processes, and bank reconciliations.
  - Continued support for additional requests from auditors for fiscal year 2020-2021 audit.
  - Completed and distributed W-2s and 1099s.
  - Implemented front gate procedures.
  - Participated in the financial committee meeting on February 7, 2022.

- Billing/Customer Service
  - General assistance with customer accounts, utility demands, adjustments, and plan review.
  - Activated new account permits and prepared letters, reports and invoices.
  - Performed purchasing duties.
  - Completed the January 2022 direct billing and made necessary corrections.

- General Administration
  - Performed various administrative duties to assist GM and Board of Directors.
  - Continued training and research on investment and funding opportunities.
  - Offer and acceptance for Purchasing Agent I/II.
  - Completed the State Controller's Report and filed to the State of California.

Review Tracking

Submitted By: ______________________
Crystal Sublet
Finance and Administrative Manager

Approved By: ______________________
LaRue Griffin
General Manager

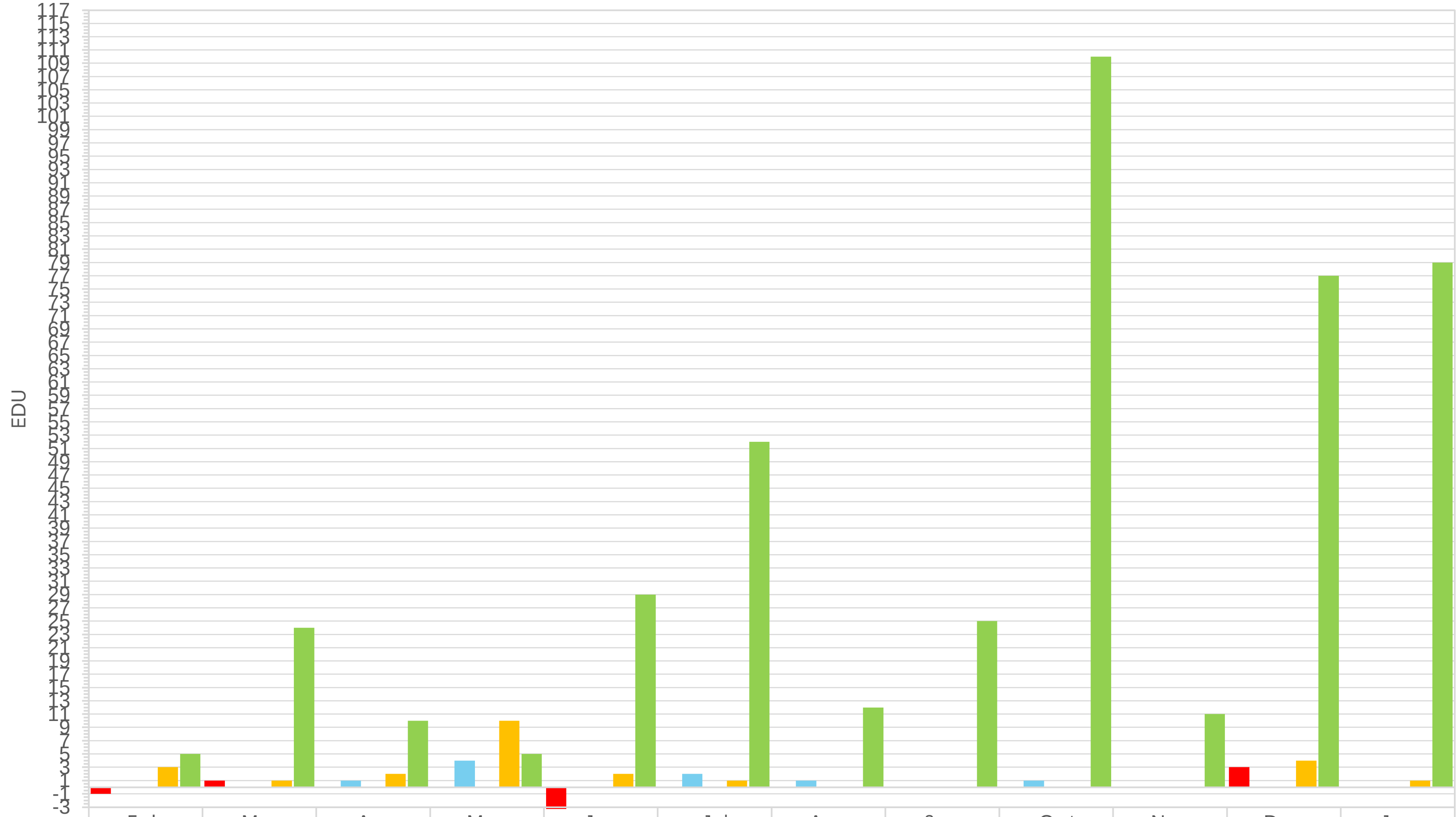
CONNECTION FEES - JANUARY 2022

Connection Fee Type	MTD Count (#)	MTD Total Ft²	MTD Total $	YTD Count (#)	YTD Total Ft²	YTD Total $
Residential	6	17,251	$ 39,189.25	231	650,605	$ 1,462,655.55
Residential Ft² Additions	0	0	$ -	15	22,956	$ 40,173.00
Residential Ft² Additions - Exempt	0	0	N/A	2	443	N/A
Accessory Dwelling Unit (ADU)	1	550	$ 2,462.50	6	6,358	$ 20,126.50
Accessory Dwelling Unit (ADU) - Exempt	0	0	N/A	1	118	N/A
Commercial	0	N/A	$ -	4	N/A	$ 78,500.00
Industrial	0	N/A	$ -	0	N/A	$ -
Grand Total	**7**	**17,801**	**$ 41,651.75**	**259**	**680,480**	**$ 1,601,455.05**

INSPECTIONS - JANUARY 2022

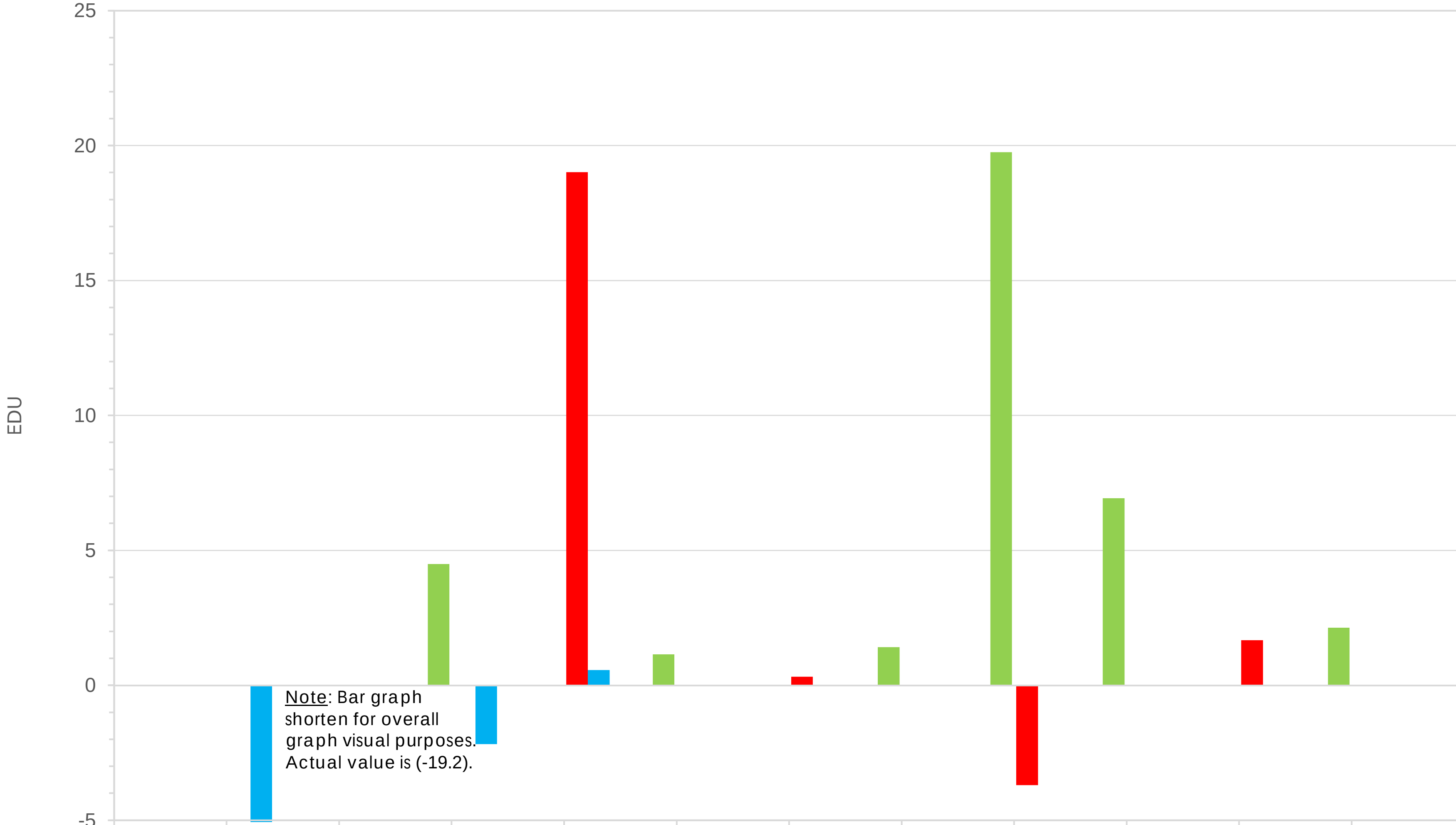
Inspection Type	MTD Count #	MTD Total	YTD Count #	YTD Total
Commercial	1	1	8	9
Residential (Drive-by of Suspended Accounts)	0		1	

Residential EDU Summary

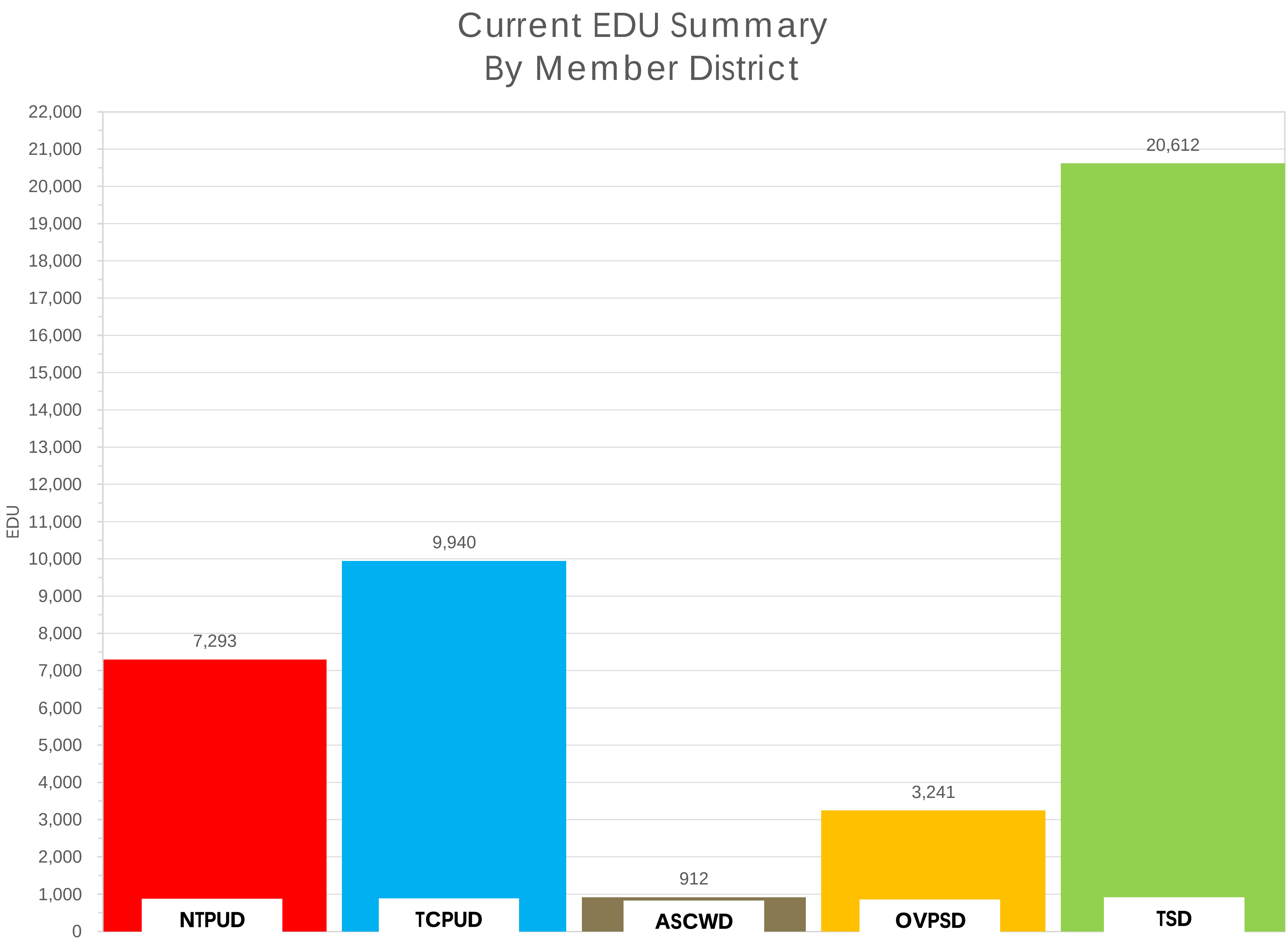


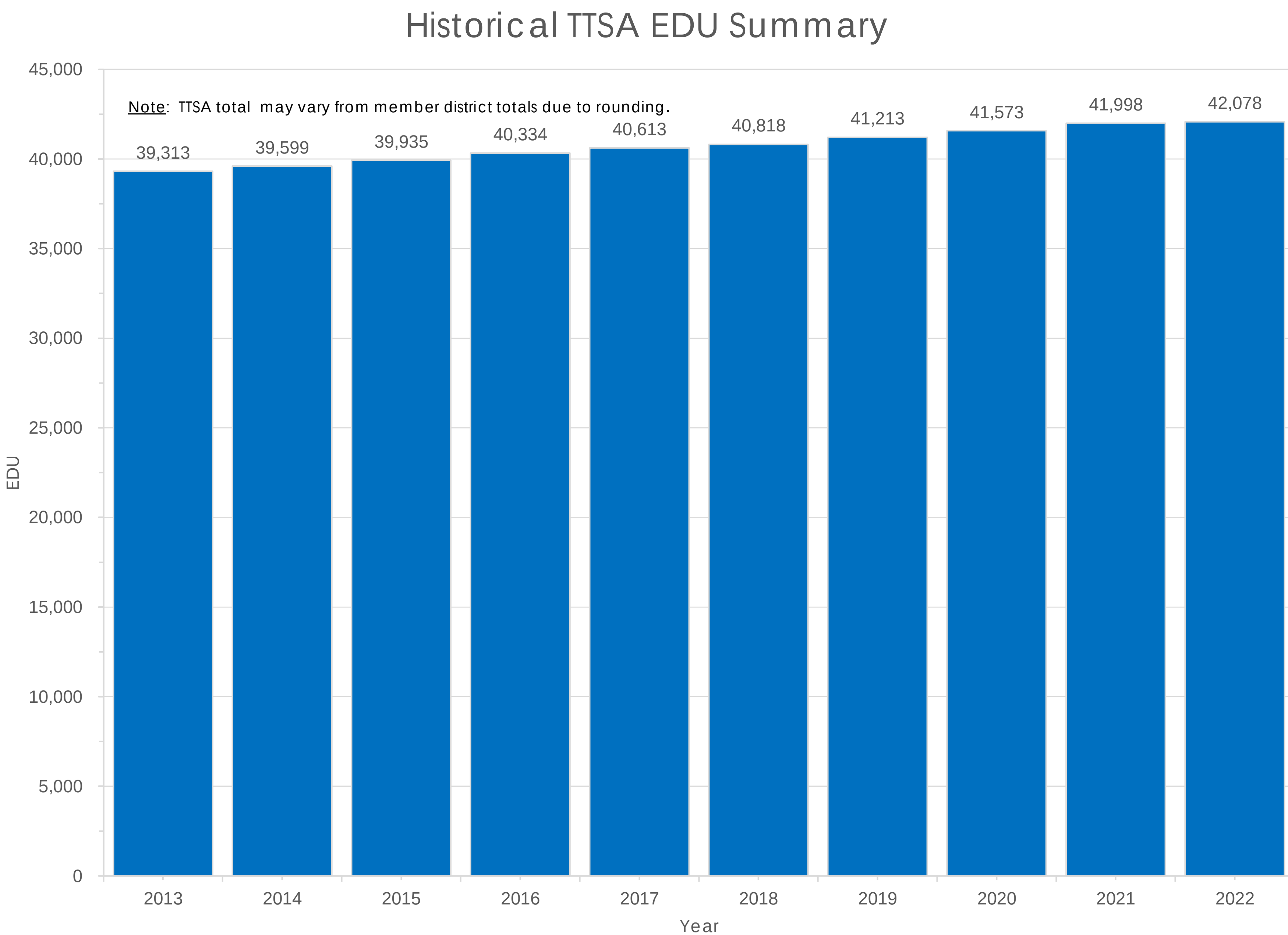
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
NTPUD	(1)	1	0	0	(19)	0	0	0	0	0	3	0
TCPUD	0	0	1	4	0	2	1	0	1	0	0	0
ASCWD	0	0	0	0	0	0	0	0	0	0	0	0
OVSPD	3	1	2	10	2	1	0	0	0	0	4	1
TSD	5	24	10	5	29	52	12	25	110	11	77	79

Other EDU Summary



	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
NTPUD	0.0	0.0	0.0	0.0	19.0	0.0	0.3	0.0	(3.7)	0.0	1.7	0.0
TCPUD	0.0	(19.2)	0.0	(2.2)	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ASCWD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OVSPD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TSD	0.0	0.0	4.5	0.0	1.2	0.0	1.4	19.8	6.9	0.0	2.1	0.0


Current EDU Summary
By Member District
EDU
22,000
21,000
20,000
19,000
18,000
17,000
16,000
15,000
14,000
13,000
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
7,293
9,940
912
3,241
20,612
NTPUD
TCPUD
ASCWD
OVPSD
TSD


Historical TTSA EDU Summary
Note: TTSA total may vary from member district totals due to rounding.
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
EDU
39,313
39,599
39,935
40,334
40,613
40,818
41,213
41,573
41,998
42,078
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Year

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: LaRue Griffin, General Manager

Item: VII-2

Subject: General Manager Report

Continuing Projects/Work

- Management and staff continued to investigate options to become more efficient.
- Management and staff continued implementation of the new software programs.
- Management and staff continued progress on CIP projects.
- Management and staff continued leadership training.

Past Month Projects/Work

- Agency recruitment status:
  - *Maintenance Mechanic I/II/III* – One candidate is scheduled to start employment at the end of February. The other candidate is expected to start at the end of March.
  - *WWTP Operator OIT/I/II/III* – Both candidates are scheduled to start employment in March.
  - *Purchasing Agent I/II* – The candidate is scheduled to start employment at the end of February.
- Management participated in safety rounds on various tasks.
- Logically Inc. has installed new anti-virus, phishing, malware, and spam software.
- Staff provided feedback to the amended front entry landscape layout.
- The Agency front entry/exit gate is in full operation.
- Management executed Change Order No. 1 for the 2021 Digital Scanning of Sewer Lines project (attached).

Review Tracking

Submitted By: ____________________
LaRue Griffin
General Manager

TAHOE-TRUCKEE SANITATION AGENCY
A Public Agency
13720 Butterfield Drive
TRUCKEE, CALIFORNIA 96161
(530) 587-2525 • FAX (530) 587-5840

Directors
Dan Wilkins: President
Blake Tresan: Vice President
S. Lane Lewis
Dale Cox
David Smelser
General Manager
LaRue Griffin

CONTRACT MODIFICATION NO. 1
(Change Order)

The following additions, deletions or revisions to the Contract Documents for the 2021 Digital Scanning of Sewer Lines by and between the Tahoe-Truckee Sanitation Agency and Pro-Pipe, Inc. dated August 2nd, 2021 have been ordered and authorized:

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
1	Reduce total length scanned from 39,100.00 Lineal Feet to 38,402.40 Lineal Feet (a decrease of 697.60 Lineal Feet).	(697.60)	Lineal Feet	$2.28	($1,590.53)
2	Reduce integration of data collection from scanning of sewer lines importable to Geographic Information System (GIS) software from 39,100.00 Lineal Feet to 38,402.40 Lineal Feet (a decrease of 697.60 Lineal Feet).	(697.60)	Lineal Feet	$2.28	($1,590.53)
				Total Cost for Items 1 and 2	($3,181.06)

ORIGINAL CONTRACT AMOUNT: $178,296.00
CONTRACT MODIFICATION NO. 1 AMOUNT: ($ 3,181.06)

REVISED CONTRACT AMOUNT: $175,114.94

CONTRACT TIME ADJUSTMENT: None

All terms and conditions stipulated in the Contract Documents for the 2021 Digital Scanning of Sewer Lines by and between the Tahoe-Truckee Sanitation Agency and Pro-Pipe, Inc. dated August 2nd, 2021 are incorporated herein, except as provided in approved Contract Modifications.

ACCEPTED BY: ______________________ 01-28-2022
Pro-Pipe, Inc. Date

APPROVED BY ______________________ 2/7/22
Tahoe-Truckee Sanitation Agency Date

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: LaRue Griffin, General Manager

Item: VIII

Subject: Board of Director Comment

Background

Opportunity for directors to ask questions for clarification, make brief announcements and reports, provide information to staff, request staff to report back on a matter, or direct staff to place a matter on a subsequent agenda.

TAHOE-TRUCKEE SANITATION AGENCY

MEMORANDUM

Date: February 16, 2022

To: Board of Directors

From: LaRue Griffin, General Manager

Item: IX

Subject: Closed Session

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1. Closed session for public employee performance evaluation of the General Manager position.