Facility Plan

Prepared for

Central Valley Water Reclamation Facility

Salt Lake City, Utah

July 3, 2019

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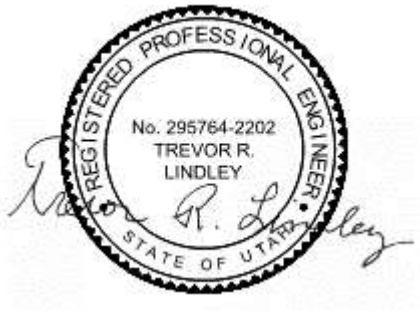

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ENVIRONMENTAL QUALITY

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DIVISION OF WATER QUALITY

July 3, 2019

Central Valley Water Reclamation Facility
Salt Lake City, Utah

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List of Abbreviations

4SMB	4-stage modified Bardenpho
5SB	5-stage Bardenpho
AADF	annual average daily flow
ADF	average daily flow
ADR	Anti-degradation review
BC	Brown and Caldwell
BNR	biological nutrient removal
BOD_5	five-day biochemical oxygen demand
CIPP	cured-in-place pipe
COD	chemical oxygen demand
CVWRF	Central Valley Water Reclamation Facility
DEQ	Utah Department of Environmental Quality
DRC	Utah Department of Environmental Quality Division of Radiation Control
DMR	Discharge Monitoring Report
DOE	United States Department of Energy
DWQ	Utah Division of Water Quality
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GHID	Granger-Hunter Improvement District
GPCD	gallons per capita per day
I/I	inflow and infiltration
KID	Kearns Improvement District
MBR	membrane bioreactor
mg/L	milligram per liter
mgd	million gallons per day
MMF	maximum month flow
mrem/h	millirem per hour
NRC	U.S. Nuclear Regulatory Commission
NWI	National Wetland Inventory
P	phosphorus
PDF	peak day flow
PHF	peak hour flow
RAS	return activated sludge
SIP	State Implementation Plan
SRF	State Revolving Fund
TAC	Technical Advisory Committee
TAZ	traffic analysis zones
TBID	Taylorsville-Bennion Improvement District
TBNEL	technology-based nitrogen effluent limit
TBPEL	technology-based phosphorus effluent limit
TF	trickling filter
TF-SC	trickling filter-solids contact
TIN	total inorganic nitrogen
TKN	total kjeldahl nitrogen
TP	total phosphorus
TSS	total suspended solids
UAC	Utah Administrative Code
UDAQ	Utah Division of Air Quality
UMTRCA	Uranium Mill Tailings Radiation Control Act
UPDES	Utah Pollutant Discharge Elimination System
VFA	Volatile Fatty Acids
WAS	waste activated sludge
WMRC	Utah Division of Waste Management and Radiation Control
WWTP	wastewater treatment plant

Section 1
Existing and Future Conditions

1.1 Project Need

The Utah Division of Water Quality (DWQ) has promulgated a technology-based phosphorus effluent limit (TBPEL). The TBPEL requires all 'non-lagoon' wastewater treatment plants (WWTPs) to meet a <1 milligram per liter (mg/L) effluent total phosphorus (TP) level by January 1, 2020. The deadline can be extended to 2025 with DWQ approval via submittal of a variance request and by showing due diligence toward compliance.

Currently, the Central Valley Water Reclamation Facility (CVWRF) uses a trickling filter-solids contact process (TF-SC) to treat incoming wastewater. The existing system does not provide a treated effluent that will meet the new phosphorus limits. Therefore, process modifications are required. A feasibility study has been conducted (Brown and Caldwell [BC], 2015) evaluating the technical and economic feasibility of modifying the CVWRF to achieve nutrient removal. The study evaluated many different chemical and biological treatment alternatives for phosphorus removal and provided a recommended alternative. The final report titled "*Evaluating the Technical and Economic Feasibility of Modifying the CVWRF to Achieve Nutrient Removal" (*aka, *Nutrient Feasibility Study*) recommended that:

- CVWRF move away from TF-SC to biological nutrient removal (BNR) using activated sludge under an anaerobic/aerobic control approach (e.g., A2O, AO, etc.); the process is to be master planned for an approach such as 5 stage Bardenpho;
- CVWRF conduct piloting to ensure adequate readily available carbon is present to drive the BNR process. CVWRF conducted the recommended piloting (2017) and is using the pilot results to further inform design of the BNR system. This piloting included fermentation of primary sludge and fermentation of return activated sludge (RAS). The piloting also further investigated optimal BNR configurations including the Westside process.

The recommended alternative was chosen based on lowest life cycle cost, cost and effectiveness analysis, and key policy directives from CVWRF including:

- Matching a recommended plan with the CVWRF mission statement, which is "…to improve the Utah environment by treating wastewater and recovering resources safely, efficiently, and sustainably." This policy directive tended to favor biological solutions over chemical solutions.
- Preference for long term solutions that would preferably address both phosphorus and nitrogen.

CVWRF requested a variance to delay the deadline for compliance to the TBPEL to provide more time to implement the recommended alternative. On April 3, 2017, DWQ provided an Approval-in Concept variance letter that effectively pushes the compliance date for the TBPEL to January 1, 2025.

In addition to the new and existing facilities directly impacted by the Nutrient Improvement Project, CVWRF is implementing other projects to address facility needs for the system's 30 to 40 year old assets. This Facility Plan is provided to the DWQ as part of a State Revolving Fund (SRF) loan request. The Facility Plan includes alternatives and recommendations related to facilities directly or

indirectly impacted by the nutrient improvements. The Facility Plan also includes an environmental review and a Level II Antidegradation review.

1.2 Existing Facilities

CVWRF was formed by an interlocal agreement in 1978. This agreement combined five smaller wastewater treatment facilities into a single larger regional wastewater treatment facility. Construction of CVWRF occurred in numerous construction packages in the early 1980s with commissioning in 1988. CVWRF is owned by its member agencies, including five special service districts and two municipalities, namely, Cottonwood Improvement District (Cottonwood ID), Granger-Hunter Improvement District (GHID), Kearns Improvement District (KID), Mt. Olympus Improvement District (Mt. Olympus ID), Taylorsville-Bennion Improvement District (TBID), Murray City (Murray), and South Salt Lake City (South SL). Each member entity is an owner based on a flow and load-proportioned share. Figure 1-1 shows the service area served by each member entity with flow to CVWRF for treatment. The combined interlocal CVWRF entity has jurisdiction over the following facilities:

- The treatment facility (i.e., the CVWRF), which is a 75 million gallon per day (mgd) TF-SC plant with its related unit processes including anaerobic digestion and cogeneration of heat and power from the biogas
- 7 miles of interceptor ranging in diameter from 33 to 84 inches
- Two siphon structures

Figure 1-2 is a site plan of the existing CVWRF with key notes detailing current CVWRF function. Raw wastewater enters the treatment plant headworks, passes through bar screens, and is pumped to aerated grit tanks and then flow is by gravity to the primary clarifiers. After treatment in the primary clarifiers, the primary effluent flows to the trickling filter pump stations (east side and west side) where it is lifted to the trickling filters. Water from the trickling filters then flows by gravity to the solids contact tank, to the secondary clarifiers and then onto UV disinfection; reaeration and discharge to Mill Creek follows UV disinfection. Primary and secondary solids are conveyed to the digestion process. The solids process includes first stage treatment in ‘egg shaped’ digesters followed by second stage digestion in conventional digesters. Solids are eventually dewatered with belt presses. Approximately 1/3 of the total solids are composted to Class A solids for local sales with the other 2/3 sent to a Class B land application site located in Weber County. The cogeneration facilities produce enough power for about 85 percent of the facility electrical needs with the remainder coming from Rocky Mtn. Power. The cogeneration engines provide enough energy to both heat and cool the entire facility. Other key support facilities include the “3Water” system (3W) which is utility water for high pressure, low pressure, and cooling water needs across the plant.

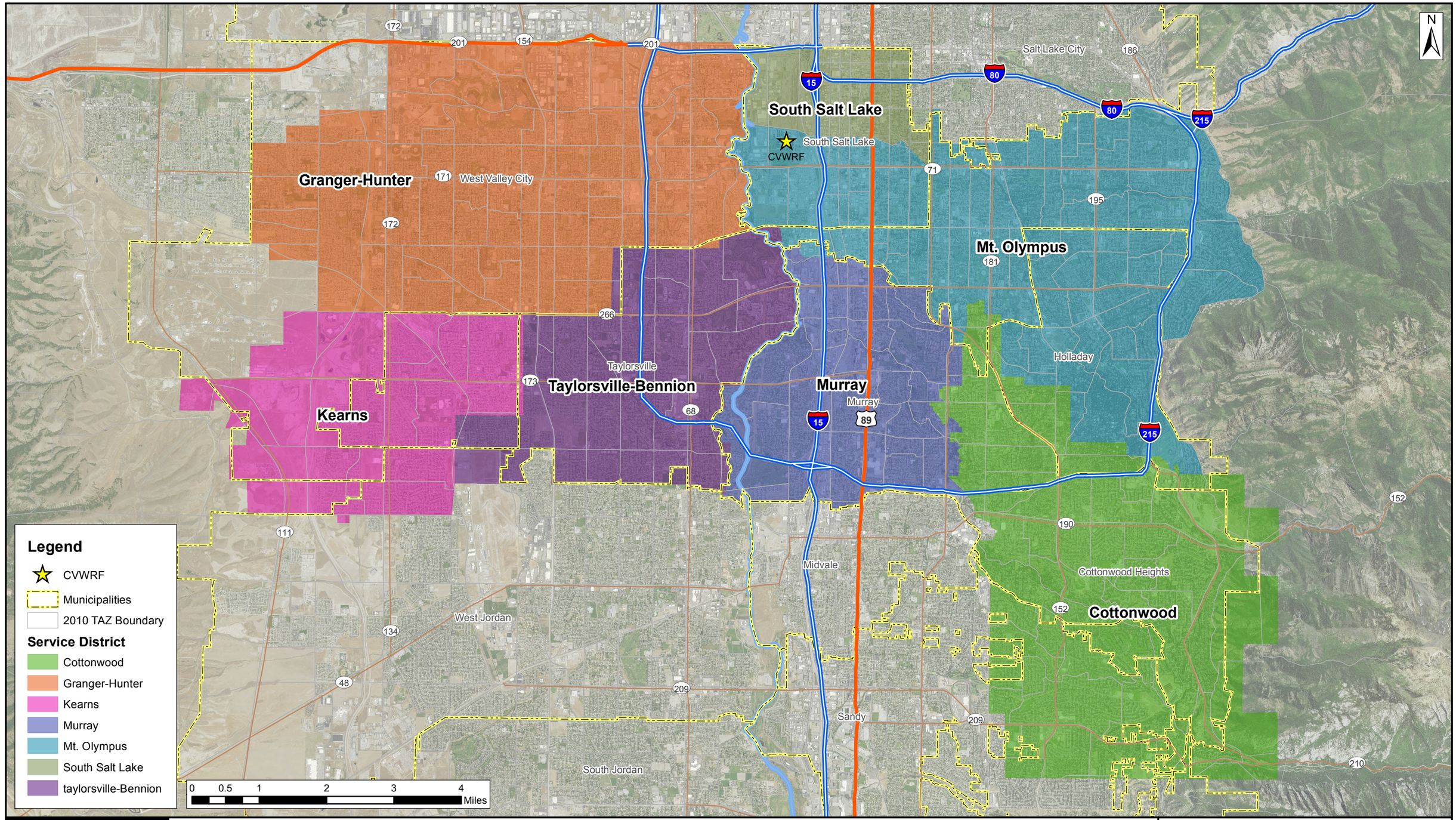

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FIGURE 1-1

CVWRF MEMBER ENTITIES

CVWRF

CENTRAL VALLEY WATER RECLAMATION FACILITY

STRUCTURES:

1. HEADWORKS / SCREENING □ GRIT HANDLING
2. AERATED GRIT CHANNELS
3. PRIMARY CLARIFIERS (WEST)
4. TRICKLING FILTER PUMP STATION (WEST)
5. TRICKLING FILTERS (WEST)
6. PRIMARY CLARIFIERS (EAST)
7. TRICKLING FILTER PUMP STATION (EAST)
8. TRICKLING FILTERS (EAST)
9. AERATED T.F. EFFLUENT CHANNEL (EAST)
10. AERATED T.F. EFFLUENT CHANNEL (WEST)
11. SOLIDS CONTACT TANKS
12. FINAL CLARIFIER TANKS OPERATIONS BUILDING
13. COGENERATION ENGINES / BLOWERS
14. ADMINISTRATION BUILDING
15. EGG DIGESTERS
16. CONVENTIONAL DIGESTERS
17. UV DISINFECTION
18. POST DO CHANNEL
19. SOLIDS DEWATERING BUILDING / SLUDGE SILO / POLYMER □ FERRIC STORAGE
20. MAINTENANCE BUILDING
21. RSS / WSS PUMP STATIONS
22. WSS THICKENING BUILDING
23. DIGESTED SLUDGE E□UALI□ATION TANKS
24. FILTRATE E□UALI□ATION TANKS
25. DIGESTER CONTROL / GAS TREATMENT BUILDINGS (EAST □ WEST)
26. MAINTENANCE/WELDING SHOP
27. 3W / COOLING WATER PUMP STATION
28. DIGESTED SLUDGE BLENDING TANK

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FIGURE 1-2
EXISTING SITE PLAN

CVWRF

CENTRAL VALLEY WATER RECLAMATION FACILITY

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1.3 Existing Capacity and Permit Conditions

The current capacity of the plant is taken from different sources including the initial 1987 design and 1994 expansion. The data has been compiled by BC and is summarized in Table 1 (BC 2015).

Table 1-1 Existing Facility Design Data	
Flows, mgd	
Permitted Process Flow Used in 2017 UPDES Renewal Wasteload allocation[a]	75
Peak Hydraulic Flow	150
Design Influent Waste Loadings	
Five-Day Biochemical Oxygen Demand (BOD_5), mg/L[b]	190
BOD_5, lb/day	118,800
Total Suspended Solids (TSS), mg/L[b]	170
TSS, lb/day	106,300
Ammonia Nitrogen (Average), mg/L[b]	18

a. Utah Division of Water Quality ADDENDUM, Statement of Basis Wasteload Analysis and Level 1 Antidegradation Review. February 14, 2017. (As part of 2017 UPDES permit renewal).

b. Construction Contract CC10 Headworks and Primary Sedimentation Tanks, Sheet G304, September 1984. Brown and Caldwell/Coon, King, and Knowlton. CVWRF Construction of PST/TF Expansion, Sheet G-4, October 1994. Brown and Caldwell/DMJM.

The CVWRF discharges treated effluent to Mill Creek and a portion of effluent is reused for irrigation water under a Utah Pollutant Discharge Elimination System (UPDES) permit. The UPDES permit currently limits the discharge as shown in Table 1-2. The permit requires regular monitoring of additional parameters and can be found on the DWQ's website under UPDES permit #UT024392.

Table 1-2 CVWRF UPDES Effluent Limits (renewed on March 31, 2017)			
	Concentration		
	Average Monthly	Average Weekly	Maximum Daily
BOD_5, mg/L			
Summer (Jul – Sep)	16	27	
Fall (Oct – Dec)	20	28	
Winter (Jan – Mar)	20	28	
Spring (Apr – Jun)	20	28	
Min % Removal	85	-	
TSS, mg/L	25	35	
Min % Removal	85	-	
Ammonia (as N), mg/L			
Summer (Jul – Sep)	3.7	-	13.1
October	4.5	-	15.9

November – December	5.9	-	15.9
Winter (Jan – Mar)	5.8	-	12.3
Spring (Apr – Jun)	5.3	-	15.9

1.4 Future Condition

1.4.1 Design Flows and Loads

As part of the 2015 *Nutrient Feasibility Study* to assess current and future loading conditions, BC in association with CVWRF reviewed the following information:

- 5 years of CVWRF data from 2010 to 2014
- Member entity master plans
- Project-specific wastewater characterization data
- Wasatch Front Regional Council Traffic Analysis Zones (TAZs) data

The details of this investigation can be found in the *Nutrient Feasibility Study* report (BC 2015) and a summary is found in Table 1-3. This assessment and review resulted in projected flows and loads for a 2040 condition and a buildout condition. Key findings from the 2015 report include:

- The influent flow rates (volumetric) have, in general, been steady for many years and during the time from 2011–14 even showed a slight decrease. The flows for many years have ranged from 50 and 53 mgd.
- The overall CVWRF loadings in terms of biological oxygen demand (BOD) and total suspended solids (TSS) have been steady with a slight downward trend in TSS loadings. The NH_3 loadings exhibited a slight upward trend.
- The growth projections, based on current zoning and entity-provided master plans, are generally modest (less than 1 percent in most cases), which is due to many of the member entities being 'built out' under current zoning criteria. CVWRF recognizes some member entities are seeing pockets of 'vertical' construction which may increase densities. This information has yet to manifest itself in revised zoning or significant influent flow increases.
- The highest flows are observed in the April–June time frame, which is indicative of snowmelt/runoff/recharge-induced infiltration into the collection system. The 2011 data set was a very high flow year, which influences the peaking factors.

The future flows are based on the population data summarized in Table 1-3 (BC 2015).

Table 1-3 Future Wastewater Production (MGD)								
Entity	Year							
	Baseline (2014)			2040			Build out	
	Population[a]	AADF (MGD)	GPCD[b]	AARC[b]	Population[a]	AADF[c] (MGD)	Population	AADF (MGD)
GHID	119,519	12.04	101	0.72%	144,170	14.52	156,000	15.71
TBID	69,113	4.89	71	0.26%	73,961	5.23	75,070	5.31
KID[d]	40,859	3.38	83 (119)	0.88%	51,300	6.10	51,300	6.10
South SL[e]	12,286	3.35	273 (80)	2.13%	21,242	4.07	24,127	4.30
Murray	44,576	4.38	98	0.82%	55,081	5.41	70,314	6.91
Cottonwood ID	84,379	8.72	103	0.20%	88,878	9.18	94,368	9.75
Mt. Olympus ID	103,002	14.38	140	0.20%	108,494	15.15	115,196	16.08
Total	473,734	51.1	108	0.53%	543,126	59.7	586,376	64.2

a. 2014 and 2040 Population estimates were calculated using WFRC transportation analysis zone (TAZ) data unless otherwise noted.

b. GPCD = Gallons per capita per day. AARC = Annual Average Rate of Change of the population between the planning periods. Calculated as the average % growth per year.

c. AADF = Annual Average Daily Flow (MGD) for 2040 is the baseline (2014) GPCD multiplied by the 2040 population unless otherwise noted. AADF for Build out is calculated the same way unless otherwise noted for a specific entity that provided a plan.

d. 2040 and Build out value for Kearns are from Preliminary Kearns CFP, IFFP, IFS (Bowen and Collins, 2015). The GPCD for 2040 and Build out is 119 GPCD per Bowen and Collins, 2015. This accounts for non-residential employment related flows.

e. South SL has a very high percentage of commercial, industrial, and I&I (Hansen, Allen, and Luce, 2014). The estimated wastewater generation for current conditions shown is 273 GPCD, the South SL 2014 Sanitary Sewer Master Plan suggests most of the future development is around high-density transit oriented developments (likely multi-housing vertical) that is assumed to generate wastewater at 80 GPCD. 80 GPCD was used for the future growth beyond 2014. The SSL population values for 2040 and build out are based on the reported South SL master plan equivalent residential connection (ERC) counts and 2.5 persons per ER, see Hansen, Allen, and Luce 2014.

CVWRF is proposing a 20-year design horizon beyond the 2024 startup and commissioning year for any new facilities, which results in a 2045 design year. Table 1-4 presents the design flows and loads to be used for the CVWRF expansion. Figures 1-3, 1-4, and 1-5 show raw influent flow (mgd), BOD, and TSS loadings (lbs/day) from the period from 2011 to 2016.

Table 1-4 CVWRF Flow and Load Design Criteria (2045)	
Projected Raw Influent Flows	2045 Design Conditions
Average day flow (ADF), mgd	61.7
Maximum month flow (MMF), mgd	67.9
Peak day flow (PDF), mgd	80.2
Peak hour flow (PHF), mgd	111.1
10-year MMF, mgd; this value represents an expected high flow condition associated with a high I&I condition. This value is the basis for wasteload allocations associated with this expansion	**83.9 (Basis of Wasteload Allocations)**
10-year PDF, mgd	116.7
10-year PHF, mgd	140.7
Projected Raw Influent Loads	

BOD	
ADF, lb/d	105,174
MMF, lb/d	122,609
PDF, lb/d	179,976
TSS	
ADF, lb/d	102,975
MMF, lb/d	117,179
PDF, lb/d	201,216
TP	
ADF, lb/d	2,510
MMF, lb/d	2,926
PDF, lb/d	4,295
Total Kjeldahl Nitrogen (TKN)	
ADF, lb/d	18,763
MMF, lb/d	21,210
PDF, lb/d	22,842

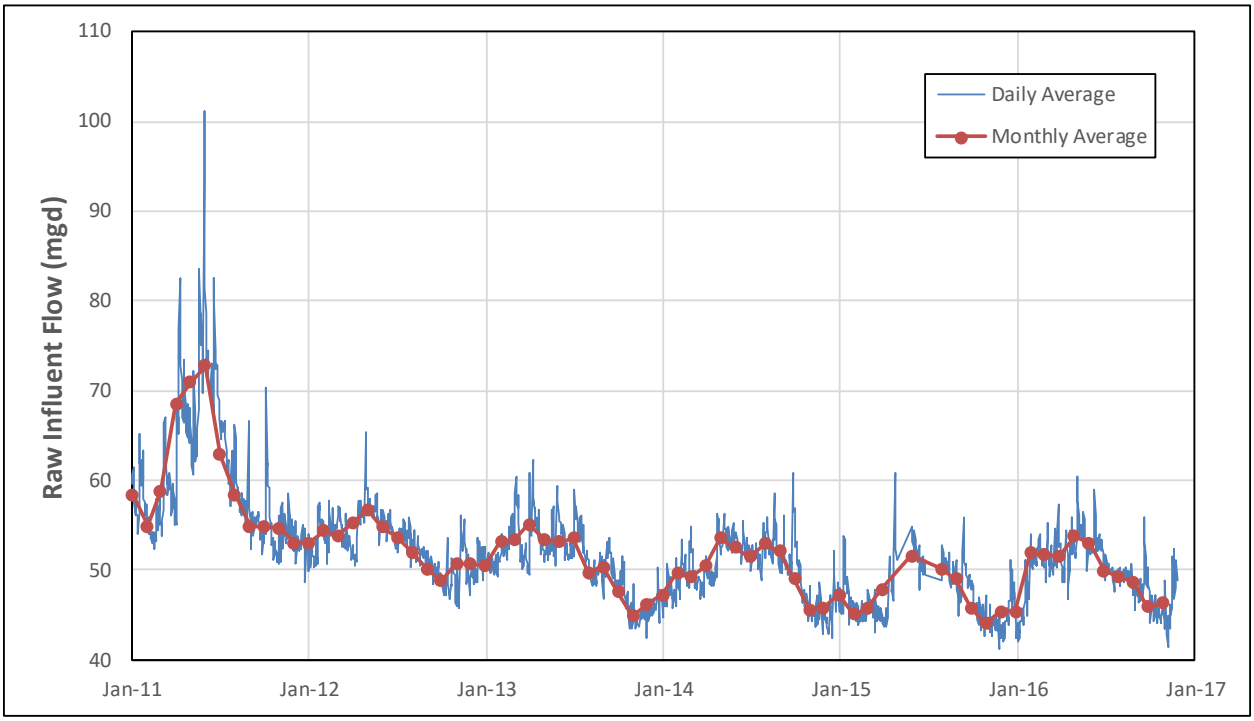

Figure 1-3 Historic Influent Flow (2011-2017)

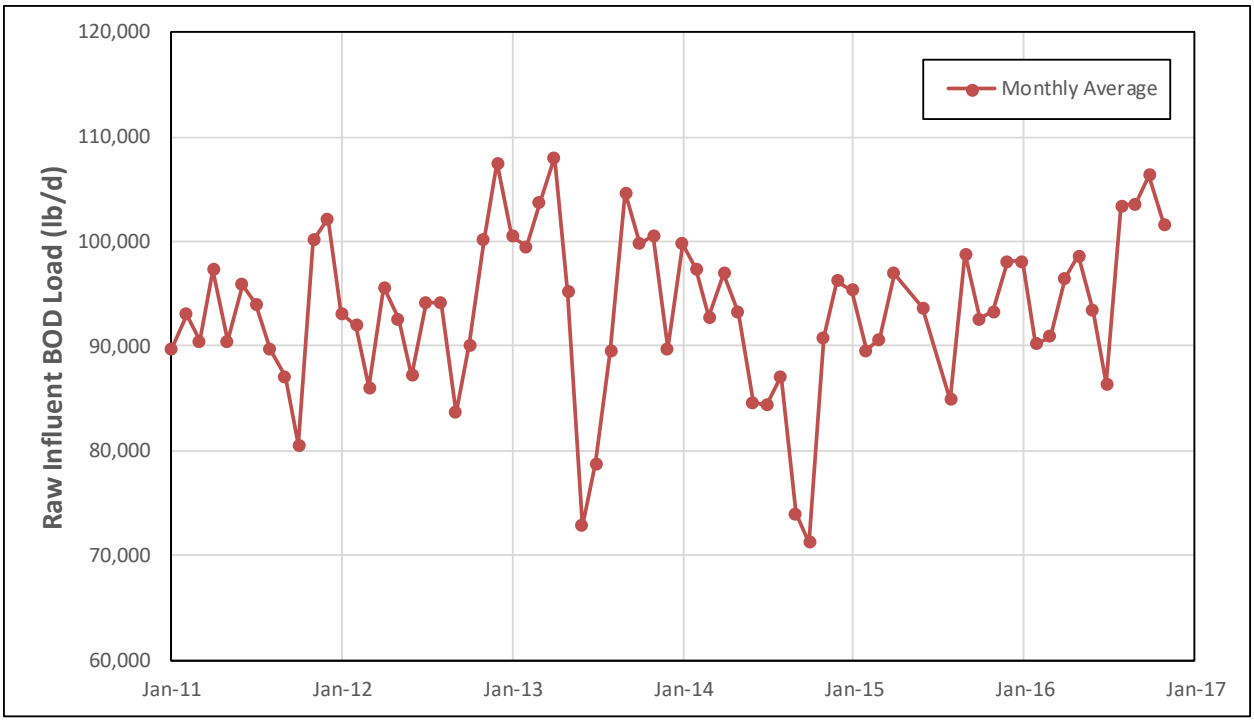

Figure 1-4 Historic Influent BOD Loading (2011-2017)

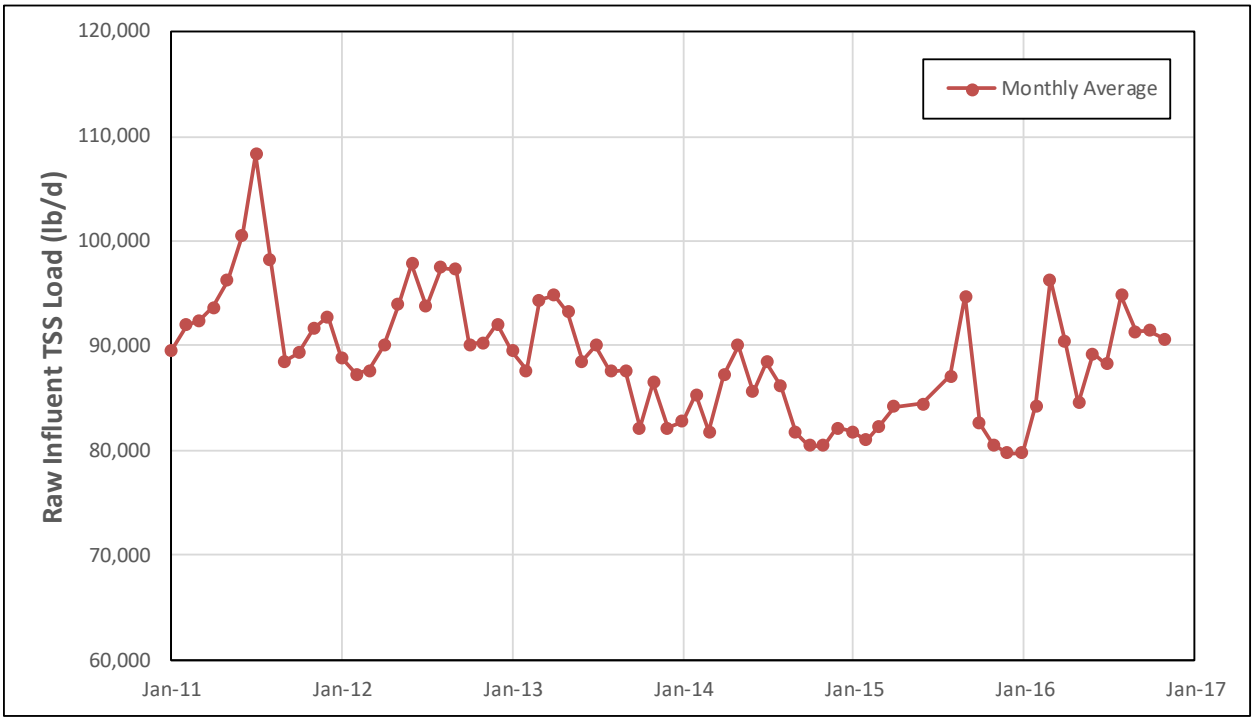

Figure 1-5 Historic Influent TSS Loading (2011-2017)

1.4.2 Effluent Objectives

As noted in Section 1.1, DWQ has recently promulgated a technology-based effluent standard for phosphorus. DWQ has also indicated that lower NH_3 limits and a limit for TIN are possible in the future. The 2015 *Nutrient Feasibility Study* (BC 2015) reviewed numerous treatment scenarios, possible permit changes, and included a review of treatment options and effluent criteria by a Technical Advisory Committee (TAC).

The recommendation of the 2015 *Nutrient Feasibility Study* was to move away from TF-SC and plan a BNR facility that is adaptable to regulatory changes. The BNR facility (including existing process units such as primary and secondary clarifiers) will include features to address BOD, chemical oxygen demand (COD), TSS, TP, TN, and NH_3. The TBPEL requirements include language (Utah Administrative Code [UAC] R317-1-3.3.D) related to optimizing N removal, which could be advantageous to CVWRF. Considering the current and future permit limits and ease of operation of the BNR facility, Table 1-5 shows the design effluent quality objectives for the future CVWRF BNR facility.

Table 1-5 CVWRF Effluent Quality Objectives for Facility Planning

Parameter	Unit	Effluent Quality Objectives			
		Monthly Maximum	Weekly Maximum	Daily Maximum	Basis of Effluent Objective
$cBOD_5$					
Jul–Sep	mg/L	16	27	-	2017 UPDES
Oct–Dec	mg/L	20	28	-	2017 UPDES
Jan–Mar	mg/L	20	28	-	2017 UPDES
Apr–Jun	mg/L	20	28	-	2017 UPDES
BOD_5 min. percent removal	%	85	-	-	2017 UPDES
TSS	mg/L	25	35	-	2017 UPDES
TSS min. percent removal	%	85	-	-	2017 UPDES
NH_3 (as N) [a]					
Jul–Sep	mg/L	3.7	-	13.1	2017 UPDES
Oct	mg/L	4.5	-	15.9	2017 UPDES
Nov–Dec	mg/L	5.9	-	15.9	2017 UPDES
Jan–Mar	mg/L	5.8	-	12.3	2017 UPDES
Apr–Jun	mg/L	5.3	-	15.9	2017 UPDES
TP [b]	mg/L	1.0	-	-	TBPEL (UAC R317-1-3.3)
TIN [c]	mg/L	10.0	-	-	(UAC R317-1-3.3.D) and to prevent clarifier denitrification

a. The future CVWRF BNR facilities will be designed to fully nitrify year-round regardless of temperature. A fully nitrified condition is deemed more stable in the BNR facility and was recommended by the TAC in the 2015

Nutrient Feasibility Study (BC 2015). It is anticipated that the effluent NH_3 will be less than 1.0 mg/L year-round based on the design described in the Selected Alternative section. The BNR modeling results and design criteria are described more fully in Section 4.

b. *CVWRF has asked for a BNR facility to meet TP < 1.0 mg/L each month of the year; regulatory compliance will be based on an annual average calculation.*

c. *Total Inorganic Nitrogen (TIN) is not a permit limit but allows for better operation of the secondary clarifiers and could be part of optimization under UAC R317-1-3.3.D.*

Section 2

Development and Screening of Alternatives

2.1 Alternatives Screening

In 2015, CVWRF recognized the newly promulgated TBPEL and potential TBNEL could have a significant impact on plant operation and configuration. During that period, CVWRF, with support of Brown and Caldwell evaluated treatment alternatives that would allow CVWRF to comply with the proposed TP and potential TIN limits. The effort included extensive wastewater characterization sampling, jar testing for chemical treatment, and process modeling.

As part of the effort, CVWRF engaged a Technical Advisory Committee (TAC) to review the work plan, alternatives, and recommendations. The TAC had over 150 years of combined experience in wastewater treatment technology. The members of the committee were: James Barnard, Ph.D. (Black and Veatch); David Stensel, Ph.D. (University of Washington); Rod Reardon, P.E. BCEE (Carollo Engineers); Denny Parker, Ph.D., P.E., (Brown and Caldwell). The TAC was tasked with providing input on the treatment alternatives during two meetings at the CVWRF. This effort is documented in the *Nutrient Feasibility Study* (BC, 2015) and is summarized as part of this Facility Plan.

The methodology that was used to evaluate the alternatives was governed by several major criteria:

i. Making the best use of existing infrastructure
ii. Selecting processes that are modular or that can be added upon in a progressive manner that builds on existing and near-term early modifications
iii. Selecting processes that minimize energy and chemical consumption, minimize maintenance and operational manpower, and meeting the overall goals of sustainable practice as defined by CVWRF
iv. Optimizing process layouts that minimize capital investment and operational cost
v. Consider side stream treatment alternatives for each alternative assessed

Other CVWRF staff preferences that also influenced the outcome included:

- Options that required running two different types of systems at the same time (for example, a partial BNR train and a partial TF-SC train) were less desirable
- Options that could immediately provide nitrogen removal or that could easily be migrated to nitrogen removal were favored

2.2 Alternatives Selected for Detailed Review

TAC Meeting No. 1 was held on May 13–14, 2015 and TAC Meeting No. 2 was held August 13, 2015. During these meetings, 40 possible treatment alternatives and technologies were reviewed such as: intensification (i.e., Biomag), membrane bioreactor (MBR), multiple configurations of BNR (i.e., MLE, A2O, etc.), nutrient recovery, trickling filters variants, and sidestream treatment.

The TAC narrowed down the possibilities to five alternatives based off collective knowledge of process efficiencies and cost (these are Alternatives 1a, 1b, 2a, 2b, and 3 below). In addition, a do-nothing and two possible filtration alternatives, MBR and tertiary filtration, were also reviewed. MBR and tertiary filtration provide a post-secondary treatment filtration step for further TSS reduction and can be considered less degrading in the context of DWQ's anti-degradation review (ADR) framework. The following alternatives were selected for further evaluation:

- Alternative 1: do-nothing
- Alternative 1a: chemical phosphorus (P) removal using current TF-SC facilities
- Alternative 1b: chemical P removal and tertiary denitrification filters
- Alternative 2a: full biological nutrient removal (BNR) activated sludge
- Alternative 2b: BNR activated sludge and chemical P removal
- Alternative 3: BNR activated sludge preceded by trickling filters
- Alternative 4: MBR activated sludge (screened out initially by TAC)
- Alternative 5: Tertiary filters with chemical treatment (not included in TAC review because tertiary filtration is not a nutrient removal technology and would need to be coupled with one of the other nutrient removal schemes)

The alternatives presented in this Facility Plan, including costs, are developed to address the TBPEL or possible future nutrient limits (i.e., ammonia and TN/TIN). The alternatives describe facilities that are required for nutrient compliance or where nutrient compliance directly impacts some other process such as solids handling. Other capital improvements considered by CVWRF (such as new headworks screens) that may be in the future or in common to each alternative are not part of the nutrient screening and costs and are not detailed in this Facility Plan. Other facilities that are being considered by CVWRF as part of overall facility planning but not directly related to differences in nutrient alternatives are discussed in Chapter 6.

2.3 Other Capital Improvements

In 2015, besides the *Nutrient Feasibility Study* (BC, 2015), CVWRF also conducted a comprehensive condition assessment resulting in an *Asset Management Based Capital Improvement Plan* for most assets at the facility (BC, 2016). Many of these improvements such as HVAC improvements, headworks screens improvements, etc. will be implemented over a 10-20 year period regardless of the nutrient alternative selected. Detailed alternatives analysis for equipment that is generally replaced in kind as part of the asset management/capital improvement plan (AM/CIP) is not typically needed and not part of the alternatives or costing in this Facility Plan. Appendix A shows the comprehensive CIP that resulted from both the *Nutrient Feasibility Study* (BC, 2015) and the *Asset Management Based Capital Improvement Plan* (BC, 2016).

Section 3
Evaluation of Principal Alternatives

3.1 Alternatives Description

All the alternatives, except Alternative 1, 4, and 5, were evaluated in depth using BNR simulation models (e.g. BioWin). Each alternative was modeled with and without sidestream treatment applied. The sidestream treatment consisted of a combination of both nitrogen and phosphorus removal processes on the return flows from the sludge treatment process.

All the modeled alternatives had the same effluent target concentrations, except Alternative 1a which does not treat for nitrogen beyond the capabilities of the existing plant. Table 3-1 shows a summary of the treatment alternatives and they are described in the subsequent sections. Appendix B shows the process schematics for the main nutrient removal alternatives recommended for further screening by the TAC. See *Nutrient Feasibility Study* (BC, 2015) for further details.

Table 3-1. Summary of Treatment Alternatives and Effluent Targets for Process Modeling

Alternative	Secondary process	Use existing TFs?	Main P removal mechanism	Nitrification location(s)	Denitrification location(s)	Final effluent targets (mg/L)		
						NH_3-N[b]	TIN	TP
1a	SCTs	Yes	Chemical	TFs, SCTs	None	< 3.7 to 5.9	None	< 1.0
1b	SCTs	Yes	Chemical	TFs, SCTs	Tertiary denite filters	< 1.7	< 10	< 1.0
2a	5SB	No	Biological	New aeration basins	Within activated sludge process	< 1.7	< 10	< 1.0
2b	4SMB	No	Chemical	New aeration basins	Within activated sludge process	< 1.7	< 10	< 1.0
3	Expanded SCTs w/new RAS treatment basins	Yes	Biological	TFs, SCTs	Anoxic RAS treatment	< 1.7	< 10	< 1.0

a. 5SB = 5-stage Bardenpho, 4SMB = 4-stage modified Bardenpho, TFs = trickling filters, SCTs = solids contact tanks, RAS = return activated sludge

b. Monthly average and peak day NH_3-N limits of 1.7 mg/L and 8.16 mg/L, respectively, were used for the evaluation (Alternatives 1b, 2a, 2b, and 3a). For Alternative 1a, seasonal limits (3.7 mg/L in the summer and 5.9 mg/L in the winter) were applied.

3.1.1 Alternative 1: do-nothing

The first alternative identified is a do-nothing alternative. This alternative was dismissed because CVWRF will be required to comply to the TBPEL Rule limit of TP <1mg/L. The average effluent TP value recorded (September 7-20, 2013) for the current CVWRF process was 3 mg/L. Without process changes, CVWRF cannot meet the new limit and a do-nothing alternative is not feasible.

3.1.2 Alternative 1a: chemical P removal

Alterative 1a investigates the impacts on the CVWRF of P removal alone. For this alternative, the TIN limit and potential lower ammonia limits are not considered.

The existing trickling filters and solids contact tanks are retained for this alternative. The chemicals added (ferric chloride, polymer, and alum) combine with the dissolved phosphorus forming a precipitate that can be removed in the clarifiers. Ferric chloride and a polymer are added at the aerated grit tanks, upstream of the primary clarifiers. The ferric combines first with alkalinity in the water and then precipitates dissolved orthophosphate. The precipitate settles as a ferric sludge in the primary clarifiers and is routed through the solids handling system including the digesters, sludge holding, and dewatering systems. Alum is added at the secondary clarifiers as a polishing step, to ensure compliance with the proposed TP limit. This alternative requires fewer capital facilities compared to the other alternatives. However, the bench scale jar testing and full scale chemical pilot showed significant chemical demand requirements (30-50 mg/L of ferric). This is due to the initial chemical reaction of ferric chloride with the high alkalinity water characteristic of waters along the Wasatch front range. This high chemical dosing results not only in high annual chemical costs but also results more solids production (either ferric or alum sludges). This further impacts the costs as digester capacity is lost and additional sludge handling is needed. The chemical demands for ferric suggest a 5,000 gallon tanker truck of ferric chemical would be needed every day to remove the phosphorus using this approach.

3.1.3 Alternative 1b: chemical P removal and tertiary denitrification filters

Alternative 1b included a nitrogen removal step but is otherwise similar to Alternative 1a. The original trickling filters are used, and ferric chloride, polymer, and alum chemical feed systems are added. In addition, a denitrification filter is added as tertiary treatment to meet a TIN of 10 mg/L. The denitrification filter requires a continuous methanol chemical feed to operate.

Alterative 1b required much more SCT volume than Alternative 1a, reflecting the more restrictive ammonia limit. The addition of more SCTs requires more blowers and a new blower building to be built. As with Alternative 1a, the SCT would generate an effluent with an average TIN concentration of 25-35 mg/L. A tertiary denitrification filter is used to denitrify this effluent to the TIN limit of < 10 mg/L. Methanol demands for such a system are projected to average 5,460 gpd (without sidestream treatment) and 4,400 gpd (with sidestream treatment).

3.1.4 Alternative 2a: full BNR activated sludge

Alternative 2a requires replacing the trickling filters with a 5-stage Bardenpho (5SB) process. This activated sludge process biologically removes phosphorus and nitrogen from the wastewater by sending the flow through anaerobic, anoxic, and aerobic basins. An alum addition system is included before the secondary clarifiers as a polishing step for phosphorus removal. Also, a primary sludge fermenter is added to generate volatile fatty acids (VFA). The VFAs are used to optimize the system and reduce the amount of chemical needed.

The 5SB configuration model was able to meet the effluent TP and TIN targets for all the cases, but there were large differences in the required total aeration basin volume and the methanol/acetate demands, depending on the use of sidestream treatment. There are high chemical demands (acetate and methanol) without sidestream treatment. Sidestream treatment provides a substantial (60-70 percent) reduction in chemical demands.

3.1.5 Alternative 2b: BNR activated sludge and chemical P removal

Alternative 2b uses a 4-stage modified Bardenpho (4SMB) process to achieve biological nitrogen removal, while phosphorus removal is achieved chemically through ferric chloride addition like Alternatives 1a and 1b. The TFs will need to be removed for this alternative.

3.1.6 Alternative 3: BNR activated sludge preceded with trickling filters

Alternative 3 utilizes the existing trickling filters and solids contact tanks. It adds a RAS anoxic basin for denitrification and a RAS anaerobic basin for phosphorus release. It also adds a primary sludge fermenter for VFA production similar to alternative 2a.

This hybrid alternative can meet the effluent TP and ammonia targets, but is not able to meet the effluent TIN target of <10mg/L. The effluent TIN averages 15.7 mg/L without sidestream treatment, and 13.2 mg/L with sidestream treatment.

3.1.7 Alternative 4: MBR activated sludge

Noting the existing CVWRF is based on a conventional secondary process including use of secondary clarifiers in good condition (at 30-40 years old), membrane bioreactors (MBR) were discussed briefly by the TAC but not recommended for detailed evaluation. The MBR is included here to support the Level II Antidegradation review.

A membrane bioreactor process would offer a compact mode of treatment which would reduce the size of the aeration basins by 50 percent or more and eliminate the need for secondary clarifiers. Additional benefits of MBR treatment would be an improved effluent quality, compatible with reuse applications.

Although an MBR system would reduce the size of the aeration basins, the cost of such a system for CVWRF is significant. Capital costs would include:

- New fine screening facilities to protect the membranes
- The membrane filtration facility (membrane modules, recycle pumps, building, etc.)
- New blowers/aeration for both process air and membrane scour air

Review of MBR facilities this size (of which there are few) suggest the capital cost is expected to be $4-$6/gallon (depending on the reuse of existing tankage, etc.) applied to the maximum month flow of 83.9 mgd suggests a capital cost of $335M to $503M for the MBR option. On an annual cost basis, the MBR system would be more expensive than a conventional system, mostly due to higher aeration demands. Also, the membranes themselves have a finite life span (10 years is a common assumption for membrane replacement) and annualized replacement costs are significant.

The largest benefit of the MBR system is that it eliminates the need for secondary clarifiers. However, at a plant which already features 12 secondary clarifiers, this benefit would be lost. For reasons of high capital, operating and maintenance costs, and a low utilization of the current system's assets, an MBR treatment alternative was removed from further consideration.

3.1.8 Alternative 5: tertiary filters

Tertiary filtration does not by itself reduce TP or TIN to any of the effluent quality levels anticipated in the future. Tertiary filtration would reduce effluent TSS resulting in some TP reduction (for TP associated with solids) but other means such as chemical or biological treatment would be needed to remove the dissolved phosphorus in the wastewater. Therefore, tertiary filtration would have to be coupled with the other alternatives noted above. Tertiary filtration would have the added benefit of producing a Type I water suitable for non-potable reuse under DWQ reuse rules. Tertiary filtration is included here to support the Level II antidegradation review.

Capital costs would include:

- Pump station to move the secondary effluent into the filters

- Filtration facility (tankage, filters, building, backwash pumps, backwash equalization storage, etc.)

Review of secondary effluent pump stations and filtration facilities this size suggest the capital cost is expected to be $1.50-$2.00/gallon applied to the maximum month flow of 83.9 mgd results in a capital cost of $126M to $168M for tertiary filtration. As noted to meet the TBPEL limit, these costs would have to be added to any of the base alternatives to achieve nutrient removal.

3.2 Cost of Alternatives

The capital and annual costs of each of the five modeled alternatives with and without sidestream treatment was analyzed (BC 2015). All costs for the alternative's comparison are shown in 2015 dollars. Table 3-2 shows the capital cost summary. For additional detail see the *Nutrient Feasibility Report* (BC, 2015).

Table 3-2 Alternatives Costs[a]

Process	Total Opinion of Probable Construction Cost	Estimate of Annual Costs
No Sidestream Treatment		
Alt 1a- Chem P with existing NH3	$ 40,390,000	$ 11,328,000
Alt 1b- Chem P	$ 145,382,000	$ 16,764,000
Alt 2a- Full BNR	$ 135,118,000	$ 14,649,000
Alt 2b- Chem P + N BNR	$ 94,243,000	$ 12,753,000
Alt 3- Hybrid	$ 155,030,000	$ 17,475,000
Alt 4- MBR[c]	$335M - $503M	Not evaluated; anticipated to be higher than any of the above costs
Alt 5 – Tertiary Filtration[b]	$126M - $168M	Not evaluated
With Sidestream Treatment		
Alt 1a- Chem P with existing NH3	$ 57,675,000	$ 11,111,000
Alt 1b- Chem P	$ 139,095,000	$ 15,046,543
Alt 2a- Full BNR	$ 136,864,000	$ 9,484,000
Alt 2b- Chem P + N BNR	$ 106,577,000	$ 11,507,000
Alt 3- Hybrid	$ 144,339,000	$ 14,203,000

a. These estimates for Alternatives 1, 2, and 3 were published in the 2015 study titled "Evaluating the Technical and Economic Feasibility of Modifying the CVWRF to Achieve Nutrient Removal" (BC 2015).

b. Tertiary filtration would not of itself provide nutrient removal. Tertiary filtration would have to be coupled with one of the other nutrient removal technologies to meet effluent TP and TN/TIN goals.

Review of Table 3-2 indicates:

- The chemical only option (1a) is significantly lower from a capital cost basis, but higher than BNR on an annual basis when sidestream treatment is included.
- Sidestream treatment results in higher capital cost, but lower annual costs.

- The high effluent quality filtration alternatives (MBR and tertiary filtration) are compared in light of the antidegradation rules which suggest a higher quality alternative must be considered if the cost is no more than 20 percent more than the next feasible alternative. The cost for the MBR is two to five times higher than any of the other alternatives. **For this reason, the MBR alternative was not investigated any further**. If tertiary filtration were added to the lowest capital cost alternative (1a), the cost increase would be $40.4M + $126M or $166.4M which is four times more costly than alternative 1a alone. If tertiary filtration were coupled with the full BNR option (2a) the cost increase would be $135M+$126M or $261M which is a 90 percent increase over alternative 2b alone. **For this reason, tertiary filters were not further evaluated.**

The recognition that some alternatives have higher capital costs, but lower annual costs suggests life cycle comparisons are needed to further screen the alternatives.

3.3 Life Cycle Cost of Alternatives

The life cycle cost for each of the five alternatives was evaluated using 20 and 40-year net present values of annual costs. A summary is found in Table 3-3. Details can be found in the *Nutrient Feasibility Study* (BC, 2015).

Table 3-3 Life Cycle Cost of Alternatives

Process	Total 20 Year Net Present Value	Total 40 Year Net Present Value
No Sidestream Treatment		
Alt 1a- Chem P with existing NH3[b]	$ 226,670,000	$ 353,462,000
Alt 1b- Chem P	$ 421,050,000	$ 608,689,000
Alt 2a- Full BNR	$ 376,010,000	$ 539,972,000
Alt 2b- Chem P + N BNR	$ 303,950,000	$ 446,698,000
Alt 3- Hybrid	$ 442,390,000	$ 637,987,000
With Sidestream Treatment		
Alt 1a- Chem P with existing NH3[b]	$ 240,380,000	$ 364,750,000
Alt 1b- Chem P	$ 386,520,000	$ 554,936,000
Alt 2a- Full BNR	$ 292,820,000	$ 398,973,000
Alt 2b- Chem P + N BNR	$ 295,800,000	$ 424,596,000
Alt 3- Hybrid	$ 377,890,000	$ 536,867,000

a. These estimates were published in the 2015 study titled "Evaluating the Technical and Economic Feasibility of Modifying the CVWRF to Achieve Nutrient Removal" (BC 2015).

b. Alternative 1a was evaluated for descriptive purposes and is not comparable to the other alternatives. It was not designed to treat for future permit limits.

3.4 Cost and Effectiveness Analysis

A cost-effectiveness analysis was performed in accordance with criteria from 40 CFR 35.2030 (B.)(3.). Each of the five alternatives were evaluated for the different criteria outlined in the sections below and assigned a value between 1 (meaning least effective) and 5 (meaning most effective). All the cost-effectiveness values for each of the alternatives are summarized in Table 3-4.

3.4.1 Flow reduction methods

CVWRF and its member entities are taking steps to reduce the wastewater flow to the facility. CVWRF, depending on climate conditions, can experience a short high flow period between April and July. This high flow is generally due to rain and snow melt induced inflow and infiltration (I/I). CVWRF and its member entities are working to reduce this increased flow by rehabilitating the collection system. The pipes are being lined with corrosion resistant fiberglass cured-in-place pipe (CIPP) lining systems or fiberglass reinforced pipe slip lining systems. With less I/I, future flows to the plant will be significantly reduced. The effectiveness of this program can be seen in the relatively low rate of increase in flow over time. Regardless of which alternative is chosen, the flow reduction efforts are ongoing and will be the same for each alternative.

3.4.2 Capacity of alternatives

Every alternative was designed to accommodate the 2045 flow design criteria stated in section 1.4. Alternative 1a is assumed to address the flow condition and phosphorus removal but would not address lower ammonia or total nitrogen limits.

However, some alternatives will be easier and more effective to upgrade for future capacity and effluent limits. For example, Alternative 2b is designed to have additional basins added in the event of stricter regulations.

3.4.3 Utilization of the current system

One of the objectives of the alternatives analysis was to maximize use of the existing facilities within each alternative. The effectiveness rating in Table 3-4 of this section is based on the amount of the existing facilities that are being used and retained as a supplement to new construction.

3.4.4 Reuse of wastewater and biosolids

Within each of the remaining alternatives, the reuse of wastewater and biosolids are as follows:

- **Type I reuse currently supplying 1 mgd during summer months to the golf course**: This reuse is anticipated to be the same for each alternative; reuse to the golf course will continue under all options.
- **Secondary effluent discharged to Mill Creek and the Jordan River for potential downstream uses or flow to the Great Salt Lake**: No changes among any alternatives.
- **Beneficial use of biosolids**: In general, no changes are anticipated to the overall solids handling among the nutrient removal alternatives. Alternatives that use extensive chemical (ferric or alum) will impact the sludge quality making Class B disposal by land application more difficult since chemical solids are undesirable to farmers. Chemical solids will also have a detrimental effect on Class A compost products.

3.4.5 Revenue generating applications

None of the alternatives employ new revenue generating applications beyond what is currently being done at the plant. The sidestream P removal systems are envisioned to sequester the phosphorus

into the biosolids with the P being removed in the biosolids as either Class A or Class B products. In the future, the sidestream systems could be configured to recover phosphorus which could be a separate source of revenue. Currently, the main revenue generating sources at CVWRF are related to the Class A compost process as well as the septage acceptance and food waste receiving. These are not anticipated to change with the nutrient removal alternatives. The major potential impact is the biosolids since high aluminum and iron concentrations are not desirable in the compost product and may have a reduced value under alternatives that use extensive chemicals (ferric or alum).

3.4.6 Energy use reduction or recovery

The current facility utilizes biogas to produce energy in the form of heat and electricity. This approach will continue under each alternative. The life cycle costs (Table 3-3) capture the direct energy impacts in the form of cost differences between the alternatives (i.e., higher energy demand results in higher costs). It is noted that nutrient removal will take more energy than the current TF-SC process. Every alternative will increase energy demand in some form or another. Each alternative has been investigated for best use of energy or more efficient use of energy, but none of the alternatives reduce energy usage below current demands. The following comparisons for each alternative are made with respect to energy use reduction:

- Alternatives that use chemical treatment for phosphorus removal:
    - The alternatives with high chemical demand tend to use less energy for aeration but there is a significant energy demand/impact on the environment (outside the fence at CVWRF) to produce the chemical (mine, transport, and process) and haul the chemical to CVWRF. Because of the high chemical demand, and the fact the chemical is produced by others, the environmental impacts cannot be mitigated by CVWRF. Costs, energy, and environmental impacts for chemical solutions are a long term risk to CVWRF due to costs/impacts being outside of CVWRF's control. In addition, extensive use of chemical will tie up digester capacity as inert chemical solids. This reduces the capacity of the digesters to produce gas from volatile carbon material.
- Alternatives that use little or no chemical (i.e., full BNR):
    - The alternatives with less chemical demand take more electrical energy due to larger process aeration blowers. However, power demands can be managed by CVWRF since most of the power used is produced on site using cogeneration. Importing additional food waste to produce more biogas and electrical energy can mitigate the additional power demands. In addition, conventional BNR treatment schemes that have been well documented and in use for many years, utilize anaerobic and anoxic zones to further reduce the oxygen demand from influent carbon by recycling oxygen in the form of nitrate. Other strategies to reduce the power demand impact include:
        - Use of very efficient fine bubble aeration
        - Use of deep tanks to maximize oxygen transfer efficiency
        - Use of high efficiency process air blowers that can be adjusted to target actual oxygen demand
        - Use of most open valve blower control which has been shown to be effective in reducing over-aeration
    - Alternatives based on new aeration tankage (Alt. 3) will be more efficient than alternatives that continue extensive use of the existing solids contact tanks (SCTs) because the SCTs are shallower than new basins would be

Sidestream treatment in all cases can be a means to reduce power demand. Sidestream nitrogen removal efficiently reduces ammonia in return (filtrate) streams which reduces blower sizing and aeration demands in the main stream process.

3.4.7 Cost-effectiveness summary

The effectiveness is ranked with the criteria stated in the previous sections on a scale of 1 to 5 with 1 being the least effective and 5 being the most. A summary of each alternative's effectiveness and the total 20-year net present value is found in Table 3-4 below.

Table 3-4 Cost and Effectiveness of Alternatives

Process	Flow Reduction	Capacity	Use of Current System	Reuse	Revenue generation	Energy Reduction	Effectiveness Summary[a]	Total 20 Year Net Present Value
No Sidestream Treatment								
1a Chem P with existing NH3[b]	5	1	3	4	3	2	3.0	$ 226,670,000
1b Chem P with denite filter	5	3	4	4	3	2	3.5	$ 421,050,000
2a Full BNR	5	5	2	5	5	4	4.3	$ 376,010,000
2b Chem P + N BNR	5	4	2	3	3	2	3.2	$ 303,950,000
3 Hybrid	5	2	4	5	5	3	4.0	$ 442,390,000
With Sidestream Treatment								
Chem P with existing NH3[b]	5	1	3	4	3	3	3.2	$ 240,380,000
Chem P with denite filter	5	3	4	4	3	3	3.6	$ 386,520,000
Full BNR	5	5	2	5	5	5	4.5	$ 292,820,000
Chem P + N BNR	5	4	2	3	3	3	3.3	$ 295,800,000
Hybrid	5	2	4	5	5	4	4.2	$ 377,890,000

a. Values are calculated by taking an average of the preceding values in each row.

b. Alternative is added only as a reference. It does not achieve the effluent quality limits desired by CVWRF.

3.5 Alternatives Comparison

In addition to life cycle costs and the effectiveness summary, CVWRF and the TAC proposed additional criteria for screening alternatives; these include:

- Each alternative should be compared against the CVWRF mission statement which is to: *"…improve the Utah environment by treating wastewater and recovery resources safely, efficiently, and sustainably."*
    - This criterion suggests alternatives with extensive chemical demand are less preferred as long term production and disposal of chemical is not viewed as a sustainable approach.
- CVWRF staff preferred alternatives that were not complicated to operate or were not a mix of treatment technologies.

    - This criterion resulted in Alternative 3 (hybrid) being less preferred because operations staff would need to operate both trickling filters and a BNR system.
- Another item, although not directly related to process performance but related to maintenance, is the production of snails in the trickling filters. CVWRF's trickling filters generate a significant snail load that manifests throughout the entire plant in the form of pump wear and tank deposition. This reality is a significant cost and maintenance burden on plant staff. Alternatives that no longer use the trickling filters were preferred in an effort to rid the plant of snails.

In reviewing the cost-effectiveness assessment (Table 3-4), life cycle cost, and other CVWRF criteria, the following comparisons and conclusions can be made:

- Sidestream treatment although higher in capital cost results in lower life cycle costs for all the alternatives except 1a.
- Of the options that provide phosphorus, ammonia, and nitrogen removal, Alternative 2a (full BNR) is the most cost effective.
- Alternative 2a scores the highest in the cost-effectiveness comparison (Table 3-4) and more fully meets the other criteria established by CVWRF namely more sustainable due to lower chemical demand and employing a single treatment process approach.

3.6 Recommended Plan

Considering the costs, other CVWRF criteria and the cost and effectiveness scoring, the CVWRF staff and TAC recommended the plant move ahead with full BNR (Alternative 2a) with sidestream treatment for future nutrient removal. The full BNR process provides removal of ammonia, phosphorus, and total nitrogen. A BNR scheme is highly adaptable and can be adjusted in different arrangements (AO, A2O, 4 stage bardenpho, 5 stage bardenpho, etc.) to meet evolving effluent objectives. The TAC further recommended that CVWRF conduct pilot testing for the optimal configuration of the BNR process and to investigate the ability to ferment primary sludge and/or RAS to ensure an adequate supply of readily degradable carbon was available to drive the BNR process.

Section 4
Selected Plan

4.1 Justification

The justification for selecting Alternative 2a (full BNR) includes:

1. Full BNR is the most cost effective alternative that removes phosphorus, ammonia, and total nitrogen. Full BNR also scored highest in the cost and effectiveness assessment (Table 2-4).
2. Full BNR most closely aligns with the mission of CVWRF to be a sustainable facility. Full BNR will maintain a reusable biosolids product compared to alternatives that use more chemicals.
3. Full BNR has a high degree of adaptability to future regulatory changes.

The basis for the selection of Alternative 2a was presented to the CVWRF Board of Trustees in September 2015. The Board unanimously passed a motion to further plan, fund, and design the new BNR facilities. The 2015 *Nutrient Feasibility Study* was conducted in parallel with an overall condition assessment/asset management plan that investigated all plant facilities including those not impacted directly by nutrient improvements. CVWRF staff and the Board noted a need to implement the nutrient planning recommendations and condition assessment recommendations together as there are likely synergies of design and construction.

4.2 Schedule of BNR Implementation

The overall schedule for implementation of the BNR facilities:

2015 Feasibility: The *Nutrient Feasibility Study* (BC, 2015) and *Condition Assessment Report* (BC, 2015b) were completed in 2015. These plans, as adopted by the Board of Trustees in September 2015 set CVWRF on a path to full BNR and other improvements as part of a 20 year overall capital improvement plan.

2016 Education and Funding Strategy: CVWRF staff spent 2016 educating member entities and their respective boards on the need for the projects and the potential cost impact to rates. The CVWRF Board of Trustees also modified their bylaws to allow for more streamlined bonding by CVWRF. Some bench scale work was also conducted in 2016 to investigate lab scale fermentation of primary sludge and food waste. CVWRF also provided DWQ with a request for variance to extend the TBPEL deadline to 2025.

2017 Pilot Testing, Modeling, Field Work: During 2017, CVWRF began more targeted process modeling of optimal BNR configurations, performed geotechnical site characterization, and constructed and operated a 10 gpm BNR pilot. The pilot tested BNR configurations including conventional A2O and the 'Westside' process which incorporates primary sludge and RAS fermentation and is named for a facility in Kelowna, BC, Canada that has used the approach for over 20 years. The piloting also included pilot scale fermentation of primary sludge.

2018-2019 Final Design: Final design is being conducted in 2018 and 2019 which will include incorporating the pilot results in the finalization of the process design, and development of construction documents suitable for review and approval by DWQ and suitable for bidding.

2020-2024 Construction: The BNR facilities will be constructed from 2020 to 2024. Other facilities identified as priorities in the capital facilities plan may also be in construction during that time.

2024-2025 Startup and Compliance: It is anticipated the BNR facilities will be operational in 2024. Plant staff have received and will continue to receive training leading up to the startup and commissioning of the nutrient facilities in 2024. The objective is to be in full compliance with the new TBPEL by January 2025.

4.3 Design Approach

The design will seek to utilize as much of the existing facility as possible. Appendix C provides preliminary drawings that summarize the basis of the design for the nutrient improvements and includes process schematics, hydraulic profiles, and site plans. Key to the design is configuring the BNR process to allow for operating in 'Westside' or traditional A2O mode. Under the Westside process, a steady, to near constant portion of the full RAS return is routed through the anaerobic zones. This approach allows for a very controlled, deep redox condition (<-400 mv) which fosters RAS fermentation. This fermentation provides a steady stream of readily available carbon to promote P-release and subsequent P-uptake. The pilot results suggest that readily available carbon from RAS fermentation supplemented with carbon from primary sludge fermentation is adequate to support TP < 1 and TIN < 10. The design will allow for reversion to conventional A2O by modest change of gates and flumes.

The flows and loads for the design are shown in the G-sheets of Appendix C and in Section 1.4 Future Conditions. Table 4-1 summarizes the improvements by process area that are related to the nutrient improvements. CVWRF has approached the Utah Water Quality Board to support funding for the nutrient improvements through the DWQ administered state revolving fund (SRF). Facilities shown in Table 4-1 would be eligible for SRF funds.

Table 4-1 Summary of Nutrient Related Facility Improvements

Facility	Area Designation	Nutrient Related	SRF Funding Candidate	New facility or reuse/ modify	Other Improvements/Comment
Primary Clarifiers	10	Primary clarifiers will continue in current use	Yes	Use as is	No major changes to primary clarifiers. Some minor changes to mixing in the primary effluent channels will be part of the nutrient project.
West Trickling Filters (TF)	-	Yes (demo)	Yes	Demo	The west trickling filters will be demolished. The west TF pump station will be upgraded and repurposed as the Primary Effluent Pump Station (PEPS).
PEPS	16	Yes	Yes	Re-purpose	The PEPS will lift primary effluent into the BNR trains.
Anaerobic basins	17	Yes	Yes	New	Anaerobic basins serve as RAS fermentation zones under 'Westside' configuration or conventional anaerobic zones in A2O mode.
New Anoxic/ Aeration Basins	18	Yes	Yes	New	Typical baffled anoxic and aerated zones for BOD removal, ammonia oxidation, denitrification, and phosphorus uptake.
Reuse of Existing SCTs for aeration	19	Yes	Yes	Re-purpose	Will serve as back end of aeration zones. Future schemes (TIN<3) could be second stage anoxic zones.
Secondary Clarifiers	20	Yes	No	Two new clarifiers; continue use of	Two new clarifiers have been added (12 total). Construction started in 2018 and will be complete in 2019. The BNR modeling did not require the clarifiers but CVWRF ops staff want

				existing clarifiers	additional redundancy of secondary clarifiers especially in winter months when MLSS is harder to settle.
RAS Pump Station	21	Yes	Yes	Modify existing	RAS pumping capacity will be increased (new pumps in existing building) to accommodate higher RAS rates of BNR process.
RAS Denite/ Surface Wasting	22	Yes	Yes	New	RAS control function to split RAS to fermenter, also surface wasting for Nocardia control and RAS denitrification.
Filter/3W Improvements		Yes	Yes	New	The AM/CIP identified the 3W system as needing upgrades and more reliability. In addition, the new BNR facilities impact the existing sand filters and new process aeration blowers need a reliable cooling supply. This project will provide 10 mgd (firm) of filtered water for plant 3W needs and Type I reuse on the golf course.
Blower building	34	Yes	Yes	New	New building to house process aeration blowers, additional office space, parts warehouse, new engine switchgear and plant Electrical Distribution.
Fermenters	40	Yes	Yes	Modify existing	The EQ tank and blend tank will be modified for fermentation.
WAS/Primary Sludge Thickening	25	Yes	Yes	Modify existing	Replace gravity belt thickeners with thickening centrifuges, add thickeners for fermented primary sludge.
Primary Sludge Straining	26	Yes	Yes	New	New facility to include improved strainers, tankage for storing thickened sludge, and separated VFAs from fermentation step.
Sidestream P	30	Yes	Yes	New	Insert sidestream P treatment to take digested solids and with pH adjustment and addition of MgCl sequester ortho-phosphate into biosolids. Phosphorus is removed with biosolids.
Sidestream N	31	Yes	Yes	New	Insert sidestream N (aka Annamox) treatment on dewatering filtrate to treat high ammonia, reducing loading from the return flows.
Food Waste Receiving	To be determined	Yes	Yes	New	Food waste receiving will be added to increase gas production (and energy production) and provide additional carbon for fermentation for BNR process.
Biosolids improvements	To be determined	Yes	Yes	Modify existing facilities with new or rehabilitate dewatering equipment	The AM/CIP identified the belt presses as near the end of their useful life. In addition, as food waste becomes more established, digester upgrades are anticipated. Near the end of the liquid stream BNR upgrades, CVWRF will conduct a study and possible capital project to include: digester upgrades, dewatering upgrades, and sludge cake storage upgrades. Additional solids processing and cake storage needed due to additional solids from BNR process.

4.4 Provisions for the Future

The BNR upgrades will incorporate the following provisions for future expansion:

- The anaerobic basins can be expanded to the east by two additional trains;
- The anoxic/aeration basins can be expanded further west in the event of low TIN limits or capacity needs that exceed current build out projections;
- Four additional secondary clarifiers can be added to the west for additional settling capacity; current buildout planning suggests these are not needed but the site is reserved for them;
- Space is reserved south and east of the headworks for additional primary clarifiers;
- Space is reserved north of the new blower building for additional blowers in the future;
- The digestion facilities can be expanded west of the current egg shaped digesters.

4.5 Energy Requirements

The major energy using equipment of the current and future process were identified and evaluated. The most significant changes to the energy demands is the demolition of the trickling filter feed pumps and the installation of new process aeration blowers. This change will remove seven connected 300 horsepower trickling filter feed pumps but will add five connected 1,200 horsepower process aeration blowers. Table 4-2 below shows the overall energy demands at the plant comparing current conditions to the anticipated future conditions.

Table 4-2 Historic and Estimated Future Power Demands

Power Demand Condition	Demands Typical of Existing TF-SC Facility (2017-2019 Metering)	Demands Anticipated with new BNR Facilities Upon start up (2025)
Average, MW	3.2	6.0
Peak, MW	4.4	8.0
Connected, MW	10.8	22.5

To address energy efficiency in the new design, oxygen transfer is maximized. Fine bubble diffusers and deeper aeration tanks will provide better oxygen transfer to the water resulting in less energy consumption by the blowers. In addition, the blower type was selected to provide the most efficient blower type and a high degree of efficiency throughout the entire range, and good turn down at low flows. CVWRF is also specifying high performance aeration control valves and DO setpoint control to minimize over aeration. The RAS fermentation approach and primary sludge fermentation are also energy saving features and overall environmental sustainability features. On site production of readily available carbon using fermentation (i.e., volatile fatty acids or VFA), eliminates the need for importing this type of carbon which reduces chemical production, trucking, and hauling impacts.

4.6 Easements and Land Needs

All new construction will be done within the existing and pre-disturbed site boundaries of the CVWRF. Additional land will not be needed for the project.

4.7 Staffing Plan

It is anticipated the new BNR facilities will require four to five additional FTEs for operation and maintenance and one additional FTE for instrument maintenance. CVWRF working closely with Brown and Caldwell has already begun training staff on the new process. Process model simulations during construction are anticipated to get the staff comfortable with the process as the construction commences and moves towards start up.

4.8 Funding Plan

A cost estimate of the recommended alternative along with the estimated rate increase per ERU is found in Tables 4-3 and 4-4. It is noted that CVWRF is considering a combination of pay as you go, public open market bonding, and SRF monies to complete an entire funding package. The facilities and cost estimates shown in Table 4-2 have some connection to the nutrient project and therefore candidates for SRF funding. CVWRF is also implementing other improvements as part of the AM/CIP which are not directly related to the nutrient improvements. Those other costs are not shown here and are not candidates for SRF funding.

Table 4-3 Nutrient Project and Other Related Capital Improvements Cost Opinion[a]

Facility	Area Designation	Cost Opinion
East and West TF Demo	-	$4,940,000
PEPS and Area 16 MCC	16	$4,400,000
Anaerobic Zones	17	$13,400,000
Anoxic/Aeration Zones	18	$38,183,000
SCT repurpose	19	$1,000,000
RAS PS	20	$750,000
RAS Denite	22	$7,375,000
Blower Building	34	$23,000,000
Thickening/Straining	25/26	$12,000,000
Sidestream P	30	$3,500,000
Sidestream N	31	$6,500,000
Misc. Nutrient Yard Piping	00	$8,263,000
Food Waste Recieving	-	$3,000,000
Filter/3W	09	$11,000,000
	Subtotal	*$137,311,000*
	Contractor Overhead and profit/general conditions (10%)	$13,731,000
	Subtotal	*$151,042,000*
	Engineering and Construction Management (15%)	$22,656,000
	Subtotal	*$173,698,000*
	Contingency (25%)	$43,425,000
	TOTAL	**$217,123,000**

a. *The cost opinion is a Class 3 estimate which has a range of +25% and -35%.*

Table 4-4 User Rate Assessment[a]		
Criteria	Scenario 1	Scenario 2
Capital Cost	$217,123,000	$217,123,000
% Bond	100%	75%
Bonding Cost (1%)	$2,171,230	$1,628,423
Bond Amount	$219,294,230	$164,470,673
Bond Rate	3.5%	1.5%
Bond Term	20	20
New annual cost increases for O&M[b]	$6,140,000	$6,140,000
Annual Bond Payment	$15,430,000	$9,580,000
New annual cost	$21,570,000	$15,720,000
ERUs	200,000	200,000
Rate Increase$/ERU/month	$8.99	$6.55

a. *The user rate analysis shown represents an approximate rate estimate based on the criteria in the table. The final user rate should be calculated by professionals who are expert in financial analysis and bonding. CVWRF is advised to seek professional opinions outside of this report for bonding and rate setting. The final rates may be influenced by market conditions, bond coverage requirements, bond ratings, and percent of total cost that is bonded.*

b. *See Table 6-1 from 2015 Feasibility Study (BC, 2015). Annual costs include incremental additional costs for labor, solids handling, and power associated with the new BNR system.*

Table 4-4 shows how the potential rate increase, using the higher rate scenario, would impact the existing user rates for the member entities and the resulting user rates relationship to % of the entities' median adjusted gross income (MAGI). DWQ uses 1.4% of the MAGI as a guide to affordable sewer bills. Projects that result in user rates greater than 1.4% of the MAGI may be candidates for reduced rates or grant funding.

South Salt Lake City already exceeds 1.4% of MAGI and has requested hardship financial assistance from the Water Quality Board or other sources to afford the rate increase from the project. Data from the Utah Water Quality Board (DEQ 2018) was used to construct a summary of the current and future percent of MAGI for each of the seven member entities in Table .

Table 4-5 Combined Sewer Rates and Percent of MAGI				
	Current Average Monthly Sewer Bill[a]	Current % MAGI[a]	Future Average Monthly Sewer Bill[b]	Future % MAGI
CWID	$20.00	0.43%	$28.99	0.62%
GHID	$31.90	1.09%	$40.89	1.40%
KID	$22.50	0.78%	$31.49	1.08%
Murray	$38.28	1.11%	$47.27	1.37%
Mt. Olympus	$15.00	0.51%	$23.99	0.82%
South SL	$42.00	1.65%	$50.99	2.00%
TBID	$19.36	0.60%	$28.35	0.88%

a. Information is from the April 18, 2018 Utah Water Quality Board Meeting minutes.

b. Highest cost scenario plus the current average sewer bill.

4.9 Public Outreach Plan

To initiate public outreach early in the project, the recommended alternative and implications associated with the proposal were presented during board and city council meetings of the member entities during the years of 2015 - 2016. In turn, the member entities notified their customers of the proposed changes and have implemented rate increases to fund the recommended alternative. Very few public comments were received regarding the projected rate increases.

CVWRF upgraded their public website to communicate the proposed changes. Currently, information about the upgrades can be found at CVWRF.org under the "Construction Progress and Plant Improvement" heading within the "About" section.

In addition, public stakeholders were notified via letters soliciting requests for comments about the project and potential impacts. The public was given 30 days to submit their responses. The letter that was sent and the list of entities contacted can be found in comments that were received can be found in Appendix D. CVWRF received no comments from any of the public entities.

The continued public outreach plan includes:

- Regular updates from CVWRF staff to the CVWRF Board in public meetings;
- Regular updates on the CVWRF website;
- Regular updates from CVWRF staff to member entity managers; the entity managers will then continue to update their respective boards.

Section 5
Environmental Assessment

5.1 Environmental Information

Environmental considerations and potential adverse impacts are addressed and mitigated in the sections below. The location of the project is on previously disturbed land owned by and correctly zoned for CVWRF use. No additional land will be disturbed, resulting in minimal negative impacts to the environment.

The existing facility and proposed project area was used as a uranium processing site until 1978. Radiologically contaminated soil and building debris were left at the site. Under the Uranium Mill Tailings Radiation Control Act (UMTRCA), the site was remediated and placed under a long-term management plan. Additional ground water monitoring was performed until it was approved to discontinue monitoring by the U.S. Nuclear Regulatory Commission (NRC) and Utah Department of Environmental Quality, Division of Radiation Control (DEQ/DRC) (Stoller 2007).

Remediation consisted of removing contaminated bulk materials. Some residual radioactive material was left on site under supplemental standards per 40 CFR 192.21 & 192.22 (Stoller 2007). A description of the closure property restrictions and a map of the contaminated material that was estimated to remain can be found in Appendix E.

Geotechnical work conducted in 2017 as part of the overall preliminary design found no indications of tailings and all soil screening with field instruments showed only background radiation readings. Additional surveys were conducted in 2017 to investigate the risk of finding contaminated material possibly under the trickling filters. The maximum amount of radiation found in the soil samples was 0.04 millirem per hour (mrem/h) which is comparable to background conditions (IGES 2017). The soil samples extracted during this effort did not show any tailings. The soil reading of 0.04 mrem/h will produce a calculated 350.4 mrem in a year. This is much less than the OSHA maximum permissible occupational exposure limit of 5000 mrem in any 1 year.

A meeting was held on February 9, 2017 to understand considerations that must be made to accommodate the radiological contamination of the site. Members from the DEQ, including a member of the Utah Division of Waste Management and Radiation Control (WMRC) were present. Attendees to the meeting were as follows:

- Mike Kobe – Brown and Caldwell
- Kim Shelley – DEQ/DWQ, *Surface Water Section Manager*
- Gwyn Galloway – DEQ/DWQ, *Health Physicist*
- Phil Goble – DEQ/WMRC, *Uranium Mills and Radioactive Materials Section Manager*

During the meeting, attendees concluded that low level radioactive material and pockets of radioactive material may still be encountered throughout the site. Materials excavated from the site should be screened for contamination during construction with special equipment and qualified personnel to determine the proper handling method.

Per the United States Department of Energy (DOE) recommendations, if radioactive materials are encountered during construction the materials will be disposed of as radioactive waste or buried into the deepest part of the excavation during back filling. In addition, DOE officials recommended to

consider installing a radon mitigation system for habitable underground structures (e.g., residential, institutional, commercial, or industrial buildings and the like) (DOE 1997).

5.2 Cultural Resources and Archaeological Sites

An archaeologist from SWCA Environmental Consultants evaluated the project area for cultural resources and archaeological sites. SWCA's findings are that the proposed project will not disturb any cultural resources or archaeological sites. See Appendix F for additional details and the complete SWCA report.

5.3 Floodplains and Wetlands

According to the most current Flood Insurance Rate Map (FIRM) published by the Federal Emergency Management Agency (FEMA), the proposed project location is in Zone X - Areas determined to be outside 500-year flood plain and areas protected by levees from 100-year flood (FEMA, 2002). See Appendix G for the relevant FIRM map.

SWCA Environmental Consultants determined the impact the project will have on any wetlands in the area. No wetlands or other Waters of the United States were identified within the project area. See Appendix G for additional details and the full report from SWCA.

5.4 Agricultural Lands

No agricultural lands will be affected by the project. The project location and surrounding area is zoned for light industrial use (South Salt Lake City 2017).

5.5 Wild and Scenic Rivers

No Wild and Scenic Rivers are located within or near the proposed project location (National Wild and Scenic Rivers System, 2018).

5.6 Fish and Wildlife Protection

SWCA Environmental Consultants was contracted to determine the impact the project will have on any endangered species and wildlife. There will be minimal impact on fish and wildlife due to the project. The project area does not meet the habitat requirements for any endangered species that could be present. See Appendix G for the full report from SWCA.

5.7 Air Quality

The primary sources that will impact the air quality are from construction fugitive dusts and two new backup diesel generators.

A Fugitive Dust Control Plan will be required and will be submitted to the Utah Division of Air Quality (UDAQ) in compliance with the requirements of UAC R307-309. The plan will minimize dust from dispersing into the atmosphere.

The backup diesel generators will be a minimum Tier 2 system with regards to emissions into the atmosphere. The generators will be used in emergency situations and during routine preventative maintenance activities.

The generators are located within an EPA designated nonattainment area and will comply with the Utah State Implementation Plan (SIP) requirements. Once the generators that will be used are chosen, their potential to emit for the criteria pollutants will be determined. Depending on the emissions from the generators, CVWRF will either claim a small source exemption under the Utah SIP

R307-401-9 or submit a request to modify the necessary documents and approvals with the state of Utah.

All other process changes will not emit air pollutants that are regulated by the UDAQ. The proposed project is designed to reduce and eliminate odors by removing the trickling filters and by maintaining proper aeration of the wastewater. Other odor control devices are already installed or are part of other projects (Headworks and Fermenter Odor Control projects) and will treat the foul air in an engineered media biofilter.

5.8 Water Quality and Quantity

The proposed project will reduce nutrient pollution to Mill Creek. CVWRF effluent data from the Discharge Monitoring Report (DMR) data averaged from 2010 to 2017 is compared with projected 2025 water quality values (upon start up of the new BNR facilities) in Table 5-1. below. The table data shows how the project will reduce the amount of nutrients that will be going into Mill Creek, thus improving the creek's current water quality. The phosphorus discharge will be reduced 3.5 times lower than current loadings and the nitrogen loading will be reduced over 2 times compared to current conditions. Appendix H includes the most recent wasteload allocation and the antidegradation review (ADR) for the proposed improvements.

Table 5-1. Effluent Water Quality Comparison

	Annual Average	
Nutrient	2010-2017	2025 Startup
Total Phosphorus		
Concentration, mg/L	3.4	<1
Loading, tons/year at 55 mgd	285	83
Total Inorganic Nitrogen[a]		
Concentration, mg/L	20.5	<10
Loading, tons/year at 55 mgd	1,716	836
Ammonia, mg/L	3-10	< 1

a. TIN was calculated from the 2010 – 2017 DMR data as follows: TIN= Nitrate + Nitrite + Ammonia

5.9 Direct and Indirect Impacts

Any potential impacts to the environment from the proposed project include:

1. Contact with residual radioactive material during construction and demolition activities.
2. Impacts to air quality from fugitive dusts disturbed during construction.
3. Impacts to air quality from emergency operation of two new backup generators.
4. Potential spills of biosolids during hauling from the CVWRF to the land application site.

5.10 Mitigating Adverse Impacts

Potential adverse impacts will be mitigated as follows:

1. A specially trained and qualified person will use detection equipment to screen suspect material that is excavated from the site for radiological contamination. All material found to have contamination will either be properly disposed of as radioactive waste or buried into the deepest part of the excavation during back filling (DOE 1997). Also, installing a radon mitigation system in habitable basements will be considered.
2. Construction contractors will be required to develop a Fugitive Dust Control Plan and submit it to UDAQ to meet the requirements of R307-309.
3. Depending on the emissions from the backup generators, CVWRF will either claim a small source exemption under the Utah SIP R307-401-9 or submit a request to modify the necessary documents and approvals with the state of Utah.

Section 6

References

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Appendix A – Plant Wide CIP

CENTRAL VALLEY WATER RECLAMATION FACILITY
Capital Funding Projections

Updated: 8/23/2018

I. Collection System/Field Projects																													
	FLD01	Cottonwood Murray (South of 3300 S) Sliplining		$ 4,244,000	$ 4,244,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,244,000	$ -
	FLD02	South Salt Lake Force Main (Interceptor) Rehabilitation/Replacement		$ 1,955,000	$ -	$ 1,955,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,955,000	$ -
	FLD03	Influent Box Channel (Rehab, Gates, Vent)		$ 2,965,000	$ 2,965,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,965,000	$ -
C	FLD04	GHID Siphon Lining/Rehabilitation		$ 1,746,000	$ 1,274,000	$ 472,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,746,000	$ -
	FLD05	Influent Bypass Box and Vitro Ditch Piping Lining/Rehabilitation		$ 2,907,450	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,907,450	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,907,450	$ -
	New	Flo-Dar Metering Equipment Rotation		$ 406,414	$ -	$ 36,000	$ 18,900	$ 19,845	$ 20,837	$ 21,879	$ 22,973	$ 24,122	$ -	$ -	$ -	$ -	$ 25,328	$ 26,594	$ 27,924	$ 29,320	$ 30,786	$ 32,325	$ 33,942	$ 35,639	$ -			
	FLD08	Murray Siphon Lining and Inlet Box Rehab		$ 1,440,000	$ -	$ -	$ 1,440,000	$ -																			$ 1,440,000	$ -
		Subtotal		$ 15,663,864	$ 8,483,000	$ 2,463,000	$ 1,458,900	$ 19,845	$ 20,837	$ 21,879	$ 22,973	$ 24,122	$ -	$ 2,907,450	$ -	$ -	$ 25,328	$ 26,594	$ 27,924	$ 29,320	$ 30,786	$ 32,325	$ 33,942	$ 35,639	$ -			$ -
A. Liquid Treatment Process Projects																													
C		Admin Bldg HVAC Units Replacement		$ 54,000	$ 54,000	$ -	$ -	$ -																					
	LTP06	Headworks HVAC Upgrade/Replacement		$ 574,350	$ -	$ 574,350	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 574,350	$ -
DL	LTP18	Thickening Building Electrical and HVAC Upgrades	Yes	$ 838,200	$ 381,000	$ -	$ -	$ -	$ 457,200	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 838,200	$ -
	LTP01A	Maintenance Building HVAC Upgrades		$ 300,000	$ -	$ 300,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 300,000	$ -
		UV HVAC Swamp Cooler Replacment		$ 191,250	$ 85,000	$ -	$ -	$ -			$ 106,250																	
	LTP01E	Digester Buildings HVAC Upgrades		$ 262,500	$ -	$ -	$ -	$ 262,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 262,500	$ -
C	LTP01F	Tunnel and Misc. Building HVAC Upgrades		$ 352,500	$ 90,000	$ -	$ -	$ 262,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 352,500	$ -
	LTP02A	Headworks Seismic Upgrades		$ 1,500,000	$ -	$ 1,500,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,500,000	$ -
	LTP02B	Maintenance Building Seismic Upgrades		$ 1,450,000	$ -	$ -	$ -	$ 1,450,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,450,000	$ -
	LTP02C	Dewatering Building Seismic Upgrades		$ 1,300,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,300,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,300,000	$ -
	LTP02D	Admin Building Seismic Upgrades		$ 1,200,000	$ -	$ -	$ -	$ -	$ -	$ 1,200,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,200,000	$ -
	LTP02E	East & West Digester Control Buildings Seismic Upgrades		$ 1,400,000	$ -	$ -	$ -	$ -	$ 1,400,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,400,000	$ -
	LTP02F	Thickening Building Seismic Upgrades	Yes	$ 350,000	$ -	$ -	$ -	$ -	$ -	$ 350,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 350,000	$ -
	LTP02G	Tunnel and Misc. Building Seismic Upgrades		$ 1,575,000	$ -	$ -	$ -	$ -	$ 1,575,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,575,000	$ -
	LTP02F	Aeration Basins, Clarifiers and Misc. Tanks Seismic Upgrades	Yes	$ 1,050,000	$ -	$ -	$ -	$ -	$ -	$ 1,050,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,050,000	$ -
		Power Gen Building Seimic Retrofit		$ 617,000	$ 617,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 617,000	$ -
	LTP05	Screenings and Grit System Replacement		$ 8,374,954	$ -	$ 5,000,625	$ 3,374,329	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,374,954	$ -
	LTP07	Influent Pump Right Angle Gear Drive Rebuild		$ 228,700	$ -	$ -	$ 46,000	$ -	$ -	$ -	$ 53,550	$ -	$ -	$ -	$ 60,900	$ -	$ -	$ -	$ -	$ 68,250	$ -	$ -	$ -	$ -	$ -	$ -	$ 228,700	$ -
	LTP11	Primary & Secondary Clarifier Launder Replacement		$ 8,818,302	$ 818,000	$ 787,500	$ 811,125	$ 835,459	$ 860,523	$ 886,339	$ 912,929	$ 940,317	$ 968,527	$ 997,583	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,818,302	$ -
	LTP13	Replace RSS Pumps		$ 60,000	$ 60,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 60,000	$ -
		3 New RAS Pumps		$ 180,000	$ -	$ 180,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 180,000	$ -
x	LTP15	Rebuild Secondary Clarifier Drives		$ 259,000	$ -	$ 50,000	$ 51,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 158,000	$ -	$ 259,000	$ -
	LTP16	Secondary Clarifier No. 1-8 Gate Repair/Replacement (8 units)		$ 205,800	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 205,800	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 205,800	$ -
C	LTP17	3W/Cooling Pump Station, Hypochlorite System, Reuse Filters		$ 8,261,000	$ 3,211,000	$ 4,050,000	$ 1,000,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,261,000	$ -
	LTP21	UV Pass No. 2 Equipment		$ 841,000	$ 631,000	$ 210,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 841,000	$ -
	LTP23	Headworks, Fermentors, Sludge Thickening Odor Control		$ 3,700,000	$ 900,000	$ 2,800,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,700,000	$ -
	LTP24	Secondary Clarifier Launders and Weirs Replacement/New Stamford Baffles		$ 3,734,777	$ -	$ 420,000	$ 432,600	$ 445,578	$ 458,945	$ 472,713	$ 486,894	$ 501,501	$ 516,546	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,734,777	$ -
	LTP25	New Influent Pumps		$ 2,011,500	$ -	$ -	$ 300,000	$ -	$ 315,000		$ -	$ -	$ -	$ 341,250	$ -	$ -	$ 346,500	$ -	$ -	$ 351,750	$ -	$ -	$ 357,000	$ -	$ -	$ -	$ -	$ 2,011,500	$ -
	LTP27	UV Equipment Replacement		$ 4,764,375	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,307,500	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,456,875	$ -	$ 4,764,375	$ -
	LTP28	UV Building Screen Replacement		$ 367,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 183,750	$ 183,750	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 367,500	$ -
	LTP29	Aeration Basin Diffuser Replacement		$ 2,100,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,050,000	$ 1,050,000	$ 2,100,000	$ -
	LTP30	Isolation Gate Replacement (Grit Basins)		$ 564,900	$ -	$ -	$ -	$ 564,900	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 564,900	$ -
	LTP32	UV Forbay and Afterbay Mixing	Yes	$ 210,000	$ -	$ -	$ -	$ -	$ 210,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 210,000	$ -
	LTP34	Headworks Area Piping Replacement		$ 121,800	$ -	$ -	$ 121,800	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 121,800	$ -
		Subtotal		$ 57,818,408	$ 6,847,000	$ 15,872,475	$ 6,136,854	$ 3,820,937	$ 5,276,668	$ 3,959,052	$ 1,559,623	$ 2,947,618	$ 1,668,823	$ 1,522,583	$ 60,900	$ 346,500	$ 3,307,500	$ 351,750	$ 68,250	$ 357,000	$ -	$ 158,000	$ 2,506,875	$ 1,050,000			$ -
B. Biosolids Treatment and Disposal Projects																													
	BTD05	Digester No. 1 - 4 Circulation Pump Replacement (Choppers)		$ 250,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 250,000	$ -	$ -	$ 250,000	$ -
	BTD06	Digester No. 6-7 Circulation Pump Replacement (Choppers)		$ 579,461	$ -	$ -	$ 78,750	$ 81,113	$ 83,546	$ 86,052	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 250,000	$ -	$ -	$ 579,461	$ -
	BTD07	Sludge Cake and Polymer Pump Rebuild		$ 306,250	$ -	$ -	$ -	$ -	$ -	$ -	$ 131,250	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 175,000	$ -	$ -	$ -	$ 306,250	$ -
	BTD08	New Dry Polymer Feed System/Upgrade Controls Existing System		$ 157,500	$ -	$ 52,500	$ 105,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 157,500	$ -
	BTD09	Refurbish Filtrate Tanks		$ 630,000	$ -		$ -	$ -	$ -	$ 630,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 630,000	$ -
C	BTD10	Refurbish Equalization and Blend Tanks		$ 2,425,000	$ 1,875,000	$ 550,000		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,425,000	$ -
	BTD11	Compost Covers (six)		$ 1,294,750	$ -	$ 75,000	$ 78,750	$ 82,688	$ 83,475	$ 87,649	$ 92,908	$ 97,553	$ 102,431	$ 107,553	$ 112,930	$ -	$ -	$ -	$ 118,577	$ 124,506	$ 130,731	$ -	$ -	$ -	$ -	$ -	$ 1,294,750	$ -
	BTD12	Dewatering Building Ventilation Replacement/Odor Control Upgrades		$ 675,600	$ -	$ -	$ -	$ -	$ 675,600	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 675,600	$ -
	BTD13	Digester 1-5 Mixing Systems Replacement (Vaughn Jet Mixing)		$ 1,537,483	$ -	$ 367,500	$ 378,525	$ 389,881	$ 401,577																		$ 1,537,483	$ -
	BTD 14	Digester 1-5 Cover Replacement (gasholder)		$ 10,232,038	$ -	$ -	$ 787,500	$ -			$ 2,257,500	$ 2,325,225	$ 2,394,982	$ 2,466,831			$ -										$ 10,232,038	$ -
	BTD 15	Replace Dewatering Equipment		$ 5,250,000	$ -	$ -	$ -	$ -	$ 5,250,000	$ -	$ -	$ -															$ 5,250,000	$ -
	BTD 16	Expand Sludge Silo System and add Truck Scale		$ 8,100,000	$ -	$ -	$ -	$ -	$ 4,050,000	$ 4,050,000			$ -														$ 8,100,000	$ -
	BTD-AM	Biosolids Treatment and Disposal Misc. Asset Management Projects		$ 4,841,738	$ -	$ -	$ 515,550	$ 565,950	$ 214,200	$ 134,400	$ 1,260,000	$ 106,050	$ 481,950	$ 112,350	$ 116,550	$ 119,700	$ 368,550	$ 127,050	$ 130,200	$ 136,710	$ 143,546	$ 150,723	$ 158,259	$ -	$ -	$ 4,841,738	$ -
		Primary sludge line replacement		$ 100,000	$ 100,000	$ -	$ -	$ -																				
		Contingency		$ 2,393,000	$ 393,000	$ 1,000,000	$ 500,000	$ 500,000																	$ -	$ -	$ 2,393,000	
																											$ -		
		Subtotal		$ 38,772,820	$ 2,368,000	$ 2,045,000	$ 2,444,075	$ 1,619,632	$ 10,758,398	$ 4,988,101	$ 3,741,658	$ 2,528,828	$ 2,979,363	$ 2,686,734	$ 229,480	$ 119,700	$ 368,550	$ 245,627	$ 254,706	$ 267,441	$ 318,546	$ 650,723	$ 158,259	$ -			$ -
C. Energy Management Projects																													
	EM01	480 V feeder / Tie Breaker		$ 110,000	$ 110,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 110,000	$ -
E	EM03	480V MCC Buckets (Maintenance)		$ 63,000	$ 63,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 63,000	$ -
x	EM04	Rebuild Transformers (every 5 years)		$ 274,636	$ -	$ 55,000	$ -	$ -	$ -	$ -	$ 63,250	$ -	$ -	$ -	$ -	$ -	$ 72,738	$ -	$ -	$ -	$ -	$ 83,648	$ -	$ -	$ -	$ 274,636	$ -
	EM05	Engine Overhaul Top End		$ 2,100,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,050,000	$ 1,050,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,100,000	$ -
	EM06	Engine #4 Turbo Rebuild		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	EM07	Major Gen. Repairs (Gen #3 Rewind and #5 Bearings)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
C	EM14	Cogen System Upgrades (Gas Treatment, Engine 1 &2 Replacement, Cooling System Replacement)		$ 16,045,400	$ 13,220,400	$ 825,000	$ 2,000,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 16,045,400	$ -
	EM15	Heat Loop Circulation Pump Replacement (2 units)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	EM16	Centrifugal Chiller and 3-stage Chiller Replacement		$ 735,000	$ -	$ 367,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 367,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 735,000	$ -
	EM18	Aeration and Channel Blower Replacement	Yes	$ 1,664,250	$ -	$ -	$ -	$ -	$ -	$ 1,664,250	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,664,250	$ -
	EM19	Air Compressor Replacement		$ 426,300	$ -	$ -	$ -	$ -	$ -	$ -	$ 157,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 268,800	$ -	$ -	$ -	$ -	$ -	$ 426,300	$ -
	EM21	Cathodic Protection Replacement		$ 500,000	$ -	$ -	$ 250,000	$ 250,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 500,000	$ -
	EM-AM	Energy Management Systems Asset Management Projects(Break out Projects each ye	Yes	$ 4,743,428	$ -	$ -	$ 208,950	$ 217,350	$ 829,500	$ 324,450	$ 130,607	$ 321,300	$ 136,827	$ 370,745	$ 145,680	$ 227,079	$ 294,687	$ 241,398	$ 164,861	$ 523,920	$ 174,069	$ 432,005	$ -	$ -	$ -	$ -	$ 4,743,428	$ -
	EM-M	Air Gap Tank Replacement		$ 90,000	$ -	$ -	$ -	$ 90,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 90,000	$ -
	EM-22	Headworks SKV Switchgear Replacement		$ 852,600	$ -	$ -	$ 852,600	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 852,600	$ -
C		Headworks Backup Generator (2 New 4160 V)		$ 600,000	$ 600,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 600,000	$ -
	EM10	Power Gen. Swamp Coolers Replacement		$ 150,000	$ 150,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 150,000	$ -
		Subtotal		$ 28,354,614	$ 14,143,400	$ 1,247,500	$ 3,311,550	$ 557,350	$ 829,500	$ 1,988,700	$ 351,357	$ 321,300	$ 136,827	$ 738,245	$ 1,195,680	$ 1,349,817	$ 294,687	$ 241,398	$ 164,861	$ 792,720	$ 257,717	$ 432,005	$ -	$ -			$ -
D. General Facilities and Grounds Projects																													
	GFG03	Fire Protection System Changeout		$ 1,165,500	$ -	$ -	$ 574,350	$ 591,150	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,165,500	$ -
x	GFG05	Secondary Clarifiers Gearbox Rebuild (2 units)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	GFG06	Metal Building Expansion		$ 223,650	$ -	$ 223,650	$ -	$ -																			$ 223,650	$ -
	GFG07	Metal Building Rehab		$ 456,750	$ -	$ -	$ -	$ -						$ 147,000	$ 152,250	$ 157,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 456,750	$ -
	GFG08	Blowdown Pond Improvement and Sealing		$ 374,850	$ -	$ -	$ -	$ -							$ 374,850	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 374,850	$ -
	GFG09	Utility Piping Replacement (headworks, secondary, tunnels)		$ 677,250	$ -	$ -	$ -	$ 126,000	$ 183,750					$ 147,000	$ 220,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 677,250	$ -
		Underground fuel storage tank removal		$ 50,000	$ 50,000	$ -	$ -	$ -																			$ 50,000	$ -
		Power Gen Elevator				$ 100,000																							
		DEF Fueling Station		$ 25,000	$ -	$ 25,000	$ -	$ -																			$ 25,000	

CENTRAL VALLEY WATER RECLAMATION FACILITY
Capital Funding Projections

	Subtotal	$ 2,973,000	$ 50,000	$ 348,650	$ 574,350	$ 717,150	$ 183,750	$ -	$ -	$ -	$ 294,000	$ 747,600	$ 157,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ -
E. Rolling Stock																													
RS01	Compost Rotomix Conveyor (for Existing Truck)	$ 228,900	$ -	$ -	$ -	$ -	$ 63,000	$ -	$ -	$ -	$ -	$ -	$ 75,600	$ -	$ -	$ -	$ -	$ -	$ -	$ 90,300	$ -	$ -	$ -	$ -	$ 228,900	$ -
RS02	New Compost Rotomix and Truck	$ 670,950	$ -	$ -	$ -	$ 296,100	$ -	$ -	$ -	$ -	$ -	$ -	$ 374,850	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 670,950	$ -
RS03	Scarab Compost Turner	$ 1,096,200	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,096,200	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,096,200	$ -
RS04	Tarp Winder	$ 274,050	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 274,050	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 274,050	$ -
RS05	Compost Screen	$ 617,400	$ -	$ -	$ -	$ -	$ -	$ -	$ 617,400	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 617,400	$ -
RS06	Wood Chipper	$ 1,637,150	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 822,150	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 815,000	$ 1,637,150	$ -
RS07	Sludge Trucks and Trailers	$ 2,710,123	$ 266,000	$ -	$ 287,700	$ -	$ -	$ -	$ 305,900	$ 315,100	$ -	$ -	$ -	$ -	$ -	$ 351,785	$ 362,365	$ -	$ -	$ -	$ -	$ -	$ 404,553	$ 416,720	$ 2,710,123	$ -
RS08	Grit/Screenings Truck and Roll Off Dumpsters	$ 687,750	$ -	$ 189,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 236,250	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 262,500	$ -	$ 687,750	$ -
RS09	Scissor Lift/Boom Lift	$ 257,250	$ -	$ 31,500	$ -	$ -	$ -	$ -	$ -	$ 84,000	$ -	$ -	$ 36,750	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 105,000	$ -	$ -	$ 257,250	$ -
RS10	Fork Lift	$ 236,950	$ -	$ 46,200	$ -	$ -	$ -	$ -	$ -	$ 57,750	$ -	$ -	$ -	$ -	$ -	$ -	$ 63,000	$ -	$ -	$ -	$ -	$ -	$ -	$ 70,000	$ 236,950	$ -
RS11	Boom Truck/Crane	$ 975,250	$ 319,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 472,500	$ 183,750	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 975,250	$ -
RS12	10 Wheel Dump	$ 727,650	$ -	$ 183,750	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 233,100	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 310,800	$ 727,650	$ -
RS13	Engineering/Field Services Pickup	$ 142,594	$ -	$ -	$ -	$ -	$ -	$ 39,393	$ -	$ -	$ -	$ -	$ 47,037	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 56,164	$ -	$ -	$ -	$ 142,594	$ -
RS14	Pretreatment Sampling Vehicle	$ 909,087	$ 30,000	$ 35,000	$ 36,050	$ 37,132	$ 38,246	$ 39,393	$ 40,575	$ 41,792	$ 43,046	$ 44,337	$ 45,667	$ 47,037	$ 48,448	$ 49,901	$ 51,398	$ 52,940	$ 54,528	$ 56,164	$ 57,849	$ 59,584	$ -	$ -	$ 909,087	$ -
RS15	Front End Loader	$ 1,822,350	$ -	$ -	$ -	$ 532,350	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 600,000	$ -	$ -	$ -	$ -	$ -	$ 690,000	$ -	$ -	$ -	$ -	$ 1,822,350	$ -
RS16	Operations and Maintenance Pickups	$ 1,032,170	$ 30,000	$ 39,900	$ 41,097	$ 42,330	$ 43,600	$ 44,908	$ 46,255	$ 47,643	$ 49,072	$ 50,544	$ 52,060	$ 53,622	$ 55,231	$ 56,888	$ 58,595	$ 60,353	$ 62,164	$ 64,029	$ 65,950	$ 67,929	$ -	$ -	$ 1,032,170	$ -
RS17	Mini Excavator	$ 105,000	$ -	$ 105,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 105,000	$ -
	Large telehandler lift	$ 150,000	$ 150,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 150,000	$ -
	Subtotal	$ 14,280,824	$ 795,000	$ 630,350	$ 364,847	$ 907,912	$ 144,846	$ 123,694	$ 1,010,130	$ 1,642,485	$ 1,188,318	$ 327,981	$ 548,177	$ 1,493,196	$ 639,214	$ 532,154	$ 109,993	$ 113,293	$ 896,992	$ 281,357	$ 790,852	$ 1,740,033		$ -
F. IT Projects																													
IT05	Asset Management Software and Setup	$ 801,000	$ 150,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 282,450	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 368,550	$ -	$ -	$ 801,000	$ -		
IT06	Phone VOIP Replacement	$ 95,550	$ -	$ -		$ -	$ -	$ -	$ 95,550	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 95,550	$ -		
IT07	Flow Stations - New Radio Frequency (digital)	$ 198,450	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 85,050	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 113,400	$ -	$ 198,450	$ -		
IT10	Color Copier/Scanner	$ 35,700	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 14,700	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 21,000	$ -	$ 35,700	$ -		
IT12	Endura VMS (Video Management System)	$ 278,250	$ -	$ -	$ 118,650	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 159,600	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 278,250	$ -		
IT13	Fiber Network Upgrades Yes	$ 315,000	$ -	$ -	$ -	$ -	$ 105,000	$ 105,000	$ 105,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 315,000	$ -		
IT15	Electronic O&Ms	$ 78,750	$ -	$ -	$ -	$ -	$ -	$ -	$ 78,750	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 78,750	$ -		
IT16	SCADA/PLC Changeout and Upgrades	$ 3,560,854	$ -	$ 420,000	$ 288,750	$ 297,413	$ 306,335	$ 315,525	$ 324,991	$ 334,741	$ 344,783	$ 355,126	$ 50,000	$ 51,500	$ 53,045	$ 54,636	$ 56,275	$ 57,963	$ 59,702	$ 61,493	$ 63,338	$ 65,238	$ 3,560,854	$ -		
IT 19	Control Room Console Equipment and Screen Replacement	$ 393,750	$ -	$ -	$ -	$ -	$ -	$ 210,000	$ 183,750	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 393,750	$ -		
IT 20	IT Server Replacement Rotation	$ 170,944	$ -	$ 25,000	$ 7,500	$ 26,250	$ 8,000	$ 27,500	$ 8,500	$ 28,875	$ 9,000	$ 30,319	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 170,944	$ -		
	UV Channel PCC (one channel)	$ 217,000	$ -	$ 107,000	$ 110,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 217,000	$ -		
	Operator Logbook replacement	$ 50,000	$ -	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 50,000	$ -		
	PLC M580 Change Out Headworks/UV	$ 100,000	$ -	$ 100,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 100,000	$ -		
	Pretreatment IUMS Software	$ 50,000	$ -	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 50,000	$ -		
	HR Software	$ 75,000	$ 75,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 75,000	$ -		
	Septage Receiving Station	$ 80,000	$ 80,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 80,000	$ -		
	PI Tags	$ 40,000	$ 40,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 40,000	$ -		
	New Process Control Network HLS	$ 100,000	$ 100,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 100,000	$ -		
	Admin & Headworks & PowerGen Roof Cameras	$ 30,000	$ 30,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 30,000	$ -		
	Subtotal	$ 6,670,248	$475,000	$ 752,000	$ 524,900	$ 323,663	$ 419,335	$ 658,025	$ 796,541	$ 363,616	$ 735,983	$ 385,445	$ 50,000	$ 51,500	$ 212,645	$ 54,636	$ 56,275	$ 57,963	$ 59,702	$ 430,043	$ 197,738	$65,238		$0	
G. Lab Projects																										
LAB01	GC/MS System	$ 411,600	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 176,400	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 235,200	$ -	$ 411,600	$ -		
LAB02	LIMS System	$ 247,450	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 106,050	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 141,400	$ -	$ 247,450	$ -		
C LAB03	AQ2 Color Metric Meter	$ 176,350	$ 64,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 112,350	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 176,350	$ -		
LAB04	LC/MS System	$ 446,250	$ -	$ -	$ -	$ -	$ -	$ -	$ 210,000	$ -	$ -	$ -		$ 236,250	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 446,250	$ -		
	Subtotal	$ 1,281,650	$ 64,000	$ -	$ -	$ -	$ -	$ -	$ 210,000	$ -	$ 282,450	$ -	$ 112,350	$ 236,250	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 376,600	$ -		$ -	
H. Nutrient Removal Upgrade Projects																										
NUT02	Nutrient Removal Engineering (Design and CM Phase 1 and 2)	$ 21,792,000	$ 4,242,000	$ 4,550,000	$ 3,500,000	$ 3,500,000	$ 2,000,000	$ 2,000,000	$ 1,500,000	$ 500,000		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 21,792,000	$ -		
NUT03	Nutrient Removal Facilities Construction Phase 1 - 3 (1 mg/l Phosphorus + TIN + low Ammonia)	$ 160,318,461	$ -	$ 5,000,000	$ 33,680,000	$ 38,680,000	$ 29,670,001	$ 33,158,460	$ 20,130,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 160,318,461	$ -		
NUT05	Accelerate design/construction of Two Secondary Clarifiers for Nutrient Removal	$ 8,546,000	$ 6,800,000	$ 1,746,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,546,000	$ -		
NUT06	Food Waste Receiving Facility	$ 4,664,000	$ -	$ 424,000	$ 4,240,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,664,000	$ -		
	Subtotal	$ 195,320,461	$ 11,042,000	$ 11,720,000	$ 41,420,000	$ 42,180,000	$ 31,670,001	$ 35,158,460	$ 21,630,000	$ 500,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ -		
Plant Projects																										
	Plant Projects Total	**$ 345,472,024**	$ 35,784,400	$ 32,615,975	$ 54,776,576	$ 50,126,644	$ 49,282,498	$ 46,876,032	$ 29,299,309	$ 8,303,847	$ 7,285,764	$ 6,408,587	$ 2,354,087	$ 3,596,963	$ 4,822,596	$ 1,425,565	$ 654,085	$ 1,588,417	$ 1,532,957	$ 1,952,128	$ 4,030,324			$ -		
	Plant Projects Cumulative Subtotal		$ 35,784,400	$ 68,400,375	$ 123,176,951	$ 173,303,595	$ 222,586,093	$ 269,462,125	$ 298,761,434	$ 307,065,281	$ 314,351,045	$ 320,759,632	$ 323,113,720	$ 326,710,682	$ 331,533,278	$ 332,958,843	$ 333,612,927	$ 335,201,344	$ 336,734,301	$ 338,686,429	$ 342,716,753					
	Plant Projects Interval Total																						**$ 342,716,753**	**$ -**		
Collection System Projects																										
	Collection System Projects Total	**$ 15,663,864**	$ 8,483,000	$ 2,463,000	$ 1,458,900	$ 19,845	$ 20,837	$ 21,879	$ 22,973	$ 24,122	$ -	$ 2,907,450	$ -	$ 25,328	$ 26,594	$ 27,924	$ 29,320	$ 30,786	$ 32,325	$ 33,942	$ 35,639			$ -		
	Collection System Projects Cumulative Subtotal		$ 8,483,000	$ 10,946,000	$ 12,404,900	$ 12,424,745	$ 12,445,582	$ 12,467,461	$ 12,490,434	$ 12,514,556	$ 12,514,556	$ 15,422,006	$ 15,422,006	$ 15,447,334	$ 15,473,928	$ 15,501,852	$ 15,531,172	$ 15,561,958	$ 15,594,284	$ 15,628,225	$ 15,663,864					
	Collection System Interval Total																						**$ 15,663,864**	**$ -**		
All Projects																										
	All Projects Total	**$ 361,135,888**	$ 44,267,400	$ 35,078,975	$ 56,235,476	$ 50,146,489	$ 49,303,335	$ 46,897,911	$ 29,322,282	$ 8,327,969	$ 7,285,764	$ 9,316,037	$ 2,354,087	$ 3,622,290	$ 4,849,190	$ 1,453,489	$ 683,405	$ 1,619,203	$ 1,565,283	$ 1,986,070	$ 4,065,963			$ -		
	All Projects Cumulative Subtotal		$ 44,267,400	$ 79,346,375	$ 135,581,851	$ 185,728,340	$ 235,031,675	$ 281,929,586	$ 311,251,868	$ 319,579,837	$ 326,865,601	$ 336,181,638	$ 338,535,726	$ 342,158,016	$ 347,007,206	$ 348,460,695	$ 349,144,100	$ 350,763,303	$ 352,328,585	$ 354,314,655						
	All Projects IntervalTotals																						**$ 358,380,618**	**$ -**		

NOTES: Costs are budgetary level estimates with an accuracy range of ±30 to 50 percent.
Costs for future years are escalated using 3.0% per year inflation.

Phase 4 Nutrient Removal project is not included in this schedule. It would likely occur around 2040 at an escalated cost of $128M (2040 dollars).

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
	$44,267,400	$35,078,975	$56,235,476	$50,146,489	$49,303,335	$46,897,911	$29,322,282			
	$44,267,400	$34,606,975	$56,235,476	$50,146,489	$49,303,335	$46,897,911	$29,322,282			
Pay-as-you-go CIP Funding Level	5,722,200	5,836,644	5,953,377	6,072,444	6,193,893	6,317,771	6,444,127	6,573,009	6,704,469	6,838,559

Maintenance Projects																													
Pre FLD07	General Collection System Manhole Rehab (as needed basis)	$ 1,640,000	$ 213,000	$ 219,000	$ 226,000	$ 232,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000		$ 1,640,000	$ -		
E EM-AM	Energy Management Systems Asset Management Projects	$ 22,000	$ 22,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 22,000	$ -		
LTP-AM	Liquid Treatment Process Asset Management Projects (Breakout Projects each Year) Yes	$ 2,335,100	$ -		$ 250,950	$ 224,700	$ 19,950	$ 49,350	$ 21,000	$ 1,365,000	$ 22,050	$ 44,000	$ 191,100	$ 33,600	$ -	$ 35,700	$ -	$ 37,800	$ -	$ 39,900	$ -	$ -	$ -	$ 2,335,100	$ -		
E HW	Overhead Bridge Crane Controls and Wiring	$ 25,000	$ -	$ 25,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 25,000	$ -		
E EM03	480V MCC Buckets	$ 73,000	$ 63,000	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 73,000	$ -		
M	Primary Clarifier Surface Sprayer Replacement	$ 85,000	$ -	$ 85,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 85,000	$ -		
M	Telescoping Valve Maintenance	$ 17,000	$ -	$ 17,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 17,000	$ -		
M	Deep Sump Pump Replacement	$ 50,000	$ -	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 50,000	$ -		
	10 Tunnel Sump Pumps	$ 40,000	$ -	$ 40,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 40,000	$ -		
CS	Inspect the Sewer Line to the Deep Sump	$ 25,000	$ -	$ 25,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 25,000	$ -		
E	NETA Motor Maintenance	$ 65,000	$ -	$ 65,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 65,000	$ -		
M BTD02	Recondition Strain Presses and Purchase New Presses	$ 1,111,000	$ 48,000	$ -	$ -	$ 225,000	$ 54,000	$ -	$ 58,000	$ -	$ 61,000	$ -	$ 65,000	$ -	$ 450,000	$ -	$ 73,000	$ -	$ 77,000	$ -	$ -	$ -	$ 1,111,000	$ -		
M BTD03	Egg Shaped Digester Recoating / New Exterior Sheathing (2)	$ 1,715,000	$ -	$ -	$ 845,000	$ 870,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,715,000	$ -		
M	UV Sump Pump	$ 50,000	$ 10,000	$ 40,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 50,000	$ -		
M	Belt Press Rollers	$ 85,000	$ 25,000	$ 60,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 85,000	$ -		
EM20	Electrical Cable Replacement (4160V and 480v)	$ 2,441,138	$ -	$ -	$ -	$ -	$ 131,250	$ 135,188	$ 139,244	$ 143,421	$ 147,724	$ 152,156	$ 156,721	$ 161,423	$ 166,266	$ 171,254	$ 176,392	$ 181,684	$ 187,135	$ 192,749	$ 198,531	$ -	$ 2,441,138	$ -		

CENTRAL VALLEY WATER RECLAMATION FACILITY
Capital Funding Projections

M		Replace tunnel sump pump (10 Units)		$ 75,000	$ 75,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 75,000	$ -
M		Vulcan Wash Press Screw and Housing		$ 21,000	$ 21,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 21,000	$ -
M	LTP-AM	Liquid Treatment Process Asset Management Projects		$ 11,000	$ 11,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,000	$ -
M	LTP-M	Liquid Treatment Process Maintenance Projects		$ 1,059,000	$ -	$ -	$ 57,000	$ -	$ 62,000	$ -	$ -	$ -	$ -	$ -	$ -	$ 445,000	$ 417,000	$ 78,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,059,000	$ -
M	LTP14	Secondary Clarifer Mechanism Coating/Recondition		$ 5,339,705	$ 130,000	$ 130,000	$ 133,900	$ 137,917	$ 142,055	$ 146,316	$ 150,706	$ 155,227	$ 159,884	$ 164,680	$ 339,241	$ 349,418	$ 359,901	$ 370,698	$ 381,819	$ 393,274	$ 405,072	$ 417,224	$ 429,741	$ 442,633	$ 5,339,705	$ -
M	LTP26	Screen Room/Primary Influent/Effluent Channel Sealing and Rehabilitation		$ 777,544	$ -	$ 150,000	$ -	$ -	$ 150,000	$ 154,500	$ 159,135	$ 163,909	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 777,544	$ -
Cap	GFG05	Secondary Clarifiers Gearbox Rebuild (2 units)		$ 84,000	$ 84,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 84,000	$ -
Cap	LTP15	Rebuild Secondary Clarifier Drives		$ 48,000	$ 48,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 48,000	$ -
	EM22	Plant Building/Tunnel Lighting Replacement with LEDs		$ 464,154	$ -	$ -	$ 84,000	$ 88,200	$ 92,610	$ 97,241	$ 102,103	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 464,154	$ -
M	LTP22	UV System Channel Cleaning and Maintenance		$ 136,000	$ -	$ -	$ 60,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 76,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 136,000	$ -
L	LAB-AM	Lab Asset Management Projects (Hoods, Fans, Coolers)		$ 190,000	$ -	$ -	$ 20,000	$ -	$ -	$ 35,000	$ -	$ -	$ -	$ 40,000		$ -	$ -	$ -	$ 45,000	$ -		$ -	$ 50,000	$ -	$ -	$ 190,000	$ -
M	IT14	Uninterruptible Power Supply Upgrades/ Battery Replacements		$ 974,675	$ -	$ 10,000	$ 41,200	$ 42,436	$ 43,709	$ 45,020	$ 46,371	$ 47,762	$ 49,195	$ 50,671	$ 52,191	$ 53,757	$ 55,369	$ 57,030	$ 58,741	$ 60,504	$ 62,319	$ 64,188	$ 66,114	$ 68,097	$ 974,675	$ -
IT	IT17	Cable Replacement and Maintenance		$ 140,000	$ -	$ -	$ 60,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 80,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 140,000	$ -
IT	IT18	Grounding System Maintenance		$ 140,000	$ -	$ -	$ 60,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 80,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 140,000	$ -
M	GFG01	Crack Seal and Seal Coat Plant Asphalt/Replace Asphalt		$ 408,000	$ 13,000	$ -	$ 20,000	$ -	$ 20,000	$ -	$ 20,000	$ -	$ 95,000	$ -	$ 25,000	$ -	$ 30,000	$ -	$ 30,000	$ -	$ 35,000	$ -	$ 120,000	$ -	$ -	$ 408,000	$ -
		Remove old oil tanks		$ 25,000	$ -	$ 25,000	$ -	$ -																			
M	GFG04	Concrete Rehab./Sealing/Replacement		$ 1,147,530	$ 43,000	$ 44,000	$ 46,000	$ 47,000	$ 48,000	$ 49,440	$ 50,923	$ 52,451	$ 54,024	$ 55,645	$ 57,315	$ 59,034	$ 60,805	$ 62,629	$ 64,508	$ 66,443	$ 68,437	$ 70,490	$ 72,604	$ 74,782	$ 1,147,530	$ -
M	GFG-AM	General Facilities and Grounds Asset Management Projects		$ 22,000	$ 22,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 22,000	$ -
M	GFG10	Reseal Tunnel Expansion Joints		$ 170,000				$ 50,000					$ 30,000			$ -	$ -	$ -			$ 50,000	$ -	$ -	$ -	$ -	$ 170,000	$ -
	Subtotal	$ -		$21,011,846	$828,000	$995,000	$1,904,050	$1,917,253	$813,574	$762,055	$797,482	$2,007,770	$638,877	$557,152	$1,381,567	$1,164,232	$1,486,341	$792,312	$834,460	$789,705	$934,962	$884,551	$936,990	$585,513	$ 20,794,846	$0
Professional Fees																															
	LTP01	Plantwide HVAC Evaluation		$ 419,000	$ 319,000	$ 100,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 419,000	$ -
		Power System Study/One Line Diagrams		$ 100,000	$ -	$ 100,000	$ -	$ -	$ -	$ -	$ -																
	LTP02	Plantwide Seismic Evaluation		$ 549,000	$ 319,000	$ 230,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 549,000	$ -
	IT01	Control and Power System Masterplan		$ 470,000	$ 320,000	$ 150,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 470,000	$ -
	EM12	Arch Flash Study / Upgrade (every 5 years)		$ 372,000	$ -	$ -	$ 74,000	$ -	$ -	$ -	$ -	$ -	$ 85,000	$ -	$ -	$ -	$ -	$ 99,000	$ -	$ -	$ -	$ -	$ 114,000	$ -	$ -	$ 372,000	$ -
Projects No Longer Needed																															
	IT03	Mobile Devices Replacement		$ 196,350	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 85,050	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 111,300	$ -	$ -	$ 196,350	$ -
	NUT04	Nutrient Removal Facilities Design and Construction Phase 3 (10mg/L TIN)	Yes	$ 55,000,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 55,000,000
	IT11	Camera/Security System		$ 139,650	$ -	$ -	$ 59,850	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 79,800	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 139,650	$ -
	BTD01	Raw Primary Sludge Surge Tank and Strain Press Feed Pumps	Yes	$ 262,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 262,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 262,500	$ -
	EM17	5KV Switchgear Replacement(part of blower Building project)	Yes	$ 2,572,500	$ -	$ -	$ -	$ 1,260,000	$ 1,312,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,572,500	$ -
	LTP33	East and West PE and TF Channels Mixing and Diffuser Replacement	Yes	$ 1,575,000	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,575,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,575,000	$ -
	NUT01	New Jordan River Outfall Piping and Diffuser System		$ 12,000,000		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 12,000,000
	BTD04	Waste Gas Burner Replacement		$ 213,000	$ 213,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 213,000	$ -
	EM02	4160 V Starters (remaining 4 of 11)		$ 132,000	$ -	$ 132,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 132,000	$ -

Appendix B – 2015 Nutrient Study PFDs

LEGEND

- WASTEWATER
- SLUDGE
- GRIT □ SCREENINGS
- AIR / CHEMICAL
- NEW E□UIPMENT
- NEW SLUDGE
- NEW AIR/CHEMICAL

HEADWORKS

RAPID MI□ DIFFUSER

RAPID MI□ DIFFUSER

AERATED GRIT REMOVAL TANKS (4)

GRIT AIR

FERRIC FEED PUMPS (3)

POLYMER METERING PUMPS (2)

FERRIC DAY TANK (2)

POLYMER STORAGE TANK (2)

FERRIC TRANSFER PUMPS (2)

FERRIC STORAGE (3) (□1)

POLYMER DRY FEEDER (2)

WEST

CHANNEL AIR

PRIMARY CLARIFIER (6)

CHANNEL AIR

TRICKLING FILTER PUMPS (4)

TRICKLING FILTER PUMPING STATION

TRICKLING FILTERS (3)

PRIMARY SCUM PUMPS (10)

TO PRIMARY SLUDGE BREAK TANK

PRIMARY SLUDGE PUMPS (10)

TRICKLING FILTER PUMPS (3)

CHANNEL AIR

CHANNEL AIR

PRIMARY CLARIFIER (4)

CHANNEL AIR

EAST

TRICKLING FILTER PUMPING STATION

TRICKLING FILTERS (3)

CHANNEL AIR

ALUM STORAGE (TOTE) (2)

ALUM FEED PUMPS (2)

SOLIDS CONTACT TANKS (6) (□4)

SOLIDS CONTACT AIR (5) (□1)

RAPID MI□ DIFFUSER

CHANNEL AIR

TO HEADWORKS OR DIGESTER

SECONDARY SCUM PUMPS (2)

SECONDARY CLARIFIER (2)

WEST

RETURN SECONDARY SLUDGE PUMPS (2)

SECONDARY SCUM PUMPS (4)

SECONDARY CLARIFIER (8)

EAST

RETURN SECONDARY SLUDGE PUMPS (8)

REAERATION CHANNELS (2)

PARSHALL FLUME

UV DISINFECTION CHANNELS (4)

MILL CREEK

TO GRIT CHANNEL EFFLUENT

GRAVITY BELT THICKENER FEED PUMPS (3)

WASTE SECONDARY SLUDGE FEED TANK (1)

GRAVITY BELT THICKENER FEED PUMPS (3)

GRAVITY BELT THICKENERS (3)

BYPASS

FROM PRIMARY SCUM AND SLUDGE PUMPS

PRIMARY SLUDGE BREAK TANK

PRIMARY SLUDGE STRAINER FEED PUMPS (2)

SLUDGE STRAINERS (2) (□2)

SCREENINGS ROLL-OFF DUMPSTERS (1) (□1)

OFFSITE DISPOSAL

GRAVITY BELT THICKENED SLUDGE PUMPS (3)

MI□ING PUMP (2)

MI□ING PUMP (2)

MI□ING TANK (1)

OVERFLOW TO INFLUENT SEWER

FILTRATE E□UALI□ATION TANKS (2)

FILTRATE E□UALI□ATION TANK PUMPS (3)

OVERFLOW TO INFLUENT DIVERSION STRUCTURE

TO PRIMARY INFLUENT CHANNEL

FILTRATE PUMP STATION

FILTRATE PUMPS (2)

POLYMER

BELT WASHWATER

BELT FILTER PRESSES (3) (□2)

COMPOSTING

LAND (□3) APPLICATION (4)

SLUDGE STORAGE BINS (3) (□3)

CAKE PUMPS (1) (□5)

BLENDED SLUDGE TRANSFER PUMPS (3) (□2)

TO TANK TRUCK CONNECTION OR DIGESTERS

DIGESTER DRAIN PUMP (2)

ANAEROBIC DIGESTERS (5)

E□UALI□ATION □ BLENDING DRAIN PUMP (1)

DIGESTED SLUDGE TRANSFER PUMPS (5)

E□ TANK (1)

E□ TANK MI□ING PUMP (1)

EGG DIGESTER FEED PUMPS (3)

DIGESTED SLUDGE BLENDING TANK (1)

MI□ING PUMP (1)

EGG SHAPED ANAEROBIC DIGESTERS (2)

PROCESS FLOW DIAGRAM
ALTERNATIVE 1A - METAL SALTS

Brown AND Caldwell

CVWRF

CENTRAL VALLEY WATER RECLAMATION FACILITY

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LEGEND

- WASTEWATER
- SLUDGE
- GRIT □ SCREENINGS
- AIR / CHEMICAL
- NEW E□UIPMENT
- NEW SLUDGE
- NEW AIR/CHEMICAL
- SIDESTREAM TREATMENT

HEADWORKS

FROM ANAMMO□

RAPID MI□ DIFFUSER

RAPID MI□ DIFFUSER

AERATED GRIT REMOVAL TANKS (4)

GRIT AIR

FERRIC FEED PUMPS (3)

POLYMER METERING PUMPS (2)

FERRIC DAY TANK (2)

POLYMER STORAGE TANK (2)

FERRIC TRANSFER PUMPS (2)

FERRIC STORAGE (3) (□1)

POLYMER DRY FEEDER (2)

WEST

CHANNEL AIR

PRIMARY CLARIFIER (6)

CHANNEL AIR

TRICKLING FILTER PUMPING STATION

TRICKLING FILTER PUMPS (4)

TRICKLING FILTERS (3)

PRIMARY SCUM PUMPS (10)

TO PRIMARY SLUDGE BREAK TANK

PRIMARY SLUDGE PUMPS (10)

CHANNEL AIR

EAST

CHANNEL AIR

PRIMARY CLARIFIER (4)

CHANNEL AIR

TRICKLING FILTER PUMPING STATION

TRICKLING FILTER PUMPS (3)

TRICKLING FILTERS (3)

CHANNEL AIR

ALUM STORAGE (TOTE) (2)

ALUM FEED PUMPS (2)

SOLIDS CONTACT TANKS (6) (□2)

SOLIDS CONTACT AIR (5) (□1)

RAPID MI□ DIFFUSER

CHANNEL AIR

TO HEADWORKS OR DIGESTER

SECONDARY SCUM PUMPS (2)

SECONDARY CLARIFIER (2)

WEST

RETURN SECONDARY SLUDGE PUMPS (2)

SECONDARY SCUM PUMPS (4)

SECONDARY CLARIFIER (8)

EAST

RETURN SECONDARY SLUDGE PUMPS (8)

REAERATION CHANNELS (2)

PARSHALL FLUME

UV DISINFECTION CHANNELS (4)

MILL CREEK

TO GRIT CHANNEL EFFLUENT

GRAVITY BELT THICKENER FEED PUMPS (3)

WASTE SECONDARY SLUDGE FEED TANK (1)

GRAVITY BELT THICKENER FEED PUMPS (3)

GRAVITY BELT THICKENERS (3)

BYPASS

FROM PRIMARY SCUM AND SLUDGE PUMPS

PRIMARY SLUDGE BREAK TANK

PRIMARY SLUDGE STRAINER FEED PUMPS (2)

SLUDGE STRAINERS (2) (□2)

SCREENINGS ROLL-OFF DUMPSTERS (1) (□1)

OFFSITE DISPOSAL

GRAVITY BELT THICKENED SLUDGE PUMPS (3)

MI□ING PUMP (2)

MI□ING PUMP (2)

MI□ING TANK (1)

OVERFLOW TO INFLUENT SEWER

FILTRATE E□UALI□ATION TANKS (2)

FILTRATE E□UALI□ATION TANK PUMPS (3)

OVERFLOW TO INFLUENT DIVERSION STRUCTURE

AIR

ANAMMO□ (1)

TO PRIMARY INFLUENT

BYPASS

TO PRIMARY INFLUENT CHANNEL

FILTRATE PUMP STATION

FILTRATE PUMPS (2)

POLYMER

BELT WASHWATER

$MgCl_2$

AIR

AIR PRE□ (1)

STRUVITE

BELT FILTER PRESSES (3) (□2)

CAKE PUMPS (1) (□5)

COMPOSTING

LAND □3) APPLICATION (4)

SLUDGE STORAGE BINS (3) (□3)

BLENDED SLUDGE TRANSFER PUMPS (3) (□2)

TO TANK TRUCK CONNECTION OR DIGESTERS

DIGESTER DRAIN PUMP (2)

ANAEROBIC DIGESTERS (5)

E□UALI□ATION □ BLENDING DRAIN PUMP (1)

DIGESTED SLUDGE TRANSFER PUMPS (5)

E□ TANK (1)

E□ TANK MI□ING PUMP (1)

EGG DIGESTER FEED PUMPS (3)

DIGESTED SLUDGE BLENDING TANK (1)

MI□ING PUMP (1)

EGG SHAPED ANAEROBIC DIGESTERS (2)

Brown AND Caldwell

PROCESS FLOW DIAGRAM
ALTERNATIVE 1A - METAL SALTS
WITH SIDESTREAM TREATMENT

CVWRF

CENTRAL VALLEY WATER RECLAMATION FACILITY

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LEGEND

- WASTEWATER
- SLUDGE
- GRIT □ SCREENINGS
- AIR / CHEMICAL
- NEW E□UIPMENT
- NEW SLUDGE
- NEW AIR/CHEMICAL

HEADWORKS

RAPID MI□ DIFFUSER

RAPID MI□ DIFFUSER

AERATED GRIT REMOVAL TANKS (4)

GRIT AIR

FERRIC FEED PUMPS (3)

POLYMER METERING PUMPS (2)

FERRIC DAY TANK (2)

POLYMER STORAGE TANK (2)

FERRIC TRANSFER PUMPS (2)

FERRIC STORAGE (3) (□1)

POLYMER DRY FEEDER (2)

WEST

CHANNEL AIR

PRIMARY CLARIFIER (6)

CHANNEL AIR

TRICKLING FILTER PUMPING STATION

TRICKLING FILTER PUMPS (4)

TRICKLING FILTERS (3)

PRIMARY SCUM PUMPS (10)

TO PRIMARY SLUDGE BREAK TANK

PRIMARY SLUDGE PUMPS (10)

TRICKLING FILTER PUMPS (3)

CHANNEL AIR

PRIMARY CLARIFIER (4)

CHANNEL AIR

TRICKLING FILTER PUMPING STATION

TRICKLING FILTERS (3)

CHANNEL AIR

CHANNEL AIR

EAST

CHANNEL AIR

ALUM STORAGE (TOTE) (2)

ALUM FEED PUMPS (2)

SOLIDS CONTACT TANKS (6) (□14)

SOLIDS CONTACT AIR (5) (□2)

RAPID MI□ DIFFUSER

CHANNEL AIR

TO HEADWORKS OR DIGESTER

SECONDARY SCUM PUMPS (2)

SECONDARY CLARIFIER (2)

WEST

RETURN SECONDARY SLUDGE PUMPS (2)

SECONDARY SCUM PUMPS (4)

SECONDARY CLARIFIER (8)

EAST

RETURN SECONDARY SLUDGE PUMPS (8)

BACKWASH AIR

METHANOL

BACKWASH WATER

DENITE FILTERS (28)

DENITE INFLUENT PUMPS (6)

BYPASS

UV DISINFECTION CHANNELS (4)

REAERATION CHANNELS (2)

PARSHALL FLUME

MILL CREEK

TO GRIT CHANNEL EFFLUENT

GRAVITY BELT THICKENER FEED PUMPS (3)

WASTE SECONDARY SLUDGE FEED TANK (1)

GRAVITY BELT THICKENER FEED PUMPS (3)

GRAVITY BELT THICKENERS (3)

BYPASS

FROM PRIMARY SCUM AND SLUDGE PUMPS

PRIMARY SLUDGE BREAK TANK

PRIMARY SLUDGE STRAINER FEED PUMPS (2)

MI□ING PUMP (2)

SLUDGE STRAINERS (2) (□2)

OFFSITE DISPOSAL

SCREENINGS ROLL-OFF DUMPSTERS (1) (□1)

GRAVITY BELT THICKENED SLUDGE PUMPS (3)

MI□ING PUMP (2)

MI□ING TANK (1)

OVERFLOW TO INFLUENT SEWER

FILTRATE E□UALI□ATION TANKS (2)

FILTRATE E□UALI□ATION TANK PUMPS (3)

OVERFLOW TO INFLUENT DIVERSION STRUCTURE

TO PRIMARY INFLUENT CHANNEL

FILTRATE PUMP STATION

FILTRATE PUMPS (2)

POLYMER

BELT WASHWATER

BELT FILTER PRESSES (3) (□2)

COMPOSTING

LAND APPLICATION (4) (□3)

SLUDGE STORAGE BINS (3) (□3)

CAKE PUMPS (1) (□5)

BLENDED SLUDGE TRANSFER PUMPS (3) (□2)

TO TANK TRUCK CONNECTION OR DIGESTERS

DIGESTER DRAIN PUMP (2)

ANAEROBIC DIGESTERS (5)

E□UALI□ATION □ BLENDING DRAIN PUMP (1)

DIGESTED SLUDGE TRANSFER PUMPS (5)

E□ TANK (1)

E□ TANK MI□ING PUMP (1)

EGG DIGESTER FEED PUMPS (3)

DIGESTED SLUDGE BLENDING TANK (1)

MI□ING PUMP (1)

EGG SHAPED ANAEROBIC DIGESTERS (2)

PROCESS FLOW DIAGRAM
ALTERNATIVE 1B - METAL SALTS WITH DENITE FILTER

Brown AND Caldwell

CVWRF

CENTRAL VALLEY WATER RECLAMATION FACILITY

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LEGEND

- WASTEWATER
- SLUDGE
- GRIT □ SCREENINGS
- AIR / CHEMICAL
- NEW E□UIPMENT
- NEW SLUDGE
- NEW AIR/CHEMICAL
- SIDESTREAM TREATMENT

HEADWORKS
FROM ANAMMO□
RAPID MI□ DIFFUSER
RAPID MI□ DIFFUSER
AERATED GRIT REMOVAL TANKS (4)
GRIT AIR
FERRIC FEED PUMPS (3)
POLYMER METERING PUMPS (2)
FERRIC DAY TANK (2)
POLYMER STORAGE TANK (2)
FERRIC TRANSFER PUMPS (2)
FERRIC STORAGE (3) (□1)
POLYMER DRY FEEDER (2)

WEST
CHANNEL AIR
PRIMARY CLARIFIER (6)
TRICKLING FILTER PUMPS (4)
TRICKLING FILTER PUMPING STATION
TRICKLING FILTERS (3)
PRIMARY SCUM PUMPS (10)
TO PRIMARY SLUDGE BREAK TANK
PRIMARY SLUDGE PUMPS (10)
TRICKLING FILTER PUMPS (3)
CHANNEL AIR
PRIMARY CLARIFIER (4)
TRICKLING FILTER PUMPING STATION
TRICKLING FILTERS (3)
CHANNEL AIR
EAST
CHANNEL AIR

ALUM STORAGE (TOTE) (2)
ALUM FEED PUMPS (2)
SOLIDS CONTACT TANKS (6) (□11)
SOLIDS CONTACT AIR (5) (□2)
RAPID MI□ DIFFUSER
CHANNEL AIR

TO HEADWORKS OR DIGESTER
SECONDARY SCUM PUMPS (2)
SECONDARY CLARIFIER (2)
RETURN SECONDARY SLUDGE PUMPS (2)
WEST
SECONDARY SCUM PUMPS (4)
SECONDARY CLARIFIER (8)
RETURN SECONDARY SLUDGE PUMPS (8)
EAST

BACKWASH AIR
METHANOL
BACKWASH WATER
DENITE FILTERS (18)
DENITE INFLUENT PUMPS (6)
BYPASS
REAERATION CHANNELS (2)
PARSHALL FLUME
UV DISINFECTION CHANNELS (4)
MILL CREEK
TO GRIT CHANNEL EFFLUENT

GRAVITY BELT THICKENER FEED PUMPS (3)
WASTE SECONDARY SLUDGE FEED TANK (1)
GRAVITY BELT THICKENER FEED PUMPS (3)
GRAVITY BELT THICKENERS (3)

BYPASS
FROM PRIMARY SCUM AND SLUDGE PUMPS
PRIMARY SLUDGE BREAK TANK
PRIMARY SLUDGE STRAINER FEED PUMPS (2)
MI□ING PUMP (2)
SLUDGE STRAINERS (2) (□2)
SCREENINGS ROLL-OFF DUMPSTERS (1) (□1)
OFFSITE DISPOSAL
GRAVITY BELT THICKENED SLUDGE PUMPS (3)

OVERFLOW TO INFLUENT SEWER
FILTRATE E□UALI□ATION TANKS (2)
OVERFLOW TO INFLUENT DIVERSION STRUCTURE
TO PRIMARY INFLUENT
AIR
ANAMMO□ (1)
FILTRATE E□UALI□ATION TANK PUMPS (3)
BYPASS
TO PRIMARY INFLUENT CHANNEL
FILTRATE PUMP STATION
FILTRATE PUMPS (2)
POLYMER
BELT WASHWATER
$MgCL_2$
AIR
AIR PRE□ (1)
STRUVITE
BELT FILTER PRESSES (3) (□2)
COMPOSTING
LAND (□3) APPLICATION (4)
SLUDGE STORAGE BINS (3) (□3)
CAKE PUMPS (1) (□5)
BLENDED SLUDGE TRANSFER PUMPS (3) (□2)

TO TANK TRUCK CONNECTION OR DIGESTERS
DIGESTER DRAIN PUMP (2)
ANAEROBIC DIGESTERS (5)
MI□ING PUMP (2)
MI□ING TANK (1)
E□UALI□ATION □ BLENDING DRAIN PUMP (1)
DIGESTED SLUDGE TRANSFER PUMPS (5)
E□ TANK (1)
E□ TANK MI□ING PUMP (1)
EGG DIGESTER FEED PUMPS (3)
DIGESTED SLUDGE BLENDING TANK (1)
MI□ING PUMP (1)
EGG SHAPED ANAEROBIC DIGESTERS (2)

Brown AND Caldwell

PROCESS FLOW DIAGRAM
ALTERNATIVE 1B - METAL SALTS WITH DENITE FILTER
WITH SIDESTREAM TREATMENT

CVWRF

CENTRAL VALLEY WATER RECLAMATION FACILITY

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LEGEND

- WASTEWATER
- SLUDGE
- GRIT □ SCREENINGS
- AIR / CHEMICAL
- NEW E□UIPMENT
- NEW SLUDGE
- NEW AIR/CHEMICAL

NOTES:
1. E□ISTING MI□ING TANK RE-PURPOSED FOR PRIMARY SLUDGE BREAK TANK.
2. E□ISTING TANK RE-PURPOSED FOR FERMENTER TANK OR CONTINUED USE AS DIGESTED SLUDGE BLEND TANK.

HEADWORKS
AERATED GRIT REMOVAL TANKS (4)
GRIT AIR
CHANNEL AIR
WEST
PRIMARY CLARIFIER (6)
PRIMARY SCUM PUMPS (10)
PRIMARY SLUDGE PUMPS (10)
PRIMARY CLARIFIER (4)
CHANNEL AIR
EAST
ACETATE STORAGE TANKS (2)
ACETATE FEED PUMPS (2)
METHANOL STORAGE TANKS (2)
METHANOL FEED PUMPS (2)
ALUM STORAGE TOTE (2)
ALUM FEED PUMPS (2)
ANAEROBIC
ANO□IC
AERATION
ANO□IC
AERATION
VFA'S
NO. 3 RETURN PUMPS (24)
AERATION BLOWERS (5)
TO HEADWORKS OR DIGESTER
SECONDARY SCUM PUMPS (2)
SECONDARY CLARIFIER (2)
WEST
RETURN SECONDARY SLUDGE PUMPS (2)
SECONDARY SCUM PUMPS (4)
SECONDARY CLARIFIER (8)
EAST
RETURN SECONDARY SLUDGE PUMPS (8)
REAERATION CHANNELS (2)
PARSHALL FLUME
UV DISINFECTION CHANNELS (4)
MILL CREEK
TO GRIT CHANNEL EFFLUENT
GRAVITY BELT THICKENER FEED PUMPS (3)
WASTE SECONDARY SLUDGE FEED TANK (1)
GRAVITY BELT THICKENER FEED PUMPS (3)
GRAVITY BELT THICKENERS (3)
ROTARY DRUM THICKENERS (2)
SLUDGE STRAINERS (2) (□2)
SCREENINGS ROLL-OFF DUMPSTER
OFFSITE DISPOSAL
MI□ING PUMP (2)
MI□ING TANK (1) (NOTE 1)
SLUDGE STRAINER FEED PUMPS (2)
VFA TANK
VFA FEED PUMPS (2)
TO VFA'S
GRAVITY BELT THICKENED SLUDGE PUMPS (3)
THICKENED SLUDGE MI□ING TANK (1)
E□ TANK (1) (NOTE 2)
E□ TANK MI□ING PUMP (1)
ROTARY DRUM THICKENER FEED PUMPS (2)
EGG DIGESTER FEED PUMPS (3)
OVERFLOW TO INFLUENT SEWER
FILTRATE E□UALI□ATION TANKS (2)
OVERFLOW TO INFLUENT DIVERSION STRUCTURE
FILTRATE E□UALI□ATION TANK PUMPS (3)
TO PRIMARY INFLUENT CHANNEL
FILTRATE PUMP STATION
FILTRATE PUMPS (2)
POLYMER
BELT WASHWATER
BELT FILTER PRESSES (3) (□1)
BLENDED SLUDGE TRANSFER PUMPS (3)
TO TANK TRUCK CONNECTION OR DIGESTERS
DIGESTER DRAIN PUMP (2)
E□UALI□ATION □ BLENDING DRAIN PUMP (1)
DIGESTED SLUDGE TRANSFER PUMPS (5)
ANAEROBIC DIGESTERS (5)
DIGESTED SLUDGE BLENDING TANK (1) (NOTE 2)
MI□ING PUMP (1)
EGG SHAPED ANAEROBIC DIGESTERS (2)
COMPOSTING
SLUDGE STORAGE BINS (3) (□3)
CAKE PUMPS (1) (□4)
LAND (□3) APPLICATION (4)

PROCESS FLOW DIAGRAM
ALTERNATIVE 2A - 5 STAGE BARDENPHO

Brown AND Caldwell

CVWRF

CENTRAL VALLEY WATER RECLAMATION FACILITY

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LEGEND

- WASTEWATER
- SLUDGE
- GRIT □ SCREENINGS
- AIR / CHEMICAL
- NEW E□UIPMENT
- NEW SLUDGE
- NEW AIR/CHEMICAL
- SIDESTREAM TREATMENT

NOTES:
1. E□ISTING MI□ING TANK RE-PURPOSED FOR PRIMARY SLUDGE BREAK TANK.
2. E□ISTING TANK RE-PURPOSED FOR FERMENTER TANK OR CONTINUED USE AS DIGESTED SLUDGE BLEND TANK.

HEADWORKS
FROM ANAMMO□
AERATED GRIT REMOVAL TANKS (4)
GRIT AIR
CHANNEL AIR
WEST
PRIMARY CLARIFIER (6)
PRIMARY SCUM PUMPS (10)
PRIMARY SLUDGE PUMPS (10)
PRIMARY CLARIFIER (4)
CHANNEL AIR
EAST
ACETATE STORAGE TANKS (2)
ACETATE FEED PUMPS (2)
METHANOL STORAGE TANKS (2)
METHANOL FEED PUMPS (2)
ALUM STORAGE TOTE (2)
ALUM FEED PUMPS (2)
ANAEROBIC
ANO□IC
AERATION
ANO□IC
AERATION
VFA'S
NO. 3 RETURN PUMPS (24)
AERATION BLOWERS (5)
TO HEADWORKS OR DIGESTER
SECONDARY SCUM PUMPS (2)
SECONDARY CLARIFIER (2)
WEST
RETURN SECONDARY SLUDGE PUMPS (2)
SECONDARY SCUM PUMPS (4)
SECONDARY CLARIFIER (8)
EAST
RETURN SECONDARY SLUDGE PUMPS (8)
REAERATION CHANNELS (2)
PARSHALL FLUME
UV DISINFECTION CHANNELS (4)
MILL CREEK
TO GRIT CHANNEL EFFLUENT
GRAVITY BELT THICKENER FEED PUMPS (3)
WASTE SECONDARY SLUDGE FEED TANK (1)
GRAVITY BELT THICKENER FEED PUMPS (3)
GRAVITY BELT THICKENERS (3)
ROTARY DRUM THICKENERS (2)
SLUDGE STRAINERS (2) (□2)
SCREENINGS ROLL-OFF DUMPSTER
OFFSITE DISPOSAL
MI□ING PUMP (2)
MI□ING TANK (1) (NOTE 1)
SLUDGE STRAINER FEED PUMPS (2)
VFA TANK
VFA FEED PUMPS (2)
TO VFA'S
GRAVITY BELT THICKENED SLUDGE PUMPS (3)
THICKENED SLUDGE MI□ING TANK (1)
E□ TANK (1) (NOTE 2)
E□ TANK MI□ING PUMP (1)
ROTARY DRUM THICKENER FEED PUMPS (2)
EGG DIGESTER FEED PUMPS (3)
OVERFLOW TO INFLUENT SEWER
FILTRATE E□UALI□ATION TANKS (2)
OVERFLOW TO INFLUENT DIVERSION STRUCTURE
TO PRIMARY INFLUENT
AIR
ANAMMO□ (1)
FILTRATE E□UALI□ATION TANK PUMPS (3)
BYPASS
TO PRIMARY INFLUENT CHANNEL
FILTRATE PUMP STATION
FILTRATE PUMPS (2)
POLYMER
BELT WASHWATER
$MgCL_2$
AIR
AIR PRE□ (1)
STRUVITE
BELT FILTER PRESSES (3) (□1)
CAKE PUMPS (1) (□4)
BLENDED SLUDGE TRANSFER PUMPS (3)
COMPOSTING
LAND (□3) APPLICATION (4)
SLUDGE STORAGE BINS (3) (□3)
TO TANK TRUCK CONNECTION OR DIGESTERS
E□UALI□ATION □ BLENDING DRAIN PUMP (1)
DIGESTER DRAIN PUMP (2)
DIGESTED SLUDGE TRANSFER PUMPS (5)
ANAEROBIC DIGESTERS (5)
DIGESTED SLUDGE BLENDING TANK (1) (NOTE 2)
MI□ING PUMP (1)
EGG SHAPED ANAEROBIC DIGESTERS (2)

PROCESS FLOW DIAGRAM
ALTERNATIVE 2A - 5 STAGE BARDENPHO
WITH SIDESTREAM TREATMENT

Brown AND Caldwell

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CENTRAL VALLEY WATER RECLAMATION FACILITY

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LEGEND

- WASTEWATER
- SLUDGE
- GRIT □ SCREENINGS
- AIR / CHEMICAL
- NEW E□UIPMENT
- NEW SLUDGE
- NEW AIR/CHEMICAL

HEADWORKS

AERATED GRIT REMOVAL TANKS (4)

GRIT AIR

FERRIC FEED PUMPS (3)

FERRIC DAY TANK (2)

FERRIC TRANSFER PUMPS (2)

FERRIC STORAGE (3) (□1)

WEST

CHANNEL AIR

PRIMARY CLARIFIER (6)

PRIMARY SCUM PUMPS (10)

TO PRIMARY SLUDGE BREAK TANK

PRIMARY SLUDGE PUMPS (10)

PRIMARY CLARIFIER (4)

CHANNEL AIR

EAST

METHANOL STORAGE TANKS (2)

METHANOL FEED PUMPS (2)

ALUM STORAGE TOTE (2)

ALUM FEED PUMPS (2)

ANO□IC

AEROBIC

ANO□IC

AEROBIC

AERATION BLOWERS (3)

CHANNEL AIR

TO HEADWORKS OR DIGESTER

SECONDARY SCUM PUMPS (2)

SECONDARY CLARIFIER (2)

WEST

RETURN SECONDARY SLUDGE PUMPS (2)

SECONDARY SCUM PUMPS (4)

SECONDARY CLARIFIER (8)

EAST

RETURN SECONDARY SLUDGE PUMPS (8)

REAERATION CHANNELS (2)

PARSHALL FLUME

UV DISINFECTION CHANNELS (4)

MILL CREEK

TO GRIT CHANNEL EFFLUENT

GRAVITY BELT THICKENER FEED PUMPS (3)

WASTE SECONDARY SLUDGE FEED TANK (1)

GRAVITY BELT THICKENER FEED PUMPS (3)

GRAVITY BELT THICKENERS (3)

GRAVITY BELT THICKENED SLUDGE PUMPS (3)

BYPASS

FROM PRIMARY SCUM AND SLUDGE PUMPS

PRIMARY SLUDGE BREAK TANK

MI□ING PUMP (1)

PRIMARY SLUDGE STRAINER FEED PUMPS (2)

SLUDGE STRAINERS (2) (□2)

SCREENINGS ROLL-OFF DUMPSTER

OFFSITE DISPOSAL

OVERFLOW TO INFLUENT SEWER

FILTRATE E□UALI□ATION TANKS (2)

OVERFLOW TO INFLUENT DIVERSION STRUCTURE

FILTRATE E□UALI□ATION TANK PUMPS (3)

TO PRIMARY INFLUENT CHANNEL

FILTRATE PUMP STATION

FILTRATE PUMPS (2)

POLYMER

BELT WASHWATER

BELT FILTER PRESSES (3) (□2)

BLENDED SLUDGE TRANSFER PUMPS (3)

CAKE PUMPS (1) (□5)

SLUDGE STORAGE BINS (3) (□3)

COMPOSTING

LAND (□3) APPLICATION (4)

TO TANK TRUCK CONNECTION OR DIGESTERS

DIGESTER DRAIN PUMP (2)

E□UALI□ATION □ BLENDING DRAIN PUMP (1)

DIGESTED SLUDGE TRANSFER PUMPS (5)

DIGESTED SLUDGE BLENDING TANK (1)

MI□ING PUMP (1)

ANAEROBIC DIGESTERS (5)

MI□ING PUMP (2)

MI□ING TANK (1)

E□ TANK (1)

E□ TANK MI□ING PUMP (1)

EGG DIGESTER FEED PUMPS (3)

EGG SHAPED ANAEROBIC DIGESTERS (2)

PROCESS FLOW DIAGRAM
ALTERNATIVE 2B - CHEM P □ BNR

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CENTRAL VALLEY WATER RECLAMATION FACILITY

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LEGEND

- WASTEWATER
- SLUDGE
- GRIT □ SCREENINGS
- AIR / CHEMICAL
- NEW E□UIPMENT
- NEW SLUDGE
- NEW AIR/CHEMICAL
- WITH SIDESTREAM TREATMENT

HEADWORKS
FROM ANAMMO□
AERATED GRIT REMOVAL TANKS (4)
GRIT AIR
FERRIC FEED PUMPS (3)
FERRIC DAY TANK (2)
FERRIC TRANSFER PUMPS (2)
FERRIC STORAGE (3) (□1)
CHANNEL AIR
WEST
PRIMARY CLARIFIER (6)
PRIMARY SCUM PUMPS (10)
TO PRIMARY SLUDGE BREAK TANK
PRIMARY SLUDGE PUMPS (10)
PRIMARY CLARIFIER (4)
CHANNEL AIR
EAST
METHANOL STORAGE TANKS (2)
METHANOL FEED PUMPS (2)
ALUM STORAGE TOTE (2)
ALUM FEED PUMPS (2)
ANO□IC
AEROBIC
ANO□IC
AEROBIC
AERATION BLOWERS (3)
CHANNEL AIR
TO HEADWORKS OR DIGESTER
SECONDARY SCUM PUMPS (2)
SECONDARY CLARIFIER (2)
WEST
RETURN SECONDARY SLUDGE PUMPS (2)
SECONDARY SCUM PUMPS (4)
SECONDARY CLARIFIER (8)
EAST
RETURN SECONDARY SLUDGE PUMPS (8)
REAERATION CHANNELS (2)
PARSHALL FLUME
UV DISINFECTION CHANNELS (4)
MILL CREEK
TO GRIT CHANNEL EFFLUENT
GRAVITY BELT THICKENER FEED PUMPS (3)
WASTE SECONDARY SLUDGE FEED TANK (1)
GRAVITY BELT THICKENER FEED PUMPS (3)
GRAVITY BELT THICKENERS (3)
GRAVITY BELT THICKENED SLUDGE PUMPS (3)
BYPASS
FROM PRIMARY SCUM AND SLUDGE PUMPS
PRIMARY SLUDGE BREAK TANK
MI□ING PUMP (1)
PRIMARY SLUDGE STRAINER FEED PUMPS (2)
SLUDGE STRAINERS (2) (□2)
SCREENINGS ROLL-OFF DUMPSTER
OFFSITE DISPOSAL
OVERFLOW TO INFLUENT SEWER
FILTRATE E□UALI□ATION TANKS (2)
OVERFLOW TO INFLUENT DIVERSION STRUCTURE
TO PRIMARY INFLUENT
AIR
ANAMMO□ (1)
FILTRATE E□UALI□ATION TANK PUMPS (3)
BYPASS
TO PRIMARY INFLUENT CHANNEL
FILTRATE PUMP STATION
FILTRATE PUMPS (2)
POLYMER
BELT WASHWATER
$MgCL_2$
AIR
AIR PRE□ (1)
STRUVITE
BELT FILTER PRESSES (3) (□2)
CAKE PUMPS (1) (□5)
BLENDED SLUDGE TRANSFER PUMPS (3)
COMPOSTING
LAND □3) APPLICATION (4)
SLUDGE STORAGE BINS (3) (□3)
TO TANK TRUCK CONNECTION OR DIGESTERS
DIGESTER DRAIN PUMP (2)
E□UALI□ATION □ BLENDING DRAIN PUMP (1)
DIGESTED SLUDGE TRANSFER PUMPS (5)
DIGESTED SLUDGE BLENDING TANK (1)
MI□ING PUMP (1)
ANAEROBIC DIGESTERS (5)
EGG SHAPED ANAEROBIC DIGESTERS (2)
MI□ING PUMP (2)
MI□ING TANK (1)
E□ TANK (1)
E□ TANK MI□ING PUMP (1)
EGG DIGESTER FEED PUMPS (3)

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PROCESS FLOW DIAGRAM
ALTERNATIVE 2B - CHEM P □ BNR
WITH SIDESTREAM TREATMENT

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CENTRAL VALLEY WATER RECLAMATION FACILITY

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LEGEND

- WASTEWATER
- SLUDGE
- GRIT □ SCREENINGS
- AIR / CHEMICAL
- NEW E□UIPMENT
- NEW SLUDGE
- NEW AIR/CHEMICAL

NOTES:
1. E□ISTING MI□ING TANK RE-PURPOSED FOR PRIMARY SLUDGE BREAK TANK.
2. E□ISTING TANK RE-PURPOSED FOR FERMENTER TANK.
3. MODIFY E□ISTING SOLIDS CONTACT TANKS FOR ANO□IC / ANAEROBIC TANKS.

HEADWORKS
AERATED GRIT REMOVAL TANKS (4)
GRIT AIR
CHANNEL AIR
WEST
PRIMARY CLARIFIER (6)
TRICKLING FILTER PUMPS (4)
TRICKLING FILTER PUMPING STATION
TRICKLING FILTERS (3)
PRIMARY SCUM PUMPS (10)
TO PRIMARY SLUDGE BREAK TANK
PRIMARY SLUDGE PUMPS (10)
TRICKLING FILTER PUMPS (3)
PRIMARY CLARIFIER (4)
EAST
TRICKLING FILTERS (3)
ALUM STORAGE (TOTE) (2)
ALUM FEED PUMPS (2)
SOLIDS CONTACT TANKS (26)
SOLIDS CONTACT AIR (5) (□3)
RAPID MI□ DIFFUSER
ANAEROBIC BASIN (3) (NOTE 3)
ANO□IC BASIN (3) (NOTE 3)
FROM VFA FEED PUMPS
ACETATE STORAGE TANKS (2)
ACETATE FEED PUMPS (2)
METHANOL FEED PUMPS (2)
METHANOL STORAGE TANKS (2)
TO HEADWORKS OR DIGESTER
SECONDARY SCUM PUMPS (2)
SECONDARY CLARIFIER (2)
RETURN SECONDARY SLUDGE PUMPS (2)
SECONDARY SCUM PUMPS (4)
SECONDARY CLARIFIER (8)
RETURN SECONDARY SLUDGE PUMPS (8)
BACKWASH AIR
METHANOL
BACKWASH WATER
DENITE FILTERS (7)
DENITE INFLUENT PUMPS (6)
BYPASS
UV DISINFECTION CHANNELS (4)
REAERATION CHANNELS (2)
PARSHALL FLUME
MILL CREEK
TO GRIT CHANNEL EFFLUENT
GRAVITY BELT THICKENER FEED PUMPS (3)
WASTE SECONDARY SLUDGE FEED TANK (1)
GRAVITY BELT THICKENER FEED PUMPS (3)
GRAVITY BELT THICKENERS (3)
ROTARY DRUM THICKENERS (2)
GRAVITY BELT THICKENED SLUDGE PUMPS (3)
SLUDGE STRAINERS (2)
SCREENINGS ROLL-OFF DUMPSTER
OFFSITE DISPOSAL
FROM PRIMARY SCUM AND SLUDGE PUMPS
MI□ING PUMP (2)
VFA TANK
VFA FEED PUMPS
TO ANAEROBIC BASIN
THICKENED SLUDGE MI□ING TANK (1)
MI□ING TANK (1) (NOTE 1)
SLUDGE STRAINER FEED PUMPS (2)
E□ TANK (1) (NOTE 2)
E□ TANK MI□ING PUMP (1)
ROTARY DRUM THICKENER FEED PUMPS (2)
EGG DIGESTER FEED PUMPS (3)
OVERFLOW TO INFLUENT SEWER
FILTRATE E□UALI□ATION TANKS (2)
OVERFLOW TO INFLUENT DIVERSION STRUCTURE
FILTRATE E□UALI□ATION TANK PUMPS (3)
TO PRIMARY INFLUENT CHANNEL
FILTRATE PUMP STATION
FILTRATE PUMPS (2)
POLYMER
BELT WASHWATER
BELT FILTER PRESSES (3) (□1)
CAKE PUMPS (1) (□4)
BLENDED SLUDGE TRANSFER PUMPS (3) (□1)
COMPOSTING
LAND (□3) APPLICATION (4)
SLUDGE STORAGE BINS (3) (□3)
TO TANK TRUCK CONNECTION OR DIGESTERS
DIGESTER DRAIN PUMP (2)
E□UALI□ATION □ BLENDING DRAIN PUMP (1)
DIGESTED SLUDGE TRANSFER PUMPS (5)
ANAEROBIC DIGESTERS (5)
DIGESTED SLUDGE BLENDING TANK (1) (NOTE 2)
MI□ING PUMP (1)
EGG SHAPED ANAEROBIC DIGESTERS (2)

PROCESS FLOW DIAGRAM
ALTERNATIVE 3 - BNR WITH TRICKLING FILTERS

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CENTRAL VALLEY WATER RECLAMATION FACILITY

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LEGEND

- WASTEWATER
- SLUDGE
- GRIT □ SCREENINGS
- AIR / CHEMICAL
- NEW E□UIPMENT
- NEW SLUDGE
- NEW AIR/CHEMICAL
- SIDESTREAM TREATMENT

NOTES:
1. E□ISTING MI□ING TANK RE-PURPOSED FOR PRIMARY SLUDGE BREAK TANK.
2. E□ISTING TANK RE-PURPOSED FOR FERMENTER TANK.
3. MODIFY E□ISTING SOLIDS CONTACT TANKS FOR ANO□IC / ANAEROBIC TANKS.
4. NEW SOLIDS CONTACT TANKS AT 21 FT DEEP

FROM ANAMMO□
HEADWORKS
AERATED GRIT REMOVAL TANKS (4)
GRIT AIR
CHANNEL AIR
WEST
PRIMARY CLARIFIER (6)
TRICKLING FILTER PUMPS (4)
TRICKLING FILTER PUMPING STATION
TRICKLING FILTERS (3)
PRIMARY SCUM PUMPS (10)
TO PRIMARY SLUDGE BREAK TANK
PRIMARY SLUDGE PUMPS (10)
TRICKLING FILTER PUMPS (3)
PRIMARY CLARIFIER (4)
EAST
TRICKLING FILTERS (3)
CHANNEL AIR
ALUM STORAGE (TOTE) (2)
ALUM FEED PUMPS (2)
SOLIDS CONTACT TANKS (16) (NOTE 4
RAPID MI□ DIFFUSER
SOLIDS CONTACT AIR (5) (□2)
ANAEROBIC BASIN (NOTE 3)
ANO□IC BASIN (NOTE 3)
FROM VFA FEED PUMPS
ACETATE STORAGE TANKS (2)
ACETATE FEED PUMPS (2)
METHANOL FEED PUMPS (2)
METHANOL STORAGE TANKS (2)
TO HEADWORKS OR DIGESTER
SECONDARY SCUM PUMPS (2)
SECONDARY CLARIFIER (2)
RETURN SECONDARY SLUDGE PUMPS (2)
SECONDARY SCUM PUMPS (4)
SECONDARY CLARIFIER (8)
RETURN SECONDARY SLUDGE PUMPS (8)
BACKWASH AIR
METHANOL
BACKWASH WATER
DENITE FILTERS (4)
DENITE INFLUENT PUMPS (6)
BYPASS
UV DISINFECTION CHANNELS (4)
REAERATION CHANNELS (2)
PARSHALL FLUME
MILL CREEK
TO GRIT CHANNEL EFFLUENT
GRAVITY BELT THICKENER FEED PUMPS (3)
WASTE SECONDARY SLUDGE FEED TANK (1)
GRAVITY BELT THICKENER FEED PUMPS (3)
GRAVITY BELT THICKENERS (3)
ROTARY DRUM THICKENERS (2)
GRAVITY BELT THICKENED SLUDGE PUMPS (3)
SLUDGE STRAINERS (2)
SCREENINGS ROLL-OFF DUMPSTER
OFFSITE DISPOSAL
FROM PRIMARY SCUM AND SLUDGE PUMPS
MI□ING PUMP (2)
VFA TANK
VFA FEED PUMPS
TO ANAEROBIC BASIN
THICKENED SLUDGE MI□ING TANK (1)
MI□ING TANK (1) (NOTE 1)
SLUDGE STRAINER FEED PUMPS (2)
E□ TANK (1) (NOTE 2)
E□ TANK MI□ING PUMP (1)
ROTARY DRUM THICKENER FEED PUMPS (2)
EGG DIGESTER FEED PUMPS (3)
OVERFLOW TO INFLUENT SEWER
FILTRATE E□UALI□ATION TANKS (2)
FILTRATE E□UALI□ATION TANK PUMPS (3)
OVERFLOW TO INFLUENT DIVERSION STRUCTURE
TO PRIMARY INFLUENT
AIR
ANAMMO□ (1)
BYPASS
TO PRIMARY INFLUENT CHANNEL
FILTRATE PUMP STATION
FILTRATE PUMPS (2)
POLYMER
BELT WASHWATER
BELT FILTER PRESSES (3) (□1)
CAKE PUMPS (1) (□4)
$MgCl_2$
AIR
AIR PRE□ (2)
STRUVITE
BLENDED SLUDGE TRANSFER PUMPS (3) (□1)
COMPOSTING
LAND (□3) APPLICATION (4)
SLUDGE STORAGE BINS (3) (□3)
TO TANK TRUCK CONNECTION OR DIGESTERS
E□UALI□ATION □ BLENDING DRAIN PUMP (1)
DIGESTER DRAIN PUMP (2)
DIGESTED SLUDGE TRANSFER PUMPS (5)
ANAEROBIC DIGESTERS (5)
DIGESTED SLUDGE BLENDING TANK (1) (NOTE 2)
MI□ING PUMP (1)
EGG SHAPED ANAEROBIC DIGESTERS (2)

PROCESS FLOW DIAGRAM
ALTERNATIVE 3 - BNR WITH TRICKLING FILTERS
WITH SIDESTREAM TREATMENT

Brown AND Caldwell

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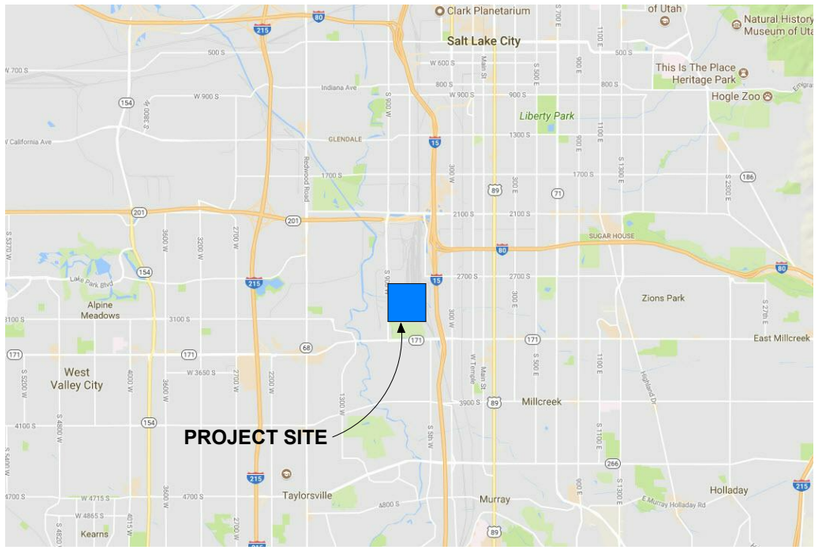
Appendix C – Preliminary Drawings of Recommended Plan

CENTRAL VALLEY WATER RECLAMATION FACILITY

800 Central Valley Rd, Salt Lake City, UT 84119

BIOLOGICAL NUTRIENT REMOVAL PROJECT

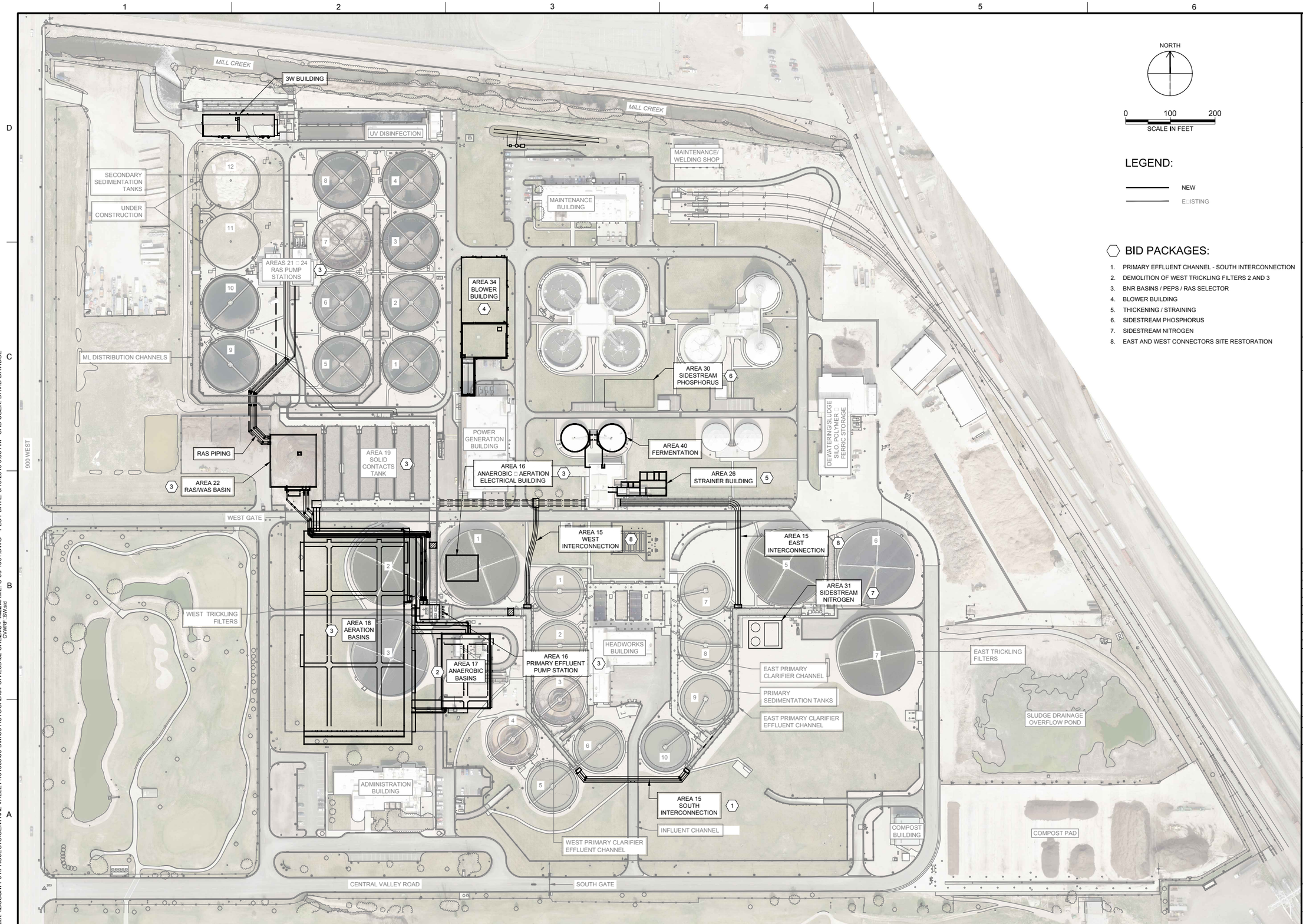


Preliminary Design
April 2019
Volume 3

Brown AND Caldwell

Path: BIM 360://151600 - CVWRF Nutrients/151600-G-00V18.rvt

Plot Date: 5/7/2019 4:32:08 PM



NORTH

0 100 200

SCALE IN FEET

LEGEND:

NEW

EXISTING

BID PACKAGES:

1. PRIMARY EFFLUENT CHANNEL - SOUTH INTERCONNECTION
2. DEMOLITION OF WEST TRICKLING FILTERS 2 AND 3
3. BNR BASINS / PEPS / RAS SELECTOR
4. BLOWER BUILDING
5. THICKENING / STRAINING
6. SIDESTREAM PHOSPHORUS
7. SIDESTREAM NITROGEN
8. EAST AND WEST CONNECTORS SITE RESTORATION

Brown AND Caldwell

6975 Union Park Center
Salt Lake City, UT

90□ PRELIMINARY DESIGN

C V W R F

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SI□E

DESIGNED:	R. YOO
DRAWN:	D. DAVIDSE
CHECKED:	M. KOBE
CHECKED:	
APPROVED:	T. LINDLEY
FILENAME	C-00-1001.DWG
BC PROJECT NUMBER	151600
CLIENT PROJECT NUMBER	151600

CIVIL

OVERALL SITE NEW FACILITY LAYOUT

DRAWING NUMBER

C-00-1001

Path: \\BCSUNFP01\PROJECTS\CENTRAL VALLEY\151600\00-BIM\03-AUTOCAD\04-CIVIL3D\02-SHEETS\ FILENAME: C-00-1001.DWG PLOT DATE: 6/19/2019 9:35 AM CAD USER: DAVID DAVIDSE
CVWRF NE.xid
CVWRF SE.xid
CVWRF NW.xid
CVWRF SW.xid

GENERAL INFORMATION		
RELIABILITY CLASS		1
DESIGN YEAR		2045
DESIGN FLOW, MGD		83.9
DESIGN YEAR	**PROJECTED RAW INFLUENT FLOWS**	
2045	AVERAGE DAILY FLOW (ADF), MGD	61.7
2045	MAXIMUM MONTH FLOW (MMF), MGD	67.9
2045	PEAK DAY FLOW (PDF), MGD	80.2
2045	PEAK HOUR FLOW (PHF), MGD	111.1
2045	10-YEAR MAXIMUM MONTH FLOW, MGD	83.9
2045	10-YEAR PEAK DAY FLOW, MGD	116.7
2045	10-YEAR PEAK HOUR FLOW, MGD	140.7
BUILDOUT	AVERAGE DAILY FLOW, MGD	64.2
BUILDOUT	10-YEAR PEAK HOUR FLOW, MGD	146.4

PROJECTED RAW INFLUENT LOADS	
BOD	
AVERAGE DAY, LB/D	105,174
PEAK MONTH, LB/D	122,609
PEAK DAY, LB/D	179,976
TSS	
AVERAGE DAY, LB/D	102,975
PEAK MONTH, LB/D	117,179
PEAK DAY, LB/D	201,216
TP	
AVERAGE DAY, LB/D	2,510
PEAK MONTH, LB/D	2,926
PEAK DAY, LB/D	4,295
TKN	
AVERAGE DAY, LB/D	18,763
PEAK MONTH, LB/D	21,210
PEAK DAY, LB/D	22,842
SCREENING	
BAR SCREENS	
NUMBER	*4*
MAXIMUM FLOW PER SCREEN, MGD	*50*
TOTAL CAPACITY, MGD	*200*
FIRM CAPACITY, MGD	*150*
INFLUENT PUMPING	
PUMPS	*5*
UNIT CAPACITY, MGD	*50*
TOTAL CAPACITY, MGD	*250*
FIRM CAPACITY, MGD	*200*
GRIT REMOVAL	
AERATED GRIT TANKS	*4*
TANK VOLUME, GAL (EACH)	*218,805*
HRT AT PDF, MIN	*15.7*
PRIMARY SEDIMENTATION	
PRIMARY CLARIFIERS	*8*
DIAMETER, FT	*110*
SIDE WATER DEPTH, FT	*10*
SOR AT PDF, GPD/FT²	*1,055*
PROJECTED PERFORMANCE	
TSS REMOVAL, %	
AVERAGE DAY	*64.0*
AVERAGE LOAD AND MMF	*59.9*
BOD REMOVAL, %	
AVERAGE DAY	*43.2*
AVERAGE LOAD AND MMF	*41.0*
PRIMARY SOLIDS	
DESIGN YEAR LOADING	
AVERAGE DAY, LB/D	*64,167*
PEAK DAY, LB/D	*121,918*
AVG SLUDGE SOLIDS, %	*4.75*
DESIGN FLOW	
AVERAGE DAY, GPM	*112*
PEAK DAY, GPM	*290*
PUMPS	
TYPE	*AIR DRIVEN DIAPHRAGM*
NUMBER	*10*
PUMP CAPACITY, GPM	*45*
FIRM CAPACITY, GPM	*405*
PRIMARY SCUM	
PUMPS	
TYPE	*AIR DRIVEN DIAPHRAGM*
NUMBER	*10*
PUMP CAPACITY, GPM	*45*
TOTAL CAPACITY, GPM	*405*

PRIMARY EFFLUENT PUMPS	
PUMPS	
TYPE	Axial Flow
NUMBER	6
MOTOR, HP	60
DRIVE	VARIABLE FREQUENCY
PUMP CAPACITY, MGD	24
FIRM CAPACITY, MGD	120
TOTAL CAPACITY, MGD	144
BIOLOGICAL PROCESS LOADINGS	
COD LB/D	
AVERAGE DAY	138,530
MAXIMUM MONTH	155,727
TP LB/D	
AVERAGE DAY	2,253
MAXIMUM MONTH	2,554
TKN LB/D	
AVERAGE DAY	16,426
MAXIMUM MONTH	18,465
BIOLOGICAL PROCESS	
ANAEROBIC BASINS	
TRAINS	4
DEPTH, FT	22
VOLUME PER TRAIN, MGAL	
ANAEROBIC 1	0.167
ANAEROBIC 2	0.167
ANAEROBIC 3	0.167
TOTAL	0.501
TOTAL VOLUME, MGAL	2.00
AERATION ZONE 1	
TRAINS	4
DEPTH, FT	22
VOLUME PER TRAIN, MGAL	
ANOXIC 1	0.25
ANOXIC 2	0.75
SWING 1	0.25
AEROBIC 1	2.44
TOTAL	3.69
TOTAL VOLUME, MGAL	14.75
AERATION ZONE 2	
TRAINS	6
DEPTH, FT	16
VOLUME PER TRAIN, MGAL	
SWING 2	0.52
AEROBIC 2	0.26
TOTAL	0.785
TOTAL VOLUME, MGAL	4.71
RAS ANOXIC BASIN	
TRAINS	1
DEPTH, FT	16
VOLUME PER TRAIN, MGAL	0.25
TOTAL BNR PROCESS VOLUME, MGAL	21.71
PROCESS DESIGN PARAMETERS	
MAXIMUM MLSS, MG/L	3,500
MAXIMUM SVI, ML/G	150
SOLIDS RETENTION TIME, DAYS	8-12
INTERNAL MIXED LIQUOR RECYCLE	
PUMPS	8
TYPE	SUBMERSIBLE AXIAL FLOW
DRIVE	VARIABLE FREQUENCY
PUMPS PER TRAIN	2
MOTOR, HP	40
PUMP CAPACITY, MGD	30
EFFECTIVE RANGE OF OPERATION PER TRAIN, MGD	15-60
EFFECTIVE RANGE OF OPERATION, TOTAL, MGD	15-240

PROCESS AERATION	
PROJECTED MAXIMUM DAY DEMAND, SCFM	
AERATION ZONE 1	53,800
AERATION ZONE 2	7,400
AERATION ZONE 1 BLOWERS	
NUMBER	4 DUTY, 1 STANDBY
TYPE	INTEGRALLY GEARED SINGLE STAGE
MOTOR SIZE, HP	1,250
DRIVE	CONSTANT SPEED
DESIGN POINT	
OUTPUT, SCFM	18,000
PRESSURE, PSIG	11.3
RANGE OF OPERATION, SCFM (EACH)	9,280 – 18,000
AERATION ZONE 2 BLOWERS	
NUMBER	5
TYPE	MULTISTAGE CENTRIFUGAL
MOTOR SIZE, HP	300
DRIVE	CONSTANT SPEED
DESIGN POINT	
OUTPUT, SCFM	4,000
PRESSURE, PSIG	8.5
RANGE OF OPERATION, SCFM	2,200 – 4,000
SECONDARY CLARIFICATION	
TOTAL CLARIFIERS	*12*
DESIGN CONDITION	
MLSS, MG/L	*3,500*
SVI, ML/G	*150*
RAS FLOW, MGD	*67.9*
TYPE A	
UNITS	*8*
TYPE	*CENTER FEED*
DIAMETER, FT	*125*
DEPTH, FT	*17.7*
TYPE B	
UNITS	*4*
TYPE	*PERIPHERAL FEED*
DIAMETER, FT	*125*
DEPTH, FT	*14*
SURFACE OVERFLOW RATE, GPD/FT²	
11 UNITS, AT DESIGN FLOW (10 YEAR MMF)	*622*
SOLIDS LOADING RATE CAPACITY, LB/D/FT²	
11 UNITS, AT DESIGN FLOW AND MAX MLSS	*32.8*
RETURN ACTIVATED SLUDGE	
DESIGN TSS CONCENTRATION, MG/L	7,000
RAS PUMPS	
NUMBER	12
UNIT CAPACITY, MGD	6.2
MOTOR, HP	50
DRIVE	VARIABLE FREQUENCY
FIRM CAPACITY, MGD	67.9
EFFECTIVE RANGE OF OPERATION, MGD	74.0
RAS FLOW SPLIT	
FLOW TO RAS ANOXIC BASIN, MGD	
MINIMUM	7
AVERAGE	16
MAXIMUM	22
BOOSTER PUMPS TO RAS ANOXIC BASIN	
NUMBER	3
TYPE	AXIAL FLOW
UNIT CAPACITY, MGD	11
FIRM CAPACITY, MGD	22
FLOW TO AERATION ZONE 1, MGD	
MINIMUM	0
AVERAGE	11
MAXIMUM	67.9
CLASSIFYING SELECTOR	
BASIN DIMENSIONS	
DEPTH, FT	16
VOLUME, MGAL	0.470
HRT AT PMF, MIN	10.0
AERATION DEMAND, SCFM	315-750

BOLD ITEMS ARE PART OF THIS DESIGN
ITALICIZED ITEMS ARE NOT PART OF THIS DESIGN

Brown AND Caldwell
6975 Union Park Center
Salt Lake City, UT

90% PRELIMINARY DESIGN

C V W R F

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED: A. KLEIN
DRAWN: C. SHEESLEY
CHECKED: N. KUNZ
CHECKED:
APPROVED: N. KUNZ

FILENAME
151600-G-00V18

BC PROJECT NUMBER
151600

CLIENT PROJECT NUMBER
151600

GENERAL

DESIGN CRITERIA 1

DRAWING NUMBER
G-00-0009

UV DISINFECTION	
CHANNELS	
DUTY	*4*
UV MODULES PER CHANNEL	*8*
TYPE	*LOW PRESSURE HIGH INTENSITY*
DESIGN TRANSMITTANCE, %	*65*
PEAK CAPACITY PER CHANNEL, MGD	*50*
FIRM CAPACITY, MGD	*150*
TOTAL CAPACITY, MGD	*200*
WASTE ACTIVATED SLUDGE	
PROJECTED YIELD, LB TSS / LB BOD	0.82
DESIGN FLOWS, GPM	
MINIMUM	174
AVERAGE	583
MAXIMUM	1,389
DESIGN SOLIDS, %	
MINIMUM	0.5
AVERAGE	0.7
MAXIMUM	1.0
PUMPS	
TYPE	CENTRIFUGAL
NUMBER	4
MOTOR, HP	10
DRIVE	VARIABLE FREQUENCY
DESIGN FLOW, MGD	1
EFFECTIVE RANGE OF OPERATION, MGD	0.25 - 2.0
WAS THICKENING	
PROJECTED FLOWS, GPM	
AVERAGE	582
MAXIMUM TWO WEEK	1056
MAXIMUM DAY	1156
WAS HOLDING TANK	
VOLUME, GAL	20,000
HRT AT AVERAGE FLOW, MIN	34.3
WAS HOLDING TANK MIXING PUMPS	
TYPE	SCREW CENTRIFUGAL
NUMBER	2.0
MOTOR, HP	15.0
DRIVE	CONSTANT SPEED
UNIT CAPACITY, GPM	TBD
WAS THICKENER FEED PUMPS	
TYPE	SCREW CENTRIFUGAL
NUMBER	3 (+1 FUTURE)
MOTOR, HP	15.0
DRIVE	VARIABLE FREQUENCY
UNIT CAPACITY, GPM	500
FIRM CAPACITY, GPM	1,000
TWAS PUMPS	
TYPE	PROGESSIVE CAVITY
NUMBER	3 (+1 FUTURE)
MOTOR, HP	10.0
DRIVE	VARIABLE FREQUENCY
UNIT CAPACITY, GPM	151
FIRM CAPACITY, GPM	302
WAS THICKENING CENTRATE SUMP	
VOLUME, GAL	20,000
HRT AT AVERAGE FLOW, MIN	38.9
WAS THICKENING CENTRATE PUMPS	
TYPE	SCREW CENTRIFUGAL
NUMBER	2 (+1 FUTURE)
MOTOR, HP	20
DRIVE	VARIABLE FREQUENCY
UNIT CAPACITY, GPM	800.0
PRIMARY SLUDGE EQUALIZATION TANK	
VOLUME, GAL	19,200
HRT AT AVERAGE FLOW, MIN	151
PS MIXING PUMPS	
TYPE	SCREW CENTRIFUGAL
NUMBER	2
MOTOR, HP	10
DRIVE	CONSTANT SPEED
UNIT CAPACITY, GPM	TBD

SLUDGE STRAINING	
PS STRAINER FEED PUMPS	
TYPE	SCREW CENTRIFUGAL
NUMBER	2
MOTOR, HP	15
DRIVE	VARIABLE FREQUENCY
UNIT CAPACITY, GPM	305
PS STRAINERS	
NUMBER	2
MOTOR, HP	5
UNIT CAPACITY, GPM	330
FIRM CAPACITY, GPM	330
FW STRAINERS	
NUMBER	2
MOTOR, HP	5
UNIT CAPACITY, GPM	83
FIRM CAPACITY, GPM	83
FOOD WASTE ADDITION	
DESIGN YEAR LOADING	
VOLUME, GPD	120,000
SOLIDS CONCENTRATION, %TS	10
SOLIDS LOAD, LB/D	100,145
BAR SCREENS	
NUMBER	TBD
UNIT CAPACITY, GPM	TBD
TOTAL CAPACITY, GPM	TBD
RECEPTION TANKS	
NUMBER	TBD
TANK VOLUME, GAL	TBD
HRT AT DESIGN YEAR LOADING, HOUR	TBD
BLEND TANK FEED PUMPS	
NUMBER	TBD
UNIT CAPACITY, GPM	TBD
TOTAL CAPACITY, GPM	TBD
FOOD WASTE BLEND TANK	
TANK VOLUME, GAL	TBD
HRT AT DESIGN YEAR LOADING, HOUR	TBD
FOOD WASTE STRAINER FEED PUMPS	
TYPE	TBD
NUMBER	TBD
MOTOR, HP	TBD
DRIVE	TBD
UNIT CAPACITY, GPM	TBD
FIRM CAPACITY, GPM	TBD
FOOD WASTE STRAINERS	
NUMBER	TBD
MOTOR, HP	TBD
UNIT CAPACITY, GPM	TBD
FIRM CAPACITY, GPM	TBD
SLUDGE FERMENTATION	
DESIGN FLOWS, GPM	
MINIMUM	90
AVERAGE	124
MAXIMUM	305
FERMENTER TANKS	
TANK 1 VOLUME	426,800
TANK 2 VOLUME	525,600
DESIGN HRT, DAYS	1-3
DESIGN TEMPERATURE, DEGREES C	25-35
FERMENTER MIXING PUMPS	
TYPE	*CENTRIFUGAL CHOPPER*
NUMBER	*2(1 PER FERMENTER)*
MOTOR, HP	*25*
DRIVE	*CONSTANT SPEED*
UNIT CAPACITY, GPM	*1500*
FERMENTER SLUDGE HEATING PUMPS	
TYPE	TBD
NUMBER	2 (1 PER FERMENTER)
MOTOR, HP	10
DRIVE	CONSTANT SPEED
UNIT CAPACITY, GPM	300
FERMENTER HEAT EXCHANGERS	
TYPE	TUBE-IN-TUBE
NUMBER	2 (1 PER FERMENTER)
HEAT TRANSFER RATE, MMBTU/HR	2
FERMENTER HRS PUMPS	
TYPE	END SUCTION CENTRIFUGAL
NUMBER	2 (1 PER FERMENTER)
MOTOR, HP	3
DRIVE	CONSTANT SPEED
UNIT CAPACITY, GPM	200
FERMENTER WITHDRAWAL PUMPS	
TYPE	SCREW CENTRIFUGAL
NUMBER	2 (1 PER FERMENTER)
MOTOR, HP	10
DRIVE	CONSTANT SPEED
UNIT CAPACITY, GPM	500

FPS THICKENING	
DESIGN FLOWS, GPM	
MINIMUM	0
AVERAGE	68
MAXIMUM	177
FPS THICKENER FEED AND BYPASS PUMPS	
TYPE	SCREW CENTRIFUGAL
NUMBER	3 (+1 FUTURE)
MOTOR, HP	10
DRIVE	VARIABLE FREQUENCY
UNIT CAPACITY, GPM	100
FIRM CAPACITY, GPM	200
FERMENTED SLUDGE THICKENERS	
TYPE	THICKENING CENTRIFUGE
NUMBER	2
MOTOR (MAIN DRIVE), HP	150
MOTOR (BACK DRIVE), HP	10
UNIT HLR CAPACITY, GPM	300
FIRM HLR CAPACITY, GPM	300
TFPS PUMPS	
TYPE	PROGRESSIVE CAVITY
NUMBER	2
MOTOR, HP	10
DRIVE	VARIABLE FREQUENCY
UNIT CAPACITY, GPM	86
FIRM CAPACITY, GPM	86
FERMENTATE SUMP	
VOLUME, GAL	14,500
HRT AT PEAK FLOW, MIN	31
FERMENTATE DESIGN FLOWS, GPM	
MINIMUM	0
AVERAGE	248
MAXIMUM	496
FERMENTATE PUMPS	
TYPE	CENTRIFUGAL NON-CLOG
NUMBER	2 (+1 FUTURE)
MOTOR, HP	15
DRIVE	VARIABLE FREQUENCY
UNIT CAPACITY, GPM	300
THICKENING POLYMER SYSTEMS	
THICKENING DRY POLYMER SYSTEMS	
TYPE	DRY POLYMER MAKE UP SYSTEM
NUMBER	2
POLYMER MIXING AND AGING	
NUMBER OF MIX/AGE TANKS	3 (EXISTING)
NUMBER OF MIXERS	3 (EXISTING)
FPS THICKENER POLYMER FEED PUMPS	
TYPE	PROGRESSIVE CAVITY
NUMBER	2 (+1 FUTURE)
MOTOR, HP	1
DRIVE	VARIABLE FREQUENCY
UNIT CAPACITY, GPM	TBD
WAS THICKENER POLYMER FEED PUMPS	
TYPE	PROGRESSIVE CAVITY
NUMBER	3 (+1 FUTURE)
MOTOR, HP	1
DRIVE	VARIABLE FREQUENCY
UNIT CAPACITY, GPM	TBD
THICKENED SLUDGE	
PROJECTED FLOWS, GPM	
AVERAGE	251
MAXIMUM TWO WEEK	322
MAXIMUM DAY	415
THICKENED SLUDGE BLEND TANKS	
NUMBER	2
VOLUME PER TANK, GAL	30,000
HRT AT AVERAGE FLOW, HOURS	239.3
THICKENED SLUDGE MIXING PUMPS	
TYPE	SCREW CENTRIFUGAL
NUMBER	2
MOTOR, HP	20
DRIVE	CONSTANT SPEED
UNIT CAPACITY, GPM	TBD
EGG DIGESTER FEED PUMPS	
NUMBER	4
UNIT CAPACITY, GPM	130
FIRM CAPACITY, GPM	390

Brown AND Caldwell
6975 Union Park Center
Salt Lake City, UT

90% PRELIMINARY DESIGN

CVWRF

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED: A. KLEIN
DRAWN: C. SHEESLEY
CHECKED: N. KUNZ
CHECKED:
APPROVED: N. KUNZ

FILENAME
151600-G-00V18

BC PROJECT NUMBER
151600

CLIENT PROJECT NUMBER
151600

GENERAL

DESIGN CRITERIA 2

DRAWING NUMBER
G-00-0010

ANAEROBIC DIGESTION	
DESIGN YEAR LOADING	
MAXIMUM TWO WEEK FLOW, GPM	*322*
MAXIMUM TWO WEEK LOAD, LB/D	*244,749*
MAXIMUM TWO WEEK VS LOAD, LB/D	*201,438*
EGG-SHAPED DIGESTERS	
NUMBER	*2*
UNIT VOLUME, MGAL	*1.65*
PRIMARY UNITS IN SERVICE	*2*
CONVENTIONAL DIGESTERS	
NUMBER	*5*
UNIT VOLUME, MGAL	*1.11*
SECONDARY UNITS IN SERVICE	*4*
PRIMARY DIGESTION VOLUME, MGAL	*3.3*
SECONDARY DIGESTION VOLUME, MGAL	*4.44*
*PRIMARY DIGESTER VOLATILE SOLIDS LOADING AT MAXIMUM TWO WEEK LOAD, LB/D/FT ^{3} **	*0.477*
*PRIMARY DIGESTER HRT AT MAXIMUM TWO WEEK LOAD, DAYS **	*7.1*
**DIGESTERS WILL SHIFT TO AN ALTERNATIVE MODE OF OPERATION BEFORE DESIGN YEAR*	
DIGESTED SLUDGE	
DESIGN YEAR LOADING	
MAXIMUM TWO WEEK FLOW, GPM	*322*
MAXIMUM DAY FLOW, GPM	*415*
DIGESTED SLUDGE TRANSFER PUMPS	
NUMBER	*5*
UNIT CAPACITY, GPM	*220*
TOTAL CAPACITY, GPM	*1100*
DIGESTED SLUDGE BLENDING TANK	
VOLUME, MGAL	*422,000*
BLENDED SLUDGE TRANSFER PUMPS	
NUMBER	*3*
UNIT CAPACITY, GPM	
TOTAL CAPACITY, GPM	
SIDE STREAM PHOSPHORUS REMOVAL	
DESIGN YEAR LOADING	
AVERAGE FLOW, GPM	251
MAXIMUM TWO WEEK FLOW, GPM	322
MAXIMUM MONTH PO4P, LB/D	1,999
DESIGN PO4P REMOVAL	90%
MGCL2 DEMAND (30% SOLUTION)	
AVERAGE, GPD	8,389
MAXIMUM MONTH, GPD	9,702
STRUVITE PRODUCTION	
AVERAGE, LB/D	12,605
MAXIMUM MONTH, LB/D	14,251
BIOSOLIDS DEWATERING	
DESIGN YEAR LOADING	
MAXIMUM TWO WEEK FLOW, GPM	*322*
MAXIMUM TWO WEEK LOAD, LB/D	*116,762*
BELT FILTER PRESSES	
NUMBER	*3*
UNIT CAPACITY, GPM	*150*
FIRM CAPACITY, GPM	*300*
CAKE LOADINGS	
MAXIMUM TWO WEEK FLOW, GPM	*42*
MAXIMUM TWO WEEK LOAD, LB/D	*112,138*
CAKE PUMPS	
NUMBER	*1*
CAPACITY, GPM	*75*
FILTRATE LOADINGS	
MAXIMUM TWO WEEK FLOW, GPM	*460*
FILTRATE PUMPS	
NUMBER	*3*
UNIT CAPACITY, GPM	*230-280*
FIRM CAPACITY, GPM	*480*
SIDE STREAM NITROGEN REMOVAL	
DESIGN YEAR LOADING	
MAXIMUM MONTH NITROGEN LOAD, LB/D	8,314
DESIGN NH3-N REMOVAL	85%
DESIGN TOTAL INORGANIC NITROGEN REMOVAL	80%

BOLD ITEMS ARE PART OF THIS DESIGN
ITALICIZED ITEMS ARE NOT PART OF THIS DESIGN

Brown AND Caldwell
6975 Union Park Center
Salt Lake City, UT

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C V W R F

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED: A. KLEIN
DRAWN: C. SHEESLEY
CHECKED: N. KUNZ
CHECKED:
APPROVED: K. KEIL

FILENAME
151600-G-00V18

BC PROJECT NUMBER
151600

CLIENT PROJECT NUMBER
151600

GENERAL

DESIGN CRITERIA 3

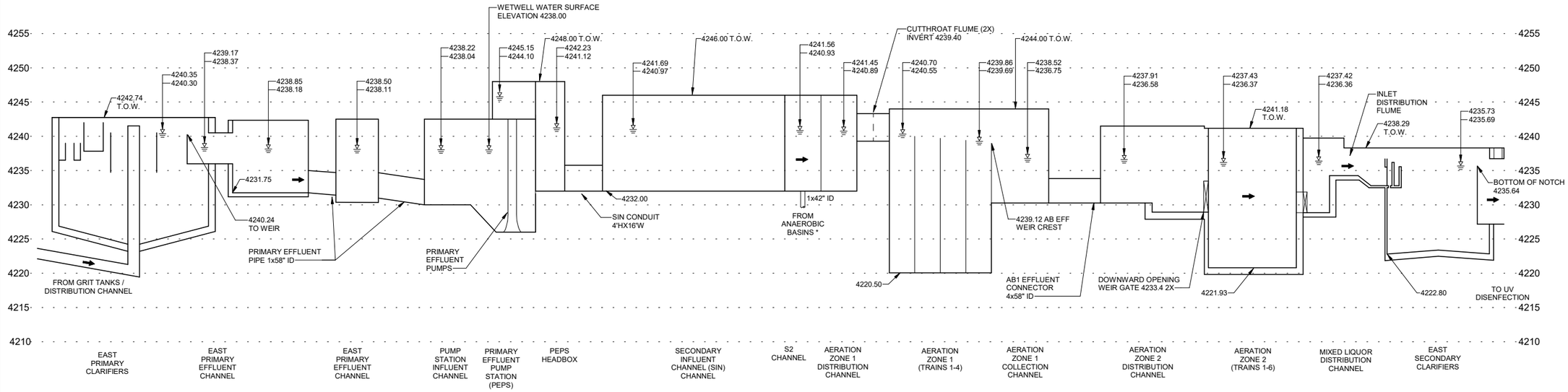
DRAWING NUMBER
G-00-0011

CENTRAL VALLEY WESTSIDE CONFIGURATION									
FLOW CONDITION	PLANT FLOW (MGD)	RAS (MGD)	PRIMARY CLARIFIERS ONLINE	SIN CHANNEL FLOW (MGD)	ANAEROBIC BASINS ONLINE	ANAEROBIC RAS FLOW (MGD)	AERATION BASINS 1 ONLINE	AERATION BASINS 2 ONLINE	SECONDARY CLARIFIERS ONLINE
PHF	146.4	67.9	10	192.3	3	22	4	6	11
ADF	64.2	41.7	10	98.9	3	7	3	6	10

WATER LEVEL AT BUILDOUT FLOW = 146.4 MGD (67.9 MGD RAS)
WATER LEVEL AT BUILDOUT FLOW = 64.2 MGD (41.7 MGD RAS)

NOTE: ALL PIPE SIZES REPRESENT INSIDE DIAMETER

*SEE HYDRAULIC PROFILE 1B WESTSIDE CONFIGURATION FOR ANAEROBIC BASIN HYDRAULIC PROFILE



BIOLOGICAL NUTRIENT PROCESS - WEST SIDE CONFIGURATION

Brown AND Caldwell
6975 Union Park Center
Salt Lake City, UT

90% PRELIMINARY DESIGN

CVWRF

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	B. BILLING
DRAWN:	R. PERSHING
CHECKED:	N. KUNZ
CHECKED:	
APPROVED:	N. KUNZ

FILENAME 151600-G-00V18
BC PROJECT NUMBER 151600
CLIENT PROJECT NUMBER 151600

GENERAL

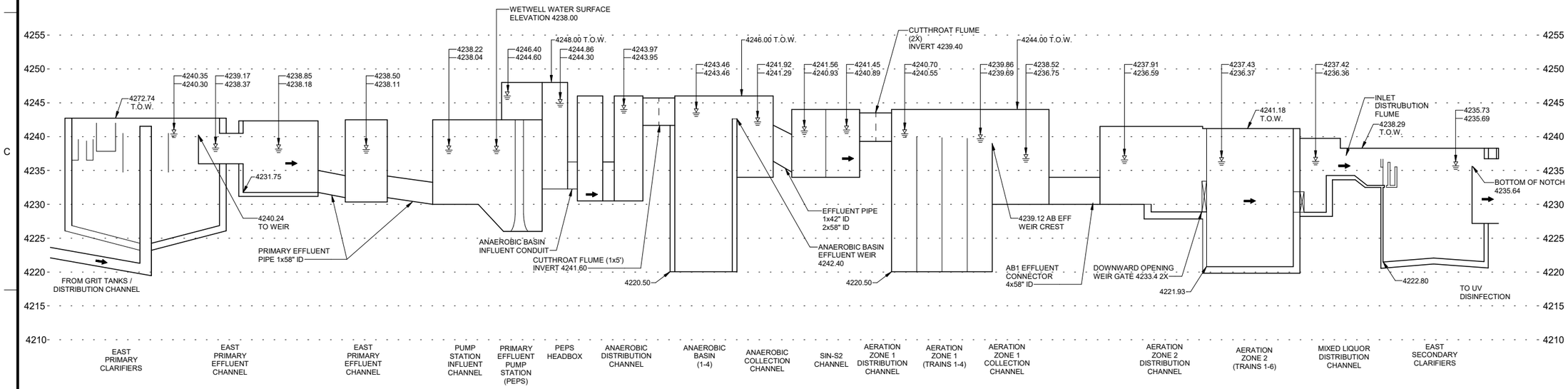
HYDRAULIC PROFILE 1A WEST SIDE CONFIGURATION

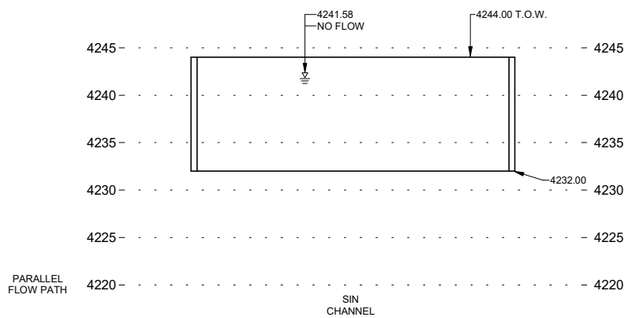
DRAWING NUMBER
G-00-0012

CENTRAL VALLEY A20 CONFIGURATION									
FLOW CONDITION	PLANT FLOW (MGD)	RAS (MGD)	PRIMARY CLARIFIERS ONLINE	SIN CHANNEL FLOW (MGD)	ANAEROBIC BASINS ONLINE	ANAEROBIC BASIN FLOW (MGD)	AERATION BASINS 1 ONLINE	AERATION BASINS 2 ONLINE	SECONDARY CLARIFIERS ONLINE
PHF	146.4	67.9	10	107.3	3	107	4	6	11
ADF	64.2	41.7	10	0	3	105.9	3	6	10

WATER LEVEL AT BUILDOUT FLOW = 146.4 MGD (67.9 MGD RAS)
WATER LEVEL AT BUILDOUT FLOW = 64.2 MGD (41.7 MGD RAS)

NOTE: ALL PIPE SIZES REPRESENT INSIDE DIAMETER





BIOLOGICAL NUTRIENT PROCESS - A20 CONFIGURATION

Brown AND Caldwell
6975 Union Park Center
Salt Lake City, UT

90% PRELIMINARY DESIGN

C V W R F

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED: B. BILLING
DRAWN: R. PERSHING
CHECKED: N. KUNZ
CHECKED:
APPROVED: N. KUNZ

FILENAME 151600-G-00V18
BC PROJECT NUMBER 151600
CLIENT PROJECT NUMBER 151600

GENERAL

HYDRAULIC PROFILE 2A A2O CONFIGURATION

DRAWING NUMBER
G-00-0013

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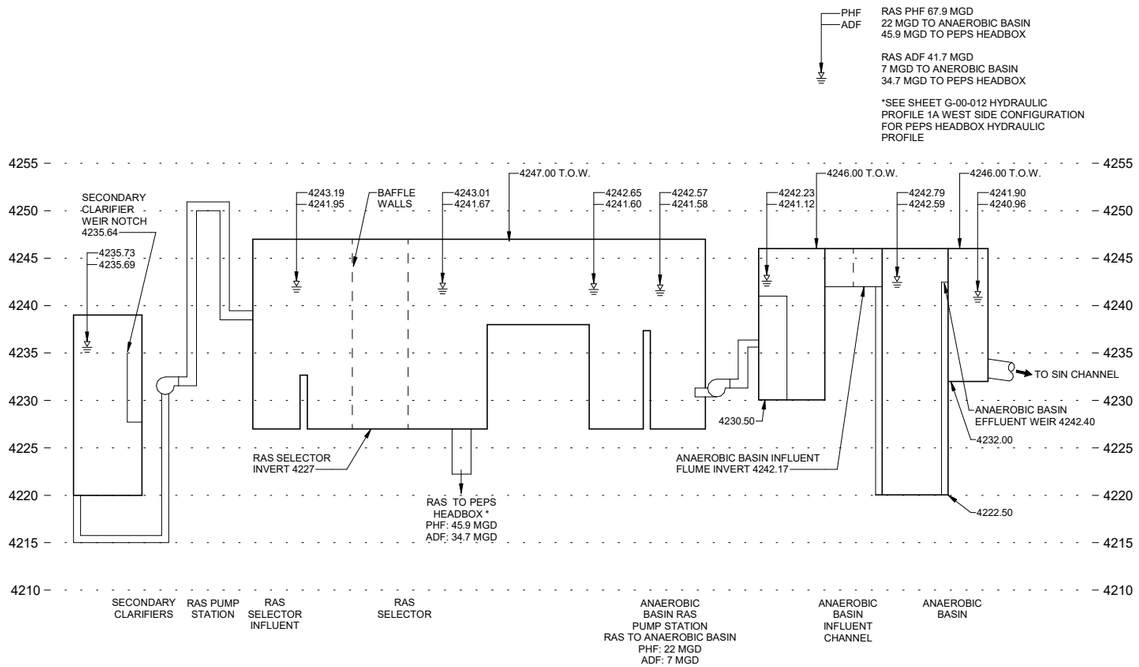
Plot Date: 6/9/2019 9:42:40 AM



RETURN ACTIVATED SLUDGE SELECTOR - WEST SIDE CONFIGURATION

Brown AND Caldwell
6975 Union Park Center
Salt Lake City, UT

90% PRELIMINARY DESIGN

C V W R F

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED: B. BILLING
DRAWN: C. SHEESLEY
CHECKED: N. KUNZ
CHECKED:
APPROVED: N. KUNZ

FILENAME
151600-G-00V18

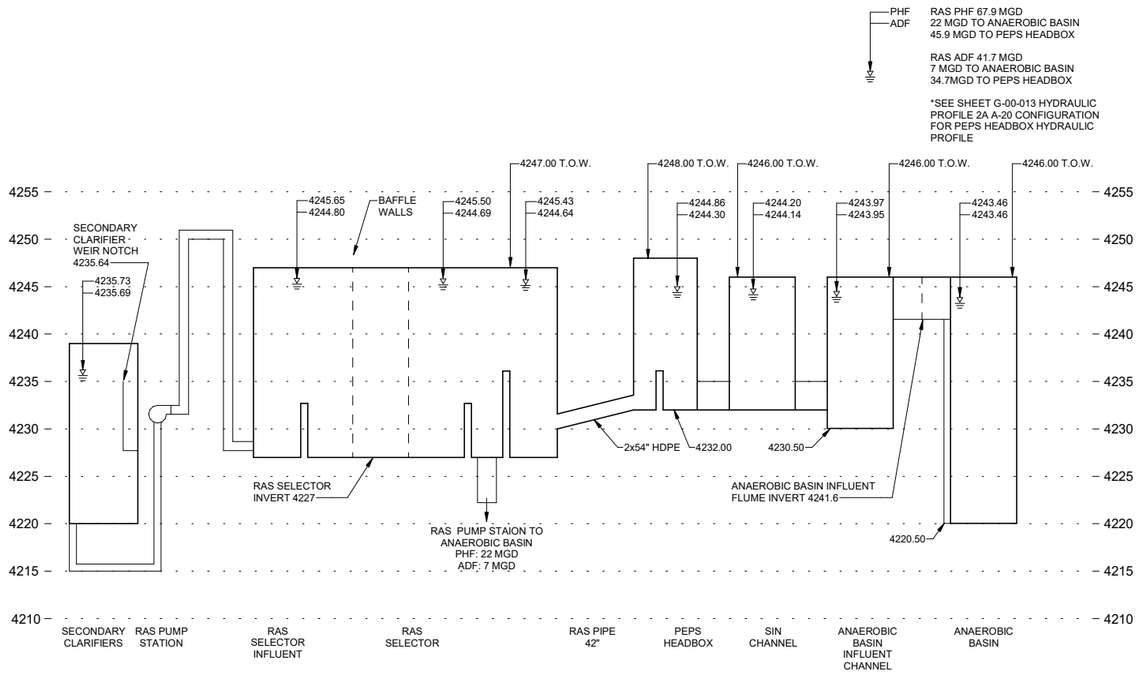
BC PROJECT NUMBER
151600

CLIENT PROJECT NUMBER
151600

GENERAL

HYDRAULIC PROFILE 1B WESTSIDE CONFIGURATION

DRAWING NUMBER
G-00-0014



RETURN ACTIVATED SLUDGE SELECTOR - A20 CONFIGURATION

Brown AND Caldwell
6975 Union Park Center
Salt Lake City, UT

90% PRELIMINARY DESIGN

C V W R F

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED: B. BILLING
DRAWN: C. SHEESLEY
CHECKED: N. KUNZ
CHECKED:
APPROVED: N. KUNZ

FILENAME
151600-G-00V18

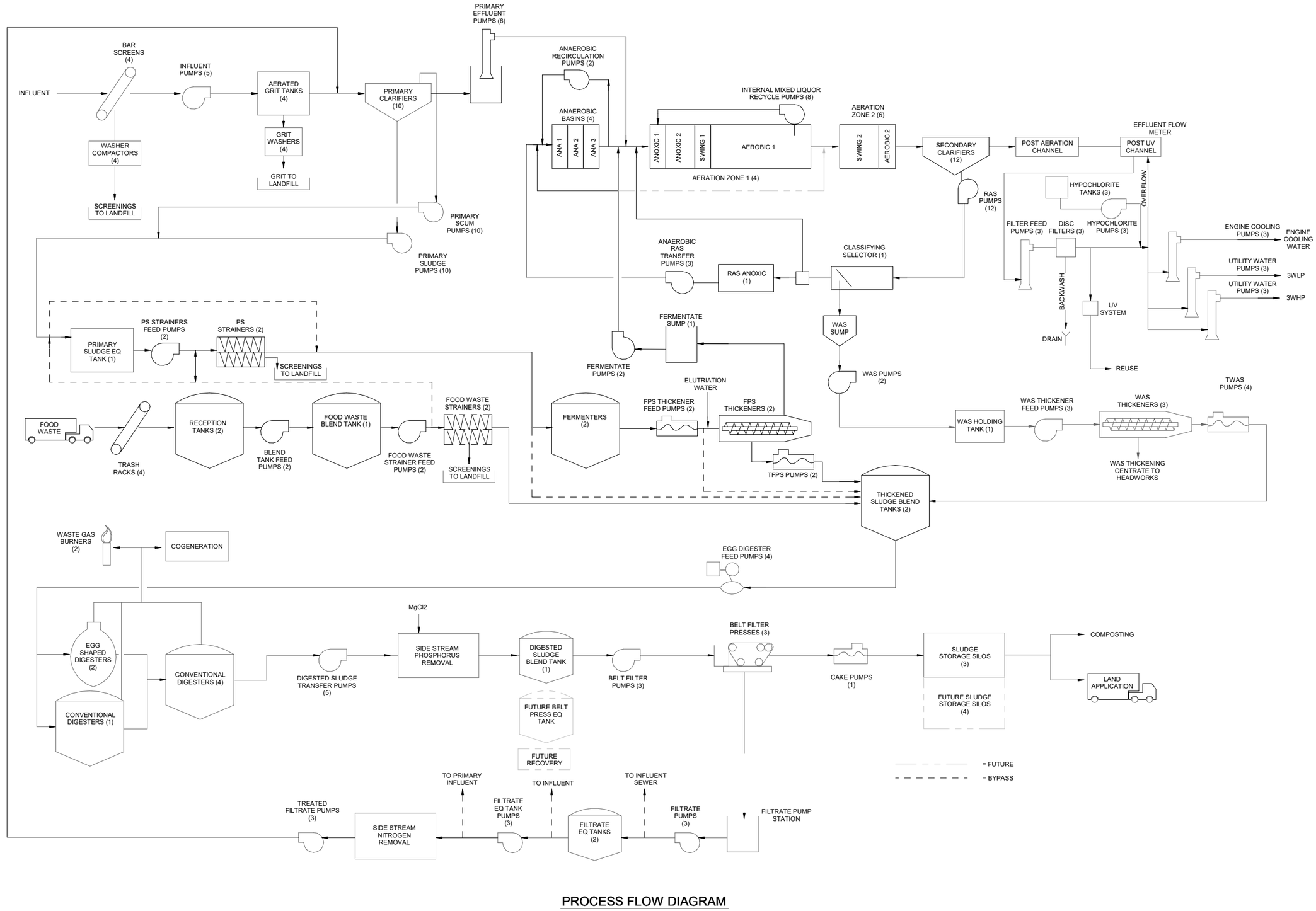
BC PROJECT NUMBER
151600

CLIENT PROJECT NUMBER
151600

GENERAL

HYDRAULIC PROFILE 2B A2O CONFIGURATION

DRAWING NUMBER
G-00-0015



PROCESS FLOW DIAGRAM

Brown AND Caldwell
6975 Union Park Center
Salt Lake City, UT

90% PRELIMINARY DESIGN

CVWRF

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	A. KLEIN
DRAWN:	C. SHEESLEY
CHECKED:	N. KUNZ
CHECKED:	
APPROVED:	N. KUNZ

FILENAME
151600-G-00V18

BC PROJECT NUMBER
151600

CLIENT PROJECT NUMBER
151600

GENERAL

PROCESS OVERVIEW PLAN 1

DRAWING NUMBER
G-00-0016

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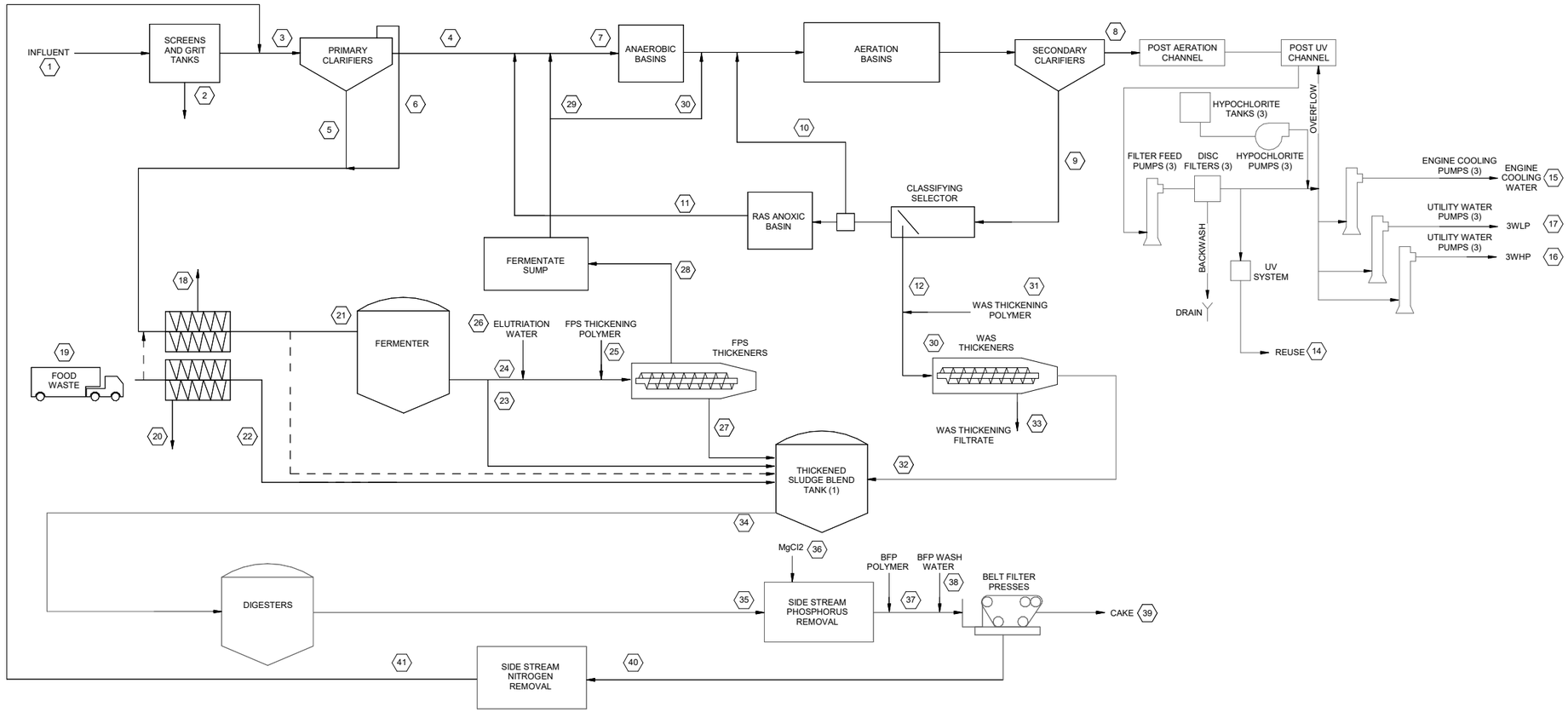


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Influent	Grit	Primary influent	Primary effluent	Primary sludge	Primary Scum	Secondary influent	Secondary effluent	RAS Total	RAS to anoxic	Fermentate RAS to anaerobic	WAS	Effluent to Mill Creek	Reuse water	Engine cooling water	3WHP	3WLP	PS screenings	Food waste	FW screenings
dry ppd	117,179	1,935.0	120,604	43,845	76,758	5,408	1,217,471	5,149	3,966,171	2,733,928	1,171,823	60,420	4,899	0	TBD	60	60	1,982	100,145	2,003
% solids	0.02	50.0	0.02	0.01	4.75	3.00	0.17	0.001	0.70	0.70	0.70	0.70	0.01	0.00	TBD	0.001	0.001	40.0	10.00	40.0
TSS, mg/L	227	N/A	228	83	47,500	30,000	1,748	10	7,000	7,000	7,000	7,000	10	0	TBD	10	10	N/A	100,000	N/A
wet ppd	515,087,154	3,870	527,860,066	526,244,101	1,615,966	180,261	696,629,932	514,946,279	566,595,870	390,561,127	167,403,325	8,631,417	489,859,904	0	TBD	6,008,713	6,008,713	4,956	1,001,452	5,007
gpd	61,720,833	464	63,251,360	63,057,726	193,635	21,600	83,474,378	61,703,953	67,892,917	46,799,378	20,059,271	1,034,268	58,697,953	1,566,000	TBD	720,000	720,000	594	120,000	600.0
gpm	42,862	0.3	43,925	43,790	134	15	57,968	42,850	47,148	32,500	13,930	718	40,762	1,088	TBD	500	500	0.4	83	0.4

	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	Screened PS + PSC to fermenter	Foodwaste to TSBT's	FPS to TSBT's	FPS thickening feed	FPS thickener polymer	Elutriation water	Thickened FPS	Fermentate total	Fermentate to anaerobic	Fermentate to anoxic	WAS thickening polymer	Thickened WAS	WAS thickening centrate	Thickened sludge to digesters	Digested sludge	MgCl2	Side Stream P Effluent	BFP wash water	BFP cake	BFP filtrate	Sidestream N effluent
dry ppd	80,184	98,142	8,079	72,105	180	0	68,499	3,605	1,803	1,803	60	57,399	3,021	232,120	86,580	24,290	110,870	0	106,541	4,329	2,339
% solids	4.47	9.85	4.47	4.47	0.20	0.00	5.50	0.06	0.06	0.06	0.20	5.50	0.04	6.70	2.50	30.00	3.13	0.00	19.34	0.08	0.05
TSS, mg/L	44,714	98.492	44,714	44,714	2000	0	55,000	604	604	604	2,037	55,000	397	66,967	24,978	300,000	31,256	0	193,369	839	453
wet ppd	1,793,253	996,445	180,685	1,612,568	90,131	0	1,245,442	5,965,013	2,982,506	2,982,506	29,661	1,043,617	7,617,461	3,466,189	3,466,189	80,967	3,547,157	0	550,972	5,159,321	5,159,321
gpd	214,878	119,400	21,651	193,228	10,800	659,972	149,236	714,764	357,382	357,382	3,554	125,052	912,770	415,340	415,340	9,702	425,042	259,200	66,021	618,221	618,221
gpm	149	83	15	134	8	458	104	496	248	248	2	87	634	288	288	7	295	180	46	429	429

MASS AND FLOW BALANCE. 2045 MAXIMUM MONTH FLOW AND AVERAGE DAY LOAD

Brown AND Caldwell
6975 Union Park Center
Salt Lake City, UT

90% PRELIMINARY DESIGN

C V W R F

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SIZE

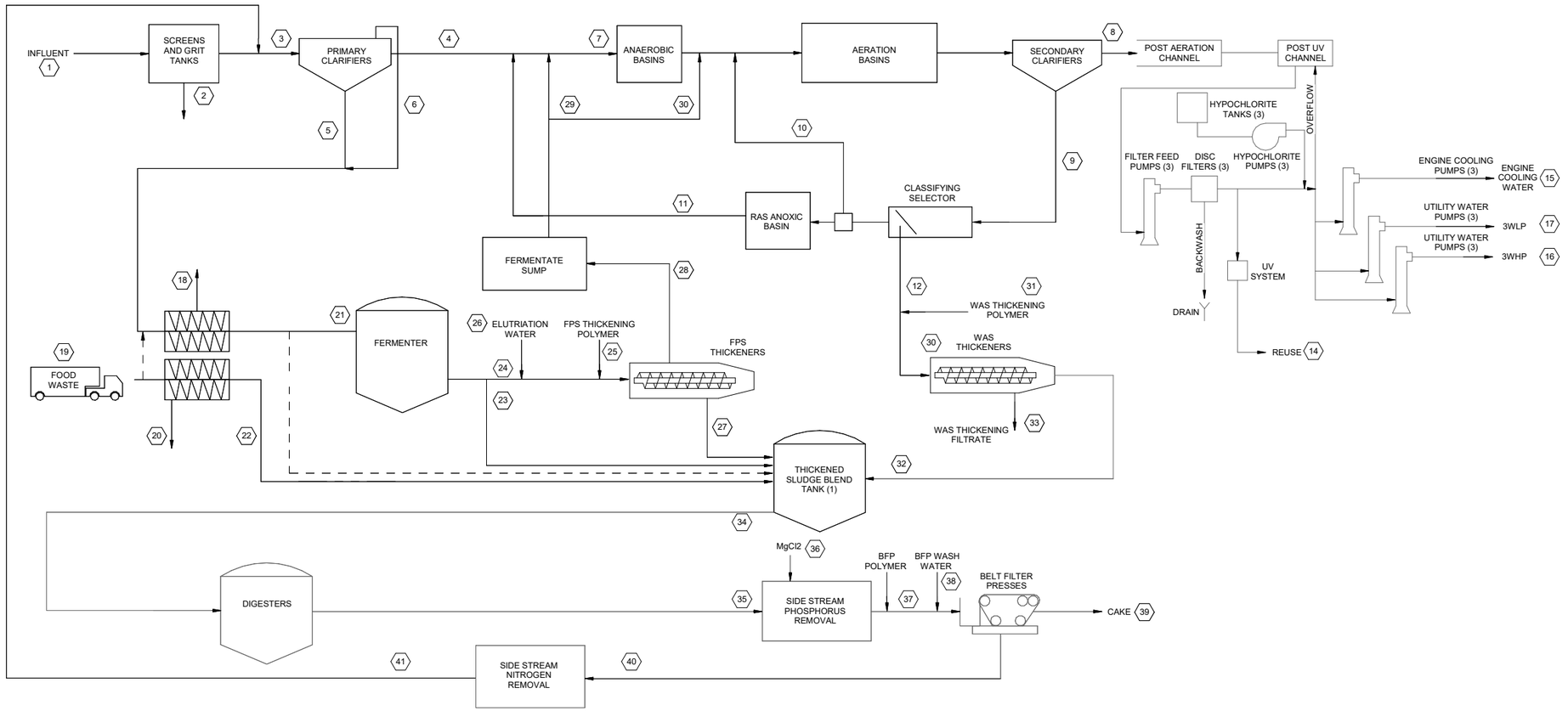
DESIGNED: A. KLEIN
DRAWN: C. SHEESLEY
CHECKED: N. KUNZ
CHECKED:
APPROVED: N. KUNZ

FILENAME 151600-G-00V18
BC PROJECT NUMBER 151600
CLIENT PROJECT NUMBER 151600

GENERAL

PROCESS OVERVIEW PLAN 2

DRAWING NUMBER
G-00-0017



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Influent	Grit	Primary influent	Primary effluent	Primary sludge	Primary Scum	Secondary influent	Secondary effluent	RAS Total	RAS to anoxic	RAS to anaerobic	WAS	Effluent to Mill Creek	Reuse water	Engine cooling water	3WHP	3WLP	PS screenings	Food waste	FW screenings
dry ppd	97,467	1,644	100,304	38,146	62,158	5,408	1,134,136	4,804	2,190,177	1,048,832	1,095,089	46,257	4,553	0	TBD	60	60	1,684	91,800	1,836.0
% solids	0.02	50.0	0.02	0.01	4.75	3.00	0.17	0.001	0.70	0.70	0.70	0.70	0.001	0.00	TBD	0.001	0.001	40.0	10	40.0
TSS, mg/L	202	N/A	204	78	47,500	30,000	1,749	10	7,000	7,000	7,000	7,000	10	0	TBD	10	10	N/A	100,000	N/A
wet ppd	481,357,691	3,288	491,970,563	490,661,969	1,308,594	180,261	648,594,472	480,428,221	312,882,499	149,833,123	156,441,250	6,608,127	455,341,846	0	TBD	6,008,713	6,008,713	4,211	917,998	4,590
gpd	57,679,167	394	58,950,865	58,794,061	156,804	21,600	77,718,481	57,567,792	37,491,458	17,953,904	18,745,729	791,825	54,561,792	1,566,000	TBD	720,000	720,000	505	110,000	550
gpm	40,055	0.3	40,938	40,829	109	15	53,971	39,978	26,036	12,468	13,018	550	37,890	1,088	TBD	500	500	0.4	76	0.4

	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	Screened PS + PSC to fermenter	Foodwaste to TSBTs	FPS to TSBTs	FPS Thickening feed	FPS thickener polymer	Elutriation water	Thickened FPS	Fermentate total	Fermentate to anaerobic	Fermentate to anoxic	WAS thickening polymer	Thickened WAS	WAS thickening centrate	Thickened sludge to digesters	Digested sludge	MgCl2	Side Stream P Effluent	BFP wash water	BFP cake	BFP filtrate	Side Stream N Effluent
dry ppd	65,882	89,964	29,830	36,052	90	0	34,250	1,803	901	901	46	43,944	2,313	197,987	71,273	20,051	91,324	0	87,760	3,564	2,169
% solids	4.43	9.85	4.43	4.43	0.20	0.00	5.50	0.06	0.06	0.06	0.20	5.50	0.04	6.58	2.37	30.00	2.97	0.00	19.34	0.07	0.05
TSS, mg/L	44,325	98,492	44,325	44,325	2,000	0	55,000	604	604	604	2,037	55,000	397	65,818	23,694	300,000	29,700	0	193,412	745	453
wet ppd	1,486,329	913,408	672,970	813,358	45,065	0	622,721	2,982,506	1,491,253	1,491,253	22,708	798,983	5,831,852	3,008,082	3,008,082	66,837	3,074,919	0	453,748	4,784,307	4,784,307
gpd	178,101	109,450	80,639	97,461	5,400	329,139	74,618	357,382	178,691	178,691	2,721	95,739	698,808	360,446	360,446	8,009	368,455	259,200	54,371	573,284	573,284
gpm	124	76	56	68	4	229	52	248	124	124	2	66	485	250	250	6	256	180	38	398	398

MASS AND FLOW BALANCE. 2035 AVERAGE DAY FLOW AND LOAD

Brown AND Caldwell
6975 Union Park Center
Salt Lake City, UT

90% PRELIMINARY DESIGN

C V W R F

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED: A. KLEIN
DRAWN: C. SHEESLEY
CHECKED: N. KUNZ
CHECKED:
APPROVED: N. KUNZ

FILENAME
151600-G-00V18

BC PROJECT NUMBER
151600

CLIENT PROJECT NUMBER
151600

GENERAL

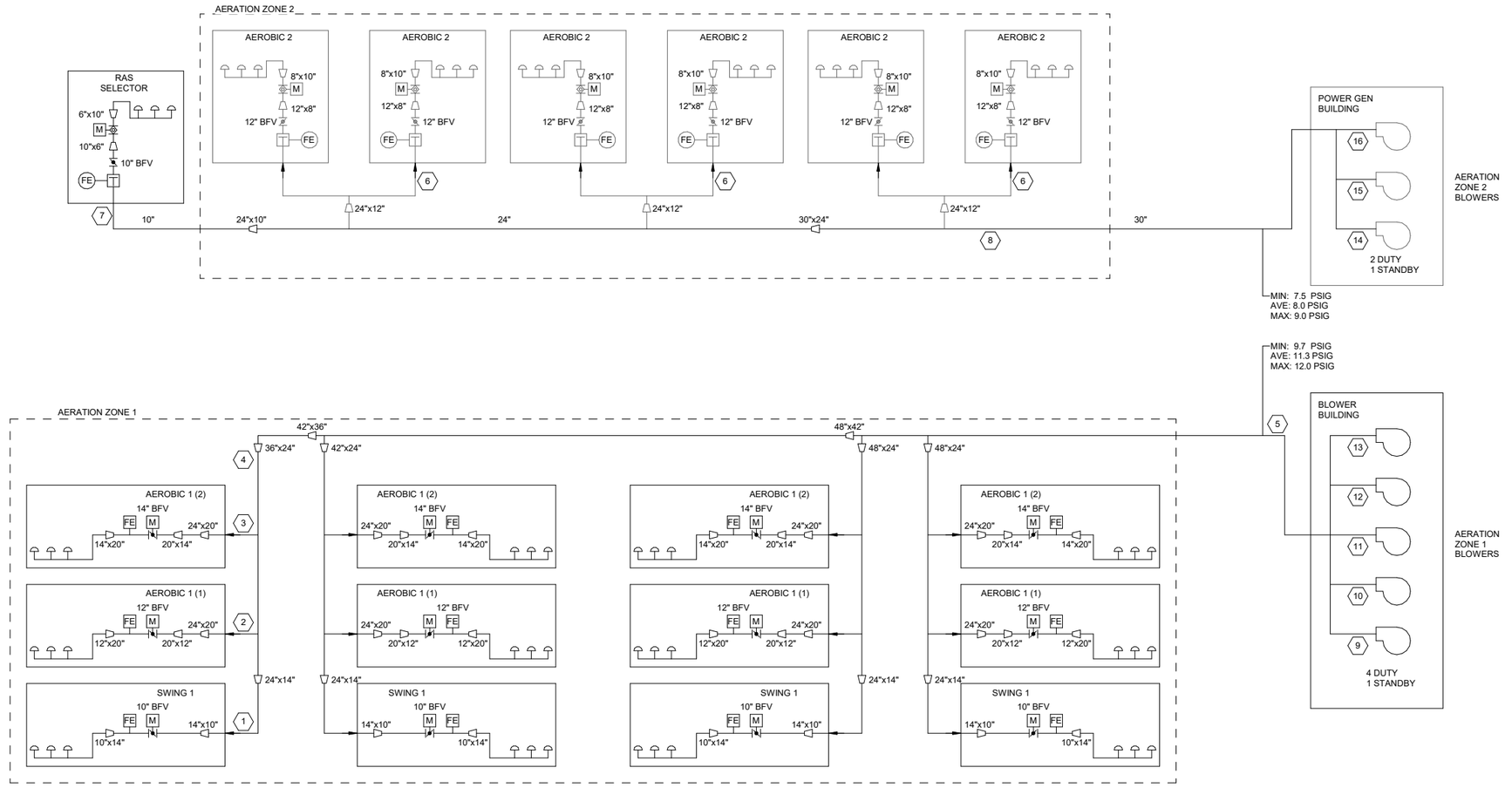
PROCESS OVERVIEW PLAN 3

DRAWING NUMBER
G-00-0018

Path: BIM 360://151600 - CVWRF Nutrients/151600-G-00V18.rvt
Plot Date: 6/9/2019 11:05:03 AM

GENERAL NOTES:

1. FLOW RATE SCENARIOS FOR EACH ZONE AND TRAIN ARE NOT CONCURRENT. BLOWER AND HEADER FLOW RATES ARE SIZED TO MEET THE OVERALL PROCESS AERATION DEMANDS.
2. FLOW RATES LISTED IN THE TABLE ARE TYPICAL FOR EACH AERATION ZONE.



		AERATION ZONE 1					AERATION ZONE 2			BLOWER FLOWRATES-ZONE 1					BLOWER FLOWRATES-ZONE 2		
SCENARIO	UNIT	⬡1	⬡2	⬡3	⬡4	⬡5	⬡6	⬡7	⬡8	⬡9	⬡10	⬡11	⬡12	⬡13	⬡14	⬡15	⬡16
MIN HOUR	SCFM	1,100	2,000	1,800	4,900	17,250	549	400	2,200	8,625	8,625	0	0	0	2,520	0	0
MIN DAY	SCFM	1,300	2,150	2,750	6,200	22,000	1,006	400	3,200	11,000	11,000	0	0	0	3,600	0	0
AVERAGE	SCFM	1,700	2,800	3,750	8,250	30,000	1,425	760	5,750	15,000	15,000	0	0	0	3,150	3,150	0
MAX DAY	SCFM	3,800	5,700	7,400	16,900	48,000	1,847	760	8,700	16,000	16,000	16,000	0	0	3,153	3,153	3,153
MAX HOUR	SCFM	4,300	6,500	9,700	20,500	56,500	3,011	800	11,000	14,125	14,125	14,125	14,125	0	3,933	3,933	3,933

Brown AND Caldwell

6975 Union Park Center
Salt Lake City, UT

90% PRELIMINARY DESIGN

C V W R F

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED: P. ZEMKE
DRAWN: R. FULK
CHECKED: J. MORGAN
CHECKED:
APPROVED: N. KUNZ

FILENAME
151600-G-00V18

BC PROJECT NUMBER
151600

CLIENT PROJECT NUMBER
151600

GENERAL

AERATION SYSTEMS PROCESS FLOW DIAGRAM

DRAWING NUMBER
G-00-0023

Path: BIM 360://151600 - CVWRF Nutrients/151600-G-00V18.rvt
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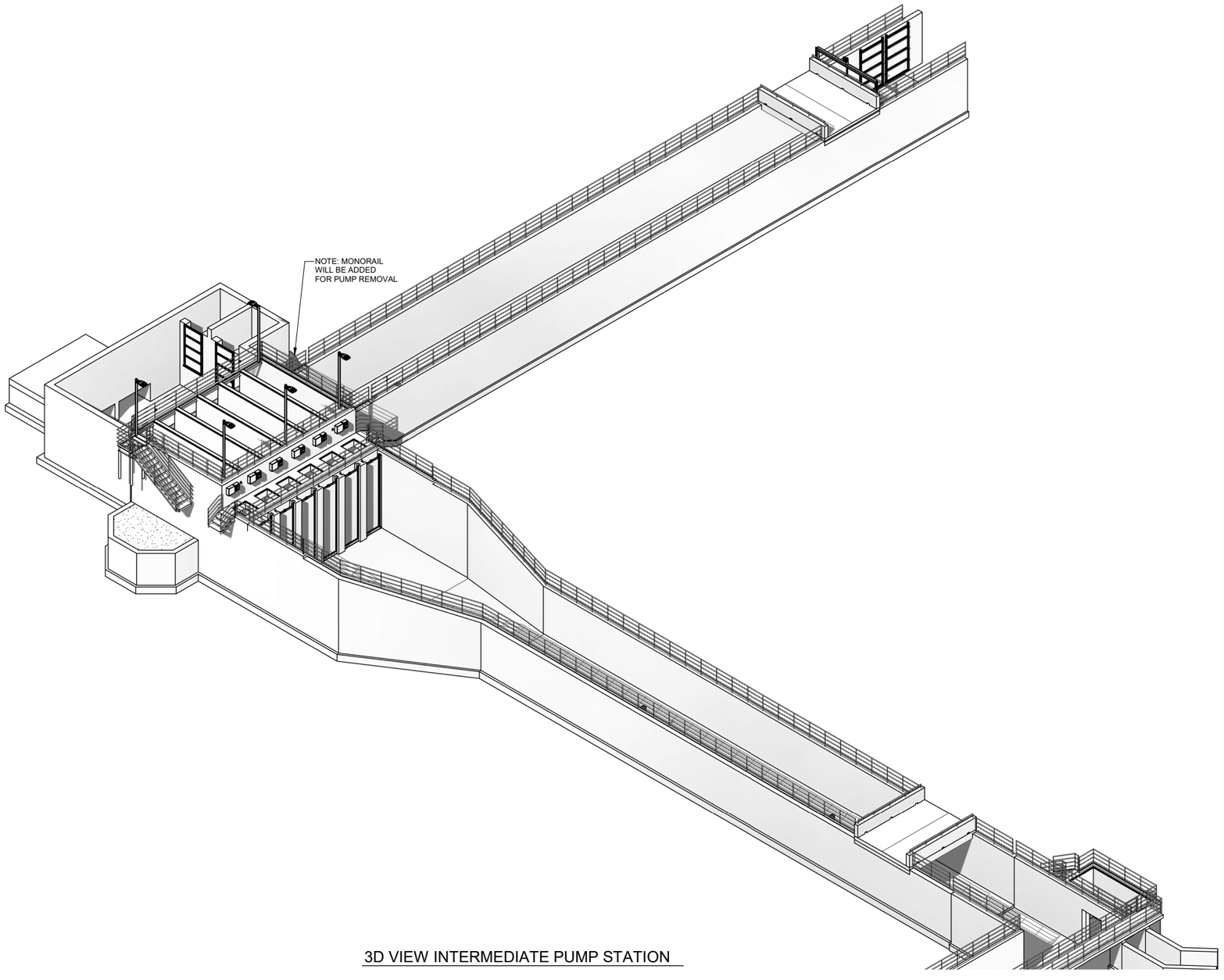


3D VIEW INTERMEDIATE PUMP STATION

Brown AND Caldwell
6975 Union Park Center
Salt Lake City, UT

90% PRELIMINARY DESIGN

C V W R F

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES
AT FULL SIZE

DESIGNED: M. KOBE
DRAWN: T. EASTMAN
CHECKED:
CHECKED:
APPROVED: M. KOBE

FILENAME
151600-P-16V18

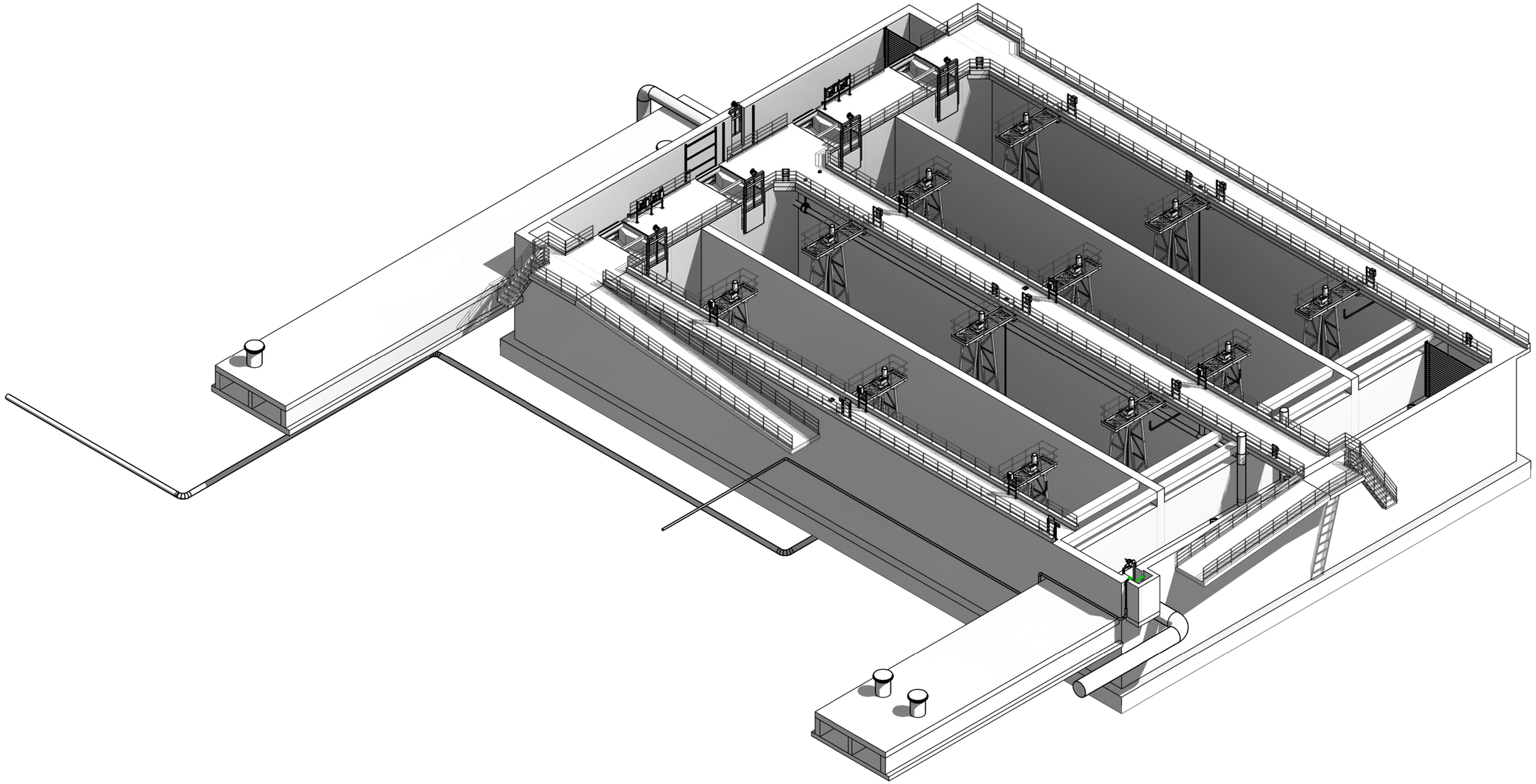
BC PROJECT NUMBER
151600

CLIENT PROJECT NUMBER
151600

PROCESS

PRIMARY PUMP STATION 3D VIEW

DRAWING NUMBER
P-16-9001



3D VIEW ANAEROBIC BASINS

Brown AND Caldwell

Brown & Caldwell
6975 Union Park Center
Salt Lake City, UT

90% Preliminary Design

C V W R F

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES
AT FULL SIZE

DESIGNED: B. WATSON
DRAWN: T. EASTMAN
CHECKED:
CHECKED:
APPROVED: K. KEIL

FILENAME
151600-M-17V18

BC PROJECT NUMBER
151600

CLIENT PROJECT NUMBER
XX

PROCESS

ANAEROBIC BASINS 3D VIEW

DRAWING NUMBER
P-17-9001

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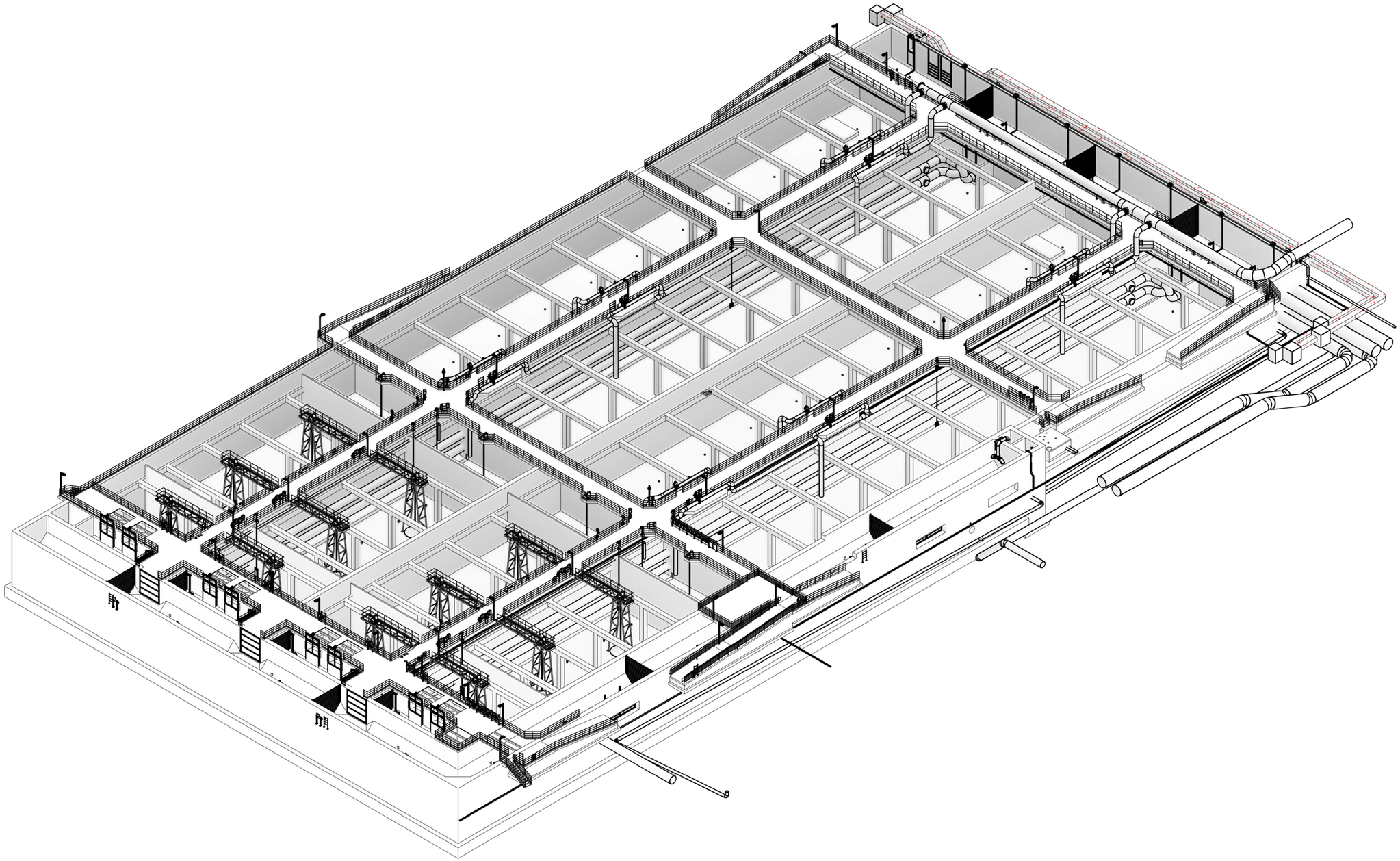

AERATION ZONE 1 3D VIEW

Brown AND Caldwell

6975 Union Park Center
Salt Lake City, UT

90% PRELIMINARY DESIGN

C V W R F

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	B. WATSON
DRAWN:	R. FULK
CHECKED:	Z. MOORE
CHECKED:	
APPROVED:	T. LINDLEY

FILENAME
151600-P-18V18

BC PROJECT NUMBER
151600

CLIENT PROJECT NUMBER
151600

PROCESS

AERATION BASINS 3D VIEW

DRAWING NUMBER
P-18-9001

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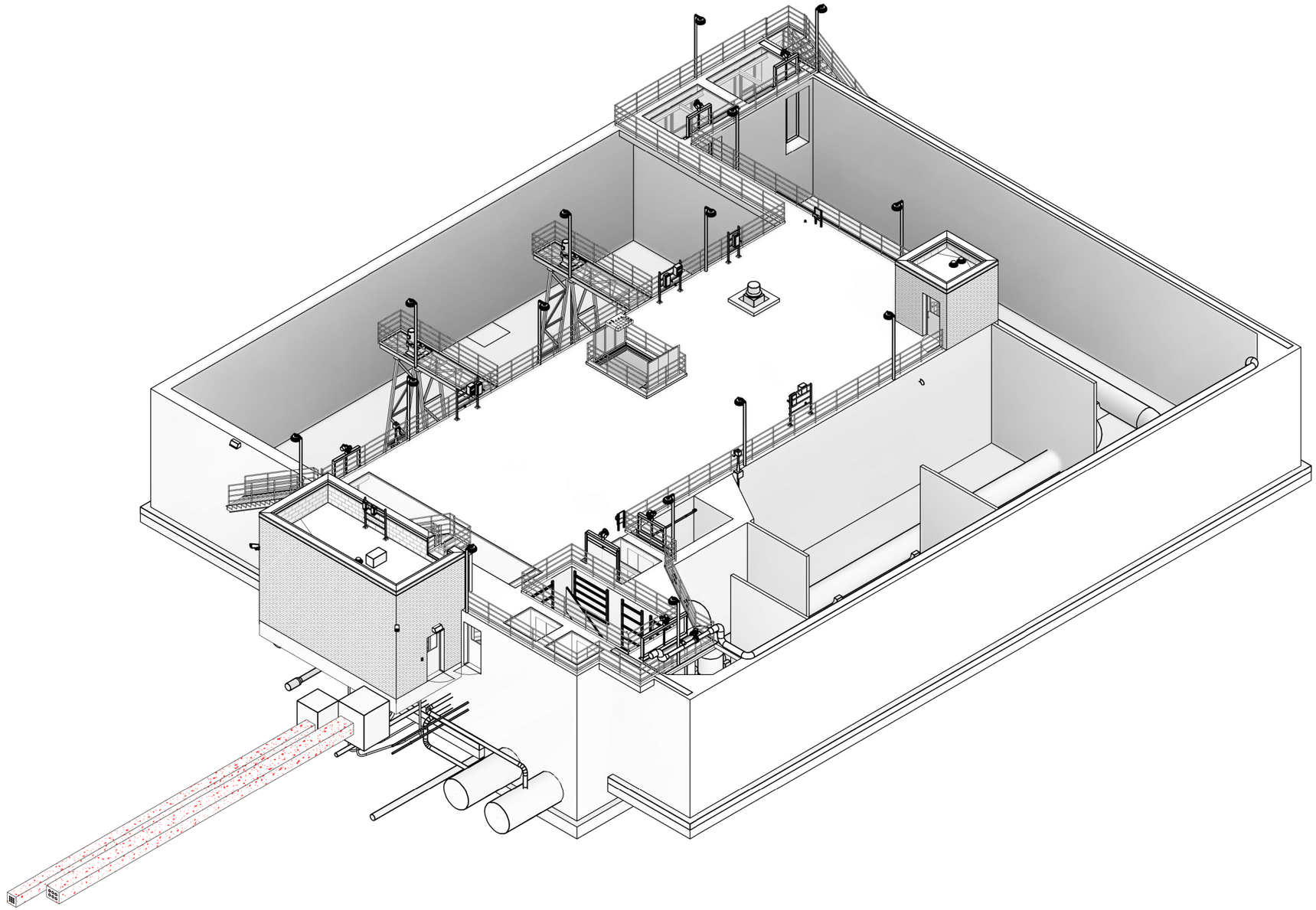


3D VIEW RAS/WAS BASIN

Brown AND Caldwell
6975 Union Park Center
Salt Lake City, UT

90% PRELIMINARY DESIGN

CVWRF

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	B. WATSON
DRAWN:	R. FULK
CHECKED:	Z. MOORE
CHECKED:	
APPROVED:	T. LINDLEY

FILENAME
151600-P-22V18

BC PROJECT NUMBER
151600

CLIENT PROJECT NUMBER
151600

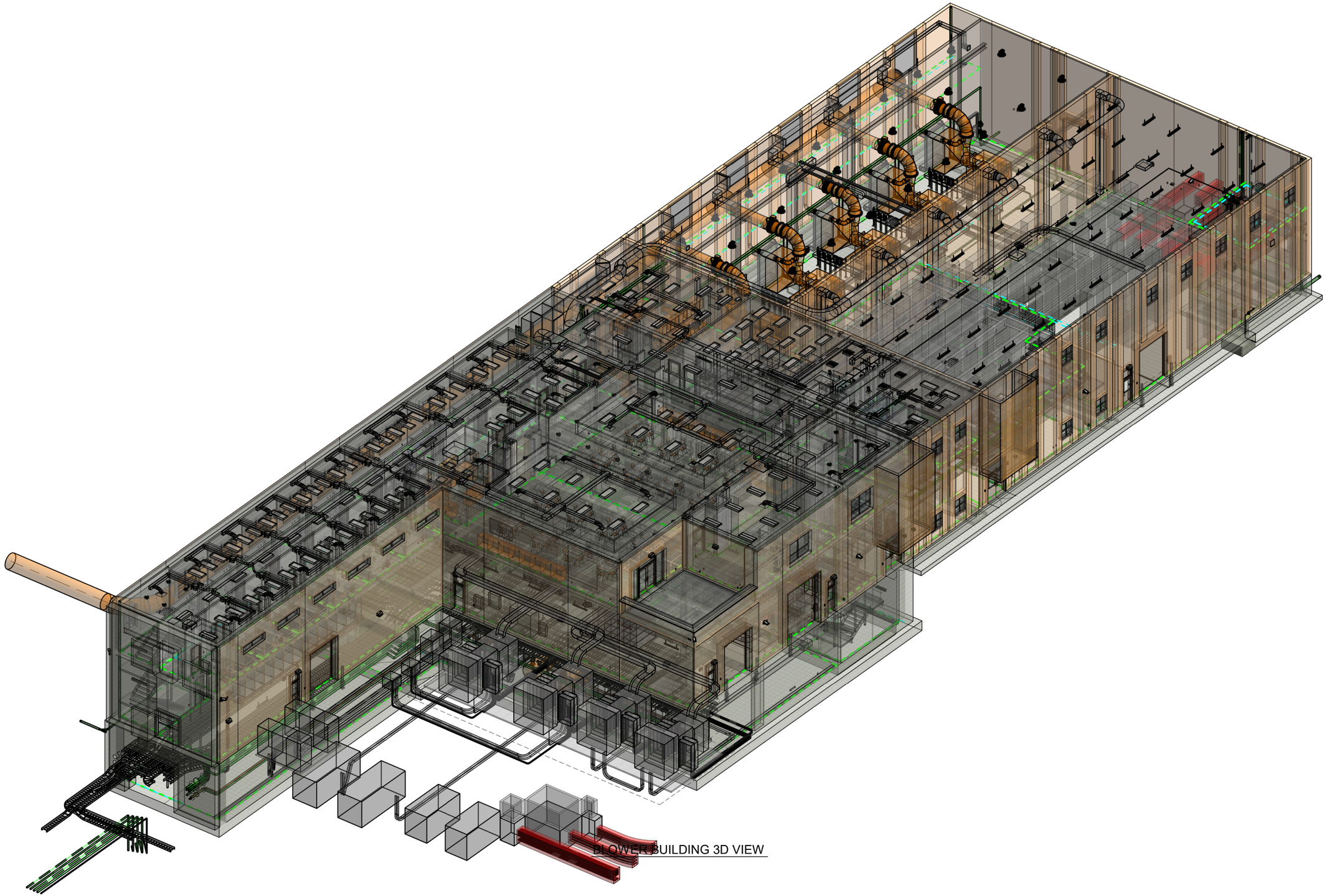
PROCESS

RAS/WAS BASIN 3D VIEW

DRAWING NUMBER
P-22-9001

Path: BIM 360://151600 - CVWRF Nutrients/151600-P-22V18.rvt

Plot Date: 6/24/2019 7:27:28 AM



BLOWER BUILDING 3D VIEW

Brown AND Caldwell

6975 Union Park Center
Salt Lake City, UT

90% PRELIMINARY DESIGN

C V W R F

BIOLOGICAL NUTRIENT REMOVAL PROJECT

REVISIONS

REV	DATE	DESCRIPTION

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	P. ZEMKE
DRAWN:	R. PERSHING
CHECKED:	Z. MOORE
CHECKED:	
APPROVED:	T. LINDLEY

FILENAME
151600-P-34V18

BC PROJECT NUMBER
151600

CLIENT PROJECT NUMBER
151600

PROCESS

BLOWER BUILDING 3D VIEW

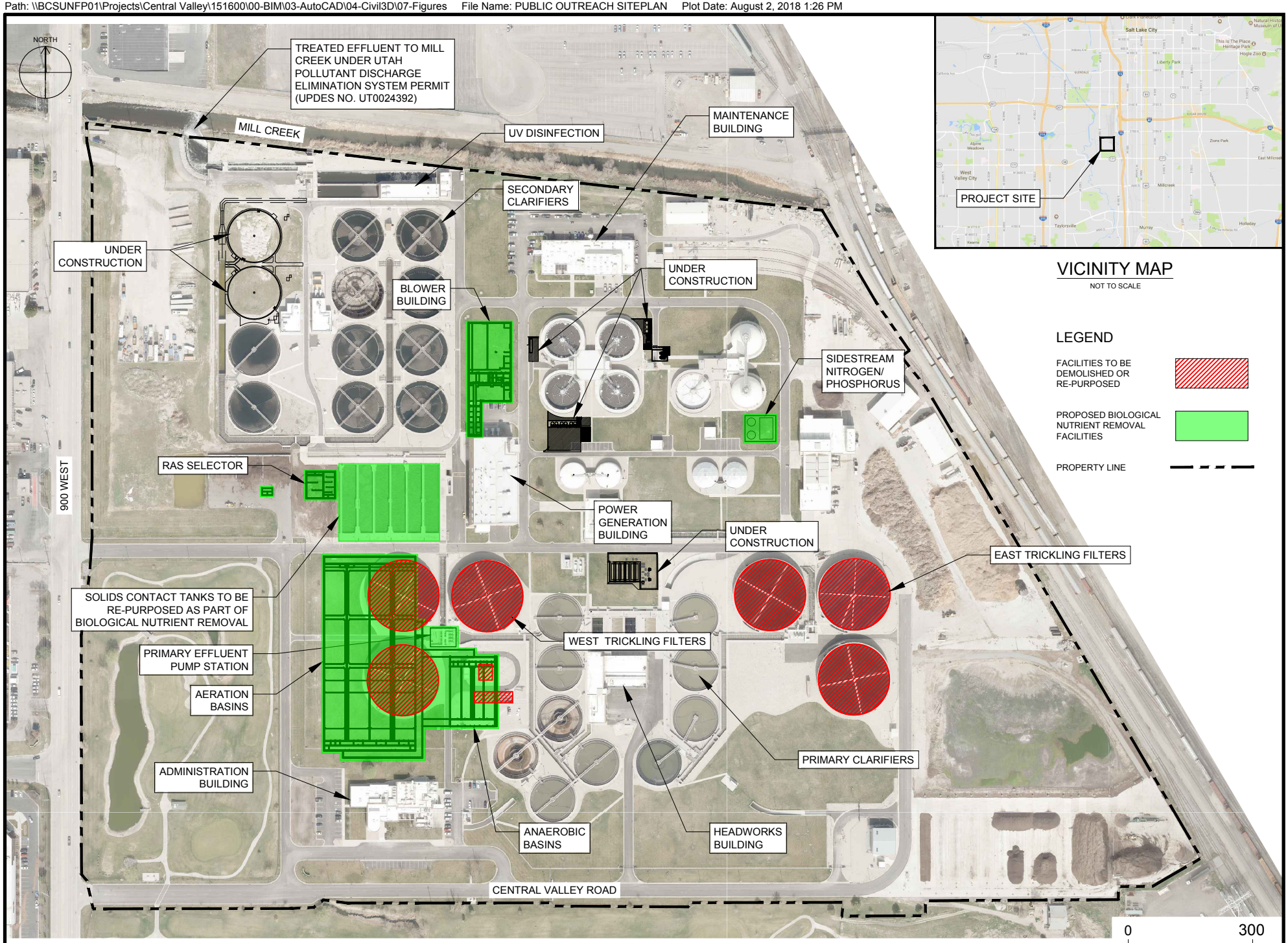
DRAWING NUMBER
P-34-9001

Path: BIM 360://151600 - CVWRF Nutrients/151600-P-34V18.rvt

Plot Date: 7/2/2019 10:57:48 AM

Appendix D - Public Agency Letters

Path: \\BCSUNFP01\Projects\Central Valley\151600\00-BIM\03-AutoCAD\04-Civil3D\07-Figures File Name: PUBLIC OUTREACH SITEPLAN Plot Date: August 2, 2018 1:26 PM



CENTRAL VALLEY WATER RECLAMATION FACILITY - NUTRIENT REMOVAL PROJECT

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

USDA, Soil Conservation Service
125 South State, Room 4402
Salt Lake City, Utah 84138

Dear Mike Domeier & Kent Sutcliffe,

This letter is to inform you that the Central Valley Water Reclamation Facility (CVWRF) proposes upgrades to its existing wastewater treatment facility located at 800 Central Valley Rd, Salt Lake City, UT 84119. These upgrades are necessary to comply with the Utah Division of Water Quality (UDEQ) Technology-based Effluent Phosphorus Limits (TBPEL) Rule that went into effect January 1, 2015. The project will be partially funded by the Utah State Revolving Fund (SRF).

The existing facility has been in operation since the 1980s and treats wastewater from over 550,000 people living within the cities of South Salt Lake and Murray and within the boundaries of the Cottonwood, Granger-Hunter, Kearns, Mt. Olympus, and Taylorsville-Bennion Improvement Districts. The CVWRF discharges treated wastewater to Mill Creek under a UPDES permit from the Utah Division of Water Quality (DWQ). Following discharge to Mill Creek the flow enters the Jordan River and the Great Salt Lake.

Purpose and Need: The upgrades are in response to DWQs newly adopted rules for reducing phosphorus discharges to Utah's lakes and rivers. Phosphorus is a nutrient that encourages plant and algae growth in water. Phosphorus in the wastewater originates from household and industrial sources. The existing treatment process cannot reduce the phosphorus to the level required by the TBPEL Rule. The proposed action includes construction of biological nutrient removal (BNR) facilities to primarily target removal of phosphorus, however, the process will also remove a substantial amount of nitrogen from the wastewater. The proposed upgrades will reduce the phosphorus loading to Mill Creek and the Jordan River by over 60 percent from current level of approximately 530,000 lbs per year to under 150,000 lbs per year based on current average daily flow.

These improvements will be constructed within the boundaries of the existing CVWRF plant site and will occur entirely on previously disturbed land or on land with existing treatment tankage that will be removed, replaced, or repurposed. No new land is being purchased as part of the project. The attached figure shows the location of the proposed action.

Comments: As part of the funding requirements, CVWRF will prepare an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA). **This letter seeks comments from your organization regarding the proposed action.** The EA will be incorporated in a Facility Plan being prepared by CVWRF. Please provide comments within 30 days of receipt of this letter. Direct your comments or questions to:

Phillip Heck, Ph.D., P.E.
Assistant General Manager
Central Valley Water Reclamation Facility
800 West Central Valley Road
Salt Lake City, UT 84119
heckp@cvwrf.org

Please send cc to:
Carl Adams
Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

U.S. Fish and Wildlife Service
2369 W. Orton Circle, Suite 50
West Valley City, Utah 84119

Dear Larry Crist,

This letter is to inform you that the Central Valley Water Reclamation Facility (CVWRF) proposes upgrades to its existing wastewater treatment facility located at 800 Central Valley Rd, Salt Lake City, UT 84119. These upgrades are necessary to comply with the Utah Division of Water Quality (UDEQ) Technology-based Effluent Phosphorus Limits (TBPEL) Rule that went into effect January 1, 2015. The project will be partially funded by the Utah State Revolving Fund (SRF).

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Purpose and Need: The upgrades are in response to DWQs newly adopted rules for reducing phosphorus discharges to Utah's lakes and rivers. Phosphorus is a nutrient that encourages plant and algae growth in water. Phosphorus in the wastewater originates from household and industrial sources. The existing treatment process cannot reduce the phosphorus to the level required by the TBPEL Rule. The proposed action includes construction of biological nutrient removal (BNR) facilities to primarily target removal of phosphorus, however, the process will also remove a substantial amount of nitrogen from the wastewater. The proposed upgrades will reduce the phosphorus loading to Mill Creek and the Jordan River by over 60 percent from current level of approximately 530,000 lbs per year to under 150,000 lbs per year based on current average daily flow.

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Phillip Heck, Ph.D., P.E.
Assistant General Manager
Central Valley Water Reclamation Facility
800 West Central Valley Road
Salt Lake City, UT 84119
heckp@cvwrf.org

Please send cc to:
Carl Adams
Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

U.S. Army Corps of Engineers
533 West 2600 South, Suite 150
Bountiful, Utah 84010

Dear Jason Gipson,

This letter is to inform you that the Central Valley Water Reclamation Facility (CVWRF) proposes upgrades to its existing wastewater treatment facility located at 800 Central Valley Rd, Salt Lake City, UT 84119. These upgrades are necessary to comply with the Utah Division of Water Quality (UDEQ) Technology-based Effluent Phosphorus Limits (TBPEL) Rule that went into effect January 1, 2015. The project will be partially funded by the Utah State Revolving Fund (SRF).

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Please send cc to:
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Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Utah Division of Air Quality
P.O. Box 144820
Salt Lake City, Utah 84114

Dear Joel Karmazyn,

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Please send cc to:
Carl Adams
Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Utah Division of Emergency Services
and Homeland Security
1110 State Office Building
Salt Lake City, Utah 84114

Dear Kathy Holder,

This letter is to inform you that the Central Valley Water Reclamation Facility (CVWRF) proposes upgrades to its existing wastewater treatment facility located at 800 Central Valley Rd, Salt Lake City, UT 84119. These upgrades are necessary to comply with the Utah Division of Water Quality (UDEQ) Technology-based Effluent Phosphorus Limits (TBPEL) Rule that went into effect January 1, 2015. The project will be partially funded by the Utah State Revolving Fund (SRF).

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Central Valley Water Reclamation Facility
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Salt Lake City, UT 84119
heckp@cvwrf.org

Please send cc to:

Carl Adams
Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Utah Wildlife Resources
P.O. Box 146301
Salt Lake City, Utah 84114

Dear Greg Sheehan,

This letter is to inform you that the Central Valley Water Reclamation Facility (CVWRF) proposes upgrades to its existing wastewater treatment facility located at 800 Central Valley Rd, Salt Lake City, UT 84119. These upgrades are necessary to comply with the Utah Division of Water Quality (UDEQ) Technology-based Effluent Phosphorus Limits (TBPEL) Rule that went into effect January 1, 2015. The project will be partially funded by the Utah State Revolving Fund (SRF).

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Please send cc to:
Carl Adams
Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Confederated Tribes of Goshute
HC 61 Box 6104
195 Tribal Center Road
Ibapah, Utah 84034

Dear Rupert Steele,

This letter is to inform you that the Central Valley Water Reclamation Facility (CVWRF) proposes upgrades to its existing wastewater treatment facility located at 800 Central Valley Rd, Salt Lake City, UT 84119. These upgrades are necessary to comply with the Utah Division of Water Quality (UDEQ) Technology-based Effluent Phosphorus Limits (TBPEL) Rule that went into effect January 1, 2015. The project will be partially funded by the Utah State Revolving Fund (SRF).

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Salt Lake City, UT 84119
heckp@cvwrf.org

Please send cc to:
Carl Adams
Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Skull Valley Band of Goshute
407 Skull Valley Road
Skull Valley, Utah 84029

Dear Candace Bear,

This letter is to inform you that the Central Valley Water Reclamation Facility (CVWRF) proposes upgrades to its existing wastewater treatment facility located at 800 Central Valley Rd, Salt Lake City, UT 84119. These upgrades are necessary to comply with the Utah Division of Water Quality (UDEQ) Technology-based Effluent Phosphorus Limits (TBPEL) Rule that went into effect January 1, 2015. The project will be partially funded by the Utah State Revolving Fund (SRF).

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800 West Central Valley Road
Salt Lake City, UT 84119
heckp@cvwrf.org

Please send cc to:
Carl Adams
Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Northwestern Band of Shoshone Nation
707 North Main Street
Brigham City, Utah 84302

Dear Darren Parry,

This letter is to inform you that the Central Valley Water Reclamation Facility (CVWRF) proposes upgrades to its existing wastewater treatment facility located at 800 Central Valley Rd, Salt Lake City, UT 84119. These upgrades are necessary to comply with the Utah Division of Water Quality (UDEQ) Technology-based Effluent Phosphorus Limits (TBPEL) Rule that went into effect January 1, 2015. The project will be partially funded by the Utah State Revolving Fund (SRF).

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Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Ute Indian Tribe of the Uintah
and Ouray Reservation
P.O. Box 190
Fort Duchesne, Utah 84026

Dear Luke Duncan,

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Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
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Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Mountain West Distributors
2889 S 900 W
Salt Lake City, Utah 84119

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Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

E J Bartells
909 W 2900 S
Salt Lake City, Utah 84119

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Please send cc to:
Carl Adams
Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Nugenix
913 W 2900 S, MS 730
Salt Lake City, Utah 84119

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Assistant General Manager
Central Valley Water Reclamation Facility
800 West Central Valley Road
Salt Lake City, UT 84119
heckp@cvwrf.org

Please send cc to:
Carl Adams
Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Excel Cabinets
900 W 2950 S
South Salt Lake, Utah 84119

To Whom It May Concern:

This letter is to inform you that the Central Valley Water Reclamation Facility (CVWRF) proposes upgrades to its existing wastewater treatment facility located at 800 Central Valley Rd, Salt Lake City, UT 84119. These upgrades are necessary to comply with the Utah Division of Water Quality (UDEQ) Technology-based Effluent Phosphorus Limits (TBPEL) Rule that went into effect January 1, 2015. The project will be partially funded by the Utah State Revolving Fund (SRF).

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Utah Division of Water Quality
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carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

NovaShip
913 W 2900 S
South Salt Lake, Utah 84119

To Whom It May Concern:

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Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

International Technifab
945 W 2900 S
West Valley City, Utah 84119

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carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Foundation Building Materials - SPI
945 W 2900 S
West Valley City, Utah 84119

To Whom It May Concern:

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P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

KIB Direct
955 W 2900 S
South Salt Lake, Utah 84119

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Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Blue Sky Pet Supply
940 W 2950 S
Salt Lake City, Utah 84119

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Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

LSI Liquid Sugars Division
988 W 2950 S
Salt Lake City, Utah 84119

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Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Cardinal Health
955 W 3100 S
South Salt Lake, Utah 84119

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Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Rocky Mountain Recycling
3110 S 900 W
Salt Lake City, Utah 84119

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Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Utah Food Bank
3150 S 900 W
South Salt Lake, Utah 84119

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Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Certifit
3170 S 900 W
Salt Lake City, Utah 84119

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Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Interstate Auto Body Parts
925 W 3160 S
South Salt Lake, Utah 84119

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Assistant General Manager
Central Valley Water Reclamation Facility
800 West Central Valley Road
Salt Lake City, UT 84119
heckp@cvwrf.org

Please send cc to:
Carl Adams
Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Ostler International
3170 S 900 W
Salt Lake City, Utah 84119

To Whom It May Concern:

This letter is to inform you that the Central Valley Water Reclamation Facility (CVWRF) proposes upgrades to its existing wastewater treatment facility located at 800 Central Valley Rd, Salt Lake City, UT 84119. These upgrades are necessary to comply with the Utah Division of Water Quality (UDEQ) Technology-based Effluent Phosphorus Limits (TBPEL) Rule that went into effect January 1, 2015. The project will be partially funded by the Utah State Revolving Fund (SRF).

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Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Xerox
977 W 3160 S
Salt Lake City, Utah 84119

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Utah Division of Water Quality
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Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Foundation Building Materials
3225 S 900 W
Salt Lake City, Utah 84119

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Salt Lake City, UT 84119
heckp@cvwrf.org

Please send cc to:
Carl Adams
Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

South Salt Lake Fire Department
3265 S 900 E
South Salt Lake, Utah 84119

To Whom It May Concern:

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heckp@cvwrf.org

Please send cc to:

Carl Adams
Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

AAA Spring Specialist
995 W 2900 S
South Salt Lake, Utah 84119

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Please send cc to:
Carl Adams
Utah Division of Water Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880
carladams@utah.gov

Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Archer Daniel Midland
995 W 2900 S
South Salt Lake, Utah 84119

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Central Valley Water Reclamation Facility - Nutrient Removal Project

August 21, 2018

Royal Wholesale Electric
3100 S 900 W
South Salt Lake, Utah 84119

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Utah Division of Water Quality
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Appendix E – Tailings Closure Memo

Stoller

established 1959

Task Order No. LM-501-02-118
Control Number 08-0171

April 17, 2008

U.S. Department of Energy
Office of Legacy Management
ATTN: Tracy A. Ribeiro
Site Manager
2597 B ¾ Road
Grand Junction, CO 81503

SUBJECT: Contract No. DE-AM01-07LM00060, Stoller
Transmittal of the Final Revised *Long-Term Management Plan for the Salt Lake City, Utah, (UMTRCA Title I) Processing Site*

References: Task Order LM-501-02-118-101, SLC Disposal/Processing Site

Dear Ms. Ribeiro:

Enclosed is the revised final *Long-Term Management Plan for the Salt Lake City, Utah, (UMTRCA Title I) Processing Site* (LTMP). The revised draft LTMP was approved by the previous DOE Site Manager, Mr. Jagdish Malhotra, by correspondence received November 2, 2007.

The LTMP was revised to reflect discontinuance of the best management practice ground water and surface water monitoring program that was conducted in accordance with the LTMP (and the *Ground Water Compliance Action Plan*) from October 1999 through May 2007. The revision also includes an update to the description and requirements of the institutional control (IC) put in place to manage residual radioactive material (RRM) that were left on site under supplemental standards, as per requirements set forth in Title 40 *Code of Federal Regulations* Part 192 (specifically, 40 CFR 192.21 & 192.22).

Final approval to discontinue ground water and surface water monitoring was received from the U.S. Nuclear Regulatory Commission (NRC) by letter date July 9, 2007 (written concurrence by the State of Utah was received June 1, 2007); these letters were incorporated into the revised documents as Attachment A. Regulatory approval to discontinue all monitoring at the site followed review of an evaluation of the monitoring program presented in the *Status Report for the Salt Lake City, Utah, UMTRA Project Processing Site* (March 2005), along with subsequent reporting submitted in 2006 and 2007 (for an additional two years of limited ground water monitoring performed over concerns raised in 2005 by the State of Utah). The remaining four ground water monitoring wells at the site were decommissioned in August 2007.

DOE's only remaining responsibility at the SLC Processing Site is to ensure that the IC put in place to control any future exposure to the RRM left on site under supplemental standards are

being implemented (as described in the *Notice of Residual Radioactive Contamination*, Attachment B in the LTMP). This will be done annually through written correspondence to the current site property owner, the Central Valley Water Reclamation Facility (property ownership was transferred following remediation; DOE does not own any real property at the site). This annual IC awareness correspondence will become part of the site record. Please be aware that the notice was signed by DOE, the State of Utah, and Central Valley Water Reclamation Facility, and is incorporated into the property deed. Also, in accordance with the notice, the property owner is responsible for ensuring that no disturbance of the RRM within the supplemental standards areas occurs on the site, and if concern arises that these supplemental standards areas may be encountered, the property owner is to notify the Utah Division of Radiation Control.

Submittal to NRC for approval is not required for this LTMP, as it is an internal document created for the former processing site – the tailings pile was relocated to the SLC Disposal Site, 90 miles to the west in Clive, Utah (as your aware, NRC requires an LTSP for the disposal site). Please let me know if you have any questions or concerns, or wish to discuss this further.

Sincerely,

Steve Hall

Steve Hall
Site Lead

SCH/hc
Enclosure

cc:
Clay Carpenter
Project File SLP 505.15 (rc-grand.junction)

cc w/ enclosure:
Steve Hall, Stoller
Correspondence Control File (thru Dee Dee Crawford/Christi Weston)

H:\Lila files\Reports by Site\Salt Lake City\SLP_Trans Ltr to DOE_LTMP rev finl_4-17-08.dot

Long-Term Management Plan for the Salt Lake City, Utah, (UMTRCA Title I) Processing Site

September 2007

U.S. Department of Energy

Office of Legacy Management

Work Performed Under DOE Contract No. DE–AC01–02GJ79491
for the U.S. Department of Energy Office of Legacy Management.

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DOE−LM/1541−2007

Office of Legacy Management

Long-Term Management Plan for the Salt Lake City, Utah, (UMTRCA Title I) Processing Site

September 2007

Work Performed by S.M. Stoller Corporation under DOE Contract No. DE−AC01−02GJ79491
for the U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado

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Attachment B—Notice of Residual Radioactive Contamination
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1.0 Introduction

1.1 Purpose

This Long-Term Management Plan (LTMP) conveys how the U.S. Department of Energy (DOE) Office of Legacy Management (LM), as the long-term custodian of the Salt Lake City, Utah, uranium processing site (SLC Processing Site), will implement institutional controls (ICs) put in place to manage residual radioactive material (RRM) that were left on site under supplemental standards as per requirements set forth in Title 40 *Code of Federal Regulations* Part 192 (specifically 40 CFR 192.21 & 192.22). This LTMP also provides historical site information and explains fulfillment, by DOE–LM, of the requirements of 40 CFR 192 regarding ground water compliance.

1.2 Regulatory Requirements

The Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 (42 USC §7901, as amended), provides regulations for the remediation (or reclamation) and long-term care of uranium mill tailings under either Title I or Title II of the act. Title I addresses former uranium mill sites that were unlicensed as of January 1, 1978, and essentially abandoned. Title II addresses uranium-milling sites under specific license as of January 1, 1978. In both cases, the licensing agency was the U.S. Nuclear Regulatory Commission (NRC), or in the case of certain Title II disposal sites, an Agreement State. The SLC Processing Site, formerly the Vitro Chemical Company of America uranium-processing site, was regulated under Title I of UMTRCA. The State of Utah became an Agreement State in 2004 (NRC 2004). Prior to that time NRC regulated all uranium processing activities in the state, including the Vitro site.

Surface remedial action at the Salt Lake City site was conducted from 1984 through 1987 under the UMTRCA. DOE and the State of Utah entered into a cooperative agreement (CA) effective January 30, 1981, to perform remedial action on the site; in 1984 the CA was amended to designate the State of Utah as the party to perform those remedial actions (DOE 1984). The federal government provided the majority (90%) of the funding for the reclamation; the remaining portion (10%) was provided by the State of Utah.

Remedial action consisted of removing most of the radiologically contaminated bulk materials (soil and building debris) to a licensed offsite disposal cell (DOE 1997) in accordance with 40 CFR 192. However, several areas containing RRM were left on site under supplemental standards as per requirements set forth in Title 40 CFR 192 (specifically 40 CFR 192.21 & 192.22). As required under the regulations, these remaining RRM (supplemental standards areas) must meet at least one of the following criteria; 1) only minor quantities exist, 2) do not pose a clear present or future hazard, 3) cost of removal outweighs the resulting benefit in reducing risk, or 4) removal would present a clear and present risk of injury to workers or the public, not withstanding reasonable measures to avoid or reduce risk.

NRC does include the disposal sites containing RRM under a general license, but does not license former UMTRCA processing sites (Statements of Consideration for 10 CFR Part 40, 40-SC-16 – April 30, 1992). NRC requires a Long-Term Surveillance Plan (LTSP) for the disposal sites, as part of the general licensing agreement, but not for former processing sites.

When DOE and the State of Utah relocated the RRM and cleaned up the surface contamination at the former Vitro processing site, ground water protection regulations in 40 CFR 192, Subpart A, which address disposal cell performance, were no longer applicable at the site. However, compliance with ground water protection regulations in 40 CFR 192, Subpart B, which address ground water contamination resulting from historical uranium-processing site operations, is applicable at the site. As promulgated by the U.S. Environmental Protection Agency (EPA), 40 CFR 192, Subpart B includes ground water protection standards, referred to as maximum concentration limits (MCLs), which are the applicable regulatory ground water compliance standards for UMTRCA Title I sites.

A Ground Water Compliance Action Plan (GCAP) was prepared for compliance with Subpart B of 40 CFR Part 192 for the SLC Processing Site that provided monitoring requirements at the site (DOE 2000). The compliance strategy proposed in the GCAP indicated that compliance with Subpart B of 40 CFR 192.21(g) would be achieved through the application of supplemental standards based on limited use ground water (see Section 2.4.2 for additional information regarding the limited use ground water designation). NRC and the State of Utah Department of Environmental Quality Division of Radiation Control (Utah DEQ/DRC) concurred with the GCAP in their letters of June 15, 2000, and June 7, 2000, respectively (NRC 2000; Utah 2000). These monitoring requirements were incorporated into the original site LTMP (DOE 2002). Following nine years of required ground water and surface water monitoring, approval to discontinue all ground water and surface water monitoring was received by NRC and Utah DEQ/DRC (Attachments A). This approval to discontinue all monitoring at the site was incorporated into site LTMP in 2007.

This LTMP is a stand-alone document to guide long-term stewardship activities at the SLC Processing Site. The LTMP incorporates long-term stewardship activities and reporting requirements necessary for the site. Upon approval to discontinue all ground water and surface water at the site, long-term stewardship only consists of ensuring that the IC put in place to manage the remaining RRM at the site under supplemental standards is adhered to and enforced. The Central Valley Water Reclamation Facility (CVWRF) is the current owner of the SLC Processing Site, controlling access to the land, and therefore, the on-site responsibility for implementation of the IC.

1.3 DOE Role

In December 2003, DOE formally established the DOE-LM office. The DOE-LM mission includes "...implementing long-term surveillance and maintenance projects at sites transferred to LM to ensure sustainable protection of human health and the environment."

Previously in 1988, DOE had designated the Grand Junction facility as the program office for managing long-term surveillance and maintenance of DOE disposal sites that contain regulated low-level radioactive materials that no longer had a DOE mission after cleanup, as well as other sites (including Title I and Title II sites) as assigned, and to establish a common office for the security, surveillance, monitoring, and maintenance of those sites.

According to the objectives of DOE Order 450.1, *Environmental Protection Program* (DOE 2005), DOE sites must implement sound stewardship practices protective of the air, water, land and other natural and cultural resources potentially affected by their operations. DOE Order 450.1 required DOE sites to have an environmental management system (EMS) in place

by December 31, 2005, to implement these practices. The DOE-LM EMS, which was formally implemented in October 2005, incorporates federal mandates specified in Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management* (EO 2007).

The LM EMS is a systematic process for reducing the environmental impacts resulting from DOE-LM and contractor work activities, products, and services and directs work to occur in a manner that protects workers, the public, and the environment. The process adheres to "Plan-Do-Check-Act" principles, mandates environmental compliance, and integrates green initiatives into all phases of work, including scoping, planning, construction, subcontracts, and operations. The EMS provides specific procedures that anticipate and mitigate negative impacts to the environment by promoting use of recycled materials; recycling to the extent practicable; conserving fuel, energy, and natural resources; and minimizing the generation of greenhouse gases, use of toxic chemicals, and generation of hazardous wastes.

End of current text

2.0 Final Site Conditions

2.1 Site Description

Located approximately 4 miles south-southwest of downtown Salt Lake City, the SLC Processing Site is situated just north of 3300 South Street and east of 900 West Street (Figure 2−1). Land use in this part of the city is primarily commercial and industrial. Following remediation, the south portion of the site was developed into a nine-hole golf course with a golf driving range; the northwest part of the site is being used for expansion of the CVWRF complex. The region is characterized by very gentle topography in which anthropogenic changes are more apparent than the original topographic features.

Surface remedial action at the Salt Lake City site, conducted from 1984 through 1987, consisted of removal of uranium mill tailings and tailings-contaminated materials. The site soils were remediated to the cleanup standards in 40 CFR 192, except for small discreet areas, referred to as supplemental standards areas, described previously in Section 1.2 and below in Section 2.3. Remediated materials were relocated to the Salt Lake Disposal Site located approximately 85 miles west of Salt Lake City. After surface remediation, the upper 4 to 13 feet (ft) of soil were replaced with clean sandy-gravel fill material.

Ground water beneath the site occurs in two aquifers; a shallow unconfined aquifer and a deeper confined aquifer. Ground water within the shallow aquifer, although initially above regulatory standards, is currently below the MCLs; the deeper aquifer remains unaffected by site-related contamination (see Section 1.2 and Section 2.4).

The lithology underlying the fill placed at the site consists of approximately 700 ft of unconsolidated Quaternary lacustrine and fluvial deposits with minor alluvial overburden.

2.2 Site Ownership and Access

The SLC Processing Site is owned by CVWRF, a wastewater treatment plant for the City of South Salt Lake City that was constructed on the site upon completion of site reclamation and transfer of property ownership. The CVWRF Administration Building is in the center of the site and is accessed from 900 West Street. Should access to the site be needed, the CVWRF needs to be contacted first; the telephone number is (801) 973-9100, the address is 800 West Central Valley Road, Salt Lake City, Utah 84119. Mr. Reed Fisher is the current manager of the CVWRF.

2.3 Soil Contamination

2.3.1 Radium-226 Contamination

During remediation of the former Vitro processing site several small pockets of contaminated soil exceeding the radium-226 standard were left within a portion of the street right-of-way along the southwest edge of the property. The estimated volume of this contamination is approximately 150 cubic meters (m^3), and the average activity of the material is 30 picocuries per gram (pCi/g). Supplemental standards were applied due to the risk of damaging a gas line and a large-diameter concrete storm drain, and the risk of collapsing the road surface (see Section 1.2 for regulatory

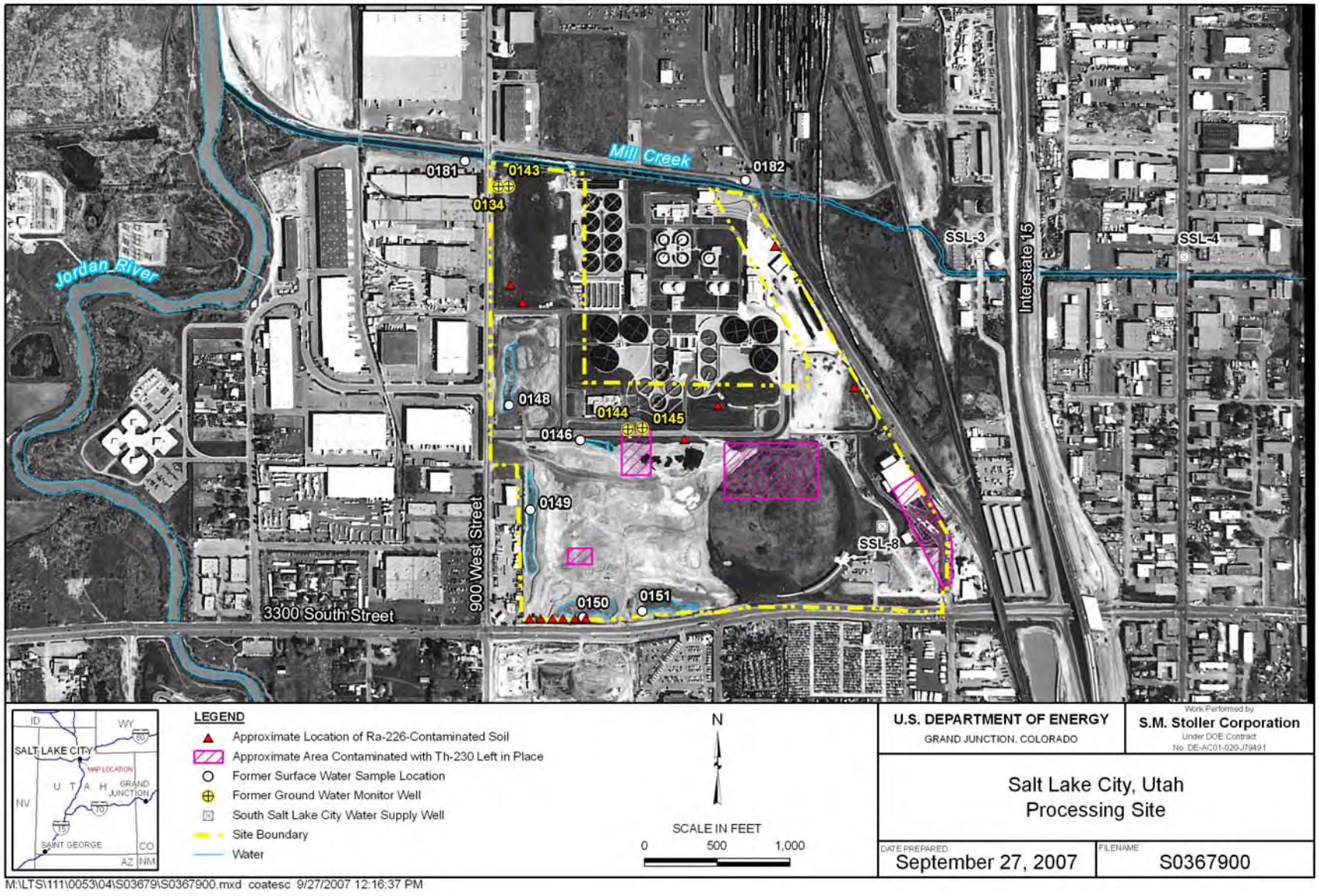

Figure 2–1. Supplemental Standards Areas and Former Monitor Wells and Surface Water Sampling Locations, Salt Lake City, Utah, Processing Site

requirements for using supplemental standards). The small pockets of contaminated soil will not adversely impact the safety of the public and the environment (DOE 1997). The location of this contamination is shown on Figure 2−1 (and on Exhibit 2 of Attachment B).

The remainder of the remediated area was divided into 100-m^2 verification areas that were scanned for gamma activity and sampled for analysis of radiological constituents. Backfill of the remediated area occurred following successful radium-226 concentrations determined by the opposed crystal system field analysis procedure. Subsequent laboratory analyses for these soil samples, conducted after the excavation was backfilled, indicated six verification grids with elevated radium-226 concentrations ranging up to 42 pCi/g (Figure 2−1 and Exhibit 2 of Attachment B). An analysis of radon flux from the grid with the highest radium-226 concentration indicated that the radon working level in a hypothetical structure constructed over the grid would be within regulatory limits. Therefore, the elevated grids were not considered to be health hazards and the contamination was left in place (DOE 1997).

Nevertheless, in order to ensure public safety, a *Notice of Residual Radioactive Contamination* was signed by DOE, Utah DEQ/DRC, and the current property owner (CVWRF) (Attachment B). Basically, this notice stipulates the property owner ensures that all construction planned does not occur in the contaminated areas (see Section 3.3 for additional detail).

2.3.2 Thorium-230 Contamination

Analytical results of soil samples collected from the remediated area, that were received after the excavations had been backfilled, indicated that 14 verification area samples, grouped into four areas of the former excavation bottom, had thorium-230 concentrations in excess of the regulatory limit. The decision to backfill the remediated area was based on field measurements.

The estimated total volume of thorium-contaminated soil is 1,480 m^3, and the average thorium-230 concentration is 234 pCi/g. Further remediation was determined to be unnecessary because the contaminated soil poses no unacceptable human health or environmental risk. NRC and the State of Utah concurred in applying supplemental standards to these areas based on the health risk assessment (DOE 1997). The locations of these areas of elevated thorium-230 are shown on Figure 2−1 (and Exhibit 2 of Attachment B).

Nevertheless, as in the case of the elevated radium-226 in soil discussed above in Section 2.3.1, in order to ensure public safety, a *Notice of Residual Radioactive Contamination* was signed by DOE, Utah DEQ/DRC, and the current property owner (CVWRF) (Attachment B). This notice stipulates the property owner ensures that all planned construction does not occur in the contaminated areas (see Section 3.3 for additional detail).

2.4 Ground Water Conditions

2.4.1 Hydrology and Water Quality

Ground water occurs in a shallow unconfined system (uppermost aquifer) and a deeper confined system (DOE 2000). The shallow unconfined aquifer extends down to approximately 50 ft, with static water levels at 5 to 10 ft below ground level. The deeper confined aquifer begins approximately 70 ft below the ground surface and ground water is under artesian pressure. The

two aquifers are separated by approximately 20 ft of interbedded layers of low-permeability clays and silts. The vertical hydraulic gradient between the two aquifers is upward toward the shallow aquifer, as indicated by the artesian conditions (flowing ground water) that exists in the two former wells in the deep confined aquifer. This is compared to the water table that occurs at approximately 10 ft below the surface in the two adjacent former wells in the shallow unconfined aquifer. Ground water in the shallow unconfined aquifer flows predominantly to the west-northwest and discharges to Mill Creek and the Jordan River. The ground water flow system beneath the site is periodically affected by CVWRF pumping activities and by the storm drain lift station near the southeast corner of the site.

Ground water from the shallow aquifer is expressed in four shallow ponds located on the golf course that was constructed on the southern portion of the site following remediation. The pond water, which is used only for irrigating the golf course, contains detectable levels of uranium and molybdenum; however, concentrations from 2001 through 2004 were well below the MCLs of 0.044 and 0.1 milligrams per liter (mg/L), respectively. Health risk assessment calculations (Attachment C) indicated that there is no unacceptable risk from incidental exposure to the pond water (DOE 2000).

Historical investigations had shown that processing of radioactive materials at the former Vitro processing site had contaminated ground water in the uppermost aquifer. The designated constituents of potential concern (COPC) and their MCL are: molybdenum (0.10 milligrams per liter [mg/L]) and uranium (0.044 mg/L) (DOE 2000). Concentrations of arsenic also exceed the MCL (0.05 mg/L) in ground water in background and crossgradient monitor wells, but are not related to activities at the former processing site (DOE 2000).

2.4.2 Ground Water Compliance Strategy

The compliance strategy to meet the EPA ground water protection standards is no remediation and application of supplemental standards based on limited use ground water (40 CFR 192.21(g)) (DOE 2000). Ground water in the shallow unconfined aquifer is of limited use because of the widespread occurrence of arsenic that is not related to former processing activities. Sources of arsenic in ground water include leaching from landfills, and from tailings and slag heaps associated with abandoned smelters in the valley that processed lead, copper, silver, and gold. Background arsenic concentrations in ground water range up to 0.173 mg/L (DOE 2000).

Compliant with 40 CFR 192.21(g), ground water in the shallow aquifer is not a current or potential source of drinking water due to widespread ambient arsenic contamination, unrelated to the site, which cannot be cleaned up using treatment methods reasonably employed in public water supply systems. Sources of potable water are readily available from municipal water supply systems in the vicinity of the site. Future use of ground water from the shallow aquifer is unlikely based on historical trends and the rapid expansion of commercial and industrial facilities in the area; therefore, there is no beneficial use that will be affected with the application of supplemental standards. In accordance with the GCAP, supplemental standards were applied to the contaminated ground water in the shallow aquifer; NRC approval and Utah DEQ/DRC concurrence to the application of supplemental standards were received (NRC 2000; Utah 2000).

2.4.3 Historical Compliance Monitoring

Ground water and surface water monitoring at the SLC Processing Site was performed at the four remaining monitor wells (now abandoned) and at seven surface locations on an annual basis as a best management practice (Table 2−1 and Figure 2−1). This monitoring was conducted for the minimum period of 5 years in accordance with the GCAP and LTMP (DOE 2000; DOE 2002); through 2004 for surface water and through 2007 for ground water. In accordance with the GCAP and LTMP, the criteria for terminating monitoring was: 1) no significant reversal of the hydraulic gradient, 2) a decrease in COPC concentrations in ground water as anticipated, and 3) no unacceptable risks related to pumping of ground water by CVWRF or the storm drain sump. The GCAP and LTMP required DOE to receive NRC approval prior to the termination of monitoring.

The primary concern Utah DEQ/DRC had was the possible migration of contaminated ground water in the shallow unconfined aquifer downward into the deeper confined aquifer if the upward vertical hydraulic gradient within the deeper aquifer were to reverse. Therefore, monitoring of ground water levels was performed in two wells completed in the shallow unconfined aquifer (monitor wells MW–134 and MW–144) and two wells completed in the deeper confined aquifer (monitor wells MW–143 and MW–145) at two locations, one onsite and one downgradient (Figure 2−1).

DOE also monitored ground water quality annually in the two wells in the shallow unconfined aquifer (monitor well MW–134 downgradient and MW–144 onsite) to ensure that concentrations of designated COPCs (molybdenum and uranium) continue to decrease (Figure 2−1) (Table 2−1). If there had been an indication that the vertical hydraulic gradient was reversing within the deeper aquifer, ground water in the deeper confined aquifer would have been sampled and analyzed to ascertain that no site-related constituents were migrating into the deeper aquifer.

The NRC was primarily concerned with potential creation of an exposure pathway for contaminated ground water within the shallow aquifer through CVWRF pumping activities or from the storm drain sump southeast of the site. Ground water that is periodically pumped from two dewatering wells by CVWRF for construction and maintenance purposes is run through a treatment plant and then discharged into Mill Creek directly north of the site. Although treatment does not include the removal of metals, the low concentrations of COPCs in ground water and the subsequent dilution during the process preclude any unacceptable risk at the discharge point in Mill Creek. Ground water that enters the storm drain sump is pumped mostly through an underground pipe system, which ultimately discharges to Mill Creek. Historically, there had been a 150-ft section of this discharge pipe system open to the surface just south of the CVWRF Administration Building.

To ensure that these potential exposure pathways of contaminated ground water did not pose a risk to human health and the environment, DOE monitored surface water annually at the west end of the open ditch onsite (location SW–146), and Mill Creek upstream (location SW–181) and downstream (location SW–182) of the site (Figure 2−1) (Table 2−1). DOE also collected samples from the ponds on the golf course that intermittently contained ground water (locations SW–148, SW–149, SW–150, and SW–151) (Figure 2−1). These samples were analyzed for the designated COPCs (molybdenum and uranium).

Table 2–1. Ground Water and Surface Water Monitoring Locations, Salt Lake City, Utah, Processing Site

Well/SW Number	Location	Interval [a]	Analytes	Water Level [b]	Frequency
MW–134	Downgradient monitor well	Shallow	U and Mo	Datalogger	Annual
MW–143	Downgradient monitor well	Deep	[c]	Manual	[d]
MW–144	Onsite monitor well	Shallow	U and Mo	Datalogger	Annual
MW–145	Onsite monitor well	Deep	[c]	Manual	[d]
SW–146	Open ditch onsite	Surface	U and Mo	N/A	Annual
SW–148	Pond west of CVWRF	Surface	U and Mo	N/A	Annual
SW–149	Pond southwest of CVWRF	Surface	U and Mo	N/A	Annual
SW–150	Pond southwest of CVWRF	Surface	U and Mo	N/A	Annual
SW–151	Pond south of CVWRF	Surface	U and Mo	N/A	Annual
SW–181	Mill Creek – upstream	Surface	U and Mo	N/A	Annual
SW–182	Mill Creek – downstream	Surface	U and Mo	N/A	Annual

[a] Shallow unconfined aquifer and deep confined aquifer.
[b] Dataloggers in shallow wells recorded ground water level measurements every 4 hours continuously and were downloaded annually—deeper wells were observed visually (and water level measured, as applicable) at the time of annual sampling.
[c] Samples were analyzed for same constituents if sampled (if vertical hydraulic gradient reversed).
[d] Wells in deep aquifer will be sampled only if vertical hydraulic gradient reverses.

Results for historical ground water and surface water monitoring performed in accordance with the GCAP and LTMP are presented below in Section 2.4.4.

In accordance with the GCAP and LTMP, at the end of the required 5-year monitoring period (through 2004) an evaluation was made to determine the need for future monitoring at the site and submitted to NRC for approval and the Utah DEQ/DRC for concurrence (DOE 2004). The evaluation concluded that the criteria specified in the GCAP and LTMP had been satisfied, and in addition, that both COPCs were below their respective MCLs at all ground water and surface water monitoring locations, and therefore, a recommendation to discontinue all monitoring was made.

Upon review of DOE's 5-year monitoring evaluation (DOE 2004), NRC approval to discontinue all surface water monitoring at the site was received by letter dated December 15, 2005, with concurrence from the Utah DEQ/DRC by letter dated November 9, 2005. However, due to concerns raised by the Utah DEQ/DRC over the trend in concentrations of molybdenum in monitor well MW–144 and the possibility of a reversal in the upward hydraulic gradient in the deeper aquifer, an additional 2 years of ground water monitoring was conducted per NRC direction. This 2 years of limited ground water monitoring consisted of sampling and analysis for molybdenum in monitor well MW–144 and continued measurement of ground water levels in both the shallow aquifer (from monitor wells MW–134 and MW–144) and the deeper aquifer (from monitor wells MW–143 and MW–145) (Figure 2−1).

Upon completion of the required additional 2 years of limited ground water monitoring, DOE presented the results NRC and Utah DEQ/DRC with a recommendation to discontinue the remaining ground water monitoring at the site since the criteria had been satisfied and the COPCs continued to remain below their respective MCLs. Approval to discontinue all ground water monitoring at the site was received from the NRC by letter dated July 9, 2007, with concurrence from the Utah DEQ/DRC by correspondence dated June 1, 2007 (Attachment A).

The four remaining ground water monitoring wells at the site were decommissioned in July 2007.

2.4.4 Historical Compliance Monitoring Results

The results of the historical ground water and surface monitoring described above in Section 2.4.3 are provided below in Figures 2−2 through 2−6.

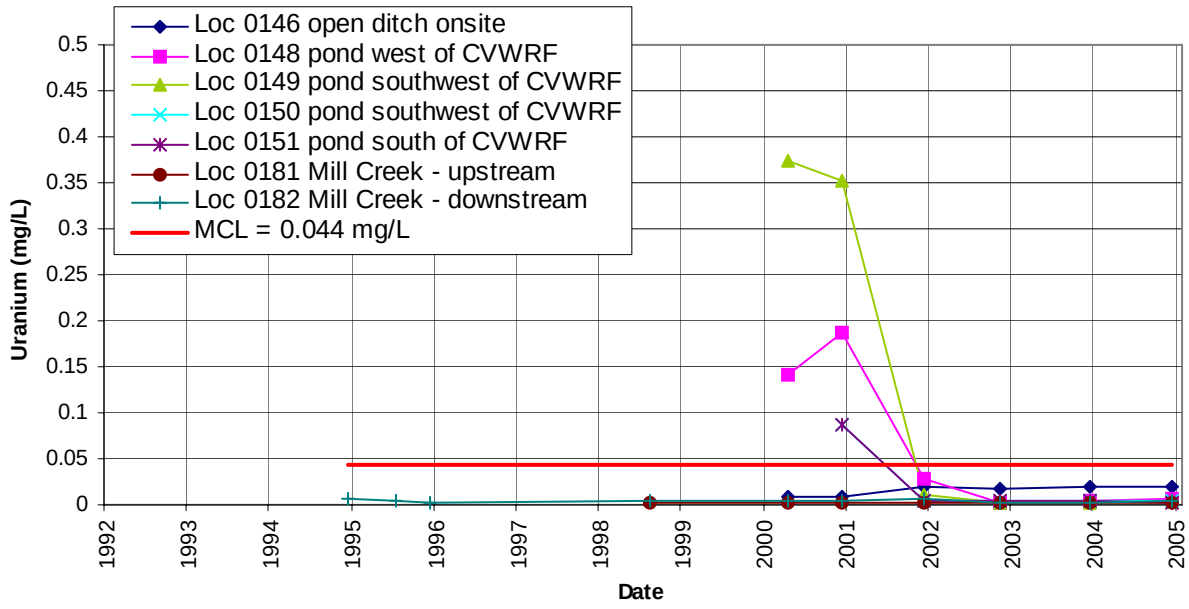

Figure 2–2. Surface Water Uranium Concentrations at the Salt Lake City Processing Site

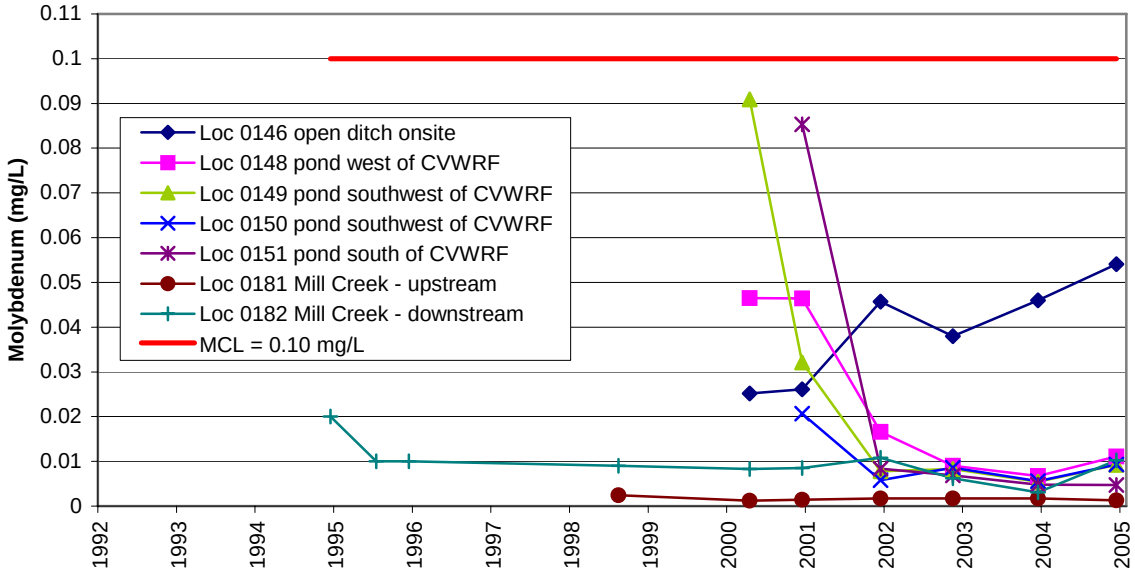

Figure 2–3. Surface Water Molybdenum Concentrations at the Salt Lake City Processing Site

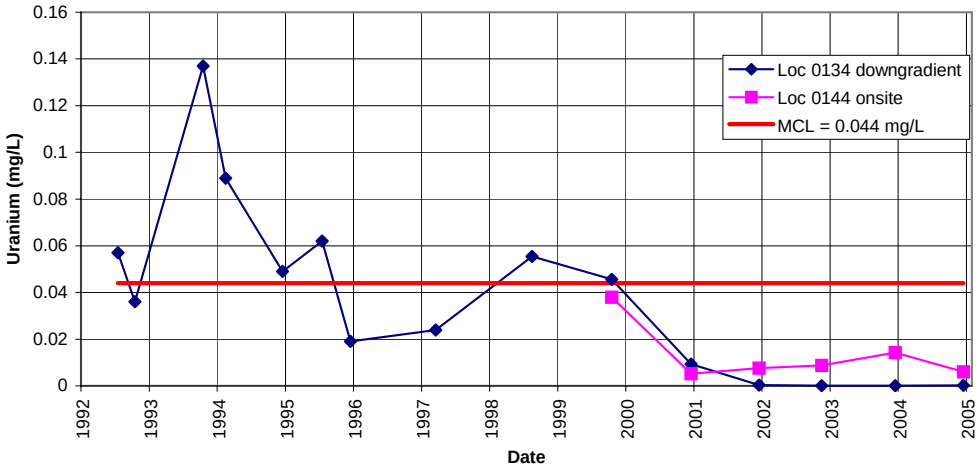

Figure 2–4. Shallow Aquifer Uranium Concentrations at the Salt Lake City Processing Site

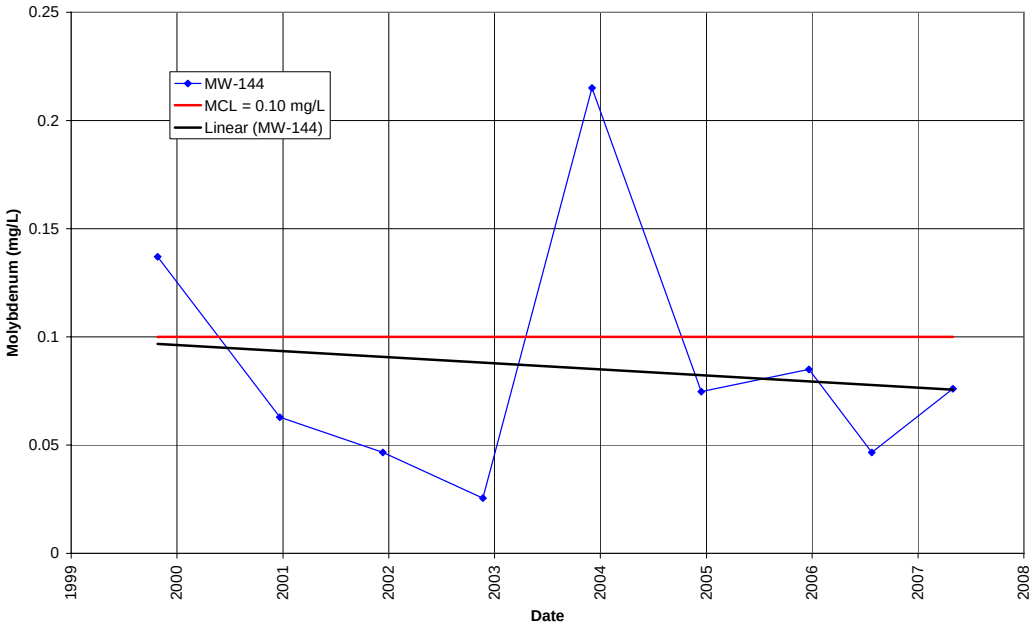

Figure 2–5. Shallow Aquifer Molybdenum Concentrations at the Salt Lake City Processing Site

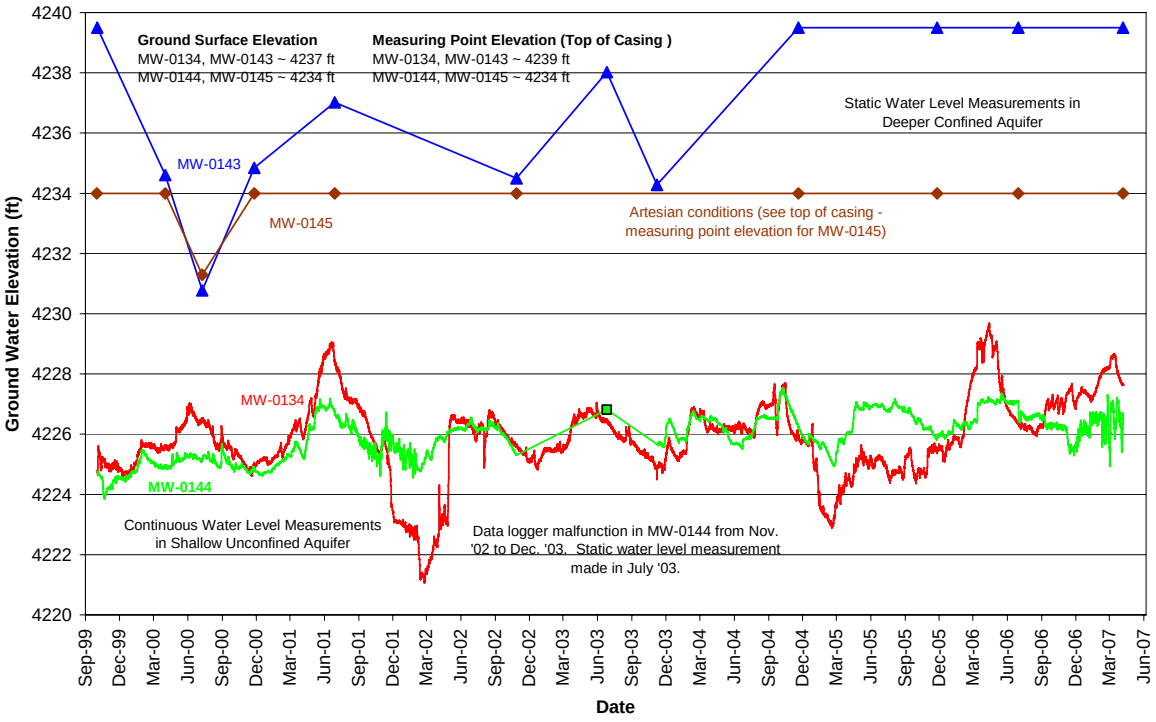

Figure 2–6. Ground Water Level Measurements at the Salt Lake City Processing Site

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3.0 Long-Term Management Program

3.1 Site Inspections

Site inspections of the SLC Processing Site are not required as all the former Vitro uranium-processing site RRM was relocated to the SLC Disposal Site in Clive, Utah (approximately 85 miles west of the former processing site), with the exception of those within the supplemental standards areas (Section 2.3 and 3.3), and ownership of the property was transferred to the CVWRF (Section 2.2). DOE no longer owns any real property at the SLC Processing Site.

3.2 Monitoring

Ground water and surface water monitoring is no longer required at the SLC Processing Site (see Section 1.2 and 2.4, particularly Section 2.4.3 and Section 2.4.4).

3.3 Institutional Controls

RRM were left on site under supplemental standards as per requirements set forth in 40 CFR 192 (specifically 40 CFR 192.21 & 192.22) as discussed in Sections 1.2 and 2.3. Assessment of site conditions and consideration of potential impacts on environmental resources indicate that supplemental standards will be protective of human health and the environment (DOE 1997, DOE 2000). Since the former processing site is owned by CVWRF, access to the land, and locations of remaining contaminated soil is controlled (supplemental standards areas, Figure 2−1).

After remediation of the site, a *Notice of Residual Radioactive Contamination* (notice) was developed and signed by DOE, the Utah DEQ/DRC, and CVWRF (Attachment B). This notice serves as an IC that supports land-use restrictions to prohibit any construction in contaminated areas and is incorporated into the property deed. The property owner is responsible for ensuring that no disturbance of the RRM within the supplemental standards areas occurs. The notice also states that if a concern arises that these supplemental standards areas may be encountered, the property owner is to notify the Utah DEQ/DRC prior to any construction activities in order to conduct radiological surveys, as deemed appropriate. The notice continues to state that if radioactive materials are encountered during construction that the materials may be disposed as radioactive waste at an appropriate waste facility or buried back into the deepest part of the excavation. The notice does indicate, regardless of the results of the radiological surveys, if a habitable structure is being built in an area of concern, that the installation of a passive sub-slab radon ventilation system is to be considered.

DOE–LM will ensure annually that the property owner is aware of the supplemental standards areas, and that the requirements of the IC (notice) are understood. This will be performed through written correspondence, which will includes a copy of the notice and a map showing the location of the RRM remaining on site under supplemental standards. This written correspondence and it's written reply will become part of the site record.

This IC will be enforced as long as necessary to prevent exposure to the remaining contaminated soil.

3.4 Quality Assurance and Health and Safety

The long-term care of the SLC Processing Site and all activities related to the annual awareness of IC at the site will comply with DOE Order 5700.6C, "Quality Assurance" and ANSI/ASQC E4-1994, *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs* (American Society for Quality Control 1994).

Health and safety procedures for long-term management of the SLC Processing Site are consistent with DOE orders, regulations, codes, and standards.

4.0 References

Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, January 24, 2007.

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NRC (U.S. Nuclear Regulatory Commission), 2004. Letter from NRC Chairman Nils J. Diaz to Governor Olene S. Walker, transmitting formal copies the amendment to Utah's Agreement that transfers regulatory authority over 11e.(2) byproduct material from the NRC to Utah, August 10.

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Attachment A

NRC Approvals and Utah DEQ/DRC Concurrence to Discontinue Ground Water and Surface Water Monitoring at the SLC Processing Site

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State of Utah

Department of
Environmental Quality

Dianne R. Nielson, Ph.D.
Executive Director

DIVISION OF RADIATION
CONTROL
Dane L. Finerfrock
Director

JON M. HUNTSMAN, JR.
Governor

GARY HERBERT
Lieutenant Governor

November 9, 2005

Mr. Tom Pauling
Site Manager
2597 B ¾ Road
Grand Junction, CO. 81503

SUBJECT: Salt Lake City, Utah, UMTRA Project Processing Site.

Dear Mr. Pauling:

The Utah Division of Radiation Control (DRC) has reviewed the 2004 Annual Status Report for the Salt Lake City, Utah, UMTRA Project Processing Site report (Report). This Report presents the results of the 5-year monitoring program as required in the Ground Water Compliance Action Plan (GCAP) for the Salt Lake City, Utah, UMTRA Project Site, May 2000. The Report recommends to discontinue all monitoring at the site because the 5 year monitoring results have demonstrated the following criteria for discontinuing the monitoring at the site have been meet:

1. No reversal of the ground water hydraulic gradient;
2. A decrease in uranium and molybdenum concentrations in the ground water; and
3. No unacceptable risks related to pumping of ground water by the Central Valley Water Reclamation Facility (CVWRF).

The DRC review found that molybdenum concentrations in the December 2004 sampling event at monitor well 0144 exceeded the ad hoc Utah Ground Water Quality Standard (GWQS) of 0.040 mg/L at a concentration of 0.075 mg/L. In addition, molybdenum concentration in the December 2003 sampling event at monitor well 0144 also had exceeded the ad hoc Utah GWQS at 0.215 mg/L. Therefore, because molybdenum concentrations in monitor well 0144 have exceeded the Utah ad hoc GWQS in consecutive sampling events (2003 and 2004 sampling events), ground water monitoring at this well should continue. In addition, to demonstrate that an upward gradient still exits in the lower confined aquifer, preventing contaminated groundwater in the shallow aquifer from migrating to the lower confined aquifer, groundwater head monitoring in monitor wells 0134, 0143, 0144, and 0145 should also continue. This monitoring should continue until molybdenum concentrations are below the Utah GWQS, and the DRC is convinced that the contaminant concentrations will not rebound.

If you have any questions regarding this letter, please call Dean Henderson at 536-0046. Thank you for your cooperation.

Sincerely,

Dane L. Finerfrock, Director

DLF/DH:dh

CC: Rob Herbert, DWQ
Paul Michalak

F:/Henderson/DOE/DOE SLC sampling.doc
File:DOE Salt Lake City

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 15, 2005

Mr. Thomas Pauling
U.S. Department of Energy
Office of Legacy Management
2597 B 3/4 Road
Grand Junction, CO 81503

SUBJECT: 2004 ANNUAL STATUS REPORT FOR THE SALT LAKE CITY, UTAH, UMTRCA PROCESSING SITE

Dear Mr. Pauling:

The U.S Department of Energy (DOE) submitted a 2004 Annual Status Report for the Salt Lake City, Utah, UMTRCA Processing Site (the site) on March 24 2005. Based on five years of monitoring, the DOE proposed discontinuing monitoring at the site based on the following criteria: 1) no reversal of the ground water hydraulic gradient; 2) a decrease in the uranium and molybdenum concentrations in the ground water as anticipated; and 3) no unacceptable risks related to pumping of ground water by the Central Valley Water Reclamation Facility (CVWRF), the current property owner, or the storm drain sump.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the above information, and conferred with both DOE and Utah Department of Environmental Protection (DEP) on this matter. The staff's Technical Evaluation Report has been enclosed for your information. The staff has determined the second criteria (i.e., decrease in molybdenum concentrations in the surficial aquifer) has not been met. Consequently, current sampling and monitoring at the site should be amended to the following:

1) Annual monitoring for molybdenum in well 0144 should continue for at least two years, with termination of monitoring contingent on the following:

   a) Molybdenum data set for monitor well 0144 exhibiting a decreasing trend (e.g., linear regression analysis resulting in a negative slope), or

   b) Data remaining below the 0.1 mg/L 40 CFR 192 UMTRCA Title I standard for molybdenum.

2) While molybdenum sampling is ongoing, annual surficial and deep aquifers water level measurements (i.e., monitor wells 0134, 0143, 0144 and 0145) to assess vertical gradients should continue.

3) Following the second year of sampling, information pertaining to all three original criteria (i.e., the complete molybdenum data set for monitor well 0144, measurements of the vertical gradient, and discussion of risks related to pumping of ground water by the Central Valley Water Reclamation Facility (CVWRF), the current property owner, or the storm

drain sump) should be submitted to the NRC and Utah DEP.

4) If in the next two years, conditions influencing Criteria 1 (vertical gradients) or Criteria 3 (risks related to pumping of ground water by CVWRF or the storm drain sump) significantly change, termination of monitoring at the site will need to be reconsidered

If you have any questions concerning this matter, please contact the NRC Project Manager, Mr. Paul Michalak, at 301-415-7612 or by e-mail at pxm2@nrc.gov .

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the NRC's Agencywide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

Sincerely,

/RA/

Gary S. Janosko, Chief
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Enclosure: Technical Evaluation Report

cc: Dean Henderson, State of Utah, DRC

TECHNICAL EVALUATION REPORT
TERMINATION OF MONITORING AT THE SALT LAKE CITY UMTRCA TITLE I PROCESSING SITE

DATE: December 6, 2005

TECHNICAL REVIEWER: Paul Michalak

SUMMARY AND CONCLUSIONS:

In March 2005, following five years of monitoring, the U.S. Department of Energy's (DOE) Office of Legacy Management proposed discontinuing monitoring at the Salt Lake City Processing Site (the site) based on the following criteria: 1) no reversal of the ground water hydraulic gradient; 2) a decrease in the uranium and molybdenum concentrations in the ground water as anticipated; and 3) no unacceptable risks related to pumping of ground water by the Central Valley Water Reclamation Facility (CVWRF), the current property owner, or the storm drain sump (DOE 2005).

The U.S. Nuclear Regulatory Commission (NRC) does not believe the second criteria has been met. The current data set for molybdenum in the surficial aquifer (specifically monitor well 0144) does not conclusively show a decreasing trend in molybdenum concentrations. Current sampling and monitoring at the site should be amended to the following:

1) Annual monitoring for molybdenum in well 0144 should continue for at least two years, with termination of monitoring contingent on the following:

   a) Molybdenum data set for monitor well 0144 exhibiting a decreasing trend (e.g., linear regression analysis resulting in a negative slope), or

   b) Data remaining below the 0.1 mg/L 40 CFR 192 UMTRCA Title I standard for molybdenum.

2) While molybdenum sampling is ongoing, annual surficial and deep aquifers water level measurements (i.e., monitor wells 0134, 0143, 0144 and 0145) to assess vertical gradients should continue.

3) Following the second year of sampling, information pertaining to all three original criteria (i.e., the complete molybdenum data set for monitor well 0144, measurements of the vertical gradient, and discussion of risks related to pumping of ground water by the Central Valley Water Reclamation Facility (CVWRF), the current property owner, or the storm drain sump) should be submitted to the NRC and Utah DEP.

4) If in the next two years, conditions influencing Criteria 1 (vertical gradients) or Criteria 3 (risks related to pumping of ground water by CVWRF or the storm drain sump) significantly change, termination of monitoring at the site will need to be reconsidered.

BACKGROUND:

The Site began operations in 1941, starting as a large smelter operation. In 1951, the plant began processing uranium ore. Operations were terminated and the plant dismantled in 1970. Between 1985 and 1987, the DOE removed 2,798,000 cubic yards of tailings from the site, essentially eliminating the source of ground water contamination. Soils contaminated with residual radioactive materials were left in place at several locations in the original property. Institutional controls governing soil excavation and construction of structures in areas of contaminated soil were established jointly by DOE, Utah Division of Radiation Control (UT-DRC), and the Central Valley Water Reclamation Facility (CVWRF), the current owners of the property.

Subsequently, DOE proposed a compliance strategy through the application of Supplemental Standards (40 CFR 192.21(g)) based on limited use ground water. Widespread ambient arsenic contamination in the shallow aquifer, not associated with activities at the site, precluded its use as a domestic drinking water source. Background well concentrations for arsenic range from 0.063 to 0.132 mg/L. In DOE's Groundwater Compliance Action Plan (GCAP) for the Salt Lake City, Utah UMTRCA Project Site (DOE 2000), three criteria were indicated for terminating monitoring:

- No significant reversal of the hydraulic gradient
- A decease in contaminants of potential concern (COPC) concentrations in ground water, and
- No unacceptable risks related to pumping of ground water by CVWRF or the storm water drain sump.

On June 15, 2000, the NRC concurred with DOE's compliance strategy and approved their GCAP (NRC 2000). The State of Utah also concurred with DOE's GCAP on June 7, 2000 (UDEQ 2000). Following approval, DOE instituted the following annual ground and surface water monitoring program: ground water quality sampling (uranium and molybdenum were identified as the contaminants of potential concern (COPCs)) at one onsite and one down gradient shallow aquifer monitoring well, water levels measurements at one onsite and one down gradient well cluster (i.e., cluster consisting of shallow and deep aquifer monitoring wells), sampling at four onsite ponds, sampling at an onsite open ditch (South Vitro Ditch), and up- and downstream sampling of the nearby Mill Creek. Annual monitoring was proposed for a minimum period of five years, at which time an evaluation, in consultation with the NRC and the State of Utah, would be conducted to determine the need for future monitoring at the site.

In March 2005, following five years of monitoring, DOE's Office of Legacy Management proposed discontinuing monitoring at the site based on the following reasons (DOE 2005):

- Since 2001 (five consecutive samples), on-site and down gradient ground water monitoring results for uranium have been below the 40 CFR 192, Subpart A Maximum Contaminant Level (MCL) of 0.044 mg/L as well as the National Primary Drinking Water Regulation MCL of 0.030 mg/L, while with two exceptions (2000 and 2004), on-site molybdenum ground water results have also been below its 40 CFR 192 MCL (0.10 mg/L). All down gradient ground water monitoring results for molybdenum have been below its MCL since 1993.

- Surface water monitoring results from four on-site ponds and an open ditch have shown uranium levels below its MCL since 2002 (four consecutive samples), while molybdenum results have been below its MCL since 2000 (six consecutive samples).

- Soils left in place at the site do not appear to be impacting ground water quality. Uranium and molybdenum concentrations in the shallow aquifer have not increased, indicating that there is little leaching of soils in place.

- Since 1999, an upward vertical gradient (i.e., under artesian conditions) has been consistently measured between the surficial and deep aquifers at both the onsite and down gradient well cluster locations.

- No unacceptable risk related to pumping of ground water by CVWRF was identified. The CVWRF property manager verified that no unauthorized construction or ground water withdrawal occurred during the last year.

TECHNICAL EVALUATION:

Hydrogeology

Hydrogeologically, the site is characterized by two aquifers: a shallow, unconfined system (water levels between 5 to 10 feet below ground surface) and a deeper confined system (under artesian conditions). Approximately 20 feet of clays and silts separate the two aquifers. The confined aquifer is used as a drinking water source in the area.

Historically, the shallow aquifer has been periodically influenced by dewatering activities conducted by the CVWRF. The pumped water is run through an on-site treatment plant (treatment does not include metals removal) prior to discharge into Mill Creek. Another feature that affects shallow aquifer flow at the site is a highway drain located in the southeastern portion of the site. Water enters the drain and is then pumped out into the South Vitro Ditch, which ultimately discharges to Mill Creek.

Regulatory

The site is regulated under Title I of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Since the residual radioactive material from the former mill operations has been excavated and removed from the site, there are no licenses (including a general licence under 10 CFR 40.27) or permits for this site with either the NRC or the State of Utah. Specific regulations are found in 40 CFR 192 and include:

Subpart A - Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites

Subpart B - Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites

Subpart C - Implementation

Table 1 to Subpart A contains maximum concentrations of constituents for ground water

protection. The maximum level for molybdenum in Table 1 is 0.1 mg/L.

Five-year Monitoring Period

Data collected during DOE's five-year monitoring period clearly demonstrated the following:

- There has been no reversal of the upward vertical gradient between the shallow and deep aquifer systems.
- Since 2001 (for ground water) and 2002 (for surface water), uranium concentrations in the shallow aquifer have reached steady levels which are well below the 0.044 mg/L regulatory concentration (40 CFR 192, Subpart A, Table 1).
- Based on data presented in Figure 6 (DOE 2005), all molybdenum results from surface water sampling locations have been below the 0.1 mg/L (40 CFR 192, Subpart A, Table 1) (Note: the open ditch shows a slightly increasing concentration trend for molybdenum; however, the levels are well below the 0.1 mg/L regulatory level.
- Molybdenum results from down gradient shallow aquifer ground water monitoring location 0134 clearly show molybdenum levels well below the 0.1 mg/L regulatory level.
- No unacceptable risks related to pumping of ground water by CVWRF or the storm drain sump have been identified.

However, the molybdenum results from shallow aquifer monitor well 0144 do not conclusively show a decreasing trend. Although molybdenum in monitor well 0144 showed a decreasing trend in four annual sampling events between 2000 and 2003, data for the last two events (2004 and 2005) exhibit the highest concentrations since 2000, with the 2004 concentration of 0.215 mg/L just over twice the 0.1 mg/L regulatory level. Moreover, applying linear regression analysis to the six data points presented in Figure 4 (DOE 2005) results in a positive (i.e., increasing) slope.

Discussion

Of the three criteria agreed upon by Utah, NRC, and DOE for termination of site monitoring, only the decrease of molybdenum concentrations in the shallow aquifer appears to be in question (specifically monitor well 0144). In conversations with the DOE, it has been proposed that averaging the molybdenum concentrations from surficial aquifer monitor wells 0134 and 0144 could be an alternate approach to assessing molybdenum in the surficial aquifer. Given that the current monitoring program for the surficial aquifer includes only two monitoring locations, averaging does not appear an appropriate analytical tool for assessing ground water quality.

On November 9, 2005, Utah's DEQ, DRC responded to DOE's proposal to discontinue monitoring (UDEQ 2005). DRC indicated that molybdenum exceeded Utah's ad hoc ground water quality standard (0.04 mg/L) in consecutive sampling events (2003 and 2004) and that ground water monitoring should continue until molybdenum concentrations are below the Utah GWQS and the DRC is convinced that the contaminant concentrations will not rebound. Subsequent conversations with Utah DRC indicated that they were primarily concerned with the

potential for molybdenum from the surficial aquifer to impact the underlying potable aquifer. It should be noted that because the site is regulated under Title I of UMTRCA, the NRC believes that the applicable regulatory standard for the site is 40 CFR 192, Subparts A, B and C. Consequently, the NRC believes that 0.1 mg/L (40 CFR 192, Subpart A, Table 1) is the relevant molybdenum standard for the site.

In DOE (2000), Supplemental Standards (40 CFR 192.21(g)) based on limited use ground water were used to establish the current monitoring program at the site (i.e., the shallow aquifer at the site is not potable due to elevated background concentrations of arsenic). As a result, the NRC understands that the 40 CFR 192, Subpart A, Table 1 molybdenum MCL (0.1 mg/L) should not be used as a remedial action standard in the shallow aquifer. However, because quantitatively proving a decreasing trend can be difficult (e.g., when data oscillates around an asymptotic value), the 40 CFR 192 molybdenum MCL is a convenient tool to assess the potential impact of molybdenum on the underlying potable aquifer. It is also understood that any leakage from the surficial aquifer into the deeper system would likely result in attenuation of the molybdenum concentrations. Regardless of attenuation, if molybdenum is below the MCL in the non-potable surficial aquifer, any leakage from the surficial aquifer into the deeper potable aquifer due to a shift in vertical gradients will not result in deeper aquifer molybdenum levels over the MCL.

Based on existing data, continued sampling of monitor well 0144 for molybdenum appears appropriate. However, it is acknowledged that the 2004 molybdenum concentration of 0.215 mg/L is at least three times greater than either the previous or subsequent sampling result and would appear to be inconsistent with recent (post 2000) data. Consequently, the NRC believes that at least two more years of molybdenum data from monitor well 0144 should be collected. If at the end of this two year period, the molybdenum set data for monitor well 0144 exhibits a decreasing trend (e.g., linear regression analysis resulting in a negative slope), or if molybdenum levels remain below the 0.1 mg/L 40 CFR 192 UMTRCA Title I standard for molybdenum, monitoring at the site can be terminated. In addition, while molybdenum sampling is ongoing, annual surficial and deep aquifers water level measurements (i.e., monitor wells 0134, 0143, 0144 and 0145) to assess vertical gradients should continue. It should be understood that if in the next two years, conditions influencing Criteria 1 (vertical gradients) or 3 (risks related to pumping of ground water by CVWRF or the storm drain sump) significantly change, termination of monitoring at the site will need to be reconsidered.

REFERENCES:

Department of Energy (DOE 2000) Ground Water Compliance Action Plan for the Salt Lake City, Utah, UMTRCA Project Site. May 2000 [Adams Accession No. ML003721622]

DOE (2005) Correspondence from Michael Tucker to Gary Janosko (NRC) and Dean Henderson (Utah DEQ) containing transmittal of 2004 Annual Status Report for the Salt Lake City, Utah, UMTRCA Processing Site. March 24, 2005 [Adams Accession No. ML050940337]

U.S. Nuclear Regulatory Commission (U.S. NRC 2000), Correspondence from Philip Ting to Donald Metzler (DOE) concerning NRC's concurrence with DOE's Ground Water Compliance Action Plan for the Salt Lake City, Utah, UMTRCA Project Site. June 15, 2000. [Adams Accession No. ML003722749]

Utah Department of Environmental Quality (UDEQ 2000) Correspondence from William Sinclair to Donald Metzler (DOE) concerning Utah's concurrence with DOE's Ground Water Compliance Action Plan for the Salt Lake City, Utah, UMTRCA Project Site. June 7, 2000 [Adams Accession No. ML003727203]

UDEQ (2005) Correspondence from Dane Finefrock to Tom Pauling (DOE) concerning Utah's review of DOE's 2004 Annual Status Report for the Salt Lake City, Utah, UMTRCA Processing Site. November 9, 2005 [Adams Accession No. ML053480212]

Steve Hall

From: Malhotra, Jagdish [Jagdish.Malhotra@hq.doe.gov]
Sent: Friday, June 01, 2007 2:42 PM
To: Steve Hall; Clay Carpenter; Tom Pauling
Subject: FW: SLC Processing Site Well Abandonment

FYI and action as needed.

Jeet

-----Original Message-----
From: Phillip Goble [mailto:pgoble@utah.gov]
Sent: Friday, June 01, 2007 4:36 PM
To: Malhotra, Jagdish
Cc: pxm2@nrc.gov
Subject: SLC Processing Site Well Abandonment

Mr. Malhotra,

As you requested during our conversation, I am writing to let the DOE know the Utah Division of Radiation Control (DRC) agrees with DOE letter dated May 23, 2007 for the Salt Lake City, Utah, UMTRCA Title I Site, where it states that all three criteria needed to discontinue sampling at the site has been fulfilled. Although the Utah DRC would like to see groundwater sampling continue at the site until molybdenum is below the Utah ad hoc rule of 0.04 mg/L in well MW-0144, the Utah DRC no authority to ask the DOE to continue sampling at the site. Therefore the Utah DRC gives its approval for the four monitoring wells at the site to be abandoned. As a courtesy we would ask the DOE to please give us ample advance notice (minimum of 1 month) before any well abandonment activities begin so I can arrange my schedule to be present during the well abandonment activities. We would also like to know how the DOE plans on abandoning the four monitor wells.

Thanks,

Phil Goble
Utah Division of Radiation Control
Phone 801-536-4044
Fax 801-533-4097

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Part C.3

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 9, 2007

Mr. Tom Pauling
U.S. Department of Energy
Office of Legacy Management
2597 B 3/4 Road
Grand Junction, CO 81503

SUBJECT: CONCURRENCE TO TERMINATE GROUND WATER MONITORING AT THE SALT LAKE CITY, UTAH, UMTRCA TITLE I PROCESSING SITE

Dear Mr. Pauling:

Nuclear Regulatory Commission (NRC) staff has reviewed the Department of Energy's (DOE's) transmittal of the May 2007 monitoring results for the Salt Lake City, Utah, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Processing Site. Based on its review and its independent analysis (see enclosed Technical Evaluation Report), the staff concludes that analytical results contained in DOE's submittal meet the ground water monitoring termination criteria proposed by the NRC on December 5, 2005. Consequently, the NRC concurs with DOE's findings that no further ground water monitoring is necessary at the site and that the site's four remaining monitoring wells may be decommissioned.

If you have any questions concerning this matter, please contact the NRC Project Manager, Mr. Paul Michalak at 301-415-7612, or by e-mail at pxm2@nrc.gov

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

Sincerely,

for Paul Michalak, Hydrogeologist
Uranium Recovery Licensing Branch
Decommissioning and Uranium Recovery
Licensing Directorate
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

Enclosure: Technical Evaluation Report

TECHNICAL EVALUATION REPORT
TERMINATION OF MONITORING AT THE SALT LAKE CITY UMTRCA TITLE I PROCESSING SITE

DATE: June 26, 2007

TECHNICAL REVIEWER: Paul Michalak

SUMMARY AND CONCLUSIONS:

The Nuclear Regulatory Commission (NRC) has evaluated additional ground water quality and elevation data collected at the Salt Lake City, Utah, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Processing Site (the site) by the Department of Energy's (DOE's) Office of Legacy Management (DOE 2007). The additional monitoring was performed in response to the NRC's comments (NRC 2005) on the DOE's original proposal (DOE 2005) to terminate ground water monitoring at the site. Combined with existing ground water monitoring data for the site, these new data support the following: the additional ground water samples from well 0144 contained molybdenum at levels below the 0.1 mg/L 40 CFR 192 UMTRCA Title I standard for molybdenum; for well 0144, the slope of the linear regression of molybdenum concentrations (nine samples collected between 1999 and 2007) was negative, indicating a decreasing concentration trend; and ground water elevation (shallow wells) and potentiometric (deep wells) measurements for well clusters 0134/0143 and 0144/0145 continued to indicate an upward vertical gradient, indicating that in the vicinity of the site, the shallow aquifer system is not recharging the deeper, confined system. Consequently, the NRC concurs with DOE's findings that no further ground water monitoring is necessary at the site and that the site's four remaining monitoring wells may be decommissioned.

BACKGROUND:

On March 24, 2005, the DOE's Office of Legacy Management proposed discontinuing ground water monitoring at the site based on the following criteria: 1) the vertical hydraulic gradient between the deep and shallow aquifers is upward (indicating that the shallow aquifer system is not recharging the deeper, confined system) and monitoring has not indicated a reversal in its direction; 2) ground water quality monitoring has indicated a decrease in the uranium and molybdenum concentrations (as anticipated), and 3) no unacceptable risks were identified related to pumping of ground water by the Central Valley Water Reclamation Facility (CVWRF), the current property owner, or the storm drain sump (DOE 2005). On December 15, 2005, NRC staff responded to DOE's request and concluded that DOE's second criteria had not been met at well 0144 (NRC 2005). As a result, ground water monitoring at the site was amended to the following:

1) Annual monitoring for molybdenum in well 0144 should continue for at least two years, with termination of monitoring contingent on the following:

    a) Molybdenum data for monitor well 0144 exhibiting a decreasing trend (e.g., linear regression analysis resulting in a negative slope), or

b) Data remaining below the 0.1 mg/L 40 CFR 192 UMTRCA Title I standard for molybdenum.

2) While molybdenum sampling is ongoing, annual surficial and deep aquifers water level measurements (i.e., monitor wells 0134, 0143, 0144 and 0145) to assess vertical gradients should continue.

On May 23, 2007, DOE submitted updated molybdenum ground water results for well 0144 and additional water level measurements for monitor wells 0134, 0143, 0144 and 0145 (DOE 2007). This data included three additional post-December 2006 molybdenum results for well 0144 and three additional ground water level measurements for deep (confined aquifer) wells 0143 and 0145. Continuous ground water measurements were also collected from shallow unconfined wells 0134 and 0144. Based on these results, DOE asserted that the NRC's December 2006 criteria had been met and that no further environmental monitoring would be performed on the site. DOE also indicated that decommissioning of the four remaining monitor wells at the site would be initiated unless otherwise directed by the NRC.

TECHNICAL EVALUATION:

The results of additional ground water sampling at well 0144 have met the 1a and 1b termination criteria established in December 2005. All three samples were below the 0.1 mg/L 40 CFR 192 UMTRCA Title I standard for molybdenum and the slope of the linear regression (nine samples collected between 1999 and 2007) was negative, indicating a decreasing concentration trend (see attached figure). Ground water elevation (shallow wells) and potentiometric (deep wells) measurements for well clusters 0134/0143 and 0144/0145 continued to indicate an upward gradient (see attached figure). The upward vertical gradient indicates that, in the vicinity of the site, the deeper, confined aquifer, which is a source of potable water in the area, is not being recharged from the shallow unconfined aquifer. In addition, the DOE has verified, through information from the CVWRF, that no unauthorized excavations or ground water withdraws have occurred at the site; demonstrating that institutional controls related to these activities are in place and continue to be protective. As a result, the NRC concurs with DOE's findings that no further ground water monitoring is necessary and that the four remaining monitoring wells on the site may be decommissioned.

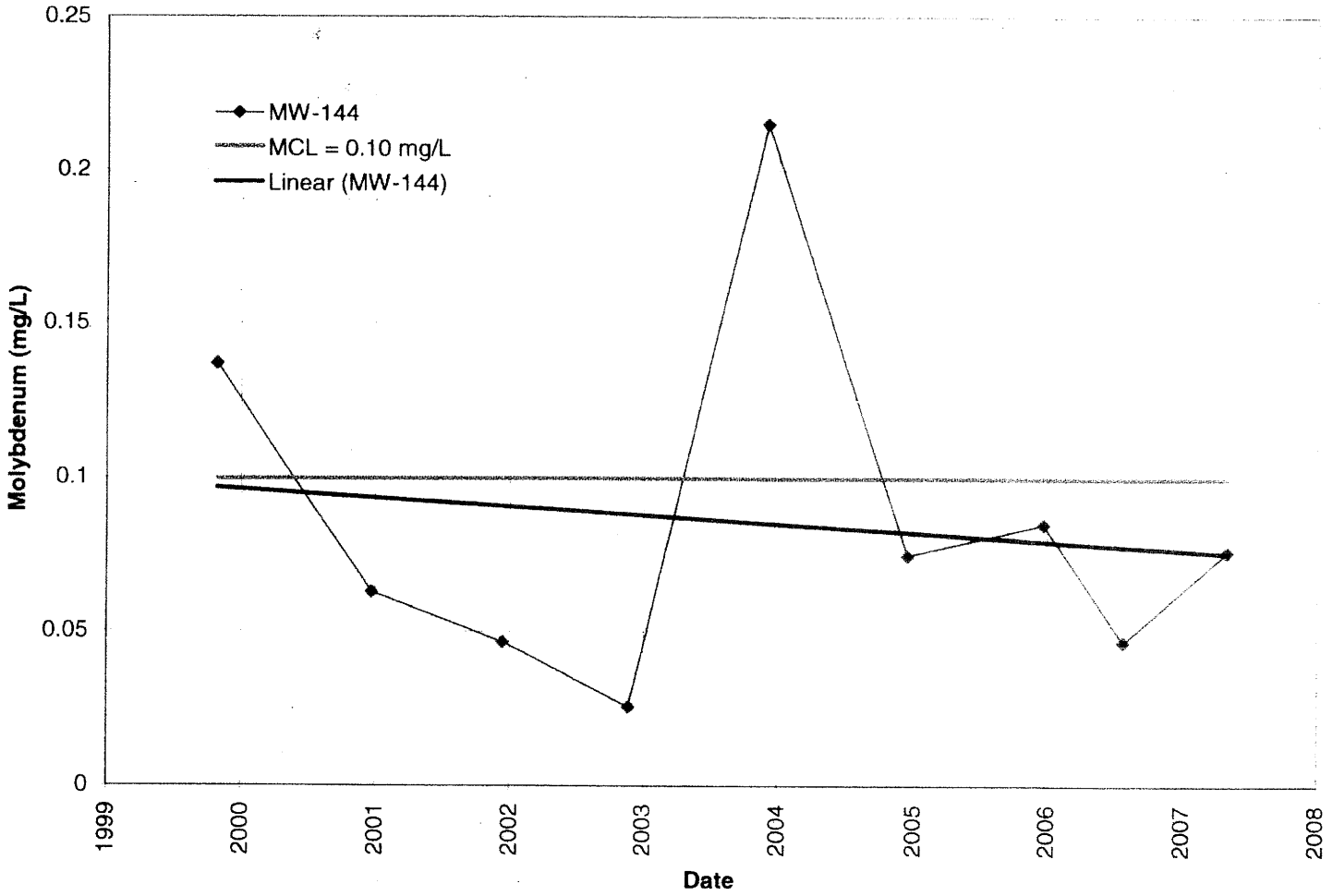
REFERENCES:

Department of Energy (2005) Correspondence from Michael Tucker to Gary Janosko (NRC) and Dean Henderson (Utah DEQ) containing transmittal of 2004 Annual Status Report for the Salt Lake City, Utah, UMTRCA Processing Site. March 24. [Adams Accession No. ML050940337]

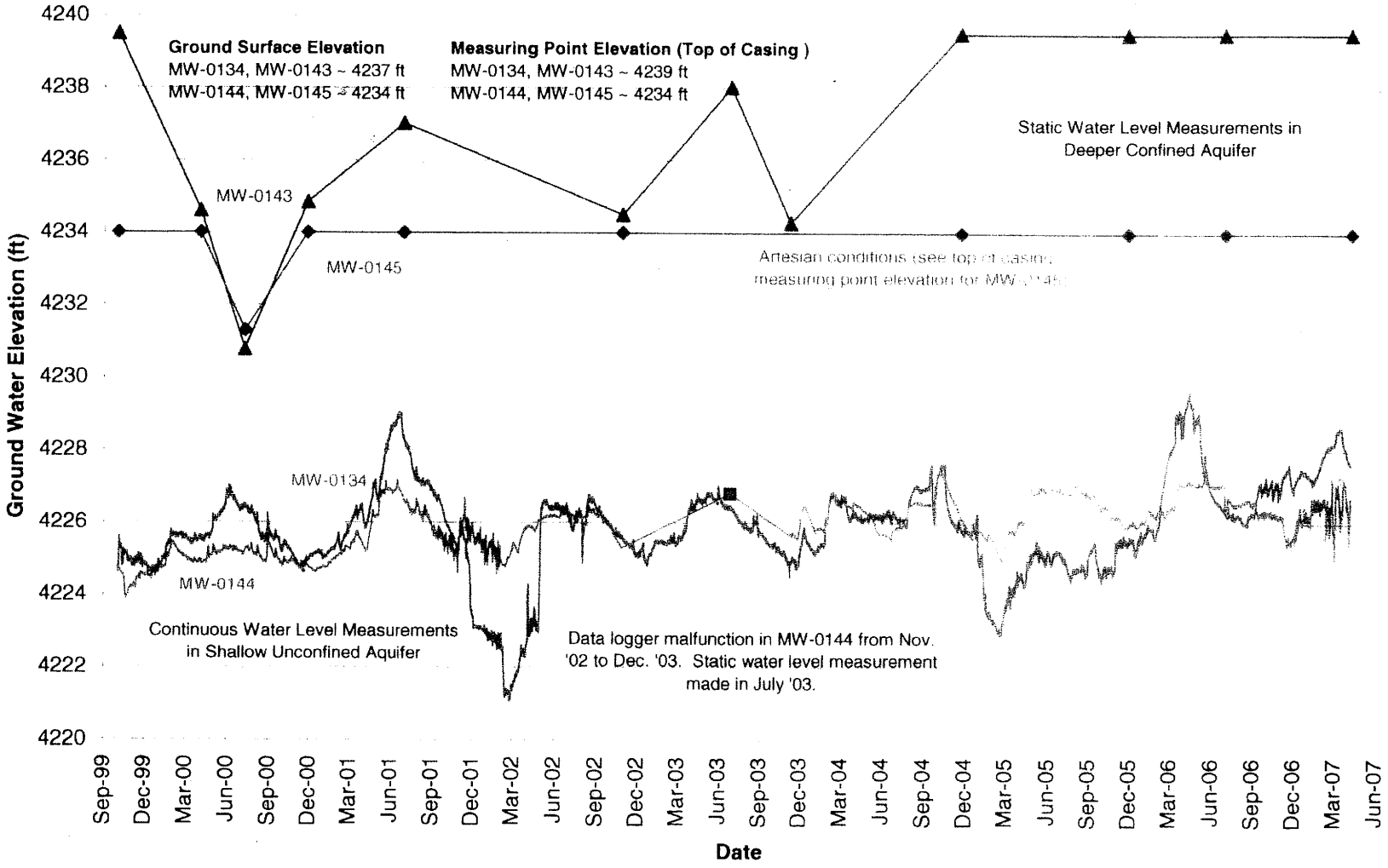
Department of Energy (2007) Correspondence from Jagdish Malhotra to Gary Janosko (NRC) transmitting May 2007 Monitoring Results for the Salt Lake City, Utah, UMTRCA Title I Processing Site. May 23. [Adams Accession No. ML071510087]

Nuclear Regulatory Commission (2005) Correspondence from Paul Michalak to Thomas Pauling, DOE concerning Annual Status Report for the Salt Lake City, Utah, UMTRCA Processing Site. December 15. [Adams Accession No. ML053460332]

Time-Concentration Plot
Linear Regression
Molybdenum Concentrations
MW-144 (Onsite, Shallow Aquifer)
Salt Lake City Processing Site



Hydrograph
Salt Lake City Processing Site



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Attachment B

Notice of Residual Radioactive Contamination

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AMENDED

NOTICE OF RESIDUAL RADIOACTIVE CONTAMINATION

THIS NOTICE IS TO ALERT BUYERS OR DEVELOPERS THAT RESIDUAL RADIOACTIVE CONTAMINATION ~~EXITS~~ /EXISTS ON THE PROPERTY HEREIN DESCRIBED.

6741920

6753637

RECITALS

A. WHEREAS, the current owner of the property known as the Salt Lake Vitro Site situated in the county of Salt Lake, Salt Lake City, Utah, and more particularly described on Exhibit 1 attached hereto is Central Valley Water Reclamation Facility Board located at 800 West Central Valley Road, Salt Lake City, Utah, 84119;

Received 1997 Division Of Radiation Control

B. WHEREAS, the Salt Lake Vitro Site was used by the Vitro Chemical Company to process uranium ore from 1951 to 1964 and to process vanadium ore from 1964 to 1968;

C. WHEREAS, when milling operations were discontinued in 1968, more than four million tons of uranium mill tailing waste remained on the Salt Lake Vitro Site;

D. WHEREAS, under the Uranium Mill Tailings Radiation Control Act of 1978 (Public Law 95-604), which requires the remediation of the identified uranium mill tailing sites, the United States Department of Energy and the state of Utah entered into Cooperative Agreement Number DE-FC04-81AL616309, dated March 30, 1983, for the remediation of the Salt Lake Vitro Site; between 1985 and 1987 excavation and disposal of the uranium mill tailings and site restoration were performed;

E. WHEREAS, not all residual radioactive materials were removed during remedial action, isolated areas of the radioactive contamination remain, examples of which are shown on the map attached hereto as Exhibit 2;

F. WHEREAS, the cleanup of the Salt Lake Vitro Site is documented in the *Completion Report for the UMTRA Project Vitro Processing Site Salt Lake City, Utah*, ("Completion Report") dated June 1997 which provides a discussion of the known contaminated areas, including an estimate of the amount of contamination present, the approximate location of the radioactive contamination, and a health assessment resulting from exposure to the contaminants; and

G. WHEREAS, the Completion Report may be examined at and copies obtained from the following:

State of Utah
Department of Environmental Quality
Division of Radiation Control
168 North 1950 West, Building #2
Salt Lake City, UT 84114-4850
(801) 536-4250

Department Of Energy
Grand Junction Office
2597 B $^{3}/_{4}$ Road
Grand Junction, CO 81503
(970) 248-6000

Department of Commerce
National Technical Information Services
5282 Port Royal Road
Springfield, VA 22161
(703) 487-4650

H. NOW THEREFORE the United States Department of Energy, the state of Utah, and the Central Valley Water Reclamation Facility Board hereby recommend to prospective purchasers or developers of part or all of the Salt Lake Vitro Site that the following actions be taken:

1. Verify that future construction plans do not occur in contaminated areas. If there is a possibility of encountering contaminated material, contact the Utah Department of Environmental Quality, Division of Radiation Control.

2. Prior to construction, conduct appropriate radiological surveys to determine whether radioactive elements are present, and their identity, concentration, and distribution.

3. If radioactive materials are encountered during construction, the materials may be; (a) dispensed of as radioactive waste in an appropriate waste facility; or (b) buried into the deepest part of the excavation during back filling.

4. Regardless of the results of the radiological surveys, if there are construction plans for habitable structures (e.g., residential, institutional, commercial, or industrial buildings and the like), consider installing a passive sub-slab radon ventilation system that will vent radon soil gas to the atmosphere.

Dated this 26th **day of** August, **1997**

UNITED STATES DEPARTMENT OF ENERGY

By: George J. Rael
George Rael
Director
Environmental Restoration Division

STATE OF NEW MEXICO)
) ss.
COUNTY OF BERNALILLO)

Before me, a Notary Public qualified for Bernalillo County, personally appeared George Rael, who by me duly swore did say that he is the Director of the Environmental Restoration Division and he further acknowledged to me that the above NOTICE OF RESIDUAL RADIOACTIVE CONTAMINATION document was duly executed by him on behalf of the United States Department of Energy.

WITNESS my hand and Notarial Seal on this 26th day of August, 1997.

Notary Public

NOTARY PUBLIC STATE OF NEW MEXICO

Residing at: Albuquerque NM

My Commission Expires: 5/25/2001

Dated this 3rd day of September, 1997

STATE OF UTAH
DEPARTMENT OF ENVIRONMENTAL QUALITY

By: William J. Sinclair
William Sinclair
Director
Division of Radiation Control

STATE OF UTAH)
) ss.
COUNTY OF SALT LAKE)

Before me, a Notary Public qualified for Salt Lake County, personally appeared William Sinclair, who by me duly swore did say that he is the Director of the Division of Radiation Control and he further acknowledged to me that the above NOTICE OF RESIDUAL RADIOACTIVE CONTAMINATION document was duly executed by him on behalf of the state of Utah.

WITNESS my hand and Notarial Seal on this 3rd day of Sept., 1997.

Mary Charlene Lamph
Notary Public

NOTARY PUBLIC
Mary Charlene Lamph
168 North 1950 West
Salt Lake City, Utah 84116
My Commission Expires
September 9, 1999
STATE OF UTAH

Residing at: Salt Lake City

My Commission Expires: Sept. 9 1999

#576096

Dated this 11 **day of** Sept., **1997**

CENTRAL VALLEY WATER RECLAMATION FACILITY BOARD

By: Reed Fisher
Reed Fisher
General Manager

STATE OF UTAH)
) ss.
COUNTY OF SALT LAKE)

Before me, a Notary Public qualified for Salt Lake County, personally appeared Reed Fisher, who by me duly swore did say that he is the General Manager of the Central Valley Reclamation Facility and he further acknowledged to me that the above NOTICE OF RESIDUAL RADIOACTIVE CONTAMINATION document was duly executed by him on behalf of the Central Valley Water Reclamation Facility Board.

WITNESS my hand and Notarial Seal on this 11th day of September 1997.

Beverly N. Bell
Notary Public

NOTARY PUBLIC
BEVERLY N. BELL
800 W. Central Valley Rd.
So. Salt Lake, Utah 84119
My Commission Expires
September 30, 1997
STATE OF UTAH

Residing at: Salt Lake City, UT

My Commission Expires: 09/30/97

BK7760PG1107

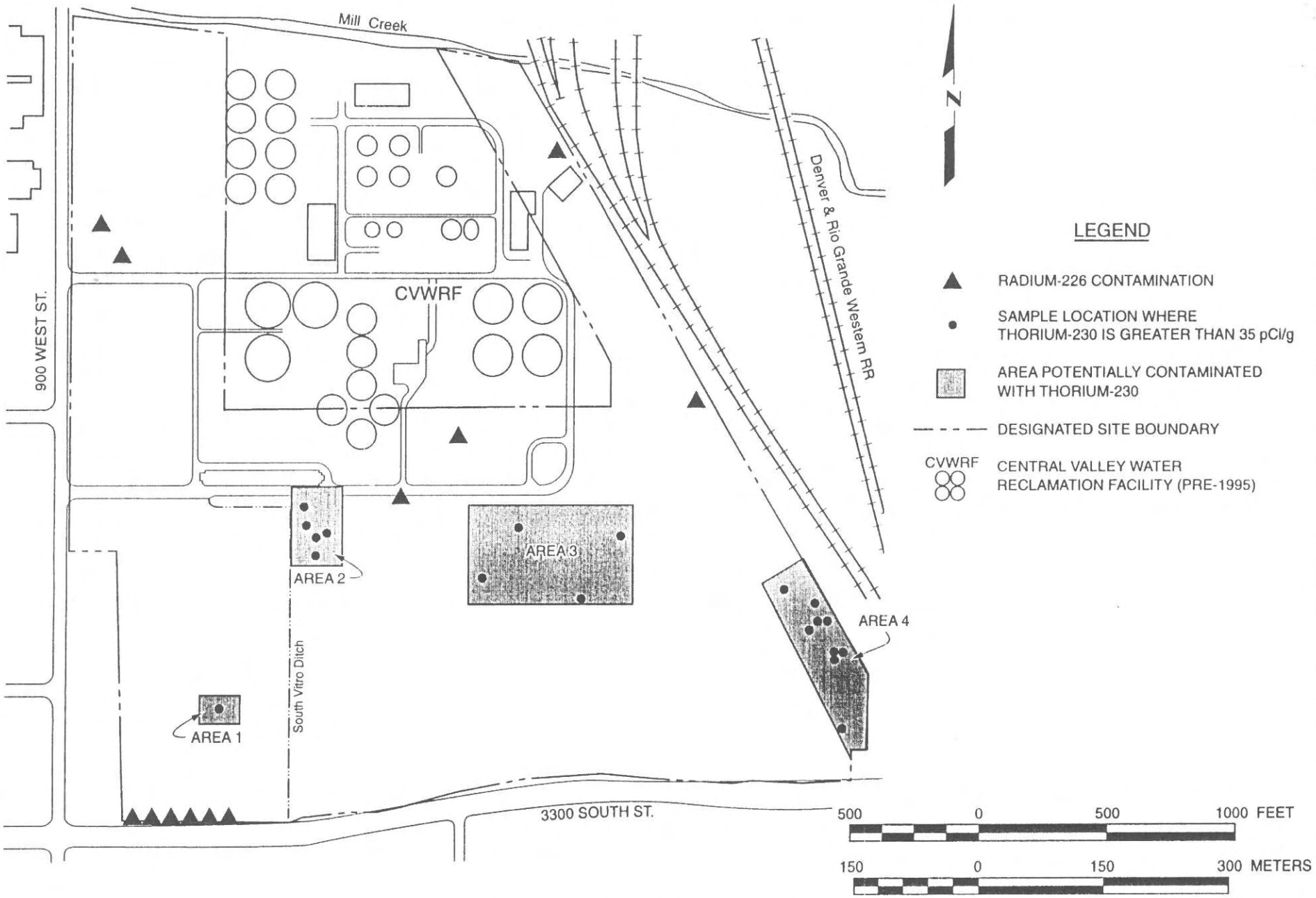

EXHIBIT 2
POST-REMEDIATION RADIOACTIVE CONTAMINATION AREAS
SALT LAKE CITY, UTAH, VITRO PROCESSING SITE

MAC: SITE/SLC/ATTCHTOCR/CRATTACH

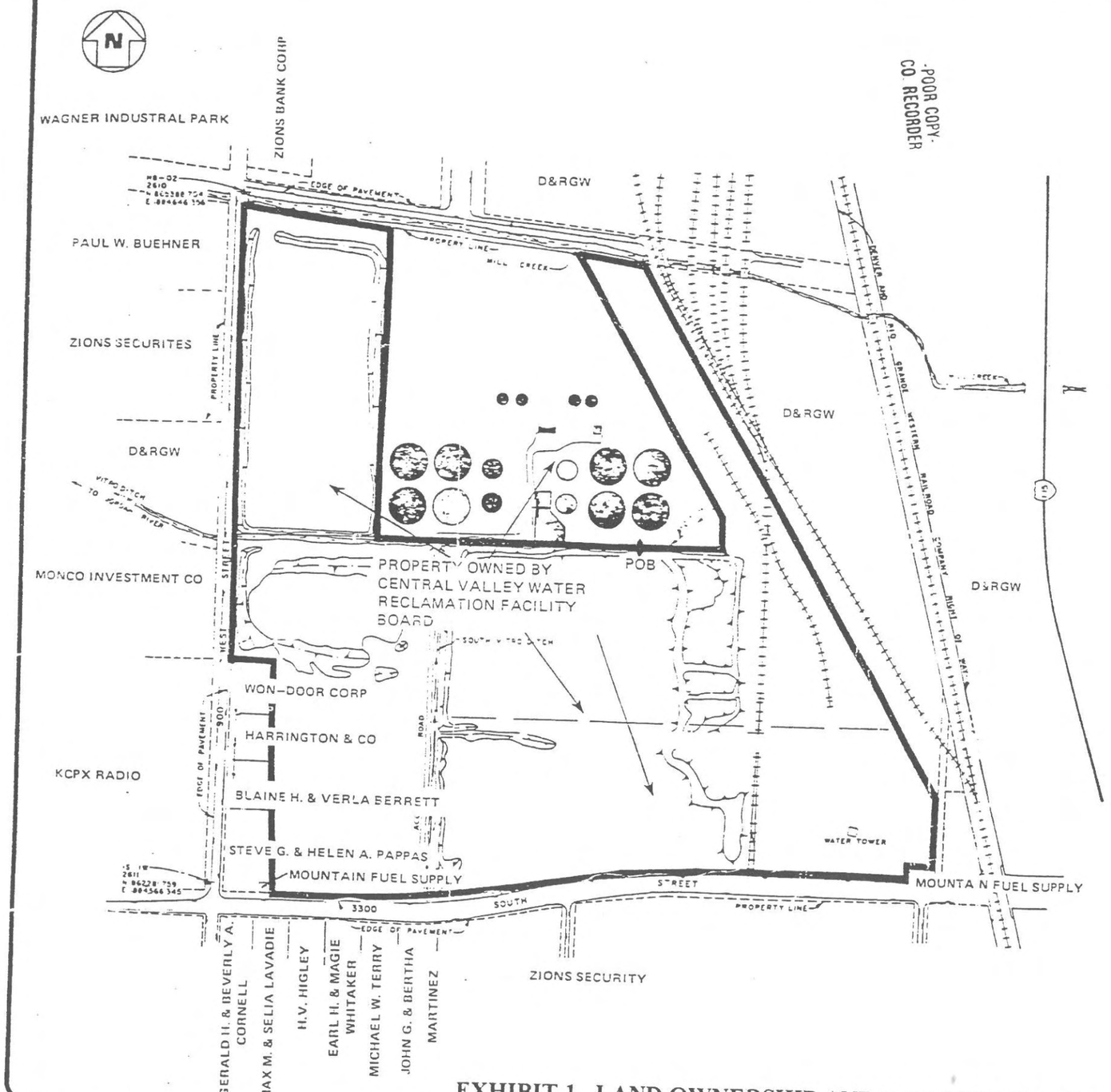

EXHIBIT 1. LAND OWNERSHIP AND SITE DESIGNATION MAP

SALT LAKE VITRO SITE

BEGINNING AT THE EAST QUARTER CORNER OF SECTION 26, T1S, R1W, SALT LAKE BASE AND MERIDIAN, AND RUNNING THENCE WEST 1154.5 FT, THENCE N 0°18'E, 1440.79 FT, THENCE N 83°16'W, 651.84 FT, THENCE S 0°03'14"W, 2078.58 FT, THENCE S 89°50'E, 179.5 FT, THENCE S 1°57'E, 1062.87 FT, THENCE N 89°43'47"E, 508.52 FT, THENCE N 86°50'27"E, 195.77 FT, THENCE N 80°45'E, 473.05 FT, THENCE N 81°32'32"E, 168 FT, THENCE N 80°44'E, 489.21 FT, THENCE N 89°55'16 'E, 956.8 FT, THENCE N 75 FT, THENCE E 150 FT, THENCE N 0°01'E, 302.86 FT, THENCE N 29°59'W, 2731.01 FT, THENCE N 85°49'W, 298.89 FT, THENCE S 29°54'30"E, 1365.31 FT, THENCE S 170.75 FEET, THENCE W 379.35 FT TO THE POINT OF BEGINNING.

CONTAINS 127.9 ACRES (MORE OR LESS)

REFERENCE 3

Attachment C

Risk Calculations

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Salt Lake City - Incidental Exposure to Surface Water - Dermal Exposure Pathway												
Contaminant	Cw-max	Sa	Pc	Cf	ET	EF	ED	BW	AT	Intake absorbed	RfD	HQ
	mg/L	cm2	cm/hr	L/cm3	hr/d	d/y	yr	kg	d	mg/kg-d	mg/kg-d	mg/kg-d
Non-carcingenic												
Uranium	0.374	312	0.001	0.001	8	250	30	70	2555	0.00004	0.003	0.013
Carcinogenic											Slope Factor	Risk
Uranium (pCi/L)	256.564	312	0.001	0.001	8	250	30	na	na	4802.878	4.36E-11	2.09E-07
Occupational Scenario												
	Non-carcinogenic intakes (mg/Kg-day) = Cw x Sa x Pc x Cf x ET x EF x ED/BW x AT											
	Carcinogenic intakes (pCi) = Cw x Sa x Pc x Cf x ET x EF x ED											
where:												
Cw is maximum detected in surface water during monitoring in 2000												
Surface area (Sa) is for a man's arms and hands; EPA 1989												
Pc (dermal permeability constant) assumes absorption is the same as water												
Cf Conversion factor												
ET Exposure time - assumes length of work day												
ED Exposure duration - 30 years												
EF Exposure frequency - assumes 5 days a week for 50 weeks												
BW Body weight; default for adult												
AT Averaging time - 365 days x ED												
Carcinogenic risks calculated assuming 1 mg U = 686 pCi of U234 + U238												
Hazard Quotient (HQ) = Intake/Reference Dose (RfD)												
Risk = Intake x Slope Factor (SF)												
Exposure factors and default values from EPA 1989												
Toxicological data are mainly from EPA's Integrated Risk Information System (IRIS); other values are from EPA Region III Risk Based Concentration Table												
Carcinogenic risks for uranium assumes 1 mg U = 686 pCi of U234 + U238; SF is average of U234 and U238												

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Appendix F – Cultural Resources Memo

SWCA
ENVIRONMENTAL CONSULTANTS
Sound Science. Creative Solutions.®

257 East 200 South, Suite 200
Salt Lake City, Utah 84111
Tel 801.322.4307 Fax 801.322.4308
www.swca.com

TECHNICAL MEMORANDUM

To: Adam Jones
Brown and Caldwell
6975 South Union Park Center, Suite 490
Midvale, Utah 84047

From: Kathryn Mohlenhoff, Archaeologist

Date: September 18, 2018

Re: Central Valley Water Reclamation Facility Cultural Resources Technical Memorandum / SWCA Project No. 39801

INTRODUCTION

On August 20, 2018, SWCA Environmental Consultants (SWCA) was contacted by Brown and Caldwell to perform a wetlands and waters of the United States survey; a cultural (archeological) resources survey; and a threatened, endangered, and sensitive species assessment to support the completion of an environmental assessment for upgrades at the Central Valley Water Reclamation Facility in Salt Lake City, Utah. SWCA conducted these efforts to better analyze the potential effects of upgrading the existing water treatment facilities. This memorandum presents the methods and results for the cultural resources survey.

METHODS

Pre-field Analysis

Prior to field surveys, SWCA used the Utah Division of State History's Preservation Pro database to conduct a file search and to identify previously recorded cultural resources projects and previously documented archaeological sites within 0.5 mile of the survey area. SWCA also reviewed topographic, aerial, and historic maps to identify any historic features in the survey area. The survey area is approximately 42 acres and includes all potential areas of development for the Central Valley Water Reclamation Facility upgrades.

Field Survey

On September 10, 2018, SWCA visited the Central Valley Water Reclamation Facility survey area. One SWCA archaeologist walked meandering transects throughout the survey area while searching for cultural material and or/features. SWCA employed Bureau of Land Management (BLM) site definitions for the field survey, and all resources were documented to the standards of the Utah BLM and the Utah State Historic Preservation Office. Sites and isolated occurrence (IO) definitions are presented in the *Bureau of*

Land Management Guidelines for Identifying Cultural Resources, Handbook H-8110[1]. Minimum criteria for defining an archaeological site that requires the use of the Utah Archaeological Site Form are as follows:

- At least 10 artifacts of a single class (e.g., 10 sherds) within a 10-meter-diameter area, except when all pieces appear to originate from a single source (e.g., one ceramic pot, one glass bottle)
- At least 15 artifacts that include at least two classes of artifact types (e.g., sherds, nails, or glass) within a 10-meter-diameter area
- One or more archaeological features in temporal association with any number of artifacts
- Two or more temporally associated archaeological features without artifacts

In addition, SWCA recorded all linear archaeological resources per the Utah Professional Archaeological Council linear site guidelines[2]. The SWCA archaeologist took several project overview photographs (Appendix A) and accompanying global positioning system photo points to document the survey area.

RESULTS

Pre-field Analysis

Based on the file search review, seven cultural resources projects and three archaeological sites are located within 0.5 mile of the project area (Table 1 and Table 2), but none intersect the survey area. Activities associated with the construction at the Central Valley Water Reclamation Facility would not affect these resources.

SWCA's review of topographic, aerial maps, and historic maps identified no historic features in the survey area (Table 3).

Table 1. Previous Cultural Resources Projects within 0.5 Mile of the Survey Area

Project Number	Title	Consultant
U00ST0695	*Report Of Excavation And Analysis Of 42SL309 And 42SL327 Report Of Excavation And Analysis Of 42SL309 And 42SL327*	SWCA
U07JS0404	*Provo To Salt Lake City Front Runner Project*	Jones and Stokes
U07ST0638	*900 West Extension*	SWCA
U13LI0816	*3300 South Trail Class III Inventory Salt Lake County UDOT*	Logan Simpson
U14ZP1303	*A Class II Archaeological Resources Inventory For The I-80; State Street Interchange Environmental Impact Statement*	Project Engineering Consultants LTD
U97SJ0278	*Central Valley Water Project*	Sagebrush Archaeological Consultants
U99SJ0638	*Upper Jordan Ecosystem*	Sagebrush Archaeological Consultants

[1] Bureau of Land Management. 2002. *Guidelines for Protecting Cultural Resources, Handbook H-8120*. Bureau of Land Management, Salt Lake City, Utah.

[2] Utah Professional Archaeological Council. 2008. *Linear Sites: Guidance for Identifying and Recording under Section 106 of the National Historic Preservation Act*. Utah Professional Archaeological Council, Salt Lake City.

Table 2. Previously Documented Archaeological Sites within 0.5 Mile of the Survey Area

Site Number	Site Class	Site Type	NRHP Eligibility
42SL293	Historic	Railroad	Eligible
42SL302	Historic	Canal	Eligible
42SL309	Historic	Artifact scatter	Eligible

Table 3. General Land Office Plat Maps, Historic Topographic Maps, and Other Historical Data Sources with Historic Features in the Survey Area

Map Source and Year	Author or Map Name	Features in the Survey Area
General Land Office 1856 (Township 1 South, Range 1 West)	Burr	None
General Land Office 1869 (Township 1 South, Range 1 West)	Bausmann	None
24K historic topographic 1963	Salt Lake City South	None

Field Survey

The survey area has been heavily developed and includes various buildings, landscaped lawns, water-treatment tanks, and other impervious surfaces associated with the Central Valley Water Reclamation Facility. One historic foundation was observed within the facility, but it is outside the survey area. It will not be affected by the project. Figure 1 presents a results map outlining the survey area and includes photo points taken during the field survey. Photographs taken at these photo points are provided in Appendix A and help characterize the survey area.

No further archaeological work is recommended for the survey area. However, if previously undocumented buried cultural resources are identified as a result of ground-disturbing activities, all work in the immediate vicinity of the discovery should stop until the find can be evaluated by a professional archaeologist.

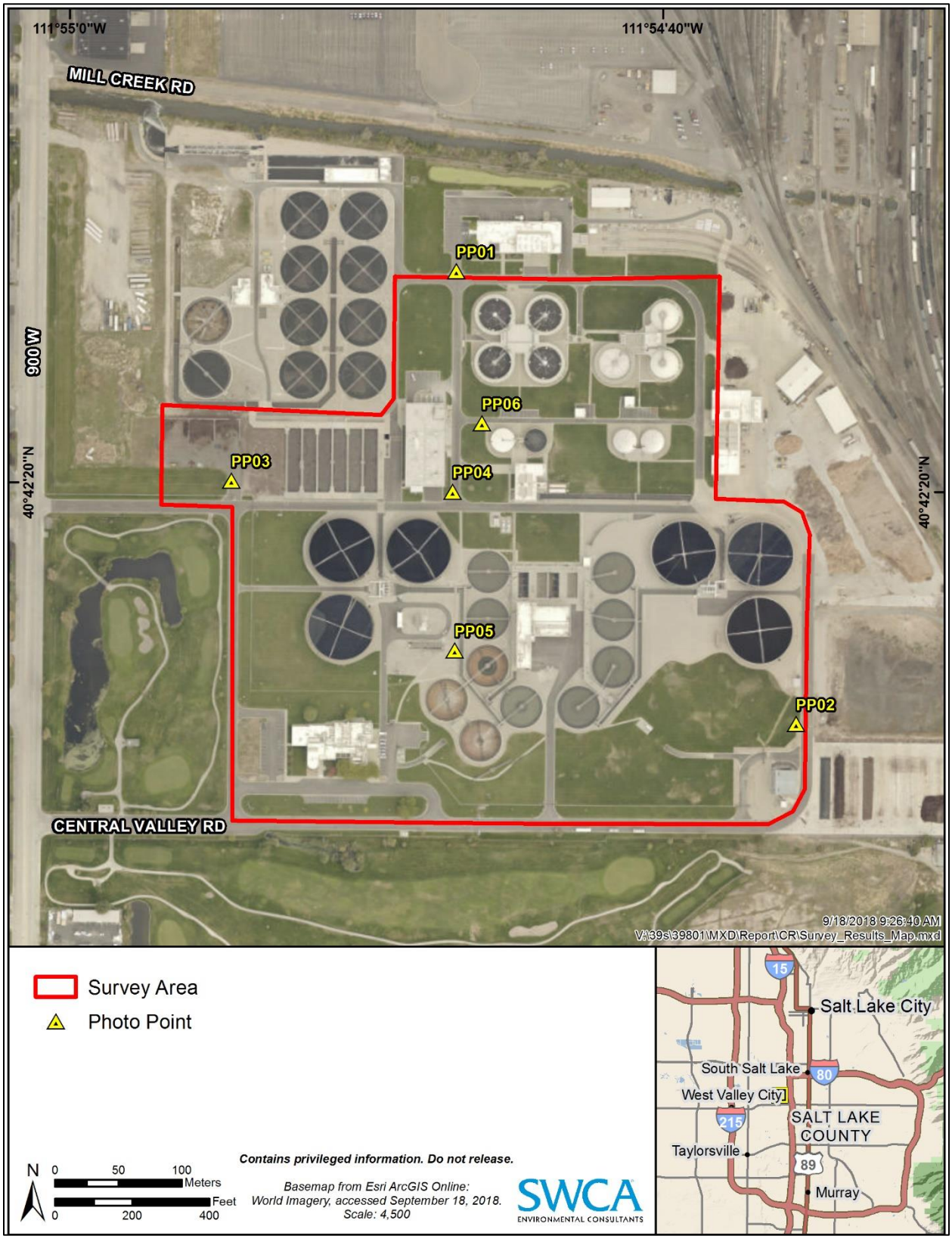

Figure 1. Survey area and photo points.

APPENDIX A

Survey Area Photographs

Figure A-1. Photo point PP01, view facing south.

Figure A-2. Photo point PP02, view facing northwest.

Figure A-3. Photo point PP03, view facing northwest.

Figure A-4. Photo point PP04, view facing southeast.

Figure A-5. Photo point PP05, view facing southwest.

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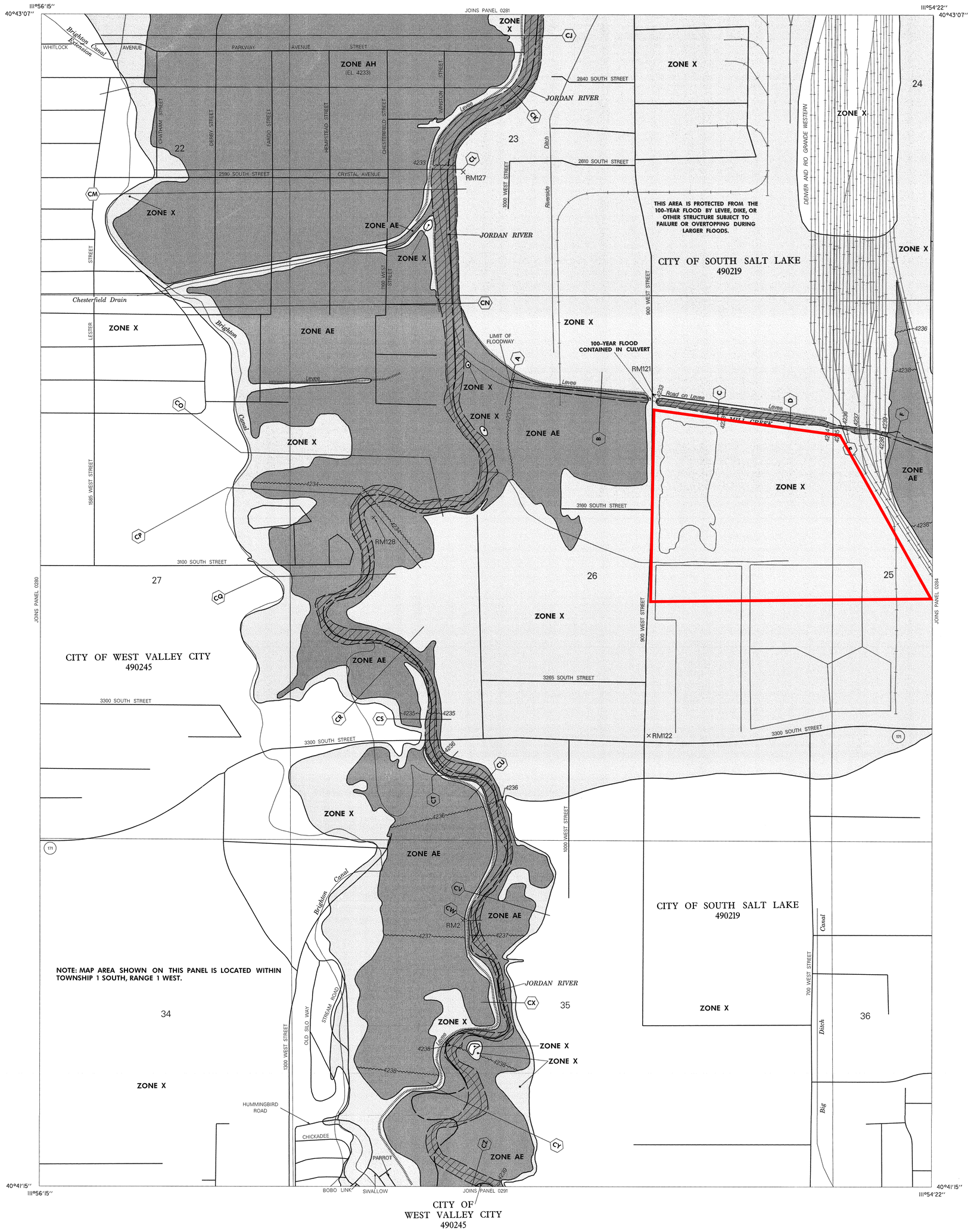
Appendix G – FIRM Map and Wetlands/Wildlife Memo

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM2	4234.85	Monument set 30 feet east of the intersection of 3620 South and 1090 West (Salt Lake County Jordan River Monument #4).
RM121	4236.30	Salt Lake County Bench Mark No. 642 stamped AHB-02@, located on northeast corner of 900 West Street bridge over Mill Creek.
RM122	4237.33	Salt Lake County Bench Mark in the intersection of 3300 South Street and 900 West Street.
RM127	4235.62	Monument set 500 feet west of intersection of 2610 South and 1030 West (Salt Lake County Jordan River Monument #2).
RM128	4232.22	Monument set 950 feet west of the north end of 1100 West (Salt Lake County Jordan River Monument #3).



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 1 SOUTH, RANGE 1 WEST.

LEGEND

To obtain more detailed information in areas where Base Flood Elevations (BFEs)and /or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS. BFEs shown on the FIRM are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and /or floodplain management.

ERM elevations listed on this map were obtained and/or developed to establish vertical control for determination of flood elevations and floodplain boundaries portrayed on this map. Users should be aware that these ERM elevations may have changed since the publication of this map. To obtain up-to-date elevaton information on National Geodetic Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

Coastal BFE's shown on this map may apply only landward of 0.0' NGVD. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and /or floodplain management purposes when they are higher than the elevations shown on this FIRM.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction ; no base flood elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year floodplain.
- **ZONE D** Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

RM7 — Elevation Reference Mark

M2 — River Mile

97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFE's, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, A1-A30, AH, AO, A99, V, VE and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 1/20 inch.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and /or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101-591).

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
SEPTEMBER 21, 2001

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:

Map revised May 15, 2002 to increase base flood elevations, to add base flood elevations, to add special flood hazard areas, to change zone designations, to reflect updated topographic information, to incorporate previously issued letter of map revision, to change floodway, and to update corporate limits.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE IN FEET
500 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

SALT LAKE COUNTY, UTAH AND INCORPORATED AREAS

PANEL 283 OF 625
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
SOUTH SALT LAKE, CITY OF	490219	0283	F
WEST VALLEY CITY, CITY OF	490245	0283	F

MAP NUMBER
49035C0283 F

MAP REVISED:
MAY 15, 2002

Federal Emergency Management Agency

SWCA
ENVIRONMENTAL CONSULTANTS
Sound Science. Creative Solutions.®

257 East 200 South, Suite 200
Salt Lake City, Utah 84111
Tel 801.322.4307 Fax 801.322.4308
www.swca.com

TECHNICAL MEMORANDUM

To: Adam Jones
Brown and Caldwell
6975 South Union Park Center, Suite 490
Midvale, Utah 84047

From: Joseph Carlo, Biologist

Date: September 24, 2018

Re: Central Valley Water Reclamation Facility Wetland and Wildlife Technical Memorandum / SWCA Project No. 39801

INTRODUCTION

On August 20, 2018, SWCA Environmental Consultants (SWCA) was contacted by Brown and Caldwell to perform a wetlands and waters of the United States (WOUS) survey; a cultural (archeological) resources survey; and a threatened, endangered, and sensitive species (TES) assessment to support the completion of an environmental assessment for upgrades at the Central Valley Water Reclamation Facility in Salt Lake City, Utah. SWCA conducted these efforts to better analyze the potential effects of upgrading the existing water treatment facilities. This memorandum presents the methods and results for the WOUS survey and TES assessment.

METHODS

Pre-field Analysis

Prior to field surveys, SWCA reviewed aerial photographs, topographic maps, and National Wetlands Inventory (NWI)–mapped wetlands[1] to identify potential wetlands and WOUS within the survey area. The survey area is approximately 42 acres and includes all potential areas of development for the Central Valley Water Reclamation Facility upgrades.

To prepare for TES plant and wildlife species surveys, SWCA obtained a resource list from the U.S. Fish and Wildlife Service Information for Planning and Consultation (IPaC)[2] website (Appendix A). This resource list identifies any TES plant and wildlife species, and their critical habitats, that could occur within the survey area.

[1] U.S. Fish and Wildlife Service (USFWS). 2015. National Wetlands Inventory. Available at: http://www.fws.gov/wetlands/Data/Mapper.html. Accessed September 9, 2018.

[2] USFWS. 2018. IPaC Resource List. IPaC: Information for Planning and Consultation. Available at: https://ecos.fws.gov/ipac. Accessed September 12, 2018.

Field Survey

On September 10, 2018, SWCA visited the Central Valley Water Reclamation Facility survey area. One SWCA biologist walked meandering transects throughout the survey area while searching for wetlands, potential WOUS, and TES wildlife and plant species. The SWCA biologist also surveyed for any potentially suitable habitat for TES species found in or near the survey area and evaluated habitat based on the IPaC resource list. Wetlands or other WOUS were surveyed for in accordance with *Corps of Engineers Wetlands Delineation Manual*[3] and the *Regional Supplement to the U.S. Army Corps of Engineers Wetland Delineation Manual: Arid West Region*.[4] Additionally, all plant and wildlife species observed in the survey area were documented. The TES and WOUS surveys were conducted simultaneously with an SWCA archaeologist performing cultural resource surveys.

RESULTS

Pre-field Analysis

NWI-mapped wetlands were identified within the survey area. However, these mapped resources are human-made wastewater tanks and systems associated with the Central Valley Water Reclamation Facility. These mapped resources were determined not to be wetlands or other WOUS. The nearest relatively permanent water to the survey area is Mill Creek and is located approximately 300 feet north of the survey area. Activities associated with construction at the Central Valley Water Reclamation Facility would not be anticipated to affect this resource.

The IPaC resource list reveals four TES plant and wildlife species that could occur in the survey area: Canada lynx (*Lynx canadensis*), yellow-billed cuckoo (*Coccyzus americanus*), June sucker (*Chasmistes liorus*), and Ute ladies'-tresses (*Spiranthes diluvialis*). There are no critical habitats of TES species identified by IPaC within the survey area.

Field Survey

The survey area has been heavily developed and includes various buildings, landscaped lawns, water-treatment tanks, and other impervious surfaces associated with the Central Valley Water Reclamation Facility. There are no naturally occurring habitat types within the survey area. The landscaped lawns are dominated by Kentucky blue grass (*Poa pratensis*) with occasional occurrences of dandelion species (*Taraxacum* spp.) and red-clover (*Trifolium pretense*). The survey area is also surrounded by a large fence that may act as a barrier to some wildlife species.

No wetlands or other WOUS were identified within the survey area. Wetland vegetation and any hydrology sources or waterways were not observed during field surveys. Figure 1 presents a results map outlining the survey area and includes photo points taken during field surveys. Photographs taken at these photo points are provided in Appendix B and help characterize the survey area.

No federally listed TES plant or animal species were observed during field surveys. Habitat within the survey area is heavily developed and does not meet the habitat requirements for Canada lynx, yellow-billed cuckoo, June sucker, or Ute ladies'-tresses as defined by the USFWS[5]. Incidental wildlife

[3] Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1*. Vicksburg, Mississippi: U.S. Army Corps of Engineers Waterways Experiment Station.

[4] U.S. Army Corps of Engineers (USACE). 2008a. *Regional Supplement to the U.S. Army Corps of Engineers Wetland Delineation Manual: Arid West Version 2.0.* Vicksburg, Mississippi: USACE Research and Development Center.

[5] USFWS. 2018. Environmental Conservation Online System. Available at: https://ecos.fws.gov/ecp/. Accessed September 9, 2018.

observations included Brewer's blackbird (*Euphagus cyanocephalus*), European starling (*Sturnus vulgaris*), Franklin's gull (*Leucophaeus pipixcan*), killdeer (*Charadrius vociferous*), rock pigeon (*Columba livia*), and white-faced ibis (*Plegadis chihi*). None of these species exhibited breeding behavior. No old or recently used migratory bird nests were identified during the visit, suggesting that this site is not regularly utilized for breeding by migratory bird species protected under the Migratory Bird Treaty Act (MBTA)

In general, this site is characterized by regularly maintained vegetation and is enclosed by fencing on all sides of the property, as such it would not be expected that this site would be regularly utilized by wildlife species or used for migratory bird breeding habitat. No wetlands or waterbodies were identified within the survey area during the field visit; however, best management practices are recommended to avoid any potential discharge or runoff from construction practices into Mill Creek (if necessary), which is located approximately 300 feet north of the survey area.

[6] Romin, L., and J. Muck. 2002. *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances*. Salt Lake City, Utah: U.S. Fish and Wildlife Service.

Figure 1. Survey area and photo points.

APPENDIX A

IPaC Resource List

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Salt Lake County, Utah

Local office

Utah Ecological Services Field Office

- (801) 975-3330
- (801) 975-3331

2369 West Orton Circle, Suite 50
West Valley City, UT 84119-7603

http://www.fws.gov
http://www.fws.gov/utahfieldoffice/

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act requires Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are not shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Canada Lynx Lynx canadensis There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3652	Threatened

Birds

NAME	STATUS
Yellow-billed Cuckoo Coccyzus americanus There is proposed critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS
June Sucker Chasmistes liorus There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/4133	Endangered

Flowering Plants

NAME	STATUS
Ute Ladies'-tresses Spiranthes diluvialis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2159	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act [1] and the Bald and Golden Eagle Protection Act [2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Brewer's Sparrow Spizella breweri This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9291	Breeds May 15 to Aug 10
Clark's Grebe Aechmophorus clarkii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jan 1 to Dec 31
Golden Eagle Aquila chrysaetos This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/1680	Breeds Dec 1 to Aug 31
Green-tailed Towhee Pipilo chlorurus This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9444	Breeds May 1 to Aug 10
Lesser Yellowlegs Tringa flavipes This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Lewis's Woodpecker Melanerpes lewis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9408	Breeds Apr 20 to Sep 30

Marbled Godwit Limosa fedoa This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9481	Breeds elsewhere
Olive-sided Flycatcher Contopus cooperi This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31
Pinyon Jay Gymnorhinus cyanocephalus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9420	Breeds Feb 15 to Jul 15
Virginia's Warbler Vermivora virginiae This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9441	Breeds May 1 to Jul 31
Willet Tringa semipalmata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 5
Willow Flycatcher Empidonax traillii This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/3482	Breeds May 20 to Aug 31

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

Wildlife refuges and fish hatcheries

REFUGE AND FISH HATCHERY INFORMATION IS NOT AVAILABLE AT THIS TIME

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER POND

- PUSCx
- PABFx
- PABF

RIVERINE

R4SBCx

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

APPENDIX B

Survey Area Photographs

Figure B-1. Photo point PP01, view facing south.

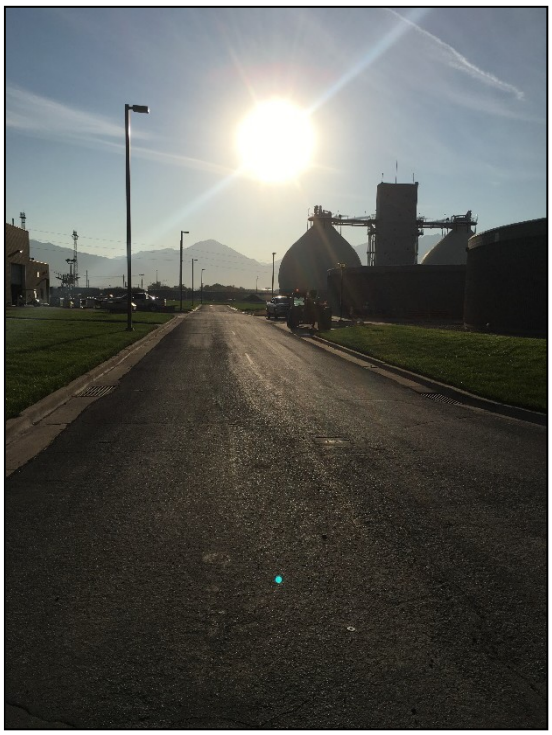

Figure B-2. Photo point PP01, view facing east.

Figure B-3. Photo point PP02, view facing north.

Figure B-4. Photo point PP02, view facing south.

Figure B-5. Photo point PP03, view facing northwest.

Figure B-6. Photo point PP03, view facing south.

Figure B-7. Photo point PP04, view facing east.

Figure B-8. Photo point PP04, view facing north.

Figure B-9. Photo point PP05, view facing northwest.

Figure B-10. Photo point PP06, view facing southeast.

Figure B-11. Photo point PP07, view facing west.

Appendix H – Antidegradation Review (ADR) and Wasteload Allocation (WLA)

ANTIDEGRADATION REVIEW FORM
UTAH DIVISION OF WATER QUALITY

Instructions

The objective of antidegradation rules and policies is to protect existing high quality waters and set forth a process for determining where and how much degradation is allowable for socially and/or economically important reasons. In accordance with Utah Administrative Code (UAC R317-2-3), an antidegradation review (ADR) is a permit requirement for any project that will increase the level of pollutants in waters of the state. The rule outlines requirements for Level I and Level II ADRs, as well as public comment procedures. This review form is intended to assist the applicant and Division of Water Quality (DWQ) staff in complying with the rule but is not a substitute for the complete rule in R317-2-3.5. Additional details can be found in the *Utah Antidegradation Implementation Guidance* and relevant sections of the guidance are cited in this review form.

ADRs should be among the first steps of an application for a UPDES permit because the review helps establish treatment expectations. The level of effort and amount of information required for the ADR depends on the nature of the project and the characteristics of the receiving water. To avoid unnecessary delays in permit issuance, the Division of Water Quality (DWQ) recommends that the process be initiated at least one year prior to the date a final approved permit is required.

DWQ will determine if the project will impair beneficial uses (Level I ADR) using information provided by the applicant and whether a Level II ADR is required. The applicant is responsible for conducting the Level II ADR. For the permit to be approved, the Level II ADR must document that all feasible measures have been undertaken to minimize pollution for socially, environmentally or economically beneficial projects resulting in an increase in pollution to waters of the state.

For permits requiring a Level II ADR, this antidegradation form must be completed and approved by DWQ before any UPDES permit can be issued. Typically, the ADR form is completed in an iterative manner in consultation with DWQ. The applicant should first complete the statement of social, environmental and economic importance (SEEI) in Part C and determine the parameters of concern (POC) in Part D. Once the POCs are agreed upon by DWQ, the alternatives analysis and selection of preferred alternative in Part E can be conducted based on minimizing degradation resulting from discharge of the POCs. Once the applicant and DWQ agree upon the preferred alternative, the review is considered complete, and the form must be signed, dated, and submitted to DWQ.

For additional clarification on the antidegradation review process and procedures, please contact Nicholas von Stackelberg (801-536-4374) or Dave Wham (801-536-4337).

Utah Division of Water Quality
Antidegradation Review Form

Part A: Applicant Information

Facility Name: Central Valley Water Reclamation Facility

Facility Owner: Central Valley Water Reclamation Facility

Facility Location: 800 Central Valley Road, So. Salt Lake City, UT 84119

Form Prepared By: Brown and Caldwell

Outfall Number: 001

Receiving Water: Mill Creek tributary to Jordan River

What Are the Designated Uses of the Receiving Water (R317-2-6)?
Domestic Water Supply: None
Recreation: 2B - Secondary Contact
Aquatic Life: 3C - Nongame Fish
Agricultural Water Supply: 4
Great Salt Lake: None

Category of Receiving Water (R317-2-3.2, -3.3, and -3.4): Category 3

UPDES Permit Number (if applicable): UT0024392

Effluent Flow Reviewed: 84 MGD Maximum Monthly Flow, 140 MGD Maximum Hourly Flow
Typically, this should be the maximum daily discharge at the design capacity of the facility. Exceptions should be noted.

What is the application for? (check all that apply)

☐ A UPDES permit for a new facility, project, or outfall.

☒ A UPDES permit renewal with an expansion or modification of an existing wastewater treatment works.

☐ A UPDES permit renewal requiring limits for a pollutant not covered by the previous permit and/or an increase to existing permit limits.

☐ A UPDES permit renewal with no changes in facility operations.

Part B. Is a Level II ADR required?

This section of the form is intended to help applicants determine if a Level II ADR is required for specific permitted activities. In addition, the Executive Secretary may require a Level II ADR for an activity with the potential for major impact on the quality of waters of the state (R317-2-3.5a.1).

B1. The UPDES permit is new or is being renewed and the proposed effluent concentration and loading limits are higher than the concentration and loading limits in the previous permit and any previous antidegradation review(s).

☒ **Yes** (Proceed to Part B2 of the Form)

☐ **No** No Level II ADR is required and there is no need to proceed further with review questions.

B2. Will any pollutants use assimilative capacity of the receiving water, i.e. do the pollutant concentrations in the effluent exceed those in the receiving waters at critical conditions? For most pollutants, effluent concentrations that are higher than the ambient concentrations require an antidegradation review. For a few pollutants, such as dissolved oxygen, an antidegradation review is required if the effluent concentrations are less than the ambient concentrations in the receiving water. (Refer to Section 3.3 of Implementation Guidance)

☒ **Yes** (Proceed to Part B3 of the Form)

☐ **No** No Level II ADR is required and there is no need to proceed further with review questions.

B3. Are water quality impacts of the proposed project temporary and limited (Section 3.3.3 of Implementation Guidance)? Proposed projects that will have temporary and limited effects on water quality can be exempted from a Level II ADR.

☐ **Yes** Identify the reasons used to justify this determination in Part B3.1 and proceed to Part G. No Level II ADR is required.

☒ **No** A Level II ADR is required (Proceed to Part C)

B3.1 Complete this question only if the applicant is requesting a Level II review exclusion for temporary and limited projects (see R317-2-3.5(b)(3) and R317-2-3.5(b)(4)). For projects requesting a temporary and limited exclusion please indicate the factor(s) used to justify this determination (check all that apply and provide details as appropriate) (Section 3.3.3 of Implementation Guidance):

☐ Water quality impacts will be temporary and related exclusively to sediment or turbidity and fish spawning will not be impaired.

Factors to be considered in determining whether water quality impacts will be temporary and limited:

a) The length of time during which water quality will be lowered:
b) The percent change in ambient concentrations of pollutants:
c) Pollutants affected:
d) Likelihood for long-term water quality benefits:
e) Potential for any residual long-term influences on existing uses:
f) Impairment of fish spawning, survival and development of aquatic fauna excluding fish removal efforts:

Additional justification, as needed:

Level II ADR

Part C, D, E, and F of the form constitute the Level II ADR Review. The applicant must provide as much detail as necessary for DWQ to perform the antidegradation review. Questions are provided for the convenience of applicants; however, for more complex permits it may be more effective to provide the required information in a separate report. Applicants that prefer a separate report should record the report name here and proceed to Part G of the form.

Optional Report Name: *Central Valley Water Reclamation Facility- Facility Plan July 3, 2019*

Part C. Is the degradation from the project socially and economically necessary to accommodate important social or economic development in the area in which the waters are located?

The applicant must provide as much detail as necessary for DWQ to concur that the project is socially and economically necessary when answering the questions in this section. More information is available in Section 6.2 of the Implementation Guidance.

C1. Describe the social and economic benefits that would be realized through the proposed project, including the number and nature of jobs created and anticipated tax revenues.

The proposed project involves improvements to an existing wastewater treatment facility. The overarching goals of wastewater treatment are the protection of public health and the environment which will indirectly promote social and economic benefits for the community. This project will create jobs during construction phases of the work. Following construction, the project is expected to require an additional five (5) full time employees for plant operations.

C2. Describe any environmental benefits to be realized through implementation of the proposed project.

This project is aimed at improving water quality. Environmental benefits will be improved water quality in the receiving waters- Mill Creek, Jordan River and ultimately the Great Salt Lake since the amount of nutrients (nitrogen and phosphorus) discharged will be reduced. The mass of Total Phosphorus discharged each day is expected to be reduced by roughly 65% from over 1,200 lb/day to below 425 lb/day. The mass of Total Nitrogen discharged each day is expected to be reduced by nearly 45% from over 7,600 lb/day to below 4,300 lb/day. The concentration of ammonia nitrogen, NH_3-N, in the effluent will also be reduced since the treatment process is designed to fully nitrify (NH_3-N < 1.0 mg/L) under most conditions. This will reduce the toxicity of the discharge effluent

C3. Describe any social and economic losses that may result from the project, including impacts to recreation or commercial development.

Social and economic losses are not anticipated with this project.

C4. Summarize any supporting information from the affected communities on preserving assimilative capacity to support future growth and development.

The planned improvements will reduce the mass loading of nutrients to the receiving water and will effectively restore assimilative capacity in the receiving water.

C5. Please describe any structures or equipment associated with the project that will be placed within or adjacent to the receiving water.

This project does not contemplate construction of any facilities within or adjacent to the receiving water.

Part D. Identify and rank (from increasing to decreasing potential threat to designated uses) the parameters of concern.

Parameters of concern are parameters in the effluent at concentrations greater than ambient concentrations in the receiving water. The applicant is responsible for identifying parameter concentrations in the effluent and DWQ will provide parameter concentrations for the receiving water. More information is available in Section 3.3.3 of the Implementation Guidance.

Parameters of Concern:

Rank	Pollutant	Ambient		Effluent	
		Concentration / Units	Basis	Concentration / Units	Basis
1	Total Ammonia-Nitrogen, TAN	0.177 mg/L	(1)	<3.7 mg/L	UPDES Permit Limit (2)
				2.53 mg/L	WRF Effluent (1)
2	Total Suspended Solids, TSS	22.3 mg/L	(1)	<25 mg/L	UPDES Permit Limit (2)
				6.97 mg/L	WRF Effluent (1)
3	Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	2.48 mg/L	(1)	<16 mg/L	UPDES Permit Limit (2)
				9.55 mg/L	WRF Effluent (1)
4	Dissolved Oxygen, DO	9.2 mg/L	(4)	>5.0 mg/L	UPDES Permit Limit (2)
				6.78 mg/L	WRF Effluent (1)
5	Total Phosphorus, TP	0.132 mg/L	(1)	<1.0 mg/L	Future UPDES Permit Limit (3)
				3.09 mg/L	WRF Effluent (1)
6	Copper	1.57 ug/L	(1)	23.3 ug/L	UPDES Permit Limit (2)
				15.3 ug/L	WRF Effluent (1)
7	pH	7.93 SU	(4)	6.5-9 SU	UPDES Permit Limit (2)
				7.18 SU	WRF Effluent (1)
8	Total Nitrogen, TN	2.23 mg/L	(1)	19.69 mg/L	(1)
9	Arsenic	1.75 ug/L	(1)	9.85 ug/L	(1)(5)
10	Boron	114.8 ug/L	(1)	290.0 ug/L	(1)(5)
11	Iron	10 ug/L	(1)	227.9 ug/L	(1)(5)
12	Lead	0.191ug/L	(1)	4.05 ug/L	(1)(5)
13	Nickel	2.5 ug/L	(1)	8.02 ug/L	(1)(5)
14	Silver	0.25 ug/L	(1)	4.05 ug/L	(1)(5)

15	Zinc	11.15 ug/L	(1)	47.08 ug/L	(1)(5)
16	Chromium - Total	1.54 ug/L	(4)	9.85 ug/L	(1)(5)
17	Selenium	1.5 ug/L	(1)	2.12 ug/L	(1)(5)
18	Temperature	11.63 deg C	(4)	21.80 deg C	(1)(5)
19	Total Dissolved Solids	637 mg/L	(4)	844 mg/L	(1)(5)

(1) Basis of ambient and WRF Effluent concentrations are monitoring data provided by CVWRF for the past 10 years (2009-2019). Ambient data are from samples taken from Mill Creek upstream of the CVWRF outfall.
(2) UPDES Permit Limits are from CVWRF's current permit. The most restrictive permit limits are noted for seasonal parameters.
(3) Future permit limit to become effective in 2025. Currently no limit.
(4) Basis of data is from Mill Creek Water Quality data provided by Utah DWQ.
(5) Effluent concentration is the 80th percentile of data set for respective parameter.

Pollutants Evaluated that are not Considered Parameters of Concern:

Pollutant	Ambient Concentration	Effluent Concentration	Justification
ecoli	254.3#/100mL	126 #/100mL	UPDES permit limits lower than ambient
		26.15 #/100mL	WRF Effluent – concentration is lower than ambient
Cadmium	1.3 ug/L	0.93 ug/L	Effluent concentration is lower than ambient.
Cyanide	(1)	12.9 ug/L	
Mercury	0.125 ug/L	0.0036 ug/L	Effluent concentration is lower than ambient.

(1) Ambient data not available.

Part E. Alternative Analysis Requirements of a Level II Antidegradation Review.

Level II ADRs require the applicant to determine whether there are feasible less-degrading alternatives to the proposed project. For new and expanded discharges, the Alternatives Analysis must be prepared under the supervision of and stamped by a Professional Engineer registered with the State of Utah. DWQ may grant an exception from this requirement under certain circumstances, such as the alternatives considered potentially feasible do not include engineered treatment alternatives. More information regarding the requirements for the Alternatives Analysis is available in Section 5 of the Implementation Guidance.

E1. The UPDES permit is being renewed without any changes to flow or concentrations. Alternative treatment and discharge options including changes to operations and maintenance were considered and compared to the current processes. No economically feasible treatment or discharge alternatives were identified that were not previously considered for any previous antidegradation review(s).

☐ **Yes** (Proceed to Part F)

☒ **No or Does Not Apply** (Proceed to E2)

E2. Attach as an appendix to this form a report that describes the following factors for all alternative treatment options 1) a technical description of the treatment process, including construction costs and continued operation and maintenance expenses, 2) the mass and concentration of discharge constituents, and 3) a description of the reliability of the system, including the frequency where recurring operation and maintenance may lead to temporary increases in discharged pollutants. Most of this information is typically available from a Facility Plan, if available.

Report Name: *Central Valley Water Reclamation Facility Plan July 3, 2019*

E3. Describe the proposed method and cost of the baseline treatment alternative. The baseline treatment alternative is the minimum treatment required to meet water quality based effluent limits (WQBEL) as determined by the preliminary or final wasteload analysis (WLA) and any secondary or categorical effluent limits.

The baseline alternative is considered to be Alternative 1a Chemical Phosphorus removal. This option considers addition of chemical to remove phosphorus to meet the future TBPEL of <1.0 mg/L for Total Phosphorus. The 20 year NPV for this alternative is $226.7M without sidestream treatment and $240.4M with sidestream treatment.

E4. Were any of the following alternatives feasible and affordable?

Alternative	Feasible	Reason Not Feasible/Affordable
Pollutant Trading	NO	Trading program not established in project area and there are no feasible trading partners that could offer the number of credits required by CVWRF.
Water Recycling/Reuse	NO	Costs to produce and convey reclaimed water would be prohibitively expensive compared to current secondary water supply. CVWRF does not own the water rights which limits the feasibility of reuse. Facility does currently produce reclaimed water for local golf course irrigation, but this is a small percent of the total flow.
Land Application	NO	Land requirements would be high for the volume of flow. The WRF is located in an urban area and large tracts of contiguous land are scarce and costs are high.
Connection to Other Facilities	NO	Not practical to direct all flow to another facility. Diverting a portion of flow would still require upgrades to existing facility to meet TBPEL and future nutrient limits.
Upgrade to Existing Facility	Yes	This is the selected alternative.
Total Containment	NO	Not practical given the volume of flow.
Improved O&M of Existing Systems	NO	This would not achieve the required levels of nutrient removal.
Seasonal or Controlled Discharge	NO	Not feasible due to the large volume of flow.
New Construction	NO	Not feasible due to costs.
No Discharge	NO	Not feasible due to the large volume of flow.

E5. From the applicant's perspective, what is the preferred treatment option?

The applicants preferred option is to upgrade their existing facility to include biological nutrient removal using the Westside BNR process with primary sludge and return activated sludge, RAS, fermentation**.** The treatment process will be upgraded in phases based on regulatory requirements.

E6. Is the preferred option also the least polluting feasible alternative?

☐ **Yes**

☒ **No**

If no, what were less degrading feasible alternative(s)? A membrane bioreactor (MBR) process or the inclusion if tertiary filtration were potentially less

degrading alternatives (when considering a constituent such as TSS), tertiary filters alone will not address the phosphorus or nitrogen removal goals. Tertiary filtration will have to be coupled with another nutrient removal approach. The selected alternative is least polluting than the baseline alternative, the baseline alternative 1a only targets phosphorus and places a long term burden on the environment due to extensive chemical use. The selected alternative removes phosphorus, and nitrogen (both total nitrogen and reduced ammonia).

If no, provide a summary of the justification for not selecting the least polluting feasible alternative and if appropriate, provide a more detailed justification as an attachment.

The MBR alternative was significantly more expensive than the selected alternative and also had a disadvantage in that it did not fully utilize existing assets. The costs for an MBR based alternative are provided in the Facility Plan. Including tertiary filtration was also expensive and would increase costs by more than 20%.

Part F. Optional Information

F1. Does the applicant want to conduct optional public review(s) in addition to the mandatory public review? Level II ADRs are public noticed for a thirty day comment period. More information is available in Section 3.7.1 of the Implementation Guidance.

☒ **No**

☐ **Yes**

F2. Does the project include an optional mitigation plan to compensate for the proposed water quality degradation?

☒ **No**

☐ **Yes**

Report Name: ☐

Part G. Certification of Antidegradation Review

G1. Applicant Certification

The form should be signed by the same responsible person who signed the accompanying permit application or certification.

Based on my inquiry of the person(s) who manage the system or those persons directly responsible for gathering the information, the information in this form and associated documents is, to the best of my knowledge and belief, true, accurate, and complete.

Print Name: Phillip Heck

Signature: Phillip Heck

Date: 7/5/2019

G2. DWQ Approval

To the best of my knowledge, the ADR was conducted in accordance with the rules and regulations outlined in UAC R-317-2-3.

Print Name: Nicholas Von Stackelberg

Signature: Nicholas v Stackelberg

Date: 6/10/2020

Utah Division of Water Quality
ADDENDUM
Statement of Basis
Wasteload Analysis and Level 1 Antidegradation Review
Facility Upgrade – Preliminary Intended For Planning Purposes

Date: **April 2, 2019**

Facility: **Central Valley Water Reclamation Facility**
UPDES No. UT-0024392

Receiving water: **Mill Creek**

This addendum summarizes the wasteload analysis that was performed to determine water quality based effluent limits (WQBEL) for this discharge. Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on in-stream water quality. The wasteload analysis also takes into account downstream designated uses (UAC R317-2-8). Projected concentrations are compared to numeric water quality standards to determine acceptability. The numeric criteria in this wasteload analysis may be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

Discharge
Outfall 001: Mill Creek → Jordan River
The design flow for the proposed facility upgrade to Biological Nutrient Removal for Outfall 001 is 84.0 MGD maximum monthly average and 140.0 MGD maximum daily.

Discharge water quality data was obtained from monitoring site 4992500 Central Valley WWTP. The seasonal average was calculated for temperature, pH and hardness.

Receiving Water
The receiving water for Outfall 001 is Mill Creek, which is tributary to the Jordan River.

Per UAC R317-2-13.10, the designated beneficial uses for Mill Creek from confluence with Jordan River to Interstate Highway 15 are 2B, 3C, and 4.

- *Class 2B - Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.*

- *Class 3C - Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain.*

- *Class 4 - Protected for agricultural uses including irrigation of crops and stock watering.*

The critical background flow for the wasteload analysis is considered the lowest stream flow for seven consecutive days with a ten year return frequency (7Q10). Daily flow records were obtained for Salt Lake County flow gage 490 Mill Creek at 460 West for the period 1979-2012. The 7Q10 critical flow was calculated using the EPA computer software DFLOW V3.1b (Table 1).

Table 1: Mill Creek critical low flow (7Q10)

Season	Flow (cfs)
Annual	6.2
Summer	9.5
Fall	6.4
Winter	7.6
Spring	14.0

Receiving water quality data was obtained from monitoring site 4992505 Mill Creek above Central Valley WWTP. The average seasonal value was calculated for background conditions.

Mixing Zone

Per UAC R317-2-5, since the discharge is more than twice the background receiving water flow, the discharge is considered instantaneously fully mixed. Therefore, no mixing zone is allowed.

Protection of Downstream Uses

Per UAC R317-2-8, *all actions to control waste discharges under these rules shall be modified as necessary to protect downstream designated uses*. The effluent limits for the discharge to the Jordan River were determined as part of the Jordan River POTW WLA. Any WQBELs that are lower in the Jordan River POTW WLA will supersede those for the Mill Creek WLA.

TMDL

Mill Creek is listed as impaired for E. coli and benthic macroinvertebrates according to the 303(d) list in the 2016 Integrated Report. Downstream segments of the Jordan River are listed for dissolved oxygen (DO), total phosphorus (TP), dissolved copper, total dissolved solids (TDS), E coli, and benthic macroinvertebrates. Phase 1 of the Jordan River TMDL determined that total organic matter is the parameter of concern for the DO impairment in the Jordan River (Cirrus Ecological Solutions and Stantec Consulting, 2013).

Parameters of Concern

The potential parameters of concern identified for the discharge/receiving water are total suspended solids (TSS), $CBOD_5$, dissolved oxygen (DO), pH, total ammonia (TAN), total nitrogen (TN), total phosphorus (TP) and metals as determined in consultation with the UPDES Permit Writer.

Ammonia Limits

The water quality criteria for ammonia toxicity are dependent on temperature and pH. Based on information provided by Central Valley, the temperature and pH of the effluent after plant upgrade are anticipated to be similar to current levels. However, if the pH of the effluent changes under the plant upgrade, the ammonia limits calculated in this WLA will be modified.

The chronic ammonia criterion is also dependent on the presence or absence of fish early life stages (ELS). An evaluation was conducted to determine the presence or absence of ELS in lower Mill Creek (UDWQ 2016). The provisional determination was that ELS are absent in Mill Creek from the Central Valley WRF discharge to the confluence with the Jordan River from November through February, subject to Division of Wildlife Resources review.

In 2013, EPA adopted new criteria for ammonia that are lower than current criteria based on the presence of unionid mussels and nonpulmonate snails. States are required to adopt the criteria or establish alternative, scientifically defensible criteria. UDWQ is proposing site-specific ammonia criteria for Mill Creek below I-15 and for the Jordan River below Mill Creek to 900 South based on unionid mussels not being residents (UDWQ 2018). For planning purposes, ammonia limits were calculated to meet the current criteria, the most stringent potential criteria with mussels criteria and the proposed criteria with mussels absent for both acute and chronic conditions (Table 2 and 3).

Table 2: Ammonia Limits (mg/L) to Meet Acute Ammonia Criteria (1 hour average)

Season	Current 1999 Criteria[1]	2013 EPA Mussels Present[1]	2013 EPA Mussels Absent[1]	Proposed Site-Specific Criteria[2]
Summer (ELS Present)	20.8	7.2	19.4	19.4
October (ELS Present)	15.7	7.1	16.4	16.4
November-December (ELS Absent)	15.7	10.3	16.4	16.4
January-February (ELS Absent)	12.3	9.8	12.9	12.9
March (ELS Present)	12.3	8.5	12.9	12.9
Spring (ELS Present)	15.6	6.9	16.2	16.2

1: Criteria apply to Mill Creek and Jordan River downstream of Mill Creek.
2: Site-specific criteria for Mill Creek below I-15 and Jordan River from Mill Creek to 900 South based on unionid mussels absent and 1999 criteria for Jordan River below 900 South.

Table 3: Ammonia Limits (mg/L) to Meet Chronic Ammonia Criteria (30 day average)

Season	Current 1999 Criteria[1]	2013 EPA Mussels Present[1]	2013 EPA Mussels Absent[1]	Proposed Site-Specific Criteria[2]
Summer (ELS Present)	3.7	1.7	6.4	5.8
October (ELS Present)	4.5	2.1	6.3	6.3
November-December (ELS Absent)	5.8	2.6	9.9	7.5
January-February (ELS Absent)	6.7	3.0	11.4	10.0
March (ELS Present)	5.9	2.9	6.5	6.5
Spring (ELS Present)	5.3	2.4	6.6	6.6

1: Criteria apply to Mill Creek and Jordan River downstream of Mill Creek.
2: Site-specific criteria for Mill Creek below I-15 and Jordan River from Mill Creek to 900 South based on unionid mussels absent and 1999 criteria for Jordan River below 900 South.

WET Limits

The percent of effluent in the receiving water in a fully mixed condition, and acute and chronic dilution in a not fully mixed condition are calculated in the WLA in order to generate WET limits. The LC_{50} (lethal concentration, 50%) percent effluent for acute toxicity and the IC_{25} (inhibition concentration, 25%) percent effluent for chronic toxicity, as determined by the WET test, needs to be below the WET limits, as determined by the WLA. The WET limit for LC_{50} is typically 100% effluent and does not need to be determined by the WLA.

Table 4: WET Limits for IC_{25}

Season	Percent Effluent
Summer	93%
Fall	95%
Winter	94%
Spring	90%

Effluent Limits

A mass balance mixing analysis was used to calculate the WLA for each constituent. The WQBELs for constituents are summarized in Appendix A and the ammonia criteria are summarized in Appendix B.

Due to the impairment of downstream segments of the Jordan River for DO and the TMDL currently under development, a wasteload allocation was not completed for DO, $CBOD_5$, TN and TP. The effluent limits for DO were set equal to the water quality criteria in Mill Creek. The effluent limits for $CBOD_5$ were set by maintaining the load in the Jordan River POTW WLA, i.e. the concentration was scaled to the new discharge rate.

The effluent limit for TDS was set equal to the water quality criteria. The effluent limits for E. coli were set equal to secondary standards, which are less than the water quality criteria.

Table 5: Water Quality Based Effluent Limits Summary

Effluent Constituent	Acute		Chronic	
	Limit	Averaging Period	Limit	Averaging Period
Flow (MGD)	140.0	Maximum	84.0	30 days
Total Recoverable Metals (µg/l)				
Aluminum	771	1 hour	N/A	4 days
Arsenic	350		157	
Cadmium	5.8		0.5	
Chromium VI	16.4		11.5	
Chromium III	1,402		187	
Copper	37.7		23.3	
Cyanide	22.5		5.3	
Iron	1,028		NONE	
Lead	207		8.2	
Mercury	2.5		0.012	
Nickel	1,186		134	
Selenium	18.9		4.7	
Silver	20.6		NONE	
Zinc	297		305	
Dissolved Oxygen (mg/l)	5.0[a]	Minimum	5.0	30 days
$CBOD_5$ (mg/l)[a]				
Summer	27.0	7-day	14.2	30 days
Fall	28.0		17.8	
Winter	28.0		17.8	
Spring	28.0		17.8	
a: Limit from Jordan River POTW WLA based on protection of downstream uses.				

For parameters without a WQBEL, permit limits should be set according to rules found in R317-1-3 and categorical UPDES discharge requirements.

Antidegradation Level I Review

The objective of the Level I ADR is to ensure the protection of existing uses, defined as the beneficial uses attained in the receiving water on or after November 28, 1975. No evidence is known that the existing uses deviate from the designated beneficial uses for the receiving water. Therefore, the beneficial uses will be protected if the discharge remains below the WQBELs presented in this wasteload.

Since the flow and pollutant loads are increasing as a result of the expansion of the facility, a Level II Antidegradation Review (ADR) is required for this discharge.

Prepared by:
Nicholas von Stackelberg, P.E.
Standards and Technical Services Section

Documents:

WLA Document: *centralvalley_wla_upgrade_2019-04-02.docx*
Mill Creek Wasteload Analysis: *centralvalley_potw_wla_2018_upgrade.xlsx*
Jordan River Wasteload Analysis: *jordan_potw_q2kw_wla_2018.xlsm*

References:

Utah Wasteload Analysis Procedures Version 1.0. 2012. Utah Division of Water Quality.

Jordan River Total Maximum Daily Load Water Quality Study – Phase 1. 2013. Cirrus Ecological Solutions and Stantec Consulting. Utah Division of Water Quality.

Wasteload Analysis for Jordan River POTWs – Final. 2016. Utah Division of Water Quality.

2016 Integrated Report. 2016. Utah Division of Water Quality.

Lower Mill Creek and Jordan River Early Life Stage Review. Memorandum from Ben Holcomb dated May 20, 2016. Utah Division of Water Quality.

Criteria Support Document: Site-specific criteria for recalculation of the USEPA 2013 aquatic life ammonia water quality criteria for a segment of Mill Creek and the Jordan River, Salt Lake County, Utah. November 21, 2018 Review Draft. Utah Division of Water Quality.

WASTELOAD ANALYSIS [WLA] Date: 11/30/2018

Appendix A: Mass Balance Mixing Analysis for Conservative Constituents

Discharging Facility:	Central Valley Water Reclamation Facility		
UPDES No:	UT-0024392		
Permit Flow [MGD]:	140.0	Annual	Max. Daily
	83.9	Annual	Max. Monthly
Receiving Water:	Mill Creek		
Stream Classification:	2B, 3C, 4		
Stream Flows [cfs]:	6.2	All Seasons	Critical Low Flow
	9.5	Summer	Jul-Sep
	6.4	Fall	Oct-Dec
	7.6	Winter	Jan-Mar
	14.0	Spring	Apr-Jun
Downstream Receiving Water:	Jordan River		
Stream Classification:	2B, 3B, 3D, 4		
Fully Mixed:	YES		
Acute River Width:	100%		
Chronic River Width:	100%		
Combined Flow [cfs]			
Acute	222.8	All Seasons	Critical Low Flow
	226.1	Summer	Jul-Sep
	223.0	Fall	Oct-Dec
	224.2	Winter	Jan-Mar
	230.6	Spring	Apr-Jun
Chronic	136.0	All Seasons	Critical Low Flow
	139.3	Summer	Jul-Sep
	136.2	Fall	Oct-Dec
	137.4	Winter	Jan-Mar
	143.8	Spring	Apr-Jun

Modeling Information

A simple mixing analysis was used to determine the effluent limits.

All model numerical inputs, intermediate calculations, outputs and graphs are available for discussion, inspection and copy at the Division of Water Quality.

Effluent Limitations

Current State water quality standards are required to be met under a variety of conditions including in-stream flows targeted to the 7-day, 10-year low flow (R317-2-9).

Other conditions used in the modeling effort reflect the environmental conditions expected at low stream flows.

Effluent Limitations for Protection of Recreation (Class 2B Waters)

No dilution in unnamed irrigation ditch.

Physical

Parameter	Maximum Concentration
pH Minimum	6.5
pH Maximum	9.0
Turbidity Increase (NTU)	10.0

Bacteriological

E. coli (30 Day Geometric Mean)	206	(#/100 mL)
E. coli (Maximum)	668	(#/100 mL)

Effluent Limitations for Protection of Aquatic Wildlife (Class 3C Waters)

Physical

Parameter	Maximum Concentration
Temperature (deg C)	27
Temperature Change (deg C)	4

Dissolved Oxygen (mg/L)	Standard	Limit
Minimum	3.0	3.0
30-day Average	5.0	5.0

Inorganics	Chronic Standard (4 Day Average)	Acute Standard (1 Hour Average)
Parameter	Standard	Standard
Phenol (mg/L)		0.010
Hydrogen Sulfide (Undissociated) [mg/L]		0.002

Ammonia-Total (mg/L) - Current Criteria

	Chronic (30-day ave)			Acute (1-hour ave)		
Season	Standard	Background	Limit	Standard	Background	Limit
Summer (ELS Present)	3.5	0.03	3.7	19.9	0.03	20.8
October (ELS Present)	4.3	0.03	4.5	15.3	0.03	15.7
November-December (ELS Absent)	5.5	0.03	5.8	15.3	0.03	15.7
January-February (ELS Absent)	6.3	0.02	6.7	11.9	0.02	12.3
March (ELS Present)	5.6	0.02	5.9	11.9	0.02	12.3
Spring (ELS Present)	4.8	0.03	5.3	14.6	0.03	15.6

Ammonia-Total (mg/L) - EPA 2013 Criteria with Mussels Present

	Chronic (30-day ave)			Acute (1-hour ave)		
Season	Standard	Background	Limit	Standard	Background	Limit
Summer (ELS Present)	1.6	0.03	1.7	6.9	0.03	7.2
October (ELS Present)	2.0	0.03	2.1	6.9	0.03	7.1
November-December (ELS Absent)	2.5	0.03	2.6	10.0	0.03	10.3
January-February (ELS Absent)	2.9	0.02	3.0	9.4	0.02	9.8
March (ELS Present)	2.7	0.02	2.9	8.2	0.02	8.5
Spring (ELS Present)	2.2	0.03	2.4	6.4	0.03	6.9

Ammonia-Total (mg/L) - EPA 2013 Criteria with Mussels Absent

	Chronic (30-day ave)			Acute (1-hour ave)		
Season	Standard	Background	Limit	Standard	Background	Limit
Summer (ELS Present)	5.9	0.03	6.4	18.6	0.03	19.4
October (ELS Present)	6.0	0.03	6.3	15.9	0.03	16.4
November-December (ELS Absent)	9.4	0.03	9.9	15.9	0.03	16.4
January-February (ELS Absent)	10.8	0.02	11.4	12.4	0.02	12.9
March (ELS Present)	6.1	0.02	6.5	12.4	0.02	12.9
Spring (ELS Present)	6.0	0.03	6.6	15.2	0.03	16.2

Metals-Total Recoverable

	Chronic (4-day ave)			Acute (1-hour ave)		
Parameter	Standard[1]	Background	Limit	Standard[1]	Background	Limit
Aluminum (µg/L)[3]	N/A	5.0	N/A	750	5.0	771
Arsenic (µg/L)	150	2.0	157	340	2.0	350
Cadmium (µg/L)	0.5	0.08	0.5	5.7	0.08	5.8
Chromium VI (µg/L)	11.0	1.5	11.5	16.0	1.5	16.4
Chromium III (µg/L)	177	1.5	186	1363	1.5	1402
Copper (µg/L)	22.2	1.6	23.2	36.6	1.6	37.7
Cyanide (µg/L)[2]	5.2	3.5	5.3	22.0	3.5	22.5
Iron (µg/L)				1000	10.0	1028
Lead (µg/L)	7.8	0.2	8.2	201	0.2	207
Mercury (µg/L)[2]	0.012	0.008	0.012	2.4	0.008	2.5
Nickel (µg/L)	128	2.5	134	1153	2.5	1186
Selenium (µg/L)	4.6	1.6	4.7	18.4	1.6	18.9
Silver (µg/L)				20.1	0.3	20.6
Tributylin (µg/L)[2]	0.072	0.048	0.073	0.46	0.048	0.47
Zinc (µg/L)	291	11.2	305	289	11.2	297

1: Based upon a Hardness of 290 mg/l as CaCO3

2: Background concentration assumed 67% of chronic standard

3: Where the pH is equal to or greater than 7.0 and the hardness is equal to or greater than 50 ppm as CaC03 in the receiving water after mixing, the 87 µg/L chronic criterion (expressed as total recoverable) does not apply.

Organics [Pesticides]

	Chronic (4-day ave)		Acute (1-hour ave)	
Parameter	**Standard**	**Limit**	**Standard**	**Limit**
Aldrin (µg/L)			1.5	1.5
Chlordane (µg/L)	0.0043	0.0043	1.2	1.2
DDT, DDE (µg/L)	0.001	0.001	0.55	0.55
Diazinon (µg/L)	0.17	0.17	0.17	0.17
Dieldrin (µg/L)	0.0056	0.0056	0.24	0.24
Endosulfan, a & b (µg/L)	0.056	0.056	0.11	0.11
Endrin (µg/L)	0.036	0.036	0.086	0.086
Heptachlor & H. epoxide (µg/L)	0.0038	0.0038	0.26	0.26
Lindane (µg/L)	0.08	0.08	1.0	1.0
Methoxychlor (µg/L)			0.03	0.03
Mirex (µg/L)			0.001	0.001
Nonylphenol (µg/L)	6.6	6.6	28.0	28.0
Parathion (µg/L)	0.0130	0.0130	0.066	0.066
PCB's (µg/L)	0.014	0.014		
Pentachlorophenol (µg/L)	15.0	15.0	19.0	19.0
Toxephene (µg/L)	0.0002	0.0002	0.73	0.73

Radiological

	Maximum Concentration
Parameter	**Standard**
Gross Alpha (pCi/L)	15

Effluent Limitation for Protection of Agriculture (Class 4 Waters)

	Maximum Concentration	
Parameter	**Standard**	**Limit**
Total Dissolved Solids (mg/L)	1200	1200
Boron (µg/L)	75	75
Arsenic (µg/L)	100	100
Cadmium (µg/L)	10	10
Chromium (µg/L)	100	100
Copper (µg/L)	200	200
Lead (µg/L)	100	100
Selenium (µg/L)	50	50
Gross Alpha (pCi/L)	15	15

Freshwater total ammonia criteria based on Title R317-2-14 Utah Administrative Code
Discharge without Mixing Zone

INPUT	Summer	October	Nov-Dec	Jan-Feb	March	Spring
Flow (cfs) - Fully Mixed	226.1	223.0	223.0	224.2	224.2	230.6
Mill Creek	*9.5*	*6.4*	*6.4*	*7.6*	*7.6*	*14.0*
Central Valley	*216.6*	*216.6*	*216.6*	*216.6*	*216.6*	*216.6*
Temperature (deg C) - Fully Mixed	23.5	20.3	15.8	13.6	15.2	20.6
Mill Creek	*18.2*	*9.8*	*6.5*	*6.7*	*10.2*	*12.1*
Central Valley	*23.7*	*20.6*	*16.1*	*13.8*	*15.4*	*21.2*
pH - Fully Mixed	7.50	7.67	7.67	7.81	7.81	7.69
Mill Creek	*7.95*	*7.89*	*7.89*	*7.82*	*7.82*	*7.89*
Central Valley	*7.48*	*7.66*	*7.66*	*7.81*	*7.81*	*7.68*
Beneficial use classification:	3C	3C	3C	3C	3C	3C

OUTPUT	Summer	October	Nov-Dec	Jan-Feb	March	Spring
Total ammonia nitrogen criteria (mg N/L):						
Current Acute:	19.9	15.3	15.3	11.9	11.9	14.6
2013 Acute Mussels Present:	6.9	6.9	10.0	9.4	8.2	6.4
Proposed 2013 Acute Mussels Absent:	18.6	15.9	15.9	12.4	12.4	15.2

Freshwater total ammonia criteria based on Title R317-2-14 Utah Administrative Code
Discharge without Mixing Zone

INPUT	Summer	October	Nov-Dec	Jan-Feb	March	Spring
Flow (cfs) - Fully Mixed	139.3	136.2	136.2	137.4	137.4	143.8
Mill Creek	*9.5*	*6.4*	*6.4*	*7.6*	*7.6*	*14.0*
Central Valley	*129.8*	*129.8*	*129.8*	*129.8*	*129.8*	*129.8*
Temperature (deg C) - Fully Mixed	21.7	18.1	14.3	12.6	13.4	16.6
Mill Creek	*18.2*	*9.8*	*6.5*	*6.7*	*10.2*	*12.1*
Central Valley	*22.0*	*18.5*	*14.7*	*12.9*	*13.6*	*17.1*
pH - Fully Mixed	7.15	7.19	7.19	7.14	7.14	7.18
Mill Creek	*7.95*	*7.89*	*7.89*	*7.82*	*7.82*	*7.89*
Central Valley	*7.10*	*7.16*	*7.16*	*7.10*	*7.10*	*7.10*
Are fish early life stages present?	Yes	Yes	No	No	Yes	Yes
OUTPUT						
Total ammonia nitrogen criteria (mg N/L):						
Current Chronic - Fish Early Life Stages Present:	**3.5**	**4.3**	5.4	5.6	**5.6**	**4.8**
Current Chronic - Fish Early Life Stages Absent:	3.5	4.3	**5.5**	**6.3**	6.0	4.8
2013 Chronic - Mussels Present:	1.6	2.0	2.5	2.9	2.7	2.2
Proposed Chronic - Mussels Absent/Fish Early Life Stages Present:	**5.9**	**6.0**	6.0	6.1	**6.1**	**6.0**
Proposed Chronic - Mussels Absent/Fish Early Life Stages Absent:	5.9	7.4	**9.4**	**10.8**	10.2	8.1