Stantec SMCFD

Superstition Mountains Community Facilities District No. 1

Wastewater Treatment Facility Phasing Plan

Stantec Project No. 181301439

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SMCFD NO. 1 WRF PHASING PLAN
Final Report

December 9, 2022
SMCFD No. 1

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Project Number:
181301439 | WRF Phasing Plan

Revision	Description	Author	Date	Quality Check	Date	Independent Review	Date
0	Draft	LH / KD	11/1/22	RM	10/31/22	JCM	11/4/2022
1	Final	KD	12/14/22	RM	12/14/22	JCM	12/14/22

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Executive Summary

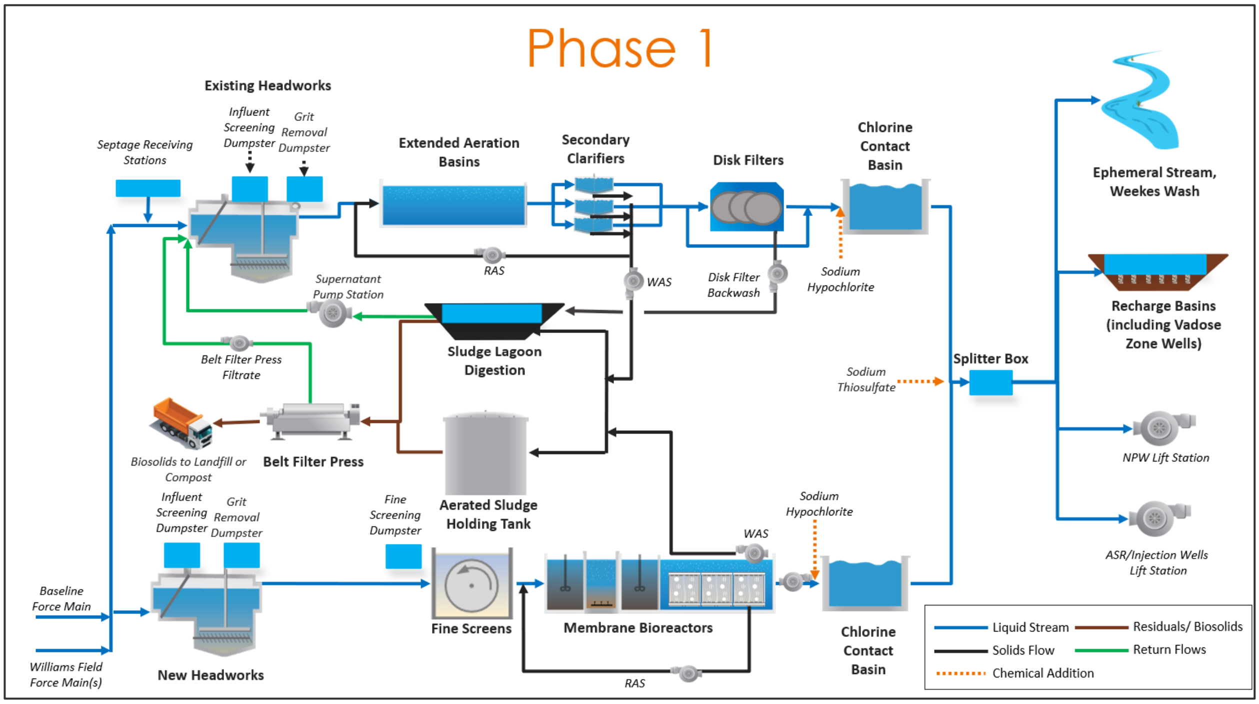
The Superstition Mountains Community Facilities District No. 1 (SMCFD) owns and operates a 2.1 million gallon per day (MGD) capacity (re-rating in progress for 3 MGD) water reclamation facility (WRF). A Water Reclamation Facility Master Plan (WRFMP) was completed in October 2022 and identified the wastewater treatment needs for the next 20 years of growth. The WRFMP includes wastewater flow projections and recommendations for treatment plant expansion, including a conversion to a membrane bioreactor (MBR) process.

This phasing plan is required to align the water quality goals identified in the WRFMP with needed expansions for the WRF. The MBR technology was recommended due to the compact site footprint which will support additional spreading basins on-site and avoid impacting existing treatment facilities during construction. The very high quality effluent produced by an MBR will support injection wells, off site irrigation, and potentially a source for an advanced water purification facility to produce potable water. It is expected that near-future effluent uses will include off site non-potable uses for open access irrigation and decorative lakes, as well as onsite and offsite recharge. Open access irrigation will require Class A+ effluent and expansion of the plant capacity will trigger rules for Best Available Demonstrated Control Technology (BADCT) which also requires Class A+ effluent.

Due primarily to a lack of customers to take the high-quality compost and other regulatory compliance issues, future biosolids disposal practice will be landfilling at the nearby landfill. Thus, the existing composting facility can be decommissioned.

The phasing plan includes four phases for implementation of capacity increases over the life of the facility. Phase 1 includes continued use of the existing Biolac™ treatment system to maximize the utilization of this resource for as long as it is practical and economical to maintain. The Phase 1 process flow diagram (PFD) is shown in **Figure ES-1**.

Figure ES-1. Process Flow Diagram for SMCFD No. 1 Phase 1



In Phase 2, the Biolac™ system is demolished in favor of the MBR process. Phase 2 will also include primary clarifiers and anaerobic digestion of biosolids, which will reduce overall facility energy consumption and reduce the mass of biosolids disposed.

Phase 3 and 4 will expand upon the process configuration established in Phase 2 with additional treatment structures and process equipment. The timing for implementation of Phases 3 and 4 is uncertain. Using the information available today, Phase 3 could be more than 20 years in the future. For this reason, some of the major structures and buried infrastructure will be built to accommodate Phases 1 and 2 now and expanded in Phase 3. This helps to optimize the capital expenditures to extend useful life of these facilities. The PFD for Phases 2 through 4 is shown in **Figure ES-2**.

Figure ES-2. Process Flow Diagram for SMCFD No. 1 Phases 2, 3, and 4

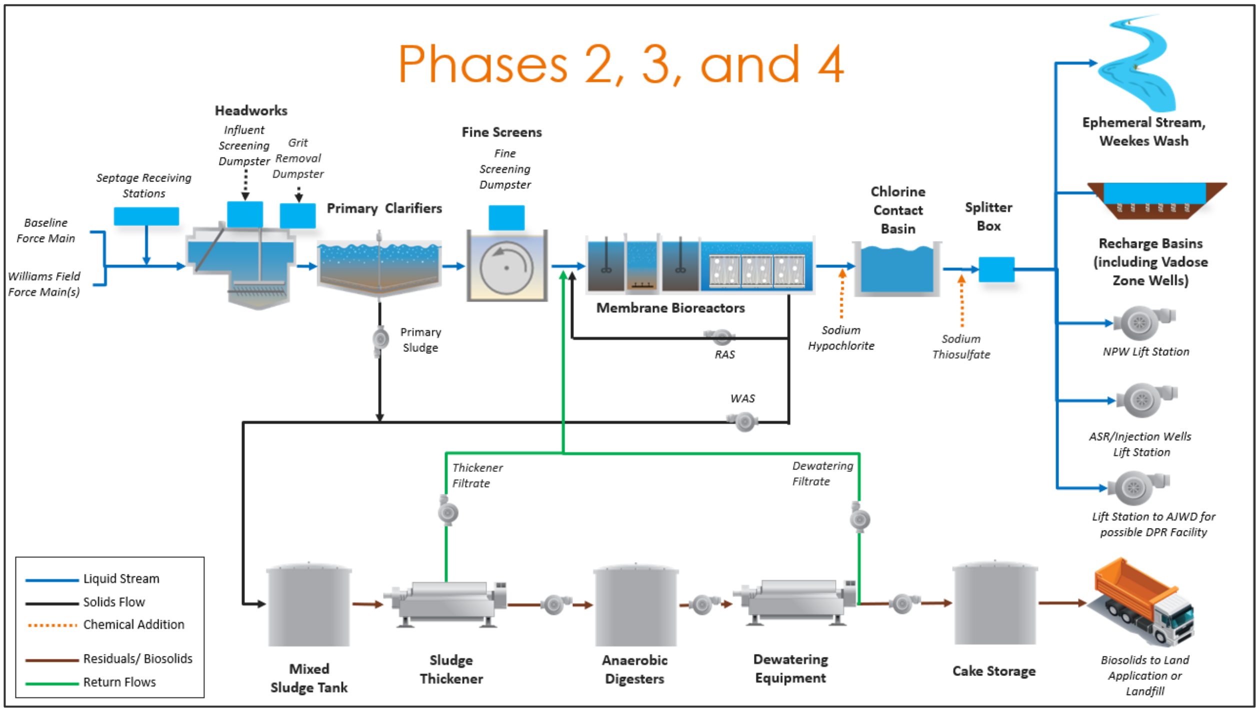


Table 1 summarizes the treatment capacity and number of process units planned for each phase. The number of process units includes sufficient redundant capacity for plant maintenance.

Table 1. SMCFD WRF Expansion - Phasing Plan Summary

	Phase			
	1	2	3	4
Year of Start of Construction	**2024**	**2038**	**>2050**	**>2050**
Capacity, AADF (MGD)	6.5	13	19.5	26
Liquid Stream				
Coarse Screens	2	3	4	5
Grit	2	2	2	3
Primary Clarifiers		2	3	4
Fine Screens	2	3	4	5
BNR Basins	2	4	6	7
MBR Tanks	4	6	8	10
Disinfection Channels	1	2	3	3
Solids Stream				
Thickening		2	3	3
Anaerobic Digesters		2	3	4
Dewatering Units	1	4	4	5
Sludge Holding Tanks	1	1	2	2

In addition to the treatment process facilities, Phase 1 will include new ancillary facilities including:

- New administration building with
  - Administrative Offices
  - Customer Service/Billing
  - Control Room
  - Laboratory
  - Meeting Room
  - Break Room
  - Shower and Locker Rooms
- New maintenance building

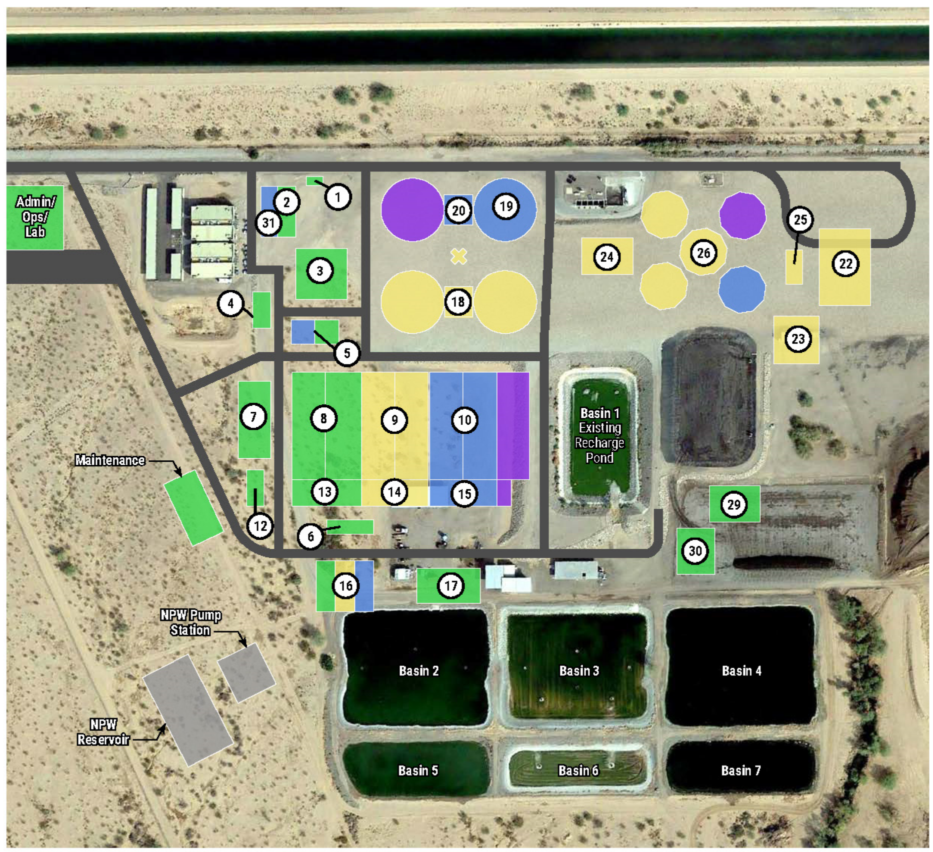
The existing power supply does not have capacity for expansion. A new electrical power supply and power distribution infrastructure will be installed in Phase 1. The existing SCADA system uses a PLC that is out-of-date and therefore a new SCADA system will be provided for all new facilities with the existing SCADA system maintained until Phase 2. **Figure ES-3** shows the SMCFD WRF site with phased improvements depicted in color.

Figure ES-3. SMCFD WRF Site Master Plan

Facility Legend

Item #	Item Description
1	Influent Splitter Structure
2	Phase 1 and 2 Headworks
3	Headworks Odor Control
4	Electrical Building 1
5	Fine Screening Facility
6	Bioreactor Odor Control
7	Blower Building
8	Biorereactors 1A/1B
9	Bioreactors 2A/2B
10	Bioreactors 3A/3B
11	Biorector 4
12	Electrical Building 2
13	Membrane Facility 1
14	Membrane Facility 2
15	Membrane Facility 3
16	Disinfection Channels/ Plant Water PS
17	Chemical Building
18	Primary Sed Basins 1 and 2, PSPS 1
19	Primary Sed Basin 3
20	Primary Sludge/ Scum Pump Station 2
21	Primary Sed Basin 4
22	Solids Handling Building
23	Solid Odor Control
24	Boiler Building and Flares
25	Electrical Building 3
26	Digesters 1, 2 and Digested Sludge Hold
27	Digester 3
28	Digester 4
29	Aerated Sludge Holding Tank
30	Belt Press Facility (Phase 1)
31	Phase 3 and 4 Headworks

Phase 1 Phase 3
Phase 2 Phase 4



Acronyms / Abbreviations

AAC	Arizona Administrative Code
AACE	Association for the Advancement of Cost Engineering
AAD	Average Annual Day
AADF	Annual Average Day Flow
AAP	Arizona Aquifer Protection
ADEQ	Arizona Department of Environmental Quality
ADMM	Average Day Maximum Month
ADMMF	Average Day Maximum Month Flow
AJWD	Apache Junction Water District
AMF	Average Day Annual Median Flow
ASR	Aquifer Storage Recovery
AWQS	Aquifer Wastewater Quality Standards
AZPDES	Arizona Pollutant Discharge Elimination System
AWC	Arizona Water Company
BADCT	Best Available Demonstrated Control Technology
BOD	Biological Oxygen Demand
CAP	Central Arizona Project

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHP	Combined Heat and Power
CMAD	Conventional Mesophilic Anaerobic Digestion
COD	Chemical Oxygen Demand
DPR	Direct Potable Reuse
EA	Each
EPA	United States Environmental Protection Agency
EDU	Equivalent Dwelling Unit
FOG	Fats, Oil and Grease
GPCD	Gallons per Day per Capita
I/O	Input-Output
IPS	Influent Pump Station
LV	Low Voltage
MBR	Membrane Bioreactor
MCC	Motor Control Center
MGD	Million Gallon per Day
MM	Maximum Month
MV	Medium Voltage
NEC	National Electrical Code
NH3	Ammonia

NPR	Non-Potable Reuse
O&M	Operation and Maintenance
OLR	Organic Loading Rate
OPCC	Opinion of Probable Construction Costs
P/DU	Person per Dwelling Unit
PDF	Peak Daily Flow
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	Perfluorobutane sulfonate
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
PHF	Peak Hour Flow
PSRP	Progress to Significantly Reduce Pathogens
SCADA	Supervisory Control and Data Acquisition
SDWA	Safe Drinking Water Act
SMCFD	Superstition Mountains Community Facilities District
SRP	Salt River Project
TKN	Total Kjeldahl Nitrogen
TSCA	Toxicity Substances Control Act
TSS	Total Suspended Solids

USF	Underground Storage Facility
UV	Ultraviolet
VOC	Volatile Organic Compound
VSS	Volatile Suspended Solids
WRF	Water Reclamation Facility
WRFMP	Water Reclamation Facility Master Plan

1 Project Background

1.1 Introduction

The Superstition Mountains Community Facilities District No. 1 (SMCFD) was established in July 1992 to provide sanitary sewer services and treatment for the City of Apache Junction (City). The district is an independent, public, non-profit utility with the rights and powers of special taxing districts. The operational system includes a sanitary sewer collection system, a lift station, and a 2.1 MGD (re-rating in progress for 3 MGD) capacity WRF. The treated wastewater is currently used for recharge in basins located within the WRF complex or discharged to the adjacent Unnamed Wash tributary connected to Siphon Draw. The Water Reclamation Facility Master Plan (WRFMP) was completed in October 2022 and identified the wastewater treatment needs for the next 20 years of growth in the existing planning area and future planning area. The WRFMP includes wastewater flow projections and recommendations for treatment plant expansion, including a conversion to membrane bioreactor (MBR) process for the high quality of effluent needed for future indirect or direct potable reuse (DPR) by the drinking water provider.

The phasing plan is required to align the water quality goals identified in the WRFMP with needed expansions for the WRF. The phasing plan will be centered on moving forward in a focused manner from existing Biolac™ treatment and sludge composting to MBR treatment and anaerobic sludge digestion at full buildout. The effluent quality is required to meet Arizona Department of Environmental Quality (ADEQ) A+ standard to match the proposed effluent reuse strategies which include ground water recharge, direct injection, ASR wells, non-potable pipe reuse, and ultimately DPR.

1.2 Scope of Work

The phasing plan will include a transition plan from the current Biolac™ treatment and sludge composting systems to a MBR and anaerobic digesters. The scope of work includes sizing treatment units to allow depiction at scale on site plans, but it is not the intent of the phasing plan effort to evaluate all possible treatment technology options. Rather, a reasonable assumption of suitable equipment and technologies, sized conservatively, will be used to demonstrate that the planned facilities will fit within the 97 acre site.

As part of the design process, proposals will be gathered from at least two manufacturer's representatives for comparable equipment and treatment systems. Future design efforts will include more detailed evaluations of specific technologies that can offer improvements in footprint, performance, price, and other factors. The phasing plan will also include a Class 4 opinion of probable construction costs (OPCC).

In general, the phasing plan includes the following:

- Four phases to the expansion
- Phase 1 increases WRF capacity to 6.5 MGD
    - The Biolac™ Facility will remain online
    - The new MBR Facility will be built in parallel to the existing Biolac™ Facility

- The two facilities will be operated simultaneously
- Some Phase 1 structures will be sized for Phase 2
- New Administrative and Maintenance Buildings will be sized for ultimate capacity

- Phase 2 increases WRF capacity to 13 MGD
  - Equipment will be added to get to Phase 2 capacity
  - The Biolac™ Facility will be decommissioned
- Phase 3 and 4 increases WRF capacity to 19.5 and 26 MGD, respectively
  - Structures will be deferred to save capital cost

2 Existing Facilities Summary

The SMCFD WRF has a rated capacity of 2.1 MGD (re-rating in progress for 3 MGD, as max month flow). The WRF receives flow from off site sanitary sewer lift stations (currently the Baseline Lift Station and Williams Field Lift Station under construction) and has a septage receiving facility onsite.

Existing unit processes at the SMCFD WRF consist of mechanical and manual bar screens, aerated grit removal, Biolac™ extended aeration basins, clarifiers, tertiary disc filters, and a chlorine contact tank for disinfection. Reclaimed water produced at the SMCFD WRF is used to recharge the aquifer through infiltration basins and recharge basins at the plant site but can also be discharged to Unnamed Wash. Descriptions of the existing WRF unit processes are provided in **Table 2**.

Table 2. Summary of Existing WRF Unit Processes

Unit Process	Facilities
Septage Receiving Stations	• Screening • Aerated holding tanks • Pump system
Headworks[1]	• 7.6 MGD peak hour capacity • Mechanical bar screen (installed 2022) • Screenings conveyor/compactor • Manual bar screen (bypass) • Aerated grit chamber • Grit classifier
Aeration Basins	• 3 MGD (re-rating in progress) total average day max month flow and load • Two trains, Parkson Biolac™ system • Aeration basins 2.12 MG each • Three turbo blowers (installation in progress)
Clarifiers[1]	• 3.17 MGD maximum month capacity • Three rectangular clarifiers each aeration basin • One RAS airlift pump per clarifier
Filtration	• One Leopold Ultrascreen Filter
Disinfection/Contact Basins[1]	• 7.2 MGD peak hour flow capacity • One chlorine contact chamber • Sodium hypochlorite for chlorination • Sodium thiosulfate for de-chlorination, respectively.
Solids Process and Handling	• 3.89 MGD average day maximum month flow equivalent • Two stabilization lagoons • Polymer addition system • Six sand drying beds, two solar drying beds (North and South)

[1] Capacity based on Findings from Rerating Study of SMCFD Water Reclamation Facility (WWTF 2018 Rerating Study, Tetra Tech, Inc, November 2019)

3 Projected Wastewater Flows and Loads

Plant influent and operational data, and the original design criteria for the SMCFD WRF were reviewed and evaluated to develop design criteria for flows, loads, and hydraulic considerations for the expansion of the facility. This section reviews the existing and projected populations, the existing and projected influent conditions, design flows, and loadings.

3.1 Population Projections

A significant population growth is expected in the SMCFD service area. The City of Apache Junction population is expected to increase at an average rate 1.8% per year based on findings from SMCFD's 2020 Master Plan. The existing service area population had an approximate population of 20,536 and it is estimated to increase at a rate of 2.0% per year. Furthermore, the Superstition Vistas planned development is expected to add 27,370 houses to the service area. Low, medium, and high growth projections have been evaluated for three different scenarios as shown in **Table 3**.

Table 3. Population Projections Based on Different Growth Assumptions from SMCFD's 2020 Master Plan

Year	Low Growth		Medium Growth		High Growth	
	EDUs	Population	EDUs	Population	EDUs	Population
2022	8,214	20,536	8,214	20,536	8,214	20,536
2025	8,717	21,793	9,767	23,893	9,767	24,943
2030	9,624	24,061	15,924	36,661	15,924	42,961
2035	10,626	26,565	22,776	50,865	22,776	63,015
2040	11,732	29,330	26,282	58,430	26,282	72,980
2045	12,953	32,383	27,953	63,595	27,953	79,201
2050	14,301	35,754	29,301	70,214	29,301	87,444

Notes:

(1) **EDU's for SMCFD existing service area and City of Apache Junction have been calculated based on a 2.5 people/EDU assumption.**

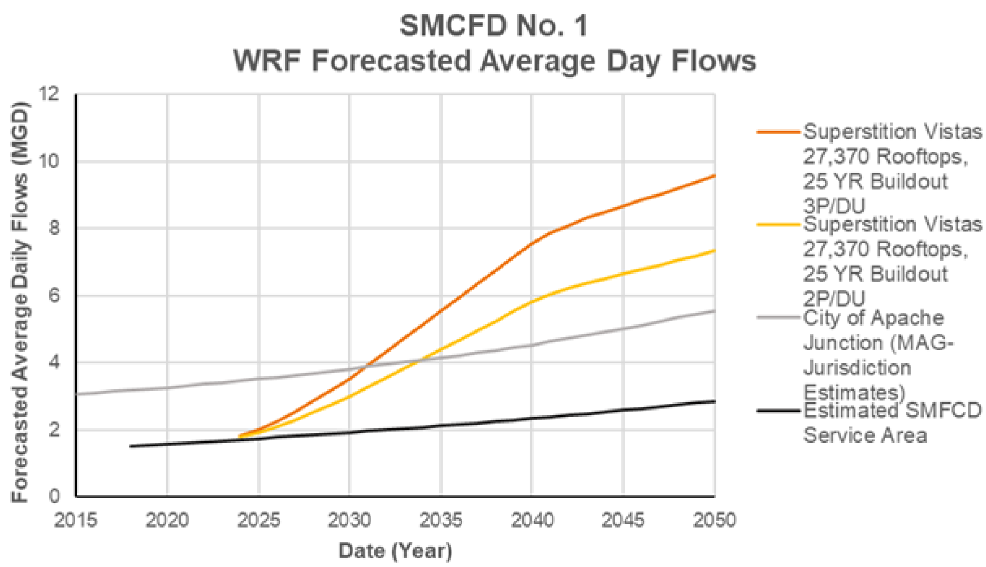
(2) **Low growth assumes a 2.0% growth rate for the existing service area and that Superstition Vistas planned development does not occur.**

(3) **Medium growth assumes a 2.0% growth rate for the existing service area and an average of 2 people/dwelling added by the Superstition Vistas planned development.**

(4) **High growth assumes a 2.0% growth rate for the existing service area and an average of 3 people/dwelling added by the Superstition Vistas planned development.**

Population growth has been converted to estimated WRF Average Day Flows by using an average per capita wastewater produced conversion of 80 gallons per day per capita (gpcd). Results are shown in **Figure 3-1**.

Figure 3-1. Estimated Average Day Flows for Current and Future Expected Development



3.2 Existing Influent Review and Projected Influent Conditions

A review of historical flow and loading data was completed. **Table 4** summarizes the daily sampling of the historical average influent and septage flows for the SMCFD WRF from January 2014 through July 2022. The AAF combined flow during the period evaluated was 1.45 MGD, while the ADMMF combined flow was 1.76 MGD.

Table 4. Historical Influent and Septage Flows, AAF, AMF, ADMMF, and PDF

Flow (MGD)	Influent	Septage	Combined
AAF	1.43	0.02	1.45
AMF	1.43	0.03	1.47
ADMMF	1.73	0.03	1.76
PDF	2.79	0.09	2.88

Notes:

(1) AAF = Average Day Annual Average Flow
(2) AMF = Average Day Annual Median Flow
(3) ADMMF = Average Day Maximum Month Flow (90th percentile of average day flows)
(4) PDF = Peak Day Flow

Figure 3-1 illustrates the daily historical combined flow for the SMCFD WRF from January 2014 through July 2022. Main takeaways from the influent flow include:

- The increase in daily flow during the winter is visible from approximately late November through April
- There is diminished fluctuation between winter and summer flows starting in 2020
- The daily flow has been increasing since 2020

Figure 3-2: Historical Combined Flows

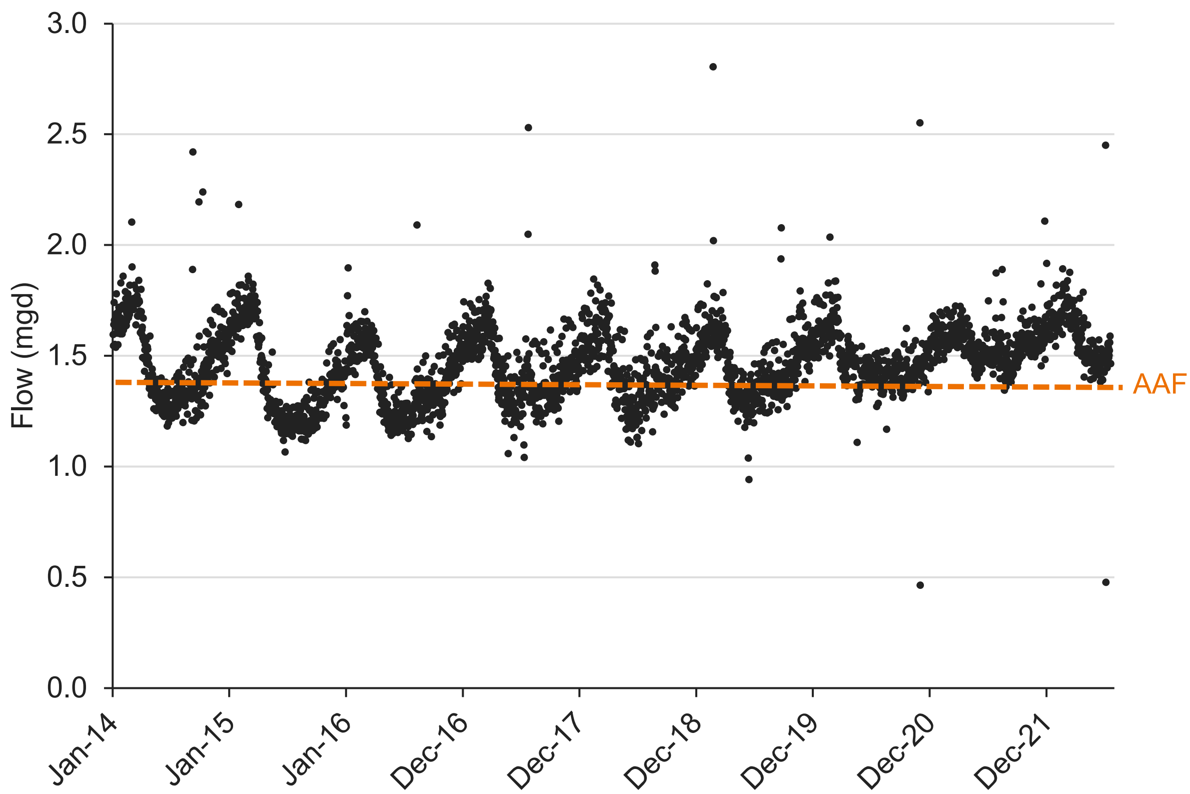


Figure 3-3 presents two weeks of diurnal influent flow in 2022. The February data set represents the winter month conditions (high flow) and June data set represents the summer conditions (low flow). The average daily flow during the two weeks was 1.4 MGD.

Figure 3-3: Diurnal Flow for 2022

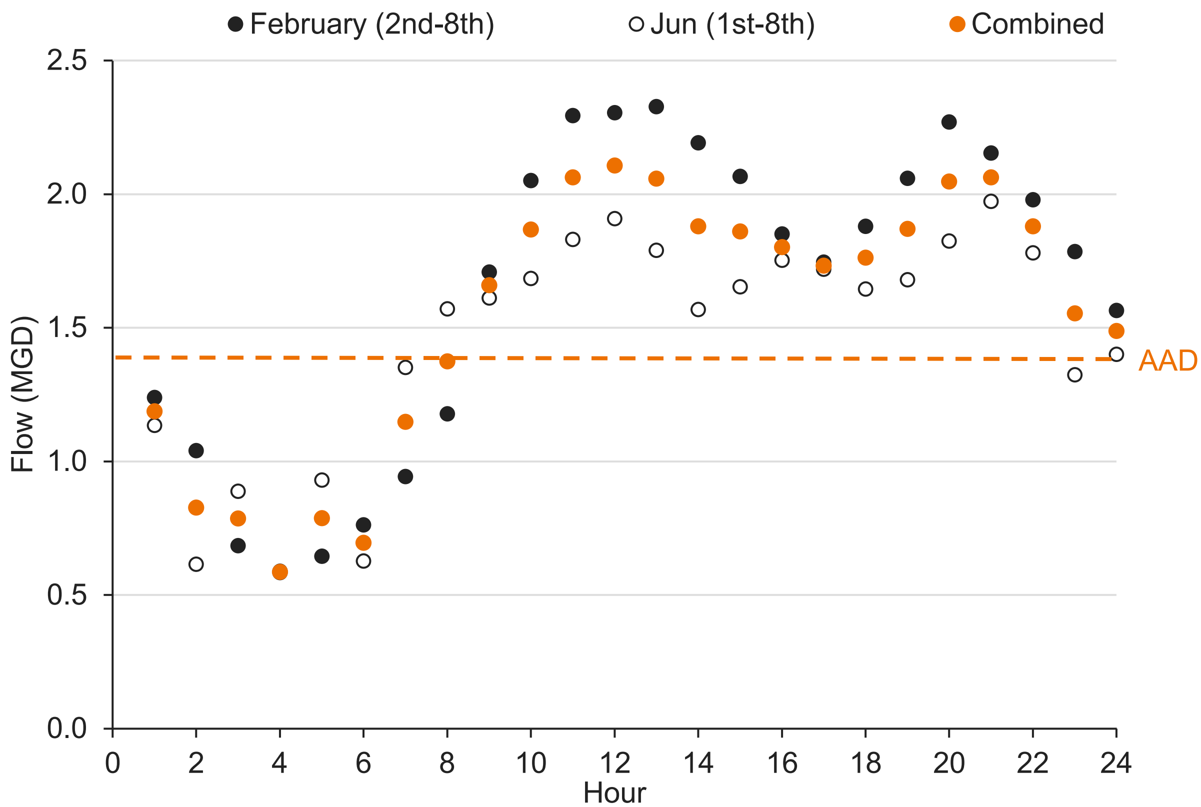


Table 5 summarizes average influent and septage concentrations for the SMCFD from January 2002 through July 2022. The time range of data analyzed for the concentration is considerably larger than the flow data since sampling of concentrations was inconsistent. Septage typically had higher BOD_5, COD, TSS, and NH_3-N concentrations than influent.

Table 5. Historical Influent and Septage concentrations for BOD, COD, TSS, and NH3-N

Concentrations (mg/L)	Parameter	Influent	Septage	Combined
BOD_5	AAD	306	1,729	335
	AM	290	1,320	313
	ADMM	432	3,330	516
	PD	510	5,520	723
COD	AAD	600	10,678	809
	AM	595	9,350	791
	ADMM	886	17,619	1,370
	PD	1,000	23,710	1,964
TSS	AAD	380	7,370	525
	AM	320	6,120	450
	ADMM	724	12,014	1,051
	PD	1,100	19,845	1,896
NH_3-N	AAD	43	60	43
	AM	40	58	40
	ADMM	50	82	51
	PD	71	118	73

Cumulative distribution functions for BOD_5, COD, TSS, and NH_3-N influent concentrations were plotted in **Figure 3-4**, **Figure 3-5**, **Figure 3-6**, and **Figure 3-7**. The primary takeaways from the cumulative distribution function for the concentrations were:

- BOD_5 data had several outliers and was modified to remove
  - Influent values > 505 mg/L
  - Septage values > 5,500 mg/L
- COD data had several outliers and was modified to remove
  - Influent values > 1,000 mg/L
  - Septage values > 25,000 mg/L
- TSS data had several outliers and was modified to remove
  - Influent values > 1,500 mg/L
  - Septage values > 20,000 mg/L
- No modifications were made to the NH3-N data

Figure 3-4: Preliminary BOD_5 Influent Concentration Cumulative Distribution Function

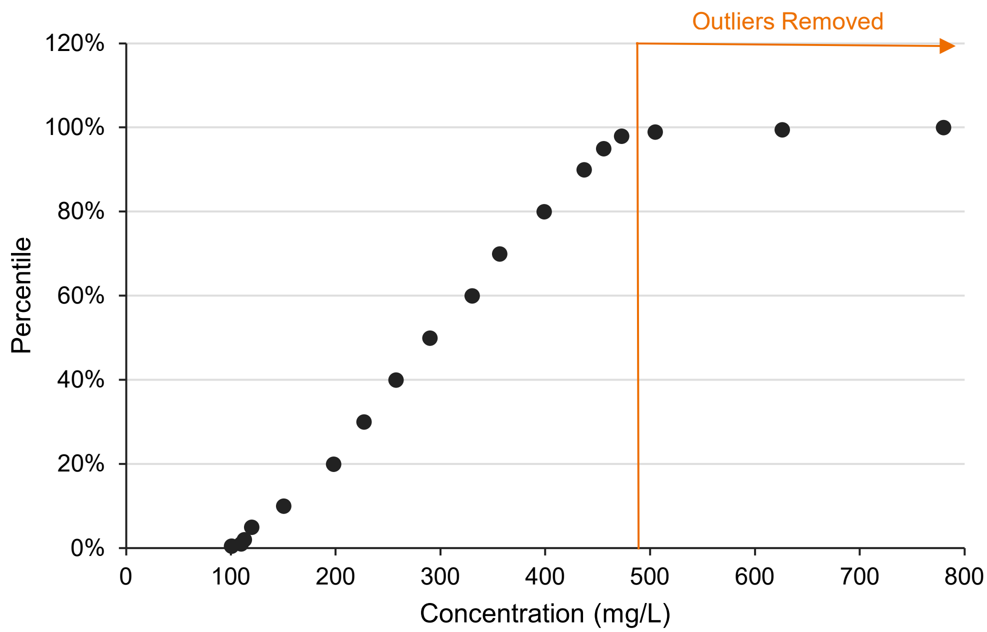


Figure 3-5: Preliminary COD Influent Concentration Cumulative Distribution Function

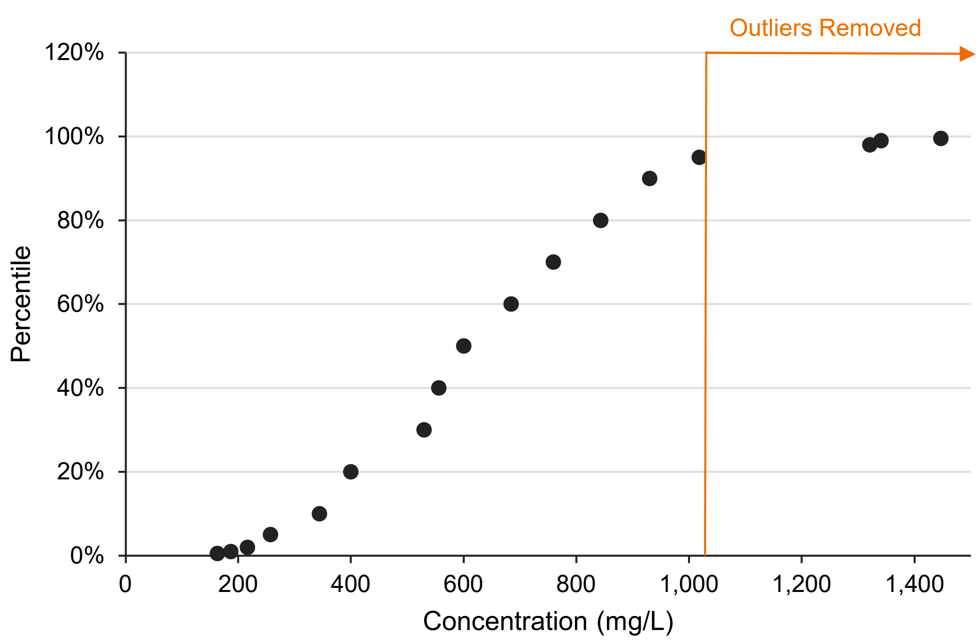


Figure 3-6: Preliminary TSS Influent Concentration Cumulative Distribution Function

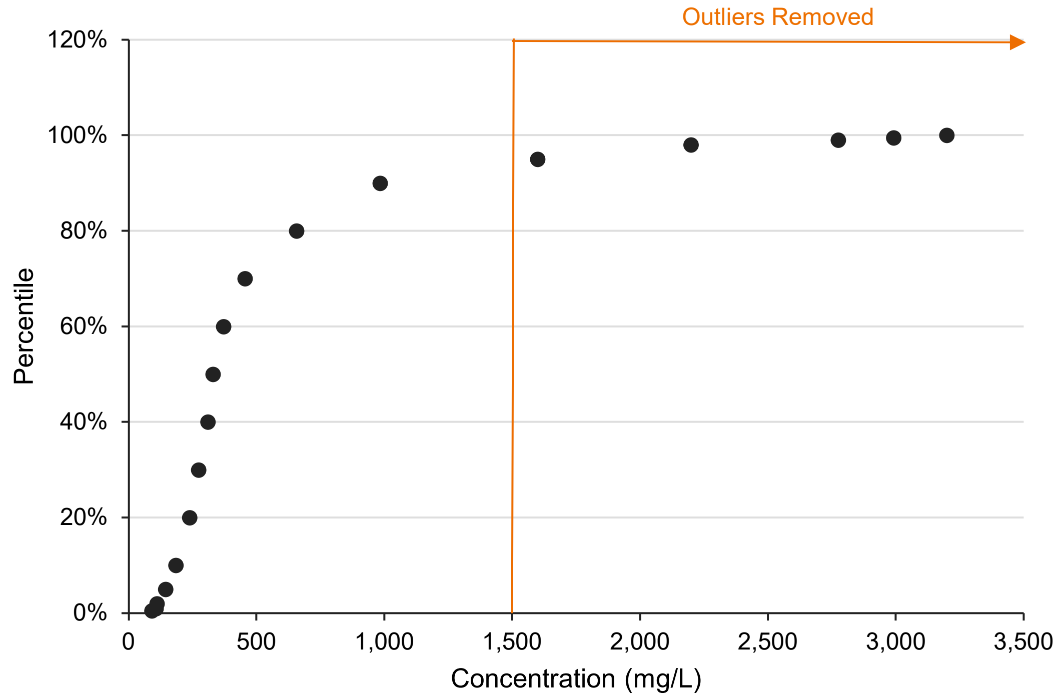


Figure 3-7: Preliminary NH_3-N Influent Concentration Cumulative Distribution Function

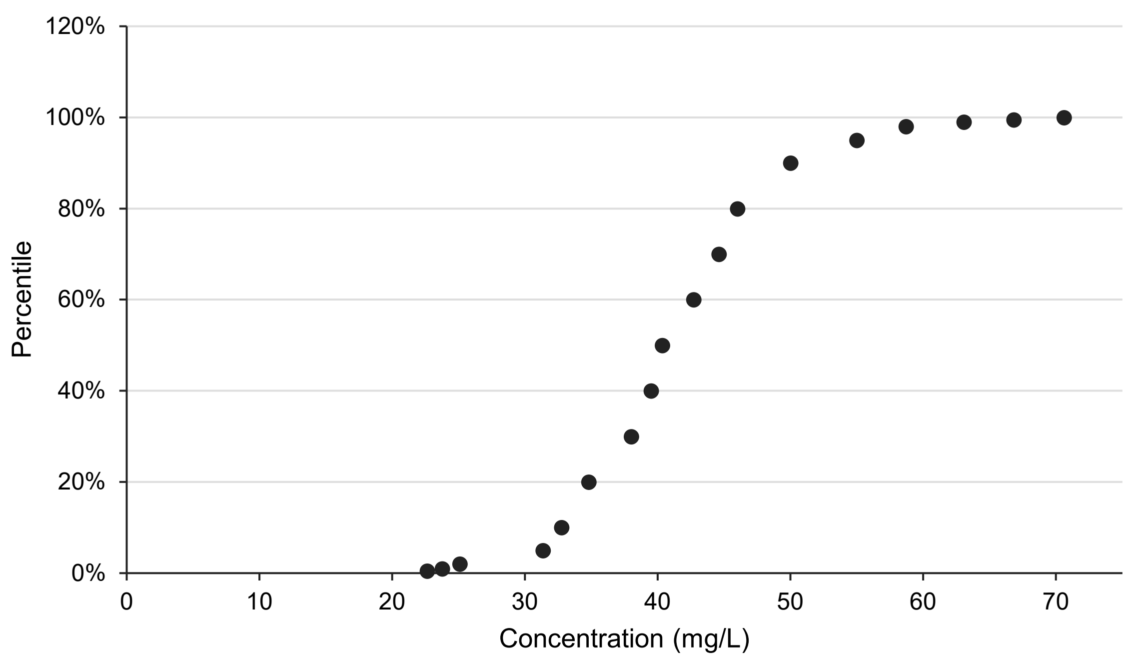


Table 6 summarizes average influent and septage loads for SMCFD from January 2002 through July 2022. The time range of data analyzed for the loads is considerably larger than the flow data used since

the sampling of concentrations was inconsistent. Influent typically had higher BOD_5, COD, TSS, and NH_3-N loads than septage.

Table 6. Historical Influent and Septage mass loads for BOD, COD, TSS, and NH_3-N

Loads (lb/day)	Parameter	Influent	Septage	Combined
BOD_5	AAD	3,053	389	3,442
	AM	2,752	339	3,091
	ADMM	4,295	655	4,950
	PD	6,359	1,469	7,828
COD	AAD	6,502	3,395	9,897
	AM	5,787	2,568	8,355
	ADMM	9,906	5,717	15,623
	PD	12,784	13,822	26,606
TSS	AAD	4,743	1,998	6,741
	AM	4,020	1,674	5,694
	ADMM	9,797	3,916	13,713
	PD	12,717	5,843	18,560
NH_3-N	AAD	508	17	525
	AM	443	16	459
	ADMM	618	27	645
	PD	752	49	801

Historical loading peaking factors for BOD, COD, TSS, and NH_3-N for PD and ADMM are summarized in **Table 7**.

Table 7. Historical Combined Load Peaking Factors, BOD, COD, TSS, and NH_3-N

Loading Factor	PD	ADMM
BOD_5	2.3	1.4
COD	2.7	1.6
TSS	2.7	2.0
NH_3-N	1.5	1.2

3.3 Design Flows and Loadings

Design flows and loadings were calculated using the peak factors shown in **Table 8**. Peaking factors were determined based on historical values and WRFs of similar size for each phase.

Table 8. Flow peaking factors for ADMM, PD, and PH

Peaking Factor	Phase			
	1	2	3	4
ADMM	1.25	1.25	1.25	1.10
PD	1.6	1.6	1.6	1.3
PH	3.0	2.5	2.5	2.25

Wastewater flow projections from SMCFD's 2020 Master Plan were used for the planning phase. Flows are based on the expected population at the time of the phase completion. A per capita consumption rate of 75 gpd was used. Projected flows are summarized in **Table 9.**

Table 9. Wastewater Flow Projections Based on Population Growth

Parameter	Units	Existing (2022)	Phase			
			1	2	3	4
EDUs	EA	8,214	32,385	64,885	97,385	129,885
Population	EA	20,536	80,963	162,213	243,463	324,713
Treatment Capacity, AADF	MGD	1.6	6.5	13	19.5	26

Furthermore, design wastewater flow projections were used to estimate expected flow rates for different facility flow conditions for each of the planning phases. Results are summarized in **Table 10**.

Table 10. Combined Design Flows for Each Project Phase

Condition	Units	Phase			
		1	2	3	4
AADF	MGD	6.5	13	19.5	26
ADMMF	MGD	8.1	16.3	24.4	28.6
PDF	MGD	10.4	20.8	31.2	33.8
PHF	MGD	19.5	32.5	48.8	58.5

Design loads for BOD5, COD, TSS, VSS and NH3-N were calculated based on historical concentrations (ADMM influent and AAD septage) and the load peaking factors shown in **Table 7.** Design loads for the AAD are summarized in **Table 11.** The septage flows and loads will remain the same for all phases, but the influent load will increase as the flows increase. This will lead to a decrease in combined concentrations as the influent flow increases.

Table 11. AAD Design Concentrations for COD, BOD_5, TSS, VSS, and NH_3-N

Parameters	Units	Influent	Septage	Combined
BOD_5	mg/L	306	1,729	335
COD	mg/L	600	10,678	810
TSS	mg/L	380	7,370	525
NH_3-N	mg/L	43	60	43

It is anticipated that the existing septage receiving station will remain as-is through Phase 1 of the project. It has not been decided if the septage receiving station will be decommissioned at a future date. If the septage receiving station is kept for all phases, the design loads for BOD, COD, TSS, and NH_3-N are calculated for the flowrates expected at each of the planning phases and the results are summarized in **Table 12**.

Table 12. Design Parameter Influent Loads for Each Project Phase

Parameter	Units	Existing	Phase			
			1	2	3	4
AADF	MGD	3	6.5	13	19.5	26
ADMMF	MGD	3.7	8.1	16.3	24.4	32.5
BOD_5	lb/day	10,337	22,630	45,540	68,171	90,801
COD	lb/day	24,994	54,718	110,113	164,831	219,550
TSS	lb/day	16,200	35,465	71,369	106,835	142,301
NH_3-N	lb/day	1,326	2,904	5,845	8,750	11,655

4 Effluent Management

The following section reviews the current permits, future practices, options, and regulatory requirements for future uses of the SMCFD effluent.

4.1 Current Practices and Permits

The SMCFD WRF effluent management strategy currently includes both well recharge and surface discharge. Recharge is completed via 36 wells distributed amongst 11 recharge basins. When effluent volumes exceed the capacity of the recharge basins, additional effluent is discharged to Unnamed Wash.

The current SMCFD WRF holds the following permits for effluent discharge and reuse:

- Arizona Aquifer Protection (APP) Permit (P-102873)
- Arizona Department of Environmental Quality (AZPDES) Permit (AZ0023931)
- ADWR Underground Storage Permits (73-584469.0101) and (71-584469.0003)

A short description of each permit is provided in the following sections.

4.1.1 State of Arizona Aquifer Protection (APP) Permit P-102873

Effective March 2, 2017, APP permit P-102873 authorizes SMCFD to operate the WRF such that the Aquifer Wastewater Quality Standards (AWQS) are not violated at the compliance points established in the permit. The authorized ADMMF is 3.0 MGD. Additionally, SMCFD is permitted for effluent disposal in 36 vadose wells located within the 11 recharge basins with intermittent flow to the Unnamed Wash under a separate permit (AZPDES permit #AZ0023931).

The WRF effluent is currently categorized as class B+ reclaimed water. Although the SMCFD WRF is currently permitted for B+, the facility may require meeting the A+ effluent quality standard for reuse applications of the effluent in future. Any significant expansion following BADCT would produce Class A+ effluent if effluent is used for offsite reuse. APP effluent quality standards are summarized in **Table 13**.

4.1.2 Arizona Department of Environmental Quality (AZPDES) Permit AZ0023931

The AZPDES Permit AZ0023931 was renewed on October 3, 2019 and is valid for five years. The permit allows the proposed discharge of up to 2.14 MGD of treated domestic wastewater from the SMCFD No.1 (WRF) to Unnamed Wash, a tributary to Siphon Draw. The permit is only valid when the effluent volume is higher than the capacity of recharge basins, or when the recharge basins are offline. The permit only allows for intermittent discharge.

Designated uses for the receiving water are aquatic and wildlife dependent and partial body contact. The APP effluent quality standards by classification are shown in **Table 13**. The permit also requires effluent toxicity testing, annual VOC sampling and quarterly metals sampling. Since the receiving stream is ephemeral prior to discharge, effluent concentrations are applied at end-of pipe.

Table 13. APP Effluent Quality Standards by Classification

Parameter	Class A+	Class B+	AZPDES Limits
BOD (mg/l), 30-day average	30	30	30
BOD (mg/l), 7-day average	45	45	45
TSS (mg/l), 30-day average	30	30	30
TSS (mg/l), 7-day average	45	45	45
Turbidity (ntu)	2	NNS	NNS
Turbidity, max (ntu)	5	NNS	NNS
Fecal Coliform(cfu/100ml), 30-day average with a minimum for 4 samples	ND	200	126
Fecal Coliform, Single Sample (cfu/100ml)	23	800	575
Nitrate (mg/l)	NNS	NNS	NNS
Nitrite (mg/l)	NNS	NNS	NNS
Total Nitrogen as N (mg/l)	10.0	10.0	NNS
pH	6.5-9	6.5-9	6.5-9

Notes:
(1) Values summarized in table correspond to those reported in SMCFD No. 1 Wastewater Treatment Facility 2020 Master Plan.
(2) NNS = no numeric water quality standard

Table 14. The Maximum Daily Discharge Concentration of Various Pollutants

Pollutants	Concentration (mg/L)
BOD5	45
TSS	34
TKN	10

4.1.3 ADWR Underground Storage Permits 73-584469.0101 and 71-584469.0003

SMCFD was granted an Underground Storage Facility (USF) Permit No. 71-584469.0003 and Water Storage (WS) Permit No. 73-584469.0101 by ADWR. Both permits grant authority to SMCFD to operate a constructed underground storage facility subject to the limitations and conditions in the permit. The maximum storage at the facility is currently 3,004 af/yr (2.6 MGD). The permit allows for a total of 12 recharge basins. The required monitoring includes Monitoring Wells (1A and MW2), recharge flow metering, and land subsidence monitoring.

4.2 Future Effluent Management Practices

Effluent management options for the SMCFD WRF include recharge basins, recharge wells, non-potable reuse (NPR), direct potable reuse (DPR), and direct surface recharge. NPR, DPR, and offsite injection or recharge options would require coordination with Apache Junction Water District (AJWD). The Phase 1 effluent flow is expected to exceed the combined permitted capacity of the existing on site recharge basins and surface discharge strategies therefore, the need for additional recharge capabilities or offsite reuse capacity is expected. A summary of the effluent management strategy options is provided in **Table 15**.

Table 15. Future Effluent Management Strategies and Considerations

Effluent Concept	Volume Anticipated	Permitting	Implications
Recharge Basins	3.0 MGD existing 6.5 MGD total, Phase 1	ADEQ APP/USF	Impacts from ADEQ determination on nitrate study
Discharge (Unnamed Wash)	2.14 MGD	ADEQ AZPDES	Intermittent
Non-Potable Pipe Reuse	TBD Future	A+ Effluent required	Seasonal variability in demand
Direct Potable Reuse	TBD Future, AJWD	A+ Effluent required	Negotiated effluent demand and treatment
Offsite Injection / Recharge	TBD Stopgap – Excess flows not managed by other means	ADEQ APP/USF	Variable use, increasing volumes year over year until buildout, may piggyback on purple pipe infrastructure

Reclaimed water quality standards and allowable uses are regulated in Article 3 of Chapter 11, Title 18 of the Arizona Administrative Code (AAC). **Table 16** presents the reclaimed water classifications, treatment and quality standards, and allowable uses.

Table 16. Arizona Reclaimed Water Classifications and Requirements

Parameter	A+	A	B+	B	C
Allowable Uses	Irrigation of food crops, open access irrigation, fire protection systems, vehicle washing, snowmaking		Surface irrigation of orchards, golf course irrigation, restricted access landscape irrigation, dust control, livestock watering (dairy), street cleaning		Livestock watering (non-dairy), irrigation of sod farms, silviculture
Treatment Requirement	Secondary Treatment, Filtration w/ Coagulant[3] Addition, Nitrogen Removal, & Disinfection	Secondary Treatment, Filtration Coagulant Addition, & Disinfection	Secondary Treatment, Nitrogen Removal, & Disinfection	Secondary Treatment & Disinfection	Secondary Treatment
Turbidity Limits	2 NTU (24-hr avg) 5 NTU (max)	2 NTU (24-hr avg) 5 NTU (max)	-	-	-
Total Nitrogen Limits	10 mg/L for 5-sample mean	-	10 mg/L for 5-sample mean	-	-
Fecal Coliform Limits	Non-detectable in 4 out of 7 daily samples 23 MPN or cfu/100 mL max	Non-detectable in 4 out of 7 daily samples 23/100 mL max	200/100 mL in 4 out of 7 daily samples 800/100 mL max	200/100 mL in 4 out of 7 daily samples 800/100 mL max	1000/100 mL in 4 out of 7 daily samples 4000/100 mL max

Notes:
(1) Source: A.A.C. R18-11-Article 3, December 31, 2008
(2) Abbreviation: NTU = nephelometric turbidity units
(3) The coagulant addition is for use during high turbidity events

5 Biosolids Management

The following section provides an overview of the current permits, per- and polyfluoroalkyl substances (PFAS), future practices, and phasing plan for biosolids management.

5.1 Current Practices, Permits and Regulatory Requirements

SMCFD WRF currently operates under the following codes for biosolids management:

- EPA 40 CFR 503.9
- Arizona Administrative Code R18-9-1001.7
- EPA Biosolids Laws and Regulations; adopted by ADEQ in 2014
- EPA Regulation 40 CFR 503; adopted by ADEQ R18-9-1005
- Method 9095A, Paint Filter Liquids Test, as described in Test Methods for Evaluating Solid Wastes, EPA Publication SW 846

All biosolids are currently landfilled at the Republic Services of Apache Junction landfill.

5.2 Future Practices

Biosolids management options for the SMCFD WRF include landfill disposal, land application, and composting. A summary of the future biosolids management strategies is provided in **Table 17**.

Table 17. Future Biosolids Management Strategies and Considerations

End Use	Biosolids Class	Considerations
Landfill	None	Higher Cost
Land Application	Class B	PFAS concerns
Composting	Class A or Exceptional Quality	PFAS concerns and requires identification of new users/markets

5.3 Emerging Pollutants: PFAS

PFAS are a class of anthropogenic compounds which have been widely used in consumer products since 1940. The strong carbon-fluorine bonds in PFAS chemical structure make them resistant toward biodegradation. PFAS compounds are also durable to heat, water, and stains. The same properties that make the use of PFAS desirable in industrial applications and consumer products also cause them to be highly persistent in the environment and resistant to biodegradation. Due to the potential adverse human health impact of PFAS, the use of PFAS have been stopped by most industries since 2000.

To date, no federal regulatory limits have been issued for PFAS. EPA has addressed PFAS related issues under four acts including the Toxic Substances Control Act (TSCA), the Safe Drinking Water Act (SDWA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). EPA has established a health advisory level for PFAO, PFOS, PFBS, GenX chemicals in drinking water. However, there are currently no state regulatory limits for PFAS in drinking water, wastewater effluent, or biosolids disposal in Arizona.

6 Influent Pumping and Headworks Conceptual Design

All influent flow to the WRF is delivered by off site sanitary sewer lift stations (currently the Baseline Lift Station, and Williams Field Lift Station under construction). The PHF is based upon the capacities of the two lift stations. Additional lift stations in the collection system will likely be added during future phases. It is not anticipated that future influent flow will enter the facility through gravity sewers.

For Phase 1 of the project, influent flow will need to be split between the existing Biolac™ Facility and the new MBR Facility. A splitter box and an influent pump station were considered. New piping will be required at the flow split to connect to the existing headworks and the headworks for the MBR Facility. As described below, a splitter box is the preferred alternative.

It is anticipated that during Phase 2 the existing Biolac™ Facility will be decommissioned. All flow will then be directed to the Phase 2 headworks and MBR Facility.

6.1 Influent Flow Pumping and Equalization

Splitting the influent flow is required during Phase 1 to route flow between the existing Biolac™ Facility and proposed MBR Facility. It is anticipated that the Biolac™ Facility will be decommissioned during Phase 2. Two options were evaluated for this facility:

1) An influent pump station (IPS)
2) A splitter box

6.1.1 Influent Pump Station

The proposed IPS would have the following features:

- The IPS would be connected to existing and future force mains. Duty and standby pump configurations will be used for both existing and future headworks during Phase 1.
- During Phase 1 construction, two future pump bases will be installed for expansion through Phase 2.
- The pumps' discharge header will be connected to both the new and existing headworks. A valve on the discharge header will separate flow between the two headworks. After the Biolac™ train is decommissioned, the pipe to the existing headworks will be plugged, and the two pumps formerly serving the Biolac™ train can be used for the MBR train.
- Some equalization of influent flow can be achieved by increasing the size of the wet well and limiting the capacity of the pumps.

6.1.2 Splitter Box

The proposed splitter box would have the following features:

- Three chambers for flow management.
  - First compartment – connects to the existing force mains.
  - Second compartment – routes flow to the proposed MBR Facility.
  - Third compartment – routes flow to the existing Biolac™ treatment system
- Splitter box does not equalize flow
- Splitter box will be configured to integrate with future expansion of the new headworks

6.1.3 Recommended Influent Flow Receiving Option

A splitter box option has been recommended for the conceptual design of the SMCFD expansion due to capital, operation costs, and functionality.

While the IPS would provide some equalization that would lower the required peak-hour treatment capacities of the downstream units, the volume of the wet well / equalization basin would need to be exceedingly large before it would provide any meaningful equalization. **Figure 6-1** and **Table 18** show that a Phase 2 wet well would need to be almost 500,000 gallons to provide a minimal reduction in PHF treatment capacity. Only the area above the "Pump Flow" line would be shaved from the peak flow. A larger wet well than 500,000 gallons to provide additional equalization was deemed too large for the SMCFD site.

Figure 6-1. Diurnal Curve for Phase 2 Equalization

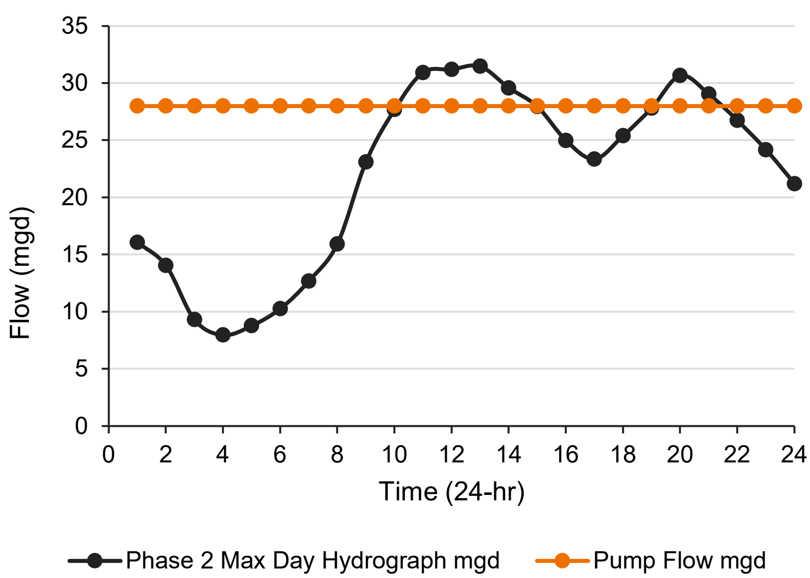


Table 18. Flow with Equalization and without Equalization

Parameter	Units	Phase			
		1	2	3	4
AADF	MGD	6.5	13	19.5	26
EQ Volume	gal	323,000	459,000	428,000	305,000
Headworks flow with IPS	MGD	14	28	42	56
Headworks flow without IPS	MGD	19	32	48	58

All influent flow to the WRF is delivered by off site sanitary sewer lift stations (currently the Baseline Lift Station, and Williams Field Lift Station under construction). The PHF is based upon the capacities of the two lift stations. All future flow to the WRF is anticipated to be pumped to the WRF; therefore, an IPS at the facility is not required to bring below-grade, gravity flow influent up to the at-grade headworks features.

An IPS would have much greater capital costs due to the larger wet well, pumps and electrical equipment, and have much greater costs for routine maintenance and electricity. The splitter box would have minimal electric requirements except for the flow meters and possibly isolation gates.

6.2 Coarse Screens

The SMCFD WRF currently uses coarse bar screens to remove large particles and obstructions that could damage downstream equipment. This technology has been effective for the facility and is recommended for this application. Description of the number and capacity of the proposed equipment is shown in **Table 19** and primary considerations for the equipment are shown in **Table 20**.

Alternative options evaluated for coarse screens included drum screens and stair screens. Drum screens have low screen carryover and simple operation; however, they tend to have the highest capital costs and headloss. Stair screens have low headloss requirements and have a pivot design for servicing the unit above the channel, but they have a large footprint and are not recommended in areas where rocks or excessive grit loadings are expected.

Table 19. Coarse Bar Screen Descriptions per Phase

Parameter	Units	Phase				
		Existing	1	2	3	4
Coarse Bar Screens						
Quantity	EA	2	2	3	4	5
Firm Capacity	MGD	7.6	15	30	45	60

Table 20. Main Considerations for Coarse Screen Equipment for Sizing and Cost Estimations

Equipment Parameters	
Type	Step
Screen Openings (mm)	6
Capacity, EA (MGD)	15
Configuration	Duty + 1 Standby

6.3 Grit Removal

The SMCFD WRF currently uses aerated grit chambers for grit removal. This technology is not optimal for future expansion due to the following considerations:

- The grit chamber concrete tanks have a large footprint.
- Continuous blower use results in additional power costs.
- Chambers have high maintenance requirements.
- Aerated grit chambers are only able to remove grit with diameters greater than 200 microns.

Options evaluated for grit removal include vortex grit chambers and stacked trays. Vortex grit chambers have small footprints and simple operation; however, they also have lower removal efficiencies and lower organic separation which leads to more odor. Stacked trays have higher capital and O&M costs but some have an option for add-on that can remove fats, oil, and grease.

Due to the smaller footprint compared to the aerated grit chambers and the lower costs compared to the stacked trays, the vortex grit chamber has been recommended for the conceptual design. A summary of equipment quantities required for each phase and main considerations for sizing and selection are included in **Table 21** and **Table 22**.

Table 21. Vortex Grit Chamber Descriptions per Phase

Parameter	Units	Phase				
		Existing	1	2	3	4
Grit Removal						
Quantity	EA	2	2	2	2	3
Capacity	MGD	7.6	40	40	40	60

Table 22. Vortex Grit Chamber Equipment Considerations for Sizing and Cost Estimations

Equipment Parameters	
Type	Vortex
Capacity, EA (MGD)	20
Configuration	Duty + 1 Standby

6.4 Odor Control

Options for odor control technology to be used at the facilities headworks included chemical wet scrubbers, bioscrubbers, and soil biofilters. Advantages and disadvantages for each option are summarized in **Table 23**. Due to efficiency and lower footprint, chemical wet scrubbers are recommended for the phasing plan.

Table 23. Chemical Wet Scrubber

Advantages	Disadvantages
Chemical Wet Scrubber	
Efficiency	Capital and chemical costs
Handles odor peaks	Hazardous chemicals
Medium size footprint	Additional operational complexity
Bioscrubber	
No chemicals, only irrigation	Less efficient with odor peaks
Simple operation	May need nutrient addition
Lower capital costs	
Soil Biofilter	
Least expensive option	Largest footprint
No chemicals, only irrigation	Less efficient with odor peaks
Simple operation	

7 Primary Treatment Conceptual Design

Primary treatment will be added in phase 2 with the future solids handling and anaerobic digestion facilities. This process will remove TSS and BOD in the liquid stream, reducing the load to the downstream biological processes and increasing the capacity of the facility.

7.1 Sedimentation Basins

Primary sedimentation is a low energy treatment technology for removal of TSS and BOD. Alternative options evaluated for primary sedimentation included rectangular clarifiers, circular clarifiers, and primary filters. Circular and rectangular clarifiers have large footprints but are a proven technology and have widespread use in Arizona. Both clarifiers offer similar treatment performance, but rectangular clarifiers tend to be less reliable and need more frequent maintenance. Primary filters had the smallest footprint and highest removal rates but are the least proven of the technologies.

Table 24 includes the process design criteria and conceptual sizing for the primary clarifiers, primary sludge, and scum pump station. Primary clarifiers may be constructed as circular basins as found at the Mesa Greenfield WRP or rectangular basins as found at the Tolleson WRF. This phasing plan is based on circular clarifiers.

Table 24. Circular Sedimentation Basin Descriptions per Phase

Parameters		Units	Phase			
			1	2	3	4
Primary Sedimentation Basins						
Diameter		ft		124	124	124
Number		EA		2	3	4
Hydraulic Loading Rates						
AADF	Capacity	gpd/ft^2		269	359	538
	Firm Capacity	gpd/ft^2		538	538	718
AAMM	Capacity	gpd/ft^2		336	449	592
	Firm Capacity	gpd/ft^2		673	673	789
PD	Capacity	gpd/ft^2		431	574	700
	Firm Capacity	gpd/ft^2		861	861	933
PHF	Capacity	gpd/ft^2		807	1,076	1,076
	Firm Capacity	gpd/ft^2		1,615	1,615	1,435
Primary Sludge and Scum Pump Stations						
Pump Station Structures		EA		1	2	2
PS Pumps		EA		2	4	4
Type		-		Progressing Cavity		
Scum Pumps		EA		2	4	4
Type		-		Progressing Cavity		

Notes:

1. Average day surface overflow rate per ADEQ Bulletin 11: 800 gpd/sf, per 10-States Standards, 1,000gpd/sf
2. Peak day surface overflow rate per ADEQ Bulletin 11: 700 to 1000 gpd/sf.
3. Peak hour overflow rate per 10-States Standards: 1500 to 2000 gpd/sf.
4. One out of Service (OOS)

8 Fine Screens Conceptual Design

Fine screens are typically the second mechanical pre-treatment process (following influent screens) and are used to remove material that may create operational and maintenance problems in downstream unit processes. They are essential for MBR facilities since they are required by MBR manufacturers for membrane warranties. In addition to having fine screens, MBR manufacturers also require full redundancy at PHF and do not allow bypass. Screens with round openings are preferred since they are the most effective.

Alternative options evaluated for fine screens included perforated plate drum and stair screens. Drum screens have low screen carryover and simple operation; however, they tend to have the highest capital costs and headloss. A summary of the recommended equipment quantities required for conceptual design of each phase and the main considerations for sizing and selection are included in **Table 25** and **Table 26**.

Table 25. Fine Drum Screen Descriptions per Phase

Parameters	Units	Phase				
		Existing	1	2	3	4
Fine Screens						
Quantity	EA		2	3	4	5
Firm Capacity	MGD		17	35	52	70

Table 26. Fine Drum Screen Equipment Considerations for Sizing and Cost Estimations

Equipment Parameters	
Type	Inclined Rotary Drum
Screen Openings (mm)	<1.5
Capacity, EA (MGD)	17.6
Configuration	Duty + 1 Standby

9 Secondary Treatment Conceptual Design

Secondary biological treatment is required to meet an A+ effluent classification. Secondary treatment utilizes microbial activity to remove carbon, nitrogen, phosphorous, and some trace organic and inorganic pollutants. Constituents will be either converted to gases, utilized for microbial cell tissues for maintenance, or captured within the biological floc that is wasted from the system. The system will be removed after Phase 2.

9.1 Biolac™ Treatment Unit

The existing Biolac™ treatment system was recently evaluated for a re-rating from 2.1 to 3 MGD capacity as part of SMCFD's 2022 Process Optimization Report. The intent is to keep the Biolac™ Facility in service for the next 10 years while transitioning to MBR treatment technology. The proposed plan is to run the Biolac ™ Facility in parallel to the new 3.5 MGD MBR treatment train as the WRF is expanded to 6.5 MGD in the next proposed expansion.

Several minor improvements were recommended from SMCFD's 2022 Process Optimization Report to maintain the performance of the Biolac™ Facility and realize the full 3 MGD of treatment capacity. These improvements include:

- Two additional aeration blowers, with redundancy
- Aeration system upgrades
- Clarifier equipment improvements

These improvements could be completed either with the first expansion or independently.

As the treatment process is expanded and more flow is treated through the MBR Facility, it is recommended that the Biolac™ Facility be dedicated for septage treatment. Since the Biolac™ Facility is currently treating the septage mixed with domestic WW and the loading rate is not changing, the performance of the Biolac™ Facility should not be impacted.

The Biolac ™ Treatment Characteristics are presented on **Table 27**.

Table 27. Description of Biolac™ Facility per Phase

Parameter	Units	Phase				
		Existing	1	2	3	4
Biolac™ Basins						
Number	EA	2	2			
Volume, EA	MG	2.16	2.16			
Volume, Total	MG	4.32	4.32			
Volume, EA	ft^3	577,540	577,540			
Side Water Depth	ft	12	12			
Area	ft^2	47,519	47,519			
Biolac™ Aeration Blowers (post-optimization[1])						
Number	EA	3	3			
Type	-	Turbo	Turbo			
Capacity[2], EA	scfm	6,094	6,094			
Firm Capacity[2]	scfm	12,186	12,186			
Power, EA	hp	250	250			

Notes:

(1) A separate project underway that will upgrade the Biolac™ Aeration Blowers per the SMCFD 2021 Blower Comparison Memo

(2) At 105° C and 7.7 psig

9.2 Membrane Bioreactor System

As MBR treatment is added to the WRF in the Phase 1 expansion, it will operate independently and in parallel with the Biolac™ Facility. The Biolac™ Facility and the MBR Facility will each have different mixed liquor characteristics and it is not practical to mix the two biomasses as it may not be possible to achieve stable process control

9.2.1 Bioreactor

The bioreactor process will need to achieve sufficient nitrogen removal to meet requirements for Class A+ effluent quality. As water conserving plumbing fixtures and appliances have come to dominate community development since the 1990s, many similar utilities have seen wastewater strengths increase, including nitrogen.

Conceptual sizing for the process bioreactors, including mixers and diffusers is found in **Table 28**. The configuration was developed with 4 selector zones per basin (anoxic, aerobic, anoxic, aerobic).

Table 28. Description of BNR Facility per Phase

Parameter	Units	Phase				
		Existing	1	2	3	4
Bioreactor Basins						
Number of Basins	EA		2	4	6	7
Volume, EA	MG		1.65	1.65	1.65	1.65
Volume, Total	MG		3.3	6.6	9.9	11.5
Volume, EA	ft^3		220,588	220,588	220,588	220,588
Side Water Depth	ft		18	18	18	18
Area, EA	ft^2		12,255	12,255	12,255	12,255
Width, EA	ft		59	59	59	59
Length, EA	ft		207	207	207	207
Equipment						
Mixers per basin	EA		2	2	2	2
Total Mixers	EA		4	8	12	14
Type	-		Propeller	Propeller	Propeller	Propeller
Mount Type	-		Deck	Deck	Deck	Deck
Power, EA	hp		Anx 1 = 18 Anx 2 = 4	Anx 1 = 18 Anx 2 = 4	Anx 1 = 18 Anx 2 = 4	Anx 1 =18 Anx 2 = 4
Controller Type	-		Constant	Constant	Constant	Constant

9.2.2 Membrane Systems

Technology selection for MBR technology will set the direction for facility expansion most probably for the life of the facility. Two types of membrane systems which represent most installations for municipal applications were considered for this evaluation: hollow fiber membranes and flat sheet membranes. Flat sheet membrane systems are often designed with the membrane cassettes in the last zone of the bioreactor basin. Hollow fiber membrane cassette systems are placed in smaller basins separate from the bioreactor. Conceptual sizing for the hollow fiber and flat sheet membranes are found in **Table 29** and **Table 30**, respectively.

Table 29. Hollow Fiber Membrane System Description per Phase

Parameter	Units	Phase				
		Existing	1	2	3	4
Membrane System – (Dupont configuration shown)						
Type		Hollow fiber, submerged				
Number of Membrane Tanks	EA		2	6	10	10
Modules per Tank	EA		464	432	400	464
Membrane Area per Tanks	ft^2		249,723	232,500	215,278	249,723
Total Membrane Area	ft^2		499,446	1,395,000	2,152,780	2,497,230
Membrane tank SWD	ft		9.6	9.6	9.6	9.6
Membrane tank length, EA	ft		42.5	42.5	42.5	42.5
Membrane tank width, EA	ft		13.5	13.5	13.5	13.5
Membrane tank, EA	ft^2		574	574	574	574
Membrane tank, total	ft^2		1,194	3,446	5,743	5,743
Membrane Volume, total	Gal		13,389	40,166	66,943	66,943
Filtrate pumps	EA		2	6	10	10
Filtrate pump type	-		End Suction Centrifugal			
Filtrate pump power, EA	hp		60	60	60	60
RAS pumps	EA		2	6	10	10
RAS pump type	-		End Suction Centrifugal			
RAS Pump Power, EA	hp		30	30	30	30

Table 30. Flat sheet Membrane System Description per Phase

Parameter	Units	Phase				
		Existing	1	2	3	4
Membrane System – (Kubota configuration shown)						
Type		Flat sheet, submerged				
Number of Membrane Tanks	EA		4	6	8	10
SMUs per Tank	EA		8	16	18	18
Total SMUs	#		32	96	144	180
Membrane Area per Tanks	ft^2		77,500	155,000	174,375	174,500
Total Membrane Area	ft^2		310,000	930,000	1,395,000	1,745,000
Membrane tank SWD	ft		19	19	19	19
Membrane tank length, EA	ft		50	50	50	50
Membrane tank width, EA	ft		26	26	26	26
Membrane tank, EA	ft^2		1,300	1,300	1,300	1,300
Membrane tank, total	ft^2		5,200	7,800	10,400	13,000
Membrane Volume, total	Gal		739,024	1,108,536	1,478,048	1,847,560
Filtrate pumps	EA		5	7	9	11
Filtrate pump type	-		Self-priming Centrifugal			
Filtrate pump power, EA	hp		50	50	50	50
RAS pumps	EA		5	7	9	11
RAS pump type	-		End Suction Centrifugal			
RAS Pump Power, EA	hp		30	30	30	30

9.3 Membrane Support Facilities

The membrane systems support facilities include process and air scour blowers, chemical cleaning systems, chemical storage/feed, return sludge pumping, and compressed air systems. Conceptual sizing for the membrane support systems is found in **Table 31**.

Table 31. Membrane Support System Descriptions per Phase

Parameter	Units	Phase				
		Existing	1	2	3	4
Bioreactor Aeration Blowers						
Process blowers	EA		4	6	8	10
Process blowers, type	-		Turbo			
Process blowers, EA	hp		250	250	250	250
Membrane Support Systems – (Dupont configuration shown)						
Air Scour blowers	EA		3	7	11	11
Air scour blowers, type	-		Positive Displacement			
Air scour blowers, EA	hp		75	75	75	75
Air compressors	EA		2	4	6	6
Air compressors, type	-		Rotary screw			
Air compressors, EA	hp		31	31	31	31
Clean in place Pumps	EA		2	4	6	6
Clean in place Pumps, type	-		End Suction Centrifugal			
Clean in place Pumps, EA	hp		40	40	40	40
Membrane Support Systems – (Kubota configuration shown)						
Air Scour blowers	EA		5	7	9	11
Air scour blowers, type	-		Positive Displacement			
Air scour blowers, EA	hp		100	100	100	100
Air compressors	EA		2	2	4	4
Air compressors, type	-		Rotary Screw			
Air compressors, EA	hp		30	30	30	30
Clean in place Pumps	EA		2	2	4	4
Clean in place Pumps, type	-		End Suction Centrifugal			
Clean in place Pumps, EA	hp		40	40	40	40

10 Disinfection Conceptual Design

Effluent disinfection is required to meet an A+ effluent classification. Disinfection supports control of THM formation potential and will give SMCFD flexibility to consider implementing DPR in the future.

10.1 Disinfection Alternatives

10.1.1 UV Disinfection

UV disinfection is an effective method for the inactivation of most viruses, spores, and cysts. It is typically, a space saving user-friendly system and has shorter contact times compared to other disinfectants. This method eliminates the risk of disinfection by-product formation often seen with chlorination. However, high power requirements and lamp sleeve fouling can lead to higher O&M costs.

10.1.2 Chlorination

Chlorination is a well-established disinfection technology and is generally a more cost-effective method than UV or ozone disinfection. An added benefit of using chlorination for disinfection is the ability to maintain a chlorine residual in non-potable water distribution systems. Chlorine can be provided in many forms: gaseous chlorine, liquid sodium hypochlorite, calcium hypochlorite, and on site generation of hypochlorite. Calcium hypochlorite is delivered as a solid and must be dissolved in water for application; it is more commonly used for smaller, remote facilities. Gaseous chlorination requires additional safety equipment including emergency scrubbers. On site hypochlorite generation requires a high quality, softened water supply and additional electrical power. The majority of WRFs in Arizona use bulk liquid sodium hypochlorite due to ease of storage and handling, availability, and cost.

10.1.3 Alternative Chemical Disinfectants

One of the common challenges with chlorination of recycled water is the formation of disinfection by-products. Alternative chemical disinfectants, such as chloramination and peracetic acid, are used in other installations to reduce the formation of disinfection by-products. Chloramination is common where membrane systems are used for advanced treatment, but it does not have the oxidative power of chlorine and requires additional contact time to achieve the same level of disinfection. Peracetic acid is less common and more costly than chlorine, but also a stronger oxidant than chloramine and offers the benefits of low disinfection byproduct formation.

10.2 Disinfection System Phasing Plan

The existing facility currently uses liquid sodium hypochlorite for disinfection and has a preference to continue this practice. There are no reports of issues with disinfection by-products currently, so the current disinfection and effluent disposal practices are presumed to be acceptable. Conceptual sizing for chlorine contact basins, including flash mixers is found in **Table 32**.

Table 32. Chlorination Contact Basin Descriptions per Phase

Parameter	Units	Phase				
		Existing	1	2	3	4
Chlorine Contact Basin						
Number	EA	1	1	2	3	3
Passes per basin	EA	5	5	5	5	5
Channel Length	ft	100	100	100	100	100
Channel Width	ft	8	8	8	8	8
Channel Depth	ft	10	10	10	10	10
Plan length	ft	100	100	100	100	100
Plan width	ft	40	40	40	40	40
L:W	-	62.5	62.5	62.5	62.5	62.5
Estimated Baffle Factor	-	0.7	0.7	0.7	0.7	0.7
Total Volume	ft^3	40,000	40,000	80,000	120,000	120,000
Factored Volume	ft^3	28,000	28,000	56,000	84,000	84,000
Contact time at PHF	minutes	15.5	15.5	15.5	18.6	17.4
Flash Mixers						
Number	EA	1	1	2	3	3

11 Recharge and Reuse Conceptual Design

Effluent disposal needs for the WRF will change as effluent flowrates increase due to population growth and phased plan expansions. Several disposal options are available depending on site availability, permitting requirements, and effluent classification produced. Options evaluated include:

- Onsite recharge basins
- Offsite recharge including basins, direct injection, and aquifer storage and recovery (ASR)
- Direct surface discharge
- Non-potable reuse
- Direct potable reuse

11.1 Recharge and Reuse Alternatives

11.1.1 Onsite Recharge Basins

SMCFD currently delivers effluent to recharge basins with intermittent flow to Unnamed Wash, a tributary to Siphon Draw, when the effluent flow exceeds the capacity of the recharge basins. SMCFD previously used seven recharge basins with thirty-six existing vadose wells and three points of compliance. Due to an increasing trend to use effluent for recharge rather than discharge new recharge basins (8-11) were constructed to increase the effluent recharge volume in 2020. This approach generates groundwater recharge credits.

Continuation of on site recharge basin effluent disposal is a likely option going forward. Expansion of the existing groundwater recharge basin system by developing additional recharge basin capacity would require an amendment to the current Aquifer Protection Permit. A summary of expansion options is provided in **Table 33**.

Table 33. Summary of Onsite Effluent Recharge Options

Description	Effluent Classification (minimum)	Details
At Existing WRF	Class B+	SMCFD has practiced groundwater recharge using infiltration basins at the WRF since the late 1990's. SMCFD has applied for an ADEQ permit and plans for additional basins at the 97 acre WRF site to recharge up to 3 MGD.
Recharge Basins	Class A+ (recommended)	Recharge basins take advantage of the significant depths to groundwater in the region. They are designed to inject water above the water table within permeable sedimentary units. Depths of VZ recharge wells up to 180 feet with recharge rates up to 500 gpm depending on favorable permeable sedimentary environment

11.1.2 Offsite Recharge: Basins, Direct Injection, ASR Wells

Limited options exist for offsite effluent recharge. These options are generally more costly than on site recharge due to the capital cost of conveyance to an offsite location. A summary of offsite basin recharge options is detailed in **Table 34**.

Table 34. Summary of Offsite Effluent Recharge Options

Description	Effluent Classification (minimum)	Details
At a new recharge basin site(s) in the area west of the Central Arizona Project (CAP) Canal and south of Baseline Avenue	Class B+	As SMCFD recharge demand surpasses 3 MGD from the present WWTF and for all the effluent from the future WWTF, offsite managed infiltration may be the best option.
At a new recharge basin in the area east of the CAP Canal and south of Baseline Avenue alignment	Class B+	As SMCFD recharge demand surpasses 3 MGD from the present WWTF and for all the effluent from the future WWTF, offsite managed infiltration may be the best option.
Recharge at the existing SMRF CAP with a SMCFD 10-mile dedicated pipeline conveyance from the WWTF to SMRF site.	Class B+	Transfer of WWTF effluent above 3 MGD to the existing Superstition Mountain CAP recharge facility south of Apache Junction for recharge. A dedicated SMCFD 10-mile pipe system from the WWTF to the recharge site will be needed in this option

Alternative Recharge Methods (i.e., indirect potable reuse for future potable use) includes direct injection wells and Aquifer Storage and Recovery (ASR). ASR is the indirect potable reuse with the goal to provide a long-term sustainable source of water for potable use by AJWD and AWC (City Water) and can be achieved with recharge well practices. Effluent can be used for well recharge and recovered at a suitable distance as defined by ADEQ to ensure human health safety. Water treatment of the recovered water will be required. Alternative recharge methods are summarized in **Table 35**.

Table 35. Summary of Alternative Effluent Recharge Options

Description	Details
Direct Injection Wells	Direct injection recharges water directly into the aquifer, below the water table. Based on past experience, recharge rates typically are 1/3 to 1/2 of pumping rate at the well.
Direct Injection and recovery (ASR) Wells	Direct injection recharges water directly into the aquifer, below the water table. By including well pumps, the injected groundwater could be recovered at this well site.

11.1.3 Direct Surface Discharge

Direct Discharge is permitted under ADEQ Permit AZ 0023931 to Unnamed Wash tributary to Siphon Draw when the effluent flow surpasses the capacity of recharge basins, or the recharge basins are offline. However, the permit limits discharge to intermittent flow. There are no ADWR groundwater credits available for direct discharge and based on the AZPDES permit are only meant to be intermittent. A summary of surface water discharge considerations is shown in **Table 36**.

Table 36. Summary of Direct Surface Effluent Discharge Options

Description	Details
Surface Water Discharge – governed by Arizona Pollutant Discharge Eliminate System (AZPDES) permitting	SMCFD currently is permitted to discharge intermittently to a wash south of the WWTF. SMCFD discharge does occur when the recharge capacity to accept effluent is less than the WWTF production or if a recharge basin is offline for maintenance. It is reported that the effluent discharged in the last year or so to the stream infiltrates the stream soils in less than 0.5 miles from the discharge point. However, converting this to a permanent discharge option would require modification of the AZPDES permit and could potentially include significant impacts to the treatment requirements.
Stream Augmentation & Restoration	Wetland development at Unnamed Wash or a different offsite surface discharge location.

11.1.4 Reuse

11.1.4.1 Non-Potable Reuse

Non-potable reuse (NPR) is generally implemented in two formats. Irrigation via a purple pipe system (dual distribution) is used to convey reuse water to an end user to replace the use of drinking water for irrigation, industrial, commercial, and other process uses. Indoor use via a purple pipe system is used to convey reuse water to an end user to replace the use of drinking water for internal plumbing water used primarily for toilet flushing. A summary of the considerations for NPR are shown in **Table 37**.

Table 37. Summary of Alternative Effluent Recharge Options

Description	Effluent Classification	Details
Irrigation: Existing irrigation sites in SMCFD north of Baseline Ave.	Class A+	Locate and develop 'purple pipe system' to convey Class A+ SMCFD effluent.
Irrigation: Future Sites in Master Planned Communities south of Baseline Road within the SMCFD Planning Area	Class A+	Future Master Planned Communities requiring public amenities such as public parks, sports fields, golf courses, etc.
Indoor Use: Dual plumbing in larger commercial and industrial building and use in industrial processes.	Class A+	Opportunities in future sites in Master Planned Communities south of Baseline Road within the SMCFD Planning Area
Industrial Cooling	Class A+	Opportunities for industrial cooling may be available with the addition of new industries in the service and surrounding area.

11.1.4.2 Direct Potable Reuse

A direct potable reuse facility has been investigated by the Apache Junction Water District to supplement the drinking water supply. The current understanding is that the SMCFD WRF would provide Class A+ effluent to a future advanced water treatment facility located adjacent to the surface water treatment facility.

ADEQ is currently in the process of preparing regulations for direct potable reuse projects. Among the topics under consideration for regulation that are pertinent to the SMCFD WRF are:

- Interagency agreement with the effluent provider and the drinking water provider
- Minimum wastewater treatment requirements and increased monitoring
- Enhanced source water control program
- Management of off-spec advanced treated water

11.2 Recharge and Reuse Phasing

As the SMCFD Expansion takes place, the larger flows will require different management strategies in order to meet the permit and effluent flowrates. A summary of anticipated effluent management strategies for different phased flowrates is shown in **Table 38**.

Table 38. Effluent Management Strategies for Each Phase

Phase	Flow (MGD)	Required Changes	Cause
1	6.5	Permit for A+ Effluent	Non-Potable, Development Demands, Open access irrigation and lakes APP BADCT requirements
2	13	Add Injection Wells	Flow exceeds recharge/ discharge/NPW capacity
3	19.5	Add Injection/ASR Wells and/or Introduce DPR	Flow exceeds recharge/ discharge/NPW capacity AJ Water District requires supplement to raw water supply
4	24-26	Increase capacity of changes implemented in prior phases	

12 Biosolids Processing Conceptual Design

The existing WRF generates secondary sludge from the Biolac™ Facility that is processed and ultimately hauled to the Apache Junction Landfill nearby. Landfill disposal requires that the dewatered sludge pass a Paint Filter Test; indicating that there is no free-draining liquid from the dewatered sludge. In prior years, the facility operated a composting facility that produced Class A biosolids, but that operation has ceased due to a lack of market for the final product. Solids processing includes stabilization lagoons and sludge drying beds. Polymer is added to facilitate settling and decanting of the sludge prior to pumping to the drying beds. The current system is operating near capacity and will require expansion or upgraded solids handling as part of planned improvements.

Biosolids are regulated by ADEQ under the legislative authority of 40 Code of Federal Regulations Part 503. As for sewage effluent, various qualities of treated biosolids are defined and appropriate disposal/reuses are dependent on the quality of the material. Three qualities are defined: Class B, Class A, and Class A-EQ, or Exceptional Quality (exceeding the requirements of Class A, this material may be distributed with less regulatory oversight, and little or none on the part of the end user).

Criteria are pathogen reduction, presence of more than the listed ceiling concentration of metals, and vector reduction.

- Pathogens must be reduced to defined levels and may be defined by actual (tested) reduction in the indicator pathogen (E. coli, or Salmonella, depending on class level; Class A requirements require virtually pathogen-free biosolids. More commonly, class limits are met by treatment method. This is based on experience-based results of a particular treatment means.

- Levels of metals are calculated based on annual and lifetime pollutant loading rates for soil (requirement is the same for both Class B and Class A uses); generally, this requirement must be met by the exclusion of inappropriate levels of such metals using a formal pretreatment program. Over time, metals levels may limit long-term use of biosolids on agricultural land.

- Vectors include flies, mosquitos, rodents, etc. When this requirement is met, odor potential is also reduced. The requirement may be partially met by application method.

While the current practice of landfilling can continue and is likely a more economical solution due to the proximity of the landfill to the WRF site, the master plan should consider alternative biosolids disposal options. A large number of wastewater treatment facilities in Arizona are capable of producing Class B biosolids as defined and regulated under 40 CFR 503. Class B biosolids can be land applied for beneficial use.

The processes shown in **Table 39** can meet the requirements of 40 CFR 503 as a process to significantly reduce pathogens (PSRP) for Class B requirements.

Table 39. Secondary Processes that can meet Class B Requirements established by 40 CFR 503

Process to Significantly Reduce Pathogens	Criteria
Aerobic Digestion	40 day SRT at 20°C or 60 day SRT at 15°C
Air Drying	Minimum 3 months with 2 months at temperatures >0°C
Anaerobic Digestion	15 day SRT at 35 to 55°C 60 day SRT at 20°C
Composting	40°C for 5 days AND 55°C for 4 hours
Lime Stabilization	Minimum 2 hours contact at pH 12

Notes:
(1) Source: 40 CFR 503

For planning purposes, it is assumed that this facility will be designed to produce Class B biosolids using an anaerobic digestion process from Phase 2 and beyond. This allows for greater flexibility for future biosolids management practices. During Phase 1, the current practice of landfilling will continue and is expected to continue through future phases.

12.1 Sludge Thickening

Sludge thickening reduces the volume of sludge and reduces the required hydraulic capacity of downstream processes. Sludge thickening can be used for primary sludge, secondary sludge, or mixed sludge. For this phasing plan, it is assumed that only secondary sludges will be thickened. The current practice is to decant the sludge lagoons to thicken sludge. In Phase 1, the MBR waste activated sludge will be held in an aerated sludge holding tank and decanted to thicken prior to mechanical dewatering. Mechanical sludge thickening could be included in Phase 1 to reduce the volume of liquid sludge sent to the drying beds, thereby reclaiming additional capacity. Preliminary modeling efforts show an expected decanted sludge solids content of 1-3%; mechanical thickener goals are to achieve 4-6% solids content. However, this will not address the capacity limitations of the stabilization lagoons. Capacity limitations may be improved by including thickening ahead of the lagoons. Alternatively, the sludge in Phase 1 could be sent directly to mechanical dewatering equipment after being sufficiently stabilized. While this practice is not necessarily the most efficient in terms of dewatering and polymer consumption, it is not an uncommon practice.

There are a variety of types of thickening equipment. Among the thickening options are:

- Centrifuges
- Disk press
- Screw press
- Rotary drum thickener
- Gravity belt thickener

- Gravity thickening

For purposes of this phasing plan, it is assumed that mechanical sludge thickening will be included in a solids processing building starting in Phase 2. **Table 40** summarizes the phasing plan for sludge thickening facilities.

Table 40. Description of Sludge Thickening Process for Each Phase

Item	Phase				
	Existing	1	2	3	4
Facilities		Sludge lagoons & polymer addition	New Solids Handling Building		
Type of sludge		Secondary	Secondary		
Secondary solids		0.5 to 1 %	0.8 to 1.4 %		
Thickened solids		2-3 %	4-6 %		
Thickening process		Use existing, Decant MBR sludge in sludge holding tank	Mechanical, equipment type TBD		
Number of units (duty + standby)		NA	1+1	2+1	2+1
Mixed sludge storage tank		NA	1	2	2
Digester feed pumps		NA	2+1	3+1	4+1

When thickening processes are to be included in a future design, the following evaluations and decisions will be required:

- If thickening is included in Phase 1, evaluate the impact on the sludge drying bed operation and useful life.
- Evaluate mechanical sludge thickening equipment alternatives.

12.2 Digestion

Digestion provides a reduction of the mass of volatile solids, pathogen reduction, and stabilization of biosolids. Digestion can be achieved using aerobic or anaerobic processes.

Aerobic digestion is more common among smaller facilities that do not have primary sedimentation basins and do not produce a primary sludge. Aerobic digestion requires significant energy for aeration and a longer solid retention time to achieve Class B biosolids.

Anaerobic digestion is more common among facilities with a liquid treatment capacity of more than 6 to 10 MGD. While anaerobic digestion can be used on secondary sludge alone, this practice is rare. Most anaerobic digestion processes digest primary and secondary sludges for the following reasons:

- Significant energy savings since 30 to 50% of BOD is not treated in the aeration basins.
- Higher potential net energy recovery due to the biogas generation potential of primary sludge.
- Less risk of process upsets including foaming. Anaerobic digesters processing secondary sludges tend to experience foaming events more frequently

There are several variations of anaerobic digestion that allow for higher rate digestion or production of Class A quality biosolids. Within Arizona, conventional mesophilic anaerobic digestion (CMAD) is commonly used to produce a Class B biosolids which is suitable for land application. Mesophilic digestion occurs in a temperature range of 35 to 38 degrees centigrade. For purposes of this phasing plan, CMAD is recommended as it is a proven and robust technology and provides a conservative footprint for the site master plan. Anaerobic digester sizing and facilities for each phase are summarized in **Table 41** and **Table 42**.

Table 41. Summary of Anaerobic Digesters for Each Phase

Parameter	Units	Phase				
		Existing	1	2	3	4
Anaerobic Digesters						
Number	EA			2	3	4
Minimum SRT	days			15	15	15
Units in service for minimum SRT	EA			2	2	3
Volume, each	ft^3			130,000	201,000	167,000
SWD	ft			32	32	32
Required Diameter	ft			71.6	75.6	78.0
Designed Diameter	ft			90	90	90

Table 42. Summary of Anaerobic Digestion Facilities for Each Phase

Item	Phase				
	Existing	1	2	3	4
Facilities			Digester Complex		
Number of digesters, Duty + standby			2+0	2+1	3+1
Minimum SRT at Maximum Month loading conditions			15 days		
Maximum organic loading rate (OLR), lb-VS/cu ft/d			0.18		
Mixing system			TBD		
Digested sludge storage tank			1		
Days of storage			10	7	5

No evaluation or decisions regarding the digestion process are required for the Phase 1 project. If alternative anaerobic digestion technologies are to be considered they should be evaluated during Phase 2 design.

12.3 Sludge Dewatering

Dewatering of biosolids will be required in all phases of the project. Dewatering reduces the volume of material for landfill disposal and must provide a sufficiently dry product that can pass a paint filter test prior to disposal. Advantages and disadvantages are summarized in **Table 43**.

Table 43. Advantages and Disadvantages of Dewatering Equipment Technologies

Technology	Advantages	Disadvantages
Belt filter press	Proven, reliable technology Lower energy consumption	Lower cake solids (15-18%) Lack of odor enclosure Mechanically complex Higher use of wash water
Screw press	Lower energy consumption Compact footprint Good solids capture High cake solids (18-25%) Suitable for low solids feed sludges with addition of polymer	Maintenance
Centrifuge	High cake solids (18-25%) Consistent and continuous performance	High cost Higher energy usage
Plate and Frame Press	Very high cake solids (>25% possible)	Higher feed solids Batch-like operation Higher operator attention

Table 44 summarizes the phasing plan for the dewatering facilities.

Table 44. Summary of Dewatering Facilities for Each Phase

Item	Phase				
	Existing	1	2	3	4
Facilities		Belt Filter Press	New Solids Handling Building		
Number of dewatering units, Duty + standby		1	3+1	3+1	4+1
Minimum cake solids, %		15	15		
Minimum solids capture, %		95	95		
Cake storage hoppers		NA	1	2	2
Operation, hours per day/days per week		6/5	12/5	12/5	12/5

A technical and economic evaluation of applicable dewatering technologies will be required in Phase 1 and to determine the appropriate capacity of individual dewatering units. It is probable that the technology recommended for Phase 1 could be the technology used for all subsequent phases.

12.4 Biosolids Management Phasing

As the SMCFD Expansion takes place, different quantities, and qualities of biosolids will be produced by the liquid stream treatment processes. A summary of anticipated biosolid management strategies for different phases is shown in **Table 45**.

Table 45. Biosolids Management Strategies for Each Phase

Phase	Proposed Changes
1	Lagoon stabilization, drying, and landfilling. Addition of mechanical thickening or dewatering is recommended.
2a	Lagoon stabilization, drying, and landfilling. Add thickening and/or dewatering capacity as needed. Addition of drying beds recommended.
2b	Land Application. Addition of anaerobic digestion produces Class B biosolids.
3	Beneficial use via land application or other means.
4	Beneficial use via land application or other means

12.5 Biogas Handling and Uses

Anaerobic digesters produce biogas which is rich in methane. Typically, biogas is used to fuel boilers that heat the digester contents. In the lower Arizona desert, there are several months of the year where heating is not required or uses only a portion of the biogas generated. Flares are used to burn excess digester gas.

The implementation of digester gas flares or other digester gas uses will require an air quality permit.

The following list includes some common biogas utilization alternatives:

- Gas flares. Required with all alternatives
- Digester heating via boilers
- Combined heat and power generation (CHP)
- Microturbines
- Bio-methane conversion (gas sale)

Table 46 summarizes the phasing plan for the digester gas utilization facilities. Only gas flares and boilers for digester heating are included.

Table 46. Summary of Digester Gas Equipment for Each Phase

Item	Phase			
	1	2	3	4
Gas flares, EA		1+1	2+1	2+1
Boilers		1+1	2+1	2+1

12.6 Future Evaluations for Biosolids Facilities

Further evaluation of the biosolids processing need should be conducted during Phase 1. Specifically,

- Evaluate class of biosolids required, means of disposal and beneficial use options
- Evaluate whether sludge thickening will be included in Phase 1 or not and which technology will be used
- Evaluate dewatering technologies
- Evaluate aerobic digestion or aerobic sludge holding (lower solid retention time and lower volatile solids destruction)

13 Ancillary Facilities Conceptual Design

The following ancillary facilities have been programmed into the Phasing plan.

13.1 Operations Building

A new building will replace the existing administration building and operations building. The new building will be a single story facility of masonry block construction. All planned spaces will be constructed in Phase 1. The following spaces are recommended for inclusion in a new operations building for the expanded facility:

- Administrative Offices
- Customer Service/Billing
- Control Room
- Laboratory
- Meeting Room
- Break Room
- Shower and Locker Rooms

The total area for the occupied space will be approximately 8,000 square feet. This building size is based upon facilities of similar function and treatment capacity.

13.2 Maintenance Facility

A new building will be constructed for maintenance activities and will be a separate building from the Operations Building. The new maintenance building will have a clear ceiling height of 20 feet and will be of masonry block construction. The facility constructed in Phase 1 is intended to serve the needs through Phase 4. The following spaces are recommended for inclusion in a new operations building for the expanded facility:

- Workshop
- Instrument calibration and repair work area
- Parts storage

The total area of the maintenance facility will be approximately 4,000 square feet. This building size is based upon facilities of similar function and treatment capacity.

13.3 Chemical Storage and Handling

Chemical storage and handling facilities will be required based on the conceptual design for the SMCFD WRF expansion. Primarily, the facility will need to house chemicals for disinfection and membrane system cleaning. The chemical storage and handling area will have separate spill containment for each chemical stored. The chemical storage and handling area will have a pre-engineered steel shade structure.

In general, the quantity of stored chemical will be between 14 and 30 days, depending on the availability and stability of chemical.

- Sodium hypochlorite will be used for effluent disinfection and for membrane cleaning
- Sodium thiosulfate will be used for dechlorination
- Sodium hydroxide will be used for membrane cleaning
- Citric acid will be used for membrane cleaning
- Spare space will be provided to allow for smaller quantities of chemicals required from time to time. Examples would be a drum or tote of sulfuric acid to further depress the pH of membrane cleaning solutions, if required.

Table 47 summarizes the chemicals along with numbers of storage tanks and dosing or transfer pumps.

Table 47. Summary of Chemical Storage and Dosing Facilities for Each Phase

Parameter	Units	Phase			
		1	2	3	4
Sodium Hypochlorite (10-15% strength)					
Storage tanks	EA	1	2	3	4
Disinfection dosing pumps	EA	2	3	4	4
Membrane cleaning transfer pumps	EA	2	2	4	4
Sodium Thiosulfate (38%)					
Storage tanks	EA	1	1	2	2
Dosing pumps	EA	2	2	3	3
Sodium Hydroxide (25%)					
Storage totes	EA	2	3	4	4
Dosing pumps	EA	2	2	4	4
Citric Acid (50%)					
Storage totes	EA	2	3	4	4
Dosing pumps	EA	2	2	4	4

The following chemicals will be stored at other facilities on site and closer to the point of application:

- Solids thickening polymer. Phases 2-4 only. Located at the solids handling building constructed in Phase 2.
- Solids dewatering polymer. Located within the solids handling building. All phases
- Chemical odor scrubbers: hypochlorite and caustic. Located in proximity to chemical odor scrubbers
- Supplemental carbon addition. If required, will be in proximity to the bioreactors

13.4 Facility Water System

The existing facility water system uses the treated effluent supply drawn from the end of the existing chlorine contact tank. Additional capacity will be required to meet new facility water demands for new facilities constructed in Phase 1 and beyond.

The new facility water pumping system will be constructed proximal to the new effluent disinfection facilities and should include new pumps and a hydropneumatic tank to handle low flows. The new facility water system should be sized to accommodate demands through Phase 2 with minor improvements needed between Phases 1 and 2.

14 Electrical Power Supply

The electrical power system for this project consists of both medium voltage (MV) and low voltage (LV) systems. MV systems are those rated for more than 1000V and LV systems are those rated for equal to and less than 1000V. The following sections provide conceptual information regarding these systems.

14.1.1 Electrical Codes and Design Standards

The following electrical codes and design standards are applicable to this conceptual design:

- 2017 National Electric Code
- 2017 National Electric Safety Code
- 2018 International Energy Code
- NFPA 820 Standard for Fire Protection in Wastewater Treatment Facilities

The outdoor electrical distribution equipment, utilization equipment and above grade conductors will be rated for an average ambient temperature of 122 degrees Fahrenheit (50 degrees Celsius).

14.1.2 Primary and Back-Up Power

Primary power will be fed from Salt River Project (SRP) utility from the north side of the facility. The incoming voltage will be 12470V, 3 phase.

Standby power generation will be implemented in a central location on the site by using paralleling switchgear. Generators will be a standard size of 1500kW. Future generators can be added to switchgear to provide additional standby power capacity for future build out phases.

14.1.3 Conceptual Electrical Power Loads

The facility is currently served by a secondary metered radial type power distribution system. The existing service is rated 1000A, 480V, 3 phase. The existing calculated load is 734kVA. This existing system will be incorporated into Phase 1. The loads that will be served by the Electrical service are as follows:

- The existing site electric loads are served by the new 750KVA medium voltage transformer. The existing switchgear is rated for 1000 amps at 480V, 3 Phase.
- Stantec recently designed a facility that implemented MBR technology similar to what is being proposed for this facility expansion. That project’s capacity was 6MGD. The MBR load for that project was 3000kVA. That is the basis for the 6MGD MBR load for this project. An additional 500kVA for other loads was added to the 3000kVA for a total of 3500kVA. That is the incremental load for Phase 2, 3 and 4.

- The estimated Phase 1 load is based on the existing calculated load of 734kVA plus 60% of the 3500kVA load. The 60% factor is based on Phase 1 only adding 3.5MGD capacity The approximate Phase 1 load will be 3368 amps at 480V, 3 phase. This is the equivalent of 2800KVA.
- Additional loads will be added in future phases, and it is recommended to have a medium voltage loop distribution system for implementation of Phase 1 and in preparation for future phases.

14.1.4 Distribution Voltages and Transformation Requirements

The SMCFD power distribution system will operate at 12470V, 480V, 208V three phase and 120V single phase. Multiple voltage transformations will be required to obtain the various distribution voltages. The existing electrical distribution will need a 12470V:480Y/277V transformer. In addition, similar transformers will be required for the new Headworks, Blower, Membrane Bioreactors and Solids Handling motor control centers.

14.1.5 Medium Voltage Power System

14.1.5.1 Service Entrance Switchgear

A MV service entrance switchgear is needed for connection to the main utility and standby power supplies. The switchgear will have the characteristics outlined in **Table 48**. Actual dimensions will be confirmed with the design basis manufacturer.

Table 48. Medium Voltage Service Entrance Switch Gear Descriptions

Parameter	Criteria
Configuration	Paralleling generator arrangement
Type	ANSI C37.20.2 metal clad switchgear
Breaker	Main and feeder; electronically operated with paralleling capabilities
Location	Outside; adjacent to existing utility transformer
Enclosure	Non-walk, NEMA 3R

14.1.5.2 Medium Voltage Transformers

MV transformers will have the characteristics described in **Table 49**.

Table 49. Medium Voltage Transformers Descriptions

Parameter	Criteria
Quantity	Five (5)
Type	12470V:480Y/277V
Areas Served	Headworks, Blowers, MBR, Solids Handling MCCs
Sizes	750 kVA, 1000kVA, and 1500kVA
Location	Outside; adjacent to buildings/structures fed
Insulations	FR3 Envirotemp insulating liquid
Ratings	UL Listed; NEMA 3R exterior rating

14.1.6 Low Voltage Power System

14.1.6.1 LV Motor Control Centers

The low voltage motor control centers (MCCs) will implement full voltage starters, reduced voltage starters and variable frequency drives for the site's ancillary motor loads. MCCs will have the characteristics described in **Table 50**.

Table 50. Low Voltage Motor Control Center Descriptions

Parameter	Criteria
Starters and Drives	Full voltage starters Reduced voltage starters Variable frequency drives
VFD's	Motors 40 Hp or greater – 18 pulse VFDs Motors less than 40 Hp – 6 pulse VFDs (or full voltage starters)
VFD Reactors	Input line reactors on all VFDs Load reactors for circuits less than 100 ft dv/dt filters for circuits 100-300 ft Specialty dv/dt filters for circuits greater than 300 ft
Feeder Breakers	Molded case Breakers for non motor load feeds
Location	Indoors; inside local electrical rooms

14.1.6.2 Panelboards

The low voltage panelboards will have the characteristics summarized in **Table 51**.

Table 51. Low Voltage Panelboard Descriptions

Parameter	Criteria
Type	480V, 3 phase, 3 wire UL67 Panelboards 208Y/120V, 3 phase, 4 wire UL67 Panelboards
Location	Indoors; pump station electrical room

14.1.7 Grounding and Lighting Protection System

The grounding system will consist of grounding electrodes required by the NEC. For the electrical rooms, these are the building's metal frame/rebar, a concrete encased electrode and ground rods. The grounding electrodes will be bonded together to form the grounding electrode system required by the NEC. A lightning protection system is already installed and therefore will not be provided.

14.1.8 Interior and Exterior Lighting Systems

Light fixtures will be supplied as described in **Table 52**.

Table 52. Lighting System Descriptions

Parameter	Criteria	Description
Interior Light Fixtures	Type	LED Type
	Mounting	T-Bar Ceilings – Integral to the Ceiling Unfinished Ceilings – Suspended with threaded rod, conduit or rolled steel channel (Unistrut)
Target Light	Intensity Levels	50-foot candles – electrical, I&C, and control rooms 30-foot candles – bathroom, utility, hallways, process areas 1-foot candle average with 0.1 foot candle minimum for emergency lighting along egress paths
Exterior Lighting	Controls	Time clock and photocell lighting controller with a hand-off-auto switch and auto mode capabilities. Select fixtures will be local switch controlled.
	Code	2018 International Energy Code
Emergency Egress Lighting and Exit Signs	Type	LED Type
	Power Supply	Self-contained battery packs

14.1.9 Conductor and Cable Types

Conductors and cable types for different applications throughout the WRF are described in **Table 53**.

Table 53. Descriptions of Conductor and Cable Types

Parameters	Criteria
Medium Voltage Power System Conductors	
Type	UL Type MV-105 in accordance with UL 1072 and ICEA-S-93-639/NEMA-WC74 - Medium Voltage Power Cables
Insulation	Ethylene-propylene rubber (EPR) insulation rated at 105 degrees C with a shield and polyvinyl chloride (PVC) jacket
Insulation Level	133 percent, 115 mil
Shield Type	Copper tape type
Use	Individual
Low Voltage Power and Lighting System Conductors	
Type	Class B Type XHHW-2 cross-linked polyethylene conforming to UL-44 - UL Standard for Thermoset-Insulated Wires and Cables
Insulation	600 V; jacketed conductors will not be implemented
Minimum Size	#12AWG
Use	Individual
Discrete I/O Wiring	
Type	Class B Type XHHW-2 cross-linked polyethylene conforming to UL-44 - UL Standard for Thermoset-Insulated Wires and Cables
Insulation	600 V; jacketed conductors will not be implemented
Minimum Size	#14AWG
Use	Individual
Analog I/O Wiring	
Type	Tinned copper #16 AWG with a PVC jacket
Wiring Type	Shielded twisted pair (STP) Drain wire will be tinned copper #18 AWG
Insulation	Polyethylene
Shield Type	Aluminum foil polyester tape

14.1.10 Raceways, Ductbanks, Manholes and Handholes

Raceways, ductbanks, and other supporting structures for the electrical facilities at the WRF are described in **Table 54**.

Table 54. Electrical Raceway, Ductbanks, and Handholes Descriptions

Parameter	Criteria
Raceways	Underground and above grade conduits Cable trays will not be used for power distribution system
Exposed conduits	Extend from electrical room to process areas (other areas possible) Rigid aluminum conduit. PVC coated Galvanized rigid metal in hazardous areas.
Below Grade Conduits	PVC schedule 40 conduits Direct bury for pumping system and related circuits under the building slab Direct bury with concrete cap pumping system single conduit beyond building Concrete encased ductbank for pumping system multiple conduits beyond building Direct bury all non-pumping related circuits
Ductbanks	Reinforced concrete Red metallic warning ribbon placed 12-inches above conduit and dyed throughout
Manholes and Handholes	Solid bottom manholes and handholes with a sump, pulling eyes, H-20 traffic rated metal lid Metal lid to be grounded to ground conductor and routed through the handholes
Electric Utility Conduits	Routed from SRP connection to utility meter will meet electric utility requirements

15 SCADA System

The existing wastewater treatment processes at the SMCFD WRF will not be integrated with the new wastewater treatment processes proposed in this report. These existing processes are controlled by Allen-Bradley PLC 5's, which are obsolete and likewise will not be integrated with the new SCADA system proposed here.

The design and construction of new wastewater treatment processes is expected to occur in four separate phases over the span of not less than 20 years.

The phase planning for the new SCADA system considers three major objectives:

1) Hardware and Software Selection

2) Network Scalability and

3) Server Relocation.

15.1.1 Hardware and Software

Allen-Bradley PLC networks are the most common process control platform used in the water/wastewater industry. In addition to their proven reliability and scalability, Allen-Bradley has demonstrated that their obsolete hardware is compatible with modern hardware, or if desired, readily migrated to the modern hardware. These are important features because during the SMCFD WRF phased expansion, any chosen PLC platform would be expected to go through modernization.

The current line of Allen-Bradley PLC's are ControlLogix, CompactLogix, and MicroLogix. These processors are recommended based on the number of inputs and outputs to be monitored and controlled. ControlLogix PLC's are commonly recommended for facility I/O processing, and CompactLogix and MicroLogix are chosen for localized or vendor skid I/O processing. All these processors will communicate with each other through Allen-Bradley Stratix switches. The design software for programming these PLC's is Allen-Bradley's Studio 5000.

The human interface software of the SCADA system preferred by SMCFD is Inductive Automation Ignition. This line of software is commonly paired with Allen-Bradley PLC's to provide operators with control and data acquisition to and from the field. This non-licensed (one-time purchase) software provides unlimited tags, SCADA clients (field operator interface terminals), historian logging, report generation, and alarm notifications. Ignition will be able to serve SCADA needs through each expansion phase of the project.

15.1.2 Network Scalability

A ring-type network architecture provides scalability. Each PLC will be integrated to this network via two connections where all connections ultimately form the ring. When one segment of the ring is disconnected to integrate an additional PLC onto the network, network traffic flows through the unbroken side of the ring. This Ethernet-based network will utilize multi-mode fiber optic cabling for the redundant pathways on the ring.

The PLC and vendor control panels that are installed in Phase 1 of the project will be sized to accommodate the expected full-build out through Phase 4. PLC chassis will include spare slots for the addition of I/O cards needed in the future, along with adequate panel space for terminal block additions. Network switches will also be sized with enough spare ports to accommodate future, anticipated Ethernet integrations.

A conceptual network expansion at each phase of this project can be seen in Appendix D, sheets I-01, I-02, I-03, and I-04.

15.1.3 SCADA Server Relocation

A new admin building is planned for Phase 1 and will eventually house the SCADA servers for this facility. Since the SCADA servers must be installed during Phase 1 in an existing operations building, a server relocation will be required.

Two SCADA server racks that are redundant to each other will be installed during Phase 1 and their servers will be configured for “hot-standby” operation in which both collect data in parallel. At the time of relocation, one of the server racks will be removed from the SCADA fiber backbone and installed in the new location, leaving the other SCADA server fully functional. After the first server is relocated and reconnected to the backbone, the second server will be relocated to the new location and reconnected to the backbone, thus restoring server redundancy.

16 Opinion of Probable Construction Cost

The Class of Estimate for this opinion of probable construction cost is based on the Association for Advancement of Cost Engineering (AACE) Recommended Practice 18R-97: Cost Estimate Classification System as Applied in Engineering, Procurement and Construction for the Process Industries. This estimate is considered a Class 4 estimate.

Class 4 estimates reflect a 1-15% level of project design development typically associated with project feasibility studies. Class 4 estimates are typically prepared using parametric models or equipment-factored values and the expected level of accuracy can be as wide as -30% to +50%.

This estimate was prepared using reference cost estimates for a similar project which bid within the last 6 months, factored estimates based on equipment budgetary proposals, and parametric cost models based on the type of facility, building square footage, and treatment capacity. Contingency factors up to 20% have been applied to elements with a lower level of definition. An additional market conditions factor is included in prices not derived from recently bid projects. Cost includes contractor bonds and insurance, but does not include engineering fees, construction management fees, or owner's contingencies.

Table 55 summarizes the OPCC for Phase 1 construction. OPCCs are given for the date the original estimate was prepared (October 2022) and for the anticipated midpoint of construction (December 2024).

Table 55. Opinion of Probable Construction Cost for Phase 1

Item	OPCC (October 2022)	OPCC (December 2024)
Influent Splitter Structure	$700,000	$800,000
Headworks	$4,600,000	$5,000,000
Headworks Odor Control	$1,300,000	$1,400,000
Fine Screening	$4,600,000	$5,000,000
Bioreactors	$7,500,000	$8,200,000
Bioreactor Odor Control	$600,000	$700,000
Membrane Facilities	$10,700,000	$11,700,000
Blower Building	$4,200,000	$4,600,000
Chlorine Contact Tank	$1,200,000	$1,300,000
Facility Water Pump Station	$900,000	$1,000,000
Chemical Building	$3,700,000	$4,000,000
Solids Holding Tank, Dewatering and Odor Control	$8,900,000	$9,800,000
Electrical Buildings	$3,800,000	$4,200,000
Administration Building	$3,800,000	$4,100,000
Maintenance Building	$1,600,000	$1,700,000
Demolition Allowance	$700,000	$800,000
Sitework and Yard Piping	$5,500,000	$6,000,000
Electrical Service	$1,400,000	$1,500,000
Electrical Power Distribution and Standby Power	$8,800,000	$9,600,000
Total OPCC	**$74,500,000**	**$81,400,000**

17 Summary of Outstanding Decisions

The goal of the phasing plan is to provide a general overview and conceptual design for the expansion of the SMCFD WRF. Additional studies and evaluation will be required during Phase 1 design to further define the design concept and select preferred configurations and types of equipment. A listing of proposed evaluation is included in **Table 56**.

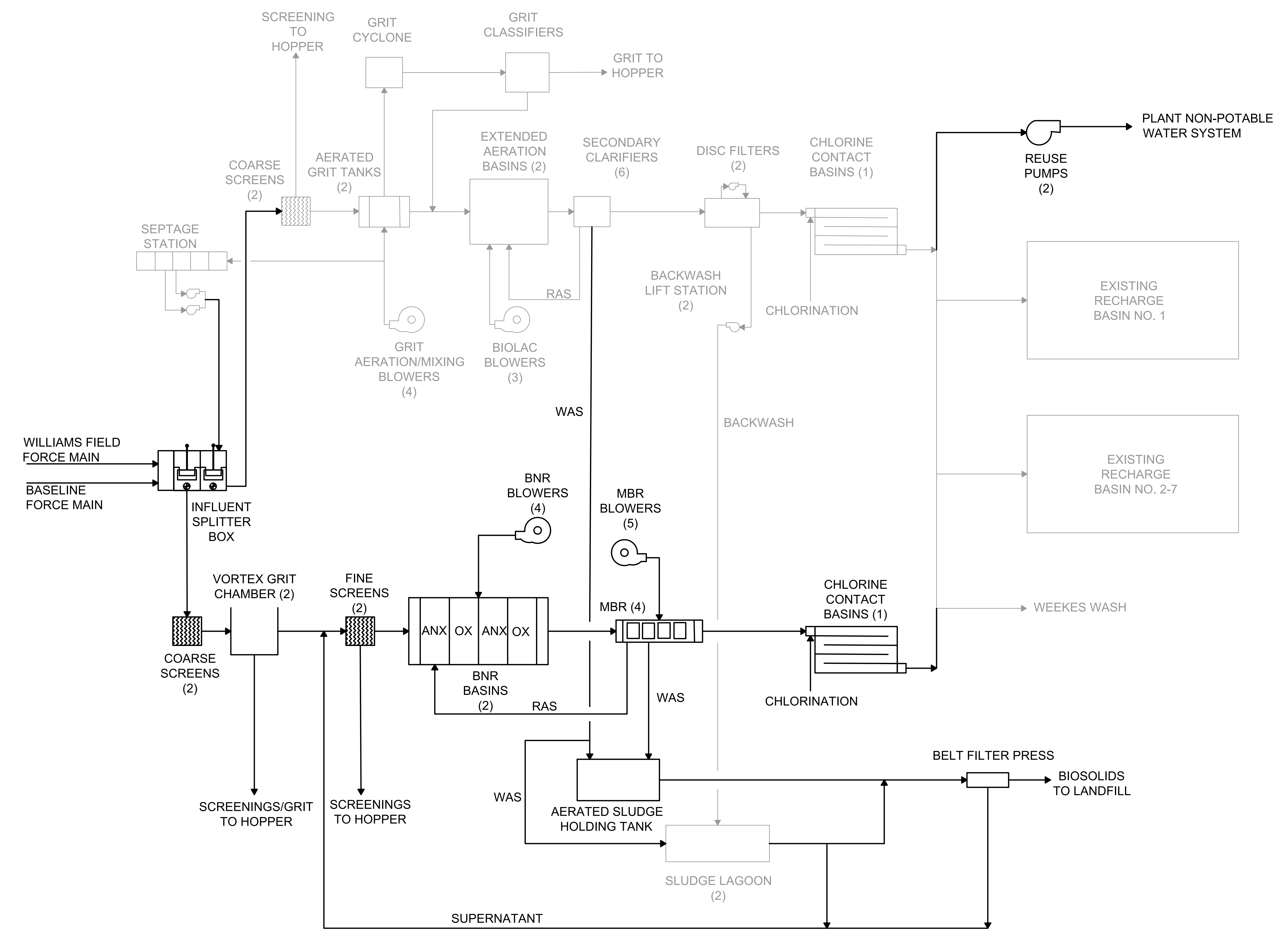
Table 56. Phase 1 Future Evaluations

Facility Component	Phase 1 Preliminary Design Evaluations
Influent flow split	Evaluate configurations and integration into the new headworks to avoid stranded assets in future phases
Preliminary screens	Evaluate alternatives for coarse screen technologies.
Grit removal	Evaluate alternatives for grit removal technologies.
Fine screens	Evaluate alternatives for fine screen technologies
Membrane bioreactor	Evaluate bioreactor configurations Evaluate process air and membrane air scour blower technologies Evaluate procurement approach for the MBR system. This should include considerations for pre-selection or pre-purchase and assignment of the procurement contract. Survey market for qualified MBR system suppliers
Effluent reuse/recharge/disposal	Prepare comprehensive effluent water balance of all on site and off site uses and recharge facilities. The water balance should include month by month water demand and supply. Evaluate recharge methods for Phase 1 and future expansion.
Biosolids Handling	Evaluate class of biosolids required for Phase 1 Evaluate benefit of sludge thickening to extend useful life of sludge drying beds Evaluate dewatering technologies Evaluate sludge holding tanks versus aerobic digestion for Phase 1

APPENDICES

APPENDIX A

Process Flow Diagrams



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Apache Junction, Arizona

Title
PROCESS FLOW DIAGRAM - PHASE 1

Project No.	Scale
181301439	AS SHOWN

Revision	Sheet	Figure
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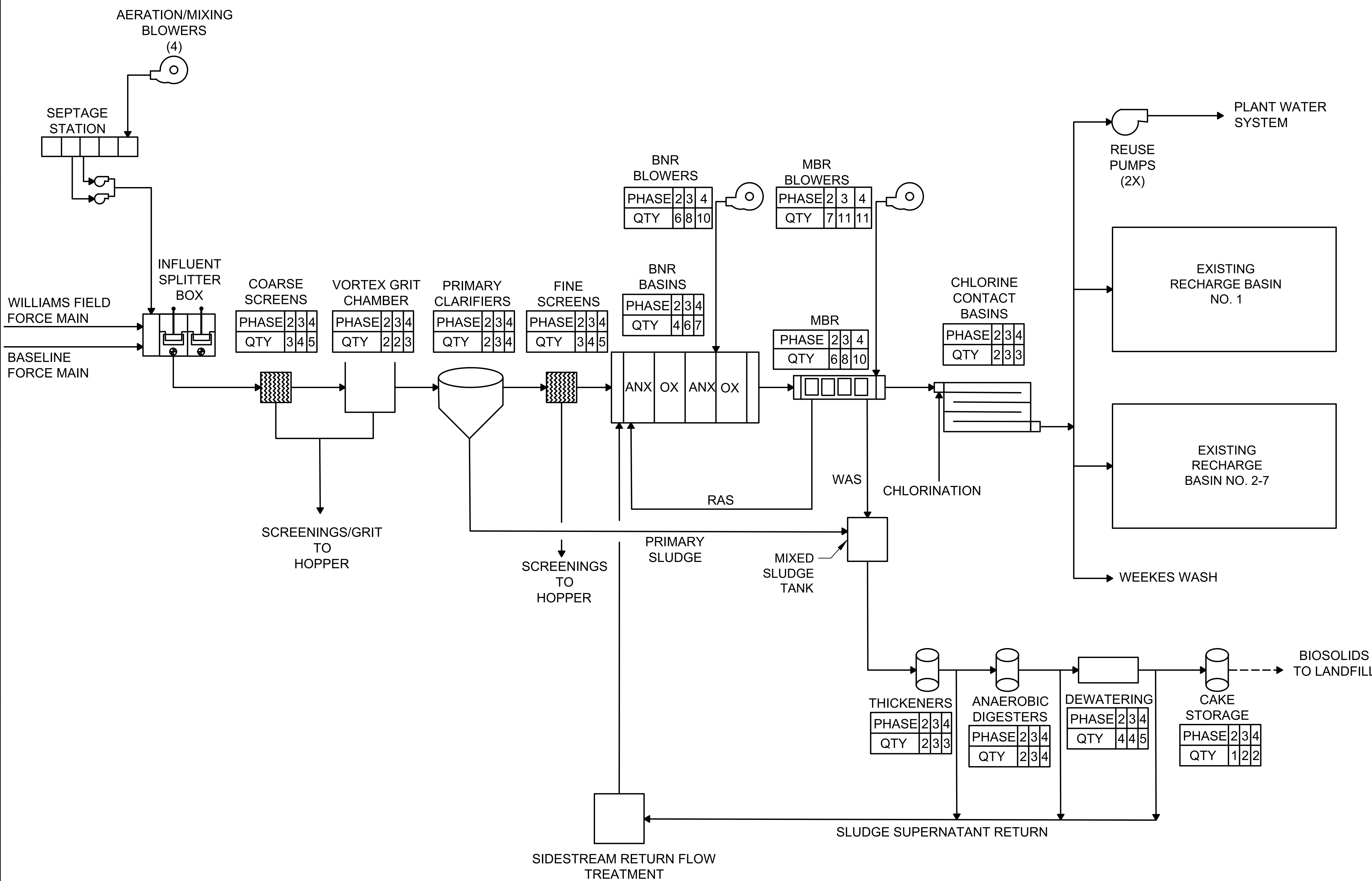

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Title
PROCESS FLOW DIAGRAM - PHASE 2, 3, 4

Project No. 181301439
Scale AS SHOWN
Revision 0
Sheet of
Figure

APPENDIX B

Hydraulic Profiles

LEGEND

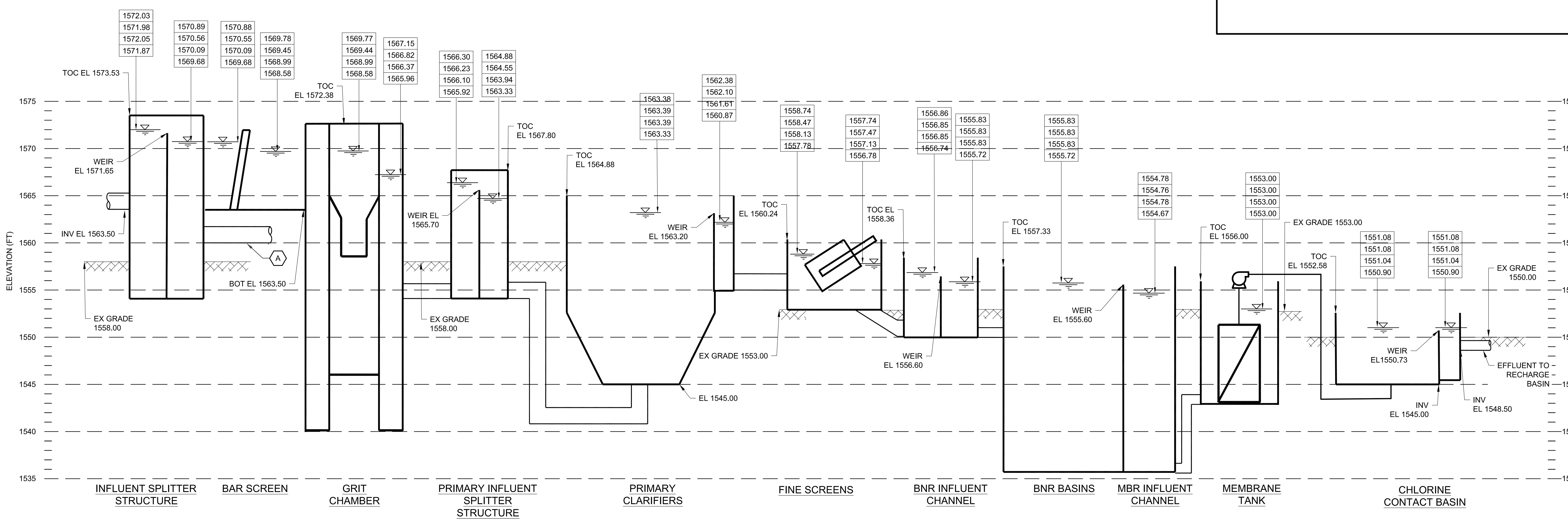
XXXX.XX	58.50 MGD: PHASE 4 PEAK HOUR INFLUENT FLOW
XXXX.XX	48.70 MGD: PHASE 3 PEAK HOUR INFLUENT FLOW
XXXX.XX	32.45 MGD: PHASE 2 PEAK HOUR INFLUENT FLOW
XXXX.XX	13.00 MGD: PHASE 2 ANNUAL AVERAGE INFLUENT FLOW

GENERAL SHEET NOTES

1. WEIR AND INVERT ELEVATIONS WERE SET USING PHASE 4 CONDITIONS.
2. GRADE ELEVATIONS WERE ESTIMATED FROM THE 1994 RECORD DRAWINGS AND SATELLITE IMAGERY OBTAINED FROM GOOGLE EARTH AND BING.
3. NUMBER OF CLARIFIERS VARIES BETWEEN PHASES. PHASE 1 HAS 0 CLARIFIERS, PHASE 2 HAS 2 CLARIFIERS, PHASE 3 HAS 3 CLARIFIERS, PHASE 4 HAS 4 CLARIFIERS.
4. THE NUMBER OF BNR BASINS VARIES BETWEEN PHASES. PHASE 1 HAS 2 BASINS, PHASE 2 HAS 4 BASINS, PHASE 3 HAS 6 BASINS, PHASE 4 HAS 7 BASINS.

SHEET KEYNOTES

A. INFLUENT SPLITTER STRUCTURE SPLITS THE FLOWS. FOR PEAK HOUR FLOWS, 10.5 MGD GOES TO MBR TRAIN, 8.9 GOES TO BIOLAC TRAIN. FOR ANNUAL AVERAGE, 3.5 MGD GOES TO MBR, 3 MGD GOES TO BIOLAC TRAIN. THE SPLIT WAS CREATED TO MATCH EXISTING DESIGN FLOWS FOR THE BIOLAC TRAIN SYSTEM.



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LEGEND

NOTES TO DESIGNER

1. REMOVE ANY PROPOSED ITEM.
2. ONLY SHOW EXISTING INFRASTRUCTURE. THERE SHOULDN'T BE ANY WEIGHTED LINES.
3. ADD IN EXISTING RECHARGE BASINS (1,2,3,4,5,6,&7), SLUDGE DRYING BEDS, AND SLUDGE LAGOONS THAT WERE PREVIOUSLY REMOVED

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Apache Junction, Arizona

Title
HYDRAULIC PROFILE - PHASES 2, 3 AND 4

Project No.	Scale
181301439	AS SHOWN

Revision	Sheet	Figure
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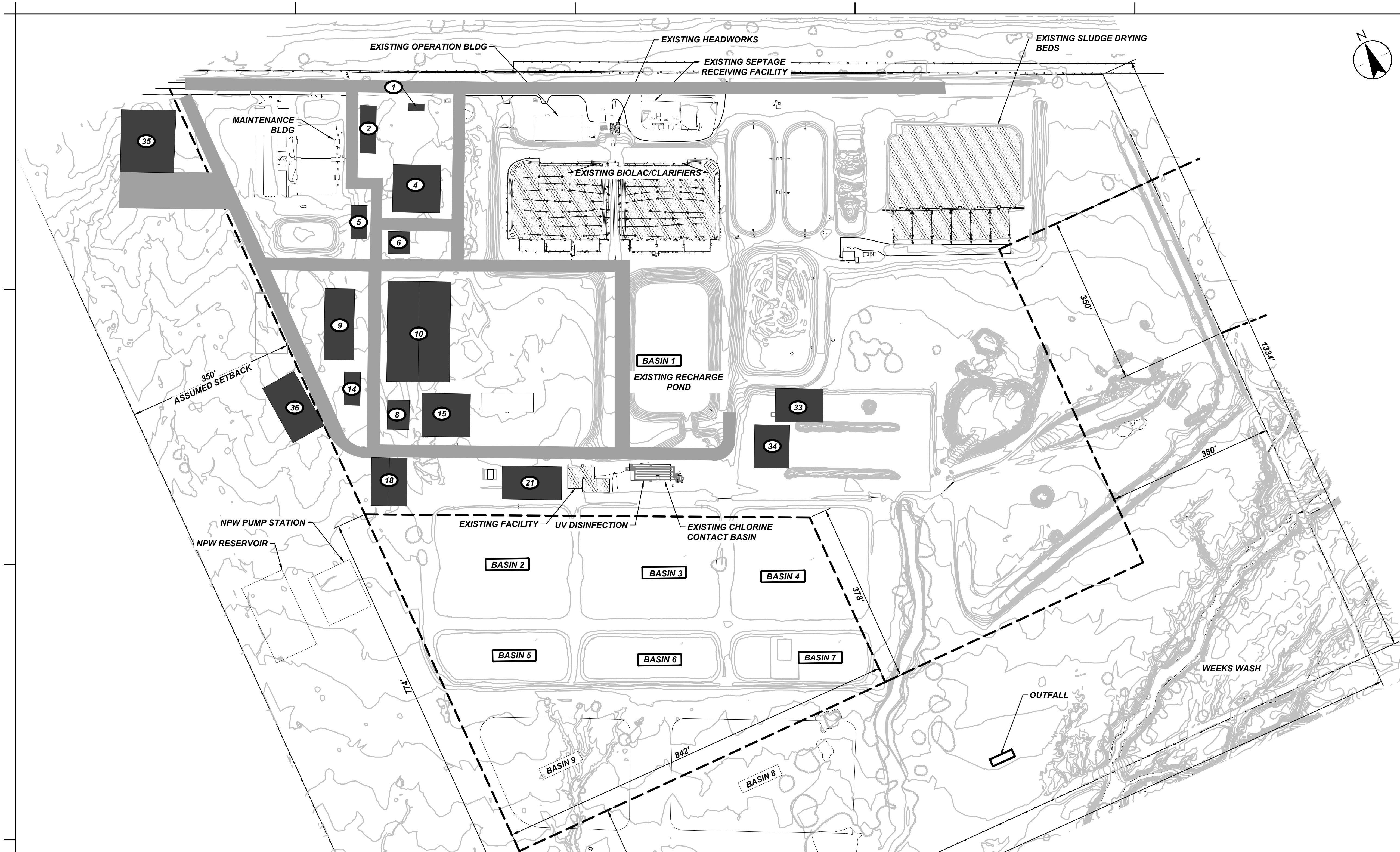
APPENDIX C

Site Plans



1	INFLUENT SPLITTER STRUCTURE
2	PHASE 1 AND 2 HEADWORKS
3	NOT USED
4	HEADWORKS ODOR CONTROL
5	ELECTRICAL BUILDING 1
6	PHASE 1 AND 2 FINE SCREENING FACILITY
7	NOT USED
8	BIOREACTOR ODOR CONTROL
9	BLOWER BUILDING
10	BIOREACTORS 1A/1B
11	NOT USED
12	NOT USED
13	NOT USED
14	ELECTRICAL BUILDING 2
15	MEMBRANE FACILITY 1
16	NOT USED
17	NOT USED
18	DISINFECTION CHANNEL 1/PLANT WATER PS

19	NOT USED
20	NOT USED
21	CHEMICAL BUILDING
22	NOT USED
23	NOT USED
24	NOT USED
25	NOT USED
26	NOT USED
27	NOT USED
28	NOT USED
29	NOT USED
30	NOT USED
31	NOT USED
32	NOT USED
33	AERATED SLUDGE HOLDING TANK
34	BELT PRESS FACILITY (PHASE 1)
35	ADMIN/OPS BUILDING
36	MAINTENANCE BUILDING

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LEGEND

PROPERTY/FENCE LINE
PROPERTY LINE
SETBACK LINE

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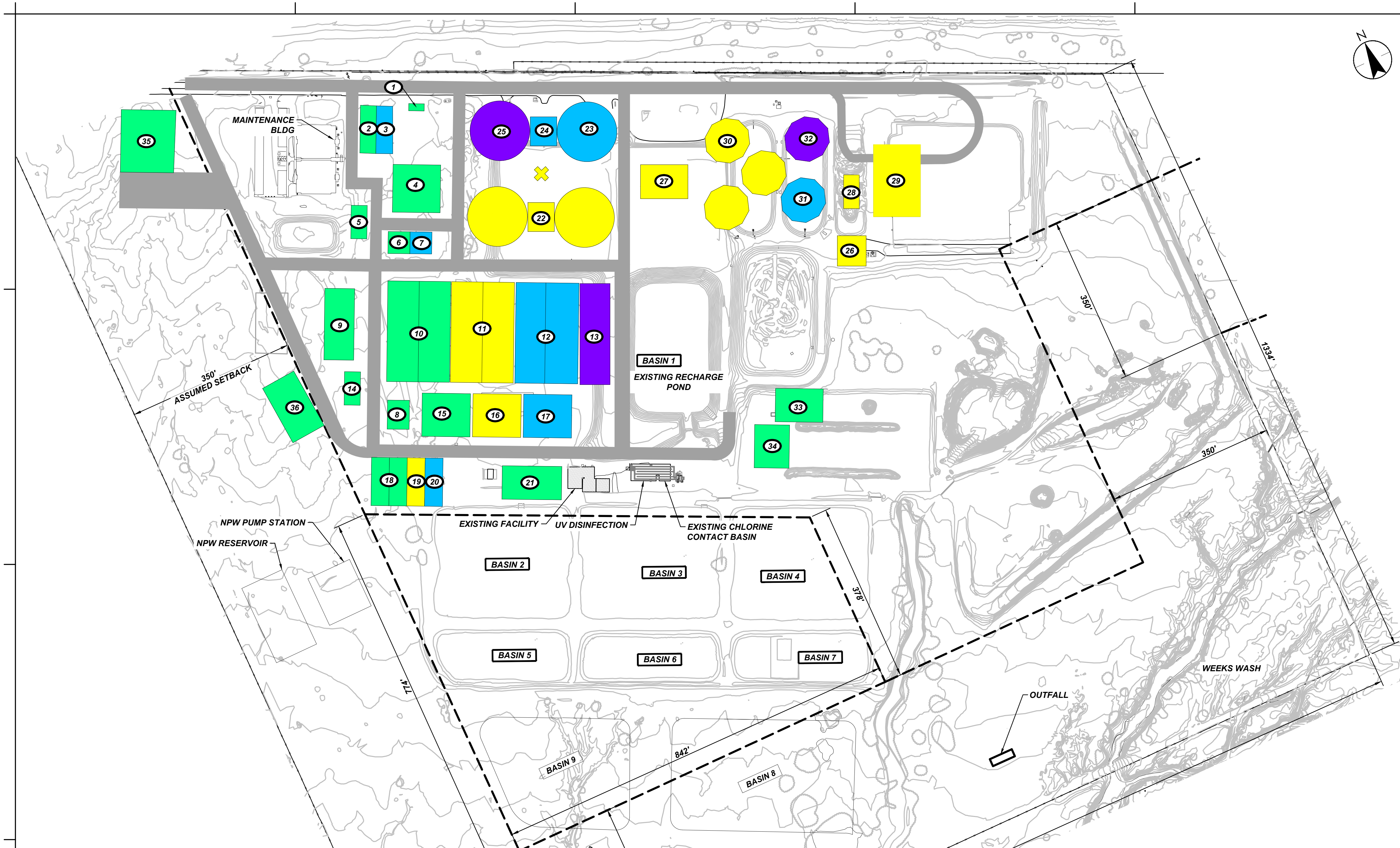
Client/Project
WRF PHASING PLAN

Apache Junction, Arizona

Title
PROPOSED SITE PHASE 1

Project No. 181301439
Scale AS SHOWN
Revision 0
Sheet of
Figure G.3

ORIGINAL SHEET - ARCH D



1	INFLUENT SPLITTER STRUCTURE
2	PHASE 1 AND 2 HEADWORKS
3	PHASE 3 AND 4 HEADWORKS
4	HEADWORKS ODOR CONTROL
5	ELECTRICAL BUILDING 1
6	PHASE 1 AND 2 FINE SCREENING FACILITY
7	PHASE 3 AND 4 FINE SCREENING FACILITY
8	BIOREACTOR ODOR CONTROL
9	BLOWER BUILDING
10	BIOREACTORS 1A/1B
11	BIOREACTORS 2A/2B
12	BIOREACTOR 3A/3B
13	BIOREACTORS 4A
14	ELECTRICAL BUILDING 2
15	MEMBRANE FACILITY 1
16	MEMBRANE FACILITY 2
17	MEMBRANE FACILITY 3
18	DISINFECTION CHANNEL 1/PLANT WATER PS

19	DISINFECTION CHANNEL 2
20	DISINFECTION CHANNEL 3
21	CHEMICAL BUILDING
22	PRIMARY SED BASINS 1 AND 2, PSPS 1
23	PRIMARY SED BASIN 3
24	PRIMARY SLUDGE/SCUM PUMP STATION 2
25	PRIMARY SED BASIN 4
26	SOLID ODOR CONTROL
27	BOILER BUILDING AND FLARES
28	ELECTRICAL BUILDING 3
29	SOLIDS HANDLING BUILDING
30	DIGESTERS 1, 2 AND DIGESTED SLUDGE HOLDING TANK
31	DIGESTER 3
32	DIGESTER 4
33	AERATED SLUDGE HOLDING TANK
34	BELT PRESS FACILITY (PHASE 1 ONLY)
35	ADMIN/OPS BUILDING
36	MAINTENANCE BUILDING

PHASE 1
PHASE 2
PHASE 3
PHASE 4

0 100' 200'
Scale in feet

ORIGINAL SHEET - ARCH D

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LEGEND
EXISTING PROPERTY/FENCE LINE
NEW PROPERTY LINE
EXISTING SETBACK LINE

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WRF PHASING PLAN

Apache Junction, Arizona

Title
PROPOSED SITE PHASING PLAN

Project No.	Scale
181301439	AS SHOWN

Revision	Sheet	Figure
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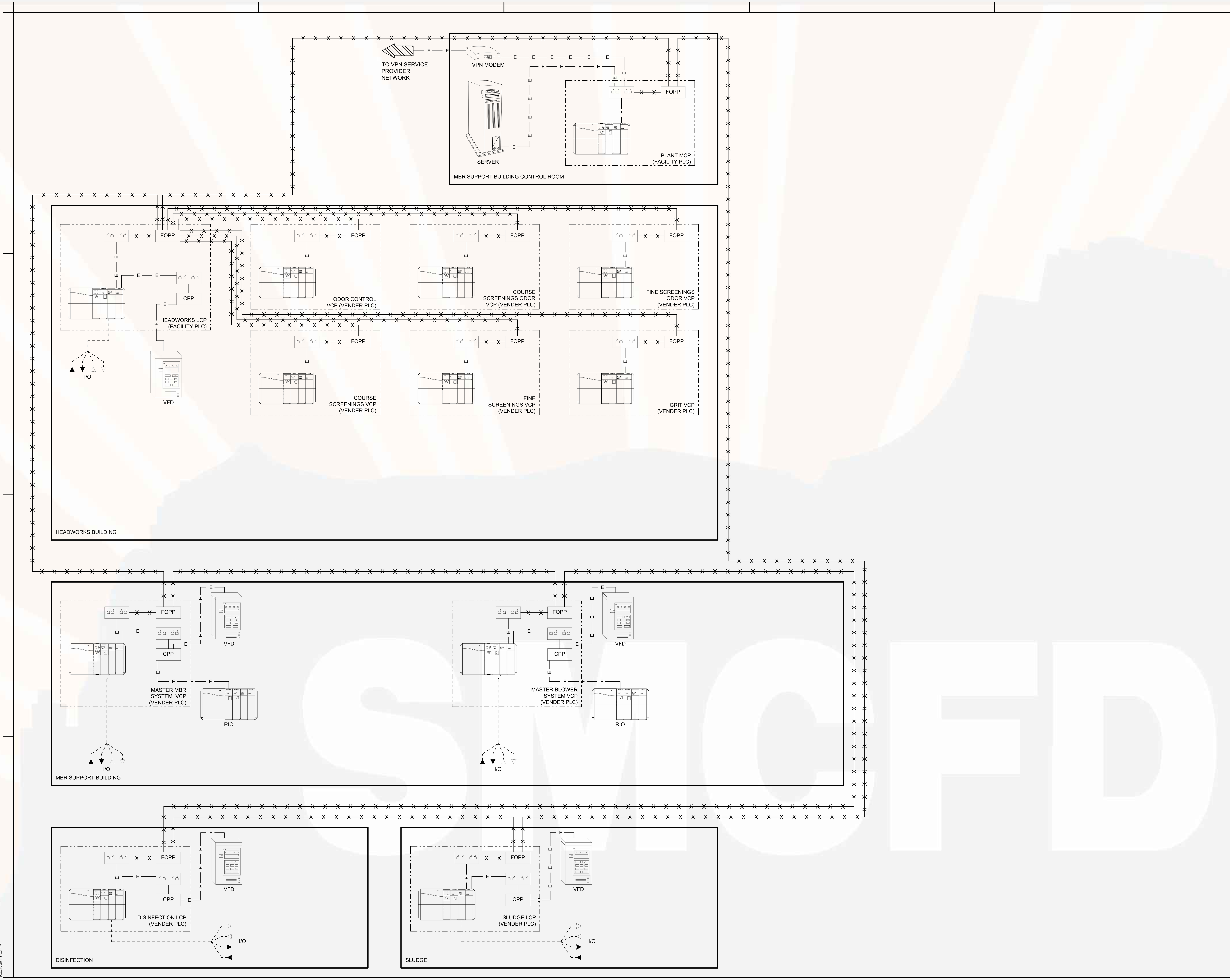
APPENDIX D

Instrumentation and Controls



ORIGINAL SHEET - ARCH D

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LEGEND

- FIBER ENET
- CAT-6 ENET
- HARDWIRE I/O

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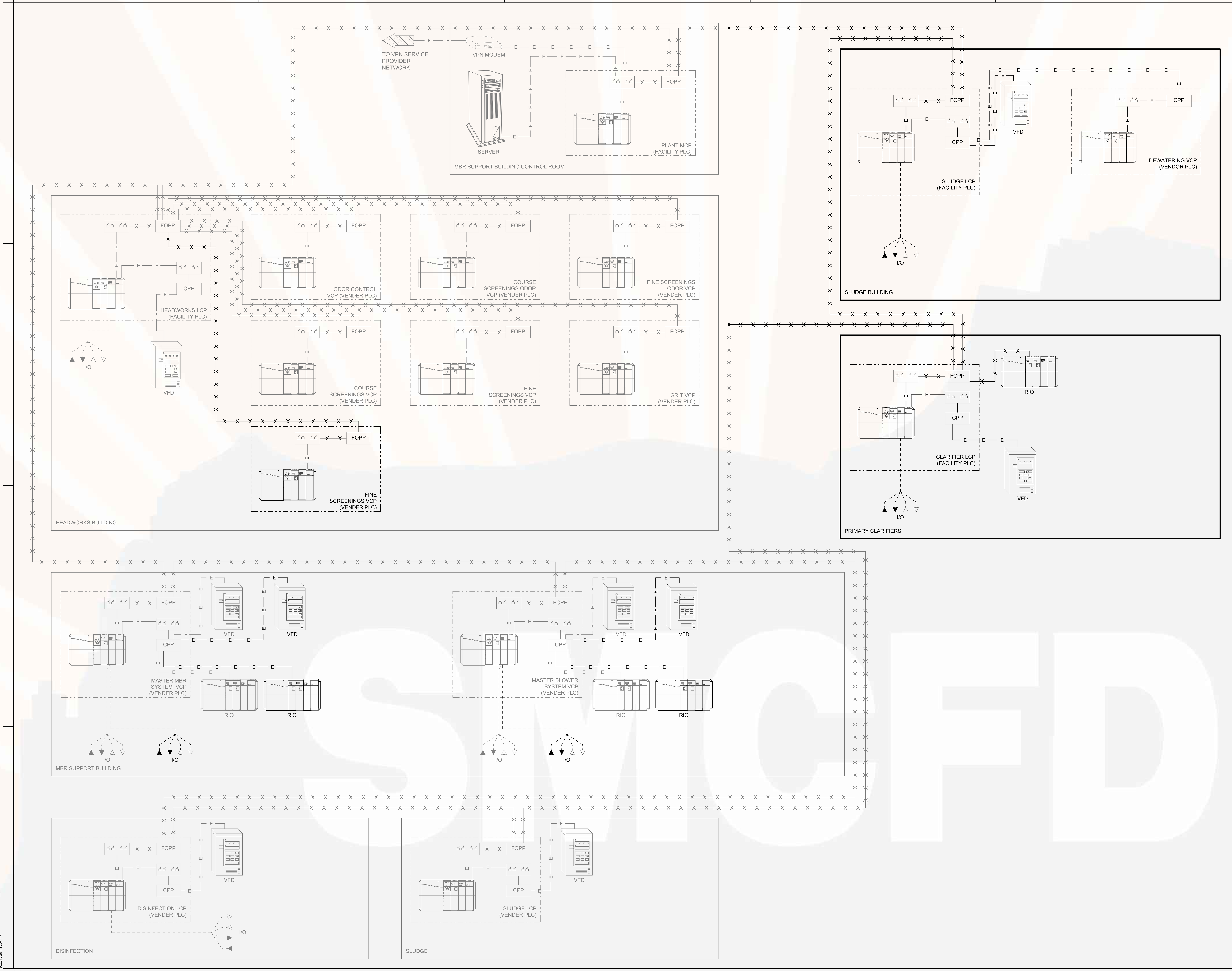
SMCFD #1 WRF PHASE EXPANSION PLAN

Apache Junction, Arizona

Title
NETWORK BLOCK DIAGRAM - PHASE 1

Project No.	Scale
181301439	NO SCALE
Revision / Sheet of	Figure I-01



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CAT-6 ENET

HARDWIRE I/O

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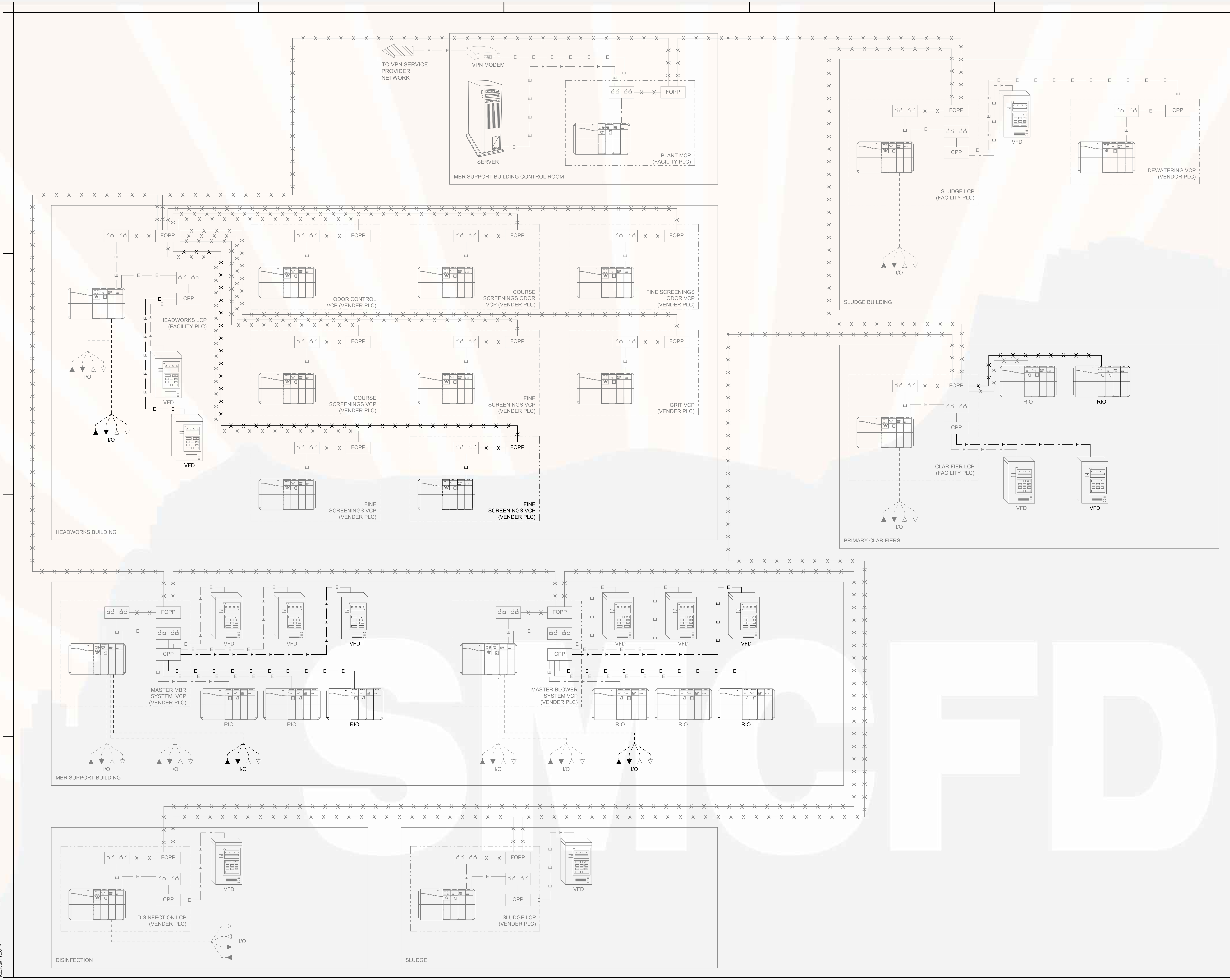
SMCFD #1 WRF PHASE EXPANSION PLAN

Apache Junction, Arizona

Title

NETWORK BLOCK DIAGRAM - PHASE 2

Project No.	Scale
181301439	NO SCALE
Revision / Sheet of	Figure I-02



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CAT-6 ENET
HARDWIRE I/O

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SMCFD #1 WRF PHASE EXPANSION PLAN

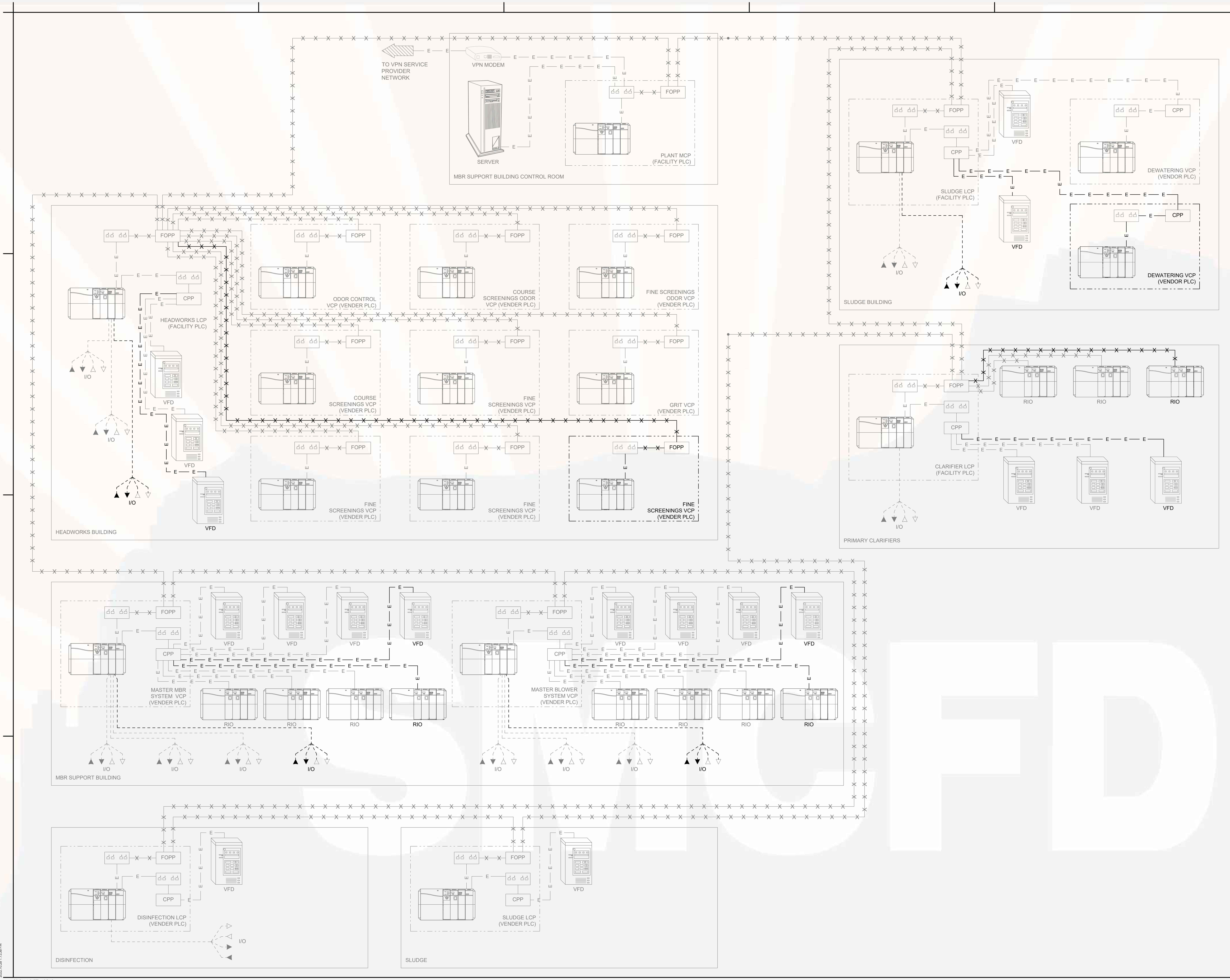
Apache Junction, Arizona

Title

NETWORK BLOCK DIAGRAM - PHASE 3

Project No.	Scale
181301439	NO SCALE
Revision / Sheet of	Figure I-03

ORIGINAL SHEET - ARCH D



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LEGEND

- *FIBER ENET*
- *CAT-6 ENET*
- *HARDWIRE I/O*

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SMCFD #1 WRF PHASE EXPANSION PLAN

Apache Junction, Arizona

Title
NETWORK BLOCK DIAGRAM - PHASE 4

Project No.	Scale
181301439	NO SCALE

Revision	Sheet	Figure
	of	I-04

APPENDIX E

Electrical

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208 PLAN AND DMA BOUNDARY AMENDMENT

Apache Junction, Arizona

Title

ELECTRICAL
PROPOSED SITE
LOOP DISTRIBUTION

Project No.	Scale
181300816	AS SHOWN

Revision	Sheet		Figure
0		of	E.101

ORIGINAL SHEET - ARCH D

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208 PLAN AND DMA BOUNDARY AMENDMENT

Apache Junction, Arizona

Title
ELECTRICAL
PROPOSED SITE
RADIAL DISTRIBUTION

Project No.	Scale
181300816	AS SHOWN

Revision	Sheet	Figure
0	of	E.102

ORIGINAL SHEET - ARCH D

SHEET KEYNOTES

A. PROVIDE PRIMARY METERING CABINET IN ACCORDANCE WITH THE ELECTRIC UTILITY COMPANY, SALT RIVER PROJECT (SRP), ELECTRIC SERVICE SPECIFICATION MANUAL (ESRM) SECTION 9 AND EUSERC DRAWING 400. IT SHALL BE UL OR CSA LISTED. EATON OR EQUAL.

B. PROVIDE SERVICE ENTRANCE RATED PARALLELING SWITCHGEAR. OPEN TRANSITION. EATON, ASCO OR EQUAL.

C. PROVIDE DIESEL ENGINE DRIVEN STANDBY GENERATOR WITH 24 HOUR FUEL TANK, WEATHER PROOF AND SOUND ATTENUATING ENCLOSURE.

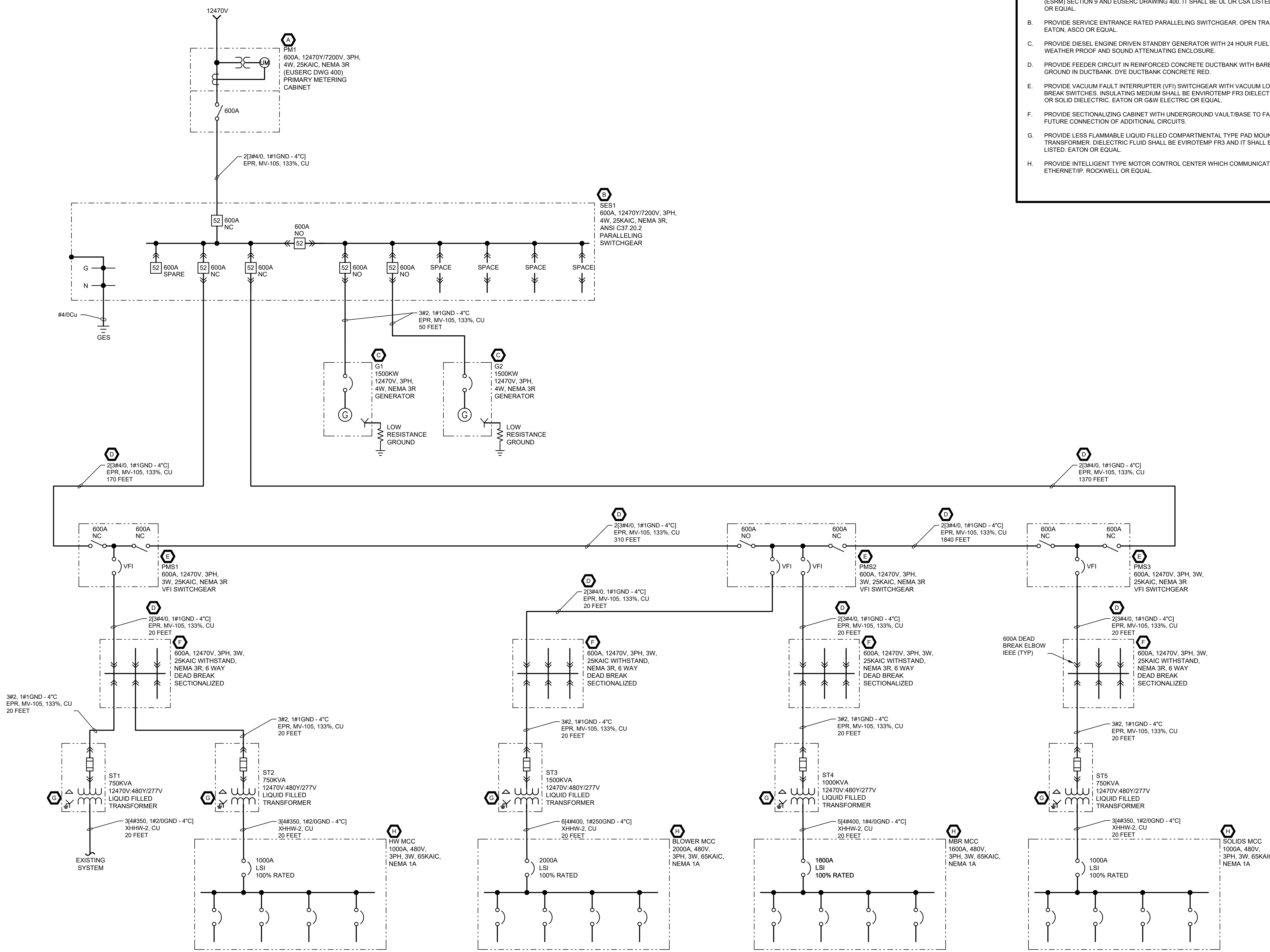
D. PROVIDE FEEDER CIRCUIT IN REINFORCED CONCRETE DUCTBANK WITH BARE #4/0 CU GROUND IN DUCTBANK. DYE DUCTBANK CONCRETE RED.

E. PROVIDE VACUUM FAULT INTERRUPTER (VFI) SWITCHGEAR WITH VACUUM LOAD BREAK SWITCHES. INSULATING MEDIUM SHALL BE ENVIROTEMP FR3 DIELECTRIC FLUID OR SOLID DIELECTRIC. EATON OR G&W ELECTRIC OR EQUAL.

F. PROVIDE SECTIONALIZING CABINET WITH UNDERGROUND VAULT/BASE TO FACILITATE FUTURE CONNECTION OF ADDITIONAL CIRCUITS.

G. PROVIDE LESS FLAMMABLE LIQUID FILLED COMPARTMENTAL TYPE PAD MOUNTED TRANSFORMER. DIELECTRIC FLUID SHALL BE EVIROTEMP FR3 AND IT SHALL BE UL LISTED. EATON OR EQUAL.

H. PROVIDE INTELLIGENT TYPE MOTOR CONTROL CENTER WHICH COMMUNICATES WITH ETHERNET/IP. ROCKWELL OR EQUAL.



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208 PLAN AND DMA BOUNDARY AMENDMENT

Apache Junction, Arizona

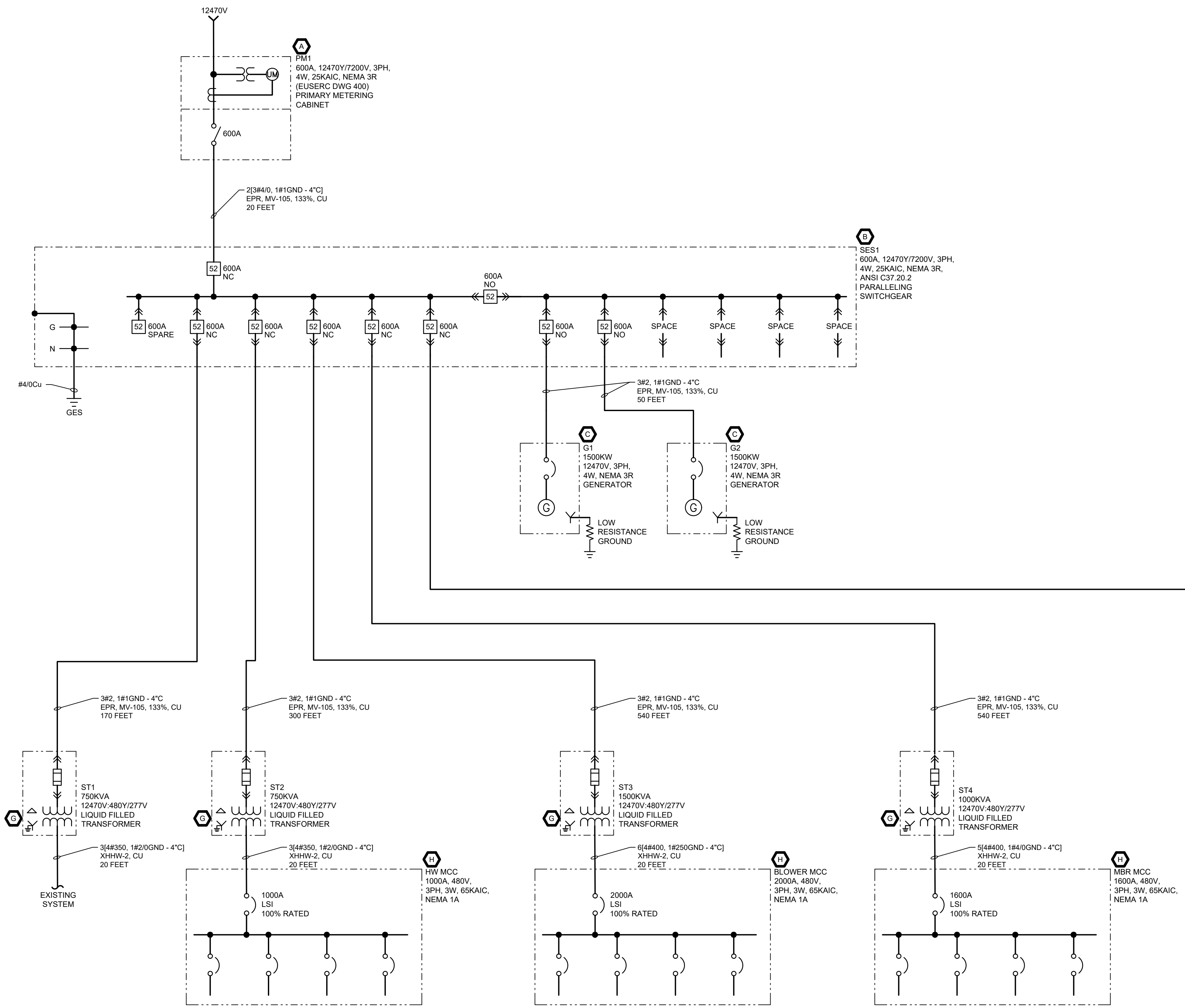
Title

ELECTRICAL
SINGLE LINE DIAGRAM
LOOP DISTRIBUTION

Project No.	Scale
181300816	AS SHOWN

Revision	Sheet	Figure
0	of	E.601

ORIGINAL SHEET - ARCH D



SHEET KEYNOTES

A. PROVIDE PRIMARY METERING CABINET IN ACCORDANCE WITH THE ELECTRIC UTILITY COMPANY, SALT RIVER PROJECT (SRP), ELECTRIC SERVICE SPECIFICATION MANUAL (ESRM) SECTION 9 AND EUSERC DRAWING 400. IT SHALL BE UL OR CSA LISTED. EATON OR EQUAL.

B. PROVIDE SERVICE ENTRANCE RATED PARALLELING SWITCHGEAR. OPEN TRANSITION. EATON, ASCO OR EQUAL.

C. PROVIDE DIESEL ENGINE DRIVEN STANDBY GENERATOR WITH 24 HOUR FUEL TANK, WEATHER PROOF AND SOUND ATTENUATING ENCLOSURE.

D. PROVIDE FEEDER CIRCUIT IN REINFORCED CONCRETE DUCTBANK WITH BARE #4/0 CU GROUND IN DUCTBANK. DYE DUCTBANK CONCRETE RED.

E. PROVIDE VACUUM FAULT INTERRUPTER (VFI) SWITCHGEAR WITH VACUUM LOAD BREAK SWITCHES. INSULATING MEDIUM SHALL BE ENVIROTEMP FR3 DIELECTRIC FLUID OR SOLID DIELECTRIC. EATON OR G&W ELECTRIC OR EQUAL.

F. PROVIDE SECTIONALIZING CABINET WITH UNDERGROUND VAULT/BASE TO FACILITATE FUTURE CONNECTION OF ADDITIONAL CIRCUITS.

G. PROVIDE LESS FLAMMABLE LIQUID FILLED COMPARTMENTAL TYPE PAD MOUNTED TRANSFORMER. DIELECTRIC FLUID SHALL BE EVIROTEMP FR3 AND IT SHALL BE UL LISTED. EATON OR EQUAL.

H. PROVIDE INTELLIGENT TYPE MOTOR CONTROL CENTER WHICH COMMUNICATES WITH ETHERNET/IP. ROCKWELL OR EQUAL.

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208 PLAN AND DMA BOUNDARY AMENDMENT

Apache Junction, Arizona

Title
ELECTRICAL
SINGLE LINE DIAGRAM
RADIAL DISTRIBUTION

Project No.	Scale
181300816	AS SHOWN

Revision	Sheet	Figure
0	of	E.602

ORIGINAL SHEET - ARCH D