Professional Service Agreement
(PSA)

Professional Services Agreement
with
Calaveras County Water District
PO Box 846 – 120 Toma Court
San Andreas, California 95249
Telephone 209-754-3543   Fax 209-754-1120

The terms on subsequent pages are incorporated in this document and will constitute a part of the agreement between the parties when signed.

To:

Phone: **Fax:**

Date: **Agreement No.** __________________
Purchase Order No. ______________

The undersigned Consultant offers to furnish the following:

Contract Price: **Not to exceed,** at the rates specified in Attachment A.

Completion Date:

For Technical Direction by Calaveras County Water District: Charles Palmer, District Engineer, Post Office Box 846, San Andreas, California 95249, charlesp@ccwd.org, telephone (209) 754-3174, or designee.

For Direction by Consultant:

Accepted: Calaveras County Water District **Consultant:**

By: ___________________________________ By: ________________________________
Michael Minkler
General Manager

Date: _____________________________, 2021 Date: _________________________, 2021

Consultant agrees with Calaveras County Water District that:

a. Hold-Harmless. When the law establishes a professional standard of care for the Consultant's services, to the fullest extent permitted by law, Consultant will indemnify and hold harmless Calaveras County Water District, its directors, officers, employees, and authorized volunteers from all claims and demands of all persons to the extent caused by the Consultant's negligence, recklessness, or willful misconduct in the performance (or actual or alleged non-performance) of the work under this agreement. Consultant shall defend itself against any and all liabilities, claims, losses, damages, and costs arising out of Consultant's negligent performance or non-performance of the work hereunder, and shall not tender such claims to Calaveras County Water District nor to its directors, officers, employees, or authorized volunteers, for defense or indemnity.

b. Indemnification. Other than in the performance of professional services, to the fullest extent permitted by law, Consultant will defend, indemnify and hold harmless Calaveras County Water District, its directors, officers, employees and authorized volunteers from all claims and demands of all persons arising out the negligent or reckless performance of the work or furnishing of materials; including but not limited to, claims by the Consultant or Consultant's employees for damages to persons or property except to the extent caused by the negligence or willful misconduct or active negligence of Calaveras County Water District, its directors, officers, employees, or authorized volunteers.

c. Workers Compensation. By his/her signature hereunder, Consultant certifies that he/she is aware of the provisions of Section 3700 of the California Labor Code which requires every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and that Consultant will comply with such provisions before commencing the performance of the professional services under this agreement. Consultant and sub-Consultants will keep workers' compensation insurance for their employees in effect during all work covered by this agreement. A sole-proprietor exempt from the requirements to provide such coverage, with no employees or using no sub consultants, shall so certify on the form provided by the District.

d. Professional Liability. Consultant will file with Calaveras County Water District, before beginning professional services, a certificate of insurance satisfactory to the Calaveras County Water District evidencing professional liability coverage of not less than $1,000,000 per claim and annual aggregate, requiring 30 day notice of cancellation (10 days for non-payment of premium) to Calaveras County Water District. Coverage is to be placed with a carrier with an A.M. Best rating of no less than A-: VII, or equivalent, or as otherwise approved by Calaveras County Water District. The retroactive date (if any) is to be no later than the effective date of this agreement. Consultant shall maintain such coverage continuously for a period of at least three years after the completion of the contract work. Consultant shall purchase a one-year extended reporting period i) if the retroactive date is advanced past the effective date of this Agreement; ii) if the policy is canceled or not renewed; or iii) if the policy is replaced by another claims-made policy with a retroactive date subsequent to the effective date of this Agreement. In the event that the Consultant employs other consultants (sub-consultants) as part of the work covered by this agreement, it shall be the Consultant's responsibility to require and confirm that each sub-consultant meets the minimum insurance requirements specified above.

e. General Liability. Consultant will file with Calaveras County Water District, before beginning professional services, certificates of insurance satisfactory to Calaveras County Water District evidencing general liability coverage of not less than $1,000,000 per occurrence ($2,000,000 general and products-completed operations aggregate (if used)) for bodily injury, personal injury and property damage; auto liability of at least $1,000,000 for bodily injury and property damage each accident limit; workers' compensation (statutory limits) and employer's liability ($1,000,000) (if applicable); requiring 30 days (10 days for non-payment of premium) notice of cancellation to Calaveras County Water District. The general liability coverage is to state or be endorsed to state "such insurance shall be primary and any insurance, self-insurance or other coverage maintained by Calaveras County Water District, its directors, officers, employees, or authorized volunteers shall not contribute to it". The general liability coverage shall give Calaveras County Water District, its directors, officers, employees, and authorized volunteers additional insured status using ISO endorsement CG2010, CG2033, or equivalent. Coverage is to be placed with a carrier with an A.M. Best rating of no less than A- :VII, or equivalent, or as otherwise approved by Calaveras County Water District. In the event that the Consultant employs other consultants (sub-consultants) as part of the work covered by this agreement, it shall be the Consultant's responsibility to require and confirm that each sub-consultant meets the minimum insurance requirements specified above.

f. Insurance Notification. If any of the required coverages expire during the term of this agreement, the Consultant shall deliver the renewal certificate(s) including the general liability additional insured endorsement to Calaveras County Water District at least ten (10) days prior to the expiration date.

g. Direction/Orders. Consultant shall not accept direction or orders from any person other than the General Manager or the person(s) whose name(s) is (are) inserted on Page 1 as "other authorized representative(s)," subject to the limitations of paragraph "Changes", below. An Amendment to this Agreement will be issued in writing, incorporating Consultant's scope and mutually agreed-upon price and estimated schedule for completion. A fully executed Revised Purchase Order incorporating the additional/changed scope and price, shall also be issued, with a copy provided to Consultant.

h. Invoices. Consultant shall submit to the District monthly invoices for time and expenses subject to the contract limitation. Invoices shall reference the Purchase Order and project number shown on the purchase order form. Each invoice shall also include the total invoiced and paid to date, and the remainder outstanding. Invoices received without this information shall be returned to Consultant unpaid, for revision and re-submittal. Invoices shall be submitted to:

Calaveras County Water District
Post Office Box 846
San Andreas, CA 95249
Attn: Kelly Soulier-Doyle / kellys@ccwd.org

i. Payment. Payment, unless otherwise specified, is to be 30 days after receipt of an invoice deemed acceptable in accordance with paragraph h., above, by Calaveras County Water District and its acceptance in meeting the criteria of this Agreement.

j. Permits. Permits required by governmental authorities will be obtained at Consultant's expense, and Consultant will comply with applicable local, state, and federal regulations and statutes including Cal/OSHA requirements.

k. Changes. Any change in the scope of the professional services to be done, method of performance, nature of materials or price thereof, or to any other matter materially affecting the performance or nature of the professional services will not be paid for or accepted unless such change, addition or deletion is approved in advance, in writing by an Agreement Amendment executed by the General Manager of Calaveras County Water District.

l. Assignment. Consultant shall not assign, delegate, sublet, or transfer any interest in or duty under this Agreement without the express prior written consent of the Calaveras County Water District.

m. Termination. Either party may terminate this Agreement with ten (10) days prior written notice to the other, and identifying the Consultant's final work date, provided that neither party will terminate this Agreement for cause without providing the other party written notice of the breach and a reasonable opportunity to cure. In the case of such termination Consultant shall provide the Calaveras County Water District a final invoice for work performed and expenses incurred prior to termination within 30 calendar days following the final work date provided in the notice of termination. No additional invoices will be accepted nor charges paid by the Calaveras County Water District after this 30-day final invoicing period.

n. Products. All work products resulting from this Agreement, including documents and reports, drawings, models, specifications, computer drawings and other electronic expression, and the like that may be drafted, assembled, compiled, or obtained by Consultant during the performance of assigned tasks, and delivered to the Calaveras County Water District as Consultant's work product shall be the property of the Calaveras County Water District for its exclusive use. Except as may be distributed in its original form, any modification or reuse of such work product for purposes other than those intended by this Agreement shall be at the Calaveras County Water District's sole risk and without liability to Consultant.

o. Provided Information. Calaveras County Water District has furnished the Consultant with all project related documents available as reference materials in the project RFP.

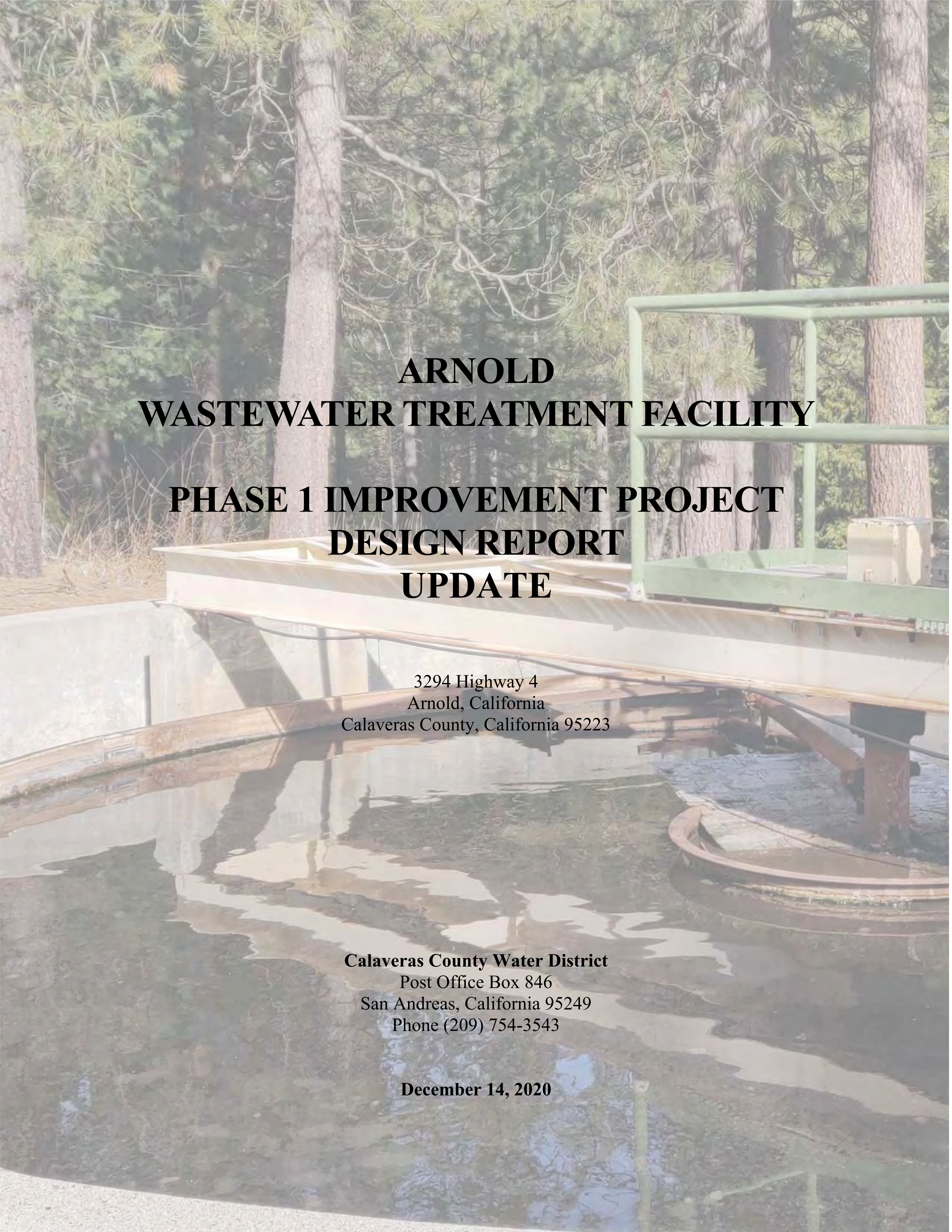
p. Third Parties. The services to be performed by Consultant are intended solely for the benefit of the Calaveras County Water District. No person or entity not a signatory to this Agreement shall be entitled to rely on the Consultant's performance of its services hereunder, and no right to assert a claim against the Consultant by assignment of indemnity rights or otherwise shall accrue to a third party as a result of this Agreement or the performance of the Consultant's services hereunder. Notwithstanding the foregoing Consultant understands and agrees that Calaveras County Water District will be submitting the report to various State and/or Federal agencies for their review. Consultant agrees that the agencies receiving the report may and will rely on its accuracy. Moreover this section in no way impairs Calaveras County Water District's rights to indemnity from Consultant as provided in this agreement, including any claims by third parties.

q. Access to Records. Consultant shall provide access to the Federal grantor agency, the Comptroller General of the United States, or any of their duly authorized representatives to any books, documents, papers, and records of the contractor which are directly pertinent to that specific contract for the purpose of making audit, examination, excerpts, and transcriptions.

r. Record Retention. Consultant shall retain all required records for three years after the Calaveras County Water District makes final payments and all other pending matters are closed.

* * *

Arnold Wastewater Treatment Facility
Phase 1 Improvement Project
Design Report Update, December 2020



ARNOLD WASTEWATER TREATMENT FACILITY

PHASE 1 IMPROVEMENT PROJECT DESIGN REPORT UPDATE

3294 Highway 4
Arnold, California
Calaveras County, California 95223

Calaveras County Water District
Post Office Box 846
San Andreas, California 95249
Phone (209) 754-3543

December 14, 2020

Report prepared by: **Bob Godwin, P.E.**
Senior Civil Engineer
CALAVERAS COUNTY WATER DISTRICT

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S400	RAS/WAS PUMP STATION– DETAILS AND SECTIONS
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S600	AEROBIC DIGESTER– DETAILS AND SECTIONS
M200	HYDRAULIC STRUCTURES – DETAILS AND SECTIONS
M300	SECONDARY CLARIFIER – DETAILS AND SECTIONS
M400	RAS/WAS PUMP STATION– DETAILS AND SECTIONS
M500	EFFLUENT PUMP STATION– DETAILS AND SECTIONS
M600	AEROBIC DIGESTER– DETAILS AND SECTIONS

1. INTRODUCTION

Construction of the Arnold Wastewater Treatment Facility (WWTF or facility) was completed in 1986. Facility infrastructure is 35-year in age and soon will either require rehabilitation or replacement. Since initial facility operation the service area increased in size when portions of the Avery community and the Millwood subdivision were added in 1992-94 and 2015, respectively. Growth in the Arnold sewer service area has been historical slow and it is anticipated to remain slow with fewer than 100 connections, or less, added in the next forty years.

Facility operation is regulated by the Central Valley Regional Water Quality Control Board based on requirements of ***General Order for Small Domestic Wastewater Treatment Systems WQ2014-153-DWQ R5190*** (General Order). Prior facility Order 97-073 was rescinded by Order R5-2016-0036 and companion Notice of Applicability.

1.1 FACILITY IMPROVEMENTS

This report concerns Phase 1 improvements to the WWTF. Project goals are: 1) improved operational reliability; 2) improved water quality; 3) assets management, and 4) ability to construct a Phase II "expansion" project in response to growth should the growth exceed projections.

Limitation of District project funds may prevent the immediate implementation all proposed Phase I improvements. In this scenario, implementation should be performed based upon priority. Proposed Phase 1 improvements are ranked in priority (1 - 10) in **Table 1**. Improvements are grouped either "new" or "replacement".

Table 1: Phase 1 Improvements Priority

Phase 1 "New" Infrastructure	*Priority (1 - 10)*
Clarifier No. 2 and RAS/WAS Pump Station	1
Mixed Liquor Splitter Box	1
Aerobic Digester No. 3	1
Mixed Liquor Metering Structure	2
Effluent Pump Station	5
Aerobic Digester No. 4 and No. 5	9
Phase 1 "Replacement" Infrastructure	
Filter Feed / Effluent Pump Station	1
Oxidation Ditch Mixed Liquor Outlet Structure	3
Aeration Blowers No. 1, 2, and 3	4
Pressure Filters	5
Electrical and Instrumentation Systems	6
RAS/WAS Pump Station (Clarifier No. 1)	7
Area Drain (supernatant) Pump Station	8
Disinfection System	10

2. CONDITION OF EXISTING WASTEWATER TREATMENT FACILITY

2.1 FACILITY SERVICE AREA

The Arnold service area is composed of approximately 975 acres including the Arnold downtown area, Avery, and Mill Woods subdivision. The source of the Arnold WWTF influent is primarily domestic and commercial wastewater. As of September 2020, the facility services 613 individual customers who combined equal 835 equivalent single family units (ESFU). Excluding Avery and Millwood subdivision, both originally outside the service area, approximately 108 ESFU have been added since 1991, and no new services added since 2005. Arnold's historic service size is presented in the **Table 2**. District sewer service boundary in Arnold is shown in the Calaveras Local Agency Formation Commission ***Sphere of Influent (SOI) Report***, dated April 2017, and on **Figure 1**.

Table 2: Historic Arnold WWTF Service Size	
Year of Facility Service	*ESFU*
1991	561
2005, including Avery	638
2020, includes Avery and Millwood	835

2.2.1 California Department of Finance Population Projections

The 2010, California Department of Finance projected an increase of 11.7 percent in County population between 2020 and 2060. However, when revised 2019, these estimates now project a decline of 12.2 percent in the County. A comparison of the two population projections is presented in the **Table 3**.

Table 3: Calaveras County Population Projections					
California Department of Finance	2020	2030	2040	2050	2060
2010 Population Projection	45,162	47,129	48,242	48,775	50,468
2020 Population Projection	44,289	42,608	39,186	35,688	34,122

The current Department of Finance population projection is located at the link below.

http://www.dof.ca.gov/forecasting/demographics/projections/documents/P1_County_1yr.xlsx

2.2.2 Calaveras County General Plan

The District's Arnold service area currently contains 232 vacant properties totaling 456 acres. Buildout for the service area based on zoning and occupancy density assumptions from the ***2019 Calaveras County General Plan*** (General Plan) is presented in **Table 4**. At buildout the service areas will have an additional 817 ESFU. General Plan population estimates are based on the 2010 Department of Finance population estimates.

Table 4: Buildout Projection for Arnold Wastewater Service Area					
Zoning	Zone Name	Area, *acre*	Property Utilization	ESFU/ *acre*	ESFU
C	Commercial	3.8	20%	10.0	7.5
CR	Commercial Recreational	37.0	20%	5.0	37.0
CC	Community Center	84.2	20%	20.0	336.8
I	Industrial	23.0	20%	7.5	34.5
PR	Parks / Recreation	16.0	-	-	-
PI	Public / Institutional	84.1	-	-	-
RLD	Residential – Low Density	59.3	50%	3.5	103.7
RMD	Residential – Medium Density	66.0	50%	9.0	296.9
RR	Rural Residential	52.5	-	-	-

2.3 INFLUENT WASTEWATER VOLUME

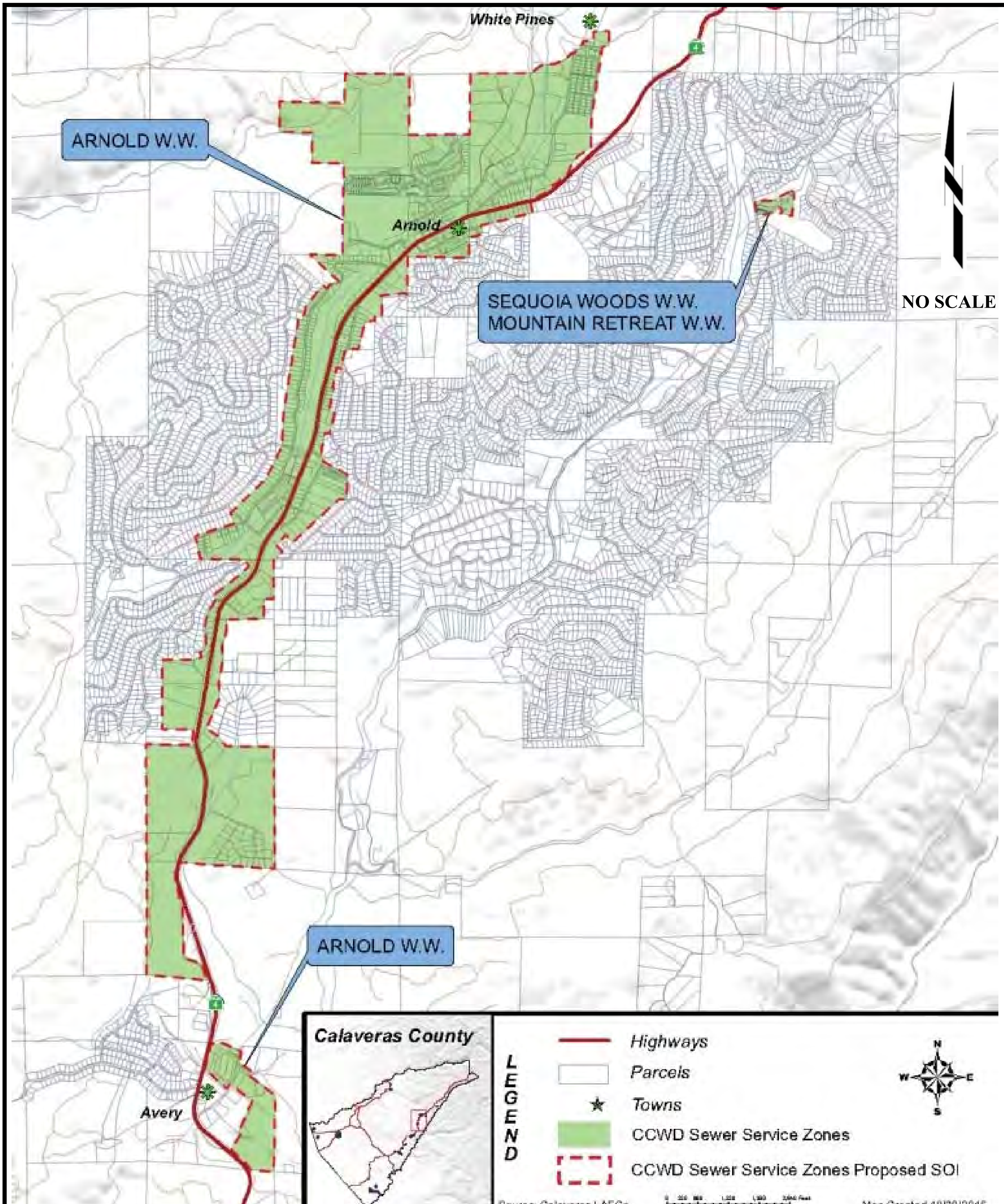
Average, maximum month (averaged as daily volume) and maximum day influent volume at the Arnold WWTF for 2019 through June 2020 is presented in **Table 5**. Average monthly influent volume since 2010 is found in **Appendix A** and daily influent volumes since 2019 in **Appendix B**.

Table 5: 2019-2020 Influent Volume		
Daily Flowrate	*gal/day*	*gal/day/ESFU*
Average	99,000	119
Maximum Month	197,000	235
Maximum Day	453,000	542

2.4 INFLUENT WASTEWATER CHARACTERIZATION

Influent wastewater is characterized by the laboratory results from 2019 through June 2020 with average values presented in **Table 6**. Monthly laboratory sample results from 2016 are provided in **Appendix C**.

Table 6: 2019-2020 Average Influent Constituent Concentrations	
BOD_5, *mg/L*	194
Suspended Solids, *mg/L*	213
Nitrogen, as N, *mg/L*	37
pH	6.9
Temperature, *C*	14.3



Arnold Wastewater Treatment Facility

DISTRICT SEWER SERVICE ZONE

Calaveras County Water District

FIGURE 1

2.5 WASTE AND THICKENED DIGESTED SLUDGE

Average daily waste activated sludge (WAS) and thickened digested sludge concentration and volumes since 2016 is presented in **Table 7**. Individual monthly values for this period are located in **Appendix D**.

Table 7: 2016-2020 Average Waste Sludge Characteristics	
WAS Concentration, *mg/L*	10,000
Thickened Sludge Concentration, *mg/L*	16,000
Thickened Sludge Volume, *gal/day*	1,400
Sludge Production, *pounds/day*	180

2.6 CURRENT TREATMENT FACILITIES

Discussion in this section general only concerns elements of the Arnold WWTF impacted by proposed improvements. A process diagram of the existing facility operation is shown in **Figure 2**. The overall facility site plan and treatment facility infrastructure are shown on drawings C100 and C101 located in **Appendix F**.

2.5.1 Biological Treatment System

Treatment is accomplished using an extended air, activated sludge system comprised of one oxidation ditch (Oxidation Ditch No. 1) and one clarifier (Clarifier No. 1). Waste generated by the activated sludge treatment system is thickened and further treated in two digesters before solids are mechanically dewatered and disposed offsite. Air for the activated sludge system and aerobic digesters is produced by three, two speed bi-lobe blowers located inside the operation building. Air flow to the oxidation ditch diffusers and aerobic digesters is proportioned by manually by valve. A summary of existing design and operational criteria is found in **Table 8**.

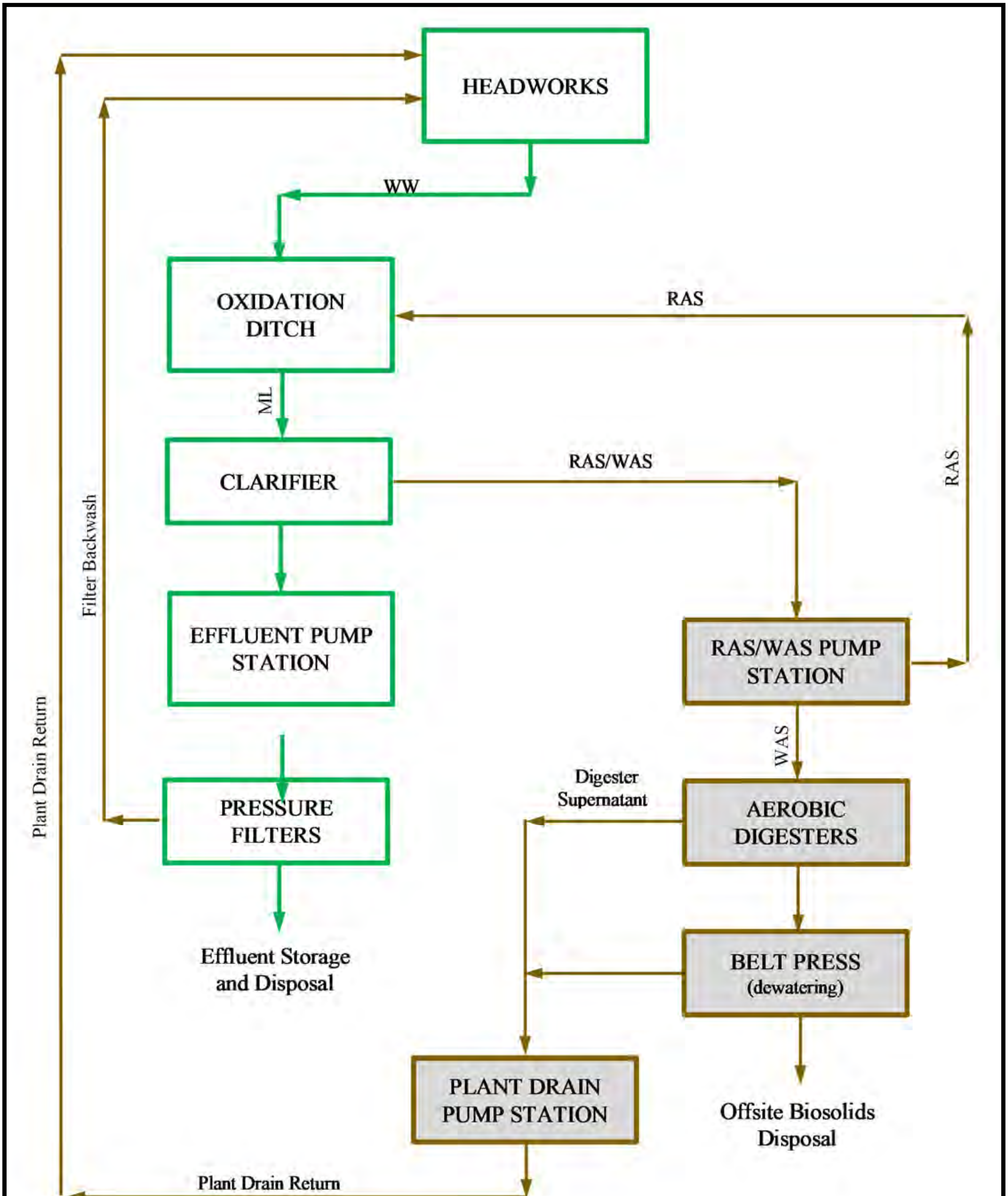
Repair to the Clarifier No. 1 mechanism was made August 2020 by District mechanics who installed a custom drive shaft linking the drive gear to the center column torque tube flange.

2.5.2 Filter Feed / Effluent Pump Station

The filter feed / effluent pump station is attached to the secondary clarifier. Vertical turbine pumps are used due to required high discharge pressure. Pumps operate in a lead/lag configuration. Motors for both pumps were replaced in August 2020 and operate at constant speed.

2.5.3 Existing Treatment System Infrastructure Elevations

Existing infrastructure elevations are shown in **Table 9**. However, a site topographic survey along with the "potholing" of buried utilities critical locations will be required for design and construction.



Arnold Wastewater Treatment Facility

EXISTING FACILITY PROCESS DIAGRAM

Calaveras County Water District

FIGURE 2

Table 8: Existing Facility Treatment System Criteria	
Influent Sewers	
No.	2
Type	Forcemain
Diameter, each, *inch*	8
Capacity, each, *gal/min*	400
Headworks	
Capacity, *gal/min*	540
Oxidation Ditch No. 1	
Type	Extended Air
Depth, *ft*	7.0 - 11.0
Volume, *gal*	111,000- 175,000
Detention Time, min., *hrs*	18
Capacity, Hydraulic, *gal/day*	233,000
Capacity, Solids, *lbs/day*	450
Diffusers	
Type	Fine Bubble
No.	48
Blowers	
Type:	Bi-Lobe
No.	3
Motor Type	2 Speed
Capacity, each, ft^3/min	250
Duty	Lead / Lag / Standby
Clarifier No. 1	
Type	Circular, Center Feed
Depth, *ft*	10.0
Diameter, *ft*	26.0
Weir Diameter, *ft*	26.0
Volume, *gal*	40,000
Aerobic Digesters No. 1 and No. 2	
Number of Cells	4
Total Volume, *gal*	18,000
Total Aeration Air Required, ft^3/min	60

Table 8: Existing Facility Treatment System Criteria (cont.)	
Filter Feed / Effluent Pump Station	
Wetwell	
Max. Depth of Water, *ft*	10.0
Volume, *gal*	3,200
Pumps	
Number	2
Type	Vertical Turbine
Duty	Lead / Lag
Capacity, each	
Flowrate, *gal/min*	200
Discharge Pressure, *ft*	200
Pressure Filters No. 1 and No. 2	
Number	2
Diameter, *ft*	6.5
Filter Area, each, ft^2	30
Loading Rate, $gal/min/ft^2$	3.0
Capacity, *gal/min*	180
Disinfection System	
Type	Sodium Hypochlorite
Solution Conc., *percent*	12
Effluent Storage Tank	
Volume, *gal*	260,000
Subsurface Infiltration System	
Number of Beds	11
Trench Length, *ft*	15,200
Trench Bed Cross Section, *ft*	10.0
Area, ft^2	152,000
Loading Rate, $gal/ft^2/day$	1.0
Capacity, *gal/day*	152,000

Table 9: Existing Facility Instructure Elevations	
<u>Oxidation Ditch No. 1</u>	<u>Elevation + 3,600 *ft*</u>
Top of Wall	83.50
Bottom of Ditch	70.50
Maximum Water Surface	81.50
8" Influent Sewer, invert	79.00
4" Plant Drain Return, centerline	82.50
4" RAS Return, centerline	82.50
<u>Clarifier No. 1</u>	
Top of Wall	75.50
Bottom of Clarifier, at Wall	73.50
6" Mixed Liquor Line (in), invert	69.50
4" RAS Line, invert	59.50
Water Surface, Effluent Weir	73.50
Effluent Outlet, invert	72.00
<u>Digesters No. 1 and No. 2</u>	
Top of Wall	73.00
Bottom of Digester, at Wall	61.00
Water Surface	71.00
6" Digested Sludge Line, centerline	60.33
6" Digester Decant Line, centerline	62.25
<u>Effluent Pump Station</u>	
Top of Wall	74.50
Bottom of Wetwell	59.50
Maximum Water Surface	71.00
<u>Pressure Filters No 1. and No. 2</u>	
Top of Slab	83.00
Backwash Water Sump, invert	81.75
<u>Effluent Storage Tank</u>	
Top of Tank	
Bottom of Tank	205.00
Overflow	235.00
<u>Area Drain Pump Station</u>	
Top of Wetwell	63.50
Bottom of Wetwell	51.00
Maximum Water Surface	61.50

3. BASIS OF DESIGN

Basis of design for Phase 1 improvements takes into consideration State and County population and development projections, Arnold Sewer Master Plan improvement recommendations, historic facility operations data, and District Operations staff input.

3.1 ARNOLD SEWER SERVICE AREA PROJECTIONS

Two growth models can be used for the Arnold sewer service area; the General Plan growth rate or 2019 Department of Finance estimate. Number of ESFU for the Arnold service area is presented in the **Table 10**. Regardless of assumed growth rate, additional facility capacity will not be required for more than approximately 100 ESFU.

Table 10: Arnold Wastewater Service Area Growth

Community Growth Estimate	2020	2030	2040	2050	2060
General Plan	835	871	891	901	933
2019 Department of Finance	835	803	739	673	643

3.2 INFLUENT WASTEWATER VOLUME AND CONSTITUENTS

Calaveras County Water District Water and Wastewater Design and Construction Standards prescribe minimum wastewater design criteria. Criteria includes a wastewater design flow requirement of 195 and 585 gallons per ESFU, average and peak daily volume. This criteria was updated to reflect historical facility data and presented in **Table 11** for service requirements in 2060. Design influent wastewater constituent concentrations are shown in **Table 12**.

Table 11: Phase 1 Design Influent Volumes

Influent Volume at 933 ESFU	*gal/day (gal/min)*	*gal/day/ESFU*
Average	120,000	125
Maximum Monthly	280,000	300
Maximum Daily	370,000	400
Peak Hour	(400)	600

Table 12: Phase 1 Design Influent Constituent Concentrations

BOD_5, *mg/L*	225
Suspended Solids, *mg/L*	225
Nitrogen, as N, *mg/L*	40
pH	8
Temperature, C	10

4. PROPOSED PHASE 1 IMPROVEMENTS

The following minimum infrastructure is proposed for the Arnold WWTF. Implementation of all, or a portion, of the improvements discussed in report dependents upon availability of District capital improvement project funds. A preliminary site plan of Phase 1 improvements is shown on drawing C102 in **Appendix F**.

1. An additional clarifier, Clarifier No.2, to increase capacity and improve reliability and water quality.
2. Mixed liquor distribution (splitter) box designed for two clarifier operation.
3. Return and waste activated sludge (RAS/WAS) pump station for Clarifier No. 2.
4. Pump station for pressure filter feed and effluent.
5. Aerobic digester No. 3.
6. Civil, mechanical, and electrical improvements related to proposed facility improvements.

4.1 PROCESS AND YARD PIPING FOR IMPROVEMENTS

Sizes for pipe systems for Phase 1 improvements at peak hour flowrate is presented in **Table 13**. Process, pipe size, design condition along with maximum velocity are shown in table. Values in table calculated assuming independent operation of Clarifier No. 1 and Clarifier No. 2.

Table 13: Phase 1 Improvement Minimum Design Requirements

Piping Systems per Clarifier	Diameter, *in*	Flow, *gal/min*	Velocity, *ft/sec*
Mixed Liquor	8	400	4.5
Return Activated Sludge	6	200	2.3
Waste Activated Sludge	4	100	2.6
Filter Feed	8	400	4.5
Filter Effluent	8	400	4.5

Pipe systems when encased in concrete shall be steel or ductile. Stainless steel pipe will be considered in conditions when the exterior pipe is submerged in wastewater. Polyvinyl chloride (PVC) pipe used in most other applications.

4.2 MIXED LIQUOR FLOW CONTROL

Mixed liquor distribution and control is required with the addition of Clarifier No. 2. Currently flow is regulated using a pitch valve. This system will not work with two clarifiers. Therefore, funding permitting, a splitter box is proposed which will combine flow from both existing oxidation ditch and future ditch and regulate the distribution of flow to both clarifiers. Upstream water level and diversion to each clarifier will be maintained by two stainless steel, AWWA C561-14 "downward" overflow weir gates. Gate operation will be automated and respond to measured flow rate. Gates will be similar to the Fontaine Aquanox Series 40 weir gate.

A preliminary splitter box design is shown on drawings S400 and M400. Process diagram of the overall facility treatment operation with Phase 1 improvements is shown on **Figure 3**.

4.2.1 Oxidation Ditch No. 1 Diversion Structure

Construction of new diversion structure, attached to Oxidation Ditch No. 1 is proposed, funding permitting. The existing outlet is not suitably configured. It may be possible to modify the existing outlet but this will the disruption operations during construction. Flow control at the diversion structure will be similar to the mixed liquor splitter box.

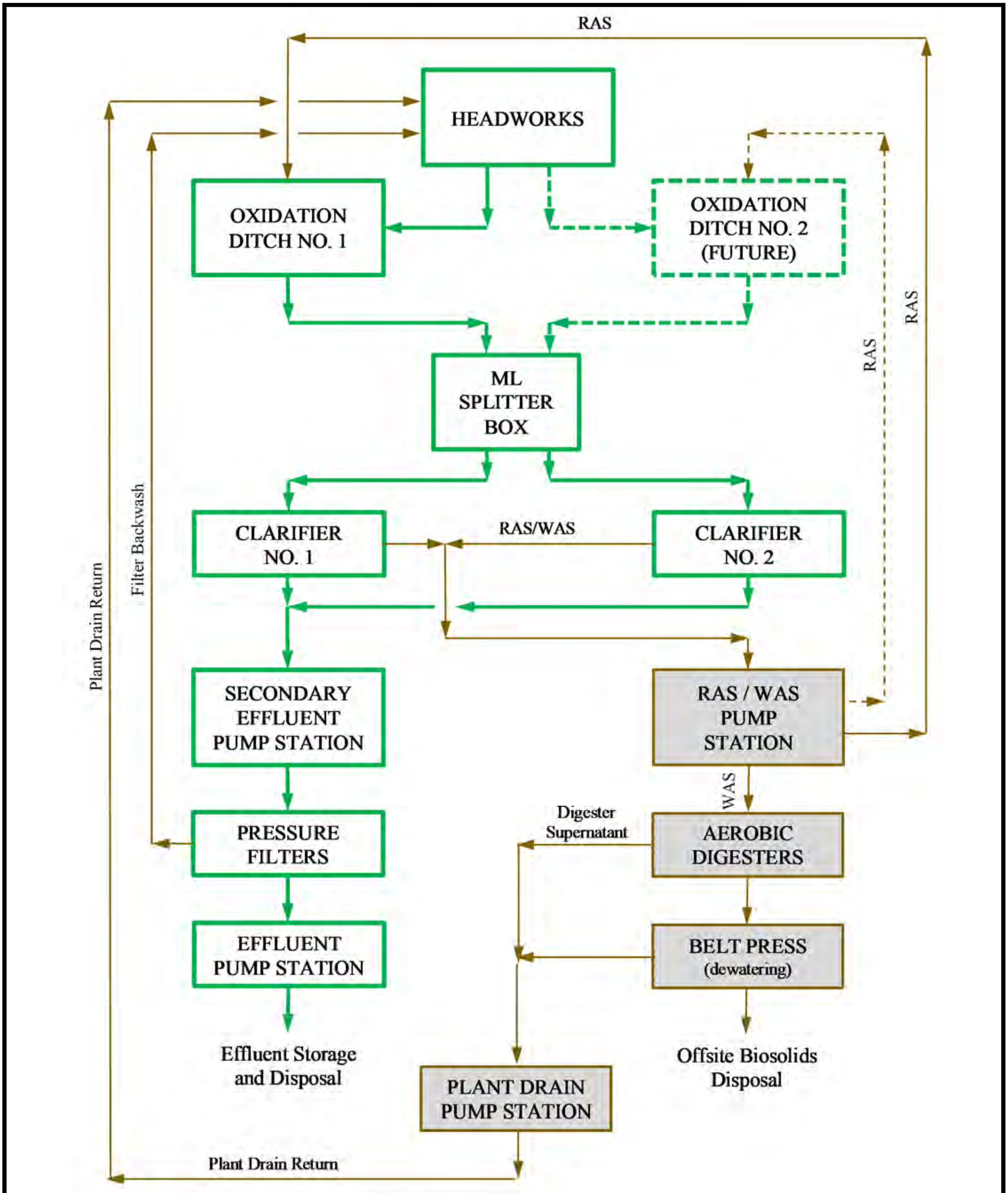
4.2.2 Clarifier Flow Measurement

Two flow meters and meter structure are proposed for measurement of flow received by Clarifier No. 1 and No. 2, funding permitting. Measured flow rate will be then be used to adjust weir gate heights in the splitter box. Each meter will be similar in design as a 6-in Foxboro MAG meter manufactured by Schneider Electric.

4.3 SECONDARY CLARIFIER NO. 2

Clarifier No. 2 design is presented in **Table 14**. The first alternative is a 10 ft. deep, 30-ft diameter (26-ft diameter overflow weir) clarifier. The calculated loads in **Table 14** represent the combined capacity of existing Clarifier No.1 and proposed Clarifier No. 2 operating at buildout capacity.

Solids loading and overload rate at maximum day flow are less than 25 *pounds/ft^2/day* and 750 *gal/day/ft^2*, respectively. Biological and activated sludge process calculations are located in **Appendix E**. Preliminary design of the 30-ft. clarifier is shown on drawing S300 and M300. The clarifier process design will be based upon the spiral blade clarifier manufactured by Westech, Inc.



Arnold Wastewater Treatment Facility PROPOSED FACILITY PROCESS DIAGRAM *Calaveras County Water District*	FIGURE 3

Table 14: Clarifier No. 2 Design	
Depth of Water, *ft*	10.0
Diameter, *ft*	30.3
Surface Area, *ft²*	531
<u>Weir</u>	
Diameter, *ft*	26.0
Length, *ft*	81.7
Volume, *gal*	54,000
<u>Criteria @ Max. Day</u>	
Solids Loading Rate, *pound/day/ft²*	20.4
Hyd. Retention Time (HRT), *hrs.*	2.9
Overflow Rate, *gal/day/ft²*	610
Weir Loading Rate, *gal/day/ft*	3,967

4.4 RETURN AND WASTE ACTIVATED SLUDGE PUMP STATION

Elimination of the existing RAS/WAS pump station and replacement with a single pump station serving clarifiers is proposed, if funding is available. A single pump station is required if the facility is to be operate with two activated sludge sources, two ditches.

Submersible chopper pumps and motors equipped with variable frequency drive (VFD) units will be used at the station for both RAS and WAS, if funding is available. A MAG meter will measure and flow regulated by pump motor speed.

Motor operated plug valves at the station will divert flow when sludge wasting is required. The station will be configured for expansion when the second oxidation ditch in constructed. Two pumps initially installed at the station and two additional pumps, if funding is available and the second oxidation ditch is built. Pumps shall be Vaughan Series E, chopper pumps.

Return and waste sludge (RAS/WAS) pump station requirements, at buildout are shown in **Table 15**. Preliminary pump station design is shown on drawings S400 and M400.

Table 15: RAS/WAS Pump Station Design	
Mixed Liquor Concentration (MLSS), *mg/L*	4,000
Return Activated Sludge (RAS)	
Solids Concentration, *mg/L*	8,000
Return Rate (each Clarifier)	
@ Max. Month, *gal/min.*	97
@ Max. Day, *gal/min.*	128
Waste Activated Sludge (WAS)	
Solids Concentration, *mg/L*	8,000
Waste Rate (each Clarifier)	
@ Max. Month, *gal/day*	2,668
@ Max. Day, *gal/day*	3,872
Solids Production (both Clarifiers)	
@ Average, *pounds/day*	121
@ Max. Month, *pounds./day*	356
RAS / WAS Pump Station	
Wetwell	
Length, *ft*	12.5
Width, *ft*	6.0
Max. Depth, *ft*	9.0
Volume, *gal*	5,000
Pumps	
Number,	2
Type	Chopper
Duty	Duty/Standby
Speed, *rpm*	Variable (600 – 1800)
Capacity, each	
Flowrate, *gal/min*	128
Discharge Pressure, *ft*	50

4.5 Aerobic Digesters No. 3, No. 4, and No. 5

Three digester tanks each with a capacity of 9,000 gallons is proposed. Currently there insufficient digester capacity. At a minimum on digester is required to correct the existing deficiency. Proposed digesters will operate independent of the existing two digesters and require mixing and aeration equipment. Mixing and aeration will be accomplished by three submersible, self-aspirating aerators similar to Sulzer ABS-XT-152 aerators.

Design criteria, at buildout, for the existing and proposed digesters is presented in **Table 16**. Two potential locations for the proposed digesters are on drawing C102. A preliminary digester design is shown on drawings S500 and M500.

Table 16: Aerobic Digester Design

Aerobic Digester No. 3, No. 4, and No. 5	
Dimensions, each	
Length, *ft*	12.0
Width, *ft*	10.0
Max. Depth, *ft*	10.0
Volume, *gal*	9,000
Aeration Air, $ft^3/min.$	35
Existing and Proposed System	
Thickened Solids Concentration, *mg/L*	12,000
Capacity, *gal*	45,000
Hydraulic Retention Time (HRT)	
@ Average, *days*	37
@ Max. Month, *days*	12.6
Aeration Air, $ft^3/min.$	100

4.6 Effluent Pump Station Improvements

The existing effluent pump station is inadequate in size, condition, and not suitable for future planned operation. Therefore, two pump stations are proposed as replacement. The first station for clarifier effluent will pump directly to the pressure filters. Design criteria for this pump station s presented in **Table 17**. Alternatively a single replacement pump station can serve both clarifiers.

The clarifier effluent pump station will utilize pumps similar to Xylem Flygt N-impeller submersible pumps. Pump motor speed will be controlled by VFD units and rate of flow by compound control loop using wetwell depth and flowrate.

The second pump station will convey filtered effluent to effluent storage or disposal facilities. Design criteria for the filtered effluent station is presented in **Table 18**. Vertical turbine pumps will be employed. Proposed station(s) location are shown on drawing C102.

Table 17: Clarifier Effluent Pump Station Design	
Clarifier Effluent Pump Station	
Wetwell	
Length, *ft*	12.0
Width, *ft*	8.0
Max. Depth, *ft*	9.0
Volume, *gal*	6,500
Pumps	
Number	3
Type	Submersible
Duty Condition	Lead/Lag/Standby
Speed, *rpm*	Variable (600 – 1800)
Capacity, each	
Flowrate, *gal/min*	200
Discharge Pressure, *ft*	50

Table 18: Filtered Effluent Pump Station Design	
Filtered Effluent Pump Station	
Wetwell	
Length, *ft*	12.0
Width, *ft*	12.0
Max. Depth, *ft*	9.0
Volume, *gal*	9,700
Pumps	
Number	3
Type	Vertical Turbine
Duty Condition	Lead/Lag/Standby
Speed, *rpm*	Variable (600 – 1800)
Capacity, each	
Flowrate, *gal/min*	200
Discharge Pressure, *ft*	150

4.7 Electrical Improvements

Electrical requirements have not be yet considered.

APPENDIX A

ARNOLD WASTEWATER TREATMENT FACILITY
2010 – 2020 AVERAGE MONTHLY INFLUENT VOLUME

2010 - 2020 Average Monthly Influent Volume, gallons per day												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	101,200	103,500	93,600	100,500	96,800	87,800	87,100	81,500	77,700	76,000	85,400	151,600
2011	106,800	86,700	117,000	110,700	83,900	82,000	89,800	84,900	83,600	73,500	76,900	77,800
2012	75,000	75,000	92,500	88,900	79,100	73,000	78,000	79,200	75,800	73,100	75,700	117,200
2013	93,000	74,900	72,400	72,200	73,500	66,100	74,900	70,000	64,600	64,800	70,100	68,300
2014	61,600	85,200	77,300	81,400	70,900	64,500	65,700	72,100	65,500	83,800	58,300	70,800
2015	64,200	75,200	60,500	57,500	60,100	59,100	70,200	71,800	75,900	70,800	70,100	80,700
2016	100,000	84,700	113,200	76,200	68,400	66,200	76,800	73,600	70,000	78,800	82,100	102,100
2017	177,400	194,700	117,700	116,200	83,600	79,300	73,200	73,200	82,200	65,500	81,800	73,700
2018	93,400	75,400	130,200	106,400	77,600	67,300	75,400	70,300	69,000	62,500	77,900	84,600
2019	123,800	196,600	180,000	126,600	111,200	95,000	83,200	71,900	77,300	68,800	78,300	118,200
2020	100,100	84,900	99,800	106,000	89,500	84,200						

Note: Values shaded in gray include service for Mill Woods subdivision.

APPENDIX B

ARNOLD WASTEWATER TREATMENT FACILITY
2019 – 2020 DAILY INFLUENT VOLUME

ARNOLD WASTEWATER TREATMENT FACILITY					
DATE	INFLUENT VOLUME	MONTHLY AVERAGE	MONTHLY TOTAL	DAILY RAINFALL	MONTHLY RAINFALL
	gallons			inches	
1/1/2019	58,700	123,800	3,836,400	0.00	13.99
1/2/2019	163,400			0.00	
1/3/2019	88,700			0.00	
1/4/2019	78,200			0.00	
1/5/2019	74,900			0.06	
1/6/2019	87,900			1.41	
1/7/2019	174,500			2.45	
1/8/2019	118,200			0.00	
1/9/2019	104,900			0.48	
1/10/2019	132,400			0.26	
1/11/2019	96,200			0.00	
1/12/2019	74,500			0.00	
1/13/2019	139,800			0.00	
1/14/2019	75,900			0.00	
1/15/2019	102,600			0.52	
1/16/2019	156,000			1.54	
1/17/2019	170,200			2.96	
1/18/2019	200,200			1.66	
1/19/2019	185,000			0.02	
1/20/2019	112,800			0.00	
1/21/2019	202,900			1.86	
1/22/2019	265,000			0.77	
1/23/2019	141,700			0.00	
1/24/2019	104,300			0.00	
1/25/2019	120,900			0.00	
1/26/2019	98,900			0.00	
1/27/2019	111,700			0.00	
1/28/2019	126,100			0.00	
1/29/2019	90,700			0.00	
1/30/2019	111,700			0.00	
1/31/2019	67,500			0.00	
2/1/2019	91,500			0.00	
2/2/2019	139,400			2.04	
2/3/2019	178,100			2.36	
2/4/2019	250,200			2.39	
2/5/2019	168,200			0.10	
2/6/2019	174,600			0.11	
2/7/2019	439,900			0.04	
2/8/2019	452,800			0.10	
2/9/2019	122,300			0.13	

ARNOLD WASTEWATER TREATMENT FACILITY					
DATE	INFLUENT VOLUME	MONTHLY AVERAGE	MONTHLY TOTAL	DAILY RAINFALL	MONTHLY RAINFALL
	gallons			inches	
2/10/2019	137,100	196,600	5,504,300	0.23	18.38
2/11/2019	218,100			0.02	
2/12/2019	141,100			0.00	
2/13/2019	115,600			2.03	
2/14/2019	289,000			3.11	
2/15/2019	344,800			2.52	
2/16/2019	255,800			0.15	
2/17/2019	196,200			0.00	
2/18/2019	143,800			0.00	
2/19/2019	320,000			0.45	
2/20/2019	128,200			0.24	
2/21/2019	131,000			0.01	
2/22/2019	134,400			0.35	
2/23/2019	123,400			0.04	
2/24/2019	174,700			0.00	
2/25/2019	126,100			0.00	
2/26/2019	125,900			0.09	
2/27/2019	168,500			1.08	
2/28/2019	213,600			0.79	
3/1/2019	178,800	180,000	5,580,700	0.00	11.59
3/2/2019	187,300			1.52	
3/3/2019	236,800			0.77	
3/4/2019	199,600			0.63	
3/5/2019	195,800			0.03	
3/6/2019	196,300			1.40	
3/7/2019	391,100			2.37	
3/8/2019	251,100			0.75	
3/9/2019	212,100			0.44	
3/10/2019	147,000			0.01	
3/11/2019	171,200			0.17	
3/12/2019	195,900			0.05	
3/13/2019	149,500			0.13	
3/14/2019	151,000			0.00	
3/15/2019	207,000			0.00	
3/16/2019	173,200			0.00	
3/17/2019	141,900			0.00	
3/18/2019	154,200			0.00	
3/19/2019	190,200			0.00	
3/20/2019	109,400			0.61	
3/21/2019	162,600			0.45	
3/22/2019	176,700			0.01	
3/23/2019	161,400			0.86	
3/24/2019	194,700			0.11	
3/25/2019	143,500			0.00	
3/26/2019	142,400			0.01	
3/27/2019	132,600			0.63	

ARNOLD WASTEWATER TREATMENT FACILITY					
DATE	INFLUENT VOLUME	MONTHLY AVERAGE	MONTHLY TOTAL	DAILY RAINFALL	MONTHLY RAINFALL
	gallons			inches	
3/28/2019	176,600			0.51	
3/29/2019	151,400			0.13	
3/30/2019	183,400			0.00	
3/31/2019	116,000			0.00	
4/1/2019	140,500	126,600	3,797,500	0.00	2.47
4/2/2019	191,000			1.30	
4/3/2019	235,500			0.17	
4/4/2019	155,000			0.00	
4/5/2019	141,700			0.00	
4/6/2019	187,300			0.08	
4/7/2019	110,000			0.05	
4/8/2019	154,100			0.00	
4/9/2019	139,400			0.33	
4/10/2019	101,200			0.03	
4/11/2019	124,300			0.00	
4/12/2019	128,100			0.00	
4/13/2019	137,000			0.04	
4/14/2019	100,600			0.00	
4/15/2019	117,800			0.00	
4/16/2019	135,200			0.43	
4/17/2019	101,700			0.01	
4/18/2019	125,200			0.00	
4/19/2019	95,100			0.01	
4/20/2019	131,000			0.00	
4/21/2019	120,600			0.00	
4/22/2019	91,600			0.01	
4/23/2019	109,000			0.00	
4/24/2019	85,600			0.01	
4/25/2019	116,400			0.00	
4/26/2019	125,800			0.00	
4/27/2019	84,400			0.00	
4/28/2019	120,300			0.00	
4/29/2019	95,500			0.00	
4/30/2019	96,600			0.00	
5/1/2019	89,600			0.00	
5/2/2019	116,900			0.00	
5/3/2019	75,700			0.00	
5/4/2019	122,500			0.00	
5/5/2019	89,100			0.00	
5/6/2019	102,700			0.00	
5/7/2019	105,900			0.00	
5/8/2019	81,500			0.00	
5/9/2019	102,500			0.01	

ARNOLD WASTEWATER TREATMENT FACILITY					
DATE	INFLUENT VOLUME	MONTHLY AVERAGE	MONTHLY TOTAL	DAILY RAINFALL	MONTHLY RAINFALL
	gallons			inches	
5/10/2019	86,500	111,200	3,447,700	0.00	8.52
5/11/2019	107,200			0.00	
5/12/2019	82,700			0.00	
5/13/2019	102,000			0.00	
5/14/2019	88,900			0.00	
5/15/2019	69,500			0.00	
5/16/2019	123,700			1.96	
5/17/2019	141,000			1.35	
5/18/2019	110,200			0.00	
5/19/2019	131,900			1.40	
5/20/2019	143,100			0.49	
5/21/2019	106,900			0.37	
5/22/2019	141,100			1.50	
5/23/2019	125,600			0.00	
5/24/2019	120,300			0.09	
5/25/2019	148,900			0.00	
5/26/2019	149,700			1.33	
5/27/2019	158,600			0.01	
5/28/2019	127,700			0.01	
5/29/2019	84,400			0.00	
5/30/2019	115,500			0.00	
5/31/2019	95,900			0.00	
6/1/2019	127,200	95,020	2,850,600		
6/2/2019	98,100				
6/3/2019	115,400				
6/4/2019	107,200				
6/5/2019	83,600				
6/6/2019	77,500				
6/7/2019	98,400				
6/8/2019	132,800				
6/9/2019	75,400				
6/10/2019	98,200				
6/11/2019	116,500				
6/12/2019	72,900				
6/13/2019	107,100				
6/14/2019	104,400				
6/15/2019	85,500				
6/16/2019	124,500				
6/17/2019	52,400				
6/18/2019	90,400				
6/19/2019	102,600				
6/20/2019	70,600				
6/21/2019	90,000				
6/22/2019	95,000				
6/23/2019	123,100				

ARNOLD WASTEWATER TREATMENT FACILITY					
DATE	INFLUENT VOLUME	MONTHLY AVERAGE	MONTHLY TOTAL	DAILY RAINFALL	MONTHLY RAINFALL
	gallons			inches	
6/24/2019	78,300				
6/25/2019	84,000				
6/26/2019	89,700				
6/27/2019	74,500				
6/28/2019	80,900				
6/29/2019	129,500				
6/30/2019	64,900				
7/1/2019	92,900	83,206	2,579,400		
7/2/2019	101,800				
7/3/2019	89,500				
7/4/2019	82,000				
7/5/2019	107,400				
7/6/2019	136,200				
7/7/2019	80,400				
7/8/2019	97,000				
7/9/2019	92,600				
7/10/2019	82,800				
7/11/2019	81,700				
7/12/2019	89,400				
7/13/2019	89,900				
7/14/2019	72,000				
7/15/2019	98,600				
7/16/2019	62,700				
7/17/2019	78,700				
7/18/2019	69,600				
7/19/2019	76,400				
7/20/2019	95,100				
7/21/2019	89,700				
7/22/2019	40,900				
7/23/2019	73,000				
7/24/2019	70,400				
7/25/2019	63,200				
7/26/2019	61,900				
7/27/2019	103,500				
7/28/2019	78,800				
7/29/2019	83,100				
7/30/2019	78,800				
7/31/2019	59,400				
8/1/2019	53,800				
8/2/2019	72,600				
8/3/2019	90,300				
8/4/2019	63,100				
8/5/2019	54,200				
8/6/2019	77,800				
8/7/2019	70,700				
8/8/2019	64,100				

ARNOLD WASTEWATER TREATMENT FACILITY					
DATE	INFLUENT VOLUME	MONTHLY AVERAGE	MONTHLY TOTAL	DAILY RAINFALL	MONTHLY RAINFALL
	gallons			inches	
8/9/2019	80,300	71,868	2,227,900		
8/10/2019	83,200				
8/11/2019	66,900				
8/12/2019	83,000				
8/13/2019	70,800				
8/14/2019	61,300				
8/15/2019	53,000				
8/16/2019	69,000				
8/17/2019	87,600				
8/18/2019	54,100				
8/19/2019	88,100				
8/20/2019	65,500				
8/21/2019	67,600				
8/22/2019	50,400				
8/23/2019	92,100				
8/24/2019	90,000				
8/25/2019	61,400				
8/26/2019	79,500				
8/27/2019	59,400				
8/28/2019	83,700				
8/29/2019	60,900				
8/30/2019	83,700				
8/31/2019	89,800				
9/1/2019	77,700	77,287	2,318,600		
9/2/2019	98,100				
9/3/2019	100,800				
9/4/2019	62,700				
9/5/2019	84,000				
9/6/2019	57,500				
9/7/2019	99,600				
9/8/2019	85,400				
9/9/2019	70,400				
9/10/2019	65,300				
9/11/2019	79,800				
9/12/2019	56,900				
9/13/2019	81,400				
9/14/2019	64,200				
9/15/2019	106,500				
9/16/2019	56,300				
9/17/2019	90,600				
9/18/2019	71,000				
9/19/2019	69,500				
9/20/2019	71,200				
9/21/2019	66,200				
9/22/2019	82,000				
9/23/2019	90,900				

ARNOLD WASTEWATER TREATMENT FACILITY					
DATE	INFLUENT VOLUME	MONTHLY AVERAGE	MONTHLY TOTAL	DAILY RAINFALL	MONTHLY RAINFALL
	gallons			inches	
9/24/2019	57,700				
9/25/2019	75,400				
9/26/2019	72,300				
9/27/2019	71,300				
9/28/2019	101,600				
9/29/2019	59,900				
9/30/2019	92,400				
10/1/2019	72,500	68,781	2,132,200		
10/2/2019	63,500				
10/3/2019	70,700				
10/4/2019	68,400				
10/5/2019	76,200				
10/6/2019	63,600				
10/7/2019	84,500				
10/8/2019	79,400				
10/9/2019	71,200				
10/10/2019	55,500				
10/11/2019	67,000				
10/12/2019	74,500				
10/13/2019	75,900				
10/14/2019	74,600				
10/15/2019	88,400				
10/16/2019	71,700				
10/17/2019	54,700				
10/18/2019	92,300				
10/19/2019	82,300				
10/20/2019	60,700				
10/21/2019	81,300				
10/22/2019	67,800				
10/23/2019	77,800				
10/24/2019	40,300				
10/25/2019	67,900				
10/26/2019	73,700				
10/27/2019	59,200				
10/28/2019	62,000				
10/29/2019	39,700				
10/30/2019	57,600				
10/31/2019	57,300				
11/1/2019	146,300			4.52	
11/2/2019	90,000			4.51	
11/3/2019	56,100			0.33	
11/4/2019	80,800			0.68	
11/5/2019	61,200			0.48	
11/6/2019	81,300			0.00	
11/7/2019	48,000			1.36	

ARNOLD WASTEWATER TREATMENT FACILITY					
DATE	INFLUENT VOLUME	MONTHLY AVERAGE	MONTHLY TOTAL	DAILY RAINFALL	MONTHLY RAINFALL
	gallons			inches	
11/8/2019	84,700	78,300	2,350,000	1.88	16.87
11/9/2019	78,800			0.00	
11/10/2019	92,400			0.00	
11/11/2019	69,100			0.00	
11/12/2019	69,100			0.17	
11/13/2019	52,400			0.17	
11/14/2019	61,700			0.88	
11/15/2019	70,700			0.07	
11/16/2019	95,300			0.29	
11/17/2019	50,400			0.02	
11/18/2019	99,100			0.00	
11/19/2019	74,800			0.00	
11/20/2019	79,200			0.01	
11/21/2019	47,100			0.00	
11/22/2019	89,200			0.37	
11/23/2019	78,700			0.84	
11/24/2019	70,500			0.25	
11/25/2019	95,800			0.00	
11/26/2019	75,300			0.04	
11/27/2019	59,600			0.00	
11/28/2019	87,500			0.00	
11/29/2019	105,600			0.00	
11/30/2019	99,300			0.00	
12/1/2019	132,800	118,200	3,663,400	0.00	12.35
12/2/2019	267,400			4.51	
12/3/2019	115,000			0.33	
12/4/2019	130,800			0.68	
12/5/2019	114,000			0.48	
12/6/2019	108,900			0.00	
12/7/2019	157,000			1.36	
12/8/2019	136,900			1.88	
12/9/2019	149,000			0.00	
12/10/2019	114,100			0.00	
12/11/2019	86,500			0.00	
12/12/2019	96,400			0.17	
12/13/2019	106,900			0.17	
12/14/2019	127,400			0.88	
12/15/2019	108,800			0.07	
12/16/2019	131,600			0.29	
12/17/2019	74,800			0.02	
12/18/2019	129,800			0.00	
12/19/2019	67,300			0.00	
12/20/2019	38,100			0.01	
12/21/2019	110,900			0.00	
12/22/2019	110,900			0.37	

ARNOLD WASTEWATER TREATMENT FACILITY					
DATE	INFLUENT VOLUME	MONTHLY AVERAGE	MONTHLY TOTAL	DAILY RAINFALL	MONTHLY RAINFALL
	gallons			inches	
12/23/2019	110,900			0.84	
12/24/2019	136,600			0.25	
12/25/2019	97,100			0.00	
12/26/2019	88,400			0.04	
12/27/2019	113,300			0.00	
12/28/2019	121,500			0.00	
12/29/2019	125,800			0.00	
12/30/2019	158,400			0.00	
12/31/2019	96,100			0.00	
1/1/2020	146,000			0.03	
1/2/2020	84,800			0.00	
1/3/2020	113,700			0.00	
1/4/2020	116,300			0.00	
1/5/2020	110,700			0.03	
1/6/2020	101,200			0.00	
1/7/2020	99,800			0.00	
1/8/2020	83,300			0.00	
1/9/2020	78,100			0.00	
1/10/2020	91,400			0.27	
1/11/2020	133,800			0.09	
1/12/2020	76,000			0.00	
1/13/2020	100,300			0.00	
1/14/2020	93,200			0.40	
1/15/2020	101,400			0.00	
1/16/2020	83,300	100,100	3,104,100	0.04	2.43
1/17/2020	112,700			0.15	
1/18/2020	102,600			0.48	
1/19/2020	89,600			0.13	
1/20/2020	117,500			0.00	
1/21/2020	106,400			0.00	
1/22/2020	79,900			0.00	
1/23/2020	83,500			0.04	
1/24/2020	111,600			0.02	
1/25/2020	104,600			0.00	
1/26/2020	75,200			0.62	
1/27/2020	148,000			0.06	
1/28/2020	105,700			0.00	
1/29/2020	86,900			0.00	
1/30/2020	66,700			0.06	
1/31/2020	99,900			0.01	
2/1/2020	113,800			0.00	
2/2/2020	79,500			0.03	
2/3/2020	112,900			0.00	
2/4/2020	81,800			0.00	
2/5/2020	73,600			0.00	

ARNOLD WASTEWATER TREATMENT FACILITY					
DATE	INFLUENT VOLUME	MONTHLY AVERAGE	MONTHLY TOTAL	DAILY RAINFALL	MONTHLY RAINFALL
	gallons			inches	
2/6/2020	79,000	84,883	2,461,600	0.00	
2/7/2020	82,800			0.00	
2/8/2020	106,400			0.00	
2/9/2020	87,100			0.00	
2/10/2020	86,100			0.01	
2/11/2020	82,600			0.00	
2/12/2020	67,300			0.00	
2/13/2020	60,200			0.00	
2/14/2020	102,400			0.00	
2/15/2020	96,900			0.00	
2/16/2020	93,300			0.00	
2/17/2020	115,900			0.00	
2/18/2020	75,700			0.00	
2/19/2020	72,600			0.00	
2/20/2020	73,400			0.00	
2/21/2020	86,000			0.00	
2/22/2020	94,600			0.00	
2/23/2020	72,700			0.00	
2/24/2020	85,800			0.00	
2/25/2020	63,000			0.00	
2/26/2020	84,000			0.00	
2/27/2020	75,300			0.00	
2/28/2020	68,900			0.00	
2/29/2020	88,000			0.00	
3/1/2020	84,800	99,800	3,092,700	0.02	10.61
3/2/2020	86,100			0.15	
3/3/2020	55,300			0.03	
3/4/2020	78,500			0.00	
3/5/2020	66,700			0.03	
3/6/2020	57,000			0.00	
3/7/2020	98,000			0.14	
3/8/2020	63,700			0.02	
3/9/2020	91,100			0.00	
3/10/2020	48,700			0.00	
3/11/2020	79,000			0.00	
3/12/2020	69,300			0.03	
3/13/2020	78,800			0.00	
3/14/2020	92,500			0.70	
3/15/2020	123,600			2.05	
3/16/2020	172,300			2.99	
3/17/2020	136,200			0.08	
3/18/2020	104,400			0.20	
3/19/2020	123,000			1.17	
3/20/2020	111,000			0.80	
3/21/2020	145,100			0.00	

ARNOLD WASTEWATER TREATMENT FACILITY					
DATE	INFLUENT VOLUME	MONTHLY AVERAGE	MONTHLY TOTAL	DAILY RAINFALL	MONTHLY RAINFALL
	gallons			inches	
3/22/2020	73,500			0.04	
3/23/2020	127,600			0.19	
3/24/2020	110,600			0.24	
3/25/2020	145,800			0.59	
3/26/2020	110,500			0.54	
3/27/2020	133,100			0.30	
3/28/2020	105,600			0.00	
3/29/2020	115,800			0.18	
3/30/2020	97,400			0.09	
3/31/2020	107,700			0.03	
4/1/2020	117,600	106,000	3,179,700	0.00	4.05
4/2/2020	85,000			0.00	
4/3/2020	104,700			0.00	
4/4/2020	90,800			0.00	
4/5/2020	128,600			1.05	
4/6/2020	144,700			0.88	
4/7/2020	148,300			1.74	
4/8/2020	113,500			0.03	
4/9/2020	112,000			0.17	
4/10/2020	160,100			0.13	
4/11/2020	111,000			0.00	
4/12/2020	89,000			0.00	
4/13/2020	126,100			0.00	
4/14/2020	88,000			0.00	
4/15/2020	183,600			0.01	
4/16/2020	149,700			0.00	
4/17/2020	113,000			0.00	
4/18/2020	68,000			0.00	
4/19/2020	117,800			0.00	
4/20/2020	83,200			0.00	
4/21/2020	89,400			0.00	
4/22/2020	71,200			0.00	
4/23/2020	105,300			0.00	
4/24/2020	78,800			0.00	
4/25/2020	98,400			0.00	
4/26/2020	66,500			0.00	
4/27/2020	102,600			0.00	
4/28/2020	71,900			0.00	
4/29/2020	80,000			0.00	
4/30/2020	80,900			0.04	
5/1/2020	97,500			0.00	
5/2/2020	91,600			0.00	
5/3/2020	72,100			0.00	
5/4/2020	113,400			0.00	
5/5/2020	79,200			0.00	
5/6/2020	69,400			0.00	

ARNOLD WASTEWATER TREATMENT FACILITY					
DATE	INFLUENT VOLUME	MONTHLY AVERAGE	MONTHLY TOTAL	DAILY RAINFALL	MONTHLY RAINFALL
	gallons			inches	
5/7/2020	97,700	89,500	2,773,800	0.00	2.46
5/8/2020	109,600			0.00	
5/9/2020	39,200			0.00	
5/10/2020	79,500			0.00	
5/11/2020	91,000			0.00	
5/12/2020	92,000			0.12	
5/13/2020	66,100			0.00	
5/14/2020	105,700			0.00	
5/15/2020	58,100			0.00	
5/16/2020	148,700			0.00	
5/17/2020	77,300			0.00	
5/18/2020	109,000			1.42	
5/19/2020	121,800			0.64	
5/20/2020	75,700			0.20	
5/21/2020	94,400			0.04	
5/22/2020	107,700			0.00	
5/23/2020	86,000			0.00	
5/24/2020	83,100			0.00	
5/25/2020	114,700			0.04	
5/26/2020	91,200			0.00	
5/27/2020	77,700			0.00	
5/28/2020	82,300			0.00	
5/29/2020	62,700			0.00	
5/30/2020	97,800			0.00	
5/31/2020	81,600			0.00	
6/1/2020	95,000	84,247	2,527,400		
6/2/2020	87,400				
6/3/2020	70,500				
6/4/2020	66,200				
6/5/2020	106,700				
6/6/2020	73,100				
6/7/2020	78,600				
6/8/2020	102,900				
6/9/2020	90,900				
6/10/2020	69,500				
6/11/2020	93,900				
6/12/2020	54,700				
6/13/2020	105,900				
6/14/2020	87,100				
6/15/2020	115,800				
6/16/2020	80,100				
6/17/2020	77,300				
6/18/2020	86,400				

ARNOLD WASTEWATER TREATMENT FACILITY					
DATE	INFLUENT VOLUME	MONTHLY AVERAGE	MONTHLY TOTAL	DAILY RAINFALL	MONTHLY RAINFALL
	gallons			inches	
6/19/2020	61,000				
6/20/2020	89,100				
6/21/2020	80,900				
6/22/2020	90,700				
6/23/2020	80,300				
6/24/2020	93,100				
6/25/2020	80,400				
6/26/2020	84,800				
6/27/2020	60,900				
6/28/2020	88,000				

APPENDIX C

ARNOLD WASTEWATER TREATMENT FACILITY
2019 – 2020 MONTHLY INFLUENT SAMPLING RESULTS

January 2016 - June 2020	Arnold WWTF Average Monthly Influent Sample Results				
	BOD_5, mg/L	Suspended Solids, mg/L	Nitrogen, mg/L	pH	Temp, C
January 2016	220	183	-	6.6	9.4
February 2016	330	198	32	6.6	9.6
March 2016	510	182	35	6.5	10.3
April 2016	180	199	56	6.6	12.9
May 2016	230	218	43	6.7	15.0
June 2016	470	242	55	6.6	18.8
July 2016	520	198	78	6.7	21.0
August 2016	63	206	26	6.6	21.4
September 2016	210	220	58	6.5	20.4
October 2016	220	172	46	6.7	17.3
November 2016	98	210	32	6.7	14.1
December 2016	41	227	41	6.8	10.6
January 2017	200	223	35	6.6	8.0
February 2017	110	204	21	6.6	8.2
March 2017	120	175	26	6.5	9.9
April 2017	120	164	29	6.5	10.8
May 2017	68	181	26	6.6	14.6
June 2017	600	204	42	6.6	17.8
July 2017	120	199	37	6.7	20.9
August 2017	110	229	42	6.7	21.8
September 2017	100	221	43	6.6	20.4
October 2017	110	233	43	6.7	17.0
November 2017	210	226	41	7.0	14.4
December 2017	200	211	91	7.1	11.9
January 2018	160	184	-	7.2	11.3
February 2018	110	149	-	7.2	10.6
March 2018	61	122	-	7.4	8.6
April 2018	34	163	-	7.1	11.6
May 2018	151	164	35	7.0	14.5
June 2018	221	193	32	6.8	18.2
July 2018	118	235	39	6.9	21.5
August 2018	196	230	42	6.9	21.0
September 2018	158	195	49	7.0	20.1
October 2018	156	190	-	6.4	17.5
November 2018	222	180	-	7.1	14.2
December 2018	175	209	-	7.3	10.8

January 2016 - June 2020	Arnold WWTF Average Monthly Influent Sample Results				
	BOD_5, mg/L	Suspended Solids, mg/L	Nitrogen, mg/L	pH	Temp, C
January 2019	144	151	28	7.2	9.4
February 2019	39	101	10	7.3	7.3
March 2019	56	110	12	7.2	7.9
April 2019	61	121	18	7.2	11.2
May 2019	39	144	9	7.2	13.2
June 2019	278	147	25	7.2	16.6
July 2019	126	194	26	7.2	19.6
August 2019	316	213	60	7.1	21.0
September 2019	302	215	13	7.1	19.6
October 2019	413	185	41	7.2	16.0
November 2019	319	193	40	7.0	14.2
December 2019	153	143	26	6.8	9.8
January 2020	155	161	52	6.0	9.3
February 2020	154	185	30	7.0	9.8
March 2020	731	157	67	6.9	9.6
April 2020	49	141	19	6.7	10.5
May 2020	106	158	26	6.8	14.5
June 2020	95	209	4	6.9	18.2
AVERAGE	194	186	37	6.9	14.3

APPENDIX D

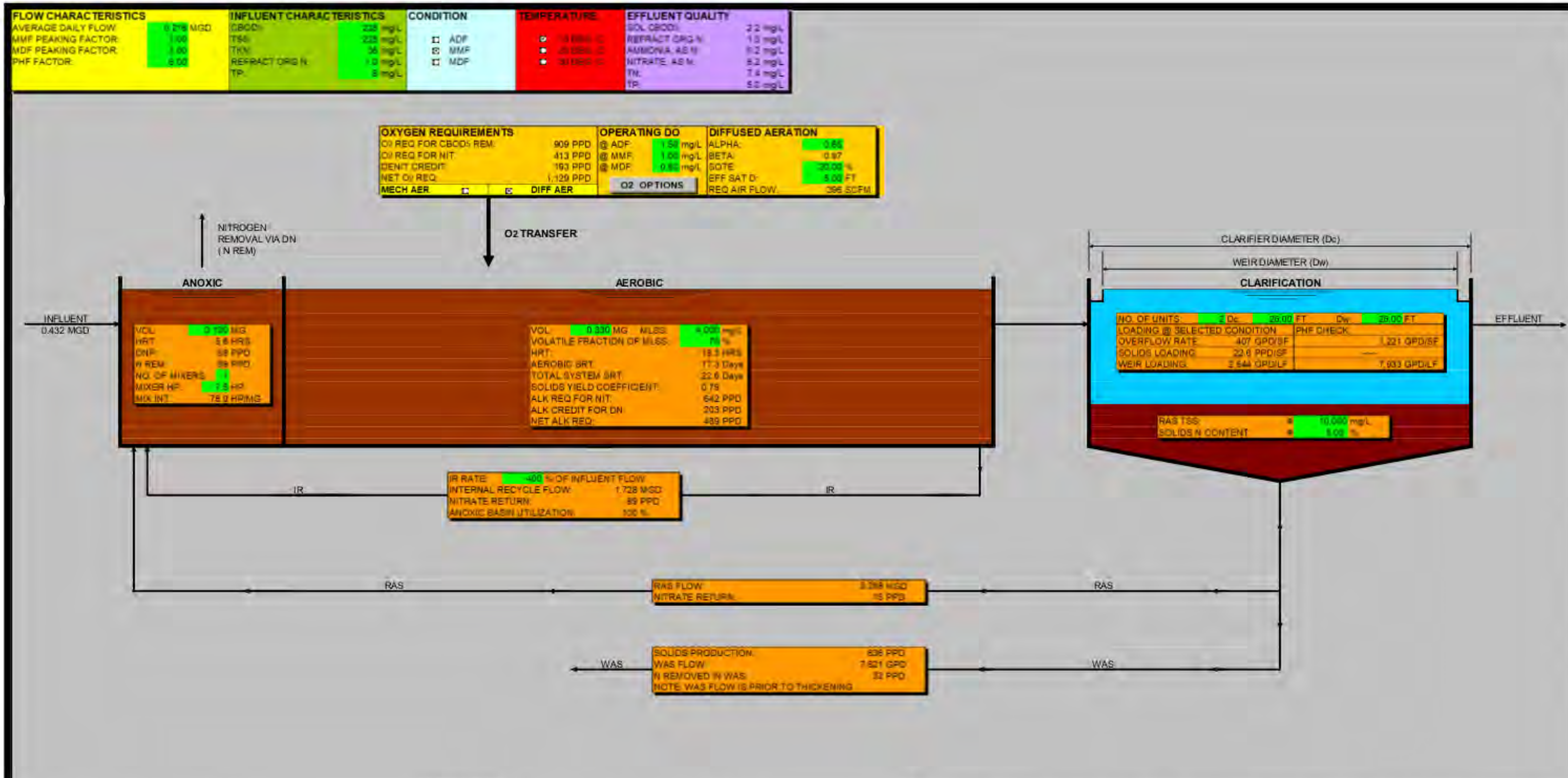
ARNOLD WASTEWATER TREATMENT FACILITY
2016 – 2020 MONTHLY BIOSOLIDS PRODUCTION

January 2016 - June 2020	Arnold WWTF Waste Activated Sludge		
	Gallons	Lbs	%
January 2016	30,770	1,874	0.73%
February 2016	30,020	4,859	1.94%
March 2016	25,000	2,789	1.34%
April 2016	40,250	4,428	1.32%
May 2016	35,550	3,584	1.21%
June 2016	56,500	4,345	0.92%
July 2016	76,750	10,170	1.59%
August 2016	54,750	2,283	0.50%
September 2016	51,100	2,131	0.50%
October 2016	44,100	3,725	1.01%
November 2016	47,925	7,764	1.94%
December 2016	50,450	4,115	0.98%
January 2017	46,500	6,661	1.72%
February 2017	39,650	4,819	1.46%
March 2017	39,800	5,798	1.75%
April 2017	33,500	3,445	1.23%
May 2017	42,900	6,883	1.92%
June 2017	48,600	4,690	1.16%
July 2017	51,700	3,909	0.91%
August 2017	52,800	5,782	1.31%
September 2017	61,750	8,941	1.74%
October 2017	61,000	16,597	3.26%
November 2017	35,600	12,057	4.06%
December 2017	14,200	3,784	3.19%
January 2018	29,800	6,255	2.52%
February 2018	34,820	5,996	2.06%
March 2018	47,760	7,099	1.78%
April 2018	36,600	4,814	1.58%
May 2018	45,200	5,946	1.58%
June 2018	50,080	5,121	1.23%
July 2018	45,442	3,766	0.99%
August 2018	64,692	8,231	1.53%
September 2018	52,380	7,273	1.66%
October 2018	48,060	5,102	1.27%
November 2018	38,610	7,099	2.20%
December 2018	41,850	6,138	1.76%

January 2016 - June 2020	Arnold WWTF Waste Activated Sludge		
	Gallons	Lbs	%
January 2019	48,600	4,789	1.18%
February 2019	38,880	4,658	1.44%
March 2019	38,880	4,859	1.50%
April 2019	36,180	7,229	2.40%
May 2019	38,340	4,916	1.54%
June 2019	26,730	2,952	1.32%
July 2019	33,030	4,281	1.55%
August 2019	45,240	3,714	0.98%
September 2019	38,300	2,901	0.91%
October 2019	40,300	5,131	1.53%
November 2019	21,600	3,080	1.71%
December 2019	32,300	4,408	1.64%
January 2020	30,800	3,054	1.19%
February 2020	41,230	3,778	1.10%
March 2020	36,720	4,592	1.50%
April 2020	27,360	1,767	0.77%
May 2020	33,696	5,047	1.80%
June 2020	47,880	12,534	3.14%
MONTLY AVERAGE	41,899	5,407	1.57%
DAILY AVERAGE	1,400	180	1.60%

APPENDIX E

ARNOLD WASTEWATER TREATMENT FACILITY
BIOLOGICAL TREATMENT PROCESS CALCULATIONS



ABBREVIATIONS			
ADF	AVERAGE DAILY FLOW	ALK	ALKALINITY AS CALCIUM CARBONATE
MMF	MAXIMUM MONTHLY FLOW	MLSS	MIXED LIQUOR SUSPENDED SOLIDS
MDF	MAXIMUM DAILY FLOW	N	NITROGEN
PHF	PEAK HOURLY FLOW	NIT	NITRIFICATION
MGD	MILLION GALLONS PER DAY	DN	DENITRIFICATION
GPD	GALLONS PER DAY	DNP	DENITRIFICATION POTENTIAL
PPD	POUNDS PER DAY	HRT	HYDRAULIC RETENTION TIME
DEG C	DEGREES CENTIGRADE	SRT	SOLIDS RETENTION TIME
CBOD5	5-DAY CARBONACEOUS BIOCHEMICAL OXYGEN DEMAND	HRS	HOURS
TSS	TOTAL SUSPENDED SOLIDS	RAS	RETURN ACTIVATED SLUDGE
TKN	TOTAL KJELDAHL NITROGEN, AS N	WAS	WASTE ACTIVATED SLUDGE
REFRACT ORG N	REFRACTORY ORGANIC NITROGEN, AS N	IR	INTERNAL RECYCLE
TP	TOTAL PHOSPHORUS	NO.	NUMBER
COD	CHEMICAL OXYGEN DEMAND	MIX INT	MIXING INTENSITY
mg/L	MILLIGRAMS PER LITER	ATM P	ATMOSPHERIC PRESSURE
SOL	SOLUBLE	RH	RELATIVE HUMIDITY
VOL	VOLUME	DIFF AER	DIFFUSED AERATION
MG	MILLION GALLONS	MECH AER	MECHANICAL AERATION
REQ	REQUIRED	SOR	STANDARD OXYGENATION RATE
LF	LINEAL FOOT	SOTE	STANDARD OXYGEN TRANSFER EFFICIENCY
SF	SQUARE FOOT	EFF SAT D	EFFECTIVE SATURATION DEPTH
O2	OXYGEN	HP	HORSEPOWER
DO	DISSOLVED OXYGEN	SCFM	STANDARD CUBIC FEET PER MINUTE

ARNOLD WASTEWATER TREATMENT FACILITY - SECONDARY CLARIFIER

PROCESS ANALYSIS AND EXPECTED PERFORMANCE FOR PROJECTED FLOWS AND LOADINGS

PROJECT: 15095 | DATE: SEPTEMBER 17, 2020 | PREPARED BY: ROG

ARNOLD WASTEWATER TREATMENT FACILITY - SECONDARY CLARIFIER
PROCESS ANALYSIS AND EXPECTED PERFORMANCE
FOR PROJECTED FLOWS AND LOADINGS

		Wastewater Temp. = 10 Deg. C			
Parameter	**Unit**	**ADF**	**MMF**	**MDF**	**PHF**
Flows & Influent Characteristics					
Flow	MGD	0.216	0.432	0.864	1.296
Influent $CBOD_5$ Concentration	mg/L	225	225	225	—
Influent TSS Concentration	mg/L	225	225	225	—
Influent TKN Concentration	mg/L	35	35	35	—
Influent TP Concentration	mg/L	8	8	8	—
Process Input Parameters					
Anoxic Volume	MG	0.100	0.100	0.100	—
Aerobic Volume	MG	0.330	0.330	0.330	—
MLSS	mg/L	4,000	4,000	4,000	—
Volatile Fraction Of MLSS	Percent	70	70	70	—
RAS TSS Concentration	mg/L	10,000	10,000	10,000	—
Internal Recycle Flow As Percent Of Influent Flow	Percent	400	400	400	—
Internal Recycle Flow	MGD	0.864	1.728	3.456	—
Refractory Organic Nitrogen Concentration	mg/L	1.0	1.0	1.0	—
Nitrogen Content Of WAS Solids	Percent	5.00	5.00	5.00	—
HRT, SRT, Yield, Effluent $CBOD_5$, & Effluent Ammonia					
RAS Flow Rate	MGD	0.144	0.288	0.576	—
Anoxic HRT	Hours	11.1	5.6	2.8	—
Aerobic HRT	Hours	36.7	18.3	9.2	—
Total HRT	Hours	47.8	23.9	11.9	—
Aerobic SRT	Days	43.4	17.3	7.2	—
Total System SRT	Days	56.6	22.6	9.4	—
Yield Coefficient	Lb./Lb.	0.63	0.79	0.96	—
Solids Production	PPD	253	636	1,532	—
WAS Flow	GPD	3,039	7,621	18,370	—
Effluent Soluble $CBOD_5$ Concentration	mg/L	1.5	2.2	4.1	—
Effluent Ammonia Concentration	mg/L	0.1	0.2	0.9	—
Nitrification Analysis					
Influent TKN	PPD	63	126	252	—
Less Nitrogen Required For Cell Synthesis	PPD	13	32	77	—
Less Effluent Ammonia	PPD	0	1	6	—
Less Refractory Organic Nitrogen	PPD	2	4	7	—
TKN To Be Nitrified	PPD	48	90	162	—
Denitrification Potential & Nitrate Removal @ Specified IR Flow					
Anoxic Stage Denitrification Potential	PPD	61	68	81	—
Anoxic Stage Nitrate Removal	PPD	40	68	81	—
Final Nitrogen Balance					
Influent TKN	PPD	63	126	252	—
Less Nitrogen Required For Cell Synthesis	PPD	13	32	77	—
Less Effluent Ammonia	PPD	0	1	6	—
Less Refractory Organic Nitrogen	PPD	2	4	7	—
TKN Converted To Nitrate	PPD	48	90	162	—
Less Nitrate Removed	PPD	40	68	81	—
Effluent Nitrate	PPD	9	22	81	—
Effluent TN (Ammonia + Ref Org N + Nitrate)	PPD	10	27	94	—
Effluent Ammonia Concentration	mg/L	0.1	0.2	0.9	—
Refractory Organic Nitrogen Concentration	mg/L	1.0	1.0	1.0	—
Effluent TKN Concentration	mg/L	1.1	1.2	1.9	—
Effluent Nitrate Concentration	mg/L	4.7	6.2	11.2	—
Effluent TN Concentration (Ammonia + Ref Org N + Nitrate)	mg/L	5.8	7.4	13.1	—
Phosphorus Removal Analysis					
Influent TP Concentration	mg/L	8.0	8.0	8.0	—
Excess Phosphorus Removal Propensity Factor	—	0.00	0.00	0.00	—
Phosphorus Removal Potential	mg/L	1.9	3.0	4.6	—
Phosphorus Removal	mg/L	1.9	3.0	4.6	—
Effluent TP Concentration	mg/L	6.1	5.0	3.4	—

ARNOLD WASTEWATER TREATMENT FACILITY - SECONDARY CLARIFIER
PROCESS ANALYSIS AND EXPECTED PERFORMANCE
FOR PROJECTED FLOWS AND LOADINGS

Parameter	Unit	Wastewater Temp. = 10 Deg. C			
		ADF	MMF	MDF	PHF
Anoxic Basin Mixing Analysis					
Number Of Anoxic Mixers	Each	1	1	1	—
Anoxic Mixer Horsepower, Each	HP	7.5	7.5	7.5	—
Anoxic Basin Mixing Intensity	HP/MG	75.0	75.0	75.0	—
Alkalinity Balance					
Alkalinity Coefficient For Nitrification	Lb./Lb.	7.14	7.14	7.14	—
Alkalinity Coefficient For Denitrification	Lb./Lb.	3.00	3.00	3.00	—
Alkalinity Required For Nitrification	PPD	346	642	1,158	—
Alkalinity Credit For Denitrification	PPD	120	203	244	—
Net Alkalinity Required	PPD	226	439	914	—
Oxygen Requirements					
Influent $CBOD_5$	PPD	405	811	1,621	—
Effluent $CBOD_5$	PPD	3	8	29	—
$CBOD_5$ Removed	PPD	403	803	1,592	—
Oxygen Coefficient For $CBOD_5$ Removal	Lb./Lb.	1.39	1.13	0.93	—
Oxygen Required For $CBOD_5$ Removal	PPD	560	909	1,480	—
Oxygen Coefficient For Nitrification	Lb./Lb.	4.60	4.60	4.60	—
TKN Converted To Nitrate	PPD	48	90	162	—
Oxygen Required For Nitrification	PPD	223	413	746	—
Oxygen Coefficient For Denitrification Credit	Lb./Lb.	2.86	2.86	2.86	—
Denitrification Credit	PPD	114	193	232	—
Net Oxygen Requirement	PPD	669	1,129	1,994	—
Clarifier Loadings					
Number Of Units	Each	2	2	2	2
Clarifier Diameter	Feet	26.00	26.00	26.00	26.00
Surface Area	SF	1,062	1,062	1,062	1,062
Weir Diameter	Feet	26.00	26.00	26.00	26.00
Weir Length	Feet	163	163	163	163
RAS Flow	MGD	0.144	0.288	0.576	—
Overflow Rate	GPD/SF	203	407	814	1,221
Weir Loading	GPD/LF	1,322	2,644	5,289	7,933
Solids Loading	PPD/SF	11.3	22.6	45.2	—
Diffused Aeration System Analysis					
Actual Oxygenation Rate (AOR)	PPD	669	1,129	1,994	—
Aerobic SRT	Days	43.4	17.3	7.2	—
Alpha	—	0.65	0.65	0.65	—
Beta	—	0.98	0.97	0.96	—
DO Saturation In Clean Water @ 20 Deg. C & 100% RH	mg/L	9.09	9.09	9.09	—
DO Saturation In Clean Water @ Specified Temp. & 100% RH	mg/L	11.29	11.29	11.29	—
Tau	—	1.24	1.24	1.24	—
Standard Atmospheric Pressure	psi	14.70	14.70	14.70	—
Barometric Pressure	psi	14.70	14.70	14.70	—
Saturated Vapor Pressure of Water @ 20 Deg. C	psi	0.34	0.34	0.34	—
Saturated Vapor Pressure of Water @ Specified Temperature	psi	0.18	0.18	0.18	—
Effective Saturation Depth	Feet	5.00	5.00	5.00	—
Omega	—	1.00	1.00	1.00	—
Corrected DO Saturation In Clean Water @ 20 Deg. C & 100% RH	mg/L	10.46	10.46	10.46	—
Operating DO	mg/L	1.50	1.00	0.50	—
OTRf/SOTR	—	0.55	0.57	0.59	—
Standard Oxygen Transfer Efficiency	Percent	20.00	20.00	20.00	—
Field Oxygen Transfer Efficiency	Percent	11.00	11.38	11.77	—
Air Flow Required For Biological Process	SCFM	243	396	676	—

APPENDIX F

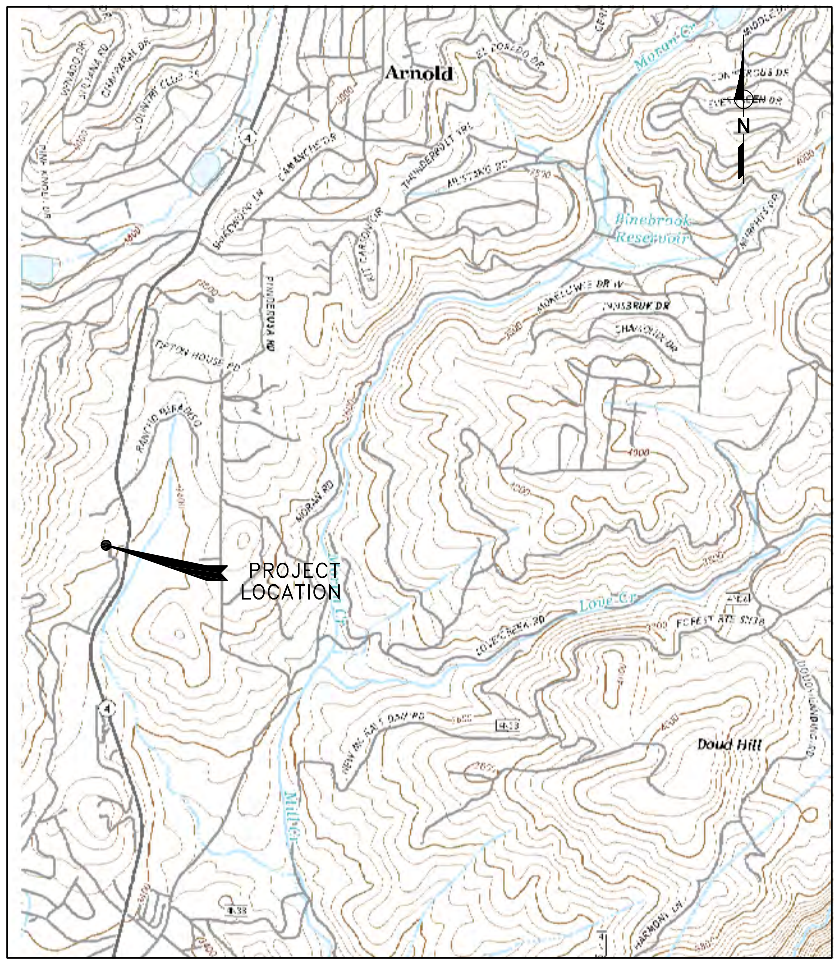
ARNOLD WASTEWATER TREATMENT FACILITY
PRELIMINARY DESIGN DRAWINGS

22 x 34 .ctb Plot Style				
Color No.	Color	Thickness, mm	Plot Output	Screening (100 = Zero)
1	Red	0.3429	Black	100
2	Yellow	0.2540	Black	100
3	Green	0.2540	Black	100
4	Cyan	0.2540	Black	100
5	Blue	0.5080	Black	100
6	Magenta	0.2540	Black	100
7	Black	0.3429	Black	100
8	Grey	0.2540	Black	100
9-255	Various	0.2032	Black	50

.ctb Plot Style				
Color No.	Color	Thickness, mm	Plot Output	Screening (100 = Zero)
1	Red	0.1750	Black	100
2	Yellow	0.1250	Black	100
3	Green	0.1250	Black	100
4	Cyan	0.1250	Black	100
5	Blue	0.2500	Black	100
6	Magenta	0.1250	Black	100
7	Black	0.1750	Black	100
8	Grey	0.1250	Black	100
9-255	Various	0.1250	Black	50

CALAVERAS COUNTY WATER DISTRICT

ARNOLD WASTEWATER TREATMENT FACILITY
PHASE 1 IMPROVEMENTS PROJECT

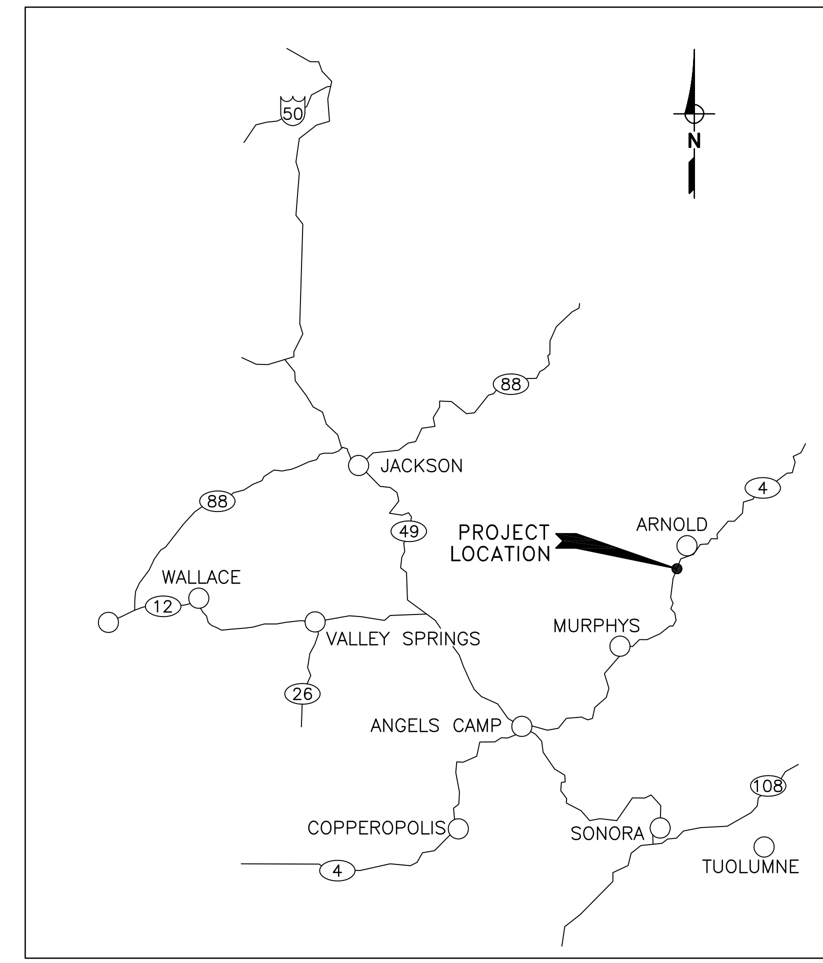


LOCATION MAP

NOT TO SCALE

SEPTEMBER 30, 2020
CIP NO. 15095

INDEX OF DRAWINGS



VICINITY MAP

NOT TO SCALE

DESIGNED BY:	R. GODWIN
DRAFTED BY:	R. GODWIN
CHECKED BY:	
DATE:	10/2/2020
SCALE:	NO SCALE
BAR LENGTH ONE INCH ON SCALED DRAWING	

REVISION:	DESCRIPTION:	DATE:	BY:

CALAVERAS COUNTY WATER DISTRICT

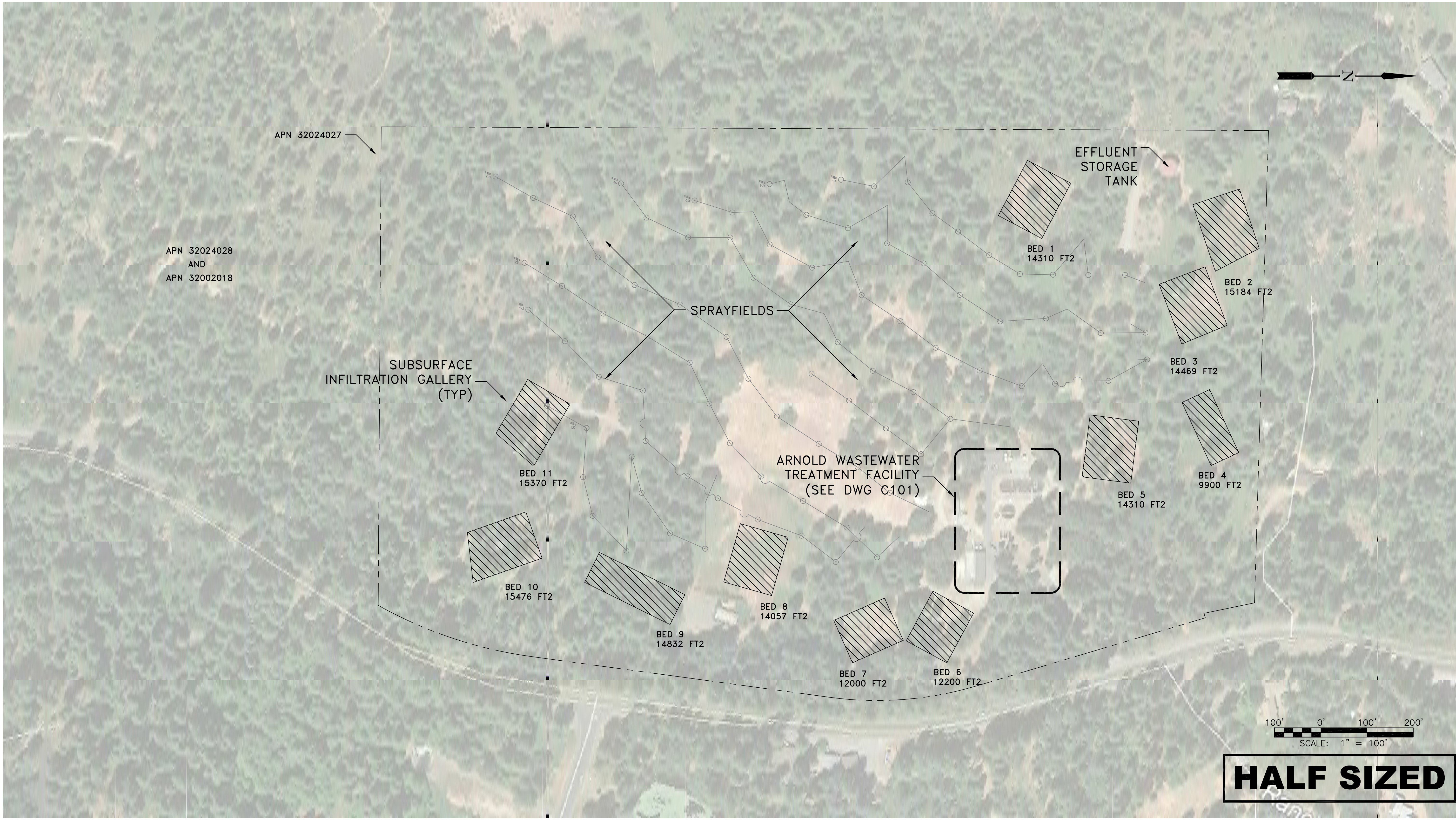
120 TOMA COURT
POST OFFICE BOX 846
SAN ANDREAS, CALIFORNIA 95249
PHONE: (209) 754-3543

TITLE SHEET
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

15095
PROJECT NUMBER

G1
DRAWING NUMBER

– OF –
SHEET NUMBER



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DRAFTED BY:	R. GODWIN
CHECKED BY:	
DATE:	9/25/2020
SCALE:	1" = 100'-0"
BAR LENGTH ONE INCH ON SCALED DRAWING	

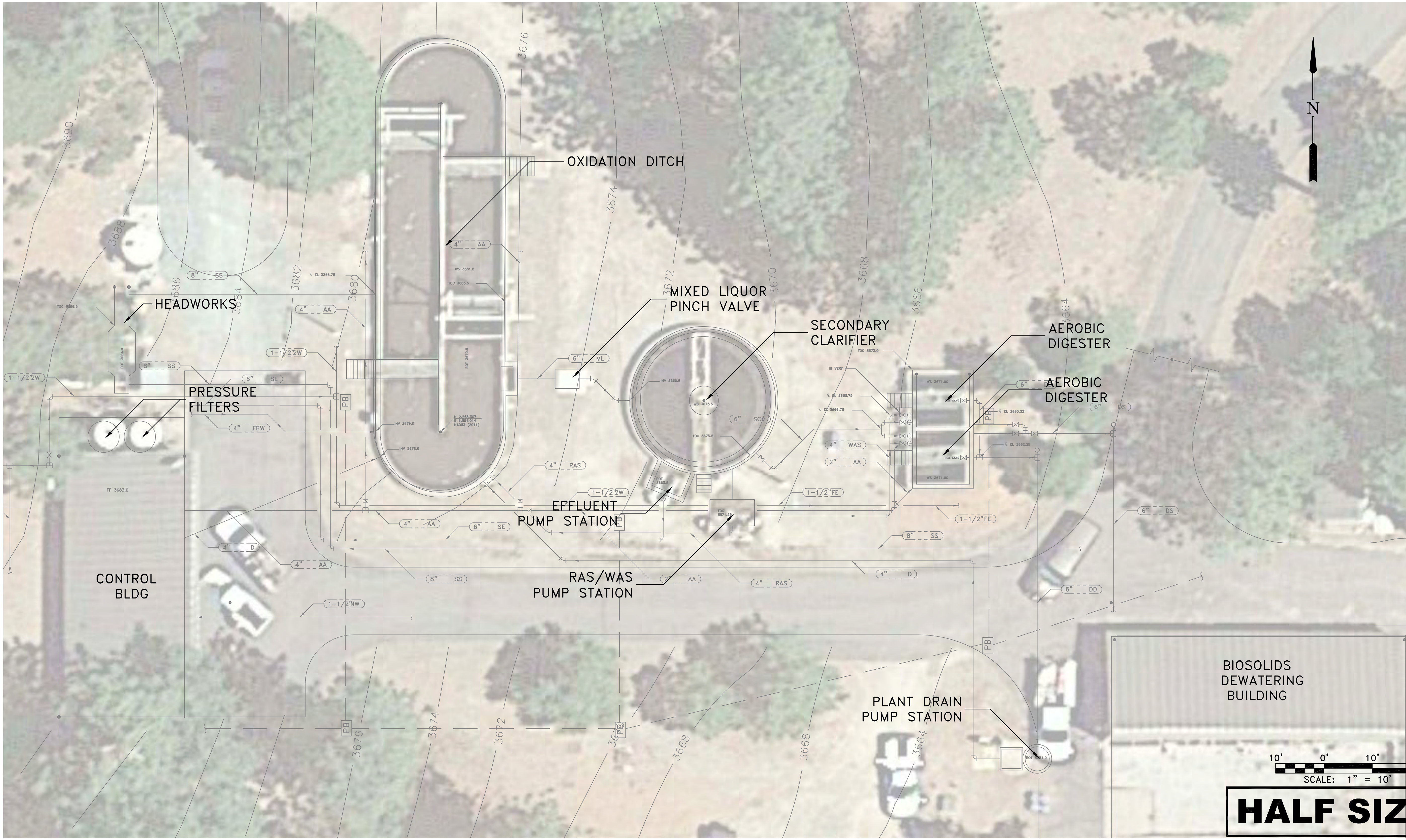
REVISION:	DESCRIPTION:	DATE:	BY:

CALAVERAS COUNTY
WATER DISTRICT

120 TOMA COURT
POST OFFICE BOX 846
SAN ANDREAS, CALIFORNIA 95249
PHONE: (209) 754-3543

OVERALL – SITE PLAN
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

15095
PROJECT NUMBER
C100
DRAWING NUMBER
–
SHEET NUMBER



HALF SIZED

DESIGNED BY:	R. GODWIN
DRAFTED BY:	R. GODWIN
CHECKED BY:	
DATE:	10/2/20
SCALE:	1" = 100'-0"
BAR LENGTH ONE INCH ON SCALED DRAWING	

REVISION:	DESCRIPTION:	DATE:	BY:

CALAVERAS COUNTY WATER DISTRICT

120 TOMA COURT
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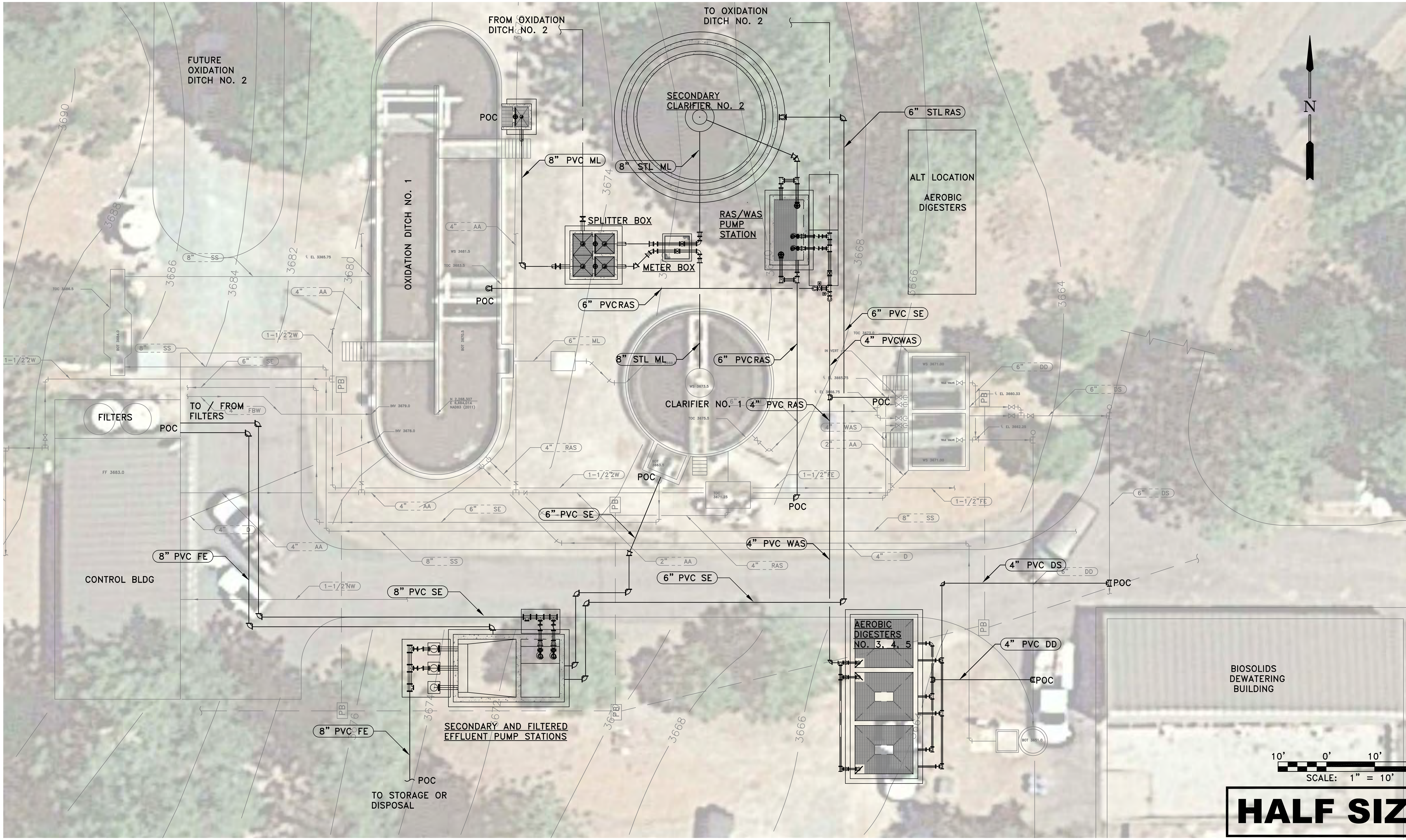
PHONE: (209) 754-3543

EXISTING FACILITY
SITE PLAN
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

15095
PROJECT NUMBER
C101
DRAWING NUMBER
–
SHEET NUMBER



HALF SIZED

DESIGNED BY:	R. GODWIN
DRAFTED BY:	R. GODWIN
CHECKED BY:	
DATE:	10/2/2020
SCALE:	1" = 10'-0"
BAR LENGTH ONE INCH ON SCALED DRAWING	

REVISION:	DESCRIPTION:	DATE:	BY:

CALAVERAS COUNTY WATER DISTRICT

120 TOMA COURT
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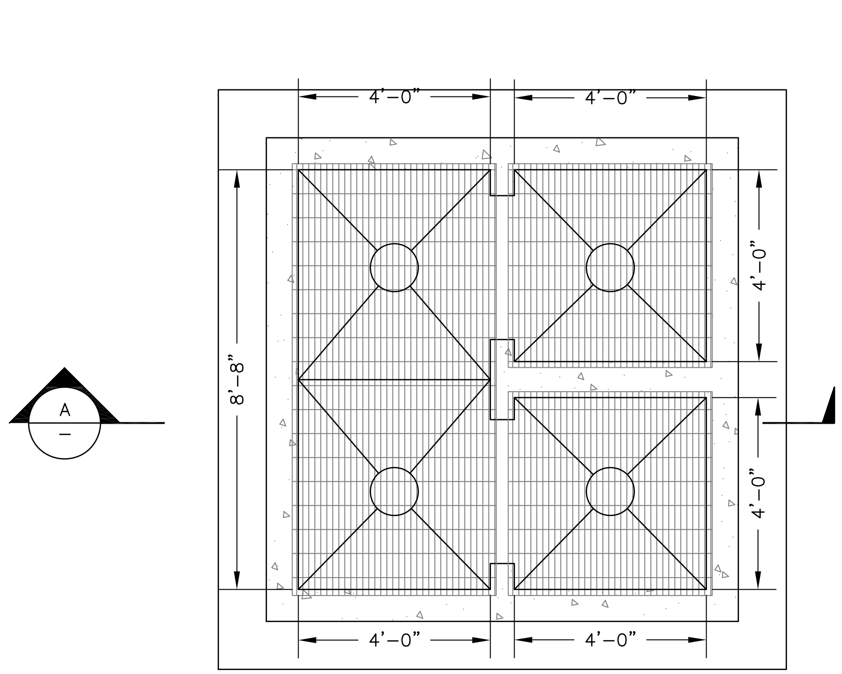
SAN ANDREAS, CALIFORNIA 95249
PHONE: (209) 754-3543

PROPOSED PHASE 1
SITE PLAN
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

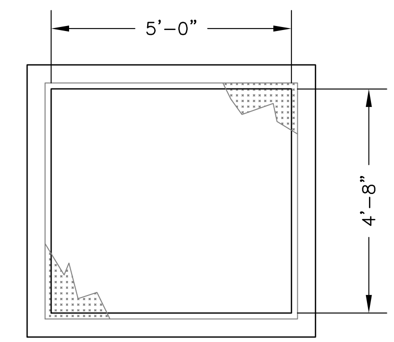
15095
PROJECT NUMBER
C102
DRAWING NUMBER
– OF –
SHEET NUMBER



ML SPLITTER BOX

DETAIL 1

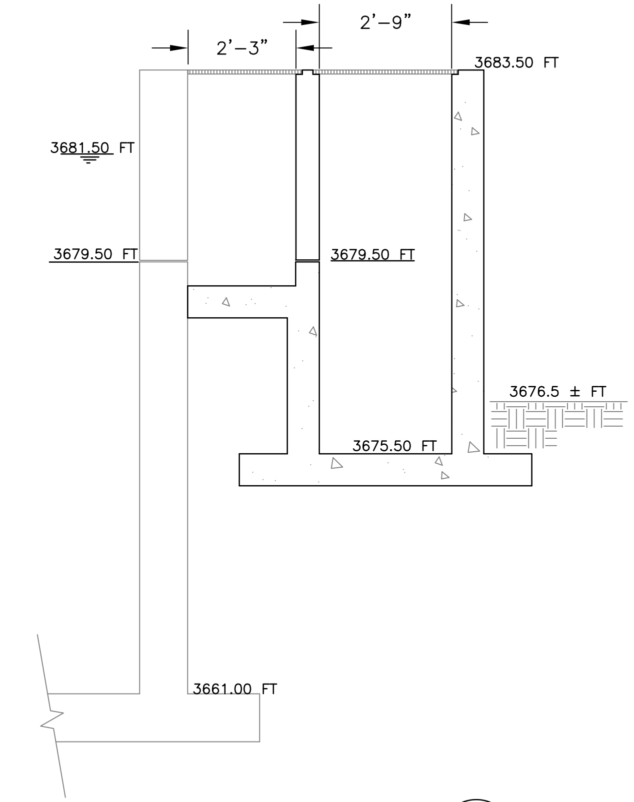
SCALE: 1/2" = 1' -0"



METER VAULT

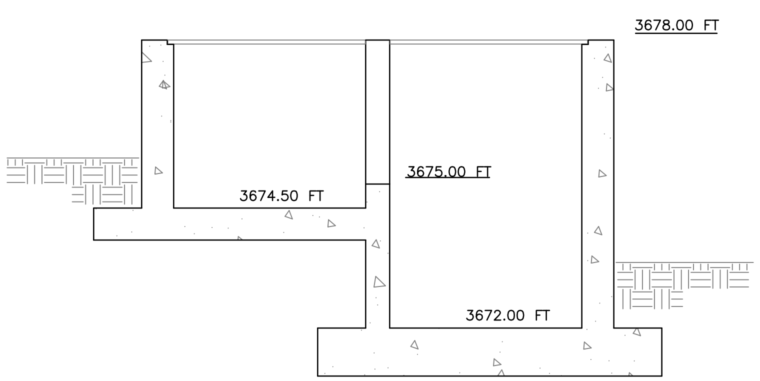
DETAIL 2

SCALE: 1/2" = 1' -0"



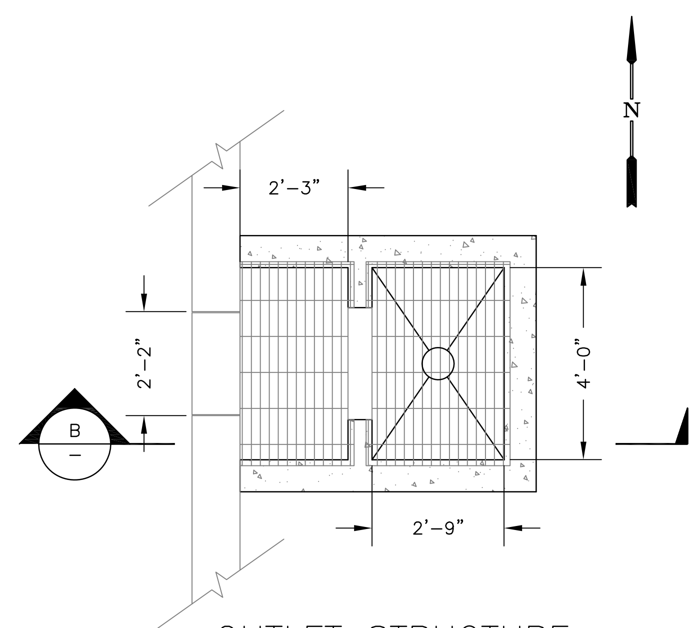
SECTION B

SCALE: 1/2" = 1' -0"



SECTION A

SCALE: 1/2" = 1' -0"



OUTLET STRUCTURE

DETAIL 3

SCALE: 1/2" = 1' -0"

0 1' 2' 4' 6'

SCALE: 1/2" = 1'-0"

HALF SIZED

DESIGNED BY:	R. GODWIN
DRAFTED BY:	R. GODWIN
CHECKED BY:	
DATE:	10/2/20
SCALE:	AS INDICATED
BAR LENGTH ONE INCH ON SCALED DRAWING	

REVISION:	DESCRIPTION:	DATE:	BY:

CALAVERAS COUNTY WATER DISTRICT

120 TOMA COURT
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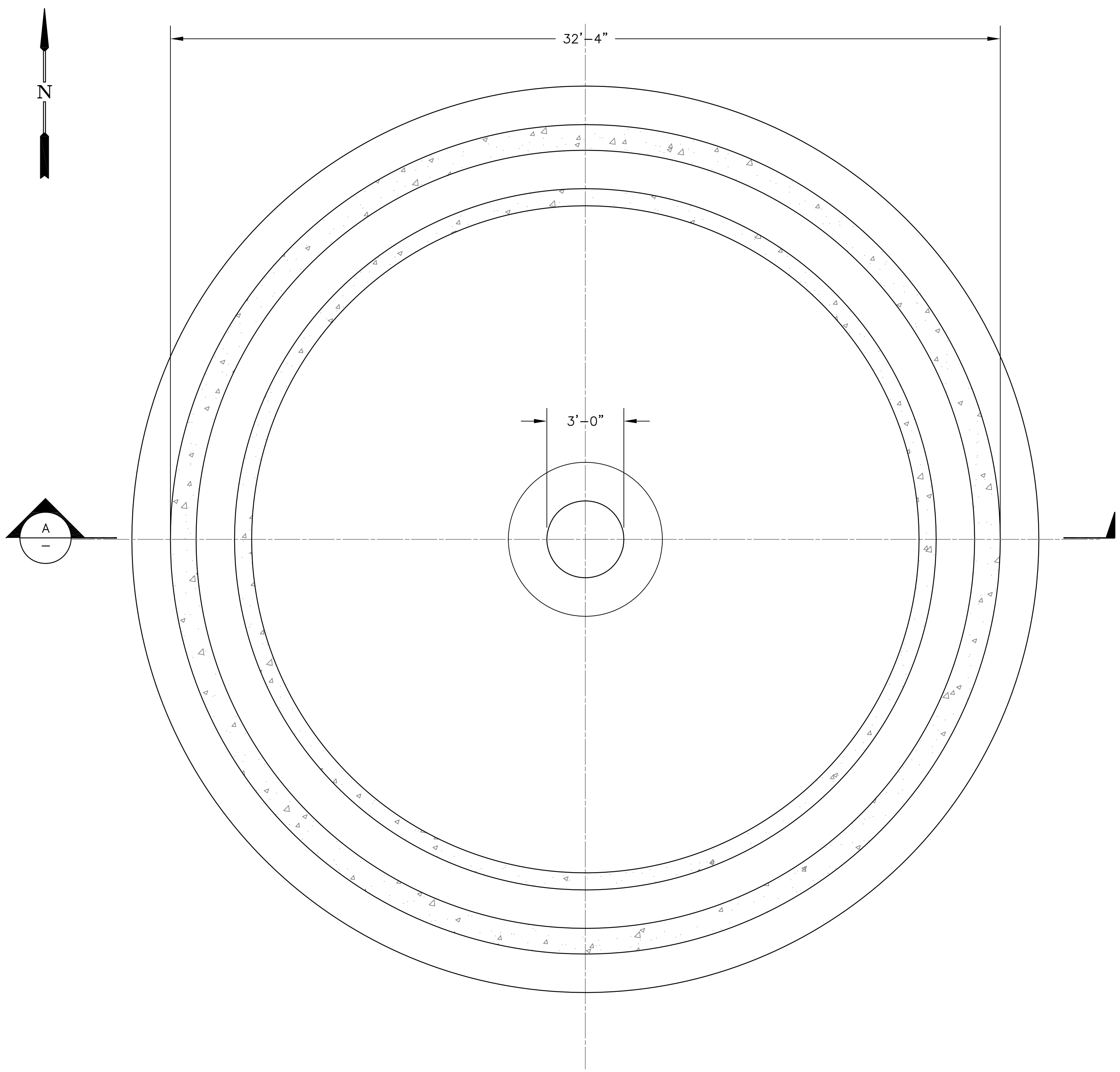
PHONE: (209) 754-3543

HYDRAULIC STRUCTURES
DETAILS AND SECTIONS
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

15095
PROJECT NUMBER

S200
DRAWING NUMBER

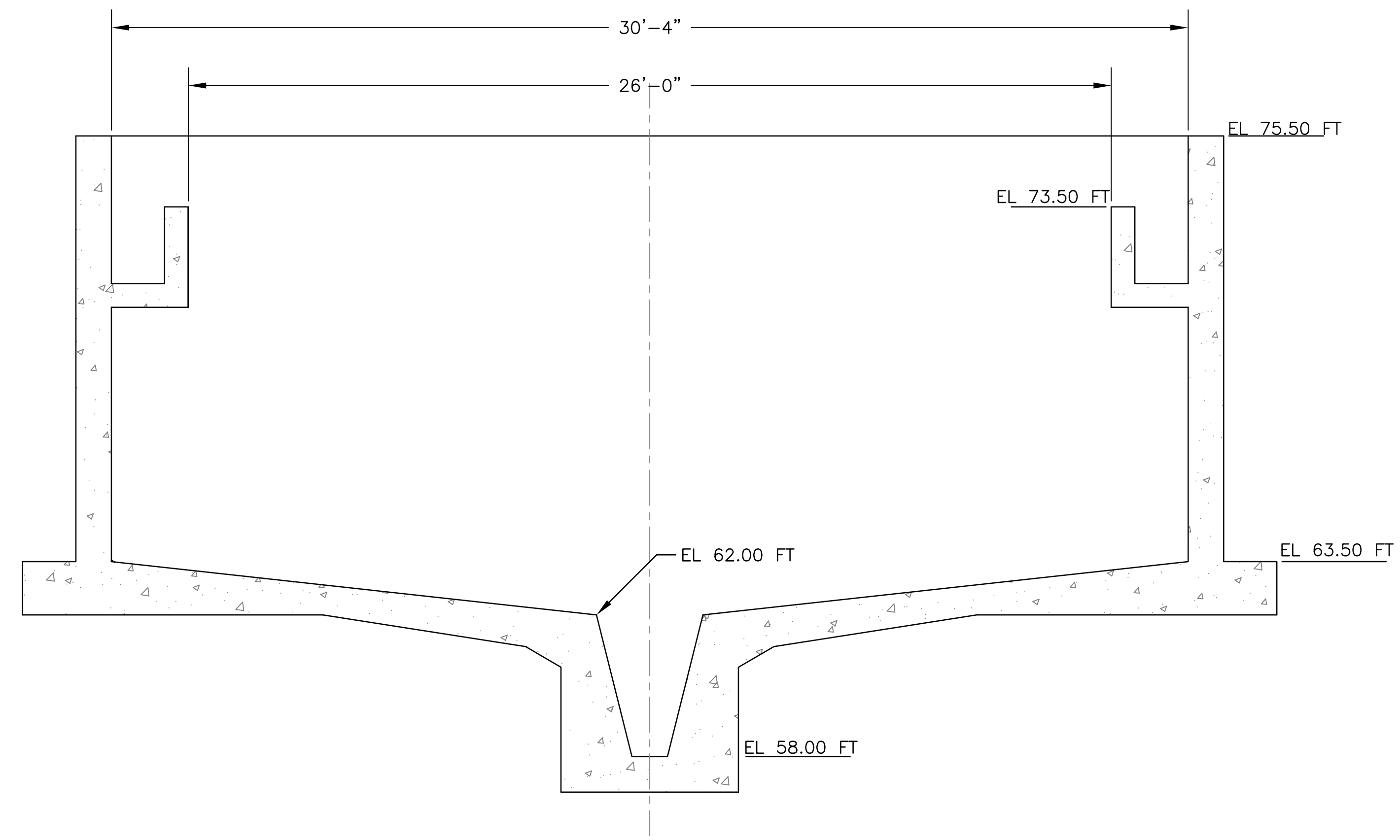
–
SHEET NUMBER



30-FT DIA CLARIFIER

DETAIL 1

SCALE: 3/8" = 1' -0"



SECTION A

SCALE: 3/8" = 1' -0"

0 2' 4' 6' 8'

SCALE: 3/8" = 1'-0"

HALF SIZED

DESIGNED BY:	R. GODWIN
DRAFTED BY:	R. GODWIN
CHECKED BY:	
DATE:	10/2/20
SCALE:	AS INDICATED
BAR LENGTH ONE INCH ON SCALED DRAWING	

REVISION:	DESCRIPTION:	DATE:	BY:

CALAVERAS COUNTY WATER DISTRICT

120 TOMA COURT
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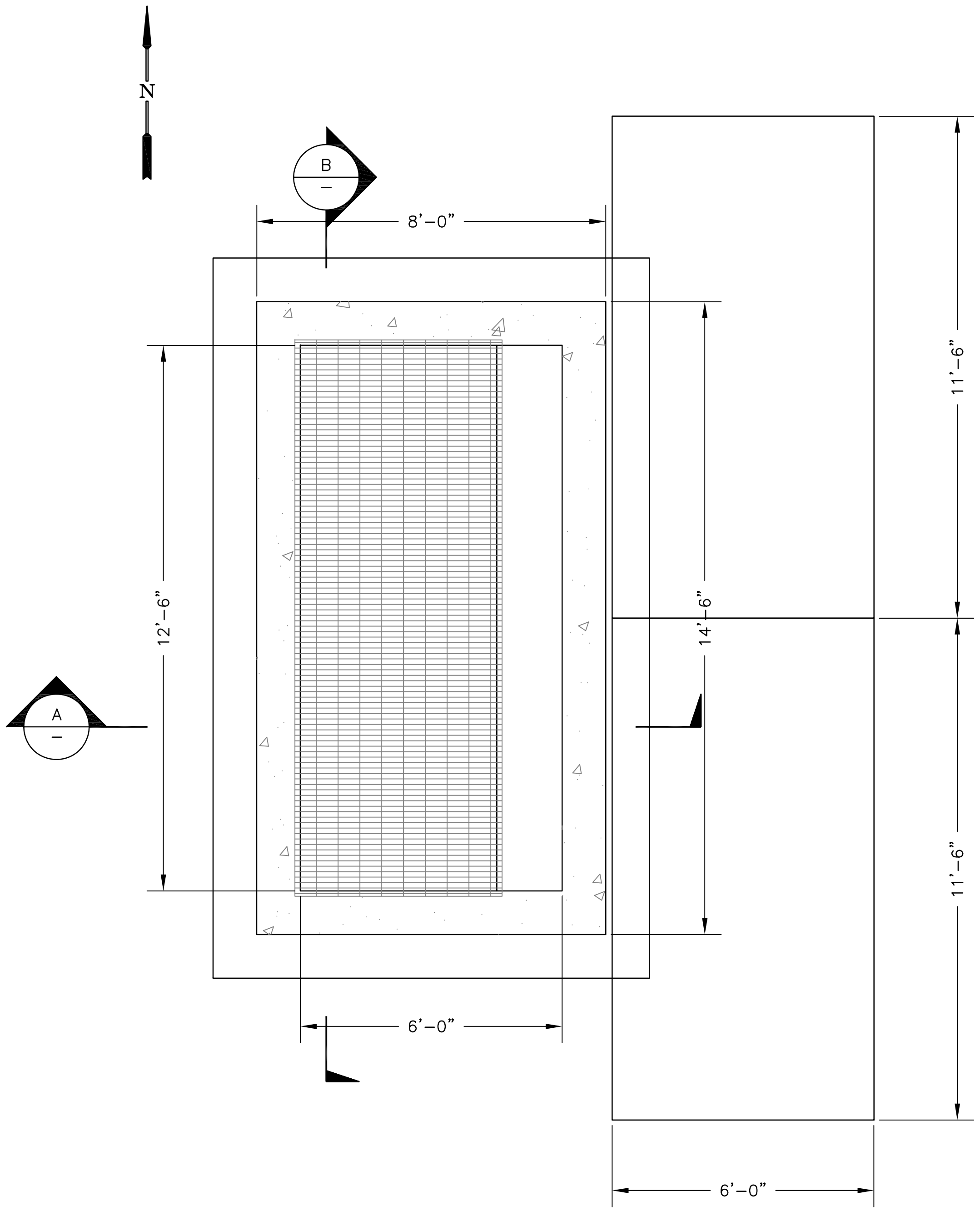
PHONE: (209) 754-3543

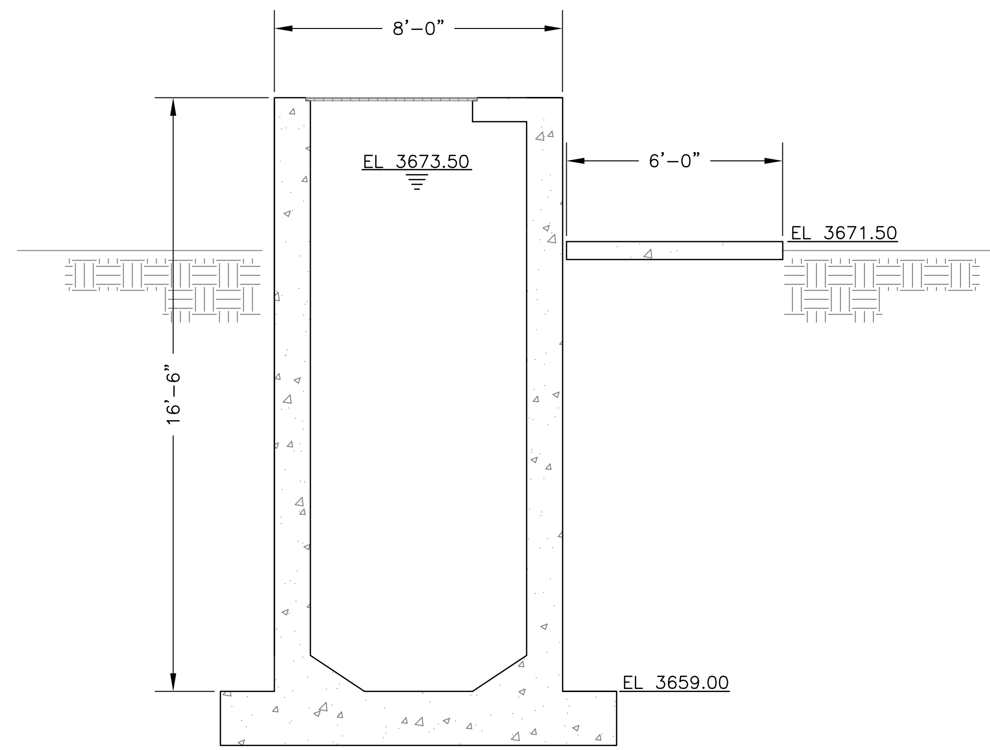
SECONDARY CLARIFIER
DETAILS AND SECTIONS
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

15095
PROJECT NUMBER
S300
DRAWING NUMBER
SHEET NUMBER

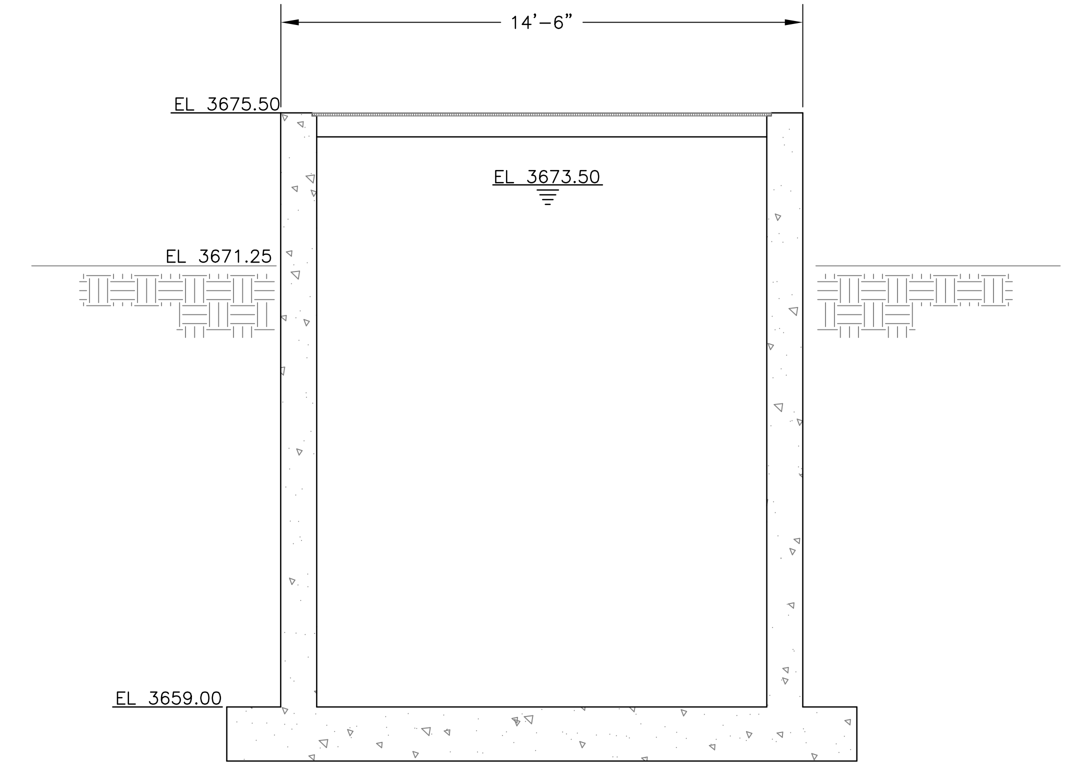


RAS/WAS PUMP STATION

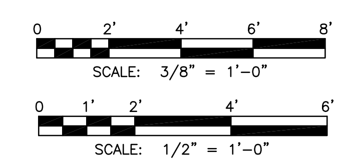
DETAIL 1
SCALE: 1/2" = 1'-0"



SECTION A
SCALE: 3/8" = 1'-0"



SECTION B
SCALE: 3/8" = 1'-0"



HALF SIZED

DESIGNED BY:	R. GODWIN
DRAFTED BY:	R. GODWIN
CHECKED BY:	
DATE:	10/2/20
SCALE:	AS INDICATED
BAR LENGTH ONE INCH ON SCALED DRAWING	

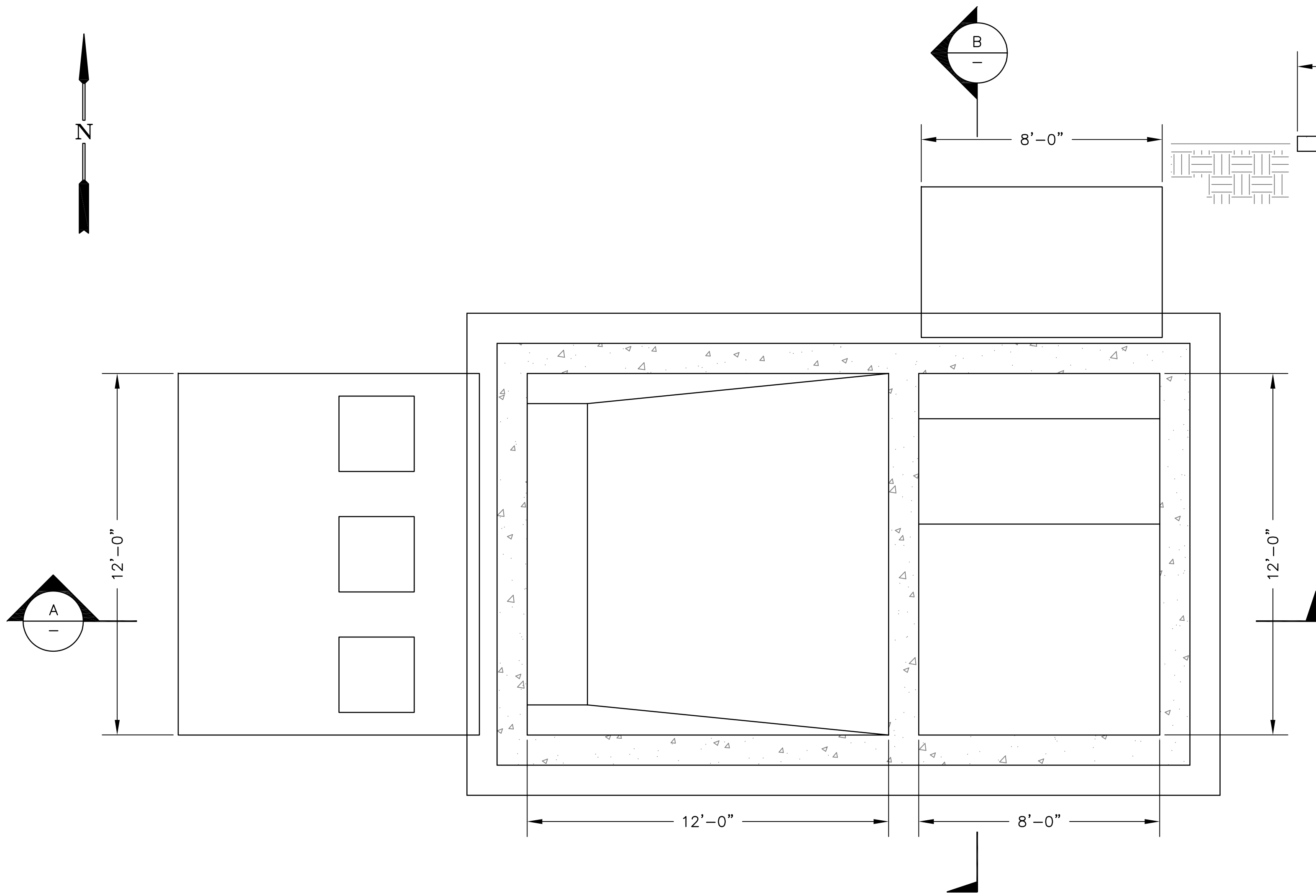
REVISION:	DESCRIPTION:	DATE:	BY:

CALAVERAS COUNTY WATER DISTRICT

120 TOMA COURT
POST OFFICE BOX 846
SAN ANDREAS, CALIFORNIA 95249
PHONE: (209) 754-3543

RAS / WAS PUMP STATION
DETAILS AND SECTIONS
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

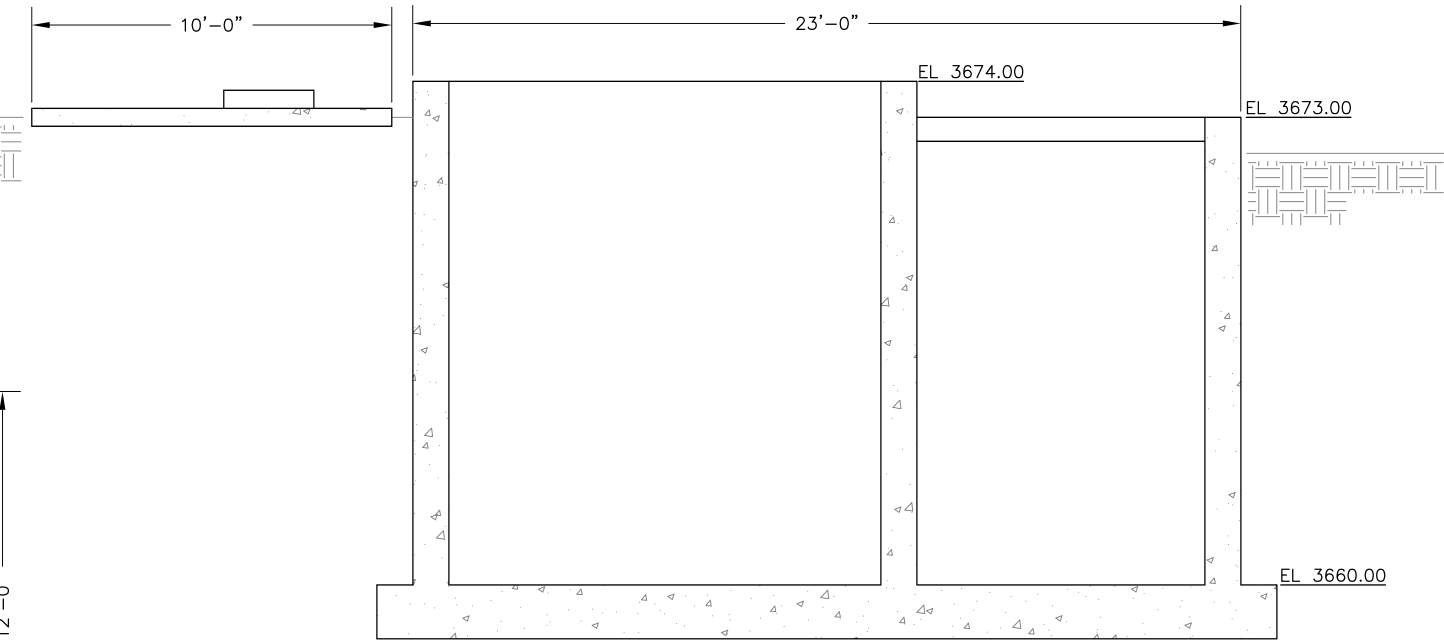
15095
PROJECT NUMBER
S400
DRAWING NUMBER
–
SHEET NUMBER



PUMP STATIONS

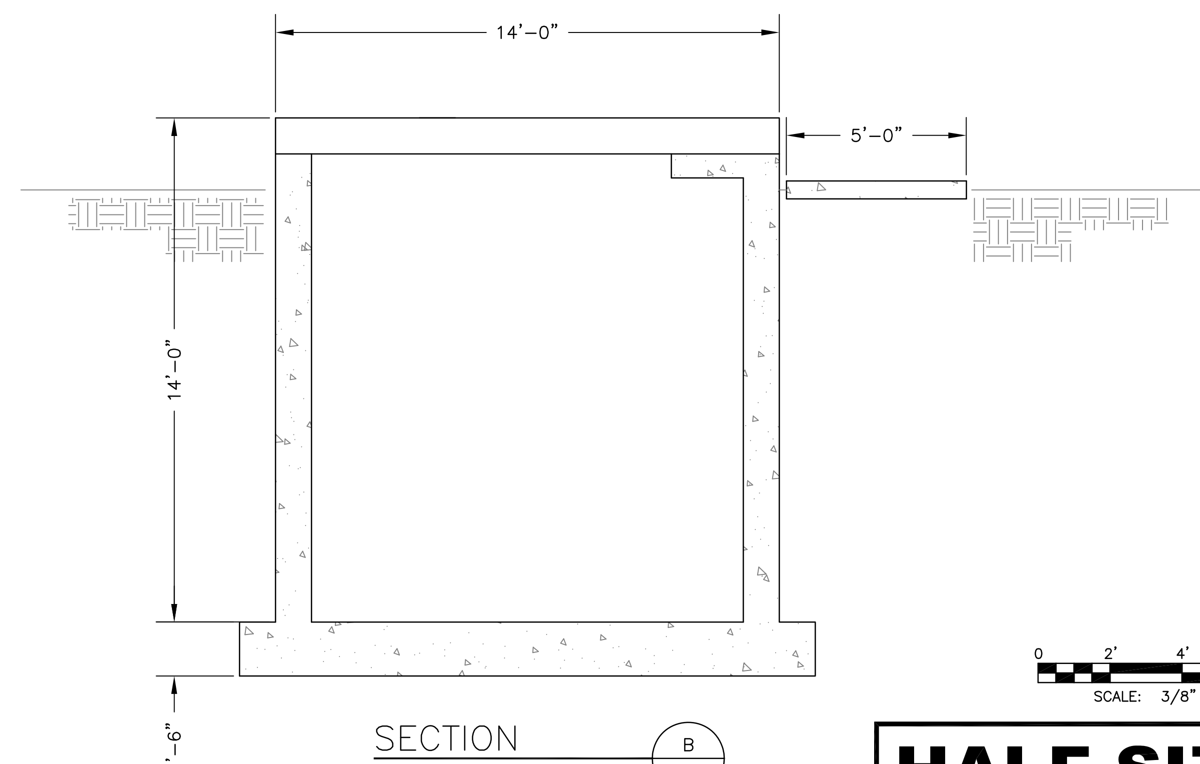
DETAIL 1

SCALE: 3/8" = 1'-0"



SECTION A

SCALE: 3/8" = 1'-0"



SECTION B

SCALE: 3/8" = 1'-0"

0 2' 4' 6' 8'

SCALE: 3/8" = 1'-0"

HALF SIZED

DESIGNED BY:	R. GODWIN
DRAFTED BY:	R. GODWIN
CHECKED BY:	
DATE:	10/2/20
SCALE:	AS INDICATED
BAR LENGTH ONE INCH ON SCALED DRAWING	

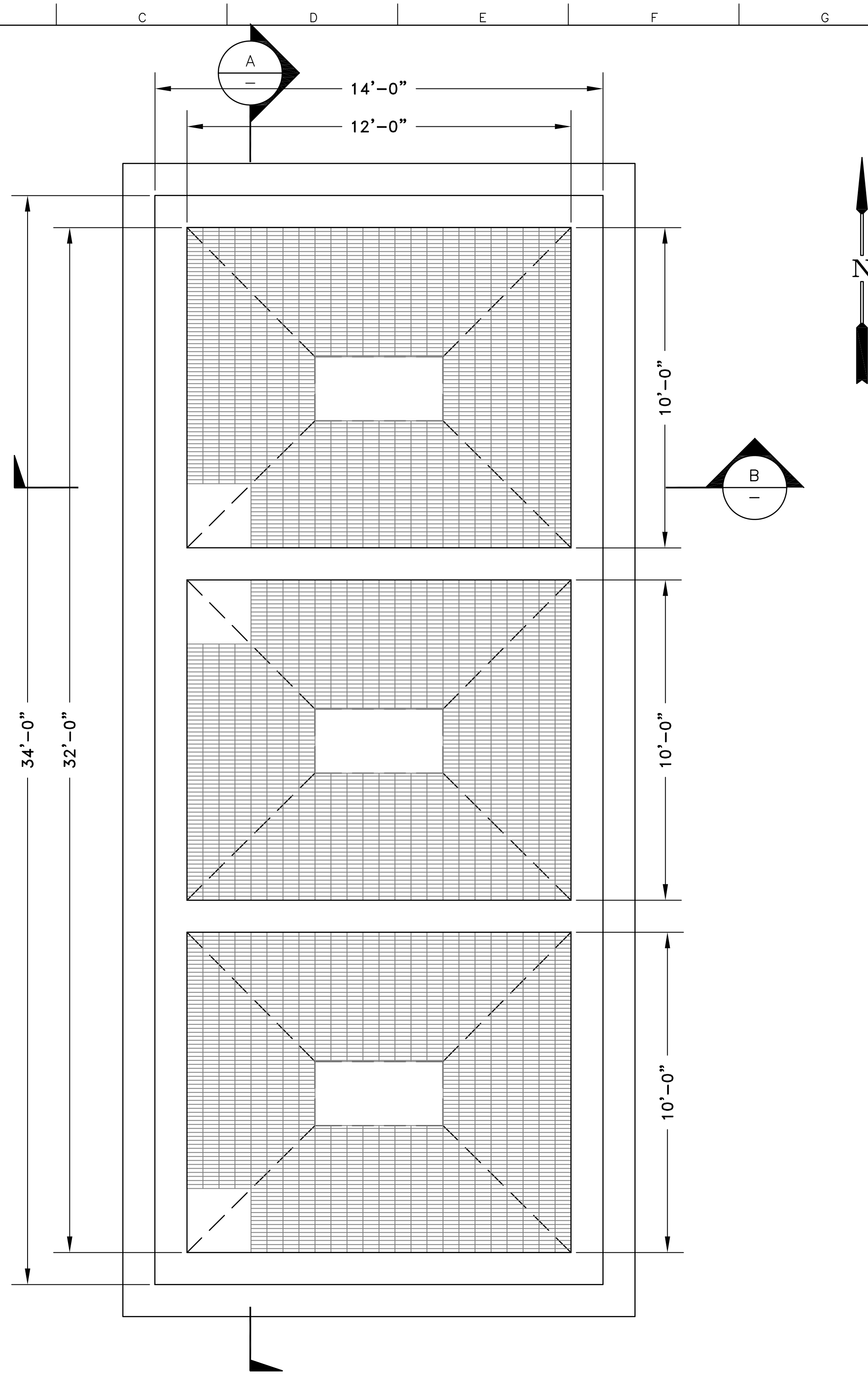
REVISION:	DESCRIPTION:	DATE:	BY:

CALAVERAS COUNTY
WATER DISTRICT

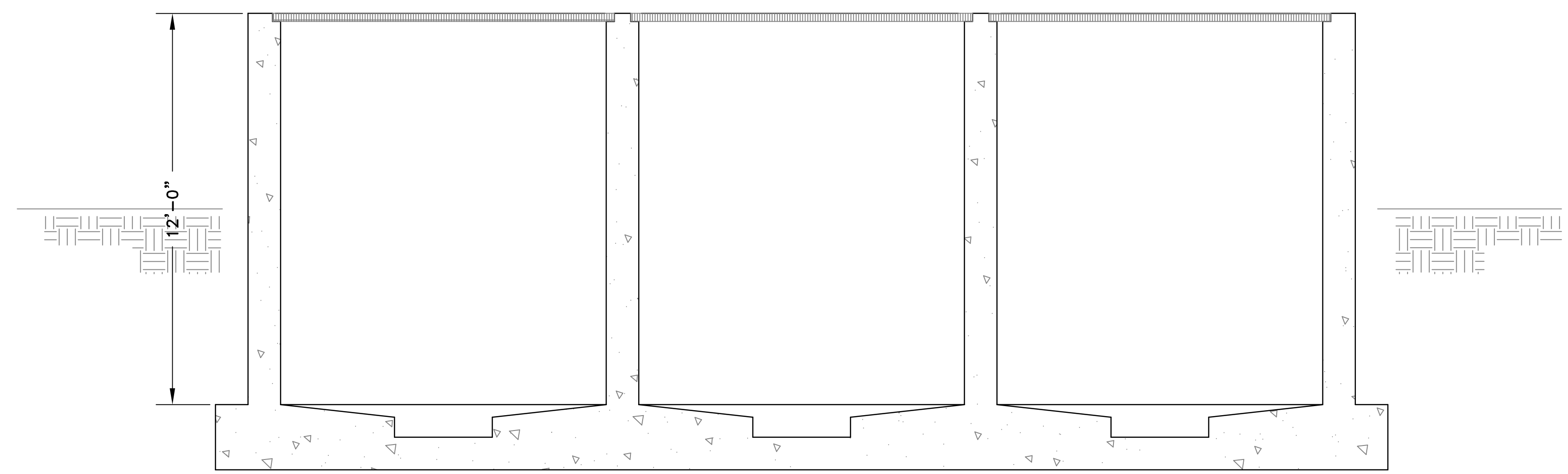
120 TOMA COURT
POST OFFICE BOX 846
SAN ANDREAS, CALIFORNIA 95249
PHONE: (209) 754-3543

SECONDARY AND FILTERED
EFFLUENT PUMP STATIONS
DETAILS AND SECTIONS
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

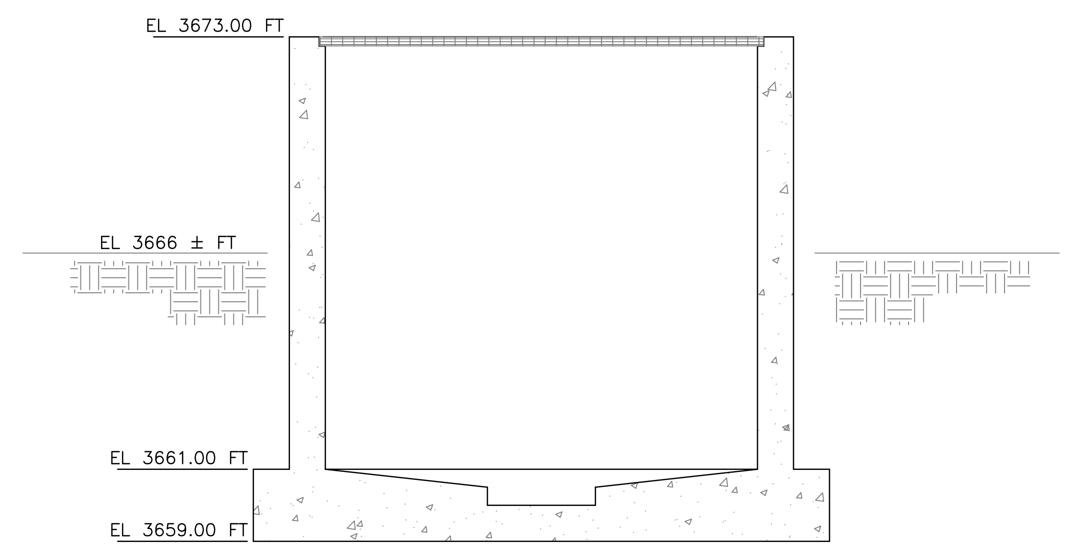
15095	PROJECT NUMBER
S500	DRAWING NUMBER
–	SHEET NUMBER



DETAIL 1
SCALE: 3/8" = 1"-0"



SECTION A
SCALE: 3/8" = 1' -0"



SECTION B
SCALE: 3/8" = 1' -0"

0 2' 4' 6' 8'
SCALE: 3/8" = 1'-0"

HALF SIZED

DESIGNED BY:	R. GODWIN
DRAFTED BY:	R. GODWIN
CHECKED BY:	
DATE:	10/3/20
SCALE:	3/8" = 1'-0"
BAR LENGTH ONE INCH ON SCALED DRAWING	

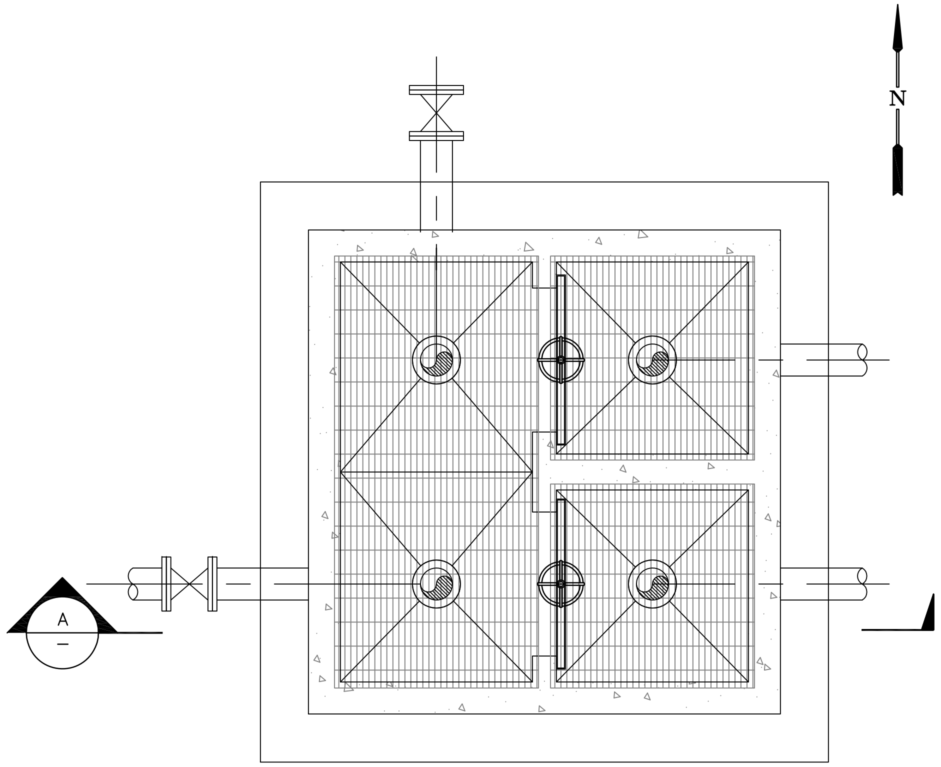
REVISION:	DESCRIPTION:	DATE:	BY:

CALAVERAS COUNTY WATER DISTRICT

120 TOMA COURT
POST OFFICE BOX 846
SAN ANDREAS, CALIFORNIA 95249
PHONE: (209) 754-3543

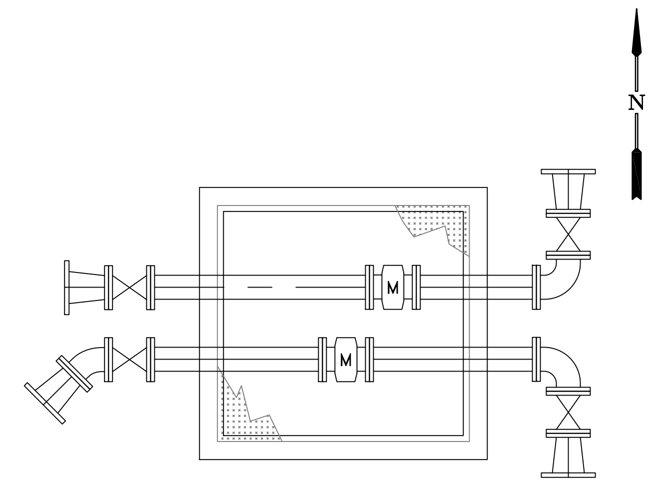
AEROBIC DIGESTERS
PLAN AND SECTIONS
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

15095
PROJECT NUMBER
S600
DRAWING NUMBER
–
SHEET NUMBER



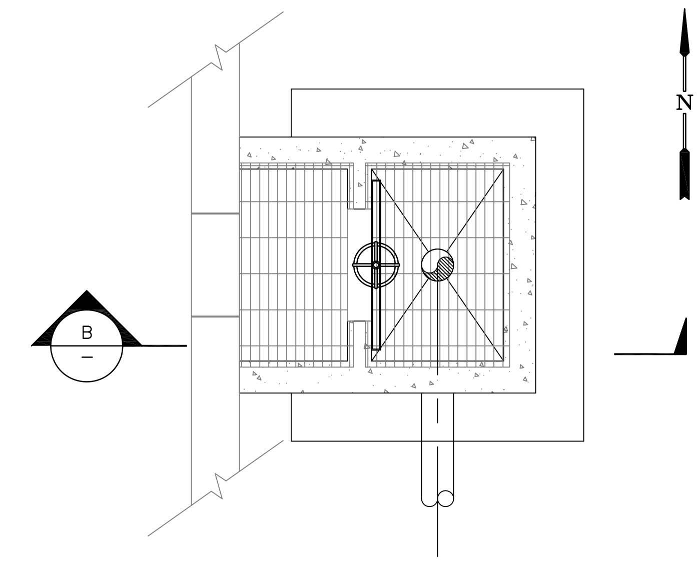
ML SPLITTER BOX

DETAIL
SCALE: 1/2" = 1' –0"
1
–



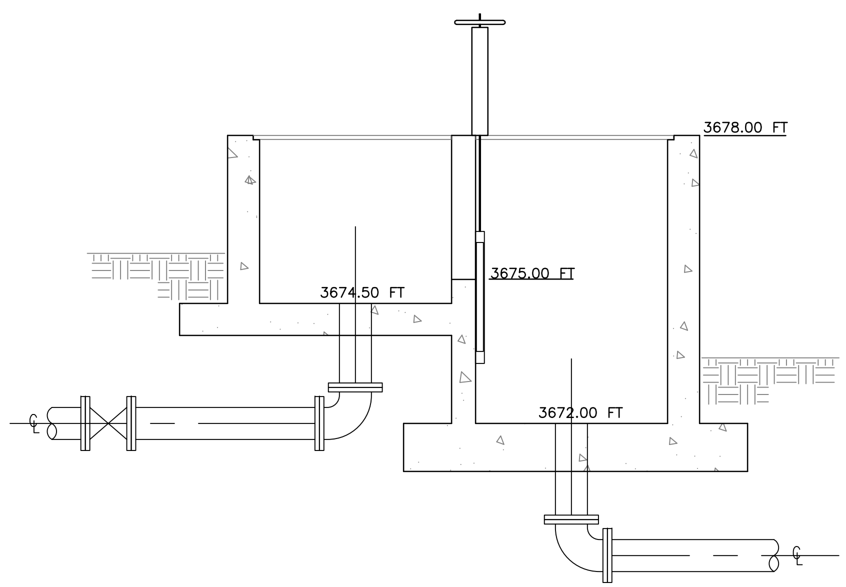
METER VAULT

DETAIL
SCALE: 1/2" = 1' –0"
2
–

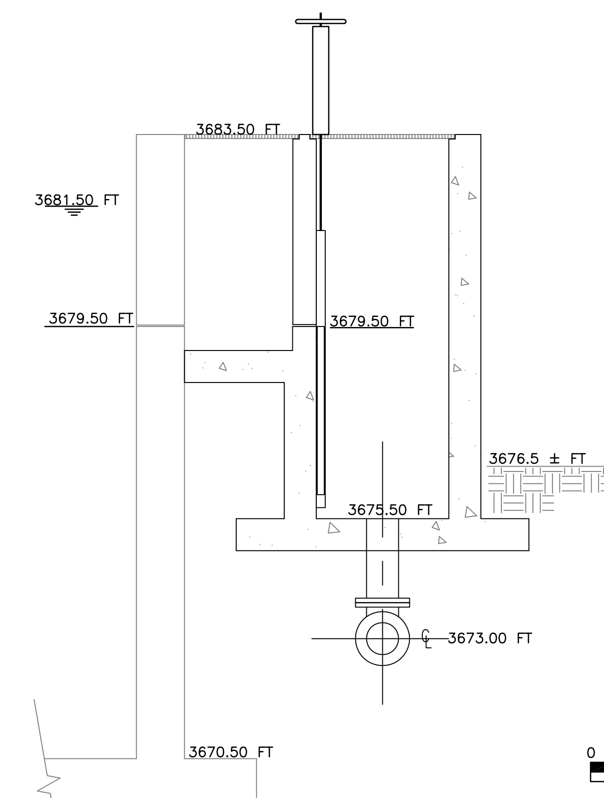


OUTLET STRUCTURE

DETAIL
SCALE: 1/2" = 1' –0"
3
–



SECTION
SCALE: 1/2"" = 1' –0"
A
–



0 1' 2' 4' 6'
SCALE: 1/2" = 1'–0"

SECTION
SCALE: 1/2" = 1' –0"
B
–

HALF SIZED

DESIGNED BY:	R. GODWIN
DRAFTED BY:	R. GODWIN
CHECKED BY:	
DATE:	10/3/20
SCALE:	AS INDICATED
BAR LENGTH ONE INCH ON SCALED DRAWING	

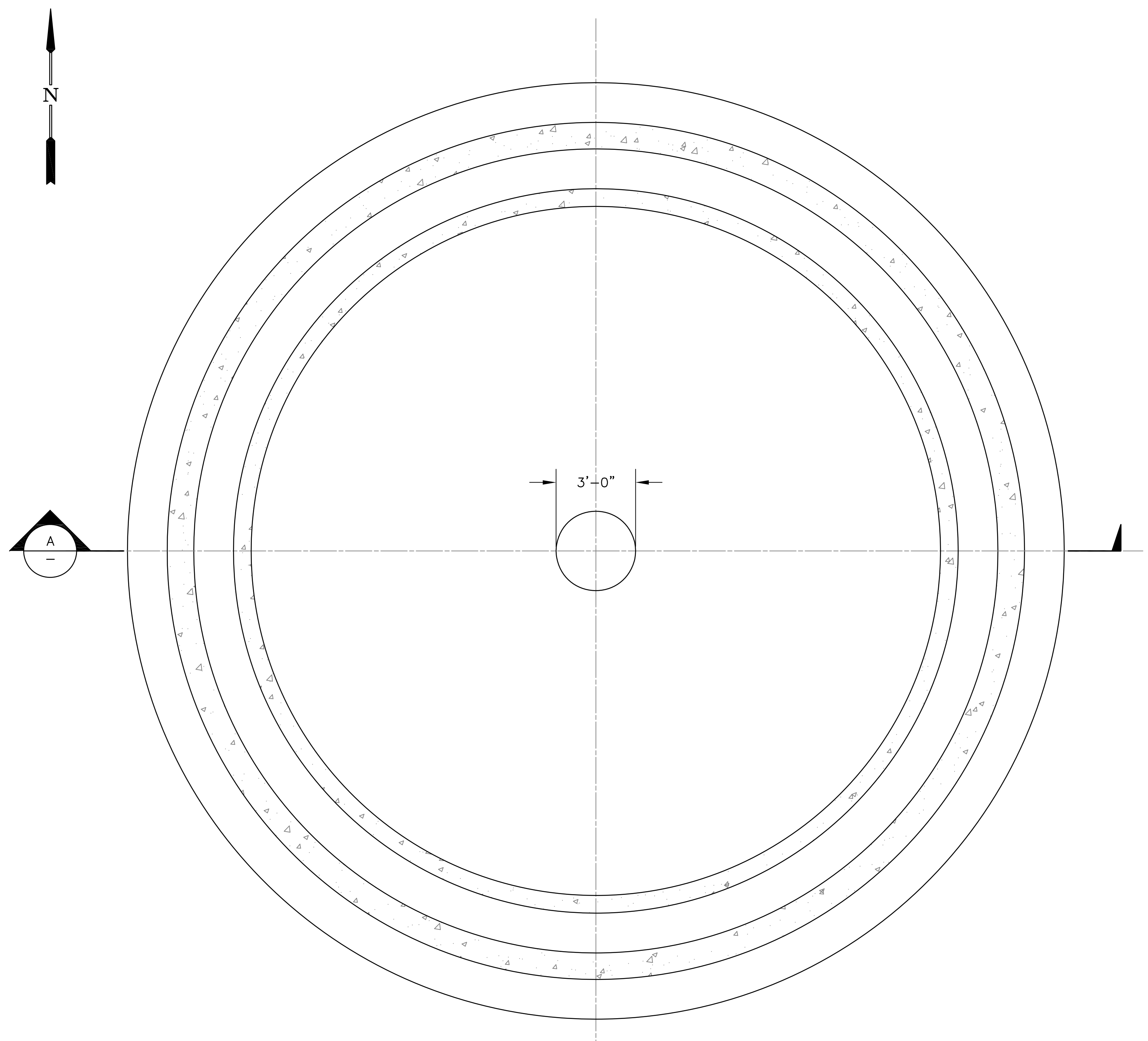
REVISION:	DESCRIPTION:	DATE:	BY:

CALAVERAS COUNTY WATER DISTRICT

120 TOMA COURT
POST OFFICE BOX 846
SAN ANDREAS, CALIFORNIA 95249
PHONE: (209) 754-3543

HYDRAULIC STRUCTURES
DETAILS AND SECTIONS
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

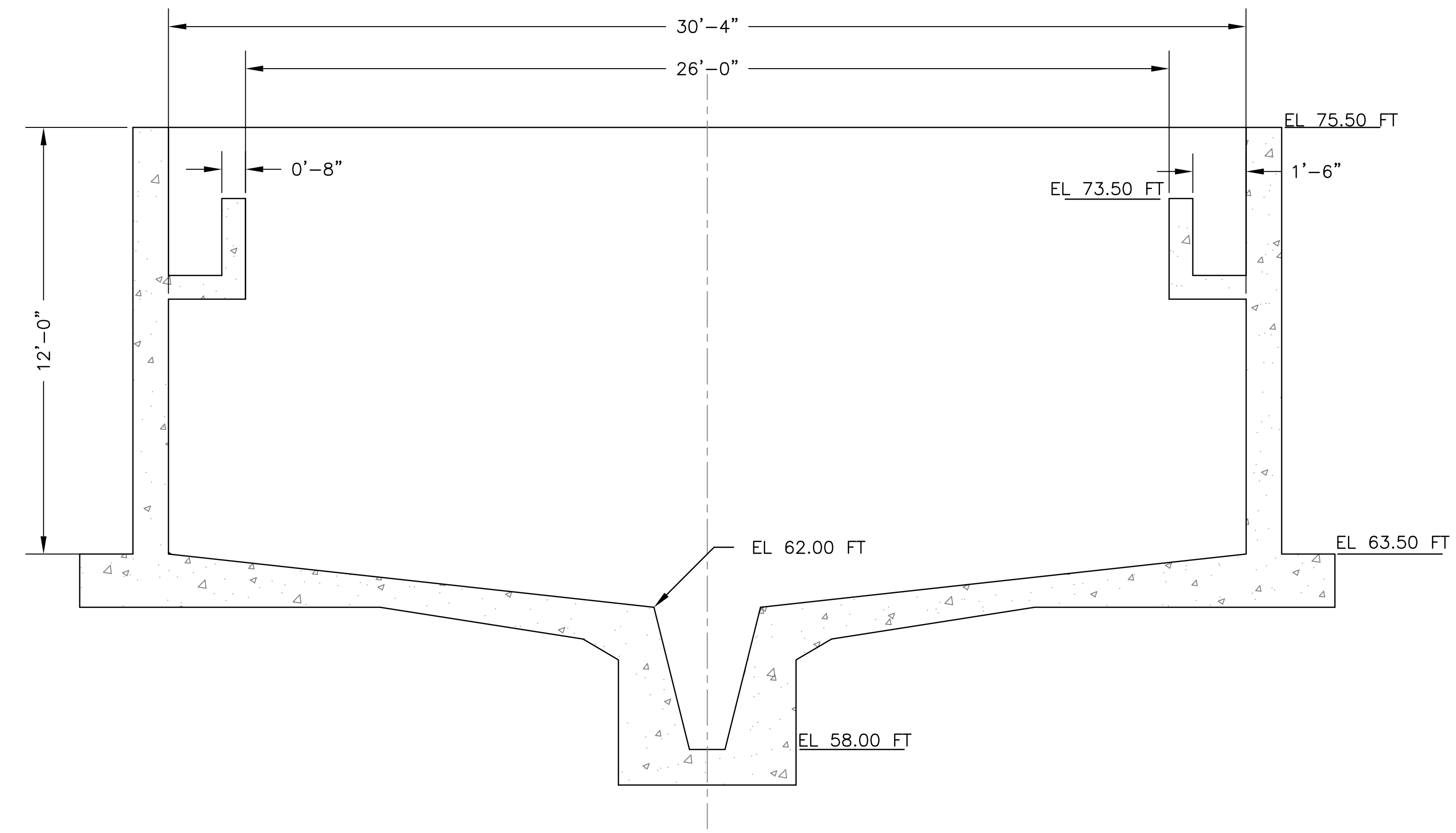
15095
PROJECT NUMBER
M200
DRAWING NUMBER
–
SHEET NUMBER



30-FT DIA CLARIFIER

DETAIL 1 –

SCALE: 3/8" = 1' -0"



SECTION A –

SCALE: 3/8" = 1' -0"

0 2' 4' 6' 8'

SCALE: 3/8" = 1'-0"

HALF SIZED

DESIGNED BY:	R. GODWIN
DRAFTED BY:	R. GODWIN
CHECKED BY:	
DATE:	10/3/20
SCALE:	3/8" = 1'-0"
BAR LENGTH ONE INCH ON SCALED DRAWING	

REVISION:	DESCRIPTION:	DATE:	BY:

CALAVERAS COUNTY WATER DISTRICT

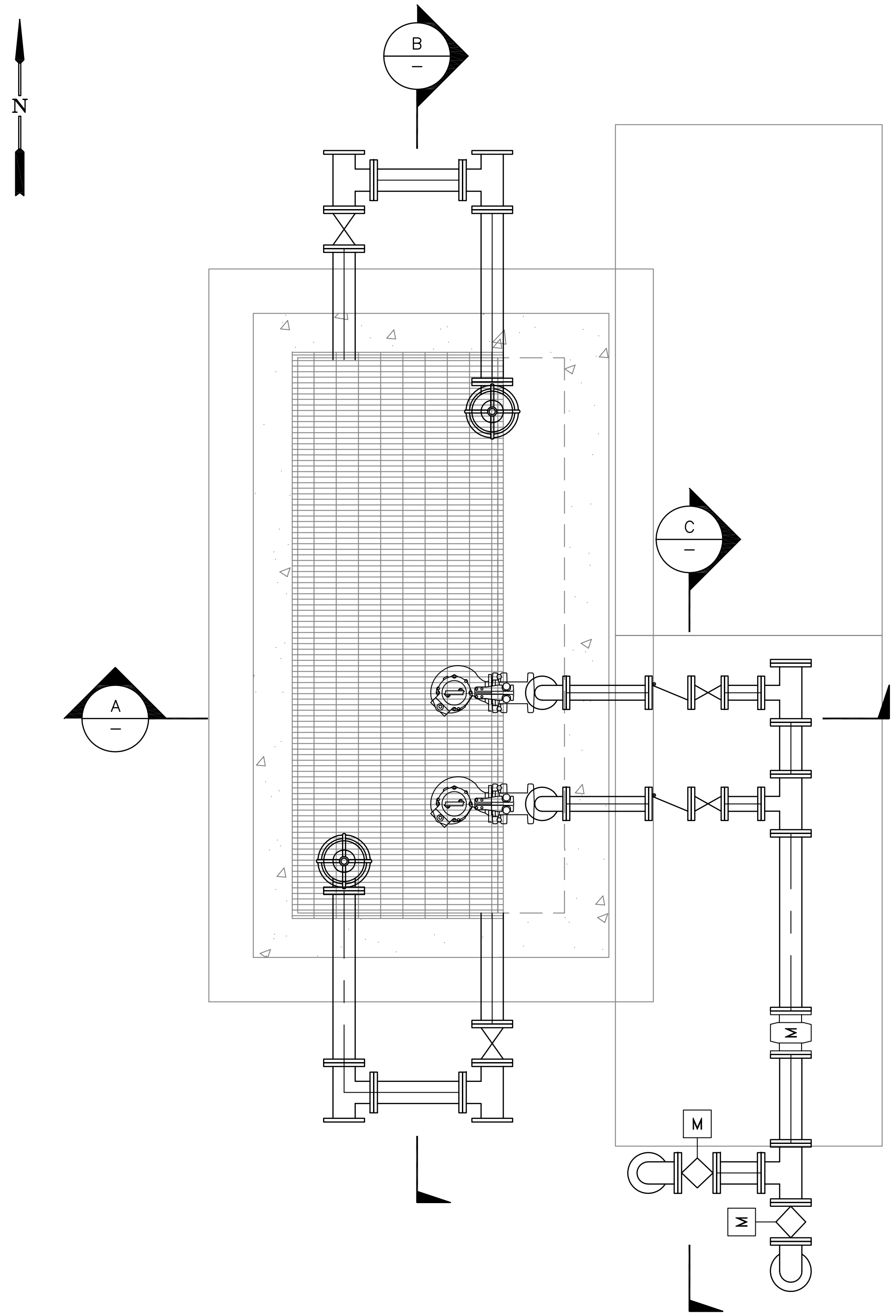
120 TOMA COURT
POST OFFICE BOX 846
SAN ANDREAS, CALIFORNIA 95249
PHONE: (209) 754-3543

SECONDARY CLARIFIER
DETAILS AND SECTIONS
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

15095
PROJECT NUMBER

M300
DRAWING NUMBER

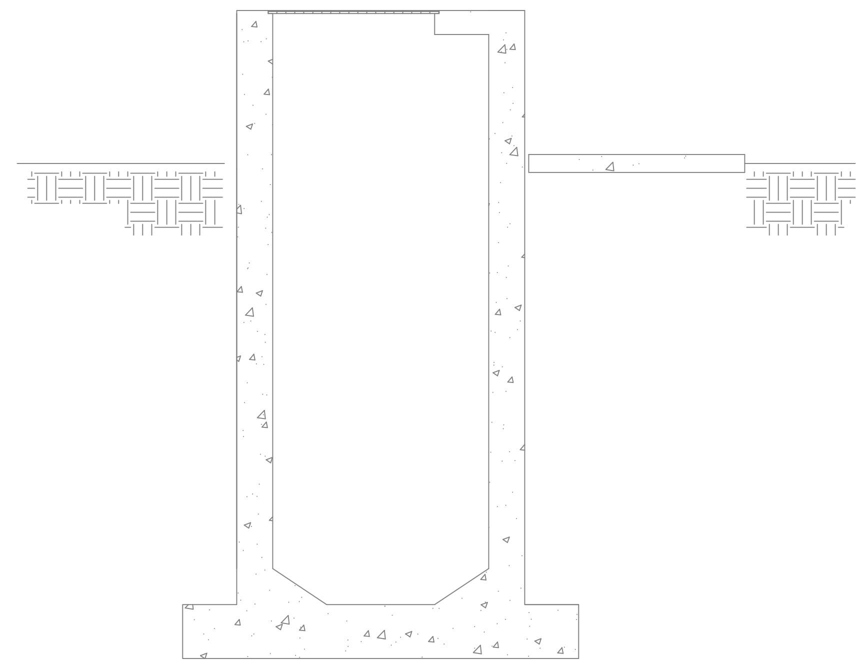
– OF –
SHEET NUMBER



RAS/WAS PUMP STATION

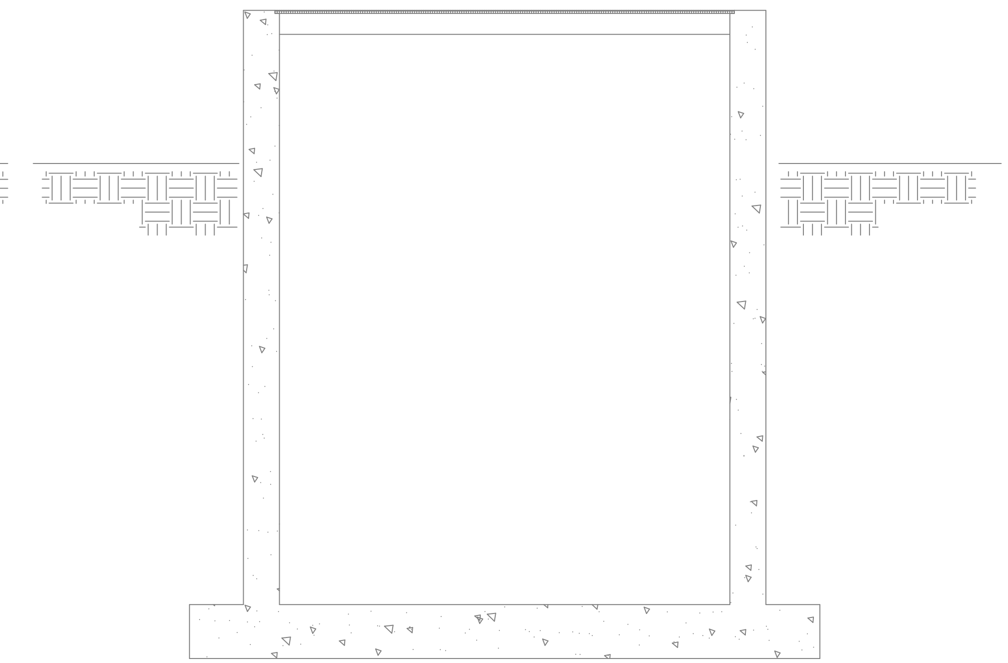
DETAIL 1

SCALE: 1/2" = 1' -0"



SECTION A

SCALE: 3/8" = 1' -0"



SECTION B

SCALE: 3/8" = 1' -0"

0 2' 4' 6' 8'
SCALE: 3/8" = 1'-0"

0 1' 2' 4' 6'
SCALE: 1/2" = 1'-0"

HALF SIZED

DESIGNED BY:	R. GODWIN
DRAFTED BY:	R. GODWIN
CHECKED BY:	
DATE:	10/2/20
SCALE:	AS INDICATED
BAR LENGTH ONE INCH ON SCALED DRAWING	

REVISION:	DESCRIPTION:	DATE:	BY:

CALAVERAS COUNTY WATER DISTRICT

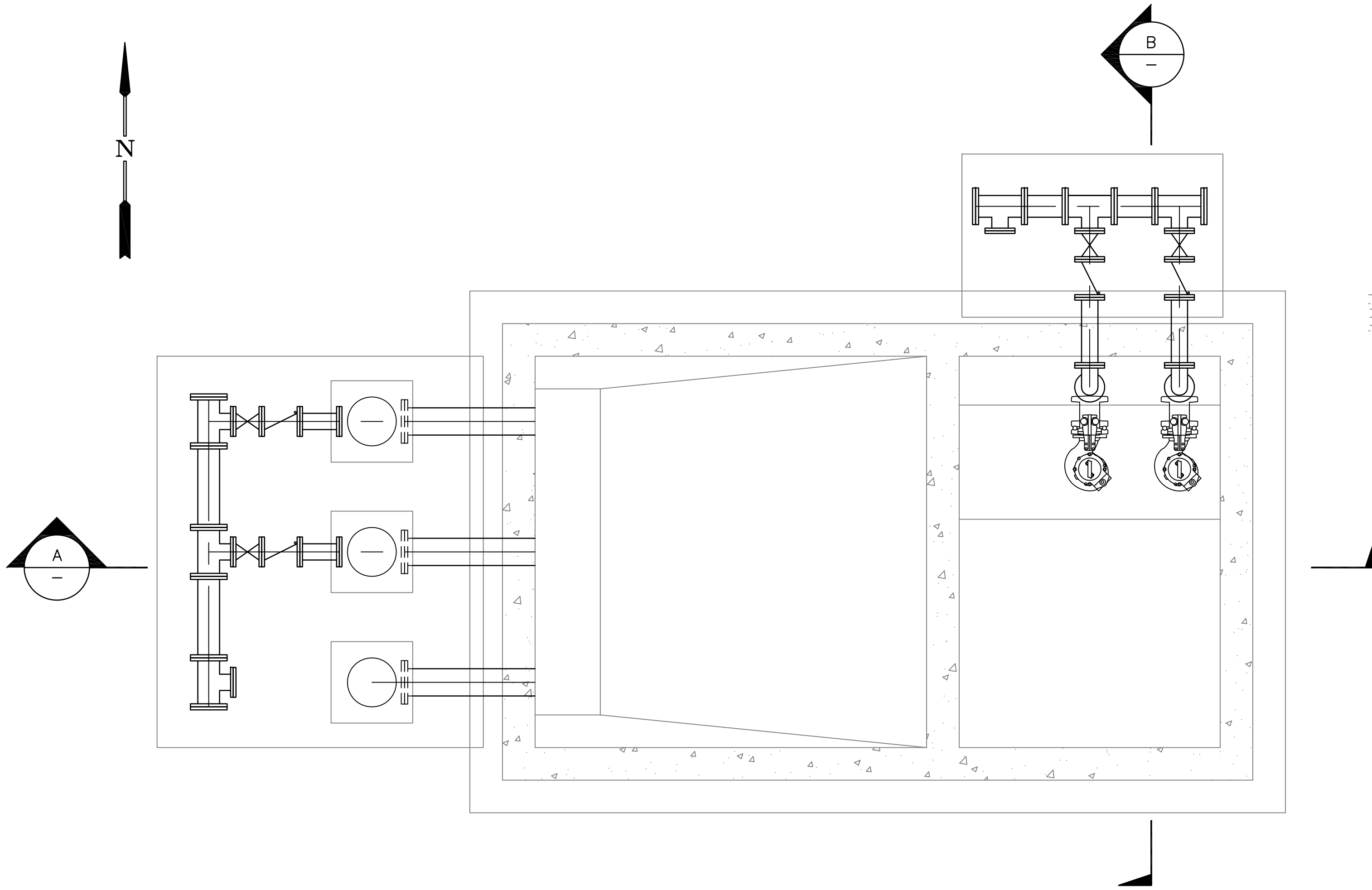
120 TOMA COURT
POST OFFICE BOX 846
SAN ANDREAS, CALIFORNIA 95249
PHONE: (209) 754-3543

RAS/WAS PUMP STATION
DETAILS AND SECTIONS
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

15095
PROJECT NUMBER

M400
DRAWING NUMBER

–
SHEET NUMBER



PUMP STATIONS

DETAIL 1

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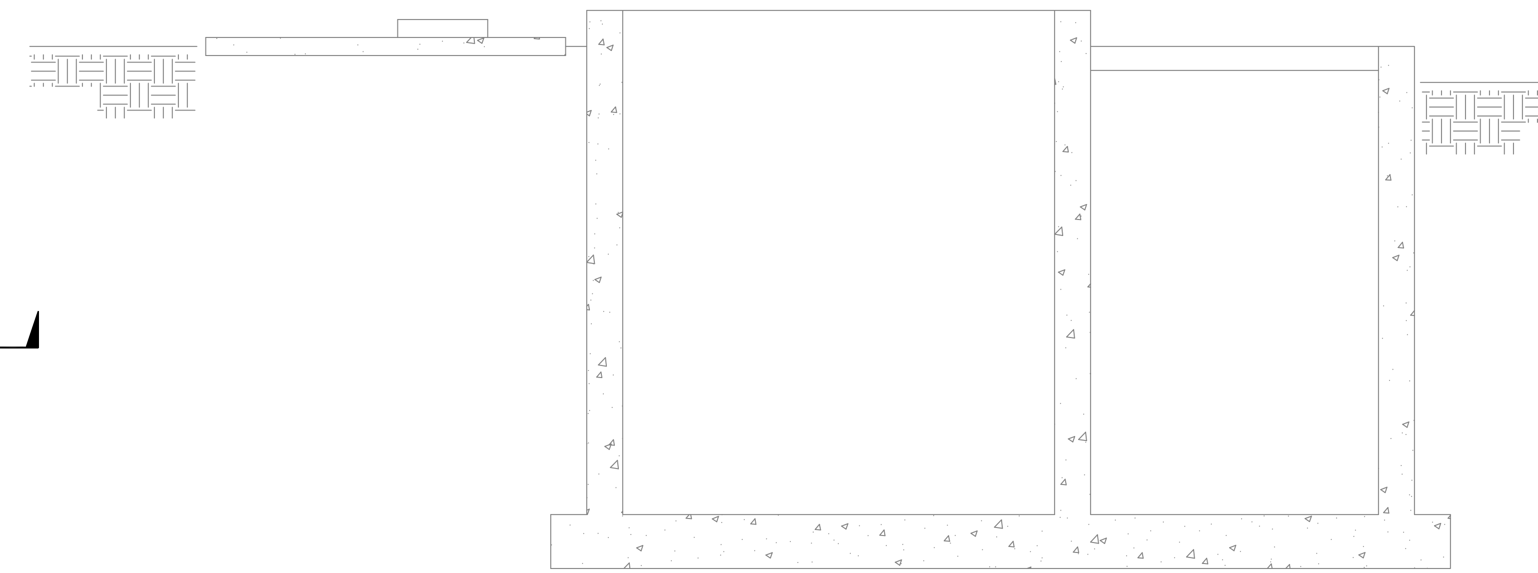

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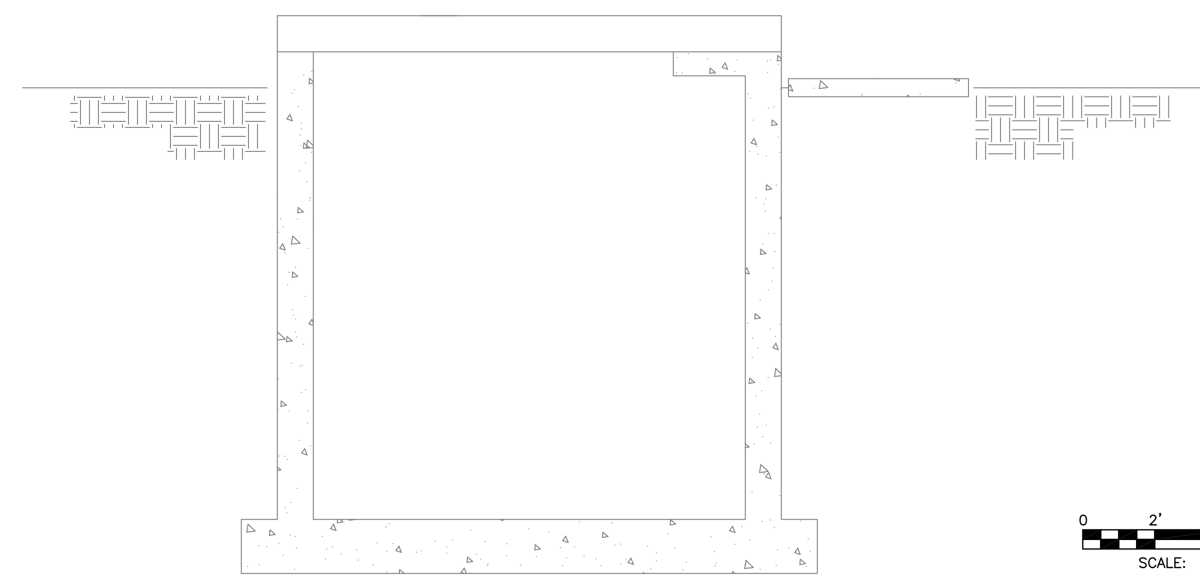

SECTION B

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SCALE: 3/8" = 1'-0"

HALF SIZED

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DRAFTED BY:	R. GODWIN
CHECKED BY:	
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SCALE:	3/8" = 1'-0"
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REVISION:	DESCRIPTION:	DATE:	BY:

CALAVERAS COUNTY WATER DISTRICT

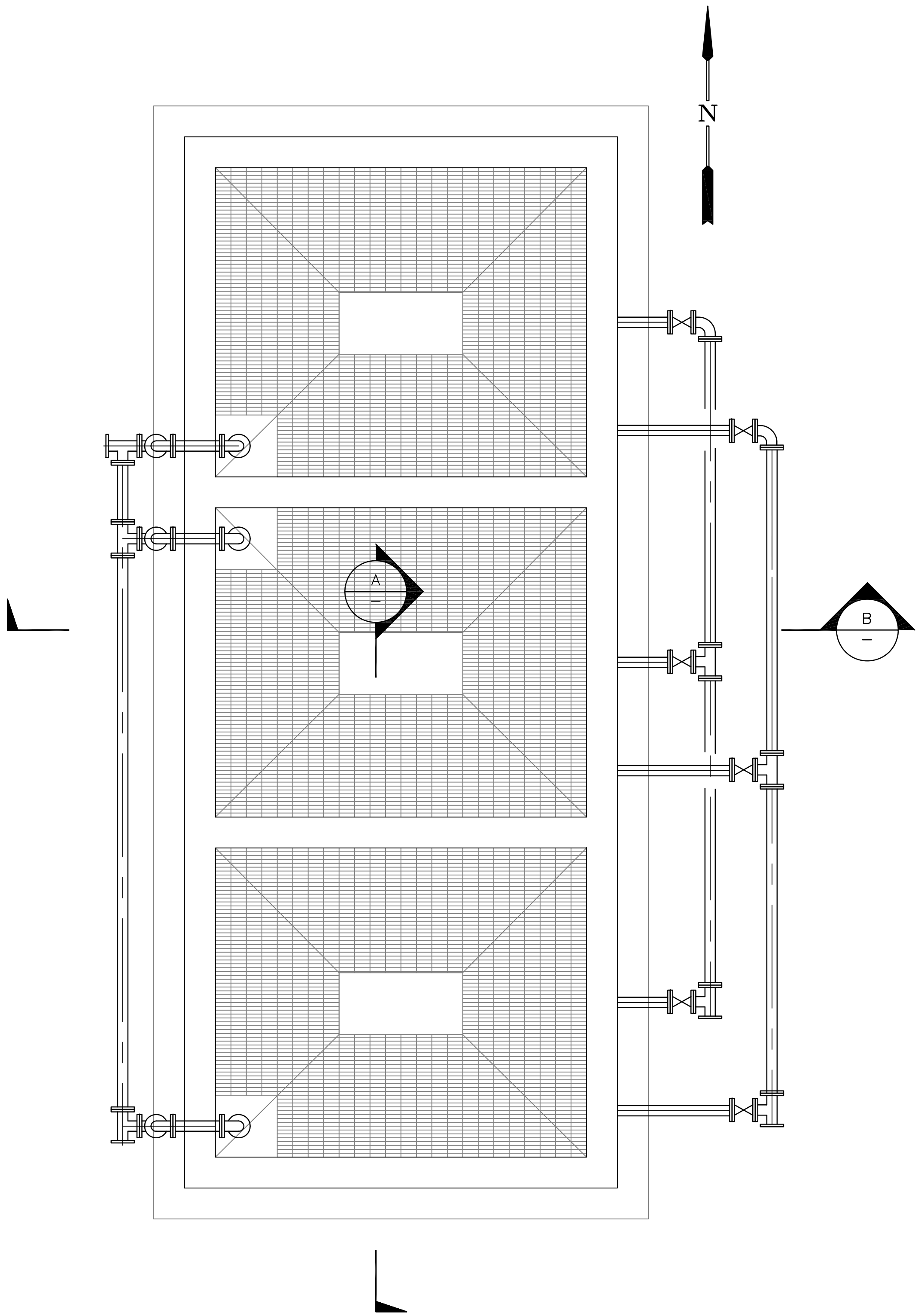
120 TOMA COURT
POST OFFICE BOX 846
SAN ANDREAS, CALIFORNIA 95249
PHONE: (209) 754-3543

SECONDARY AND EFFLUENT PUMP STATIONS
DETAILS AND SECTIONS
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

15095
PROJECT NUMBER

M500
DRAWING NUMBER

– OF –
SHEET NUMBER



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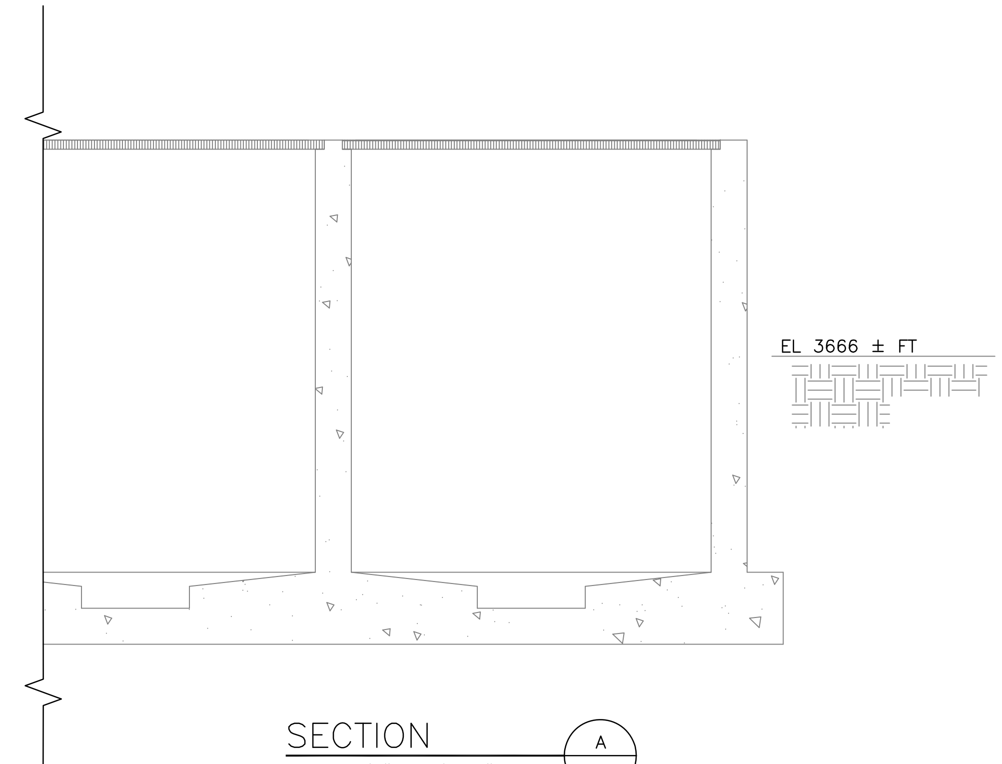

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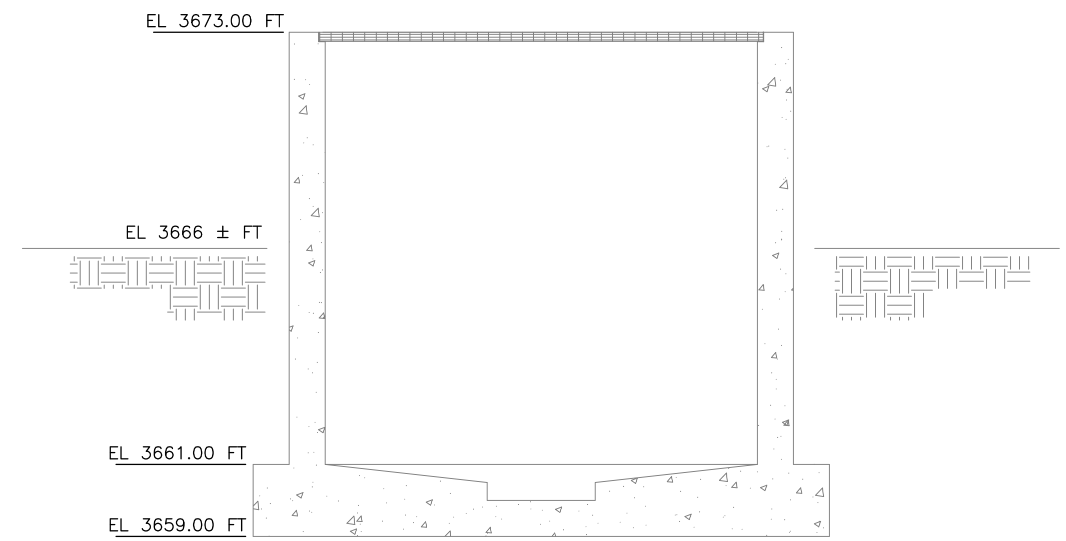

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DESIGNED BY: R. GODWIN
DRAFTED BY: R. GODWIN
CHECKED BY:
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SCALE: 3/8" = 1'–0"
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CALAVERAS COUNTY WATER DISTRICT

120 TOMA COURT
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AEROBIC DIGESTERS
PLAN AND SECTIONS
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

15095
PROJECT NUMBER
M600
DRAWING NUMBER
– OF –
SHEET NUMBER

Arnold Sewer
Master Plan, 2005

Arnold Sewer System Master Plan

May 2005

HDR ONE COMPANY *Many Solutions*

Arnold Sewer System
Master Plan

Calaveras County Water District

May, 2005

Prepared under the responsible charge of
Kevin A. Kennedy, P.E.

2365 Iron Point Road, Suite 300
Folsom, CA 95630

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Executive Summary

Executive Summary

The Calaveras County Water District (District) is embarking on an effort to develop a District-wide financial plan for all its water and sewer service areas. To accomplish this task, a master plan describing conveyance, treatment, and effluent holding and disposal system improvement needs is required for the Arnold Sewer System. At the District's request, HDR evaluated the possibility of treating and disposing of sewage from the Millwoods Septage System at the Arnold Wastewater Treatment Plant (Arnold WWTP). HDR also evaluated the possibility of conveying, treating, and disposing of wastewater from the Avery Commercial area to the Arnold WWTP.

Current and Projected Flows

Analyses of historic data were conducted to determine the number of equivalent single family units (ESFUs) served and to characterize historic influent flows. Projected ESFUs and future flows were based on the growth anticipated for the service area and the District's standard unit flow rate of 195 gallons per day (gpd) per ESFU. Table 1 presents the projected breakdown of the existing and future ESFUs for the various service area scenarios.

Table 1. Projected Breakdown of Existing and New Connections

Location	Projected ESFUs at Buildout	Notes / Description
Existing Service Area ESFUs	638	Historic ESFUs as of 2004, includes Arnold and Avery ESFUs.
Infill -- Outside of Cedar Ridge Development	381	Infill in existing Arnold service area. Growth based on an additional 5 ESFUs per year.
Infill - Cedar Ridge Development	213	A new development that has been accepted into the service area. All new ESFUs are expected to be connected within the next 10 years.
Base Scenario	1,232	Buildout projection based on infill development and Cedar Ridge development ESFUs only.
Millwoods Septage System	177	Existing septage system outside of the service area. Area is essentially built-out (i.e., no increase in connections)
Existing Service Area Plus Millwoods (Scenario 1)	1,409	Buildout projections are based on the Base Scenario projections plus allowing the Millwoods septage system to be connected to the Arnold Sewer System.
Avery	22	Existing septage system outside of the service area. A portion of the system has already been connected to the Arnold system. The 22 ESFUs represent new connections.
Existing Service Area Plus Avery (Scenario 2)	1,254	Buildout projections are based on the Base Scenario projections plus allowing Avery to be connected to the Arnold Sewer System
Existing Service Area Plus Millwoods and Avery (Scenario 3)	1,431	Buildout projections are based on the Base Scenario projections plus allowing Avery and Millwoods to be connected to the Arnold Sewer System

Currently the Arnold WWTP receives approximately 75,000 gpd on an average dry weather flow (ADWF) basis. At buildout (under the Base Scenario), the ADWF is projected to increase to approximately 240,000 gpd based on the existing service area. Projected ADWFs associated with Scenarios 1, 2, and 3 are approximately 275,000, 245,000, and 280,000 gpd, respectively. The existing treatment and effluent holding and disposal facilities have a rated ADWF capacity of 170,000 gpd.

Regulatory Considerations

The Regional Water Quality Control Board (RWQCB) was contacted on December 16, 2004 to discuss potential changes and/or additions the District might expect in the near future. The RWQCB provided insight about its perceived areas of concern for the Arnold Sewer System. A summary of the information gathered is described below:

- The current Waste Discharge Requirements (WDR) is scheduled to expire in fiscal year 2007. A new Report of Waste Discharge will be required at that time.
- The RWQCB has concerns regarding the underlying groundwater quality at the Arnold WWTP. More groundwater monitoring wells for the percolation beds and irrigation fields will likely be required when the WDR is renewed.

In addition, based on past experience with similar wastewater treatment facilities, the following additional changes/requirements may be incorporated into the next WDR:

- Disinfection By-Products: Research has shown that chlorine disinfection results in the formation of disinfection by-products, primarily trihalomethanes (THMs) and haloacetic acids (HAAs), which are known human carcinogens. To minimize the impact on groundwater quality, the District should consider installing ultraviolet light (UV) disinfection when the existing disinfection system requires substantial maintenance or replacement.

Alternative Analyses

Alternative analyses were prepared to determine the cost effectiveness for incorporating the Millwoods service area and a future Avery commercial area into the Arnold service area.

Incorporation of Millwoods Service Area

Adding a settling tank adjacent to the existing Millwoods leachfield and routing the Millwoods septic tank effluent directly to the Arnold Sewer System were the two alternatives considered in the evaluation. The following is a summary of key findings and recommendations:

- **Septic Tank Improvements (Millwoods):** Regardless of which alternative is selected, screens would have to be installed in several existing septic tanks along with concrete lids and septic tank discharge piping improvements. The total estimated project cost for these improvements is $385,000.

- **Recommended Alternative:** Installing a settling basin and continuing to operate Millwoods as a separate system has a significantly lower net present worth cost. It is estimated that this alternative represents approximately 65 percent of the costs associated with abandoning the Millwoods treatment and disposal systems and routing this flow to the Arnold WWTP for subsequent treatment and disposal. Based on this cost comparison, it is recommended that Millwoods continue to operate as a separate system.

Incorporation of Avery Commercial Area

The Arnold WWTP currently receives a small amount of domestic sewage from the Avery Middle School and Safari Mobile Home Park. The District is considering expanding this service by providing sewer service to a future Avery commercial area. Providing service to this area is not expected to alter the costs or timeline requirements for the Arnold sewer system improvements described later in Table 2 and Table 3. In addition, the Avery force main and pumping station have adequate capacity to serve this expansion. However, a collection would need to be necessary to connect the commercial area to the Avery force main. Assuming this collection system expansion is paid for by the commercial area, adding this service area is attractive from a cost standpoint since it will provide added customers at no additional costs to the District.

Recommended Improvements and Timelines

Capacities for the existing facilities were determined to identify bottlenecks and improvements needed to accommodate future flows. Timeline requirements were based on evaluating project influent flows, specific system capacities, and an infill growth rate of 5 ESFUs per year. Two improvement phases are required for all four buildout scenarios.

A summary of the Phase I Improvements is shown in Table 2 along with estimated costs for the Base Scenario.[1] As shown, the total estimated project cost for the Phase I Improvements is $1,190,000. It is recommended that these improvements be implemented immediately to improve operations and maintenance and provide adequate capacity to accommodate future flows.

[1] Tables describing the improvements and timeline requirements for Scenarios 1, 2, and 3 are presented in Appendix F.

Table 2. Phase I Improvements (Base Scenario)

Cost Component	Estimated Costs ($)[a]
Collection System	
Lift Station 1	60,000[b]
Lift Station 2	250,000
Treatment Plant	
Secondary Clarifier and Return Activated Sludge (RAS) Pump	300,000
Dissolved Oxygen (DO) Control System	40,000
Effluent Pump	35,000
Site Piping	40,000
Effluent Disposal Evaluation	35,000
Subtotal A	760,000
Contingency (30 percent of Subtotal A)	230,000
Subtotal B[c]	990,000
Administration and Engineering (20 percent of Subtotal B)	200,000
Total Estimated Project Cost	1,190,000

a Estimated costs presented in terms of 2004 US dollars.
b Cost represents the District's contribution to this lift station and not the total estimated cost.
c Estimate of probable construction cost.

Approximately 22 acres of additional spray field irrigation and six percolation beds are required to accommodate increased flows and serve buildout. These improvements (referred to as the Phase II Improvements) are required to be in service by 2011 or when the ADWF approaches 130,000 gpd. The total estimated project cost for these improvements is $865,00 and includes an additional effluent holding tank.

A summary of the Phase III Improvements is shown in Table 3 along with estimated costs. As shown, the total estimated project cost for the Phase III Improvements is $2,380,000. These improvements are needed to be in service by 2020 when the ADWF approaches 170,000 gpd. The total number of ESFUs served in 2020 is estimated to be 940. Once these improvements are completed, the sewer system will have adequate capacity through buildout.

Table 3. Phase III Improvements (Base Scenario).

Cost Component	Estimated Costs ($)[a]
Collection System – Lift Station 3	125,000
Treatment Plant Expansion	1,400,000
Subtotal A	1,525,000
Contingency (30 percent of Subtotal A)	460,000
Subtotal B[b]	1,985,000
Administration and Engineering (20 percent of Subtotal B)	395,000
Total Estimated Project Cost	2,380,000

[a] Estimated costs presented in terms of 2004 US dollars.
[b] Estimate of probable construction cost.

Introduction

Introduction

The District is embarking on an effort to develop a District-wide financial plan for its water and sewer systems. To accomplish this task, master plans technical memoranda describing conveyance, treatment, storage, and disposal system improvements required to meet current and future needs must be developed.

This master plan report presents a summary of the results and findings for the Arnold Sewer System Master Planning Project. The intent of this project is to provide a basis for managed upgrade of the conveyance, treatment, storage, and disposal systems and provide financial information for a District-wide financial master plan.

Background

The District owns and operates the Arnold Wastewater Treatment Plant (Arnold WWTP) located next to Highway 4, four miles south of Arnold. The Arnold WWTP was designed in 1984 and began operation in June of 1986. Wastewater treatment processes consist of an extended oxidation ditch followed by clarification, chlorination, sand filtration, and effluent holding. Solids handling processes consist of two aerobic digesters and two sludge drying beds. Currently the District is in the process of installing a new belt filter press for biosolids dewatering. The treatment plant has an average dry weather flow (ADWF) capacity of 170,000 gallons per day (gpd) and the inflow presently averages about 75,000 gpd.

Effluent is disposed of via spray irrigation or subsurface disposal beds. Spray irrigation is used during the dry season for irrigation of up to 25 acres of native grassland, shrubs and trees. In addition, 11 subsurface disposal beds can be used throughout the year for effluent disposal. Potential groundwater impacts are monitored through three onsite monitoring wells. Discharge requirements and key treatment and effluent disposal provisions are discussed in the Regulatory Considerations section of this report.

Purpose and Specific Objectives

This purpose of this report is to describe the conveyance, treatment, storage, and disposal system improvements required to meet the current and future service area needs. In particular, this report provides the following information:

- Delineation of the service area (infill areas and Cedar Ridge). As alternatives, the following revisions to the service area are considered in this report:
  - The potential for providing wastewater treatment and disposal services for the Millwoods sewer system.
  - The potential for providing wastewater treatment and disposal services for the Avery Community Sewer System in addition to the Avery Middle School and Safari Mobile Home Park.

- Characterization of historic wastewater flows, including existing and projected average dry weather, average day, peak month, maximum day, and peak wet weather flows and infiltration and inflow (I&I).
- Projection of future flows.
- Description of the existing facilities and estimated capacities.
- Evaluation of the existing and future options for the conveyance, treatment, storage, and disposal systems.
- Identification of the improvements needed to meet growth, improve operations, comply with current and known future regulations, and correct deficiencies.
- Recommendations for sewer system improvements needed to serve buildout conditions.
- Timelines and cost information for constructing the recommended improvements.

Current and Projected Flows and Wastewater Characteristics

Current and Projected
Flows and Wastewater
Characteristics

Current and Projected Flows and Wastewater Characteristics

Analyses of service area and treatment plant operating data were conducted to characterize historic influent flows and pollutant loads. Projected future flows were based on the growth anticipated for the service area and the District's standard unit flow rate as described below.

Service Area

The area served by the Arnold WWTP is shown in Figure 1. The service area is composed of approximately 590 acres of the Arnold downtown area. The source of the Arnold WWTP's influent is from primarily domestic and light commercial sources. The Arnold WWTP also receives a relatively small amount of domestic sewage from the Avery Middle School and Safari Mobile Home Park located in Avery, south of the immediate service area boundaries. No industries discharge wastewater to the collection system.

Existing Service Area

The Arnold WWTP currently serves 638 ESFUs. Most connections are single family residences, while some connections serve commercial or multi-family developments. To characterize wastewater flows, the District uses a unit called an equivalent single family unit (ESFU). For single-family residential development, one connection is typically equivalent to one ESFU. Commercial and multi-family connections are assigned a number of ESFUs to represent the flow they contribute to the collection system. In most cases, commercial and multi-family connections each represent more than one ESFU.

Service Area Growth Scenarios

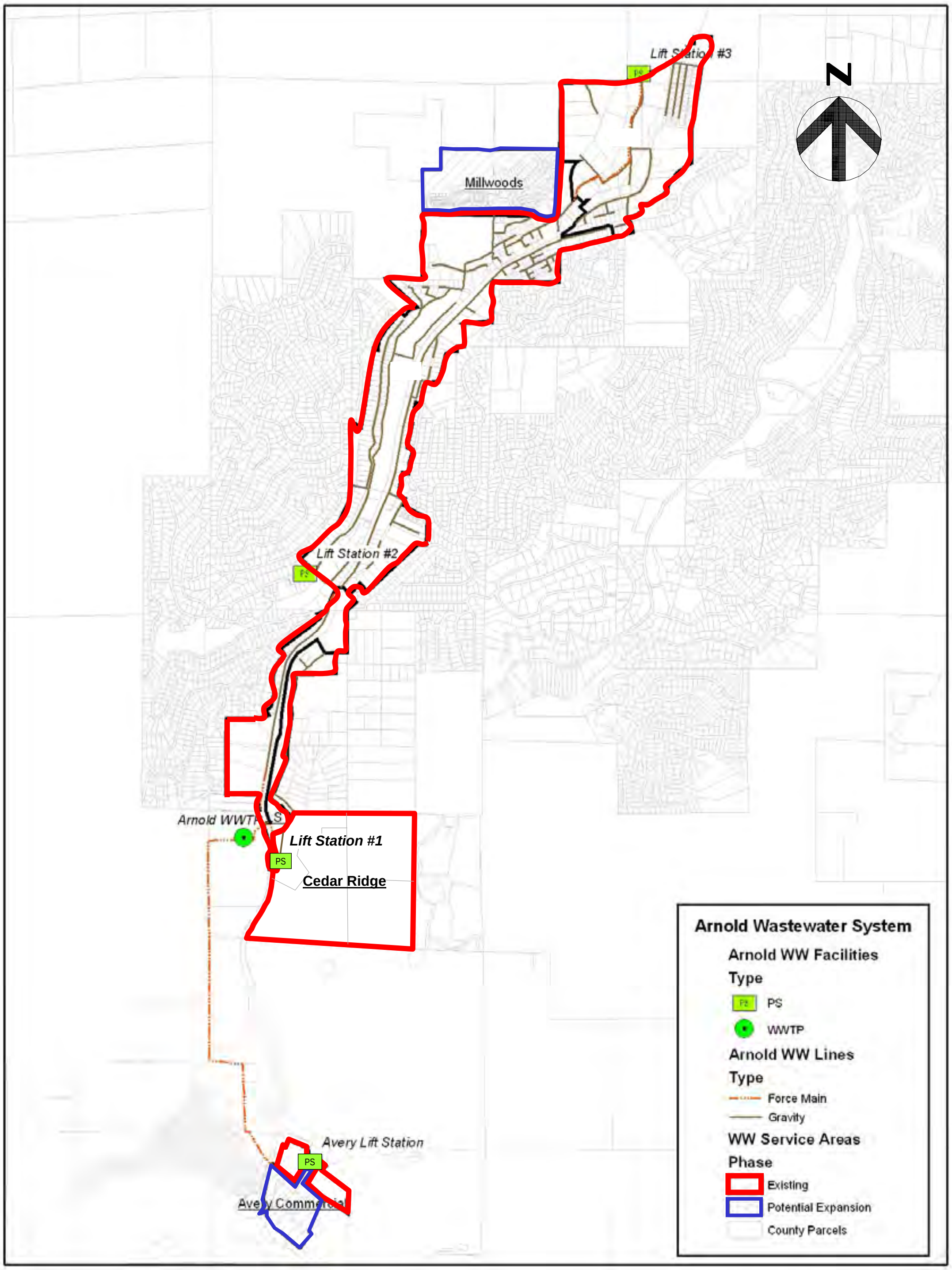
Future growth within the service area can come in three ways, infill within the service area, service area expansion, and connection of existing septic systems to the Arnold sewer system as described below.

Infill

The 1984 Engineer's Report for the Arnold Wastewater Assessment District (as amended) estimated an ultimate total of 986 equivalent single family units (ESFUs) within the service area. The WWTP currently serves 638 ESFUs.[2] However, 33 of the existing ESFUs are in Avery, outside the original service area. Therefore the current ESFUs in the original service area are estimated as 638 minus 33, or 605 ESFUs. The infill potential in the Arnold service area is estimated as the difference between 986 and 605, or 381 ESFUs.

[2] This value includes the Avery Middle School and Safari Mobile Home Park.

Connections in 1991	561
ESFU per Master Plan	
2005 ESFU excluding prior 33 ESFU for Avery	605
Initial Avery	33
Millwoods	177
Avery	22
Subtotal	804
Future ESFU per Master Plan	
Infill (1984 Engineering Report)	381
Cedar Ridge	213
Subtotal	594
Total	**1398**
Actual Current Connections	835
Difference	563
Connections added since Master Plan	31
Connection added prior to Master Plan	77
ESFU added since 1991	108



Arnold Sewer Service Area

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Figure 1

The Cedar Ridge development area has been accepted into the Arnold service area. Cedar Ridge is a 169-acre residential and commercial development located east of the Arnold WWTP. The development is expected to represent 213 ESFUs (100 single family units, 120 multi-family units, and 12-acre hotel and conference facilities). The development will be completed over a four-year period, starting in 2005, and is expected to be fully inhabited within the next ten years.

Service Area Expansion

Two areas were considered for potential expansion of the service area in this master plan. The first is the Millwoods subdivision, which represents 177 ESFUs and is considered to be essentially built-out. Properties in the Millwoods subdivision have individual septic tanks, and the septic tank effluent is collected and conveyed to the Millwoods pump station. The pump station directs flow to a disposal field located in the western portion of the subdivision. The pump station could be re-configured to direct flow to the Arnold collection system. The current ADWF from Millwoods is approximately 10,000 gpd, or 56 gpd per ESFU. The annual average flow is 10,800 gpd.

The second area for service expansion is a portion of Avery currently designated as commercial. This is the area that is most likely to be connected to the Arnold WWTP over time due to a planned extension of the sewer line. It is estimated that this expansion area will ultimately serve an estimated 22 ESFUs.[3]

Connection of Existing Septic Systems

The potential for connecting residences to the Arnold sewer system that currently have individual, on-site septic systems was discussed during the January 25, 2005 Public Meeting. Some individuals expressed concern that future on-site septic failures would require implementing a regional sewer solution.

In their response to public comments (see Appendix G), the District explained that implementing a regional solution to eliminate on-site septic systems would be initiated by the county and/or other state agencies, not the District. The District also explained that in the event that a health threat was identified, impacts to the existing sewer system would need to be funded by those directly benefiting from the solution, not by existing customers. Based on this assessment, the District concluded that the scope of this master plan cannot speculate on the need to develop a regional solution to eliminate the septic system. Therefore, connection of existing septic systems to the Arnold sewer system was not considered in this master plan.

Historic and Projected Service Area Contributions

The District provided historical data pertaining to influent flows and connections served by the Arnold WWTP. Historic values for flow and ESFUs are shown in Table 4. ADWF is the average flow from June through September. Between 1991 and 2004, the average geometric

[3] Estimates provided by the District on January 25, 2005.

growth rate has been approximately 1.0 percent per year. The highest growth rates of six percent per year occurred in 2002.

A projection of buildout conditions was made to estimate the ultimate flows that could reach the treatment plant. A total of four potential buildout scenarios were defined based on the possible inclusion of Millwoods and Avery. The projected ESFUs associated with these four scenarios are shown in Table 5.

Table 4. Historic Growth in Influent Flow and ESFUs Served.

Year	Average Dry Weather Flow (gpd)	Annual Average Flow (gpd)	ESFUs	Annual Increase in ESFUs	Percent Increase in ESFUs	ADWF / ESFU (gpd)	Ratio of Annual Average to ADWF
1991	61,300	-	561	-	-	109	-
1992	63,300	-	566	5	1%	112	-
1993	54,800	-	572	6	1%	96	-
1994	71,800	-	577	5	1%	124	-
1995	75,000	81,000	583	6	1%	129	1.08
1996	77,500	83,000	589	6	1%	132	1.07
1997	70,700	72,000	595	6	1%	119	1.02
1998	66,700	70,000	601	6	1%	111	1.05
1999	59,600	64,000	607	6	1%	98	1.07
2000	57,600	61,000	583	(24)	-4%	99	1.06
2001	60,000	61,000	589	6	1%	102	1.02
2002	54,700	59,000	625	36	6%	88	1.08
2003	74,300	70,000	631	6	1%	118	0.94
2004	75,000	-	638	7	1%	118	-

Table 5. Projected Breakdown of Existing and Future Connections.

Location	Scenario	Projected Buildout ESFUs[a]	Notes / Description
Existing Service Area ESFUs	--	638	Historic ESFUs as of 2004, includes Arnold and Avery ESFUs.
Infill -- Outside of Cedar Ridge Development	--	*381*	Infill in existing Arnold service area.
Infill - Cedar Ridge Development	--	*213*	A new development that has been accepted into the service area. All new ESFUs are expected to be connected within the next 10 years.
Base Scenario		1,232	Buildout projections are based on infill development and Cedar Ridge development ESFUs only.
Millwoods Septage System		*177*	Existing septage system outside of the service area. Area is essentially built-out (i.e., no increase in connections)
Existing Service Area Plus Millwoods	1	1,409	Buildout projections are based on the base scenario plus allowing the MIllwoods septage system to be connected to the Arnold Sewer System.
Avery		*22*	Existing septage system outside of the service area. A portion of the system has already been connected to the Arnold system. The 2 ESFUs represent new connections.
Existing Service Area Plus Avery	2	1,254	Buildout projections are based on the base scenario plus allowing Avery to be connected to the Arnold Sewer System
Existing Service Area Plus Millwoods and Avery	3	1,431	Buildout projections are based on the base scenario plus allowing Avery and Millwoods septage systems to be connected to the Arnold Sewer System

a Future ESFUs shown in italics. In 2002 there were 625 ESFUs. Based on a one percent growth rate, the ESFUs in 2004 is estimated at 638.

Historic and Projected Flows

A summary of the flow estimating assumptions is shown in Table 6.

Table 6. Flow Estimating Criteria.

Parameter	2005	2015	2025	Comments
Arnold ADWF (gpd/ESFU)	118	157	195	Phased increase over 20 years
Millwoods ADWF (gpd/ESFU)	56	126	195	Phased increase over 20 years
Cedar Ridge ADWF (gpd/ESFU)	195	195	195	New development at design rate
Avery Expansion ADWF (gpd/ESFU)	195	195	195	New development at design rate
Ratio of Annual Average Flow to ADWF	1.08	1.08	1.08	
Maximum month I&I (gpd/acre)	56	56	56	
Ratio of Maximum Day to Annual Average	1.72	1.6	1.5	Phased decrease over 20 years
Ratio of Peak Hour to Annual Average	3.0	3.0	3.0	Assumed value

The following are descriptions of the methodologies used to characterize historic and project future flows conveyed to the Arnold WWTP.

Average Dry Weather Flow

The District's Board of Directors has adopted a policy to plan for an ADWF of 195 gallons per day (gpd) per ESFU. The existing flow per ESFU is approximately 118 gpd in the existing service area, and only 56 gpd in Millwoods. The increase in flows is expected to occur as more properties are inhabited and used year-round and the number of residents per household increase to values which are typical for California residences. All areas of new development are expected to contribute 195 gpd per ESFU under ADWF conditions. In existing developed areas, the flow per ESFU is expected to transition from the existing value to 195 over a 20-year period, from 2005 to 2025.

Average Annual Flow

The data in Table 4 show that the ratio of average annual flow to ADWF ranges between 0.94 and 1.08. For planning purposes, a ratio of 1.08 will be used for estimating current and future average annual flows.

Maximum Month

The District provided daily influent flow data for 2001 through 2004. Based on a review of this data, the highest average flow for a 30-day period was 80,000 gpd in December 2001. The ADWF during that year was 60,000 gpd, meaning that the maximum month I&I was 20,000 gpd. The approximate active service area at that time was 360 acres, resulting in a maximum month inflow and infiltration (I&I) of 56 gpd/acre. This value of 56 gpd/acre will be used for estimating future I&I in the service area.

Maximum Day

A statistical analysis of the influent flow data was performed to determine the maximum day flow. As shown in Figure 2, the maximum day flow was selected as the 99.7th percentile value of the observed flows. This value was 107,600 gpd. The average flow for the corresponding period was 62,500 gpd. Based on the ratio of these two values, the current peaking factor for maximum day compared to annual average is 1.72. This ratio is assumed to drop from 1.72 to 1.5 over the next 20 years, due to better construction practices that are expected to reduce I&I.

Peak Hour Flow

Hourly flow data were not available at the time this memorandum was prepared. The assumed peak hour flow is 3.0 times the annual average flow based on typical peaking factors and previous factors used for the District's master planning efforts.

Service Area Scenarios and Projected Flows

As previously described, different scenarios were created to represent different buildout conditions with varying degrees of service area expansion. The projected flows under the different buildout scenarios are shown in Table 7.

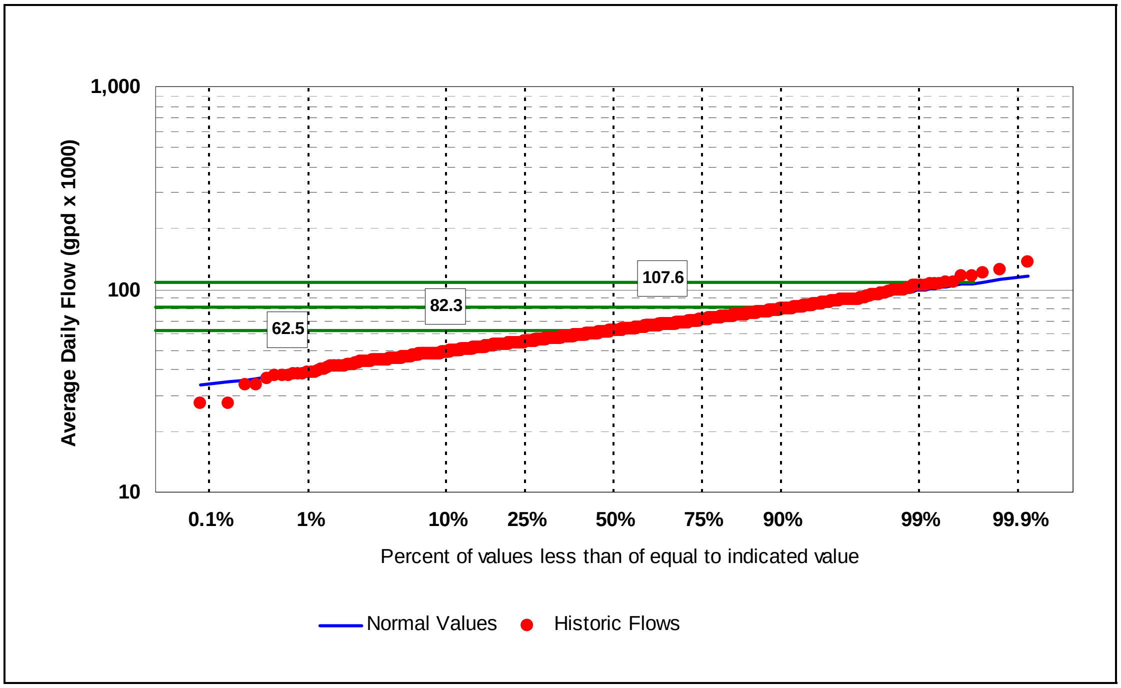


Figure 2. Average Daily Flows and Estimated Maximum Peak Day Flow.

Table 7. Scenarios for Ultimate Buildout.

Location	Currently Connected ESFUs	Ultimate Area (acres)	Additional ESFUs	Ultimate ESFUs	Ultimate ADWF (gpd)	Ultimate Annual Average (gpd)	Ultimate Maximum Month (gpd)	Ultimate Maximum Day (gpd)	Ultimate Peak Hour (gpd)
Existing Service Area	638	740	594	1,232	240,240	259,459	281,680	389,189	778,378
Millwoods	--	78	177	177	34,515	37,276	38,883	55,914	111,829
Avery Expansion	--	29	22	22	4,290	4,633	5,914	6,950	13,900
Base Scenario				1,232	240,240	259,459	281,680	389,189	778,378
Scenario 1 – Existing Service Area Plus Millwoods				1,409	274,755	296,735	320,563	445,103	890,207
Scenario 2 – Existing Service Area Plus Avery				1,254	244,530	264,092	287,594	396,139	792,278
Scenario 3 – Existing Service Area Plus Millwoods and Avery				1,431	279,045	301,368	326,477	452,053	904,107

Notes:

Design ADWF/ESFU (gpd):	195
Ratio of annul average flow to ADWF:	1.08
Maximum month I&I (gpd/acre):	56
Ultimate ratio of maximum day to annual average:	1.5
Ratio of peak hour to annual average:	3.0

Projections of interim growth between 2005 and buildout were made using growth rates developed in cooperation with District staff. For the purposes of this master planning effort, the assumed growth rate for infill in the Arnold service area is 5 ESFUs per year, which is equivalent to a growth rate of 0.8 percent per year. For Cedar Ridge, all 213 ESFUs are assumed to be connected between 2005 and 2015. For Millwoods, all 177 ESFUs are assumed to be connected in the middle or towards the end of 2005. For the Avery expansion area, the 22 new ESFUs are assumed to be connected over a 20-year period (approximately 1 ESFU per year).

Flow projections were developed for 2005, 2015, and 2025. Calculated flows included ADWF, annual average flow, and peak hour flow. To limit the possibility of sewer overflows, the collection system should be sized to handle peak hour flows. Flow projections were developed only for Scenario 3 (infill in the Arnold service area and the addition of Millwoods and the Avery expansion area). Flows for the other development scenarios would be slightly lower. The flow projections are shown in Table 8.

Table 8. Flow Projections for Interim Years – Scenario 3.

Parameter	2005	2015	2025
Arnold ESFU	638	688	738
Arnold ADWF (gpd/ESFU)	118	157	195
Arnold ADWF (gpd)	75,284	107,672	143,910
Arnold Annual Average (gpd)	81,307	116,286	155,423
Arnold Peak Flow (gpd)	243,921	348,858	466,269
Cedar Ridge ESFU	0	213	213
Cedar Ridge ADWF (gpd/ESFU)	195	195	195
Cedar Ridge ADWF (gpd)	0	41,535	41,535
Cedar Ridge Annual Average (gpd)	0	44,858	44,858
Cedar Ridge Peak Hour (gpd)	0	134,573	134,573
Millwoods ESFU	0	177	177
Millwoods ADWF (gpd/ESFU)	56	126	195
Millwoods ADWF (gpd)	0	22,214	34,515
Millwoods Annual Average (gpd)	0	23,991	37,276
Millwoods Peak Hour (gpd)	0	71,973	111,829
Avery Expansion ESFU	0	11	22
Avery Expansion ADWF (gpd/ESFU)	195	195	195
Avery Expansion ADWF (gpd)	0	2,145	4,290
Avery Expansion Annual Average (gpd)	0	2,317	4,633
Avery Expansion Peak Hour (gpd)	0	6,950	13,900
Combined ADWF (gpd)	75,284	173,566	224,250
Combined Annual Average (gpd)	81,307	187,452	242,190
Combined Peak Hour (gpd)	243,921	562,354	726,571

Notes:

Infill growth (ESFU/year) 5
Annual average to ADWF 1.08
Peak hour to annual average 3.0
0 = No ESFUs connected at the beginning of 2005.

Historic and Projected Wastewater Characteristics

Historic wastewater characteristics were estimated by the three methods described below. A copy of the calculations prepared for these analyses are attached in Appendix B for reference.

- **Statistical Analysis of Historic BOD Loads:** Statistical analyses of historic biochemical oxygen demand (BOD) and total suspended solids (TSS) loads between December 2002 and May 2004 were conducted. The overall average annual (50^{th} percentile value) BOD and TSS loads were determined to be 124 lb BOD/d and 121 lb TSS/day, respectively. Based on the current number of connections (638 ESFUs), unit loading rates are estimated to be 0.19 lb BOD per ESFU and 0.19 lb TSS per ESFU.
- **Historic BOD and TSS Concentrations:** A review of historic influent BOD and TSS concentrations between December 2002 and May 2004 was conducted. The overall average BOD and TSS concentrations during this period were determined to be 242 and 237 mg/L, respectively. Based on these concentrations, and the current unit flow rates of 118 gpd, the estimated unit loading rates are estimated to be 0.24 lb BOD per ESFU and 0.23 lb TSS per ESFU.
- **Statistical Analysis of Historic Per Capita Loading Rates:** The District routinely monitors historic unit loading rates entering the Arnold WWTP. Statistical analyses of these historic values were performed for data collected between December 2002 and May 2004. The overall average (50^{th} percentile values) unit loading rates were determined to be 0.22 lb BOD per ESFU and 0.19 lb TSS per ESFU.

Based on a review of the analysis results, loading rates of 0.24 lb BOD per ESFU and 0.20 lb TSS per ESFU will be used as the basis for estimating current BOD and TSS concentrations. Future BOD and TSS concentrations are assumed to be equal to current values.

Similar analyses were prepared to determine the historic peak month BOD and TSS loads. In general, peak month pollutant loads were equal to twice the average annuals loads. Based on these results a load peak factor of 2.0 will be used to project the future peak month wastewater characteristics at buildout.

Summary of Current and Projected Flows and Wastewater Characteristics

Table 9 presents a summary of current and projected flows and loads for the four growth scenarios. Calculations showing how these flow and load projections were developed are shown in Appendix C. The ADWF, average annual, peak month flows and loads will be used to assess the majority of the treatment plant, effluent holding, and disposal facilities. The peak flows will be used to assess the collection system and treatment plant headworks and effluent pumping station.

Table 9. Current and Buildout Wastewater Flows and Characteristics.

Condition	Influent Concentrations (mg/L)		Base Scenario	Scenario 1	Scenario 2	Scenario 3
	BOD	TSS	Flow (gpd)	Flow (gpd)	Flow (gpd)	Flow (gpd)
Current Conditions						
ADWF	--	--	75,284	75,284	75,284	75,284
Average Annual	226	188	81,307	81,307	81,307	81,307
Peak Month	384	322	95,444	95,444	95,444	95,444
Maximum Day	--	--	139,848	139,848	139,848	139,848
Peak Flow	--	--	243,921	243,921	243,921	243,921
Buildout Conditions						
ADWF	--	--	240,240	274,755	244,530	279,045
Average Annual	226	188	259,459	296,735	264,092	301,368
Peak Month	384	322	281,680	320,563	287,594	326,477
Maximum Day	--	--	389,189	445,103	396,139	452,053
Peak Flow	--	--	778,378	890,207	792,278	904,107

Notes:

Scenario 1 includes existing service area plus Millwoods
Scenario 2 includes existing service area plus Avery
Scenario 3 includes existing service area plus Millwoods and Avery

Regulatory Considerations

Regulatory Considerations

A summary of current waste discharge requirements (WDR) for the Arnold Sewer System is presented below. In addition, potential future changes to the WDR are discussed.

Waste Discharge Requirements

The current WDR (Order No. 97-073) for the Arnold WWTP was adopted by the Regional Water Quality Control Board (RWQCB) in April 1997. A copy of the WDR can be found in Appendix A. The WDR covers discharge prohibitions and specifications, effluent limitations, reclamation specifications, solids disposal requirements, groundwater limitations, and other provisions. Portions of the WDR pertinent to wastewater treatment and disposal systems are discussed below.

Discharge Requirements

Treated effluent is permitted to be discharged to either the spray irrigation fields or subsurface disposal beds provided the effluent quality meets the requirements stipulated in the WDR.

Numerical Effluent Limits

Table 10 summarizes the treated effluent requirements listed in the WDR.

Table 10. Effluent Discharge Specifications.

Constituent	Units	Effluent Limitation		
		Average Dry Weather	Monthly Average	Monthly Maximum
Flow	gpd	170,000	--	--
BOD[a]	mg/L	--	40	80
Settable Solids	mg/L	--	0.5	1.0
Total Coliform	MPN/100 mL	--	23[b]	240[c]

a 5-day, 20°C Biochemical Oxygen Demand
b Monthly median value.
c Daily Maximum.

Other Key Requirements

In addition to the limits shown above, the District must comply with the following key specifications:

Discharge Limits and Specifications

- Objectionable odors originating at the facility shall not be perceivable beyond the limits of the wastewater treatment and disposal area.
- The treatment facilities shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency.
- Bypass or overflow of untreated or partially treated waste is prohibited.

Irrigation

- Public contact with the reclaimed water shall be precluded through such means as fences, signs, and other acceptable alternatives.
- Areas irrigated with reclaimed water shall be managed to prevent the breeding of mosquitoes.
- Reclaimed water for irrigation shall be managed to minimize erosion, runoff, and movement of aerosols from the disposal area.
- Direct or windblown spray shall be confined to the designated reclamation area and prevented from contacting drinking water facilities.
- Spray irrigated effluent shall not occur during periods of precipitation and for at least 24 hours after cessation of precipitation, or when winds exceed 30 mph.
- Storm water runoff from the irrigation field shall not be discharged to any surface water drainage course within 48-hours of the last application of reclaimed water.
- Reclaimed water for irrigation shall be managed to minimize erosion, runoff, and movement of aerosols from the disposal area.

Ground Water Limitations

- The discharge shall not cause underlying ground water to exceed a most probable number of total coliform organisms of 2.2/100 mL over any seven-day period.
- The discharge shall not contain concentrations of chemical constituents in amounts that adversely affect agricultural use.
- The discharge shall not contain taste or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses.
- The discharge shall not contain chemicals, heavy metals or trace elements in concentrations that adversely affect beneficial uses or exceed maximum contaminant levels specified in 22 California Code of Regulations (CCR), Division 4, Chapter 15.

Possible Changes to Permit Requirements and Areas of Concern

The RWQCB was contacted on December 16, 2004 to discuss potential changes and/or additions the District might expect in the future. The RWQCB provided insight about its perceived areas of concern for the Arnold Sewer System. A summary of the information gathered from this effort is described below.

- The current WDR is scheduled to expire in fiscal year 2007. A new Report of Waste Discharge will be required at that time.
- The RWQCB has concerns regarding the underlying groundwater quality at the Arnold WWTP. More groundwater monitoring wells for the subsurface disposal beds and irrigation field will likely be added when the WDR is renewed.

In addition, based on past experience with similar wastewater facilities, the following additional changes/requirements may be incorporated into the next WDR:

- **Disinfection By-Products:** Research has shown that chlorine disinfection results in the formation of disinfection byproducts, primarily trihalomethanes (THMs) and haloacetic acids (HAAs), which are know human carcinogens. To minimize the impact on groundwater quality, the District should consider installing ultraviolet light (UV) disinfection when the existing disinfection system requires substantial maintenance or replacement.

Description and Evaluation of Existing Facilities

Description and Evaluation of Existing Facilities

Description and Evaluation of Existing Facilities

The existing wastewater facilities serving Arnold consist of a conveyance system, treatment plant, effluent holding and disposal facilities. The attributes of each facility and a summary of the results of a capacity evaluation are described below.

Sewer Conveyance System

A schematic of the Arnold collection system in shown in Figure 3. The existing collection system includes approximately 15 miles of pipe and four lift stations.

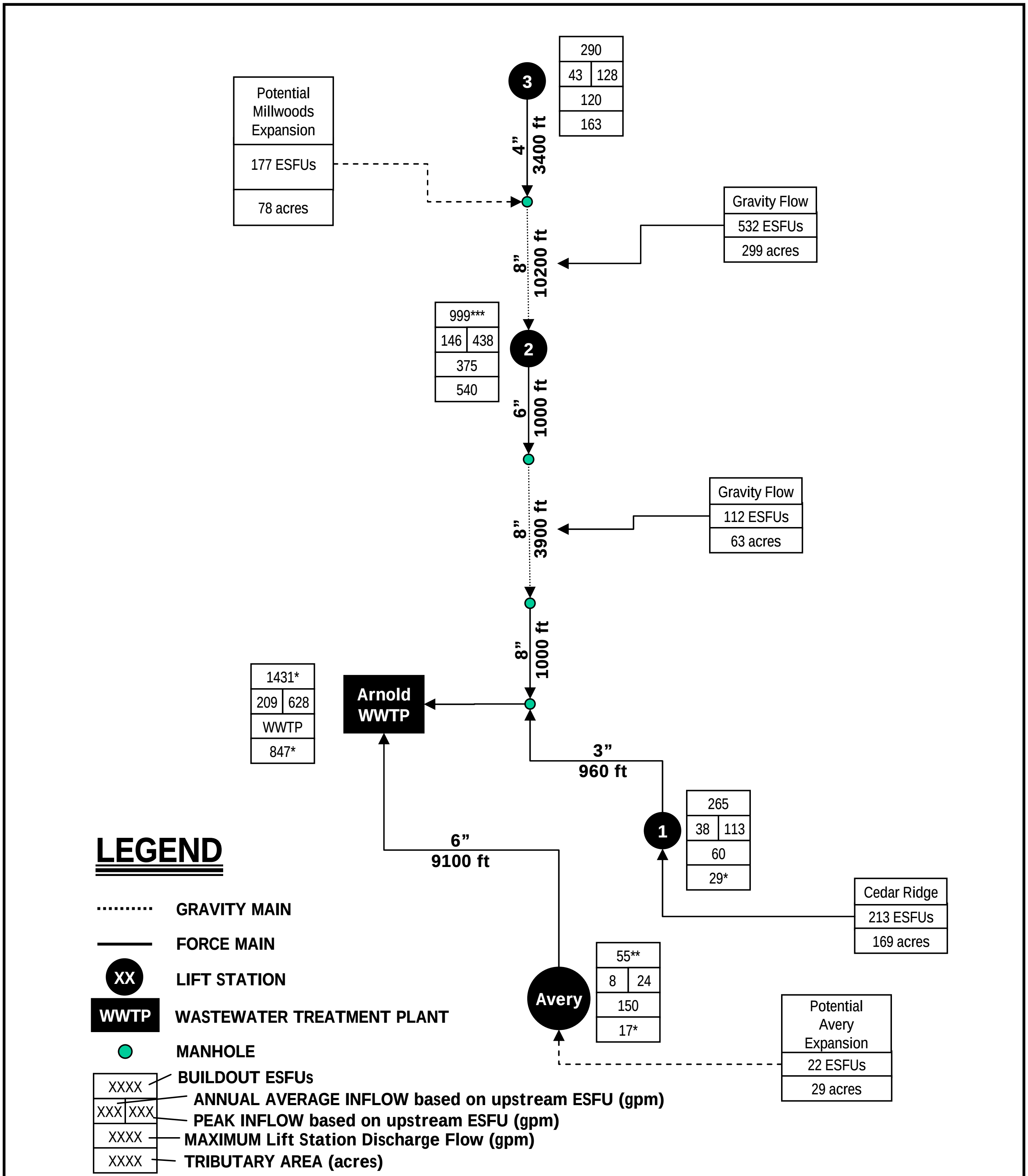
The northernmost portion of the service area drains to Lift Station 3 on Dunbar Road. Lift Station 3 pumps into the 4-inch diameter White Pines Force Main, which runs south into the White Pines Interceptor. The White Pines Interceptor is an 8-inch diameter gravity line running south parallel to Highway 4, collecting gravity flow from both sides of the service area. The White Pines Interceptor terminates at Lift Station 2, on Pines Drive. Lift Station 2 pumps into the 6-inch diameter Meadowmont Force Main, which runs east to Highway 4 and then south approximately 300 feet along Highway 4. At this point the Meadowmont Force Main empties into an 8-inch gravity line called Lateral MM. Lateral MM runs south along Highway 4 for approximately 3,900 feet, to a drop manhole beside Highway 4. At the drop manhole, the line drops in elevation and becomes a pressure line, called the Lakemont Force Main. The 8-inch diameter Lakemont Force Main then flows to the Arnold WWTP.

In the southernmost portion of the collection system, areas east of Highway 4 are lower than the Highway. A gravity lateral on the eastern service area boundary gathers flow from these properties and conveys it to Lift Station 1, which is located near Highway 4 at the southern edge of the Arnold service area. Lift Station 1 pumps into the 3-inch diameter Arnold Force Main, which flows north along Highway 4 to the Arnold WWTP entrance. At this point the Arnold Force Main meets the Lakemont Force Main, and flow enters the plant.

The fourth lift station is located in Avery, a small community located approximately one mile south of the treatment plant. The Avery Pump Station (APS) collects flow from the Avery Middle School and the Safari Mobile Home Park. The flow is then pumped through the 6-inch diameter Avery Force Main directly to the headworks of the Arnold WWTP.

The entire gravity collection system consists of 51,200 feet of 6-inch pipe and 14,000 feet of 8-inch pipe. The force mains, ranging from 3-inch to 8-inch, have a total length of 16,100 feet.

The available data for the four lift stations is shown in Table 11.



ARNOLD TRUNK SEWER SYSTEM WITH BUILDOUT ESFU AND PEAK FLOWS

Notes:
* Total for Scenario 3.
** 33 without Avery Expansion.
*** 822 without Millwoods Expansion.

HDR

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Figure 3

Table 11. Pump Station Data.

	Avery Lift Station	Lift Station 1	Lift Station 2	Lift Station 3
Pumps	Two 15-hp submersible turbine	Two 5-hp submersible grinder	Two 10-hp submersible non-clog	Two 5 hp submersible grinder followed by two 5-hp dry pit non-clog
Average Design Inflow (gpm)	N/A	12	165	29
Peak Design Inflow (gpm)	N/A	30	350	105
Capacity – one pump				
Pumping Rate (gpm)	110	40	275	81
Head (ft)	400	103	62	181
Capacity – both pumps				
Pumping Rate (gpm)	150	60	375	120
Head (ft)	500	111	68	198
Capacity with Both Pumps (gpd)	216,000	86,400	540,000	172,800

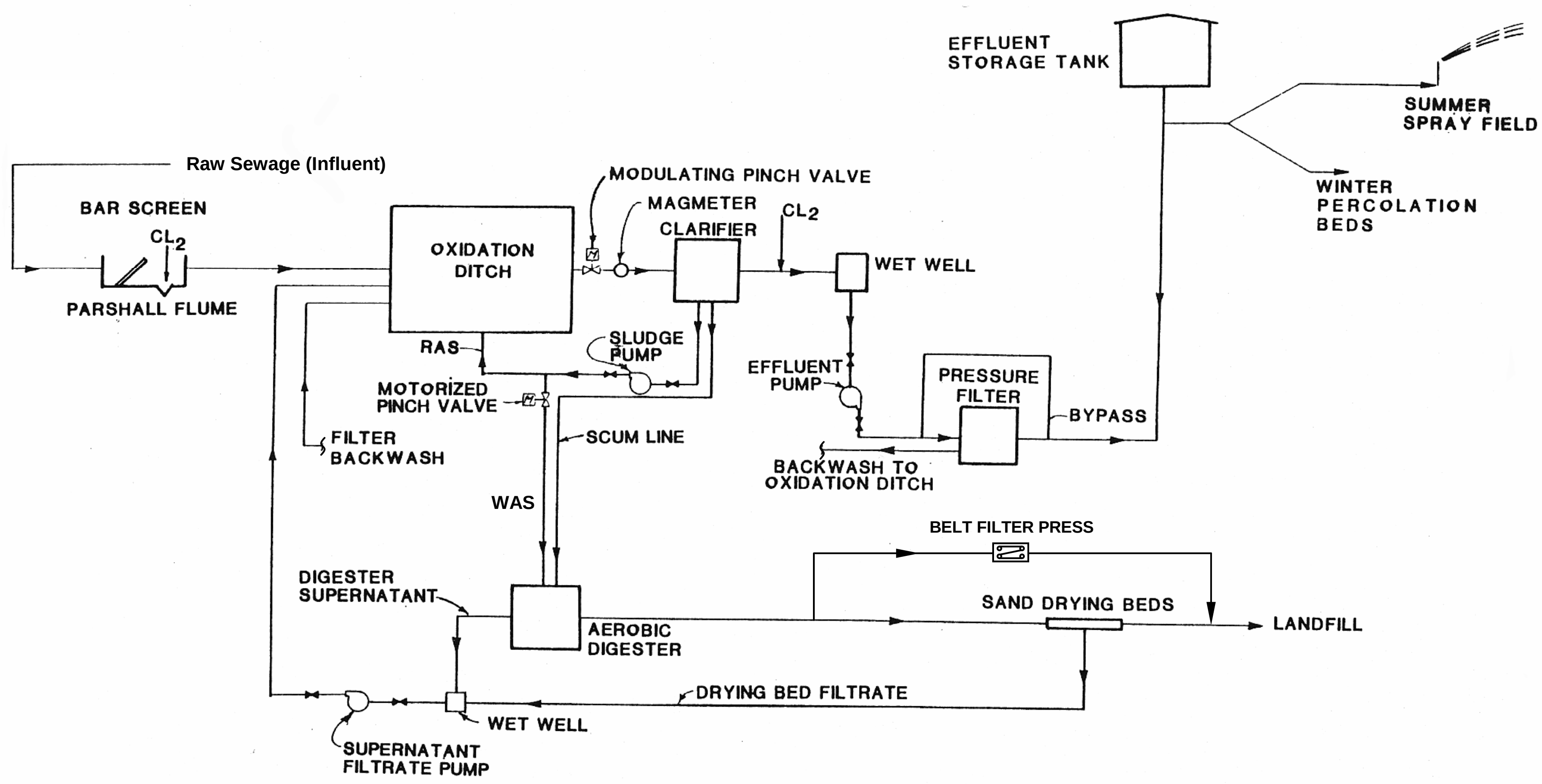
N/A = Not Available

Wastewater Treatment Plant

The Arnold WWTP consists of an extended oxidation ditch followed by clarification, chlorination, sand filtration, an enclosed storage tank, eleven subsurface disposal beds, and a 25-acre spray irrigation field. Additionally, there are two aerobic digesters and two sludge drying beds for solids treatment. The District is currently in the process of installing a belt filter press for solids dewatering. According to the WDR, the treatment facility, holding tank, and disposal beds have a design ADWF capacity of 170,000 gpd.

A process schematic and site plan of the Arnold WWTP are shown in Figure 4 and Figure 5, respectively. A summary of key design criteria and operating parameters for the major unit processes is presented in Table 12.

Figure 4



Notes:

RAS = Return Activated Sludge
WAS = Waste Activated Sludge

Arnold WWTP
Process Schematic

HDR

ARNOLD WWTP SITE PLAN
SCALE: 1" = 150'

HDR

Figure 5

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Table 12. Key Design and Operating Criteria.

Headworks		
Comminutor	Number	1
	Capacity	626,000 gpd @ Peak Hour
Parshall Flume	Number	1
	Throat Size	3 inches
	Flow Range	19,000 gpd to 777,000 gpd
Chlorine Diffuser	Number	1
	Capacity	500 lbs chlorine/day
Bypass Bar Screen	Number	1
	Bar Spacing	2-inch
Secondary Treatment		
Oxidation Ditch	Number	1
	Maximum Side Water Depth	11 feet
	Volume	175,000 gallons @ maximum depth
	Detention Time	24 hours @ ADWF
	Mixed Liquor Suspended Solids	3,000 to 6,000 mg/L
	Mean Cell Residence Time	20 to 30 days
	Organic Loading Rate (Maximum)	20 lbs BOD/day/1,000cf @ peak month
	Dissolved Oxygen Concentration	1 to 3 mg/L
Air Diffuser	Number of Aeration Head	9
	Number of Diffusers per Head	8
	Type	Fine Bubble
	Capacity	500 cfm
Low Speed Mixer	Number	2
	Horsepower, each	1.5 hp
Flow Control Vault		
Pinch Valve	Number	1
	Maximum Flow Regulating Capacity	180,000 gpd
Clarifier	Number	1
	Type	Center Feed
	Diameter	26 feet
	Side Water Depth	10 feet
	Volume	40,000 gallons
	Hydraulic Loading Rate	330 gpd/sf @ ADWF
	Solids Loading Rate	25 lbs/day/sf @ ADWF
Sludge Pump	Number	2
	Type	Variable Frequency Belt Drive
	Capacity, each	60 to 125 gpm
	Recycling Rate	100 percent at average annual flow with 1 pump out of service
Effluent Pump	Number	2
	Type	Vertical Turbine

	Capacity, ea	125 gpm
	Total Dynamic Head	200 feet
Pressure Filter	Number	2
	Type	Single Media Sand
	Volume	2, 500 gallons each
	Hydraulic Capacity	125 gpm
	Hydraulic Loading Rate	3.8 gpm/sf @ ADWF of 170,000 gpd
	Maximum Loading Rate	10 gpm/sf
	Backwash Flow Rate	500 gpm
	Backwash Duration	10 to 15 minutes
	Backwash Hydraulic Loading	15 gpm/sf
	Backwash Air	5 cfm/sf
Blower[a]	Number	3 + 1 standby
	Type	Positive Displacement
	Horsepower	3 - 15 hp; 1 - 10 hp
Disinfection		
Feed Tank	Number	1
Metering Pump (Chlorination)	Number	1
	Type	Peristaltic
	Capacity	30 gpd
	Minimum Residual	0.2 mg/L
	Contact Time	30 minutes through Filters @ peak hour flow
Sludge Treatment		
Aerobic Digester	Number	1
	Compartments	2
	Volume, ea	9,050 gallons
	Sludge Age	15 days
Mixer	Number	2, one each compartment
	Horsepower	1 hp
Supernatant/ Filtrate Pump	Number	2
	Type	Submersible, non-clog
	Capacity, ea	50 gpm
	Total Dynamic Head	31 feet
Sludge Drying Bed	Number	3
	Surface Area, ea	1,000 sf
	Maximum Solids Loading Rate	25 lb/sf/yr
Belt Filter Press[b]	Number of Units	1
	Belt Width	0.7 m
	Rated Capacity, ea	50 gpm

[a] Blowers are shared between the oxidation ditch, digesters, and filters.
[b] Scheduled to be installed by July 2005

Effluent Holding and Disposal

Following filtration and disinfection, the treated effluent is pumped to a 262,500-gallon enclosed steel holding tank. This tank is located in the northwest corner of the treatment plant site, at the highest elevation in the system. The tank is designed to provide a minimum of one-day holding capacity for the treated effluent. From the tank, effluent can be discharged by gravity to either the spray irrigation area or disposal beds.

The spray irrigation area consists of eight different pressure zones spanning a total area of 25 acres. Each area consists of native grassland, shrubs, and trees. The upper-most pressure zone consists of ten sprinklers with 77-ft diameter spray circles capable of discharging 4.7 gpm per sprinkler. The remaining pressure zones each have between nine and fourteen sprinklers with 100-ft diameter spray circles capable of discharging 11.7 gpm per sprinkler. Overall, the design application rate of the entire spray irrigation system is 1.8 inches per week. When in operation, effluent disposal is accomplished by a combination of plant uptake, evaporation, evapotranspiration, and percolation. The spray irrigation system is used only during the dry weather season, in accordance with the WDR.

Whenever the spray irrigation system cannot be used, effluent is disposed of using the 11 subsurface disposal beds which are located around the periphery of the spray irrigation areas. Each disposal bed consists of sixteen parallel trenches with 100-ft long distribution laterals. Each trench has 10 ft^2 of surface area per lineal foot of length. An observation port (vertical pipe) is installed in every other trench to monitor the water level in the trench. Each disposal bed is sized to accept up to 16,000 gpd at a hydraulic loading rate of one gallon per square foot per day. The disposal beds are rotated for efficiency and monitored through a flow meter at the holding tank and the observation ports to visually inspect the degree of saturation.

Both the subsurface disposal beds and spray irrigation areas are located on the treatment plant site. Ground water is monitored by extracting samples from the three wells located on the plant site. Table 13 provides a summary of the key attributes for the effluent holding and disposal facilities.

Table 13. Design and Operating Criteria of Effluent Holding and Disposal.

	Effluent Holding	
Storage Tank	Number	1
	Volume	262,500 gallons
	Effluent Disposal	
Spray Irrigation System	Area	25 acres
	Design Application Rate	1.8 inches / week
	Recommended Application Rate	36 inches/yr[a]
Percolation Bed	Number	11
	Application Rate	1 gpd/sf of bed trench area
	Disposal Capacity	16,000 gpd per bed

a. Based on agronomic rates.

Evaluation of Existing Facilities

Hydraulic, process and operational capacities for the existing facilities were determined to identify the capacity bottlenecks and improvements needed to accommodate future flows. The evaluations described below assume that all wastewater will be conveyed, treated, stored, and disposed of using the existing facilities. Potential solutions for overcoming the capacity bottlenecks identified in this evaluation are discussed later in the report. The following are descriptions of the capacity analyses performed for this task:

- **Conveyance System Evaluation:** Hydraulic capacities of the existing lift stations were compared to the projected buildout flow at each station. In turn, these capacities were used to identify the lift station improvements needed to accommodate future flows.
- **Treatment Plant Assessment:** Process capacities of the existing treatment plant facilities were determined using a treatment plant mass balance model. Model results were compared to site-specific and standard design criteria and constraints.
- **Effluent Holding and Disposal Evaluation:** Capacities of the existing holding tank and effluent disposal facilities were developed based on previous capacity assessments and design criteria.

Collection System Evaluation

A hydraulic analysis of the collection system was prepared using a Microsoft Excel spreadsheet. Existing and future flows were distributed around the service area to estimate the flow in each part of the system. For flows within the existing Arnold service area, the existing flow contribution was assumed to be spread uniformly throughout the service area. Similarly, the infill development was expected to occur uniformly throughout the service area. The Millwoods subdivision was assumed to flow directly into the White Pines Interceptor. The Cedar Ridge development was assumed to flow directly to Lift Station 1. The Avery Expansion area was assumed to flow directly to the Avery Pump Station.

The boundaries of the 1984 assessment district were drawn in GIS over the County’s parcel base layer. The measured service area was approximately 554 acres. The service area was divided into basins that flowed to major facilities. The northernmost basin, flowing to Lift Station 3, includes 163 acres. All flow from Lift Station 3 is pumped to the White Pines Interceptor, which eventually flows to Lift Station 2. An additional 299 acres contributes flow to the White Pines Interceptor upstream of Lift Station 2. All flow from Lift Station 2 is pumped to Lateral MM, which flows to the Lakemont Force Main and the plant. An additional 63 acres contributes flow to Lateral MM upstream of the plant. The final 29 acres flow to Lift Station 1, which pumps directly to the Arnold WWTP.

The flow to the Avery Pump Station was not calculated based on the acreage of the service area. The District has assigned 3 ESFUs to the Middle School and 30 ESFUs to the Safari Mobile Home Park. Using the standard values for estimating flows from Table 6, the 33 ESFUs correspond to:

- ADWF of 6,435 gpd.
- Annual average flow of 6,950 gpd.
- Peak hour flow of 20,850 gpd.

The estimated flow distribution and collection system evaluation results are shown in Table 14.

Table 14. Collection System Evaluation.

	Avery Lift Station	Lift Station 1	Lift Station 2	Lift Station 3
Contributing Area				
Acres	N/A	29	462	163
2005 Peak Hour Flow (gpd)	20,850	11,677	186,552	65,633
2025 Peak Hour Flow from Existing Area (gpd)	20,850	23,316	371,451	131,053
2025 Peak Hour Flow from Avery Expansion (gpd)	13,900	--	--	--
2025 Peak Hour Flow from Cedar Ridge (gpd)	--	134,573	--	--
2025 Peak Hour Flow from Millwoods (gpd)	--	--	111,829	--
Total 2025 Peak Hour Flow (gpd)	34,750	157,889	483,280	131,053
Firm Capacity (gpd)[a]	158,400	57,600	396,000	116,640

Notes:

2005 Peak Hour Flow for Arnold (gpd)	243,921
2005 Peak Hour Flow for Arnold excluding Avery (gpd)	223,071
Arnold Service Area (acres)	554
2025 Peak Hour Flow for Arnold (gpd)	466,269
2025 Peak Hour Flow for Arnold excluding Avery (gpd)	445,419

[a] Capacity with largest pump out of service in accordance with District standards.

N/A = Not Applicable.

The Avery Lift Station is projected to have adequate capacity through buildout. However, as shown in Table 14, the evaluation results indicate that Lift Stations 1, 2, and 3 will need to be upgraded to accommodate future flows based on the District standards.[4] The following is the recommended approach for expanding their capacities.

- **Lift Station 1:** This station is already scheduled to be replaced as part of the Cedar Ridge development. All flows currently routed to Lift Station 1 will be conveyed to the new Cedar Ridge Lift Station, which will in turn, pump all flows to the Lift Station 1 force main. It is recommended that the new Cedar Ridge Lift Station be designed based on a minimum firm capacity of 110 gpm.
- **Lift Station 2:** An assessment of the existing pump vault shows that this vault cannot accommodate large pumps. Therefore, this lift station will require replacement in the future by installing a package lift station adjacent to the existing, or demolishing the existing station and building a new lift station in its place. If a new station is installed, a

[4] Sewer lift stations shall be capable of providing the maximum design flow with the largest pumping unit out of service. Section 1108 of the *Calaveras County Water District Improvement Standards*, June 1997.

manhole can be used as a temporary pump vault during construction. It is recommended that the new lift station be designed based on a minimum firm capacity of about 340 gpm.

- **Lift Station 3:** The existing pump vaults at Lift Station 2 and 3 are identical with regard to wet well volume. However, Lift Station 3 currently has significantly smaller pumps than Lift Station 2. Based on this assessment, it is expected that the pumps in Lift Station 3 can be replaced with larger capacity units to accommodate future flows. It is recommended that the replacement pumps be designed based on a minimum firm capacity of about 95 gpm to accommodate 2025 flows.

Treatment Plant Evaluation

A mass balance model of the treatment plant was constructed using HDR's ENVision program. The model incorporates flows and pollutant loads (i.e., BOD and TSS) from both influent and internal recycle streams and calculates loading rates of individual unit processes to assess performance. ENVision provides the ability to calibrate each individual unit process based on historic operating data, or in the absence of operating data, typical performance values. The mass balance model was run for a total of eight scenarios: current and buildout average dry weather, average annual, peak month and maximum day. The ENVision mass balance output is included in Appendix D.

After the mass balance was constructed, loading conditions for each unit process were compared to the site-specific and standard design criteria developed for the Arnold WWTP. This comparison allows one to determine whether a unit process is under or over loaded compared to the design criteria.

Table 15 summarizes the base scenario loading conditions under various flow conditions for all major unit processes within the treatment plant. This table also contains a general description of each process along with the criterion or criteria which limit the overall capacity of each unit process. As shown in Table 15, all the key unit processes will require expansion to accommodate buildout conditions.

A site visit of the Arnold WWTP was conducted on November 12, 2004. The following operation and maintenance improvements were discussed during the visit. The need to:

- Add a dissolved oxygen control system in the oxidation ditch to minimize blower output and energy costs.
- Conduct a more thorough evaluation of the subsurface disposal beds and spray irrigation area during the wet weather season.

Effluent Holding and Disposal Evaluation

A summary of the effluent holding and disposal system evaluation is presented in Table 16 for the four buildout scenarios.

Table 15. Treatment Plant Capacity Assessment – Base Scenario.

Process	Unit	Description	Size or Capacity per Unit	Standard or Site Specific Design/Operating Criteria			Mass Balance Output (Current Conditions)			Mass Balance Output (Buildout Conditions) (Base Scenario)			Mass Balance Output (Buildout Conditions) (Scenario 1)			Mass Balance Output (Buildout Conditions) (Scenario 2)			Mass Balance Output (Buildout Conditions) (Scenario 3)		
				Criteria Description	Value	Units	Value	Percent of Rated Capacity	Expansion Needed	Value	Percent of Rated Capacity	Expansion Needed	Value	Percent of Rated Capacity	Expansion Needed	Value	Percent of Rated Capacity	Expansion Needed	Value	Percent of Rated Capacity	Expansion Needed
Headworks	Screening	1 Comminutor	626,000 gpd	Peak flow capacity	435	gpm	169	39	NO	526	121	YES	604	139	YES	536	123	YES	613	141	YES
	Flow Measurement	1 Parshall flume	3 inch throat	Peak flow capacity	540	gpm	169	31	NO	526	98	NO	604	112	YES	536	99	NO	613	134	YES
Secondary Treatment	Oxidation Ditch	1 Oval channel	180 ft x 12 ft x 11 ft deep Volume = 23,400 cf	Hydraulic Retention Time @ average dry weather flow	24	hours	51	47	NO	17	141	YES	15.4	156	YES	17.3	139	YES	15.2	158	YES
				Mixed Liquor Concentration @ peak month	6,000	mg/L	2,465	41	NO	4,710	79	NO	5,380	90	NO	4,900	82	NO	5,400	90	NO
	Clarifier	1 Circular tank	26 ft Diameter 10 ft side water depth Volume = 40,000 gallons	Hydraulic Loading Rate @ average dry weather flow	330	gpd/sf	150	45	NO	449	136	YES	514	156	YES	457	138	YES	522	158	YES
				Solids Loading Rate @ average dry weather flow	25	lbs/day/sf	4	16	NO	35.5	142	YES	46.5	186	YES	36.8	147	YES	48	192	YES
	RAS Pumps	2 Variable speed sludge pumps	125 gpm each	100% recycling rate @ average annual flow with 1 standby pump	125	gpm	56	45	NO	175	140	YES	201	161	YES	179	143	YES	204	163	YES
Filtration and Disinfection	Effluent (Filter Feed Pumps	2 Vertical turbine pumps	125 gpm each	Maximum day flow with 1 standby pump	125	gpm	97	77	NO	263	210	YES	302	242	YES	268	168	YES	307	246	YES
	Pressure Filters	2 Single Media Sand Filters	66 ft² media area per filter; 132 ft² total	Hydraulic loading rate @ average dry weather flow; both filters in service	2	gpm/sf	0.4	20	NO	1.23	62	NO	1.4	70	NO	1.25	63	NO	1.43	72	NO
				Hydraulic loading rate @ average dry weather flow; 1 standby filter (in backwash)	2	gpm/sf	0.8	40	NO	2.5	125	YES	2.8	140	YES	2.5	125	YES	2.86	144	YES
				Hydraulic loading rate @ maximum day; both filters in service	10	gpm/sf	0.7	7	NO	2.0	20	NO	2.3	23	NO	2.0	20	NO	2.3	23	NO
				Hydraulic loading rate @ maximum day; 1 standby filter (in backwash)	10	gpm/sf	1.5	15	NO	4.0	40	NO	4.6	46	NO	4.0	40	NO	4.6	46	NO
	Chlorination	Storage/Feed Tank	1 hypo vat; volume = 350 gal	Storage at Average Annual Flow with 15ppm Chlorine dose	14	days	35	40	NO	11	127	YES	10	127	YES	11	127	YES	9.5	147	YES
		Feed Pump	1 peristaltic pump; 30 gpd	Feed rate at Maximum Day and 15ppm Chlorine dose	30	gpd	17	57	NO	47	157	YES	54	181	YES	48	160	YES	55	183	YES

Process	Unit	Description	Size or Capacity per Unit	Standard or Site Specific Design/Operating Criteria			Mass Balance Output (Current Conditions)			Mass Balance Output (Buildout Conditions) (Base Scenario)			Mass Balance Output (Buildout Conditions) (Scenario 1)			Mass Balance Output (Buildout Conditions) (Scenario 2)			Mass Balance Output (Buildout Conditions) (Scenario 3)		
				Criteria Description	Value	Units	Value	Percent of Rated Capacity	Expansion Needed	Value	Percent of Rated Capacity	Expansion Needed	Value	Percent of Rated Capacity	Expansion Needed	Value	Percent of Rated Capacity	Expansion Needed	Value	Percent of Rated Capacity	Expansion Needed
	Chlorine Contact Time	Detention Time Through Pressure Filters	2 pressure filters, 2,500 gallons each	Hydraulic detention time at maximum day flow	30	minutes	52	58	NO	19	158	YES	17	176	YES	19	158	YES	16	188	YES
Sludge Treatment and Dewatering	Aerobic Digester	1 Aerobic Digester with 2 compartments	9,050 gallons per compartment ; 18,100 gallons total (at 10,000 mg/L)	Hydraulic retention time @ average annual flow	15	days	22	68	NO	7	214	YES	6.2	242	YES	7	214	YES	6.1	246	YES
	Supernatant Filtrate Pumps	2 Submersible non-clog pumps	50 gpm each	Average annual digester feed flow with 1 standby pump	50	gpm	< 1.0	2	NO	1.8	4	NO	2	4	NO	1.7	3	NO	2.0	4	NO
	Sludge Drying Beds	3 Sand beds	1,000 sf each	Solids loading rate @ average annual	25	lb/sf/yr	5	20	NO	10	40	NO	11	45	NO	10	40	NO	11.3	45	NO
	Belt Filter Press	0.7 meter unit	50 gpm	Hydraulic loading rate @ average annual	Operating Time	Hours per week	1.5	—	NO	3.0	—	NO	3.0	—	NO	3.0	—	NO	3.0	—	NO

Notes:

Scenario 1 includes existing service area plus Millwoods
Scenario 2 includes existing service area plus Avery
Scenario 3 includes existing service area plus Millwoods and Avery

Table 16. Effluent Storage and Disposal System Capacity Assessment.

Process	Unit	Description	Size or Capacity per Unit	Standard or Site Specific Design/Operating Criteria			Mass Balance Output (Current Conditions)			Mass Balance Output (Buildout Conditions) (Base Scenario)			Mass Balance Output (Buildout Conditions) (Scenario 1)			Mass Balance Output (Buildout Conditions) (Scenario 2)			Mass Balance Output (Buildout Conditions) (Scenario 3)		
				Criteria Description	Value	Units	Value	Percent of Rated Capacity	Expansion Needed	Value	Percent of Rated Capacity	Expansion Needed	Value	Percent of Rated Capacity	Expansion Needed	Value	Percent of Rated Capacity	Expansion Needed	Value	Percent of Rated Capacity	Expansion Needed
Effluent Holding	Effluent Holding Tank	One 38 ft diameter tank	262,500 gallons	Storage Capacity @ average dry weather flow	1.0	days	3.2	31	NO	1.1	91	NO	1.0	98	NO	1.0	98	NO	1.0	100	NO
Effluent Disposal	Disposal Beds	11 subsurface disposal beds	Trench length total = 17,600 ft; 10 ft^2 per lineal ft of trench length	Disposal capacity of 16,000 gpd per bed @ average dry weather flow (wet season application only)	176,000 total	gpd	81,000	46	NO	252,000	143	YES	268,300	152	YES	238,100	135	YES	272,600	155	YES
				Disposal capacity of 16,000 gpd per bed @ average dry weather flow (year round application)	176,000 total	gpd	40,500	23	NO	126,000	72	NO	134,150	76	NO	119,050	68	NO	136,300	78	NO
				Percolation rate at wet season plant effluent in Water Balance	1.0	gallon/ day/ square foot of trench area	0.5	50	NO	1.5	150	YES	1.5	170	YES	1.5	150	YES	1.8	180	YES
	Spray Irrigation Area	Spray fields	25 acres total	Agronomic rates	36	Inches/ year	21.4	59	NO	67	186	YES	77	214	YES	68	188	YES	79	219	YES

Notes:

Scenario 1 includes existing service area plus Millwoods
Scenario 2 includes existing service area plus Avery
Scenario 3 includes existing service area plus Millwoods and Avery

The effluent holding tank was originally designed to provide a minimum hydraulic detention time of one day at the plant's design capacity of 170,000 gpd. This criterion will be used to determine whether additional effluent holding capacity is needed for buildout.

As previously described, the spray irrigation system relies on soil percolation to dispose of a portion of the treated effluent. Percolation is also the primary means of disposal for the subsurface disposal beds. Information pertaining to soil characteristics or percolation rates was not available. The capacity of the disposal beds and spray irrigation system has been previously assessed by District staff and consultants.[5] Although the studies were inconclusive, both consultants indicated that the District should consider expanding the disposal facilities only when influent flows approach the design flow of 170,000 gpd. Based on these recommendations and the absence of wet weather field testing results, the original design criteria for the percolation beds will be used to determine if additional land is necessary to accommodate the projected buildout flows. The rated capacity of the spray irrigation system is based on agronomic rates as described in Table 13. Copies of the water balances developed for this evaluation are in Appendix E.

Summary of Required Improvements

The following is a list of improvements needed to accommodate the buildout flows for the base scenario.

- **Collection System:** The following improvements are recommended based on the projected 2025 peak hour flows.
  - Lift Station 1: As part of the Cedar Ridge development, this lift station is already scheduled to be replaced. It is recommended that the station be designed to provide a minimum firm capacity[6] of 110 gpm.
  - Lift Station 2: Expand the existing or construct a new lift station to provide a minimum firm capacity of 350 gpm.
  - Lift Station 3: Replace pumps to provide a minimum firm capacity of 95 gpm.
- **Treatment Plant:** The following improvements are recommended based on projected buildout flows.
  - Septage Receiving: A new, stand alone, septage receiving station is recommended. The station should be equipped with an integral screen and grinder.
  - Headworks: Given that the existing septage receiving station requires replacement and the headworks require expansion, the District should consider installing a new headworks.

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[5] *Arnold Wastewater Treatment Plant Capacity* (West Yost & Associates, December 1990) and *Wastewater Treatment Plant Evaluation* (Kennedy/Jenks Consultants, November 2001).
[6] Pumping station capacity with largest pump out of service.

- Oxidation Ditch and Clarifier: An additional ditch and clarifier capacity is not necessarily required to accommodate the projected buildout conditions. However, these units will be over 30 years old when influent flows exceed the plant's rated capacity. Moreover, an additional ditch and clarifier should be added for redundancy and to allow the existing units to be taken out of service for routine maintenance.
- RAS Pumps: One additional pump is recommended to service the new clarifier. The configuration of one of the existing RAS pumps should be modified to serve as standby for both dedicated RAS pumps.
- Effluent (Filter Feed) Pumps: A minimum of two additional pumps are required for buildout based on a rated capacity of 125 gpm each.
- Effluent Filters: Additional filters are not needed to accommodate buildout. However, the District should assess whether replacement of these units is required based on their past performance.
- Disinfection: The contact time associated with the pressure filters is insufficient for the projected buildout flows. Therefore additional contact time is required. The District should consider installing UV disinfection to minimize the formation of disinfection byproducts.
- Aerobic Digester: The addition of one more 9,050 gallon compartment is recommended.
- Supernatant Filtrate Pumps: No additional capacity required.
- Sludge Drying Beds: No additional capacity required.
- Belt Filter Press: No additional capacity is required.

- **Effluent Holding:** An additional tank is not required based on providing storage equal to one day at buildout conditions. However, another tank may be necessary if the spray irrigation system and/or the disposal beds are expanded.
- **Disposal Beds and Spray Irrigation Fields:** The District owns an additional 40 acres of land immediately south of the existing disposal system that can be used for these improvements. The additional spray fields and percolation beds will not require the entire 40 acres. It is recommended that the extra ten acres of land be set aside to accommodate additional disposal beds or to expand the spray irrigation area in the future. Approximately 22 acres of additional spray fields are needed to accommodate buildout. In addition, six more percolation beds are needed.

Alternative Analyses

Alternative Analyses

An alternative analysis was prepared to determine the cost effectiveness for incorporating Millwoods into the Arnold service area. The following is a description of the analysis along with the key findings, results, and recommendations.

Incorporation of Millwoods Service Area

The District currently owns and operates both the Arnold and Millwoods sewer systems. As previously described, the District would like to consider connecting the Millwoods system to the Arnold system to centralize operation and maintenance requirements and reduce costs.

Millwoods Septic Tanks

The Millwoods septic tanks have been operating for the past thirteen years with varying degrees of success. The following is a summary of the problems associated with the existing Millwoods septic tanks and sewer system.

Odors

The original septic tanks are two-compartment tanks with concrete lids. Each tank serves two houses, except for condominium areas, where one tank serves three houses. Newer units have a tank serving each house. The lids on the original septic tanks do not seal properly which allows odors to escape from the septic tanks. To minimize odors, the concrete lids need to be replaced and fastened directly to the concrete tank.

Pipeline Plugging

Septic tank discharge pipelines are 1-1/2 inches in diameter. Due to their small diameter, these pipelines have plugged and subsequently overflowed onto residential property in the past. In addition, the existing check valves do not operate properly and require replacement.

The manufacturer’s newer septic tank design does not use check valves and the tanks are equipped with 2-inch discharge pipelines. The District believes that increasing the existing discharge pipeline from 1-1/2 to 2-inches would help reduce plugging. The existing 1-1/2-inch discharge pipeline is located in the middle of the second tank, which greatly reduces the tank’s capacity; therefore the discharge pipeline should be relocated to the top of the tank.

Solids

The District performed testing at the Millwoods Lift Station and measured a 2-ft sludge blanket at the bottom of the wet well. The original pumps installed at the lift station were designed for clean water applications. These pumps have been replaced with grinder-type pumps suitable for this application. However, the fact that a considerable amount of solids are being conveyed to the lift station and subsequently to the leachfield is problematic, since the leachfield will eventually plug due to solids accumulation and soil pore blockage.

Adding a settling basin for solids removal adjacent to the existing leachfield and routing the Millwoods septic tank effluent directly to the Arnold Sewer System are two viable alternatives for eliminating the problems associated with septic tank effluent solids. In either of these cases, screens would have to be installed in 39 of the existing septic tanks along with the previously mentioned septic tank improvements.

Alternative 1 – Install Settling Basin

One potential alternative would be to install a new settling basin for solids removal prior to leachfield disposal. The District would continue to operate and maintain the Millwoods Sewer System and leachfield if this alternative was selected. The following is a summary of the improvements associated with this alternative:

- **Install Septic Tank Screens:** Install screens (basket type) in the 39 septic tanks that do not presently have them to reduce solids carryover.
- **Replace the Existing Concrete Lids:** Install sealed risers that are connected directly to the concrete tanks. It is estimated that 23 of the existing septic tanks require this improvement.
- **Increase Septic Tank Discharge Pipeline to 2-inch:** Replace the existing 1-1/2-inch discharge lines with 2-inch piping and relocate the tank discharge pipe. For cost estimating purposes, it is assumed that 40 septic tanks require this modification.
- **Install Settling Basin at the Leachfield:** Provide solids removal prior to effluent disposal to reduce leachfield solids deposition and plugging.
- **Drill Monitoring Well:** A new monitoring well is required at the treatment plant site as the existing upstream monitoring well is dry.
- **Annual Operation and Maintenance Costs:** The total estimated operation and maintenance costs for the Millwoods Sewer System is approximately $20,000 per year.

Alternative 2 – Abandon Millwoods Treatment and Disposal Systems

A second alternative to consider is continuing to operate and maintain the Millwoods collection system and pump the septic tank effluent to the Arnold WWTP for subsequent treatment and disposal. Under this option, the District would no longer need to maintain the Millwoods leachfield. The following is a summary of the improvements associated with this alternative:

- **Install Septic Tank Screens:** Install screens (basket type) in the 39 septic tanks that do not presently have them to reduce solids carryover.
- **Replace the Existing Concrete Lids:** Install sealed risers that are connected directly to the concrete tanks. It is estimated that 23 of the existing septic tanks require this improvement.

- **Increase Septic Tank Discharge Pipeline to 2-inch:** Replace the existing 1-1/2-inch discharge lines with 2-inch piping and relocate the tank discharge pipe. For cost estimating purposes, it is assumed that 40 septic tanks require this modification.
- **Provide Additional Capacity at the Arnold WWTP and Alter Expansion Timeline:** Approximately 35,000 gpd of additional ADWF capacity will be required if septic tank effluent is conveyed from Millwoods to the Arnold WWTP. Based on the current service area, improvements to the Arnold sewer system will be required by year 2020. If Millwooods is added, the timeline for required improvements will occur earlier in year 2014.
- **Millwoods Tie-In to the Arnold Sewer System:** It is estimated that a new 4-inch pipeline, approximately 200 feet in length, will be required to accomplish this tie-in.
- **Annual Operation and Maintenance Costs:** It is estimated that the total operation and maintenance costs for the Millwoods system can be reduced from $20,000 to $6,000 per year.

Cost Comparison and Recommendations

Table 17 presents a summary of the estimated life cycle costs developed for this alternative analysis. As shown in the last row, installing a settling basin and continuing to operate Millwoods as a separate system has a significantly lower life cycle cost. It is estimated that this alternative represents approximately 65 percent of the costs associated with abandoning the Millwoods treatment and disposal systems. Based on this cost comparison, it is recommended that Millwoods continue to operate as a separate system.

Table 17. Incorporation of Millwoods Service Area Cost Comparison.

Cost Component	Estimated Costs ($)	
	Alternative 1 - Install Settling Basins	Alternative 2 – Abandon Millwoods Treatment and Disposal Systems
Septic Tank Screens	90,000	90,000
Replace Existing Concrete Lids	15,000	15,000
Increase and Modify Septic Tank Discharge Pipeline	65,000	65,000
Install Solids Removal at the Leachfield	65,000[a]	--
Drill New Monitoring Well	10,000	--
Provide Additional Capacity at the Arnold WWTP	--	380,000[b]
Millwoods and Arnold Connection	--	15,000
Subtotal A	245,000	565,000
Contingency (30 percent of Subtotal A)	75,000	170,000
Subtotal B (Estimate of Probable Construction Cost)	320,000	735,000
Regulatory Requirements and Documentation	--	5,000
Administration and Engineering (20 percent of Subtotal B)	65,000	145,000
Total Estimated Project Costs	385,000	885,000
Estimated Annual Operation and Maintenance Costs	20,000	6,000
Estimated Life Cycle Costs[c]	615,000	955,000

a Cost based on installing a 10,000 gallon concrete tank adjacent to the existing leachfield.

b Incremental costs for treatment plant expansion with and without Millwoods are not expected to be significant. However, the cost associated with moving the expansion timeline from 2020 to 2014 is estimated to be $380,000 based on an interest rate of six percent and the total estimated project cost of $2,185,000 for the treatment plant expansion.

c Life Cycle Costs based on total project costs and annual operation and maintenance costs. A 20-year time period and interest rate of six percent were used in the analysis.

Incorporation of Avery Commercial Area

As previously described, the Arnold WWTP currently receives a small amount of domestic sewage from the Avery Middle School and Safari Mobile Home Park. The District is considering expanding this service by providing sewer service to the Avery commercial area. It is estimated that this area would represent 22 ESFUs. To provide this service, the Avery sewer pipeline would have to be extended. It is estimated that this extension would cost approximately $470,000.[7]

Providing service to this area is not expected to significantly alter the costs or timeline requirements for Arnold sewer system improvements described later in this technical memorandum. In addition, the Avery force main and pumping station have adequate capacity to serve this expansion. Assuming that the Avery sewer pipeline expansion will be paid for by the Avery commercial area, connecting the Avery commercial area to the Arnold sewer system is attractive since it will provide added customers at no additional cost.

[7] Costs obtained from the 2002 Preliminary Avery Sewer Line Cost Allocation provided by the District.

Recommended Improvements and Timeline

Recommended Improvements and Timeline

Recommended improvements for upgrading the wastewater collection, treatment, and effluent holding and disposal facilities were developed based on the results and information presented in this report. The recommended improvements and timeline requirements described in this section are for the Base Scenario. Improvements and timelines for the other scenarios are presented in Appendix F.

Cost Estimate Development

Costs shown in the tables presented in this section represent total project cost and include administration and engineering costs. Project costs are presented in terms of 2004 U.S dollars according to Engineering News Record's (ENR's) cost indexes, currently equal to 7,115 (see 20 City Construction Cost Index, 1913 = 100 base).

Construction costs are based on equipment costs obtained from equipment manufacturers, past project experience, and quantity and standard unit cost estimates. A 30 percent contingency is included to account for change orders and items not included in the cost breakdowns. Administration and engineering costs are based on 20 percent of the construction costs (with contingency).

Improvements and Project Phasing

Timeline requirements for specific improvements were based on evaluating projected influent flows and specific system capacities. No improvements are required for the collection system piping or the effluent holding and disposal facilities.

- **Collection System – Lift Station:**
  - Lift Station 1: This station is scheduled to be replaced as part of the Cedar Ridge development. All flows currently routed to Lift Station 1 will be conveyed to the new Cedar Ridge Lift Station, which will in turn, pump all flows to the Lift Station 1 force main. It is recommended that the new Cedar Ridge Lift Station be designed based on a minimum firm capacity of 110 gpm.
  - Lift Station 2: The existing lift station wet well cannot accommodate larger capacity pumps. Therefore, this lift station requires replacement to accommodate future flows. The lift station's capacity will be exceeded in year 2019. However, due to its critical location, this lift station should be replaced immediately. The new lift station should be designed to provide a minimum firm capacity of 350 gpm.
  - Lift Station 3: Higher capacity pumps can be installed in the existing wet well to accommodate future flows. The lift station's capacity will be exceeded in year 2020. Replacement pumps should be designed to provide a minimum firm capacity of 95 gpm.
- **Collection System – Septic Tank (Millwoods):** Improvements include installing septic tank screens, replacing the existing concrete lids, and replacing the existing discharge

piping with larger diameter pipe. These improvements should be implemented immediately to minimize odors and maintenance requirements associated with the septic tanks located in the Millwoods service area.

It is recommended that the Arnold and Millwoods service areas be maintained and operated separately. Therefore, the total estimated project cost associated with the Millwoods improvements of $385,000 was not included in the cost estimates presented later in this report (i.e., Table 18 and Table 19).

- **Treatment Plant:** Two phases of improvements are required for the treatment plant. The following is a summary of the major improvements for both phases:
  - Immediate Improvements:
    1. Secondary Clarifier: A second clarifier is needed for redundancy and to allow the existing unit to be taken out of service for routine maintenance. The installation of one additional Return Activated Sludge (RAS) pump will be required to serve the new clarifier. The configuration of one of the existing RAS pumps should be modified to serve as standby for both dedicated RAS pumps.
    2. Dissolved Oxygen (DO) Control System: The addition of an automatic DO control system is recommended to minimize blower output and energy costs.
    3. Effluent (Filter Feed) Pumps: A minimum of two additional pumps are required for buildout. One additional effluent pump will be required by 2008. The second effluent pump is needed after 2060 and has been added to the Phase II improvements.
    4. Effluent Disposal Evaluation: The capacity of the disposal beds and spray irrigation system has been assessed by District staff and consultants in the past. However, these assessments were conducted during the dry season and were inconclusive. A more thorough evaluation of the disposal beds and spray irrigation area should be conducted during the wet weather season to assess their performance and capacity.
  - Plant Expansion: The capacity of the existing treatment plant is estimated to be exceeded by year 2020 and the influent ADWF is projected to approach 170,000 gpd. At that time, the following major unit processes will require expansion to accommodate future flows.
    1. Headworks and Septage Receiving Station: Install a new headworks and a new, stand alone septage receiving station. The new headworks should have a minimum peak flow capacity of 525 gpm.
    2. Oxidation Ditch: An additional oxidation ditch is not necessarily required to accommodate the projected buildout flows. However, the ditch will be over 35 years old when the plant expansion is completed and nearing the end of its useful life. Moreover, an additional ditch, similar in size to the existing, should be

added for redundancy and to allow the existing unit to be taken out of service for routine maintenance.

3. Effluent Pumps: A second additional effluent pump is projected to be required after 2060. It is recommended that this pump be added as part of this expansion phase.
4. Disinfection: Additional contact time is needed to accommodate future flows. At that time, it is recommended that the existing chlorine disinfection system be replaced with UV disinfection to minimize the formation of disinfection byproducts.
5. Aerobic Digester: One additional 9,050 gallon compartment is recommended to serve flows through buildout.

- **Effluent Holding and Disposal:** Approximately 22 acres of additional spray field area and six percolation beds are required to serve buildout. These improvements should be in service by 2011 to accommodate the additional flows.

Figure 6 and Figure 7 show the recommended collection and treatment plant improvements and phasing requirements.

Phase I Improvements (Immediate Improvements)

A summary of the Phase I Improvements is shown in Table 18 along with estimated costs. As shown, the total estimated project cost for the Phase I Improvements is $1,190,000. It is recommended that these improvements be implemented immediately to improve operations and maintenance and provide adequate capacity to accommodate future flows.

Table 18. Phase I Improvements (Base Scenario)

Cost Component	Estimated Costs ($)[a]
Collection System	
Lift Station 1	60,000[b]
Lift Station 2	250,000
Treatment Plant	
Secondary Clarifier and RAS Pump	300,000
DO Control System	40,000
Effluent Pump	35,000
Site Piping	40,000
Effluent Disposal Evaluation	35,000
Subtotal A	760,000
Contingency (30 percent of Subtotal A)	230,000
Subtotal B[c]	990,000
Administration and Engineering (20 percent of Subtotal B)	200,000
Total Estimated Project Cost	1,190,000

a Estimated costs presented in terms of 2004 US dollars.

b Cost represents the District's contribution to this lift station and not the total estimated project cost.

c Estimate of probable construction cost.

Phase II Improvements

Approximately 22 acres of additional spray field area and six percolation beds are required to serve buildout. As previously described, these improvement should be in service no later than 2011, or when the ADWF reaches 130,000 gpd. The total estimated project cost for the Phase II improvements is $865.000, which includes an additional effluent holding tank similar in size to the existing.

Phase III Improvements

A summary of the Phase III Improvements is shown in Table 19 along with estimated costs. As shown, the total estimated project cost for the Phase III Improvements is $2,380,000. These improvements are needed to be in service by 2020 when the ADWF approaches 170,000 gpd. The total number of ESFUs served in 2020 is estimated to be 940. Once these improvements are completed, the sewer system will have adequate capacity through buildout.

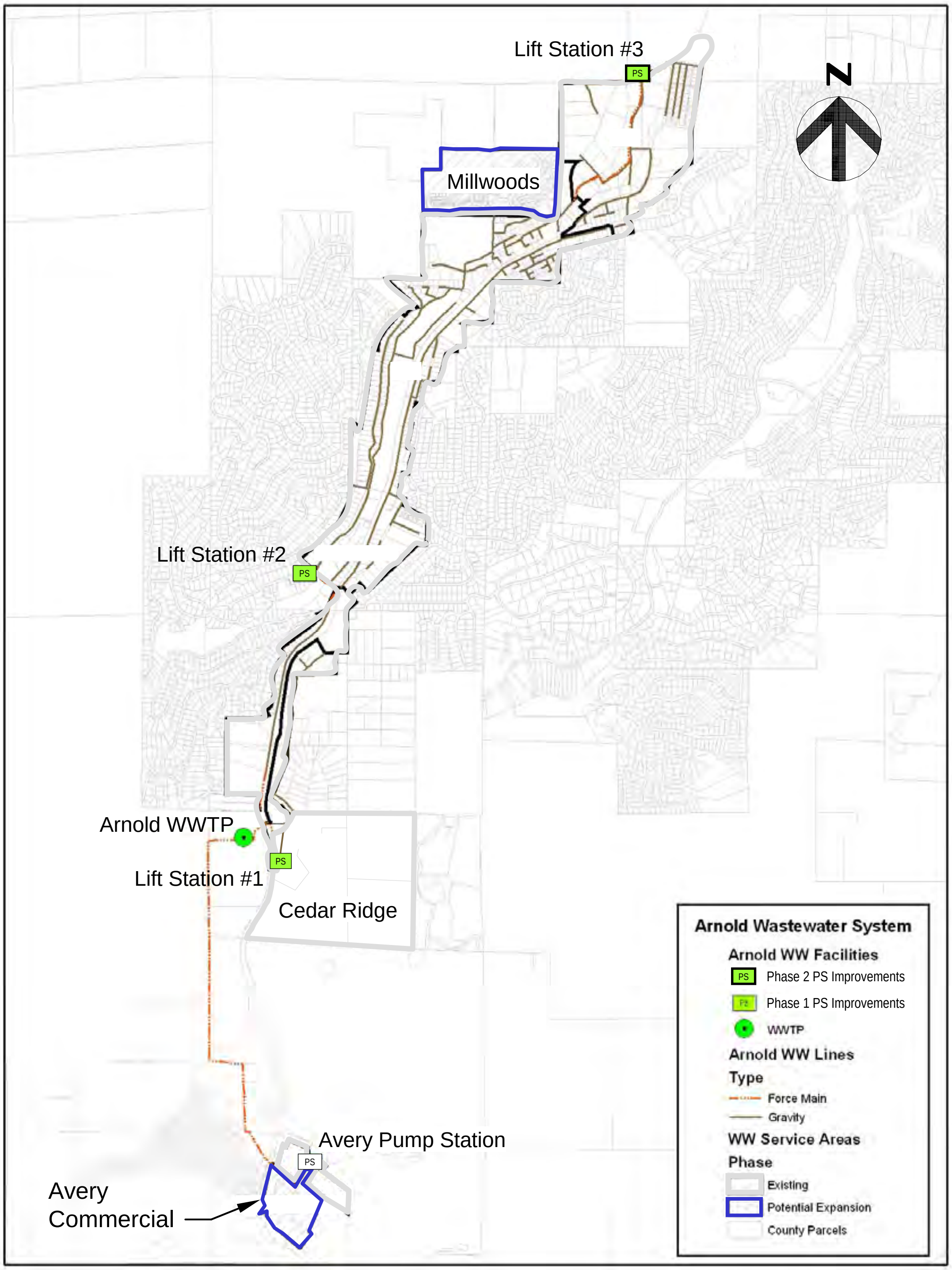
Table 19. Phase III Improvements (Base Scenario).

Cost Component	Estimated Costs ($)[a]
Collection System – Lift Station 3	125,000
Treatment Plant Expansion[b]	1,400,000
Subtotal A	1,525,000
Contingency (30 percent of Subtotal A)	460,000
Subtotal B[c]	1,985,000
Administration and Engineering (20 percent of Subtotal B)	395,000
Total Estimated Project Cost	2,380,000

a Estimated costs presented in 2004 US dollars.

b Treatment plant expansion includes headworks and septage receiving station, oxidation ditch, effluent pumping, disinfection, and aerobic digestion improvements.

c Estimate of probable construction cost.



Recommended Lift Station Improvements

HDR

Figure 6

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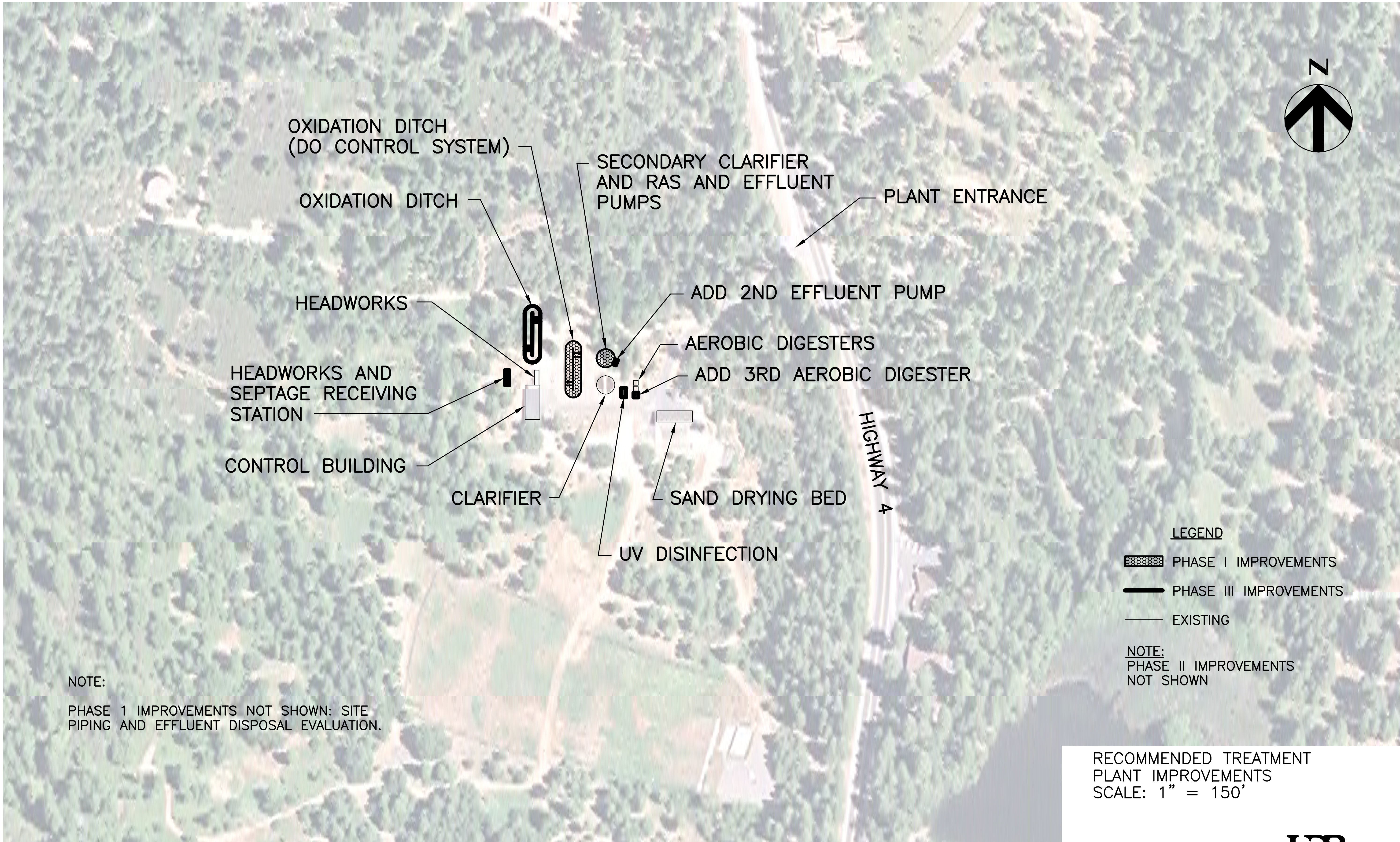

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RECOMMENDED TREATMENT
PLANT IMPROVEMENTS
SCALE: 1" = 150'

HDR

Figure 7

Appendix A. Waste Discharge Requirements.

Appendix A. Waste Discharge Requirements.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. 97-073

WASTE DISCHARGE REQUIREMENTS

FOR
CALAVERAS COUNTY WATER DISTRICT
ARNOLD WASTEWATER TREATMENT FACILITY
CALAVERAS COUNTY

The California Regional Water Quality Control Board, Central Valley Region, (hereafter Board) finds that:

1. Calaveras County Water District (hereafter Discharger) submitted a Report of Waste Discharge and a site evaluation report, dated 4 March 1997, for its wastewater treatment and disposal facility. The property, Assessor's Parcel No. 032-024-01, is owned by Calaveras County Water District.

2. Calaveras County Water District, Arnold Wastewater Treatment Facility is in Sections 6 & 7, T4N, R15E, MDB&M, with surface water drainage to the North Fork Stanislaus River via unnamed ephemeral stream, Mill Creek, and Hunter Reservoir as shown in Attachment A, which is attached hereto and part of the Order by reference. The site lies within the North Fork Stanislaus hydrologic unit/area/subarea No. 534.50, as depicted on interagency hydrologic maps prepared by the Department of Water Resources in August 1986.

3. Waste Discharge Requirements Order No. 85-015, adopted by the Board on 25 January 1985, prescribes requirements for a discharge from the Arnold Wastewater Treatment Facility to land.

4. Order No. 85-015 is neither adequate nor consistent with current plans and policies of the Board.

5. The Calaveras County Water District received a Clean Water Grant from the State Water Resources Control Board in 1984 to construct the Arnold Wastewater Treatment Facility.

6. Arnold Wastewater Treatment Facility is located four miles south of the community of Arnold. The treatment of domestic wastewater consists of an extended oxidation ditch (racetrack) followed by clarification, chlorination, sand filtrations, and holding tank. Additionally, two aerobic sludge digesters and two sludge drying beds are also incorporated into the facility. The treatment facility has a maximum design capacity of 0.170 million gallons per day (mgd) and the inflow presently averages 0.080 mgd. The source of the influent is primarily from domestic and light industries. The facility receives a small amount domestic wastewater from Avery Elementary School south of the facility.

7. The facility during the wet months utilizes 11 subsurface disposal beds. A single disposal bed is sized to accept up to 16,000 gallons per day (gpd) at a hydraulic loading rate of 1 gal/ft^2/day.

The disposal beds are rotated for efficiency. The disposal beds are frequently monitored through a flow meter at the storage tank and visually at observation ports for saturation. A pond in the higher elevation is also used during the dry months for storage of treated wastewater. Spray irrigation is utilized during the dry months for up to 25 acres of native grassland, shrubs, and trees. The sprinkler heads are observed weekly for clogging. Moreover, the subsurface disposal and spray irrigation are both used when conditions are acceptable. Potential impact of ground water is monitored through the three on-site wells.

8. The California Department of Health Services has established statewide reclamation criteria in Title 22, California Code of Regulations, Section 60301, et seq. (hereafter Title 22) for the use of reclaimed water has developed guidelines for specific uses. These uses are consistent with those guidelines.

9. The Board adopted a Water Quality Control Plan, Third Edition, for the Sacramento River Basin and the San Joaquin River Basin (hereafter Basin Plan), which contains water quality objectives for all waters of the Basin. These requirements implement the Basin Plan.

10. The beneficial uses of North Fork Stanislaus River are municipal, industrial, and agricultural supply; recreation; aesthetic enjoyment; navigation; fresh water replenishment; and preservation and enhancement of fish, wildlife, and other aquatic resources.

11. The beneficial uses of underlying ground water are domestic, industrial, and agricultural supply.

12. The action to revise waste discharge requirements for this facility is exempt from the provisions of the California Environmental Quality Act (CEQA), in accordance with Title 14, California Code of Regulations (CCR), Section 15301.

13. This discharge is exempt from the requirements of Title 23, CCR, Section 2510, et seq. (hereafter Chapter 15). The exemption, pursuant to Section 2511(b), is based on the following:

    a. The Board is issuing waste discharge requirements, and
    b. The discharge complies with the Basin Plan, and
    c. The wastewater does not need to be managed according to 22 CCR, Division 4.5, Chapter 11, as a hazardous waste.

14. The Board has notified the Discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for this discharge and has provided them with an opportunity for a public hearing and an opportunity to submit their written views and recommendations.

15. The Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED that Order No. 85-015 is rescinded and Calaveras County Water District, Arnold Wastewater Treatment Facility, its agents, successors, and assigns, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, shall comply with the following:

A. Discharge Prohibitions:

1. Discharge of wastes to surface waters or surface water drainage courses is prohibited.

2. Bypass or overflow of untreated or partially treated waste is prohibited.

3. Discharge of waste classified as 'hazardous' or 'designated', as defined in Sections 2521(a) and 2522(a) of Chapter 15, is prohibited.

B. Discharge Specifications:

1. The monthly average dry weather discharge flow shall not exceed 0.170 million gallons/day.

2. Objectionable odors originating at this facility shall not be perceivable beyond the limits of the wastewater treatment and disposal areas.

3. The treatment facilities shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency.

4. The following constituent limitations shall apply to wastewater discharge to land:

Constituents	Unit	Monthly Average	Monthly Maximum
BOD_5[1]	mg/l	40	80
Settleable Solids	ml/l	0.5	1.0

[1] 5-day, 20°C Biochemical Oxygen Demand

C. Reclamation Specifications:

1. Public contact with the reclaimed water shall be precluded through such means as fences, signs, and other acceptable alternatives.

2. Area irrigated with reclaimed water shall be managed to prevent breeding of mosquitos. More specifically,

   a. Tail water must be returned and all applied irrigation water must infiltrate completely within 48-hour period.

   b. Ditches not serving as wildlife habitat should be maintained free of emergent, marginal, and floating vegetation.

   c. Low-pressure and unpressurized pipelines and ditches accessible to mosquitos shall not be used to store reclaimed water

3. Reclaimed water for irrigation shall be managed to minimize erosion, runoff, and movement of aerosols from the disposal area.

4. Direct or windblown spray shall be confined to the designated reclamation area and prevent from contacting drinking water facilities.

5. The Discharger may not spray irrigate effluent during periods of precipitation and for at least 24 hours after cessation of precipitation, or when winds exceed 30 mph.

6. Application of reclaimed wastewater to the reclamation area shall be at reasonable rates considering the crop, soil, climate, and irrigation management system. The nutrient loading of the reclamation area, including the nutritive value of organic and chemical fertilizers and of the reclaimed water, shall not exceed the crop demand.

7. The effluent from the chlorination facility shall not exceed the following limits:

Constituent	Units	Monthly Average	Monthly Median	Daily Maximum
Total Coliform Organisms*	MPN/100 ml	----	23	240

* The limits are established under CCR, Title 22, Division 4, Chapter 3

8. There shall be no irrigation or impoundment of reclaimed water within 500 feet of any domestic water well or within 100 feet of any irrigation well unless it is demonstrated to the satisfaction of the Executive Officer that less distance is justified.

9. Storm water runoff from the irrigation field shall not be discharged to any surface water drainage course within 48-hours of the last application of reclaimed water.

D. Sludge Disposal:

1. Collected screenings, sludge, and other solids removed from liquid wastes shall be disposed of in a manner that is consistent with Chapter 15, Division 3, Title 23, of the California Code of Regulations and approved by the Executive Officer.

2. Any proposed change in sludge use or disposal practice from a previously approved practice shall be reported to the Executive Officer and U.S. Environmental Protection Agency (EPA) Regional Administrator at least 90 days in advance of the change.

3. Use and disposal of sewage shall comply with existing Federal and State laws and regulations, including permitting requirements and technical standards included in 40 CFR 503.

   If the State Water Resources Control Board and the Regional Water Quality Control Boards are given the authority to implement regulations contained in 40 CFR 503, this Order may be reopened to incorporate appropriate time schedules and technical standards. The Discharger must comply with the standards and time schedules contained in 40 CFR 503 whether or not they have been incorporated into this Order.

4. **Thirty days** after the adoption of this Order, the Discharger shall submit a sludge disposal plan describing the annual volume of sludge generated by the plant and specifying the disposal practices.

E. Ground Water Limitations:

The discharge shall not cause underlying ground water to:

1. Be degraded.

2. Contain chemicals, heavy metals, or trace elements in concentrations that adversely affect beneficial uses or exceed maximum contaminant levels specified in 22 CCR, Division 4, Chapter 15.

3. Exceed a most probable number of total coliform organisms of 2.2/100 ml over any seven-day period.

4. Exceed concentrations of radionuclides specified in 22 CCR, Division 4, Chapter 15.

5. Contain taste or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

6. Contain concentrations of chemical constituents in amounts that adversely affect agricultural use.

F. Provisions:

1. The Discharger shall comply with the Monitoring and Reporting Program No. 97-073, which is part of this Order, and any revisions thereto as ordered by the Executive Officer.

2. The Discharger shall comply with the "Standard Provisions and Reporting Requirements for Waste Discharge Requirements", dated 1 March 1991, which are attached hereto and by reference a part of this Order. This attachment and its individual paragraphs are commonly referenced as "Standard Provision(s)."

3. In the event of any change in control or ownership of land or waste discharge facilities described herein, the Discharger shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be immediately forwarded to this office.

4. At least **90 days** prior to termination or expiration of any lease, contract, or agreement involving disposal or reclamation areas or off-site reuse of effluent, used to justify the capacity authorized herein and assure compliance with this Order, the Discharger shall notify the Board in writing of the situation and of what measures have been taken or are being taken to assure full compliance with this Order.

5. The Discharger must comply with all conditions of this Order, including timely submittal of technical and monitoring reports as directed by the Executive Officer. Violations may result in enforcement action, including Regional Board or court orders requiring corrective action or imposing civil monetary liability, or in revision or rescission of this Order.

6. A copy of this Order shall be kept at the discharge facility for reference by operating personnel. Key operating personnel shall be familiar with its contents.

7. If reclaimed water is used for construction purposes, it shall comply with the most current edition of "Guidelines for Use of Reclaimed Water for Construction Purposes". Other uses of reclaimed water not specifically authorized herein shall be subject to the approval of the Executive Officer and shall comply with 22 CCR, Division 4.

8. The Board will review this Order periodically and will revise requirements when necessary.

I, JAMES R. BENNETT, Interim Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on 25 April 1997.

Thomas R Pinkos

for JAMES R. BENNETT, Interim Executive Officer

IK:ik

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. 97-073

FOR
CALAVERAS COUNTY WATER DISTRICT
ARNOLD WASTEWATER TREATMENT FACILITY
CALAVERAS COUNTY

INFLUENT MONITORING

Constituents	Units	Type of Sample	Sampling Frequency
Flow	mgd	Meter	Cumulative

EFFLUENT MONITORING

Effluent samples shall be collected just prior to discharge to the disposal facility. Effluent samples should be representative of the volume and nature of the discharge. Time of collection of a grab sample shall be recorded. Effluent monitoring shall include at least the following:

Constituents	Units	Type of Sample	Sampling Frequency
20°C BOD_5 [1]	mg/l	Grab	Monthly
Suspended Matter	mg/l	Grab	Monthly
Settleable Matter	ml/l	Grab	Monthly
Specific Conductivity	μmhos/cm	Grab	Monthly
pH	pH Units	Grab	Monthly
Total Coliform Organisms [2]	MPN/100 ml	Grab	Weekly [2]

[1] Biochemical Oxygen Demand, 5 days at 20°C
[2] Shall be monitored twice weekly when irrigating to golf course

3. If requested by staff, copies of laboratory analytical report(s); and

4. A calibration log verifying calibration of all monitoring instruments and devices used to fulfill the prescribed monitoring program.

B. Quarterly Monitoring Reports

Quarterly Monitoring Reports shall be submitted to the Regional Board by the **1st day of the second month** following the end of the quarter (i.e. the January-March quarterly report is due by May 1st). Monthly reports for the months of March, June, September, and December may be submitted as part of the Quarterly Monitoring Report, if desired. The Quarterly Report shall include the following:

1. A narrative description of all preparatory, monitoring, sampling, and analytical testing activities for the groundwater monitoring. The narrative shall be sufficiently detailed to verify compliance with the WDRs, this MRP, and the Standard Provisions and Reporting Requirements. The narrative shall be supported by field logs for each well documenting depth to groundwater; parameters measured before, during, and after purging; method of purging; calculation of the casing volume; and total volume of water purged.

2. Calculation of groundwater elevations, an assessment of the groundwater flow direction and gradient on the date of measurement, comparison to previous flow direction and gradient data, and discussion of seasonal trends, if any.

3. A narrative discussion of the analytical results for all media and locations monitored, including spatial and temporal trends, with reference to summary data tables, graphs, and appended analytical reports (as applicable).

4. A comparison of monitoring data to the discharge specifications, groundwater limitations and surface water limitations, and explanation of any violation of those requirements.

5. Summary data tables of historical and current water table elevations and analytical results.

6. A scaled map showing relevant structures and features of the facility, the locations of monitoring wells and other sampling stations, and groundwater elevation contours referenced to mean sea level datum.

7. Copies of laboratory analytical report(s).

C. Annual Report

An Annual Report shall be prepared as the fourth quarter monitoring report. The Annual Report will include all monitoring data required in the monthly/quarterly schedule. The Annual Report shall be submitted to the Regional Board by **1 February** each year. In addition to the data normally presented, the Annual Report shall include the following:

1. The contents of the regular Quarterly Monitoring Report for the last quarter of the year;

2. The results from annual monitoring of groundwater wells, water supply, and supplemental water supply;

3. If requested by staff, tabular and graphical summaries of all data collected during the year;

4. Data for monitoring and analysis performed on an annual basis (i.e., standard minerals and biosolids);

5. An evaluation of the performance of the wastewater treatment system, as well as a forecast of the flows anticipated in the next year;

6. An evaluation of the groundwater quality beneath the wastewater treatment facility;

7. A discussion of any data gaps and potential deficiencies/redundancies in the monitoring system or reporting program;

8. A discussion of compliance and the corrective actions taken, as well as any planned or proposed actions needed to bring the discharge into full compliance with the waste discharge requirements;

9. The results from any sludge monitoring required by the disposal facility;

10. Summary of information on the disposal of sludge and/or solid waste;

11. A forecast of influent flows, as described in Standard Provision No. E.4; and

12. A copy of the certification for each certified wastewater treatment plant operator working at the facility and a statement about whether the Discharger is in compliance with Title 23, CCR, Division 3, Chapter 26.

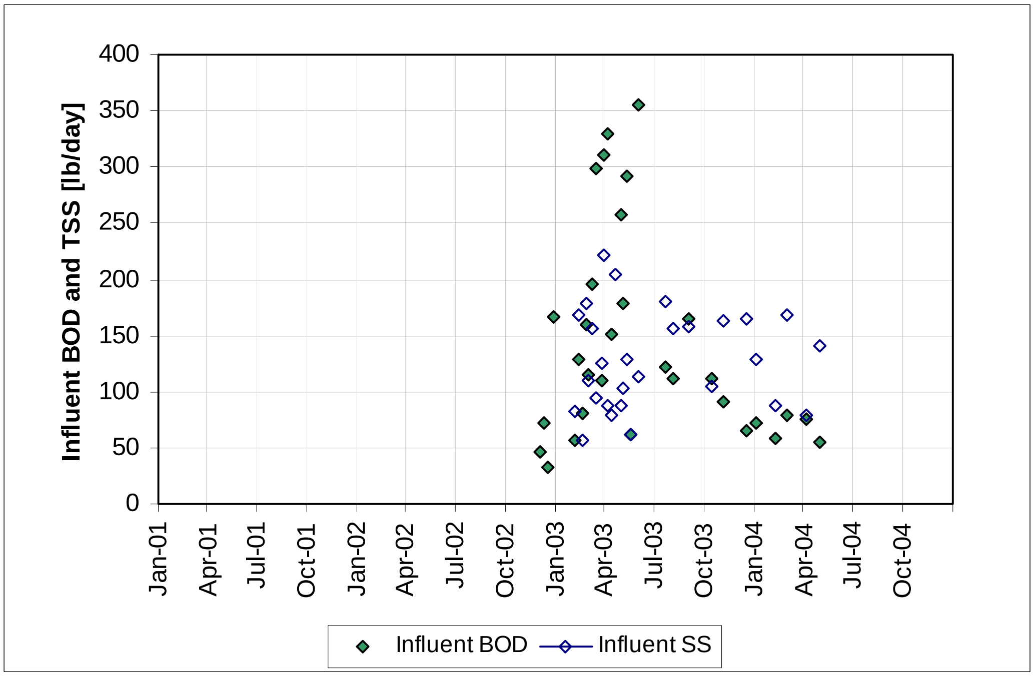
The Discharger shall implement the above monitoring program as of **1 March 2003**.

Ordered by: ______________________________
THOMAS R. PINKOS, Executive Officer

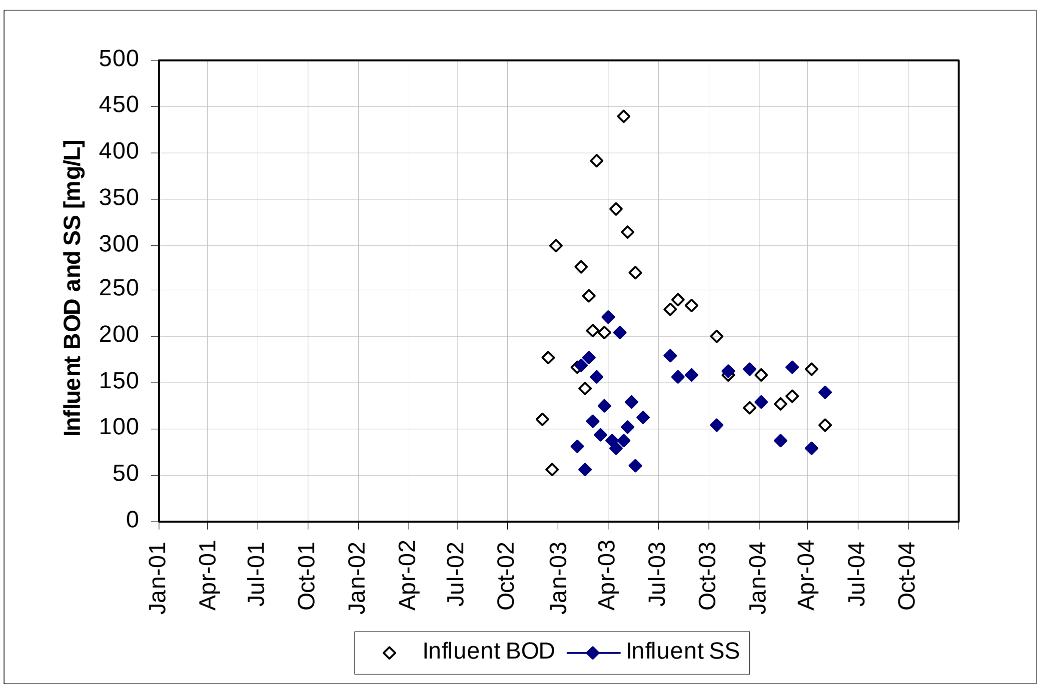
6 February 2003
(Date)

JSK: 2/6/03

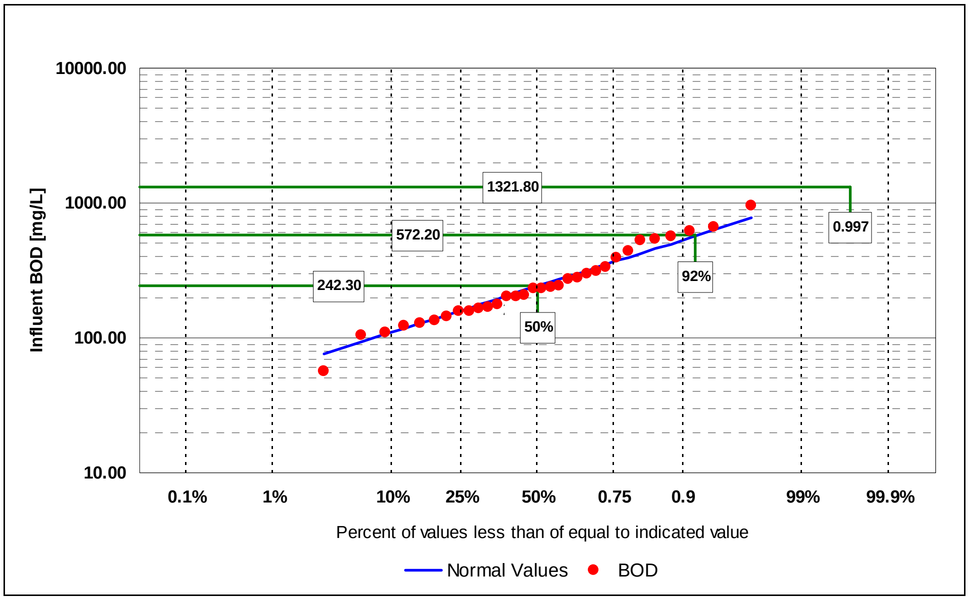
Appendix B. Probability Analysis of Historical Plant and Flow Data.

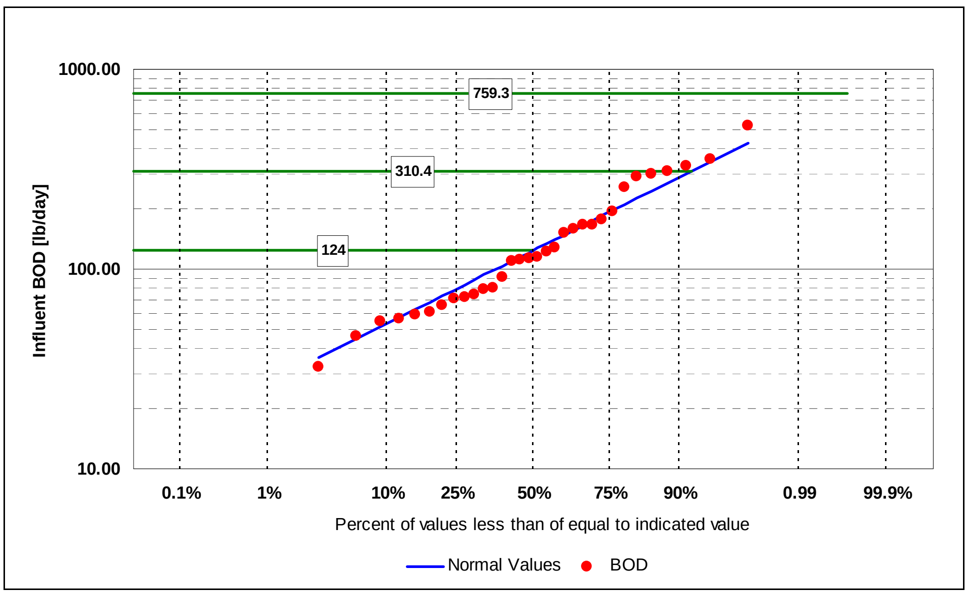


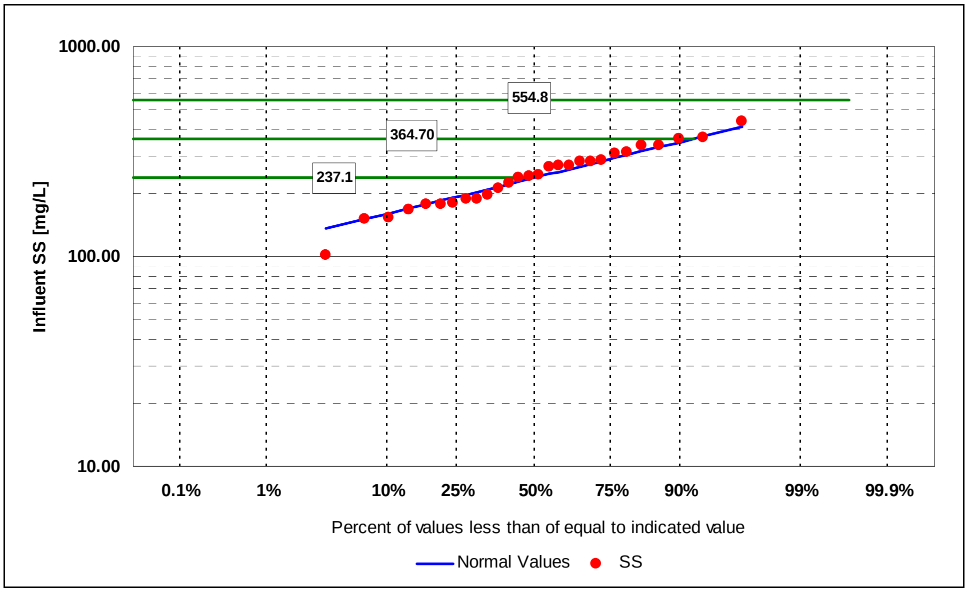
Influent BOD and TSS [lb/day]
400
350
300
250
200
150
100
50
0
Jan-01
Apr-01
Jul-01
Oct-01
Jan-02
Apr-02
Jul-02
Oct-02
Jan-03
Apr-03
Jul-03
Oct-03
Jan-04
Apr-04
Jul-04
Oct-04
Influent BOD
Influent SS



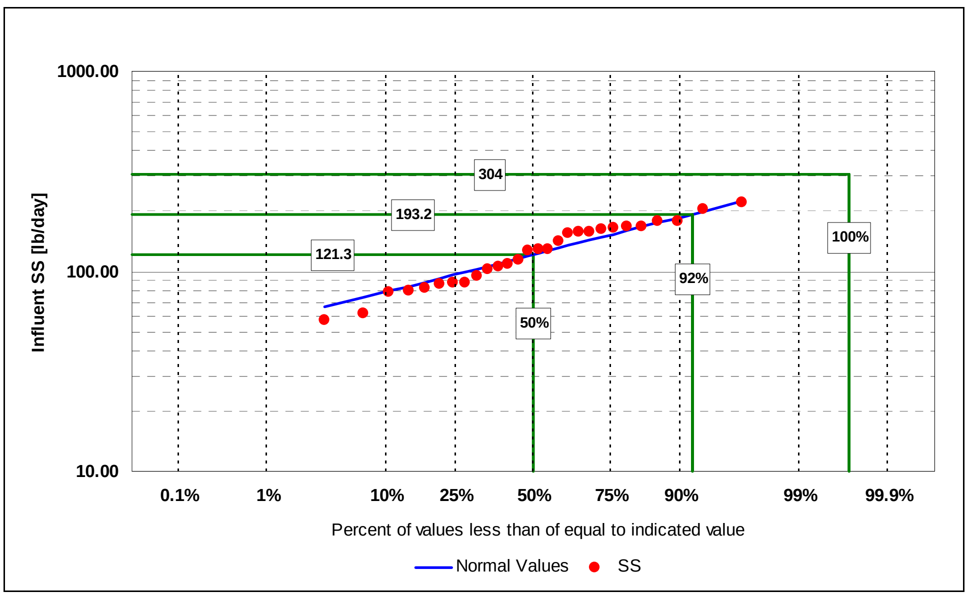
Influent BOD and SS [mg/L]
500
450
400
350
300
250
200
150
100
50
0
Jan-01
Apr-01
Jul-01
Oct-01
Jan-02
Apr-02
Jul-02
Oct-02
Jan-03
Apr-03
Jul-03
Oct-03
Jan-04
Apr-04
Jul-04
Oct-04
Influent BOD
Influent SS


10000.00
1000.00
100.00
10.00
Influent BOD [mg/L]
1321.80
572.20
242.30
0.997
92%
50%
0.1%
1%
10%
25%
50%
0.75
0.9
99%
99.9%
Percent of values less than of equal to indicated value
Normal Values
BOD

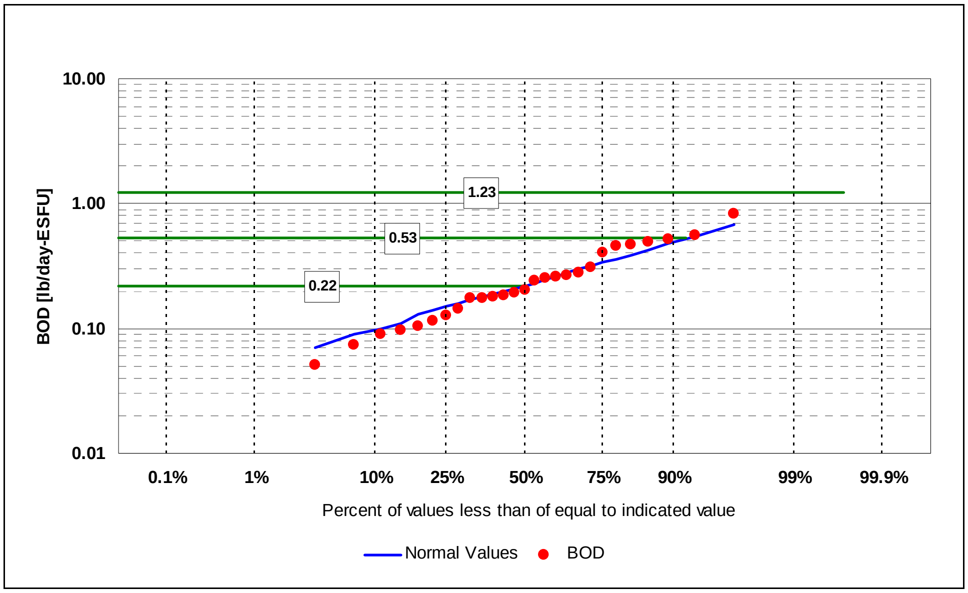

1000.00
100.00
10.00
Influent BOD [lb/day]
759.3
310.4
124
0.1%
1%
10%
25%
50%
75%
90%
0.99
99.9%
Percent of values less than of equal to indicated value
Normal Values
BOD

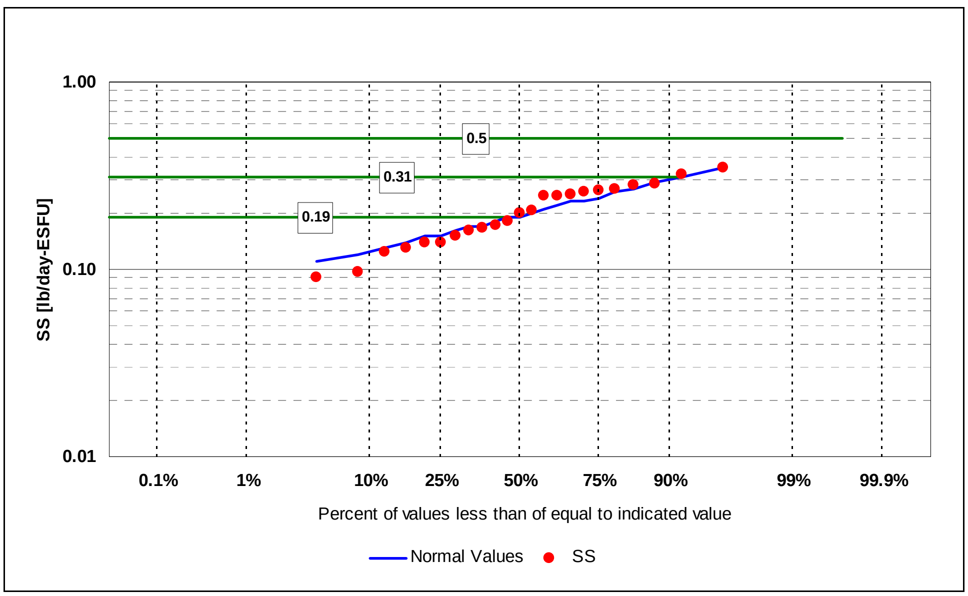


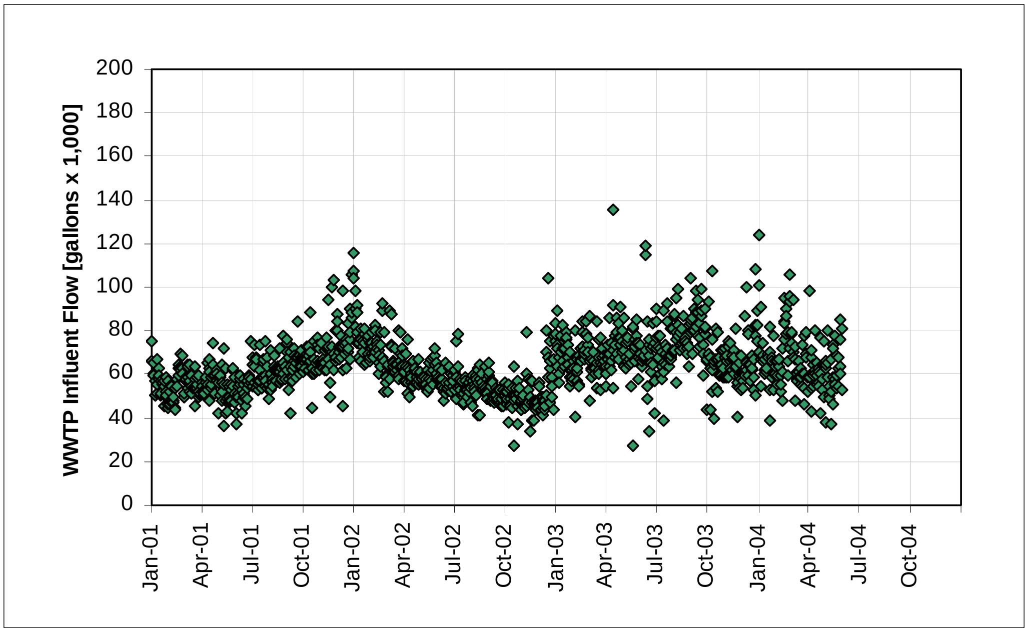
1000.00
100.00
10.00
Influent SS [mg/L]
554.8
364.70
237.1
0.1%
1%
10%
25%
50%
75%
90%
99%
99.9%
Percent of values less than of equal to indicated value
Normal Values
SS



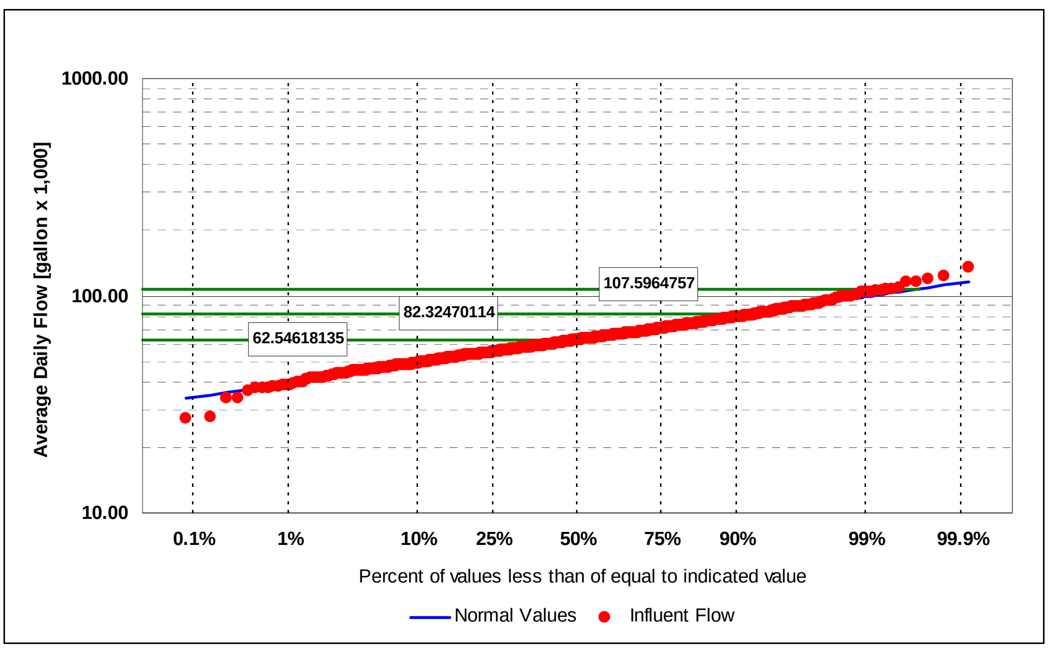
1000.00
100.00
10.00
Influent SS [lb/day]
304
193.2
121.3
100%
92%
50%
0.1%
1%
10%
25%
50%
75%
90%
99%
99.9%
Percent of values less than of equal to indicated value
Normal Values
SS


10.00
1.00
0.10
0.01
BOD [lb/day-ESFU]
1.23
0.53
0.22
0.1%
1%
10%
25%
50%
75%
90%
99%
99.9%
Percent of values less than of equal to indicated value
Normal Values
BOD


1.00
0.10
0.01
SS [lb/day-ESFU]
0.5
0.31
0.19
0.1%
1%
10%
25%
50%
75%
90%
99%
99.9%
Percent of values less than of equal to indicated value
Normal Values
SS



WWTP Influent Flow [gallons x 1,000]
200
180
160
140
120
100
80
60
40
20
0
Jan-01
Apr-01
Jul-01
Oct-01
Jan-02
Apr-02
Jul-02
Oct-02
Jan-03
Apr-03
Jul-03
Oct-03
Jan-04
Apr-04
Jul-04
Oct-04



Average Daily Flow [gallon x 1,000]
1000.00
100.00
10.00
107.5964757
82.32470114
62.54618135
0.1%
1%
10%
25%
50%
75%
90%
99%
99.9%
Percent of values less than of equal to indicated value
Normal Values
Influent Flow

Appendix C. Projected Flows and Loads.

Table C-1. Summary of Current and Buildout Wastewater Flows and Characteristics Base Scenario – Infill and Cedar Ridge

Parameter	Units	Wastewater Flows and Characteristics	
		Current (2004)	Buildout
Average Dry Weather Flow (ADWF)			
Connections	ESFUs	638	1,232
Unit Flow Factor	gpd per ESFU	118	195
Flow	gpd	75,284	240,240
Average Annual			
Flow Peaking Factor	ratio to ADWF	1.08	1.08
Flow	gpd	81,307	259,459
BOD per Capita	lb per ESFU	0.24	
BOD Load	lb BOD/d	153	
BOD Concentration (calculated value)	mg/L	226	226
TSS per Capita	lb per ESFU	0.20	
TSS Load	lb TSS/d	128	
TSS Concentration	mg/L	188	188
Peak Month			
I&I Rate	gallons per acre	56	56
Service Area	acres	360	740
I&I Flow Rate	gpd	20,160	41,440
Flow	gpd	95,444	281,680
BOD Peaking Factor	Ratio to Average Annual	2.0	
BOD Load	lb BOD/d	306	
BOD Concentration	mg/L	384	384
TSS Peaking Factor	Ratio to Average Annual	2.0	
TSS Load	lb TSS/d	256	
TSS Concentration	mg/L	322	322
Maximum Day			
Flow Peaking Factor	Ratio of Average Annual	1.72	1.5
Flow	Gpd	139,848	389,189
Peak Hour Flow			
Flow Peaking Factor	Ratio to Average Annual	3.0	3.0
Flow	Gpd	243,921	778,378

Table C-2. Summary of Current and Buildout Wastewater Flows and Characteristics
Scenario 1 – Infill, Cedar Ridge, and Millwooods

Parameter	Units	Wastewater Flows and Characteristics	
		Current (2004)	Buildout
Average Dry Weather Flow (ADWF)			
Connections	ESFUs	638	1,409
Unit Flow Factor	gpd per ESFU	118	195
Flow	Gpd	75,284	274,755
Average Annual			
Flow Peaking Factor	ratio to ADWF	1.08	1.08
Flow	Gpd	81,307	296,735
BOD per Capita	lb per ESFU	0.24	
BOD Load	lb BOD/d	153	
BOD Concentration (calculated value)	mg/L	226	226
TSS per Capita	lb per ESFU	0.20	
TSS Load	**lb TSS/d**	128	
TSS Concentration	mg/L	188	188
Peak Month			
I&I Rate	gallons per acre	56	56
Service Area	acres	360	818
I&I Flow Rate	gpd	20,160	45,808
Flow	**gpd**	95,444	320,563
BOD Peaking Factor	Ratio to Average Annual	2.0	
BOD Load	lb BOD/d	306	
BOD Concentration	mg/L	384	384
TSS Peaking Factor	Ratio to Average Annual	2.0	
TSS Load	**lb TSS/d**	256	
TSS Concentration	mg/L	322	322
Maximum Day			
Flow Peaking Factor	Ratio of Average Annual	1.72	1.5
Flow	gpd	139,848	445,103
Peak Hour Flow			
Flow Peaking Factor	Ratio to Average Annual	3.0	3.0
Flow	gpd	243,921	890,207

Table C-3. Summary of Current and Buildout Wastewater Flows and Characteristics Scenario 2 – Infill, Cedar Ridge, and Avery

Parameter	Units	Wastewater Flows and Characteristics	
		Current (2004)	Buildout
Average Dry Weather Flow (ADWF)			
Connections	ESFUs	638	1,254
Unit Flow Factor	gpd per ESFU	118	195
Flow	gpd	75,284	244,530
Average Annual			
Flow Peaking Factor	ratio to ADWF	1.08	1.08
Flow	gpd	81,307	264,092
BOD per Capita	lb per ESFU	0.24	
BOD Load	lb BOD/d	153	
BOD Concentration (calculated value)	mg/L	226	226
TSS per Capita	lb per ESFU	0.20	
TSS Load	**lb TSS/d**	128	
TSS Concentration	mg/L	188	188
Peak Month			
I&I Rate	gallons per acre	56	56
Service Area	acres	360	769
I&I Flow Rate	gpd	20,160	43,064
Flow	**gpd**	95,444	287,594
BOD Peaking Factor	Ratio to Average Annual	2.0	
BOD Load	lb BOD/d	306	
BOD Concentration	mg/L	384	384
TSS Peaking Factor	Ratio to Average Annual	2.0	
TSS Load	**lb TSS/d**	256	
TSS Concentration	mg/L	322	322
Maximum Day			
Flow Peaking Factor	Ratio of Average Annual	1.72	1.5
Flow	gpd	139,848	396,139
Peak Hour Flow			
Flow Peaking Factor	Ratio to Average Annual	3.0	3.0
Flow	gpd	243,921	792,278

Table C-4. Summary of Current and Buildout Wastewater Flows and Characteristics Scenario 3 – Infill, Cedar Ridge, Millwoods, and Avery

Parameter	Units	Wastewater Flows and Characteristics	
		Current (2004)	Buildout
Average Dry Weather Flow (ADWF)			
Connections	ESFUs	638	1,431
Unit Flow Factor	gpd per ESFU	118	195
Flow	gpd	75,284	279,045
Average Annual			
Flow Peaking Factor	ratio to ADWF	1.08	1.08
Flow	gpd	81,307	301,369
BOD per Capita	lb per ESFU	0.24	
BOD Load	lb BOD/d	153	
BOD Concentration (calculated value)	mg/L	226	226
TSS per Capita	lb per ESFU	0.20	
TSS Load	**lb TSS/d**	128	
TSS Concentration	mg/L	188	188
Peak Month			
I&I Rate	gallons per acre	56	56
Service Area	acres	360	847
I&I Flow Rate	gpd	20,160	47,432
Flow	**gpd**	95,444	326,477
BOD Peaking Factor	Ratio to Average Annual	2.0	
BOD Load	lb BOD/d	306	
BOD Concentration	mg/L	384	384
TSS Peaking Factor	Ratio to Average Annual	2.0	
TSS Load	**lb TSS/d**	256	
TSS Concentration	mg/L	322	322
Maximum Day			
Flow Peaking Factor	Ratio of Average Annual	1.72	1.5
Flow	gpd	139,848	452,053
Peak Hour Flow			
Flow Peaking Factor	Ratio to Average Annual	3.0	3.0
Flow	gpd	243,921	904,107

Appendix D. Mass Balance.

Appendix D. Mass Balance.

Summary Report For
Arnold WWTP
CCWD

by HDR Engineering, Inc.

January 26, 2005

Prepared By jleng

Process/Loading	Units	Current Average Dry Weather Flow (Curr	Current Average Annual (Current)	Current Peak Month (Current)	Current Maximum Day (Current)	Base Scenario Average Dry Weather Flow (Buil	Base Scenario Average Annual (Buildout)	Base Scenario Peak Month (Buildout)	Base Scenario Maximum Day (Buildout)
Influent									
Flow	mgd	7.50E-02	8.10E-02	9.52E-02	0.1393	0.2338	0.2525	0.2724	0.3788
Biochemical oxygen demand concentration	mg/L	240	227	386	263	240	137	253	182
Total suspended solids concentration	mg/L	230	189	323	220	230	114	211	152
Percentage of total solids consisiting of vol	%	80	80	80	80	80	80	80	80
Ammonia concentration	mg/L	25	25	25	25	25	25	25	25
Total Kjeldahl Nitrogen	mg/L	35	35	35	35	35	35	35	35
Phosphorous concentration	mg/L	15	15	15	15	15	15	15	15
Alkalinity concentration	mg/L	230	230	230	230	230	230	230	230
Mixing Unit									
Oxidation Ditch									
Flow to AS	mgd	8.34E-02	8.85E-02	0.1035	0.1477	0.2422	0.2603	0.2808	0.3872
BOD in feed	mg/L	230.8	221.4	369.8	262.7	246.6	146.8	260.7	193.2
BOD load	lb/d	160.5	163.5	319.4	323.6	498.1	318.7	610.4	623.7
TKN in feed	mg/L	33.66	33.86	34.93	34.87	35.46	34.9	35.53	35.38
TKN load	lb/d	23.41	25	30.16	42.94	71.62	75.74	83.18	114.2
Number of basins	none	1	1	1	1	1	1	1	1
Length	ft	180	180	180	180	180	180	180	180
Width	ft	12	12	12	12	12	12	12	12
Depth	ft	11	11	11	11	11	11	11	11
Liquid temperature	C	20	20	20	20	20	20	20	20
Oxygen field transfer efficiency as percent	%/ft	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Dissolved oxygen setpoint	mg/L	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Basin volume (Total)	Mgal	0.1777	0.1777	0.1777	0.1777	0.1777	0.1777	0.1777	0.1777
Sludge age (w/o clarifier)	days	25	25	25	25	25	25	25	25
Sludge age (w/ clarifier)	days	26.1	25.61	26.37	26.95	28.19	27.06	28.7	30.11
Hydraulic retention time	hr	51.15	48.18	41.2	28.88	17.61	16.39	15.19	11.02
MLSS	mg/L	1,348	1,275	2,467	2,513	4,148	2,505	4,710	4,842
F/M	lb BOD/lb VSS/d	8.34E-02	9.00E-02	9.09E-02	9.04E-02	8.41E-02	8.93E-02	9.10E-02	9.04E-02
Observed growth yield	lb VSS/lb BOD	0.4796	0.4443	0.4398	0.4423	0.4758	0.4481	0.4395	0.4423
Carb 02 required	lb O2/lb BOD	1.239	1.239	1.238	1.236	1.232	1.232	1.231	1.227
Total O2 required	lb O2/lb BOD	1.73	1.775	1.509	1.681	1.716	2.154	1.693	1.902
Oxygen uptake rate	mg/L/h	7.805	8.157	13.54	15.29	24.02	19.3	29.05	33.35
Diurnal OUR peak	mg/L/h	10.54	11.01	18.29	20.64	32.43	26.05	39.21	45.02
Oxygen required	lb/d	277.7	290.2	481.8	543.9	854.5	686.4	1,033	1,186
SOTE	%	15	15	15	15	15	15	15	15
Average required blower capacity	SCFM	2.109	2.205	3.661	4.132	6.492	5.215	7.85	9.013
Average blower energy	hp	0.1004	0.105	0.1743	0.1968	0.3091	0.2483	0.3738	0.4292
Diurnal peak blower capacity	SCFM	2.848	2.976	4.942	5.578	8.764	7.04	10.6	12.17
Peak blower energy	hp	0.1356	0.1417	0.2353	0.2656	0.4173	0.3353	0.5047	0.5794
Nitrogen in VSS	g N/g VSS	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02
Secondary Clarifier									
Number of secondary clarifiers	none	1	1	1	1	1	1	1	1
Diameter	ft	26	26	26	26	26	26	26	26
Depth	ft	10	10	10	10	10	10	10	10
TSS concentration in liquid effluent stream	mg/L	30	30	30	30	30	30	30	30
Maximum MLSS	mg/L	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Clarifier area (Total)	sq ft	530.9	530.9	530.9	530.9	530.9	530.9	530.9	530.9
Clarifier volume (Total)	cu ft	5,309	5,309	5,309	5,309	5,309	5,309	5,309	5,309
Hydraulic surface loading rate	gpd/sq ft	149.6	164.7	187.6	270.8	448.8	486.8	521.6	722
Solids loading rate	lb/sq ft/d	3.972	2.084	9.027	13.11	35.51	13.83	46.74	66.25
Solids loading rate at set MLSS	lb/sq ft/d	3.972	2.084	9.027	13.11	35.51	13.83	46.74	66.25
Weir loading (single side)	gpd/ft	972.2	1,070	1,219	1,760	2,917	3,164	3,390	4,693
HRT (w/ recycle)	hr	5.079	9.162	4.091	2.869	1.749	2.713	1.509	1.094
HRT (w/o recycle)	hr	12	10.9	9.569	6.629	4	3.688	3.442	2.487
RAS concentration	mg/L	2,314	7,829	4,287	4,406	7,350	9,390	8,363	8,623
Max SVI allowed	mL/g	432.1	127.7	233.3	226.9	136.1	106.5	119.6	116
Filter									
Number of filtration units	none	2	2	2	2	2	2	2	2
Surface area per unit	sq ft	16	16	16	16	16	16	16	16
Depth	in	36	36	36	36	36	36	36	36
Filter run time	hr	24	24	24	24	24	24	24	24
Backwash rate	gpm/sq ft	15	15	15	15	15	15	15	15
Backwash duration	min	15	15	15	15	15	15	15	15
Area (total)	sq ft	32	32	32	32	32	32	32	32
Flow into filter	mgd	7.94E-02	8.74E-02	9.96E-02	0.1438	0.2383	0.2584	0.2769	0.3833
Hydraulic Loading (avg)	gpm/sq ft	1.723	1.897	2.162	3.12	5.171	5.608	6.009	8.318
Hydraulic Loading (1 off line)	gpm/sq ft	3.447	3.794	4.323	6.24	10.34	11.22	12.02	16.64
Solids loading	lb/sq ft/d	0.6209	0.6835	0.7788	1.124	1.863	2.021	2.165	2.997
Backwash Flow (avg)	gpm	5	5	5	5	5	5	5	5
Backwash Flow (instantaneous)	gpm	480	480	480	480	480	480	480	480
Effluent									
RAS Split									
Return activated sludge rate as a percenta	%	125	17.5	125	125	125	35	125	125
RAS stream	mgd	0.1042	1.55E-02	0.1294	0.1846	0.3027	9.11E-02	0.3509	0.4839
WAS stream	mgd	3.99E-03	1.11E-03	3.93E-03	3.90E-03	3.87E-03	1.82E-03	3.85E-03	3.84E-03
Aerobic Digester									
Number of digesters	none	2	2	2	2	2	2	2	2
Diameter	ft	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4
Depth	ft	10	10	10	10	10	10	10	10

Process/Loading	Units	Average Dry Weather Flow (Curr	Average Annual (Current)	Peak Month (Current)	Maximum Day (Current)	Average Dry Weather Flow (Buil	Average Annual (Buildout)	Peak Month (Buildout)	Maximum Day (Buildout)
Digester volume (total)	1000 cu ft	2.415	2.415	2.415	2.415	2.415	2.415	2.415	2.415
Percentage of VSS destroyed during diges	%	45	45	45	45	45	45	45	45
Precent NH4 in VSS	%	9	9	9	9	9	9	9	9
Precent phosphate in VSS	%	2	2	2	2	2	2	2	2
Supernatant flow as a percentage of influe	%	30	30	30	30	30	30	30	30
Detention time	days	4.529	16.24	4.598	4.639	4.673	9.908	4.697	4.71
Flow to disgester	mgd	-	-	-	-	-	-	-	-
VSS in inflow	lb VSS/d	-	-	-	-	-	-	-	-
TSS in inflow	lb TSS/d	3.99E-03	1.11E-03	3.93E-03	3.90E-03	3.87E-03	1.82E-03	3.85E-03	3.84E-03
VSS in outflow	lb VSS/d	74.18	69.85	134.9	137.5	228.3	137.3	257.7	265.1
TSS in outflow	lb TSS/d	76.99	72.69	140.4	143.1	237	142.8	268.2	275.8
Inflow TSS concentration	%	40	38.19	73.38	74.84	124.8	75.16	140.9	145
Outflow TSS concentration	%	40.81	40.48	76.97	78.51	131.5	79.77	149.6	153.9
Sludge Drying Beds									
Flow	gpm	1.939	0.5407	1.91	1.893	1.879	0.8864	1.87	1.865
BOD loading	lb/d	3.493	0.9741	3.441	3.41	3.386	1.597	3.368	3.359
TSS loading	lb/d	40.81	40.48	76.97	78.51	131.5	79.77	149.6	153.9

Process/Loading	Units	Current Average Dry Weather Flow (Curr	Current Average Annual (Current)	Current Peak Month (Current)	Current Maximum Day (Current)	Scenario 1 Average Dry Weather Flow (Buil	Scenario 1 Average Annual (Buildout)	Scenario 1 Peak Month (Buildout)	Scenario 1 Maximum Day (Buildout)
Influent									
Flow	mgd	7.50E-02	8.10E-02	9.52E-02	0.1393	0.2683	0.2898	0.3114	0.4347
Biochemical oxygen demand concentration	mg/L	240	227	386	263	240	137	253	182
Total suspended solids concentration	mg/L	230	189	323	220	230	114	211	152
Percentage of total solids consisiting of vol	%	80	80	80	80	80	80	80	80
Ammonia concentration	mg/L	25	25	25	25	25	25	25	25
Total Kjeldahl Nitrogen	mg/L	35	35	35	35	35	35	35	35
Phosphorous concentration	mg/L	15	15	15	15	15	15	15	15
Alkalinity concentration	mg/L	230	230	230	230	230	230	230	230
Mixing Unit									
Oxidation Ditch									
Flow to AS	mgd	8.34E-02	8.85E-02	0.1035	0.1477	0.2767	0.2975	0.3198	0.443
BOD in feed	mg/L	230.8	221.4	369.8	262.7	247.9	147.5	261.9	194
BOD load	lb/d	160.5	163.5	319.4	323.6	571.9	365.9	698.4	716.7
TKN in feed	mg/L	33.65	33.86	34.93	34.87	35.58	35.01	35.63	35.46
TKN load	lb/d	23.4	25	30.16	42.94	82.09	86.87	95.03	131
Number of basins	none	1	1	1	1	1	1	1	1
Length	ft	180	180	180	180	180	180	180	180
Width	ft	12	12	12	12	12	12	12	12
Depth	ft	11	11	11	11	11	11	11	11
Liquid temperature	C	20	20	20	20	20	20	20	20
Oxygen field transfer efficiency as percent	%/ft	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Dissolved oxygen setpoint	mg/L	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Basin volume (Total)	Mgal	0.1777	0.1777	0.1777	0.1777	0.1777	0.1777	0.1777	0.1777
Sludge age (w/o clarifier)	days	25	25	25	25	25	25	25	25
Sludge age (w/ clarifier)	days	26.1	25.61	26.37	26.95	28.65	27.35	29.22	30.84
Hydraulic retention time	hr	51.15	48.18	41.2	28.88	15.42	14.34	13.34	9.628
MLSS	mg/L	1,348	1,275	2,467	2,513	4,757	2,873	5,382	5,552
F/M	lb BOD/lb VSS/d	8.34E-02	9.00E-02	9.09E-02	9.04E-02	8.42E-02	8.94E-02	9.11E-02	9.06E-02
Observed growth yield	lb VSS/lb BOD	0.4796	0.4443	0.4398	0.4423	0.4752	0.4474	0.4389	0.4414
Carb 02 required	lb O2/lb BOD	1.239	1.239	1.238	1.236	1.231	1.23	1.229	1.224
Total O2 required	lb O2/lb BOD	1.73	1.775	1.509	1.681	1.713	2.152	1.691	1.899
Oxygen uptake rate	mg/L/h	7.804	8.157	13.54	15.29	27.54	22.13	33.19	38.25
Diurnal OUR peak	mg/L/h	10.54	11.01	18.29	20.64	37.19	29.88	44.81	51.64
Oxygen required	lb/d	277.6	290.2	481.8	543.9	979.9	787.3	1,181	1,361
SOTE	%	15	15	15	15	15	15	15	15
Average required blower capacity	SCFM	2.109	2.205	3.661	4.132	7.444	5.981	8.97	10.34
Average blower energy	hp	0.1004	0.105	0.1743	0.1968	0.3545	0.2848	0.4272	0.4923
Diurnal peak blower capacity	SCFM	2.847	2.976	4.942	5.578	10.05	8.075	12.11	13.96
Peak blower energy	hp	0.1356	0.1417	0.2353	0.2656	0.4786	0.3845	0.5767	0.6645
Nitrogen in VSS	g N/g VSS	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02
Secondary Clarifier									
Number of secondary clarifiers	none	1	1	1	1	1	1	1	1
Diameter	ft	26	26	26	26	26	26	26	26
Depth	ft	10	10	10	10	10	10	10	10
TSS concentration in liquid effluent stream	mg/L	30	30	30	30	30	30	30	30
Maximum MLSS	mg/L	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Clarifier area (Total)	sq ft	530.9	530.9	530.9	530.9	530.9	530.9	530.9	530.9
Clarifier volume (Total)	cu ft	5,309	5,309	5,309	5,309	5,309	5,309	5,309	5,309
Hydraulic surface loading rate	gpd/sq ft	149.6	164.7	187.6	270.8	513.9	557	595.1	827.2
Solids loading rate	lb/sq ft/d	3.972	2.084	9.027	13.11	46.52	18.12	60.83	86.94
Solids loading rate at set MLSS	lb/sq ft/d	3.972	2.084	9.027	13.11	46.52	18.12	60.83	86.94
Weir loading (single side)	gpd/ft	972.2	1,070	1,219	1,760	3,340	3,620	3,868	5,377
HRT (w/ recycle)	hr	5.079	9.162	4.091	2.869	1.531	2.373	1.325	0.9562
HRT (w/o recycle)	hr	12	10.9	9.569	6.629	3.494	3.223	3.017	2.17
RAS concentration	mg/L	2,314	7,829	4,287	4,406	8,445	10,810	9,571	9,902
Max SVI allowed	mL/g	432.1	127.7	233.3	226.9	118.4	92.54	104.5	101
Filter									
Number of filtration units	none	2	2	2	2	2	2	2	2
Surface area per unit	sq ft	16	16	16	16	16	16	16	16
Depth	in	36	36	36	36	36	36	36	36
Filter run time	hr	24	24	24	24	24	24	24	24
Backwash rate	gpm/sq ft	15	15	15	15	15	15	15	15
Backwash duration	min	15	15	15	15	15	15	15	15
Area (total)	sq ft	32	32	32	32	32	32	32	32
Flow into filter	mgd	7.94E-02	8.74E-02	9.96E-02	0.1438	0.2728	0.2957	0.316	0.4392
Hydraulic Loading (avg)	gpm/sq ft	1.723	1.897	2.162	3.12	5.921	6.417	6.857	9.531
Hydraulic Loading (1 off line)	gpm/sq ft	3.447	3.794	4.323	6.24	11.84	12.83	13.71	19.06
Solids loading	lb/sq ft/d	0.6209	0.6835	0.7788	1.124	2.133	2.312	2.47	3.434
Backwash Flow (avg)	gpm	5	5	5	5	5	5	5	5
Backwash Flow (instantaneous)	gpm	480	480	480	480	480	480	480	480
Effluent									
RAS Split									
Return activated sludge rate as a percenta	%	125	17.5	125	125	125	35	125	125
RAS stream	mgd	0.1042	1.55E-02	0.1294	0.1846	0.3458	0.1041	0.3997	0.5538
WAS stream	mgd	3.99E-03	1.11E-03	3.93E-03	3.90E-03	3.86E-03	1.82E-03	3.84E-03	3.83E-03
Aerobic Digester									
Number of digesters	none	2	2	2	2	2	2	2	2
Diameter	ft	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4
Depth	ft	10	10	10	10	10	10	10	10

Process/Loading	Units	Average Dry Weather Flow (Curr	Average Annual (Current)	Peak Month (Current)	Maximum Day (Current)	Average Dry Weather Flow (Buil	Average Annual (Buildout)	Peak Month (Buildout)	Maximum Day (Buildout)
Digester volume (total)	1000 cu ft	2.415	2.415	2.415	2.415	2.415	2.415	2.415	2.415
Percentage of VSS destroyed during diges	%	45	45	45	45	45	45	45	45
Precent NH4 in VSS	%	9	9	9	9	9	9	9	9
Precent phosphate in VSS	%	2	2	2	2	2	2	2	2
Supernatant flow as a percentage of influer	%	30	30	30	30	30	30	30	30
Detention time	days	4.529	16.24	4.598	4.639	4.682	9.944	4.705	4.716
Flow to disgester	mgd	-	-	-	-	-	-	-	-
VSS in inflow	lb VSS/d	-	-	-	-	-	-	-	-
TSS in inflow	lb TSS/d	3.99E-03	1.11E-03	3.93E-03	3.90E-03	3.86E-03	1.82E-03	3.84E-03	3.83E-03
VSS in outflow	lb VSS/d	74.18	69.85	134.9	137.5	261.8	157.4	294.4	304
TSS in outflow	lb TSS/d	76.99	72.69	140.4	143.1	271.7	163.8	305.5	316.3
Inflow TSS concentration	%	40	38.19	73.38	74.84	143.2	86.23	161.2	166.4
Outflow TSS concentration	%	40.81	40.48	76.97	78.51	151.2	91.65	171.3	176.8
Sludge Drying Beds									
Flow	gpm	1.939	0.5407	1.91	1.893	1.876	0.8831	1.867	1.862
BOD loading	lb/d	3.493	0.9741	3.441	3.41	3.379	1.591	3.363	3.355
TSS loading	lb/d	40.81	40.48	76.97	78.51	151.2	91.65	171.3	176.8

Process/Loading	Units	Current Average Dry Weather Flow (Curr	Current Average Annual (Current)	Current Peak Month (Current)	Current Maximum Day (Current)	Scenario 2 Average Dry Weather Flow (Buil	Scenario 2 Average Annual (Buildout)	Scenario 2 Peak Month (Buildout)	Scenario 2 Maximum Day (Buildout)
Influent									
Flow	mgd	7.50E-02	8.10E-02	9.52E-02	0.1393	0.2381	0.2571	0.2834	0.3857
Biochemical oxygen demand concentration	mg/L	240	227	386	263	240	137	253	182
Total suspended solids concentration	mg/L	230	189	323	220	230	114	211	152
Percentage of total solids consisiting of vol	%	80	80	80	80	80	80	80	80
Ammonia concentration	mg/L	25	25	25	25	25	25	25	25
Total Kjeldahl Nitrogen	mg/L	35	35	35	35	35	35	35	35
Phosphorous concentration	mg/L	15	15	15	15	15	15	15	15
Alkalinity concentration	mg/L	230	230	230	230	230	230	230	230
Mixing Unit									
Oxidation Ditch									
Flow to AS	mgd	8.34E-02	8.85E-02	0.1035	0.1477	0.2465	0.2649	0.2918	0.3941
BOD in feed	mg/L	230.8	221.4	369.8	262.7	246.8	146.9	261	193.3
BOD load	lb/d	160.5	163.5	319.4	323.6	507.3	324.5	635.2	635.2
TKN in feed	mg/L	33.65	33.86	34.93	34.87	35.48	34.91	35.56	35.39
TKN load	lb/d	23.41	25	30.16	42.94	72.92	77.13	86.52	116.3
Number of basins	none	1	1	1	1	1	1	1	1
Length	ft	180	180	180	180	180	180	180	180
Width	ft	12	12	12	12	12	12	12	12
Depth	ft	11	11	11	11	11	11	11	11
Liquid temperature	C	20	20	20	20	20	20	20	20
Oxygen field transfer efficiency as percent	%/ft	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Dissolved oxygen setpoint	mg/L	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Basin volume (Total)	Mgal	0.1777	0.1777	0.1777	0.1777	0.1777	0.1777	0.1777	0.1777
Sludge age (w/o clarifier)	days	25	25	25	25	25	25	25	25
Sludge age (w/ clarifier)	days	26.1	25.61	26.37	26.95	28.25	27.1	28.85	30.2
Hydraulic retention time	hr	51.15	48.18	41.2	28.88	17.31	16.1	14.62	10.82
MLSS	mg/L	1,348	1,275	2,467	2,513	4,224	2,551	4,900	4,930
F/M	lb BOD/lb VSS/d	8.34E-02	9.00E-02	9.09E-02	9.04E-02	8.41E-02	8.93E-02	9.10E-02	9.05E-02
Observed growth yield	lb VSS/lb BOD	0.4796	0.4443	0.4398	0.4423	0.4757	0.448	0.4394	0.4422
Carb 02 required	lb O2/lb BOD	1.239	1.239	1.238	1.236	1.232	1.231	1.23	1.226
Total O2 required	lb O2/lb BOD	1.73	1.775	1.509	1.681	1.715	2.154	1.692	1.902
Oxygen uptake rate	mg/L/h	7.805	8.157	13.54	15.29	24.46	19.65	30.22	33.95
Diurnal OUR peak	mg/L/h	10.54	11.01	18.29	20.64	33.02	26.53	40.79	45.84
Oxygen required	lb/d	277.6	290.2	481.8	543.9	870.1	699	1,075	1,208
SOTE	%	15	15	15	15	15	15	15	15
Average required blower capacity	SCFM	2.109	2.205	3.661	4.132	6.61	5.31	8.166	9.177
Average blower energy	hp	0.1004	0.105	0.1743	0.1968	0.3148	0.2529	0.3889	0.437
Diurnal peak blower capacity	SCFM	2.848	2.976	4.942	5.578	8.924	7.169	11.02	12.39
Peak blower energy	hp	0.1356	0.1417	0.2353	0.2656	0.4249	0.3414	0.525	0.5899
Nitrogen in VSS	g N/g VSS	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02
Secondary Clarifier									
Number of secondary clarifiers	none	1	1	1	1	1	1	1	1
Diameter	ft	26	26	26	26	26	26	26	26
Depth	ft	10	10	10	10	10	10	10	10
TSS concentration in liquid effluent stream	mg/L	30	30	30	30	30	30	30	30
Maximum MLSS	mg/L	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Clarifier area (Total)	sq ft	530.9	530.9	530.9	530.9	530.9	530.9	530.9	530.9
Clarifier volume (Total)	cu ft	5,309	5,309	5,309	5,309	5,309	5,309	5,309	5,309
Hydraulic surface loading rate	gpd/sq ft	149.6	164.7	187.6	270.8	456.9	495.5	542.3	735
Solids loading rate	lb/sq ft/d	3.972	2.084	9.027	13.11	36.8	14.33	50.53	68.66
Solids loading rate at set MLSS	lb/sq ft/d	3.972	2.084	9.027	13.11	36.8	14.33	50.53	68.66
Weir loading (single side)	gpd/ft	972.2	1,070	1,219	1,760	2,970	3,221	3,525	4,777
HRT (w/ recycle)	hr	5.079	9.162	4.091	2.869	1.719	2.665	1.452	1.075
HRT (w/o recycle)	hr	12	10.9	9.569	6.629	3.929	3.623	3.31	2.442
RAS concentration	mg/L	2,314	7,829	4,287	4,406	7,486	9,566	8,704	8,781
Max SVI allowed	mL/g	432.1	127.7	233.3	226.9	133.6	104.5	114.9	113.9
Filter									
Number of filtration units	none	2	2	2	2	2	2	2	2
Surface area per unit	sq ft	16	16	16	16	16	16	16	16
Depth	in	36	36	36	36	36	36	36	36
Filter run time	hr	24	24	24	24	24	24	24	24
Backwash rate	gpm/sq ft	15	15	15	15	15	15	15	15
Backwash duration	min	15	15	15	15	15	15	15	15
Area (total)	sq ft	32	32	32	32	32	32	32	32
Flow into filter	mgd	7.94E-02	8.74E-02	9.96E-02	0.1438	0.2426	0.2631	0.2879	0.3902
Hydraulic Loading (avg)	gpm/sq ft	1.723	1.897	2.162	3.12	5.265	5.709	6.248	8.468
Hydraulic Loading (1 off line)	gpm/sq ft	3.447	3.794	4.323	6.24	10.53	11.42	12.5	16.94
Solids loading	lb/sq ft/d	0.6209	0.6835	0.7788	1.124	1.897	2.057	2.251	3.051
Backwash Flow (avg)	gpm	5	5	5	5	5	5	5	5
Backwash Flow (instantaneous)	gpm	480	480	480	480	480	480	480	480
Effluent									
RAS Split									
Return activated sludge rate as a percenta	%	125	17.5	125	125	125	35	125	125
RAS stream	mgd	0.1042	1.55E-02	0.1294	0.1846	0.3081	9.27E-02	0.3647	0.4926
WAS stream	mgd	3.99E-03	1.11E-03	3.93E-03	3.90E-03	3.87E-03	1.82E-03	3.84E-03	3.84E-03
Aerobic Digester									
Number of digesters	none	2	2	2	2	2	2	2	2
Diameter	ft	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4
Depth	ft	10	10	10	10	10	10	10	10

Process/Loading	Units	Average Dry Weather Flow (Curr	Average Annual (Current)	Peak Month (Current)	Maximum Day (Current)	Average Dry Weather Flow (Buil	Average Annual (Buildout)	Peak Month (Buildout)	Maximum Day (Buildout)
Digester volume (total)	1000 cu ft	2.415	2.415	2.415	2.415	2.415	2.415	2.415	2.415
Percentage of VSS destroyed during diges	%	45	45	45	45	45	45	45	45
Precent NH4 in VSS	%	9	9	9	9	9	9	9	9
Precent phosphate in VSS	%	2	2	2	2	2	2	2	2
Supernatant flow as a percentage of influer	%	30	30	30	30	30	30	30	30
Detention time	days	4.529	16.24	4.598	4.639	4.674	9.913	4.699	4.71
Flow to disgester	mgd	-	-	-	-	-	-	-	-
VSS in inflow	lb VSS/d	-	-	-	-	-	-	-	-
TSS in inflow	lb TSS/d	3.99E-03	1.11E-03	3.93E-03	3.90E-03	3.87E-03	1.82E-03	3.84E-03	3.84E-03
VSS in outflow	lb VSS/d	74.18	69.85	134.9	137.5	232.5	139.8	268	269.9
TSS in outflow	lb TSS/d	76.99	72.69	140.4	143.1	241.3	145.4	279	280.8
Inflow TSS concentration	%	40	38.19	73.38	74.84	127.1	76.54	146.6	147.7
Outflow TSS concentration	%	40.81	40.48	76.97	78.51	134	81.25	155.7	156.7
Sludge Drying Beds									
Flow	gpm	1.939	0.5407	1.91	1.893	1.879	0.8859	1.869	1.864
BOD loading	lb/d	3.493	0.9741	3.441	3.41	3.385	1.596	3.367	3.359
TSS loading	lb/d	40.81	40.48	76.97	78.51	134	81.25	155.7	156.7

Process/Loading	Units	Current Average Dry Weather Flow (Curr	Current Average Annual (Current)	Current Peak Month (Current)	Current Maximum Day (Current)	Scenario 3 Average Dry Weather Flow (Buil	Scenario 3 Average Annual (Buildout)	Scenario 3 Peak Month (Buildout)	Scenario 3 Maximum Day (Buildout)
Influent									
Flow	mgd	7.50E-02	8.10E-02	9.52E-02	0.1393	0.2726	0.2944	0.3124	0.4416
Biochemical oxygen demand concentration	mg/L	240	227	386	263	240	137	253	182
Total suspended solids concentration	mg/L	230	189	323	220	230	114	211	152
Percentage of total solids consisiting of vol	%	80	80	80	80	80	80	80	80
Ammonia concentration	mg/L	25	25	25	25	25	25	25	25
Total Kjeldahl Nitrogen	mg/L	35	35	35	35	35	35	35	35
Phosphorous concentration	mg/L	15	15	15	15	15	15	15	15
Alkalinity concentration	mg/L	230	230	230	230	230	230	230	230
Mixing Unit									
Oxidation Ditch									
Flow to AS	mgd	8.34E-02	8.85E-02	0.1035	0.1477	0.281	0.3022	0.3208	0.45
BOD in feed	mg/L	230.8	221.4	369.8	262.7	248	147.5	261.9	194.1
BOD load	lb/d	160.5	163.5	319.4	323.6	581.1	371.8	700.6	728.2
TKN in feed	mg/L	33.65	33.86	34.93	34.87	35.59	35.02	35.63	35.47
TKN load	lb/d	23.41	25	30.16	42.94	83.39	88.25	95.32	133.1
Number of basins	none	1	1	1	1	1	1	1	1
Length	ft	180	180	180	180	180	180	180	180
Width	ft	12	12	12	12	12	12	12	12
Depth	ft	11	11	11	11	11	11	11	11
Liquid temperature	C	20	20	20	20	20	20	20	20
Oxygen field transfer efficiency as percent	%/ft	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Dissolved oxygen setpoint	mg/L	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Basin volume (Total)	Mgal	0.1777	0.1777	0.1777	0.1777	0.1777	0.1777	0.1777	0.1777
Sludge age (w/o clarifier)	days	25	25	25	25	25	25	25	25
Sludge age (w/ clarifier)	days	26.1	25.61	26.37	26.95	28.71	27.39	29.23	30.93
Hydraulic retention time	hr	51.15	48.18	41.2	28.88	15.18	14.12	13.3	9.479
MLSS	mg/L	1,348	1,275	2,467	2,513	4,833	2,918	5,398	5,641
F/M	lb BOD/lb VSS/d	8.34E-02	9.00E-02	9.09E-02	9.04E-02	8.42E-02	8.94E-02	9.11E-02	9.06E-02
Observed growth yield	lb VSS/lb BOD	0.4796	0.4443	0.4398	0.4423	0.4751	0.4474	0.4389	0.4413
Carb 02 required	lb O2/lb BOD	1.239	1.239	1.238	1.236	1.231	1.23	1.229	1.224
Total O2 required	lb O2/lb BOD	1.73	1.775	1.509	1.681	1.713	2.151	1.691	1.898
Oxygen uptake rate	mg/L/h	7.805	8.157	13.54	15.29	27.98	22.48	33.29	38.86
Diurnal OUR peak	mg/L/h	10.54	11.01	18.29	20.64	37.78	30.35	44.95	52.46
Oxygen required	lb/d	277.6	290.2	481.8	543.9	995.4	799.8	1,184	1,382
SOTE	%	15	15	15	15	15	15	15	15
Average required blower capacity	SCFM	2.109	2.205	3.661	4.132	7.563	6.076	8.998	10.5
Average blower energy	hp	0.1004	0.105	0.1743	0.1968	0.3601	0.2894	0.4285	0.5001
Diurnal peak blower capacity	SCFM	2.848	2.976	4.942	5.578	10.21	8.203	12.15	14.18
Peak blower energy	hp	0.1356	0.1417	0.2353	0.2656	0.4862	0.3906	0.5785	0.6751
Nitrogen in VSS	g N/g VSS	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02	8.00E-02
Secondary Clarifier									
Number of secondary clarifiers	none	1	1	1	1	1	1	1	1
Diameter	ft	26	26	26	26	26	26	26	26
Depth	ft	10	10	10	10	10	10	10	10
TSS concentration in liquid effluent stream	mg/L	30	30	30	30	30	30	30	30
Maximum MLSS	mg/L	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Clarifier area (Total)	sq ft	530.9	530.9	530.9	530.9	530.9	530.9	530.9	530.9
Clarifier volume (Total)	cu ft	5,309	5,309	5,309	5,309	5,309	5,309	5,309	5,309
Hydraulic surface loading rate	gpd/sq ft	149.6	164.7	187.6	270.8	521.9	565.7	596.9	840.3
Solids loading rate	lb/sq ft/d	3.972	2.084	9.027	13.11	47.99	18.7	61.2	89.7
Solids loading rate at set MLSS	lb/sq ft/d	3.972	2.084	9.027	13.11	47.99	18.7	61.2	89.7
Weir loading (single side)	gpd/ft	972.2	1,070	1,219	1,760	3,393	3,677	3,880	5,462
HRT (w/ recycle)	hr	5.079	9.162	4.091	2.869	1.508	2.337	1.321	0.9414
HRT (w/o recycle)	hr	12	10.9	9.569	6.629	3.44	3.173	3.007	2.136
RAS concentration	mg/L	2,314	7,829	4,287	4,406	8,582	10,980	9,601	10,060
Max SVI allowed	mL/g	432.1	127.7	233.3	226.9	116.5	91.06	104.2	99.4
Filter									
Number of filtration units	none	2	2	2	2	2	2	2	2
Surface area per unit	sq ft	16	16	16	16	16	16	16	16
Depth	in	36	36	36	36	36	36	36	36
Filter run time	hr	24	24	24	24	24	24	24	24
Backwash rate	gpm/sq ft	15	15	15	15	15	15	15	15
Backwash duration	min	15	15	15	15	15	15	15	15
Area (total)	sq ft	32	32	32	32	32	32	32	32
Flow into filter	mgd	7.94E-02	8.74E-02	9.96E-02	0.1438	0.2771	0.3003	0.3169	0.4461
Hydraulic Loading (avg)	gpm/sq ft	1.723	1.897	2.162	3.12	6.014	6.518	6.878	9.682
Hydraulic Loading (1 off line)	gpm/sq ft	3.447	3.794	4.323	6.24	12.03	13.04	13.76	19.36
Solids loading	lb/sq ft/d	0.6209	0.6835	0.7788	1.124	2.167	2.348	2.478	3.488
Backwash Flow (avg)	gpm	5	5	5	5	5	5	5	5
Backwash Flow (instantaneous)	gpm	480	480	480	480	480	480	480	480
Effluent									
RAS Split									
Return activated sludge rate as a percenta	%	125	17.5	125	125	125	35	125	125
RAS stream	mgd	0.1042	1.55E-02	0.1294	0.1846	0.3512	0.1058	0.401	0.5625
WAS stream	mgd	3.99E-03	1.11E-03	3.93E-03	3.90E-03	3.86E-03	1.82E-03	3.84E-03	3.83E-03
Aerobic Digester									
Number of digesters	none	2	2	2	2	2	2	2	2
Diameter	ft	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4
Depth	ft	10	10	10	10	10	10	10	10

Process/Loading	Units	Average Dry Weather Flow (Curr	Average Annual (Current)	Peak Month (Current)	Maximum Day (Current)	Average Dry Weather Flow (Buil	Average Annual (Buildout)	Peak Month (Buildout)	Maximum Day (Buildout)
Digester volume (total)	1000 cu ft	2.415	2.415	2.415	2.415	2.415	2.415	2.415	2.415
Percentage of VSS destroyed during diges	%	45	45	45	45	45	45	45	45
Precent NH4 in VSS	%	9	9	9	9	9	9	9	9
Precent phosphate in VSS	%	2	2	2	2	2	2	2	2
Supernatant flow as a percentage of influe	%	30	30	30	30	30	30	30	30
Detention time	days	4.529	16.24	4.598	4.639	4.683	9.948	4.705	4.717
Flow to disgester	mgd	-	-	-	-	-	-	-	-
VSS in inflow	lb VSS/d	-	-	-	-	-	-	-	-
TSS in inflow	lb TSS/d	3.99E-03	1.11E-03	3.93E-03	3.90E-03	3.86E-03	1.82E-03	3.84E-03	3.83E-03
VSS in outflow	lb VSS/d	74.18	69.85	134.9	137.5	266	159.9	295.3	308.8
TSS in outflow	lb TSS/d	76.99	72.69	140.4	143.1	276.1	166.4	307.4	321.3
Inflow TSS concentration	%	40	38.19	73.38	74.84	145.5	87.6	161.7	169.1
Outflow TSS concentration	%	40.81	40.48	76.97	78.51	153.7	93.12	171.8	179.7
Sludge Drying Beds									
Flow	gpm	1.939	0.5407	1.91	1.893	1.875	0.8828	1.867	1.862
BOD loading	lb/d	3.493	0.9741	3.441	3.41	3.378	1.59	3.362	3.354
TSS loading	lb/d	40.81	40.48	76.97	78.51	153.7	93.12	171.8	179.7

Appendix E. Water Balances.

Table E1 - Water Balance (Current Conditions)
Arnold WWTP Facility - Water Balance

Month	Days	EFFLUENT PRODUCTION ADWF gpd	ADWF gal/month	ADWF ac-ft/month	I/I ac-ft/month	Total Effluent ac-ft	WET SEASON PERCOLATION Application Rate ac-ft/yr	DRY SEASON IRRIGATION Application Rate ac-ft/yr
(1)				(2)	(3)	(4)	(5)	(6)
Oct	31	75,284	2,333,804	7.16	0.79	8.0	4.0	4.0
Nov	30	75,284	2,258,520	6.93	1.47	8.4	8.4	0.0
Dec	31	75,284	2,333,804	7.16	1.92	9.1	9.1	0.0
Jan	31	75,284	2,333,804	7.16	1.92	9.1	9.1	0.0
Feb	28	75,284	2,107,952	6.47	1.43	7.9	7.9	0.0
Mar	31	75,284	2,333,804	7.16	1.46	8.6	8.6	0.0
Apr	30	75,284	2,258,520	6.93	0.96	7.9	3.9	3.9
May	31	75,284	2,333,804	7.16	0.53	7.7	0.0	7.7
Jun	30	75,284	2,258,520	6.93	0.19	7.1	0.0	7.1
Jul	31	75,284	2,333,804	7.16	0.13	7.3	0.0	7.3
Aug	31	75,284	2,333,804	7.16	0.20	7.4	0.0	7.4
Sep	30	75,284	2,258,520	6.93	0.32	7.3	0.0	7.3
Total				84.32	11.33	95.6	51.0	44.6

Average Dry Weather Flow, gal/d:	**75,284** Current ADWF

DRY SEASON PERCOLATION

Irrigation Area (Dry Season), acres:	25
Maximum Application Rate (inches per year)	36.0
Irrigation Duration	April 15 through October 15
Number of Irrigation Days	183
Actual Application Rate (inches per year)	21.4
Over Irrigating ?	**No**

WET SEASON PERCOLATION

Percolation Area (sf trench area per bed)	16,000
Number of Percolation Beds	11
Maximum Percolation Rate (gallon/sf trench area day)	1.0
Number of Percolation Days	182
Applied Percolation Rate (gallon/sf trench area day)	0.5
Over Percolate?	**No**

Note:
(1) Month
(2) ADWF converted to acre-ft/month
(3) Calculated I/I flows. ADWF and influent flows obtained from CCWD 2001 to 2004 monitoring reports.
(4) Total effluent flow is equal to the sum of the ADWF plus I/I. Column (2) + Column (3)
(5) Percolation is practiced during wet season which is estimated to be between October 16 through April 14. Percolation water obtained from Column (4)
(6) Irrigation is practiced during dry season which is estimated to be between April 15 and October 15. Irrigation water obtained from Column (4)

Table E2 - Water Balance (Base Scenario - Existing Service Area)
Arnold WWTP Facility - Water Balance

Month	Days	EFFLUENT PRODUCTION ADWF gpd	ADWF gal/month	ADWF ac-ft/month	I/I ac-ft/month	Total Effluent ac-ft	WET SEASON PERCOLATION Application Rate ac-ft/yr	DRY SEASON IRRIGATION Application Rate ac-ft/yr
(1)				(2)	(3)	(4)	(5)	(6)
Oct	31	240,240	7,447,440	22.85	1.52	24.4	12.2	12.2
Nov	30	240,240	7,207,200	22.11	2.82	24.9	24.9	0.0
Dec	31	240,240	7,447,440	22.85	3.68	26.5	26.5	0.0
Jan	31	240,240	7,447,440	22.85	3.68	26.5	26.5	0.0
Feb	28	240,240	6,726,720	20.64	2.75	23.4	23.4	0.0
Mar	31	240,240	7,447,440	22.85	2.79	25.6	25.6	0.0
Apr	30	240,240	7,207,200	22.11	1.84	24.0	12.0	12.0
May	31	240,240	7,447,440	22.85	1.01	23.9	0.0	23.9
Jun	30	240,240	7,207,200	22.11	0.37	22.5	0.0	22.5
Jul	31	240,240	7,447,440	22.85	0.25	23.1	0.0	23.1
Aug	31	240,240	7,447,440	22.85	0.38	23.2	0.0	23.2
Sep	30	240,240	7,207,200	22.11	0.61	22.7	0.0	22.7
Total				269.06	21.71	290.8	151.2	139.6

Average Dry Weather Flow, gal/d: **240,240** Current ADWF

DRY SEASON PERCOLATION

Irrigation Area (Dry Season), acres: 46.5 Increase to reduced rate to 36 in/yr
Maximum Application Rate (inches per year) 36.0
Irrigation Duration April 15 through October 15
Number of Irrigation Days 183
Actual Application Rate (inches per year) 36.0
Over Irrigating ? **No**

WET SEASON PERCOLATION

Percolation Area (sf trench area per bed) 16,000
Number of Percolation Beds 17 Increased to reduce rate to 1.0
Maximum Percolation Rate (gallon/sf trench area day) 1.0
Number of Percolation Days 182
Applied Percolation Rate (gallon/sf trench area day) 1.0
Over Percolate? **No**

Note:
(1) Month
(2) ADWF converted to acre-ft/month
(3) Calculated I/I flows. ADWF and influent flows obtained from CCWD 2001 to 2004 monitoring reports.
(4) Total effluent flow is equal to the sum of the ADWF plus I/I. Column (2) + Column (3)
(5) Percolation is practiced during wet season which is estimated to be between October 16 through April 14. Percolation water obtained from Column (4)
(6) Irrigation is practiced during dry season which is estimated to be between April 15 and October 15. Irrigation water obtained from Column (4)

Table E3 - Water Balance (Scenario 1 - Existing Service Area Plus Millwoods)
Arnold WWTP Facility - Water Balance

Month (1)	Days	EFFLUENT PRODUCTION ADWF gpd	ADWF gal/month	ADWF ac-ft/month (2)	I/I ac-ft/month (3)	Total Effluent ac-ft (4)	WET SEASON PERCOLATION Application Rate ac-ft/yr (5)	DRY SEASON IRRIGATION Application Rate ac-ft/yr (6)
Oct	31	274,755	8,517,405	26.14	1.70	27.8	13.9	13.9
Nov	30	274,755	8,242,650	25.29	3.15	28.4	28.4	0.0
Dec	31	274,755	8,517,405	26.14	4.10	30.2	30.2	0.0
Jan	31	274,755	8,517,405	26.14	4.10	30.2	30.2	0.0
Feb	28	274,755	7,693,140	23.61	3.07	26.7	26.7	0.0
Mar	31	274,755	8,517,405	26.14	3.11	29.2	29.2	0.0
Apr	30	274,755	8,242,650	25.29	2.05	27.3	13.7	13.7
May	31	274,755	8,517,405	26.14	1.13	27.3	0.0	27.3
Jun	30	274,755	8,242,650	25.29	0.41	25.7	0.0	25.7
Jul	31	274,755	8,517,405	26.14	0.28	26.4	0.0	26.4
Aug	31	274,755	8,517,405	26.14	0.42	26.6	0.0	26.6
Sep	30	274,755	8,242,650	25.29	0.68	26.0	0.0	26.0
Total				307.72	24.23	331.9	172.4	159.5

Average Dry Weather Flow, gal/d: **274,755** Current ADWF

DRY SEASON PERCOLATION

Irrigation Area (Dry Season), acres:	53.2	Increase to reduced rate to 36 in/yr
Maximum Application Rate (inches per year)	36.0	
Irrigation Duration	April 15 through October 15	
Number of Irrigation Days	183	
Actual Application Rate (inches per year)	36.0	
Over Irrigating ?	**No**	

WET SEASON PERCOLATION

Percolation Area (sf trench area per bed)	16,000	
Number of Percolation Beds	19	Increased to reduce rate to 1.0
Maximum Percolation Rate (gallon/sf trench area day)	1.0	
Number of Percolation Days	182	
Applied Percolation Rate (gallon/sf trench area day)	1.0	
Over Percolate?	**No**	

Note:
(1) Month
(2) ADWF converted to acre-ft/month
(3) Calculated I/I flows. ADWF and influent flows obtained from CCWD 2001 to 2004 monitoring reports.
(4) Total effluent flow is equal to the sum of the ADWF plus I/I. Column (2) + Column (3)
(5) Percolation is practiced during wet season which is estimated to be between October 16 through April 14. Percolation water obtained from Column (4)
(6) Irrigation is practiced during dry season which is estimated to be between April 15 and October 15. Irrigation water obtained from Column (4)

Table E4 - Water Balance (Scenario 2 - Existing Service Area Plus Millwoods)
Arnold WWTP Facility - Water Balance

		EFFLUENT PRODUCTION					WET SEASON PERCOLATION	DRY SEASON IRRIGATION
			ADWF		I/I	Total Effluent	Application Rate	Application Rate
Month		gpd	gal/month	ac-ft/month	ac-ft/month	ac-ft	ac-ft/yr	ac-ft/yr
(1)	Days			(2)	(3)	(4)	(5)	(6)
Oct	31	244,530	7,580,430	23.26	1.59	24.8	12.4	12.4
Nov	30	244,530	7,335,900	22.51	2.95	25.5	25.5	0.0
Dec	31	244,530	7,580,430	23.26	3.84	27.1	27.1	0.0
Jan	31	244,530	7,580,430	23.26	3.84	27.1	27.1	0.0
Feb	28	244,530	6,846,840	21.01	2.87	23.9	23.9	0.0
Mar	31	244,530	7,580,430	23.26	2.91	26.2	26.2	0.0
Apr	30	244,530	7,335,900	22.51	1.92	24.4	12.2	12.2
May	31	244,530	7,580,430	23.26	1.06	24.3	0.0	24.3
Jun	30	244,530	7,335,900	22.51	0.38	22.9	0.0	22.9
Jul	31	244,530	7,580,430	23.26	0.26	23.5	0.0	23.5
Aug	31	244,530	7,580,430	23.26	0.40	23.7	0.0	23.7
Sep	30	244,530	7,335,900	22.51	0.64	23.1	0.0	23.1
Total				273.87	22.65	296.5	154.3	142.2

Average Dry Weather Flow, gal/d:	**244,530**	Current ADWF
DRY SEASON PERCOLATION		
Irrigation Area (Dry Season), acres:	47.4	Increase to reduced rate to 36 in/yr
Maximum Application Rate (inches per year)	36.0	
Irrigation Duration	April 15 through October 15	
Number of Irrigation Days	183	
Actual Application Rate (inches per year)	36.0	
Over Irrigating ?	**No**	
WET SEASON PERCOLATION		
Percolation Area (sf trench area per bed)	16,000	
Number of Percolation Beds	17	Increased to reduce rate to 1.0
Maximum Percolation Rate (gallon/sf trench area day)	1.0	
Number of Percolation Days	182	
Applied Percolation Rate (gallon/sf trench area day)	1.0	
Over Percolate?	**No**	

Note:
(1) Month
(2) ADWF converted to acre-ft/month
(3) Calculated I/I flows. ADWF and influent flows obtained from CCWD 2001 to 2004 monitoring reports.
(4) Total effluent flow is equal to the sum of the ADWF plus I/I. Column (2) + Column (3)
(5) Percolation is practiced during wet season which is estimated to be between October 16 through April 14. Percolation water obtained from Column (4)
(6) Irrigation is practiced during dry season which is estimated to be between April 15 and October 15. Irrigation water obtained from Column (4)

Table E5 - Water Balance (Scenario 3 - Existing Service Area Plus Avery and Millwoods)
Arnold WWTP Facility - Water Balance

Month (1)	Days	EFFLUENT PRODUCTION ADWF gpd	ADWF gal/month	ADWF ac-ft/month (2)	I/I ac-ft/month (3)	Total Effluent ac-ft (4)	WET SEASON PERCOLATION Application Rate ac-ft/yr (5)	DRY SEASON IRRIGATION Application Rate ac-ft/yr (6)
Oct	31	279,045	8,650,395	26.54	1.76	28.3	14.2	14.2
Nov	30	279,045	8,371,350	25.69	3.27	29.0	29.0	0.0
Dec	31	279,045	8,650,395	26.54	4.26	30.8	30.8	0.0
Jan	31	279,045	8,650,395	26.54	4.26	30.8	30.8	0.0
Feb	28	279,045	7,813,260	23.97	3.19	27.2	27.2	0.0
Mar	31	279,045	8,650,395	26.54	3.23	29.8	29.8	0.0
Apr	30	279,045	8,371,350	25.69	2.13	27.8	13.9	13.9
May	31	279,045	8,650,395	26.54	1.18	27.7	0.0	27.7
Jun	30	279,045	8,371,350	25.69	0.43	26.1	0.0	26.1
Jul	31	279,045	8,650,395	26.54	0.29	26.8	0.0	26.8
Aug	31	279,045	8,650,395	26.54	0.44	27.0	0.0	27.0
Sep	30	279,045	8,371,350	25.69	0.71	26.4	0.0	26.4
Total				312.52	25.17	337.7	175.6	162.1

Average Dry Weather Flow, gal/d: **279,045** Current ADWF

DRY SEASON PERCOLATION

Irrigation Area (Dry Season), acres:	54.1	Increase to reduced rate to 36 in/yr
Maximum Application Rate (inches per year)	36.0	
Irrigation Duration	April 15 through October 15	
Number of Irrigation Days	183	
Actual Application Rate (inches per year)	35.9	
Over Irrigating ?	**No**	

WET SEASON PERCOLATION

Percolation Area (sf trench area per bed)	16,000	
Number of Percolation Beds	20	Increased to reduce rate to 1.0
Maximum Percolation Rate (gallon/sf trench area day)	1.0	
Number of Percolation Days	182	
Applied Percolation Rate (gallon/sf trench area day)	1.0	
Over Percolate?	**No**	

Note:
(1) Month
(2) ADWF converted to acre-ft/month
(3) Calculated I/I flows. ADWF and influent flows obtained from CCWD 2001 to 2004 monitoring reports.
(4) Total effluent flow is equal to the sum of the ADWF plus I/I. Column (2) + Column (3)
(5) Percolation is practiced during wet season which is estimated to be between October 16 through April 14. Percolation water obtained from Column (4)
(6) Irrigation is practiced during dry season which is estimated to be between April 15 and October 15. Irrigation water obtained from Column (4)

Appendix F. Improvements and Timelines for Scenario 1, Scenario 2 and Scenario 3.

Appendix F

Scenario 1, 2, and 3 Improvement and Timeline Requirements

Projected average dry weather flows (ADWFs) at buildout at estimated to be approximately 240,000, 275,000, 245,000, and 280,000 gallons per day (gpd) for the Base Scenario and Scenarios 1, 2, and 3, respectively.

Currently the plant has a rated ADWF capacity of 170,000 gpd. It is recommended that an additional clarifier and return activated sludge (RAS) pump be installed in the first improvement phase. This clarifier is recommended for redundancy and to allow the existing clarifier to be taken out of service for routine maintenance. Based on this approach, the new clarifier will be 26 ft diameter, with a greater side water depth. This sizing criterion is based on mirroring the existing clarifier as opposed to providing additional clarification capacity based on the difference between the projected ADWF at buildout and the current plant capacity. Once installed, the secondary clarifiers and RAS system will provide adequate capacity through buildout for all growth scenarios. A same sizing criterion is recommended for the oxidation ditch. However a second oxidation ditch is not required until the Phase III improvements.

Overall, the oxidation ditch and secondary clarifier represent a large portion of the overall expansion costs. Moreover, the relative difference in ADWFs between the four scenarios is at most 40,000 gpd, which is relatively small. Based on these considerations, it is expected that the relative costs for expanding the treatment plant are expected to be similar for all four growth scenarios. However, as described in the Millwoods alternative analysis, the expansion timeline will change based on which scenario is implemented.

Table 1 provides a summary of the improvements, estimated costs, and timeline requirements for all four growth scenarios.

Table 1. Summary of Recommended Timeline and Costs for All Growth Scenarios

	Base Scenario	Scenario 1 – Existing Service Area Plus Millwoods	Scenario 2 – Existing Service Area Plus Avery	Scenario 3 – Existing Service Area Plus Millwoods and Avery
	Recommended	Not Recommended	Recommended provided collection system expansion is paid for by Avery commercial area	Not Recommended
Phase I Improvements				
Timeline	Immediately	Immediately	Immediately	Immediately
Improvements	See Table 18	See Table 18	See Table 18	See Table 18
Estimated Project Cost	$1,170,000	$1,170,000	$1,170,000	$1,170,000
Phase II Improvements				
Timeline	2011	2009	2010	2008
Improvements	See Page 40	See Page 40	See Page 40	See Page 40

Estimated Project Cost	$865,000	$865,000	$865,000	$865,000
Phase III Improvements				
Timeline[a]	2020	2014	2019	2014
Improvements	See Table 19	See Table 19	See Table 19	See Table 19
Estimated Project Cost	$2,380,000	$2,380,000	$2,380,000	$2,380,000

[a] Year in which expansion is required to be in service.

Appendix G. Responses to Public Comments.

Appendix G. Responses
to Public Comments.

Arnold Wastewater Master Plan

Calaveras County Water District

PUBLIC PRESENTATION

January 25, 2005

HDR

Purpose

Describe District's Planning Efforts

Present Draft Master Plan Results

Collect Comments and Feedback
Prior to Finalizing Plan

Planning Effort Overview

Master Plan
(*Arnold Sewer System*)

Identify specific improvements

- **Regulations**
- **Growth**
- **Facility Age**

Financial Plan
(*District-wide*)

Develop a basis for managed upgrade to meet short and long-term needs

Master Plan Components

Master Plan

Recommend Improvements and Schedule

Compare Alternatives

Evaluate Current Facilities

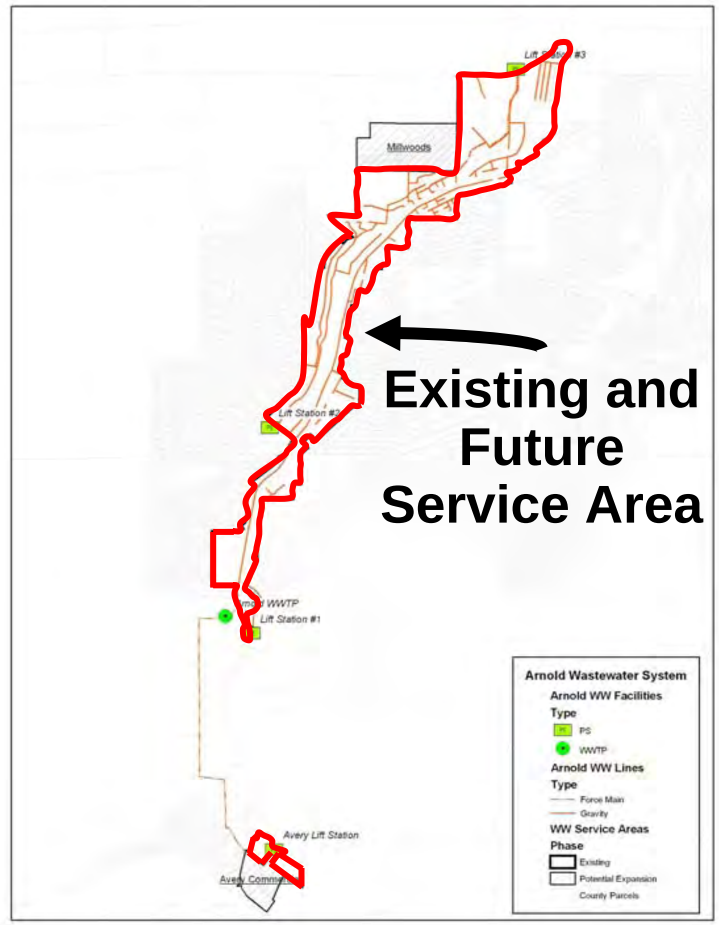
Assess Regulations

Characterize Current and Future Flows

Financial Plan

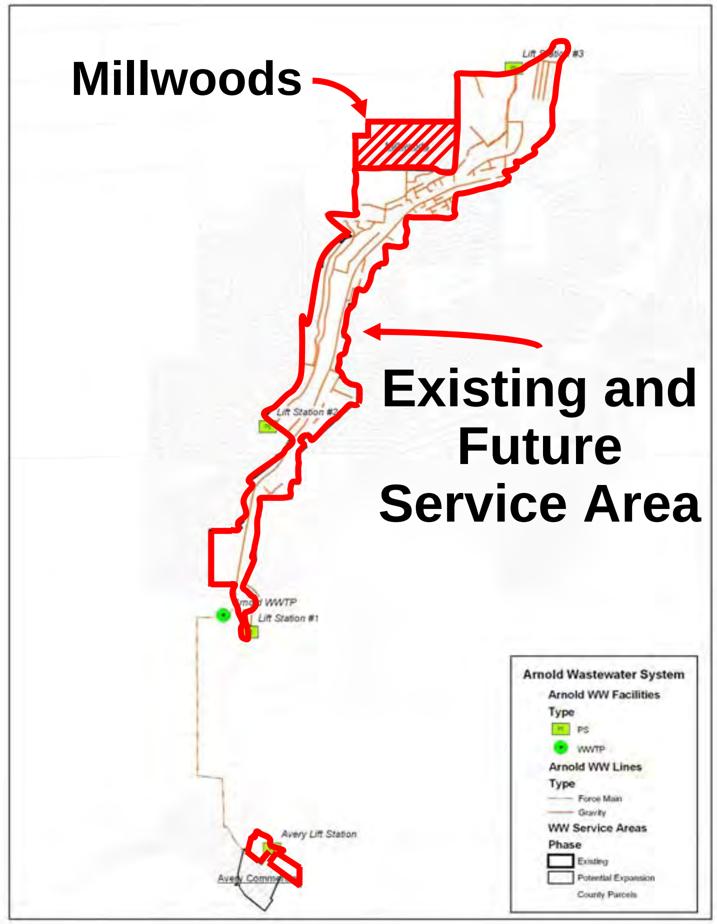
Existing Service Area
Scenario 1

Location	Contributions (ESFUs)
Existing (Current)	638
Infill (Future)	348
Cedar Ridge (Future)	213
Total (Buildout)	1,199



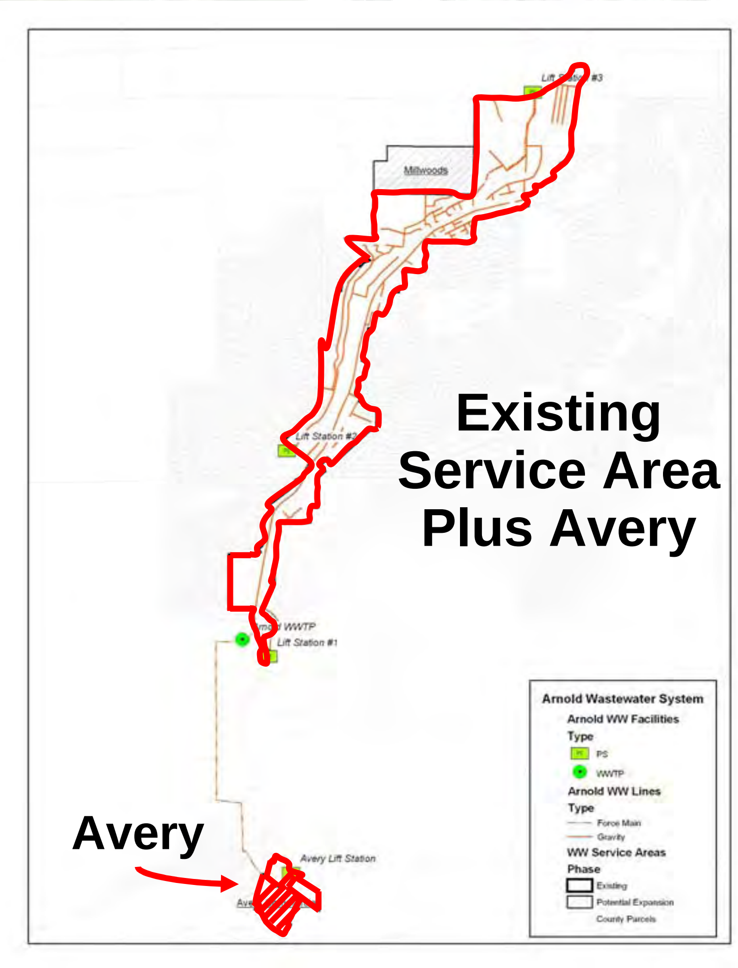
Millwoods Addition
Scenario 2

Location	Contributions (ESFUs)
Existing	638
Infill	348
Cedar Ridge	213
Millwoods	177
Total (Buildout)	1,376



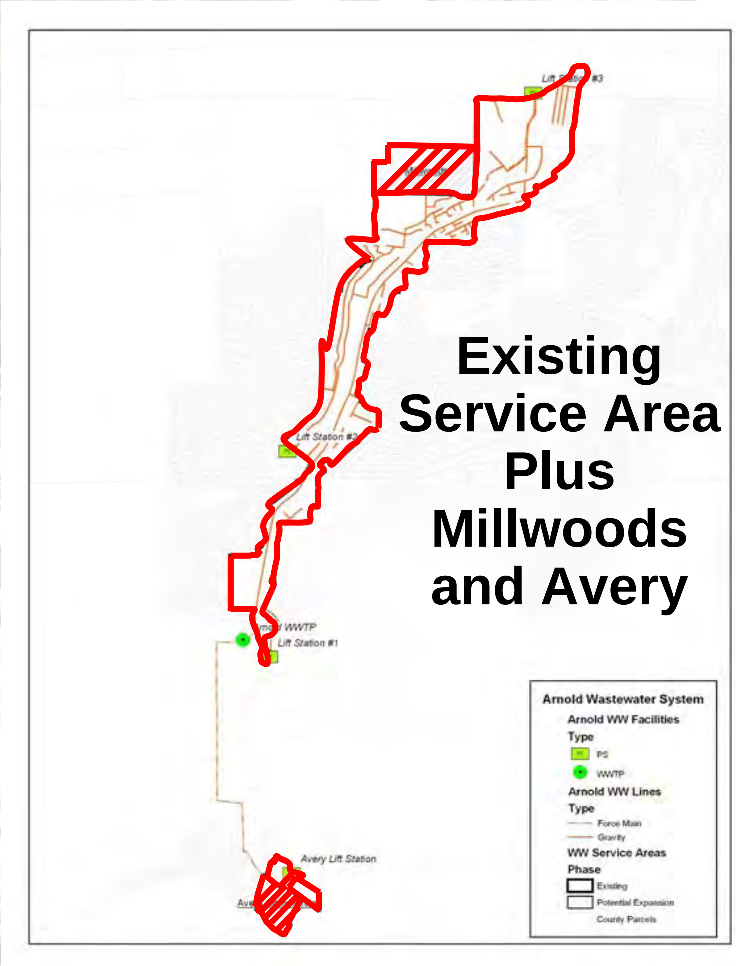
Avery Addition
Scenario 3

Location	Contributions (ESFUs)
Existing	638
Infill	348
Cedar Ridge	213
Avery	83
Total (Buildout)	1,282

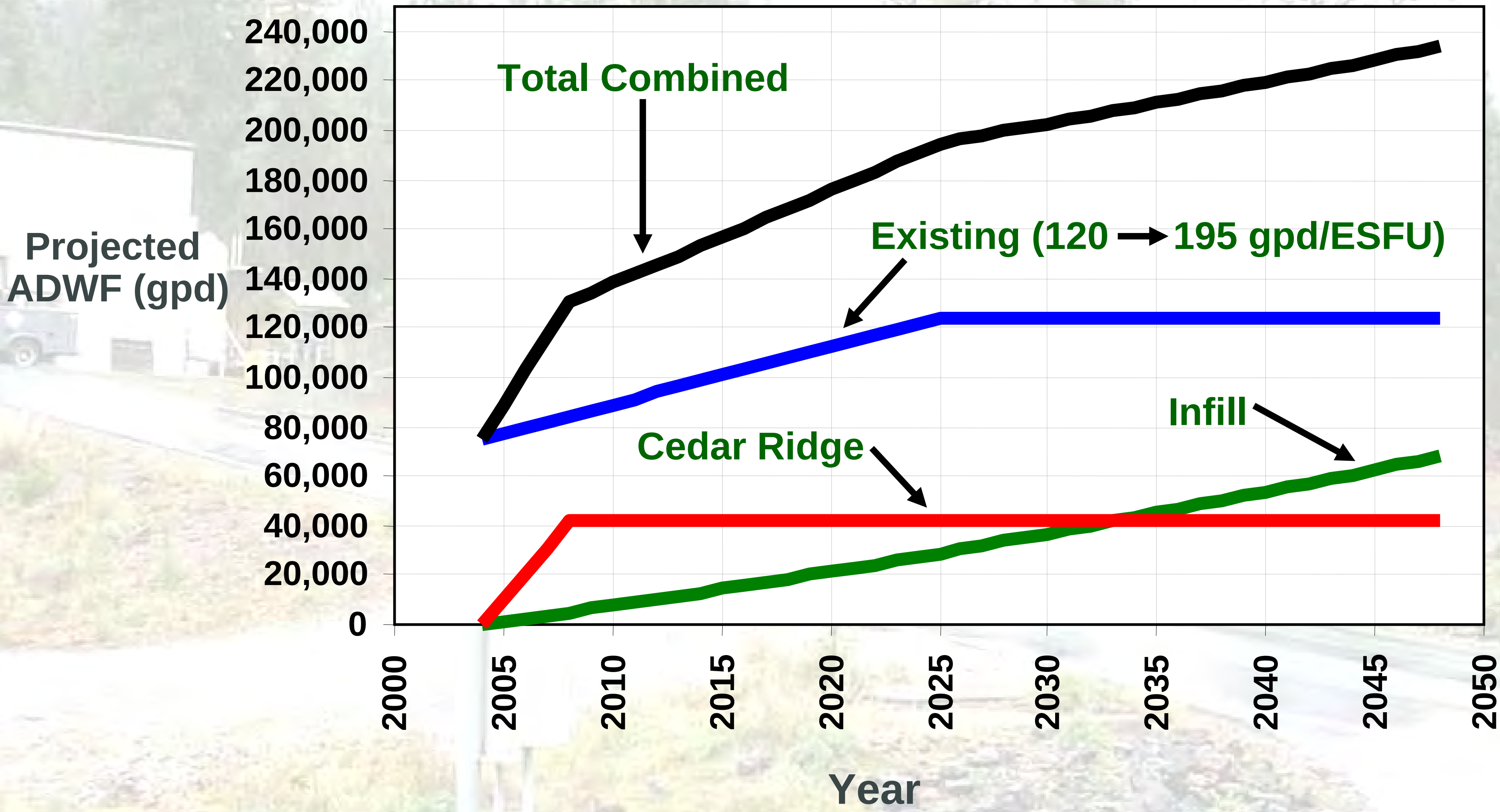


Millwoods and Avery Addition
Scenario 4

Location	Contributions (ESFUs)
Existing	638
Infill	348
Cedar Ridge	213
Millwoods	177
Avery	83
Total (Buildout)	1,459



Current and Future Flows
Scenario 1



Regulatory Considerations

WDR Adopted April 1997

2007 Renew Permit

Future Changes/ Requirements

Groundwater Monitoring
Disinfection By-Products

Facility Evaluation
(accommodate Buildout)

Conveyance System	LS 1, 2, and 3 require additional capacity (*LS 1 scheduled to be replaced*)
Treatment Plant	• Various O & M Improvements – 20 years old • Capacity of most major processes exceeded in 10 to 15 years
Effluent Holding	Additional capacity needed only if existing disposal system is expanded
Effluent Disposal	• Additional capacity not required. • Recommend existing 40 acre site be set aside as fail safe.

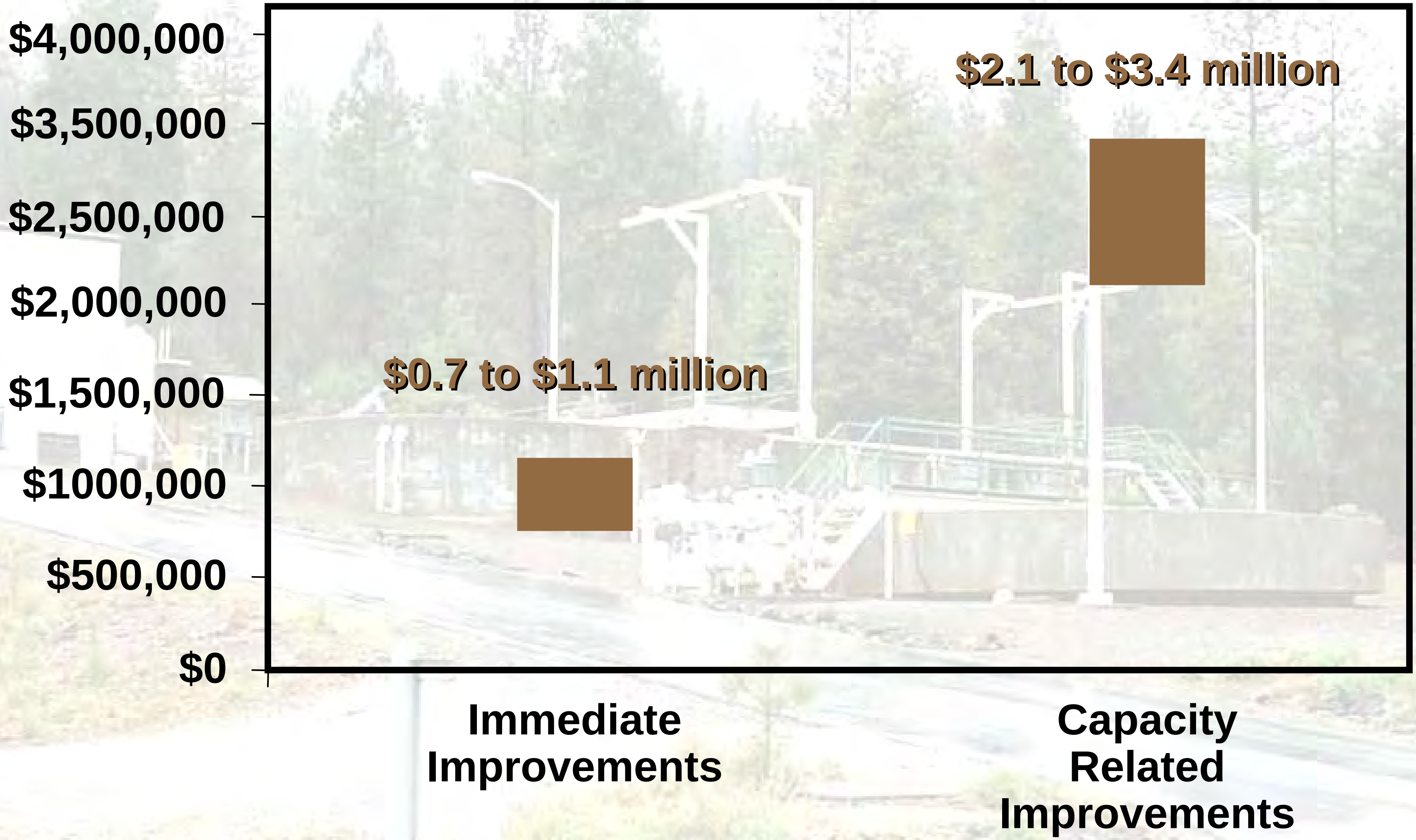
Immediate Improvements
(within the next 5 years)

Conveyance System	Lift Station 1 - replaced as part of Cedar Ridge Development
Treatment Plant	• Septage Receiving Improvements • Ability to Optimize Energy Use (DO control) • Second Clarifier • Effluent Pumps
Effluent Holding	None Required
Effluent Disposal	None Required

Capacity Related Improvements
(required by 2017)

Conveyance System	Lift Stations 2 and 3
Treatment Plant	Expansion of most unit processes
Effluent Holding	Not Required
Effluent Disposal	Not Required

Preliminary Project Costs



Next Steps

Obtain and Address District and Public Comments

Refine Improvement Costs and Develop Timelines

Allocate Improvement Costs (Existing, Infill, and New)

Final Master Plan (February 2005) → **Financial Plan Input**

Future Stakeholder Presentations

- **Final Master Plan and Preliminary Financial Plan ~ May 2005**
- **Final Financial Plan ~ June 2005**

Arnold Wastewater Master Plan

Calaveras County Water District

PUBLIC PRESENTATION

January 25, 2005

HDR

Arnold Sewer System Master Plan

Calaveras County Water District

PUBLIC PRESENTATION

May 4, 2005

HDR

Purpose

Present Master Plan Results and Recommendations

Describe Cost Information
Input to Financial Master Plan

Overview of Response to Public Comments

Planning Effort Overview

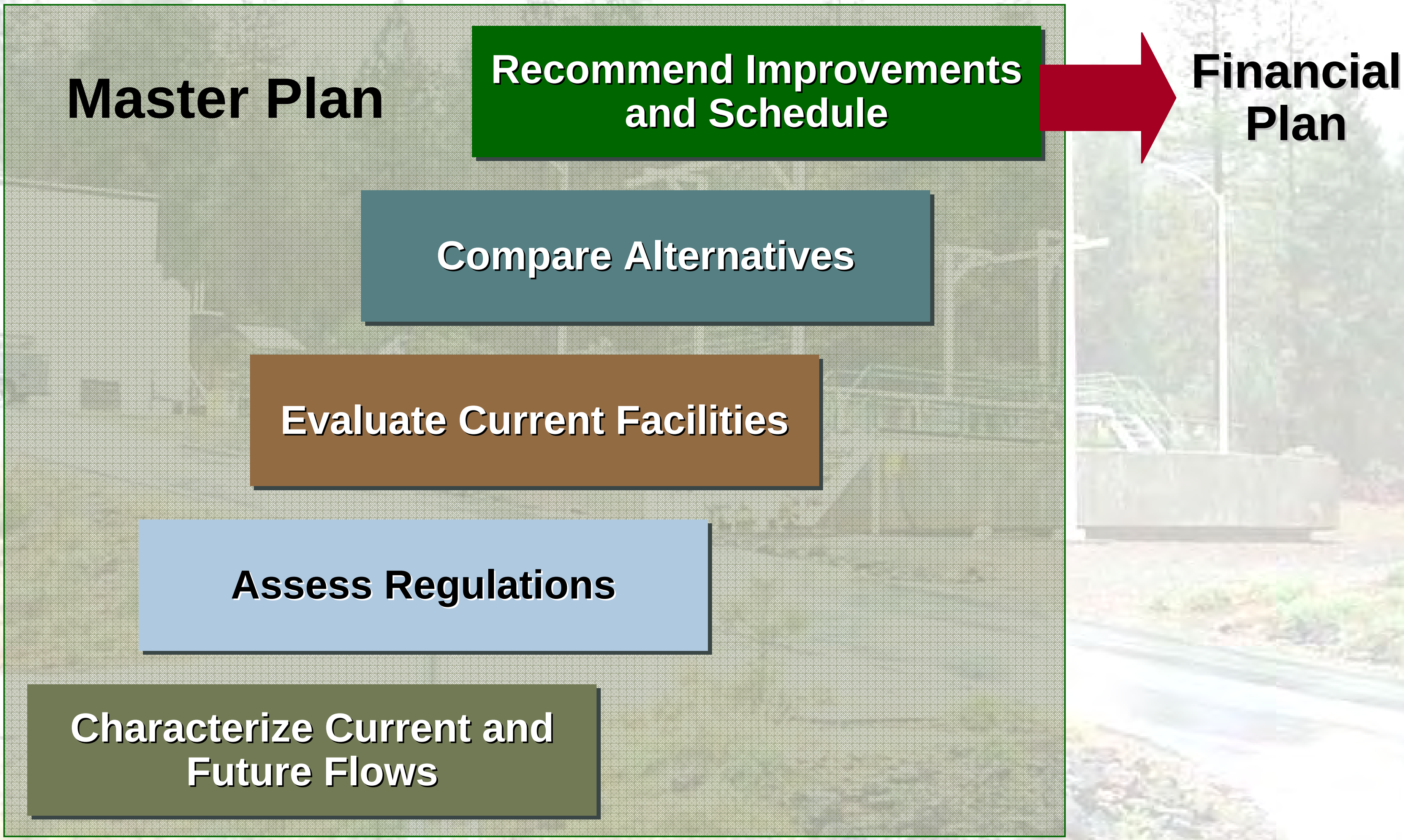
Master Plan
(*Arnold Sewer System*)

Identify specific improvements
- **Regulations**
- **Growth**
- **Facility Age**

Financial Plan
(*District-wide*)

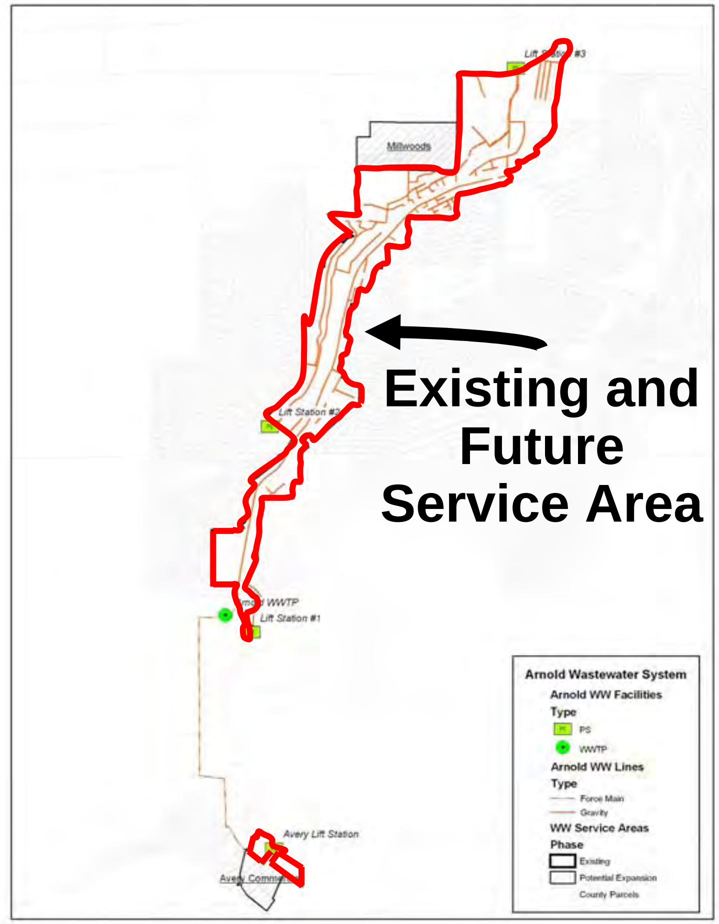
Develop a basis for managed upgrade to meet short and long-term needs

Master Plan Components



Existing Service Area
Base Scenario

Location	Contributions (ESFUs)
Existing (Current)	**638**
Avery (Current)	**33**
Infill (Future)	**348**
Cedar Ridge (Future)	**213**
Total	**1,232**

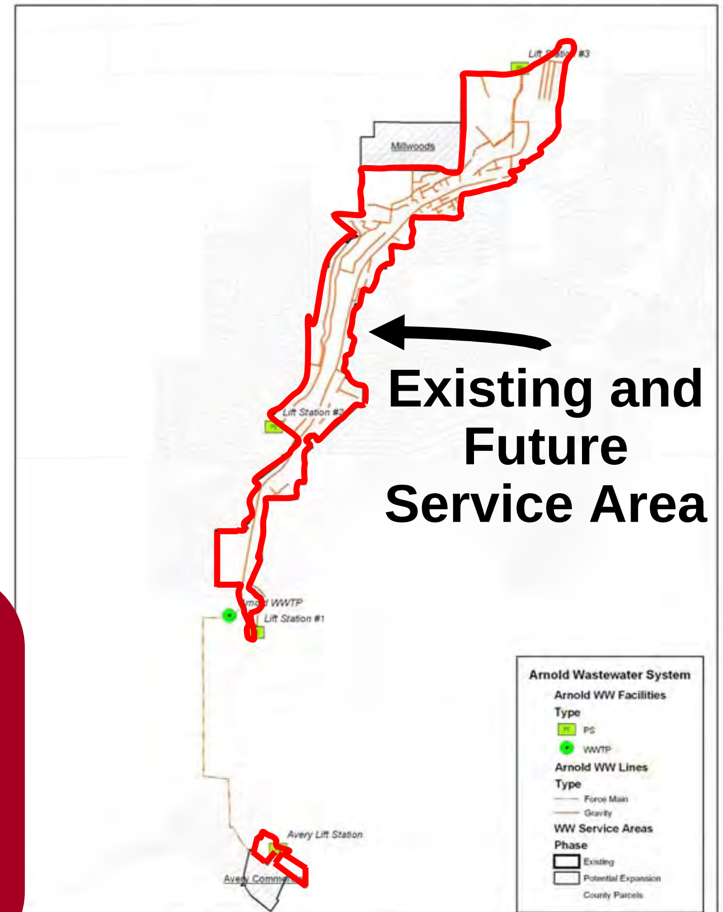


Existing Service Area
Base Scenario

Location	Contributions (ESFUs)
Existing (Current)	638
Avery (Current)	33
Infill (Future)	348
Cedar Ridge (Future)	213
Total	1,232

How was this value determined?

- ***1984 Assessment Project: 986 ESFUs***
- ***2002 + Historic Growth: 638 ESFUs***
- ***Difference = 348 ESFUs***



Millwoods Addition
Scenario 1

Location	Contributions (ESFUs)
Base Scenario	1,232
Millwoods	177
Total	1,409

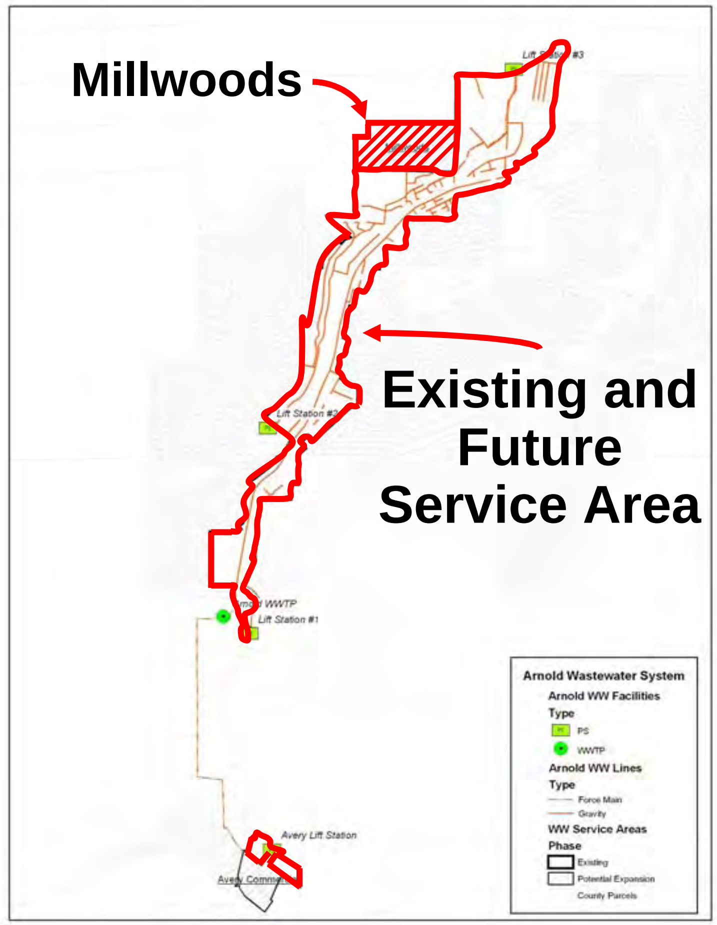
Cost Comparison with/without Millwoods System

Results

- Continued use of Millwoods system: 35% less than combining with Arnold

Recommendations

- Continue operating Millwoods as a separate system



Avery Addition
Scenario 2

Location	Contributions (ESFUs)
Base Scenario	1,232
Avery Commercial	22
Total (Buildout)	1,254

Cost Comparison with/without Millwoods System

Results

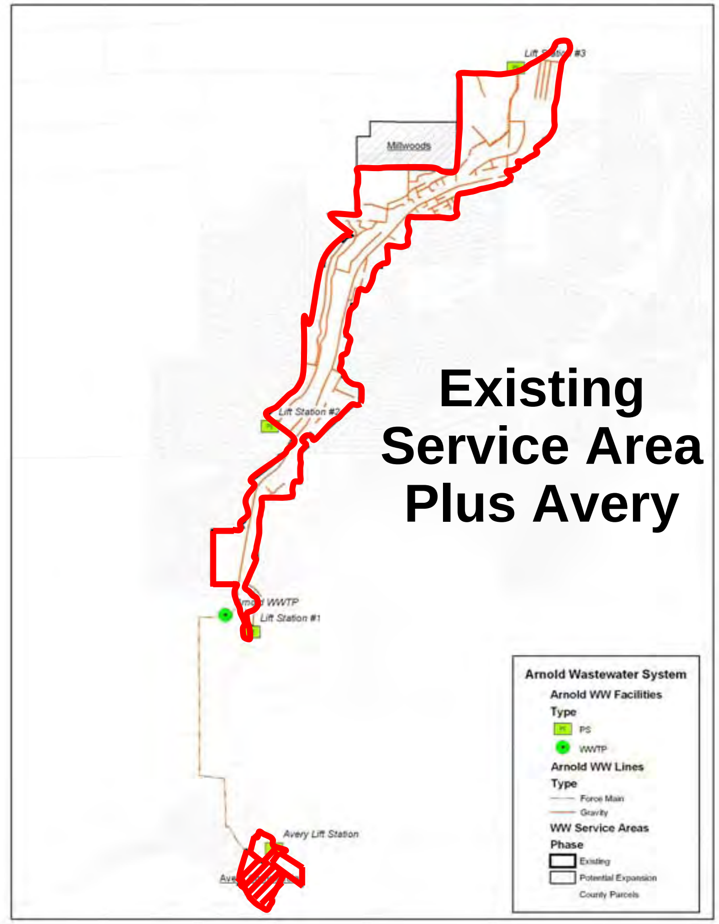
- Negligible impact on cost and timing of Arnold WWTP improvements

Recommendations

- Allow connection

Improvement Needed

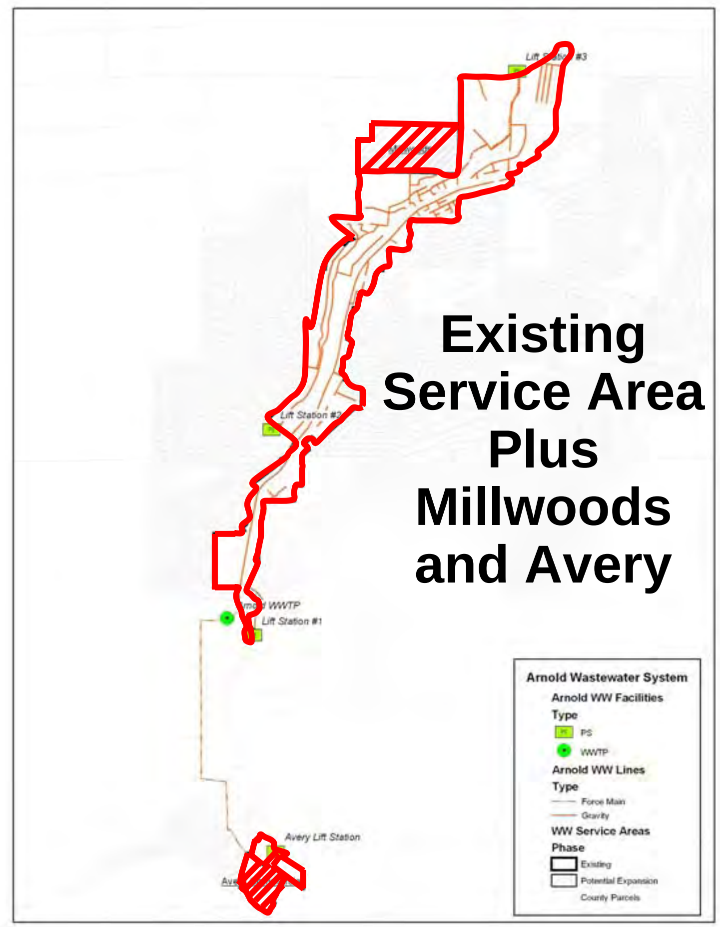
- Collection system – paid for by Avery Commercial Area



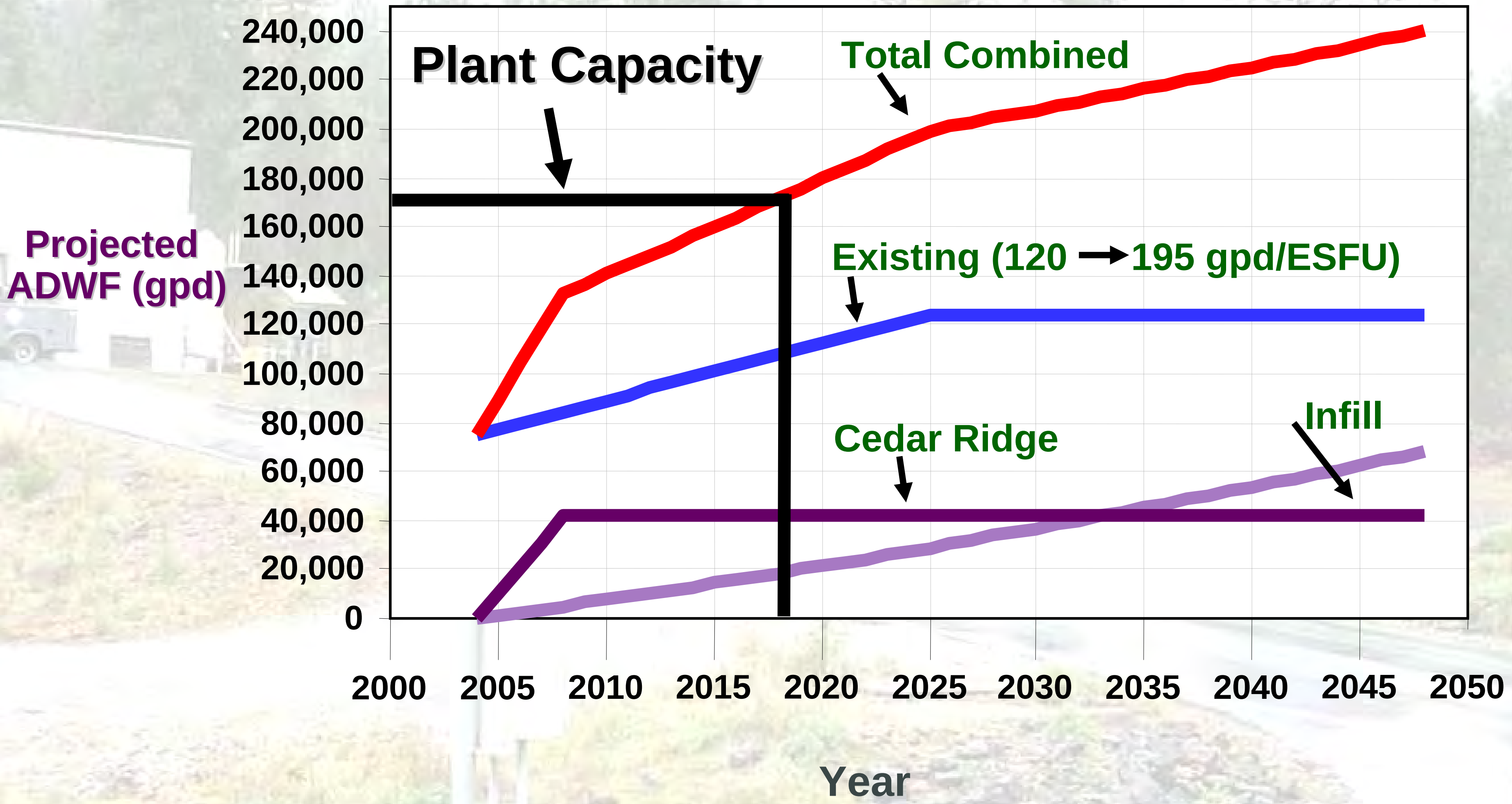
Millwoods and Avery Addition
Scenario 3

Location	Contributions (ESFUs)
Base Scenario	1,232
Millwoods	177
Avery	22
Total	1,431

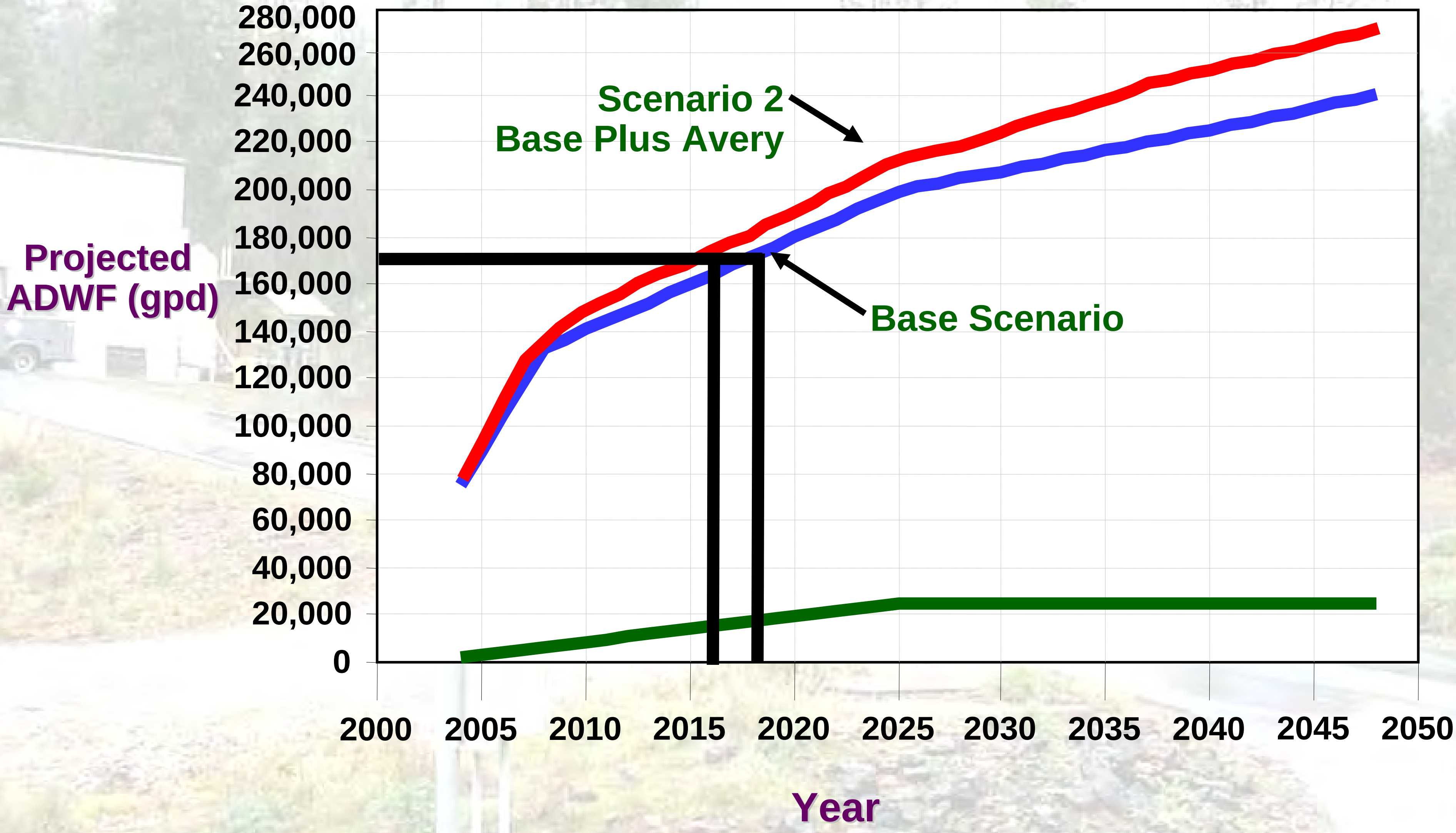
Not Recommended



Current and Future Flows
Base Scenario



Current and Future Flows
Base Scenario and Scenario 2



Facility Evaluation
(accommodate Buildout)

Conveyance System	LS 1, 2, and 3 require additional capacity (*LS 1 scheduled to be replaced for Cedar Ridge*)
Treatment Plant	• Various O & M Improvements – 20 years old • Capacity of most major processes exceeded in 2018
Effluent Holding	Additional capacity needed only if existing disposal system is expanded
Effluent Disposal	• Develop 25 acres for leachfield and spray field expansion. • Remaining 15 acre site to be set aside as fail safe.

Phase I (Immediate) Improvements

Conveyance System	• Lift Station 1 – to be replaced as part of Cedar Ridge Development • Lift Station 2 – Firm capacity of 350 gpm
Treatment Plant	• Ability to Optimize Energy Use (DO control) • Second Clarifier • Effluent Pumps
Effluent Holding/Disposal	None Required

Estimated Project Cost: $1,190,000

Phase II (Capacity Related) Improvements
(Required by 2018)

Conveyance System	• Lift Station 3 – Firm capacity of 350 gpm
Treatment Plant	• Expansion of most unit processes
Effluent Holding/Disposal	• Leachfield and spray field expansion

Estimated Project Cost: $3,245,000

Other Considerations: Replacement Costs

	Replacement Cost	*Useful Life*
Building	**$289,000**	**50**
Improvements other than Buildings	**$6,158,000**	**50**
Machinery & Equipment	**$556,700**	**10**
Total	**$7,004,000**	

Facility Plan Input

Compliance Costs	$760,000	
Expansion Costs	$3,675,000	
Replacement Costs*	$184,600/yr*	Actual value to be determined during Financial MP

* Based on estimated replacement costs of $7.0 million

Next Steps

Develop Draft and Final Financial Master Plans

Future Stakeholder Presentations

- **Final Master Plan and Preliminary Financial Plan – Early June 2005**
- **Final Financial Plan – Late June 2005**

Questions

Arnold Sewer System Master Plan

Calaveras County Water District

PUBLIC PRESENTATION

May 4, 2005

HDR

Arnold Wastewater Sewer Project
As-Built Drawings, 1986

ARNOLD WASTEWATER PROJECT
TREATMENT

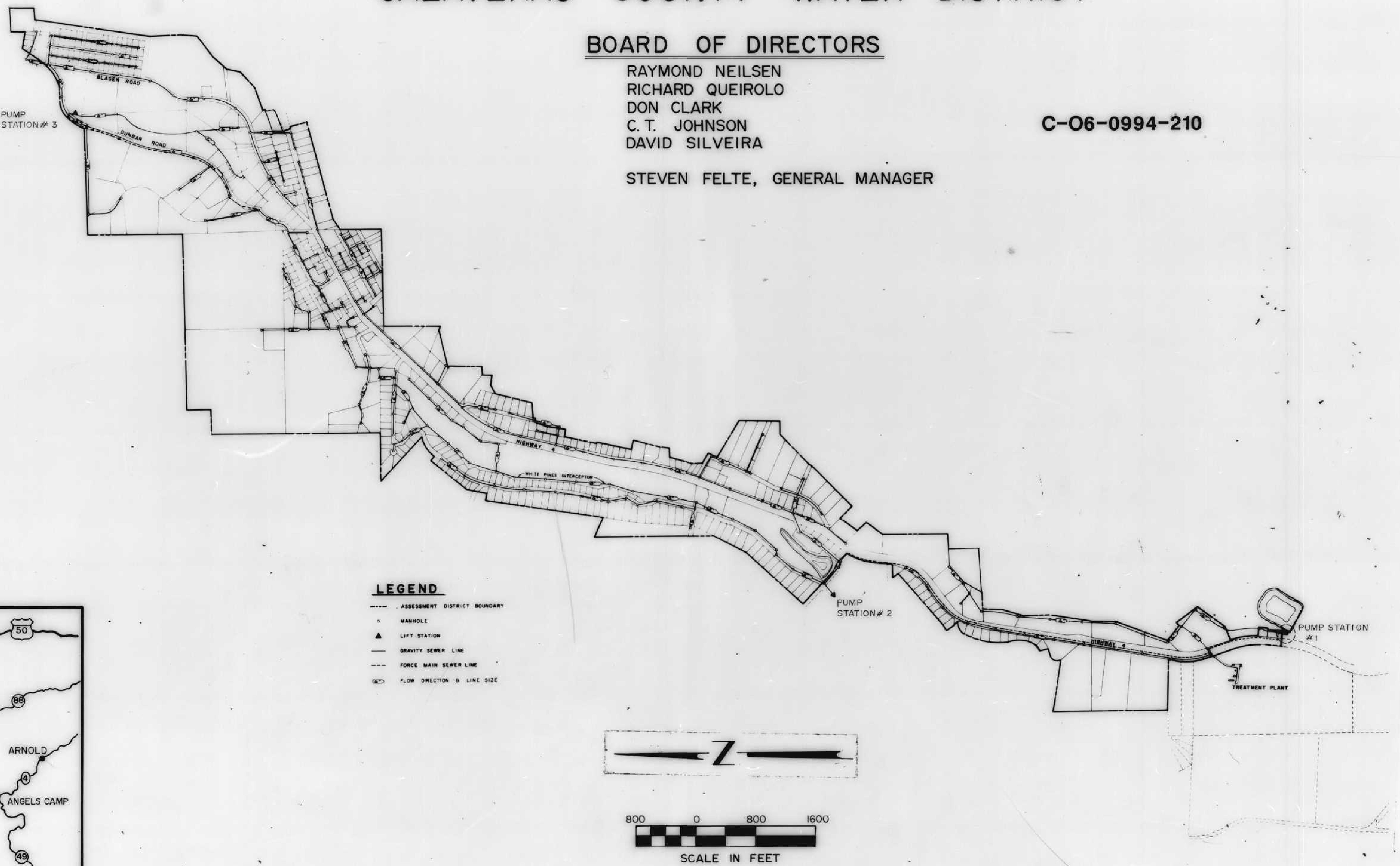
CALAVERAS COUNTY WATER DISTRICT

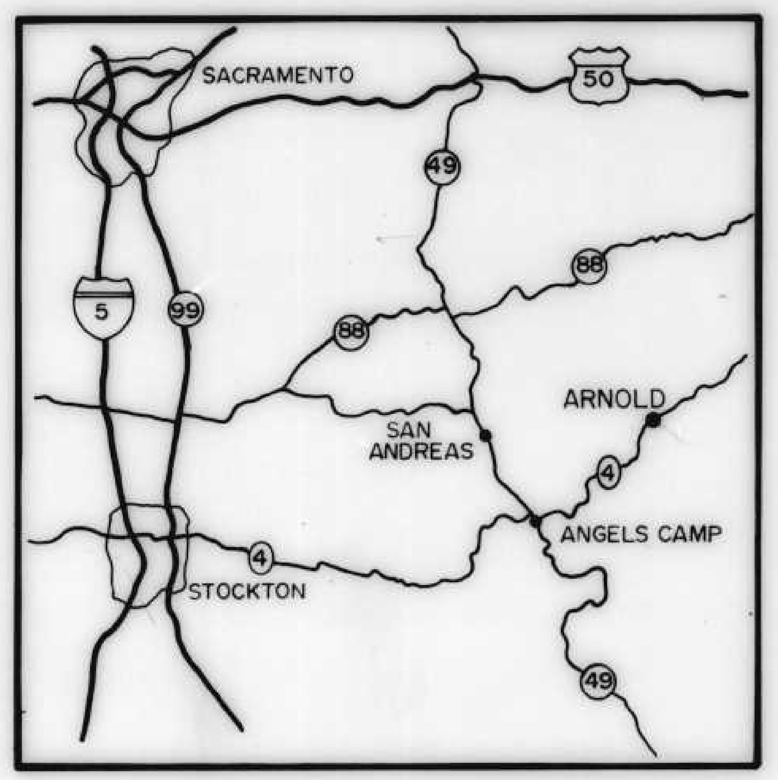
BOARD OF DIRECTORS

RAYMOND NEILSEN
RICHARD QUEIROLO
DON CLARK
C. T. JOHNSON
DAVID SILVEIRA

STEVEN FELTE, GENERAL MANAGER

C-06-0994-210





VICINITY MAP
1"=20 MI.

SHEET INDEX

1. TITLE
2. SYMBOL SHEET
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4. LIQUID STREAM FLOW DIAGRAM
5. SITE CONDITIONS
6. GRADING PLAN
7. PLANT PIPING PLAN
8. ROADWAY & PIPELINE PROFILE
9. ACCESS ROAD
10. HEADWORKS
11. OXIDATION DITCH
12. OXIDATION DITCH DETAILS
13. CLARIFIER
14. CLARIFIER STRUCTURAL DETAILS
15. AEROBIC DIGESTER
16. MISC. STRUCTURES
17. HYDROPNEUMATIC SYSTEM AND DETAILS
18. DITCH CRANE SYSTEM
19. STORAGE TANK
20. DISPOSAL DETAILS
21. SLUDGE DRYING BEDS
22. SLUDGE DRYING BEDS DETAILS
23. CONTROL BUILDING
24. CONTROL BUILDING
25. CONTROL BUILDING
26. CONTROL BUILDING - PLUMBING AND CHLORINATION SCHEMATIC
27. CONTROL BUILDING - MECHANICAL
28. STANDARD DETAILS
29. STANDARD DETAILS
30. STANDARD DETAILS
31. CONTROL BUILDING - ELECTRICAL
32. ELECTRICAL SITE PLAN
33. CONTROL SCHEMATIC
34. ELECTRICAL DIAGRAMS
35. ELECTRICAL DETAILS
36. PUMP STATION #1
37. PUMP STATION #1 AND #2 - ARCH.
38. PUMP STATION #1 ELECTRICAL
39. PUMP STATION #2
40. PUMP STATION #2 ELECTRICAL
41. PUMP STATION #3
42. PUMP STATION #3 - ARCH.
43. PUMP STATION #3 - ELECTRICAL

Michael S. Thalhamer

DRAWN BY M. SOLEM DESIGN BY M. THALHAMER
CHECK BY D. THOMPSON
BY Michael S. Thalhamer R.C.E. 23237

REVISION	DATE	DESCRIPTION	

RVA RAYMOND VAIL AND ASSOCIATES
ENGINEERING • PLANNING • SURVEYING
SACRAMENTO, CALIFORNIA 1410 Ethan Way 95825

ARNOLD WASTEWATER PROJECT
TITLE

DATE AUG. 1984
SCALE
HORIZONTAL AS SHOWN
VERTICAL
W.O. NO. 4391.03

SHEET 1 OF 43 SHEETS

FILE NO. D-0217

LEGEND

PIPING SYMBOLS

- BUTTERFLY VALVE
- PLUG VALVE
- BALL VALVE
- CHECK VALVE
- GATE VALVE
- GLOBE VALVE
- PRESSURE REDUCING VALVE
- VALVE OPERATORS M-MOTOR S-SOLENOID
- DIAPHRAGM VALVE
- FLOAT CONTROL VALVE
- UNION
- DIFFUSER
- METER
- PRESSURE GAUGE
- HOSE BIB
- HOSE BIB, FREEZLESS
- PUMP
- CO CLEAN OUT
- H/C HOT OR COLD WATER
- D DRAIN LINE
- FLOOR DRAIN W/C.O.

ELECTRICAL SYMBOLS

- 15A CIRCUIT BREAKER W/TRIP AMPS
- OPERATING COIL
- CONTACT-NORM. OPEN
- CONTACT-NORM. CLOSED
- THERMAL OVERLOAD
- TRANSFORMER
- 3 POSITION SELECTOR SWITCH
- FUSE
- PUSH BUTTON SWITCH NORMALLY OPEN
- CONDUCTORS NOT CONNECTED
- CONDUCTORS CONNECTED
- ON-OFF SWITCH
- MOTOR STARTER W/SIZE
- MOTOR
- PILOT LIGHT W/COLOR
- L.O.S. (LOCK-OUT-STOP)
- ON-OFF SELECTOR SWITCH
- HAND-OFF-AUTOMATIC (H-O-A) SELECTOR SWITCH
- REMOTE AT MOTOR
- RVS REDUCED VOLTAGE MAGNETIC STARTER
- MOTOR HORSEPOWER
- TR TIME RELAY
- DUPLEX RECEPTACLE
- 3 PHASE RECEPTACLE
- JUNCTION BOX
- PULL BOX 2'x3'
- PULL BOX 14"x23"
- SINGLE POLE SWITCH
- LIGHT POLE
- THERMOSTAT
- HEATER

INSTRUMENTATION

FT	FLOW TRANSMITTER
FIT	FLOW INDICATOR TRANSMITTER
FR	FLOW RECORDER
FQ	FLOW INTEGRATOR
QI	TOTALIZER
FI	FLOW INDICATOR
L.I.	LEVEL INDICATOR
F.I.R.T.	FLOW INDICATOR RECORDER TOTALIZER

SITE

- FINISH GRADE ELEVATION
- ORIGINAL GROUND ELEVATION
- FLOW LINE & DIRECTION
- TREES & SHRUBS
- FENCE

SECTIONS & DETAILS

DIRECTION ARROW

3 — SECTION NO.
8 — DRAWING NO. WHERE SECTION IS SHOWN

SECTION
3 — SECTION NO.
7 — DRAWING NO. WHERE SECTION IS CUT

DETAIL
A — DETAIL LETTER
6 — DRAWING WHERE DETAIL IS CALLED OUT

NOTE: THIS IS A STANDARD SHEET, THEREFORE, SOME SYMBOLS MAY APPEAR ON THIS SHEET AND NOT ON THE PLANS.

AS BUILT

DRAWN BY R.A.W.	DESIGN BY K.J.M.	REVISION	DATE	DESCRIPTION
CHECK BY M.G.T.				
BY Michael A. Fllen	23237			

RVA RAYMOND VAIL AND ASSOCIATES
ENGINEERING • PLANNING • SURVEYING
SACRAMENTO, CALIFORNIA 1410 Ethan Way 95825

ARNOLD WASTEWATER PROJECT
SYMBOL SHEET

DATE AUG. 1984
SCALE
HORIZONTAL
VERTICAL
W.O. NO 4391.03

SHEET 2 OF 43 SHEETS

FILE NO D-0217

BASIC DESIGN DATA

DESIGN FLOW	175,000 G.P.D.
BOD LOAD	213 Mg/l
SUSPENDED SOLID LOAD	213 Mg/l

SECONDARY CLARIFIER

VOLUME	40,000 GAL
OVERFLOW RATE	330 G.P.D./ft²
HYDRAULIC DETENTION TIME	5.5 HRS.

EFFLUENT STORAGE TANK

VOLUME	262,500 GAL
DETENTION	1.5 DAYS

SUMMER SPRAY FIELD

APPLICATION RATE	1.5"/WEEK
AREA	40 ACRES

OXIDATION DITCH

VOLUME	175,000 GAL.
DETENTION TIME	21 HRS
AIR	500 CFM

PRESSURE FILTER

NUMBER OF UNITS	2
DIA. OF EACH UNIT	6'-6"
MEDIA	SAND
FILTER RATE/Both	2.0 G.P.M./SQ.FT.

SAND DRYING BEDS

NUMBER OF OPEN UNITS	2
NUMBER OF COVERED UNITS	1
SIZE OF EACH UNIT	1000 S.F.
SIZE CRITERIA	1.35 Ft²/CAPITA

WINTER ABSORPTION TRENCHES

LOADING RATE	1.0 GAL/ft²/DAY
TRENCH LENGTH	17,500 ft

AEROBIC DIGESTER

VOLUME	18,100 GAL
HYDRAULIC DETENTION TIME	12 DAYS

AS BUILT

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BY [signature] 23237

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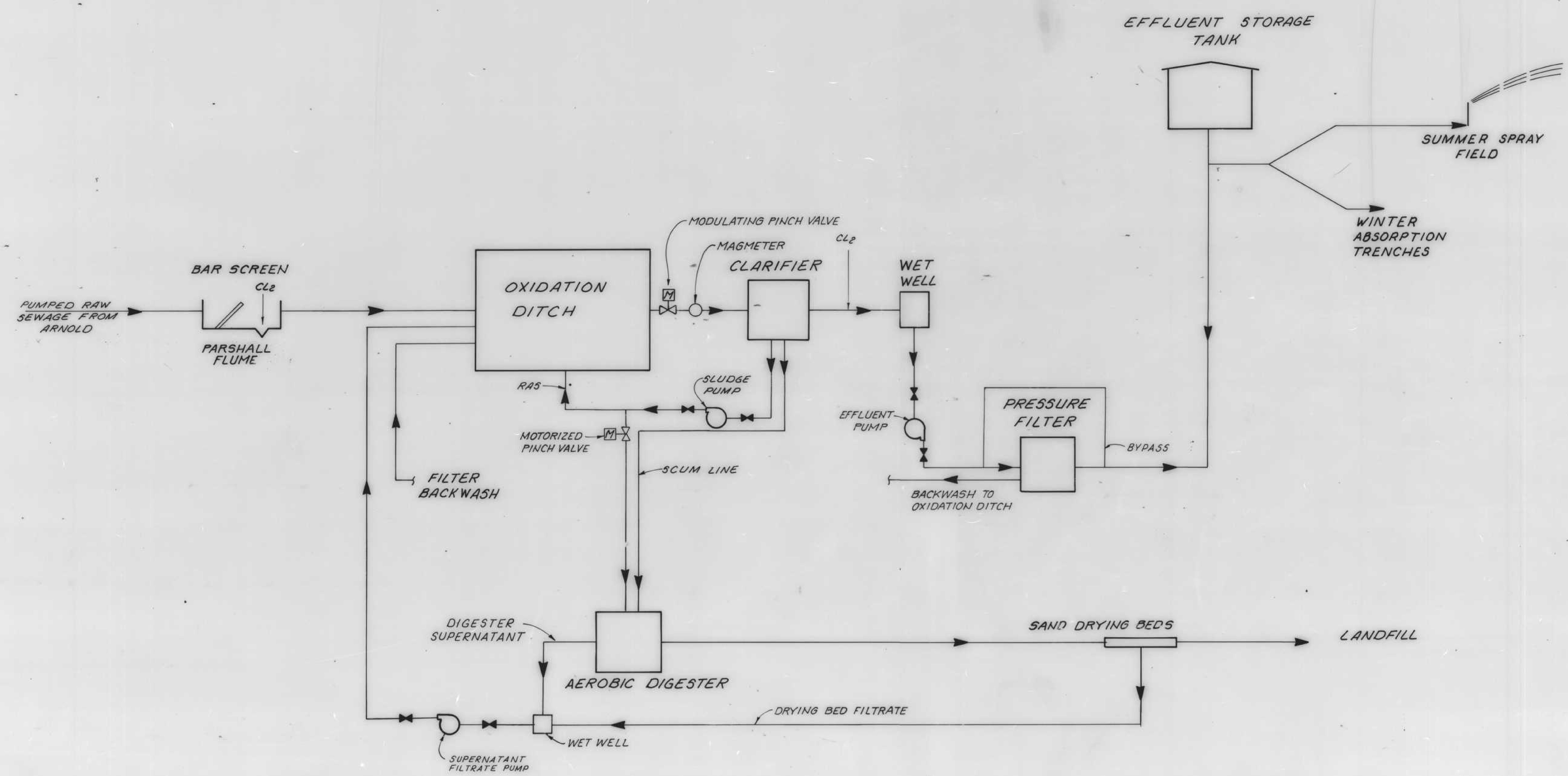
ARNOLD WASTEWATER PROJECT
HYDRAULIC PROFILE / UNIT SIZING CRITERIA

DATE AUG. 1984
SCALE
HORIZONTAL
VERTICAL
W.O. NO. 4391.03

SHEET 3 OF 43 SHEETS

FILE NO. D-0217



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CHECK BY M. THALHAMER		
BY *(signature)*		23237

REVISION	DATE	DESCRIPTION

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ARNOLD WASTEWATER PROJECT

LIQUID STREAM FLOW DIAGRAM

DATE AUG. 1984
SCALE:
HORIZONTAL NO SCALE
VERTICAL
W.O. NO. 4391.03

SHEET 4 OF 43 SHEETS

FILE NO. D-0217

TEST BORING G2

- 0–2: BROWN-RED, MOIST, SANDY SILT WITH RED RHYOLITE ROCK
- 8: LESS WEATHERED, HARDER TO DRILL AT 10 FEET
- 14–16: BROWN, WET, FIRM FINE SILTY SAND WITH DIABASE & TUFFACEOUS ROCKS
- BREAK IN LOG
- 24–26: WET AT 25 FEET
- 30: BORING TERMINATED AT 30 FEET

TEST BORING G3

- 0–2: RED-BROWN, FRACTURED RHYOLITE ROCK WITH SAND & CLAY SOIL
- 4–6: GRADES INTO BROWN, MOIST, FIRM SANDY SILT & CLAY WITH SMALL PIECES OF RHYOLITE ROCK
- 8: TAN, WET, FIRM, CLAYEY SILT WITH SMALL QUARTZ ROCK
- 10–12: VERY WET, BROWN, FIRM, HIGHLY FRACTURED & WEATHERED RHYOLITE-TUFF FLOW (FREE WATER IN SAMPLE)
- 14: DRILL RETURNS ARE MOSTLY SILT & CLAY INDICATING THAT ROCK IS HIGHLY DECOMPOSED (EASY DRILLING) WL
- 18: BORING TERMINATED IN REFUSAL AT 18 FEET

TEST HOLE NO. 1

- TOPSOIL
- LIGHT BROWN CLAYEY SILT
- MOIST CLAY

TEST HOLE NO. 2

- TOPSOIL
- BROWN CLAYEY SILT
- CLAYEY SILT W/MIXED COBBLES
- SILTY SAND

TEST HOLE NO. 3

- TOPSOIL
- MOIST BROWN CLAYEY SILT
- BROWN CLAYEY SILT
- BROWN SILTY SAND NO FREE MOISTURE

TEST HOLE NO. 4

- TOPSOIL
- DARK CLAYEY SILT
- REDDISH RHYOLITE NO FREE MOISTURE

TEST HOLE NO. 5

- TOPSOIL
- DARK SANDY SILT
- LIGHT SILTY CLAY
- VERY LIGHT SILT NO MOISTURE

TEST HOLE NO. 6

- GREEN GRASS ON SURFACE TOPSOIL
- RED CLAY-NO FREE MOISTURE
- LIGHT BROWN DECOMPOSED-SANDY NO MOISTURE

TEST HOLE NO. 7

- TOPSOIL DARK SILTY CLAY
- MOIST CLAYEY SILT DARK CLAY SILT NO FREE MOISTURE

TEST HOLE NO. 8

- DARK TOPSOIL
- DARK SILTY CLAY NO MOISTURE

NOTES:

1. ALL SPRINKLERS & CONTROL VALVES TO BE FIELD LOCATED BY ENGINEER.
2. LINE "PE" TO BE FIELD LOCATED BY ENGINEER. SEE SHEET 28 FOR PIPE TRENCH DETAIL.
3. SPRINKLER MANIFOLD PIPE TO BE FIELD LOCATED AND TO FOLLOW CONTOURS FOR A CONTINUOUS NEGATIVE GRADIENT. PROVIDE 1" DRAIN VALVE AND VALVE BOX AT END OF EACH MANIFOLD PIPE.
4. EXISTING FENCE POSTS ON EAST R. MAY BE REUSED.

* SPRINKLER SYSTEM TOTAL RUN EQUALS FROM VALVE BOX TO LAST SPRINKLER HEAD.

AS BUILT

DRAWN BY G. ZUEGER	DESIGN BY K. MULLIN	
CHECK BY M. THALHAMER		
BY [signature]	R.C.E. 23237	

REVISION	DATE	DESCRIPTION

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ARNOLD WASTEWATER PROJECT

SITE CONDITIONS

DATE AUG 1984
SCALE HORIZONTAL 1" = 100'
VERTICAL
W.O. NO 4391.03

SHEET 5 OF 43 SHEETS

FILE NO. D-0217

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CHECK BY D. THOMPSON		
BY Michael L. Thalhamer	23237	

REVISION	DATE	DESCRIPTION

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ARNOLD WASTEWATER PROJECT
GRADING PLAN

DATE AUG 1984
SCALE HORIZONTAL 1" = 10'
VERTICAL
W.O. NO. 4391.03

SHEET 6 OF 43 SHEETS

D-0217

		SIZING, YARD PIPE (YP)
~~BA~~	BLOWER AIR	8" YP
BW	BACKWASH	4" YP
CBS	CONTROL BUILDING SEWER	6" FORCE MAIN PIPING SPEC
CE	CLARIFIER EFFLUENT	1-1/2" PVC
CL	CHLORINE SOLUTION	6" YP
CSD	CLARIFIER SCUM DISCHARGE	4" FORCE MAIN PIPING SPEC
DBF	DRYING BED FILTRATE	6" YP
DS	DIGESTED SLUDGE	6" YP
DSP	DIGESTER SUPERNATANT	8" FORCE MAIN PIPING SPEC
IS	INFLUENT SEWER	6" YP OR AS SHOWN
ODE	OXIDATION DITCH EFFLUENT	6" FORCE MAIN PIPING SPEC
PE	PLANT EFFLUENT	8" YP
PI	PLANT INFLUENT	1-1/2" & 6" FORCE MAIN PIPING SPEC
PW	POTABLE WATER	4" FORCE MAIN PIPING SPEC
RS & WS	RETURN SLUDGE	1-1/2" PVC
~~SW~~	SECONDARY WATER	

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CHECK BY M. THALHAMER

BY [signature] 23237

REVISION	DATE	DESCRIPTION

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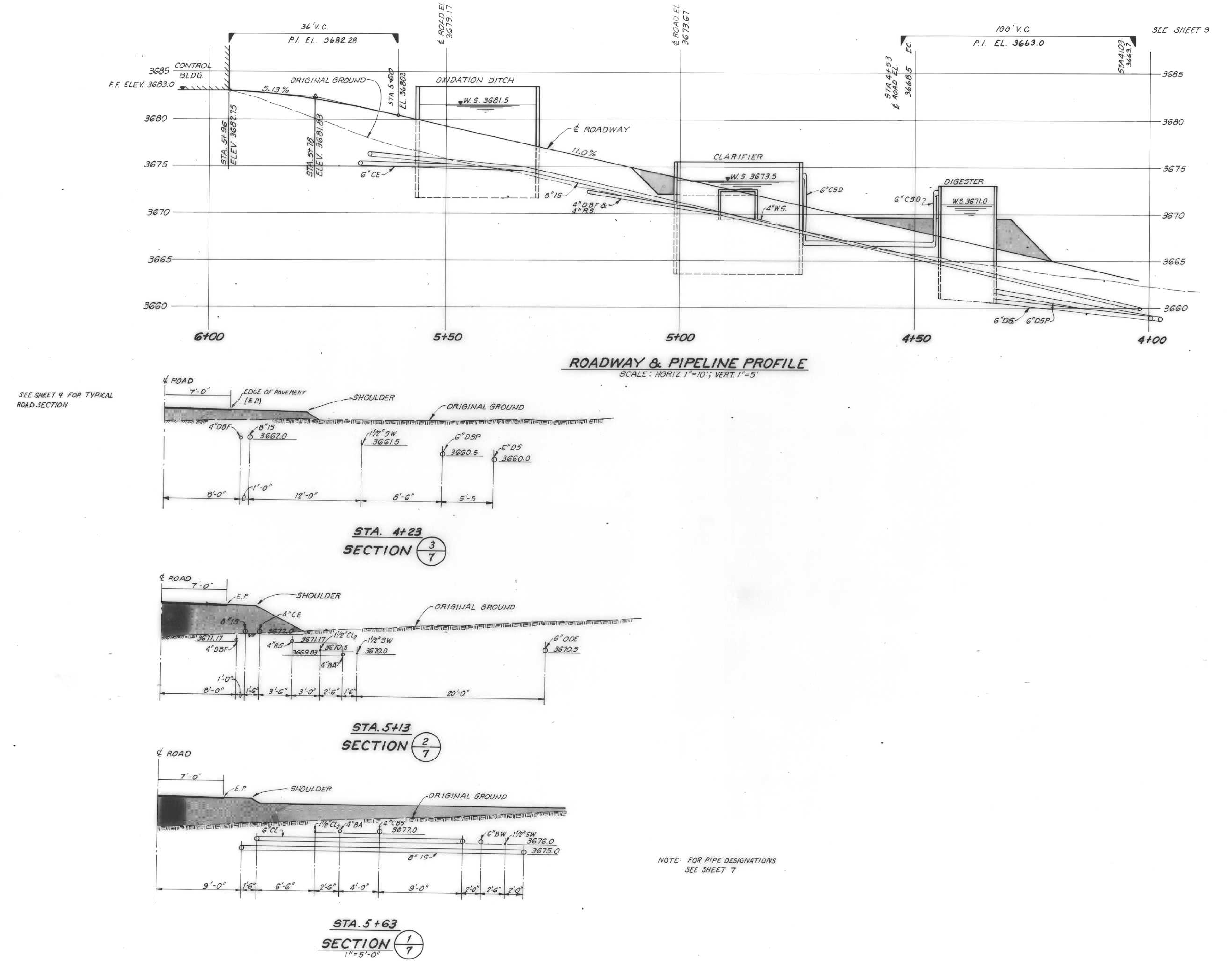
ARNOLD WASTEWATER PROJECT
PLANT PIPING PLAN

DATE AUG. 1984
SCALE
HORIZONTAL 1" = 10'
VERTICAL
W.O. NO. 4391.03

SHEET 7 OF 43 SHEETS

FILE NO. D-0217



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CHECK BY M. THALHAMER			
BY Michael A. Thalhamer	23237		

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ARNOLD WASTEWATER PROJECT

ROADWAY & PIPELINE PROFILE

DATE AUG. 1984
SCALE
HORIZONTAL AS SHOWN
VERTICAL
W.O. NO. 4391.03

SHEET 8 OF 43 SHEETS

FILE NO. D-0217

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CHECK BY: M. THALHAMER		
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REVISION	DATE	DESCRIPTION

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PROPOSED IMPROVEMENTS FOR
ARNOLD WASTEWATER PROJECT
ACCESS ROAD

DATE AUG. 1984
SCALE
HORIZONTAL 1"=20'
VERTICAL 1"=4'
W.O. NO. 4391.03

SHEET 9 OF 43 SHEETS

FILE NO. D-0217

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CHECK BY DTT		
BY Michael S. [signature]	23237	

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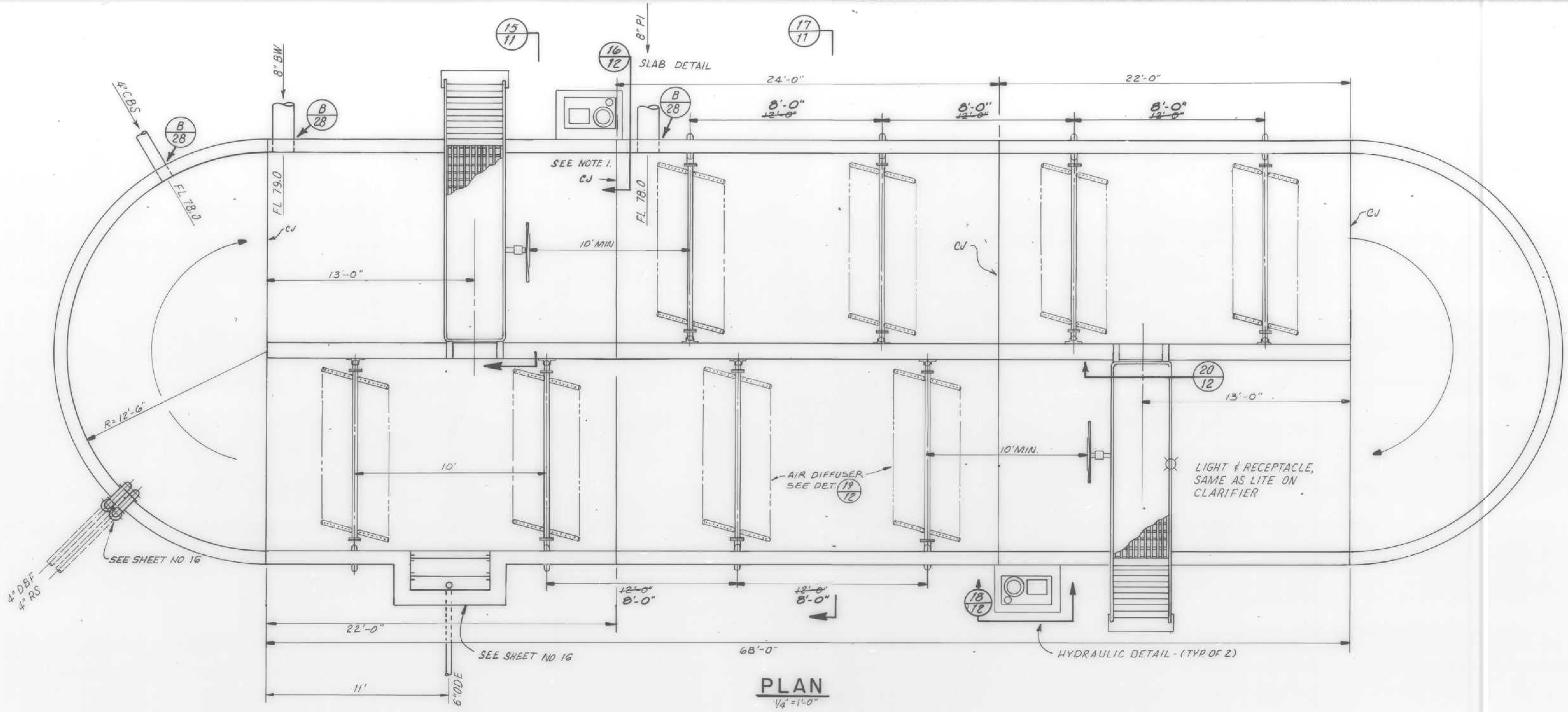
ARNOLD WASTEWATER PROJECT
HEADWORKS

DATE AUG 1984
SCALE
HORIZONTAL
VERTICAL
W.O. NO. 4391.03

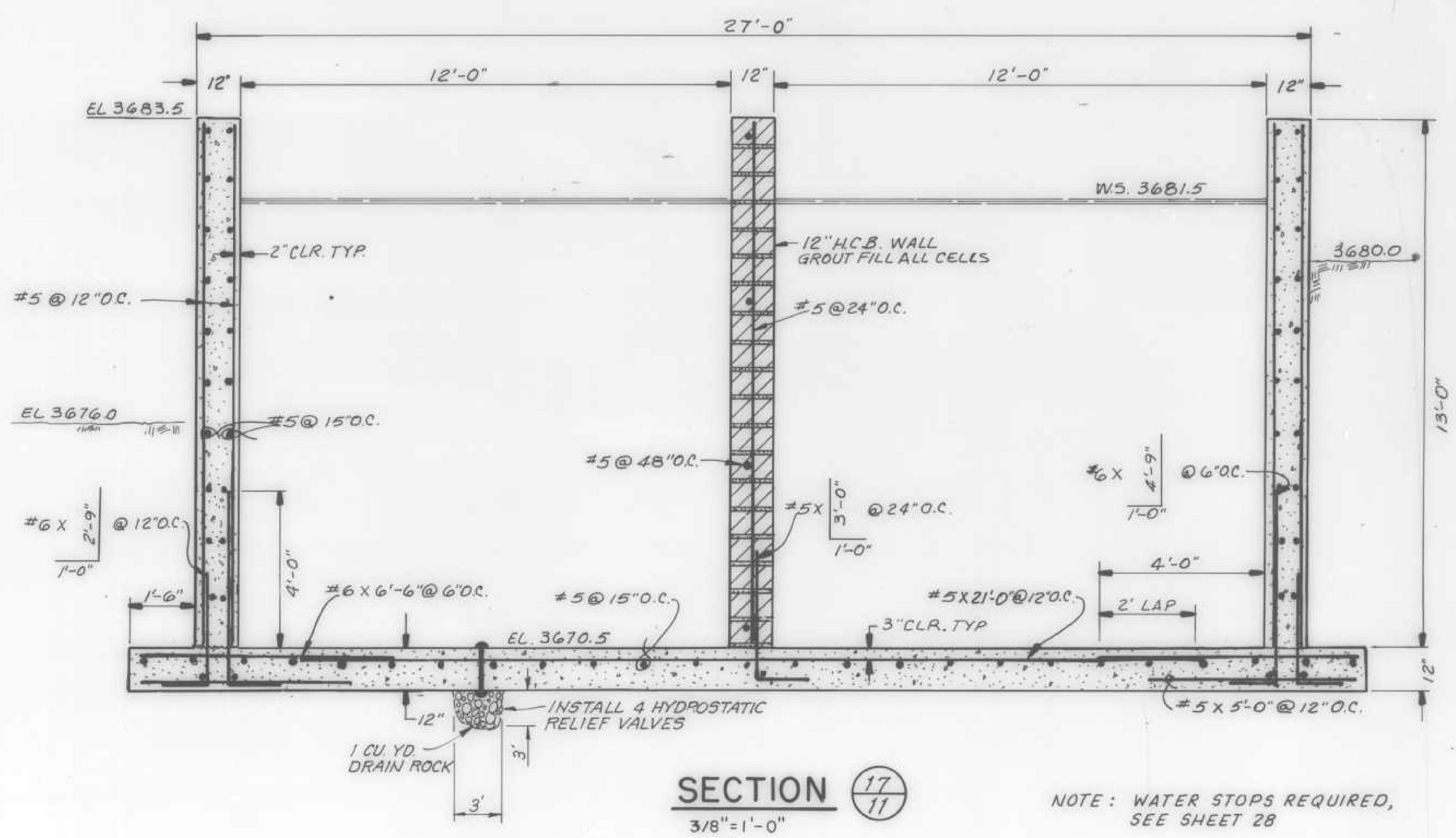
SHEET 10 OF 43 SHEETS

FILE NO. D-0217

NOTES:
1. CONSTRUCTION JOINT (C.J.) WITH WATER STOP 10" (SEE STA. DETAILS) RUN #5 @ 15" O.C. THRU JOINTS.
2. SEE SHEET 18 FOR CRANE RAIL SYSTEM.

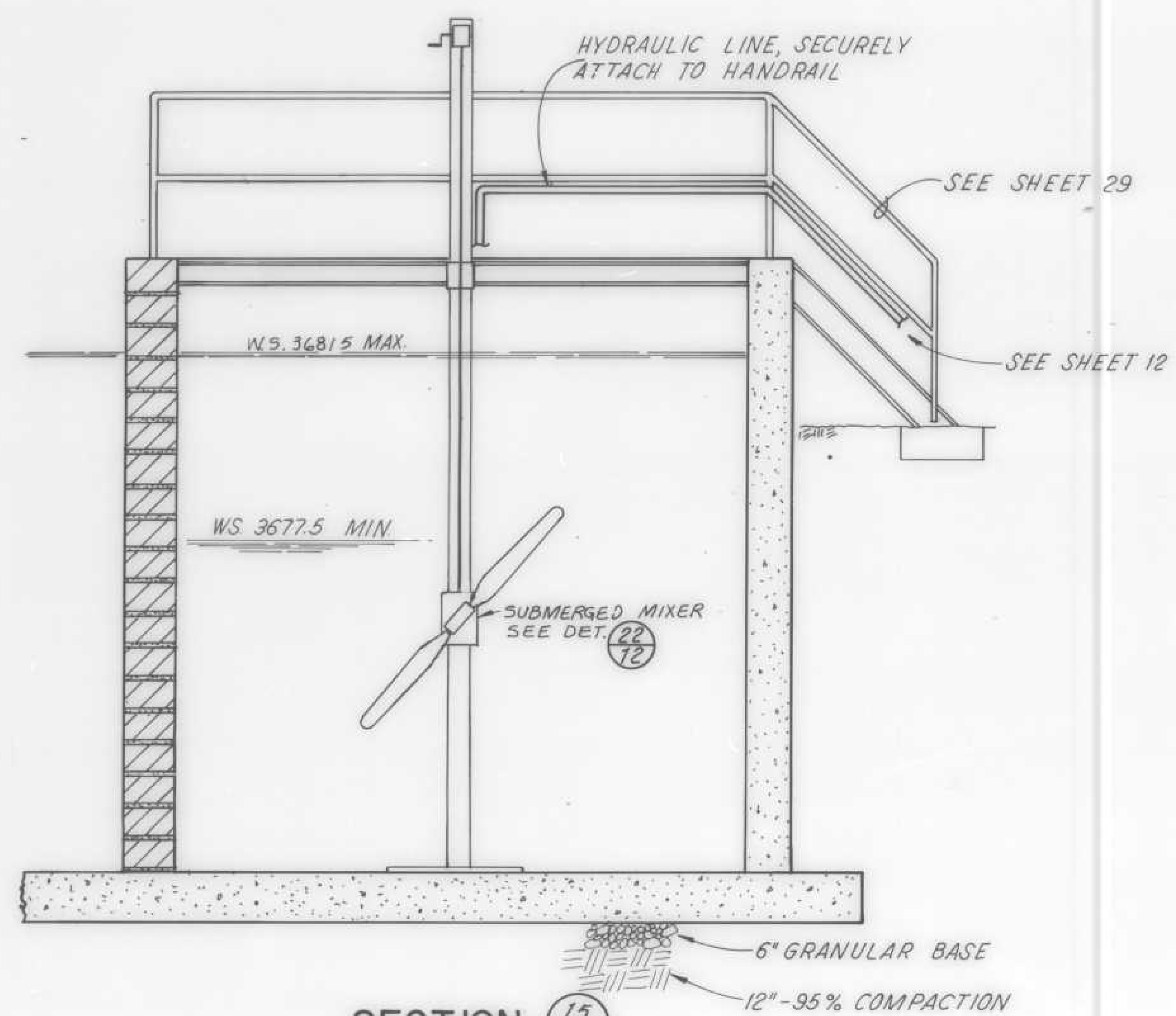


PLAN
1/4" = 1'-0"



SECTION 17/11
3/8" = 1'-0"

NOTE: WATER STOPS REQUIRED, SEE SHEET 28



SECTION 15/11
3/8" = 1'-0"

AS BUILT

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BY Michael S. [signature]	23237		

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ARNOLD WASTEWATER PROJECT
OXIDATION DITCH

DATE AUG 1984
SCALE
HORIZONTAL
VERTICAL
W.O. NO 4391.03

SHEET 11 OF 43 SHEETS

FILE NO D-0217

DRAWN BY R.A.W. — DESIGN BY M. THALHAMER CHECK BY D. THOMPSON BY Michael S. [signature] 23237	REVISION / DATE / DESCRIPTION	RVA RAYMOND VAIL AND ASSOCIATES ENGINEERING • PLANNING • SURVEYING SACRAMENTO, CALIFORNIA 1410 Ethan Way 95825	ARNOLD WASTEWATER PROJECT OXIDATION DITCH DETAILS

DATE AUG 1984
SCALE HORIZONTAL AS SHOWN
VERTICAL
W.O. NO. 4391.03
SHEET 12 OF 43 SHEETS
FILE NO. D-0217

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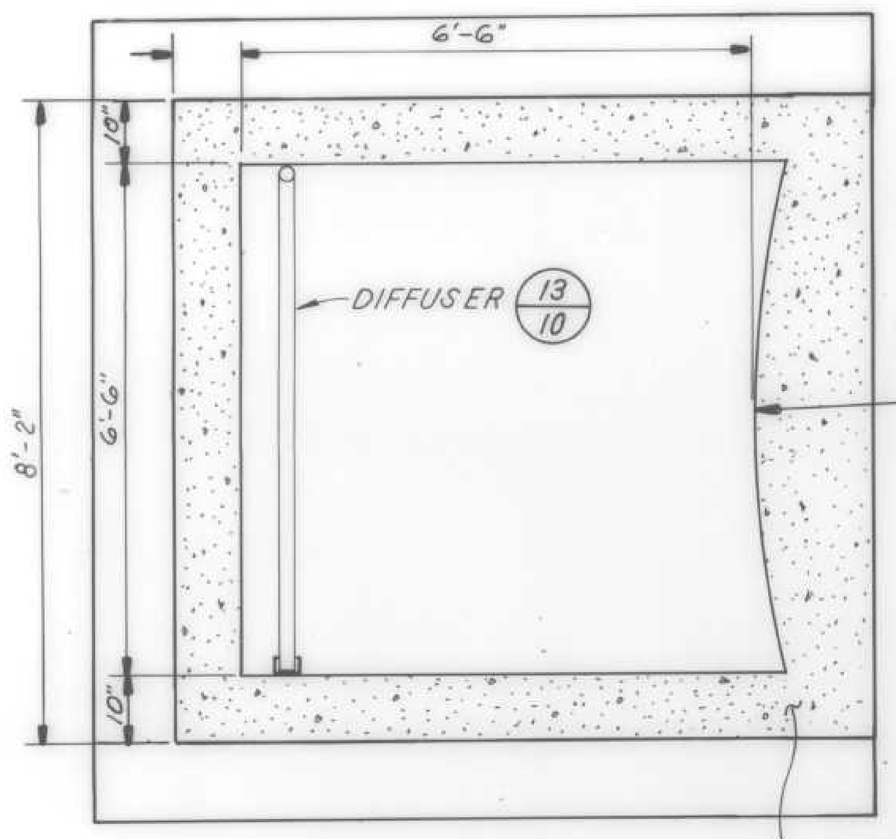
ARNOLD WASTEWATER PROJECT

CLARIFIER

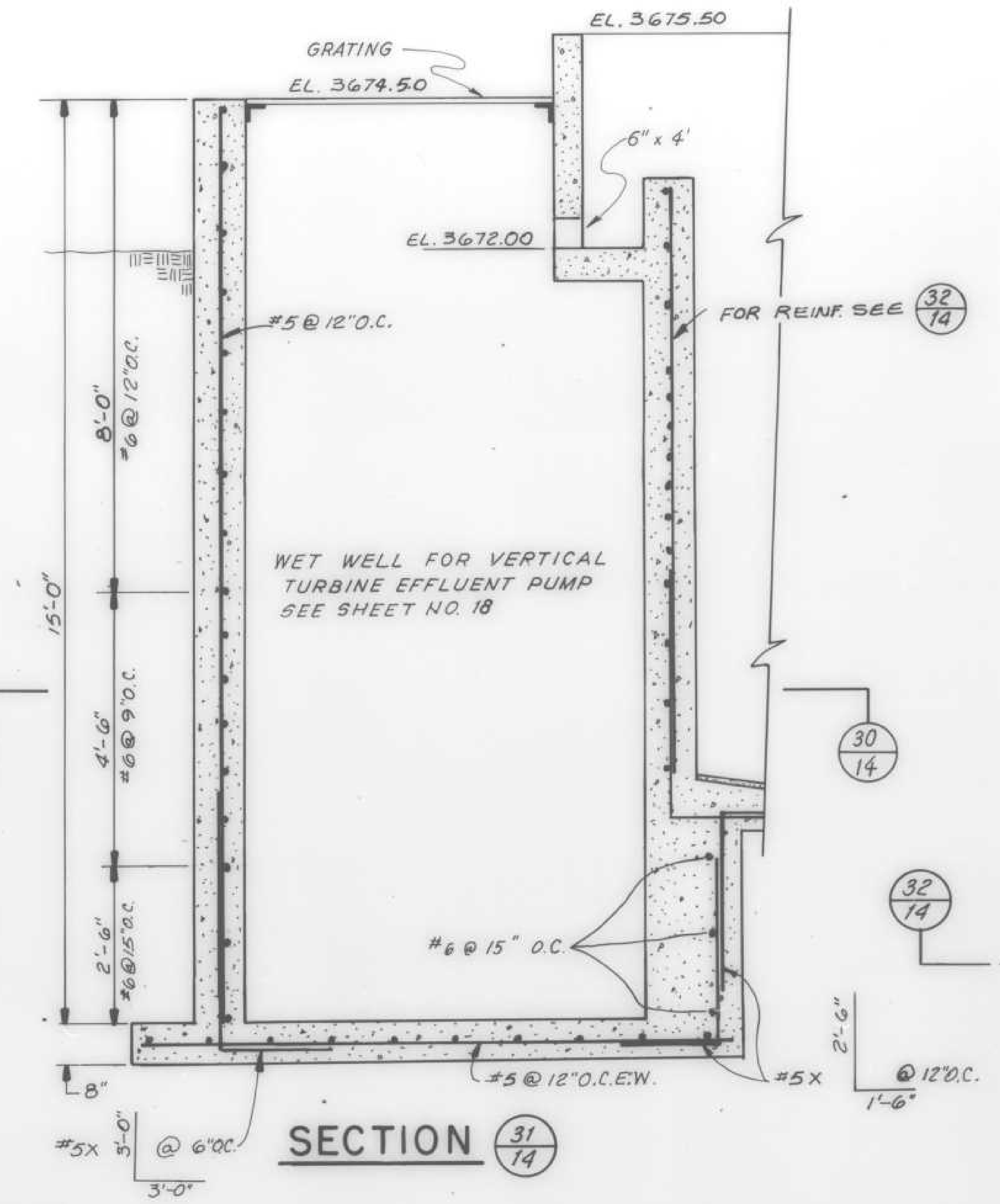
DATE AUG. 1984
SCALE
HORIZONTAL AS NOTED
VERTICAL
W.O. NO. 4391.03

SHEET 13 OF 43 SHEETS

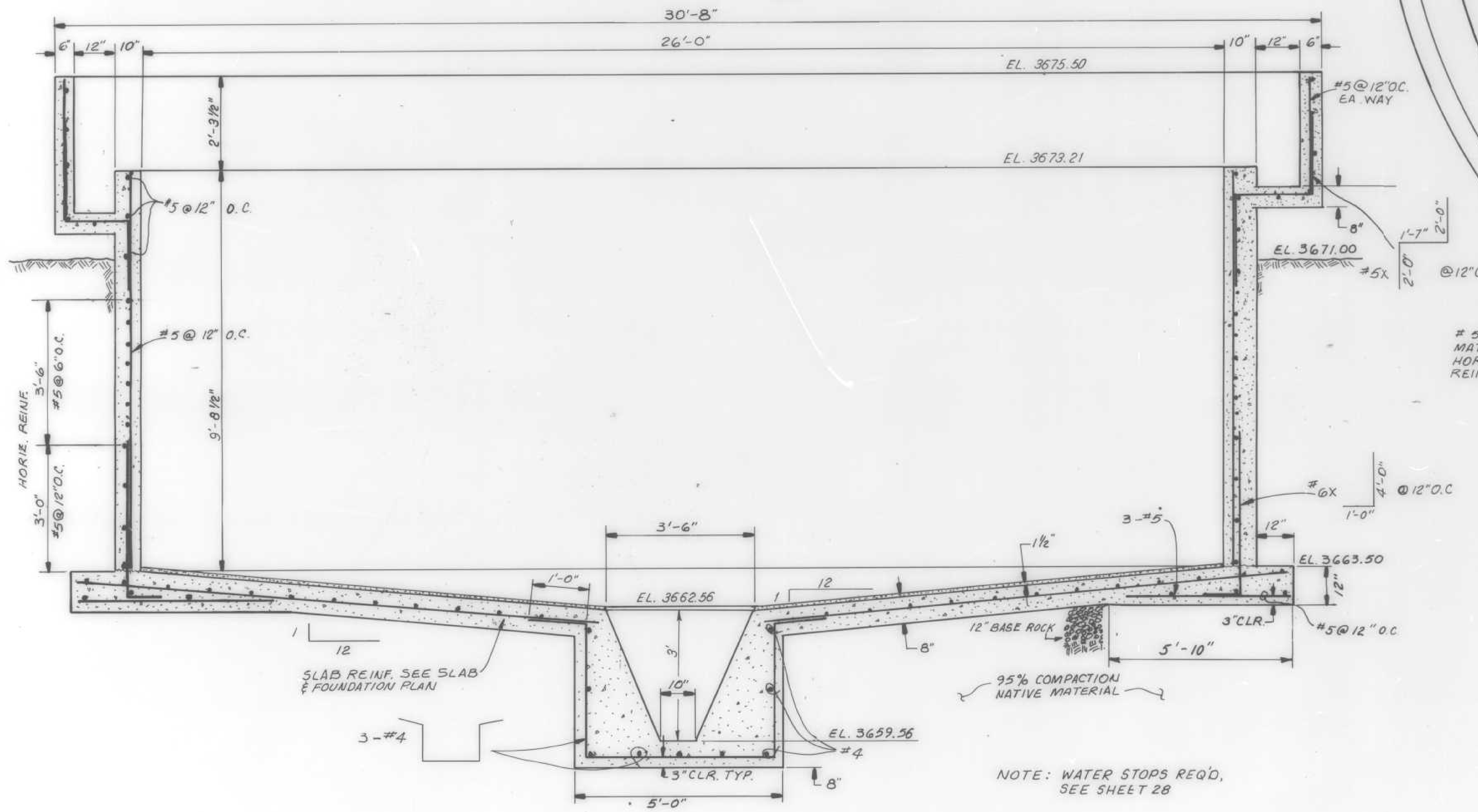
FILE NO. D-0217



SECTION 30/14

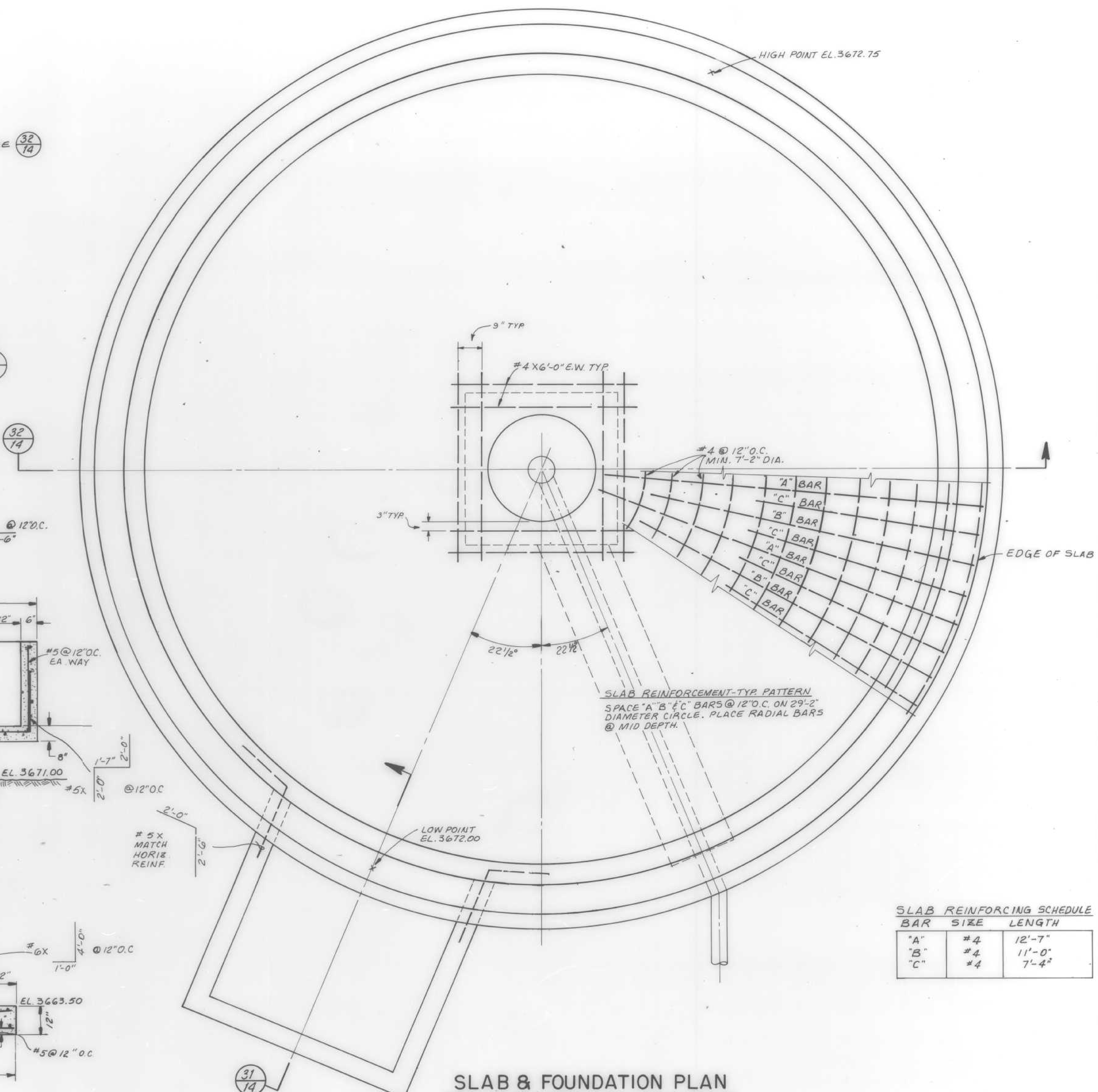


SECTION 31/14



SECTION 32/14

1/2" = 1'-0"



SLAB & FOUNDATION PLAN

1/2" = 1'-0"

SLAB REINFORCING SCHEDULE

BAR	SIZE	LENGTH
"A"	#4	12'-7"
"B"	#4	11'-0"
"C"	#4	7'-4"

DRAWN BY R. WILLICK DESIGN BY K. MULLIN

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BY Michael A. Thalhamer 23237

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ARNOLD WASTEWATER PROJECT

CLARIFIER-STRUCTURAL DETAILS

DATE AUG. 1984

SCALE

HORIZONTAL AS NOTED

VERTICAL

W.O. NO. 4391.03

SHEET 14 OF 43 SHEETS

FILE NO. D-0217

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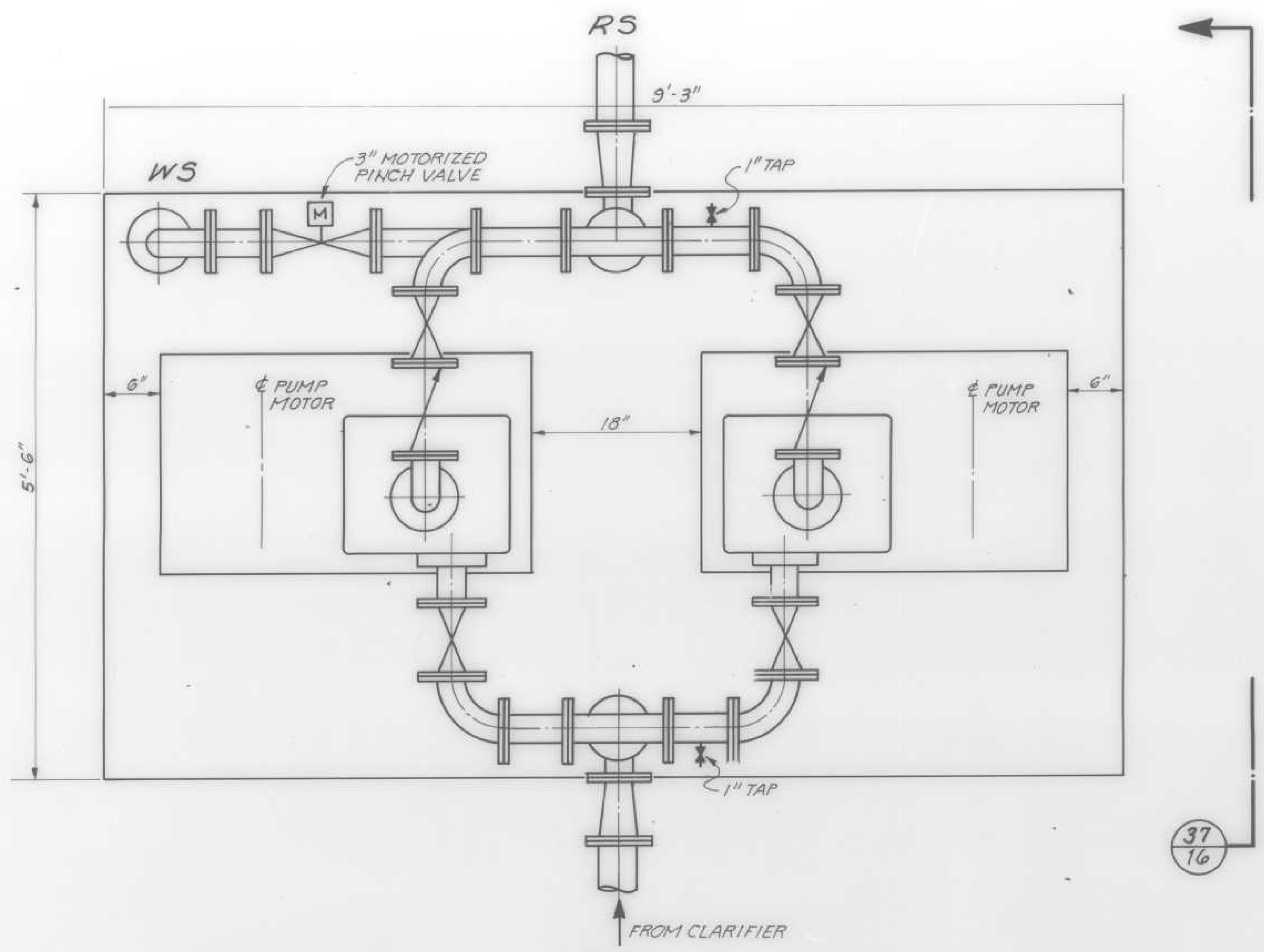
ARNOLD WASTEWATER PROJECT
AEROBIC DIGESTER

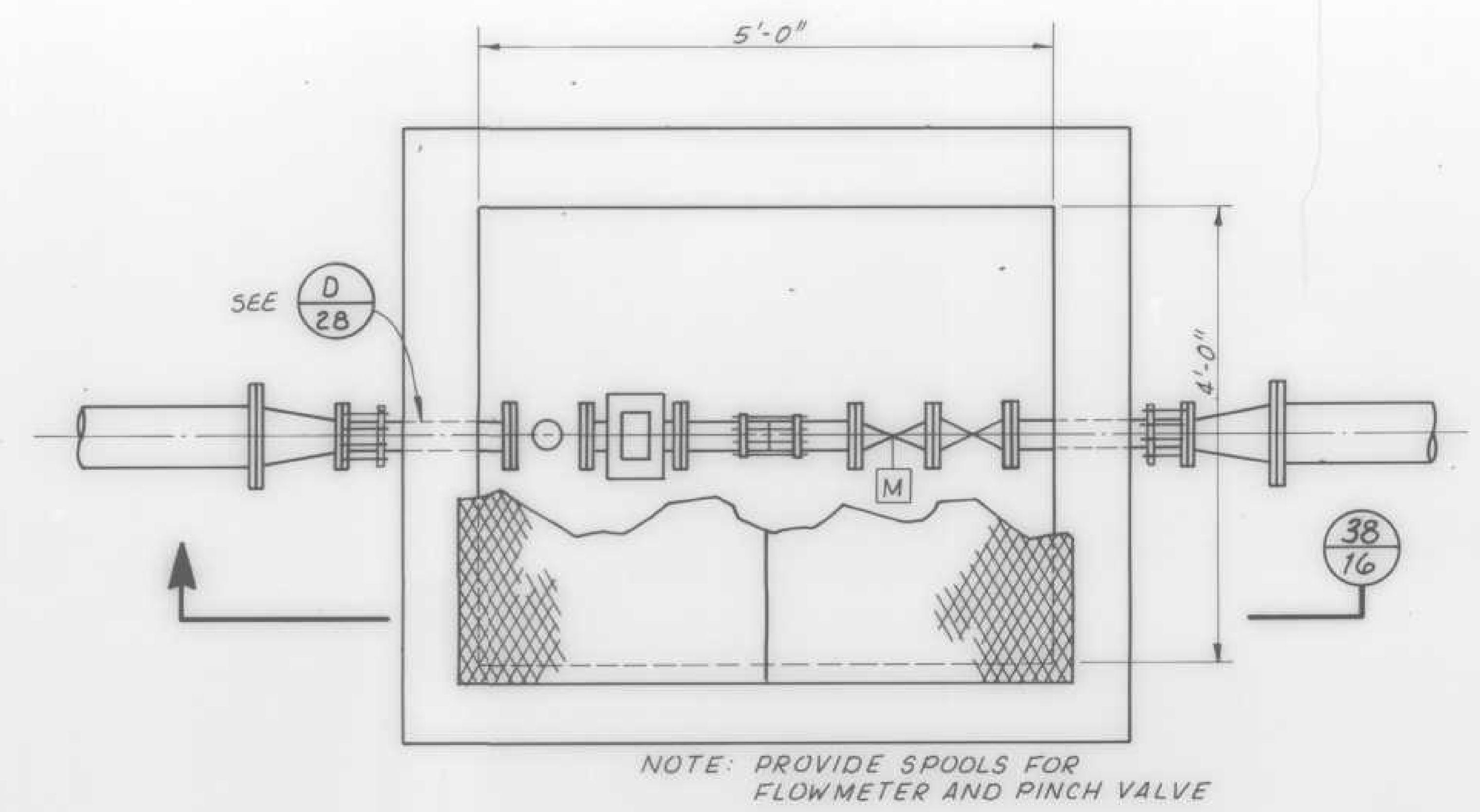
DATE AUG. 1984
SCALE HORIZONTAL AS NOTED
VERTICAL
W.O. NO. 4391.03
SHEET 15 OF 43 SHEETS
FILE NO. D-0217



PLAN

SLUDGE RETURN ASSEMBLY

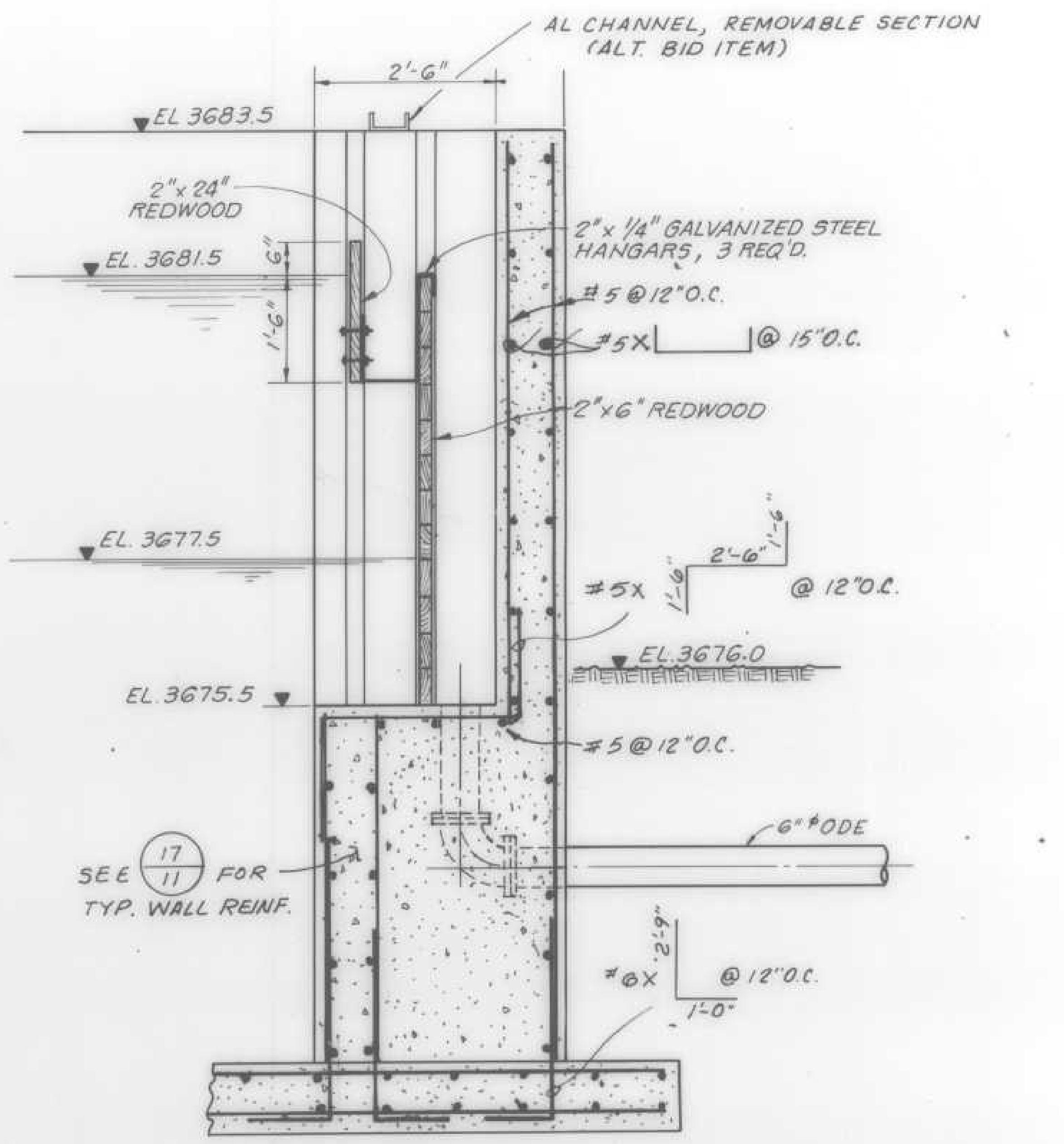
1" = 1'-0"



PLAN

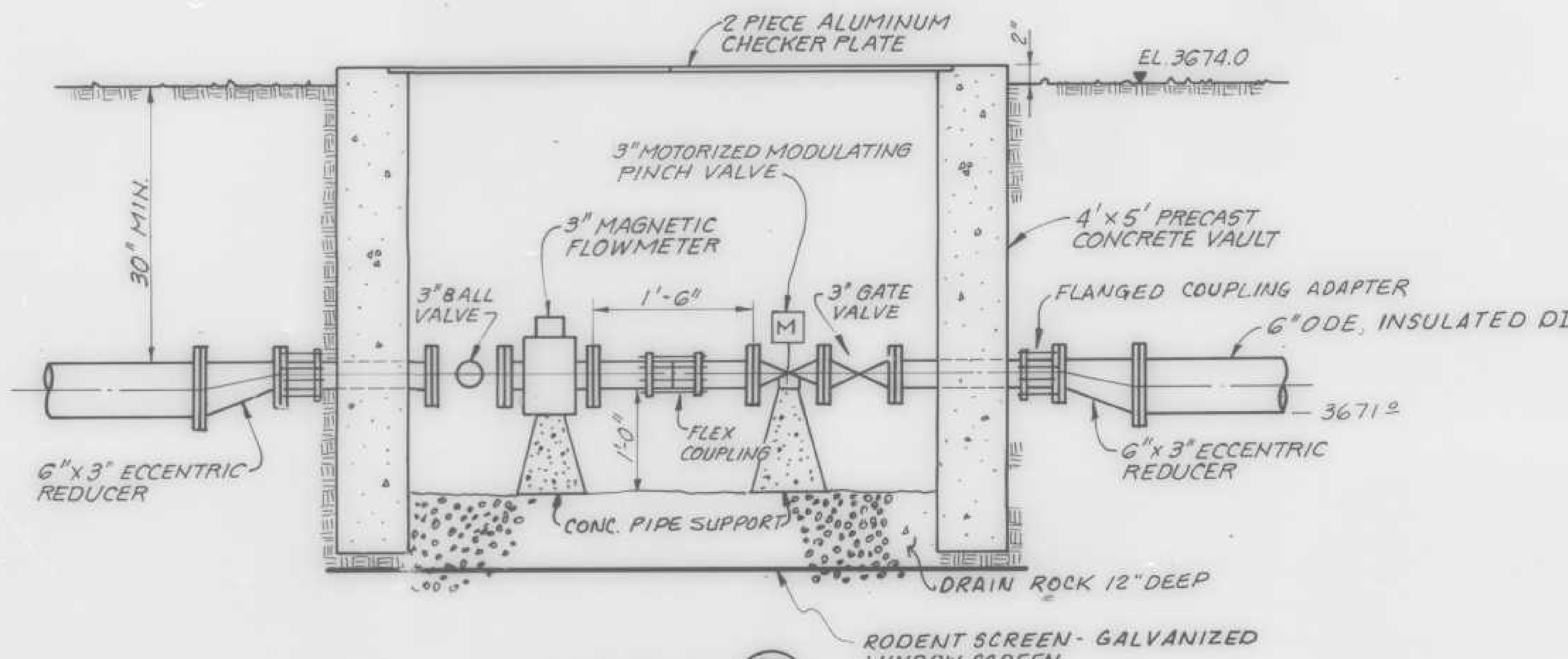
FLOW CONTROL VAULT

3/4" = 1'-0"



SECTION 39/16

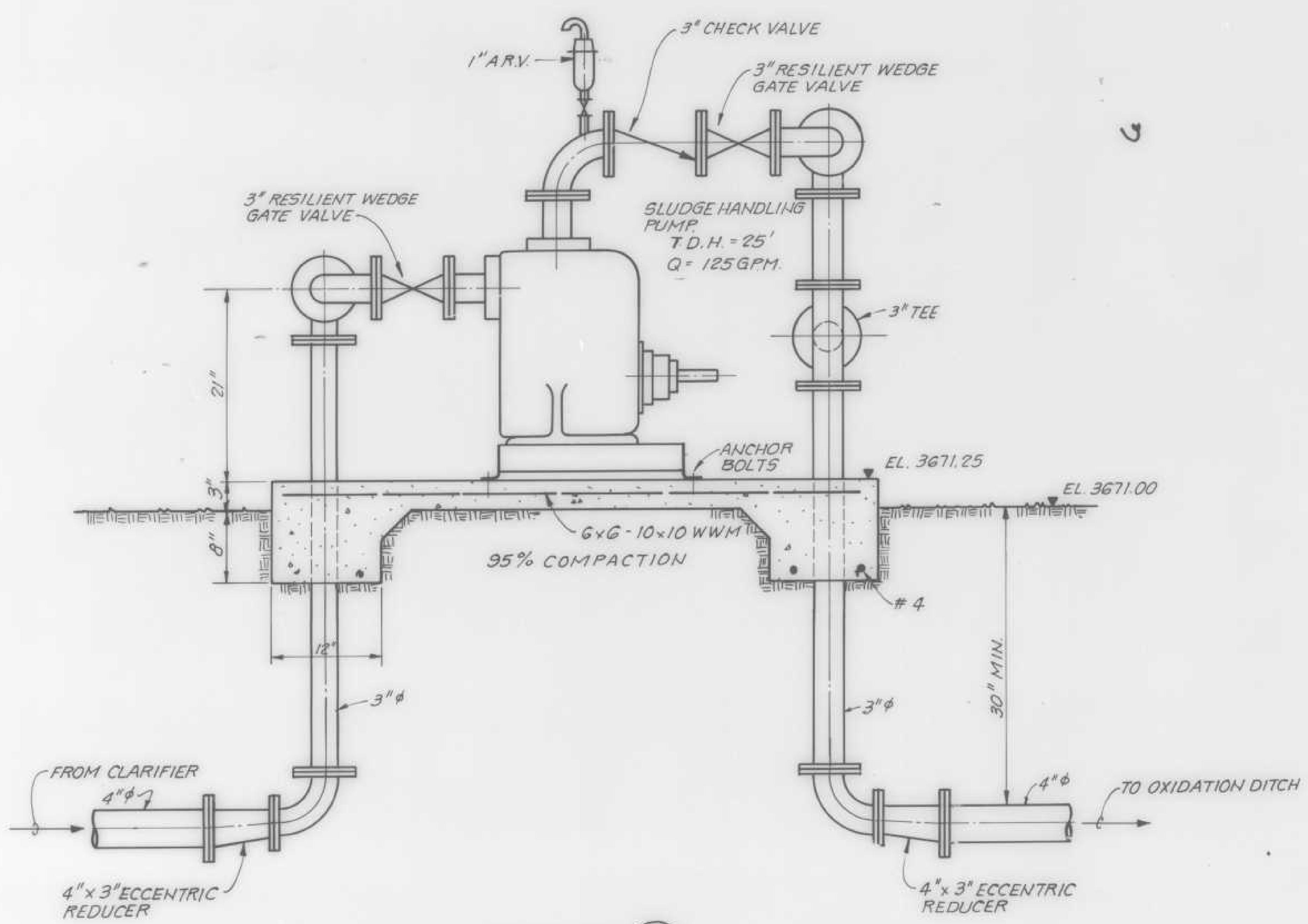
1/2" = 1'-0"



SECTION 38/16

FLOW CONTROL VAULT

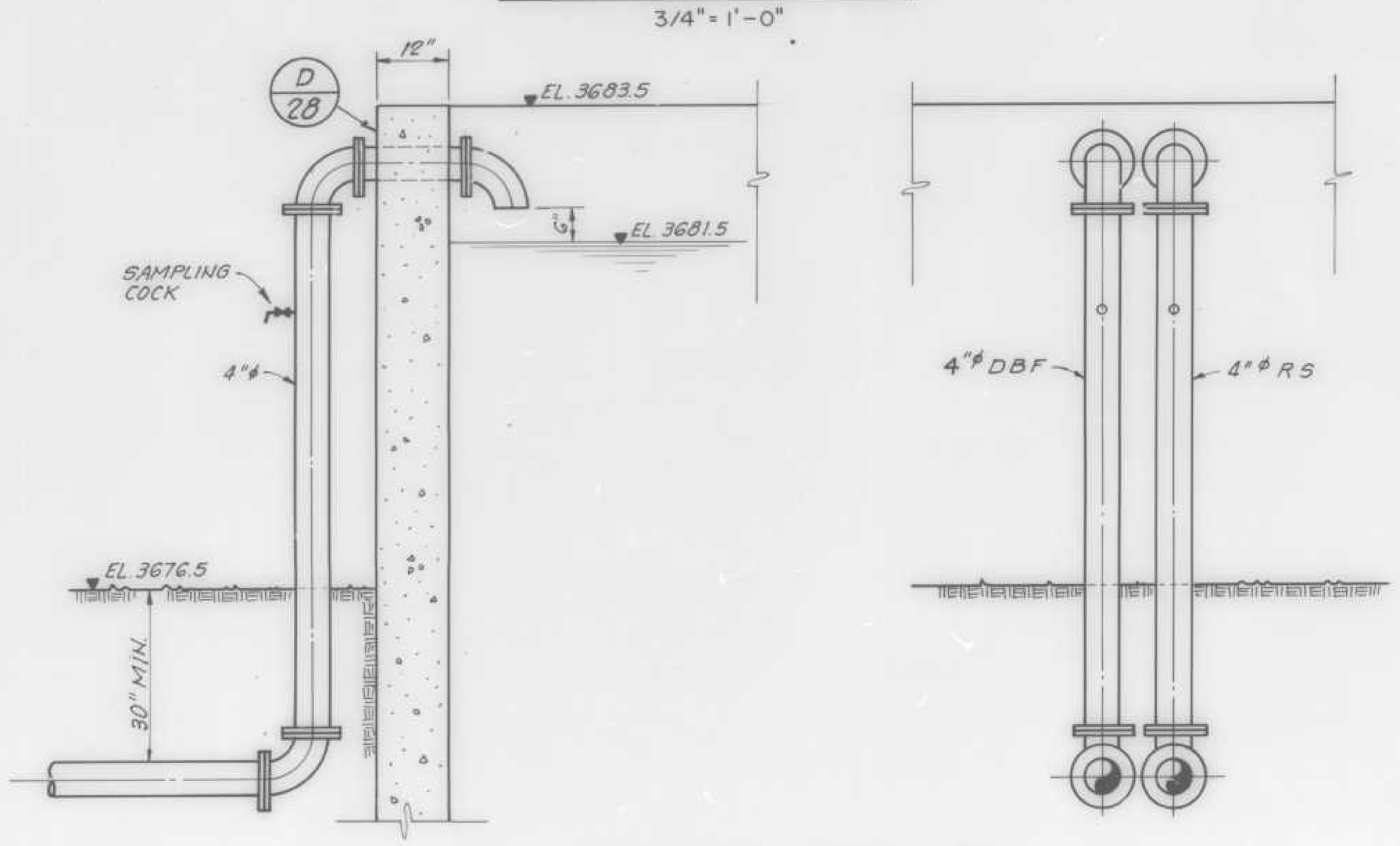
3/4" = 1'-0"



SECTION 37/16

SLUDGE RETURN ASSEMBLY

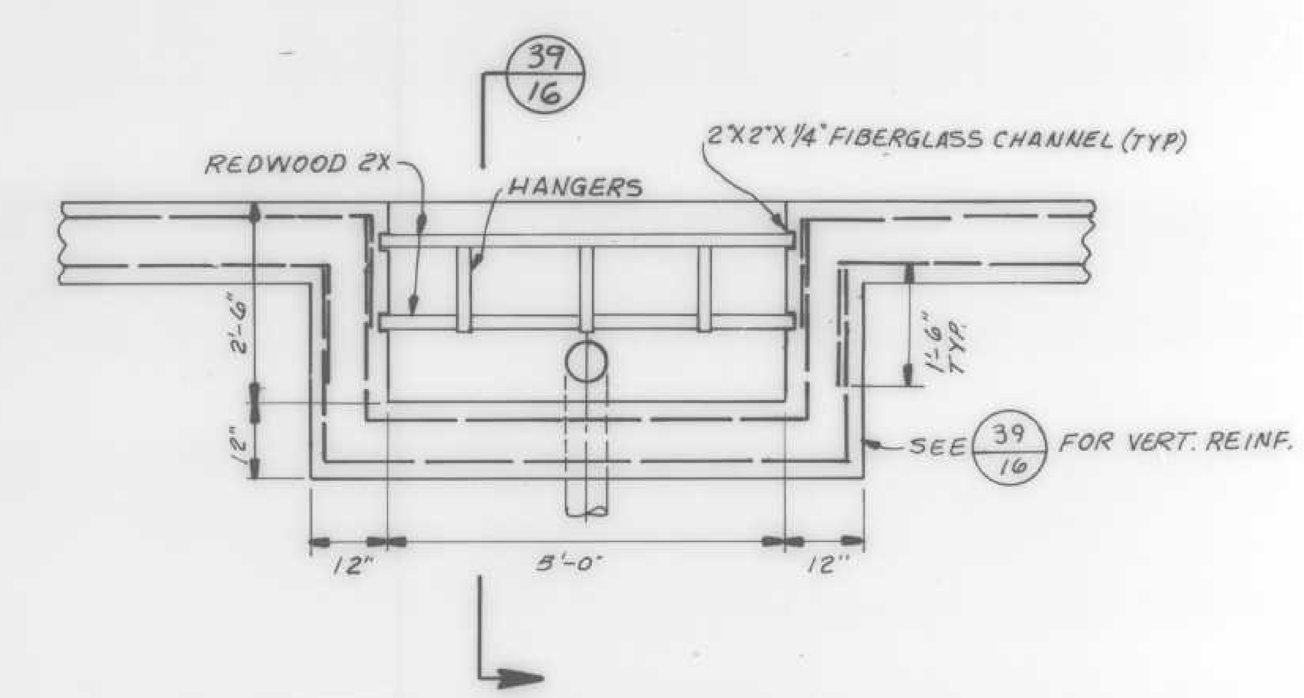
1" = 1'-0"



PIPE INLET DETAIL 4/16

1/2" = 1'-0"

SEE SHEET NO. 11



PLAN—OXIDATION DITCH WEIR

1/2" = 1'-0"

AS BUILT

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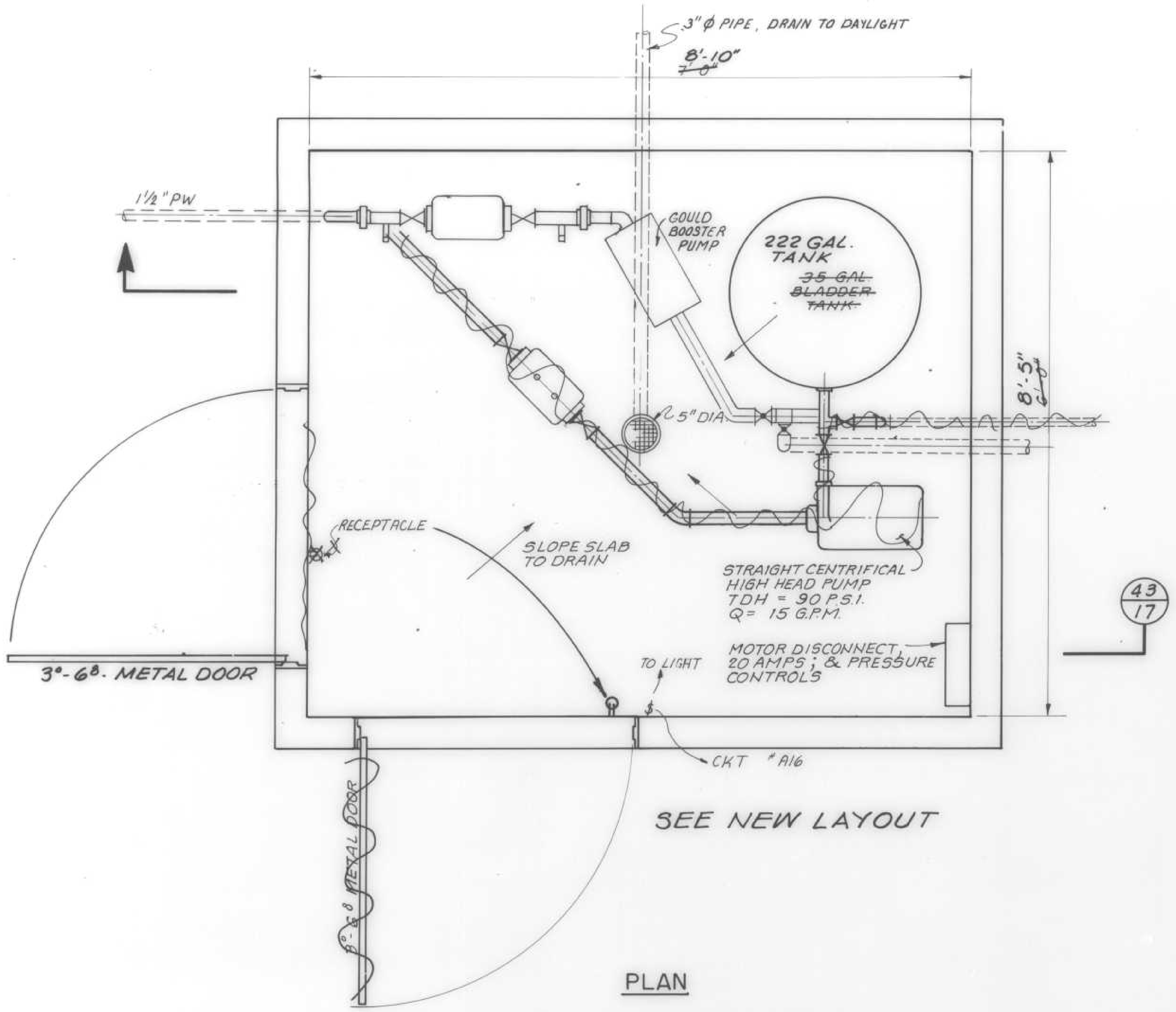
ARNOLD WASTEWATER PROJECT

MISC. STRUCTURES

DATE AUG. 1984
SCALE HORIZONTAL AS SHOWN
VERTICAL
W.O. NO. 4391.03
SHEET 16 OF 43 SHEETS
FILE NO. D-0217



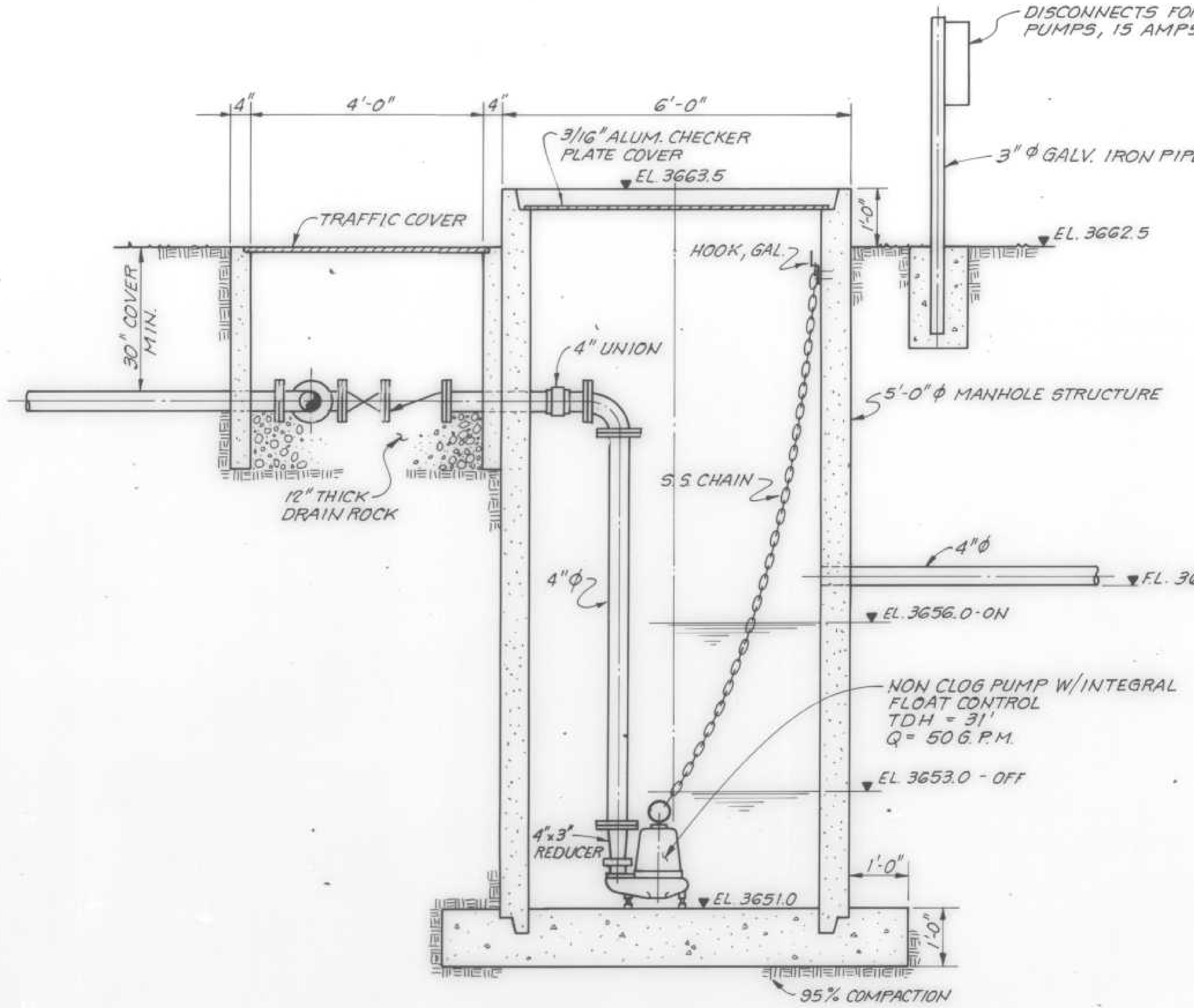
SEE NEW LAYOUT

PLAN

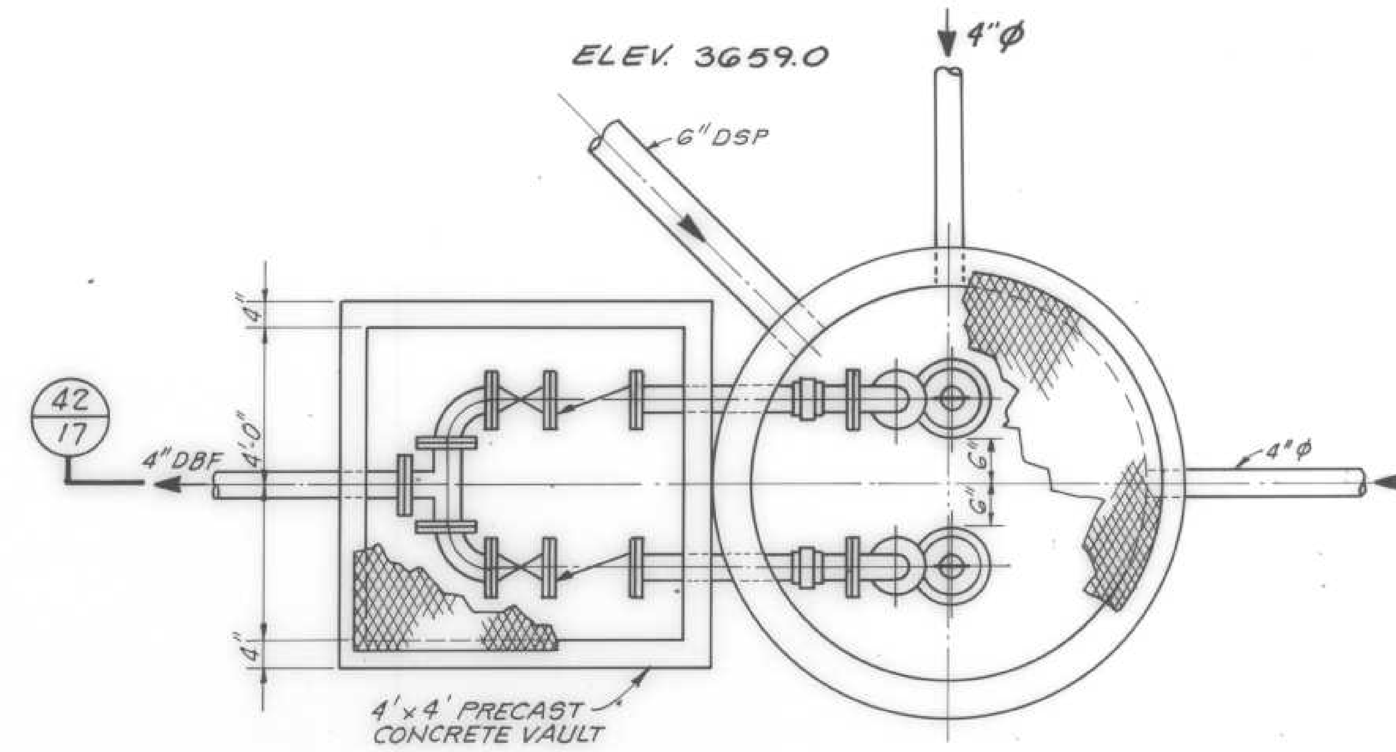
43/17

HYDROPNEUMATIC SYSTEM

1" = 1'-0"



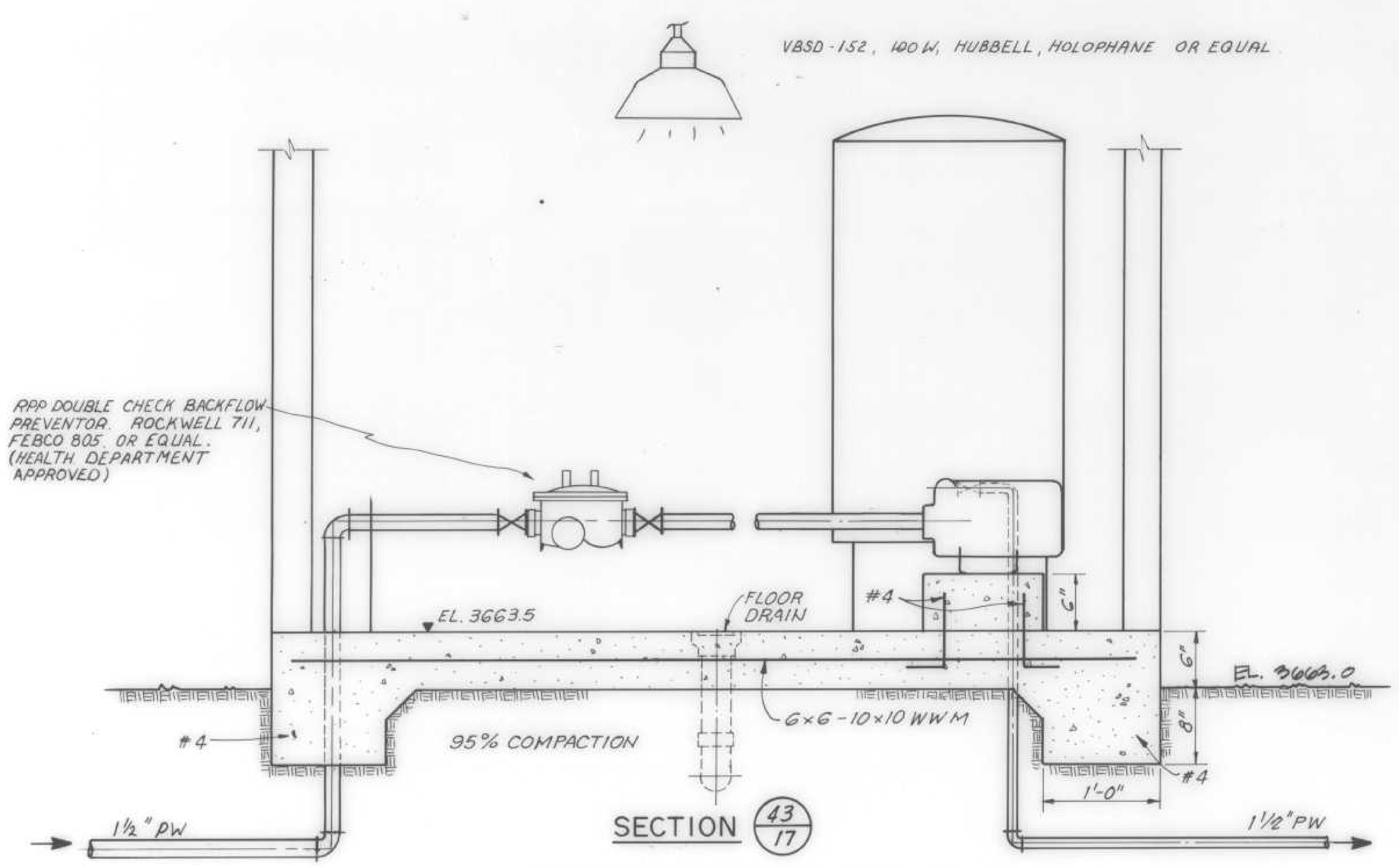
SECTION 42/17



PLAN

S & F SUMP

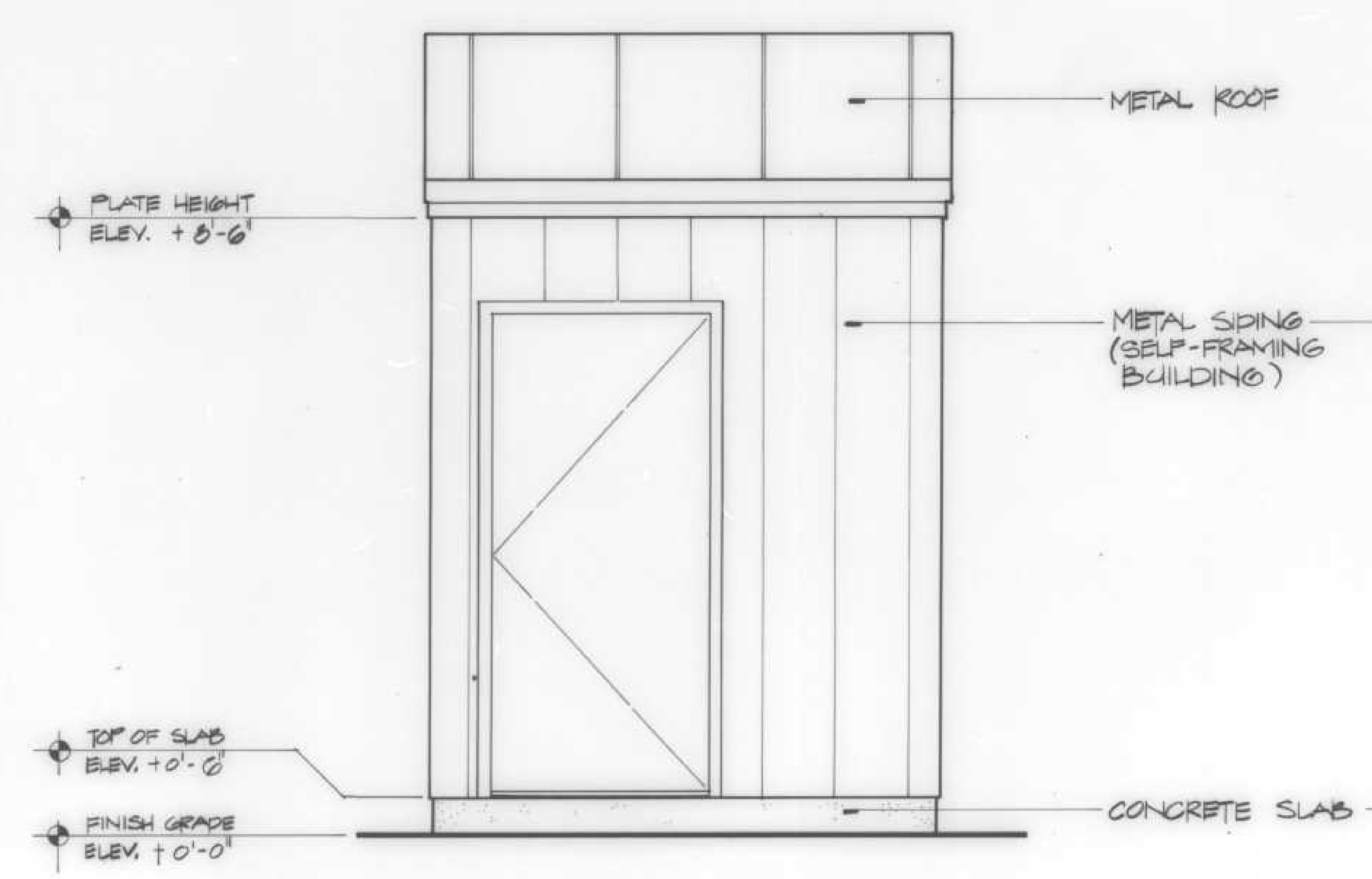
1/2" = 1'-0"



SECTION 43/17

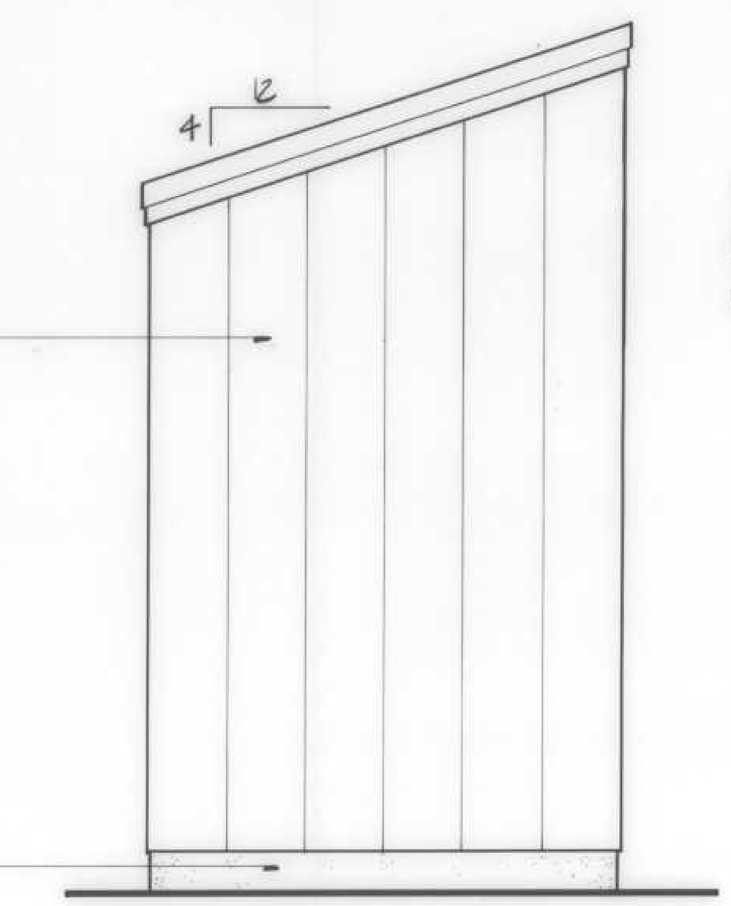
HYDROPNEUMATIC SYSTEM

1" = 1'-0"



FRONT ELEVATION

1/2" = 1'-0"



RIGHT ELEVATION

1/2" = 1'-0"

NOTE: BUILDING TO BE CONSTRUCTED BY THE SAME MANUFACTURER AS OTHER METAL BUILDINGS.

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BY	23237		

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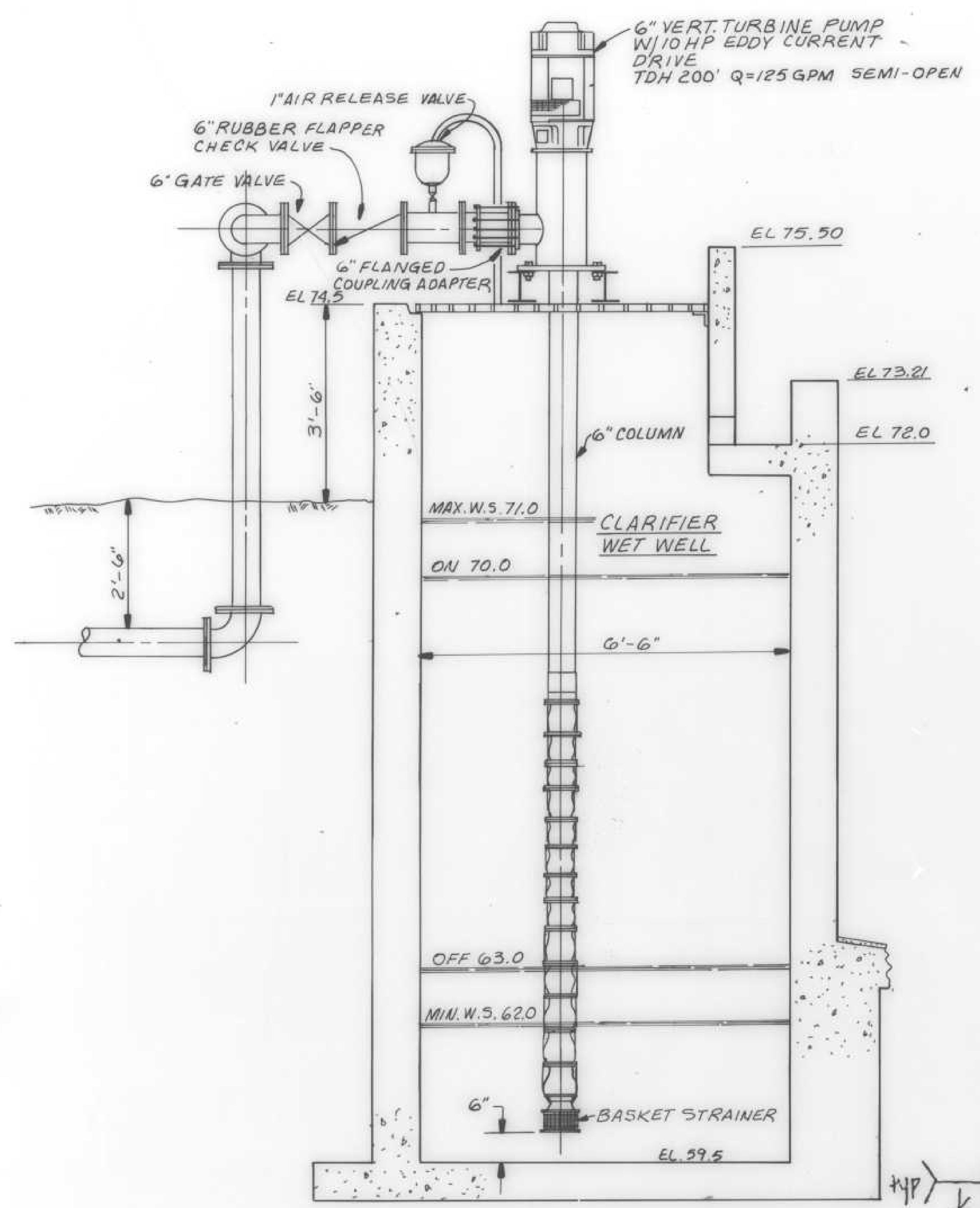
ARNOLD WASTEWATER PROJECT

HYDROPNEUMATIC SYSTEM
DETAILS

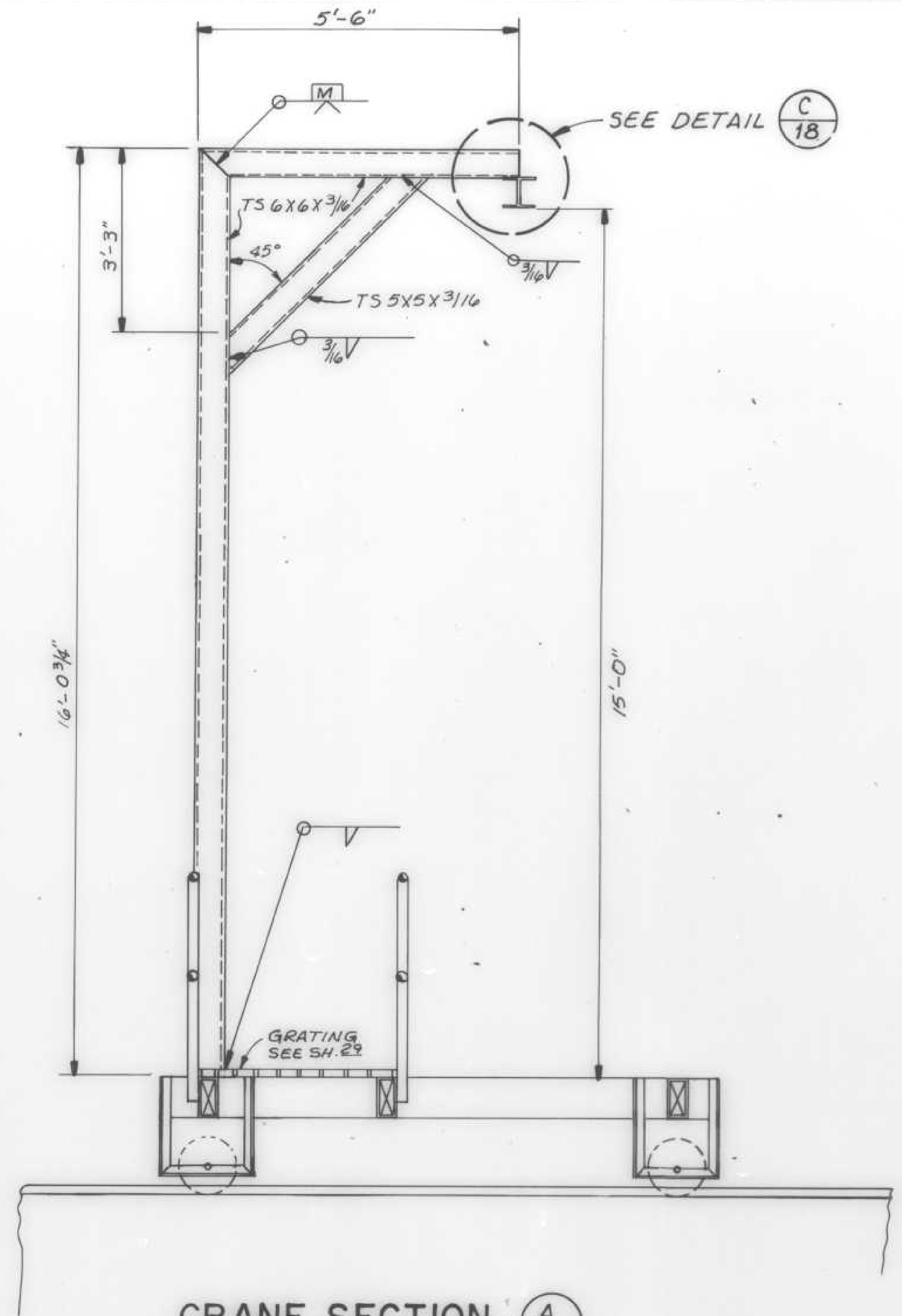
DATE AUG. 1984
SCALE HORIZONTAL AS SHOWN
VERTICAL
W.O. NO.

SHEET 17 OF 43 SHEETS

FILE NO. D-0217

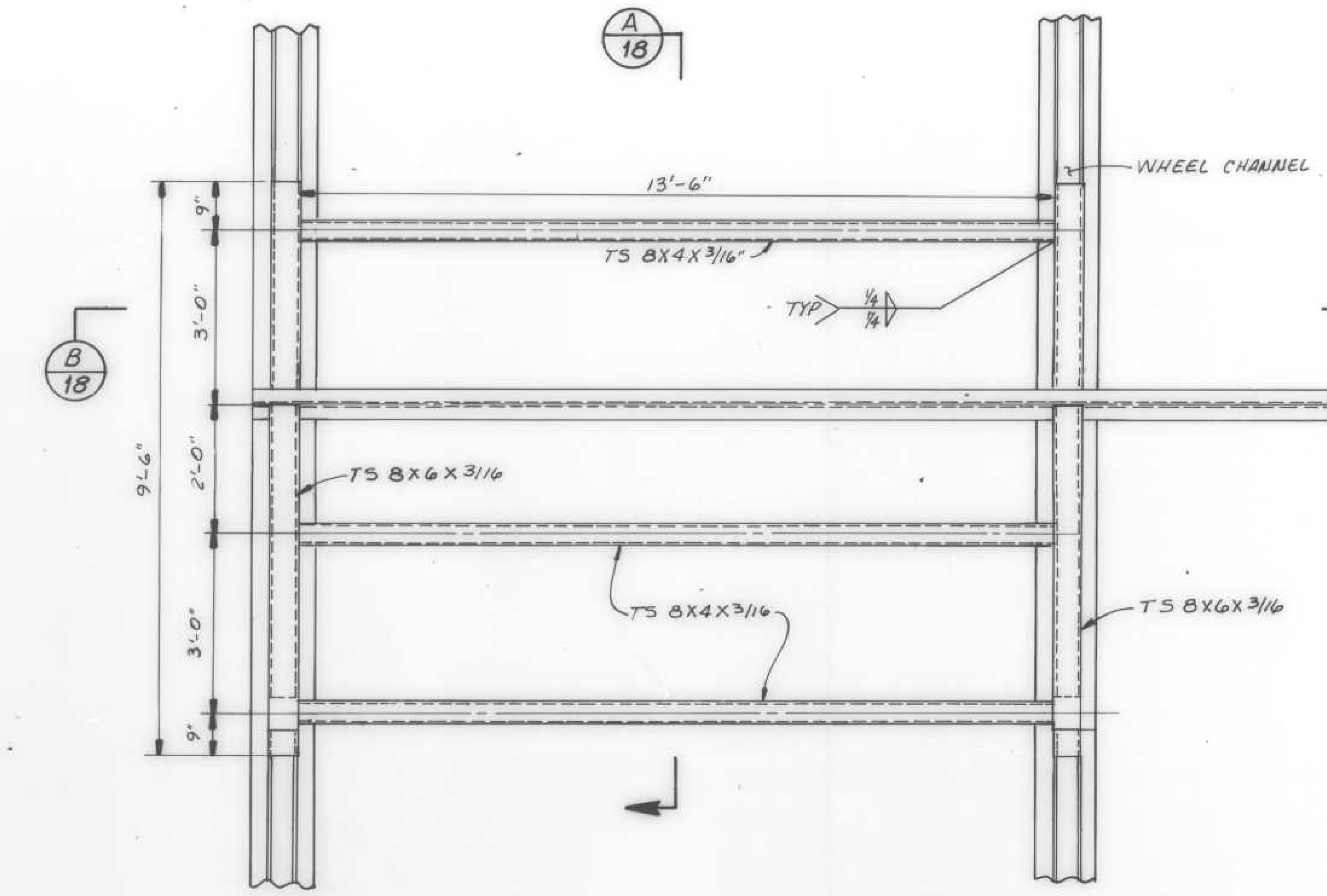


EFFLUENT PUMP DETAIL
1/2" = 1'-0"
SEE SH. NO'S 13 & 14

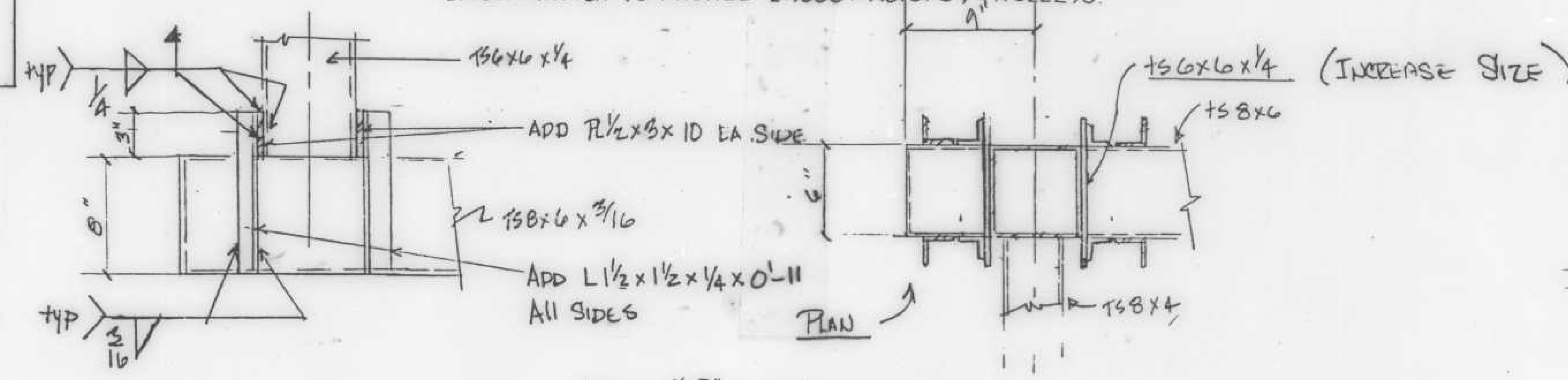


CRANE SECTION A/18
1/2" = 1'-0"

NOTES: 1. CONTRACTOR TO PROVIDE COMPLETE CALCULATIONS & SHOP DRAWINGS
2. CONTRACTOR TO PROVIDE 2-1000# HOISTS & TROLLEYS.

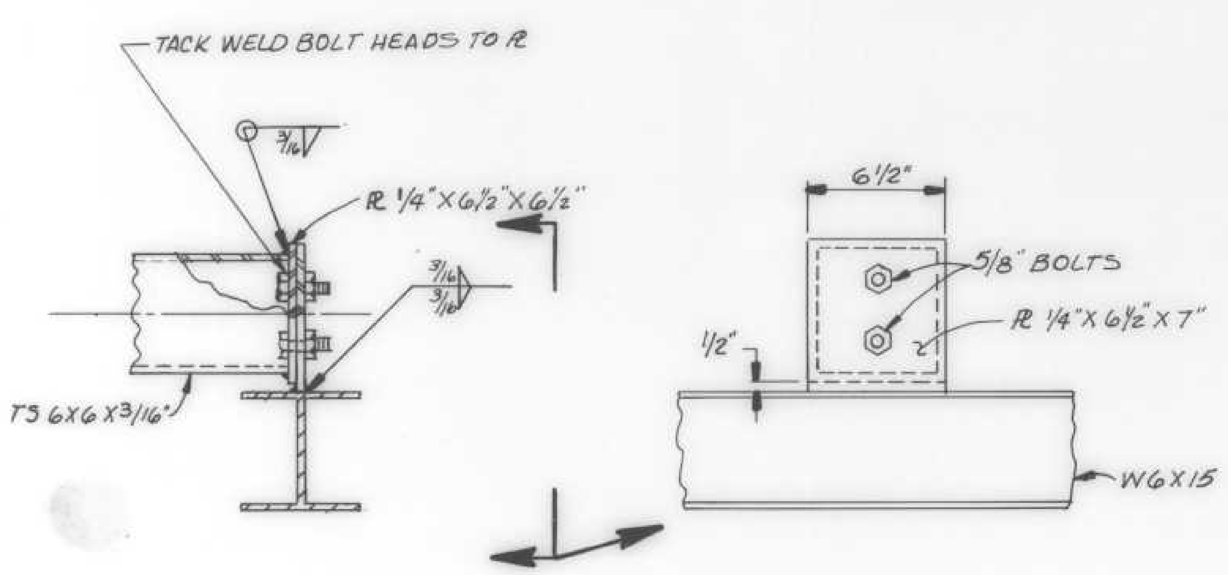


PLAN-OXIDATION DITCH CRANE (2 EACH)
1/2" = 1'-0"
"ALT. BID ITEM"

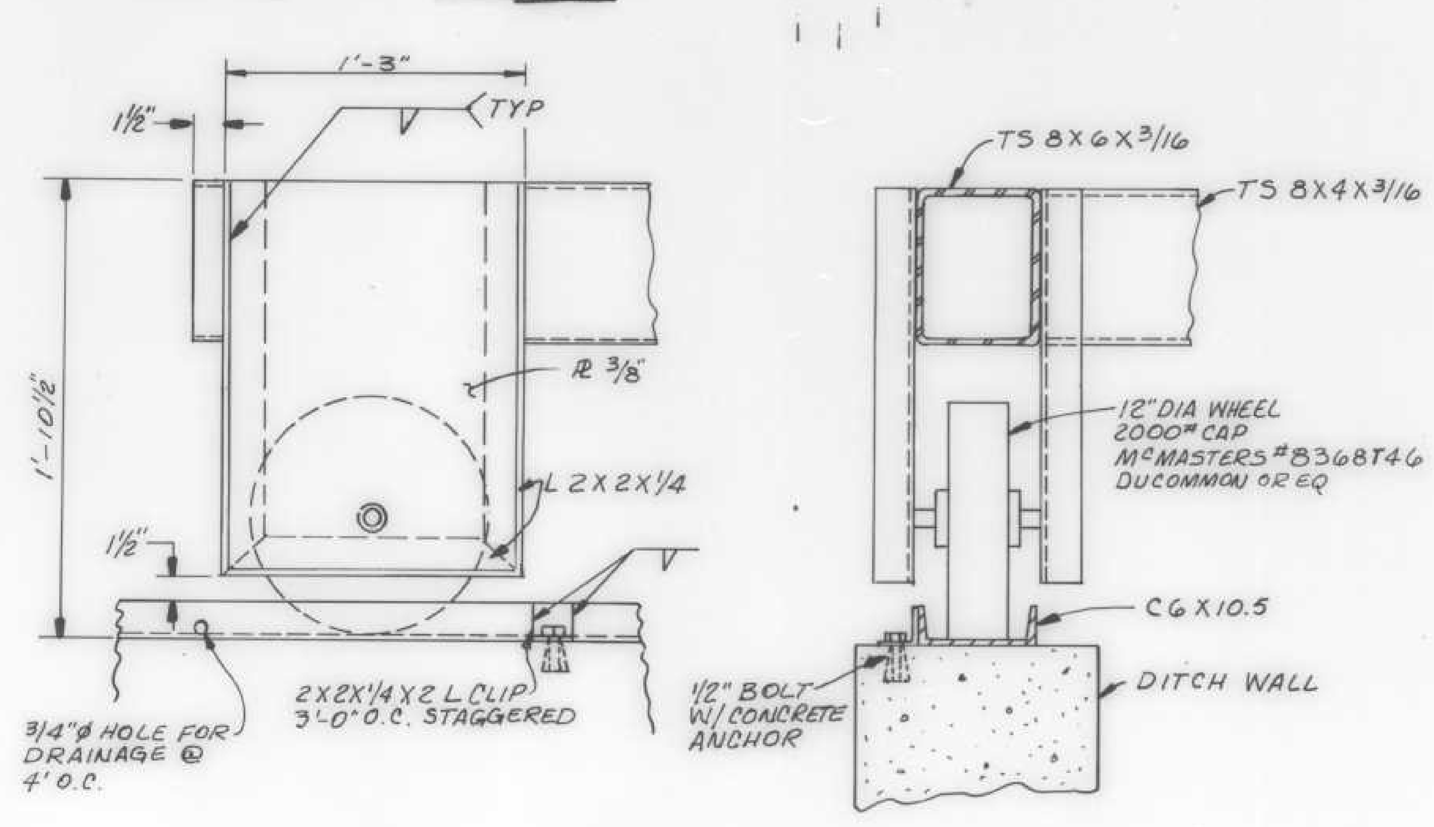


ELEVATION
SCALE 1 1/2" = 1'-0"

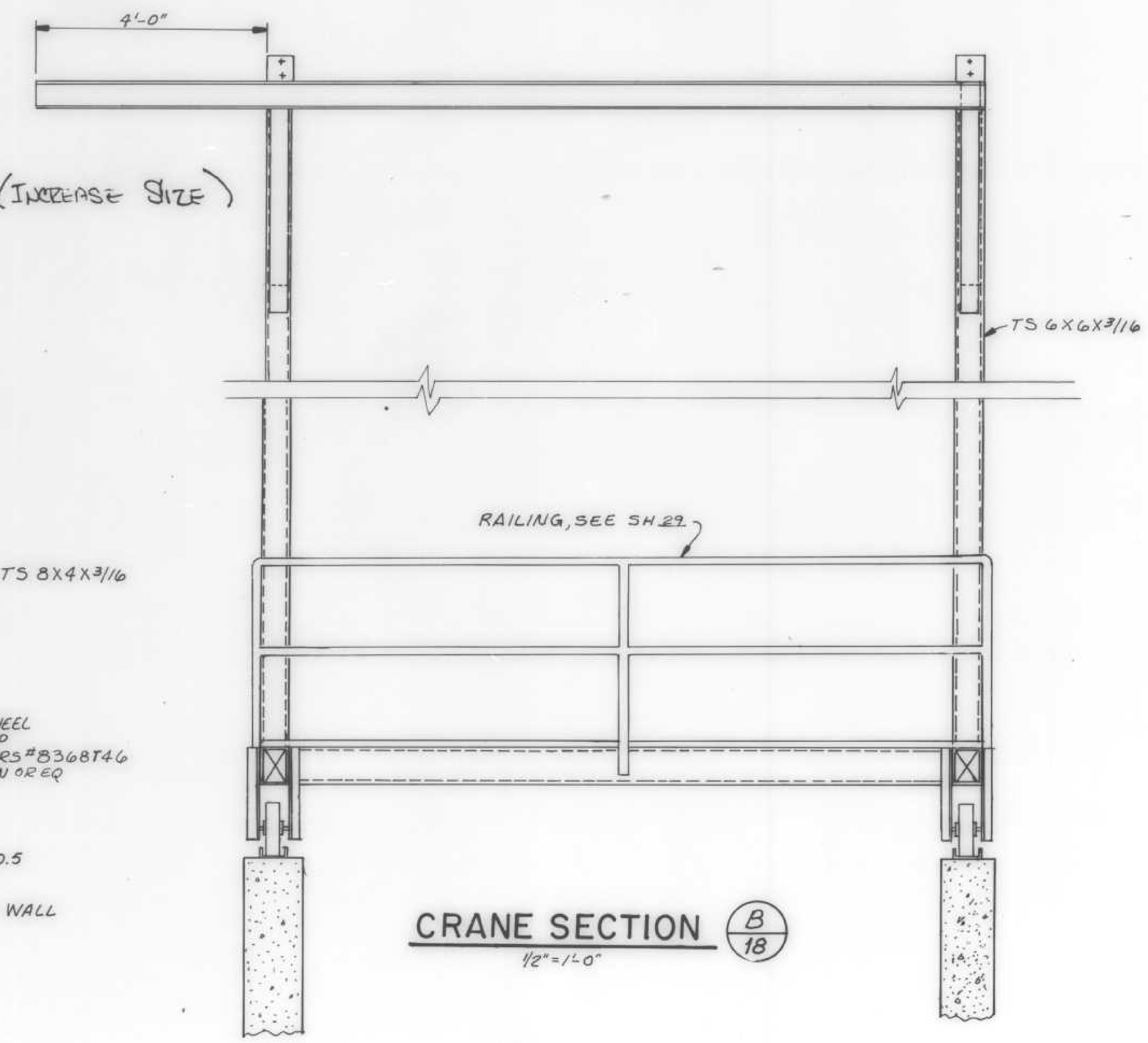
MODIFICATIONS TO CRANE DETAILS SHEET 18 OF 43



DETAIL C/18
1 1/2" = 1'-0"



WHEEL DETAIL (TYP)
1 1/2" = 1'-0"



CRANE SECTION B/18
1/2" = 1'-0"

AS BUILT

DRAWN BY R.A.W.	DESIGN BY F.S.	
CHECK BY M.G.T.		
BY Michael Ihelan		23237

REVISION	DATE	DESCRIPTION

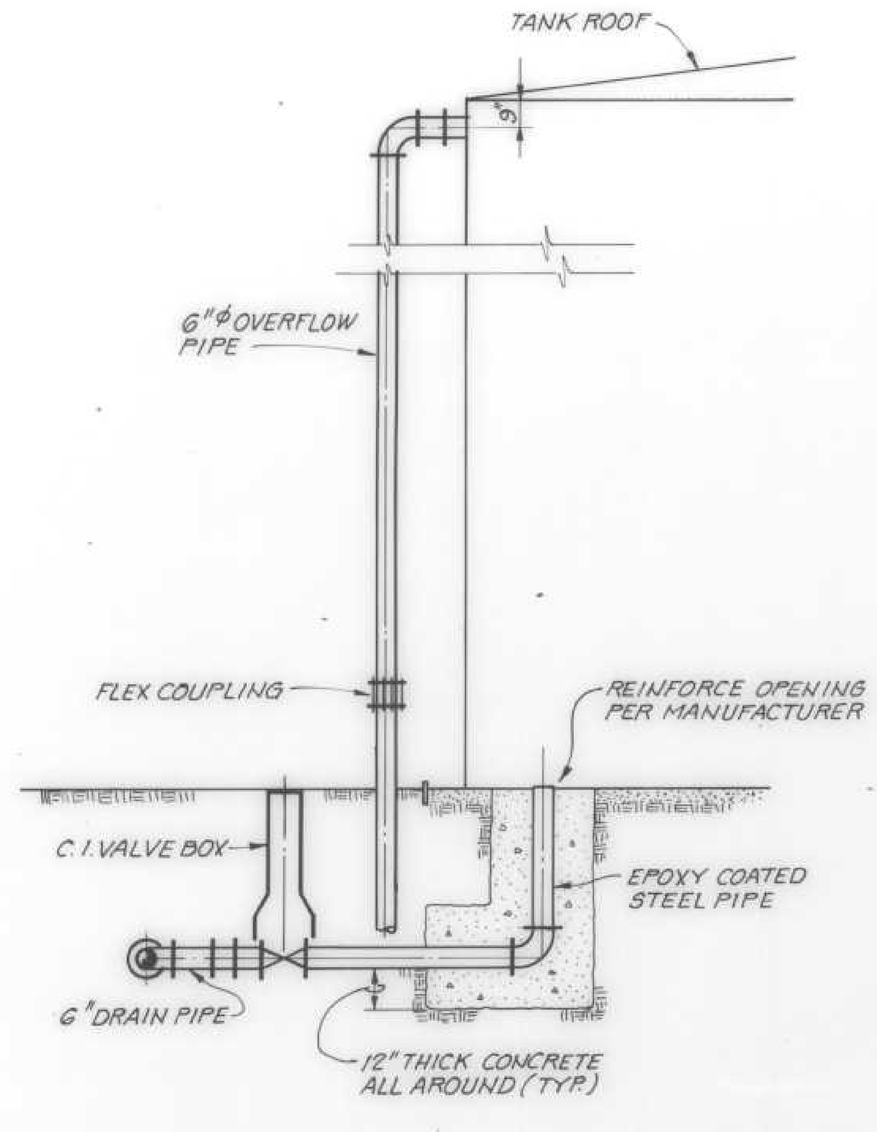
RVA RAYMOND VAIL AND ASSOCIATES
ENGINEERING • PLANNING • SURVEYING
SACRAMENTO, CALIFORNIA 1410 Ethan Way 95825

ARNOLD WASTEWATER PROJECT
CRANE & EFFLUENT PUMP DETAILS

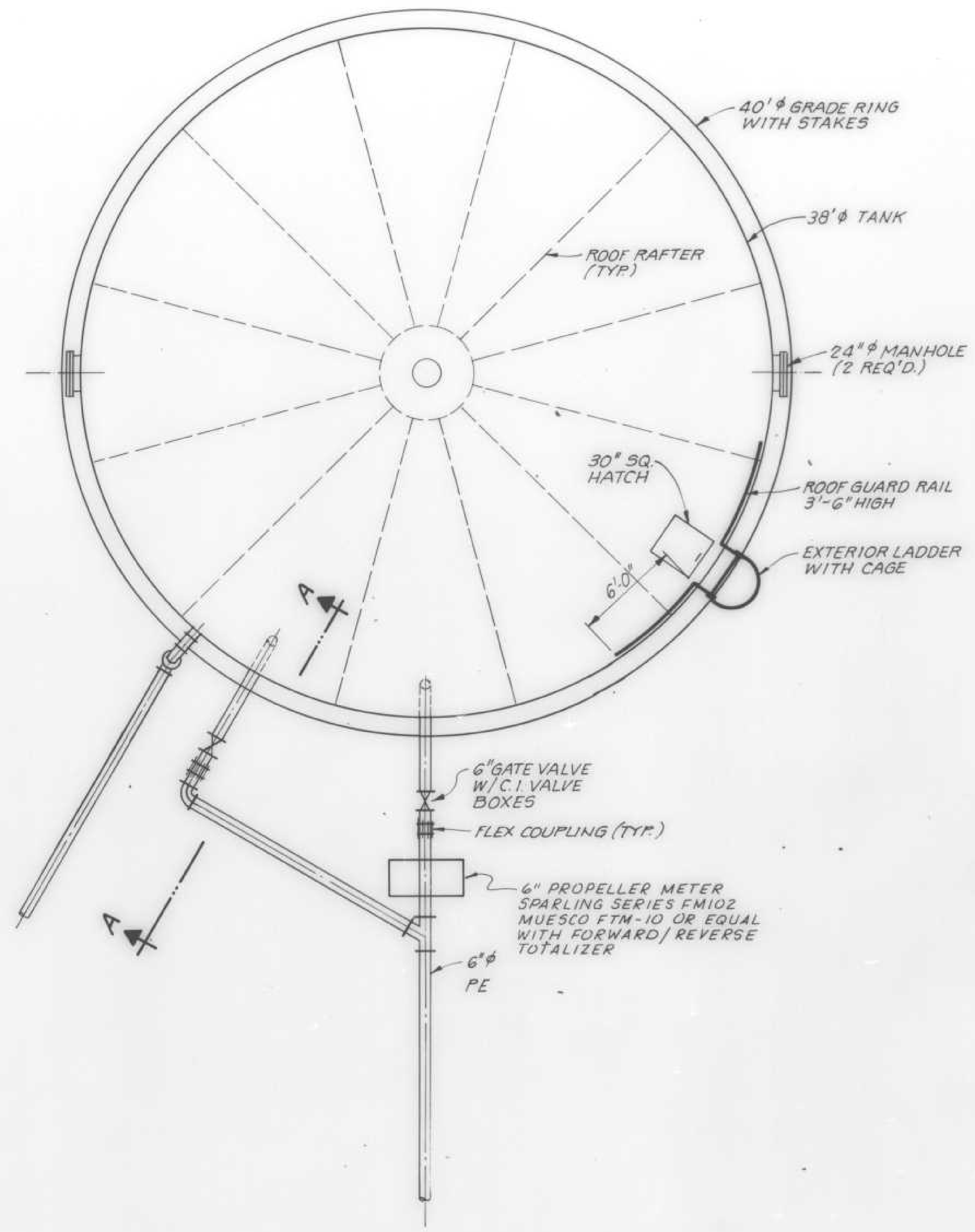
DATE AUG. 84
SCALE
HORIZONTAL
VERTICAL
W.O. NO. 4391.03

SHEET 18 OF 43 SHEETS

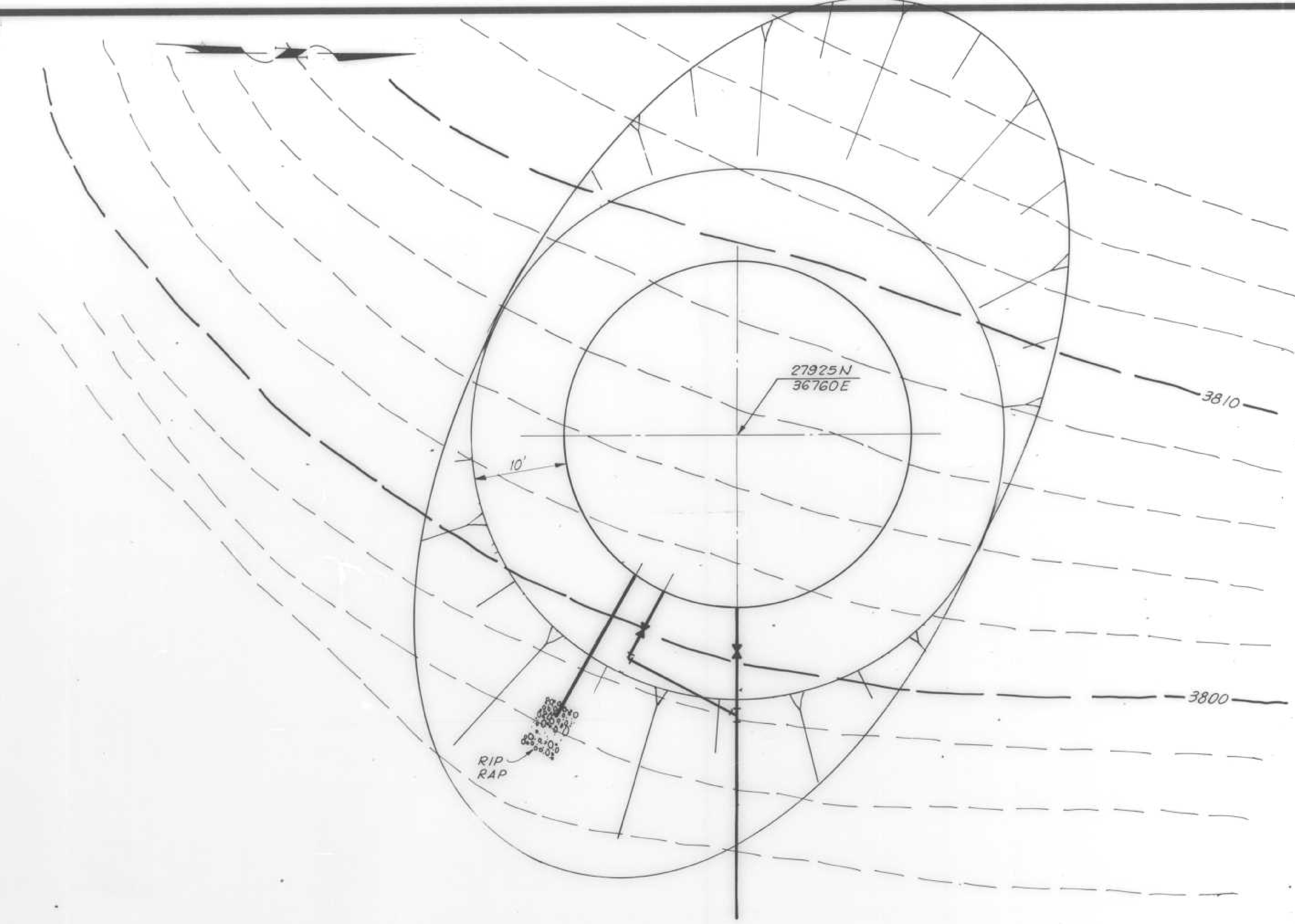
FILE NO. D-0217



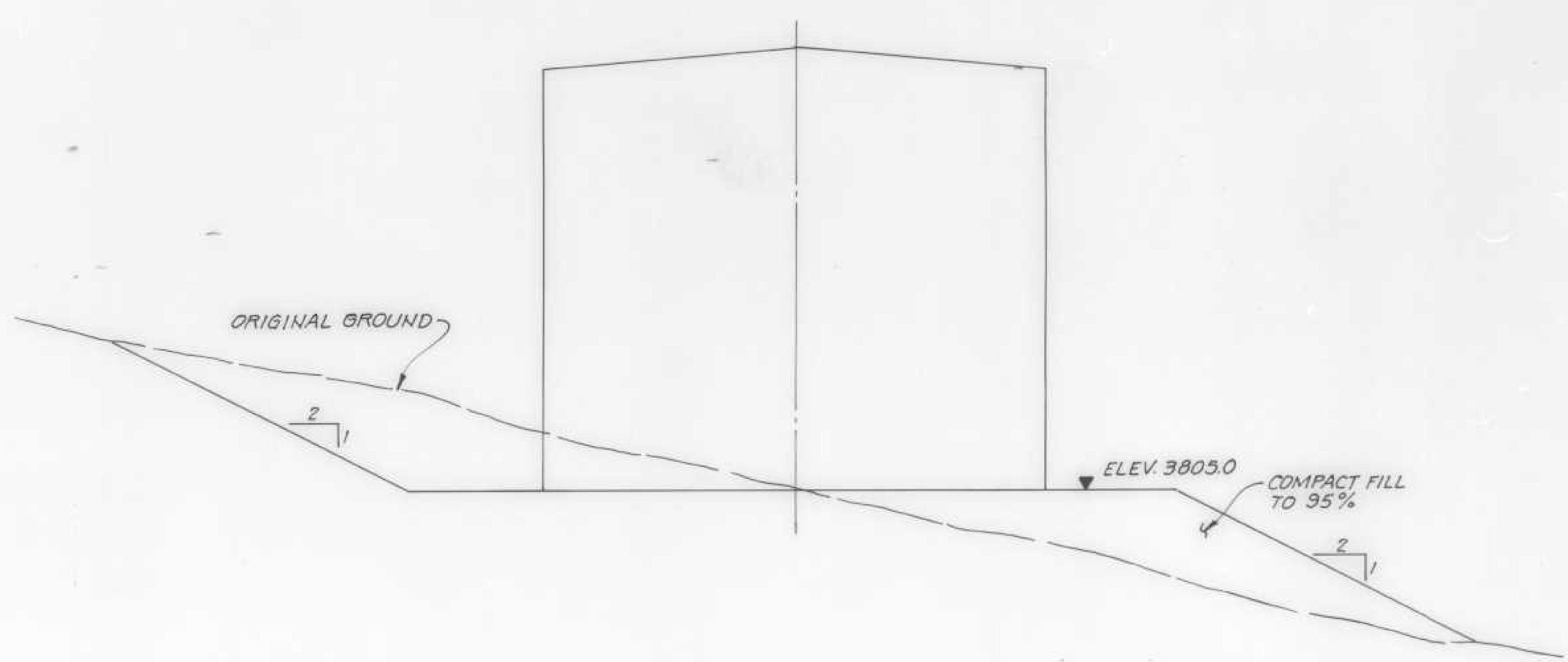
SECTION A-A
1/4" = 1'-0"



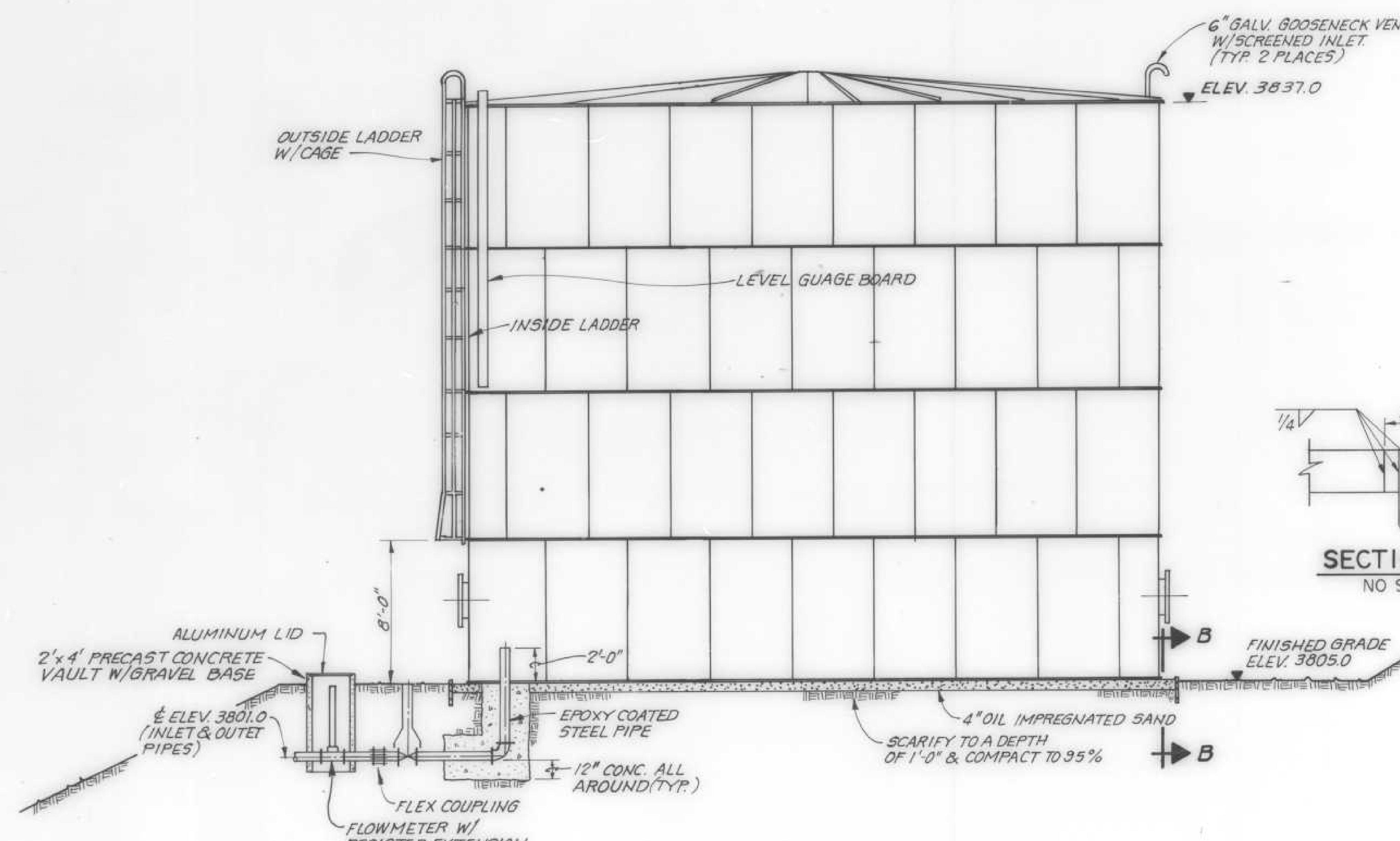
PLAN - TANK DETAILS
1" = 6'-0"



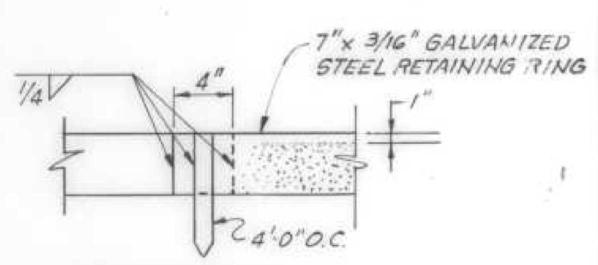
SITE PLAN
1" = 10'



ELEVATION
1" = 10'



TANK ELEVATION
1" = 6'-0"



SECTION B-B
NO SCALE

NOTES:

1. TANK SHALL HAVE A MINIMUM CAPACITY OF 262,500 GALLONS AND SHALL BE OF THE GENERAL CONFIGURATION SHOWN, FACTORY WELDED STEEL CONSTRUCTION AND SHALL BE DESIGNED IN ACCORDANCE WITH THE LATEST AWWA D100 STANDARD AND CONTRACT SPECIFICATIONS. SNOW LOAD SHALL BE 72 LBS/SF.
2. TANK ACCESSORIES SHALL INCLUDE OUTSIDE AND INSIDE LADDERS AND HANDRAILS TO OSHA STANDARDS, ROOF VENT, SHELL MANHOLES, ROOF HATCH, OVERFLOW PIPE, DRAIN PIPE, INLET OUTLET PIPE, LIQUID LEVEL GAUGE (HALF TRAVEL), AND CONNECTION FOR LEVEL TRANSMITTER.
3. DESIGN CALCULATION AND SHOP DRAWINGS SHALL BE SUBMITTED FOR REVIEW AND APPROVAL BEFORE FABRICATION.

AS BUILT

DRAWN BY G. ZUEGER	DESIGN BY J. LAM
CHECK BY M. THALHAMER	
BY [signature]	23237

REVISION	DATE	DESCRIPTION

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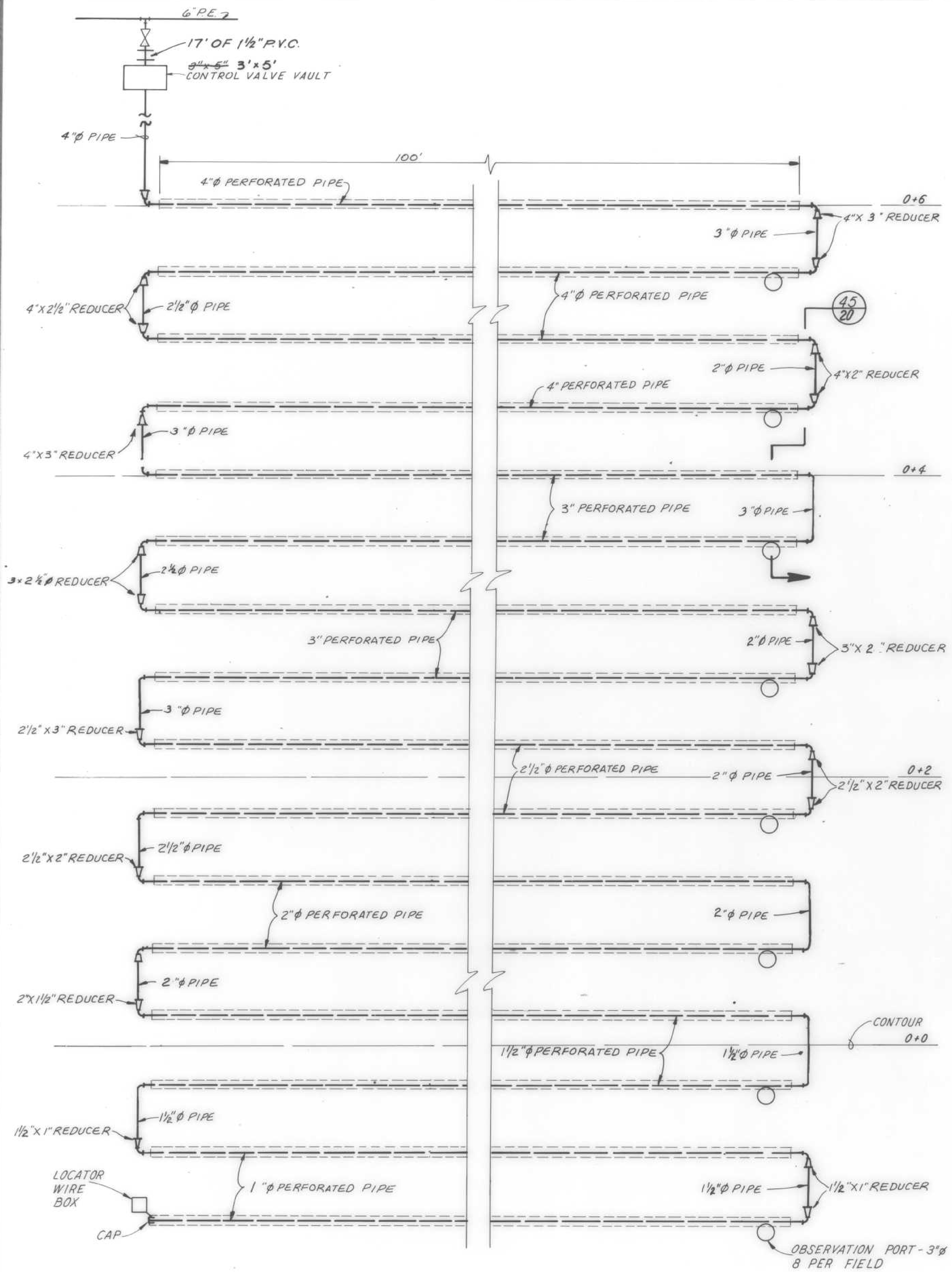
SACRAMENTO, CALIFORNIA 1410 Ethan Way 95825

ARNOLD WASTEWATER PROJECT
STORAGE TANK

DATE AUG 1984
SCALE
HORIZONTAL AS SHOWN
VERTICAL
W.O. NO. 4391.03

SHEET 19 OF 43 SHEETS

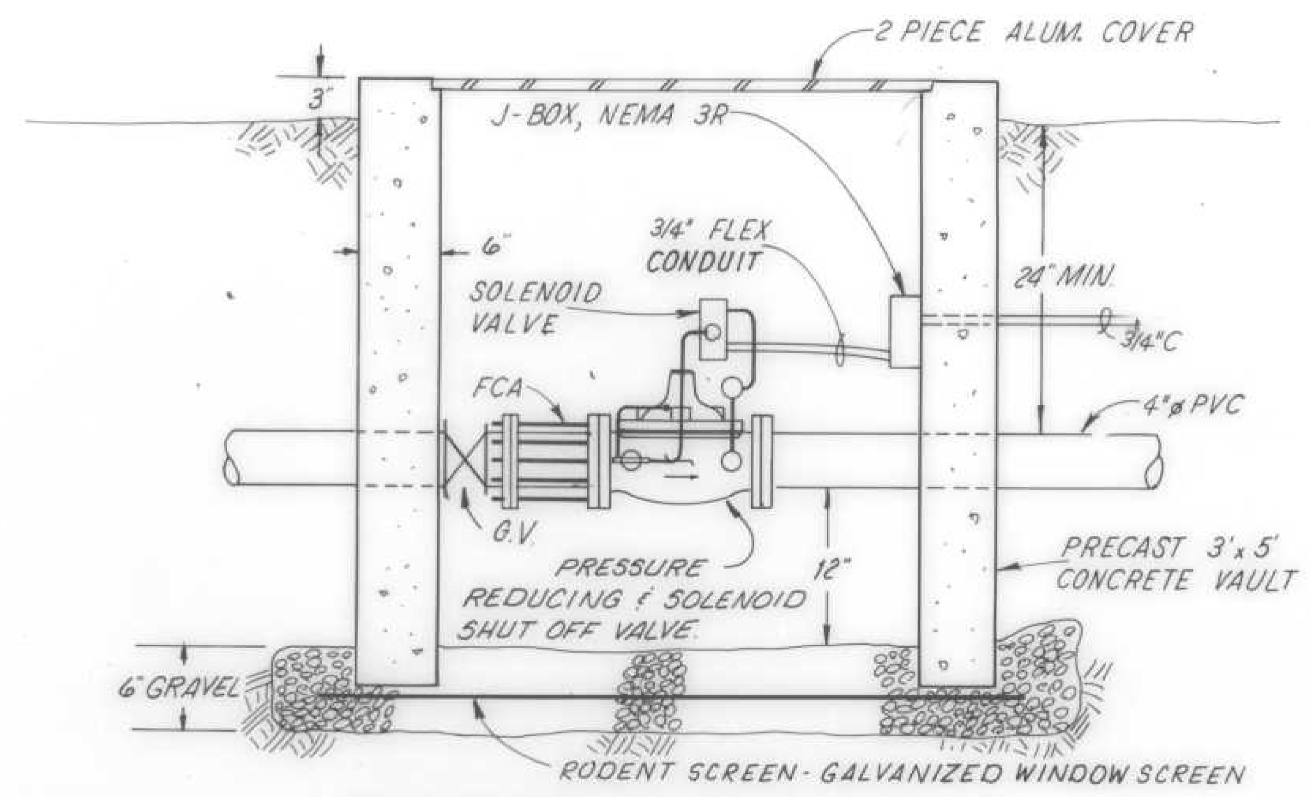
FILE NO. D-0217



TYP. PERCOLATION TRENCH LAYOUT — PRESSURE DOSE

1"=8'-0"

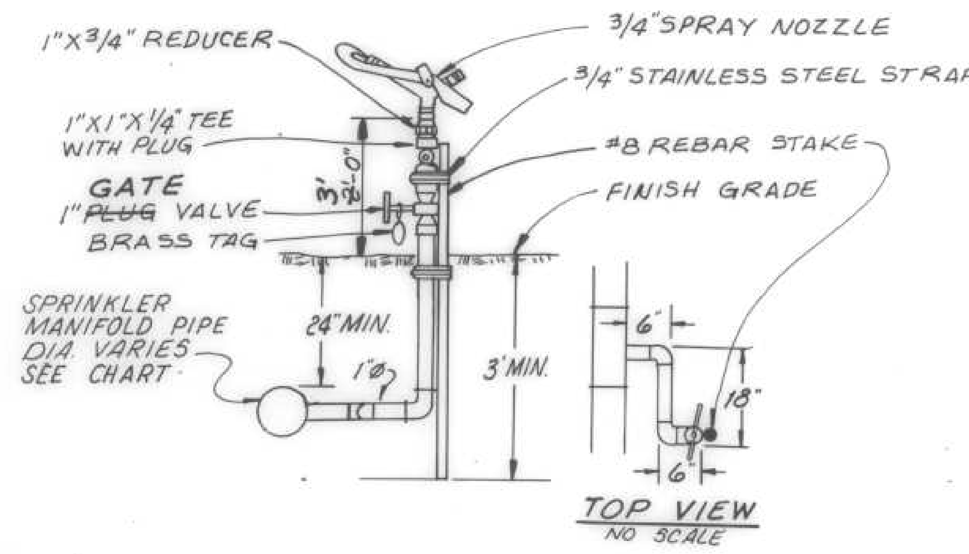
NOTE: PRIOR TO CONSTRUCTION OF EACH OF 11 PERCOLATION BEDS, A 10' DEEP BACKHOE SOIL OBSERVATION PIT SHALL BE EXECAVATED FOR INSPECTION BY THE OWNER. APPROVAL OF SOIL STRATA MUST BE OBTAINED PRIOR TO CONSTRUCTION OF EACH BED.



CONTROL VALVE VAULT

NO SCALE

NOTE: BED #4 150'x80'
BED #9 200'x56'
BEDS: 1,2,3,5,8,10 & 11 - 100'x120'



SPRAY NOZZLE DETAIL

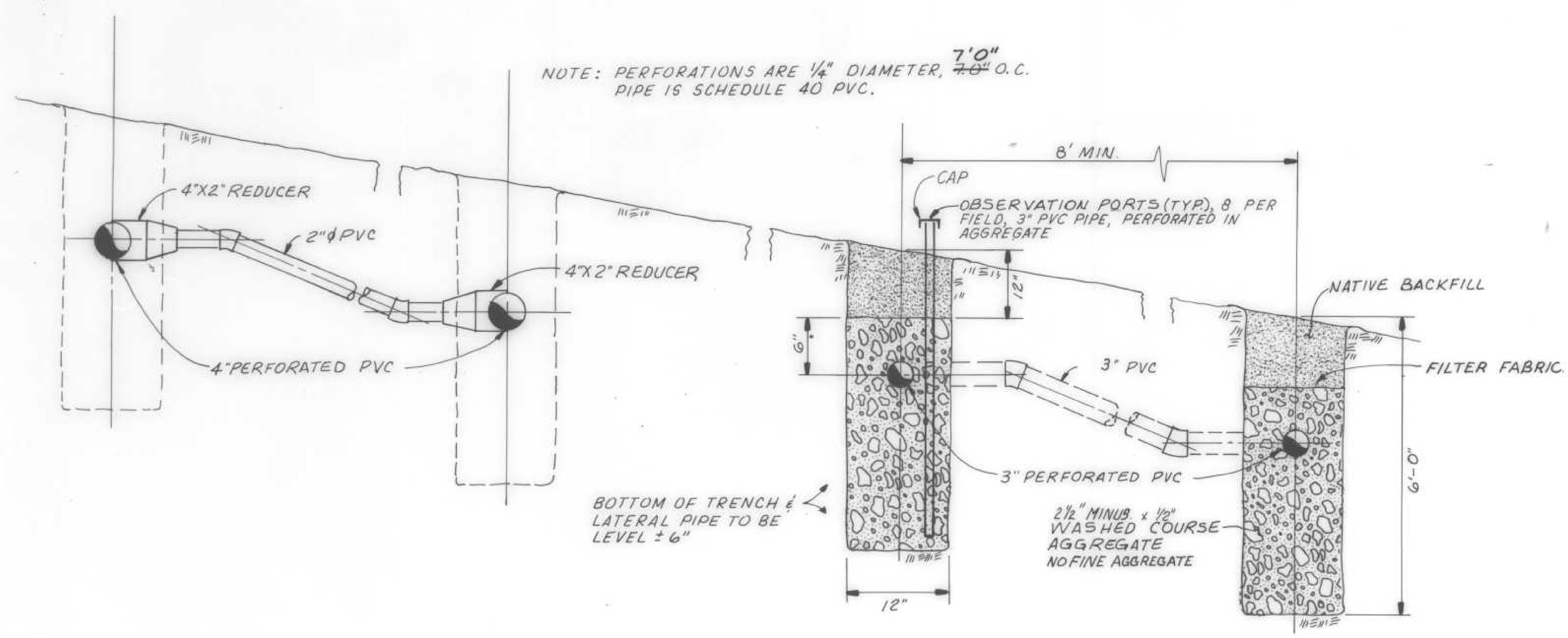
NO SCALE

NOTES:
1. RISER TO BE PERPENDICULAR TO SLOPE
2. ALL LINES FROM THE MANIFOLD ON, ARE TO BE GALV. STEEL

SPRINKLER MANIFOLD PIPE SIZE (PVC SCH 40)

# OF SPRINKLERS	100' DIA. LINE SIZE	77' DIA. LINE SIZE
1	1"	1"
2	1½"	1"
3	2"	1"
4	2"	1½"
5	2½"	1½"
6	2½"	1½"
7	2½"	2"
8	3"	2"
9	3"	2"
10	3"	2"
11	4"	
12	4"	

NOTE: PERFORATIONS ARE ¼" DIAMETER, 7'0" O.C.
PIPE IS SCHEDULE 40 PVC.



SECTION 45/20

NO SCALE

AS BUILT

DRAWN BY D.A.J.	DESIGN BY K. MULLIN		
CHECK BY M. THALHAMER			
BY Michael R. Thalhamer	23237		
REVISION	DATE	DESCRIPTION	

RAYMOND VAIL AND ASSOCIATES
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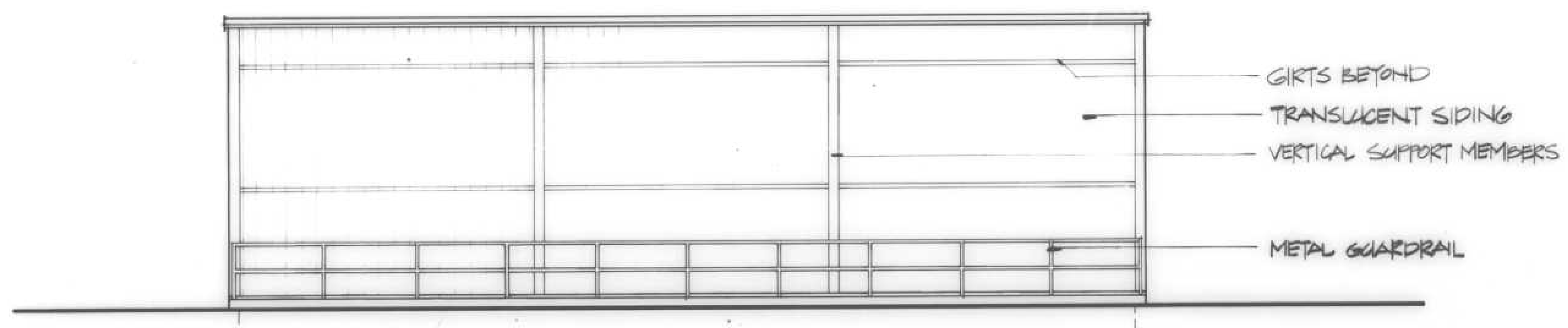
ARNOLD WASTEWATER PROJECT

DISPOSAL DETAILS

DATE AUG. 1984
SCALE
HORIZONTAL
VERTICAL
W.O. NO. 4391.03

SHEET 20 OF 43 SHEETS

FILE NO. D-0217

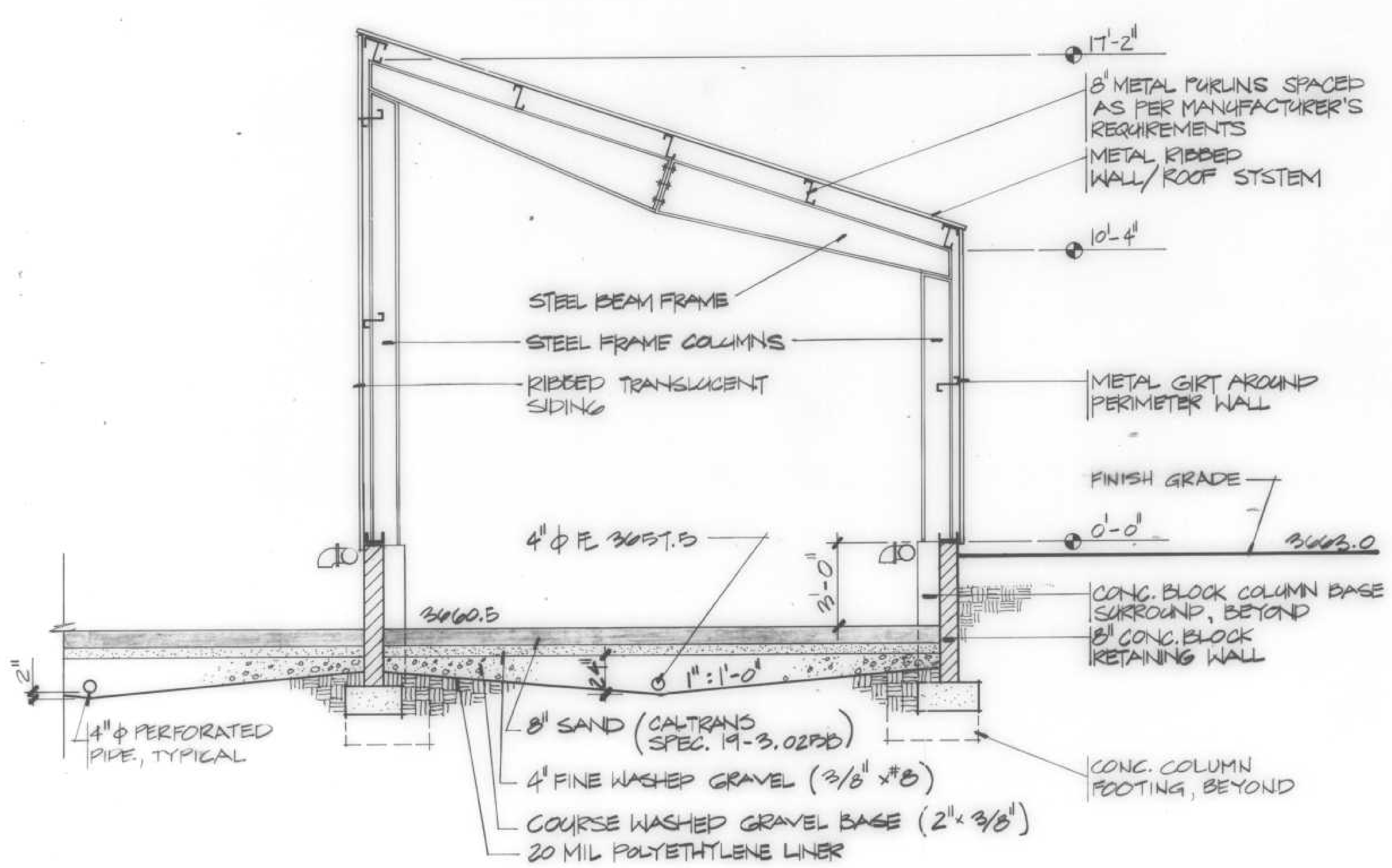


South

East (West Opposite)

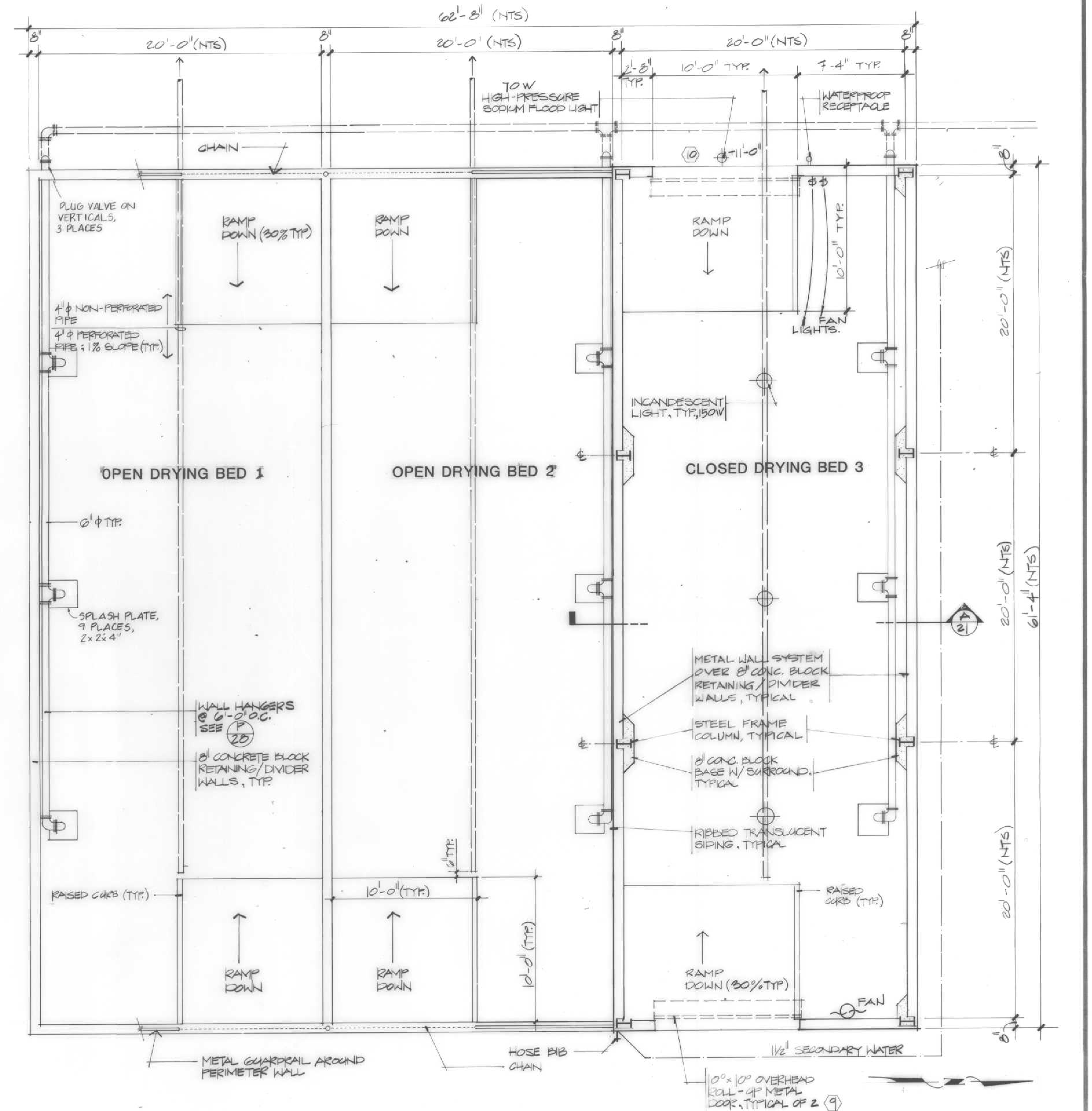
EXTERIOR ELEVATIONS

SCALE: 1/8" = 1'-0"



CROSS SECTION A-A

SCALE: 1/4" = 1'-0"



FLOOR PLAN

SCALE: 1/4" = 1'-0"

AS BUILT

DRAWN BY BH	DESIGN BY SPJ	REVISION	DATE	DESCRIPTION	RVA RAYMOND VAIL AND ASSOCIATES ENGINEERING • PLANNING • SURVEYING SACRAMENTO, CALIFORNIA 1410 Ethan Way 95825	ARNOLD WASTEWATER PROJECT SAND DRYING BEDS	DATE AUG. 1984 SCALE HORIZONTAL AS SHOWN VERTICAL W.O. NO. 4391.03	SHEET 21 OF 43 SHEETS
CHECK BY SPJ	BY [signature]							

FILE NO. D-0217

DRAWN BY:	DESIGN BY: J. DUNLAP
CHECK BY: M THALHAMER	
BY:	23237

REVISION	DATE	DESCRIPTION

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SACRAMENTO • ANTIOCH • SONORA • TAHOE CITY

ARNOLD WASTEWATER PROJECT
SLUDGE DRYING BEDS
STRUCTURAL DETAILS

DATE: AUG 1984
SCALE:
HORIZONTAL: AS NOTED
VERTICAL:
W.O. NO. 439103

SHEET 22 OF 43 SHEETS

FILE NO. D-0217

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REVISION	DATE	DESCRIPTION

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ARNOLD WASTEWATER PROJECT
CONTROL BUILDING

DATE AUG. 1984
SCALE HORIZONTAL AS SHOWN
VERTICAL
W.O. NO. 4391.03
SHEET 23 OF 43 SHEETS
FILE NO. D-0217

ROOM MATERIALS and FINISH SCHEDULE

ROOM NO	FUNCTION	FLOOR: EXPOSED CONCRETE	FLOOR: SHEET VINYL W/ WELDED SEAM	FLOOR	BASE: NONE	BASE: RUBBER	BASE	WALLS: EXPOSED CONCRETE BLOCK	WALLS: GYP. BD. TAPE & TOP ONLY	WALLS: GYP. BD. TAPE, TOP & TEXTURE	WALLS: WAINSCOT 48"	WALLS: EXPOSED INSULATION	CEILING: EXPOSED INSULATION	CEILING: GYP. BD. TAPE & TOP ONLY	CEILING: GYP. BD. TAPE, TOP & TEXTURE	CEILING: ACOUSTICAL PANEL	HEIGHT	MISC.
101	CONTROL ROOM		●			●				●				●		●	9'	
102	HALL		●			●				●				●		●	8'	
103	RESTROOM		●			●				●	●				●		8'	WATERPROOF GYP. BD. SEE PLAN
104	WATER HEATER	●			●				●					●			8'	
105	CHLORINE ROOM	●			●			●						●			8'	WALLS TO BE SEALED
106	MECHANICAL/SHOP	●			●							●	●				VARIES	

DOOR SCHEDULE

SEE SPECS TS-5

DOOR NO	TYPE	SIZE	THICKNESS	MATERIAL	FINISH	REMARKS	HARDWARE	FRAME	DETAILS: HEAD	DETAILS: JAMB	DETAILS: SILL	DETAILS	MISC.
1	1	3⁰ x 7⁰	1¾	HM	PAINT		1	HM					
2	1	4⁰ x 7⁰					1						
3	1	3⁰ x 7⁰					1						
4	1	3⁰ x 7⁰					2						
5	1	3⁰ x 7⁰					2						
6	1	3⁰ x 7⁰					3						
7	1	2⁰ x 7⁰	↓	↓			2	↓					
8	2	10⁰ x 10⁰		METAL		OVERHEAD ROLL-UP	4						
9	2	10⁰ x 10⁰					4						
10	2	10⁰ x 10⁰		↓	↓	↓	4						

WINDOW SCHEDULE (ALL GLASS TO BE DUO-PANE INSULATED)

WINDOW NO	TYPE	SIZE	MATERIAL	FINISH		DETAILS: HEAD	DETAILS: JAMB	DETAILS: SILL	DETAILS	MISC.
A	HORIZ SLIDE	4⁰ x 4⁰	AL							
B	↓	4⁰ x 3⁰	AL							
C	FIXED	2⁰ x 2⁰	STEEL							1/4" WIRE GLASS IN A STEEL FRAME W/ CLEAR SEALANT ENTIRE PERIMETER

AS BUILT

DRAWN BY GEIGER	DESIGN BY SPJ	
CHECK BY SPJ		
BY [signature]		

REVISION	DATE	DESCRIPTION

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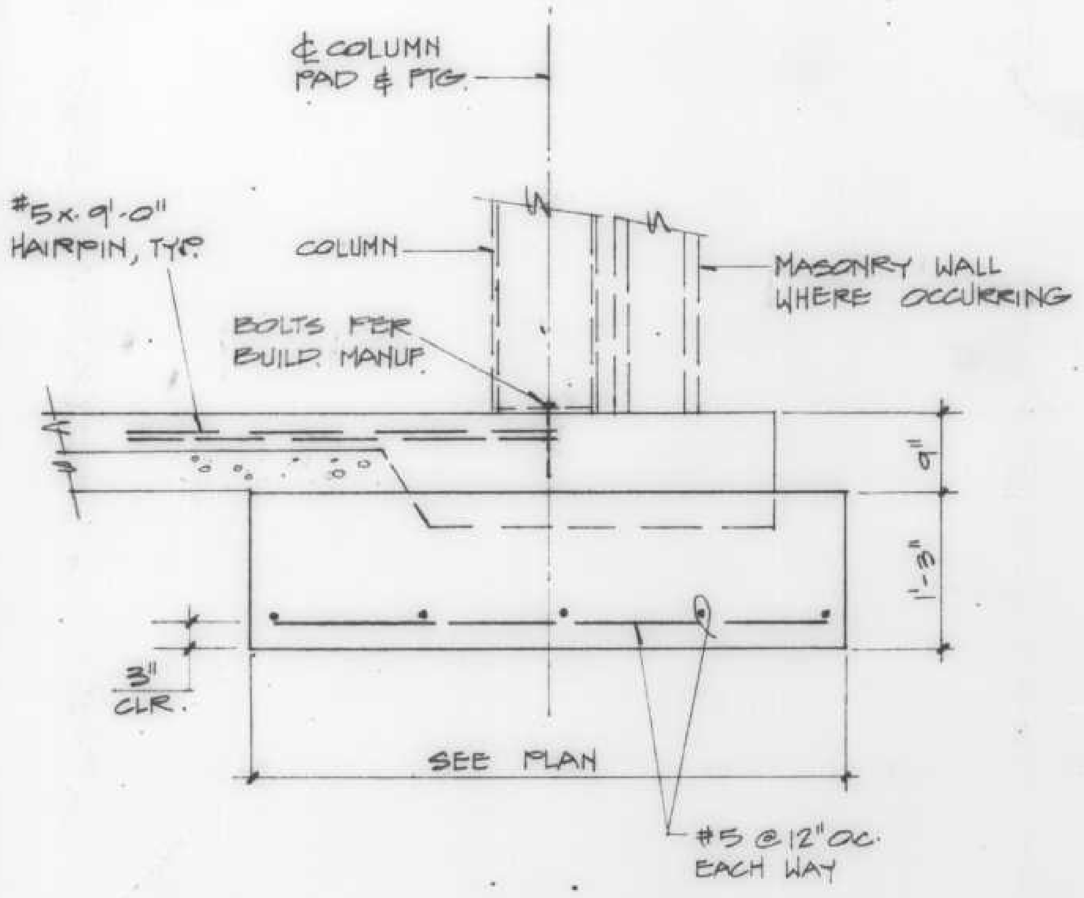
ARNOLD WASTEWATER PROJECT
CONTROL BUILDING

DATE AUG. 1984
SCALE HORIZONTAL AS SHOWN
VERTICAL
W.O. NO. 4391.03
SHEET 24 43 SHEETS
FILE NO. D-0217

STRUCTURAL FRAME AND ROOF DECK

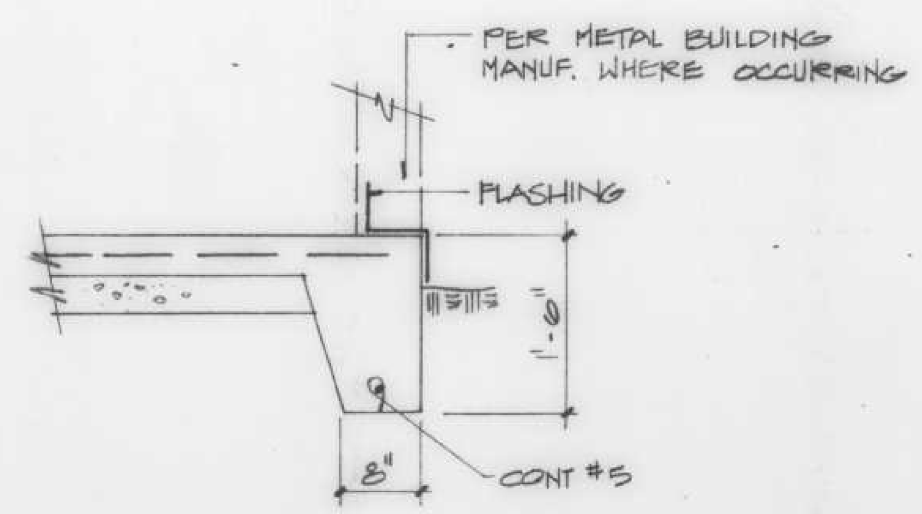
1. THE CONTRACTOR SHALL SUPPLY THE ARCHITECT PLANS, DETAILS AND CALCULATIONS, ALL SIGNED BY A CALIFORNIA LICENSED CIVIL OR STRUCTURAL ENGINEER, SUBSTANTIATING THE ADEQUACY OF THE METAL DECK, PURLINS, BEAMS AND MAIN FRAMES, AND ALL CONNECTIONS, TO SUPPORT THE LOADS REQUIRED BY THE 1982 UNIFORM BUILDING CODE, INCLUDING DEAD, LIVE, SEISMIC, WIND AND A 75 PSF SNOW LOAD.

* THIS NOTE ALSO APPLIES TO SHEET 22 OF 43.

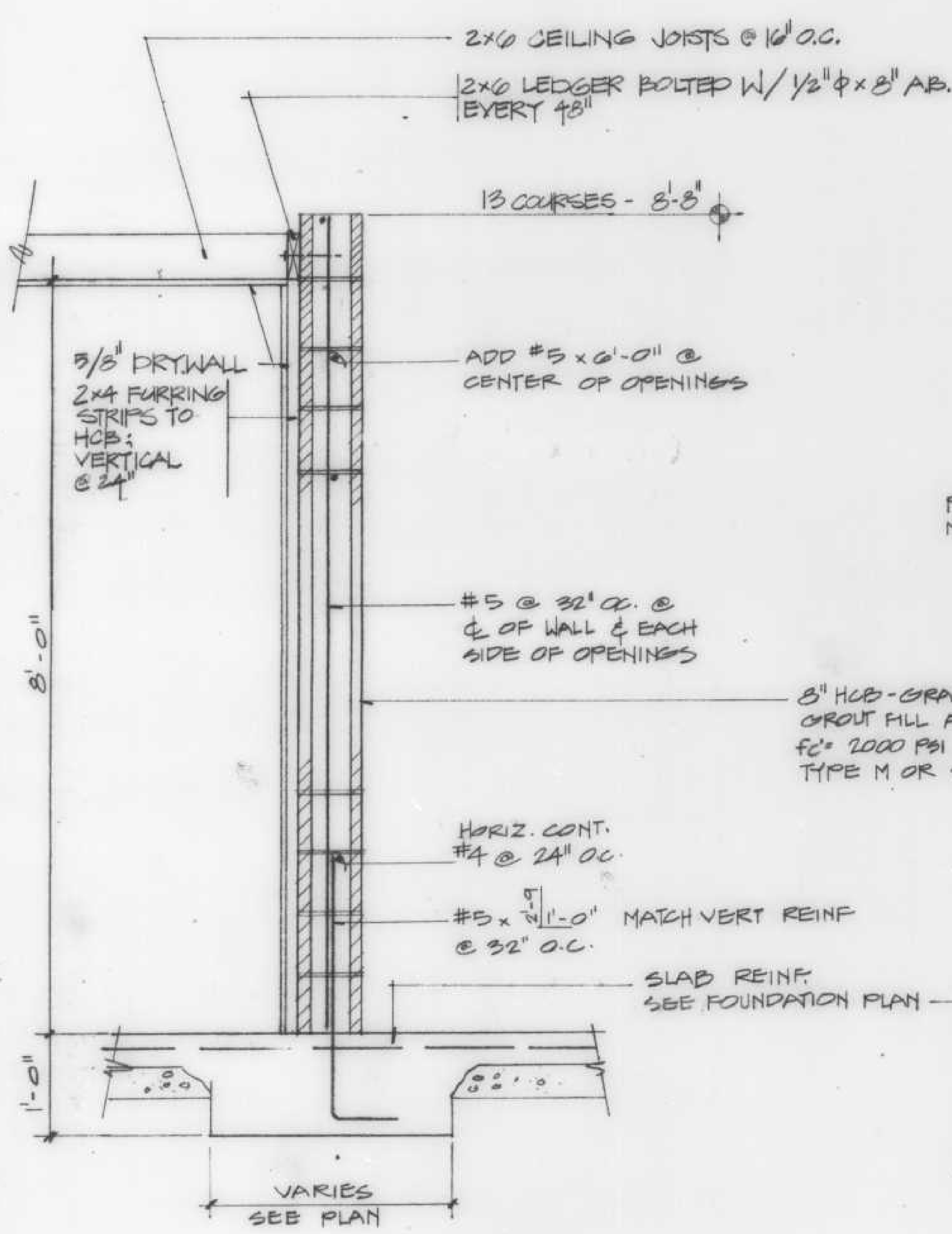


TYPICAL COLUMN PAD (1)

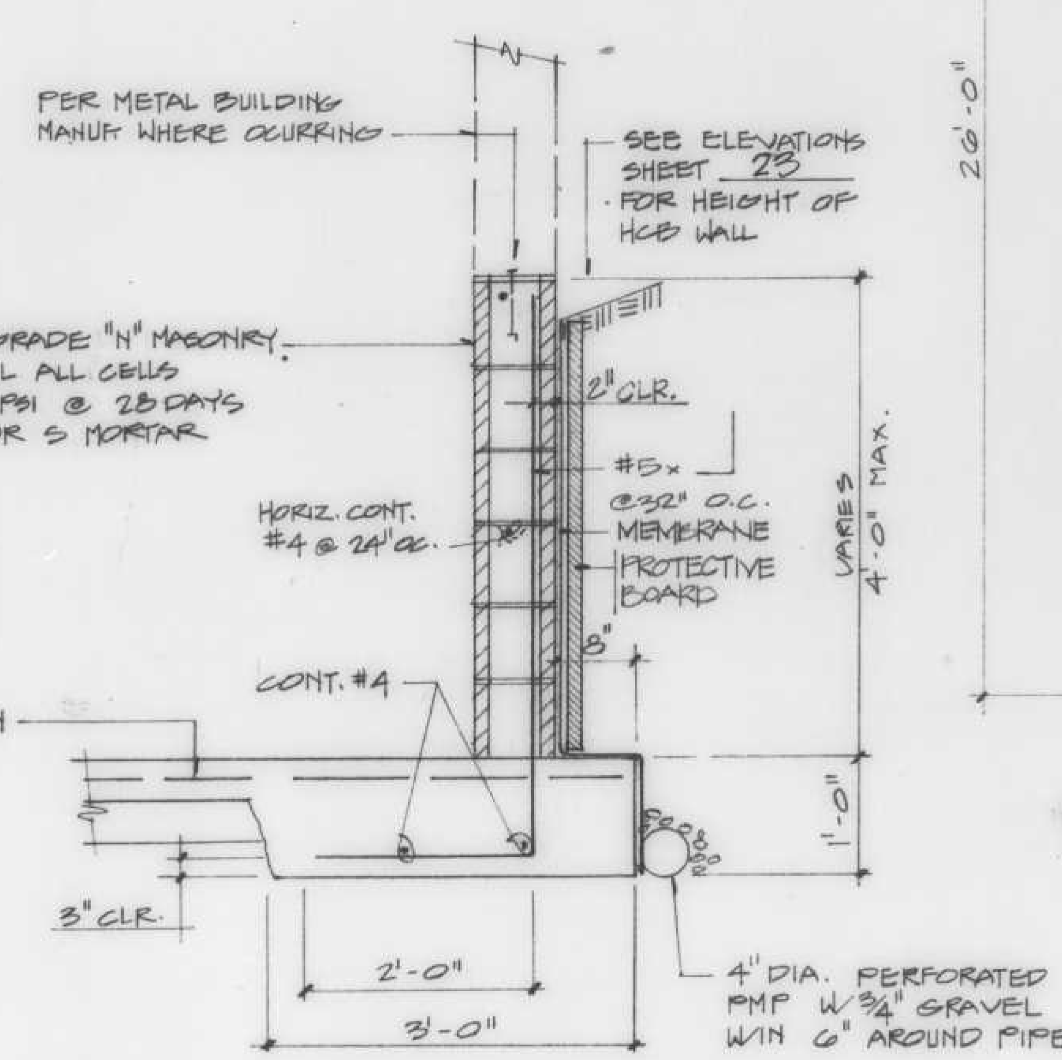
SCALE: 3/4" = 1'-0"



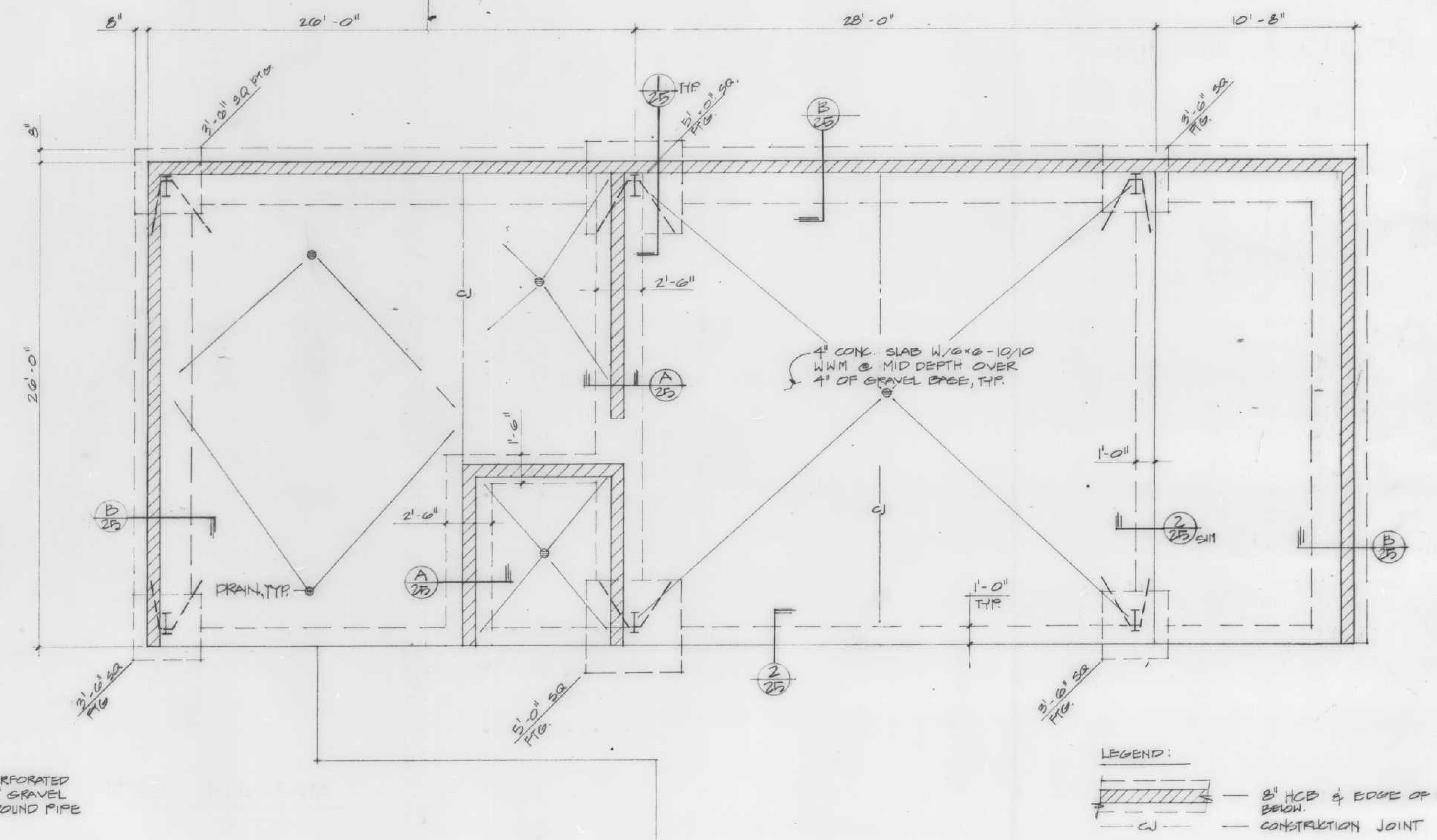
DETAIL (2)



SECTION (A)



SECTION (B)



FOUNDATION PLAN

SCALE: 1/4" = 1'-0"

AS BUILT

DRAWN BY:	DESIGN BY: J. DUNLAP
CHECK BY: M. THALHAMER	
BY [signature]	23237

REVISION	DATE	DESCRIPTION

RVA RAYMOND VAIL AND ASSOCIATES
ENGINEERING · ARCHITECTURE · PLANNING · SURVEYING
SACRAMENTO • ANTIOCH • SONORA • TAHOE CITY

ARNOLD WASTEWATER PROJECT

CONTROL BUILDING - STRUCTURAL

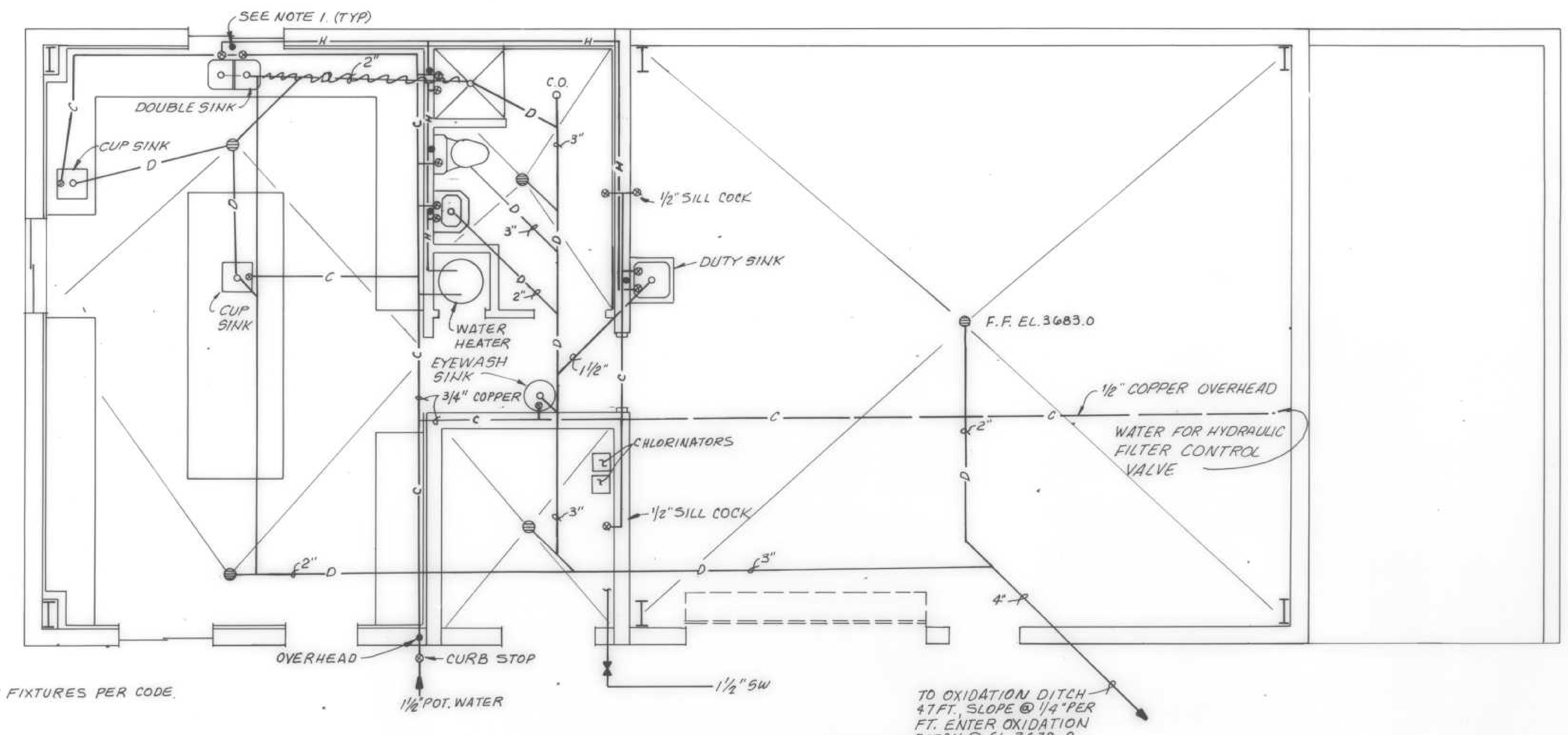
DATE AUG 1984

SCALE: HORIZONTAL AS NOTED; VERTICAL

W.O. NO. 439103

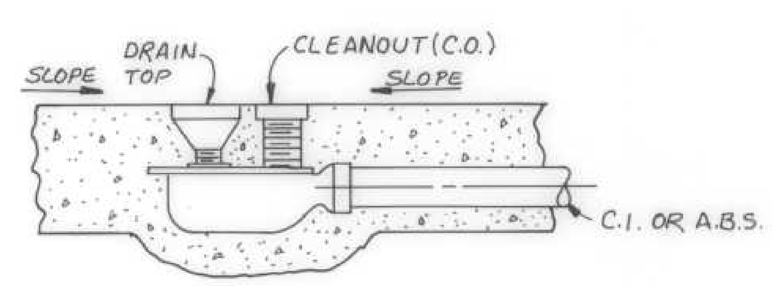
SHEET 25 OF 43 SHEETS

FILE NO. D-0217



NOTE 1. VENT FIXTURES PER CODE.

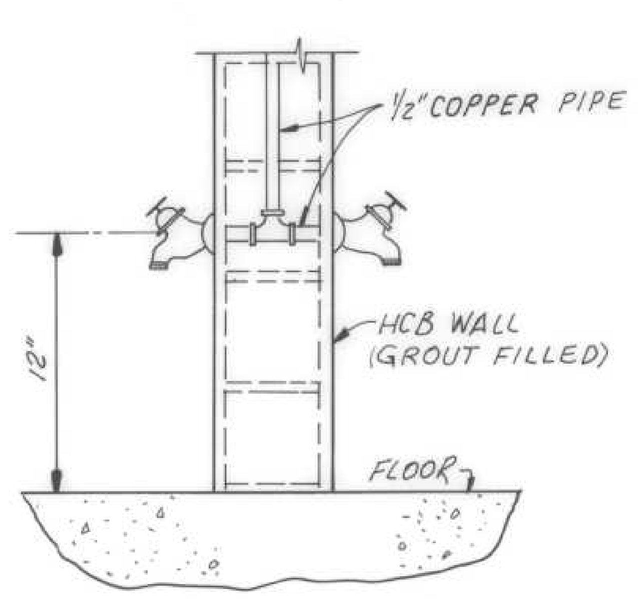
FLOOR PLAN–PLUMBING



FLOOR DRAIN DETAIL (5 EACH)

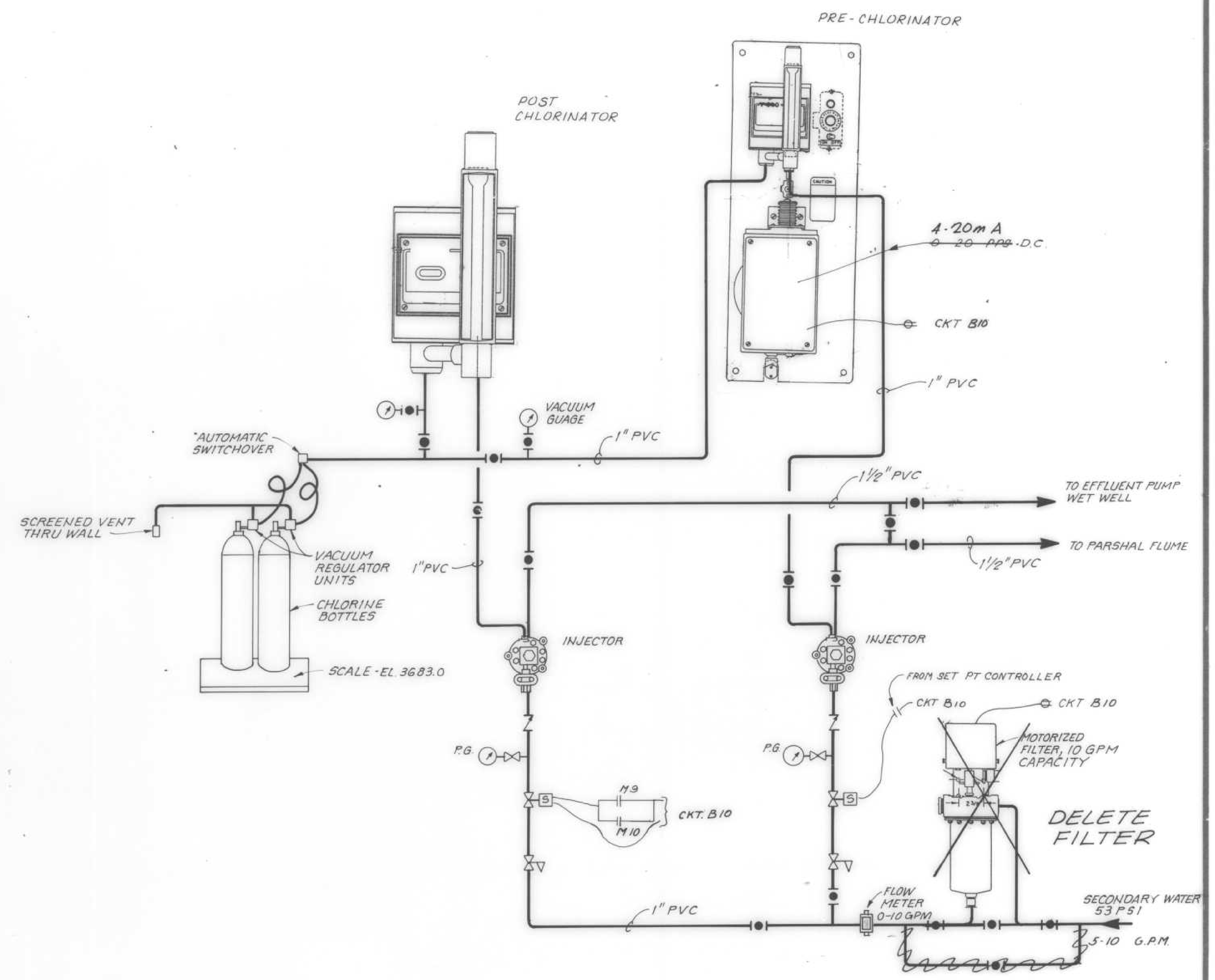
N.T.S.

NOTE: FLOOR DRAIN ZURN Z-455, JOSAM S-240-A OR EQ.



SILL COCK DETAIL

N.T.S.



CHLORINE SCHEMATIC

PLUMBING FIXTURE SCHEDULE		
FIXTURE	ELJER PART NO.	AMERICAN STD. PART NO. OR EQ.
SHOWER	#034-09508 & #532-0350 W/GLASS DOOR	#2152.017 & #1200.146 W/GLASS DOOR
LAVATORY	#051-1604	#4869.012
TOILET	#091-1825	#2109.405
SINK	ELKAY #LR 3322-10 DOUBLE S. STEEL	MOEN EDE 3322-4-H
DUTY SINK	#242-0155	#7695.018
CUP SINK	KEWAUNEE #413	VAN LAB #VL 9510
EYE WASH	BRADLEY S 192 3-SB-SCE-SR	VWR #56611-009

DRAWN BY G. ZUEGER	DESIGN BY J. LAM
CHECK BY M. THALHAMER	
BY [signature]	23237

REVISION	DATE	DESCRIPTION

RVA RAYMOND VAIL AND ASSOCIATES
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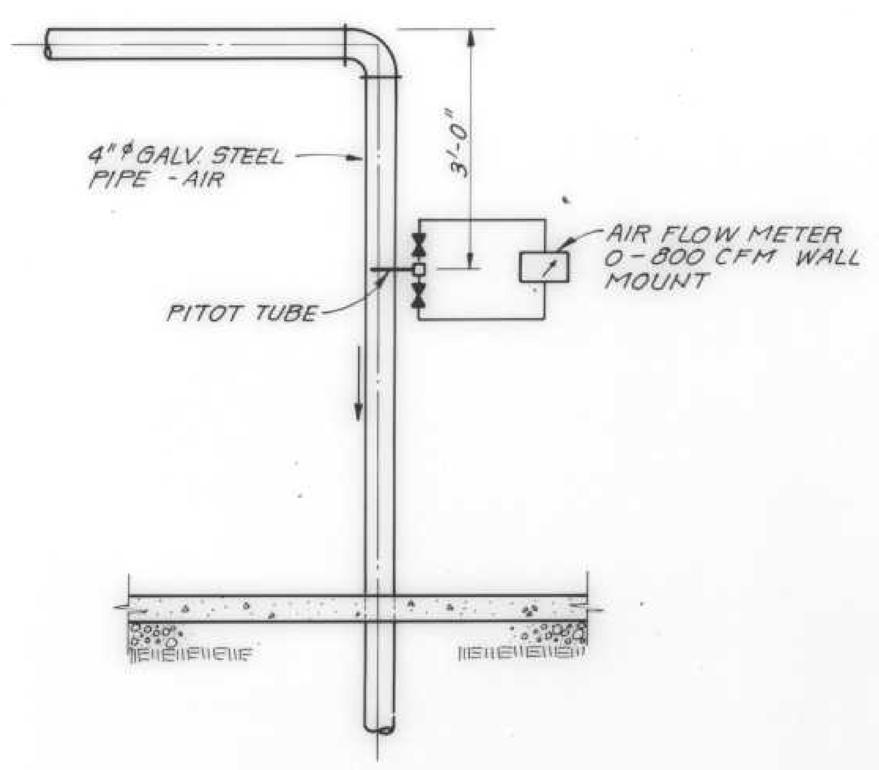
SACRAMENTO, CALIFORNIA 1410 Ethan Way 95825

ARNOLD WASTEWATER PROJECT
CONTROL BLDG.–PLUMBING & CHLORINE SCHEMATIC

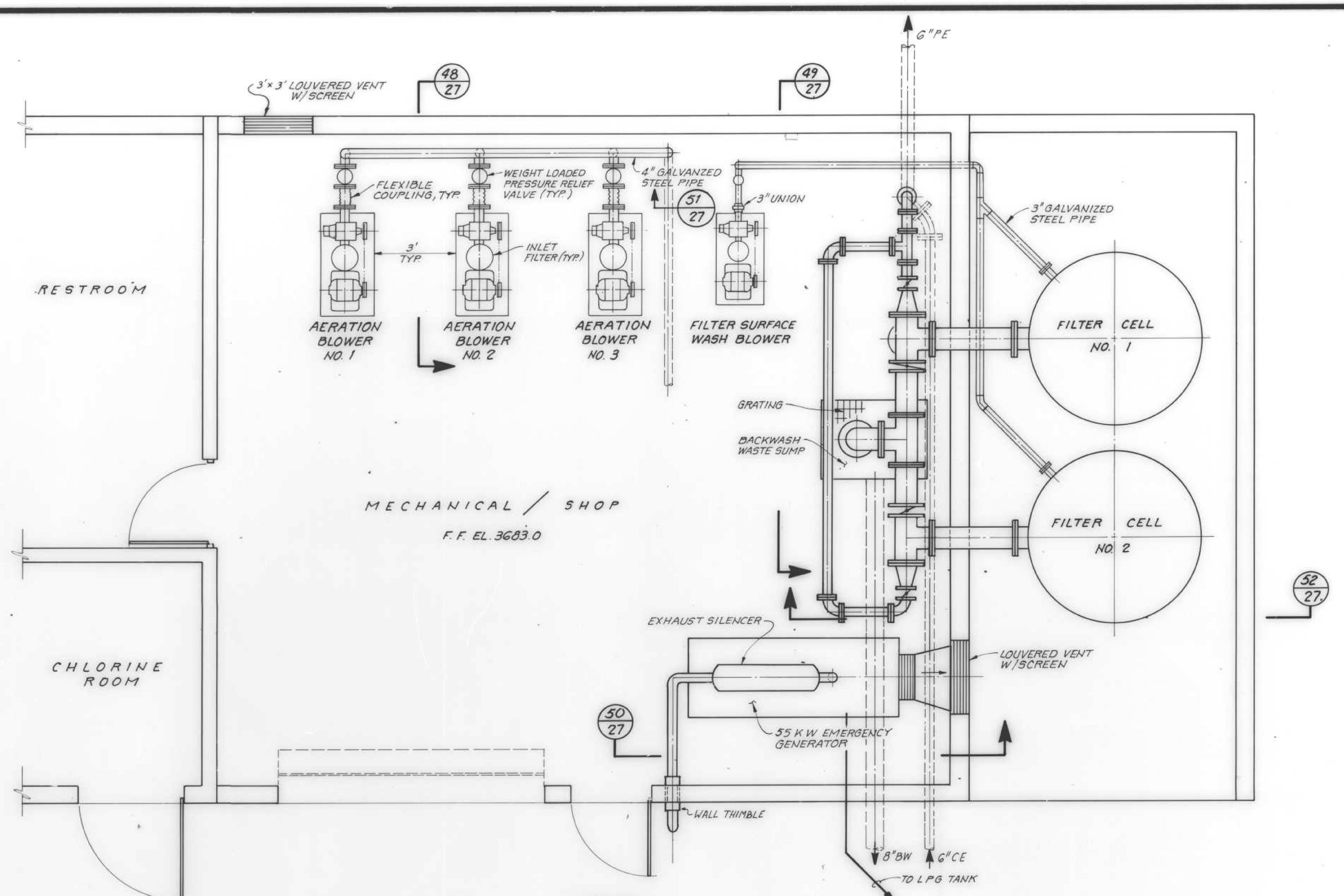
DATE AUG. 1984
SCALE HORIZONTAL AS SHOWN
VERTICAL
W.O. NO. 439103

SHEET 26 OF 43 SHEETS

FILE NO. D-0217



SECTION 51/27
1/2"=1'-0"



PLAN
3/8"=1'-0"

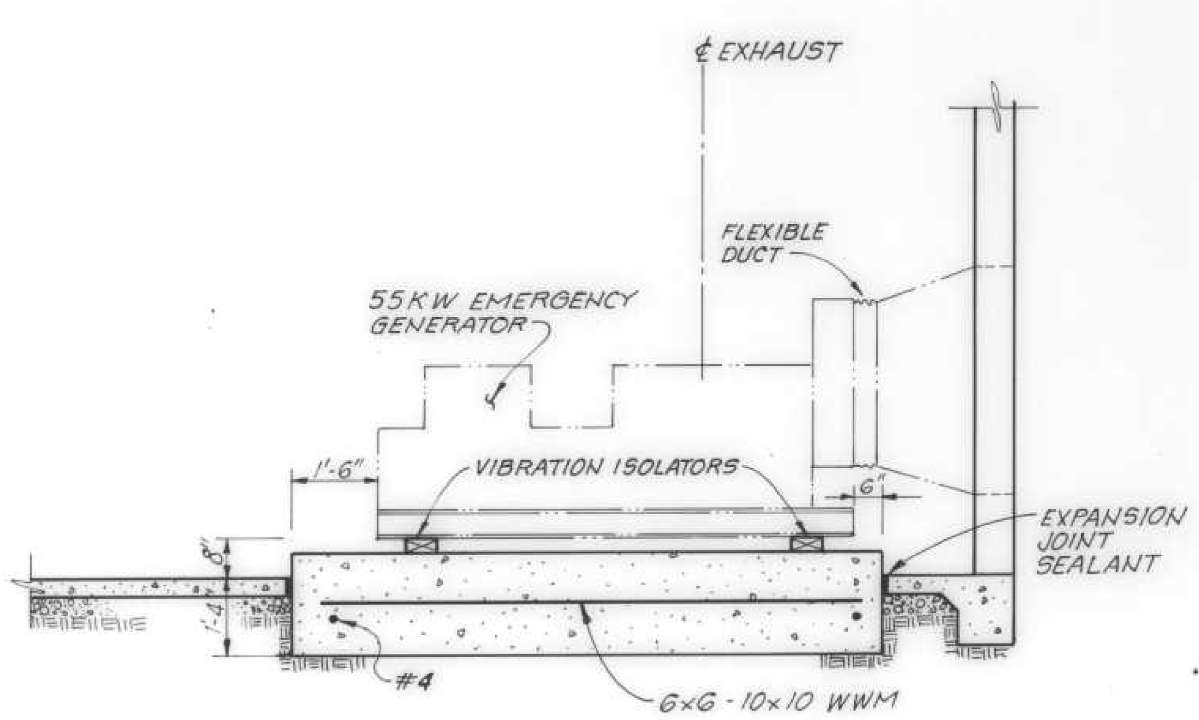
VALVE NO.	M 1	2	3	4	5	M 6	7	8	9	10	M 11	12	M 13
FILTER	O	O	O	O	O	O	X	X	X	X	O	X	X
BACKWASH #1	O	X	O	X	O	O	O	X	O	X	O	O	X
BACKWASH #2	O	O	X	O	X	O	X	O	X	O	O	O	X
FILTER BYPASS	X					X							O

M MANUAL

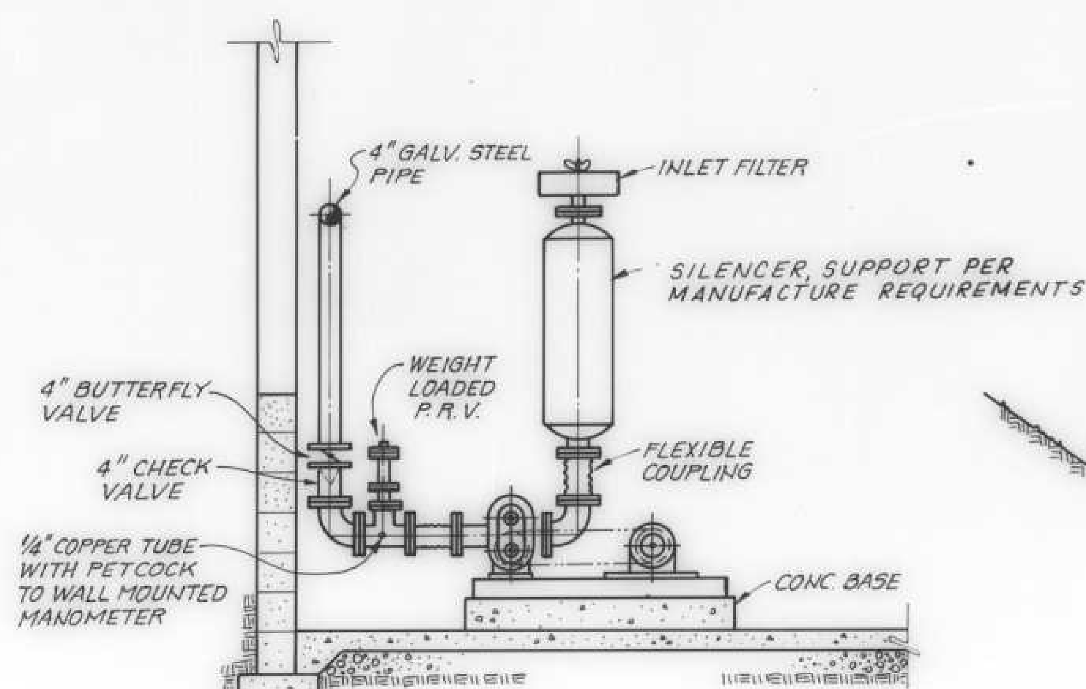
X = CLOSE
O = OPEN

Q FORWARD = 125 GPM
Q BACKWASH = 500 GPM

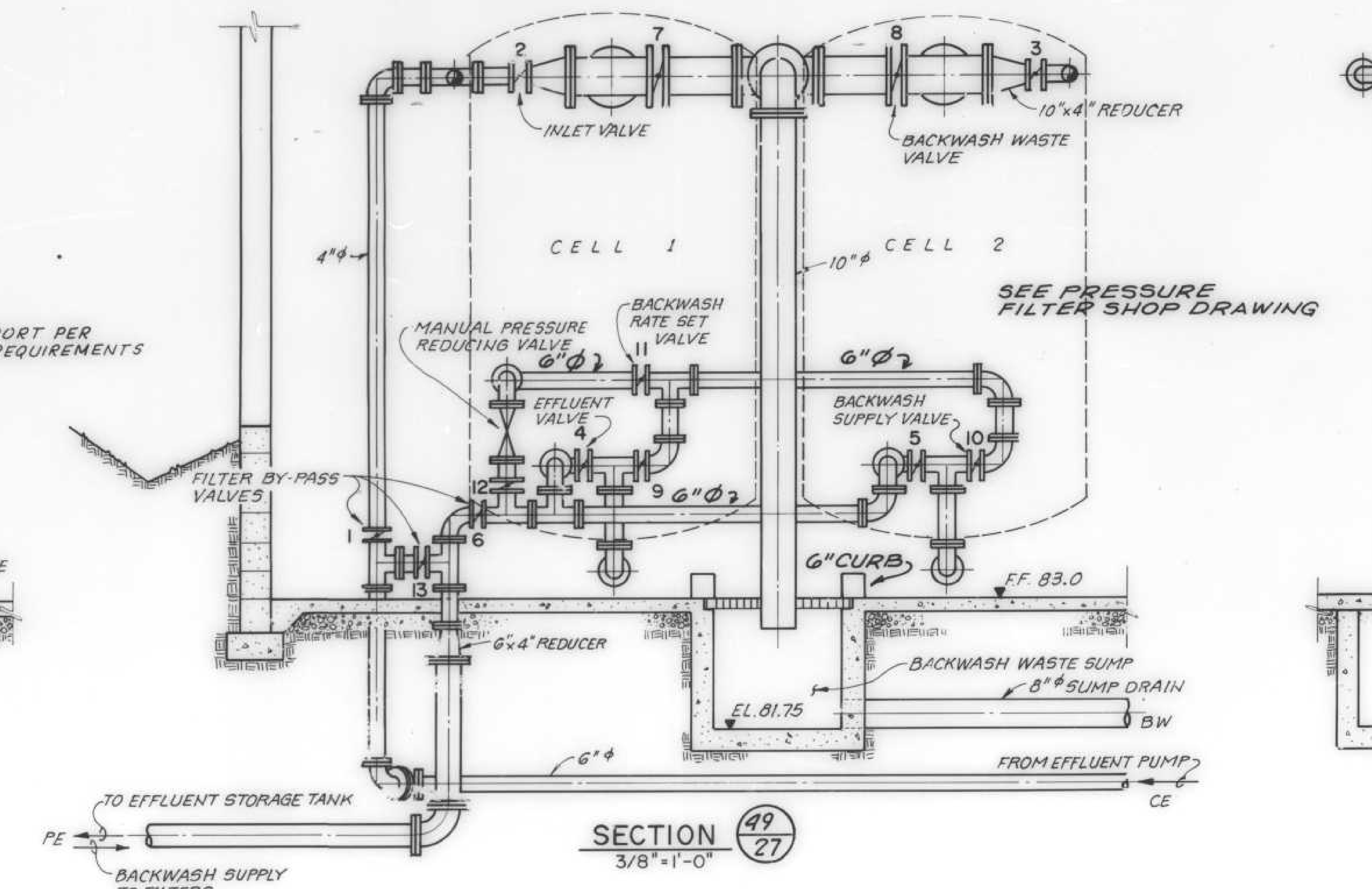
VALVE SEQUENCE SCHEDULE
SEE SECTION 49/27



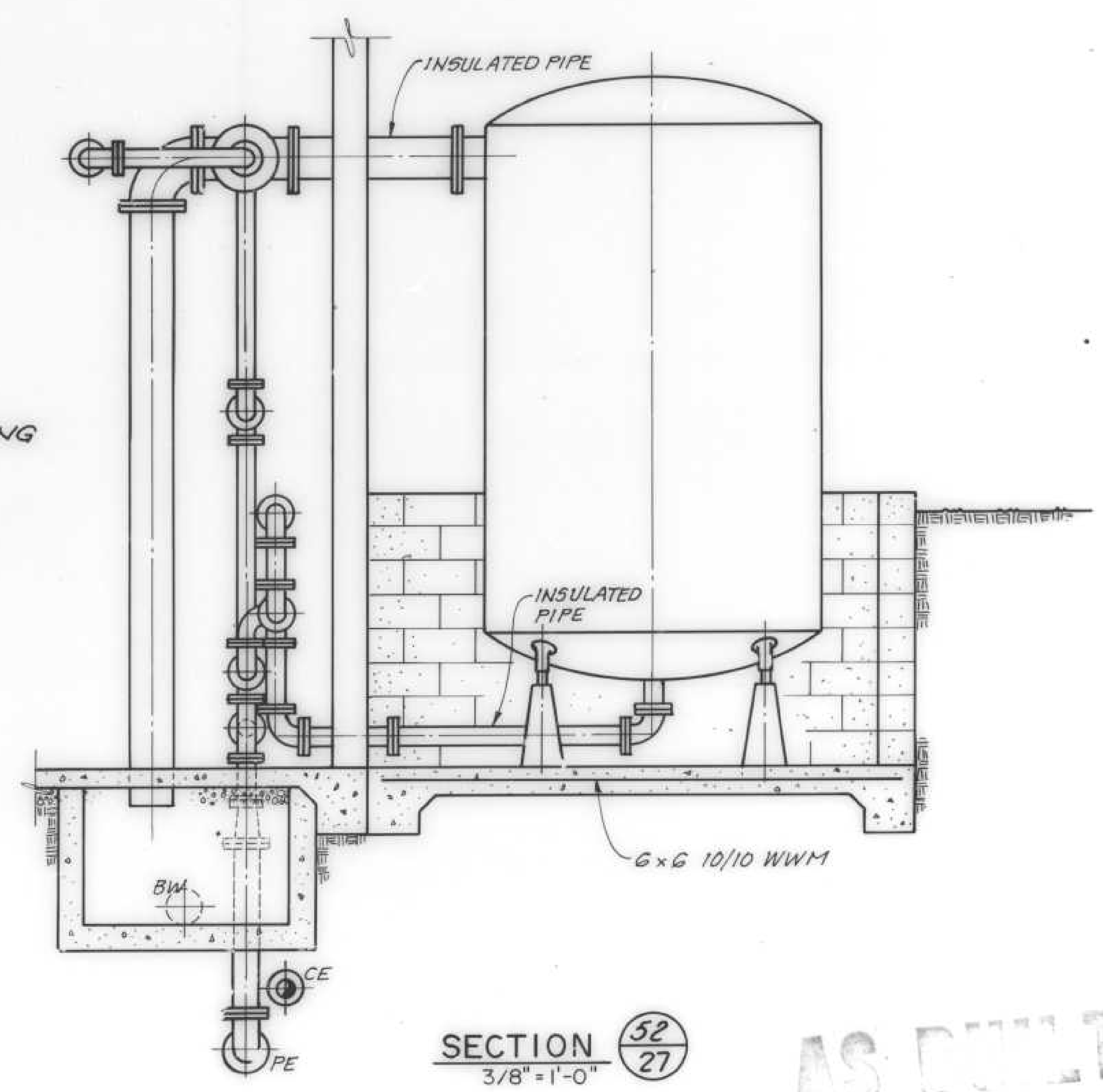
SECTION 50/27
3/8"=1'-0"



SECTION 48/27
3/8"=1'-0"



SECTION 49/27
3/8"=1'-0"



SECTION 52/27
3/8"=1'-0"

AS BUILT

DRAWN BY G. ZUEGER	DESIGN BY J. LAM
CHECK BY M. THALHAMER	
BY [signature]	23237

REVISION	DATE	DESCRIPTION

RVA RAYMOND VAIL AND ASSOCIATES
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SACRAMENTO, CALIFORNIA 1410 Ethan Way 95825

ARNOLD WASTEWATER PROJECT
CONTROL BLDG. - MECHANICAL

DATE	AUG 1984
SCALE	
HORIZONTAL	AS SHOWN
VERTICAL	
W.O. NO.	4391.03

SHEET 27 OF 43 SHEETS

FILE NO. D-0217

DRAWN BY R.A.W.	DESIGN BY K.J.M.	CHECK BY M.G.T.	RCE 23237

REVISION	DATE	DESCRIPTION

RVA — RAYMOND VAIL AND ASSOCIATES
ENGINEERS · ARCHITECTS · PLANNERS · SURVEYORS
FAIR OAKS · TAHOE CITY · ANTIOCH · AUBURN · SONORA · CARSON CITY

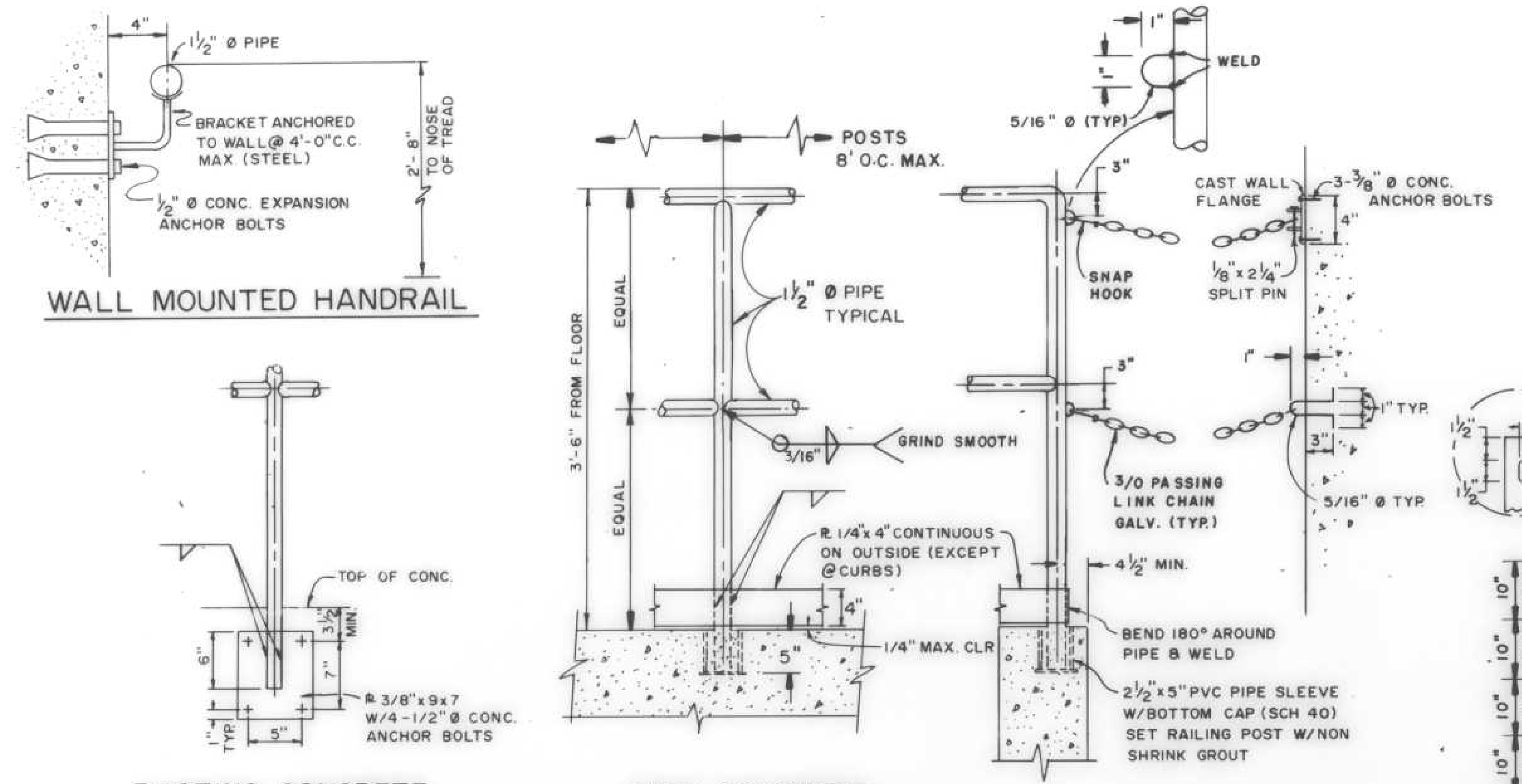
ARNOLD WASTEWATER PROJECT

STANDARD DETAILS

DATE AUG 1984
SCALE
HORIZONTAL
VERTICAL
W.O. NO. 4391.03

SHEET 28 OF 43

FILE NO. D-0217



WALL MOUNTED HANDRAIL

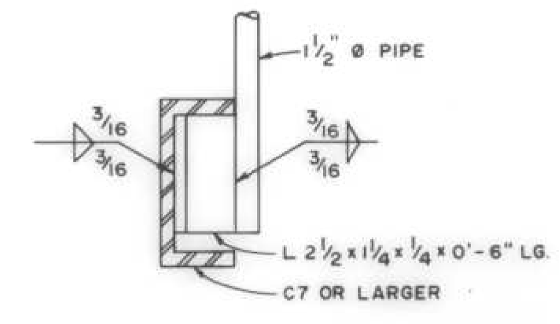
EXISTING CONCRETE

NEW CONCRETE

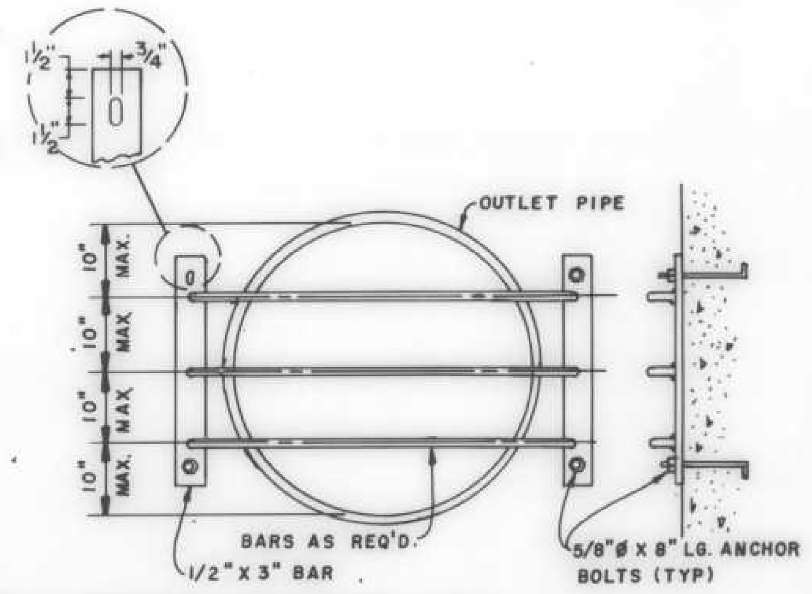
HANDRAIL DETAIL

N.T.S.

NOTES: 1. METAL RAILINGS AND POSTS SHALL BE 1½" Ø SCHED. 40 STEEL PIPE, GALVANIZED



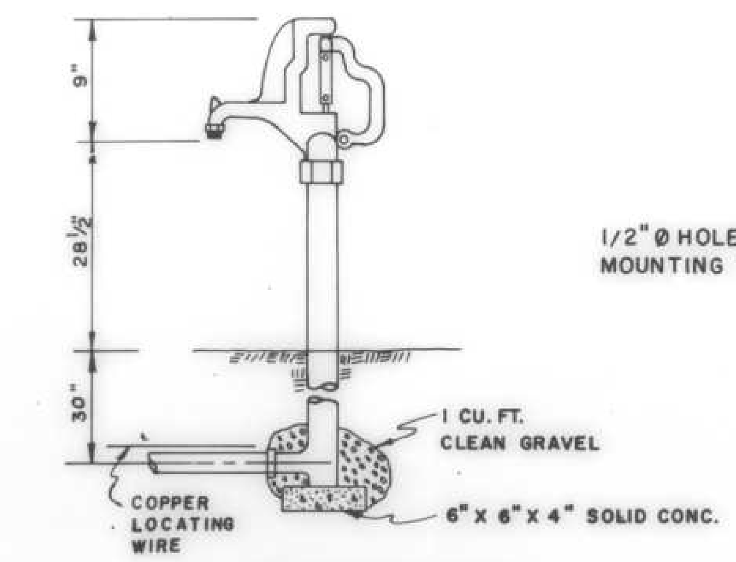
MOUNTING ON STRUCTURAL SHAPE



NOTES: 1. GUARDS SHALL BE 3/4" Ø RODS. EXTEND 3" FROM WALL, WELD TO FLAT BAR.
2. NOT REQ'D. WHERE GRATING IS USED.

PIPE INLET GUARD (A)

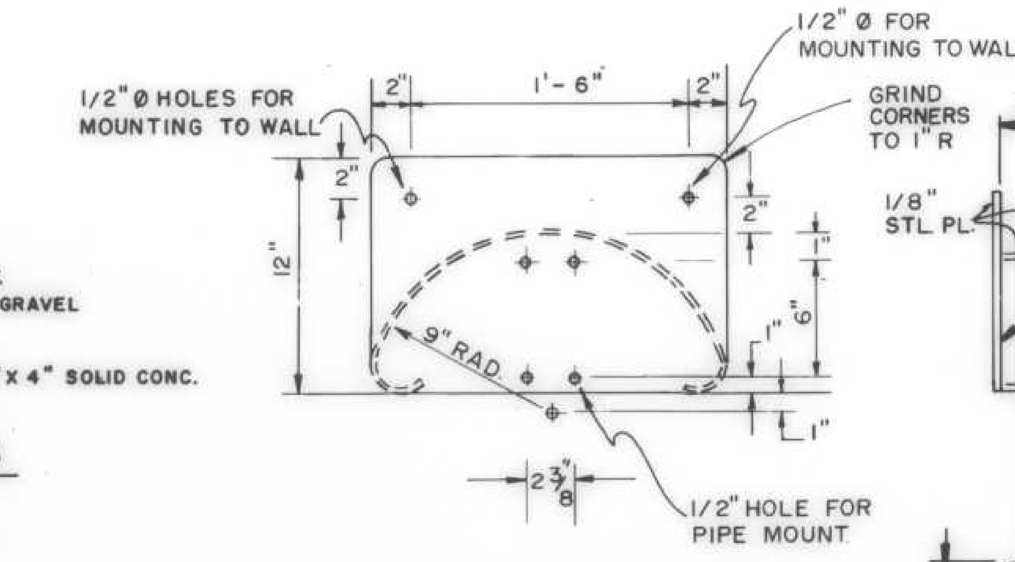
PIPE = OR > 12"



1" FREEZELESS HOSE BIB

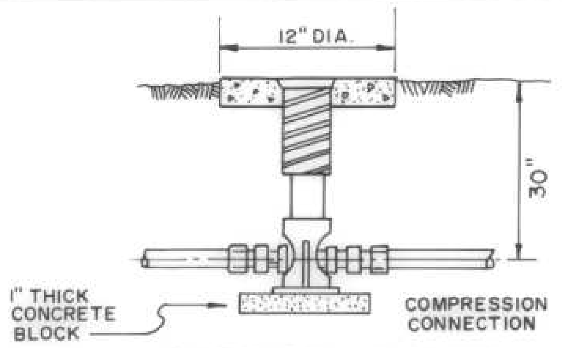
N.T.S.

(E)



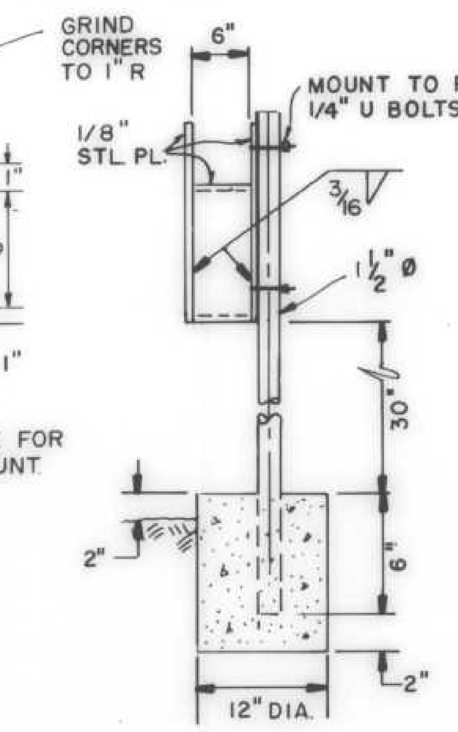
HOSE RACK DETAIL (B)

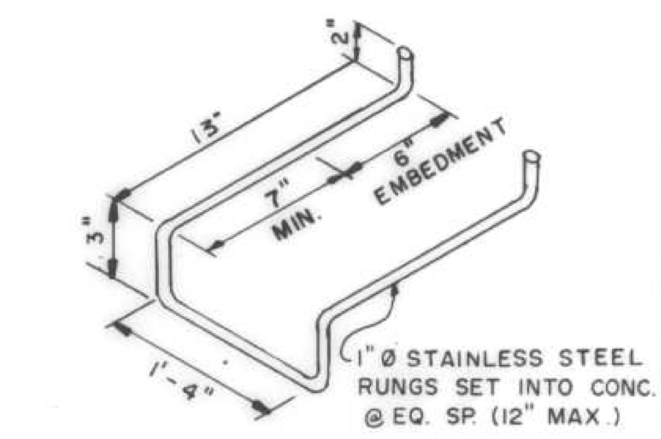
GALVANIZED SCALE 1 1/2" = 1'



CURB BOX & STOP

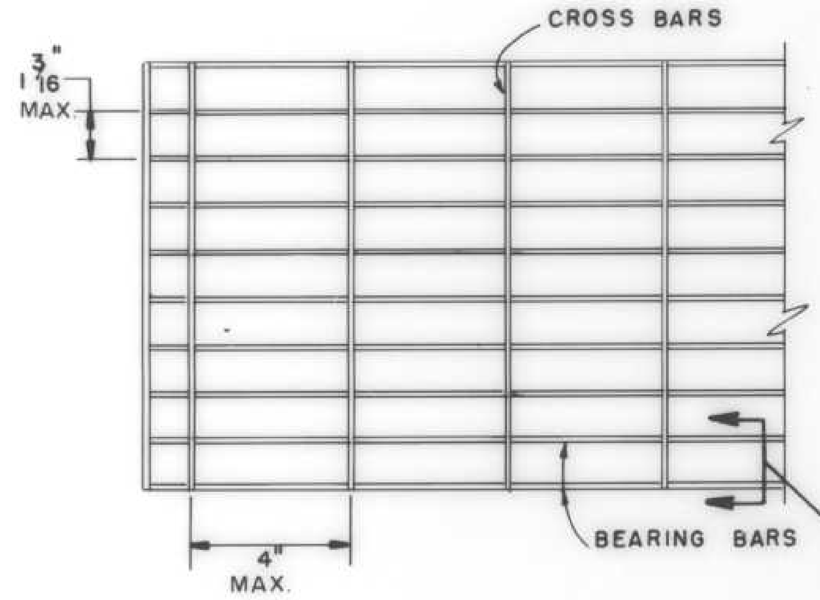
(FURNISH 2 SHUT OFF KEYS)





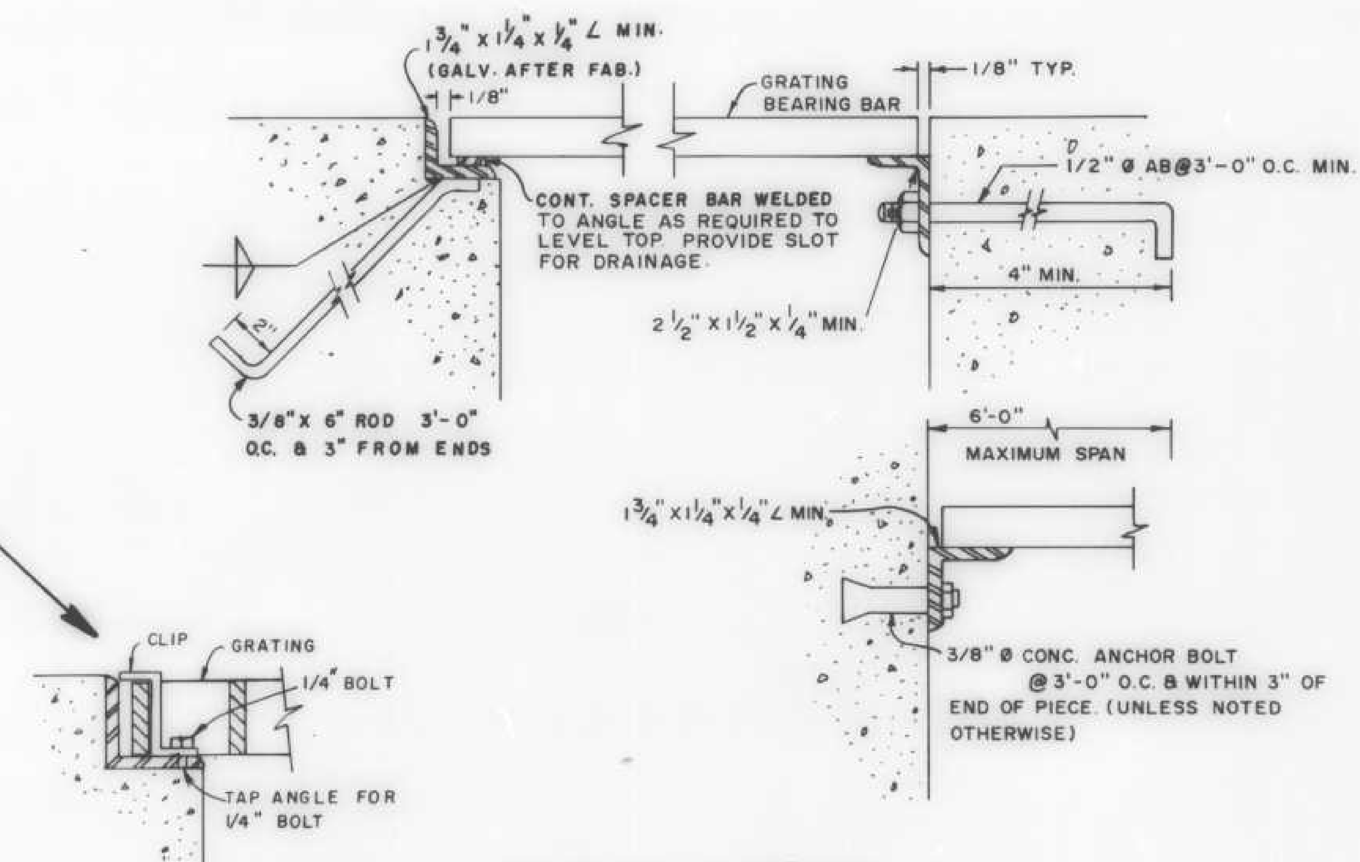
LADDER RUNG DETAIL (C)

N.T.S.



TYPICAL GRATING

(125# S.F. LOADING)

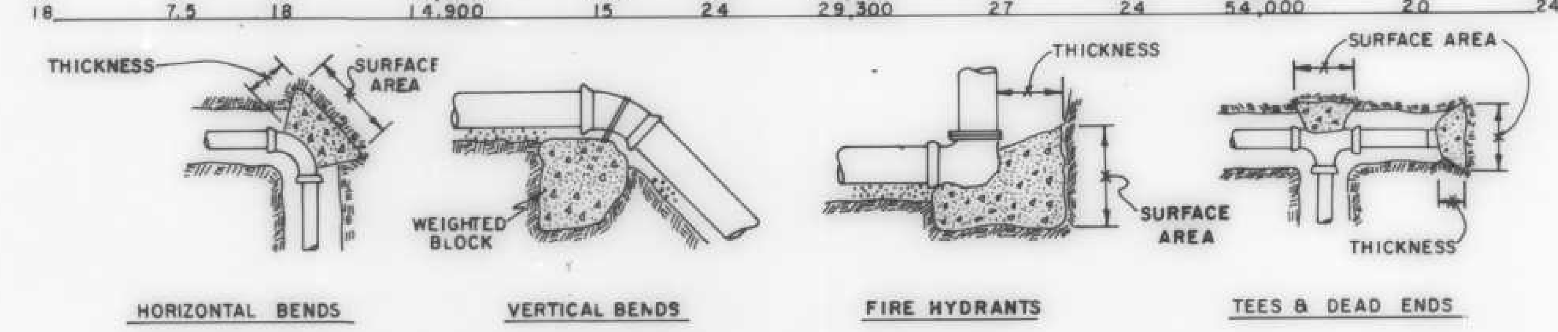


GRATING HOLD-DOWN CLIP DETAIL

4 PER SECTION

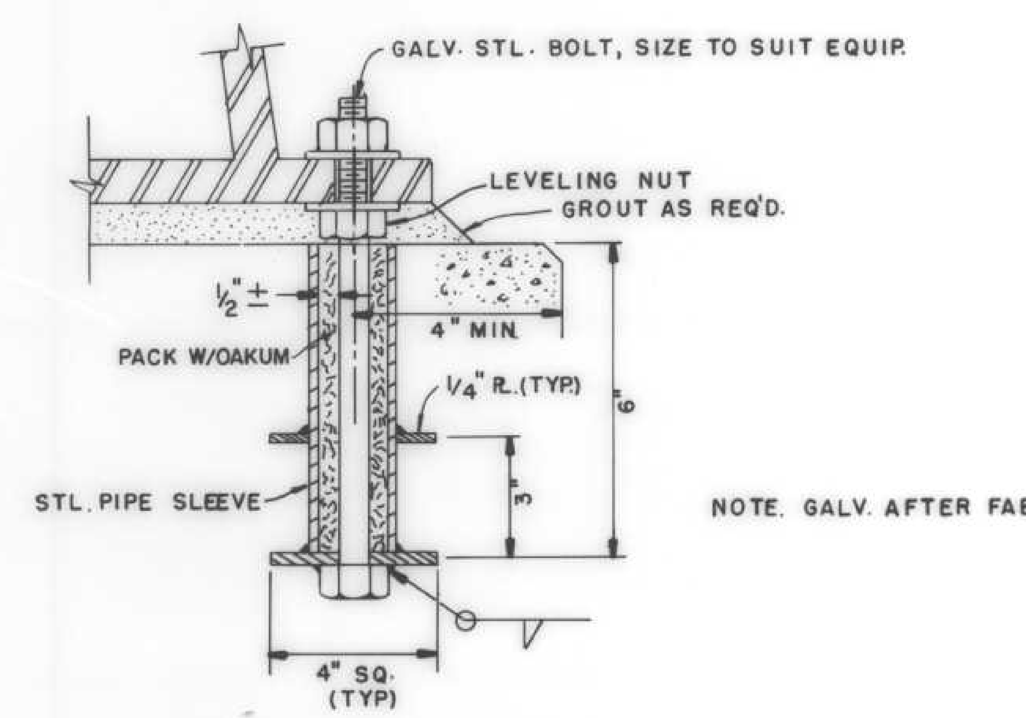
GRATING SUPPORT

DIAMETER OF PIPE IN.	22½ HORIZONTAL BEND SURFACE AREA SQ. FT.	22½ HORIZONTAL BEND THICKNESS IN.	WEIGHT @ VERTICAL BENDS LBS.	45° HORIZONTAL BEND SURFACE AREA SQ. FT.	45° HORIZONTAL BEND THICKNESS IN.	WEIGHT @ VERTICAL BENDS LBS.	90° HORIZONTAL BEND SURFACE AREA SQ. FT.	90° HORIZONTAL BEND THICKNESS IN.	WEIGHT @ VERTICAL BENDS LBS.	TEE & DEAD ENDS SURFACE AREA SQ. FT.	TEE & DEAD ENDS THICKNESS IN.
4	1	8	1,000	1	8	1,500	2	12	3,600	2	12
6	1	8	1,700	2	12	3,200	3	12	6,000	2	12
8	1.5	12	3,000	3	14	5,800	5	15	10,700	4	15
10	2	12	4,600	4.5	18	9,000	8	18	16,700	6	18
12	3	14	6,600	6.5	18	13,000	12	18	24,000	8.5	18
14	4.5	18	9,000	8	24	17,700	18	24	32,600	11.5	24
16	6	18	11,800	11.5	24	23,200	21	24	42,700	15	24
18	7.5	18	14,900	15	24	29,300	27	24	54,000	20	24



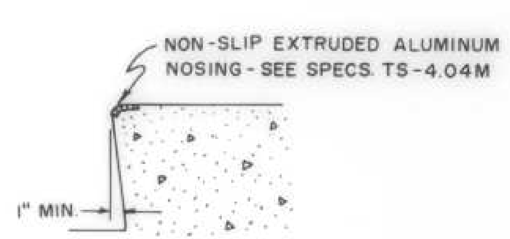
NOTE: 1. ALL VALUES SHOWN ARE MINIMUM FOR A HYDROSTATIC PRESSURE OF 150 PSI AND A SOIL RESISTANCE OF 2,000 LBS./SQ. FT. WITH PIPELINE A MINIMUM OF 2 FEET OF COVER.
2. GRAVITY LINES, ALL SIZES, 10 PSI OR LESS, USE THE 4" DIMENSION ABOVE.

THRUST BLOCK DIMENSIONS

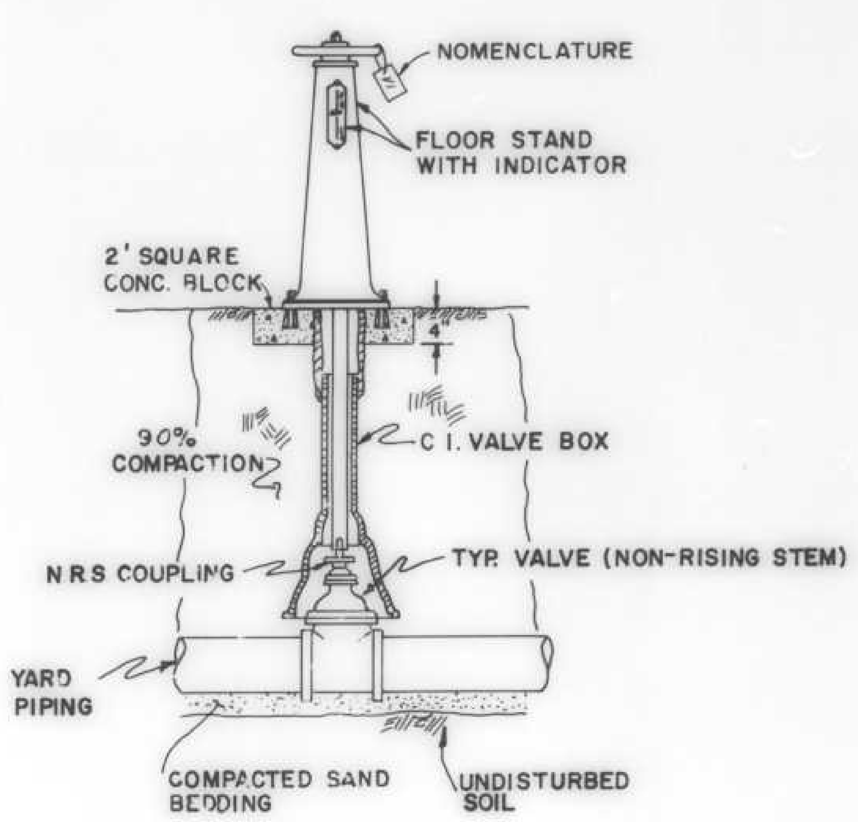


NOTE. GALV. AFTER FAB.

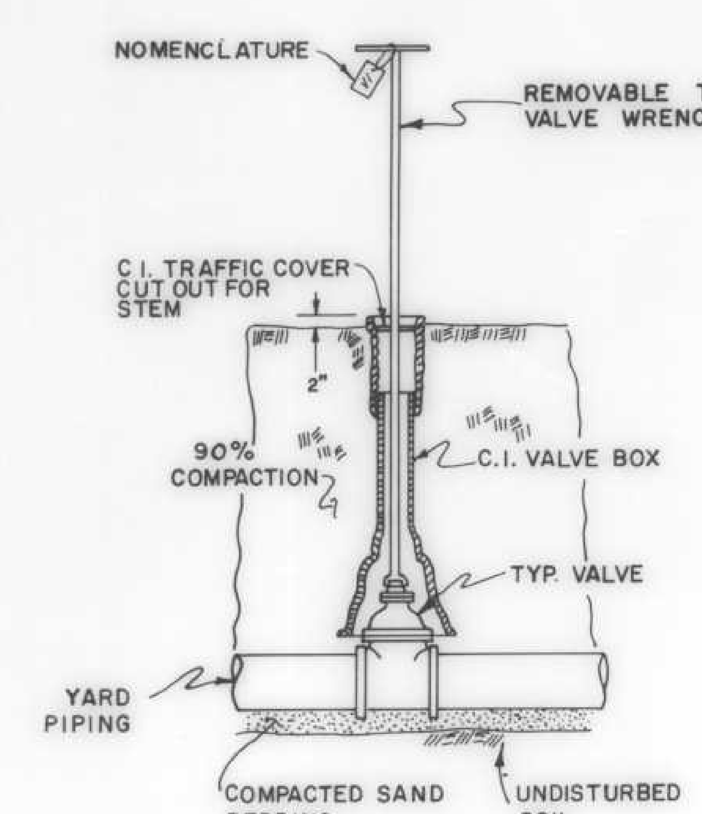
TYP. EQUIPMENT ANCHOR BOLT



CONCRETE STEP DETAIL



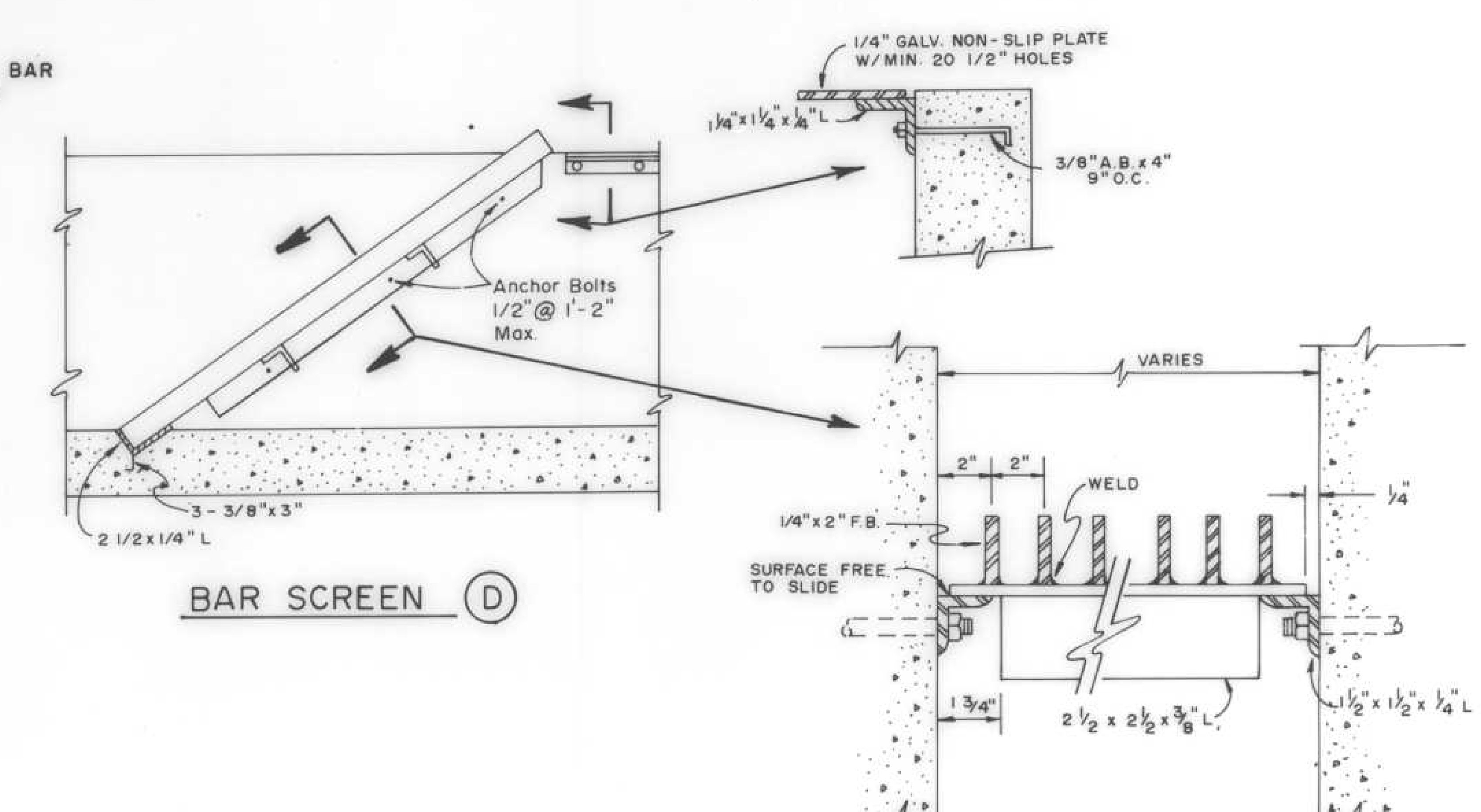
INDICATOR VALVE (TYPE A)



T BAR VALVE (TYPE B)

TYPICAL VALVE INSTALLATION

N.T.S.



BAR SCREEN (D)

AS BUILT

DRAWN BY R.A.W.	DESIGN BY K.J.M.
CHECK BY M.G.T.	
BY Michael L. [signature]	R.C.E. 23237

REVISION	DATE	DESCRIPTION

RVA RAYMOND VAIL AND ASSOCIATES
ENGINEERS · ARCHITECTS · PLANNERS · SURVEYORS
FAIR OAKS · TAHOE CITY · ANTIOCH · AUBURN · SONORA · CARSON CITY

ARNOLD WASTEWATER PROJECT

STANDARD DETAILS

DATE AUG. 1984
SCALE
HORIZONTAL
VERTICAL
W.O. NO. 4391.03

SHEET 29 OF 43

FILE NO. D-0217

- DESIGN LOADINGS
  Seismic ....Zone 3
  Wind........................15 psf

- ALLOWABLE SOIL BEARING
  Dead plus live load.........2,000 psf

- GENERAL
  1. The notes and detailes on this sheet are general. Specific information on the drawings differing from these notes shall apply.
  2. The Contractor shall verify all dimensions on the job.

- FOUNDATIONS
  1. The Contractor shall provide the Engineer at least 48 hours notice following excavation for foundations and prior to the placement of formwork, reinforcing steel, or concrete.
  2. Footings shall bear on firm, undisturbed, natural ground or on engineered fill approved by the Engineer, at the minimum depths shown on the drawings.

- CONCRETE
  1. Concrete shall be of 4" maximum slump and shall have a minimum compressive strength of 3,000 psi for the construction of the control buildings and 3,500 psi for the construction of tanks and other hydraulic structures.
  2. The requirements for concrete mixes, placing, testing, and curing are contained in the specifications.
  3. The Contractor shall notify the Engineer 48 hours prior to the placement of concrete.
  4. Horizontal construction joints shall be prepared to expose clean, solidly embedded aggregate over the entire joint interface.
  5. Placement of pipes, conduits, or other embedded items in the concrete shall be in accordance with these drawings.
  6. All dimensions shown for location of reinforcing steel are to face of bar and denote clear coverage. Unless specifically noted otherwise, concrete coverage shall be 3" where concrete is placed directly against the ground and 2" where concrete is exposed to the ground but is placed against forms. Slabs on ground shall have reinforcing at mid-depth unless otherwise noted.

- MASONRY
  1. Masonry units shall be Grade N, fm=1350, conforming to the requirements of ASTM-90 and the Uniform Building Code.
  2. Mortar shall be Type S, as designated by the Uniform Building Code.
  3. Grout shall be coarse grout, as designated by the Uniform Building Code, and shall develop a minimum compressive strength of 2,000 psi at 28 days.
  4. All masonry unit cells containing reinforcing or other embedded items shall be grout filled following the precedures set forth by Section 2415(b) of the 1973 Uniform Building Code.
  5. Blocks shall be laid in running bond.

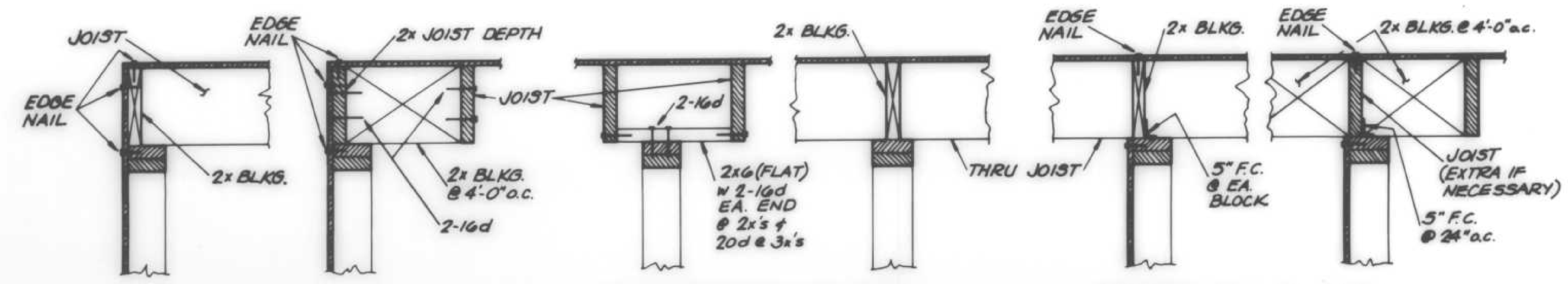
- REINFORCING STEEL
  1. Reinforcing bars #5 & below shall conform to the requirements of ASTM A615, Grade 40, #6 & above shall grade 60.
  2. Welded steel wire fabric shall conform to the requirements of ASTM A185.
  3. Bends in reinforcing shall be in accordance with ACI 318-71.
  4. All dimensions for location of reinforcing steel are to the face of the bar and denote clear concrete coverage.
  5. Splices in continuous reinforcing shall have laps of 40 bar diamters minimum in masonry construction and 30 bar diameters minimum in concrete construction. Except where shown otherwise, horizontal laps in adjacent bars shall be staggered 5'0" minimum.

- STEEL
  1. Structural steel shall conform to ASTM A36.
  2. Bolts shall conform to ASTM 307.
  3. Structural steel shall be fabricated and erected in accordance with the 1970 AISC Specifications.
  4. Stud bolts shall be connected to steel members with full penetration butt welds.

- CARPENTRY
  1. Structural framing shall be Douglas Fir of the grades indicated or better (WWPA Grading Rules):
     Beams and Stringers ....Number 2
     Joints ....Number 2
     Posts and Timbers ....Number 1
     Studs and Sills
       2"x4" ....Stud
       2"x6" ....Number 3
  2. Sills on concrete slabs on grade shall be Foundation Grade Redwood or approved pressure treated Douglas Fir.
  3. Plywood shall be of the designated grade and shall meet the requirements of U.S. Product Standard PS 1-66.
  4. Wood structural members shall not be drilled or notched except as shown or as approved by the Engineer.
  5. Framing hardware noted is Simpson Strong-Tie and shall be installed with connectors specified for each specific device by the manufacture's catalog number 74HI. Equal devices approved by the Engineer may be substituted.
  6. Wood sills for bearing and sheathed walls bearing on masonry or concrete shall be bolted with 5/8" ø bolts at 4'0" maximum spacing and within 9" of end of each piece. Each piece shall receive at least two bolts.
  7. Wood plates and nailers on steel beams shall be bolted with 1/2" ø bolts or welded studs at 2'8" maximum spacing. Bolts and welded studs shall be staggered for plates and nailers wider than 3-1/2".
  8. Bolt holes in wood or steel shall be 1/16" larger than bolts.
  9. All nuts shall be tightened when placed and retightened prior to application of finish or at completion of job.
  10. Except where noted otherwise, studs shall be 2x6 at 16" maximum spacing.
  11. Blocking, 2 x width of stud, shall be provided at floor, ceiling, and roof lines and so that unbraced length of stud does not exceed 10'0".
  12. Standard cut washers shall be provided under the heads and nuts of all bolts bearing on wood.

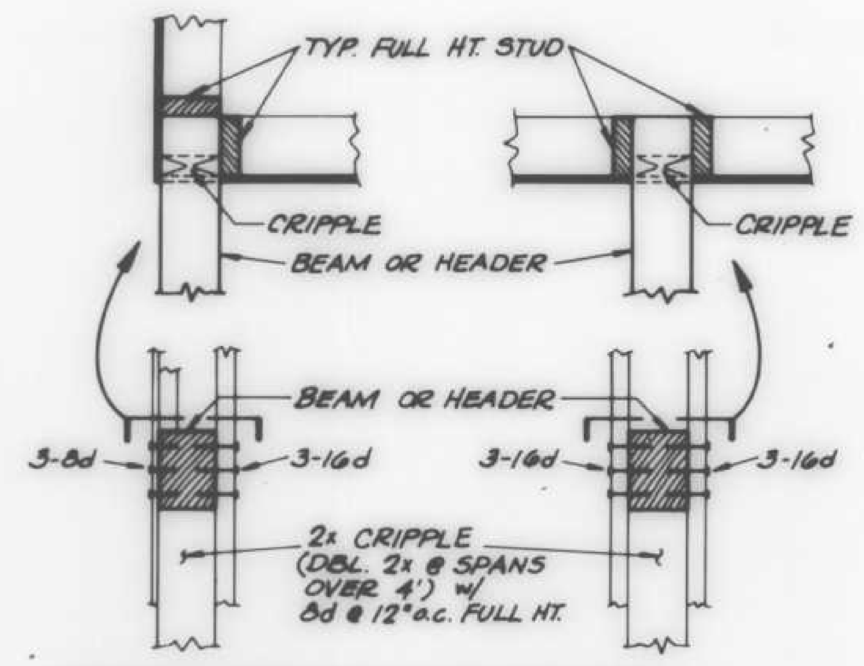
- NAILING
  1. Nails for structural connections shall be common wire nails unless otherwise specified.
  2. Nail holes shall be subdrilled where necessary to prevent splitting of wood.
  3. Except as noted on drawings, nailing shall be as specified below:

```
Studs to Sills:
(Nailing may be as shown for studs to lower top plate)
   2 x 6 and smaller ............2 - 8d toenail each side
Double top plates:
   Lower plate to stud ...........2 -16d
   Upper plate to lower plate ......16d at 18" o.c. staggered
   Corners and intersections .....3 -16d
Plate laps:
   4'0" (Minimum) ...................16d at 9" o.c. staggered
   8'0" .............................16d at 24" staggered
Joists:
   To bearings ...................3 -10d toenail (2 one side)
   At laps (12" minimum) .........4 -16d
   To sides of stud ..............3 -16d
Blocking:
   To joists or rafters, .........2 -10d toenails each side
     each end                           or 2-16d
   To bearings ...................2 -10d toenails each side
   To studs ......................2 -10d toenails or 2-16d
                                        each end
Ceiling Strips:
   1" nominal, each bearing ......1 - 8d straight and 1-3d slant
   2" nominal, each bearing ......1 -10d straight and 1-10d slant
Ribbons and ledgers to studs:
   2 x 8 and smaller .............2 -16d
   2 x 10 and larger .............3 -16d
```

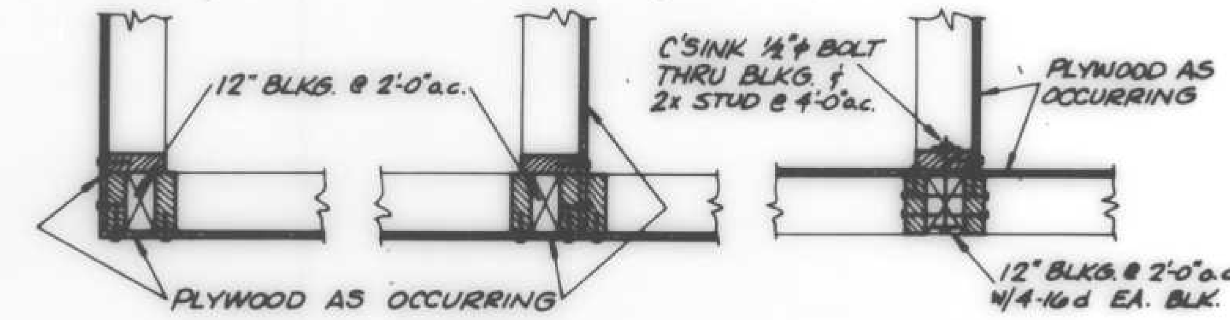


JOISTS TO SHEATHED WALL — NON-SHEATHED WALL TO JOISTS — SHEATHED WALL TO JOISTS

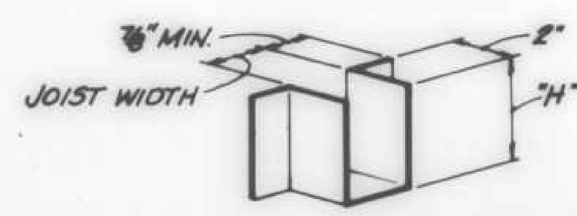
JOIST/WALL CONNECTIONS



BEAM OR HEADER TO WALL

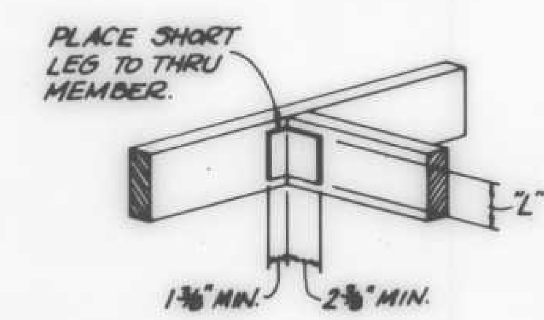


STUD WALL FRAMING DETAILS



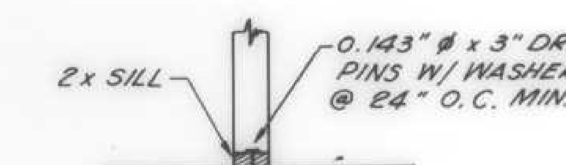
JOIST SIZE	"H" (MIN.)	NAILS TO HEADER	NAILS TO JOIST	METAL GAGE (GALV.)
2x4	3⅛"	4-10d	4-10d	16
2x6	5"	6-10d	6-10d	16
2x8	5"	6-10d	6-10d	16
2x10	8⅛"	10-10d	8-10d	16
2x12	8⅛"	10-10d	8-10d	16
3x4	3⅜"	4-16d	2-10d	16
3x6	5⅜"	8-16d	4-10d	16
3x8	5⅜"	8-16d	4-10d	16
3x10	8⅞"	14-16d	6-10d	16
3x12	8⅞"	14-16d	6-10d	16

JOIST HANGERS (J.H.)

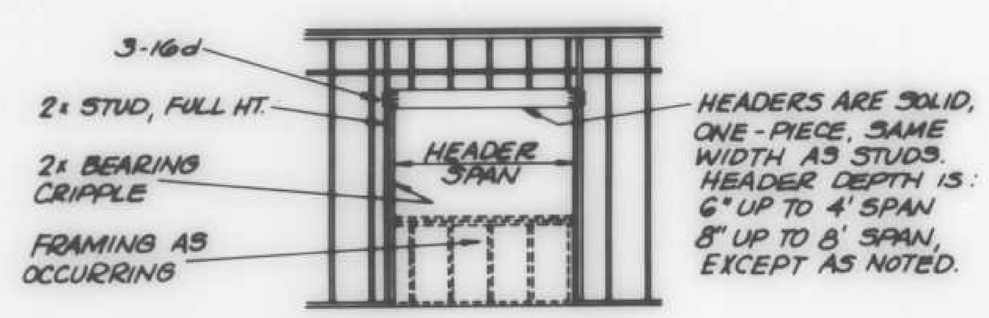


LENGTH "L"	NAILS EA. LEG	METAL GAGE (GALV.)
3"	2-10d	16
5"	3-10d	16
7"	4-10d	16
9"	5-10d	16

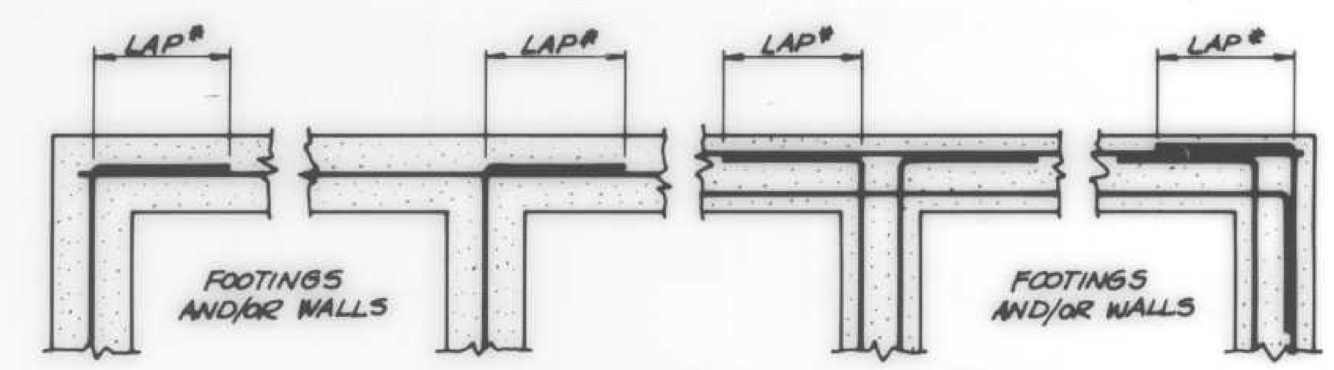
FRAMING CLIPS (F.C.)



SILL CONNECTION NON-BRG. WALL

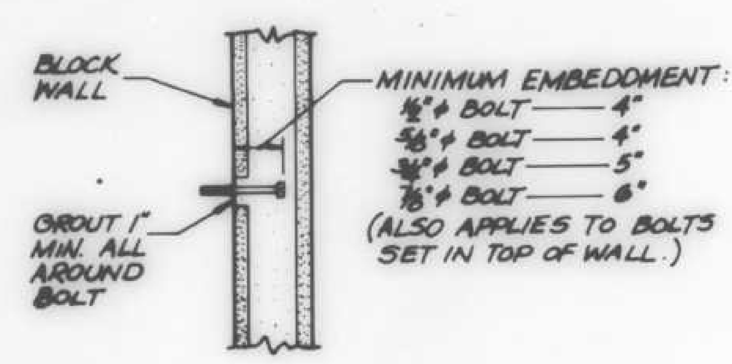


WALL OPENING

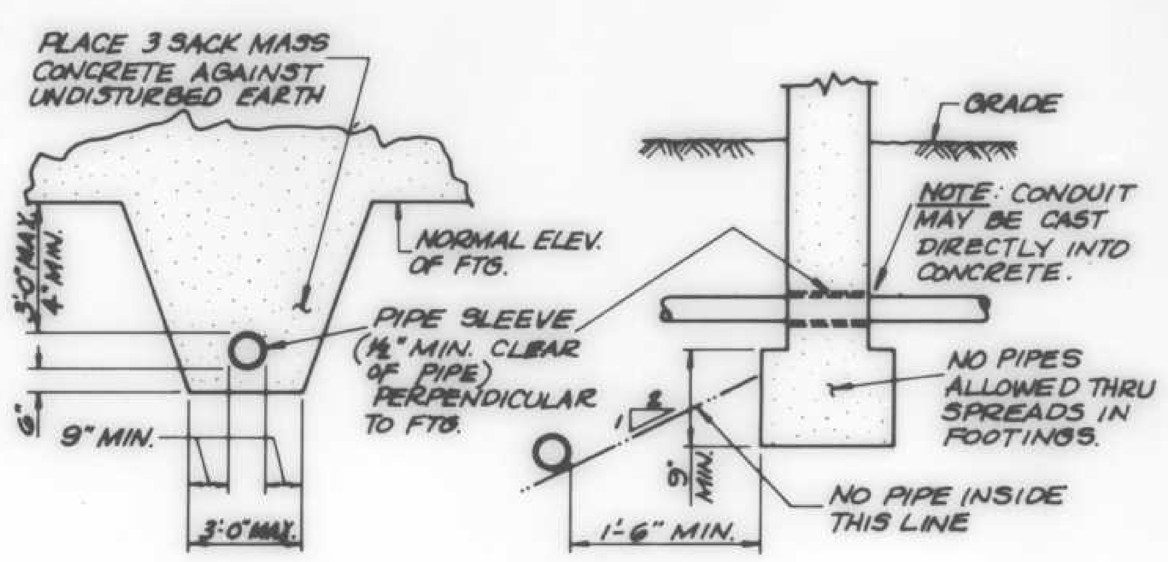


* LAP = 24d IN CONCRETE AND 40d IN MASONRY.

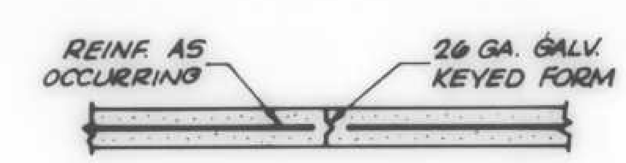
WALL REINF. - SINGLE & DOUBLE CURTAIN



BOLTS IN MASONRY

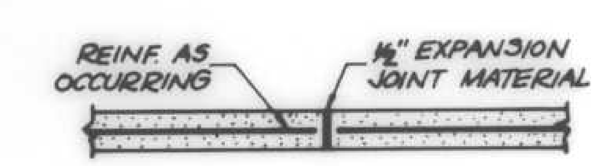


PIPE/FOOTING DETAILS



NOTE: SEE PLANS FOR LOCATIONS.

CONSTRUCTION JOINT (C.J.)



NOTE: SEE PLANS FOR LOCATIONS.

EXPANSION JOINT (E.J.)

AS BUILT

DRAWN BY: R.A.W.	DESIGN BY: K.J.M.
CHECK BY: M.G.T.	
BY [signature]	R.C.E. 23237

REVISION	DATE	DESCRIPTION

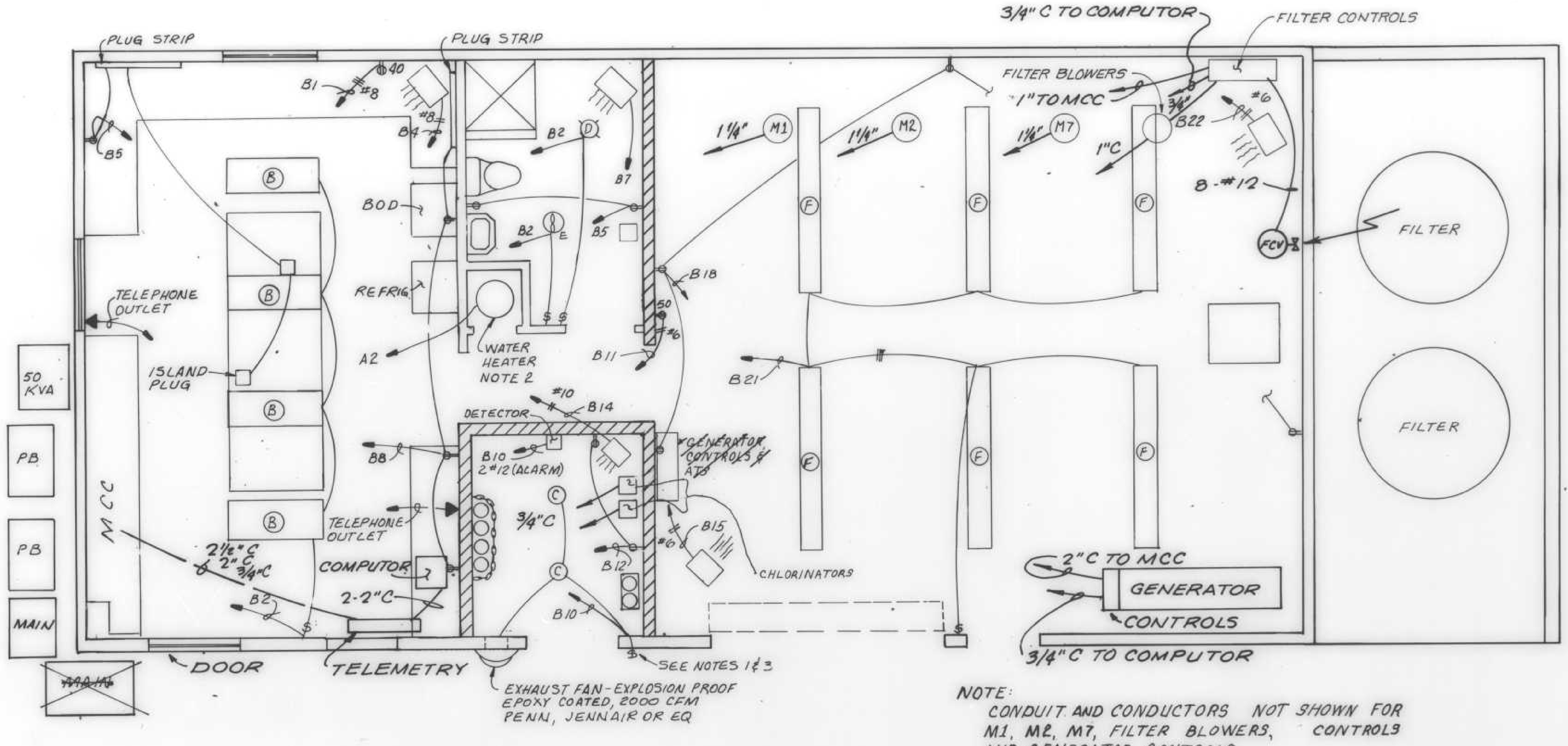
RVA SACRAMENTO
RAYMOND VAIL AND ASSOCIATES
ENGINEERING · ARCHITECTURE · PLANNING · SURVEYING
· TAHOE CITY · ANTIOCH · AUBURN · SONORA

ARNOLD WASTEWATER PROJECT
STANDARD DETAILS

DATE AUG. 1984
SCALE
HORIZONTAL
VERTICAL
W.O. NO. 4391.03

SHEET 30 OF 43 SHEETS

FILE NO. D-0217

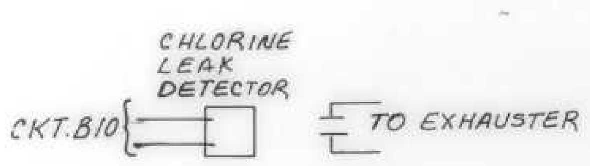


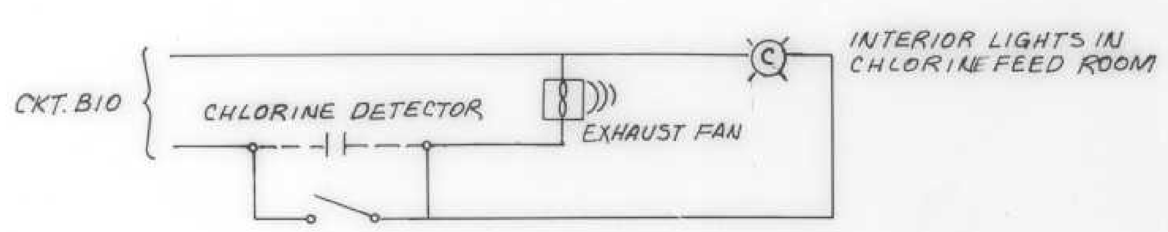
NOTE:
CONDUIT AND CONDUCTORS NOT SHOWN FOR M1, M2, M7, FILTER BLOWERS, CONTROLS AND GENERATOR CONTROLS

FLOOR PLAN
1/4" = 1'-0"

PANEL "A" 120/208 V, 4 W, 3 ϕ 200 AMP BUS							SWBD. MTD.
LOAD	KW	C/B	℄	℄	C/B	KW	LOAD
SPARE	.3	20/1	1	2	20/2	2.0	WATER HEATER
SPARE	.3	20/1	3	4			
S & F PUMP 1HP	1.8	30/2	5	6	20/1		SPARE
			7	8	30/2	1.5	SLUDGE BED EXHAUSTER 2 HP
S & F PUMP 1HP	1.8	30/2	9	10			
			11	12	20/1	.8	SLUDGE BED LIGHTS
MAG DRIVE	.5	20/1	13	14	20/1	.5	MICRO PROCESSOR
			15	16	30/2	1.1	HYDRO PUMP 1½ HP
			17	18			
MOTOR OPERATED PINCH VALVE 1HP	.8	20/3	19	20	20/3	.8	MOTOR OPERATED PINCH VALVE 1HP
			21	22			
			23	24			
SPACE			25	26	20/1	1.0	SLUDGE BED RECEPTACLE GFI
CONTROL VALVES - TRENCHES	1.0	20/1	27	28	20/1		SPARE
CONTROL VALVES - TRENCHES	1.2	20/1	29	30	20/1	.8	CONTROL VALVES - SPRINKLER
CONTROL VALVES - SPRINKLER	.8	20/1	31	32	20/1	.4	MAG. METER
TANK LEVEL TRANSMITTER	.2	20/1	33	34	20/1	.2	SLUDGE WASTING
SPARE		20/1	35	36	20/1	.3	BUBBLER
ALARM PANEL	.5	20/1	37	38	20/1	1.0	FLOAT ALARMS (4 EA)
INSTRUMENTATION	.5	20/1	39	40	20/1	.5	SPARE
SPARE	.5	20/1	41	42	20/1	.5	SPARE
LOAD 20KW					100/3		

PANEL "B" 120/208 V, 4 W, 3 ϕ 200 AMP BUS							SWBD. MTD.
LOAD	KW	C/B	℄	℄	C/B	KW	LOAD
LAB 208 OUTLET	4.0	40/2	1	2	20/1	1.0	LAB & RESTROOM LIGHTS
			3	4	60/2	10.0	LAB HEATER
RESTROOM & LAB. RECEPTACLES	.5	20/1	5	6			
RESTROOM HEATER	3.0	20/2	7	8	20/1	1.0	LAB. RECEPTACLE
			9	10	20/1	1.0	CHLORINATION EQUIPMENT
SHOP 208 OUTLET	4.0	60/2	11	12	20/1	.4	CHLORINE ROOM RECEPTACLES
			13	14	30/2	3.0	CHLORINE ROOM HEATER
SHOP HEATERS	10.0	60/2	15	16			
			17	18	20/1	.8	SHOP RECEPTACLES
SPARE		20/1	19	20	20/1	.3	EXTERIOR LIGHTS
SHOP LIGHTS	1.0	20/1	21	22	60/2	10.0	SHOP HEATER
EXTERIOR LIGHTS	.3	20/1	23	24			
LOAD 33 KW					125/3		





CHLORINE ROOM EXHAUSTER CONTROLS

LIGHT SCHEDULE				
TYPE	MANUFACTURER	MANUFACTURER OR EQ.	LAMPS	TYPE
A	AMERICAN 23-6252-6HPS	~~CROUSE HINDS 2602-368~~ ITT	150W	POLE MTD. W/PHOTO CELL ←26' POLE
B	LITHONIA LB 440 A	GLOBE U-3753-48RS	4-40W	CEILING MOUNTED
C	KILLARK HXG-3-125	CROUSE HINDS IXH 156P	1-150W	" "
D	AIKCO 1060	PRESCOLITE 90 HF-3	1-100W	RECESSED
E	NUTONE MOD 8490 10" FAN	BROAN ~~655~~	100W	RECESSED
F	LITHONIA AF296 HO	GLOBE 2002-4H	2-75 W	SUSPEND W/CHAIN

HEATER SCHEDULE			
ROOM	MANFACTURER	MANFACTURER OR EQ.	KW
LAB	WESIX CUA 28103	CHROMALOX MUH-10-8	10
RESTROOM	WESIX CUA 2813	CHROMALOX MUH-03-8	3
CHLORINE	WESIX CUA 2813	CHROMALOX MUH-03-8	3
SHOP	WESIX CUA 28103	CHROMALOX MUH-10-8	2 @ 10

ALL UNITS TO HAVE THERMOSTATS, TO BE WALL MOUNTED WITH 6'-6" CLEARANCE.

NOTES:
1. SEE SHEET 26 FOR CHLORINATION EQUIPMENT ELECTRICAL.
2. HOYT 30E3, RHEEM EG 6-50-G, OR EQUAL
3. ALL CONDUITS IN CHLORINATION ROOM TO BE SEALED OFF.

AS BUILT

DRAWN BY RAW	DESIGN BY MGT	REVISION	DATE	DESCRIPTION
CHECK BY MTT				
BY Michael D. Hallam	23237			

RVA RAYMOND VAIL AND ASSOCIATES
ENGINEERING • PLANNING • SURVEYING
SACRAMENTO, CALIFORNIA 1410 Ethan Way 95825

ARNOLD WASTEWATER PROJECT
CONTROL BLDG.—ELECTRICAL

DATE AUG. 1984
SCALE
HORIZONTAL
VERTICAL
W.O. NO. 4391.03

SHEET 31 OF 43 SHEETS

FILE NO. D-0217

DRAWN BY RAW	DESIGN BY MGT	RVA RAYMOND VAIL AND ASSOCIATES ENGINEERING • PLANNING • SURVEYING SACRAMENTO, CALIFORNIA 1410 Ethan Way 95825	ARNOLD WASTEWATER PROJECT ELECTRICAL—SITE PLAN
CHECK BY DTT			DATE AUG. 1984
BY [signature]	23237		SCALE HORIZONTAL 1" = 10' VERTICAL
			W.O. NO. 4391.03

REVISION | DATE | DESCRIPTION

SHEET 32 OF 43 SHEETS

FILE NO. D-0217

DRAWN BY RAW	DESIGN BY MGT
CHECK BY DTT	
BY [signature]	23237

REVISION	DATE	DESCRIPTION

RVA RAYMOND VAIL AND ASSOCIATES
ENGINEERING • PLANNING • SURVEYING
SACRAMENTO, CALIFORNIA 1410 Ethan Way 95825

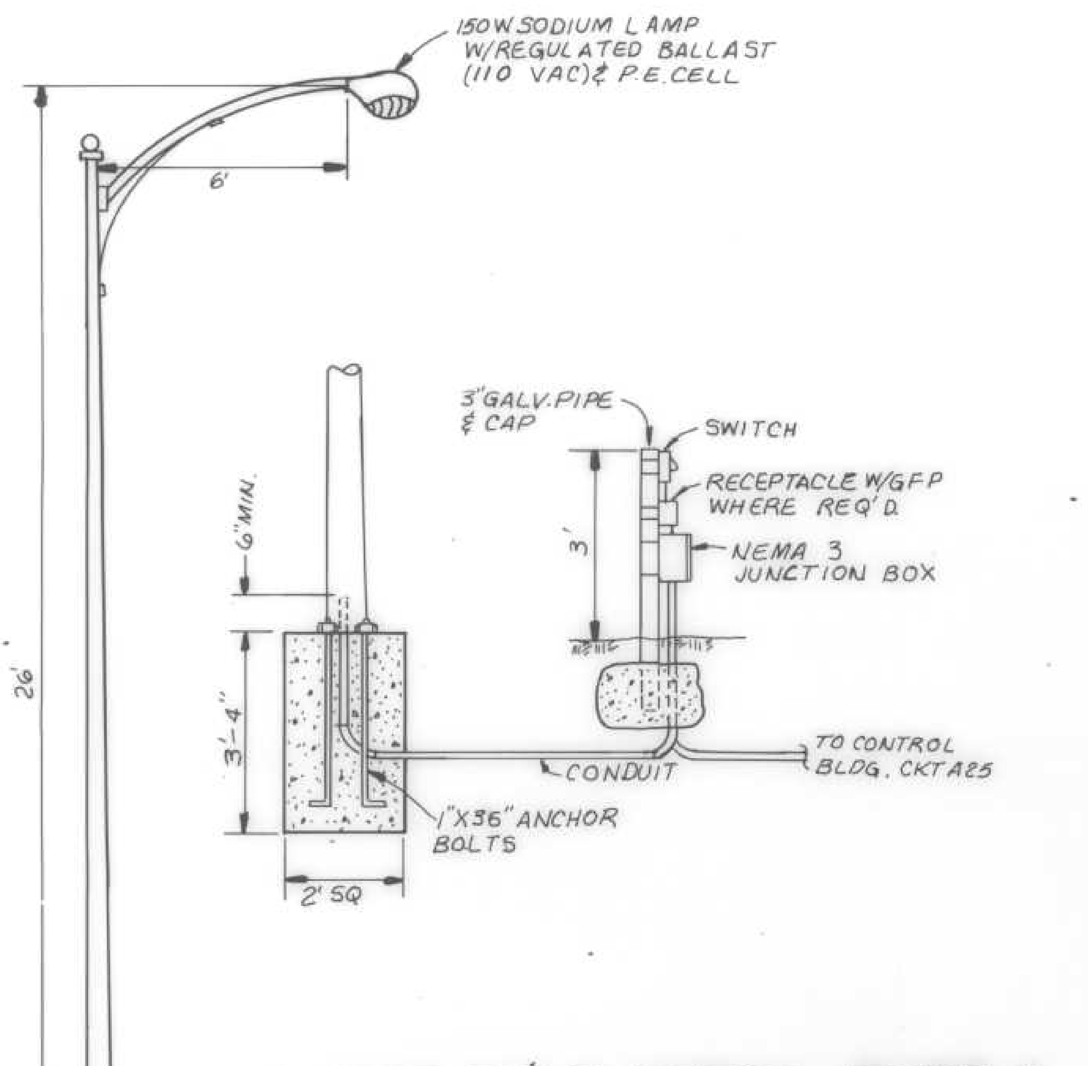
ARNOLD WASTEWATER PROJECT

CONTROL SCHEMATIC

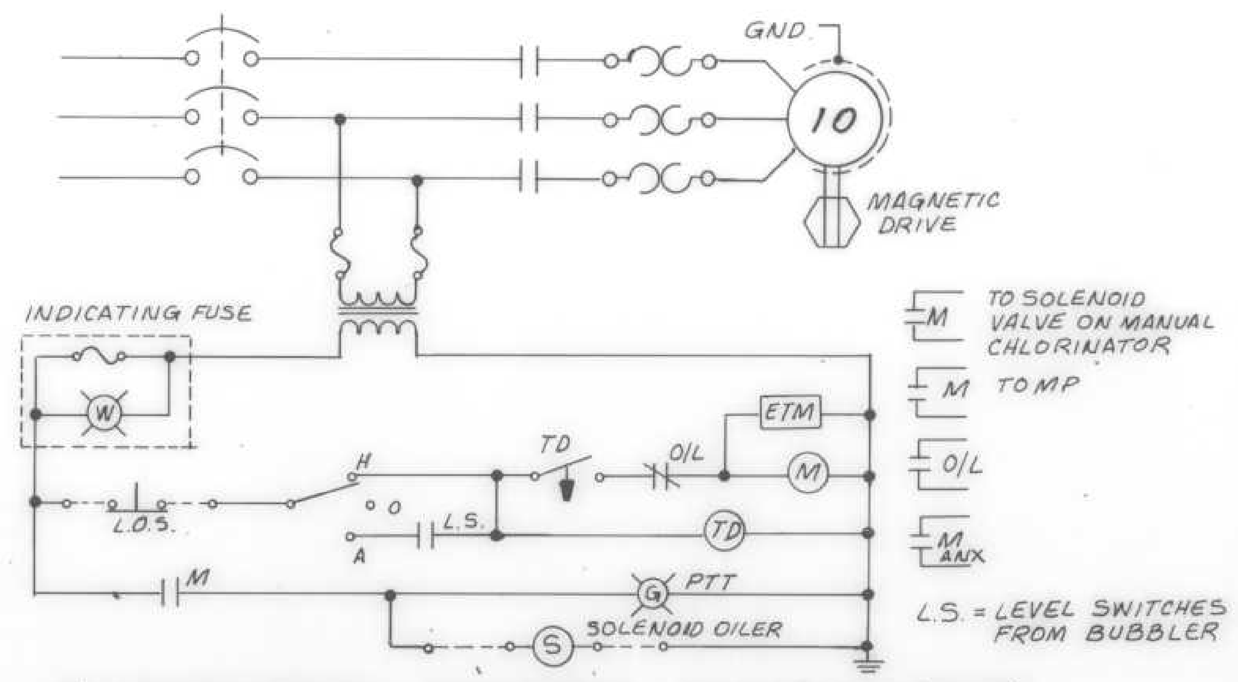
DATE AUG 1984
SCALE
HORIZONTAL
VERTICAL
W.O. NO. 4391.03

SHEET 33 OF 43 SHEETS

FILE NO. D-0217

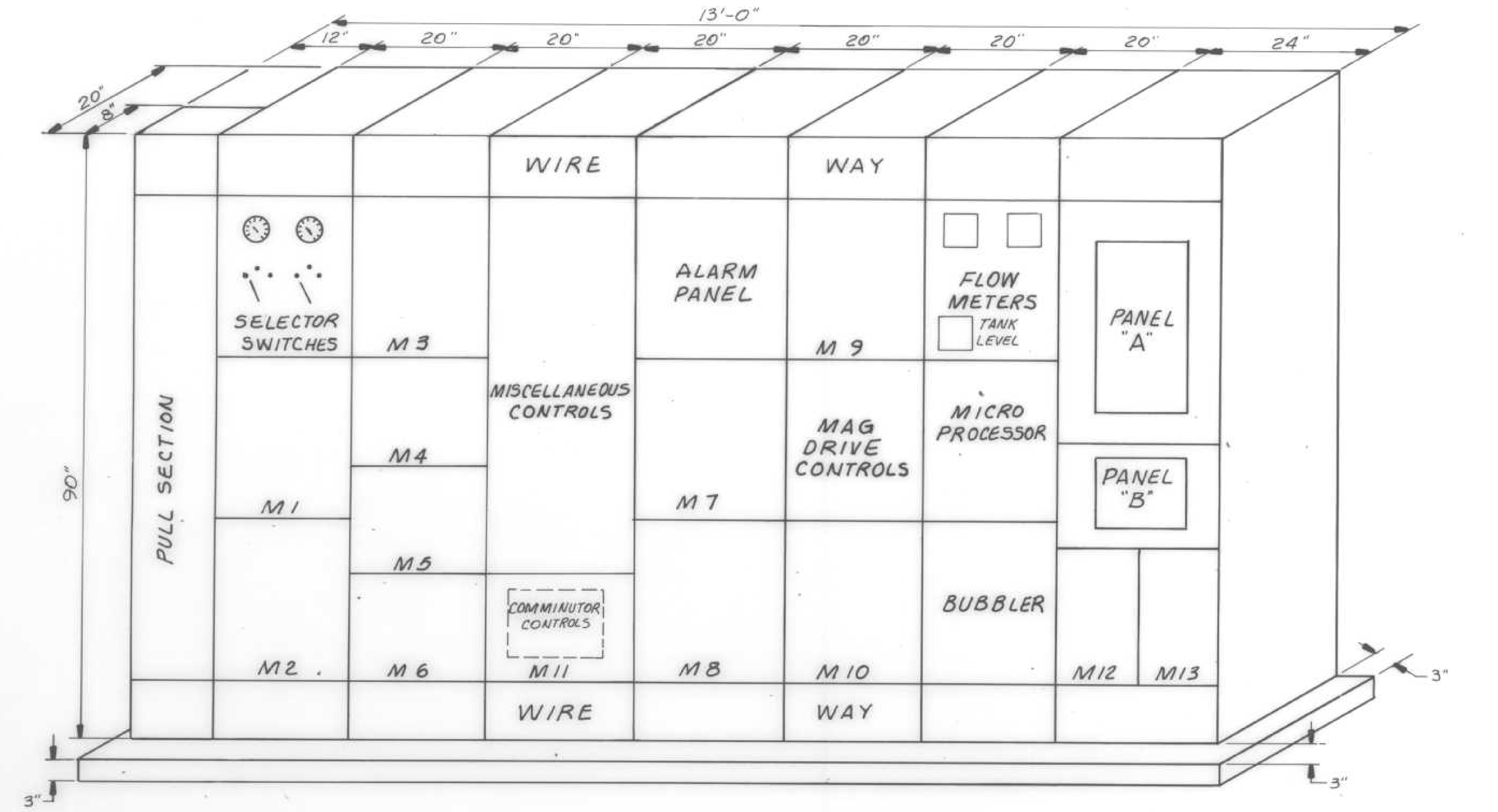


LIGHT POLE DETAIL-TYPE A

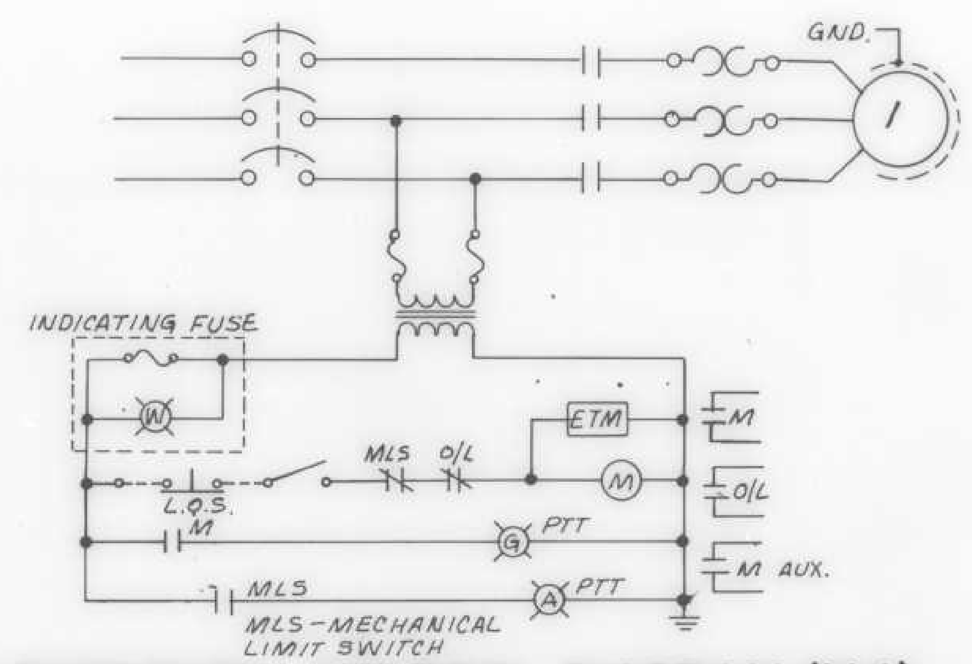


ELEMENTARY CONTROL DIAGRAM (M9)

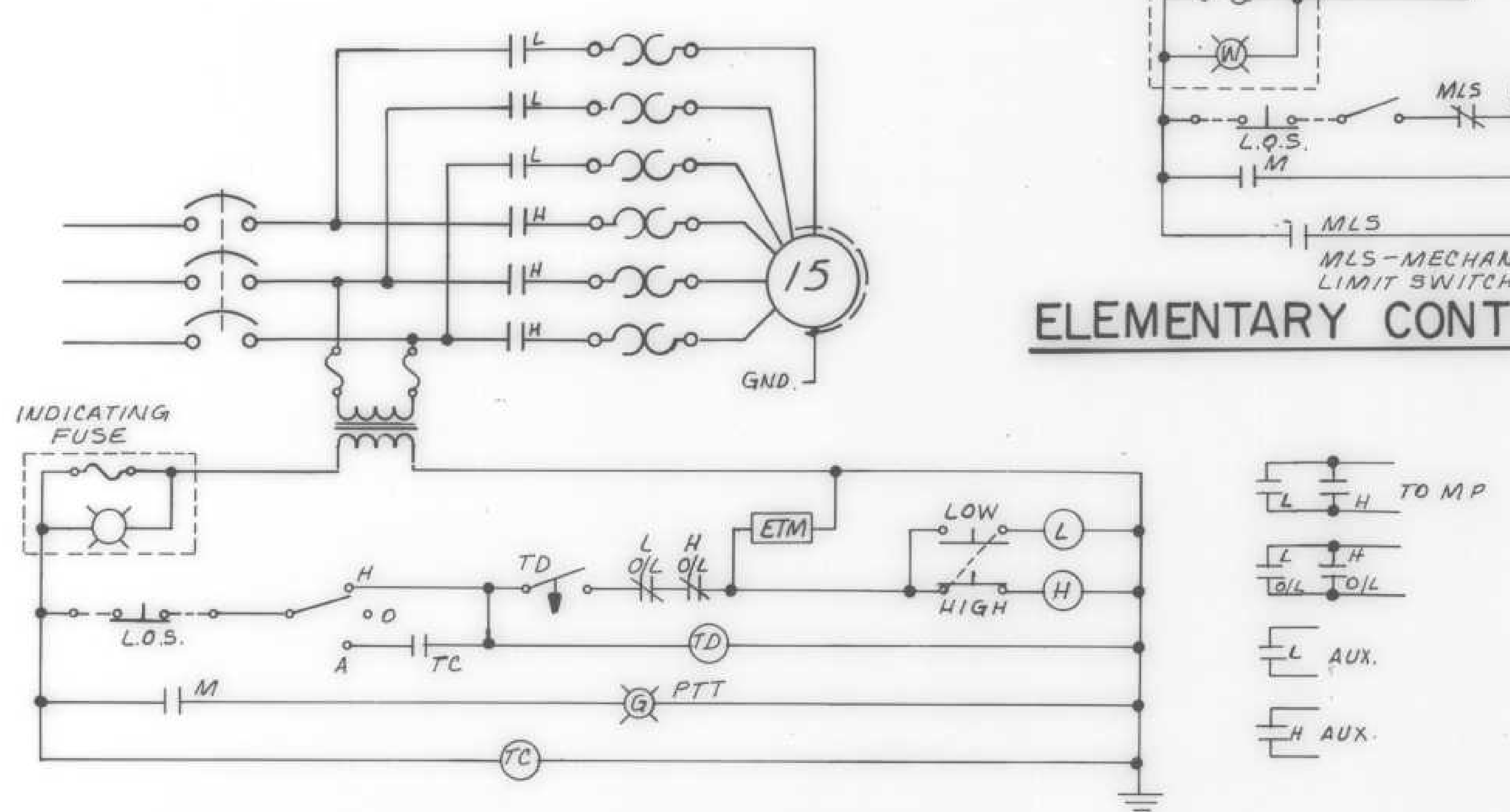
M10 SIMILAR



MOTOR CONTROL CENTER (MCC) NEMA IA

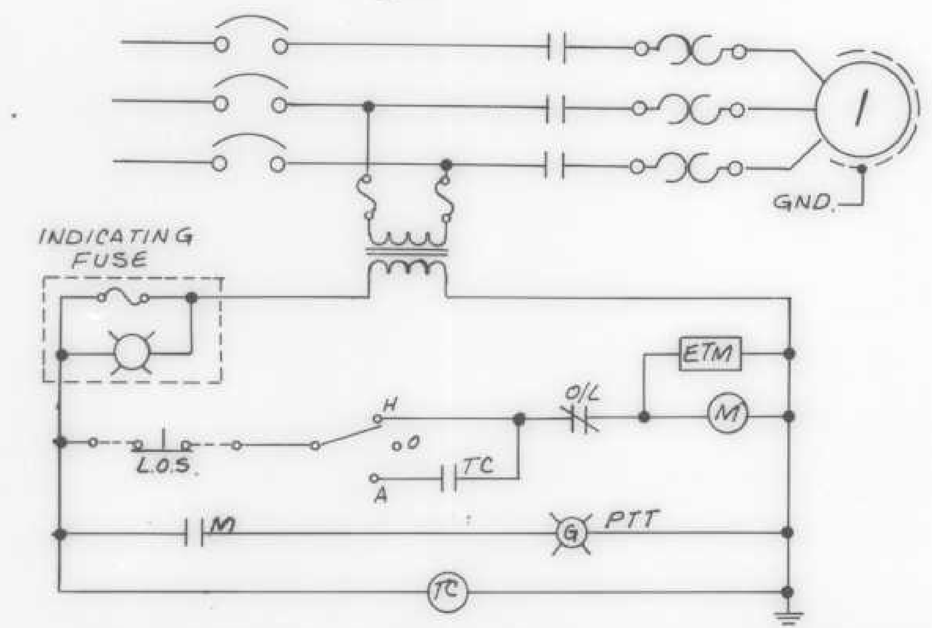


ELEMENTARY CONTROL DIAGRAM (M4)



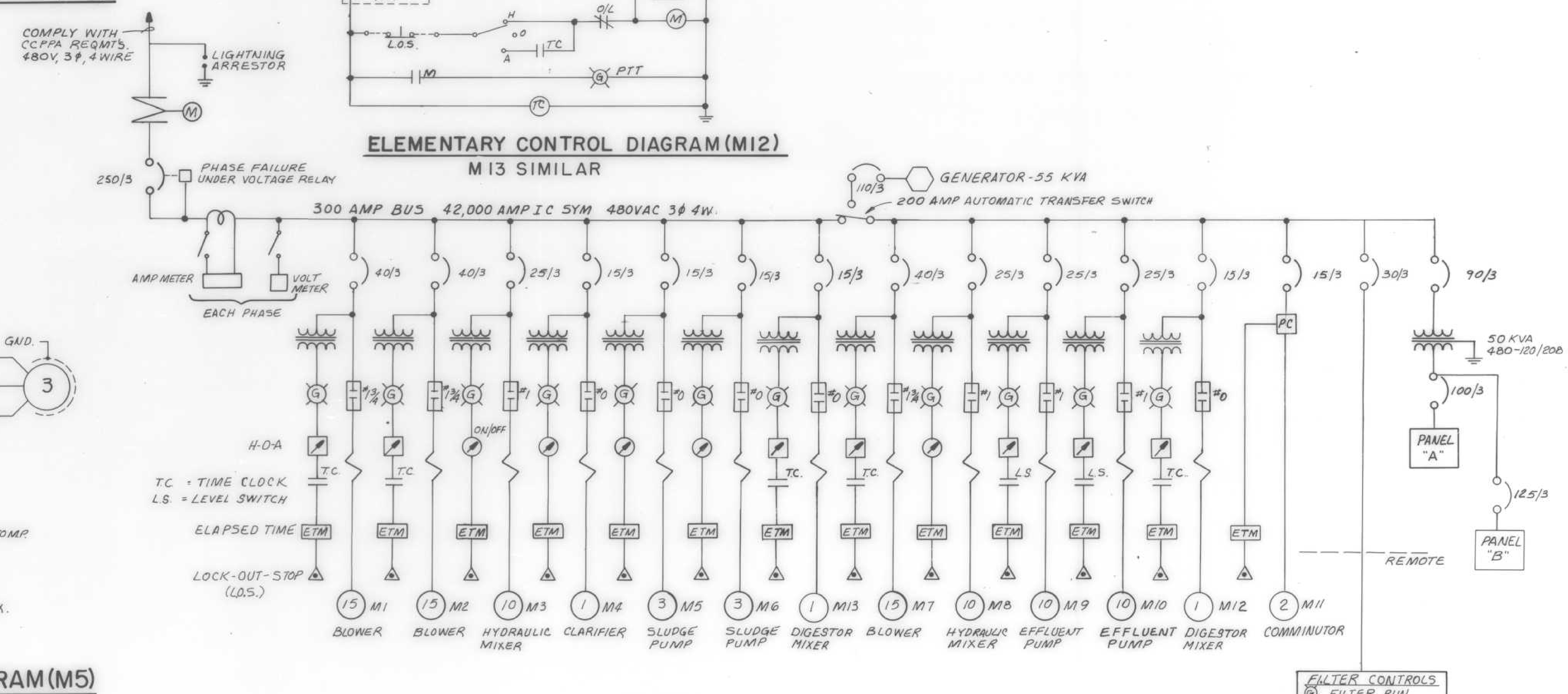
ELEMENTARY CONTROL DIAGRAM (M1)

M2 & M7 SIMILAR

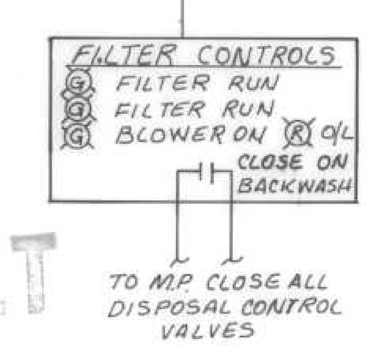


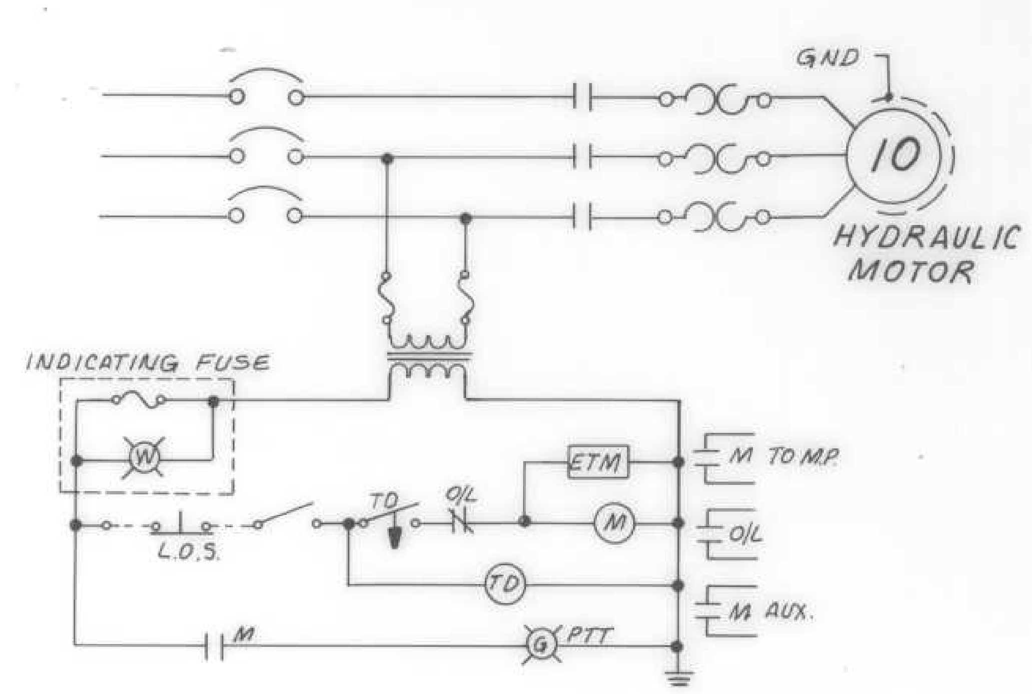
ELEMENTARY CONTROL DIAGRAM (M12)

M13 SIMILAR



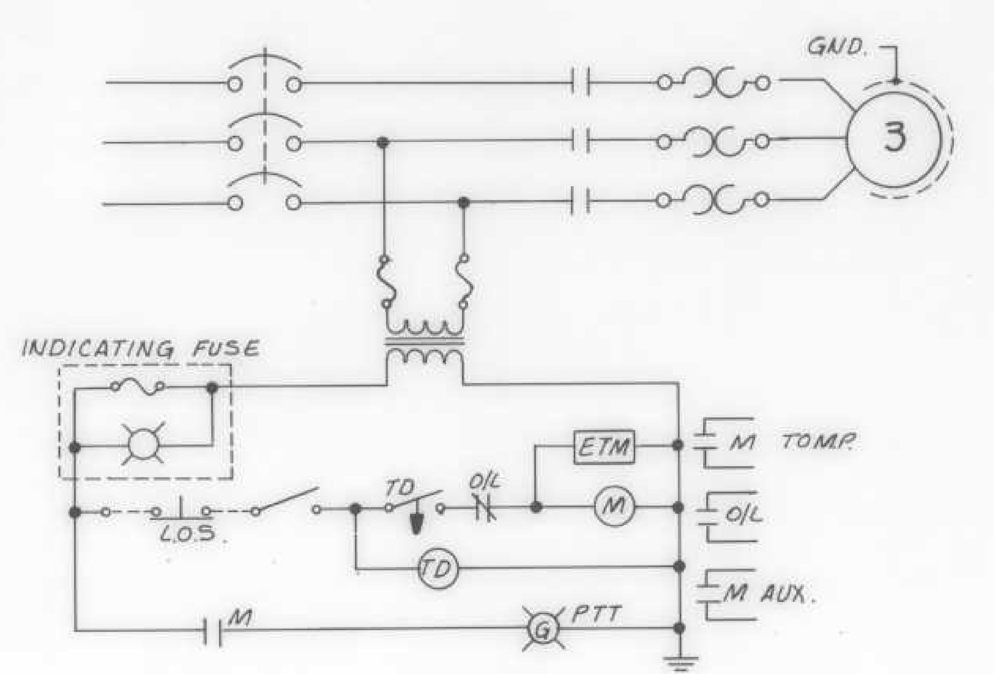
ONE LINE DIAGRAM





ELEMENTARY CONTROL DIAGRAM (M3)

M8 SIMILAR



ELEMENTARY CONTROL DIAGRAM (M5)

M6 SIMILAR

AS BUILT

DRAWN BY RAW	DESIGN BY MGT	
CHECK BY DTT		
BY		23237

REVISION	DATE	DESCRIPTION

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SACRAMENTO, CALIFORNIA 1410 Ethan Way 95825

ARNOLD WASTEWATER PROJECT

ELECTRICAL DIAGRAMS

DATE AUG. 1984
SCALE
HORIZONTAL
VERTICAL
W.O. NO. 439/03
FILE NO. D-0217

SHEET 34 OF 43 SHEETS

AS BUILT

DRAWN BY RAW	DESIGN BY MGT	REVISION / DATE / DESCRIPTION	
CHECK BY MTT			
BY [signature]	23237		

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ARNOLD WASTEWATER PROJECT
ELECTRICAL DETAILS

DATE AUG. 84
SHEET 35 OF 43 SHEETS
W.O. NO. 4391.03

D-0217

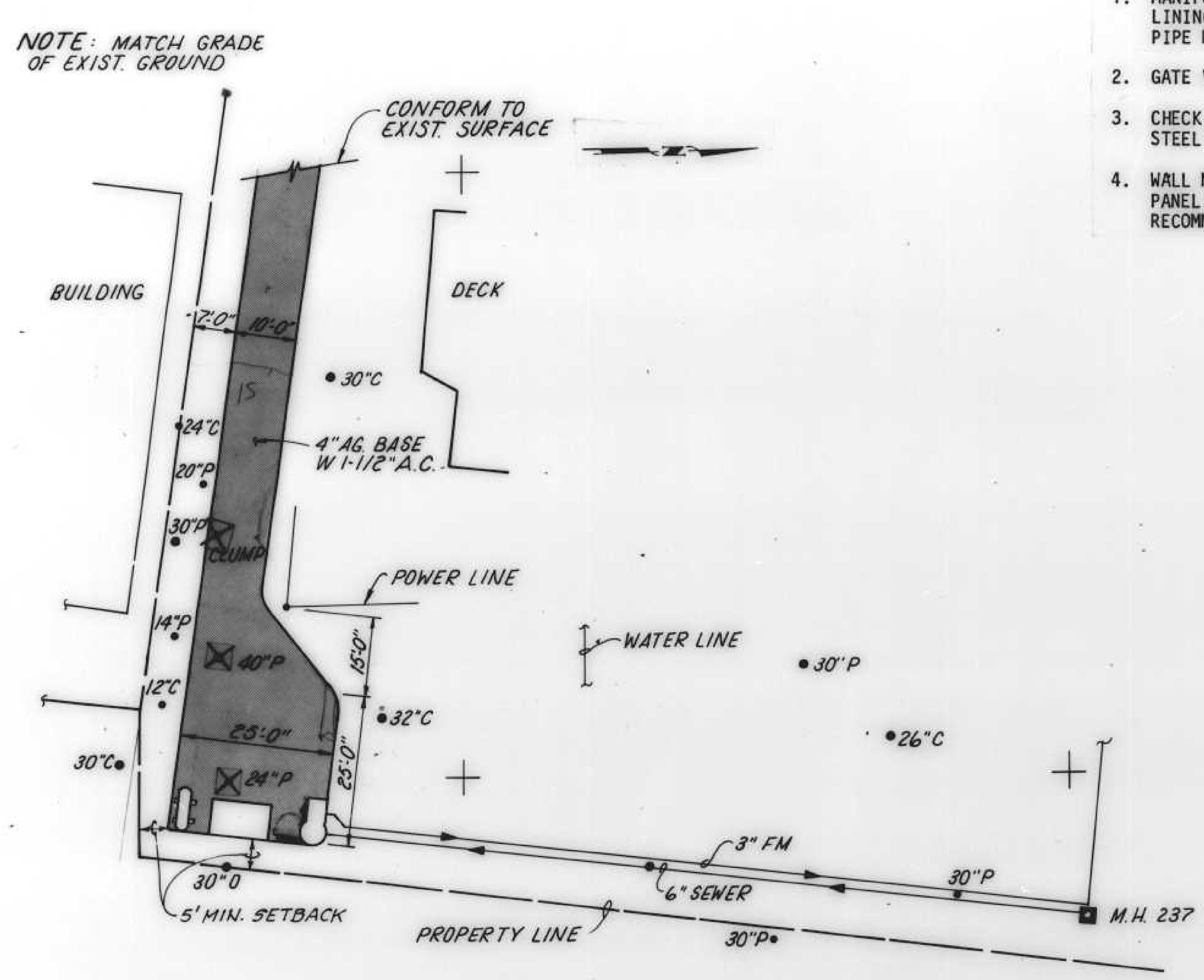
NOTES:

1. MANIFOLD PIPING SHALL BE SCH. 40 WELDED STEEL WITH COAL TAR EPOXY LINING AND COATING AND WITH FLANGES AND COUPLINGS AS SHOWN. 2" PIPE MAY BE SCH. 40 GALVANIZED.
2. GATE VALVES SHALL BE RESILIENT WEDGE AS PER AWWA ~~C509~~ C500.
3. CHECK VALVES SHALL BE SWING TYPE, WAFER DESIGN WITH STAINLESS STEEL DISC, RESILIENT SEAT AND EXTERNAL SPRING.
4. WALL MOUNT THE MICROPROCESSOR/RADIO TRANSMITTER ABOVE THE CONTROL PANEL AND ERECT THE ANTENNA ON THE BUILDING AS PER MANUFACTURER'S RECOMMENDATIONS.

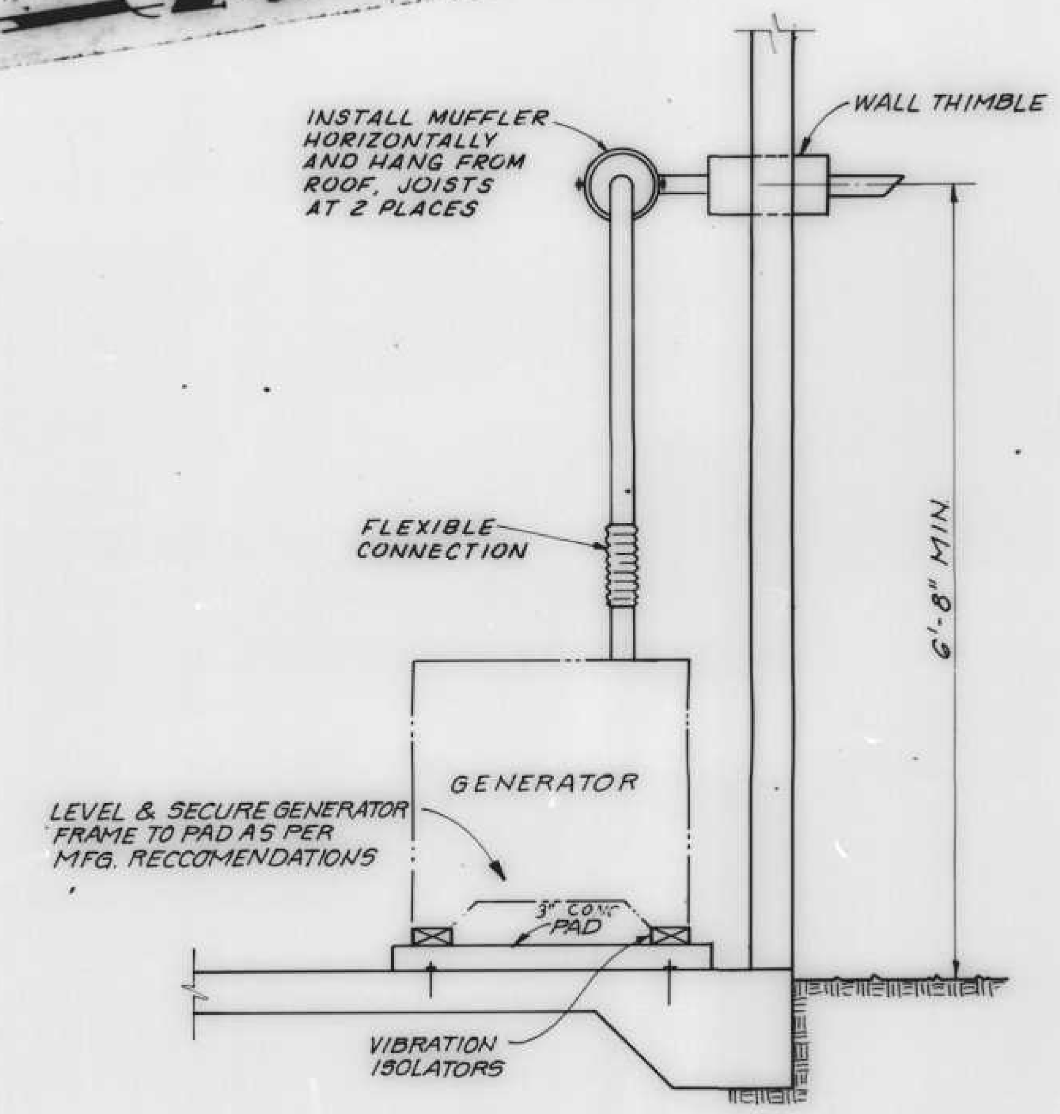
DESIGN CRITERIA - PUMP STA #1

AVERAGE INFLOW	12 GPM
PEAK INFLOW	60 GPM
ON-OFF STORAGE	120 GAL
STATIC LIFT	96 FT
FORCE MAIN DIAMETER	3 IN
FORCE MAIN LENGTH	1200 FT
1 PUMP ON DESIGN POINT	40 GPM @ 103 FT
2 PUMPS ON DESIGN POINT	60 GPM @ 111 FT

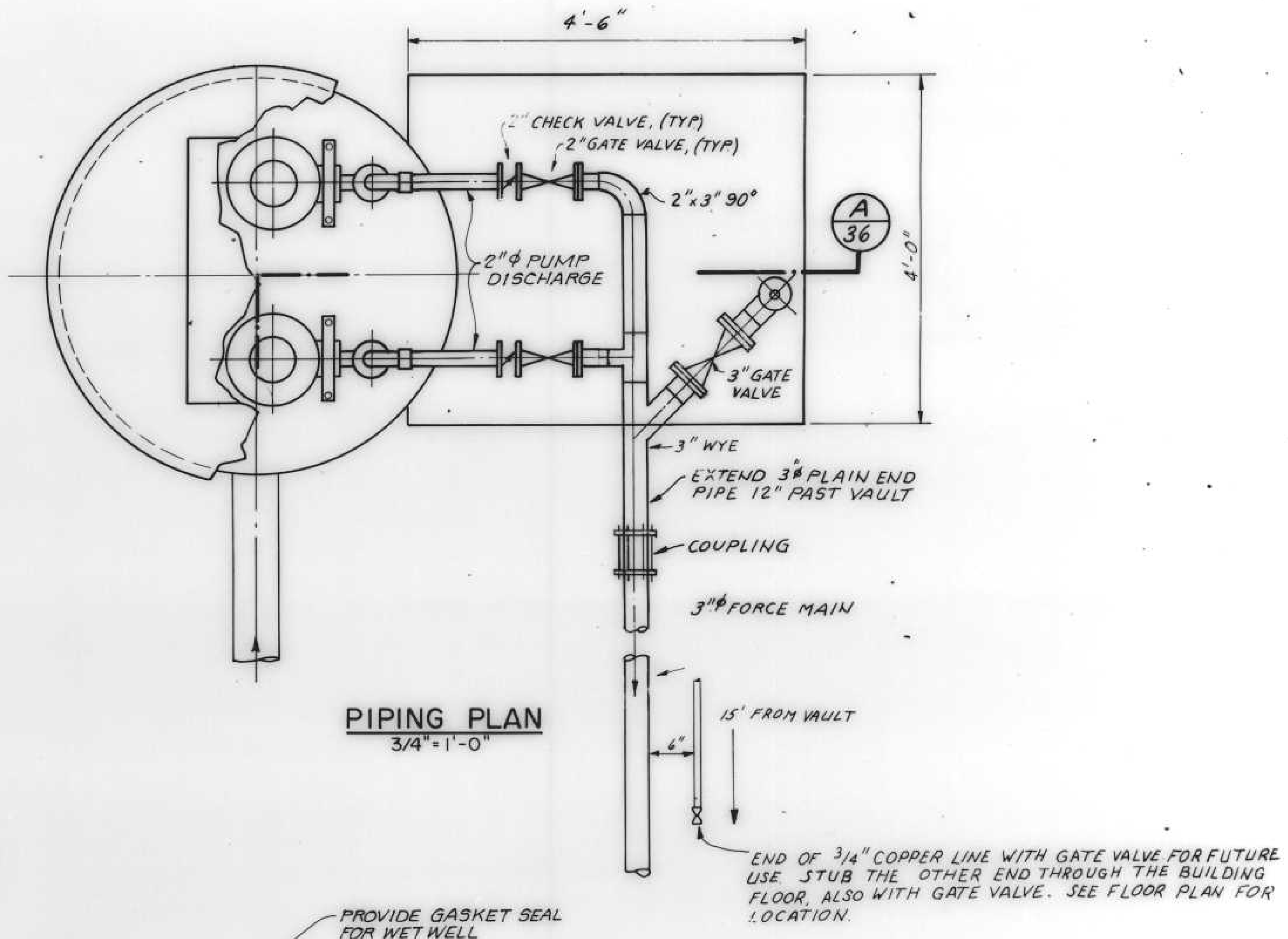
PUMP SPECS: 5 HP, 3500 RPM SUBMERSIBLE GRINDER PUMP
BACKUP GENERATOR: 22 KW, PROPANE POWERED



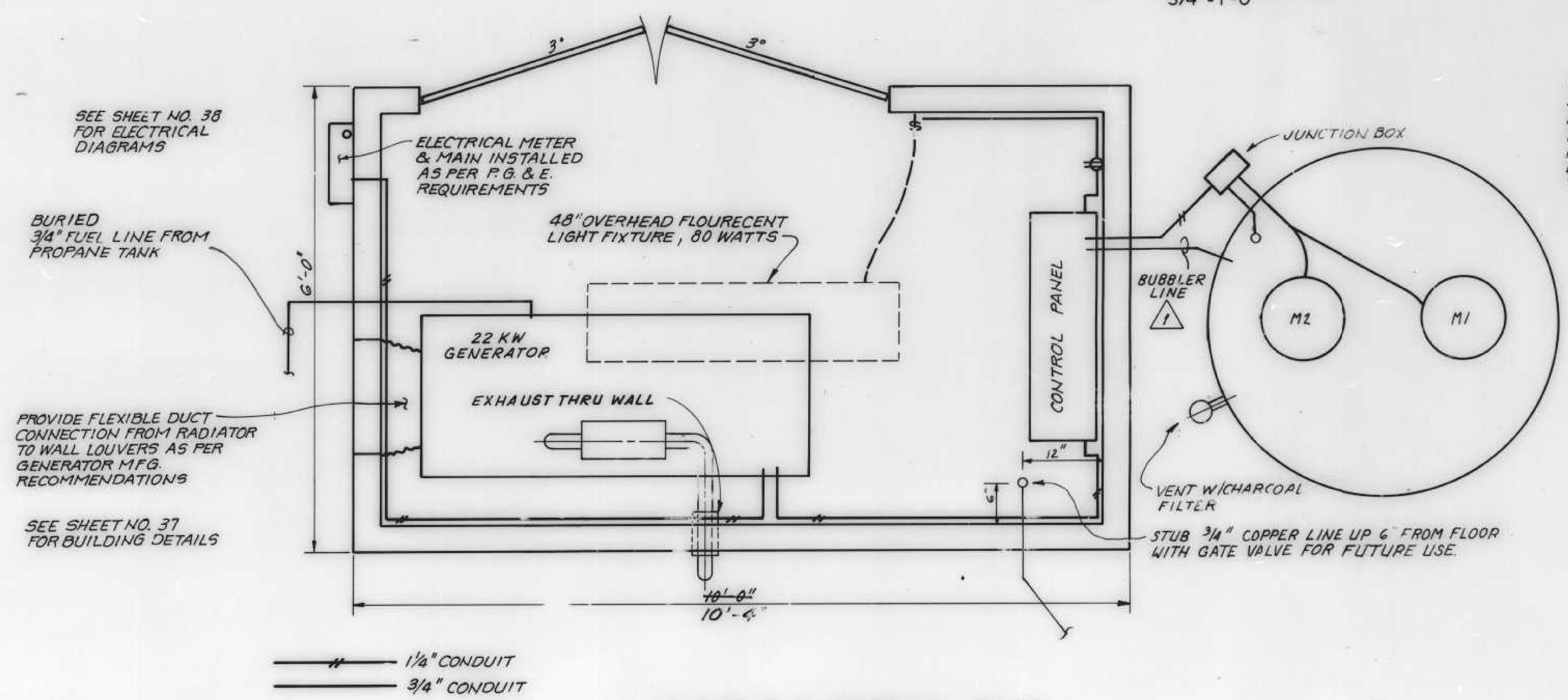
SITE PLAN
1" = 20'-0"



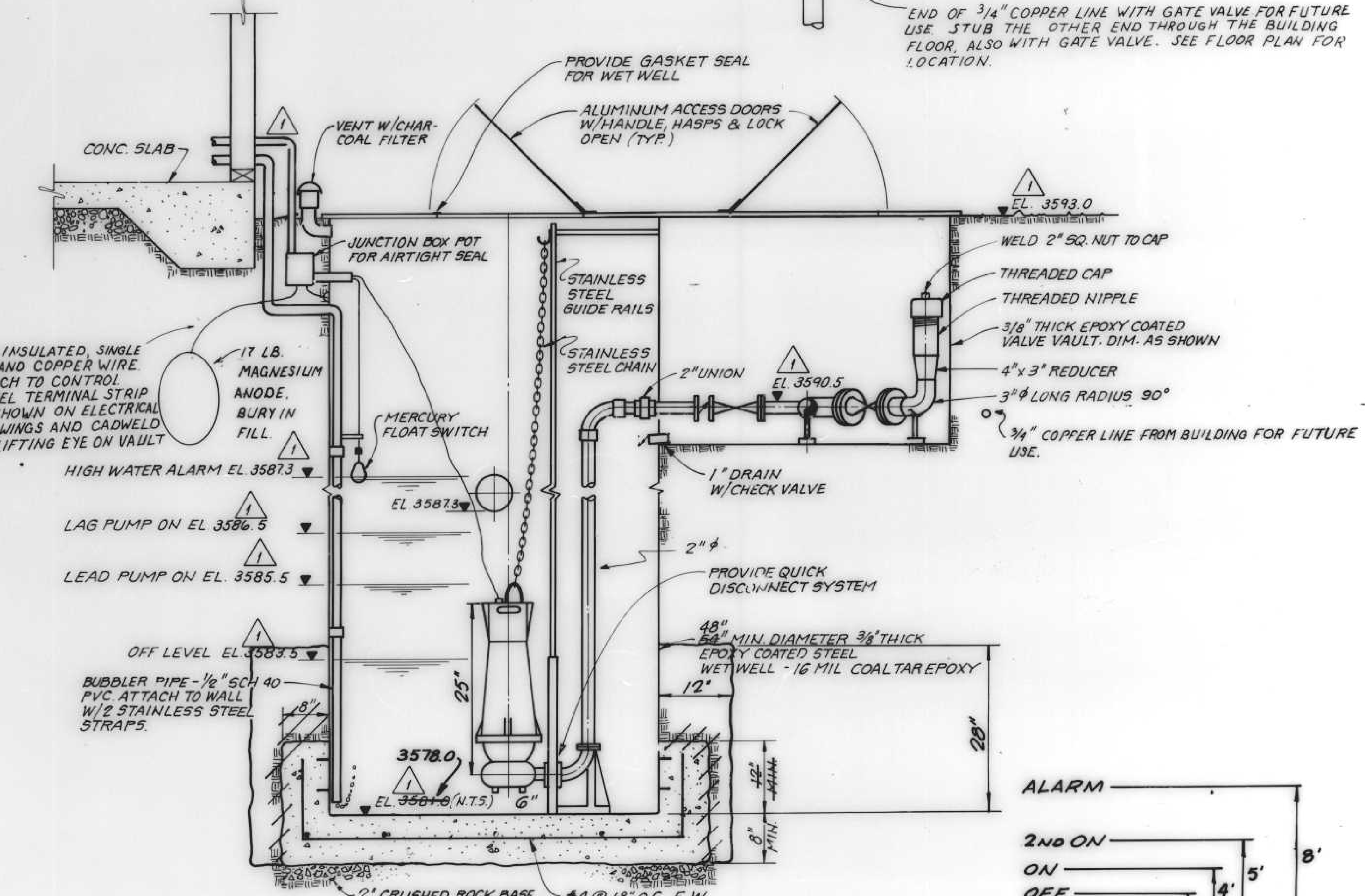
GENERATOR DETAIL
3/4" = 1'-0"



PIPING PLAN
3/4" = 1'-0"



FLOOR & ELECTRICAL PLAN
3/4" = 1'-0"



SECTION A/36
N.T.S.

AS BUILT

DRAWN BY G. ZUEGER	DESIGN BY E. MAISCH	
CHECK BY M. THALHAMER		
BY		23237

REVISION	DATE	DESCRIPTION
1	5/14/85	REVISED SITE PLAN

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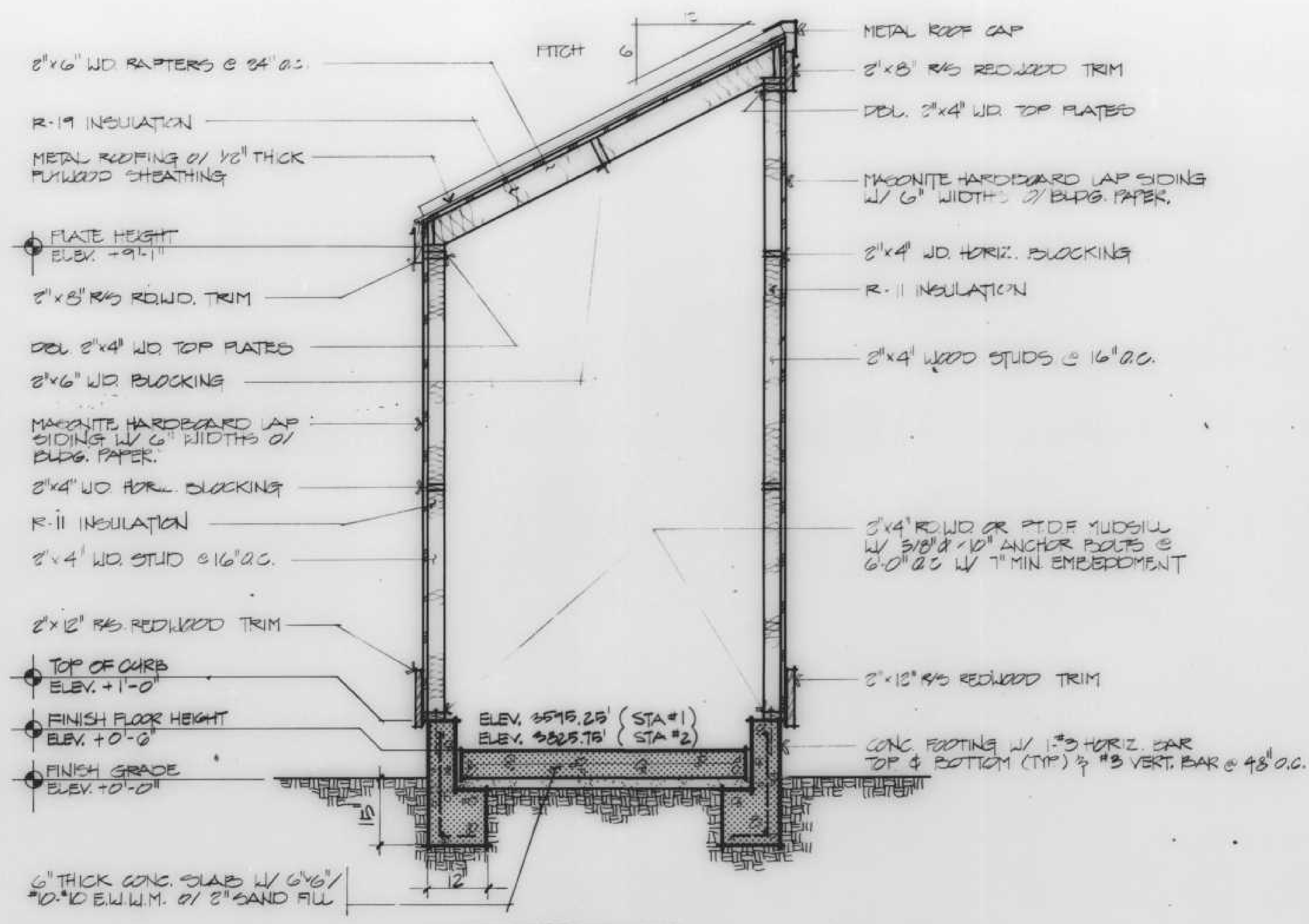
ARNOLD WASTEWATER PROJECT
PUMP STATION NO I

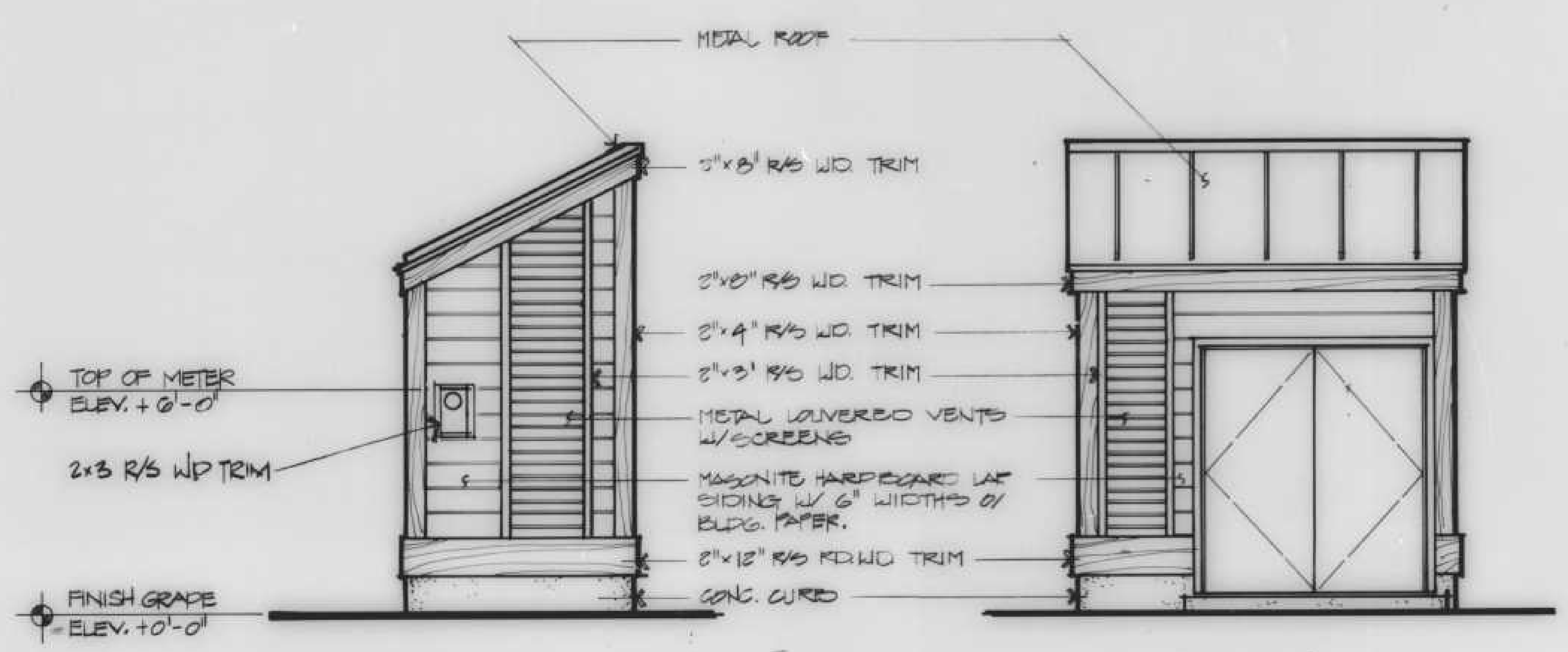
DATE AUG 1984
SCALE
HORIZONTAL AS SHOWN
VERTICAL
W.O. NO 4391.03
FILE NO D-0217

SHEET 36 OF 43 SHEETS



SECTION A

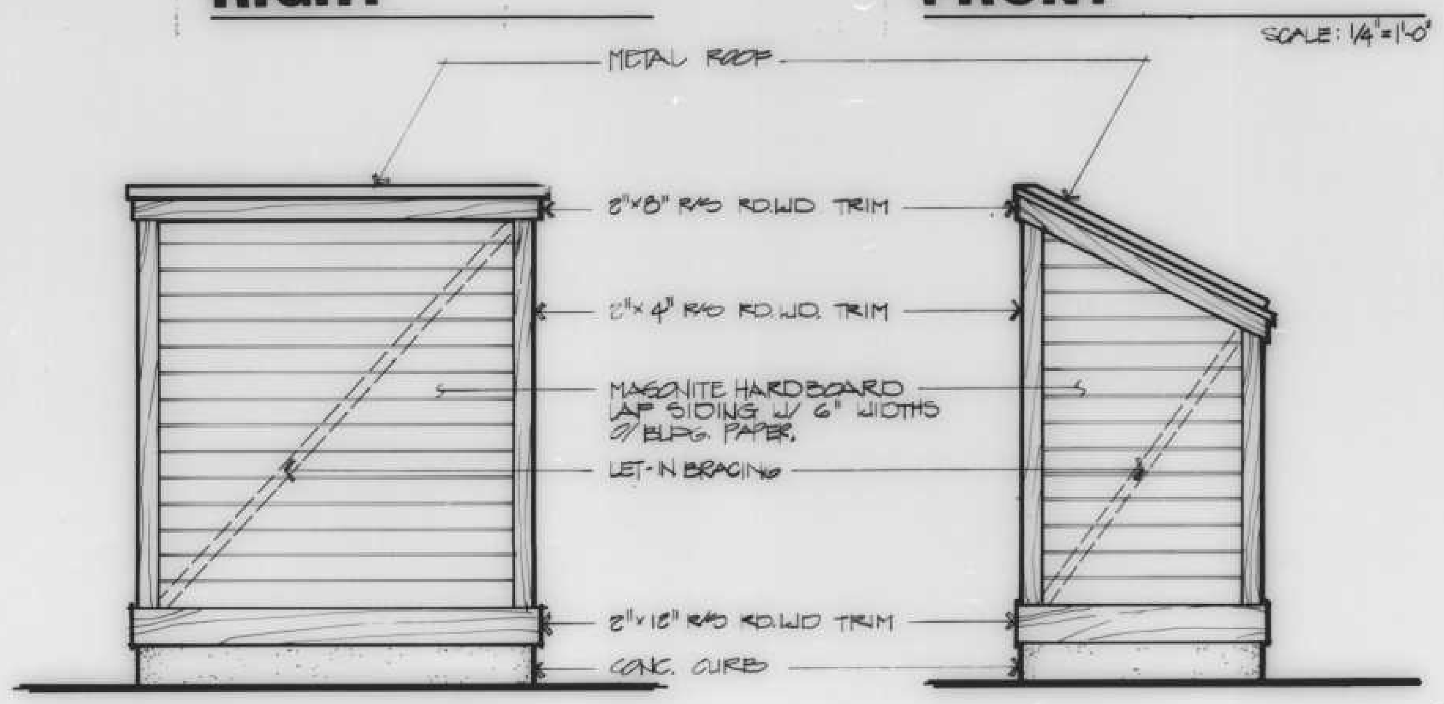
SCALE: 1/2"=1'-0"



RIGHT

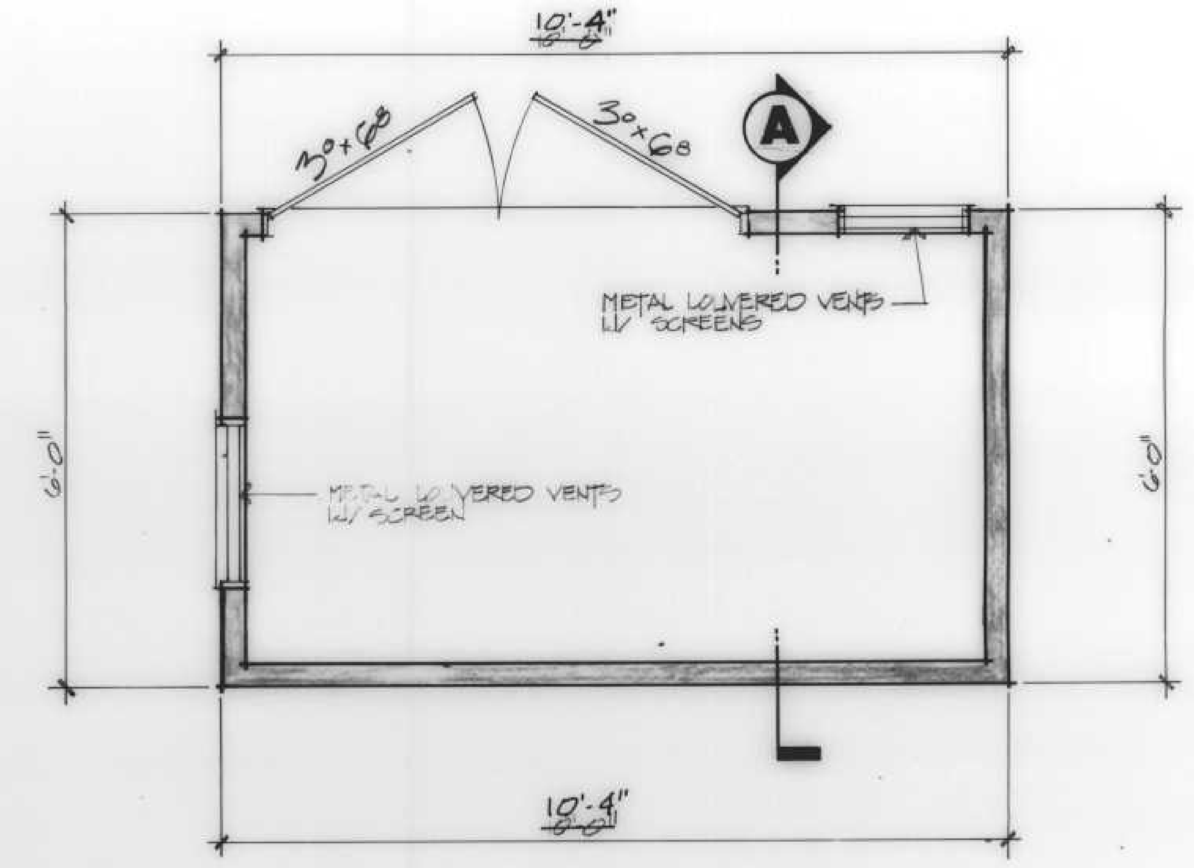
FRONT

SCALE: 1/4"=1'-0"



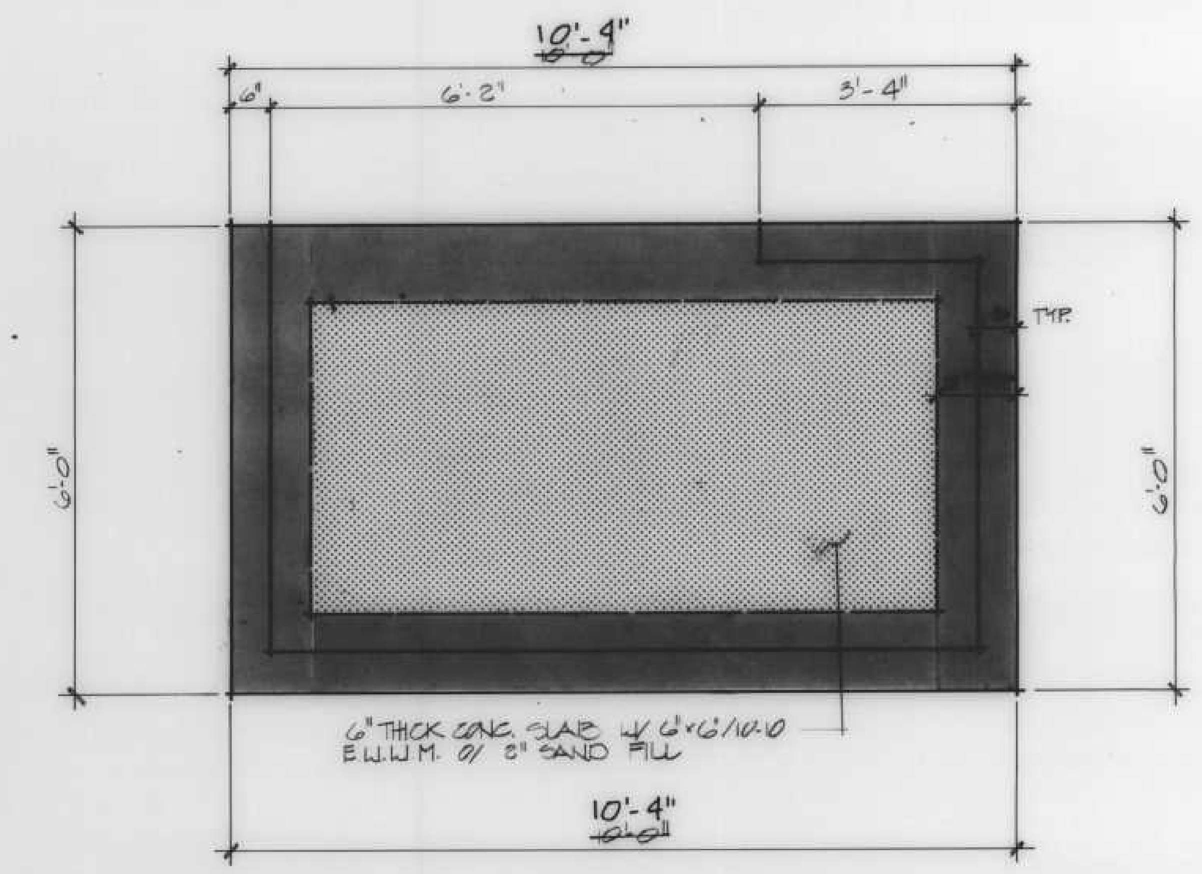
BACK

LEFT



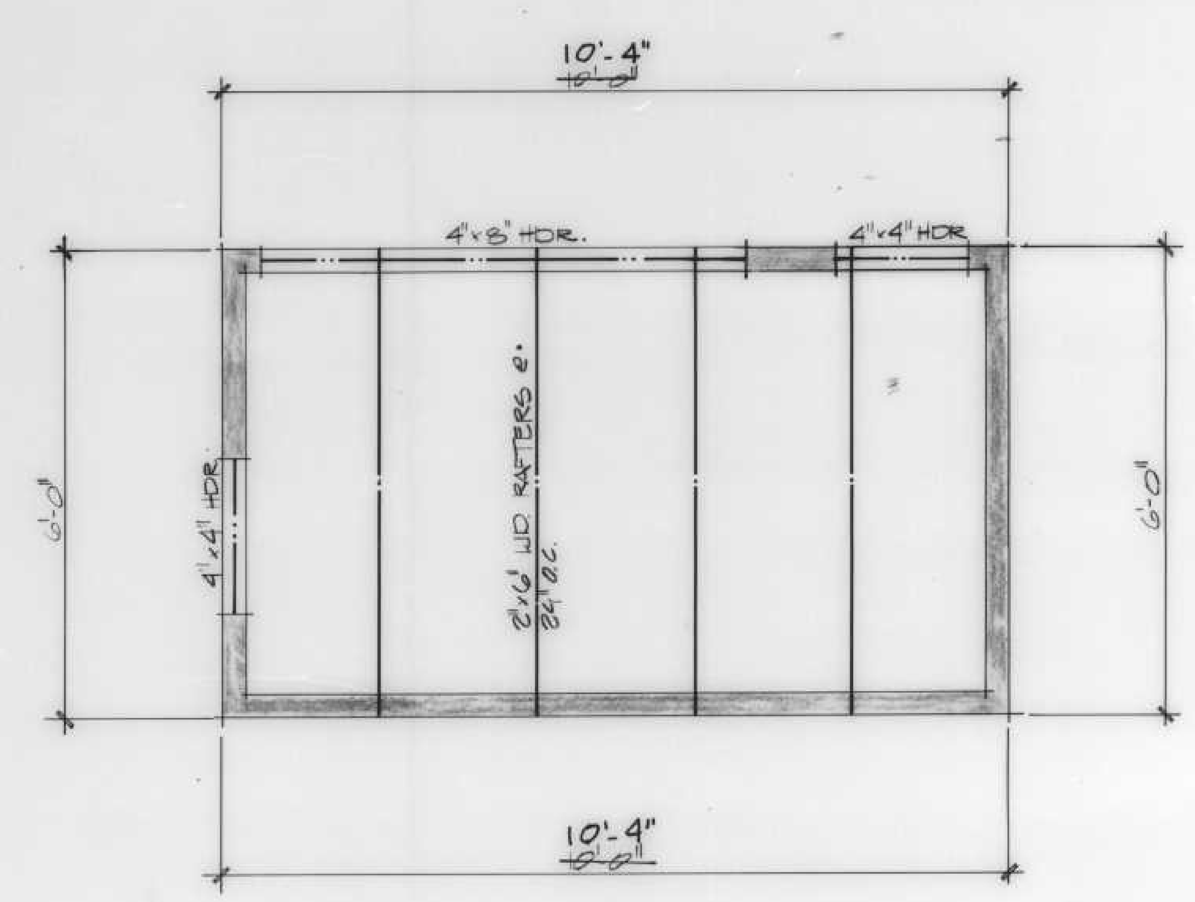
FLOOR PLAN

SCALE: 1/8"=1'-0"



FOUNDATION PLAN

SCALE: 1/8"=1'-0"



ROOF FRAMING PLAN

SCALE: 1/8"=1'-0"

AS BUILT

DRAWN BY FF	DESIGN BY SPJ	REVISION / DATE / DESCRIPTION	
CHECK BY SPJ			
BY [signature]			

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ARNOLD WASTEWATER PROJECT

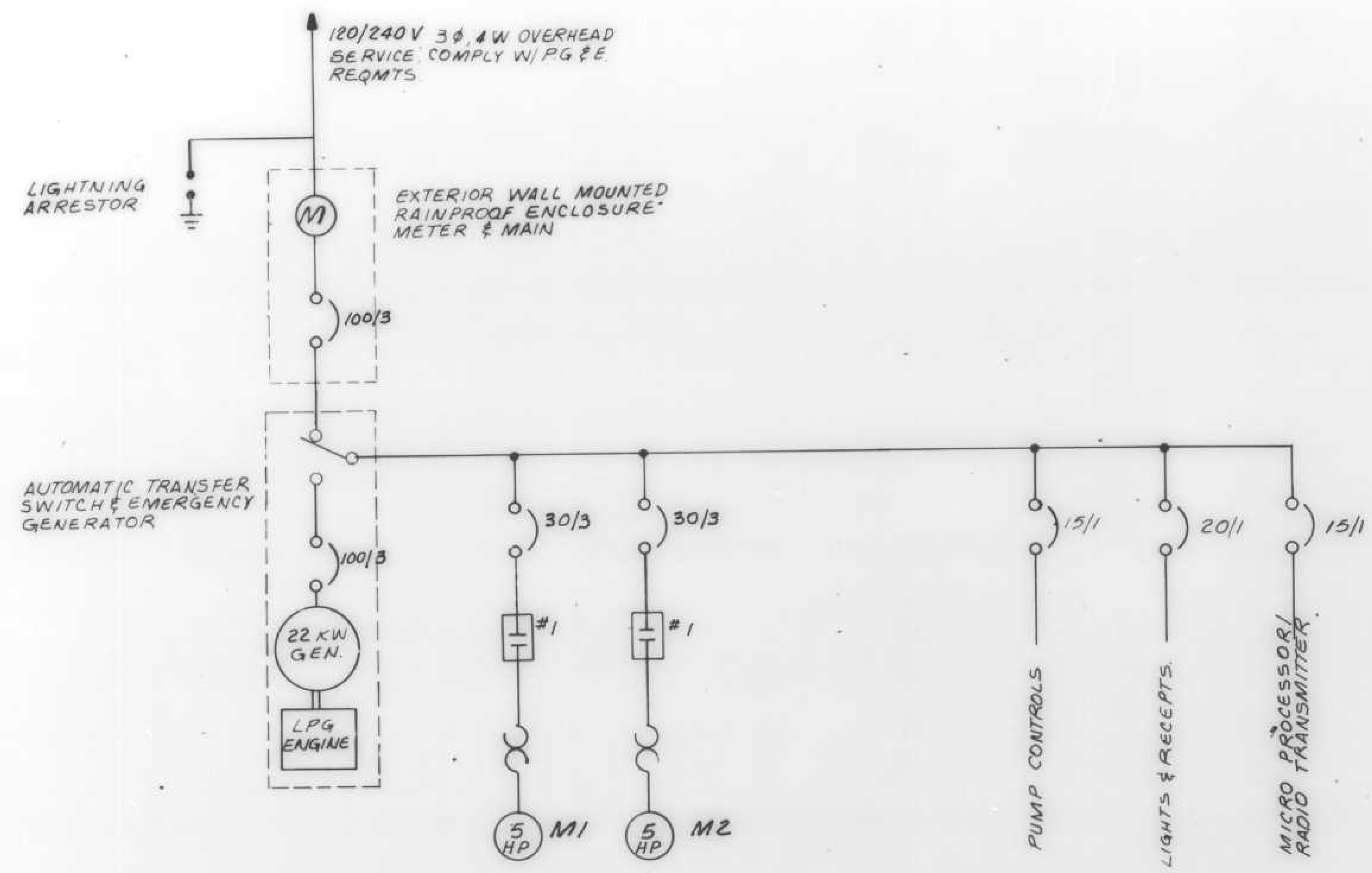
PUMP STATION NO. 1 & 2

DATE	AUG. 1984
SCALE HORIZONTAL	AS SHOWN
VERTICAL	
W.O. NO.	4391.03
SHEET	37 OF 43 SHEETS

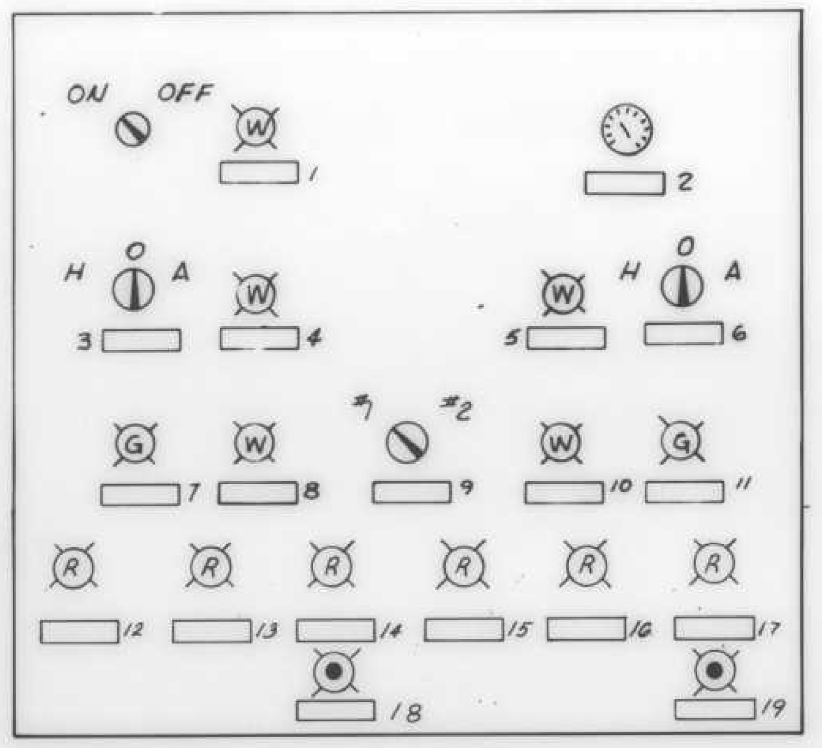
FILE NO. D-0217

LEGEND

L1 - OFF LEVEL, BUBBLER PRESSURE SWITCH.
L2 - 1 SET ON LEVEL, BUBBLER PRESSURE SWITCH.
L3 - 2 SETS ON LEVEL, BUBBLER PRESSUER SWITCH.
FS4 - HIGH WATER ALARM LEVEL, FLOAT SWITCH.
PS1 - PRESSURE SWITCH, TYP.
MS1 - MOTOR NO. 1 MOISTURE SENSOR, TYP.
O/LM1 - MOTOR NO. 1 OVERLOAD, TYP.
TD1 - TIME DELAY RELAY, TYP.
AR - ALARM RELAY
M1 - MOTOR NO. 1 CONTACTOR, TYP.
(G) - INDICATING LIGHT, GREEN, TYP.
ALT - TIME CLOCK ALTERNATOR.
C1 - BUBBLE SYSTEM COMPRESSOR, TYP.
(G) - 0 to160 INCHES PRESSURE GAGE.
ATX1 - AUTOMATIC TRANSFER SWITCH AUXILIARY CONTACT FOR TRANSFER MADE.
ETM - ELAPSED TIME METER.
ATX2 - AUTOMATIC TRANSFER SWITCH AUXILIARY CONTACT FOR GENERATOR FAILED TO START.
ATX3 - AUTO TRANS AUX CON FOR GENERATOR RUNNING.
IR1 - INTRINSICALLY SAFE RELAY.
MOT1 - MOTOR OVERTEMP IMBEDDED THERMISTOR TYP



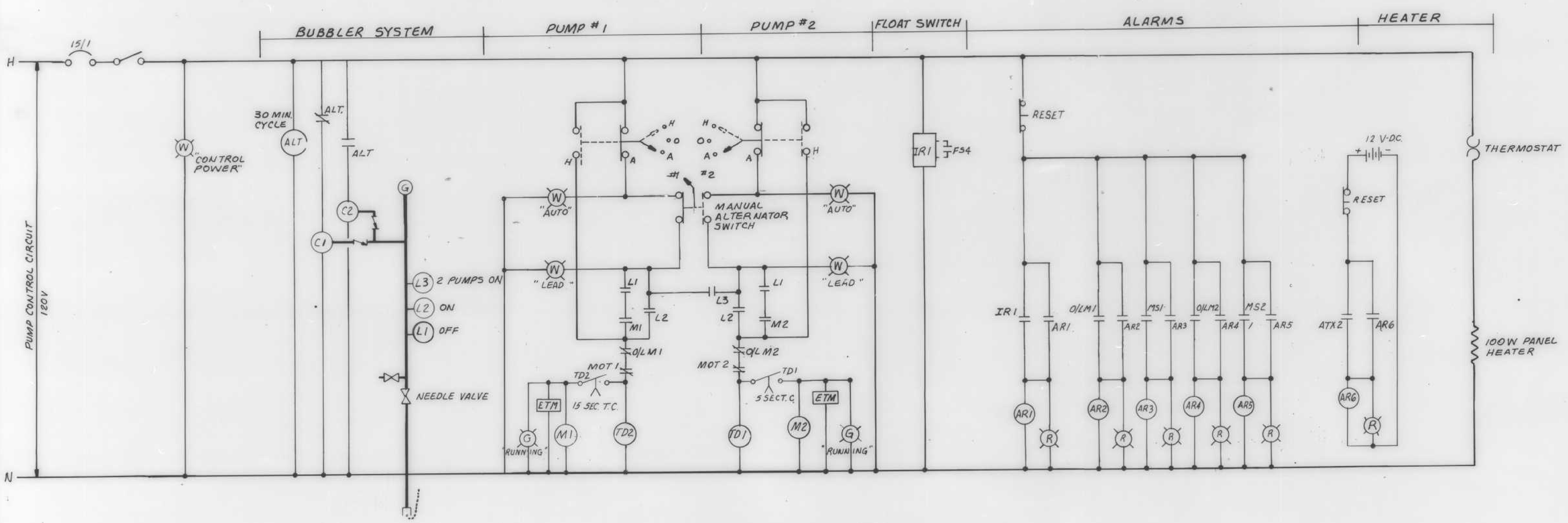
ONE LINE DIAGRAM



OPERATOR CONTROL PANEL

1. CONTROL POWER
2. WET WELL LEVEL
3. PUMP #1
4. AUTO
5. AUTO
6. PUMP #2
7. RUNNING
8. LEADY
9. ALTERNATOR
10. LEAD
11. RUNNING
12. HIGH WATER
13. M1 OVERLOAD
14. M1 MOISTURE SENSOR
15. M2 OVERLOAD
16. M2 MOISTURE SENSOR
17. GENERATOR FAILED TO START
18. RESET
19. RESET - GEN. ONLY

PHENOLIC NAME PLATES

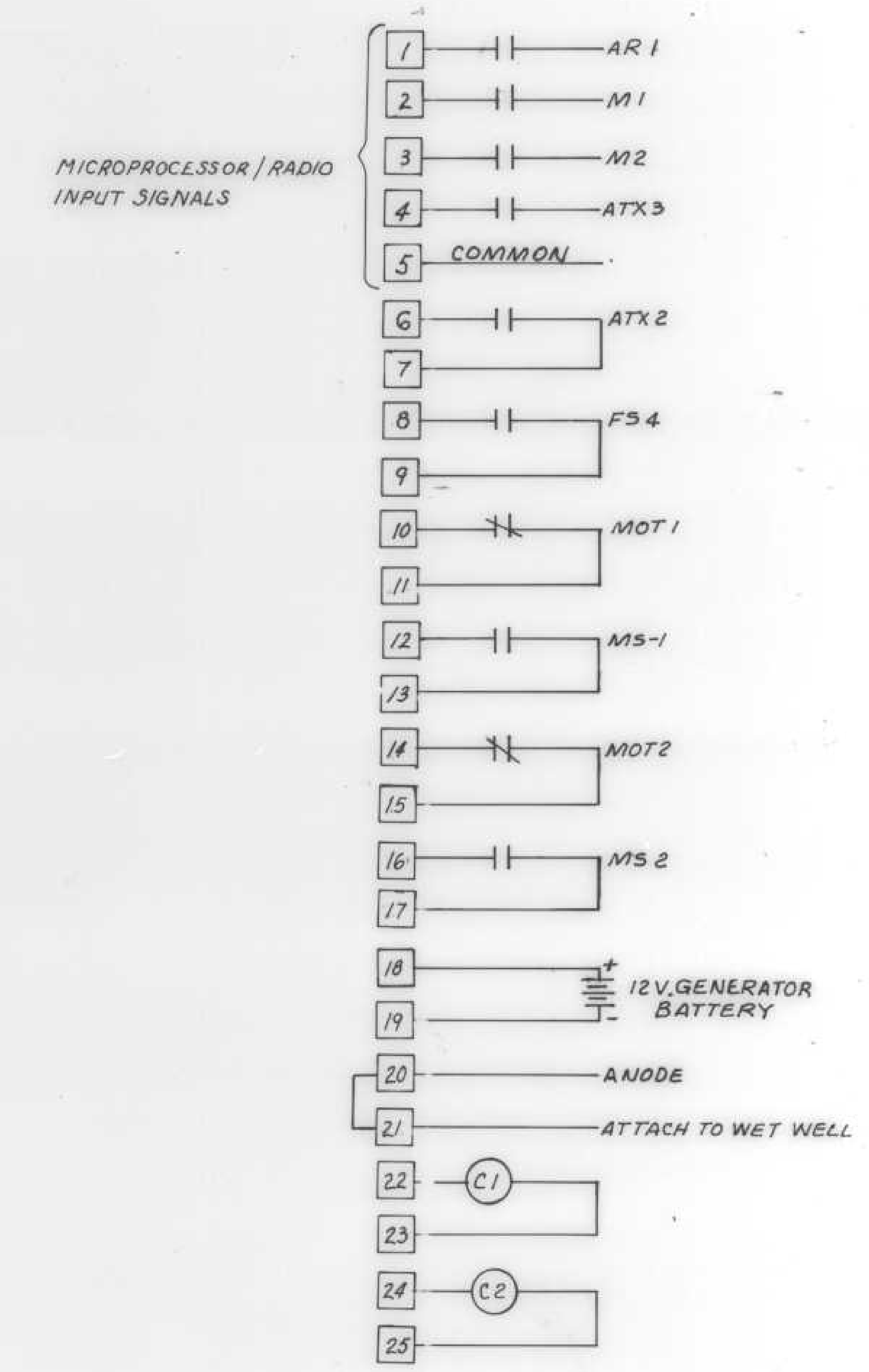


NOTES:
1. ALL INDICATING LIGHTS SHALL BE PUSH TO TEST.
2. ALL CIRCUITRY SHALL BE WIRED RELAYS, NOT PROGRAMMABLE ELECTRONIC, EXCEPT AS NOTED IN THE SPECIFICATIONS.

CONTROL DIAGRAM

ALARM LEGEND

AR1 - HIGH WATER ALARM
AR2 - M1 OVERLOAD
AR3 - M1 MOISTURE SENSOR
AR4 - M2 OVERLOAD
AR5 - M2 MOISTURE SENSOR
AR6 - GENERATOR FAILED TO START



CONTROL PANEL TERMINAL STRIP

AS BUILT STA #1

DRAWN BY: RAW	DESIGN BY: ELM	
CHECK BY: MGT		
BY [signature]	23237	

REVISION | DATE | DESCRIPTION

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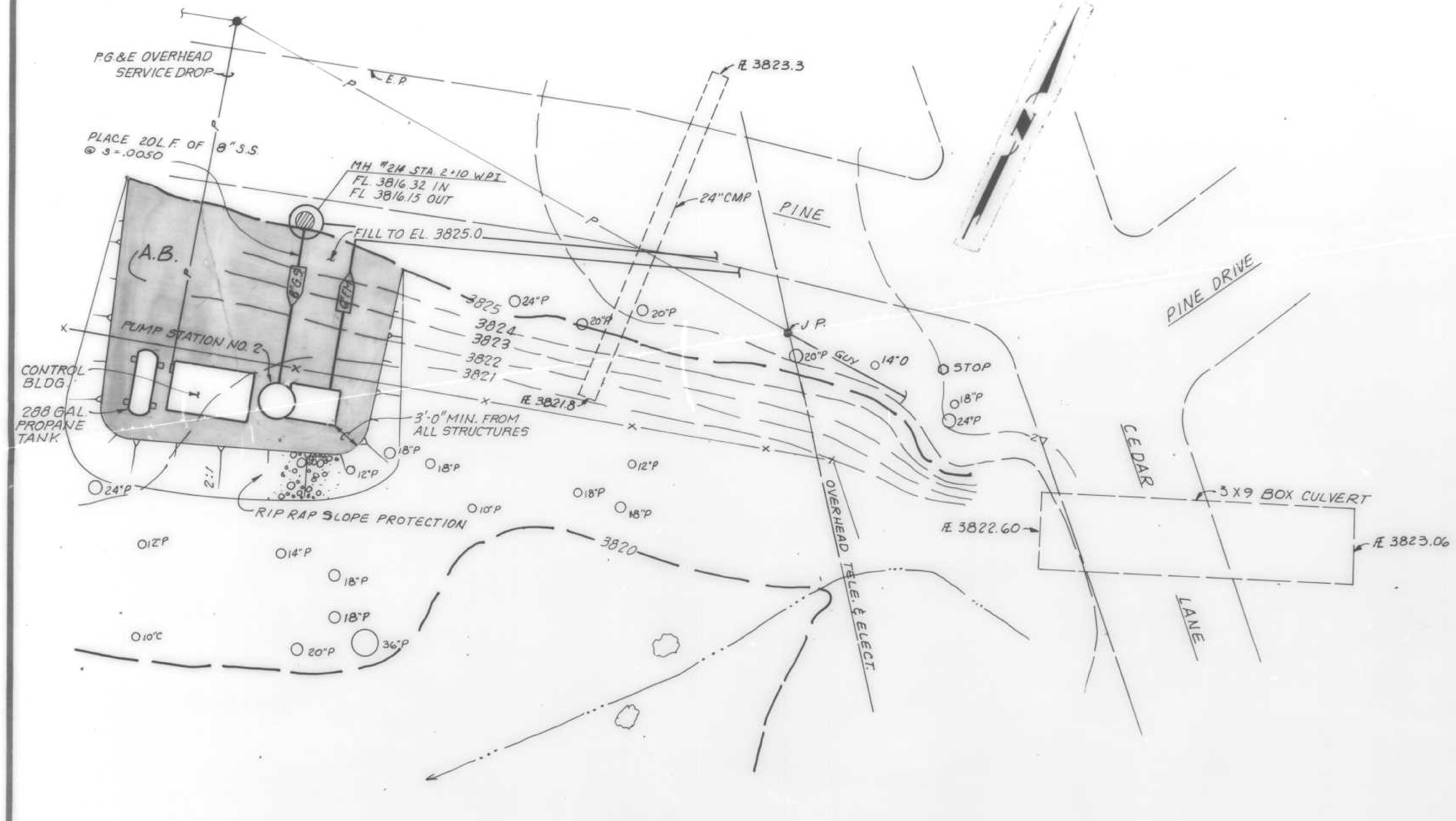
ARNOLD WASTEWATER PROJECT
PUMP STATION NO. 1
ELECTRICAL DIAGRAMS

DATE AUG. 1984
SCALE
HORIZONTAL
VERTICAL
W.O. NO. 4391.03

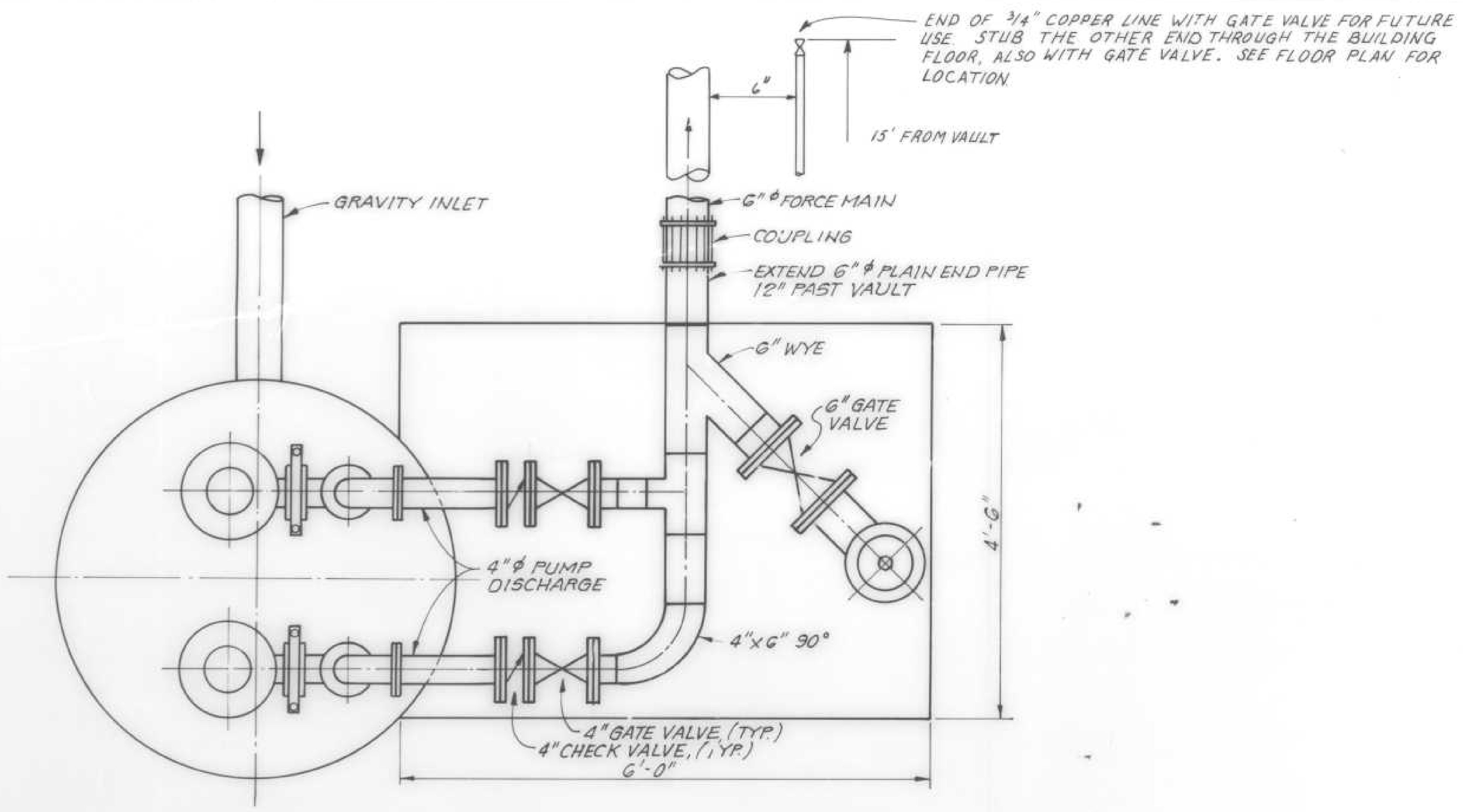
SHEET 38 OF 43 SHEETS

FILE NO. D-0217



SITE PLAN

1" = 10'

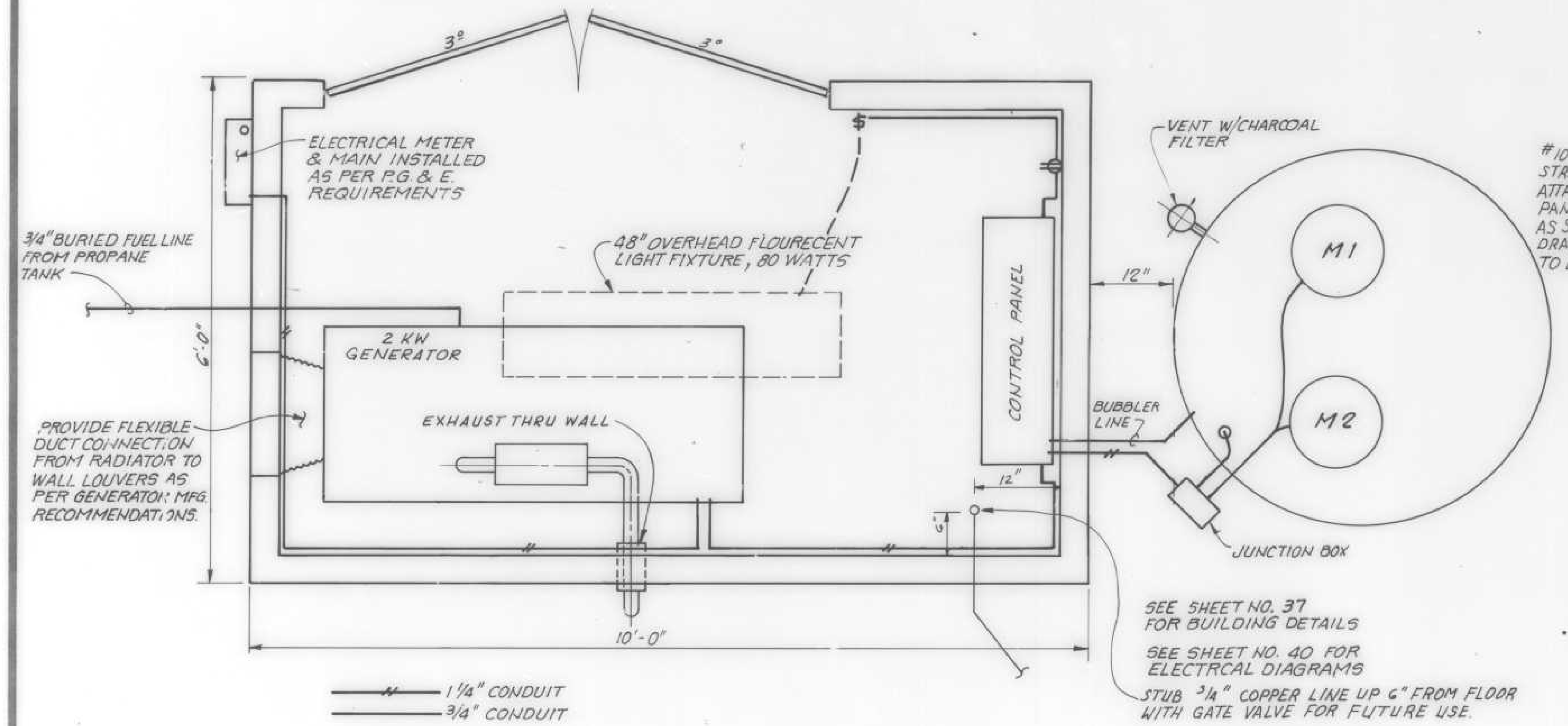


PIPING PLAN

DESIGN CRITERIA - PUMP STA #2

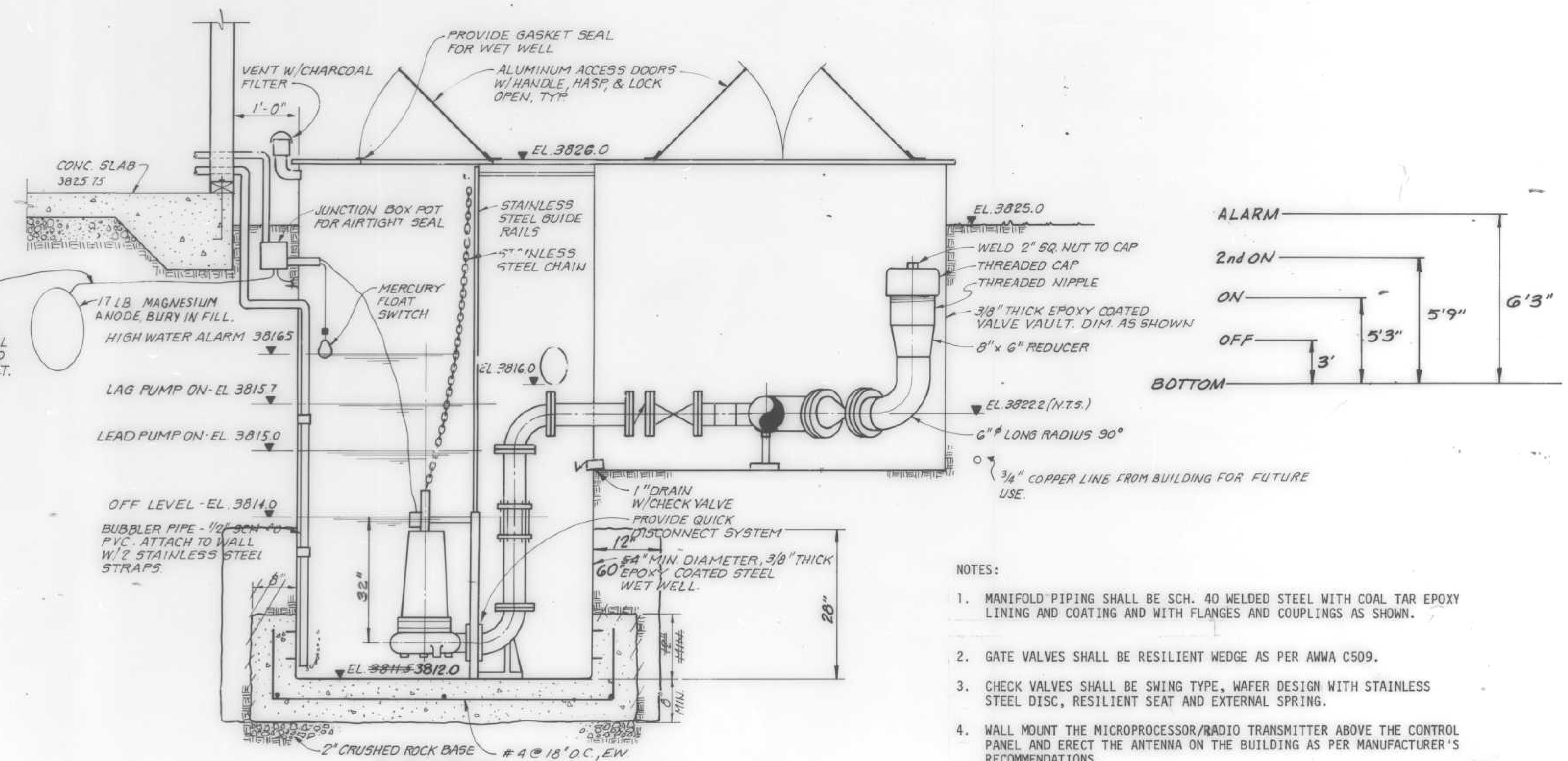
AVERAGE INFLOW	165 GPM
PEAK INFLOW	350 GPM
ON-OFF STORAGE	660 GAL
STATIC LIFT	52 FT
FORCE MAIN DIAMETER	6 IN
FORCE MAIN LENGTH	1060 FT
1 PUMP ON DESIGN POINT	275 GPM @ 62 FT
2 PUMPS ON DESIGN POINT	375 GPM @ 68 FT

PUMP SPECS: 10.0 HP, 1750 RPM SUBMERSIBLE NON CLOG
BACKUP GENERATOR: 22 KW, PROPANE POWERED



FLOOR & ELECTRICAL PLAN

3/4" = 1'-0"



ELEVATION

3/4" = 1'-0"

NOTES:

1. MANIFOLD PIPING SHALL BE SCH. 40 WELDED STEEL WITH COAL TAR EPOXY LINING AND COATING AND WITH FLANGES AND COUPLINGS AS SHOWN.
2. GATE VALVES SHALL BE RESILIENT WEDGE AS PER AWWA C509.
3. CHECK VALVES SHALL BE SWING TYPE, WAFER DESIGN WITH STAINLESS STEEL DISC, RESILIENT SEAT AND EXTERNAL SPRING.
4. WALL MOUNT THE MICROPROCESSOR/RADIO TRANSMITTER ABOVE THE CONTROL PANEL AND ERECT THE ANTENNA ON THE BUILDING AS PER MANUFACTURER'S RECOMMENDATIONS.

DRAWN BY G. ZUEGER DESIGN BY E. MAISCH
CHECK BY M. THALHAMER
BY 23237

REVISION	DATE	DESCRIPTION

RVA RAYMOND VAIL AND ASSOCIATES
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ARNOLD WASTEWATER PROJECT

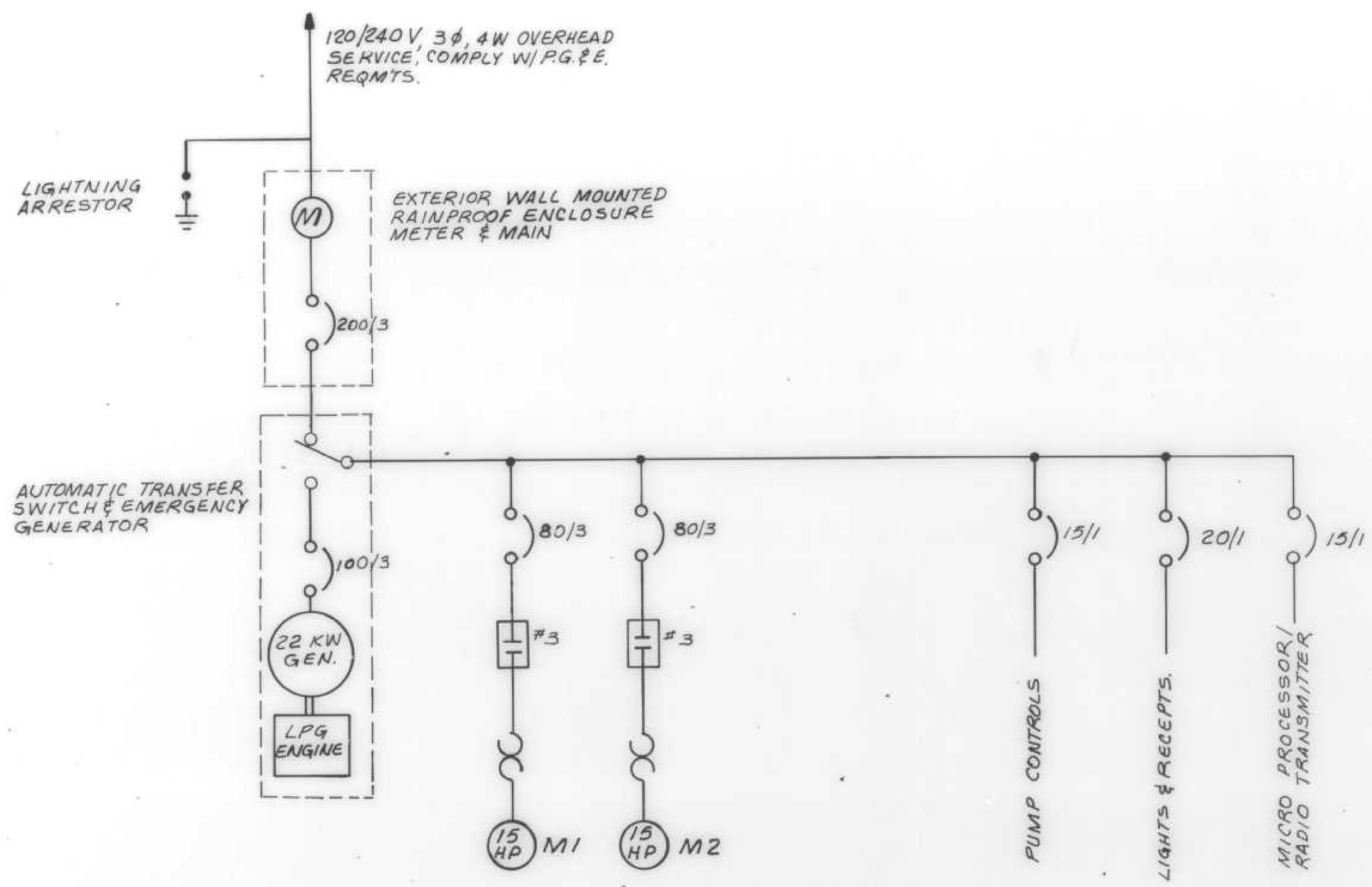
PUMP STATION NO. 2

DATE AUG 1984
SCALE HORIZONTAL AS SHOWN
VERTICAL
W.O. NO 4391.03

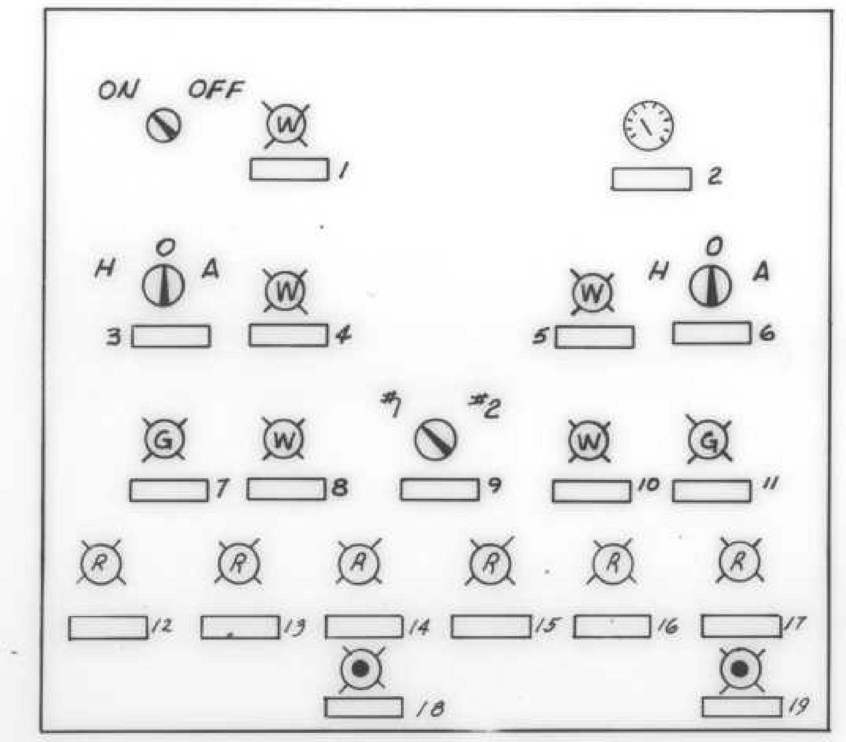
SHEET 39 OF 43 SHEETS

FILE NO D-0217

L1 - OFF LEVEL, BUBBLER PRESSURE SWITCH.
L2 - 1 SET ON LEVEL, BUBBLER PRESSURE SWITCH.
L3 - 2 SETS ON LEVEL, BUBBLER PRESSUER SWITCH.
FS4 - HIGH WATER ALARM LEVEL, FLOAT SWITCH.
PS1 - PRESSURE SWITCH, TYP.
MS1 - MOTOR NO. 1 MOISTURE SENSOR, TYP.
O/LM1 - MOTOR NO. 1 OVERLOAD, TYP.
TD1 - TIME DELAY RELAY, TYP.
AR - ALARM RELAY
M1 - MOTOR NO. 1 CONTACTOR, TYP.
(G) - INDICATING LIGHT, GREEN, TYP.
ALT - TIME CLOCK ALTERNATOR.
C1 - BUBBLE SYSTEM COMPRESSOR, TYP.
(G) - 0 to160 INCHES PRESSURE GAGE.
ATX1 - AUTOMATIC TRANSFER SWITCH AUXILIARY CONTACT FOR TRANSFER MADE.
ETM - ELAPSED TIME METER.
ATX2 - AUTOMATIC TRANSFER SWITCH AUXILIARY CONTACT FOR GENERATOR FAILED TO START.
ATX3 - AUTO TRANS AUX CON FOR GENERATOR RUNNING.
IR1 - INTRINSICALLY SAFE RELAY.
MOT1 - MOTOR OVERTEMP IMBEDDED THERMISTOR TYP.



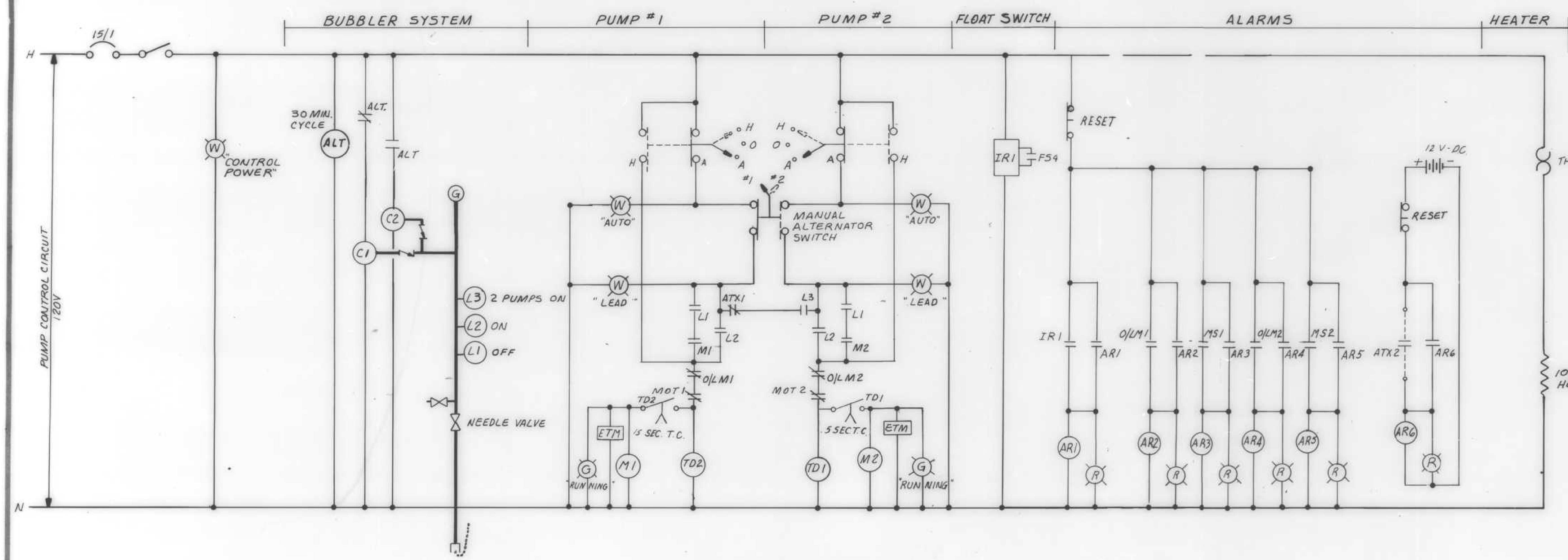
ONE LINE DIAGRAM



OPERATOR CONTROL PANEL

1. CONTROL POWER
2. WET WELL LEVEL
3. PUMP #1
4. AUTO
5. AUTO
6. PUMP #2
7. RUNNING
8. LEAD
9. ALTERNATOR
10. LEAD
11. RUNNING
12. HIGH WATER
13. M1 OVERLOAD
14. M1 MOISTURE SENSOR
15. M2 OVERLOAD
16. M2 MOISTURE SENSOR
17. GENERATOR FAILED TO START
18. RESET
19. RESET - GEN. ONLY

PHENOLIC NAME PLATES

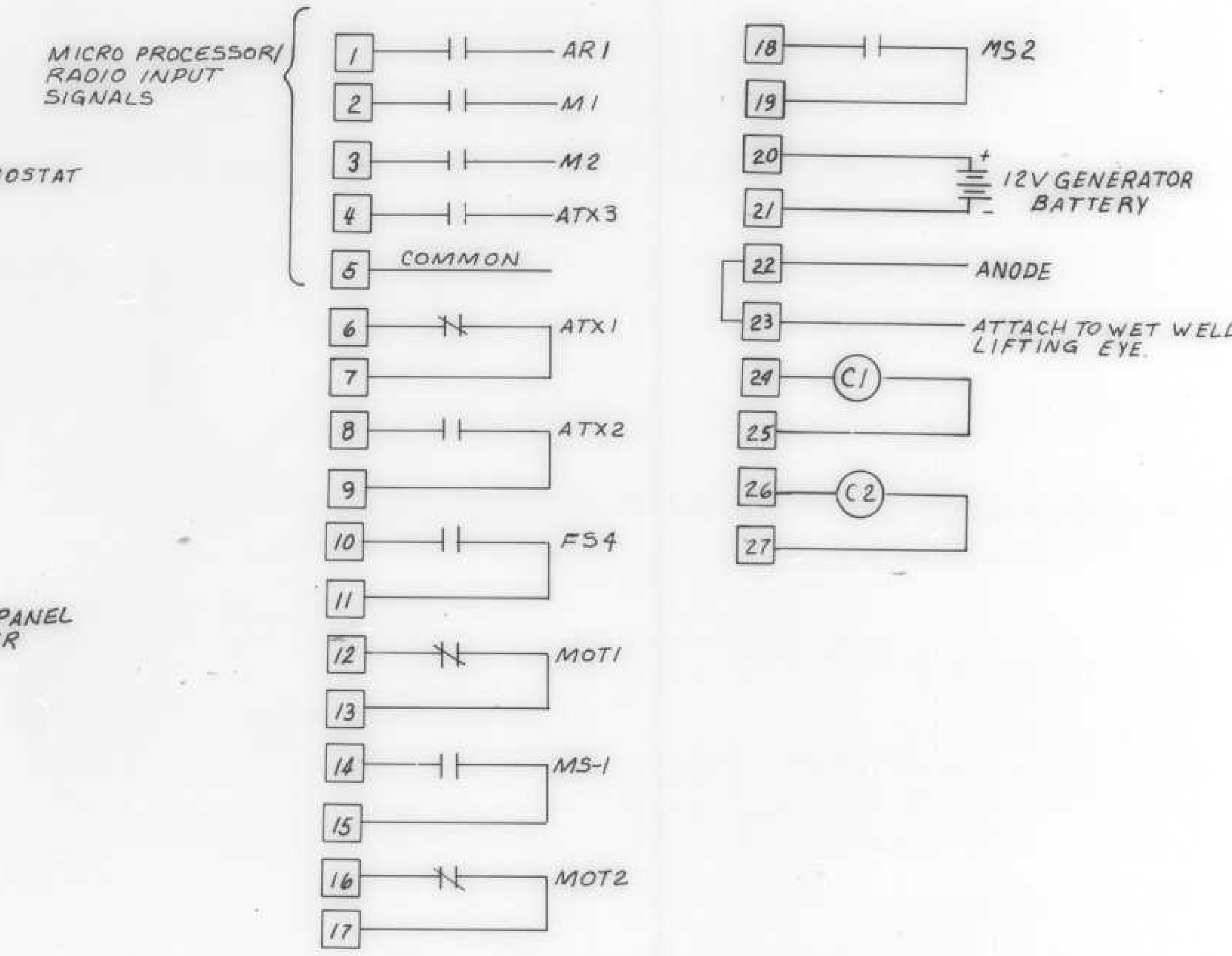


CONTROL DIAGRAM

NOTES:
1. ALL INDICATING LIGHTS SHALL BE PUSH TO TEST.
2. ALL CIRCUITRY SHALL BE WIRED RELAYS, NOT PROGRAMMABLE ELECTRONIC, EXCEPT AS NOTED IN THE SPECIFICATIONS.

ALARM LEGEND

AR1 - HIGH WATER ALARM
AR2 - M1 OVERLOAD
AR3 - M1 MOISTURE SENSOR
AR4 - M2 OVERLOAD
AR5 - M2 MOISTURE SENSOR
AR6 - GENERATOR FAILED TO START



CONTROL PANEL TERMINAL STRIP

DRAWN BY RAW	DESIGN BY ELM	
CHECK BY MGT		
BY [signature]	23237	

REVISION	DATE	DESCRIPTION

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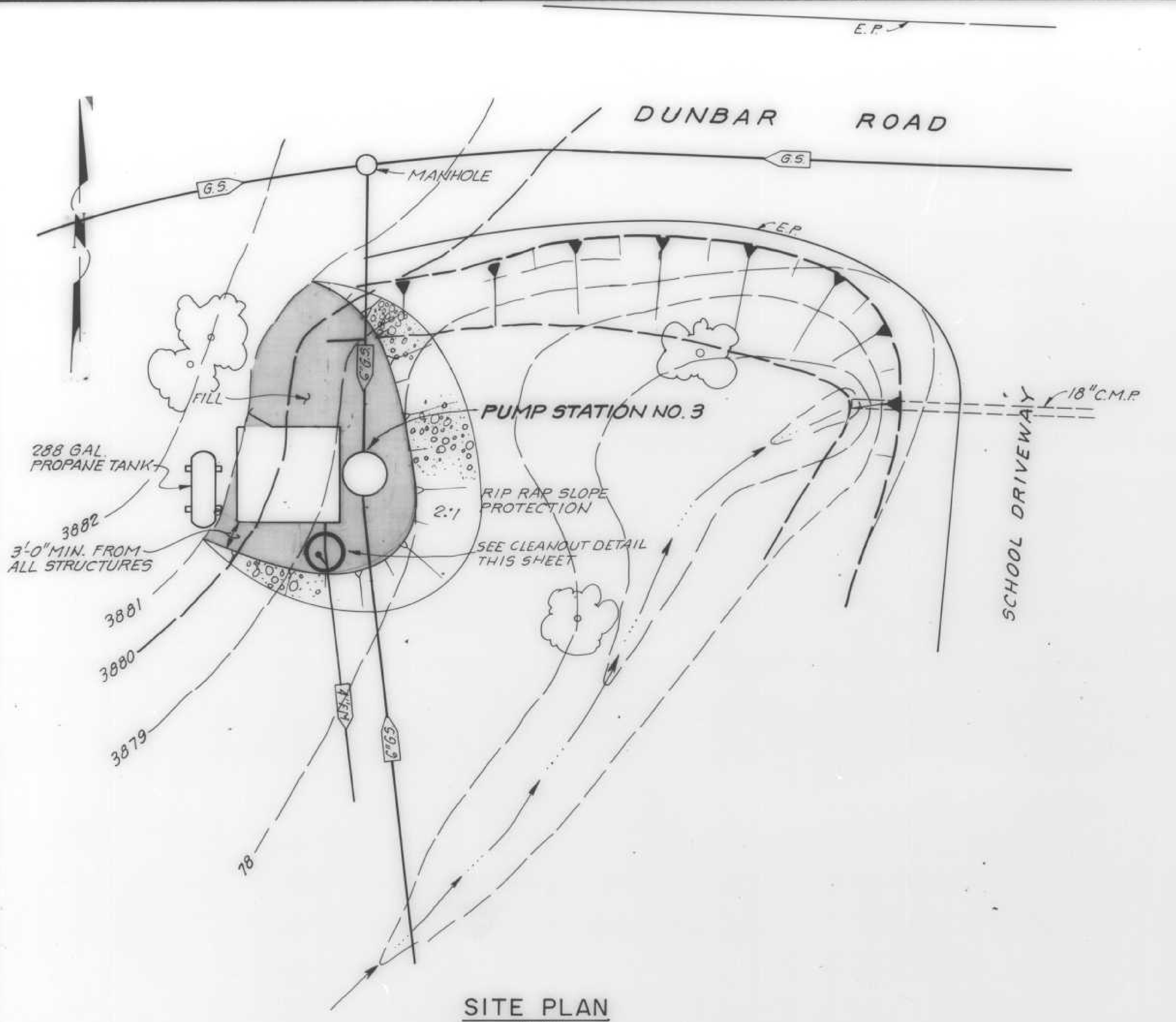
ARNOLD WASTEWATER PROJECT
PUMP STATION NO. 2
ELECTRICAL DIAGRAMS

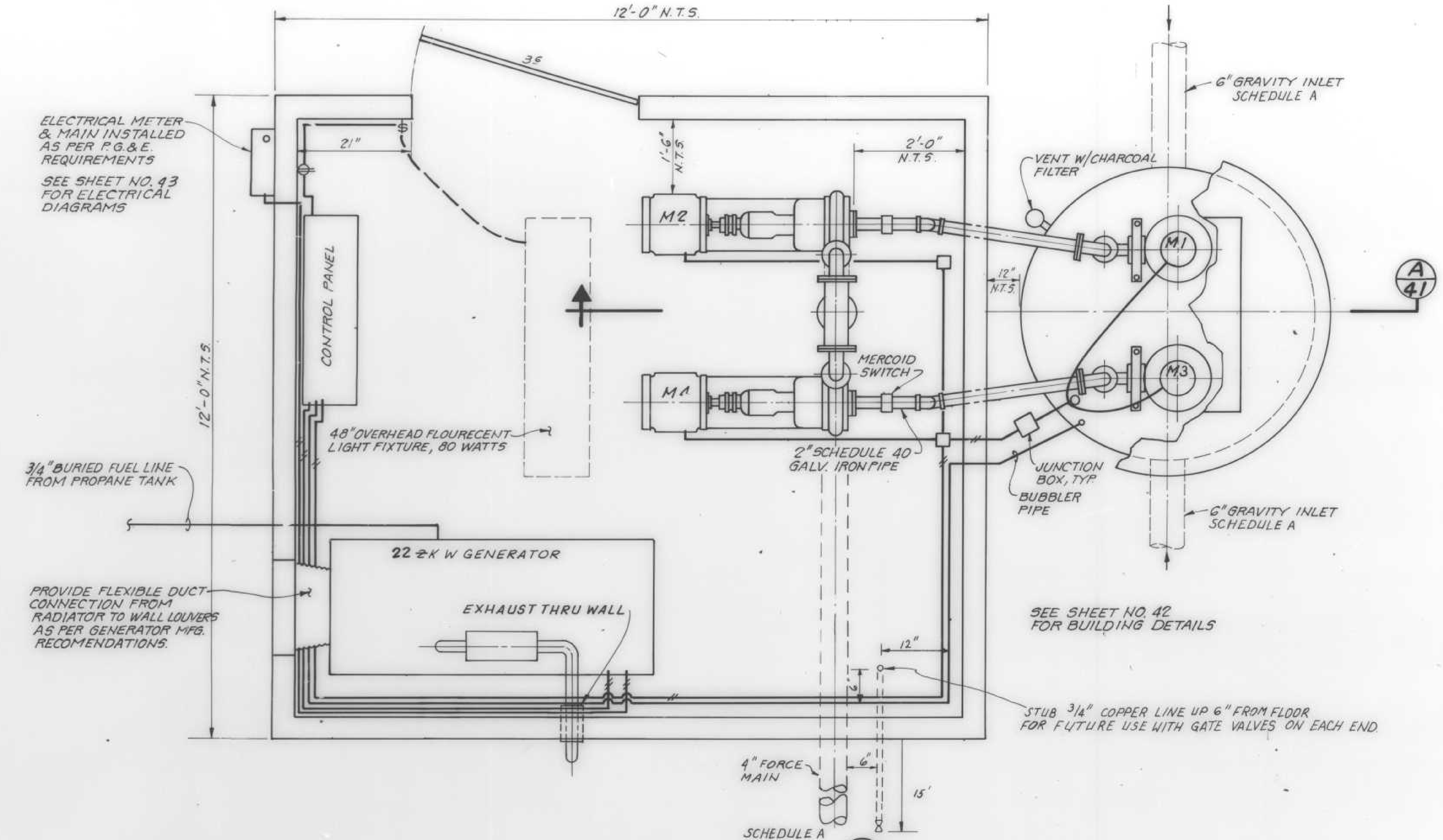
DATE AUG 1984
SCALE
HORIZONTAL
VERTICAL
W.O. NO. 4391.03

SHEET 40 OF 43 SHEETS

FILE NO. D-0217



SITE PLAN
1" = 10'



PLAN
3/4" = 1'-0"

DESIGN CRITERIA - PUMP STA #3

AVERAGE INFLOW	29 GPM
PEAK INFLOW	104 GPM
ON-OFF STORAGE	120 GAL
STATIC LIFT	161 FT
FORCE MAIN DIAMETER	4"
FORCE MAIN LENGTH	3200 FT

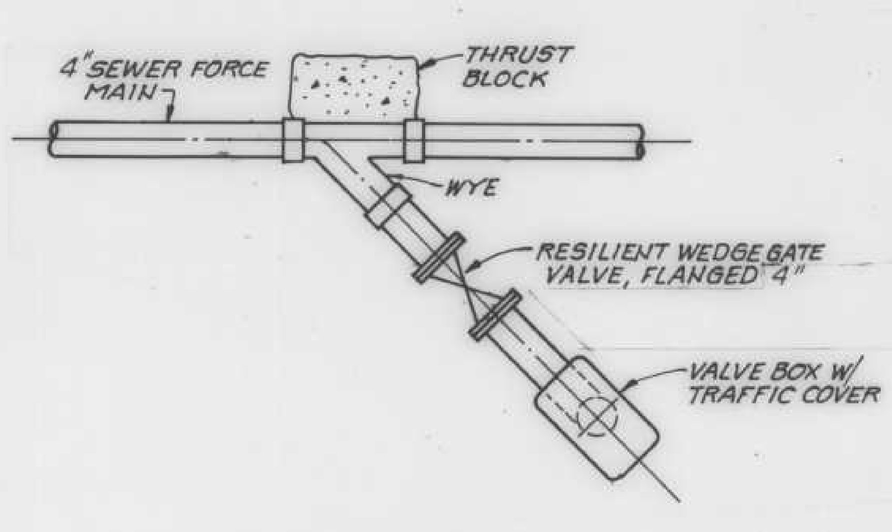
2 STAGE PUMPING:

1 SET ON DESIGN POINT	81 GPM @ 181 FT
2 SETS ON DESIGN POINT	120 GPM @ 198 FT

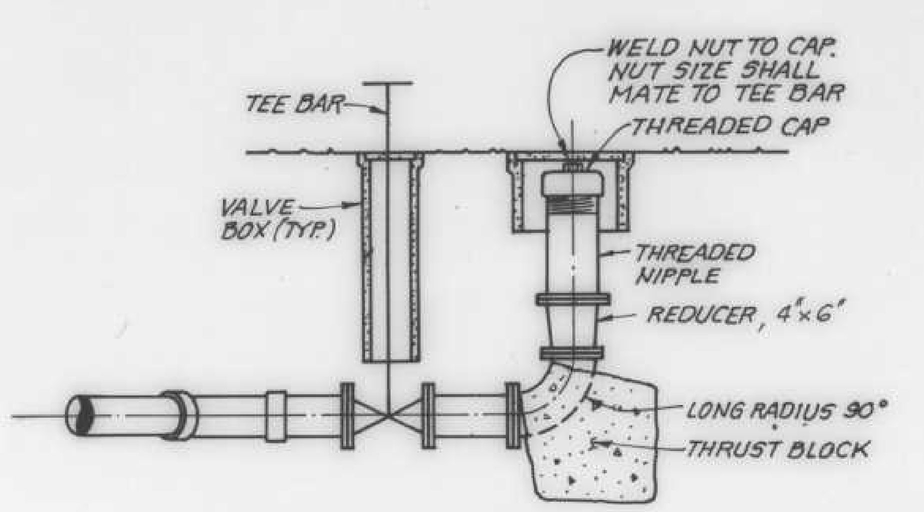
1ST STAGE: 7 1/2 HP, 3500 RPM SUBMERSIBLE GRINDER PUMP
2ND STAGE: 5 HP, 1750 RPM, DRY PIT NON CLOG PUMP
BACKUP GENERATOR: 22 kW, PROPANE POWERED

NOTES:

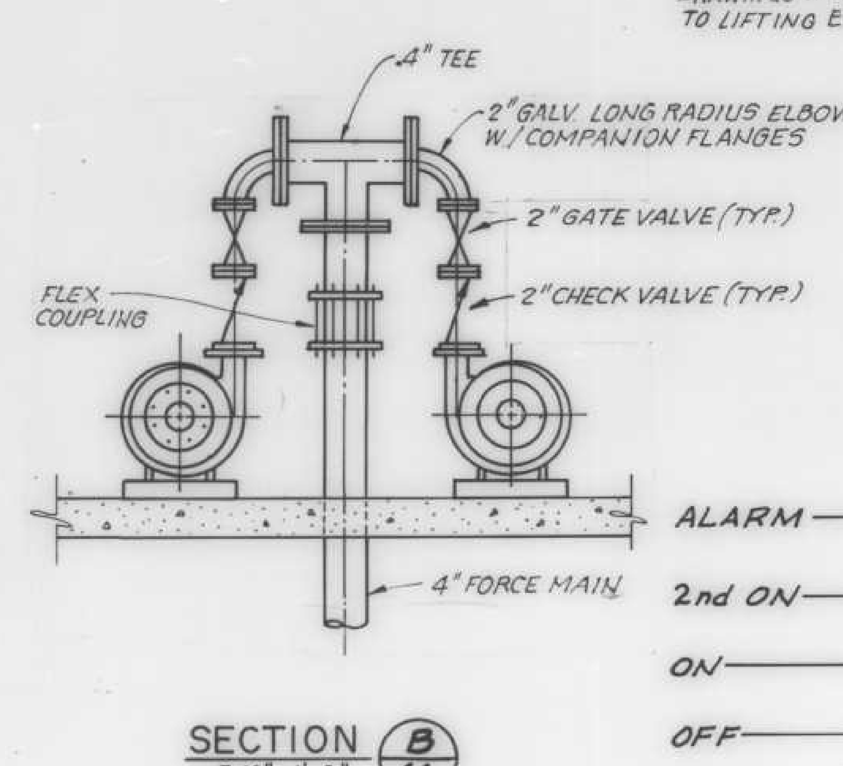
1. MANIFOLD PIPING SHALL BE SCH. 40 WELDED STEEL WITH COAL TAR EPOXY LINING AND COATING AND WITH FLANGES AND COUPLINGS AS SHOWN. 2" PIPE MAY BE SCH. 40 GALVANIZED.
2. GATE VALVES SHALL BE RESILIENT WEDGE AS PER AWWA C509.
3. CHECK VALVES SHALL BE SWING TYPE, WAFER DESIGN WITH STAINLESS STEEL DISC, RESILIENT SEAT AND EXTERNAL SPRING.
4. WALL MOUNT THE MICROPROCESSOR/RADIO TRANSMITTER ABOVE THE CONTROL PANEL AND ERECT THE ANTENNA ON THE BUILDING AS PER MANUFACTURER'S RECOMMENDATIONS.
5. THE PRESSURE SWITCH SHALL BE FULLY AUTOMATIC MERCURY TYPE SWITCH WITH INDIVIDUAL ADJUSTMENTS FOR HIGH AND LOW SET POINTS, NEMA 1 ENCLOSURE, 1/8 - 15 PSI RANGE, 1 PSI MIN. DIFFERENTIAL, SPST CLOSES ON INCREASING PRESSURE, MERCOID, ASCO, OR EQUAL. THE CONTRACTOR SHALL ALSO PROVIDE 1/4" SHUT-OFF COCK AND ISOLATION DIAPHRAGM.



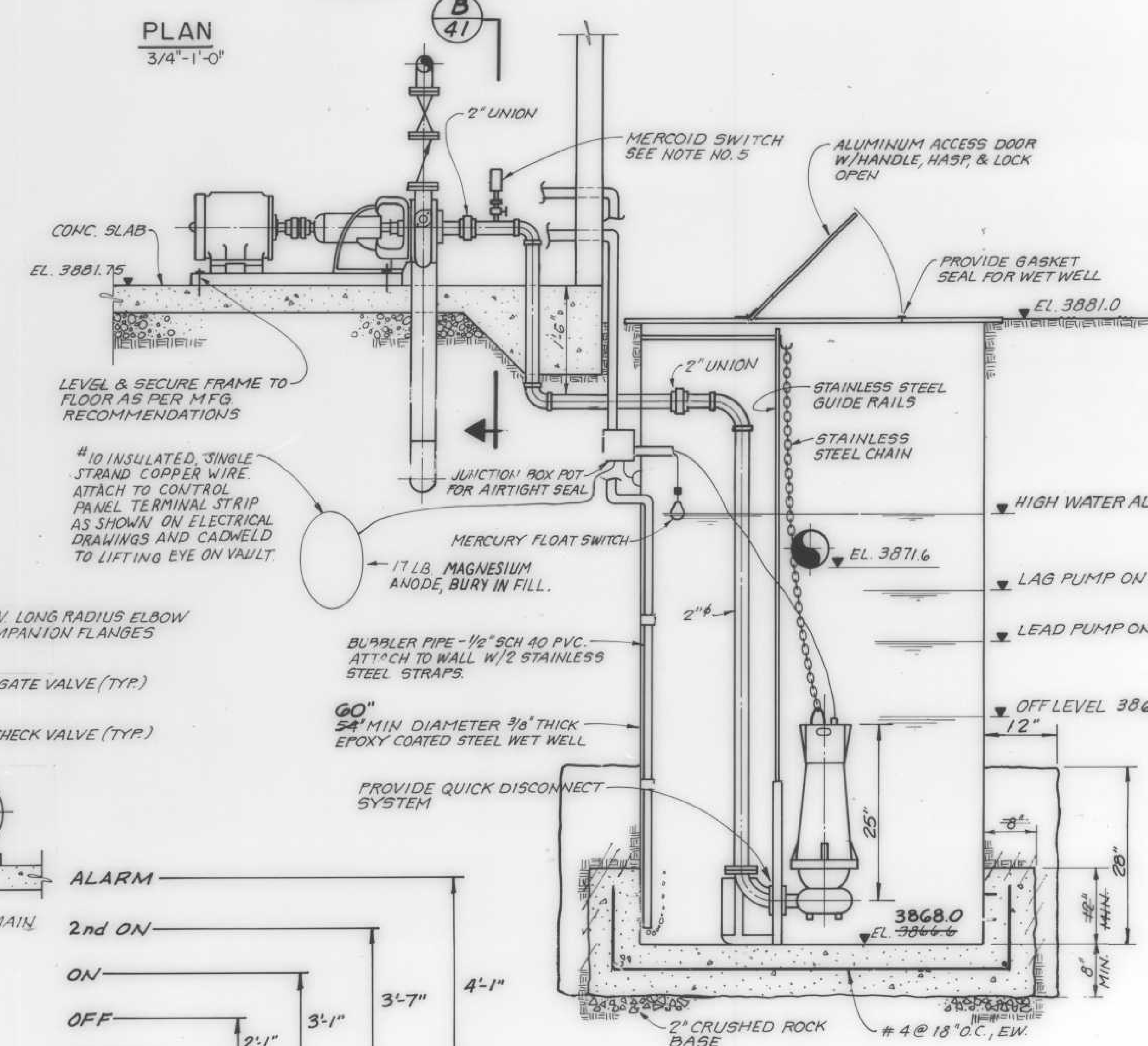
PLAN



SECTION
CLEANOUT DETAIL
NO SCALE



SECTION B/41
3/4" = 1'-0"



SECTION A/41
3/4" = 1'-0"

AS BUILT

DRAWN BY G. ZUEGER	DESIGN BY E. MAISCH
CHECK BY M. THALHAMER	
BY [signature]	23237

REVISION	DATE	DESCRIPTION

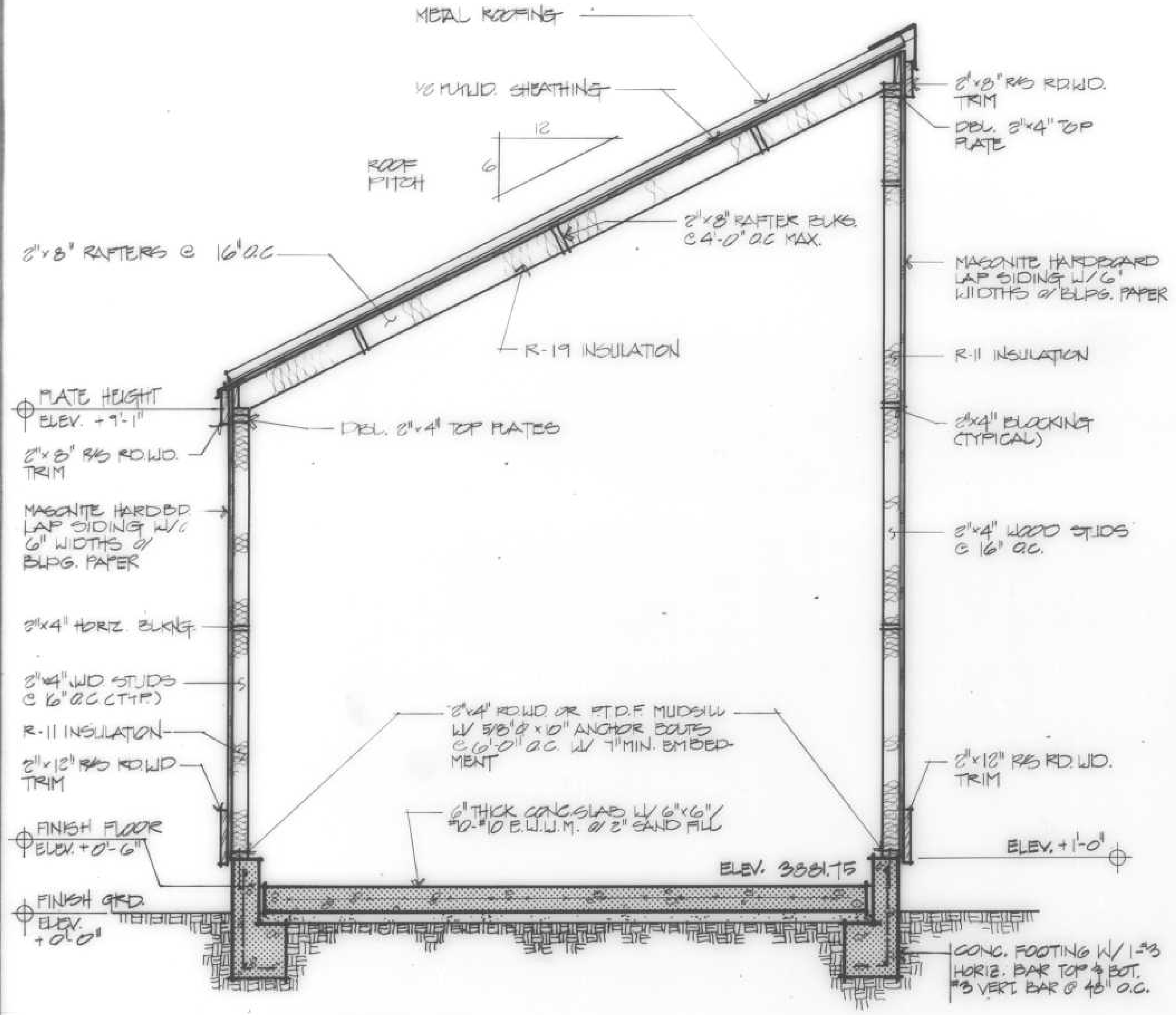
RVA RAYMOND VAIL AND ASSOCIATES
ENGINEERING • PLANNING • SURVEYING
SACRAMENTO, CALIFORNIA 1410 Ethan Way 95825

ARNOLD WASTEWATER PROJECT
PUMP STATION NO. 3

DATE AUG. 1984
SCALE
HORIZONTAL AS SHOWN
VERTICAL
W.O. NO. 4391.03

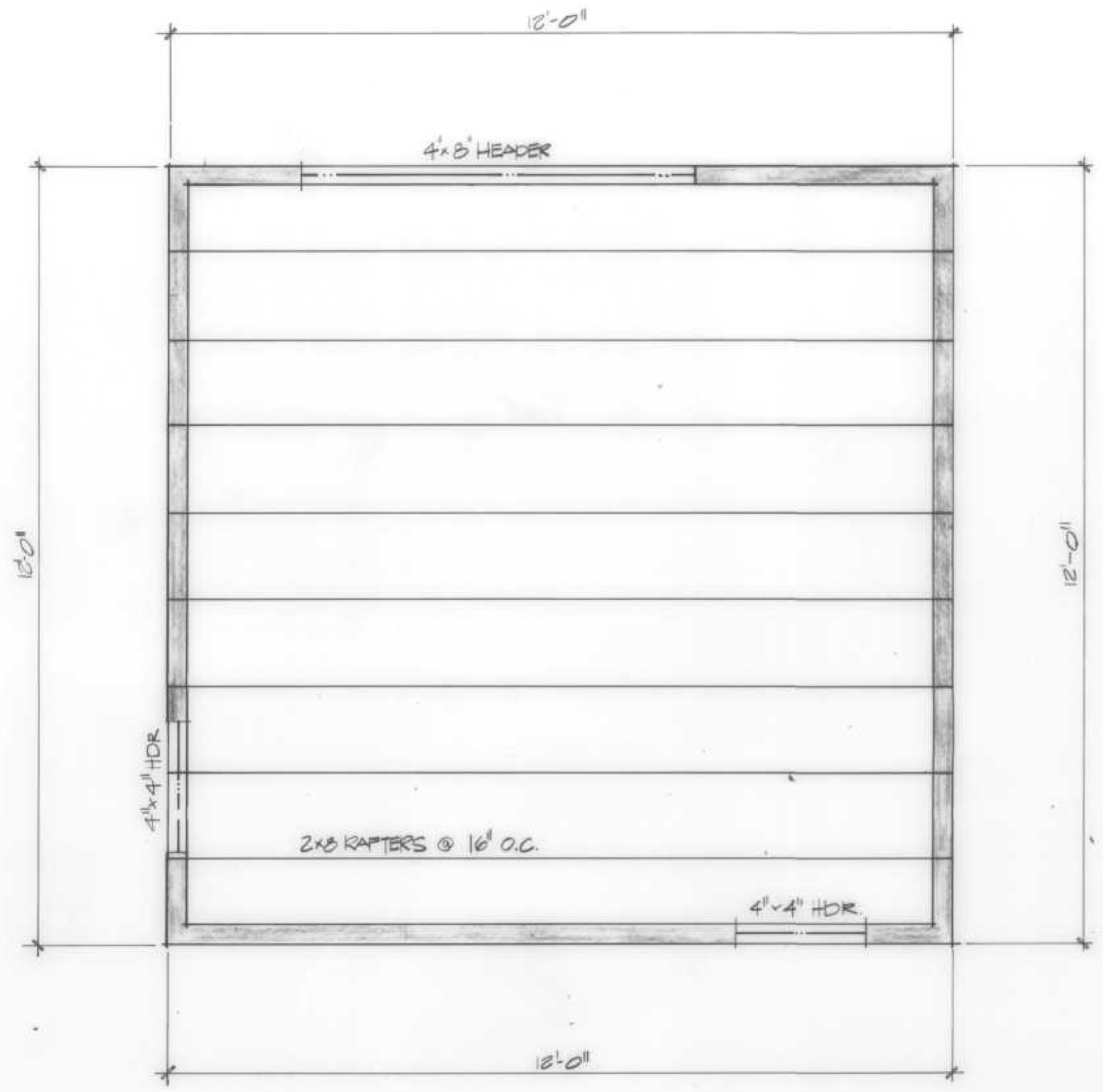
SHEET 41 OF 43 SHEETS

FILE NO. D-0217



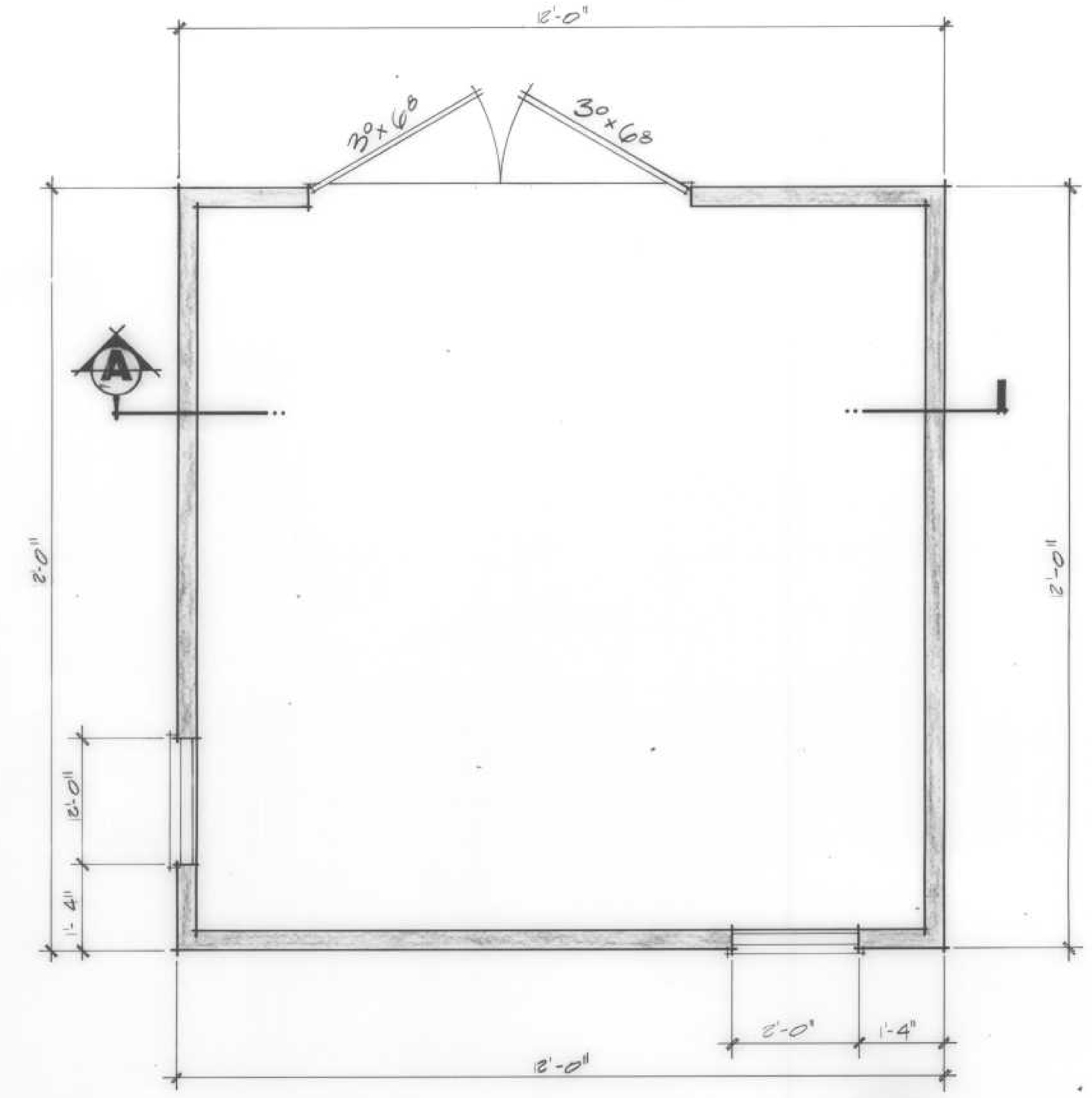
SECTION A

SCALE: 1/2"=1'-0"



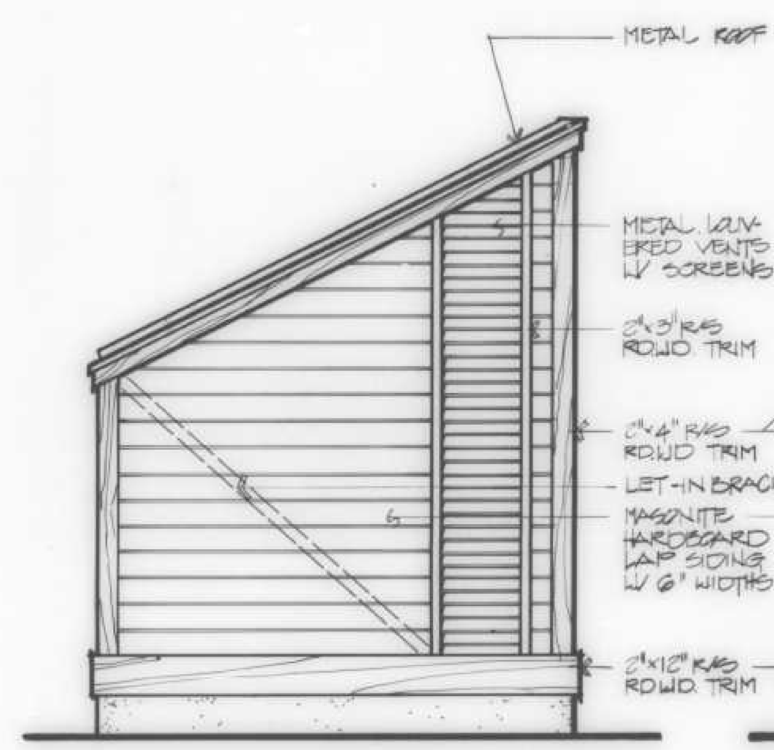
ROOF FRAMING PLAN

SCALE: 1/8"=1'-0"



FLOOR PLAN

SCALE: 1/8"=1'-0"

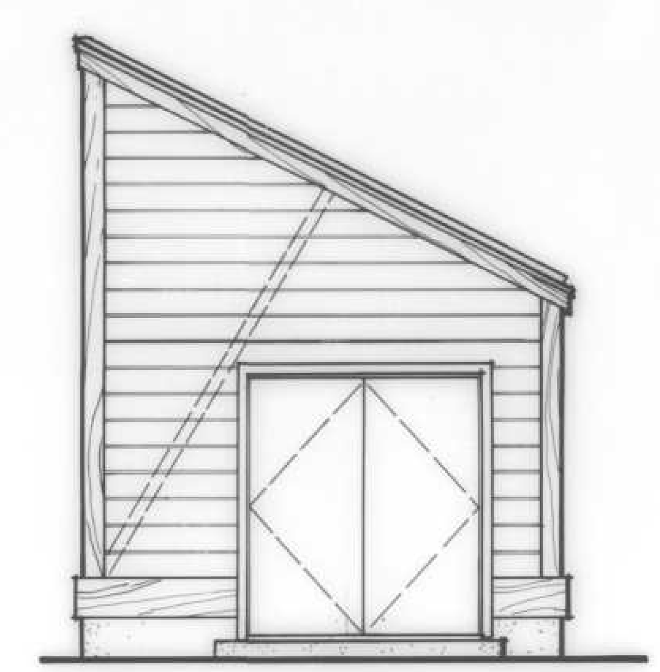


SOUTH ELEVATION

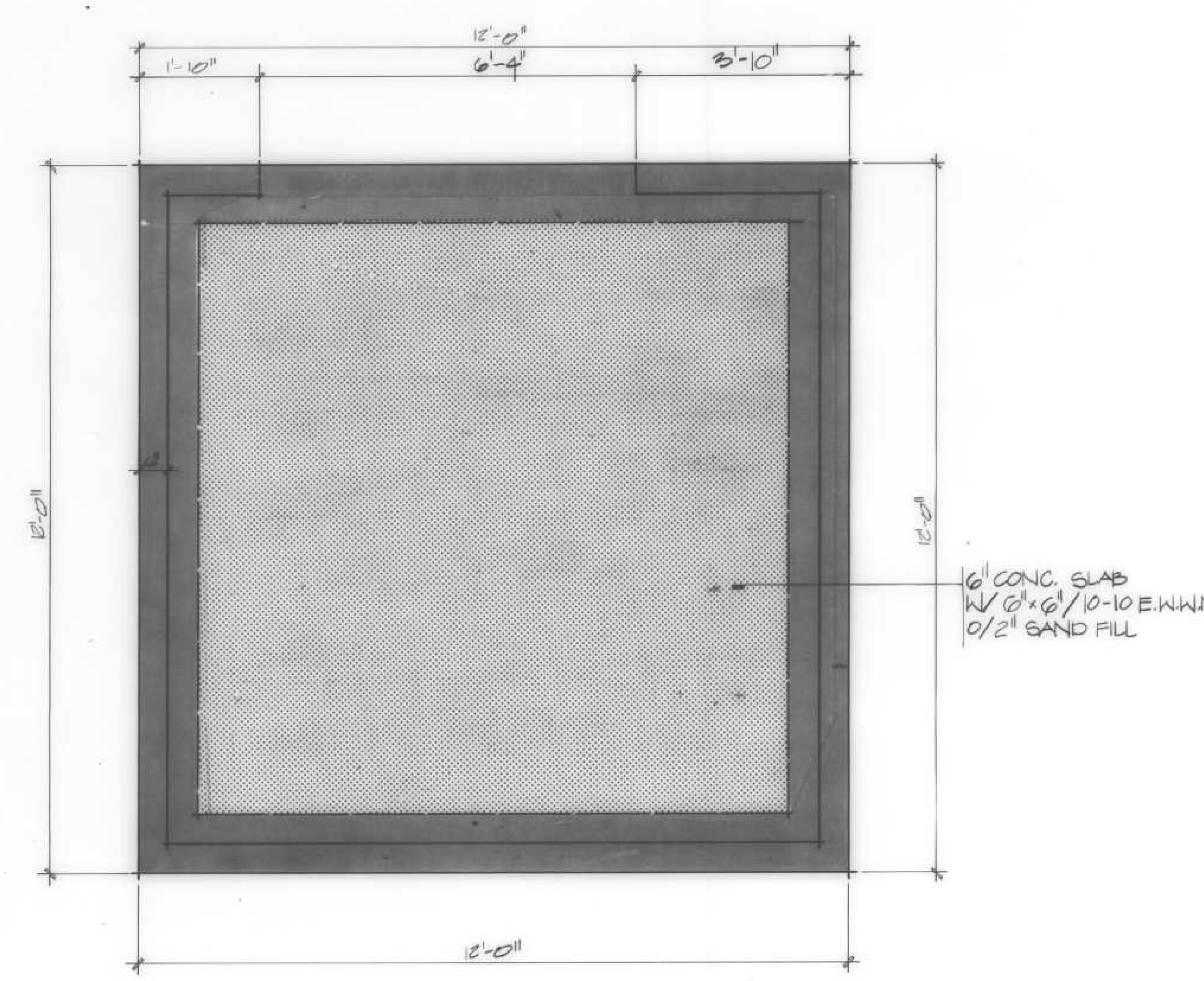
WEST ELEVATION

SCALE: 1/4"=1'-0"

EAST ELEVATION



NORTH ELEVATION



FOUNDATION PLAN

SCALE: 1/8"=1'-0"

DRAWN BY SPJ	DESIGN BY SPJ		
CHECK BY SPJ			
BY [signature]			

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ARNOLD WASTEWATER PROJECT

PUMP STATION NO. 3

DATE Aug. 1984
SCALE
HORIZONTAL AS SHOWN
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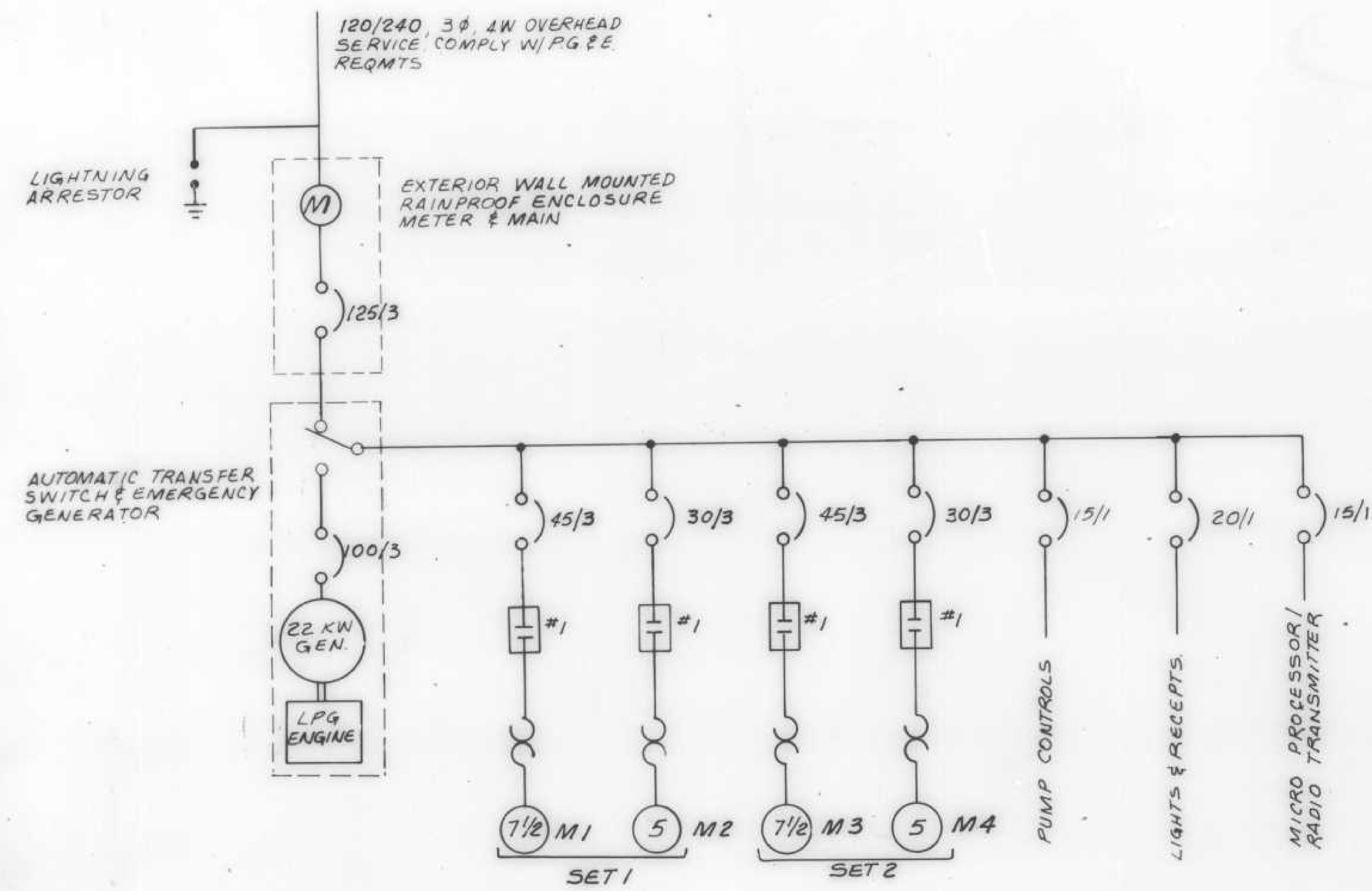
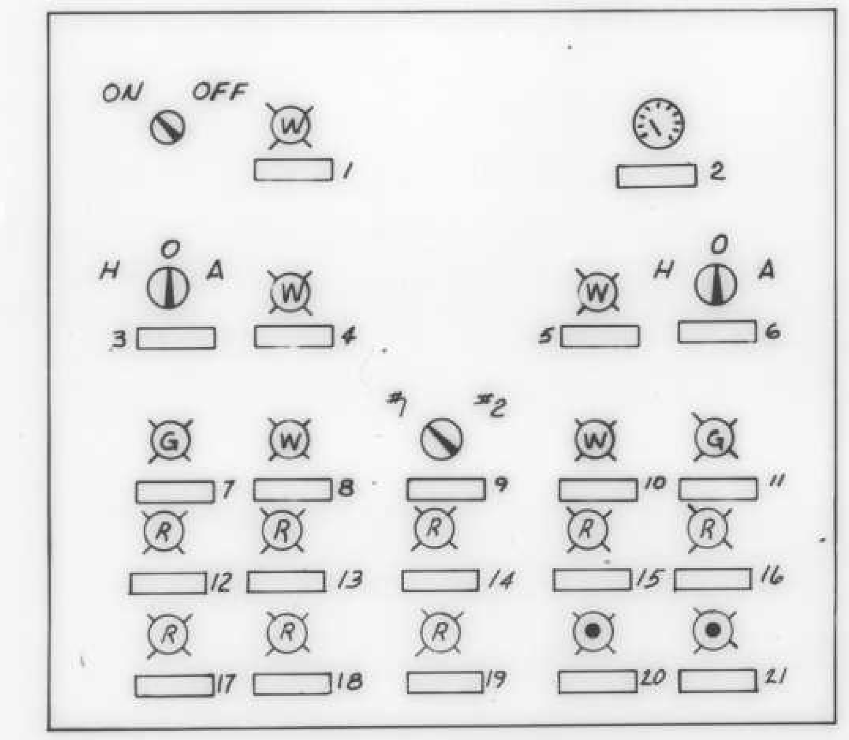
FILE NO. D-0217

SHEET 42 OF 43 SHEETS

L1 - OFF LEVEL, BUBBLER PRESSURE SWITCH.
L2 - 1 SET ON LEVEL, BUBBLER PRESSURE SWITCH.
L3 - 2 SETS ON LEVEL, BUBBLER PRESSUER SWITCH.
FS4 - HIGH WATER ALARM LEVEL, FLOAT SWITCH.
PS1 - PRESSURE SWITCH, TYP.
MS1 - MOTOR NO. 1 MOISTURE SENSOR, TYP.
O/LM1 - MOTOR NO. 1 OVERLOAD, TYP.
TD1 - TIME DELAY RELAY, TYP.
AR - ALARM RELAY
M1 - MOTOR NO. 1 CONTACTOR, TYP.
G - INDICATING LIGHT, GREEN, TYP.
ALT - TIME CLOCK ALTERNATOR.
C1 - BUBBLE SYSTEM COMPRESSOR, TYP.
G - 0 to160 INCHES PRESSURE GAGE.
ATX1 - AUTOMATIC TRANSFER SWITCH AUXILIARY CONTACT FOR TRANSFER MADE.
ETM - ELAPSED TIME METER.
ATX2 - AUTOMATIC TRANSFER SWITCH AUXILIARY CONTACT FOR GENERATOR FAILED TO START.
ATX3 - AUTO TRANS AUX CON FOR GENERATOR RUNNING.
IR1 - INTRINSICALLY SAFE RELAY.
MOT1 - MOTOR OVERTEMP EMBEDDED THERMISTOR TYP



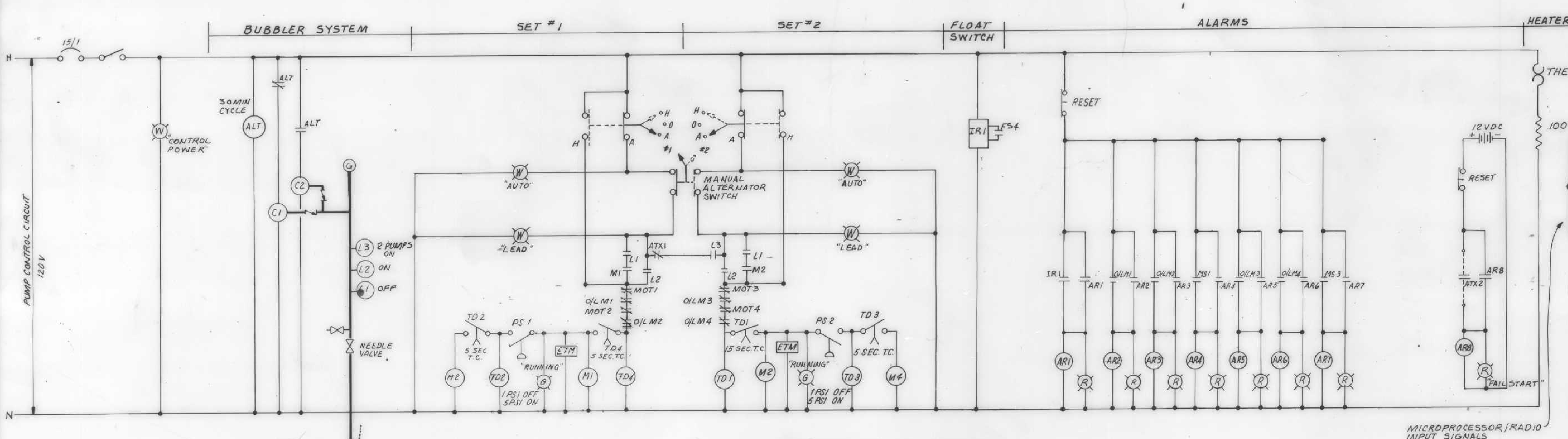
ONE LINE DIAGRAM



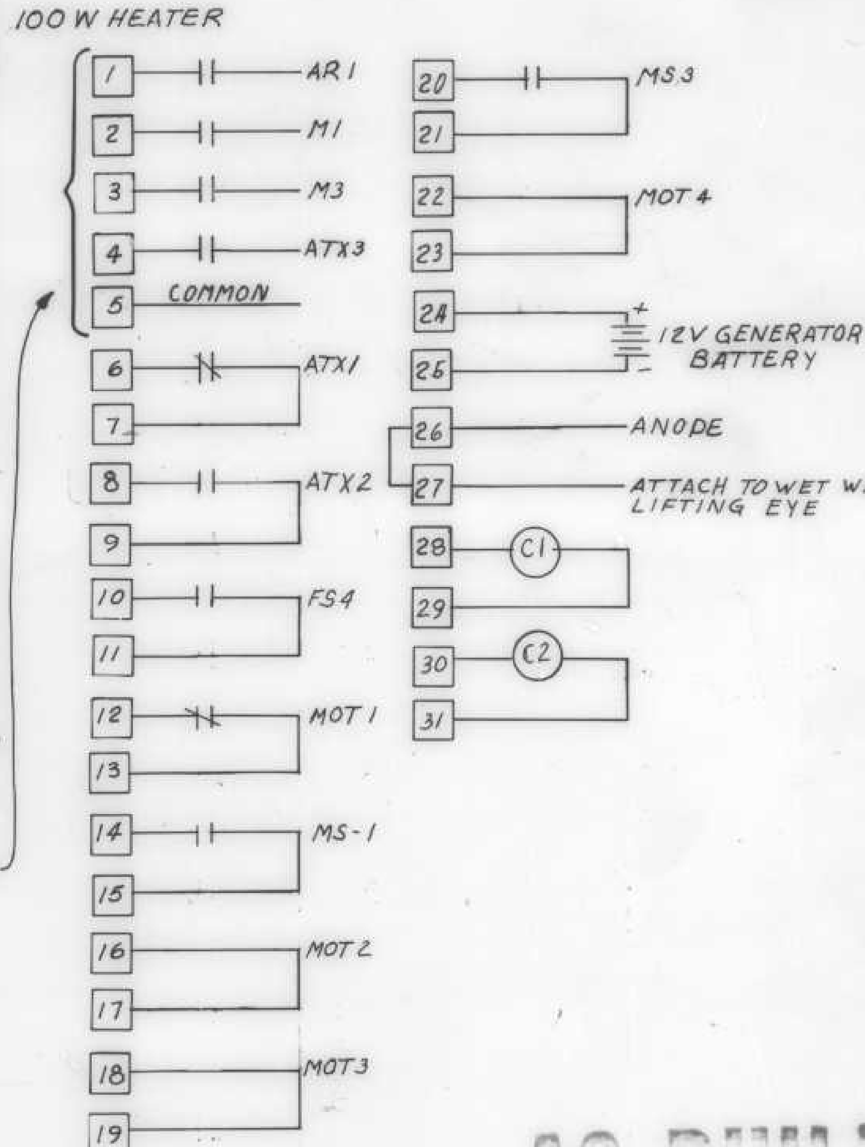
OPERATOR CONTROL PANEL

1. CONTROL POWER
2. WET WELL LEVEL
3. SET #1
4. AUTO
5. AUTO
6. SET #2
7. RUNNING
8. LEAD
9. ALTERNATOR
10. LEAD
11. RUNNING
12. HIGH WATER
13. M1 OVERLOAD
14. M2 OVERLOAD
15. M1 MOISTURE SENSOR
16. M3 OVERLOAD
17. M4 OVERLOAD
18. M3 MOISTURE SENSOR
19. GENERATOR - FAIL TO START
20. RESET
21. RESET - GENERATOR ONLY

PHENOLIC NAME PLATES



CONTROL DIAGRAM



CONTROL PANEL TERMINAL STRIP

NOTES:
1. ALL INDICATING LIGHTS SHALL BE PUSH TO TEST.
2. ALL CIRCUTRY SHALL BE WIRED RELAYS, NOT PROGRAMMABLE ELECTRONIC, EXCEPT AS NOTED IN THE SPECIFICATIONS.

ALARM LEGEND

AR1 - HIGH WATER ALARM
AR2 - M1 OVERLOAD
AR3 - M2 OVERLOAD
AR4 - M1 MOISTURE SENSOR
AR5 - M3 OVERLOAD
AR6 - M4 OVERLOAD
AR7 - M3 MOISTURE SENSOR
AR8 - GENERATOR FAILED TO START

AS BUILT

DRAWN BY RAW DESIGN BY ELM
CHECK BY MGT
BY [signature] 23237

REVISION	DATE	DESCRIPTION

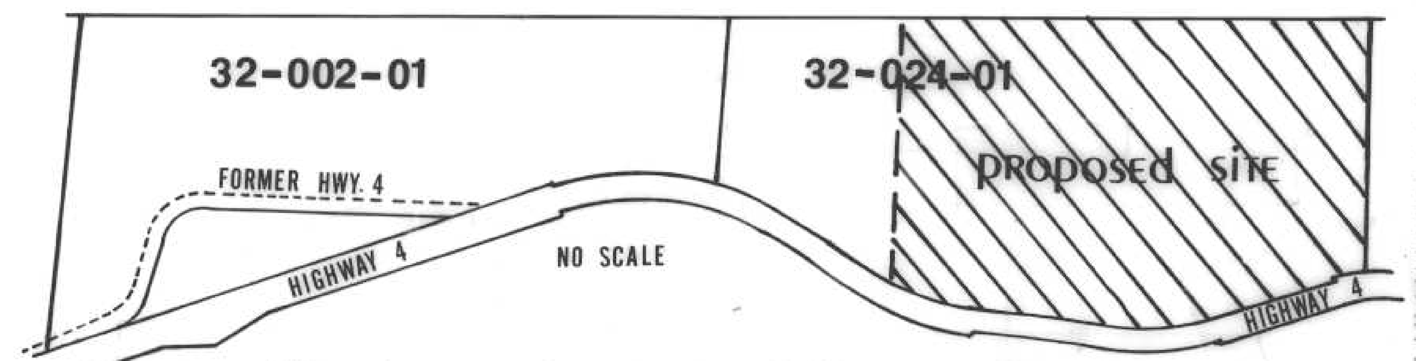
RVA RAYMOND VAIL AND ASSOCIATES
ENGINEERING • PLANNING • SURVEYING
SACRAMENTO, CALIFORNIA 1410 Ethan Way 95825

ARNOLD WASTEWATER PROJECT
PUMP STATION NO. 3
ELECTRICAL DIAGRAMS

DATE AUG 1984
SCALE
HORIZONTAL
VERTICAL
W.O. NO. 4391.03

SHEET 43 OF 43 SHEETS

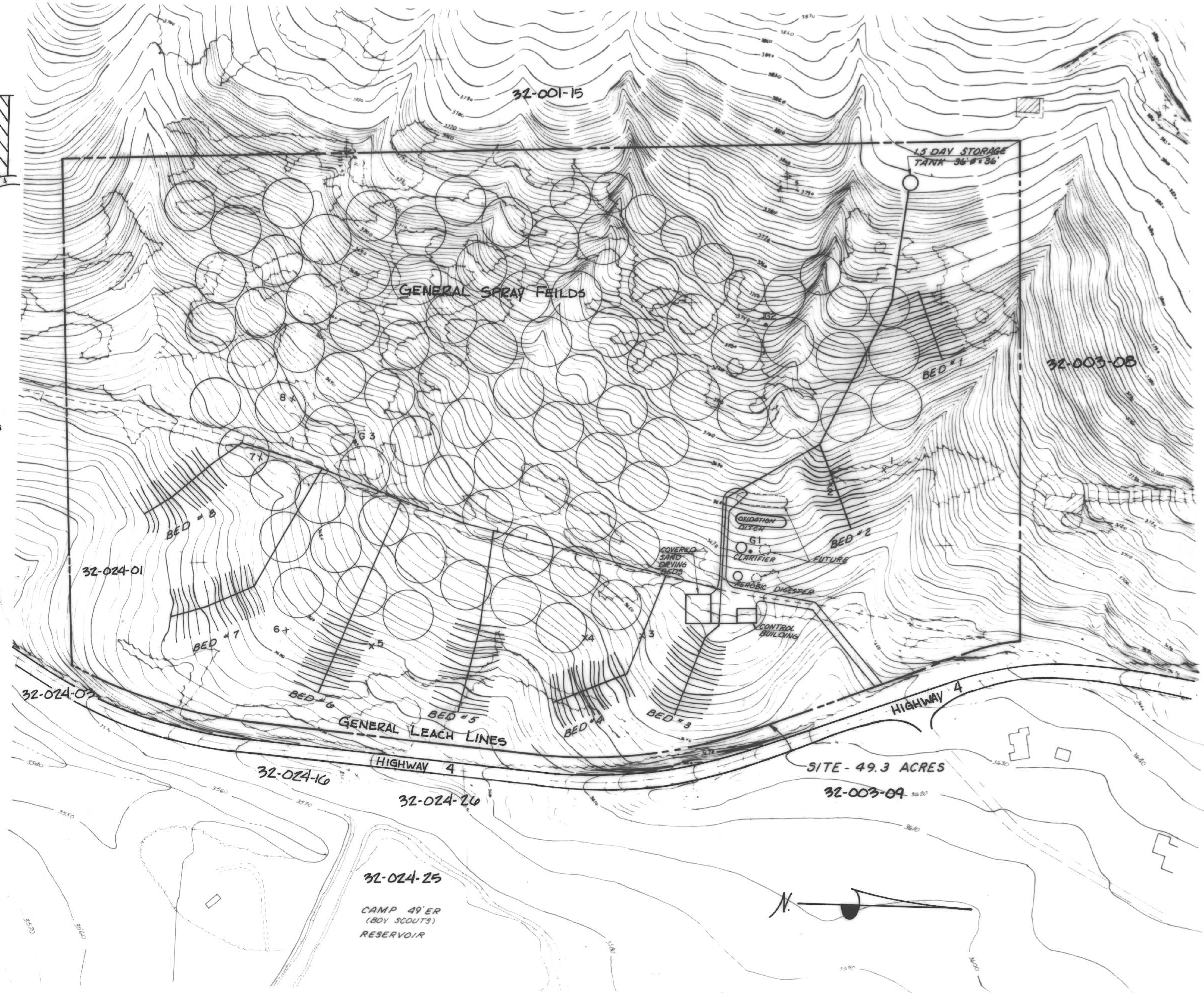
FILE NO. D-0217

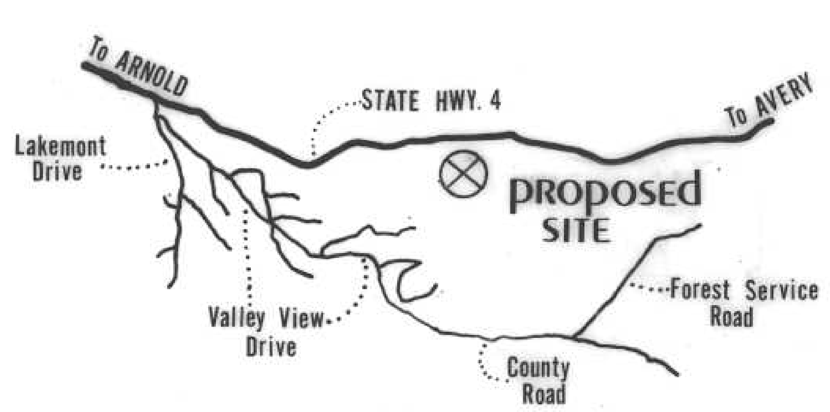


Site in relation to total Noss ownership

NOTES

1. Slopes average 15%-20%
2. Item to be determined during the design phase:
   A. Location of all utility easements, parking facilities
   B. Location of all fences
   C. Location of solid waste storage
   D. Location of exterior lighting
   E. Location of new landscaping, snow removal storage areas
   F. Mature trees that will be removed or retained
   G. Off-structure and On-structure signs
3. A blow-up of the treatment plant site may be found on page 84 of July 1983 Project Report.
4. Exact location & number of leach lines & spray area to be determined by engineer.





VICINITY MAP
NO SCALE

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CHECK BY ______			SITE CONDITIONS	SCALE HORIZONTAL 1"=100' VERTICAL ______
BY ______ R.C.E. ______				W.O. NO. ______
				SHEET ___ OF ___ SHEETS

FILE NO D-0217

ARNOLD STP
SITE TOPO

D-0217

Arnold Wastewater Treatment Facility
Photographs

Arnold WWTF Oxidation Ditch

Secondary Clarifier, Filter Feed Pump Pump Station, RAS/WAS Pump Station
Aerobic Digesters in Distance

Secondary Clarifier


Filter Feed Pump Station – Pumps No. 1 and 2


Aerobic Digester No. 2