City of Pinole

Pinole/Hercules WPCP Project

Technical Memorandum 15

Hydraulic Profile

March 1, 2013

PRELIMINARY
FOR REVIEW ONLY

Prepared under the responsible charge of

Craig Olson
39819

2365 Iron Point Road, Suite 300
Folsom, CA 95630

Contents

Figures

Tables

TM 15 – HYDRAULIC PROFILE

Pinole/Hercules WPCP Project ***March 1, 2012***

Reviewed by: Craig Olson, P.E., Mallika Ramanathan, P.E.

Prepared by: Rob Natoli, P.E.

Executive Summary

Purpose

The purpose of this technical memorandum (TM) is to prepare a detailed hydraulic profile analysis for the proposed process upgrades at the Pinole/Hercules Water Pollution Control Plant (WPCP). Additionally this TM will outline proposed modifications to address hydraulic issues.

Background

The WPCP was issued a renewed National Pollution Discharge Elimination System (NPDES) permit in August 2012, which contains new treatment and discharge requirements that become effective in 2017. Upgrades to the Headworks, secondary treatment and disinfection system are needed to meet renewed permit requirements. These upgrades will change the hydraulic capacity of the WPCP. This TM presents the hydraulic analysis of flow conditions developed in TM 1 and treatment scenarios developed in TM 8.

Conclusions

HDR reviewed four hydraulic scenarios:

- Average Dry Weather Flow (ADWF)
- Maximum Month Flow (MMF)
- Maximum Day Flow (MDF)
- Peak Wet Weather Flow (PWWF)

The existing primary clarifiers and Secondary Clarifier Distribution Box do not have capacity to handle wet weather flows. To mitigate hydraulic issues, flows greater than 12 million gallons per day (mgd) will bypass the primary clarifiers and discharge to the Primary Effluent Junction Box. A new Secondary Clarifier Distribution Box will be constructed to split flow between five secondary clarifiers. Weirs at both primary and secondary clarifiers will be reinstalled to confirm they are at the required elevation. Following construction of the upgrades the secondary system will be able to treat up to 20-

mgd. The costs for the hydraulic improvements discussed in this TM are included in the design costs for the upgrades treatment process they are most closely related to.

Introduction

Hydraulic analyses were performed to model proposed upgrades to the WPCP to determine if the proposed plant modifications will significantly alter the hydraulic profile of the plant. The NPDES permit requires that all influent flows receive secondary treatment prior to disinfection and discharge to the San Pablo Bay. Currently, the secondary treatment system does not have the hydraulic capacity to treat flows above approximately 11 mgd.

HDR used Visual Hydraulics, a commercial software program, to analyze the future hydraulic profiles. This model was developed using existing plant information and proposed dimensions and elevations for new plant processes. The following sections contain the design criteria used for the hydraulic analysis, a description of the hydraulic analysis and flow scenarios, hydraulic profile figures and a summary of the hydraulic modeling results.

Design Criteria

The following sections provide the design criteria that are used in the development of the WPCP hydraulic profile for the WPCP upgrades project.

Design Flows

The basis of hydraulic design flows were developed in TM 1. Flow scenarios include the ADWF, MMF, MDF, and PWWF. Table 15-1 presents the flow components for each design scenario. A description of each flow component can be found in TM 1.

Table 15-1. Design Flow Scenarios

Flow Component	ADWF (mgd)	MMF (mgd)	MDF (mgd)	PWWF (mgd)	Comment
Combined Influent Flow	4.06	6.09	11.3	20	
Return Activated Sludge (RAS)	3.25	4.87	5.65	10.00	80% of Influent, 50% during storm events
Mixed Liquor Recycle (MLR)	8.12	12.18	22.6	0	200% of Influent, no recycle during PWWF
Disinfected Effluent Flow	4.06	6.09	11.3	20	

Process Units in Service

The number of process units in service varies with the flow scenario. During ADWF at least one process unit from each treatment process was modeled as offline to ensure that a unit can be out of service for maintenance and cleaning. Table 15-2 provides a list of the major unit processes modeled and the number of units in service under each flow scenario.

Table 15-2. Number of Units in Service

Unit Process	ADWF	MMF	MDF	PWWF	Comment
Primary Clarifier Distribution Box	1	1	1	1	When influent exceeds 12-mgd, remaining flow is by-passed around the primary clarifiers
Primary Clarifiers	2	3	3	3	Hydraulic capacity of 12-mgd
Primary Effluent Junction Box	1	1	1	1	
Aeration Basins	1	2	2	2	Contact stabilization is utilized during storm events
Secondary Clarifier Distribution Box	1	1	1	1	
Secondary Clarifiers	4	5	5	5	Per new NPDES Permit all flow must receive secondary treatment
Chlorine Contact Basins	1	2	2	2	

Each flow scenario routes specific volumes of flow through each unit process. During ADWF, MMF, and MDF the biological treatment system will operate in a Modified Ludzack-Ettinger (MLE) configuration, with internal mixed liquor recycle. During storm events (prior to and during PWWF), the biological treatment system will operate in contact stabilization mode. This is necessary to stabilize the treatment process during high flow. Table 15-3 provides a list of flows modeled through each unit process for each of the flow scenarios.

Table 15-3. Flow Modeled Through Each Unit Process

Unit Process	ADWF	MMF	MDF	PWWF	Comment
Primary Clarifier Distribution Box	4.06	6.09	11.3	12	By-pass of Primary Clarifiers occurs when flows surpass 12-mgd
Primary Clarifier No. 2	1.35	2.03	3.77	4.00	
Primary Effluent Junction Box	7.31	10.96	16.95	20.00	RAS returned to AB Zone A During Storm Events
Aeration Basin 3/4	15.43	11.57	19.78	30.00	Contact Stabilization Mode
Secondary Clarifier Distribution Box	7.31	10.96	16.95	30.00	Distribution box weirs are fully submerged at all flow conditions.
Secondary Clarifier No. 2	2.41	3.62	5.59	9.90	
Chlorine Contact Basin No. 1	2.03	3.05	5.65	10.00	

The hydraulic profile calculations were completed using the longest hydraulic path to achieve conservative results. The ADWF, MMF, and MDF patterns are outlined in Figure 15-1. The following unit processes were used: Chlorine Contact Basin No. 1, Secondary Clarifier No. 2, Aeration Basin 3/4, and Primary Clarifier No. 2. The PWWF pattern is outlined in Figure 15-2.

LEGEND:
- INFLUENT FLOW
- RAS FLOW
- MIXED LIQUOR RECYCLE

1" = 30'

SECONDARY CLARIFIER DISTRIBUTION BOX WEIR ELEV = 110.00 FT

PARCEL 5b
4958 or 483
CONTRA COSTA COUNTY FLOOD CONTROL

10" RAS TO AB #1 AND #4

AERATION BASINS

REPLACE RAS/WAS PUMPS, REHAB PS-1

SECONDARY CLARIFIER #4

SECONDARY CLARIFIER #3

SECONDARY CLARIFIER #5

AB #4

AB #3

AB #2

AB #1

ODOR CONTROL

SLUDGE STORAGE

EXISTING 24" SE

10" RAS TO AB No. 1

DIGESTER #3

DIGESTER #4

65 FT DIAMETER SECONDARY CLARIFIER #2

65 FT DIAMETER SECONDARY CLARIFIER #1

CO-GEN

42" AERATION BASIN INFLUENT

SOLIDS HANDLING BUILDING

NEW 6" WAS TO SOLIDS HANDLING

DIGESTER #1

DIGESTER #2

PARCEL 5b
4958 or 483
CONTRA COSTA COUNTY FLOOD CONTROL

EFFLUENT WEIR ELEV 107.15 FT

CHLORINE CONTACT BASIN

#1

#2

PRIMARY CLARIFIER #1

PRIMARY CLARIFIER DISTRIBUTION BOX W/ WEIR ELEV 117.00 FT

INTERCEPTOR MANHOLE

CITY OF HERCULES INFLUENT SEWER

30" EMERGENCY OUTFALL

45 FT DIAMETER PRIMARY CLARIFIER #3

BLOWER BUILDING

REPLACE EXISTING BLOWERS

PRIMARY EFFLUENT

EMERGENCY OUTFALL STRUCTURE

PRIMARY EFFLUENT JUNCTION BOX

HYPOCHLORITE/BISULFITE STORAGE AND DOSING

CONTROL BUILDING

INTERCEPTOR MANHOLE

PRIMARY CLARIFIER #2

EFFLUENT PUMP STATION

CITY OF PINOLE INFLUENT SEWER

INVERT ELEVATION 97.00

36" RCP SEWER

PLANT DRAIN

OUTFALL PIPELINE – TO DEEP WATER OUTFALL

WPCP DEED LINE

30" BYPASS

30" INFLUENT

PROPOSED INFLUENT PUMPING STATION, HEADWORKS, AND GRIT SCREENING FACILITY

0 1" 2"

PINOLE/HERCULES WPCP PROJECT

ADWF/MMF/MDF – FLOW PATH

HDR

Figure 15-1

G:\pwworking\sac\d0436859\Figure 15-1.dwg
03-01-13 RMKOLL 12:14:42

LEGEND:
- INFLUENT FLOW
- RAS FLOW
- BYPASS FLOW

1" = 30'

SECONDARY CLARIFIERS
RAS TO ZONE A
SECONDARY CLARIFIER DISTRIBUTION BOX
AERATION BASINS FOR BIOLOGICAL NUTRIENT REMOVAL
RAS FLOW
SECONDARY CLARIFIER #4
SECONDARY CLARIFIER #3
SECONDARY CLARIFIER #5
RAS/WAS PUMPS
65 FT DIAMETER SECONDARY CLARIFIER #2
65 FT DIAMETER SECONDARY CLARIFIER #1
DIGESTER GAS FLARE
ODOR CONTROL
SLUDGE BLENDING
DIGESTER #3
DIGESTER #4
SOLIDS HANDLING BUILDING
CORPORATION YARD BUILDING
CO-GEN
MAINTENANCE SHOP
MAINTENANCE SHOP AND ELECTRICAL ROOM
DIGESTER #1
DIGESTER #2
CHLORINE CONTACT BASIN
30" EMERGENCY OUTFALL
PRIMARY CLARIFIER #1
45 FT DIAMETER PRIMARY CLARIFIER #3
BLOWERS
BLOWER BUILDING
INTERCEPTOR MANHOLE
BLOWER BUILDING AND EMERGENCY GENERATOR
HERCULES FLOWMETER MANHOLE
CITY OF HERCULES INFLUENT SEWER
EMERGENCY OUTFALL STRUCTURE
PRIMARY EFFLUENT JUNCTION BOX
PRIMARY SLUDGE PUMPS
PRIMARY CLARIFIER #2
HYPOCHLORITE/BISULFITE STORAGE AND DOSING
CONTROL BUILDING
INTERCEPTOR MANHOLE
CITY OF PINOLE INFLUENT SEWER
FENCE LINE
FENCE LINE
NEW ELECTRICAL BUILDING
EFFLUENT PUMP STATION
PINOLE FLOWMETER MANHOLE
OUTFALL PIPELINE – TO DEEP WATER OUTFALL
WPCP PROPERTY LINE
30" BYPASS
30" INFLUENT
PROPOSED INFLUENT PUMPING STATION, HEADWORKS, AND GRIT FACILITY

0 1" 2"

PINOLE/HERCULES WPCP PROJECT

PWWF – FLOW PATH

HDR

Figure 15–2

C:\Dwworking\acad\d0436859\Figure 15-2.dwg
03-01-13 RNAIDU 12:15:20

The starting water surface elevation for each flow scenario is calculated as the headloss over the effluent weir in Chlorine Contact Basin. The 2002 Secondary Clarifier Expansion record drawings indicate that the weir elevation is set at 107.15 ft. The final upstream elevation is set at the Primary Clarifier Distribution Box. Weir elevations in this box are manually set with stop logs. For the purpose of this analysis the weir Primary Clarifier Distribution Box weir elevation was assumed to be 117.00 ft.

Hydraulic Analysis

Four flow patterns were analyzed for this TM, ADWF scenario, MMF scenario, MDF scenario, and the PWWF scenario. All reference elevations for the models are based on the 1929 Datum per the 1971 WPCF drawings. (Yoder – Trotter – Orlob & Associates). A hydraulic profile of the proposed plant upgrades is provided in Figure 15-3. A detailed hydraulic element list for each flow scenario is provided in Appendix A. Descriptions of each flow pattern are presented in the following paragraphs.

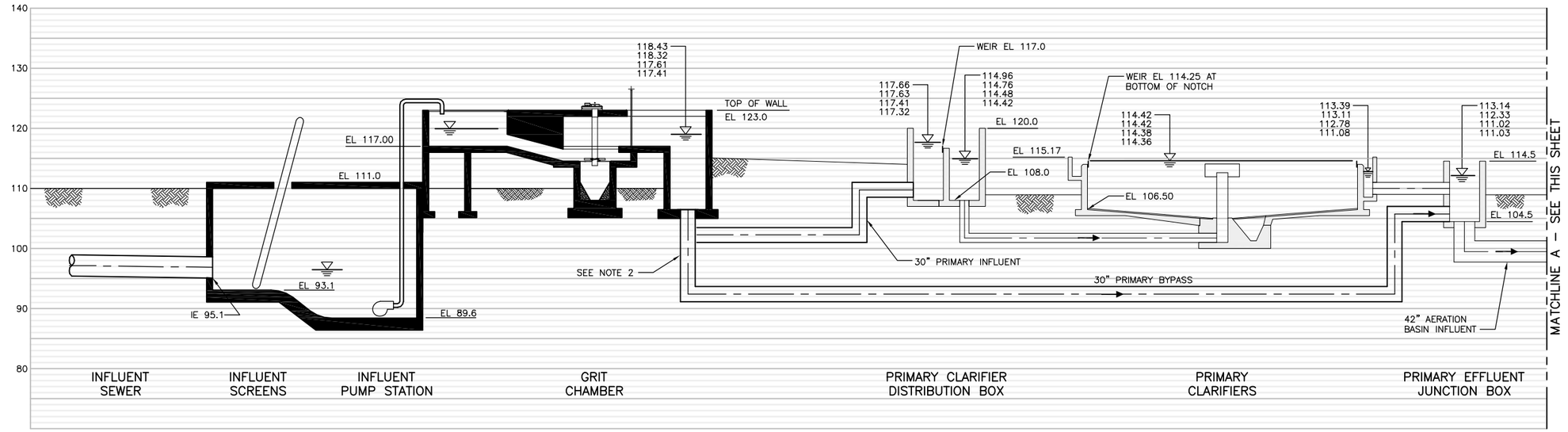
ADWF Scenario

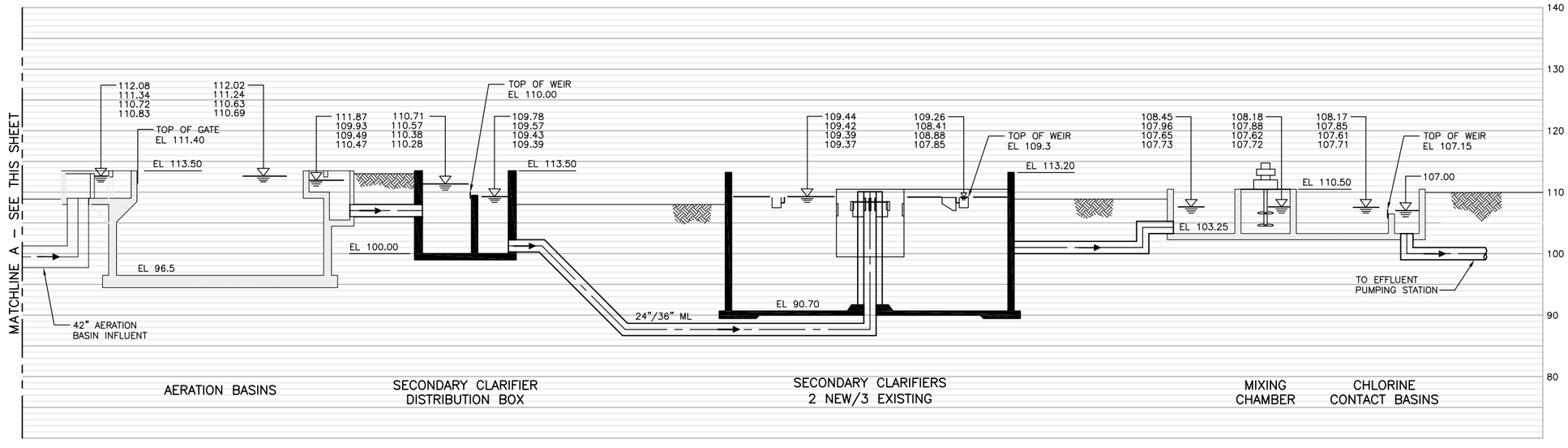
Figure 15-1 illustrates the flow path for this flow scenario. Raw sewage from the Headworks is pumped to Primary Clarifier Distribution Box where it flows over one of three weirs to each of the Primary Clarifiers. Flow from the primary clarifiers is combined in the Primary Effluent Junction Box, where it is mixed with Return Activated Sludge (RAS) pumped from the secondary clarifiers.

Primary effluent and RAS flow by gravity through a 42-in diameter reinforced concrete pipe to the aeration basins. During ADWF, all flow will be routed to a single aeration basin train. Flow enters the aeration basins through a 36-in downward opening sluice gate. The basins operate in a wrap-around configuration with an internal MLR. Mixed liquor exits the center aeration basins through a 36-in gate and is conveyed by gravity to the Secondary Clarifier Distribution Box through a 30-in diameter concrete pipe.

Mixed liquor is split in the Secondary Clarifier Distribution Box by a series of weirs dedicated to each of the five secondary clarifiers. The new distribution box will consist of five weirs. Two of the five weirs are 7-ft long to feed new Secondary Clarifiers No. 1 and No. 2; the remaining three weirs are 2.5-ft long to feed existing Secondary Clarifiers No. 3, No. 4, and No. 5. This allows more flow to enter the larger 65-ft diameter clarifiers.

Flow feeding Secondary Clarifier No. 2 cascades over the weir and enters a drop box that feeds a 36-IN pipe. The pipe enters the clarifier through the center well, and exits through a peripheral v-notch weir. The effluent launders feed a drop box and 36-IN effluent pipe.





NOTES:

1. ENERGY GRADE LINE ELEVATIONS ARE SHOWN AS FOLLOWS:

   PEAK WET WEATHER FLOW (PWWF)
   MAXIMUM DAY FLOW (MDF)
   MAXIMUM MONTH FLOW (MMF)
   AVERAGE DRY WEATHER FLOW (ADWF)

2. FLOWS ABOVE 12 MGD WILL BYPASS THE PRIMARY CLARIFIERS.
3. REFER TO FIGURES 15–1 AND 15–2 FOR THE FLOW PATH OF EACH SCENARIO.
4. REFER TO TABLE 15–1 FOR INFLUENT, RAS, MLR, AND EFFLUENT FLOW RATES IN EACH FLOW SCENARIO.
5. REFER TO TABLE 15–2 FOR THE NUMBER OF PROCESS UNITS ONLINE IN EACH FLOW SCENARIO.
6. WATER SURFACE ELEVATIONS IN THE INFLUENT PUMP STATION ARE DICTATED BY PUMP LEVEL CONTROL. REFER TO TM 5/6 FOR ADDITIONAL DETAILS ON THE HEADWORKS HYDRAULICS.

PINOLE/HERCULES WPCP PROJECT

HYDRAULIC PROFILE

0 1" 2"

HDR

Figure 15–3

C:\pwworking\sac\d0436859\FIGURE 15-3.dwg
03-01-13 RMADLI 12:17:02

Secondary effluent combined from all clarifiers enters a 42-in common header and is conveyed to the Chlorine Contact Basin for disinfection. Following disinfection, treated effluent passes over an effluent weir and into a 36-in effluent pipe to the Outfall Junction Structure. From the Outfall Junction Structure flows are diverted to the Effluent Pump Station or to the Emergency Outfall.

MMF and MDF Scenarios

The MMF and MDF scenarios are operated in a similar fashion the ADWF scenario; however, two aeration basins are online, as well as all primary and Secondary Clarifiers and both Chlorine Contact Basins. In the MDF scenario the RAS recycle is reduced to 50 percent of the influent flow as listed in Table 15-1.

PWWF Scenario

Figure 15-2 illustrates the flow path for the PWWF scenario. At PWWF the influent flow exceeds the hydraulic capacity of the primary clarifiers. Approximately 12 mgd will pass through the primary clarifiers and the remaining 8 mgd will flow from the Headworks directly to the Primary Effluent Junction Box. The biological treatment process will change to operate in contact stabilization mode.

In contact stabilization mode, RAS will be pumped directly to the aeration basins rather than to the Primary Effluent Junction Box. RAS will enter Aeration Basin Zone 1 through the existing 36-in downward opening sluice gate. Primary Effluent will flow through the 42-in diameter pipe, and enter the mixed liquor channel for Aeration Basin 3. Metal stop gates will be reconfigured so flow is conveyed down the existing step feed channel between Aeration Basins 1 and 2 and Aeration Basins 3 and 4. Flow will exit the step feed ports into Zones D and E. Aeration Basin zones are described in more detail TM 8. At PWWF the MLR pumps will be turned off and no internal recycle will occur.

Flow exits the aeration basins through the 36-in sluice gate and enters the Secondary Clarifier Distribution Box. To provide adequate flow split at PWWF, the weirs in the distribution box will be set at 110.00-ft. This analysis assumes the existing secondary clarifier weirs will be reinstalled, and the invert elevation raised 1.5-in to 109.3-ft. Flow follows the same path as described in the ADWF scenario for the remainder of the treatment process.

Recommended Project

Output from the Visual Hydraulics model is presented in Appendix B. The construction of a new Secondary Clarifier Distribution Box and two new Secondary Clarifiers will allow the WPCP to operate at all flow scenarios with no hydraulic issues. At least 1-ft of clearance between the water surface elevation and the top of the concrete is provided for each process unit at all flow conditions. The invert of the primary clarifier weirs is adequate; however, HDR recommends that the elevation be field verified as part of the construction project. Table 15-4 provides a list of design considerations for each hydraulic unit process.

Table 15-4. Unit Process Design Constraints

Unit Process	Comment
Primary Clarifier Distribution Box	• No modifications necessary
Primary Clarifiers	• Weir elevations field verified and reset if needed • By-pass flows at 12 mgd
Primary Effluent Junction Box	• Junction box provides mixing of RAS and primary effluent prior to biological treatment • At PWWFs RAS will not enter the junction box
Aeration Basins	• Step feed ports will need to be open/retrofitted • Operates in contact stabilization mode at during large storm events • RAS pumped to Zone A • Primary effluent enters basin at Zone D/E • 30-IN effluent pipe will be replaced with 36-IN pipe to minimize headloss.
Secondary Effluent Junction Box	• New box will provide correct flow split to five secondary clarifiers • New box will limit the headloss through the secondary system
Secondary Clarifiers	• Weir elevations will be raised to 109.30-FT, to handle 20 mgd • Two new 65-FT diameter clarifiers will be constructed to handle 60 percent of the flow.
Chlorine Contact Basin	• Re-use existing infrastructure, no hydraulic modifications

There are no costs included in this TM for the recommended improvements. The costs for the discussed improvements are included in the TMs for the associated treatment process.

Appendix A. Pinole/Hercules WPCP Hydraulic Element List

HYDRAULIC ELEMENTS LIST -ADWF

Pinole/Hercules WPCP Predesign

FACILITY	DWG. NO.	COMPONENT	ELEVATIONS*			DIMENSIONS					LOSSES	FLOW						COMMENTS/OPERATION
												Average Dry Weather Flow						
			WSE (ft)	TOP / ROOF (ft)	INVERT (ft)	LENGTH	DIAMETER	WIDTH	SLOPE (ft/ft)	DEPTH		FORWARD FLOW	PERCENT (%)	RAS FLOW	PERCENT (%)	MLS FLOW	PERCENT (%)	
Chlorine Contact Basin	2002 SC G-4	Effluent Weir	107.71		107.15	4.50						2.03	50%					
	1971 WPCF M-55.4	Basin	107.72	110.50	103.25	140.0 ft		4.0 ft			6 - 180 deg Bends 1-90 deg Bend	2.03	50%					
	1971 WPCF M-55.4	Slide Gate			103.25			24.0 in		36.0 in		2.03	50%					
	1971 WPCF M-55.4	Influent Box	107.73		103.25	8.0 ft		4.0 ft				4.06	100%					
	Figure C	42 - IN SCE				116.0 ft	42.0 in				3-90 deg bends Exit	4.06	100%					New Pipeline
	Figure C	SC #1 Effluent Connection	107.75				24.0 in				Wye 24" to 42"							
Secondary Clarifier # 1	Not yet produced	SC # 1 30" Effluent Pipe				70 ft	30.0 in				Entrance 2-90 deg Bends	1.22	30%		30%			30% to each new SC (1,2), 14% to each old SC (3,4,5) Assumptions made for design of a 65' Ø central feed / peripheral take off clarifier, with v notch weir.90 deg V-Notches, spaced 4.5" O.C. = 529. 64' diameter No drawings produced yet
		SC # 1 Effluent Box			90	4 ft		4 ft										
		SC # 1 Effluent Launder	107.84		107	100 ft		1.0 ft	0.004			0.61	15%		30%			
	Weir Elv. Increased by 4"	SC # 1Effluent Weir	109.37		109.3							1.22	30%		30%			
		SC #1	109.37	112.00	90.00		65.0 ft		0.00522222	22.5 ft -22.03 ft		1.22	30%	0.97	30%			
		SC # 1 Inlet Ports		109.8 ft	106.00 ft			0.5 ft		2.5 ft	6 Inlet ports	1.22	30%	0.97	30%			
		SC #1 Influent Line		--		200 ft	24.0 in				2 - 90 deg bends 5 - 45 deg bends Entrance	1.22	30%	0.97	30%			
Secondary Clarifier Distribution Box	See TM	SC #2 Influent Box	109.39	113.50	100.00	3.0 ft		7.5		13.5 ft	High headloss over short weir	1.22	30%	0.97	30%			New splitter box required,
	See TM	Submerged Weir SC 5 Dist. Box Weir	110.28		110.00	7.0 ft						1.22	30%	0.97	30%			
	See TM	SC Distribution Box	110.28	113.50	100.00	9.0 ft		30.0 ft		13.50 ft		4.06	100%	3.25	100%			
AB # 3,4	Not yet produced	AB No. 3 36-IN Effluent				5.0 ft	36.0 in				exit 2 - 11.25 deg bends entrance	4.06	100%	3.25	100%			
	Not yet produced	AB No. 3 36-IN Gate			105.50		36.0 in											
	1983 Exp. S-4	AB 3 ML Drop Box	110.46	113.5 ft	105.5 ft	3.0 ft		3.0 ft		5.5 ft		4.06	100%	3.25	100%			
	1983 Exp. S-4	AB 3 ML Effluent Channel	110.47		109.25 ft	5.5 ft		3.0 ft		4.3 ft		4.06	100%	3.25	100%			High headloss
	1983 Exp. M-7	AB No. 3 - Effluent Sluice Gate			109.25 ft	--		36.0 in		30.0 in		4.06	100%	3.25	100%			Oriface DS control
	Figure 10	AB No. 3 Zone E	110.57		96.5 ft	95.0 ft		20.0 ft		17.0 ft		4.06	100%	3.25	100%	8.12	100%	190' is total length of Abs.
	Figure 10	Baffle Zone E to D			109.0 ft	--		20.0 ft		--		4.06	100%	3.25	100%	8.12	100%	
	Figure 10	AB No. 3 Zone D	110.60		96.5 ft	95.0 ft		20.0 ft		17.0 ft		4.06	100%	3.25	100%	8.12	100%	During MM flow conditions, 100% of influent is sent to Aeration Basins, 90% is RAS, and 145% is MLR.
	Figure 10	Baffle Zone D to C			109.0 ft	--		20.0 ft		--		4.06	100%	3.25	100%	8.12	100%	
	Figure 10	AB No. 4 Zone C	110.63		96.5 ft	130.0 ft		20.0 ft		17.0 ft		4.06	100%	3.25	100%	8.12	100%	
	Figure 10	Baffle Zone C to B			109.0 ft	--		20.0 ft		--		4.06	100%	3.25	100%	8.12	100%	
	Figure 10	AB No 4. Zone B	110.66		96.5 ft	30.0 ft		20.0 in		17.0 in		4.06	100%	3.25	100%	8.12	100%	
	Figure 10	Baffle Zone B to A			109.0 ft	--		20.0 ft		--		4.06	100%	3.25	100%	8.12	100%	
	1983 Exp. S-4	AB 4 Zone A	110.69		96.5 ft	30.0 ft		20.0 ft		17.0 ft		4.06	100%	3.25	100%	8.12	100%	
	1983 Exp. M-7	AB No. 4 - Influent Sluice Gate			110.00 ft	--		36.0 in		30.0 in	3 gates	4.06	100%	3.25	100%			3 gates modeled @ Inv 110.004
	1983 Exp. S-4	AB No. 4 Influent Channe	110.72		109.25 ft	4.0 ft		3.0 ft		4.0 ft		4.06	100%	3.25	100%			
	1983 Exp. S-4	AB No. 4 Sloped Channel			109.25 ft	5.3 ft		3.0 ft	0.141 ft			4.06	100%	3.25	100%			
	1983 Exp S-5	AB No. 3/4 Splitter Box/Channe	110.83		110.0 ft	12.0 ft		4.5 ft		3.0 ft	2 90-deg bends	4.06	100%	3.25	100%			High headloss
	1983 Exp.	42-IN RCP Influent Pipe AB No. 3/4				58.0 ft	42.0 in				exit 2 - 90 deg bends	4.06	100%	3.25	100%			
	1983 Exp.	42-IN RCP Tee Line to Branch	110.88				42.0 in				Tee	4.06	100%	3.25	100%			
Primary Effluent Junction Box	1971 EXP M 30.2	42-IN RCP PC Effluent Pipe to Junction Box				224 ft	45.0 in					4.06	100%	3.248	100%			May cause hydraulic issues if SC Dist. Box Weir Elve. Is raised
	1971 EXP M 30.2	PE Junction Box	111.03	114.5 ft	104.5 ft	16.5 ft		7.0 ft		10.0 ft		4.06	100%	3.248	100%			
Primary Clarifier #2	1983 - S.2	PC # 2 24 -IN RCP Effluent				120					4-45 deg bends 2-90 deg bends exit	1.34	33%					Pipe assumed to go all the way to the new PC#3
	1971 WPCF M 30.1	PC # 2 Effluent Box	111.03	116.00	112.00	4		1.5 ft				1.34	33%					
	1971 WPCF M 30.1	PC # 2 Effluent Trough/Launder			112.00	78		1.0 ft	-0.0094			0.67	17%					
	2002 SC G4	PC # 2 Effluent Weir			114.25	135						1.34	33%					V-notch weir 8" Spacing 90 deg angle, 212 notches Invert = 114.25
	1971 WPCF M 30.1	PC # 2 Basin	114.36		106.00		45.0 ft					1.34	33%					
	1971 WPCF M 30.1	PC # 2 18-IN Influent wel				7 ft	18.0 in											
	1971 WPCF M 30.1	PC # 2 24-In Influent				18 ft	24.0 in				90 bend Bend Exit Reducer 36" to 24"	1.34	33%					
	1971 WPCF M 30.1	36-In Influent pipe				32 ft	36.0 in				90 Bend Entrance	1.34	33%					
PC Flow Split Structure	1971 WPCF M 30.1	Drop Box to Primary Clarifier No.2	114.42			40.0 in		40.0 in				1.34	33%					Flow is pumped to this location.
	1971 WPCF M 30.2	Primary Clarifier Distribution Box Weir	117.32	120.00	117.00	4.0 ft						1.34	33%					

*All elevations on the 1929 Datum per 1971 WPCF Drawings

Drawing Sets Used to Develop Hydraulic Elements List

YEAR	DRAWING SET	Abbr.
2002	B&C Secondary Clarifier # 5 Expansion	2002 SC
1983	M&E Plant Expansion	1983 Exp.
1971	Yoder - Trotter - Orlob & Associates WPCF	1971 WPCF

Input Flows

CONDITION		FLOW (MGD)		
		INFLUENT	RAS	MLR
2010	Average	4.05	3.85	--
	Peak Wet Weather	10.00	5.00	--
2030	Average Dry Weather	4.06	3.25	8.12
	Maximum Month	6.09	4.87	12.18
	Maximum Day	11.30	10.74	13.56
	Peak Wet Weather	20.00	10.00	5.50

HYDRAULIC ELEMENTS LIST - MM

Pinole/Hercules WPCP Predesign

FACILITY	DWG. NO.	COMPONENT	ELEVATIONS*			DIMENSIONS					LOSSES	FLOW						COMMENTS/OPERATION
												Max Month Flow						
			WSE (ft)	TOP / ROOF (ft)	INVERT (ft)	LENGTH	DIAMETER	WIDTH	SLOPE (ft/ft)	DEPTH		FORWARD FLOW	PERCENT (%)	RAS FLOW	PERCENT (%)	MLS FLOW	PERCENT (%)	
Chlorine Contact Basin	2002 SC G-4	Effluent Weir			107.15	4.50						3.045	50%					
	1971 WPCF M-55	Basin		110.50	103.25	140.0 ft		4.0 ft			6 - 90 deg Bends	3.045	50%					
	1971 WPCF M-55	Slide Gate			103.25			24.0 in		36.0 in		3.045	50%					
	1971 WPCF M-55	Influent Box			103.25	8.0 ft		4.0 ft				6.09	100%					
	Figure C	42 - IN SCE				116.0 ft	42.0 in				Wye - Branch to line 3 - 90 deg bend Exit	6.09	100%					
	Figure C	SC #1 Effluent Connection					24.0 in				Wye 24" to 42"							
Secondary Clarifier # 1	Not yet produced	SC # 1 30" Effluent Pipe				70 ft	30.0 in				Entrance 2-90 deg Bends	1.83	30%		30%			30% to each new SC (1,2), 14% to each old SC (3,4,5) Assumptions made for design of a 65' Ø central feed / peripheral take off clarifier, with v notch weir.90 deg V-Notches, spaced 4.5" O.C. = 594. 63' diameter No drawings produced yet
		SC # 1 Effluent Box			90	4 ft		4 ft				1.83	30%					
		SC # 1 Effluent Launder			100	100 ft		1.0 ft	0.004			0.91	15%		30%			
	Weir Elv. Increased by 4"	SC # 1Effluent Weir			200							1.83	30%		30%			
		SC #1		112.00	90.00		65.0 ft		0.00522222	22.5 ft -22.03 ft		1.83	30%	1.46	30%			
		SC # 1 Inlet Ports		109.8 ft	106.00 ft			0.5 ft		2.5 ft	6 Inlet ports	1.83	30%	1.46	30%			
		SC #1 Influent Line		--		200 ft	24.0 in				2 - 90 deg bends 5 - 45 deg bends Entrance	1.83	30%	1.46	30%			
Secondary Clarifier Distributio n Box	See TM	SC # 1 Influent Box		113.50	100.00	3.0 ft		7.5		13.5 ft	High headloss over short weir	1.83	30%	1.46	30%			New splitter box required,
	See TM	Weir to SC #1			110.00	7.0 ft						1.83	30%	1.46	30%			
	See TM	SC Distribution Box		113.50	100.00	9.0 ft		30.0 ft		13.50 ft		6.09	100%	4.87	100%			
AB # 3,4	Not yet produced	AB No. 3 36-IN Effluent				5.0 ft	36.0 in				exit 2 - 11.25 deg bends entrance	3.045	50%	2.436	50%			
	Not yet produced	AB No. 3 36-IN Gate			105.50		36.0 in					3.045	50%	2.436	50%			
	1983 Exp. S-4	AB 3 ML Drop Box		113.5 ft	105.5 ft	3.0 ft		3.0 ft		5.5 ft		3.045	50%	2.436	50%			
	1983 Exp. S-4	AB 3 ML Effluent Channel			109.25 ft	5.5 ft		3.0 ft		4.3 ft		3.045	50%	2.436	50%			High headloss
	1983 Exp. M-7	AB No. 3 - Effluent Sluice Gate			109.25 ft	--		36.0 in		30.0 in		3.045	50%	2.436	50%			Oriface DS control
	Figure 10	AB No. 3 Zone E			96.5 ft	95.0 ft		20.0 ft		17.0 ft		3.045	50%	2.436	50%	6.09	50%	190' is total length of Abs.
	Figure 10	Baffle Zone E to D			109.0 ft	--		20.0 ft		--		3.045	50%	2.436	50%	6.09	50%	
	Figure 10	AB No. 3 Zone D			96.5 ft	95.0 ft		20.0 ft		17.0 ft		3.045	50%	2.436	50%	6.09	50%	During MM flow conditions, 100% of influent is sent to Aeration Basins, 90% is RAS, and 145% is MLR.
	Figure 10	Baffle Zone D to C			109.0 ft	--		20.0 ft		--		3.045	50%	2.436	50%	6.09	50%	
	Figure 10	AB No. 4 Zone C			96.5 ft	130.0 ft		20.0 ft		17.0 ft		3.045	50%	2.436	50%	6.09	50%	
	Figure 10	Baffle Zone C to B			109.0 ft	--		20.0 ft		--		3.045	50%	2.436	50%	6.09	50%	
	Figure 10	AB No 4. Zone B			96.5 ft	30.0 ft		20.0 in		17.0 in		3.045	50%	2.436	50%	6.09	50%	
	Figure 10	Baffle Zone B to A			109.0 ft	--		20.0 ft		--		3.045	50%	2.436	50%	6.09	50%	
	1983 Exp. S-4	AB 4 Zone A			96.5 ft	30.0 ft		20.0 ft		17.0 ft		3.045	50%	2.436	50%	6.09	50%	
	1983 Exp. M-7	AB No. 4 - Influent Sluice Gate			110.00 ft	--		36.0 in		30.0 in	3 gates	3.045	50%	2.436	50%			3 gates modeled @ Inv 110.004
	1983 Exp. S-4	AB No. 4 Influent Channel			109.25 ft	4.0 ft		3.0 ft		4.0 ft		3.045	50%	2.436	50%			
	1983 Exp. S-4	AB No. 4 Sloped Channel			109.25 ft	5.3 ft		3.0 ft	0.141 ft			3.045	50%	2.436	50%			
	1983 Exp S-5	AB No. 3/4 Splitter Box/Channel			110.0 ft	12.0 ft		4.5 ft		3.0 ft	2 90-deg bends	3.045	50%	2.436	50%			High headloss
	1983 Exp.	42-IN RCP Influent Pipe AB No. 3/4				58.0 ft	42.0 in				exit 2 - 90 deg bends	3.045	50%	2.436	50%			
	1983 Exp.	42-IN RCP Tee Line to Branch					42.0 in				Tee	3.045	50%	2.436	50%			
Primary Effluent Junction Box	1971 EXP M 30.2	42-IN RCP PC Effluent Pipe to Junction Box				224 ft	45.0 in				2-90deg bends entrance	6.09	100%	4.872	100%			May cause hydraulic issues if SC Dist. Box Weir Elve. Is raised
	1971 EXP M 30.2	PE Junction Box		114.5 ft	104.5 ft	16.5 ft		7.0 ft		10.0 ft		6.09	100%	4.872	100%			
Primary Clarifier #2	1983 - S.2	PC # 2 24 -IN RCP Effluent				120					4-45 deg bends	2.01	33%					Pipe assumed to go all the
	1971 WPCF M 30	PC # 2 Effluent Box		116.00	112.00	4		1.5 ft				2.01	33%					
	1971 WPCF M 30	PC # 2 Effluent Trough/Launder			112.00	78		1.0 ft	-0.0094			1.00	17%					
	2002 SC G4	PC # 2 Effluent Weir			114.25	135						2.01	33%					V-notch weir 8" Spacing 90 deg angle, 212 notches
	1971 WPCF M 30	PC # 2 Basin			106.00		45.0 ft					2.01	33%					
	1971 WPCF M 30	PC # 2Influent well				7 ft	18.0 in					2.01	33%					
	1971 WPCF M 30	PC # 2 24-In Influent				18 ft	24.0 in				90 bend Bend Exit Reducer 36" to 24"	2.01	33%					
	1971 WPCF M 30	36-In Influent pipe				32 ft	36.0 in				90 Bend Entrance	2.01	33%					
PC Flow Split Structure	1971 WPCF M 30	Drop Box to Primary Clarifier No.2			108.00	40.0 in		40.0 in				2.01	33%					Flow is pumped to this location.
	1971 WPCF M 30	Primary Clarifier Distribution Box Weir		120.00	117.00	4.0 ft						2.01	33%					

*All elevations on the 1929 Datum per 1971 WPCF Drawings

Drawing Sets Used to Develop Hydraulic Elements List

YEAR	DRAWING SET	Abbr.
2002	B&C Secondary Clarifier # 5 Expansion	2002 SC
1983	M&E Plant Expansion	1983 Exp.
1971	Yoder - Trotter - Orlob & Associates WPCF	1971 WPCF

Input Flows

CONDITION		FLOW (MGD)		
		INFLUENT	RAS	MLR
2010	Average	4.05	3.85	--
	Peak Wet Weather	10.00	5.00	--
2030	Maximum Month	6.09	4.87	12.18
	Maximum Day	11.30	10.74	13.56
	Peak Wet Weather	20.00	10.00	5.50

HYDRAULIC ELEMENTS LIST - MD

Pinole/Hercules WPCP Predesign

FACILITY	DWG. NO.	COMPONENT	ELEVATIONS*			DIMENSIONS					LOSSES	FLOW						COMMENTS/OPERATION
												Max Day Flow						
			WSE (ft)	TOP / ROOF (ft)	INVERT (ft)	LENGTH	DIAMETER	WIDTH	SLOPE (ft/ft)	DEPTH		FORWARD FLOW	PERCENT (%)	RAS FLOW	PERCENT (%)	MLS FLOW	PERCENT (%)	
Chlorine Contact Basin	2002 SC G-4	Effluent Weir			107.15	4.50						5.65	50%					
	1971 WPCF M-55	Basin		110.50	103.25	140.0 ft		4.0 ft			6 - 90 deg Bends	5.65	50%					
	1971 WPCF M-55	Slide Gate			103.25			24.0 in		36.0 in		5.65	50%					
	1971 WPCF M-55	Influent Box			103.25	8.0 ft		4.0 ft				11.3	100%					
	Figure C	42 - IN SCE				116.0 ft	42.0 in				Wye - Branch to line 3 - 90 deg bend Exit	11.3	100%					
	Figure C	SC #1 Effluent Connection					36.0 in				Wye 24" to 42"							
Secondary Clarifier # 1	Not yet produced	SC # 1 36" Effluent Pipe				70 ft	36.0 in				Entrance 2-90 deg Bends	3.39	30%		30%			30% to each new SC (1,2), 14% to each old SC (3,4,5) Assumptions made for design of a 65' Ø central feed / peripheral take off clarifier, with v notch weir.90 deg V-Notches, spaced 4.5" O.C. = 594. 63' diameter No drawings produced yet
		SC # 1 Effluent Box			90	4 ft		4 ft				3.39	30%					
		SC # 1 Effluent Launder			107	100 ft		1.0 ft	0.004			3.39	30%					
	Weir Elv.	SC # 1Effluent Weir			109.3							1.70	15%		15%			
		SC #1		112.00	90.00		65.0 ft		0.00522222	22.5 ft -22.03 ft		3.39	30%		30%			
		SC # 1 Inlet Ports		109.8 ft	106.00 ft			0.5 ft		2.5 ft	6 Inlet ports	3.39	30%	2.71	30%			
		SC #1 Influent Line		--		200 ft	36.0 in				3-45 bends	3.39	30%	2.71	30%			
												3.39	30%	2.71	30%			
Secondary Clarifier Distribution Box	See TM	SC #2 Influent Box		113.50	100.00	3.0 ft		7.5		13.5 ft		3.39	30%	2.71	30%			New splitter box required,
	See TM	Submerged Weir SC 5 Dist. Box Weir			110.00	7.0 ft					High headloss over short weir	3.39	30%	2.71	30%			
	See TM	SC Distribution Box		113.50	100.00	9.0 ft		30.0 ft		13.50 ft		11.30	100%	9.04	100%			
AB # 3,4	Not yet produced	AB No. 3 36-IN Effluent				5.0 ft	36.0 in				exit 2 - 11.25 deg bends entrance	5.65	50%	4.52	50%			
	Not yet produced	AB No. 3 36-IN Gate			105.50		36.0 in					5.65	50%	4.52	50%			
	1983 Exp. S-4	AB 3 ML Drop Box		113.5 ft	105.5 ft	3.0 ft		3.0 ft		5.5 ft		5.65	50%	4.52	50%			
	1983 Exp. S-4	AB 3 ML Effluent Channel			109.25 ft	5.5 ft		3.0 ft		4.3 ft		5.65	50%	4.52	50%			High headloss
	1983 Exp. M-7	AB No. 3 - Effluent Sluice Gate			109.25 ft	--		36.0 in		30.0 in		5.65	50%	4.52	50%			Oriface DS control
	Figure 10	AB No. 3 Zone E			96.5 ft	95.0 ft		20.0 ft		17.0 ft		5.65	50%	4.52	50%	11.3	50%	190' is total length of Abs.
	Figure 10	Baffle Zone E to D			109.0 ft	--		20.0 ft		--		5.65	50%	4.52	50%	11.3	50%	
	Figure 10	AB No. 3 Zone D			96.5 ft	95.0 ft		20.0 ft		17.0 ft		5.65	50%	4.52	50%	11.3	50%	During MM flow conditions, 100% of influent is sent to Aeration Basins, 90% is RAS, and 145% is MLR.
	Figure 10	Baffle Zone D to C			109.0 ft	--		20.0 ft		--		5.65	50%	4.52	50%	11.3	50%	
	Figure 10	AB No. 4 Zone C			96.5 ft	130.0 ft		20.0 ft		17.0 ft		5.65	50%	4.52	50%	11.3	50%	
	Figure 10	Baffle Zone C to B			109.0 ft	--		20.0 ft		--		5.65	50%	4.52	50%	11.3	50%	
	Figure 10	AB No 4. Zone B			96.5 ft	30.0 ft		20.0 in		17.0 in		5.65	50%	4.52	50%	11.3	50%	
	Figure 10	Baffle Zone B to A			109.0 ft	--		20.0 ft		--		5.65	50%	4.52	50%	11.3	50%	
	1983 Exp. S-4	AB 4 Zone A			96.5 ft	30.0 ft		20.0 ft		17.0 ft		5.65	50%	4.52	50%	11.3	50%	
	1983 Exp. M-7	AB No. 4 - Influent Sluice Gate			110.00 ft	--		36.0 in		30.0 in	3 gates	5.65	50%	4.52	50%			3 gates modeled @ Inv 110.004
	1983 Exp. S-4	AB No. 4 Influent Channel			109.25 ft	4.0 ft		3.0 ft		4.0 ft		5.65	50%	4.52	50%			
	1983 Exp. S-4	AB No. 4 Sloped Channel			109.25 ft	5.3 ft		3.0 ft	0.141 ft			5.65	50%	4.52	50%			
	1983 Exp S-5	AB No. 3/4 Splitter Box/Channel			110.0 ft	12.0 ft		4.5 ft		3.0 ft	2 90-deg bends	5.65	50%	4.52	50%			High headloss
	1983 Exp.	42-IN RCP Influent Pipe AB No. 3/4				58.0 ft	42.0 in				Exit 2 -90 deg bends	5.65	50%	4.52	50%			
	1983 Exp.	42-IN RCP Tee Line to Branch					42.0 in				Tee	5.65	50%	4.52	50%			
Primary Effluent Junction Box	1971 EXP M 30.2	42-IN RCP PC Effluent Pipe to Junction Box				224 ft	45.0 in				2-90deg bends entrance	11.30	100%	9.04	100%			
	1971 EXP M 30.2	PE Junction Box		114.5 ft	104.5 ft	16.5 ft		7.0 ft		10.0 ft		11.30	100%	9.04	100%			
Primary Clarifier #2	1983 - S.2	PC # 2 24 -IN RCP Effluent				120					4-45 deg bends	3.73	33%					
	1971 WPCF M 30	PC # 2 Effluent Box		116.00	112.00	4		1.5 ft				3.73	33%					
	1971 WPCF M 30	PC # 2 Effluent Trough/Launder			112.00	78		1.0 ft	-0.0094			1.86	17%					
	2002 SC G4	PC # 2 Effluent Weir			114.25	135						3.73	33%					V-notch weir 4" Spacing 90 deg angle, 212 notches Invert = 114.25
	1971 WPCF M 30	PC # 2 Basin			106.00		45.0 ft					3.73	33%					
	1971 WPCF M 30	PC # 2 Influent well				7 ft	18.0 in					3.73	33%					
	1971 WPCF M 30	PC # 2 24-In Influent				18 ft	24.0 in				90 bend Bend	3.73	33%					
	1971 WPCF M 30	36-In Influent pipe				32 ft	36.0 in				90 Bend	3.73	33%					
PC Flow Split Structure	1971 WPCF M 30	Drop Box to Primary Clarifier No.2			108.00	40.0 in		40.0 in				3.73	33%					
	1971 WPCF M 30	Primary Clarifier Distribution Box Weir		120.00	117.00	4.0 ft						3.73	33%					Flow is pumped to this location.

*All elevations on the 1929 Datum per 1971 WPCF Drawings

Drawing Sets Used to Develop Hydraulic Elements List

YEAR	DRAWING SET	Abbr.
2002	B&C Secondary Clarifier # 5 Expansion	2002 SC
1983	M&E Plant Expansion	1983 Exp.
1971	Yoder - Trotter - Orlob & Associates WPCF	1971 WPCF

Input Flows

CONDITION		FLOW (MGD)		
		INFLUENT	RAS	MLR
2010	Average	4.05	3.85	--
	Peak Wet Weather	10.00	5.00	--
2030	Maximum Month	6.09	4.87	12.18
	Maximum Day	11.30	9.04	22.6
	Peak Wet Weather	20.00	10.00	

HYDRAULIC ELEMENTS LIST - PWWF

Pinole/Hercules WPCP Predesign

FACILITY	DWG. NO.	COMPONENT	ELEVATIONS*			DIMENSIONS					LOSSES	FLOW						EXTENDED DESCRIPTION
												PWWF Flow						
			WSE (ft)	TOP / ROOF (ft)	INVERT (ft)	LENGTH (ft)	DIAMETER	WIDTH (ft)	SLOPE (ft/ft)	DEPTH (ft)		FORWARD FLOW	PERCENT (%)	RAS FLOW	PERCENT (%)	MLS FLOW	PERCENT (%)	
Chlorine Contact Basin	2002 SC G-4	Effluent Weir	107.54		107.15	4.50						10.00	50%					
	1971 WPCF M-55	Basin	107.55	110.50	103.25	140.0 ft		4.0 ft			6 - 90 deg Bends	10.00	50%					
	1971 WPCF M-55	Slide Gate	107.82		103.25			24.0 in		36.0 in		10.00	50%					
	1971 WPCF M-55	Influent Box	107.82		103.25	8.0 ft		4.0 ft				20.00	100%					
	Figure C	42 - IN SCE	108.20			116.0 ft	42.0 in				Wye - Branch to line 3 - 90 deg bend Entrance	20.00	100%					
	Figure C	SC #1 Effluent Connection	108.48				30.0 in				Wye 24" to 42"							
Secondary Clarifier # 1	Not yet produced	SC # 1 36" Effluent Pipe	108.77			70 ft	30.0 in				Entrance 2-90 deg Bends	6.00	30%					30% to each new SC (1,2), 14% to each old SC (3,4,5) Assumptions made for design of a 65' Ø central feed / peripheral take off clarifier, with v notch weir.90 deg V-Notches, spaced 4.5" O.C. = 594. 63' diameter No drawings produced yet
		SC # 1 Effluent Box	108.77		90	4 ft		4 ft				6.00	30%					
		SC # 1 Effluent Launder	109.25		107	100 ft		1.0 ft	0.004			3.00	15%	1.50	15%			
	Weir Elv. Increased by 4"	SC # 1Effluent Weir			109.3	204 ft					Wer	6.00	30%					
		SC #1	109.30	112.00	90.00		65.0 ft		0.00522222	22.5 ft -22.03 ft		6.00	30%	3.00	30%			
		SC # 1 Inlet Ports	109.47	109.8 ft	106.00 ft			0.5 ft		2.5 ft	6 Inlet ports	6.00	30%	3.00	30%			
		SC #1 Influent Line	110.83	--		200 ft	24.0 in				2 - 90 deg bends 5 - 45 deg bends Entrance	6.00	30%	3.00	30%			
Secondary Clarifier Distribution Box	See TM	SC #2 Influent Box		113.50	100.00	3.0 ft		7.5		13.5 ft	High headloss over short weir	6.00	30%	3.00	30%			New splitter box required,
	See TM	Submerged Weir SC 5 Dist. Box Weir			110.00	7.0 ft						6.00	30%	3.00	30%			
	See TM	SC Distribution Box		113.50	100.00	9.0 ft		30.0 ft		13.50 ft		20.00	100%	10.00	100%			
AB # 3,4 Zone E Contact Stabilization	Not yet produced	AB No. 3 36-IN Effluent				5.0 ft	36.0 in				exit 2 - 11.25 deg bends entrance	10.00	50%	5.00	50%			
	Not yet produced	AB No. 3 36-IN Gate			105.50		36.0 in											
	1983 Exp. S-4	AB No. 3 ML Drop Box	112.49	113.5 ft	105.5 ft	3.0 ft		3.0 ft		16.0 ft		10.00	50%	5.00	50%			
	1983 Exp. S-4	ML Effluent Channel	112.50	113.5 ft	109.25 ft	5.5 ft		3.0 ft		4.0 ft		10.00	50%	5.00	50%			High headloss
	1983 Exp. M-7	AB No. 3 - Effluent Sluice Gate	112.88	113.5 ft	109.25 ft	--		36.0 in		30.0 in		10.00	50%	5.00	50%			Oriface DS control
	Figure 10	AB No. 3 Zone E	112.89	113.5 ft	96.5 ft	95.0 ft		20.0 ft		17.0 ft		10.00	50%	5.00	50%			
PWWF Contact Stabilization	1983 Exp. S-4	AB No. 3 Step Feed Disharge Gates	112.92	113.50	110.50			2.0 ft		3.0 ft	3 gates ppem	10.00	50%					
	1983 Exp S-4	AB No. 3 Step Feed Channel	112.96	113.5 ft	110.0 ft	108.0 ft		3.0 ft				10.00	50%					High headloss
	1984 Exp S-4	AB No. 3 Step Feed Channel	112.98		110.0 ft	8.0 ft		3.0 ft			Bend							
	1983 Exp.	42-IN RCP Influent Pipe AB No. 3/4	113.10			58.0 ft	42.0 in				exit 2 - 90 deg bends	10.00	50%					
	1983 Exp.	42-IN RCP Tee Line to Branch	113.20				42.0 in				Tee	10.00	50%					
AB # 3,4 Contact Stabilization	Figure 10	Baffle Zone E to D			96.5 ft	--		24.0 in		24.0 in	Assume 4 Ports	0.00	0%	5.00	50%			
	Figure 10	AB No. 3 Zone 1D	112.91	113.5 ft	109.0 ft	95.0 ft		20.0 ft		17.0 ft		0.00	0%	5.00	50%			
	Figure 10	Baffle Zone D to C			96.5 ft	--		24.0 in		24.0 in	Assume 4 Ports	0.00	0%	5.00	50%			During MM flow conditions, 100% of influent is sent to Aeration Basins, 90% is RAS, and 145% is MLR.
	Figure 10	AB No. 4 Zone 1C	112.93	113.5 ft	109.0 ft	130.0 ft		20.0 ft		17.0 ft		0.00	0%	5.00	50%			
	Figure 10	Baffle Zone C to B			96.5 ft	--		24.0 in		24.0 in	Assume 4 Ports	0.00	0%	5.00	50%			
	Figure 10	AB No 4. Zone 1B	112.95	113.5 ft	109.0 ft	30.0 ft		20.0 in		17.0 in		0.00	0%	5.00	50%			
	Figure 10	Baffle Zone B to A			96.5 ft	--		24.0 in		24.0 in	Assume 4 Ports	0.00	0%	5.00	50%			
	1983 Exp. S-4	AB No. 4 Zone 1A	112.97	113.5 ft	96.5 ft	30.0 ft		20.0 ft		17.0 ft		0.00	0%	5.00	50%			
	1983 Exp. M-7	AB No. 4 - Influent Sluice Gate		113.5 ft	109.25 ft	--		36.0 in		30.0 in		0.00	0%	5.00	50%			Oriface DS control
	1983 Exp. S-4	AB No. 4 Influent Channel	113.00	113.5 ft	109.25 ft	18.0 ft		3.0 ft		4.0 ft		0.00	0%	5.00	50%			
	1983 Exp. S-4	AB No. 4 Sloped Channel		113.5 ft	109.25 ft	5.3 ft		3.0 ft	0.141 ft			0.00	0%	5.00	50%			
Primary Effluent Junction Box	1971 EXP M 30.2	42-IN RCP PC Effluent Pipe to Junction Box	114.05			224 ft	45.0 in					20.00	100%					
	1971 EXP M 30.2	PE Junction Box	114.05	114.5 ft	104.5 ft	16.5 ft		7.0 ft		10.0 ft		20.00	100%					
Primary Clarifier #2	1983 - S.2	PC # 2 24 -IN RCP Effluent	114.19			120					4-45 deg bends	3.96	33%					
	1971 WPCF M 30	PC # 2 Effluent Box	114.19	116.00	112.00	4		1.5 ft				3.96	33%					
	1971 WPCF M 30	PC # 2 Effluent Trough/Launder	114.25		112.00	78		1.0 ft	-0.0094			1.98	17%					
	2002 SC G4	PC # 2 Effluent Weir	114.22		114.25	135						3.96	33%					
	1971 WPCF M 30	PC # 2 Basin	114.42		106.00		45.0 ft					3.96	33%					
	1971 WPCF M 30	PC # 2 18-IN Influent wel	114.42			7 ft	18.0 in					3.96	33%					
	1971 WPCF M 30	PC # 2 24-In Influent	114.72			18 ft	24.0 in				90 bend Bend Exit Reducer 36" to 24"	3.96	33%					V-notch weir 4" Spacing 90 deg angle, 212 notches Invert = 114.25
	1971 WPCF M 30	36-In Influent pipe	114.79			32 ft	36.0 in				90 Bend Entrance	3.96	33%					
PC Flow Split Structure	1971 WPCF M 30	Drop Box to Primary Clarifier No.2	114.87			40.0 in		40.0 in				3.96	33%					
	1971 WPCF M 30	Primary Clarifier Distribution Box Weir	117.66	120.00	117.00	4.0 ft						3.96	33%					Flow is pumped to this location.

*All elevations on the 1929 Datum per 1971 WPCF Drawings

Drawing Sets Used to Develop Hydraulic Elements List

YEAR	DRAWING SET	Abbr.
2002	B&C Secondary Clarifier # 5 Expansion	2002 SC
1983	M&E Plant Expansion	1983 Exp.
1971	Yoder - Trotter - Orlob & Associates WPCF	1971 WPCF

Input Flows

CONDITION		FLOW (MGD)		
		INFLUENT	RAS	MLR
2010	Average	4.05	3.85	5.8725
	Peak Wet Weather	10.00	5.00	--
2030	Maximum Month	6.09	5.79	8.8305
	Maximum Day	11.30	10.74	16.385
	Peak Wet Weather	20.00	10.00	0.00

Appendix B. Pinole/Hercules WPCP VH Output

Pinole ADWF Flow.vhf

Hydraulic Profile

Current flow conditions

Forward Flow	Return I Flow	Return II Flow	Return III Flow
4.06 mgd	3.25 mgd	8.12 mgd	-----

Section Description	Water Surface Elevation
Starting water surface elevation	**107**
Effluent Weir	**107.71**
Weir invert (top of weir) = 107.15 Weir length = 4.5 ft Weir 'C' coefficient = 3.33 Flow over weir = 4.06 mgd Weir submergence = unsubmerged Head over weir = 0.56 ft	
Chlorine Contact Basin	**107.72**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 140 ft Channel width/diameter = 4 ft Flow = 2.03 mgd Downstream channel invert = 103.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 17.84 ft^2 Hydraulic radius = 1.381 Normal depth = infinite Critical depth = 0.27 ft Depth downstream = 4.46 ft Bend loss = 0 ft Depth upstream = 4.47 ft Velocity = 0.18 ft/s Flow profile = Horizontal	
Slide Gate	**107.73**
Opening type = rectangular gate Opening diameter/width = 24 in Gate height = 36 in Invert = 103.25 Number of gates = 1 Flow through gate(s) = 2.03 mgd	

Section Description	Water Surface Elevation
Total area of opening(s) = 6 ft^2 Velocity through gate(s) = 0.52 ft/s Flow behavior = orifice, downstream control Gate loss = 0.01 ft Downstream water level = 107.72 Upstream water level = 107.73	
CC Basin Influent Box	**107.73**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 8 ft Channel width/diameter = 4 ft Flow = 4.06 mgd Downstream channel invert = 103.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 17.91 ft^2 Hydraulic radius = 1.382 Normal depth = infinite Critical depth = 0.43 ft Depth downstream = 4.48 ft Bend loss = 0 ft Depth upstream = 4.48 ft Velocity = 0.35 ft/s Flow profile = Horizontal	
42-IN SC Effluent	**107.75**
Pipe shape = Circular Diameter = 42 in Length = 116 ft Flow = 4.06 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1.75 Pipe area = 9.62 ft² Pipe hydraulic radius = 0.875 Age factor = 1 Solids factor = 1 Velocity = 0.65 ft/s Friction loss = 0.01 ft Fitting loss = 0.01 ft Total loss = 0.02 ft	
SC #2 Effluent Connection	**107.75**
Tee type = branch to line Diameter of pipe line = 42 in Diameter of pipe branch = 30 in	

Section Description	Water Surface Elevation
Flow through tee = 1.22 mgd Velocity through tee = 0.38 ft/s Total tee K value = 1.69 Overall head loss = 0 ft	
SC #2 - 30-IN Effluent	**107.76**
Pipe shape = Circular Diameter = 30 in Length = 70 ft Flow = 1.22 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1 Pipe area = 4.91 ft² Pipe hydraulic radius = 0.625 Age factor = 1 Solids factor = 1 Velocity = 0.38 ft/s Friction loss = 0 ft Fitting loss = 0 ft Total loss = 0 ft	
SC #2 Effuent Box	**107.76**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 4 ft Channel width/diameter = 4 ft Flow = 1.22 mgd Downstream channel invert = 90 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 71.04 ft^2 Hydraulic radius = 1.798 Normal depth = infinite Critical depth = 0.19 ft Depth downstream = 17.76 ft Bend loss = 0 ft Depth upstream = 17.76 ft Velocity = 0.03 ft/s Flow profile = Horizontal	
SC #2 Effluent Launder	**107.85**
Launder invert = 107 Launder length = 100 ft Launder width = 1 ft Launder slope = 0.004 ft/ft Flow through launder = 0.61 mgd	

Section Description	Water Surface Elevation
Critical depth = 0.3 ft Downstream depth = 0.76 ft Upstream depth = 0.45 ft	
SC #2 Effluent Weir	**109.37**
Invert of V notch = 109.3 Angle of V notch = 90 degrees Number of notches = 594 Total flow over weir = 1.22 mgd Weir submergence = unsubmerged Head over weir = 0.07 ft	
SC #2	**109.37**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 75 ft Channel width/diameter = 75 ft Flow = 2.2 mgd Downstream channel invert = 90 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 1452.75 ft^2 Hydraulic radius = 12.773 Normal depth = infinite Critical depth = 0.04 ft Depth downstream = 19.37 ft Bend loss = 0 ft Depth upstream = 19.37 ft Velocity = 0 ft/s Flow profile = Horizontal	
SC #2 Inlet Ports	**109.38**
Opening type = rectangular orifice Opening diameter/width = 6 in Opening height = 30 in Invert = 106 Number of openings = 6 Flow through opening(s) = 2.421 mgd Total area of opening(s) = 7.5 ft^2 Velocity through opening(s) = 0.5 ft/s Flow behavior = orifice, downstream control Orifice loss = 0.01 ft Downstream water level = 109.37 Upstream water level = 109.38	
SC #2 - 36-IN Influent	**109.39**
Pipe shape = Circular Diameter = 36 in	

Section Description	Water Surface Elevation
Length = 200 ft Flow = 2.2 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 2 Pipe area = 7.07 ft² Pipe hydraulic radius = 0.75 Age factor = 1 Solids factor = 1 Velocity = 0.48 ft/s Friction loss = 0.01 ft Fitting loss = 0.01 ft Total loss = 0.01 ft	
SC #2 Influent Box	**109.39**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 3 ft Channel width/diameter = 7.5 ft Flow = 2.2 mgd Downstream channel invert = 100 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 70.43 ft^2 Hydraulic radius = 2.68 Normal depth = infinite Critical depth = 0.19 ft Depth downstream = 9.39 ft Bend loss = 0 ft Depth upstream = 9.39 ft Velocity = 0.05 ft/s Flow profile = Horizontal	
SC Dist Box Weir #2	**110.28**
Weir invert (top of weir) = 110 Weir length = 7 ft Weir 'C' coefficient = 3.33 Flow over weir = 2.2 mgd Weir submergence = unsubmerged Head over weir = 0.28 ft	
SC Distribution Box	**110.28**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 9 ft Channel width/diameter = 30 ft Flow = 7.31 mgd	

Section Description	Water Surface Elevation
Downstream channel invert = 105.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 143.33 ft^2 Hydraulic radius = 3.623 Normal depth = infinite Critical depth = 0.16 ft Depth downstream = 4.78 ft Bend loss = 0 ft Depth upstream = 4.78 ft Velocity = 0.08 ft/s Flow profile = Horizontal	
AB 36-IN Effluent	**110.35**
Pipe shape = Circular Diameter = 36 in Length = 5 ft Flow = 7.31 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1.76 Pipe area = 7.07 ft² Pipe hydraulic radius = 0.75 Age factor = 1 Solids factor = 1 Velocity = 1.6 ft/s Friction loss = 0 ft Fitting loss = 0.07 ft Total loss = 0.07 ft	
AB Exit Gate	**110.46**
Opening type = circular gate Opening diameter/width = 36 in Gate height = 36 in Invert = 105.5 Number of gates = 1 Flow through gate(s) = 7.31 mgd Total area of opening(s) = 7.07 ft^2 Velocity through gate(s) = 1.6 ft/s Flow behavior = orifice, downstream control Gate loss = 0.11 ft Downstream water level = 110.35 Upstream water level = 110.46	
AB 3 ML Drop Box	**110.46**
Channel shape = Rectangular Manning's 'n' = 0.012	

Section Description	Water Surface Elevation
Channel length = 3 ft Channel width/diameter = 3 ft Flow = 7.31 mgd Downstream channel invert = 105.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 14.88 ft^2 Hydraulic radius = 1.152 Normal depth = infinite Critical depth = 0.76 ft Depth downstream = 4.96 ft Bend loss = 0 ft Depth upstream = 4.96 ft Velocity = 0.76 ft/s Flow profile = Horizontal	
AB 3 ML Effluent Channel	**110.47**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 5.5 ft Channel width/diameter = 3 ft Flow = 7.31 mgd Downstream channel invert = 109.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 3.65 ft^2 Hydraulic radius = 0.672 Normal depth = infinite Critical depth = 0.76 ft Depth downstream = 1.21 ft Bend loss = 0 ft Depth upstream = 1.22 ft Velocity = 3.11 ft/s Flow profile = Horizontal	
AB 3 Effluent Sluice Gate	**110.56**
Opening type = rectangular gate Opening diameter/width = 36 in Gate height = 30 in Invert = 109.25 Number of gates = 1 Flow through gate(s) = 7.31 mgd Total area of opening(s) = 7.5 ft^2 Velocity through gate(s) = 1.51 ft/s Flow behavior = orifice, downstream control Gate loss = 0.09 ft Downstream water level = 110.47	

Section Description	Water Surface Elevation
Upstream water level = 110.56	
AB 3 Zone E	**110.57**
Channel shape = Rectangular	
Manning's 'n' = 0.012	
Channel length = 95 ft	
Channel width/diameter = 20 ft	
Flow = 15.43 mgd	
Downstream channel invert = 96.5	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 281.27 ft^2	
Hydraulic radius = 5.844	
Normal depth = infinite	
Critical depth = 0.35 ft	
Depth downstream = 14.06 ft	
Bend loss = 0 ft	
Depth upstream = 14.07 ft	
Velocity = 0.08 ft/s	
Flow profile = Horizontal	
Baffle Wall E to D	**110.6**
Weir invert (top of weir) = 109	
Weir length = 20 ft	
Weir 'C' coefficient = 3.33	
Flow over weir = 15.43 mgd	
Weir submergence = fully submerged	
Head over weir = 1.6 ft	
Contact Stabilization Influent Pipe	**110.63**
Pipe shape = Circular	
Diameter = 24 in	
Length = 100 ft	
Flow = 4.06 mgd	
Friction method = Hazen Williams	
Friction factor = 120	
Total fitting K value = 0	
Pipe area = 3.14 ft²	
Pipe hydraulic radius = 0.5	
Age factor = 1	
Solids factor = 1	
Velocity = 2 ft/s	
Friction loss = 0.07 ft	
Fitting loss = 0 ft	
Total loss = 0.07 ft	
AB 3 Zone D	**110.6**

Section Description	Water Surface Elevation
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 95 ft Channel width/diameter = 20 ft Flow = 15.43 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 281.91 ft^2 Hydraulic radius = 5.85 Normal depth = infinite Critical depth = 0.35 ft Depth downstream = 14.1 ft Bend loss = 0 ft Depth upstream = 14.1 ft Velocity = 0.08 ft/s Flow profile = Horizontal	
Baffle Wall D to C	**110.63**
Weir invert (top of weir) = 109 Weir length = 20 ft Weir 'C' coefficient = 3.33 Flow over weir = 15.43 mgd Weir submergence = fully submerged Head over weir = 1.63 ft	
AB 4 Zone C	**110.63**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 130 ft Channel width/diameter = 20 ft Flow = 15.43 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 282.55 ft^2 Hydraulic radius = 5.855 Normal depth = infinite Critical depth = 0.35 ft Depth downstream = 14.13 ft Bend loss = 0 ft Depth upstream = 14.13 ft Velocity = 0.08 ft/s Flow profile = Horizontal	
Baffle Wall C to B	**110.66**
Weir invert (top of weir) = 109	

Section Description	Water Surface Elevation
Weir length = 20 ft Weir 'C' coefficient = 3.33 Flow over weir = 15.43 mgd Weir submergence = fully submerged Head over weir = 1.66 ft	
AB Zone B	**110.66**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 30 ft Channel width/diameter = 20 ft Flow = 15.43 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 283.19 ft^2 Hydraulic radius = 5.861 Normal depth = infinite Critical depth = 0.35 ft Depth downstream = 14.16 ft Bend loss = 0 ft Depth upstream = 14.16 ft Velocity = 0.08 ft/s Flow profile = Horizontal	
Baffle Wall B to A	**110.69**
Weir invert (top of weir) = 109 Weir length = 20 ft Weir 'C' coefficient = 3.33 Flow over weir = 15.43 mgd Weir submergence = fully submerged Head over weir = 1.69 ft	
AB Zone A	**110.69**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 30 ft Channel width/diameter = 20 ft Flow = 15.43 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 283.83 ft^2 Hydraulic radius = 5.866 Normal depth = infinite Critical depth = 0.35 ft Depth downstream = 14.19 ft Bend loss = 0 ft	

Section Description	Water Surface Elevation
Depth upstream = 14.19 ft Velocity = 0.08 ft/s Flow profile = Horizontal	
AB 4 Influent Sluice Gate	**110.72**
Opening type = rectangular gate Opening diameter/width = 36 in Gate height = 30 in Invert = 110 Number of gates = 2 Flow through gate(s) = 7.31 mgd Total area of opening(s) = 15 ft^2 Velocity through gate(s) = 0.75 ft/s Flow behavior = orifice, downstream control Gate loss = 0.02 ft Downstream water level = 110.69 Upstream water level = 110.72	
AB 4 Influent Channel	**110.72**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 3 ft Channel width/diameter = 3 ft Flow = 7.31 mgd Downstream channel invert = 109.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 4.4 ft^2 Hydraulic radius = 0.742 Normal depth = infinite Critical depth = 0.76 ft Depth downstream = 1.47 ft Bend loss = 0 ft Depth upstream = 1.47 ft Velocity = 2.57 ft/s Flow profile = Horizontal	
AB 4 Influent Slopped Channel	**110.71**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 5.3 ft Channel width/diameter = 3 ft Flow = 7.31 mgd Downstream channel invert = 109.25 Channel slope = 0.0141 ft/ft Channel side slope = not applicable Area of flow = 4.28 ft^2 Hydraulic radius = 0.732	

Section Description	Water Surface Elevation
Normal depth = 0.5 ft Critical depth = 0.76 ft Depth downstream = 1.47 ft Bend loss = 0 ft Depth upstream = 1.39 ft Velocity = 2.56 ft/s Flow profile = Steep	
AB 4 Influent Split Box-Channel	**110.83**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 12.7 ft Channel width/diameter = 4.5 ft Flow = 7.31 mgd Downstream channel invert = 110 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 3.29 ft^2 Hydraulic radius = 0.552 Normal depth = infinite Critical depth = 0.58 ft Depth downstream = 0.71 ft Bend loss = 0.08 ft Depth upstream = 0.83 ft Velocity = 3.54 ft/s Flow profile = Horizontal	
AB 3/4 42-IN Influent Pipe	**110.87**
Pipe shape = Circular Diameter = 42 in Length = 58 ft Flow = 7.31 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1.5 Pipe area = 9.62 ft² Pipe hydraulic radius = 0.875 Age factor = 1 Solids factor = 1 Velocity = 1.18 ft/s Friction loss = 0.01 ft Fitting loss = 0.03 ft Total loss = 0.04 ft	
42-IN Tee to AB 3/4	**110.88**
Tee type = run of tee Diameter of pipe run past tee = 42 in	

Section Description	Water Surface Elevation
Flow through tee = 7.31 mgd Velocity through tee = 1.18 ft/s Total tee K value = 0.6 Overall head loss = 0.01 ft	
42-IN PC Effluent to PC Junction Box Pipe shape = Circular Diameter = 42 in Length = 244 ft Flow = 7.31 mgd Friction method = Hazen Williams Friction factor = 100 Total fitting K value = 2 Pipe area = 9.62 ft² Pipe hydraulic radius = 0.875 Age factor = 2.348 Solids factor = 1 Velocity = 1.18 ft/s Friction loss = 0.11 ft Fitting loss = 0.04 ft Total loss = 0.15 ft	**111.03**
Prim. Eff. Junction Box Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 16.5 ft Channel width/diameter = 7 ft Flow = 7.31 mgd Downstream channel invert = 104.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 45.71 ft^2 Hydraulic radius = 2.279 Normal depth = infinite Critical depth = 0.43 ft Depth downstream = 6.53 ft Bend loss = 0 ft Depth upstream = 6.53 ft Velocity = 0.25 ft/s Flow profile = Horizontal	**111.03**
PC 2 24-IN Effluent Pipe shape = Circular Diameter = 24 in Length = 120 ft Flow = 1.353 mgd Friction method = Hazen Williams	**111.08**

Section Description	Water Surface Elevation
Friction factor = 100 Total fitting K value = 2.4 Pipe area = 3.14 ft² Pipe hydraulic radius = 0.5 Age factor = 2.348 Solids factor = 1 Velocity = 0.67 ft/s Friction loss = 0.04 ft Fitting loss = 0.02 ft Total loss = 0.05 ft	
PC 2 Effluent Box	**111.08**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 1.5 ft Channel width/diameter = 4 ft Flow = 1.353 mgd Downstream channel invert = 106 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 20.32 ft^2 Hydraulic radius = 1.435 Normal depth = infinite Critical depth = 0.2 ft Depth downstream = 5.08 ft Bend loss = 0 ft Depth upstream = 5.08 ft Velocity = 0.1 ft/s Flow profile = Horizontal	
PC 2 Effluent Launder	**112.64**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 78 ft Channel width/diameter = 1 ft Flow = 0.677 mgd Downstream channel invert = 112 Channel slope = 0.0015 ft/ft Channel side slope = not applicable Area of flow = 0.43 ft^2 Hydraulic radius = 0.23 Normal depth = 0.54 ft Critical depth = 0.32 ft Depth downstream = 0.32 ft Bend loss = 0 ft Depth upstream = 0.53 ft Velocity = 3.23 ft/s	

Section Description	Water Surface Elevation
Flow profile = Mild	
PC 2 Effluent Weir	**114.36**
Invert of V notch = 114.25	
Angle of V notch = 90 degrees	
Number of notches = 212	
Total flow over weir = 1.353 mgd	
Weir submergence = unsubmerged	
Head over weir = 0.11 ft	
PC 2 Basin	**114.36**
Channel shape = Rectangular	
Manning's 'n' = 0.012	
Channel length = 45 ft	
Channel width/diameter = 45 ft	
Flow = 1.353 mgd	
Downstream channel invert = 106	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 376.19 ft^2	
Hydraulic radius = 6.095	
Normal depth = infinite	
Critical depth = 0.04 ft	
Depth downstream = 8.36 ft	
Bend loss = 0 ft	
Depth upstream = 8.36 ft	
Velocity = 0.01 ft/s	
Flow profile = Horizontal	
PC 2 Influent Well	**114.4**
Pipe shape = Circular	
Diameter = 18 in	
Length = 7 ft	
Flow = 1.353 mgd	
Friction method = Hazen Williams	
Friction factor = 100	
Total fitting K value = 1.25	
Pipe area = 1.77 ft²	
Pipe hydraulic radius = 0.375	
Age factor = 2.348	
Solids factor = 1	
Velocity = 1.18 ft/s	
Friction loss = 0.01 ft	
Fitting loss = 0.03 ft	
Total loss = 0.04 ft	
24-IN Influent Pipe	**114.41**
Pipe shape = Circular	

Section Description	Water Surface Elevation
Diameter = 24 in Length = 10 ft Flow = 1.353 mgd Friction method = Hazen Williams Friction factor = 100 Total fitting K value = 0.42 Pipe area = 3.14 ft² Pipe hydraulic radius = 0.5 Age factor = 2.348 Solids factor = 1 Velocity = 0.67 ft/s Friction loss = 0 ft Fitting loss = 0 ft Total loss = 0.01 ft	
36-IN PC Influent Pipe	**114.42**
Pipe shape = Circular Diameter = 24 in Length = 10 ft Flow = 1.353 mgd Friction method = Hazen Williams Friction factor = 100 Total fitting K value = 0.42 Pipe area = 3.14 ft² Pipe hydraulic radius = 0.5 Age factor = 2.348 Solids factor = 1 Velocity = 0.67 ft/s Friction loss = 0 ft Fitting loss = 0 ft Total loss = 0.01 ft	
Drop Box to Primary Clarifier No 2	**114.42**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 3.5 ft Channel width/diameter = 3.5 ft Flow = 1.353 mgd Downstream channel invert = 108 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 22.47 ft^2 Hydraulic radius = 1.375 Normal depth = infinite Critical depth = 0.22 ft Depth downstream = 6.42 ft Bend loss = 0 ft	

Section Description	Water Surface Elevation
Depth upstream = 6.42 ft Velocity = 0.09 ft/s Flow profile = Horizontal	
Primary Clarifier Distribution Box Weir Weir invert (top of weir) = 117 Weir length = 3.5 ft Weir 'C' coefficient = 3.33 Flow over weir = 1.347 mgd Weir submergence = unsubmerged Head over weir = 0.32 ft	**117.32**

Pinole MM-MD Flow.vhf

Hydraulic Profile

Current flow conditions

Forward Flow	Return I Flow	Return II Flow	Return III Flow
11.3 mgd	9.04 mgd	22.6 mgd	-----

Section Description	Water Surface Elevation
Starting water surface elevation	**107**
Effluent Weir	**107.85**
Weir invert (top of weir) = 107.15 Weir length = 4.5 ft Weir 'C' coefficient = 3.33 Flow over weir = 5.65 mgd Weir submergence = unsubmerged Head over weir = 0.7 ft	
Chlorine Contact Basin	**107.88**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 140 ft Channel width/diameter = 4 ft Flow = 5.65 mgd Downstream channel invert = 103.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 18.4 ft^2 Hydraulic radius = 1.394 Normal depth = infinite Critical depth = 0.53 ft Depth downstream = 4.6 ft Bend loss = 0.03 ft Depth upstream = 4.63 ft Velocity = 0.48 ft/s Flow profile = Horizontal	
Slide Gate	**107.96**
Opening type = rectangular gate Opening diameter/width = 36 in Gate height = 24 in Invert = 103.25 Number of gates = 1 Flow through gate(s) = 5.65 mgd	

Section Description	Water Surface Elevation
Total area of opening(s) = 6 ft^2 Velocity through gate(s) = 1.46 ft/s Flow behavior = orifice, downstream control Gate loss = 0.09 ft Downstream water level = 107.88 Upstream water level = 107.96	
CC Basin Influent Box	**107.96**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 8 ft Channel width/diameter = 4 ft Flow = 11.3 mgd Downstream channel invert = 103.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 18.85 ft^2 Hydraulic radius = 1.404 Normal depth = infinite Critical depth = 0.84 ft Depth downstream = 4.71 ft Bend loss = 0 ft Depth upstream = 4.71 ft Velocity = 0.93 ft/s Flow profile = Horizontal	
42-IN SC Effluent	**108.09**
Pipe shape = Circular Diameter = 42 in Length = 116 ft Flow = 11.3 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1.75 Pipe area = 9.62 ft² Pipe hydraulic radius = 0.875 Age factor = 1 Solids factor = 1 Velocity = 1.82 ft/s Friction loss = 0.03 ft Fitting loss = 0.09 ft Total loss = 0.12 ft	
SC #2 Effluent Connection	**108.12**
Tee type = branch to line Diameter of pipe line = 42 in Diameter of pipe branch = 30 in	

Section Description	Water Surface Elevation
Flow through tee = 3.39 mgd Velocity through tee = 1.07 ft/s Total tee K value = 1.69 Overall head loss = 0.03 ft	
SC #2 - 36-IN Effluent	**108.13**
Pipe shape = Circular Diameter = 36 in Length = 70 ft Flow = 3.39 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1 Pipe area = 7.07 ft² Pipe hydraulic radius = 0.75 Age factor = 1 Solids factor = 1 Velocity = 0.74 ft/s Friction loss = 0 ft Fitting loss = 0.01 ft Total loss = 0.01 ft	
SC #2 Effluent Box	**108.13**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 4 ft Channel width/diameter = 4 ft Flow = 3.748 mgd Downstream channel invert = 90 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 72.52 ft^2 Hydraulic radius = 1.801 Normal depth = infinite Critical depth = 0.4 ft Depth downstream = 18.13 ft Bend loss = 0 ft Depth upstream = 18.13 ft Velocity = 0.08 ft/s Flow profile = Horizontal	
SC #2 Effluent Launder	**108.45**
Launder invert = 107 Launder length = 100 ft Launder width = 1 ft Launder slope = 0.004 ft/ft Flow through launder = 1.7 mgd	

Section Description	Water Surface Elevation
Critical depth = 0.6 ft Downstream depth = 1.13 ft Upstream depth = 1.05 ft	
SC #2 Effluent Weir	**109.41**
Invert of V notch = 109.3 Angle of V notch = 90 degrees Number of notches = 594 Total flow over weir = 3.748 mgd Weir submergence = unsubmerged Head over weir = 0.11 ft	
SC #2	**109.41**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 75 ft Channel width/diameter = 75 ft Flow = 6.1 mgd Downstream channel invert = 90 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 1455.7 ft^2 Hydraulic radius = 12.79 Normal depth = infinite Critical depth = 0.08 ft Depth downstream = 19.41 ft Bend loss = 0 ft Depth upstream = 19.41 ft Velocity = 0.01 ft/s Flow profile = Horizontal	
SC #2 Inlet Ports	**109.48**
Opening type = rectangular orifice Opening diameter/width = 6 in Opening height = 30 in Invert = 106 Number of openings = 6 Flow through opening(s) = 6.2 mgd Total area of opening(s) = 7.5 ft^2 Velocity through opening(s) = 1.28 ft/s Flow behavior = orifice, downstream control Orifice loss = 0.07 ft Downstream water level = 109.41 Upstream water level = 109.48	
SC #2 - 36-IN Influent	**109.57**
Pipe shape = Circular Diameter = 36 in	

Section Description	Water Surface Elevation
Length = 200 ft Flow = 6.1 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 2 Pipe area = 7.07 ft² Pipe hydraulic radius = 0.75 Age factor = 1 Solids factor = 1 Velocity = 1.34 ft/s Friction loss = 0.04 ft Fitting loss = 0.06 ft Total loss = 0.1 ft	
SC #2 Influent Box	**109.57**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 3 ft Channel width/diameter = 7 ft Flow = 6.1 mgd Downstream channel invert = 100 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 66.99 ft^2 Hydraulic radius = 2.563 Normal depth = infinite Critical depth = 0.38 ft Depth downstream = 9.57 ft Bend loss = 0 ft Depth upstream = 9.57 ft Velocity = 0.14 ft/s Flow profile = Horizontal	
SC Dist Box Weir #5	**110.57**
Weir invert (top of weir) = 110 Weir length = 7 ft Weir 'C' coefficient = 3.33 Flow over weir = 6.458 mgd Weir submergence = unsubmerged Head over weir = 0.57 ft	
SC Distribution Box	**110.57**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 9 ft Channel width/diameter = 35 ft Flow = 20.34 mgd	

Section Description	Water Surface Elevation
Downstream channel invert = 105.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 177.41 ft^2 Hydraulic radius = 3.93 Normal depth = infinite Critical depth = 0.29 ft Depth downstream = 5.07 ft Bend loss = 0 ft Depth upstream = 5.07 ft Velocity = 0.18 ft/s Flow profile = Horizontal	
AB 36-IN Effluent	**110.71**
Pipe shape = Circular Diameter = 36 in Length = 5 ft Flow = 10.17 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1.76 Pipe area = 7.07 ft² Pipe hydraulic radius = 0.75 Age factor = 1 Solids factor = 1 Velocity = 2.23 ft/s Friction loss = 0 ft Fitting loss = 0.14 ft Total loss = 0.14 ft	
Effluent Gate	**110.92**
Opening type = circular gate Opening diameter/width = 36 in Gate height = 36 in Invert = 106 Number of gates = 1 Flow through gate(s) = 10.179 mgd Total area of opening(s) = 7.07 ft^2 Velocity through gate(s) = 2.23 ft/s Flow behavior = orifice, downstream control Gate loss = 0.21 ft Downstream water level = 110.71 Upstream water level = 110.92	
AB 3 ML Drop Box	**110.93**
Channel shape = Rectangular Manning's 'n' = 0.012	

Section Description	Water Surface Elevation
Channel length = 3 ft Channel width/diameter = 3 ft Flow = 10.179 mgd Downstream channel invert = 105.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 16.27 ft^2 Hydraulic radius = 1.175 Normal depth = infinite Critical depth = 0.95 ft Depth downstream = 5.42 ft Bend loss = 0 ft Depth upstream = 5.43 ft Velocity = 0.97 ft/s Flow profile = Horizontal	
AB 3 ML Effluent Channel	**110.93**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 5.5 ft Channel width/diameter = 3 ft Flow = 10.179 mgd Downstream channel invert = 109.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 5.04 ft^2 Hydraulic radius = 0.792 Normal depth = infinite Critical depth = 0.95 ft Depth downstream = 1.68 ft Bend loss = 0 ft Depth upstream = 1.68 ft Velocity = 3.13 ft/s Flow profile = Horizontal	
AB 3 Effluent Sluice Gate	**111.11**
Opening type = rectangular gate Opening diameter/width = 36 in Gate height = 30 in Invert = 109.25 Number of gates = 1 Flow through gate(s) = 10.179 mgd Total area of opening(s) = 7.5 ft^2 Velocity through gate(s) = 2.1 ft/s Flow behavior = orifice, downstream control Gate loss = 0.18 ft Downstream water level = 110.93	

Section Description	Water Surface Elevation
Upstream water level = 111.11	
AB 3 Zone E	**111.11**
Channel shape = Rectangular	
Manning's 'n' = 0.012	
Channel length = 95 ft	
Channel width/diameter = 20 ft	
Flow = 21.479 mgd	
Downstream channel invert = 96.5	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 292.23 ft^2	
Hydraulic radius = 5.937	
Normal depth = infinite	
Critical depth = 0.44 ft	
Depth downstream = 14.61 ft	
Bend loss = 0 ft	
Depth upstream = 14.61 ft	
Velocity = 0.11 ft/s	
Flow profile = Horizontal	
Baffle Wall E to D	**111.14**
Weir invert (top of weir) = 109	
Weir length = 20 ft	
Weir 'C' coefficient = 3.33	
Flow over weir = 21.479 mgd	
Weir submergence = fully submerged	
Head over weir = 2.14 ft	
Contact Stabilization Influent Pipe	**111.57**
Pipe shape = Circular	
Diameter = 24 in	
Length = 100 ft	
Flow = 11.3 mgd	
Friction method = Hazen Williams	
Friction factor = 120	
Total fitting K value = 0	
Pipe area = 3.14 ft²	
Pipe hydraulic radius = 0.5	
Age factor = 1	
Solids factor = 1	
Velocity = 5.56 ft/s	
Friction loss = 0.46 ft	
Fitting loss = 0 ft	
Total loss = 0.46 ft	
AB 3 Zone D	**111.15**

Section Description	Water Surface Elevation
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 95 ft Channel width/diameter = 20 ft Flow = 21.479 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 292.87 ft^2 Hydraulic radius = 5.942 Normal depth = infinite Critical depth = 0.44 ft Depth downstream = 14.64 ft Bend loss = 0 ft Depth upstream = 14.65 ft Velocity = 0.11 ft/s Flow profile = Horizontal	
Baffle Wall D to C	**111.18**
Weir invert (top of weir) = 109 Weir length = 20 ft Weir 'C' coefficient = 3.33 Flow over weir = 21.479 mgd Weir submergence = fully submerged Head over weir = 2.18 ft	
AB 4 Zone C	**111.18**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 130 ft Channel width/diameter = 20 ft Flow = 21.479 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 293.51 ft^2 Hydraulic radius = 5.947 Normal depth = infinite Critical depth = 0.44 ft Depth downstream = 14.68 ft Bend loss = 0 ft Depth upstream = 14.68 ft Velocity = 0.11 ft/s Flow profile = Horizontal	
Baffle Wall C to B	**111.21**
Weir invert (top of weir) = 109	

Section Description	Water Surface Elevation
Weir length = 20 ft Weir 'C' coefficient = 3.33 Flow over weir = 21.479 mgd Weir submergence = fully submerged Head over weir = 2.21 ft	
AB Zone B	**111.21**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 30 ft Channel width/diameter = 20 ft Flow = 21.479 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 294.15 ft^2 Hydraulic radius = 5.953 Normal depth = infinite Critical depth = 0.44 ft Depth downstream = 14.71 ft Bend loss = 0 ft Depth upstream = 14.71 ft Velocity = 0.11 ft/s Flow profile = Horizontal	
Baffle Wall B to A	**111.24**
Weir invert (top of weir) = 109 Weir length = 20 ft Weir 'C' coefficient = 3.33 Flow over weir = 21.479 mgd Weir submergence = fully submerged Head over weir = 2.24 ft	
AB Zone A	**111.24**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 30 ft Channel width/diameter = 20 ft Flow = 21.479 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 294.79 ft^2 Hydraulic radius = 5.958 Normal depth = infinite Critical depth = 0.44 ft Depth downstream = 14.74 ft Bend loss = 0 ft	

Section Description	Water Surface Elevation
Depth upstream = 14.74 ft Velocity = 0.11 ft/s Flow profile = Horizontal	
AB 4 Influent Sluice Gate Opening type = rectangular gate Opening diameter/width = 36 in Gate height = 30 in Invert = 110 Number of gates = 2 Flow through gate(s) = 10.179 mgd Total area of opening(s) = 15 ft^2 Velocity through gate(s) = 1.05 ft/s Flow behavior = orifice, downstream control Gate loss = 0.04 ft Downstream water level = 111.24 Upstream water level = 111.29	**111.29**
AB 4 Influent Channel Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 4 ft Channel width/diameter = 3 ft Flow = 10.179 mgd Downstream channel invert = 109.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 6.11 ft^2 Hydraulic radius = 0.864 Normal depth = infinite Critical depth = 0.95 ft Depth downstream = 2.04 ft Bend loss = 0 ft Depth upstream = 2.04 ft Velocity = 2.58 ft/s Flow profile = Horizontal	**111.29**
AB 4 Influent Sloped Channel Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 5.3 ft Channel width/diameter = 3 ft Flow = 10.179 mgd Downstream channel invert = 109.25 Channel slope = 0.0141 ft/ft Channel side slope = not applicable Area of flow = 6 ft^2 Hydraulic radius = 0.857	**111.28**

Section Description	Water Surface Elevation
Normal depth = 0.62 ft Critical depth = 0.95 ft Depth downstream = 2.04 ft Bend loss = 0 ft Depth upstream = 1.96 ft Velocity = 2.57 ft/s Flow profile = Steep	
AB 4 Influent Split Box-Channel	**111.34**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 12 ft Channel width/diameter = 4.5 ft Flow = 10.179 mgd Downstream channel invert = 110 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 5.79 ft^2 Hydraulic radius = 0.819 Normal depth = infinite Critical depth = 0.72 ft Depth downstream = 1.28 ft Bend loss = 0.05 ft Depth upstream = 1.34 ft Velocity = 2.73 ft/s Flow profile = Horizontal	
AB 3/4 42-IN Influent Pipe	**111.42**
Pipe shape = Circular Diameter = 42 in Length = 58 ft Flow = 10.179 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1.5 Pipe area = 9.62 ft² Pipe hydraulic radius = 0.875 Age factor = 1 Solids factor = 1 Velocity = 1.64 ft/s Friction loss = 0.01 ft Fitting loss = 0.06 ft Total loss = 0.08 ft	
42-IN Tee to AB 3/4	**111.44**
Tee type = run of tee Diameter of pipe run past tee = 42 in	

Section Description	Water Surface Elevation
Flow through tee = 10.179 mgd Velocity through tee = 1.64 ft/s Total tee K value = 0.6 Overall head loss = 0.02 ft	
42-IN PC Effluent to PC Junction Box Pipe shape = Circular Diameter = 42 in Length = 244 ft Flow = 20.34 mgd Friction method = Hazen Williams Friction factor = 100 Total fitting K value = 1 Pipe area = 9.62 ft² Pipe hydraulic radius = 0.875 Age factor = 2.348 Solids factor = 1 Velocity = 3.27 ft/s Friction loss = 0.72 ft Fitting loss = 0.17 ft Total loss = 0.88 ft	**112.33**
Prim. Eff. Junction Box Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 16.5 ft Channel width/diameter = 7 ft Flow = 20.34 mgd Downstream channel invert = 104.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 54.81 ft^2 Hydraulic radius = 2.419 Normal depth = infinite Critical depth = 0.86 ft Depth downstream = 7.83 ft Bend loss = 0 ft Depth upstream = 7.83 ft Velocity = 0.57 ft/s Flow profile = Horizontal	**112.33**
PC 2 24-IN Effluent Pipe shape = Circular Diameter = 24 in Length = 15 ft Flow = 3.767 mgd Friction method = Hazen Williams	**112.48**

Section Description	Water Surface Elevation
Friction factor = 100 Total fitting K value = 2.2 Pipe area = 3.14 ft² Pipe hydraulic radius = 0.5 Age factor = 2.348 Solids factor = 1 Velocity = 1.85 ft/s Friction loss = 0.03 ft Fitting loss = 0.12 ft Total loss = 0.15 ft	
PC 2 Effluent Box	**112.48**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 1.5 ft Channel width/diameter = 4 ft Flow = 3.767 mgd Downstream channel invert = 106 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 25.92 ft^2 Hydraulic radius = 1.528 Normal depth = infinite Critical depth = 0.4 ft Depth downstream = 6.48 ft Bend loss = 0 ft Depth upstream = 6.48 ft Velocity = 0.22 ft/s Flow profile = Horizontal	
PC 2 Effluent Launder	**113.11**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 71 ft Channel width/diameter = 1 ft Flow = 1.883 mgd Downstream channel invert = 112 Channel slope = 0.0015 ft/ft Channel side slope = not applicable Area of flow = 0.82 ft^2 Hydraulic radius = 0.311 Normal depth = 1.22 ft Critical depth = 0.64 ft Depth downstream = 0.64 ft Bend loss = 0 ft Depth upstream = 1 ft Velocity = 4.54 ft/s	

Section Description	Water Surface Elevation
Flow profile = Mild	
PC 2 Effluent Weir	**114.41**
Invert of V notch = 114.25	
Angle of V notch = 90 degrees	
Number of notches = 212	
Total flow over weir = 3.767 mgd	
Weir submergence = unsubmerged	
Head over weir = 0.16 ft	
PC 2 Basin	**114.42**
Channel shape = Rectangular	
Manning's 'n' = 0.012	
Channel length = 45 ft	
Channel width/diameter = 45 ft	
Flow = 3.767 mgd	
Downstream channel invert = 106	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 378.68 ft^2	
Hydraulic radius = 6.125	
Normal depth = infinite	
Critical depth = 0.08 ft	
Depth downstream = 8.41 ft	
Bend loss = 0 ft	
Depth upstream = 8.42 ft	
Velocity = 0.02 ft/s	
Flow profile = Horizontal	
PC 2 Influent Well	**114.68**
Pipe shape = Circular	
Diameter = 18 in	
Length = 7 ft	
Flow = 3.767 mgd	
Friction method = Hazen Williams	
Friction factor = 100	
Total fitting K value = 1.25	
Pipe area = 1.77 ft²	
Pipe hydraulic radius = 0.375	
Age factor = 2.348	
Solids factor = 1	
Velocity = 3.3 ft/s	
Friction loss = 0.06 ft	
Fitting loss = 0.21 ft	
Total loss = 0.27 ft	
24-IN Influent Pipe	**114.72**
Pipe shape = Circular	

Section Description	Water Surface Elevation
Diameter = 24 in Length = 10 ft Flow = 3.767 mgd Friction method = Hazen Williams Friction factor = 100 Total fitting K value = 0.42 Pipe area = 3.14 ft² Pipe hydraulic radius = 0.5 Age factor = 2.348 Solids factor = 1 Velocity = 1.85 ft/s Friction loss = 0.02 ft Fitting loss = 0.02 ft Total loss = 0.04 ft	
36-IN PC Influent Pipe	**114.83**
Pipe shape = Circular Diameter = 24 in Length = 10 ft Flow = 3.767 mgd Friction method = Hazen Williams Friction factor = 100 Total fitting K value = 1.67 Pipe area = 3.14 ft² Pipe hydraulic radius = 0.5 Age factor = 2.348 Solids factor = 1 Velocity = 1.85 ft/s Friction loss = 0.02 ft Fitting loss = 0.09 ft Total loss = 0.11 ft	
Drop Box to Primary Clarifier No 2	**114.83**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 3.5 ft Channel width/diameter = 3.5 ft Flow = 3.767 mgd Downstream channel invert = 108 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 23.91 ft^2 Hydraulic radius = 1.393 Normal depth = infinite Critical depth = 0.44 ft Depth downstream = 6.83 ft Bend loss = 0 ft	

Section Description	Water Surface Elevation
Depth upstream = 6.83 ft Velocity = 0.24 ft/s Flow profile = Horizontal	
Primary Clarifier Distribution Box Weir Weir invert (top of weir) = 117 Weir length = 3.5 ft Weir 'C' coefficient = 3.33 Flow over weir = 3.748 mgd Weir submergence = unsubmerged Head over weir = 0.63 ft	**117.63**

Pinole MM-MD Flow.vhf

Hydraulic Profile

Current flow conditions

Forward Flow	Return I Flow	Return II Flow	Return III Flow
6.06 mgd	4.87 mgd	12.18 mgd	-----

Section Description	Water Surface Elevation
Starting water surface elevation	**107**
Effluent Weir	**107.61**
Weir invert (top of weir) = 107.15 Weir length = 4.5 ft Weir 'C' coefficient = 3.33 Flow over weir = 3.03 mgd Weir submergence = unsubmerged Head over weir = 0.46 ft	
Chlorine Contact Basin	**107.62**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 140 ft Channel width/diameter = 4 ft Flow = 3.03 mgd Downstream channel invert = 103.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 17.44 ft^2 Hydraulic radius = 1.371 Normal depth = infinite Critical depth = 0.35 ft Depth downstream = 4.36 ft Bend loss = 0.01 ft Depth upstream = 4.37 ft Velocity = 0.27 ft/s Flow profile = Horizontal	
Slide Gate	**107.65**
Opening type = rectangular gate Opening diameter/width = 36 in Gate height = 24 in Invert = 103.25 Number of gates = 1 Flow through gate(s) = 3.03 mgd	

Section Description	Water Surface Elevation
Total area of opening(s) = 6 ft^2 Velocity through gate(s) = 0.78 ft/s Flow behavior = orifice, downstream control Gate loss = 0.02 ft Downstream water level = 107.62 Upstream water level = 107.65	
CC Basin Influent Box	**107.65**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 8 ft Channel width/diameter = 4 ft Flow = 6.06 mgd Downstream channel invert = 103.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 17.58 ft^2 Hydraulic radius = 1.375 Normal depth = infinite Critical depth = 0.55 ft Depth downstream = 4.4 ft Bend loss = 0 ft Depth upstream = 4.4 ft Velocity = 0.53 ft/s Flow profile = Horizontal	
42-IN SC Effluent	**107.68**
Pipe shape = Circular Diameter = 42 in Length = 116 ft Flow = 6.06 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1.75 Pipe area = 9.62 ft² Pipe hydraulic radius = 0.875 Age factor = 1 Solids factor = 1 Velocity = 0.97 ft/s Friction loss = 0.01 ft Fitting loss = 0.03 ft Total loss = 0.04 ft	
SC #2 Effluent Connection	**107.69**
Tee type = branch to line Diameter of pipe line = 42 in Diameter of pipe branch = 30 in	

Section Description	Water Surface Elevation
Flow through tee = 1.818 mgd Velocity through tee = 0.57 ft/s Total tee K value = 1.69 Overall head loss = 0.01 ft	
SC #2 - 36-IN Effluent	**107.69**
Pipe shape = Circular Diameter = 36 in Length = 70 ft Flow = 1.818 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1 Pipe area = 7.07 ft² Pipe hydraulic radius = 0.75 Age factor = 1 Solids factor = 1 Velocity = 0.4 ft/s Friction loss = 0 ft Fitting loss = 0 ft Total loss = 0 ft	
SC #2 Effluent Box	**107.69**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 4 ft Channel width/diameter = 4 ft Flow = 2.01 mgd Downstream channel invert = 90 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 70.76 ft^2 Hydraulic radius = 1.797 Normal depth = infinite Critical depth = 0.27 ft Depth downstream = 17.69 ft Bend loss = 0 ft Depth upstream = 17.69 ft Velocity = 0.04 ft/s Flow profile = Horizontal	
SC #2 Effluent Launder	**107.87**
Launder invert = 107 Launder length = 100 ft Launder width = 1 ft Launder slope = 0.004 ft/ft Flow through launder = 0.912 mgd	

Section Description	Water Surface Elevation
Critical depth = 0.4 ft Downstream depth = 0.69 ft Upstream depth = 0.47 ft	
SC #2 Effluent Weir	**109.38**
Invert of V notch = 109.3 Angle of V notch = 90 degrees Number of notches = 594 Total flow over weir = 2.01 mgd Weir submergence = unsubmerged Head over weir = 0.08 ft	
SC #2	**109.39**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 75 ft Channel width/diameter = 75 ft Flow = 3.278 mgd Downstream channel invert = 90 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 1453.9 ft^2 Hydraulic radius = 12.779 Normal depth = infinite Critical depth = 0.05 ft Depth downstream = 19.38 ft Bend loss = 0 ft Depth upstream = 19.39 ft Velocity = 0 ft/s Flow profile = Horizontal	
SC #2 Inlet Ports	**109.41**
Opening type = rectangular orifice Opening diameter/width = 6 in Opening height = 30 in Invert = 106 Number of openings = 6 Flow through opening(s) = 3.332 mgd Total area of opening(s) = 7.5 ft^2 Velocity through opening(s) = 0.69 ft/s Flow behavior = orifice, downstream control Orifice loss = 0.02 ft Downstream water level = 109.39 Upstream water level = 109.41	
SC #2 - 36-IN Influent	**109.43**
Pipe shape = Circular Diameter = 36 in	

Section Description	Water Surface Elevation
Length = 200 ft Flow = 3.278 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 2 Pipe area = 7.07 ft² Pipe hydraulic radius = 0.75 Age factor = 1 Solids factor = 1 Velocity = 0.72 ft/s Friction loss = 0.01 ft Fitting loss = 0.02 ft Total loss = 0.03 ft	
SC #2 Influent Box	**109.43**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 3 ft Channel width/diameter = 7 ft Flow = 3.278 mgd Downstream channel invert = 100 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 66.01 ft^2 Hydraulic radius = 2.553 Normal depth = infinite Critical depth = 0.25 ft Depth downstream = 9.43 ft Bend loss = 0 ft Depth upstream = 9.43 ft Velocity = 0.08 ft/s Flow profile = Horizontal	
SC Dist Box Weir #5	**110.38**
Weir invert (top of weir) = 110 Weir length = 7 ft Weir 'C' coefficient = 3.33 Flow over weir = 3.47 mgd Weir submergence = unsubmerged Head over weir = 0.38 ft	
SC Distribution Box	**110.38**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 9 ft Channel width/diameter = 35 ft Flow = 10.93 mgd	

Section Description	Water Surface Elevation
Downstream channel invert = 105.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 170.66 ft^2 Hydraulic radius = 3.813 Normal depth = infinite Critical depth = 0.19 ft Depth downstream = 4.88 ft Bend loss = 0 ft Depth upstream = 4.88 ft Velocity = 0.1 ft/s Flow profile = Horizontal	
AB 36-IN Effluent	**110.42**
Pipe shape = Circular Diameter = 36 in Length = 5 ft Flow = 5.465 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1.76 Pipe area = 7.07 ft² Pipe hydraulic radius = 0.75 Age factor = 1 Solids factor = 1 Velocity = 1.2 ft/s Friction loss = 0 ft Fitting loss = 0.04 ft Total loss = 0.04 ft	
Effluent Gate	**110.48**
Opening type = circular gate Opening diameter/width = 36 in Gate height = 36 in Invert = 106 Number of gates = 1 Flow through gate(s) = 5.47 mgd Total area of opening(s) = 7.07 ft^2 Velocity through gate(s) = 1.2 ft/s Flow behavior = orifice, downstream control Gate loss = 0.06 ft Downstream water level = 110.42 Upstream water level = 110.48	
AB 3 ML Drop Box	**110.48**
Channel shape = Rectangular Manning's 'n' = 0.012	

Section Description	Water Surface Elevation
Channel length = 3 ft Channel width/diameter = 3 ft Flow = 5.47 mgd Downstream channel invert = 105.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 14.95 ft^2 Hydraulic radius = 1.153 Normal depth = infinite Critical depth = 0.63 ft Depth downstream = 4.98 ft Bend loss = 0 ft Depth upstream = 4.98 ft Velocity = 0.57 ft/s Flow profile = Horizontal	
AB 3 ML Effluent Channel	**110.49**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 5.5 ft Channel width/diameter = 3 ft Flow = 5.47 mgd Downstream channel invert = 109.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 3.71 ft^2 Hydraulic radius = 0.678 Normal depth = infinite Critical depth = 0.63 ft Depth downstream = 1.23 ft Bend loss = 0 ft Depth upstream = 1.24 ft Velocity = 2.29 ft/s Flow profile = Horizontal	
AB 3 Effluent Sluice Gate	**110.54**
Opening type = rectangular gate Opening diameter/width = 36 in Gate height = 30 in Invert = 109.25 Number of gates = 1 Flow through gate(s) = 5.47 mgd Total area of opening(s) = 7.5 ft^2 Velocity through gate(s) = 1.13 ft/s Flow behavior = orifice, downstream control Gate loss = 0.05 ft Downstream water level = 110.49	

Section Description	Water Surface Elevation
Upstream water level = 110.54	
AB 3 Zone E	**110.54**
Channel shape = Rectangular	
Manning's 'n' = 0.012	
Channel length = 95 ft	
Channel width/diameter = 20 ft	
Flow = 11.56 mgd	
Downstream channel invert = 96.5	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 280.81 ft^2	
Hydraulic radius = 5.84	
Normal depth = infinite	
Critical depth = 0.29 ft	
Depth downstream = 14.04 ft	
Bend loss = 0 ft	
Depth upstream = 14.04 ft	
Velocity = 0.06 ft/s	
Flow profile = Horizontal	
Baffle Wall E to D	**110.56**
Weir invert (top of weir) = 109	
Weir length = 20 ft	
Weir 'C' coefficient = 3.33	
Flow over weir = 11.56 mgd	
Weir submergence = fully submerged	
Head over weir = 1.56 ft	
Contact Stabilization Influent Pipe	**110.69**
Pipe shape = Circular	
Diameter = 24 in	
Length = 100 ft	
Flow = 6.06 mgd	
Friction method = Hazen Williams	
Friction factor = 120	
Total fitting K value = 0	
Pipe area = 3.14 ft²	
Pipe hydraulic radius = 0.5	
Age factor = 1	
Solids factor = 1	
Velocity = 2.98 ft/s	
Friction loss = 0.14 ft	
Fitting loss = 0 ft	
Total loss = 0.14 ft	
AB 3 Zone D	**110.56**

Section Description	Water Surface Elevation
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 95 ft Channel width/diameter = 20 ft Flow = 11.56 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 281.25 ft^2 Hydraulic radius = 5.844 Normal depth = infinite Critical depth = 0.29 ft Depth downstream = 14.06 ft Bend loss = 0 ft Depth upstream = 14.06 ft Velocity = 0.06 ft/s Flow profile = Horizontal	
Baffle Wall D to C	**110.58**
Weir invert (top of weir) = 109 Weir length = 20 ft Weir 'C' coefficient = 3.33 Flow over weir = 11.56 mgd Weir submergence = fully submerged Head over weir = 1.58 ft	
AB 4 Zone C	**110.59**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 130 ft Channel width/diameter = 20 ft Flow = 11.56 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 281.69 ft^2 Hydraulic radius = 5.848 Normal depth = infinite Critical depth = 0.29 ft Depth downstream = 14.08 ft Bend loss = 0 ft Depth upstream = 14.09 ft Velocity = 0.06 ft/s Flow profile = Horizontal	
Baffle Wall C to B	**110.61**
Weir invert (top of weir) = 109	

Section Description	Water Surface Elevation
Weir length = 20 ft Weir 'C' coefficient = 3.33 Flow over weir = 11.56 mgd Weir submergence = fully submerged Head over weir = 1.61 ft	
AB Zone B	**110.61**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 30 ft Channel width/diameter = 20 ft Flow = 11.56 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 282.13 ft^2 Hydraulic radius = 5.852 Normal depth = infinite Critical depth = 0.29 ft Depth downstream = 14.11 ft Bend loss = 0 ft Depth upstream = 14.11 ft Velocity = 0.06 ft/s Flow profile = Horizontal	
Baffle Wall B to A	**110.63**
Weir invert (top of weir) = 109 Weir length = 20 ft Weir 'C' coefficient = 3.33 Flow over weir = 11.56 mgd Weir submergence = fully submerged Head over weir = 1.63 ft	
AB Zone A	**110.63**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 30 ft Channel width/diameter = 20 ft Flow = 11.56 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 282.57 ft^2 Hydraulic radius = 5.856 Normal depth = infinite Critical depth = 0.29 ft Depth downstream = 14.13 ft Bend loss = 0 ft	

Section Description	Water Surface Elevation
Depth upstream = 14.13 ft Velocity = 0.06 ft/s Flow profile = Horizontal	
AB 4 Influent Sluice Gate Opening type = rectangular gate Opening diameter/width = 36 in Gate height = 30 in Invert = 110 Number of gates = 2 Flow through gate(s) = 5.47 mgd Total area of opening(s) = 15 ft^2 Velocity through gate(s) = 0.56 ft/s Flow behavior = orifice, downstream control Gate loss = 0.01 ft Downstream water level = 110.63 Upstream water level = 110.64	**110.64**
AB 4 Influent Channel Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 4 ft Channel width/diameter = 3 ft Flow = 5.47 mgd Downstream channel invert = 109.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 4.18 ft^2 Hydraulic radius = 0.723 Normal depth = infinite Critical depth = 0.63 ft Depth downstream = 1.39 ft Bend loss = 0 ft Depth upstream = 1.4 ft Velocity = 2.02 ft/s Flow profile = Horizontal	**110.65**
AB 4 Influent Sloped Channel Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 5.3 ft Channel width/diameter = 3 ft Flow = 5.47 mgd Downstream channel invert = 109.25 Channel slope = 0.0141 ft/ft Channel side slope = not applicable Area of flow = 4.07 ft^2 Hydraulic radius = 0.712	**110.64**

Section Description	Water Surface Elevation
Normal depth = 0.41 ft Critical depth = 0.63 ft Depth downstream = 1.4 ft Bend loss = 0 ft Depth upstream = 1.31 ft Velocity = 2.02 ft/s Flow profile = Steep	
AB 4 Influent Split Box-Channel	**110.72**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 12 ft Channel width/diameter = 4.5 ft Flow = 5.47 mgd Downstream channel invert = 110 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 2.94 ft^2 Hydraulic radius = 0.506 Normal depth = infinite Critical depth = 0.48 ft Depth downstream = 0.64 ft Bend loss = 0.05 ft Depth upstream = 0.72 ft Velocity = 2.94 ft/s Flow profile = Horizontal	
AB 3/4 42-IN Influent Pipe	**110.74**
Pipe shape = Circular Diameter = 42 in Length = 58 ft Flow = 5.47 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1.5 Pipe area = 9.62 ft² Pipe hydraulic radius = 0.875 Age factor = 1 Solids factor = 1 Velocity = 0.88 ft/s Friction loss = 0 ft Fitting loss = 0.02 ft Total loss = 0.02 ft	
42-IN Tee to AB 3/4	**110.75**
Tee type = run of tee Diameter of pipe run past tee = 42 in	

Section Description	Water Surface Elevation
Flow through tee = 5.47 mgd Velocity through tee = 0.88 ft/s Total tee K value = 0.6 Overall head loss = 0.01 ft	
42-IN PC Effluent to PC Junction Box Pipe shape = Circular Diameter = 42 in Length = 244 ft Flow = 10.93 mgd Friction method = Hazen Williams Friction factor = 100 Total fitting K value = 1 Pipe area = 9.62 ft² Pipe hydraulic radius = 0.875 Age factor = 2.348 Solids factor = 1 Velocity = 1.76 ft/s Friction loss = 0.23 ft Fitting loss = 0.05 ft Total loss = 0.28 ft	**111.02**
Prim. Eff. Junction Box Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 16.5 ft Channel width/diameter = 7 ft Flow = 10.93 mgd Downstream channel invert = 104.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 45.64 ft^2 Hydraulic radius = 2.278 Normal depth = infinite Critical depth = 0.57 ft Depth downstream = 6.52 ft Bend loss = 0 ft Depth upstream = 6.52 ft Velocity = 0.37 ft/s Flow profile = Horizontal	**111.02**
PC 2 24-IN Effluent Pipe shape = Circular Diameter = 24 in Length = 15 ft Flow = 2.02 mgd Friction method = Hazen Williams	**111.07**

Section Description	Water Surface Elevation
Friction factor = 100 Total fitting K value = 2.2 Pipe area = 3.14 ft² Pipe hydraulic radius = 0.5 Age factor = 2.348 Solids factor = 1 Velocity = 0.99 ft/s Friction loss = 0.01 ft Fitting loss = 0.03 ft Total loss = 0.04 ft	
PC 2 Effluent Box	**111.07**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 1.5 ft Channel width/diameter = 4 ft Flow = 2.02 mgd Downstream channel invert = 106 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 20.28 ft^2 Hydraulic radius = 1.434 Normal depth = infinite Critical depth = 0.27 ft Depth downstream = 5.07 ft Bend loss = 0 ft Depth upstream = 5.07 ft Velocity = 0.15 ft/s Flow profile = Horizontal	
PC 2 Effluent Launder	**112.78**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 71 ft Channel width/diameter = 1 ft Flow = 1.01 mgd Downstream channel invert = 112 Channel slope = 0.0015 ft/ft Channel side slope = not applicable Area of flow = 0.55 ft^2 Hydraulic radius = 0.261 Normal depth = 0.74 ft Critical depth = 0.42 ft Depth downstream = 0.42 ft Bend loss = 0 ft Depth upstream = 0.67 ft Velocity = 3.69 ft/s	

Section Description	Water Surface Elevation
Flow profile = Mild	
PC 2 Effluent Weir	**114.38**
Invert of V notch = 114.25	
Angle of V notch = 90 degrees	
Number of notches = 212	
Total flow over weir = 2.02 mgd	
Weir submergence = unsubmerged	
Head over weir = 0.13 ft	
PC 2 Basin	**114.38**
Channel shape = Rectangular	
Manning's 'n' = 0.012	
Channel length = 45 ft	
Channel width/diameter = 45 ft	
Flow = 2.02 mgd	
Downstream channel invert = 106	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 377.05 ft^2	
Hydraulic radius = 6.105	
Normal depth = infinite	
Critical depth = 0.05 ft	
Depth downstream = 8.38 ft	
Bend loss = 0 ft	
Depth upstream = 8.38 ft	
Velocity = 0.01 ft/s	
Flow profile = Horizontal	
PC 2 Influent Well	**114.46**
Pipe shape = Circular	
Diameter = 18 in	
Length = 7 ft	
Flow = 2.02 mgd	
Friction method = Hazen Williams	
Friction factor = 100	
Total fitting K value = 1.25	
Pipe area = 1.77 ft²	
Pipe hydraulic radius = 0.375	
Age factor = 2.348	
Solids factor = 1	
Velocity = 1.77 ft/s	
Friction loss = 0.02 ft	
Fitting loss = 0.06 ft	
Total loss = 0.08 ft	
24-IN Influent Pipe	**114.47**
Pipe shape = Circular	

Section Description	Water Surface Elevation
Diameter = 24 in Length = 10 ft Flow = 2.02 mgd Friction method = Hazen Williams Friction factor = 100 Total fitting K value = 0.42 Pipe area = 3.14 ft² Pipe hydraulic radius = 0.5 Age factor = 2.348 Solids factor = 1 Velocity = 0.99 ft/s Friction loss = 0.01 ft Fitting loss = 0.01 ft Total loss = 0.01 ft	
36-IN PC Influent Pipe	**114.5**
Pipe shape = Circular Diameter = 24 in Length = 10 ft Flow = 2.02 mgd Friction method = Hazen Williams Friction factor = 100 Total fitting K value = 1.67 Pipe area = 3.14 ft² Pipe hydraulic radius = 0.5 Age factor = 2.348 Solids factor = 1 Velocity = 0.99 ft/s Friction loss = 0.01 ft Fitting loss = 0.03 ft Total loss = 0.03 ft	
Drop Box to Primary Clarifier No 2	**114.5**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 3.5 ft Channel width/diameter = 3.5 ft Flow = 2.02 mgd Downstream channel invert = 108 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 22.75 ft^2 Hydraulic radius = 1.379 Normal depth = infinite Critical depth = 0.29 ft Depth downstream = 6.5 ft Bend loss = 0 ft	

Section Description	Water Surface Elevation
Depth upstream = 6.5 ft Velocity = 0.14 ft/s Flow profile = Horizontal	
Primary Clarifier Distribution Box Weir Weir invert (top of weir) = 117 Weir length = 3.5 ft Weir 'C' coefficient = 3.33 Flow over weir = 2.01 mgd Weir submergence = unsubmerged Head over weir = 0.41 ft	**117.41**

Pinole PWWF Flow.vhf

Hydraulic Profile

Current flow conditions

Forward Flow	Return I Flow	Return II Flow	Return III Flow
20 mgd	10 mgd	-----	-----

Section Description	Water Surface Elevation
Starting water surface elevation	**107**
Effluent Weir	**108.17**
Weir invert (top of weir) = 107.15 Weir length = 4.5 ft Weir 'C' coefficient = 3.33 Flow over weir = 10 mgd Weir submergence = unsubmerged Head over weir = 1.02 ft	
Chlorine Contact Basin	**108.18**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 140 ft Channel width/diameter = 4 ft Flow = 10 mgd Downstream channel invert = 103.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 19.69 ft^2 Hydraulic radius = 1.422 Normal depth = infinite Critical depth = 0.77 ft Depth downstream = 4.92 ft Bend loss = 0 ft Depth upstream = 4.93 ft Velocity = 0.79 ft/s Flow profile = Horizontal	
Slide Gate	**108.45**
Opening type = rectangular gate Opening diameter/width = 36 in Gate height = 24 in Invert = 103.25 Number of gates = 1 Flow through gate(s) = 10 mgd	

Section Description	Water Surface Elevation
Total area of opening(s) = 6 ft^2 Velocity through gate(s) = 2.58 ft/s Flow behavior = orifice, downstream control Gate loss = 0.27 ft Downstream water level = 108.18 Upstream water level = 108.45	
CC Basin Influent Box	**108.45**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 8 ft Channel width/diameter = 4 ft Flow = 20 mgd Downstream channel invert = 103.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 20.8 ft^2 Hydraulic radius = 1.444 Normal depth = infinite Critical depth = 1.23 ft Depth downstream = 5.2 ft Bend loss = 0 ft Depth upstream = 5.2 ft Velocity = 1.49 ft/s Flow profile = Horizontal	
42-IN SC Effluent	**108.83**
Pipe shape = Circular Diameter = 42 in Length = 116 ft Flow = 20 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1.75 Pipe area = 9.62 ft² Pipe hydraulic radius = 0.875 Age factor = 1 Solids factor = 1 Velocity = 3.22 ft/s Friction loss = 0.1 ft Fitting loss = 0.28 ft Total loss = 0.38 ft	
SC #1 Effluent Connection	**108.85**
Tee type = branch to line Diameter of pipe line = 42 in Diameter of pipe branch = 42 in	

Section Description	Water Surface Elevation
Flow through tee = 6 mgd Velocity through tee = 0.96 ft/s Total tee K value = 1.5 Overall head loss = 0.02 ft	
SC #1 - 30-IN Effluent	**108.87**
Pipe shape = Circular Diameter = 42 in Length = 70 ft Flow = 6 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1 Pipe area = 9.62 ft² Pipe hydraulic radius = 0.875 Age factor = 1 Solids factor = 1 Velocity = 0.96 ft/s Friction loss = 0.01 ft Fitting loss = 0.01 ft Total loss = 0.02 ft	
SC #1 Effluent Box	**108.87**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 4 ft Channel width/diameter = 4 ft Flow = 6 mgd Downstream channel invert = 90 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 75.48 ft^2 Hydraulic radius = 1.808 Normal depth = infinite Critical depth = 0.55 ft Depth downstream = 18.87 ft Bend loss = 0 ft Depth upstream = 18.87 ft Velocity = 0.12 ft/s Flow profile = Horizontal	
SC #1 Effluent Launder	**109.26**
Launder invert = 107 Launder length = 100 ft Launder width = 1 ft Launder slope = 0.004 ft/ft Flow through launder = 3 mgd	

Section Description	Water Surface Elevation
Critical depth = 0.87 ft Downstream depth = 1.87 ft Upstream depth = 1.86 ft	
SC #1 Effluent Weir	**109.43**
Invert of V notch = 109.3 Angle of V notch = 90 degrees Number of notches = 594 Total flow over weir = 6 mgd Weir submergence = unsubmerged Head over weir = 0.13 ft	
SC #1	**109.43**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 75 ft Channel width/diameter = 75 ft Flow = 9 mgd Downstream channel invert = 90 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 1457.39 ft^2 Hydraulic radius = 12.799 Normal depth = infinite Critical depth = 0.1 ft Depth downstream = 19.43 ft Bend loss = 0 ft Depth upstream = 19.43 ft Velocity = 0.01 ft/s Flow profile = Horizontal	
SC #2 Influent Ports	**109.57**
Opening type = rectangular orifice Opening diameter/width = 6 in Opening height = 30 in Invert = 106 Number of openings = 6 Flow through opening(s) = 9 mgd Total area of opening(s) = 7.5 ft^2 Velocity through opening(s) = 1.86 ft/s Flow behavior = orifice, downstream control Orifice loss = 0.14 ft Downstream water level = 109.43 Upstream water level = 109.57	
SC #2 - 36-IN Influent	**109.78**
Pipe shape = Circular Diameter = 36 in	

Section Description	Water Surface Elevation
Length = 200 ft Flow = 9 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 2 Pipe area = 7.07 ft² Pipe hydraulic radius = 0.75 Age factor = 1 Solids factor = 1 Velocity = 1.97 ft/s Friction loss = 0.08 ft Fitting loss = 0.12 ft Total loss = 0.2 ft	
SC #1 Drop box	**109.78**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 3 ft Channel width/diameter = 8 ft Flow = 9 mgd Downstream channel invert = 100 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 78.24 ft^2 Hydraulic radius = 2.839 Normal depth = infinite Critical depth = 0.46 ft Depth downstream = 9.78 ft Bend loss = 0 ft Depth upstream = 9.78 ft Velocity = 0.18 ft/s Flow profile = Horizontal	
SC Dist Box Weir #5	**110.71**
Weir invert (top of weir) = 110 Weir length = 7 ft Weir 'C' coefficient = 3.33 Flow over weir = 9 mgd Weir submergence = unsubmerged Head over weir = 0.71 ft	
SC Distribution Box	**110.71**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 9 ft Channel width/diameter = 30 ft Flow = 30 mgd	

Section Description	Water Surface Elevation
Downstream channel invert = 100 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 321.29 ft^2 Hydraulic radius = 6.248 Normal depth = infinite Critical depth = 0.42 ft Depth downstream = 10.71 ft Bend loss = 0 ft Depth upstream = 10.71 ft Velocity = 0.14 ft/s Flow profile = Horizontal	
AB 36-IN Effluent	**111.01**
Pipe shape = Circular Diameter = 36 in Length = 5 ft Flow = 15 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1.76 Pipe area = 7.07 ft² Pipe hydraulic radius = 0.75 Age factor = 1 Solids factor = 1 Velocity = 3.28 ft/s Friction loss = 0.01 ft Fitting loss = 0.29 ft Total loss = 0.3 ft	
AB Exit Gate	**111.48**
Opening type = circular gate Opening diameter/width = 36 in Gate height = 36 in Invert = 106 Number of gates = 1 Flow through gate(s) = 15.01 mgd Total area of opening(s) = 7.07 ft^2 Velocity through gate(s) = 3.29 ft/s Flow behavior = orifice, downstream control Gate loss = 0.47 ft Downstream water level = 111.01 Upstream water level = 111.48	
AB 3 ML Drop Box	**111.48**
Channel shape = Rectangular Manning's 'n' = 0.012	

Section Description	Water Surface Elevation
Channel length = 3 ft Channel width/diameter = 3 ft Flow = 15.01 mgd Downstream channel invert = 105.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 17.93 ft^2 Hydraulic radius = 1.199 Normal depth = infinite Critical depth = 1.23 ft Depth downstream = 5.98 ft Bend loss = 0 ft Depth upstream = 5.98 ft Velocity = 1.3 ft/s Flow profile = Horizontal	
AB 3 ML Effluent Channel	**111.49**
Channel shape = Rectangular Manning's 'n' = 0.013 Channel length = 5.5 ft Channel width/diameter = 3 ft Flow = 15.01 mgd Downstream channel invert = 109.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 6.69 ft^2 Hydraulic radius = 0.897 Normal depth = infinite Critical depth = 1.23 ft Depth downstream = 2.23 ft Bend loss = 0 ft Depth upstream = 2.24 ft Velocity = 3.47 ft/s Flow profile = Horizontal	
AB 3 Effluent Sluice Gate	**111.87**
Opening type = rectangular gate Opening diameter/width = 36 in Gate height = 30 in Invert = 109.25 Number of gates = 1 Flow through gate(s) = 15.01 mgd Total area of opening(s) = 7.5 ft^2 Velocity through gate(s) = 3.1 ft/s Flow behavior = orifice, downstream control Gate loss = 0.39 ft Downstream water level = 111.49	

Section Description	Water Surface Elevation
Upstream water level = 111.87	
AB 3 Zone E	**111.87**
Channel shape = Rectangular	
Manning's 'n' = 0.013	
Channel length = 95 ft	
Channel width/diameter = 20 ft	
Flow = 15.01 mgd	
Downstream channel invert = 96.5	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 307.46 ft^2	
Hydraulic radius = 6.059	
Normal depth = infinite	
Critical depth = 0.35 ft	
Depth downstream = 15.37 ft	
Bend loss = 0 ft	
Depth upstream = 15.37 ft	
Velocity = 0.08 ft/s	
Flow profile = Horizontal	
Baffle Wall E to D	**111.89**
Weir invert (top of weir) = 109	
Weir length = 20 ft	
Weir 'C' coefficient = 3.33	
Flow over weir = 15 mgd	
Weir submergence = fully submerged	
Head over weir = 2.89 ft	
Step Feed Gates AB No 3	**111.9**
Opening type = rectangular gate	
Opening diameter/width = 24 in	
Gate height = 36 in	
Invert = 110.5	
Number of gates = 3	
Flow through gate(s) = 10 mgd	
Total area of opening(s) = 18 ft^2	
Velocity through gate(s) = 0.86 ft/s	
Flow behavior = orifice, downstream control	
Gate loss = 0.03 ft	
Downstream water level = 111.87	
Upstream water level = 111.9	
Step Feed Channel AB No 3	**112.03**
Channel shape = Rectangular	
Manning's 'n' = 0.013	
Channel length = 108 ft	

Section Description	Water Surface Elevation
Channel width/diameter = 3 ft Flow = 10 mgd Downstream channel invert = 110 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 5.84 ft^2 Hydraulic radius = 0.847 Normal depth = infinite Critical depth = 0.94 ft Depth downstream = 1.9 ft Bend loss = 0.05 ft Depth upstream = 2.03 ft Velocity = 2.71 ft/s Flow profile = Horizontal	
Step Feed Channel Bend	**112.08**
Channel shape = Rectangular Manning's 'n' = 0.013 Channel length = 8 ft Channel width/diameter = 3 ft Flow = 10 mgd Downstream channel invert = 110 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 6.11 ft^2 Hydraulic radius = 0.864 Normal depth = infinite Critical depth = 0.94 ft Depth downstream = 2.03 ft Bend loss = 0.04 ft Depth upstream = 2.08 ft Velocity = 2.54 ft/s Flow profile = Horizontal	
AB 3/4 Influent Pipe	**112.19**
Pipe shape = Circular Diameter = 42 in Length = 54 ft Flow = 10 mgd Friction method = Hazen Williams Friction factor = 100 Total fitting K value = 1.7 Pipe area = 9.62 ft² Pipe hydraulic radius = 0.875 Age factor = 2.348 Solids factor = 1 Velocity = 1.61 ft/s	

Section Description	Water Surface Elevation
Friction loss = 0.04 ft Fitting loss = 0.07 ft Total loss = 0.11 ft	
42-IN Tee to AB 3/4	**112.29**
Tee type = run of tee Diameter of pipe run past tee = 42 in Flow through tee = 20 mgd Velocity through tee = 3.22 ft/s Total tee K value = 0.6 Overall head loss = 0.1 ft	
42-IN PC Effluent to PC Junction Box CS Mode	**113.14**
Pipe shape = Circular Diameter = 42 in Length = 244 ft Flow = 20 mgd Friction method = Hazen Williams Friction factor = 100 Total fitting K value = 1 Pipe area = 9.62 ft² Pipe hydraulic radius = 0.875 Age factor = 2.348 Solids factor = 1 Velocity = 3.22 ft/s Friction loss = 0.7 ft Fitting loss = 0.16 ft Total loss = 0.86 ft	
Prim. Eff. Junction Box (CS Mode)	**113.14**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 15.5 ft Channel width/diameter = 7 ft Flow = 20 mgd Downstream channel invert = 104.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 60.48 ft^2 Hydraulic radius = 2.491 Normal depth = infinite Critical depth = 0.85 ft Depth downstream = 8.64 ft Bend loss = 0 ft Depth upstream = 8.64 ft Velocity = 0.51 ft/s Flow profile = Horizontal	

Section Description	Water Surface Elevation
PC 2 24-IN Effluent CS Mode	**113.28**
Pipe shape = Circular	
Diameter = 24 in	
Length = 15 ft	
Flow = 4 mgd	
Friction method = Hazen Williams	
Friction factor = 100	
Total fitting K value = 1.7	
Pipe area = 3.14 ft²	
Pipe hydraulic radius = 0.5	
Age factor = 2.348	
Solids factor = 1	
Velocity = 1.97 ft/s	
Friction loss = 0.03 ft	
Fitting loss = 0.1 ft	
Total loss = 0.14 ft	
PC 2 Effluent Box CS Mode	**113.28**
Channel shape = Rectangular	
Manning's 'n' = 0.012	
Channel length = 1.5 ft	
Channel width/diameter = 4 ft	
Flow = 4 mgd	
Downstream channel invert = 104.5	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 35.12 ft^2	
Hydraulic radius = 1.629	
Normal depth = infinite	
Critical depth = 0.42 ft	
Depth downstream = 8.78 ft	
Bend loss = 0 ft	
Depth upstream = 8.78 ft	
Velocity = 0.18 ft/s	
Flow profile = Horizontal	
PC 2 Effluent Launder CS Mode	**113.39**
Channel shape = Rectangular	
Manning's 'n' = 0.012	
Channel length = 71 ft	
Channel width/diameter = 1 ft	
Flow = 2 mgd	
Downstream channel invert = 112	
Channel slope = 0.0015 ft/ft	
Channel side slope = not applicable	
Area of flow = 1.28 ft^2	
Hydraulic radius = 0.36	

Section Description	Water Surface Elevation
Normal depth = 1.28 ft Critical depth = 0.67 ft Depth downstream = 1.28 ft Bend loss = 0 ft Depth upstream = 1.28 ft Velocity = 2.41 ft/s Flow profile = Mild	
PC 2 Effluent Weir CS Mode	**114.42**
Invert of V notch = 114.25 Angle of V notch = 90 degrees Number of notches = 212 Total flow over weir = 4 mgd Weir submergence = unsubmerged Head over weir = 0.17 ft	
PC 2	**114.42**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 45 ft Channel width/diameter = 45 ft Flow = 3.96 mgd Downstream channel invert = 106 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 378.86 ft^2 Hydraulic radius = 6.127 Normal depth = infinite Critical depth = 0.08 ft Depth downstream = 8.42 ft Bend loss = 0 ft Depth upstream = 8.42 ft Velocity = 0.02 ft/s Flow profile = Horizontal	
PC Influent Well	**114.72**
Pipe shape = Circular Diameter = 18 in Length = 7 ft Flow = 4 mgd Friction method = Hazen Williams Friction factor = 100 Total fitting K value = 1.25 Pipe area = 1.77 ft² Pipe hydraulic radius = 0.375 Age factor = 2.348 Solids factor = 1 Velocity = 3.5 ft/s	

Section Description	Water Surface Elevation
Friction loss = 0.06 ft Fitting loss = 0.24 ft Total loss = 0.3 ft	
24-IN PC Influent	**114.79**
Pipe shape = Circular Diameter = 24 in Length = 15 ft Flow = 4 mgd Friction method = Hazen Williams Friction factor = 100 Total fitting K value = 0.67 Pipe area = 3.14 ft² Pipe hydraulic radius = 0.5 Age factor = 2.348 Solids factor = 1 Velocity = 1.97 ft/s Friction loss = 0.03 ft Fitting loss = 0.04 ft Total loss = 0.07 ft	
36-IN PC Influent	**114.87**
Pipe shape = Circular Diameter = 24 in Length = 15 ft Flow = 4 mgd Friction method = Hazen Williams Friction factor = 100 Total fitting K value = 0.75 Pipe area = 3.14 ft² Pipe hydraulic radius = 0.5 Age factor = 2.348 Solids factor = 1 Velocity = 1.97 ft/s Friction loss = 0.03 ft Fitting loss = 0.05 ft Total loss = 0.08 ft	
Drop Box to PC 2	**114.87**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 3.5 ft Channel width/diameter = 3.5 ft Flow = 4 mgd Downstream channel invert = 108 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 24.05 ft^2	

Section Description	Water Surface Elevation
Hydraulic radius = 1.395 Normal depth = infinite Critical depth = 0.46 ft Depth downstream = 6.87 ft Bend loss = 0 ft Depth upstream = 6.87 ft Velocity = 0.26 ft/s Flow profile = Horizontal	
PC Distribution Box Weir to PC 2	**117.66**
Weir invert (top of weir) = 117 Weir length = 3.5 ft Weir 'C' coefficient = 3.33 Flow over weir = 4 mgd Weir submergence = unsubmerged Head over weir = 0.66 ft	
AB 3 Zone D	**111.9**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 95 ft Channel width/diameter = 20 ft Flow = 15.01 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 307.9 ft^2 Hydraulic radius = 6.062 Normal depth = infinite Critical depth = 0.35 ft Depth downstream = 15.39 ft Bend loss = 0 ft Depth upstream = 15.4 ft Velocity = 0.08 ft/s Flow profile = Horizontal	
Baffle Wall D to C	**111.92**
Weir invert (top of weir) = 109 Weir length = 20 ft Weir 'C' coefficient = 3.33 Flow over weir = 5 mgd Weir submergence = fully submerged Head over weir = 2.92 ft	
AB 3 Zone C	**111.92**
Channel shape = Rectangular Manning's 'n' = 0.013 Channel length = 130 ft	

Section Description	Water Surface Elevation
Channel width/diameter = 20 ft Flow = 5.01 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 308.34 ft^2 Hydraulic radius = 6.066 Normal depth = infinite Critical depth = 0.17 ft Depth downstream = 15.42 ft Bend loss = 0 ft Depth upstream = 15.42 ft Velocity = 0.03 ft/s Flow profile = Horizontal	
Baffle Wall C to B	**111.94**
Weir invert (top of weir) = 109 Weir length = 20 ft Weir 'C' coefficient = 3.33 Flow over weir = 5 mgd Weir submergence = fully submerged Head over weir = 2.94 ft	
AB Zone B	**111.94**
Channel shape = Rectangular Manning's 'n' = 0.013 Channel length = 30 ft Channel width/diameter = 20 ft Flow = 5.01 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 308.78 ft^2 Hydraulic radius = 6.069 Normal depth = infinite Critical depth = 0.17 ft Depth downstream = 15.44 ft Bend loss = 0 ft Depth upstream = 15.44 ft Velocity = 0.03 ft/s Flow profile = Horizontal	
Baffle Wall A to B	**111.96**
Weir invert (top of weir) = 109 Weir length = 20 ft Weir 'C' coefficient = 3.33 Flow over weir = 5 mgd	

Section Description	Water Surface Elevation
Weir submergence = fully submerged Head over weir = 2.96 ft	
AB Zone A	**111.96**
Channel shape = Rectangular Manning's 'n' = 0.013 Channel length = 30 ft Channel width/diameter = 20 ft Flow = 5.01 mgd Downstream channel invert = 96.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 309.22 ft^2 Hydraulic radius = 6.072 Normal depth = infinite Critical depth = 0.17 ft Depth downstream = 15.46 ft Bend loss = 0 ft Depth upstream = 15.46 ft Velocity = 0.03 ft/s Flow profile = Horizontal	
AB 4 Influent Sluice Gate	**111.97**
Opening type = rectangular gate Opening diameter/width = 36 in Gate height = 30 in Invert = 110 Number of gates = 2 Flow through gate(s) = 5.01 mgd Total area of opening(s) = 15 ft^2 Velocity through gate(s) = 0.52 ft/s Flow behavior = orifice, downstream control Gate loss = 0.01 ft Downstream water level = 111.96 Upstream water level = 111.97	
AB 4 Influent Channel	**111.98**
Channel shape = Rectangular Manning's 'n' = 0.013 Channel length = 3 ft Channel width/diameter = 3 ft Flow = 5.01 mgd Downstream channel invert = 109.25 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 8.17 ft^2 Hydraulic radius = 0.967 Normal depth = infinite	

Section Description	Water Surface Elevation
Critical depth = 0.59 ft Depth downstream = 2.72 ft Bend loss = 0 ft Depth upstream = 2.73 ft Velocity = 0.95 ft/s Flow profile = Horizontal	
AB 4 Influent Slopped Channel	**111.97**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 5.3 ft Channel width/diameter = 3 ft Flow = 15.01 mgd Downstream channel invert = 109.25 Channel slope = 0.0141 ft/ft Channel side slope = not applicable Area of flow = 8.06 ft^2 Hydraulic radius = 0.962 Normal depth = 0.81 ft Critical depth = 1.23 ft Depth downstream = 2.73 ft Bend loss = 0 ft Depth upstream = 2.64 ft Velocity = 2.84 ft/s Flow profile = Steep	
AB 4 Influent Split Box-Channel	**112.02**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 12 ft Channel width/diameter = 4.5 ft Flow = 15.01 mgd Downstream channel invert = 110 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 8.87 ft^2 Hydraulic radius = 1.051 Normal depth = infinite Critical depth = 0.94 ft Depth downstream = 1.97 ft Bend loss = 0.04 ft Depth upstream = 2.02 ft Velocity = 2.62 ft/s Flow profile = Horizontal	
10-IN RAS Influent Pipe	**122.12**
Pipe shape = Circular	

Section Description	Water Surface Elevation
Diameter = 10 in Length = 58 ft Flow = 5 mgd Friction method = Hazen Williams Friction factor = 120 Total fitting K value = 1.9 Pipe area = 0.55 ft² Pipe hydraulic radius = 0.208 Age factor = 1 Solids factor = 1 Velocity = 14.18 ft/s Friction loss = 4.17 ft Fitting loss = 5.93 ft Total loss = 10.1 ft	