SEWER BASIS OF DESIGN

Cielo Stellato

Accepted for

Water Resources Administration 9379 E. San Salvador Scottsdale, AZ 85258

Doug MANN 6.8.16

Prepared for:

Pinnacle Land Development, LLC 7440 E. Pinnacle Peak Road Scottsdale, AZ 85255

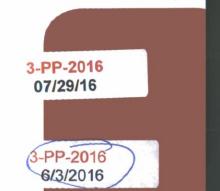


Prepared by:

Kimley-Horn and Associates, Inc. 7740 N. 16th Street, Suite 300 Phoenix, Arizona 85020



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Preliminary Sewer Basis of Design

CIELO STELLATO



MAY 2016

Prepared By:

Kimley » Horn

Appendix A - Site Location Map

Appendix B – Proposed Sewer System Layout

Appendix C – Flowmaster Calculations

INTRODUCTION

INTENT

The purpose of this sewer report is to support the sanitary sewer system for the proposed Cielo Stellato residential development located at the northeast corner of Lone Mountain Parkway and Via Cortana Road in Scottsdale, Arizona. This report presents the basis of design criteria that will be used for the engineering design of the proposed development utilizing current sewer design standards and guidelines set forth by the City of Scottsdale, Arizona.

PROJECT DESCRIPTION

Cielo Stellato is located within Section 33 of Township 6 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. The site is bound to the west by Lone Mountain Parkway and Via Cortana Road to the south. The site is surrounded by existing single family residential developments. See **Appendix A: Site Location Map**

Cielo Stellato is a proposed 20-acre single family residential subdivision, consisting of 14 single family residential units. The existing and proposed zoning of the project is R1-43.

DISTRIBUTION SYSTEM DESCRIPTION

EXISTING COLLECTION SYSTEM

The site is surrounded by existing single family residential development. Per the City of Scottsdale Quarter Section Map 61-54 there is an existing 8-inch PVC sewer stub located at the intersection of Lone Mountain Parkway and Cortana Road. The stub is extended from a 24' deep manhole at the intersection to the project property boundary.

PROPOSED COLLECTION SYSTEM

The proposed Cielo Stellato gravity sewer system will connect to the City of Scottsdale sewer stub at the southwest corner of the site. The proposed on-site collection system will consist of an 8" PVC gravity sewer line that will collect and convey wastewater flows generated by the site. Refer to **Appendix B** for the Proposed Sewer System Layout Exhibit.

BASIS OF DESIGN

DESIGN METHODOLOGY

Average Day Demand design flows are calculated based on design criteria detailed within the City of Scottsdale Design Standards and Polices Manual (DS&PM). Per DS&PM Chapter 7, a design flow of 100 gallons per capita per day (gpcpd) shall be used. The DS&PM also requires a peaking factor of 4.0 and a

residential density of 2.5 persons per dwelling unit. Water System Analysis. See **Table 1** below for a summary of sewer demands.

Table 1 Sewer Demands

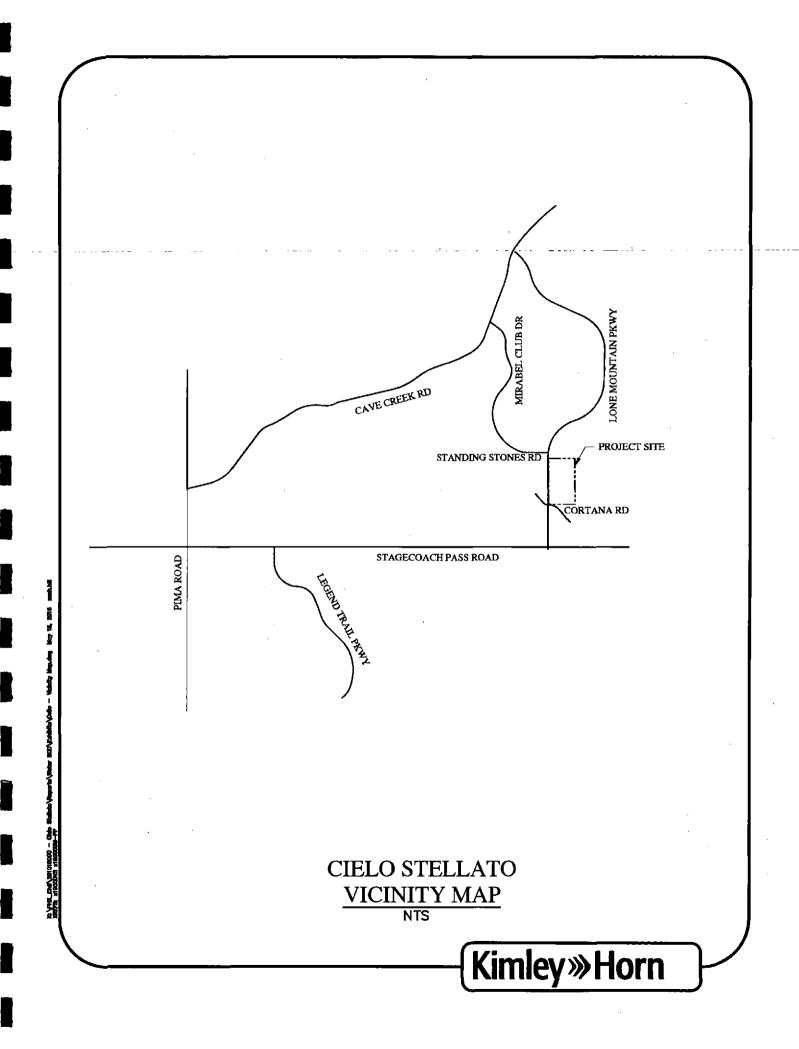
Land Use	Dwelling units	Density	Population	Average Day	Peak Flow	Peak Flow
	(du)	(persons/ du)	(persons)	Demand (gpd)	(gpd)	(gpm)
	14	2.5	35	3,500	14,000	9.7

Per the DS&PM proposed sewer lines were designed to achieve a full flow velocity of between 2.5 and 10 feet per second and maintain a maximum d/D ration 0.65 when calculated with a Manning's "n" value of 0.013. To satisfy these requirements the proposed public 8-inch sewer will meet be design with a minimum slope of 0.0052 ft/ft (0.52%) and a maximum slope of 0.0833 ft/ft (8.33%). See **Appendix C** for pipe slope calculations.

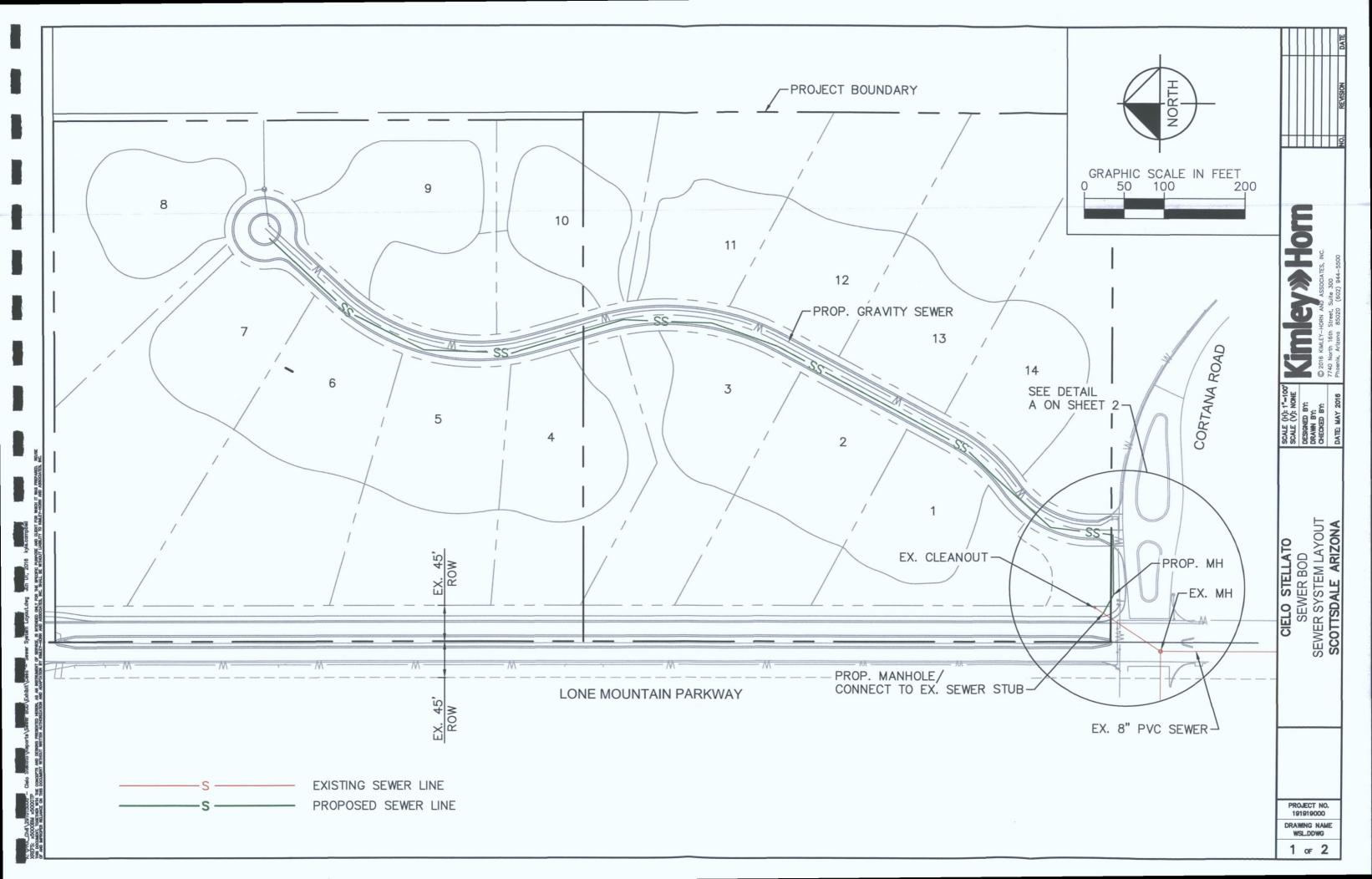
WASTEWATER SYSTEM ANAYLSIS AND RESULTS

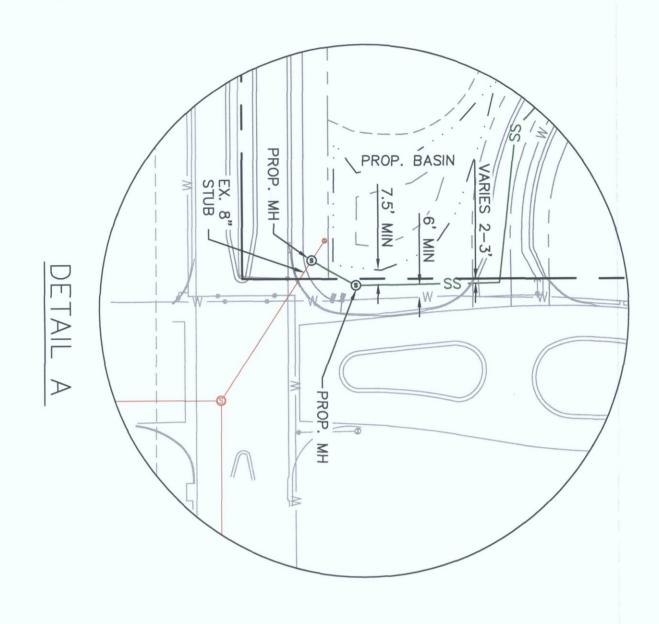
To determine the capacity of the proposed wastewater collection system, the peak design flow was analyzed within the minimum design pipe slope. At the minimum design slope of 0.0052 ft/ft an 8-inch line has the capacity to convey approximately 563,000 gallons per day. An 8-inch line at the minimum design slope can convey the proposed peak design flow of 14,000 gallons per day at a normal depth of 0.07' or a d/D ratio of 0.10, at a velocity of 1.05 ft/s. **See Appendix C – Flowmaster Calculations** for pipe capacity calculations.

Appendix A – Site Location Map

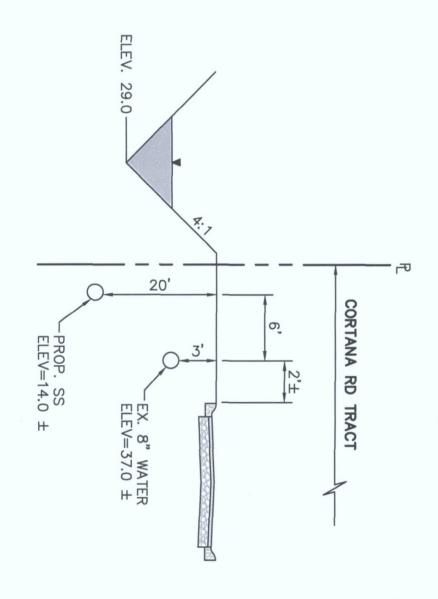


Appendix B – Proposed Sewer System Layout









CIELO STELLATO SEWER BOD SEWER SYSTEM LAYOUT SCOTTSDALE ARIZONA

SCALE (H): 1"=100" SCALE (V): NONE DESIGNED BY: DRAWN BY: CHECKED BY:

DATE: MAY 2016

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7740 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

Appendix C – Flowmaster Calculations

Project Description		Worksheet for	8-Inch F	ull - Min
Four Profile Place Pull Flow Capacity Pull Fl	Project Description			
Found Full Flow Capacity	Friction Method	Manning Formula		
Roughness Coefficient 0.013 Channel Slope 0.00520 ft/h Normal Depth 0.67 ft Diameter 0.67 ft Discharge 563167.59 gal/day Rosults Properties 0.67 ft Flow Area 0.35 ft* Vetted Parlmeter 2.09 ft Hydraulic Radius 0.17 ft Top Width 0.00 ft Critical Depth 0.44 ft Percent Full 100.0 % Critical Slope 0.00857 ft/ft Velocity 2.50 ft/s Velocity Head 0.10 ft Specific Energy 0.78 ft Froude Number 0.00 ft/ft Flow Type SubCritical 0.87 ft/fs Slope Full 0.87 ft/fs Slope Full 0.00 ft Flow Type SubCritical ft GVF Input Data	Solve For	Full Flow Capacity		
Channel Slope 0.00520 ft/ft Normal Depth 0.67 ft Dlameter 0.67 ft Discharge 563167.59 gal/day ReSUlts Discharge Mormal Depth 0.67 ft Flow Area 0.35 ft* Wetted Parlmeter 2.09 ft Hydraulic Radius 0.17 ft Top Width 0.00 ft Critical Depth 0.44 ft Percent Fulf 100.0 % Critical Slope 0.00857 ft/ft Valocity 2.50 ft/s Valocity Head 0.10 ft Specific Energy 0.78 ft Froude Number 0.00 Maximum Discharge 0.94 ft/s Discharge Full 0.05 tt/s Slope Full 0.0520 ft/s Flow Type SubCritical Cover Input Data 0.00 ft	Input Data			
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Profile Prof	Diameter		0.67	ft ·
Discharge 563167.59 gal/day Normal Depth 0.67 ft Flow Area 0.35 ft Wetted Perimeter 2.09 ft Hydraulic Radius 0.17 ft Top Width 0.00 ft Critical Depth 0.44 ft Percent Full 100.0 % Critical Slope 0.00857 fuft Velocity 2.50 ft Velocity 2.50 ft Velocity 2.50 ft Specific Energy 0.78 ft Froude Number 0.00 Maxfmum Discharge 0.94 ft //s Discharge Full 0.87 ft //s Slope Full 0.87 ft //s Flow Type SubCritical GVF Input Data Downetream Depth 0.00 ft Length 0.00 ft Number Of Steps 0 0.00 GVF Quiput Data Upstream Depth 0.00 ft Profile Description Profile Description 0.00 ft Profile Peadloss 0.00 Profile Peadloss 0.00 ft Profile Peadloss 0.00 ft Profile Peadloss 0.00 ft Profile Peadloss 0.00	Discharge		563167.59	gai/day
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Flow Area 0.35 ft Wetted Perimeter 2.09 ft Hydraulic Radlus 0.17 ft Top Width 0.00 ft Critical Depth 0.44 ft Percent Full 1000 % Critical Slope 0.00857 ft/ft Velocity 2.50 ft/s Velocity 2.50 ft/s Velocity 0.10 ft Froude Number 0.00 Maximum Discharge 0.94 ft/s Discharge Full 0.00520 ft/ft Flow Type SubCritical GYF Input Data 0.00 Cay Full 0.00 ft Length 0.00 ft Length 0.00 ft Cay Full Description 0.00 ft Froile Description	Discharge		563167.59	gal/day
Wetted Parimeter 2.09 ft Hydraulic Radlus 0.17 ft Top Wridth 0.00 ft Critical Depth 0.44 ft Percent Full 100.0 % Critical Slope 0.00857 ft/ft Velocity 2.50 ft/s Velocity Head 0.10 ft Specific Energy 0.76 ft Froude Number 0.00 ft Discharge Full 0.87 ft/s Slope Full 0.0520 ft/ft Flow Type SubCritical ft/s GVF Input Data 0.00 ft Length 0.00 ft Number Of Steps 0 ft CVF Output Data 0.00 ft Upstream Depth 0.00 ft Profile Description ft ft Profile Headloss 0.00 ft	Normal Depth		0.67	ft .
Hydraulic Radius 0.17 ft Top Width 0.00 ft Critical Depth 0.44 ft Percent Full 100.0 % Critical Slope 0.00857 ft/ft Velocity 2.50 ft/s Velocity 1.50 ft Specific Energy 0.76 ft Froude Number 0.00 Maximum Discharge 0.94 ft/s Discharge Full 0.87 ft/s Slope Full 0.00520 ft/ft Flow Type SubCritical GVF Input Data Cover Output Data Cover Output Data Upstream Depth 0.00 ft Profile Description Profile Description 0.00 ft Profile Description 0.00 ft Profile Description 0.00 ft Profile Headloss 0.00 ft Cover Output Data 0.00 ft Cover Data 0.00	Flow Area		. 0.35	ft²
Top Width 0.00 ft Critical Depth 0.44 ft Percent Fuli 1000 % Critical Slope 0.00857 fvft Valocity 2.50 fvs Valocity Head 0.10 ft Specific Energy 0.76 ft Froude Number 0.00 ft Discharge Full 0.87 ft/ft Slope Full 0.00520 ft/ft Flow Type SubCritical ft GVF Input Data Downstream Depth 0.00 ft Length 0.00 ft Number Of Steps 0 ft GVF Quiput Data ft Upstream Depth 0.00 ft Profile Description ft ft Profile Description ft ft	Wetted Perimeter		2.09	ft
Critical Depth 0.44 ft Percent Fuli 100.0 % Critical Slope 0.00857 ft/ft Valocity 2.50 ft/s Valocity Head 0.10 ft Specific Energy 0.76 ft Froude Number 0.00 ft/s Discharge Full 0.87 ft/s Slope Full 0.00520 ft/ft Flow Type SubCritical ft/ft GVF Input Data Downstream Depth 0.00 ft Length 0.00 ft GVF Qutput Data Upstream Depth 0.00 ft Forfile Description Profile Description 0.00 ft	Hydraulic Radlus		0.17	ft
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Velocity Head 0.10 ft Specific Energy 0.76 ft Froude Number 0.00 ft*/s Maximum Discharge 0.94 ft*/s Discharge Full 0.07 ft* Slope Full 0.00520 ft* Flow Type SubCritical GVF Input: Data Downstream Depth 0.00 ft Length 0.00 ft Number Of Steps 0 ft GVF Quitput Data 0.00 ft Upstream Depth 0.00 ft Profile Description 0.00 ft	Critical Slope		0.00857	ft/ft
Specific Energy 0.76 ft Froude Number 0.00 ft²/s Maximum Discharge 0.94 ft²/s Discharge Full 0.00520 ft/ft Slope Full 0.00520 ft/ft Flow Type SubCritical	Velocity		2.50	ft/s
Specific Energy 0.76 ft Froude Number 0.00 ft*/s Maximum Discharge 0.94 ft*/s Discharge Full 0.00520 ft/ft Slope Full 0.00520 ft/ft Flow Type SubCritical	Velocity Head		0.10	ft ,
Maximum Discharge 0.94 ft*/s Discharge Full 0.07 ft*/ft Slope Full 0.00520 ft/ft Flow Type SubCritical	Specific Energy		0.76	
Discharge Full 0.87 ft³/s Slope Full 0.00520 ft/ft Flow Type SubCritical GVF Input Data 0.00 ft Length 0.00 ft Number Of Steps 0 GVF Output Data Upstream Depth 0.00 ft Profile Description 0.00 ft	Froude Number		0.00	,
Slope Full	Maximum Discharge		0.94	ft³/s
Slope Full	Discharge Full		0.87	ft³/s
GVF Input Data Downstream Depth Length 0.00 ft Number Of Steps 0 GVF Qutput Data Upstream Depth 0.00 ft Profile Description Profile Headloss 0.00 ft			0.00520	ft/ft
Downstream Depth 0.00 ft Length 0.00 ft Number Of Steps 0 T GVF Qutput Data Upstream Depth 0.00 ft Profile Description Profile Headloss 0.00 ft	Flow Type	SubCritical		
Length Number Of Steps 0 GVF Qutput Data Upstream Depth Profile Description Profile Headloss 0.00 ft	GVF Input Data			
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GVF Output Data Upstream Depth Profile Description Profile Headloss 0.00 ft	Length		0.00	ft
Upstream Depth 0.00 ft Profile Description Profile Headloss 0.00 ft	Number Of Steps		0	
Profile Description Profile Headloss 0.00 ft	GVF Output Data			
Profile Description Profile Headloss 0.00 ft	Upstream Depth		0.00	ft
Profile Headloss 0.00 ft	,			
	•		0.00	ft
	Average End Depth Over Rise		0.00	%

Worksheet for 8-Inch Full - Min

GVF Output Data		
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	. 0.67	ft
Critical Depth	0.44	ft
Channel Slope	0.00520	ft/ft
Critical Slope	0.00857	ft/ft

1	Worksheet for 8-inch i	uli -Max
Project Description		
Friction Method	Manning Formula	
Solve For	Full Flow Capacity	·
input Data		
Roughness Coefficient	0.013	
Channel Slope	0.08330	ft/ft
Normal Depth	0.67	ft .
Diameter	0.67	ft
Discharge	2254023.72	gal/day
Results		
Discharge	2254023.72	gal/day
Normal Depth	0.67	ft
Flow Area	0.35	ft ²
Wetted Perimeter	2.09	ft
Hydraulic Radius	0.17	ft ·
Top Width	0.00	ft
Critical Depth	0.66	ft
Percent Full	100.0	%
Critical Slope	0.07763	ft/ft
Velocity	9.99	ft/s
Velocity Head	1.55	ft '
Specific Energy	2.22	ft
Froude Number	0.00	
Maximum Discharge	3.75	ft³/s
Discharge Full	3.49	ft³/s
Slope Full	0.08330	ft/ft
Flow Type	SubCritical	•
GVE Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	. 0	
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	· 0.0 0	ft ·
Average End Depth Over Rise	0.00	%

Worksheet for 8-Inch Full -Max

GVF Output Data		
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.67	ft
Critical Depth	0.68	ft
Channel Slope	0,08330	ft/ft
Critical Slope	0.07763	ft/ft

	Worksheet for 8	-Inch (Capacity
Project Description			
Friction Method	Manning Formula		
Solve For	Normal Depth		
Input Data		4	
Roughness Coefficient		0.013	
Channel Slope		0.00520	fl/ft
Diameter		0.67	ft
Discharge		1400 0.00	gal/day
Results			
Normal Depth		0.07	ft ·
Flow Area		0.02	ft² ·
Wetted Perimeter		0.45	ft
Hydraulic Radius		0.05	ft
Top Width	•	0.42	ft .
Critical Depth		0.07	ft
Percent Full		10. 9	%
Critical Slope		0.00761	ft/ft
Velocity		1.05	ft/s
Velocity Head		0.02	ft
Specific Energy		0.09	ft
Froude Number		0.84	
Maximum Discharge		0.94	ff³/s
Discharge Full		0.87	ft³/s
Słope Full		0.00000	ft/ft
Flow Type	SubCritical		
GVF Input Data			
Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	
GVF Output Data			
Upstream Depth	-	0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Average End Depth Over Rise		0.00	%
Normal Depth Over Rise		10.87	%
Downstream Velocity		Infinity	ft/s

Worksheet for 8-Inch Capacity

GVF Output Data		
Upstream Velocity	Infinity	ft/s
Normal Depth	0.07	ft
Critical Depth	0.07	ft
Channel Slope	0.00520	ft/ft
Critical Slope	0.00761	ft/ft