

APPENDIX 5A

WASTEWATER FLOW MONITORING TEST REPORT

Dry Weather Sewer Flow Monitoring, Goodyear AZ, 2023

Final Report Submitted to **Carollo**
July 17, 2023



ADS ENVIRONMENTAL
SERVICES



July 17, 2023

Richard A. Humpherys, PE*

Project Manager / Vice President

Carollo Engineers

4600 East Washington St. / Phoenix, AZ 85034

602-882-7904

rhumpherys@carollo.com / carollo.com



SUBJECT: Dry Weather Sewer Flow Monitoring, Goodyear AZ, 2023

Dear Mr. Humpherys,

ADS is pleased to submit the report for the project reference above completed on behalf of Carollo. The metering was conducted at sixteen (16) locations. The study was conducted during the period of Sunday, 11 June 2023 to Tuesday, 27 June 2023.

The report contains depth, velocity, and quantity hydrographs as well as daily long tables for the metering period. An Excel file containing depth, quantity, and velocity entities for the monitoring location in 5-minute format has been provided.

In addition, we would be happy to further explain any details about the report that may seem unclear. Should you have any questions or comments, you may contact the Project Manager, Paul Mitchell at 714.379.9778 xt.223 (O) or 714.920.5518 (M).

It has been our pleasure to be of service to you in the performance of this project. Thank you for choosing ADS products and services to meet your flow monitoring needs.

Sincerely,

ADS ENVIRONMENTAL SERVICES

Justin Hatch
Data Analyst

Sunday, 11 June 2023 to Tuesday, 27 June 2023

Dry Weather Sewer Flow Monitoring, Goodyear AZ, 2023

Prepared For:

Richard A. Humpherys, PE*
Project Manager / Vice President
Carollo Engineers
4600 East Washington St. / Phoenix, AZ 85034
602-882-7904
rhumpherys@carollo.com / carollo.com



Prepared By:



ADS, LLC
4820 Mercury Street, Suite C
San Diego, CA 92111

Scope and Methodology

Introduction

Carollo entered into an agreement with ADS Environmental Services to conduct flow monitoring at (16) sixteen locations in the Goodyear Arizona Sanitary Collection System. The study was scheduled for a period of (14) fourteen days. Data from Sunday, 11 June 2023 to Tuesday, 27 June 2023 is included in this report in order to provide at least 14 full days of data at each location. Once in place, the flow monitoring equipment was used to measure depth, velocity, and to quantify flows. Data obtained from the study will be used to confirm dry weather flows in selected sewer tributaries for planning purposes.

Project Scope

The scope of this study involved using a flow monitor to quantify wastewater flow at the designated locations for the 14-day time period. Specifically, the study included the following key components.

- Investigate the proposed flow-monitoring sites for adequate hydraulic conditions
- Flow monitor installations
- Flow monitor confirmations and data collections
- Flow data analysis

Equipment installation was completed on June 10, 2023. The monitoring began on June 11, 2023 and was completed on June 27, 2023. Upon completion of the study, equipment was removed from the system.

Flow Monitoring Equipment



The **ADS Triton+** monitor was selected for this project. This flow monitor is an area velocity flow monitor that uses both the Continuity and Manning's equations to measure flow.

The ADS Triton+ monitor consists of data acquisition sensors and a battery-powered microcomputer. The microcomputer includes a processor unit, data storage, and an on-board clock to control and synchronize the sensor recordings. The monitor was programmed to acquire and store depth of flow and velocity readings at 5-minute intervals.

The Triton+ monitor features cross-checking using multiple technologies in each sensor for continuous running of comparisons and tolerances. The Triton+ monitor can support two (2) sets of sensors. The sensor option used for this project was:

The Peak Combo Sensor installed at the bottom of the pipe includes three types of data acquisition technologies.

The **up looking ultrasonic depth** uses sound waves from two independent transceivers to measure the distance from the sensor upward toward the flow surface; applying the speed of sound in the water and the temperature measured by

sensor to calculate depth.

The **pressure depth** is calculated by using a piezo-resistive crystal to determine the difference between hydrostatic and atmospheric pressure. The pressure sensor is temperature compensated and vented to the atmosphere through a desiccant filled breather tube.

To obtain **peak velocity**, the sensor sends an ultrasonic signal at an angle upward through the widest cross-section of the oncoming flow. The signal is reflected by suspended particles, air bubbles, or organic matter with a frequency shift proportional to the velocity of the reflecting objects. The reflected signal is received by the sensor and processed using digital spectrum analysis to determine the peak flow velocity.

Installation

Installation of flow monitoring equipment typically proceeds in four steps. First, the site is investigated for safety and to determine physical and hydraulic suitability for the flow monitoring equipment. Second, the equipment is physically installed at the selected location. Third, the monitor is tested to assure proper operation of the velocity and depth of flow sensors and verify that the monitor clock is operational and synchronized to the master computer clock. Fourth, the depth and velocity sensors are confirmed and line confirmations are performed.

In pipes up to 42 inches in diameter, the sensors were mounted on expandable stainless steel rings, inserted at least a foot upstream into influent pipes and tightened against the inside walls of the pipes. Influent pipe installations reduce the influences of turbulence and backwater often caused by changes in channel geometry in manholes.





Data Collection, Confirmation, and Quality Assurance

Data collection was done remotely via wireless connect on a weekly basis via ADS Field Representatives. During the monitoring period, field crews visit each monitoring location to verify proper monitor operation and document field conditions. The following quality assurance steps are taken to assure the integrity of the collected data:

Measure power supplies: monitors were powered by dry cell battery packs. Voltages were recorded and battery packs replaced, as necessary. Separate batteries provided back-up power to memory allowing primary batteries to be replaced without loss of data.

Clock synchronization: Field crews synchronized monitor clocks to master clocks.

Confirm depth and velocity readings: Field crews descended into meter manholes to manually measure depths and velocities and compare them meter readings to confirm that they agreed. They also measured silt levels, if any, in the inverts of the pipes. Silt areas were subtracted from flow areas to compute true areas of flow.

Confirm average velocities through cross-sectional velocity profiles: Since ADS velocity sensors measure peak velocity, field crews collected cross-sectional velocity profiles in order to develop a relationship between peak and average velocity in lines that meet the hydraulic criteria.

Upload and Review Data: Data collected from the monitors were uploaded and reviewed by a Data Analyst for completeness, outliers and deviations in the flow patterns, which indicate system anomalies or equipment failure.

Flow Quantification Methods

There are two main equations used to measure open channel flow: the **Continuity Equation** and the **Manning Equation**. The Continuity Equation, which is considered the most accurate, can be used if both depth of flow and velocity are available. In cases where velocity measurements are not available or not practical to obtain, the Manning Equation can be used to estimate velocity from the depth data based on certain physical characteristics of the pipe (i.e. the slope and roughness of the pipe being measured). However, the Manning equation assumes uniform, steady flow hydraulic conditions with non-varying roughness, which are typically invalid assumptions in most sanitary sewers. The Continuity Equation was used exclusively for this study.

Continuity Equation

The Continuity Equation states that the flow quantity (Q) is equal to the wetted area (A) multiplied by the average velocity (V) of the flow.

This equation is applicable in a variety of conditions including backwater, surcharge, and reverse flow.

Data Analysis and Presentation

Data Analysis

A flow monitor is typically programmed to collect data at 5-minute intervals throughout the monitoring period. The monitor stores raw data consisting of (1) the ultrasonic depth, (2) the peak velocity and (3) the pressure depth. The data is imported into ADS's proprietary software and is examined by a data analyst to verify its integrity. The data analyst also reviews the daily field reports and site visit records to identify conditions that would affect the collected data.

Velocity profiles and the line confirmation data developed by the field personnel are reviewed by the data analyst to identify inconsistencies and verify data integrity. Velocity profiles are reviewed and an average to peak velocity ratio is calculated for the site. This ratio is used in converting the peak velocity measured by the sensor to the average velocity used in the Continuity equation. The data analyst selects which depth sensor entity will be used to calculate the final depth information. Silt and/or debris are often present in sewer lines. When present, silt levels are measured at each site visit. They are reviewed by the data analyst and representative silt levels established. Silt reduces the cross sectional area of the flow where as debris causes depth to become deeper and slower. Calculated flow should remain consistent in both hydraulic conditions. Debris may result in reduced line capacity.

Occasionally the velocity sensor's performance may be compromised resulting in invalid readings sporadically during the monitoring period. This is generally caused by excessive debris (silt) blocking the sensor's crystals, shallow flows ($\sim < 1"$) that may drop below the top of the sensor or very clear flows lacking the particles needed to measure rate. In order to use the Continuity equation to quantify the flow during these periods, a Data Analyst and/or Engineer will use the site's historical pipe curve (depth vs. velocity) data along with valid field confirmations to reconstitute and replace the false velocity recordings with expected velocity readings for a given historical depth along the curve.

Selections for the above parameters can be constant or can change during the monitoring period. While the data analysis process is described in a linear manner, it often requires an iterative approach to accurately complete.

Data Presentation

This type of flow monitoring project generates a large volume of data. To facilitate review of the data, results have been provided in graphical and tabular formats. The flow data is presented graphically in the form of scattergraphs and hydrographs. Hydrographs are based on 15 minute averaging. Tables are provided in daily average format. These tables show the flow rate for each day, along with the daily minimum and maximums, the times they were observed, the total daily flow, and total flow for the month (or monitoring period). The following explanation of terms may aid in interpretation of the tables and hydrographs.

DFINAL - Final calculated depth measurement (in inches)

QFINAL - Final calculated flow rate (in MGD)

VFINAL - Final calculated flow velocity (in feet per second)

REPORT TOTAL - Total volume of flow recorded for the indicated time period (in MG)

FM_01

Site Commentary

SITE INFORMATION

Pipe	Elliptical (11.88 in H x 11.88 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study.

This site was positioned downstream of site FM_07 and upstream of site FM_16. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	3.29	1.77	0.208
Minimum	2.15	1.19	0.073
Maximum	4.82	2.39	0.435
Min Time	06/25/2023 6:45:00 AM	06/25/2023 6:45:00 AM	06/25/2023 6:45:00 AM
Max Time	06/26/2023 12:00:00 PM	06/16/2023 11:30:00 AM	06/26/2023 12:00:00 PM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100

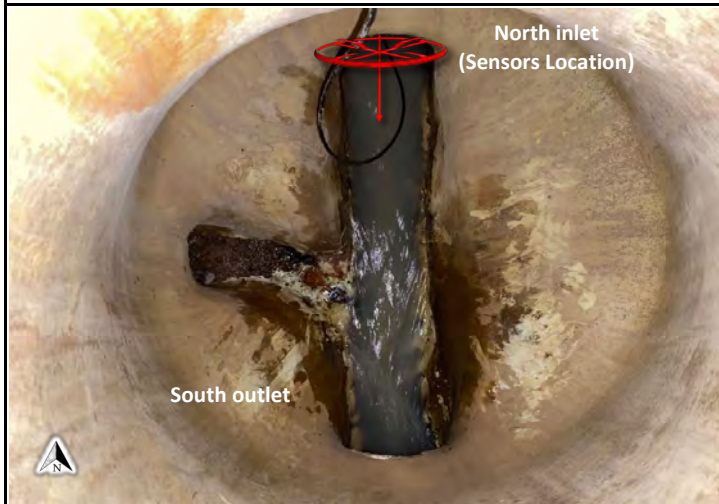


GoodYear.Carollo.TFM.AZ23**Site Name****Flow Monitoring
Site Report****FM_01**

Site Address /Location:	4204 S Bullard Ave, Goodyear, AZ 85338		Monitor Series	Location Type
Site Access Details:	External Traffic Control Required	Latitude:	TRITON+	Temporary
		Longitude:	Pipe Size (H x W)	Pipe Shape
			11.88"x 11.88"	Circular



Manhole #	System Characteristics
N/A	Residential/Commercial
Access	Traffic
Drive	Medium

**Installation Information**

Installation Date:	Installation Type:
Tuesday, June 6, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
11:47:00 PM	11.88"x 11.88"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
3.63"	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
2.14	0"
Silt (in)	Silt Type
0"	

Hydraulic Comments:

Smooth flow with low depth and moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
6.11	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

External Traffic Control Required

ADS Project Name: GoodYear.Carollo.TFM.AZ23

ADS Project Number: 22930.11.325

Hydrograph Report
FM_01

Flow Monitor

FM_01

Pipe Height
11.88
in

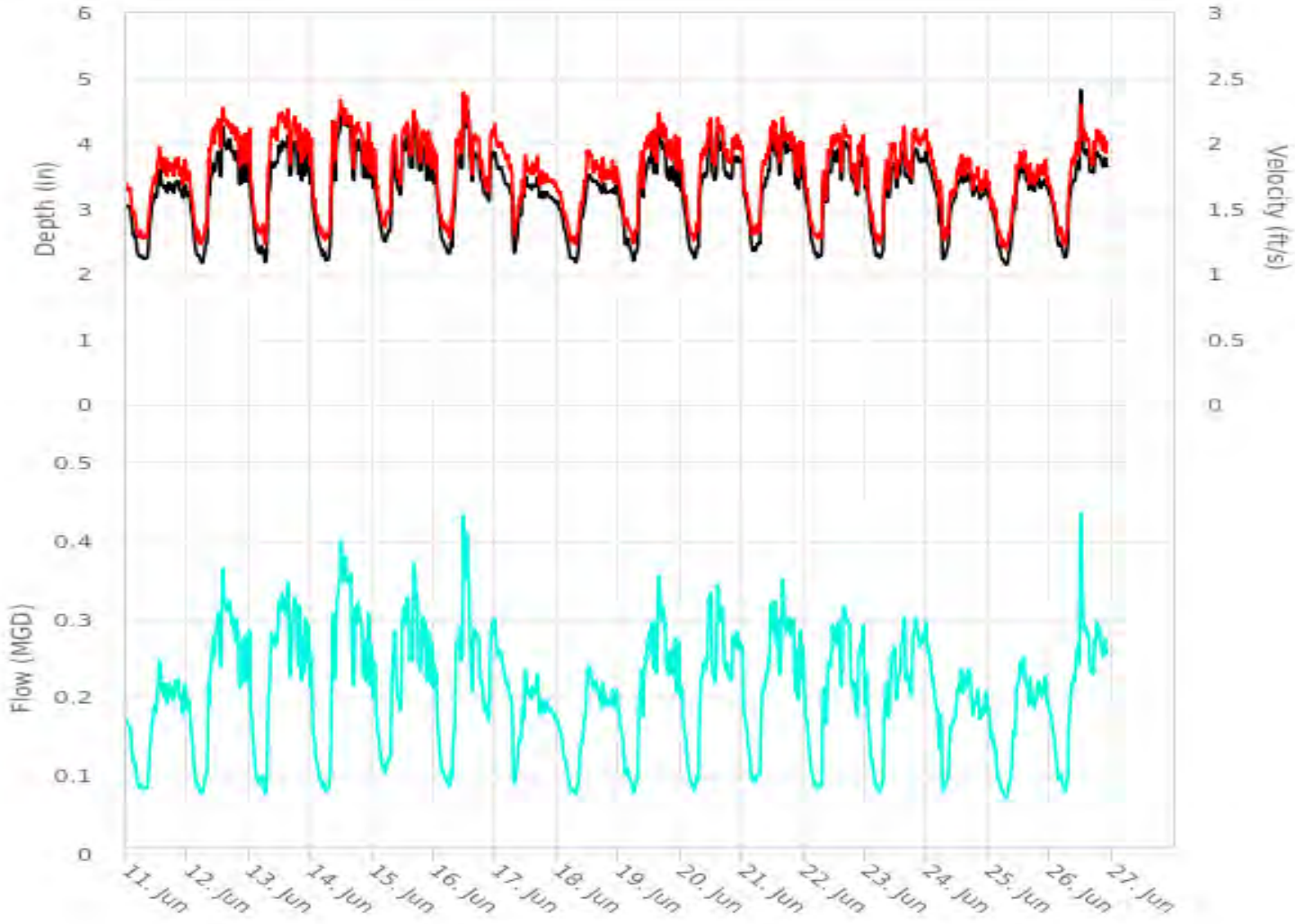
Report Period

06/11/2023
To
06/27/2023

Legend

— DFINAL
— QFINAL
— VFINAL

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Scattergraph Report

FM_01

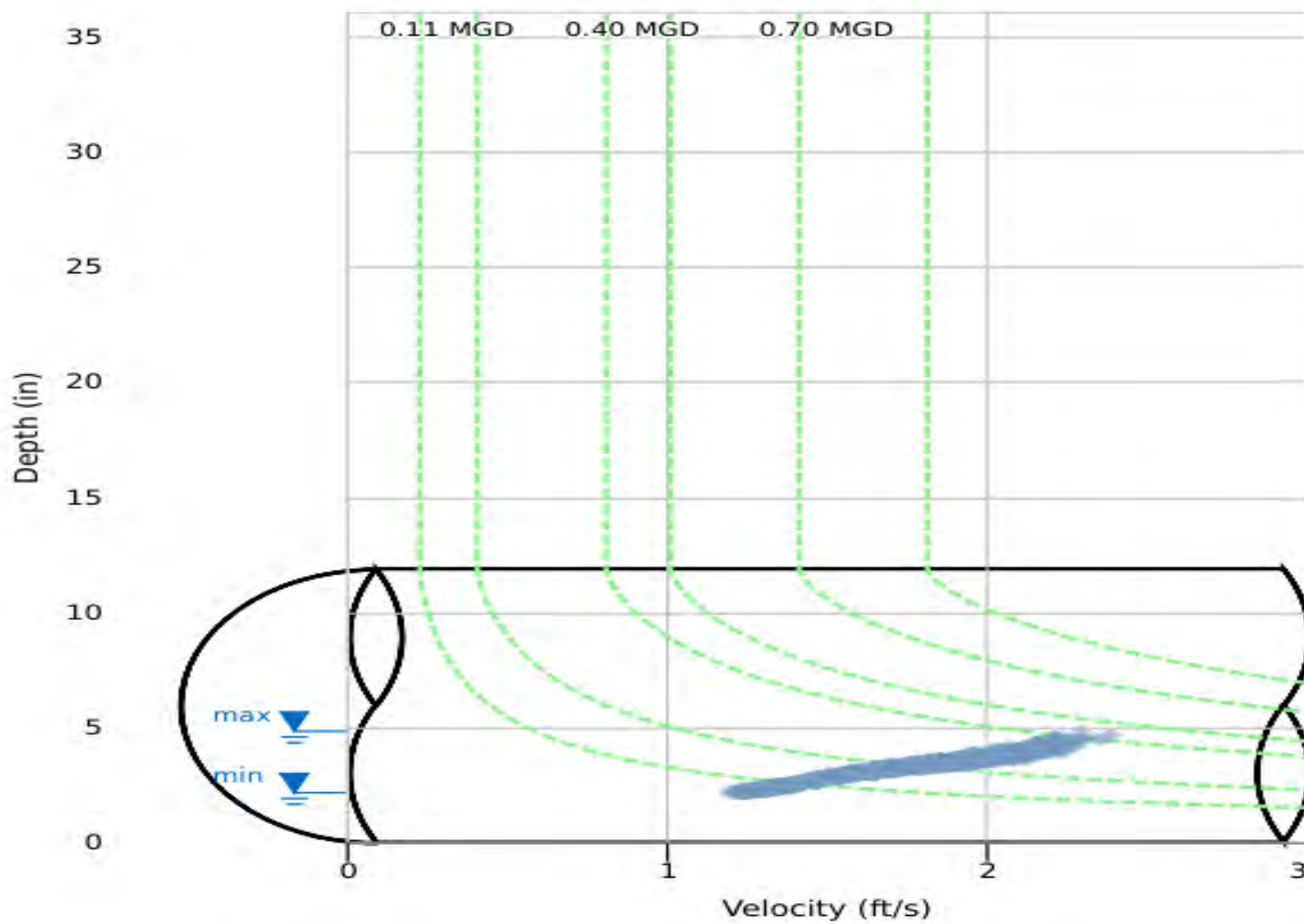
Flow Monitor
FM_01

Pipe Height
11.88
in

Report Period
06/11/2023
To
06/27/2023

Legend
□ DFINAL - VFINAL
--- Iso-Qth
▼ Min-Max Depth

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Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_01Pipe: Elliptical (11.88 in H x 11.88 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	06:45	2.23	13:00	3.62	3.00	06:20	1.26	12:55	2.04	1.65	06:50	0.082	12:55	0.260	0.168	0.168	
06/12/2023	05:30	2.17	13:40	4.29	3.34	05:20	1.21	13:45	2.32	1.85	05:20	0.076	13:45	0.376	0.223	0.223	
06/13/2023	06:05	2.18	15:10	4.14	3.40	06:10	1.21	15:05	2.35	1.88	06:10	0.076	15:05	0.362	0.232	0.232	
06/14/2023	05:45	2.20	11:40	4.53	3.48	05:45	1.25	11:40	2.43	1.86	05:45	0.079	11:40	0.423	0.239	0.239	
06/15/2023	05:10	2.49	16:30	4.38	3.45	04:15	1.34	16:20	2.30	1.85	05:10	0.102	16:20	0.383	0.229	0.229	
06/16/2023	05:35	2.31	11:35	4.67	3.38	06:00	1.22	11:35	2.43	1.81	06:00	0.083	11:35	0.441	0.221	0.221	
06/17/2023	07:15	2.33	00:00	3.82	3.23	07:05	1.27	00:05	2.07	1.76	07:10	0.089	00:00	0.284	0.195	0.195	
06/18/2023	07:10	2.18	12:20	3.53	3.01	07:30	1.21	12:40	1.99	1.64	07:30	0.076	12:40	0.244	0.167	0.167	
06/19/2023	05:45	2.20	15:35	4.24	3.29	05:50	1.22	15:50	2.28	1.80	05:50	0.077	15:50	0.360	0.211	0.211	
06/20/2023	05:20	2.24	14:45	4.20	3.36	05:10	1.24	11:50	2.26	1.82	05:20	0.081	14:30	0.348	0.219	0.219	
06/21/2023	04:15	2.35	15:55	4.28	3.43	05:10	1.28	16:05	2.23	1.82	05:10	0.090	15:55	0.356	0.225	0.225	
06/22/2023	05:40	2.24	16:05	4.08	3.33	05:25	1.25	15:45	2.20	1.77	05:25	0.082	15:45	0.328	0.211	0.211	
06/23/2023	05:35	2.24	19:50	3.93	3.30	05:40	1.22	18:55	2.22	1.78	05:40	0.079	15:25	0.312	0.208	0.208	
06/24/2023	06:20	2.22	00:00	3.81	3.20	06:15	1.25	00:35	2.04	1.71	06:15	0.081	00:00	0.279	0.188	0.188	
06/25/2023	06:40	2.15	13:45	3.71	3.05	06:25	1.17	14:05	2.00	1.62	06:50	0.072	14:05	0.255	0.170	0.170	
06/26/2023	05:50	2.25	12:05	4.83	3.36	05:25	1.21	12:10	2.34	1.79	06:15	0.081	12:10	0.444	0.217	0.202	
06/27/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			3.309
Average	3.29	1.77	0.208

FM_02

Site Commentary

SITE INFORMATION

Pipe	Elliptical (11.88 in H x 11.88 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study.

This site was positioned upstream of site FM_16. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	2.27	1.77	0.121
Minimum	1.61	0.92	0.037
Maximum	2.85	2.19	0.190
Min Time	06/18/2023 5:45:00 AM	06/18/2023 5:45:00 AM	06/18/2023 5:45:00 AM
Max Time	06/25/2023 9:45:00 PM	06/25/2023 12:00:00 PM	06/25/2023 9:45:00 PM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100



GoodYear.Carollo.TFM.AZ23**Site Name****Flow Monitoring
Site Report****FM_02**

Site Address /Location:	3900 Estrella Pkwy, Goodyear, AZ 85338			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	External Traffic Control Required	Latitude:	33.4109769	Pipe Size (H x W)	Pipe Shape
		Longitude:	-112.3923757°	11.88"x 11.88"	Circular



Manhole #	System Characteristics
MH86D-201	Residential/Commercial
Access	Traffic
Drive	Medium

**Installation Information**

Installation Date:	Installation Type:
Tuesday, June 6, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
10:39:00 PM	11.88"x 11.88"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
2.50"	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
2.21	0"
Silt (in)	Silt Type
0"	

Hydraulic Comments:

Smooth flow with low depth and moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
14.34	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

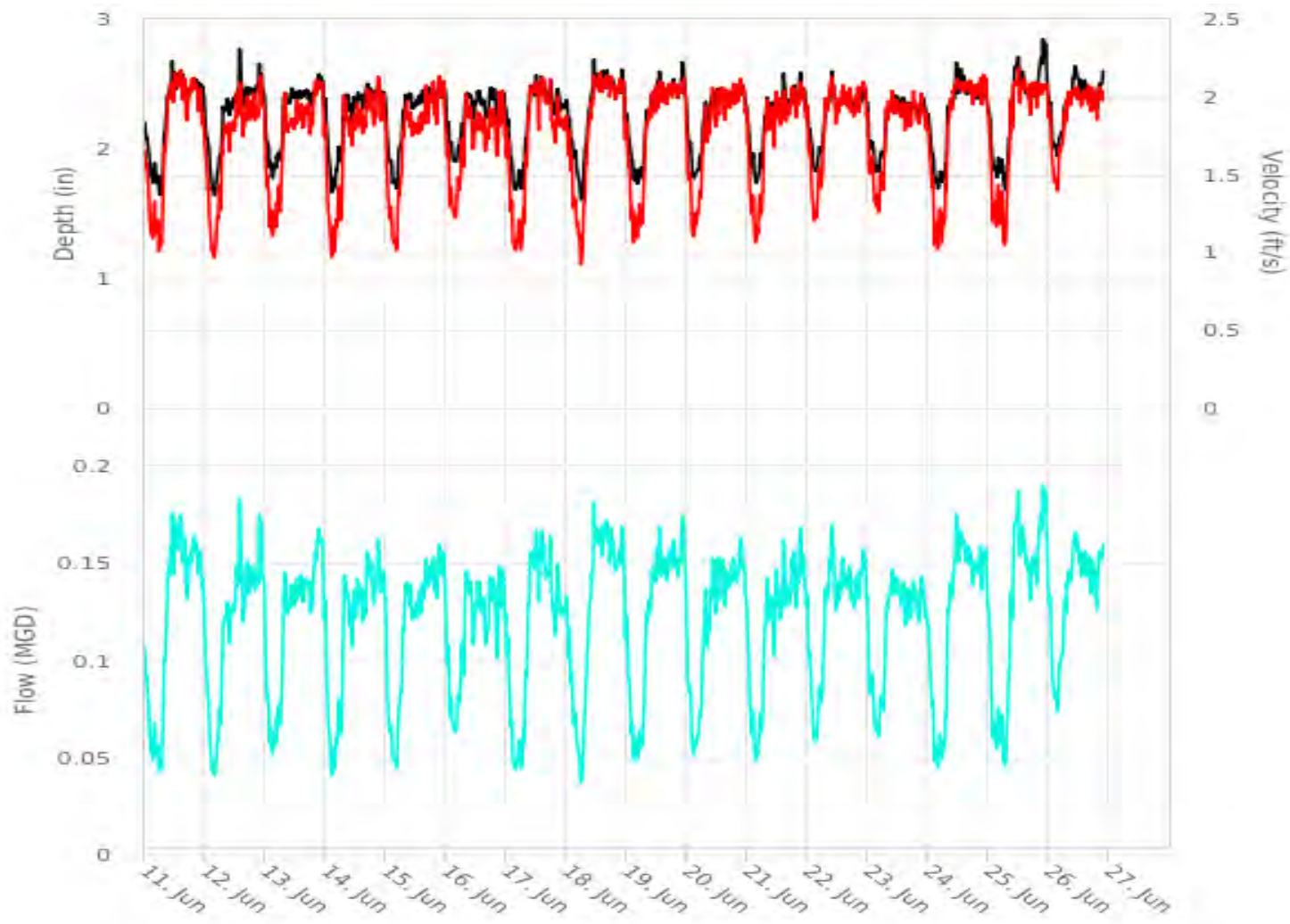
External Traffic Control Required

ADS Project Name: GoodYear.Carollo.TFM.AZ23

ADS Project Number: 22930.11.325

Hydrograph Report

FM_02



Scattergraph Report

FM_02

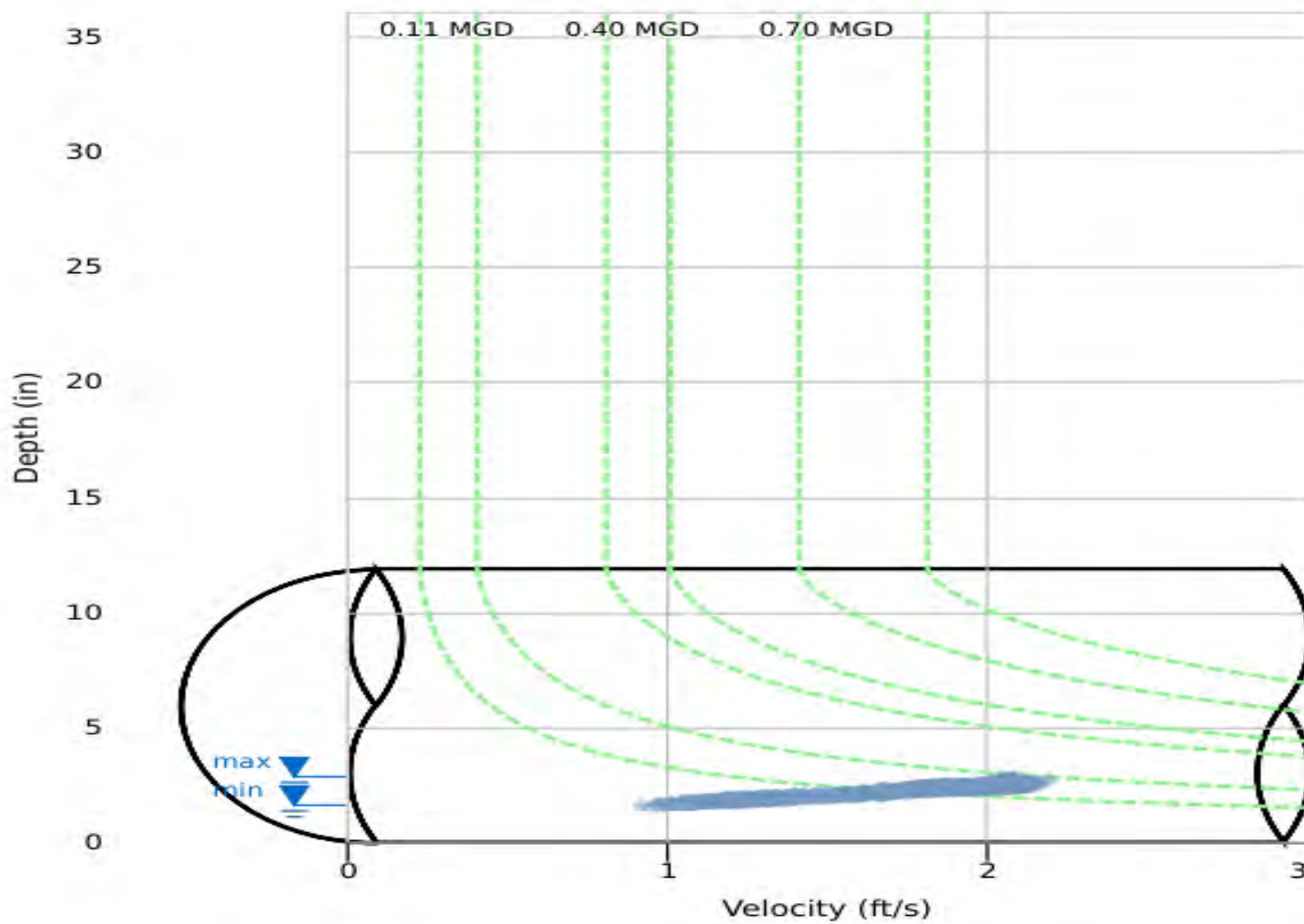
Flow Monitor
FM_02

Pipe Height
11.88
in

Report Period
06/11/2023
To
06/27/2023

Legend
□ DFINAL - VFINAL
--- Iso-Qth
▲ Min-Max Depth

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Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_02Pipe: Elliptical (11.88 in H x 11.88 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	06:05	1.64	11:05	2.70	2.27	05:55	0.98	14:40	2.19	1.76	05:55	0.041	14:35	0.178	0.122	0.122	
06/12/2023	03:55	1.64	13:55	3.32	2.27	03:50	0.96	22:30	2.16	1.71	03:50	0.040	13:55	0.237	0.118	0.118	
06/13/2023	03:05	1.77	21:25	2.59	2.28	03:00	1.08	21:30	2.14	1.74	03:00	0.050	21:30	0.171	0.119	0.119	
06/14/2023	02:35	1.66	16:30	2.51	2.25	02:35	0.97	21:00	2.17	1.71	02:35	0.041	21:00	0.166	0.115	0.115	
06/15/2023	04:25	1.69	21:25	2.49	2.27	04:20	1.00	21:30	2.16	1.74	04:20	0.044	21:30	0.164	0.118	0.118	
06/16/2023	03:00	1.90	18:10	2.48	2.27	04:05	1.20	21:20	2.08	1.72	04:05	0.062	08:30	0.150	0.116	0.116	
06/17/2023	03:50	1.68	12:00	2.58	2.23	03:50	0.98	14:55	2.17	1.71	03:50	0.042	12:00	0.169	0.115	0.115	
06/18/2023	05:55	1.60	11:05	2.71	2.30	05:45	0.90	16:00	2.20	1.80	05:45	0.036	11:05	0.182	0.126	0.126	
06/19/2023	04:10	1.72	22:25	2.69	2.27	02:50	1.04	13:00	2.13	1.79	04:20	0.047	22:15	0.177	0.123	0.123	
06/20/2023	02:50	1.77	21:10	2.52	2.26	02:55	1.08	21:35	2.13	1.79	02:55	0.050	21:30	0.163	0.121	0.121	
06/21/2023	03:40	1.73	14:35	2.60	2.24	03:15	1.07	21:15	2.13	1.77	03:40	0.048	21:15	0.172	0.118	0.118	
06/22/2023	03:40	1.82	09:50	2.61	2.27	02:50	1.20	09:35	2.14	1.84	03:00	0.058	09:50	0.170	0.124	0.124	
06/23/2023	03:20	1.82	09:50	2.43	2.23	04:30	1.22	09:50	2.08	1.79	04:30	0.059	09:50	0.152	0.117	0.117	
06/24/2023	04:05	1.68	11:15	2.69	2.25	04:05	0.99	22:05	2.17	1.81	04:05	0.043	11:15	0.179	0.123	0.123	
06/25/2023	06:50	1.68	21:50	2.88	2.30	06:40	1.02	12:05	2.19	1.80	06:40	0.044	21:55	0.194	0.127	0.127	
06/26/2023	03:40	1.93	10:35	2.66	2.36	03:40	1.37	15:50	2.10	1.89	03:40	0.072	10:50	0.168	0.134	0.122	
06/27/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			1.925
Average	2.27	1.77	0.121

FM_03

Site Commentary

SITE INFORMATION

Pipe	Elliptical (14 in H x 14 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study.

This site was positioned upstream of site FM_16. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	2.46	1.19	0.108
Minimum	1.24	0.59	0.019
Maximum	4.73	2.22	0.452
Min Time	06/25/2023 5:15:00 AM	06/22/2023 3:45:00 AM	06/16/2023 4:15:00 AM
Max Time	06/11/2023 4:15:00 AM	06/11/2023 4:00:00 AM	06/11/2023 4:00:00 AM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

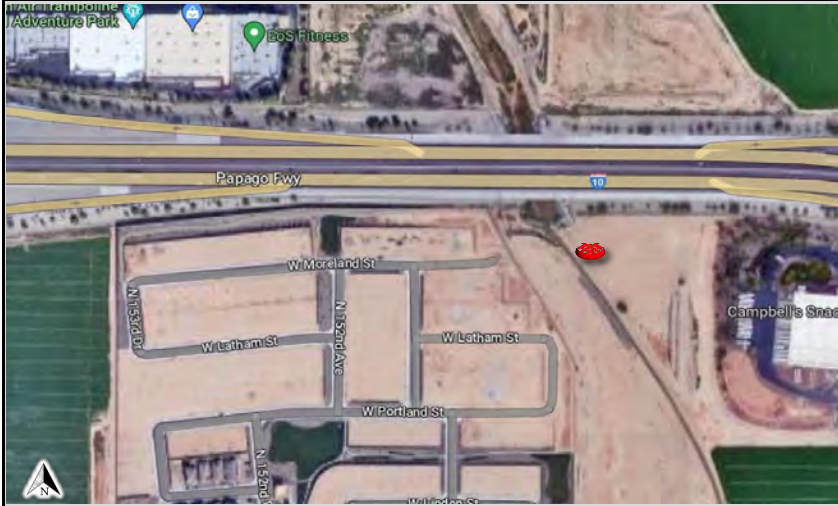
Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100



GoodYear.Carollo.TFM.AZ23**Site Name****Flow Monitoring
Site Report****FM_03**

Site Address /Location:	1200 N Bullard Ave, Goodyear, AZ 85338		Monitor Series	Location Type
			TRITON+	Temporary
Site Access Details:	External Traffic Control Required	Latitude:	Pipe Size (H x W)	Pipe Shape
		Longitude:	14.00"x 14.00"	Circular



Manhole #	System Characteristics
MH57B-304	Residential/Commercial
Access	Traffic
Drive	Medium

**Installation Information**

Installation Date:	Installation Type:
Wednesday, June 7, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
8:57:00 AM	14.00"x 14.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
2.25"	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.25	0"
Silt (in)	Silt Type
0"	

Hydraulic Comments:

Smooth flow with low depth and low velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
10.79	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

External Traffic Control Required

ADS Project Name: GoodYear.Carollo.TFM.AZ23

ADS Project Number: 22930.11.325

Hydrograph Report
FM_03

Flow Monitor

FM_03

Pipe Height
14.00
in

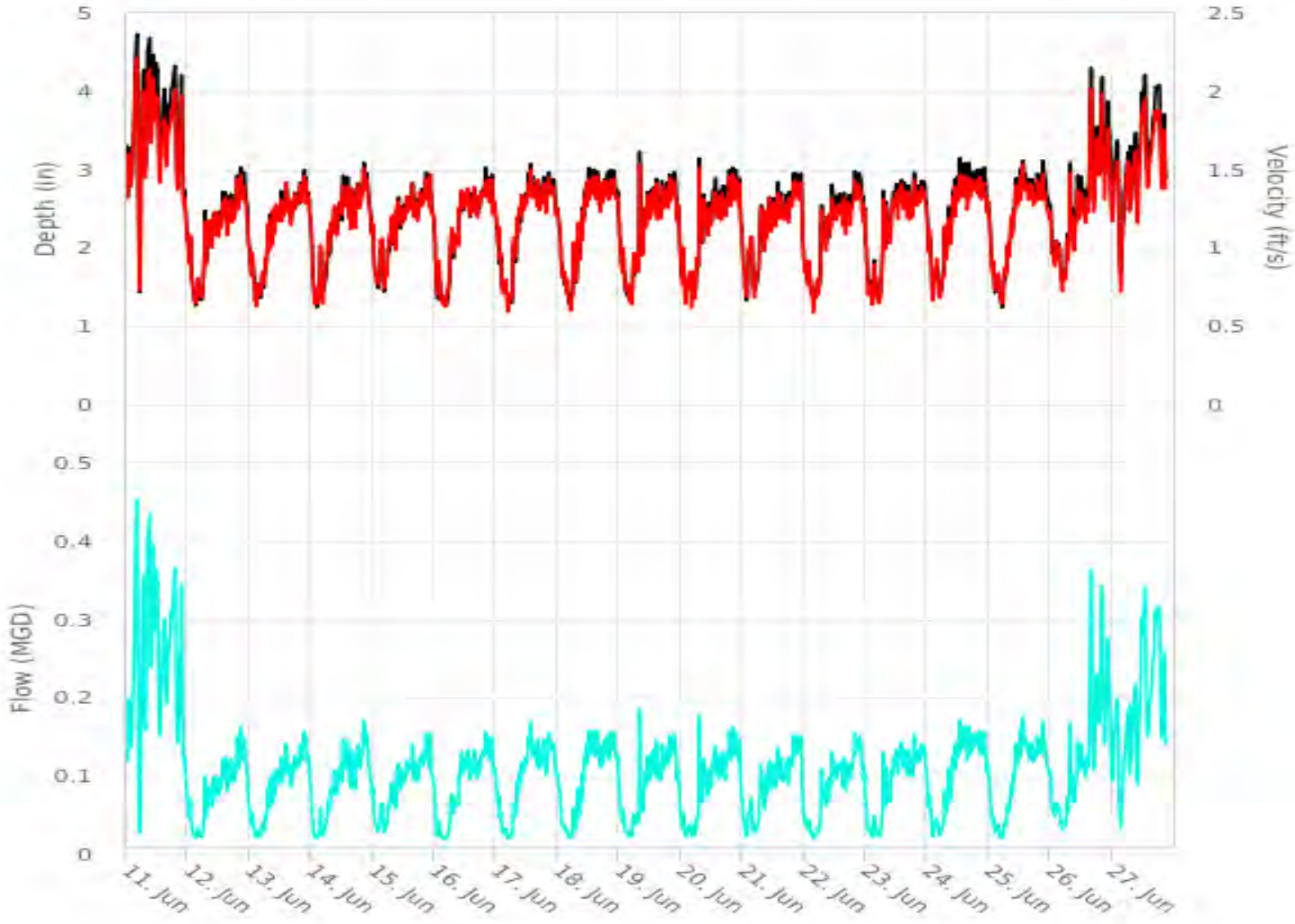
Report Period

06/11/2023
To
06/27/2023

Legend

— DFINAL
— QFINAL
— VFINAL

ABS ENVIRONMENTAL
SERVICES



Scattergraph Report

FM_03

Flow Monitor
FM_03

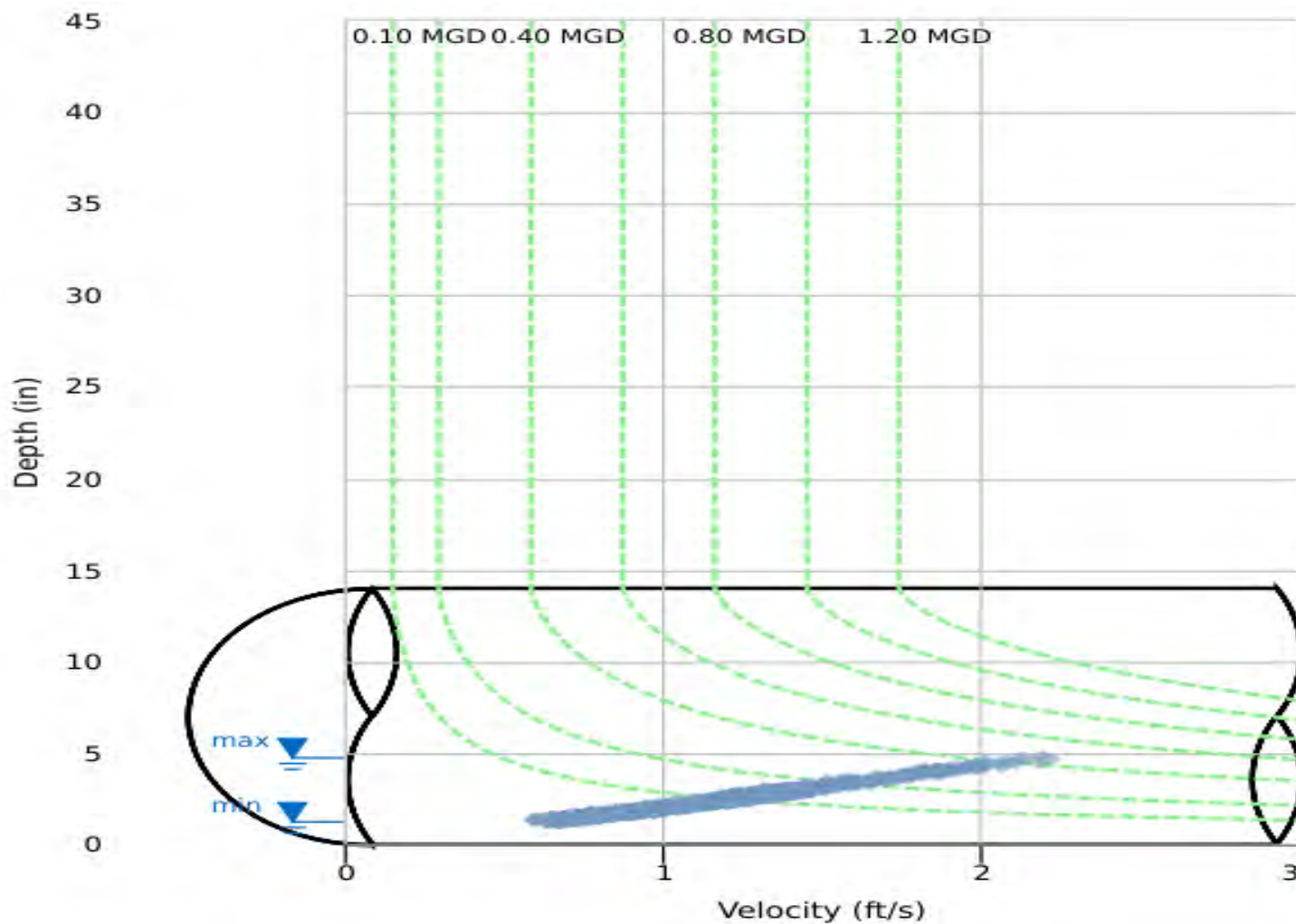
Pipe Height
14.00
in

Report Period
06/11/2023
To
06/27/2023

Legend

 DFINAL - VFINAL
 Iso-Q
 Min-Max Depth

ABS ENVIRONMENTAL SERVICES



Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_03Pipe: Elliptical (14 in H x 14 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	05:25	1.27	04:15	4.76	3.57	05:25	0.66	04:10	2.25	1.68	05:25	0.021	04:10	0.461	0.247	0.247	
06/12/2023	03:10	1.24	20:35	3.05	2.22	03:15	0.61	20:40	1.49	1.09	03:15	0.018	20:35	0.164	0.082	0.082	
06/13/2023	02:30	1.27	21:40	3.03	2.27	02:50	0.62	14:25	1.49	1.12	02:30	0.020	21:40	0.160	0.087	0.087	
06/14/2023	02:25	1.23	20:40	3.15	2.27	02:45	0.61	20:40	1.56	1.13	02:45	0.020	20:40	0.182	0.089	0.089	
06/15/2023	04:35	1.40	20:55	3.11	2.31	01:55	0.71	20:55	1.54	1.15	04:35	0.027	20:55	0.176	0.090	0.090	
06/16/2023	04:25	1.26	20:00	3.06	2.26	04:20	0.61	22:25	1.50	1.13	04:20	0.019	20:00	0.166	0.089	0.089	
06/17/2023	06:20	1.29	13:40	3.16	2.35	04:50	0.58	13:45	1.54	1.16	04:50	0.019	13:45	0.180	0.096	0.096	
06/18/2023	04:30	1.28	12:15	3.10	2.38	05:10	0.59	12:15	1.50	1.16	05:15	0.020	12:15	0.171	0.098	0.098	
06/19/2023	04:30	1.34	08:15	3.46	2.30	05:15	0.60	08:15	1.65	1.12	04:25	0.021	08:15	0.219	0.090	0.090	
06/20/2023	04:30	1.37	07:20	3.33	2.31	04:20	0.61	07:20	1.59	1.12	04:25	0.022	07:20	0.200	0.090	0.090	
06/21/2023	02:05	1.28	07:25	3.47	2.30	02:10	0.66	07:25	1.59	1.13	02:05	0.022	07:25	0.212	0.089	0.089	
06/22/2023	04:10	1.29	21:45	3.00	2.28	03:45	0.57	20:05	1.46	1.10	03:45	0.019	20:05	0.158	0.087	0.087	
06/23/2023	03:05	1.25	07:05	3.19	2.33	05:40	0.60	19:00	1.48	1.12	05:40	0.021	07:05	0.174	0.092	0.092	
06/24/2023	02:15	1.32	08:40	3.43	2.46	02:20	0.65	08:40	1.58	1.17	02:15	0.022	08:40	0.207	0.104	0.104	
06/25/2023	05:15	1.23	21:20	3.14	2.40	05:35	0.63	13:35	1.57	1.16	05:15	0.020	13:35	0.181	0.100	0.100	
06/26/2023	04:50	1.57	16:10	4.37	2.69	04:45	0.70	16:15	2.07	1.26	04:50	0.030	16:15	0.381	0.130	0.130	
06/27/2023	03:40	1.66	13:00	4.22	3.19	03:40	0.68	12:55	2.00	1.50	03:40	0.031	12:55	0.350	0.187	0.167	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			1.826
Average	2.46	1.19	0.108

FM_04

Site Commentary

SITE INFORMATION

Pipe	Elliptical (14.5 in H x 14.5 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were experienced during the study. Backwater conditions were observed on 11 June 2023, 12 June 2023, 17 June 2023, and 19 June 2023.

This site was positioned upstream of site FM_06. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	0.69	3.40	0.048
Minimum	0.47	0.38	0.003
Maximum	1.03	6.06	0.101
Min Time	06/16/2023 5:00:00 AM	06/16/2023 3:00:00 AM	06/16/2023 3:00:00 AM
Max Time	06/17/2023 1:15:00 PM	06/15/2023 5:15:00 PM	06/17/2023 1:15:00 PM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100

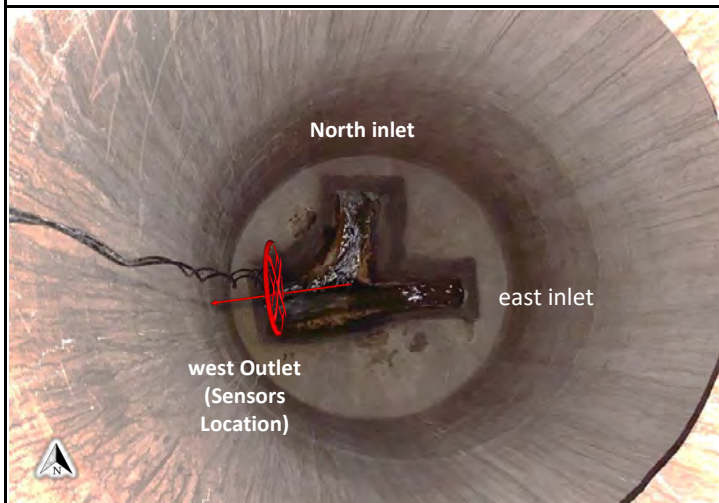


GoodYear.Carollo.TFM.AZ23**Site Name****Flow Monitoring
Site Report****FM_04**

Site Address /Location:	17037 W Yuma Rd, Goodyear, AZ 85338		Monitor Series	Location Type
Site Access Details:	External Traffic Control Required	Latitude: 33.4357617 Longitude: -112.425959°	TRITON+ Pipe Size (H x W) 14.50"x 14.50"	Temporary Pipe Shape Circular



Manhole #	System Characteristics
MH65C-301	Residential/Commercial
Access	Traffic
Drive	Medium

**Installation Information**

Installation Date:	Installation Type:
Thursday, June 8, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4), Smart Depth (CS5)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
8:57:00 AM	14.50"x 14.50"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
1.13"	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
3.58	0"
Silt (in)	Silt Type
0"	

Hydraulic Comments:

Smooth flow with low depth and moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
17	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

External Traffic Control Required/ reverse installation

ADS Project Name: GoodYear.Carollo.TFM.AZ23

ADS Project Number: 22930.11.325

Hydrograph Report

FM_04

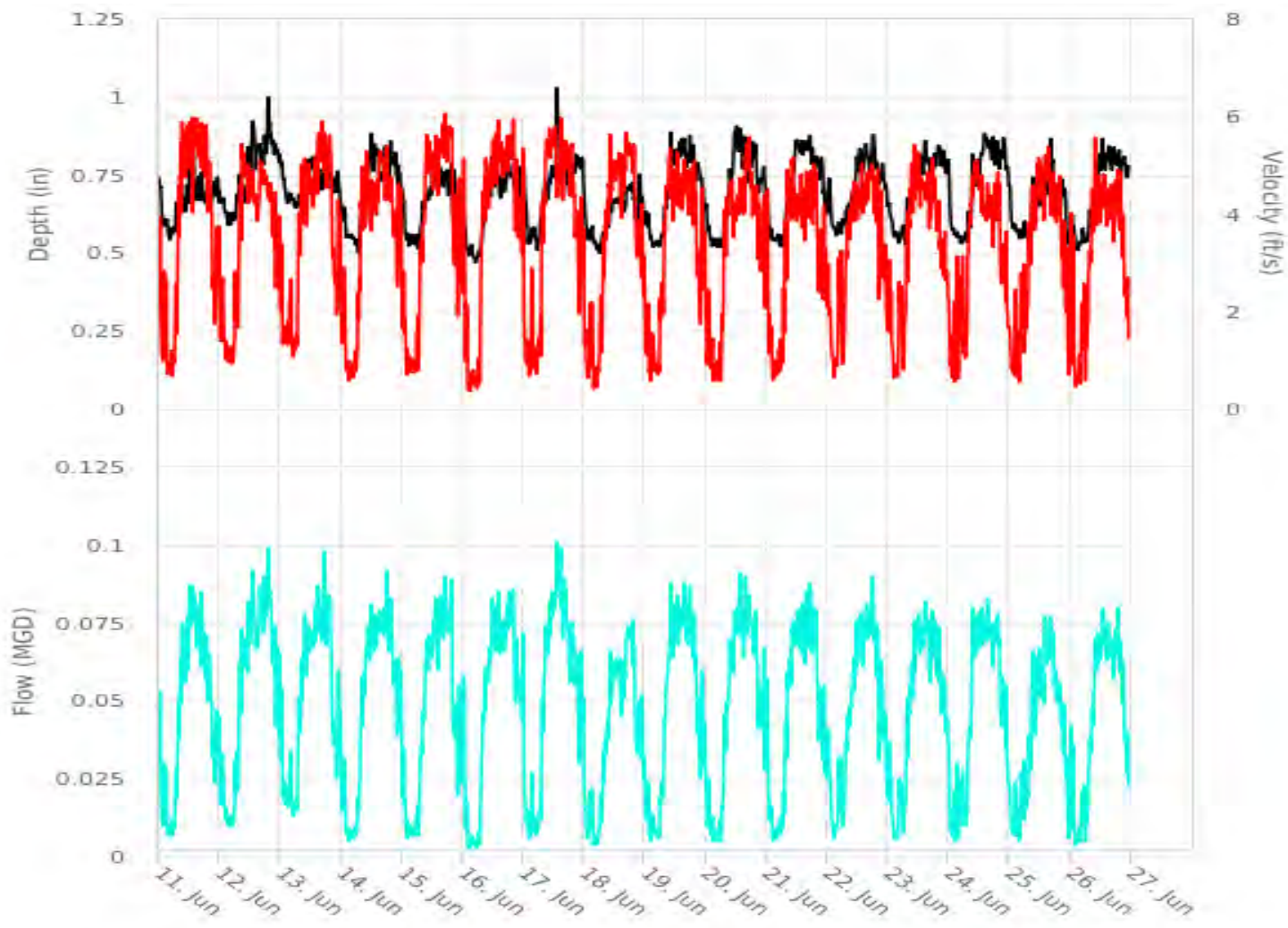
Flow Monitor
FM_04

Pipe Height
14.50
in

Report Period
06/11/2023
To
06/27/2023

Legend
— DFINAL
— QFINAL
— VFINAL

ABS ENVIRONMENTAL
SERVICES



Scattergraph Report

FM_04

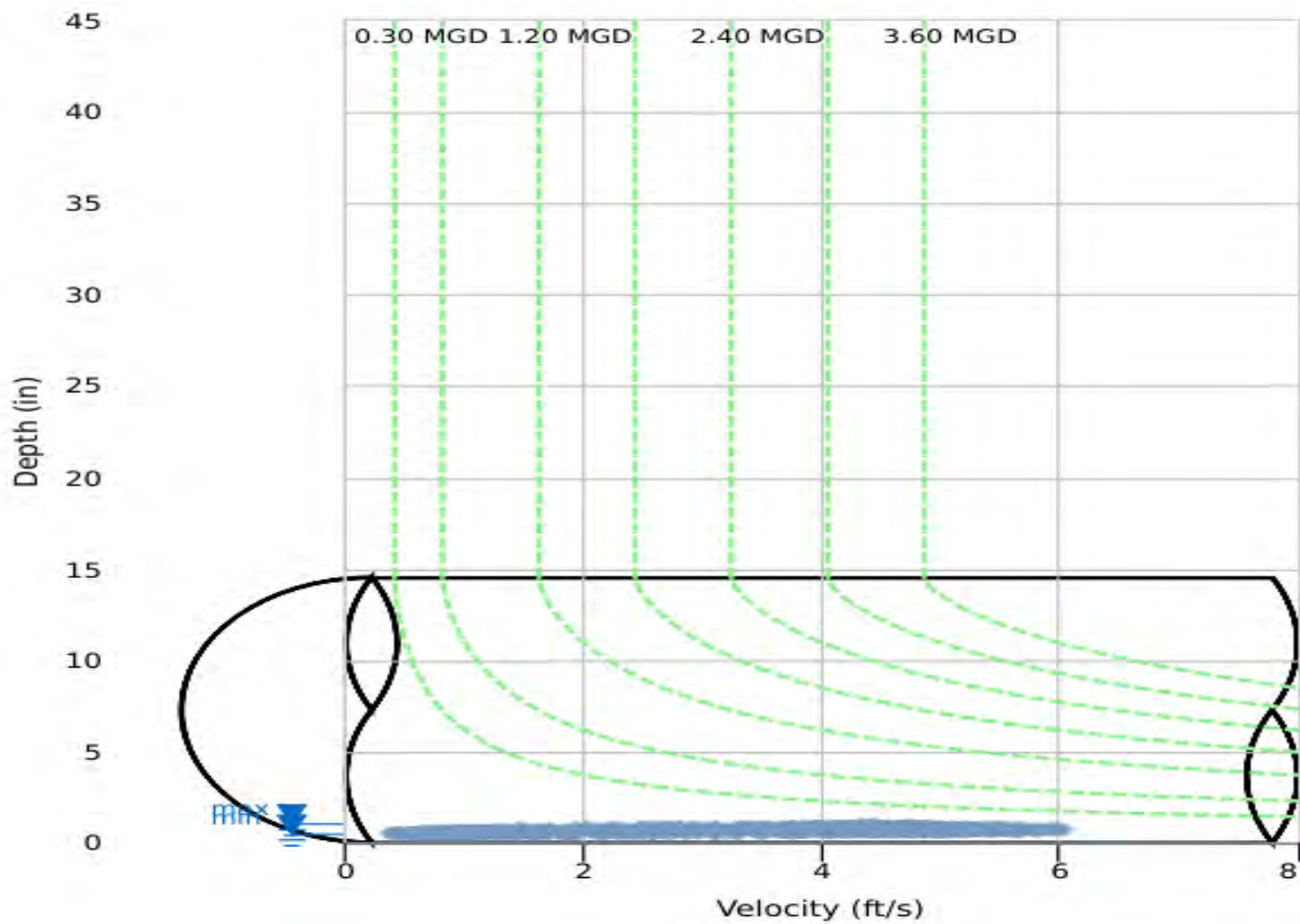
Flow Monitor
FM_04



Report Period
06/11/2023
To
06/27/2023

Legend
□ DFINAL - VFINAL
--- Iso-Qth
▲ Min-Max Depth

ADS ENVIRONMENTAL
SERVICES



Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_04Pipe: Elliptical (14.5 in H x 14.5 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	04:20	0.54	13:30	0.93	0.67	04:50	0.49	16:55	6.27	3.69	04:50	0.004	16:55	0.091	0.047	0.047	
06/12/2023	03:35	0.58	19:10	1.23	0.76	06:05	0.75	08:50	5.68	3.45	06:05	0.008	19:10	0.119	0.054	0.054	
06/13/2023	05:40	0.64	17:30	0.85	0.73	05:20	0.99	16:30	6.14	3.61	05:45	0.012	17:40	0.101	0.052	0.052	
06/14/2023	07:10	0.49	12:00	0.90	0.70	04:15	0.47	18:15	5.95	3.41	04:15	0.004	18:15	0.101	0.049	0.049	
06/15/2023	06:40	0.48	13:20	0.81	0.65	02:20	0.47	17:15	6.29	3.64	02:20	0.004	13:20	0.094	0.047	0.047	
06/16/2023	04:55	0.46	11:35	0.82	0.65	03:50	0.31	20:10	6.12	3.70	07:00	0.002	18:20	0.090	0.049	0.049	
06/17/2023	05:35	0.50	13:10	1.04	0.72	05:50	0.52	12:45	6.15	3.62	05:50	0.004	13:25	0.106	0.053	0.053	
06/18/2023	06:20	0.48	22:00	0.81	0.62	03:55	0.33	10:15	5.84	3.39	03:55	0.003	19:25	0.081	0.040	0.040	
06/19/2023	03:25	0.51	10:20	1.07	0.71	02:20	0.38	11:35	5.98	3.30	02:20	0.003	10:20	0.101	0.048	0.048	
06/20/2023	02:30	0.52	12:20	0.94	0.71	04:00	0.29	17:20	5.98	3.26	04:00	0.003	13:30	0.098	0.048	0.048	
06/21/2023	05:25	0.52	17:20	0.90	0.71	03:45	0.37	10:35	5.63	3.22	03:45	0.003	17:20	0.101	0.048	0.048	
06/22/2023	03:35	0.55	18:10	0.89	0.71	03:15	0.45	14:20	5.49	3.30	03:15	0.004	18:10	0.091	0.047	0.047	
06/23/2023	04:15	0.52	14:25	0.87	0.71	04:00	0.45	12:15	5.77	3.33	04:00	0.004	20:25	0.089	0.048	0.048	
06/24/2023	04:35	0.52	09:20	0.93	0.72	01:30	0.48	13:20	5.67	3.19	01:30	0.005	09:25	0.095	0.047	0.047	
06/25/2023	23:40	0.51	16:15	0.88	0.65	23:40	0.49	09:05	5.56	3.19	23:40	0.004	14:00	0.079	0.040	0.040	
06/26/2023	02:35	0.51	12:50	0.89	0.70	06:10	0.32	09:45	5.69	3.13	06:10	0.003	13:10	0.086	0.045	0.043	
06/27/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			0.761
Average	0.69	3.40	0.048

FM_05

Site Commentary

SITE INFORMATION

Pipe	Elliptical (30.5 in H x 30 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study.

This site was positioned downstream of site FM_13 and upstream of site FM_15. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	7.62	2.83	1.832
Minimum	4.70	1.84	0.584
Maximum	11.08	3.71	3.911
Min Time	06/11/2023 6:00:00 AM	06/11/2023 6:45:00 AM	06/11/2023 6:45:00 AM
Max Time	06/23/2023 12:30:00 PM	06/23/2023 1:30:00 PM	06/23/2023 1:30:00 PM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

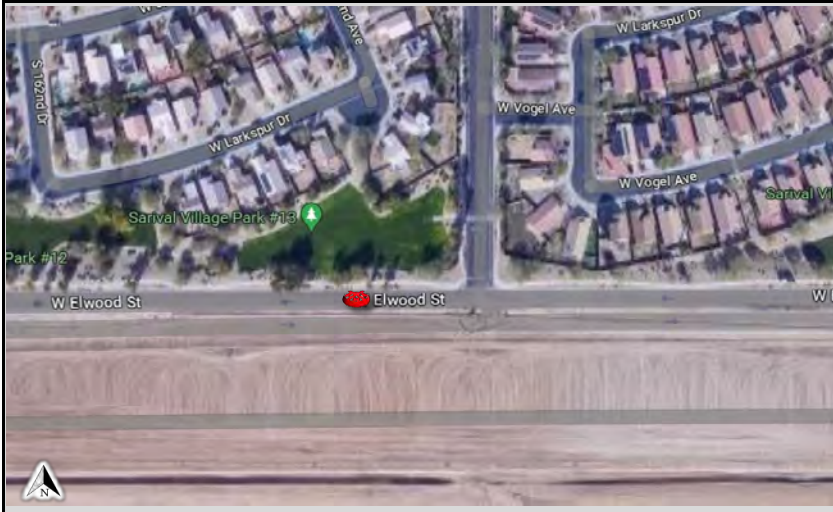
Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100

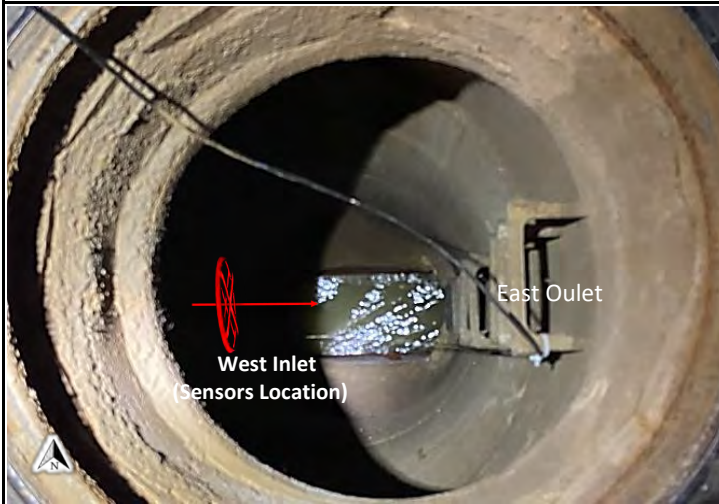


GoodYear.Carollo.TFM.AZ23**Site Name****Flow Monitoring
Site Report****FM_05**

Site Address /Location:	16099 W Vogel Ave, Goodyear, AZ 85338		Monitor Series	Location Type
Site Access Details:	External Traffic Control Required	Latitude:	TRITON+	Temporary
		Longitude:	Pipe Size (H x W)	Pipe Shape
			30.50"x 30.00"	Elliptical



Manhole #	System Characteristics
MH86A-301	Residential/Commercial
Access	Traffic
Drive	Medium

**Installation Information**

Installation Date:	Installation Type:
Thursday, June 8, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
7:58:00 PM	30.50"x 30.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
7.88"	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
2.86	0"
Silt (in)	Silt Type
0"	

Hydraulic Comments:

Smooth flow with medium depth and low velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
18.07	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Vitrified Clay Pipe	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

External Traffic Control Required

ADS Project Name: GoodYear.Carollo.TFM.AZ23

ADS Project Number: 22930.11.325

Hydrograph Report
FM_05

Flow Monitor

FM_05

Pipe Height
30.50
in

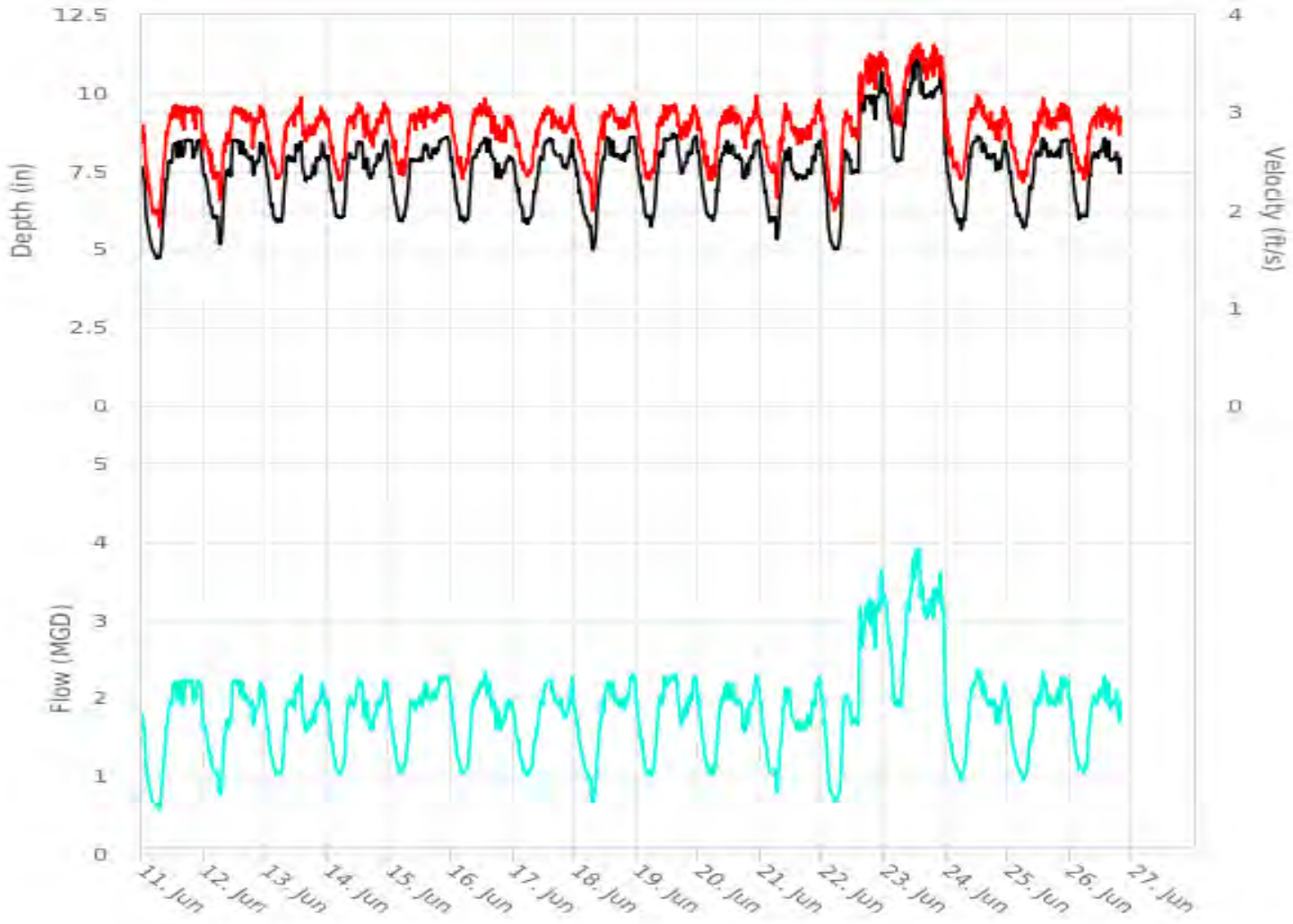
Report Period

06/11/2023
To
06/27/2023

Legend

— DFINAL
— QFINAL
— VFINAL

ABS ENVIRONMENTAL
SERVICES



Scattergraph Report
FM_05

Flow Monitor

FM_05

Pipe Height
30.50
in

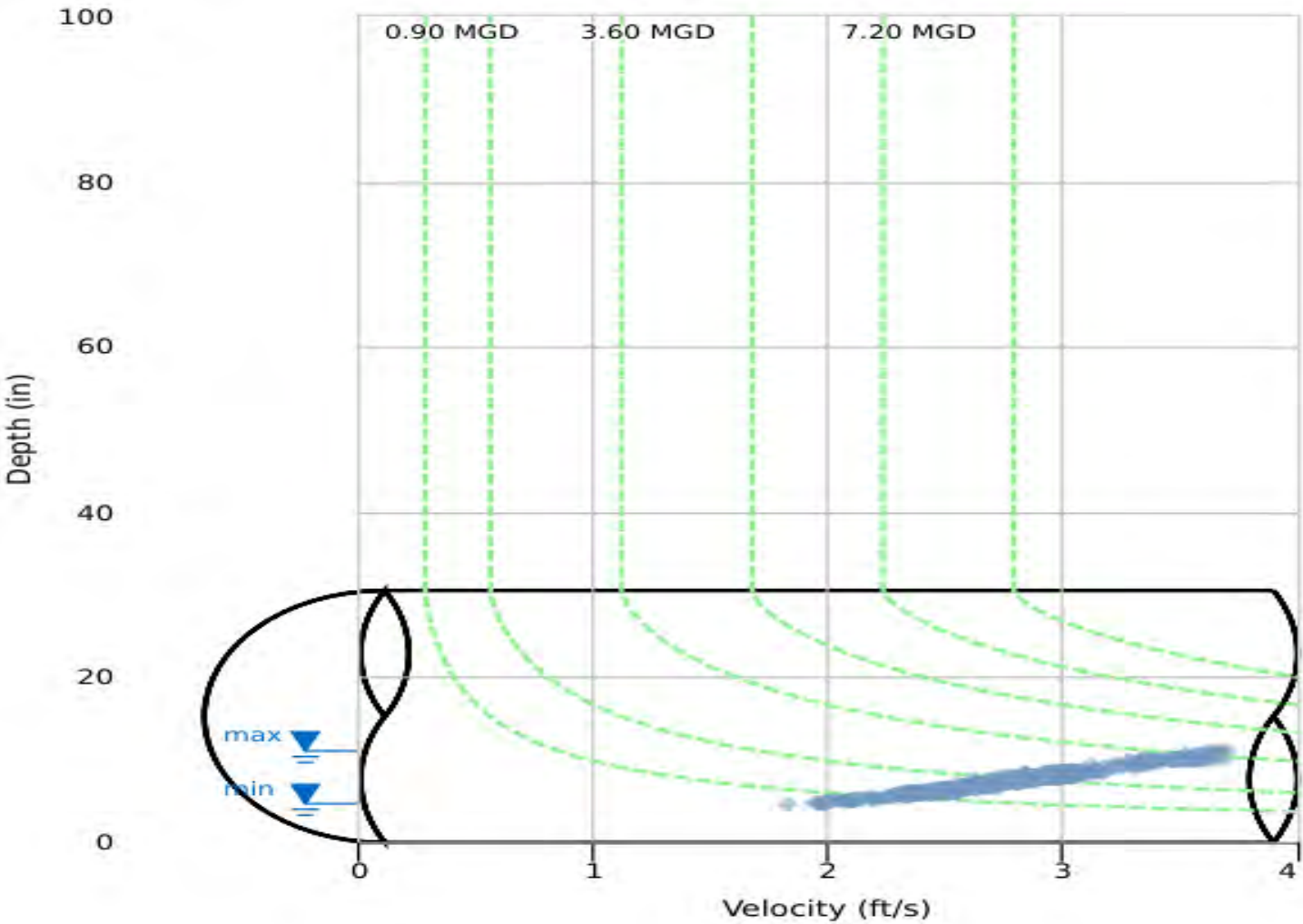
Report Period

06/11/2023
To
06/27/2023

Legend

- DFINAL - VFINAL
- Iso-Qth
- Min-Max Depth





Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_05Pipe: Elliptical (30.5 in H x 30 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	06:15	4.69	16:50	8.55	7.18	06:50	1.74	14:15	3.15	2.69	06:50	0.555	17:35	2.270	1.634	1.634	
06/12/2023	06:40	5.15	11:55	8.55	7.40	06:25	2.06	12:20	3.15	2.76	06:25	0.745	12:20	2.319	1.705	1.705	
06/13/2023	04:35	5.86	13:45	8.45	7.37	05:25	2.25	13:55	3.19	2.79	05:25	0.987	13:55	2.321	1.699	1.699	
06/14/2023	04:55	5.97	13:25	8.50	7.51	05:05	2.28	22:00	3.13	2.80	04:55	1.018	12:05	2.276	1.751	1.751	
06/15/2023	05:05	5.88	22:25	8.61	7.62	04:15	2.32	19:45	3.15	2.85	04:55	1.033	19:45	2.323	1.823	1.823	
06/16/2023	05:00	5.86	13:25	8.58	7.48	04:35	2.24	13:20	3.20	2.81	04:35	1.008	13:20	2.371	1.745	1.745	
06/17/2023	05:35	5.80	14:05	8.57	7.44	06:55	2.22	22:55	3.16	2.78	05:40	0.991	22:55	2.335	1.717	1.717	
06/18/2023	07:05	4.96	21:50	8.63	7.39	06:45	1.98	13:50	3.17	2.75	07:00	0.684	22:35	2.329	1.700	1.700	
06/19/2023	05:40	5.68	14:05	8.73	7.65	05:05	2.26	10:40	3.16	2.80	05:35	0.983	15:00	2.339	1.800	1.800	
06/20/2023	05:25	5.86	11:25	8.52	7.53	06:30	2.25	22:20	3.20	2.80	05:30	1.008	22:20	2.317	1.760	1.760	
06/21/2023	06:25	5.29	23:20	8.49	7.26	06:40	2.08	09:35	3.16	2.76	06:35	0.787	22:30	2.285	1.648	1.648	
06/22/2023	04:40	4.97	22:55	10.72	7.98	04:30	1.98	18:20	3.66	2.92	04:35	0.682	22:50	3.681	2.088	2.088	
06/23/2023	05:00	7.78	12:30	11.15	9.65	23:50	2.72	13:40	3.79	3.38	23:50	1.832	13:40	3.986	2.989	2.989	
06/24/2023	06:00	5.57	12:00	8.64	7.52	05:30	2.29	12:10	3.22	2.80	06:00	0.926	12:10	2.403	1.763	1.763	
06/25/2023	06:00	5.64	13:35	8.59	7.49	05:35	2.25	13:40	3.22	2.78	06:05	0.948	13:40	2.372	1.742	1.742	
06/26/2023	03:40	5.94	13:35	8.57	7.46	05:25	2.24	18:10	3.11	2.79	03:20	1.015	13:40	2.293	1.733	1.426	
06/27/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			28.989
Average	7.62	2.83	1.832

FM_06

Site Commentary

SITE INFORMATION

Pipe	Elliptical (54 in H x 53.5 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study.

This site was positioned downstream of sites FM_04 and FM_14 and upstream of site FM_16. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	6.41	2.76	1.920
Minimum	3.66	1.91	0.586
Maximum	10.91	3.27	4.568
Min Time	06/13/2023 5:15:00 AM	06/13/2023 5:00:00 AM	06/13/2023 5:00:00 AM
Max Time	06/13/2023 10:45:00 AM	06/13/2023 11:15:00 AM	06/13/2023 11:30:00 AM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100



GoodYear.Carollo.TFM.AZ23**Site Name****Flow Monitoring
Site Report****FM_06**

Site Address /Location:	15775 W Elwood St, Goodyear, AZ 85338		Monitor Series	Location Type
Site Access Details:	External Traffic Control Required	Latitude: 33.4134711 Longitude: -112.4023421°	TRITON+ Pipe Size (H x W) 54.00"x 53.50"	Temporary Pipe Shape Elliptical
			Manhole #	System Characteristics
			MH86C-203	Residential/Commercial
			Access	Traffic
			Drive	Light

**Installation Information**

Installation Date:	Installation Type:
Monday, June 5, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
9:23:00 PM	54.00"x 53.50"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
6.75"	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
3.58	0"
Silt (in)	Silt Type
0"	

Hydraulic Comments:

Smooth flow with medium depth and low velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
30.45	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

External Traffic Control Required

ADS Project Name: GoodYear.Carollo.TFM.AZ23

ADS Project Number: 22930.11.325

Hydrograph Report

FM_06

Flow Monitor FM_06
 Pipe Height 54.00 in
Report Period 06/11/2023 To 06/27/2023
Legend — DFINAL — QFINAL — VFINAL

ABS ENVIRONMENTAL SERVICES



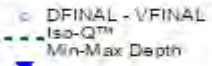
Scattergraph Report

FM_06

Flow Monitor
FM_06

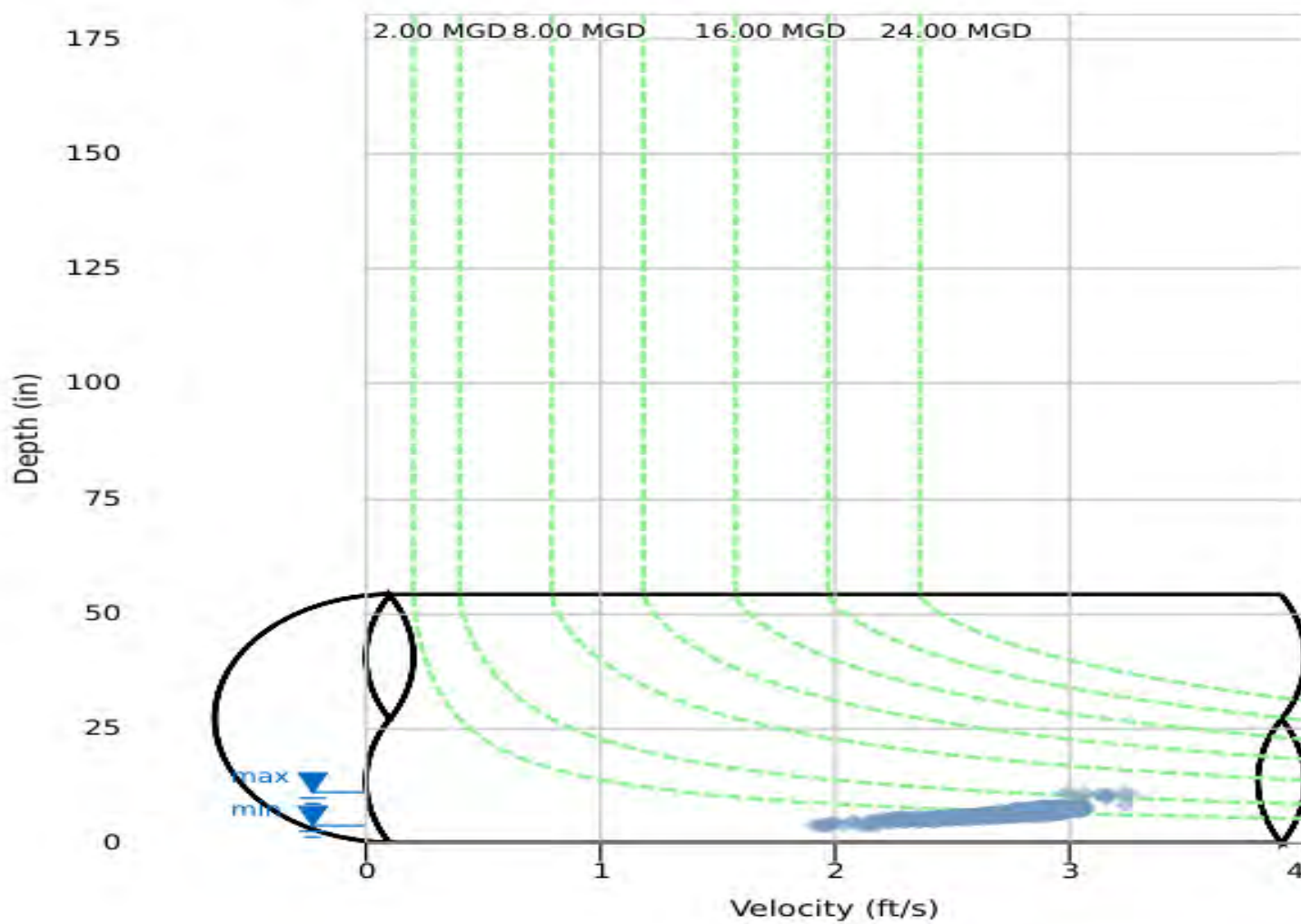
Pipe Height
54.00
in

Report Period
06/11/2023
To
06/27/2023

Legend


DFINAL - VFINAL
Iso-QTM
Min-Max Depth

ABS ENVIRONMENTAL
SERVICES



Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_06Pipe: Elliptical (54 in H x 53.5 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	08:05	4.57	13:15	7.26	6.22	06:20	2.13	11:40	3.10	2.73	06:20	0.922	13:15	2.417	1.818	1.818	
06/12/2023	06:20	4.78	00:00	6.78	5.60	03:40	2.15	00:05	2.96	2.57	06:20	0.967	00:05	2.174	1.445	1.445	
06/13/2023	05:20	3.65	11:40	11.14	6.14	05:10	1.82	11:25	3.36	2.65	05:10	0.554	11:40	4.749	1.836	1.836	
06/14/2023	04:50	4.77	14:00	7.76	6.10	03:25	2.18	13:40	3.13	2.73	04:40	0.996	13:55	2.707	1.760	1.760	
06/15/2023	04:35	4.75	12:55	7.97	6.29	04:25	2.17	21:10	3.09	2.74	04:45	0.967	12:40	2.844	1.856	1.856	
06/16/2023	05:00	5.55	20:35	7.87	6.71	04:20	2.40	01:05	3.11	2.84	04:20	1.375	20:35	2.825	2.084	2.084	
06/17/2023	07:50	5.52	12:55	7.98	6.64	03:05	2.46	12:45	3.12	2.82	06:30	1.403	13:05	2.859	2.044	2.044	
06/18/2023	08:00	4.59	12:20	6.98	6.00	06:05	2.13	11:50	3.05	2.69	06:05	0.929	11:50	2.316	1.695	1.695	
06/19/2023	04:35	4.75	11:35	8.07	6.56	04:10	2.12	11:05	3.08	2.77	04:45	0.941	11:35	2.930	1.998	1.998	
06/20/2023	05:05	5.65	23:10	7.50	6.74	05:25	2.47	22:10	3.13	2.85	05:25	1.441	22:10	2.575	2.098	2.098	
06/21/2023	04:30	5.58	13:00	7.44	6.65	03:55	2.42	19:10	3.08	2.83	03:55	1.406	13:15	2.572	2.046	2.046	
06/22/2023	05:00	4.71	23:30	6.90	5.99	04:45	2.16	20:40	3.07	2.68	05:00	0.942	00:20	2.197	1.676	1.676	
06/23/2023	03:50	4.96	13:15	7.49	6.68	03:35	2.22	23:40	3.08	2.79	03:35	1.064	20:45	2.562	2.038	2.038	
06/24/2023	06:35	5.55	12:45	7.71	6.81	04:40	2.47	13:55	3.14	2.84	06:35	1.429	12:50	2.690	2.131	2.131	
06/25/2023	07:50	5.33	12:40	7.88	6.83	07:35	2.36	11:10	3.12	2.84	07:35	1.253	12:40	2.839	2.150	2.150	
06/26/2023	03:50	5.59	00:00	7.43	6.65	04:45	2.45	20:00	3.13	2.84	04:45	1.401	20:00	2.555	2.058	1.729	
06/27/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			30.405
Average	6.41	2.76	1.919

FM_07

Site Commentary

SITE INFORMATION

Pipe	Elliptical (12 in H x 12 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study.

This site was positioned upstream of site FM_01. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	2.95	1.24	0.127
Minimum	1.87	0.68	0.035
Maximum	5.32	1.77	0.388
Min Time	06/23/2023 3:45:00 AM	06/22/2023 3:30:00 AM	06/22/2023 3:30:00 AM
Max Time	06/26/2023 10:45:00 AM	06/26/2023 10:30:00 AM	06/26/2023 10:30:00 AM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100



GoodYear.Carollo.TFM.AZ23				Site Name	
Flow Monitoring Site Report				FM_07	

Site Address /Location:	1300 S Litchfield Rd, Goodyear, AZ 85338		Monitor Series	TRITON+		Location Type	Temporary	
Site Access Details:	External Traffic Control Required	Latitude:	33.4329212	Pipe Size (H x W)	12.00"x 12.00"	Pipe Shape	Circular	
		Longitude:	-112.358208°					



Manhole #	System Characteristics
MH79A-101	Residential/Commercial
Access	Traffic
Drive	Light



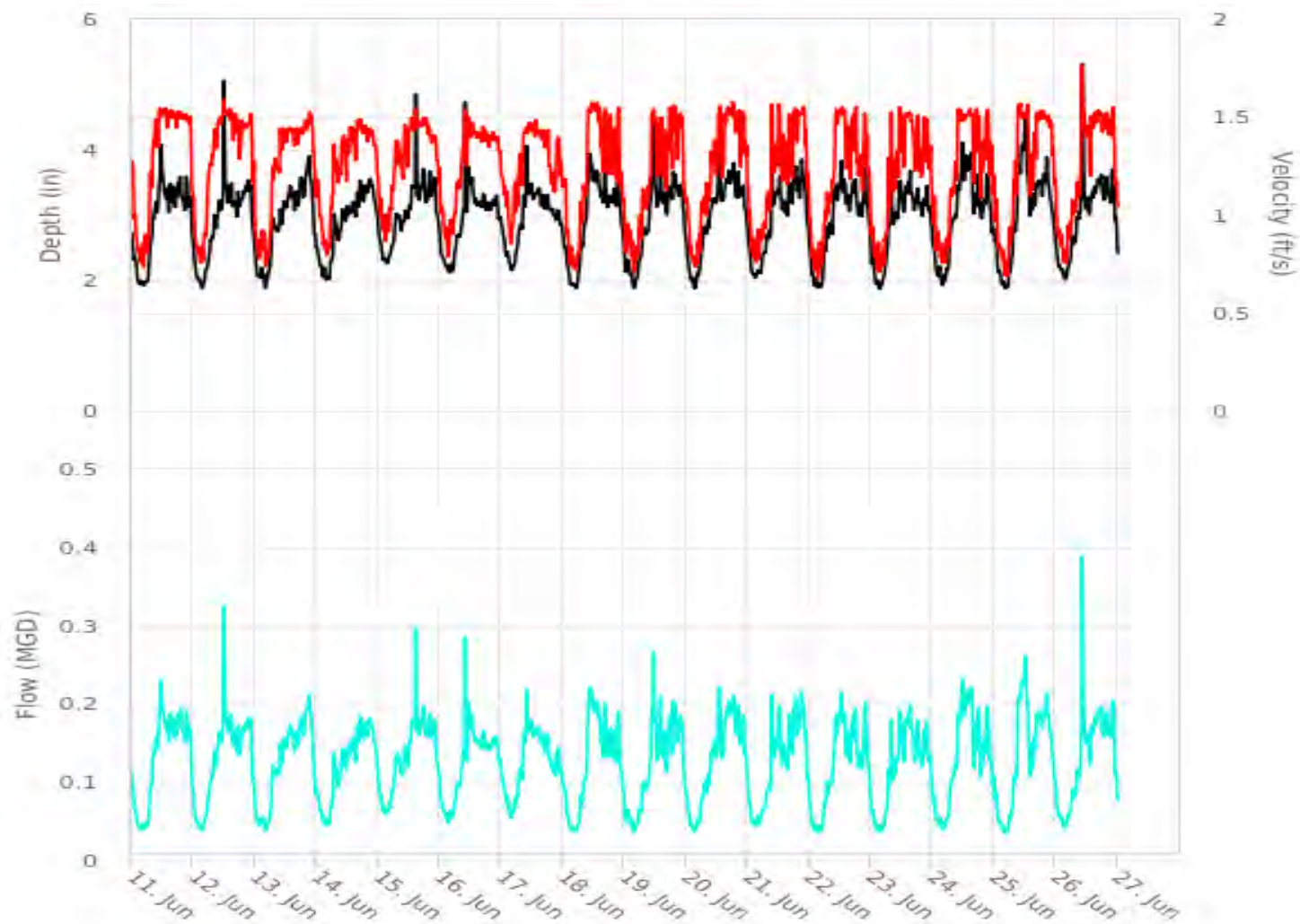


Installation Information	
Installation Date:	Installation Type:
Wednesday, June 7, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi
Installation Confirmation:	
Confirmation Time:	Pipe Size (HxW)
7:41:00 PM	12.00"x 12.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
4.00 "	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.56	0"
Silt (in)	Silt Type
0"	
Hydraulic Comments:	
Smooth flow with medium depth and low velocity	
Manhole / Pipe Information:	
Manhole Depth (Approx. FT):	Manhole Configuration
8.71	Single
Manhole Material:	Manhole Condition:
Brick	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Vitrified Clay Pipe	Good
Communication Information:	
Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole
Additional Site Info. / Comments:	
External Traffic Control Required	

ADS Project Name:	GoodYear.Carollo.TFM.AZ23
ADS Project Number:	22930.11.325

Hydrograph Report

FM_07



Scattergraph Report
FM_07

Flow Monitor

FM_07

Pipe Height
12.00
in

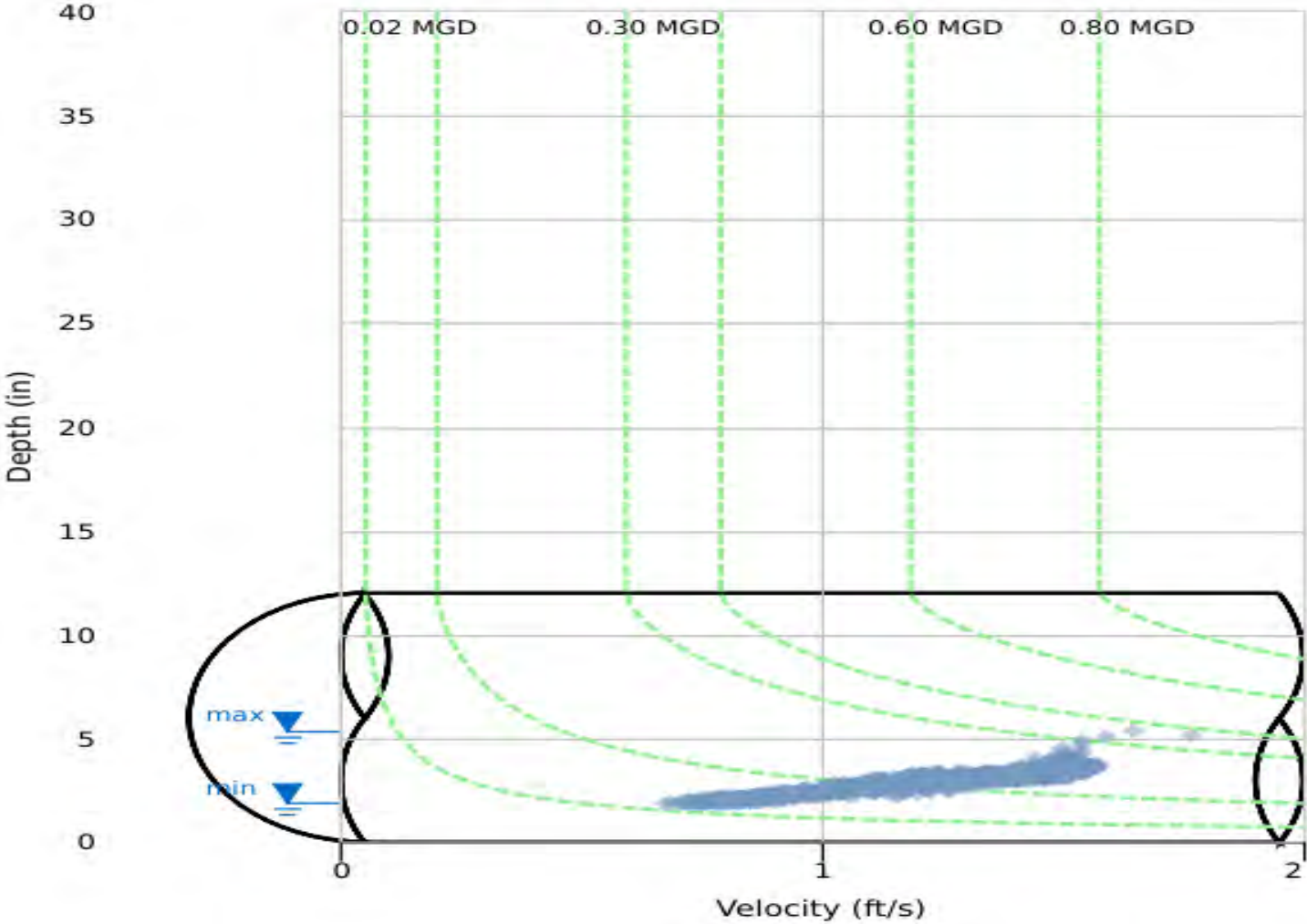
Report Period

06/11/2023
To
06/27/2023

Legend

- DFINAL - VFINAL
- Iso-Qth
- Min-Max Depth





Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_07Pipe: Elliptical (12 in H x 12 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	04:50	1.92	11:35	4.09	2.92	04:45	0.69	15:35	1.56	1.29	04:45	0.037	11:35	0.232	0.132	0.132	
06/12/2023	03:30	1.88	12:05	5.20	2.90	02:40	0.74	12:05	1.60	1.30	03:50	0.039	12:05	0.338	0.130	0.130	
06/13/2023	04:05	1.87	21:15	3.94	2.91	04:20	0.72	21:30	1.55	1.23	04:20	0.037	21:15	0.213	0.124	0.124	
06/14/2023	03:50	2.00	21:00	3.56	2.87	03:35	0.76	17:15	1.50	1.25	03:35	0.043	17:10	0.186	0.122	0.122	
06/15/2023	03:50	2.25	14:45	5.07	3.03	03:00	0.86	14:40	1.56	1.29	03:30	0.059	14:45	0.317	0.135	0.135	
06/16/2023	03:50	2.12	10:05	4.90	2.93	03:20	0.75	10:00	1.55	1.26	03:20	0.047	10:05	0.301	0.126	0.126	
06/17/2023	04:20	2.15	10:05	4.09	2.96	03:40	0.79	13:45	1.50	1.26	03:40	0.052	10:05	0.221	0.127	0.127	
06/18/2023	05:15	1.88	10:40	3.95	2.95	04:45	0.68	11:15	1.58	1.21	04:45	0.036	10:40	0.224	0.126	0.126	
06/19/2023	03:55	1.87	11:30	4.62	2.93	03:45	0.65	11:25	1.58	1.19	03:45	0.033	11:30	0.280	0.123	0.123	
06/20/2023	03:45	1.87	13:05	3.96	2.98	03:45	0.70	18:40	1.60	1.23	03:45	0.035	13:10	0.224	0.129	0.129	
06/21/2023	03:05	2.03	09:40	4.02	2.96	02:20	0.71	09:35	1.61	1.21	02:20	0.042	09:45	0.232	0.125	0.125	
06/22/2023	03:25	1.87	12:45	3.90	2.91	03:35	0.64	18:25	1.56	1.20	03:35	0.033	12:45	0.220	0.121	0.121	
06/23/2023	03:55	1.86	15:30	3.70	2.88	05:15	0.68	11:15	1.56	1.21	03:45	0.035	15:30	0.202	0.120	0.120	
06/24/2023	04:25	1.92	11:55	4.25	2.99	03:25	0.73	21:55	1.56	1.22	04:10	0.040	11:50	0.242	0.129	0.129	
06/25/2023	04:55	1.87	12:20	4.55	3.04	05:30	0.64	13:30	1.59	1.24	05:30	0.033	12:20	0.266	0.135	0.135	
06/26/2023	03:50	2.01	10:40	6.15	3.01	04:30	0.70	10:40	1.90	1.25	04:25	0.040	10:40	0.498	0.133	0.133	
06/27/2023	00:30	2.42	00:00	2.94	2.64	00:25	0.93	00:00	1.31	1.11	00:25	0.069	00:00	0.126	0.093	0.002	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			2.038
Average	2.95	1.24	0.127

FM_08

Site Commentary

SITE INFORMATION

Pipe	Elliptical (22.5 in H x 22.5 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study.

This site was positioned upstream of site FM_16. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	6.24	1.26	0.514
Minimum	5.54	1.07	0.371
Maximum	8.30	1.61	0.945
Min Time	06/19/2023 7:30:00 AM	06/16/2023 7:45:00 AM	06/15/2023 11:00:00 PM
Max Time	06/12/2023 3:15:00 PM	06/13/2023 11:45:00 AM	06/12/2023 2:15:00 PM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

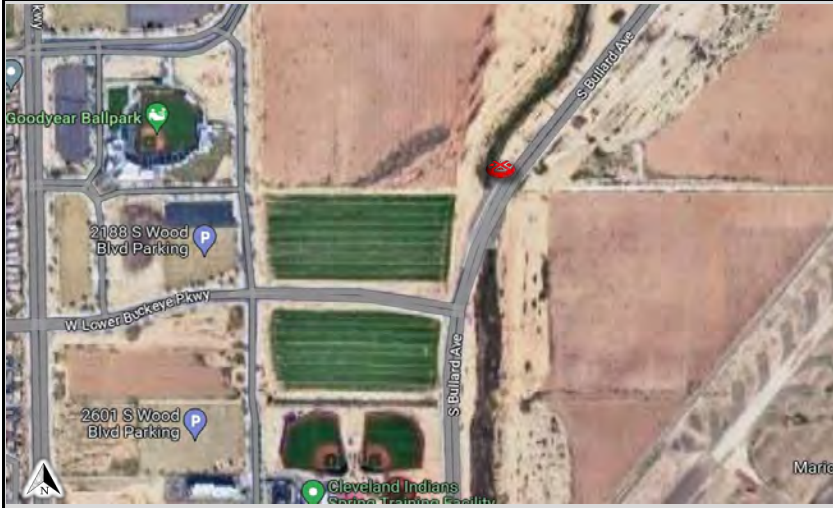
Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100

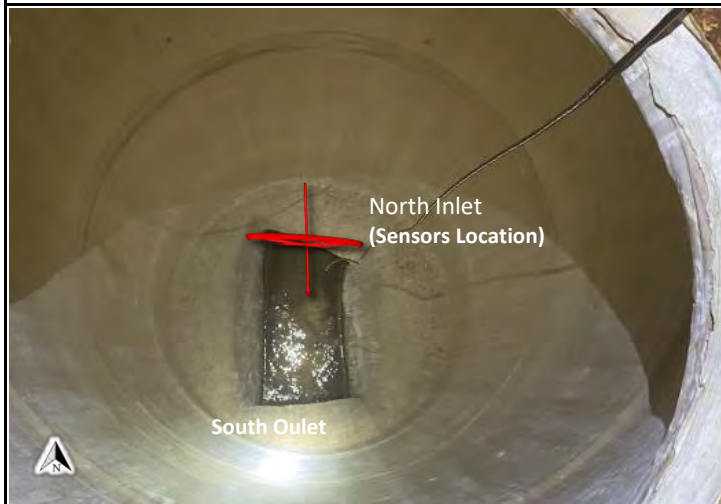


GoodYear.Carollo.TFM.AZ23**Site Name****Flow Monitoring
Site Report****FM_08**

Site Address /Location:	Between W Lower Buckeye Pkwy and S Bullard Ave		Monitor Series	Location Type
Site Access Details:	External Traffic Control Required	Latitude: 33.4283388 Longitude: -112.3832062°	TRITON+ Pipe Size (H x W) 22.50"x 22.50"	Temporary Pipe Shape Circular



Manhole #	System Characteristics
MH77B-308	Residential/Commercial
Access	Traffic
Drive	Light

**Installation Information**

Installation Date:	Installation Type:
Monday, June 5, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
11:37:00 PM	22.50"x 22.50"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
6.75 "	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.51	0"
Silt (in)	Silt Type
0"	

Hydraulic Comments:

Smooth flow with medium depth and low velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
17.77	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

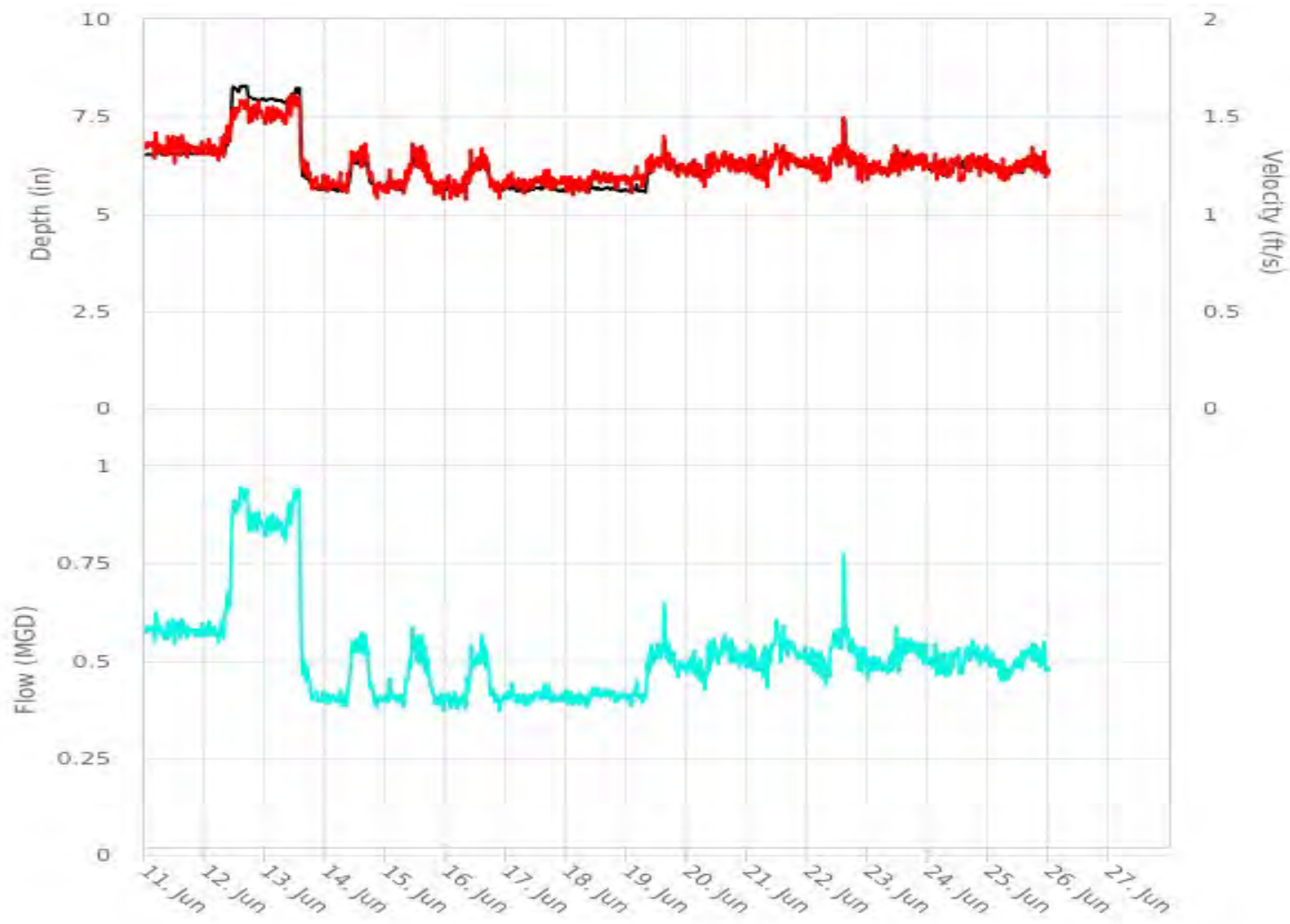
External Traffic Control Required

ADS Project Name: GoodYear.Carollo.TFM.AZ23

ADS Project Number: 22930.11.325

Hydrograph Report

FM_08



Scattergraph Report

FM_08

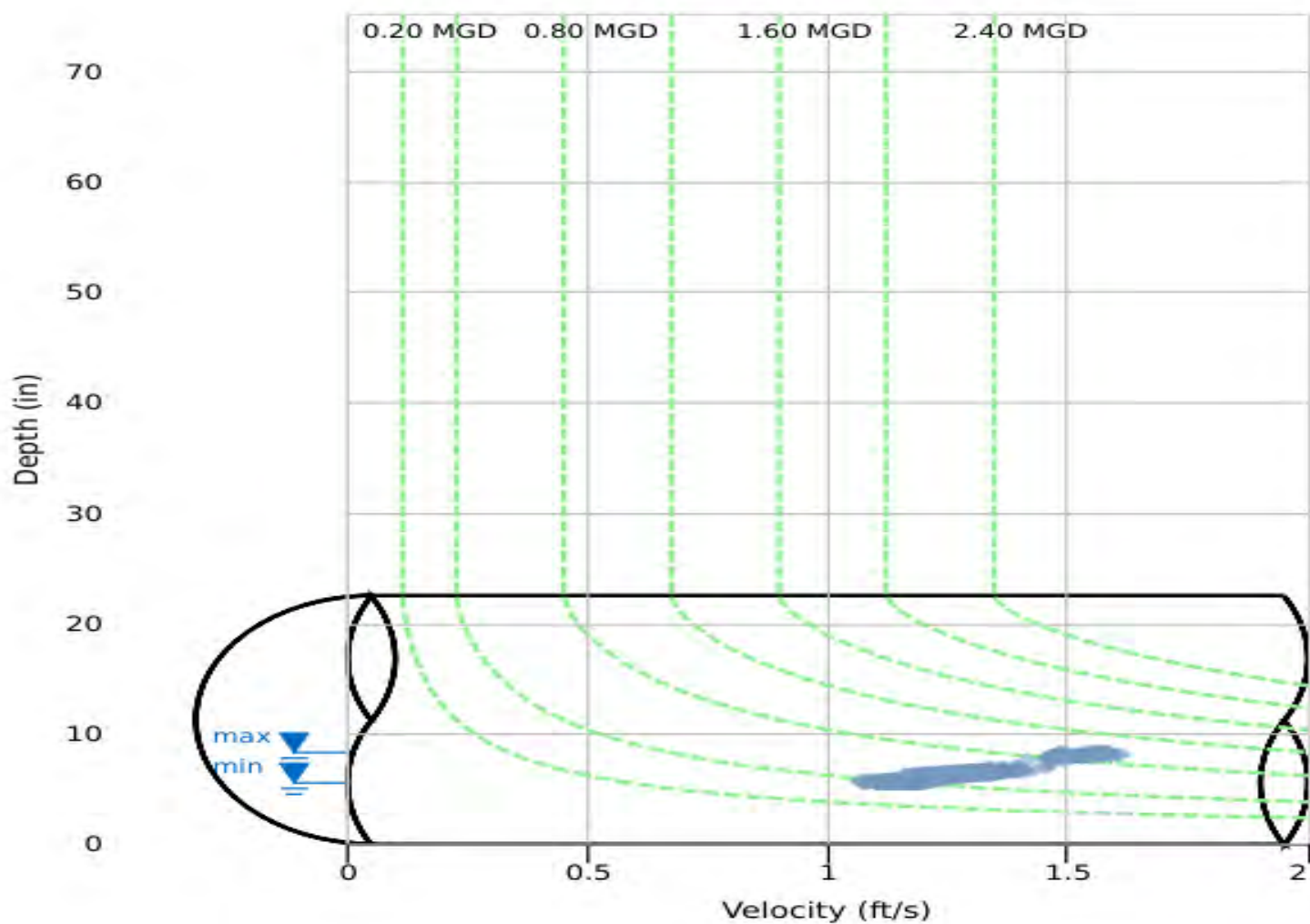
Flow Monitor
FM_08

Pipe Height
22.50
in

Report Period
06/11/2023
To
06/27/2023

Legend
□ DFINAL - VFINAL
--- Iso-Qth
▼ Min-Max Depth

ABS ENVIRONMENTAL
SERVICES



Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_08Pipe: Elliptical (22.5 in H x 22.5 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	08:45	6.48	04:50	6.75	6.54	12:00	1.23	04:35	1.43	1.34	14:25	0.531	04:35	0.631	0.578	0.578	
06/12/2023	04:15	6.53	14:25	8.30	7.44	05:25	1.25	15:30	1.62	1.45	05:25	0.539	15:30	0.965	0.755	0.755	
06/13/2023	21:10	5.60	12:25	8.24	7.09	18:50	1.11	09:50	1.63	1.39	21:05	0.386	13:55	0.951	0.689	0.689	
06/14/2023	04:45	5.56	14:45	6.49	5.88	20:45	1.07	15:55	1.37	1.19	06:45	0.370	14:40	0.580	0.445	0.445	
06/15/2023	07:10	5.58	10:50	6.57	5.90	23:10	1.04	10:35	1.38	1.19	23:10	0.359	10:40	0.593	0.447	0.447	
06/16/2023	05:00	5.55	14:35	6.45	5.85	02:00	1.03	14:30	1.36	1.18	02:00	0.361	14:35	0.576	0.437	0.437	
06/17/2023	21:35	5.56	02:20	5.84	5.63	07:25	1.06	02:20	1.24	1.16	07:25	0.373	02:20	0.458	0.407	0.407	
06/18/2023	08:45	5.53	00:00	5.73	5.63	05:05	1.08	11:00	1.25	1.17	08:15	0.374	11:00	0.440	0.409	0.409	
06/19/2023	07:30	5.54	14:55	6.95	6.04	02:00	1.06	14:50	1.43	1.23	02:00	0.368	14:50	0.664	0.476	0.476	
06/20/2023	07:15	5.87	15:20	6.53	6.26	07:00	1.14	18:00	1.34	1.24	07:10	0.422	18:00	0.570	0.505	0.505	
06/21/2023	08:15	5.92	11:50	6.74	6.32	08:05	1.13	11:40	1.38	1.27	08:05	0.428	11:40	0.618	0.521	0.521	
06/22/2023	07:30	5.92	14:40	7.62	6.33	05:40	1.15	14:40	1.55	1.27	07:40	0.436	14:40	0.824	0.524	0.524	
06/23/2023	00:15	5.98	11:20	6.70	6.28	08:30	1.16	11:10	1.40	1.25	00:10	0.446	11:10	0.614	0.511	0.511	
06/24/2023	07:30	5.93	18:10	6.47	6.26	03:40	1.15	17:55	1.35	1.24	03:40	0.446	17:55	0.572	0.504	0.504	
06/25/2023	05:35	5.95	22:25	6.39	6.19	06:35	1.13	17:35	1.37	1.24	06:35	0.432	18:40	0.563	0.496	0.496	
06/26/2023	00:00	6.15	00:00	6.15	6.15	00:05	1.16	00:00	1.23	1.20	00:05	0.457	00:00	0.488	0.475	0.005	
06/27/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			7.710
Average	6.24	1.26	0.514

FM_09

Site Commentary

SITE INFORMATION

Pipe	Elliptical (24 in H x 24 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study.

This site was positioned downstream of site FM_10 and upstream of site FM_13. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	4.63	1.60	0.455
Minimum	2.71	1.04	0.135
Maximum	5.79	1.88	0.702
Min Time	06/13/2023 4:45:00 AM	06/16/2023 4:45:00 AM	06/20/2023 4:30:00 AM
Max Time	06/18/2023 11:45:00 AM	06/11/2023 1:15:00 PM	06/18/2023 11:45:00 AM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100



GoodYear.Carollo.TFM.AZ23				Site Name	
Flow Monitoring Site Report				FM_09	

Site Address /Location:	W Mc Dowell Rd and Clubhouse Dr		Monitor Series	Location Type	
			TRITON+	Temporary	
Site Access Details:	External Traffic Control Required	Latitude:	33.4647726	Pipe Size (H x W)	Pipe Shape
		Longitude:	-112.4182181	24.00"x 24.00"	Circular



Manhole #	System Characteristics
MH45C-401	Residential
Access	Traffic
Drive	None





Installation Information	
Installation Date:	Installation Type:
Wednesday, June 7, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi
Installation Confirmation:	
Confirmation Time:	Pipe Size (HxW)
10:00:00 PM	24.00"x 24.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
5.25"	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.96	0"
Silt (in)	Silt Type
0"	
Hydraulic Comments:	
Smooth flow with medium depth and slow velocity	
Manhole / Pipe Information:	
Manhole Depth (Approx. FT):	Manhole Configuration
12.64	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Vitrified Clay Pipe	Good
Communication Information:	
Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole
Additional Site Info. / Comments:	
No TC required	



ADS Project Name:	GoodYear.Carollo.TFM.AZ23
ADS Project Number:	22930.11.325

Hydrograph Report

FM_09

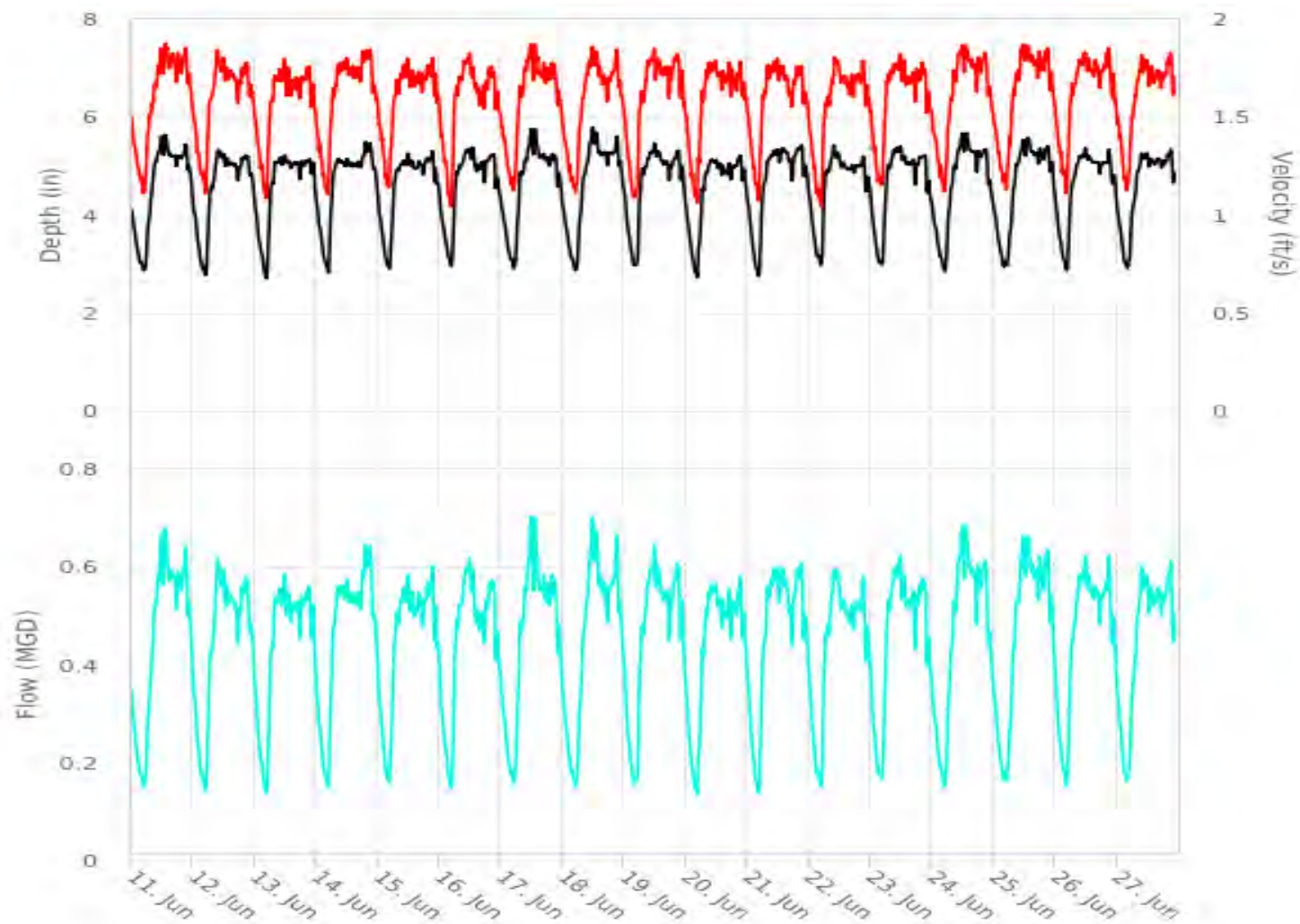
Flow Monitor
FM_09

Pipe Height
24.00
in

Report Period
06/11/2023
To
06/27/2023

Legend
— DFINAL
— QFINAL
— VFINAL

ABS ENVIRONMENTAL
SERVICES



Scattergraph Report
FM_09

Flow Monitor

FM_09

Pipe Height
24.00
in

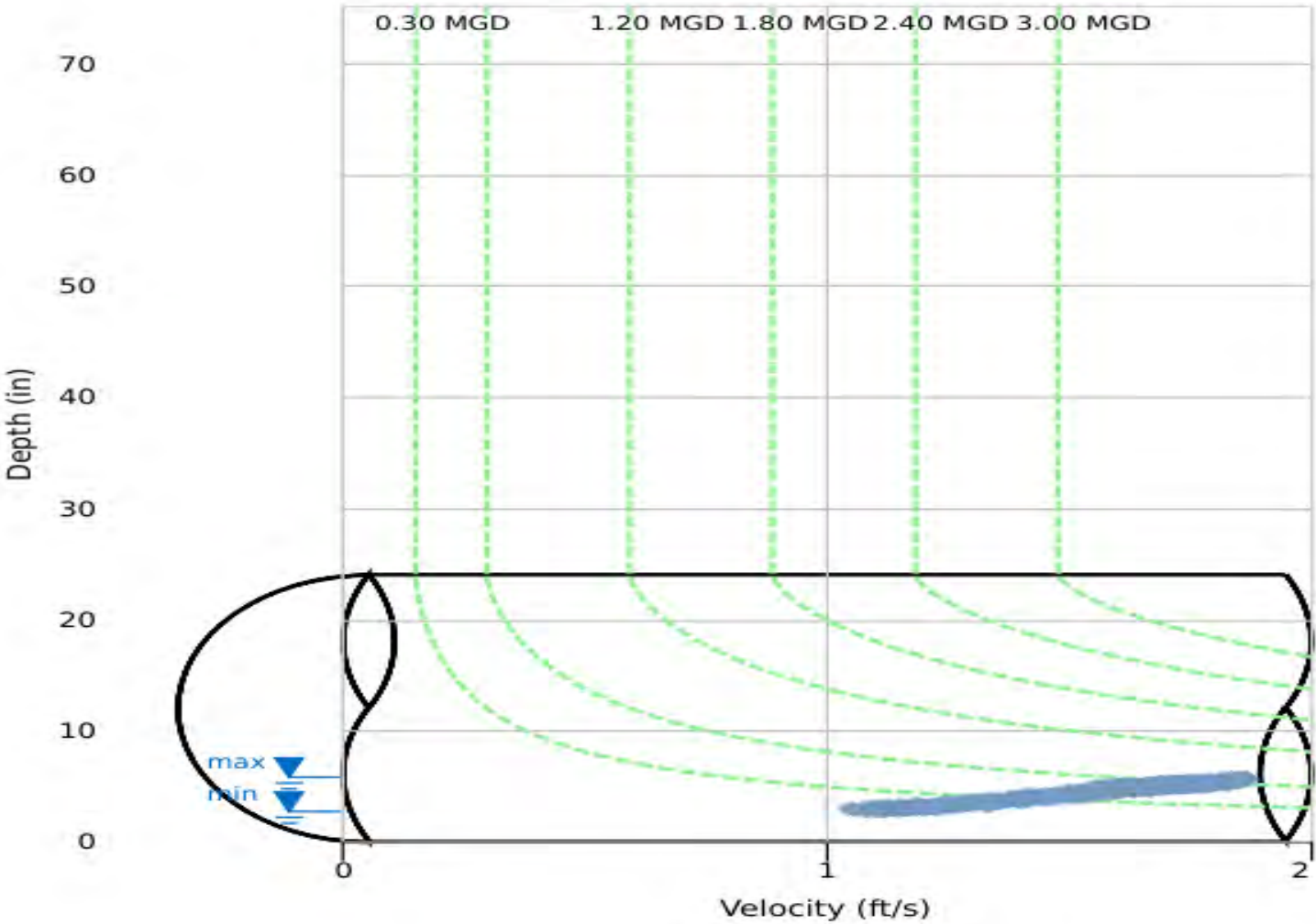
Report Period

06/11/2023
To
06/27/2023

Legend

- DFINAL - VFINAL
- Iso-Qth
- Min-Max Depth

ABS ENVIRONMENTAL SERVICES



Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_09Pipe: Elliptical (24 in H x 24 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	04:40	2.86	13:10	5.67	4.61	05:15	1.09	13:25	1.89	1.60	05:15	0.151	13:05	0.686	0.458	0.458	
06/12/2023	04:45	2.77	09:50	5.34	4.56	04:45	1.09	09:35	1.85	1.60	04:45	0.142	09:50	0.623	0.445	0.445	
06/13/2023	04:40	2.70	11:55	5.24	4.59	04:40	1.08	11:45	1.82	1.58	04:40	0.136	11:45	0.591	0.442	0.442	
06/14/2023	04:50	2.81	19:20	5.51	4.67	04:30	1.08	18:00	1.87	1.62	04:50	0.148	21:00	0.651	0.465	0.465	
06/15/2023	04:35	2.90	21:20	5.32	4.61	04:15	1.10	11:30	1.82	1.60	04:15	0.156	21:20	0.606	0.450	0.450	
06/16/2023	04:45	2.95	13:05	5.41	4.65	04:40	1.04	11:55	1.84	1.58	04:45	0.149	11:55	0.624	0.450	0.450	
06/17/2023	04:55	2.91	11:55	5.78	4.65	04:40	1.12	13:15	1.92	1.59	04:55	0.157	13:15	0.719	0.459	0.459	
06/18/2023	05:05	2.86	11:50	5.80	4.67	05:00	1.08	11:55	1.89	1.58	05:00	0.149	11:55	0.715	0.460	0.460	
06/19/2023	03:50	2.97	11:50	5.47	4.66	04:30	1.08	11:40	1.86	1.60	04:30	0.157	11:50	0.648	0.461	0.461	
06/20/2023	04:35	2.72	21:30	5.24	4.53	04:35	1.05	16:55	1.83	1.59	04:35	0.133	21:20	0.587	0.438	0.438	
06/21/2023	04:35	2.75	21:25	5.44	4.71	04:25	1.06	11:50	1.83	1.59	04:25	0.137	11:50	0.611	0.463	0.463	
06/22/2023	04:45	2.98	09:50	5.43	4.63	04:40	1.04	10:15	1.85	1.56	04:45	0.151	10:15	0.609	0.444	0.444	
06/23/2023	04:50	2.97	10:25	5.41	4.66	04:15	1.15	11:50	1.85	1.60	04:50	0.167	11:50	0.633	0.459	0.459	
06/24/2023	05:05	2.85	12:00	5.72	4.65	04:35	1.11	12:00	1.92	1.61	05:05	0.152	12:00	0.712	0.465	0.465	
06/25/2023	04:00	2.94	13:40	5.59	4.64	05:05	1.10	11:25	1.89	1.62	05:05	0.160	13:35	0.670	0.467	0.467	
06/26/2023	04:45	2.86	11:50	5.38	4.63	04:15	1.09	21:10	1.86	1.63	04:50	0.152	21:10	0.626	0.462	0.462	
06/27/2023	04:20	2.91	21:10	5.35	4.59	04:10	1.11	20:15	1.84	1.60	04:10	0.157	21:05	0.619	0.450	0.421	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			7.708
Average	4.63	1.60	0.455

FM_10

Site Commentary

SITE INFORMATION

Pipe	Round (17.13 in H)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study.

This site was positioned upstream of site FM_09. A review of flow balancing indicated no problems.

A meter issue at this site caused its start to be delayed until 14 June 2023.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	3.22	1.35	0.188
Minimum	2.13	0.86	0.065
Maximum	4.15	1.69	0.335
Min Time	06/14/2023 2:30:00 AM	06/24/2023 5:45:00 AM	06/25/2023 5:45:00 AM
Max Time	06/27/2023 10:00:00 PM	06/20/2023 3:00:00 PM	06/20/2023 3:00:00 PM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100



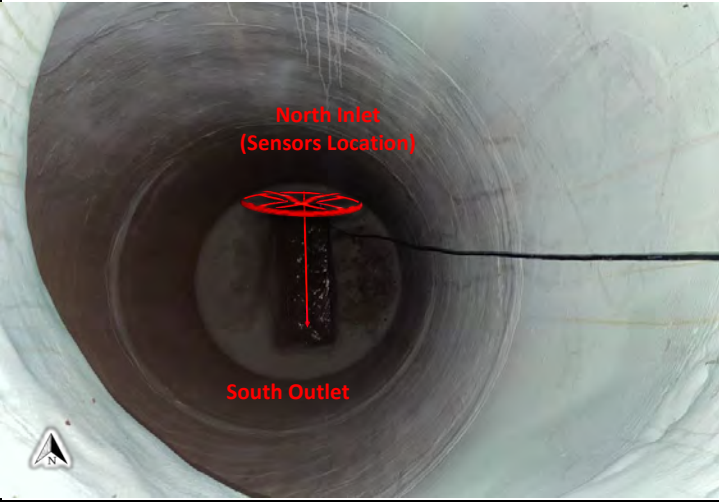
GoodYear.Carollo.TFM.AZ23				Site Name	
Flow Monitoring Site Report		FM_10			

Site Address /Location:	N Citrus Rd, about 575 ft south of Indian School Rd		Monitor Series	Location Type	
Site Access Details:	No Traffic Control required	Latitude: 33.4499679 Longitude: -112.372242	TRITON+ Pipe Size (H x W) 17.13"x 17.13"	Temporary Pipe Shape Circular	



Manhole #	System Characteristics
MH34A-102	Residential
Access	Traffic
Drive	None





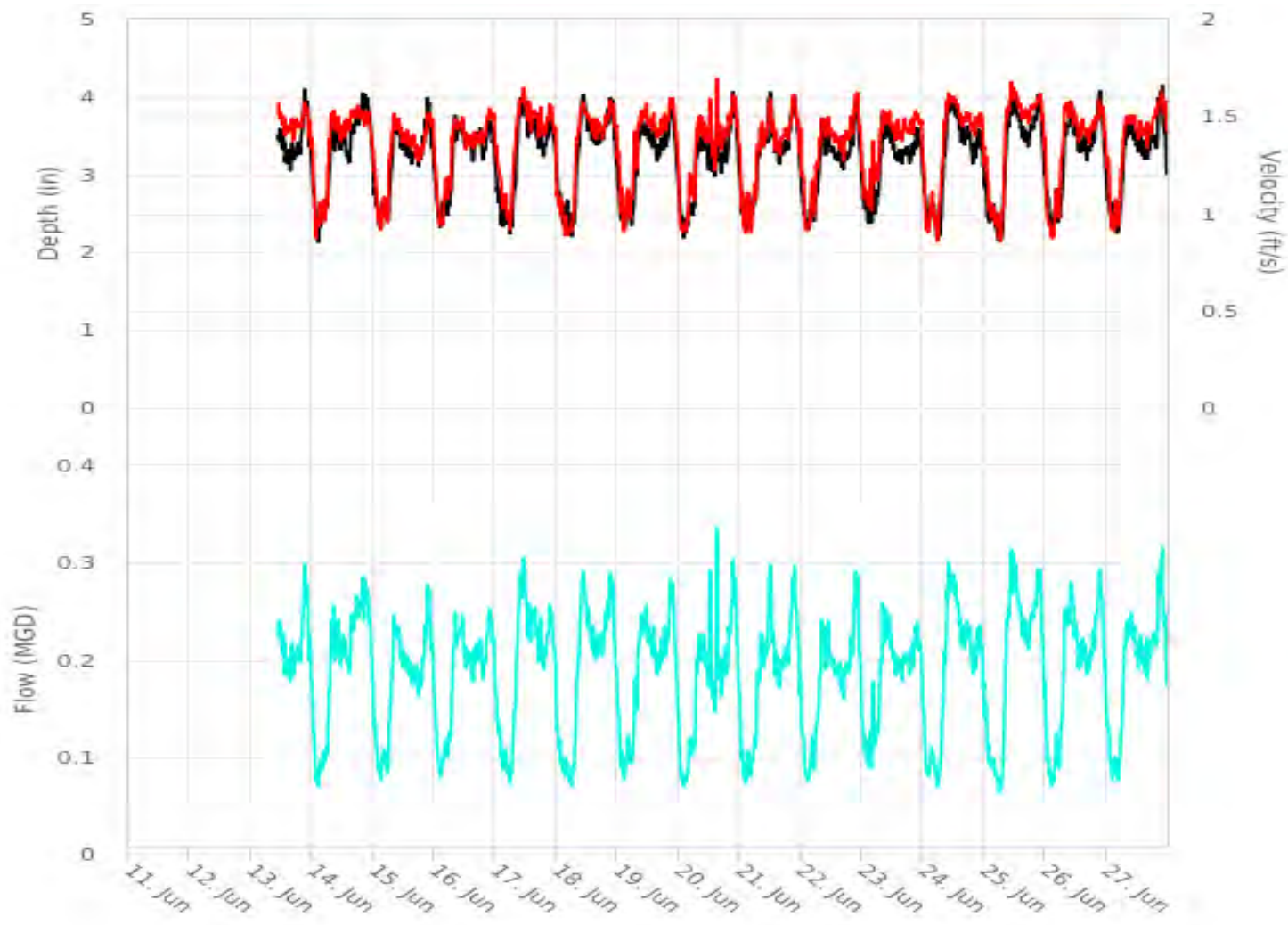
Installation Information	
Installation Date: Thursday, June 8, 2023	Installation Type: Doppler Standard Ring and Crank
Monitoring Location (Sensors): Upstream 0-5 FT	Monitor Location: Manhole
Sensors / Devices: Peak Combo (CS4)	Pressure Sensor Range (psi) 0 - 5 psi
Installation Confirmation:	
Confirmation Time: 10:00:00 AM	Pipe Size (HxW) 17.13"x 17.13"
Depth of Flow (Wet DOF) (in) 3.48"	Range (Air DOF) (in) -
Downlooker Physical Offset (in) NA	Measurement Confidence (in) 0.25"
Peak Velocity (fps) 1.53	Velocity Sensor Offset (in) 0"
Silt (in) 0"	Silt Type
Hydraulic Comments:	
Smooth flow with medium depth and moderate velocity	
Manhole / Pipe Information:	
Manhole Depth (Approx. FT): 16.3	Manhole Configuration Single
Manhole Material: Concrete	Manhole Condition: Good
Manhole Opening Diameter (in) 26"	Manhole Diameter (Approx.): 54"
Manhole Cover Unbolted	Manhole Frame Normal
Active Drop Connections No	Air Quality: Normal
Pipe Material PVC	Pipe Condition: Good
Communication Information:	
Communication Type Wireless	Antenna Location Manhole Pick / Vent Hole
Additional Site Info. / Comments:	
No TC required	



ADS Project Name:	GoodYear.Carollo.TFM.AZ23
ADS Project Number:	22930.11.325

Hydrograph Report

FM_10



Scattergraph Report
FM_10

Flow Monitor

FM_10

Pipe Height
17.13
in

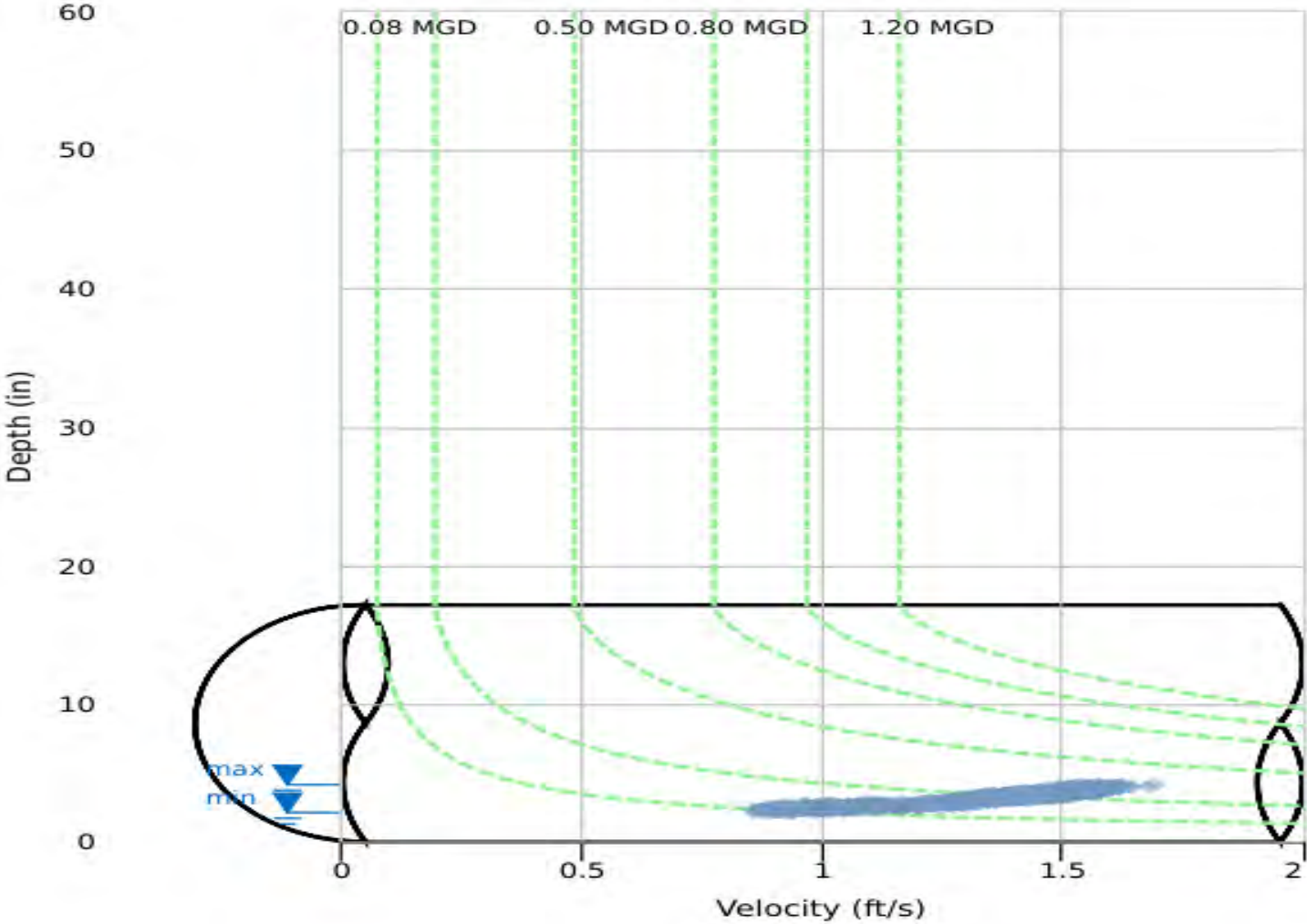
Report Period

06/11/2023
To
06/27/2023

Legend

- DFINAL - VFINAL
- Iso-Qth
- Min-Max Depth





Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_10Pipe: Round (17.13 in H), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
06/12/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
06/13/2023	15:40	3.01	21:05	4.17	3.43	14:10	1.31	21:05	1.59	1.47	14:10	0.169	21:05	0.310	0.217	0.118	
06/14/2023	02:40	2.10	19:50	4.06	3.29	01:45	0.86	18:00	1.57	1.35	02:40	0.065	19:50	0.287	0.194	0.194	
06/15/2023	03:25	2.29	21:30	4.01	3.18	02:45	0.91	22:10	1.54	1.31	03:25	0.076	21:35	0.280	0.178	0.178	
06/16/2023	02:20	2.30	08:15	3.81	3.21	02:10	0.93	21:55	1.55	1.33	02:20	0.078	21:55	0.257	0.183	0.183	
06/17/2023	05:55	2.21	11:25	4.06	3.24	05:05	0.91	09:40	1.67	1.38	05:55	0.072	11:20	0.312	0.194	0.194	
06/18/2023	06:00	2.20	10:30	4.04	3.25	05:55	0.86	21:15	1.63	1.32	06:10	0.068	21:15	0.298	0.189	0.189	
06/19/2023	02:55	2.30	21:40	3.99	3.20	02:50	0.90	20:40	1.62	1.36	02:55	0.075	21:40	0.296	0.187	0.187	
06/20/2023	02:10	2.15	12:25	5.10	3.12	01:55	0.89	12:25	2.06	1.32	02:10	0.070	12:25	0.532	0.177	0.177	
06/21/2023	02:35	2.18	11:25	4.14	3.23	02:25	0.87	21:30	1.63	1.33	02:25	0.069	11:55	0.306	0.186	0.186	
06/22/2023	02:55	2.25	21:45	3.98	3.14	02:50	0.88	21:40	1.65	1.33	02:50	0.072	21:45	0.299	0.177	0.177	
06/23/2023	03:00	2.29	08:20	3.78	3.15	03:55	0.92	08:25	1.56	1.37	04:05	0.079	08:25	0.264	0.182	0.182	
06/24/2023	05:35	2.10	10:05	4.06	3.20	05:50	0.85	10:05	1.64	1.35	05:35	0.066	10:05	0.308	0.189	0.189	
06/25/2023	06:00	2.09	10:50	4.10	3.25	05:45	0.84	10:45	1.68	1.37	06:00	0.064	10:50	0.319	0.198	0.198	
06/26/2023	02:45	2.23	21:25	4.18	3.25	03:20	0.86	21:20	1.64	1.35	02:45	0.069	21:25	0.319	0.192	0.192	
06/27/2023	04:20	2.23	22:05	4.17	3.24	03:30	0.88	22:00	1.64	1.37	05:05	0.074	22:05	0.319	0.192	0.191	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			2.737
Average	3.22	1.35	0.188

FM_11

Site Commentary

SITE INFORMATION

Pipe	Elliptical (18 in H x 18 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study.

This site was positioned upstream of site FM_16. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	4.17	1.41	0.292
Minimum	3.12	0.89	0.119
Maximum	5.27	1.87	0.517
Min Time	06/20/2023 4:00:00 AM	06/20/2023 3:45:00 AM	06/20/2023 4:00:00 AM
Max Time	06/21/2023 2:30:00 PM	06/21/2023 2:15:00 PM	06/21/2023 2:15:00 PM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100



GoodYear.Carollo.TFM.AZ23				Site Name	
Flow Monitoring Site Report		FM_11			

Site Address /Location:	14480-14624 W Van Buren St, Goodyear, AZ 85338		Monitor Series	TRITON+		Location Type	Temporary	
Site Access Details:	Traffic Control required	Latitude:	33.4499679	Pipe Size (H x W)	18.00"x 18.00"	Pipe Shape	Circular	
		Longitude:	-112.372242					



Manhole #	System Characteristics
MH58C-302	Industrial
Access	Traffic
Drive	Medium





Installation Information	
Installation Date:	Installation Type:
Wednesday, June 7, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi
Installation Confirmation:	
Confirmation Time:	Pipe Size (HxW)
8:00:00 AM	18.00"x 18.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
4.50"	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.73	0"
Silt (in)	Silt Type
0"	
Hydraulic Comments:	
Smooth flow with medium depth and moderate velocity	
Manhole / Pipe Information:	
Manhole Depth (Approx. FT):	Manhole Configuration
15.06	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Vitrified Clay Pipe	Good
Communication Information:	
Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole
Additional Site Info. / Comments:	
TC required	

ADS Project Name:	GoodYear.Carollo.TFM.AZ23
ADS Project Number:	22930.11.325

Hydrograph Report
FM_11

Flow Monitor

FM_11

Pipe Height
18.00
in

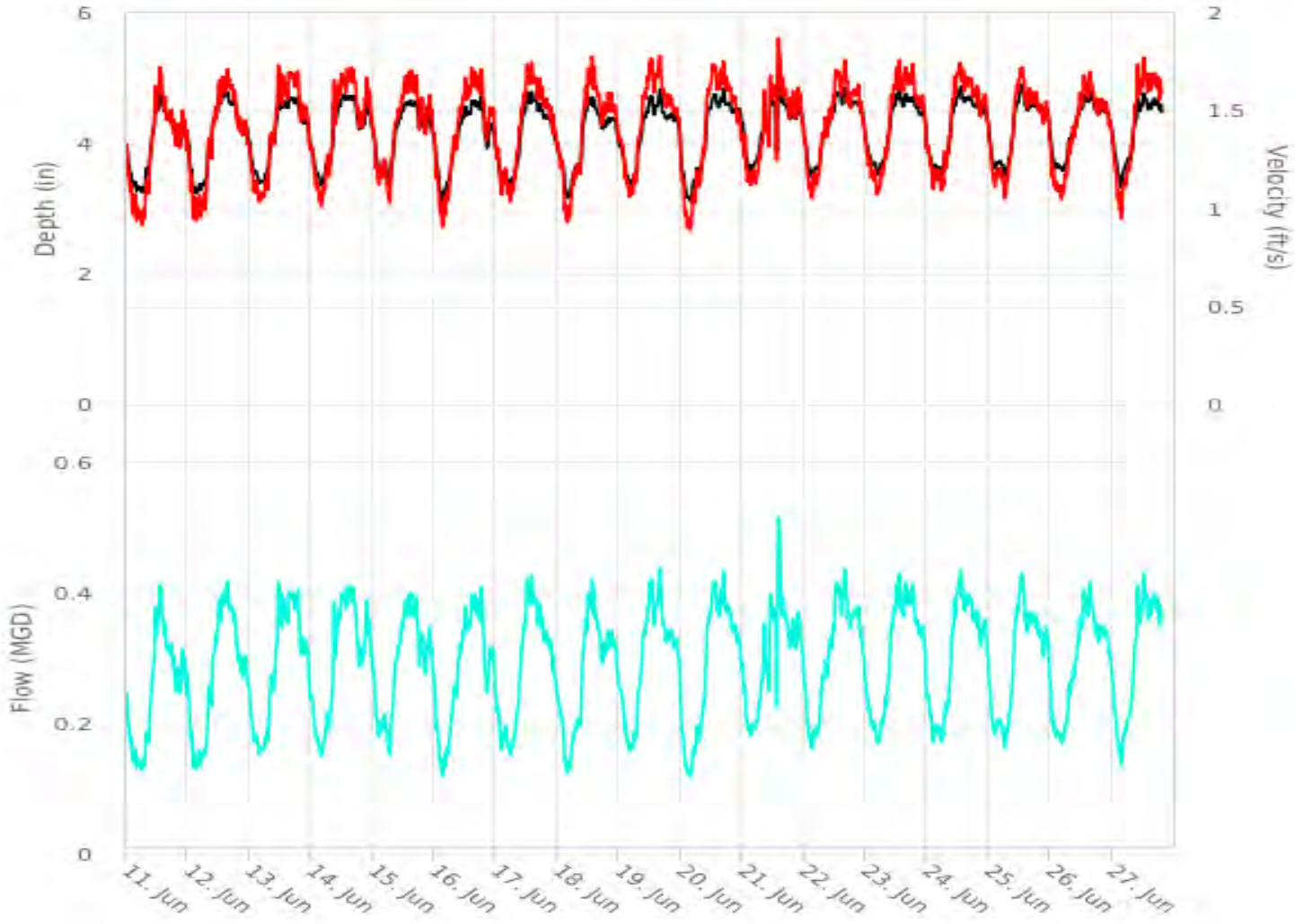
Report Period

06/11/2023
To
06/27/2023

Legend

— DFINAL
— QFINAL
— VFINAL

ABS ENVIRONMENTAL
SERVICES



Scattergraph Report
FM_11

Flow Monitor

FM_11

Pipe Height
18.00
in

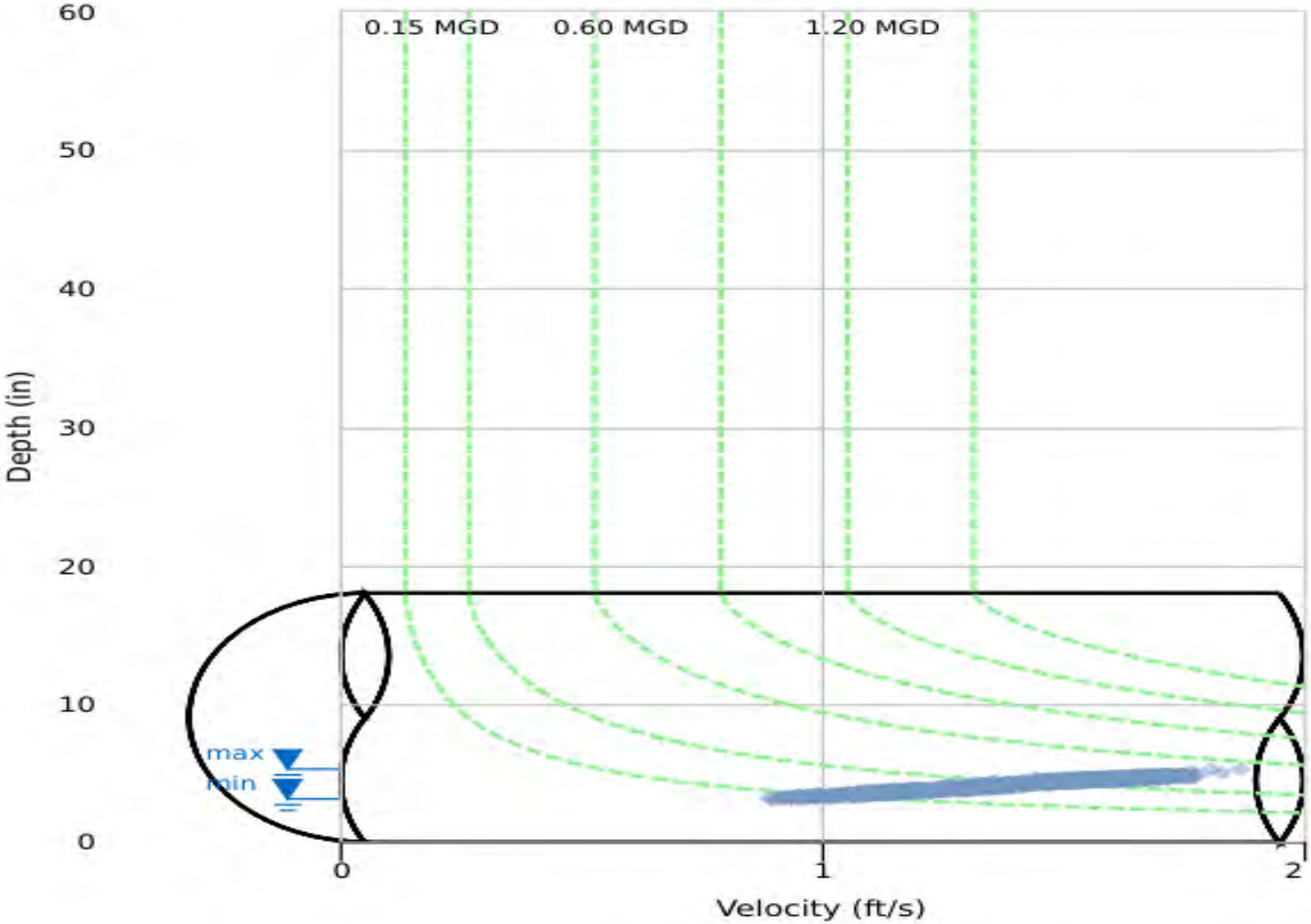
Report Period

06/11/2023
To
06/27/2023

Legend

- DFINAL - VFINAL
- Iso-Qth
- Min-Max Depth

ABS ENVIRONMENTAL
SERVICES



Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_11Pipe: Elliptical (18 in H x 18 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	06:20	3.24	13:10	4.77	3.98	06:15	0.90	13:10	1.75	1.31	06:15	0.126	13:10	0.424	0.253	0.253	
06/12/2023	03:25	3.22	15:25	4.80	4.10	03:30	0.91	15:30	1.72	1.36	03:30	0.126	15:30	0.421	0.276	0.276	
06/13/2023	03:45	3.40	11:25	4.82	4.16	03:50	1.01	11:30	1.76	1.41	03:50	0.151	11:25	0.430	0.289	0.289	
06/14/2023	04:05	3.35	09:00	4.76	4.20	04:05	1.00	09:00	1.76	1.44	04:05	0.147	09:00	0.425	0.299	0.299	
06/15/2023	06:45	3.39	15:00	4.69	4.17	06:45	1.02	15:05	1.74	1.43	06:45	0.152	15:05	0.408	0.292	0.292	
06/16/2023	03:15	3.12	18:30	4.74	4.08	03:20	0.90	14:40	1.75	1.40	03:20	0.119	18:25	0.414	0.280	0.280	
06/17/2023	05:45	3.32	14:10	4.81	4.11	05:40	0.99	14:10	1.76	1.41	05:40	0.144	14:10	0.432	0.285	0.285	
06/18/2023	04:05	3.15	13:45	4.75	4.06	03:55	0.91	13:45	1.80	1.39	03:55	0.123	13:45	0.434	0.277	0.277	
06/19/2023	04:20	3.38	16:05	4.84	4.19	04:20	1.05	16:05	1.80	1.46	04:20	0.156	16:05	0.445	0.301	0.301	
06/20/2023	03:55	3.10	16:55	4.86	4.13	02:40	0.87	13:45	1.78	1.40	03:55	0.114	16:55	0.438	0.287	0.287	
06/21/2023	03:40	3.57	14:30	5.28	4.29	02:30	1.07	14:15	1.89	1.44	03:45	0.173	14:20	0.521	0.306	0.306	
06/22/2023	03:25	3.47	16:15	4.87	4.28	03:05	1.04	16:05	1.78	1.45	03:30	0.160	16:05	0.443	0.308	0.308	
06/23/2023	04:50	3.52	13:10	4.83	4.27	04:40	1.05	13:30	1.79	1.45	04:45	0.167	13:30	0.442	0.308	0.308	
06/24/2023	02:50	3.49	13:25	4.89	4.26	05:30	1.07	13:10	1.77	1.45	05:30	0.169	13:10	0.440	0.307	0.307	
06/25/2023	06:25	3.50	13:05	4.93	4.24	06:20	1.03	12:40	1.74	1.42	06:20	0.162	13:00	0.439	0.297	0.297	
06/26/2023	05:05	3.58	15:30	4.82	4.25	04:35	1.04	15:40	1.71	1.41	04:40	0.168	15:40	0.419	0.295	0.295	
06/27/2023	04:00	3.31	12:40	4.78	4.20	03:55	0.94	10:15	1.79	1.43	03:55	0.136	12:35	0.431	0.299	0.245	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			4.905
Average	4.17	1.41	0.292

FM_12

Site Commentary

SITE INFORMATION

Pipe	Elliptical (12 in H x 11.5 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study.

This site was positioned upstream of site FM_16. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	3.49	1.04	0.131
Minimum	2.43	0.56	0.041
Maximum	4.60	1.55	0.258
Min Time	06/12/2023 4:45:00 AM	06/12/2023 4:30:00 AM	06/12/2023 4:30:00 AM
Max Time	06/21/2023 11:45:00 AM	06/21/2023 1:30:00 PM	06/21/2023 1:30:00 PM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

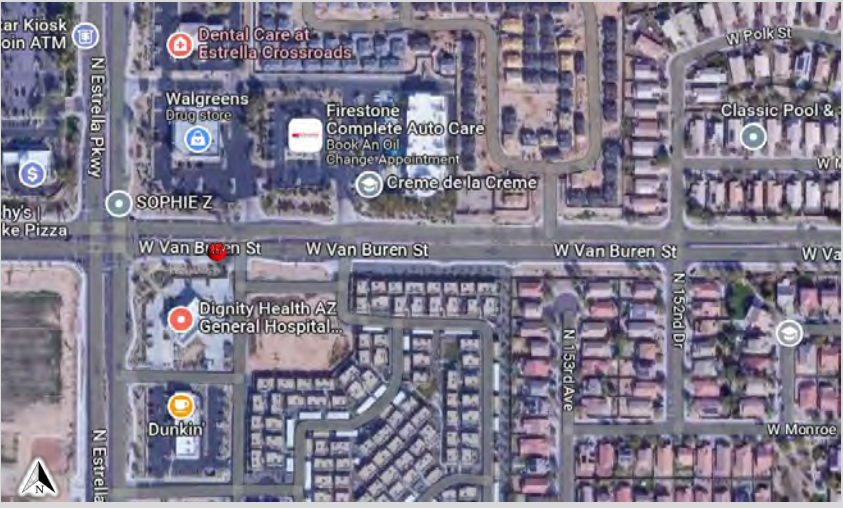
Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100



GoodYear.Carollo.TFM.AZ23				Site Name	
Flow Monitoring Site Report		FM_12			

Site Address /Location:	251 N Estrella Pkwy, Goodyear, AZ 85338		Monitor Series	TRITON+		Location Type	Temporary	
Site Access Details:	Traffic Control required	Latitude:	33.4499772	Pipe Size (H x W)	12.00"x 11.50"		Pipe Shape	Elliptical
		Longitude:	-112.3916582					



Manhole #	System Characteristics
MH67A-104	Commercial
Access	Traffic
Drive	Heavy





Installation Information	
Installation Date:	Installation Type:
Tuesday, June 6, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi
Installation Confirmation:	
Confirmation Time:	Pipe Size (HxW)
1:00:00 AM	12.00"x 11.50"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
2.88"	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
0.91	0"
Silt (in)	Silt Type
0"	
Hydraulic Comments:	
Smooth flow with low depth and low velocity	
Manhole / Pipe Information:	
Manhole Depth (Approx. FT):	Manhole Configuration
10.12	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Vitrified Clay Pipe	Good
Communication Information:	
Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole
Additional Site Info. / Comments:	
TC required	



ADS Project Name:	GoodYear.Carollo.TFM.AZ23
ADS Project Number:	22930.11.325

Hydrograph Report
FM_12

Flow Monitor

FM_12

Pipe Height
12.00
in

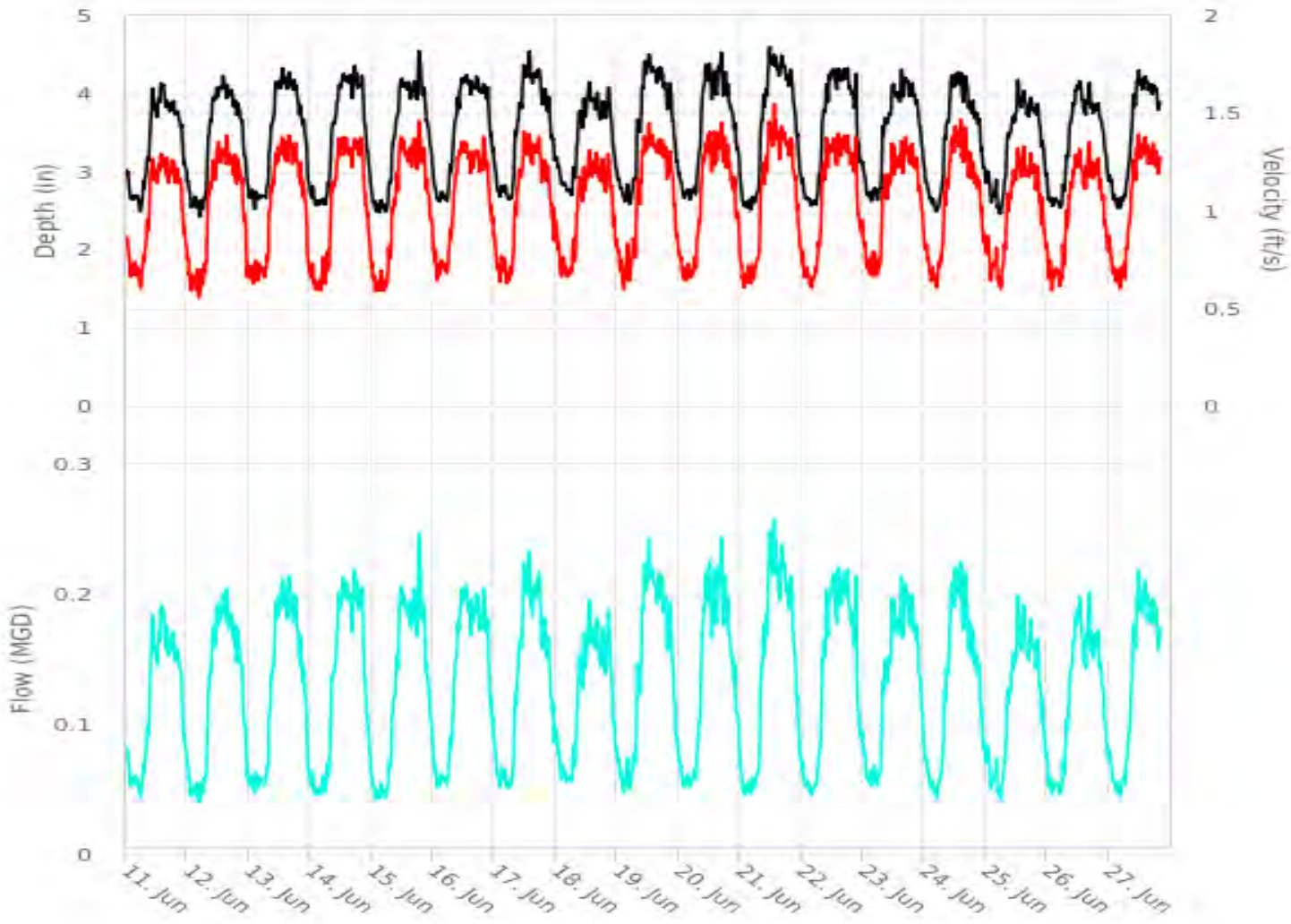
Report Period

06/11/2023
To
06/27/2023

Legend

— DFINAL
— QFINAL
— VFINAL

ABS ENVIRONMENTAL
SERVICES



Scattergraph Report

FM_12

Flow Monitor
FM_12

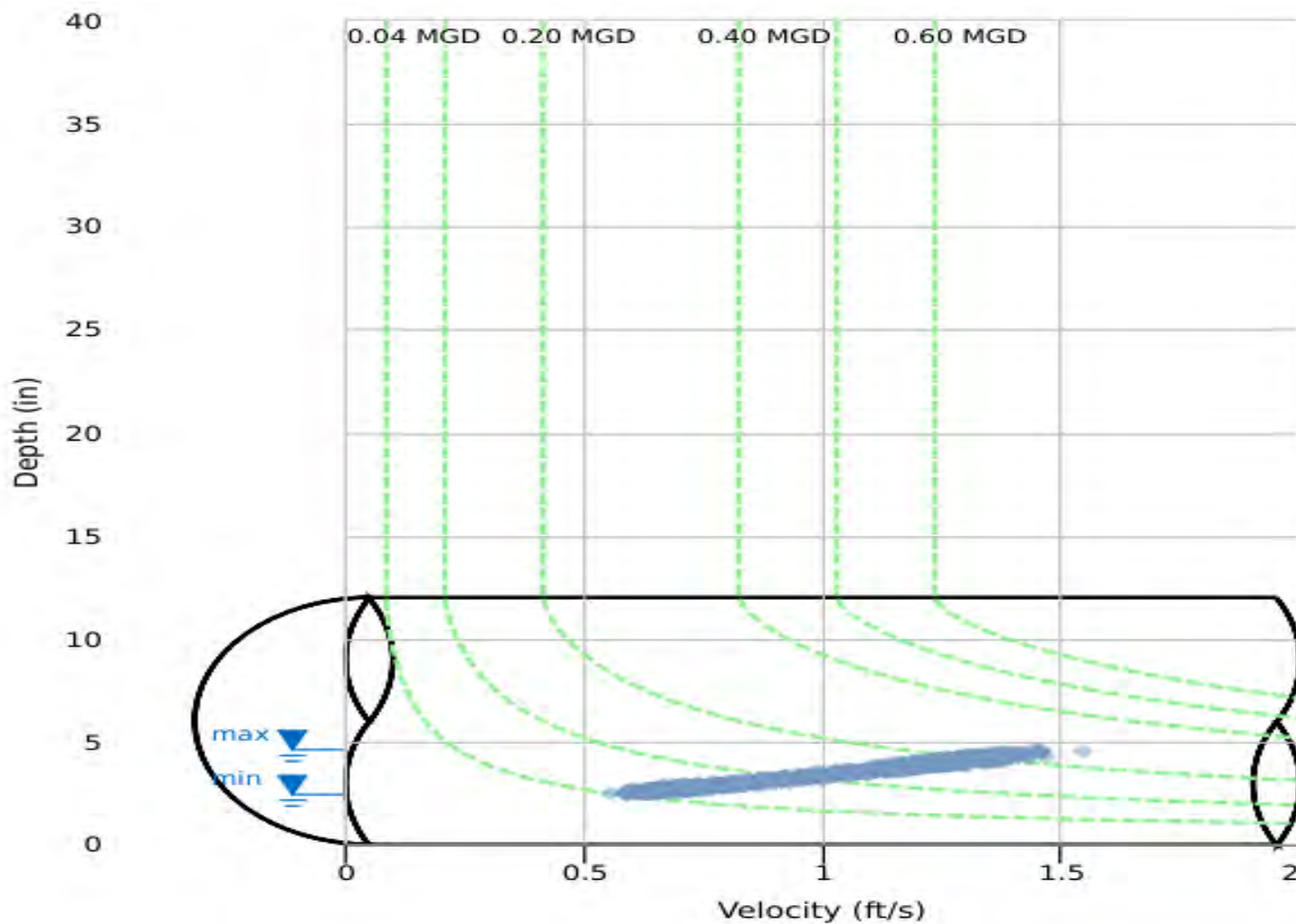
Pipe Height
12.00
in

Report Period
06/11/2023
To
06/27/2023

Legend

 DFINAL - VFINAL
 Iso-QTM
 Min-Max Depth

ABS ENVIRONMENTAL SERVICES



Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_12Pipe: Elliptical (12 in H x 11.5 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	05:40	2.48	13:40	4.18	3.38	05:50	0.60	13:50	1.33	1.00	05:50	0.043	13:50	0.198	0.119	0.119	
06/12/2023	04:45	2.42	14:05	4.27	3.41	04:35	0.55	15:30	1.41	1.01	04:35	0.039	15:50	0.211	0.124	0.124	
06/13/2023	02:20	2.51	13:15	4.34	3.47	01:45	0.60	16:00	1.40	1.03	02:35	0.045	13:10	0.219	0.129	0.129	
06/14/2023	02:10	2.57	17:25	4.37	3.49	04:10	0.57	13:00	1.44	1.04	04:10	0.044	13:00	0.225	0.132	0.132	
06/15/2023	03:30	2.47	18:30	4.66	3.47	01:55	0.57	18:30	1.53	1.04	03:30	0.041	18:30	0.267	0.131	0.131	
06/16/2023	05:35	2.61	13:15	4.27	3.57	01:35	0.61	11:45	1.39	1.07	01:35	0.050	11:45	0.213	0.138	0.138	
06/17/2023	06:05	2.63	13:55	4.63	3.57	04:50	0.60	11:35	1.45	1.05	05:55	0.049	14:00	0.244	0.135	0.135	
06/18/2023	06:10	2.69	13:25	4.16	3.46	03:40	0.64	13:25	1.35	1.01	04:30	0.054	13:25	0.203	0.122	0.122	
06/19/2023	05:05	2.58	12:25	4.58	3.61	02:45	0.59	12:25	1.53	1.08	02:45	0.047	12:25	0.260	0.142	0.142	
06/20/2023	04:30	2.63	16:50	4.56	3.57	02:15	0.61	16:50	1.47	1.06	02:15	0.050	16:50	0.249	0.137	0.137	
06/21/2023	04:20	2.50	11:40	4.69	3.60	01:50	0.60	13:35	1.59	1.08	01:50	0.046	13:35	0.268	0.144	0.144	
06/22/2023	03:40	2.56	21:30	4.46	3.56	04:25	0.57	21:30	1.46	1.07	04:25	0.043	21:30	0.240	0.139	0.139	
06/23/2023	03:40	2.62	15:15	4.32	3.52	03:15	0.65	17:05	1.40	1.06	06:00	0.051	15:20	0.215	0.134	0.134	
06/24/2023	04:55	2.48	13:15	4.31	3.46	05:20	0.60	14:15	1.48	1.06	05:20	0.044	12:20	0.227	0.131	0.131	
06/25/2023	06:10	2.42	12:40	4.22	3.36	06:00	0.57	15:00	1.38	1.00	06:00	0.041	12:45	0.208	0.117	0.117	
06/26/2023	05:25	2.53	12:40	4.18	3.41	02:00	0.58	16:50	1.37	1.01	02:00	0.045	16:50	0.206	0.121	0.121	
06/27/2023	04:40	2.52	12:05	4.32	3.48	04:35	0.60	12:45	1.44	1.04	04:35	0.045	12:05	0.224	0.131	0.111	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			2.205
Average	3.49	1.04	0.131

FM_13

Site Commentary

SITE INFORMATION

Pipe	Elliptical (23.75 in H x 24 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were experienced during the study. Backwater conditions were observed on 22 June 2023.

This site was positioned downstream of site FM_09 and upstream of site FM_05. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	9.89	2.22	1.792
Minimum	6.32	1.42	0.614
Maximum	14.82	3.10	3.929
Min Time	06/11/2023 6:00:00 AM	06/11/2023 5:30:00 AM	06/11/2023 6:00:00 AM
Max Time	06/23/2023 1:00:00 PM	06/22/2023 11:45:00 PM	06/23/2023 11:45:00 AM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100



GoodYear.Carollo.TFM.AZ23				Site Name	
Flow Monitoring Site Report				FM_13	

Site Address /Location:	W Yuma and Sariva ave		Monitor Series	Location Type	
			TRITON+	Temporary	
Site Access Details:	Traffic Control required	Latitude: 33.4343999	Pipe Size (H x W)	Pipe Shape	
		Longitude: -112.4095445	23.75" x 24.00"	Elliptical	



Manhole #	System Characteristics
MH75B-203	Commercial
Access	Traffic
Drive	Heavy





Installation Information	
Installation Date:	Installation Type:
Wednesday, June 7, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi
Installation Confirmation:	
Confirmation Time:	Pipe Size (HxW)
9:00:00 PM	23.75" x 24.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
10.38"	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
2.51	0"
Silt (in)	Silt Type
0"	
Hydraulic Comments:	
Smooth flow with low depth and low velocity	
Manhole / Pipe Information:	
Manhole Depth (Approx. FT):	Manhole Configuration
17.628	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Vitrified Clay Pipe	Good
Communication Information:	
Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole
Additional Site Info. / Comments:	
No TC required	

ADS Project Name:	GoodYear.Carollo.TFM.AZ23
ADS Project Number:	22930.11.325

Hydrograph Report
FM_13

Flow Monitor

FM_13

Pipe Height
23.75
in

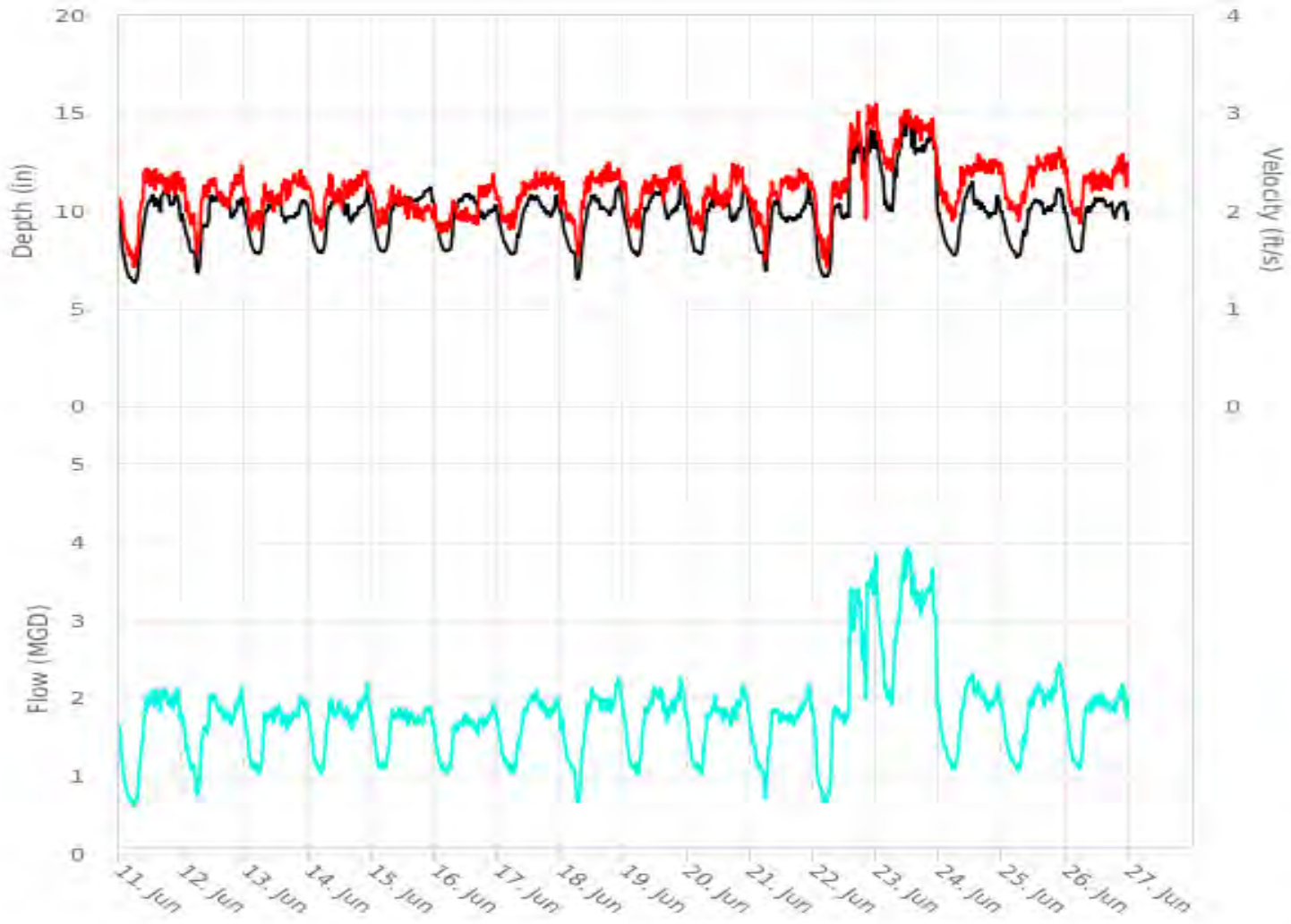
Report Period

06/11/2023
To
06/27/2023

Legend

— DFINAL
— QFINAL
— VFINAL

ABS ENVIRONMENTAL
SERVICES



Scattergraph Report

FM_13

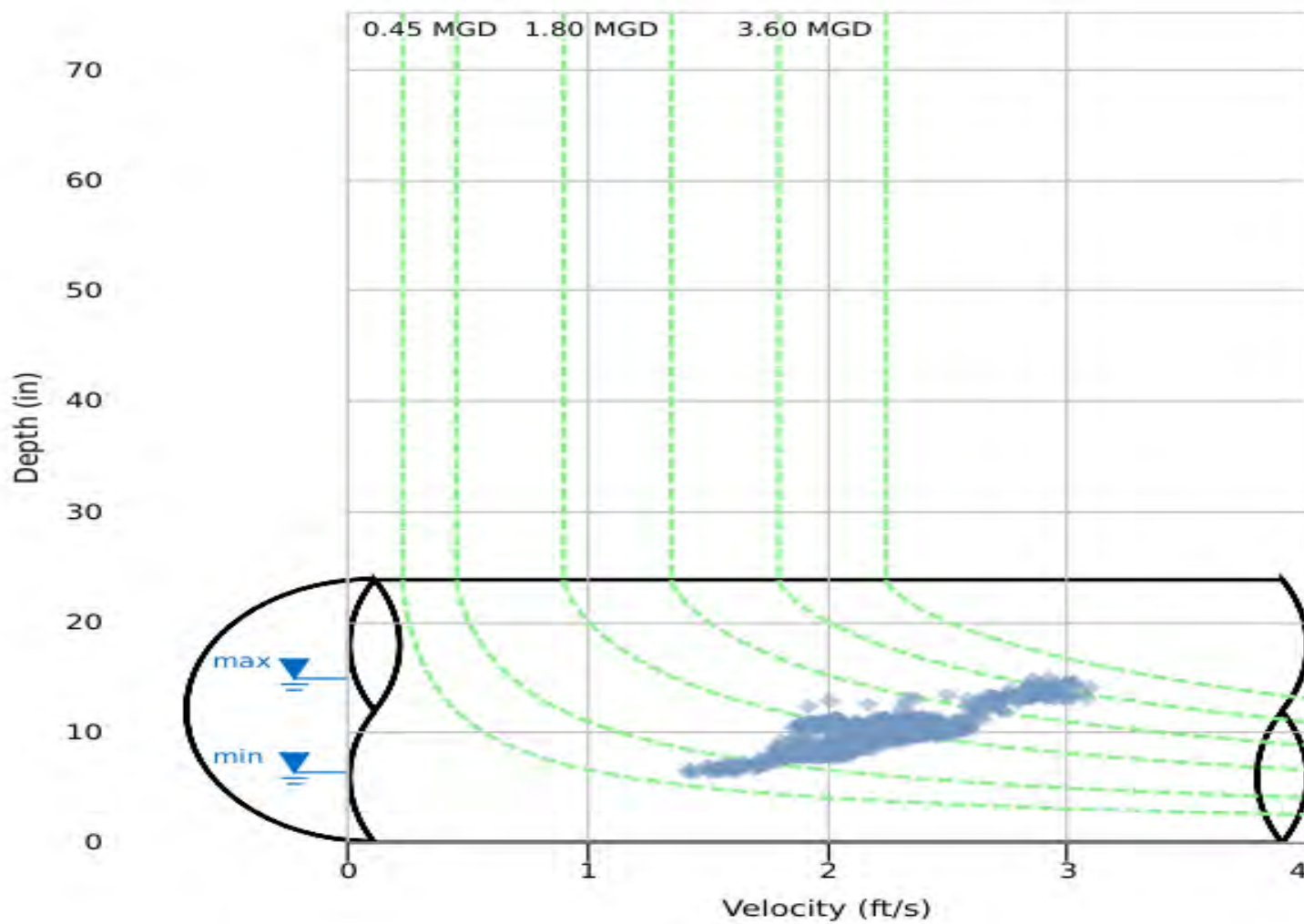
Flow Monitor
FM_13

Pipe Height
23.75
in

Report Period
06/11/2023
To
06/27/2023

Legend
□ DFINAL - VFINAL
--- Iso-Qth
▼ Min-Max Depth

ABS ENVIRONMENTAL
SERVICES



Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_13Pipe: Elliptical (23.75 in H x 24 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	06:10	6.30	17:40	11.05	9.28	06:10	1.36	11:05	2.53	2.10	06:10	0.582	22:00	2.196	1.586	1.586	
06/12/2023	05:50	6.83	11:05	10.86	9.56	06:15	1.53	22:40	2.56	2.14	06:15	0.741	22:40	2.255	1.638	1.638	
06/13/2023	05:05	7.79	13:05	10.87	9.60	02:30	1.75	20:40	2.46	2.14	05:15	1.011	20:55	2.056	1.640	1.640	
06/14/2023	05:05	7.84	22:30	11.16	9.71	04:55	1.72	08:10	2.53	2.17	04:55	0.998	22:15	2.246	1.691	1.691	
06/15/2023	04:45	7.90	22:10	11.25	9.96	02:30	1.78	07:45	2.30	2.04	03:35	1.078	22:10	1.930	1.632	1.632	
06/16/2023	04:00	7.94	12:45	10.94	9.73	04:55	1.71	22:20	2.40	2.01	04:55	1.008	22:45	1.987	1.563	1.563	
06/17/2023	05:55	7.79	12:35	10.88	9.59	06:15	1.75	18:10	2.51	2.17	06:15	1.008	14:45	2.144	1.666	1.666	
06/18/2023	06:30	6.47	22:20	11.34	9.51	06:40	1.50	17:20	2.55	2.18	06:40	0.675	22:00	2.324	1.669	1.669	
06/19/2023	05:05	7.67	21:40	11.39	9.81	02:40	1.77	18:10	2.53	2.20	05:05	0.993	21:25	2.348	1.745	1.745	
06/20/2023	05:05	7.77	21:50	11.27	9.74	05:35	1.75	17:35	2.51	2.15	05:35	1.015	21:05	2.259	1.683	1.683	
06/21/2023	06:00	6.89	22:10	11.33	9.45	05:55	1.45	13:45	2.53	2.16	05:55	0.704	22:00	2.217	1.629	1.629	
06/22/2023	04:10	6.62	23:50	14.47	10.58	05:10	1.38	21:10	3.18	2.31	05:10	0.635	23:50	4.039	2.123	2.123	
06/23/2023	23:30	9.83	12:55	14.90	12.70	23:55	2.30	11:50	3.09	2.76	23:25	1.816	11:50	3.999	3.037	3.037	
06/24/2023	05:40	7.71	12:20	11.65	9.68	05:00	1.78	14:45	2.67	2.32	05:00	1.025	12:35	2.347	1.806	1.806	
06/25/2023	05:30	7.60	21:00	11.21	9.59	06:10	1.83	21:35	2.69	2.32	06:10	1.033	21:30	2.487	1.790	1.790	
06/26/2023	04:15	7.89	11:25	10.77	9.71	05:25	1.81	20:25	2.62	2.27	05:25	1.063	21:55	2.219	1.772	1.754	
06/27/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			28.652
Average	9.89	2.22	1.792

FM_14

Site Commentary

SITE INFORMATION

Pipe	Elliptical (11.88 in H x 11.88 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study.

This site was positioned upstream of site FM_06. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	2.74	1.91	0.179
Minimum	1.32	0.82	0.025
Maximum	4.07	2.45	0.369
Min Time	06/18/2023 5:45:00 AM	06/11/2023 4:45:00 AM	06/11/2023 5:45:00 AM
Max Time	06/11/2023 9:00:00 PM	06/11/2023 9:00:00 PM	06/11/2023 9:00:00 PM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100

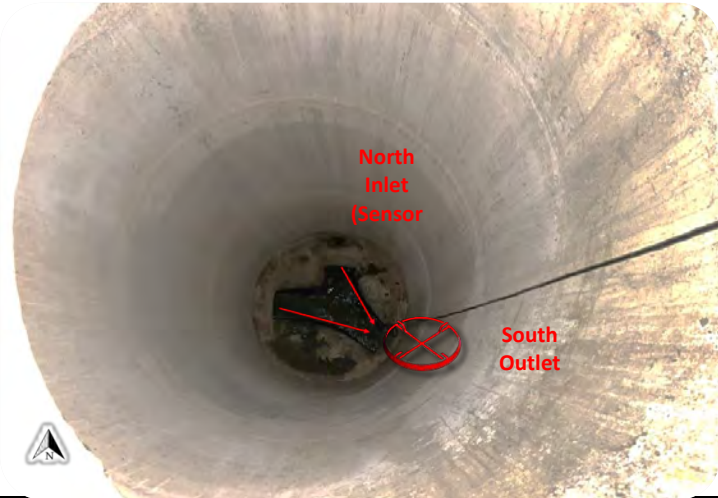
GoodYear.Carollo.TFM.AZ23				Site Name	
Flow Monitoring Site Report		FM_14			

Site Address /Location:	4219 S 181st Dr, Goodyear, AZ 85338		Monitor Series	TRITON+		Location Type	Temporary	
Site Access Details:	Traffic Control required	Latitude:	33.4071617	Pipe Size (H x W)	11.88"x 11.88"		Pipe Shape	Circular
		Longitude:	-112.4489827					



Manhole #	System Characteristics
MH83D-302	Residential
Access	Traffic
Drive	Light





Installation Information	
Installation Date:	Installation Type:
Thursday, June 8, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi
Installation Confirmation:	
Confirmation Time:	Pipe Size (HxW)
9:30:00 PM	11.88"x11.88"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
3.38"	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
2.55	0"
Silt (in)	Silt Type
0"	
Hydraulic Comments:	
Smooth flow with low depth and low velocity	
Manhole / Pipe Information:	
Manhole Depth (Approx. FT):	Manhole Configuration
21	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Vitrified Clay Pipe	Good
Communication Information:	
Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole
Additional Site Info. / Comments:	
TC required site located in a cul-va-sac	



ADS Project Name:	GoodYear.Carollo.TFM.AZ23
ADS Project Number:	22930.11.325

Hydrograph Report
FM_14

Flow Monitor

FM_14

Pipe Height
11.88
in

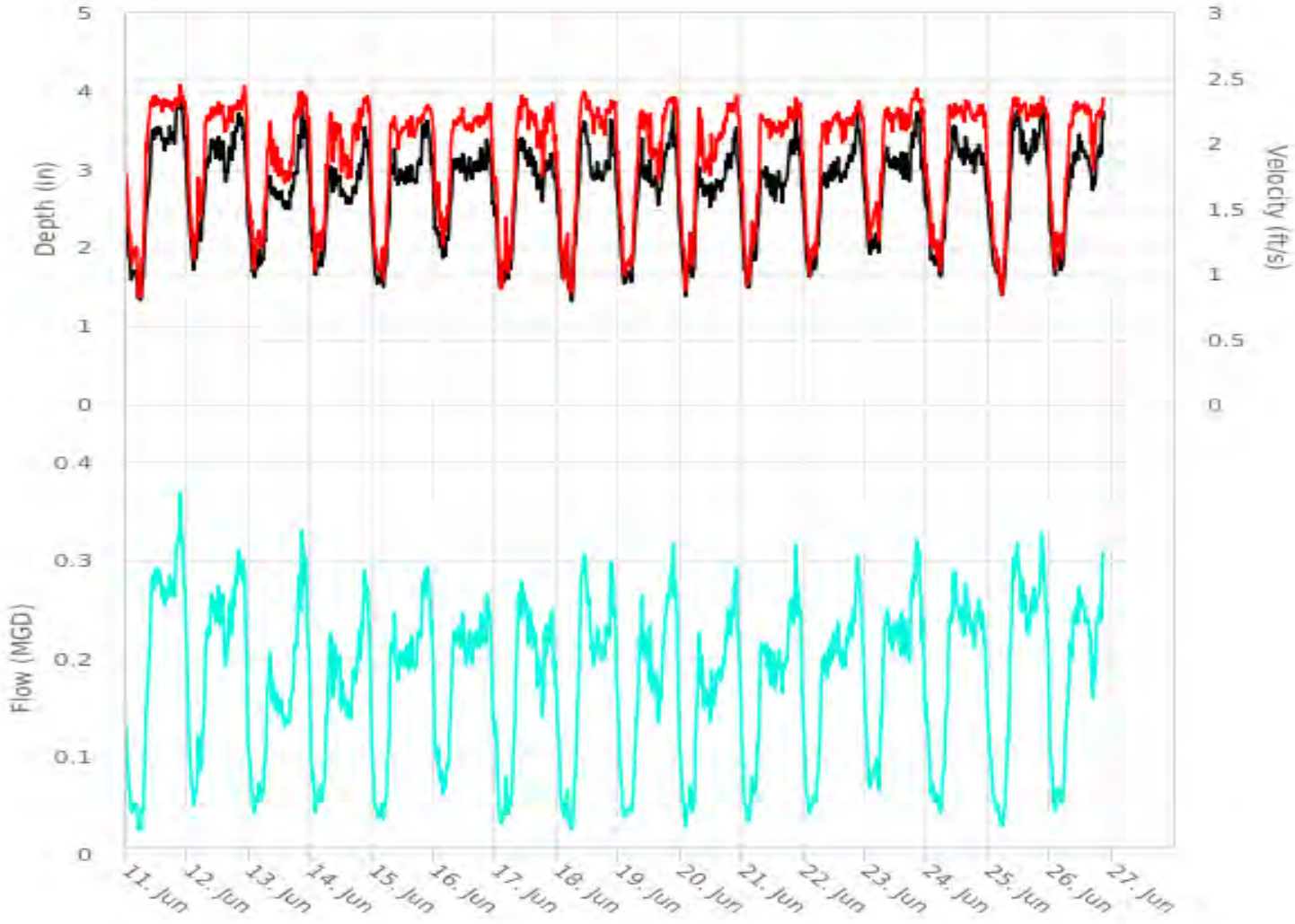
Report Period

06/11/2023
To
06/27/2023

Legend

— DFINAL
— QFINAL
— VFINAL

ABS ENVIRONMENTAL
SERVICES



Scattergraph Report

FM_14

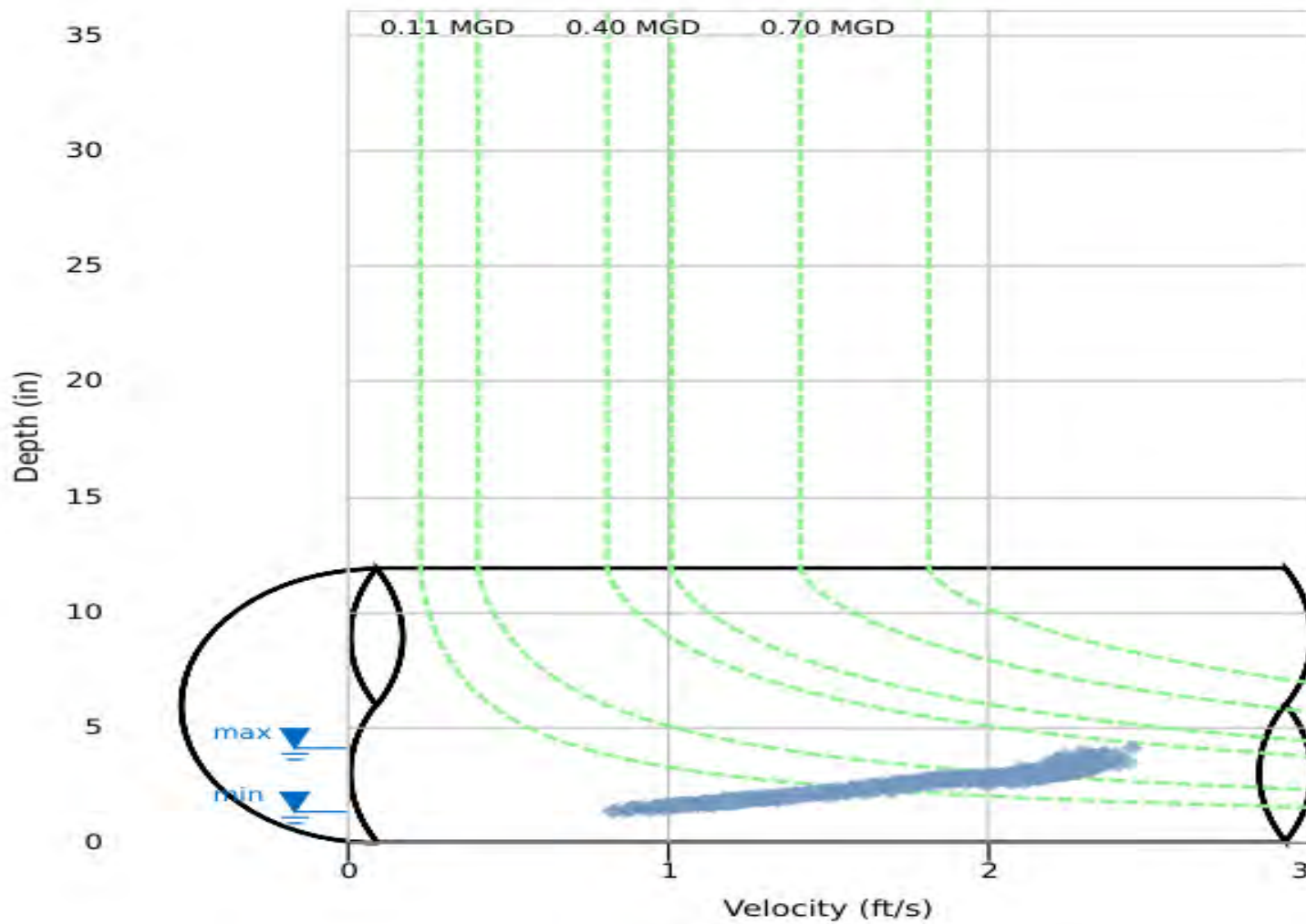
Flow Monitor
FM_14

Pipe Height
11.88
in

Report Period
06/11/2023
To
06/27/2023

Legend
□ DFINAL - VFINAL
--- Iso-Qth
▼ Min-Max Depth

ADS ENVIRONMENTAL
SERVICES



Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_14Pipe: Elliptical (11.88 in H x 11.88 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	05:45	1.31	21:10	4.14	2.86	04:45	0.79	21:10	2.45	1.95	04:50	0.025	21:10	0.379	0.202	0.202	
06/12/2023	02:25	1.69	20:55	3.77	2.93	02:25	1.11	21:40	2.46	2.01	02:25	0.048	20:10	0.317	0.203	0.203	
06/13/2023	02:00	1.61	20:25	3.96	2.62	01:50	1.00	21:55	2.45	1.81	01:50	0.041	20:30	0.346	0.158	0.158	
06/14/2023	02:00	1.62	21:10	3.62	2.62	01:50	0.99	22:00	2.38	1.87	01:50	0.041	21:10	0.299	0.161	0.161	
06/15/2023	04:20	1.49	21:30	3.70	2.71	04:25	0.94	21:30	2.33	1.89	04:25	0.034	21:30	0.308	0.175	0.175	
06/16/2023	03:20	1.86	20:25	3.45	2.78	03:35	1.20	20:50	2.32	1.96	03:20	0.061	20:25	0.276	0.181	0.181	
06/17/2023	02:00	1.46	11:00	3.48	2.67	02:00	0.85	10:10	2.41	1.86	02:00	0.030	10:10	0.285	0.170	0.170	
06/18/2023	05:35	1.28	20:55	3.70	2.70	04:45	0.81	10:15	2.42	1.89	05:35	0.025	10:15	0.312	0.177	0.177	
06/19/2023	02:05	1.54	21:20	3.78	2.67	02:50	0.96	21:20	2.44	1.85	02:50	0.037	21:20	0.333	0.168	0.168	
06/20/2023	02:00	1.36	21:55	3.60	2.62	01:50	0.82	22:10	2.40	1.84	01:55	0.027	21:55	0.299	0.161	0.161	
06/21/2023	02:25	1.48	21:05	3.80	2.66	02:00	0.89	21:00	2.37	1.91	02:00	0.032	21:05	0.323	0.171	0.171	
06/22/2023	02:20	1.62	21:05	3.88	2.74	02:30	0.94	21:45	2.36	1.92	02:30	0.039	21:05	0.315	0.178	0.178	
06/23/2023	02:15	1.90	20:25	3.80	2.87	05:15	1.23	19:55	2.43	2.01	05:15	0.066	20:25	0.326	0.195	0.195	
06/24/2023	05:10	1.62	11:15	3.60	2.78	05:25	0.98	15:10	2.39	1.93	05:25	0.041	15:15	0.299	0.184	0.184	
06/25/2023	05:10	1.36	20:45	3.86	2.86	05:30	0.79	10:30	2.38	1.91	05:25	0.027	20:45	0.330	0.195	0.195	
06/26/2023	02:10	1.64	20:45	3.80	2.75	02:10	1.03	20:50	2.42	1.91	02:10	0.043	20:50	0.321	0.180	0.158	
06/27/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			2.837
Average	2.74	1.91	0.179

FM_15

Site Commentary

SITE INFORMATION

Pipe	Elliptical (24 in H x 24 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were experienced during the study. Backwater conditions were observed on 12 June 2023 and 13 June 2023.

This site was positioned downstream of site FM_05. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	9.45	2.86	2.133
Minimum	6.82	2.48	1.232
Maximum	12.34	3.10	3.198
Min Time	06/22/2023 4:45:00 AM	06/13/2023 3:30:00 AM	06/18/2023 7:00:00 AM
Max Time	06/23/2023 10:00:00 PM	06/23/2023 7:15:00 PM	06/23/2023 5:30:00 PM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100

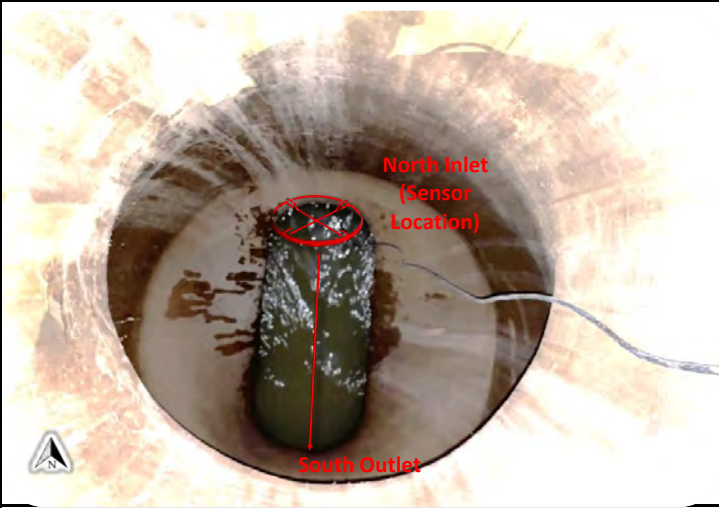


GoodYear.Carollo.TFM.AZ23				Site Name	
Flow Monitoring Site Report				FM_15	

Site Address /Location:	4980 S 157th Ave, Goodyear, AZ 85338		Monitor Series	TRITON+		Location Type	Temporary	
Site Access Details:	No Traffic Control required	Latitude:	33.4030411	Pipe Size (H x W)	24.00"x 24.00"	Pipe Shape	Circular	
		Longitude:	-112.4008065					



Manhole #	System Characteristics
MH96B-108	Residential
Access	Traffic
Drive	Light



Installation Information	
Installation Date:	Installation Type:
Tuesday, June 6, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi
Installation Confirmation:	
Confirmation Time:	Pipe Size (HxW)
8:00:00 PM	24.00"x24.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
10.50"	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
3.25	0"
Silt (in)	Silt Type
0"	
Hydraulic Comments:	
Smooth flow with low depth and low velocity	
Manhole / Pipe Information:	
Manhole Depth (Approx. FT):	Manhole Configuration
8.634	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Vitrified Clay Pipe	Good
Communication Information:	
Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole
Additional Site Info. / Comments:	
No TC required	



ADS Project Name:	GoodYear.Carollo.TFM.AZ23
ADS Project Number:	22930.11.325

Hydrograph Report

FM_15

Flow Monitor

FM_15

Pipe Height
24.00
in

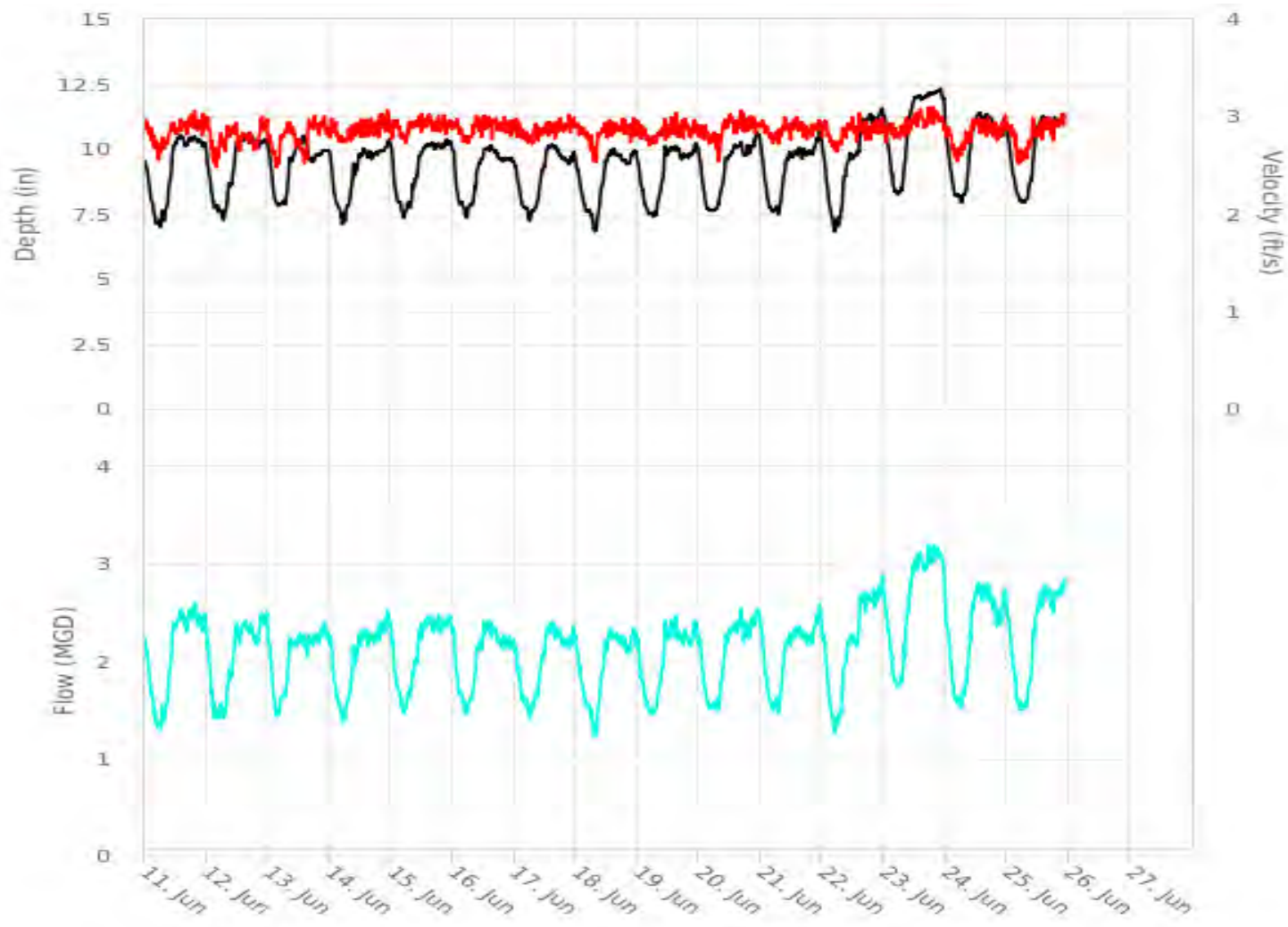
Report Period

06/11/2023
To
06/27/2023

Legend

- DFINAL
- QFINAL
- VFINAL

ABS ENVIRONMENTAL SERVICES



Scattergraph Report

FM_15

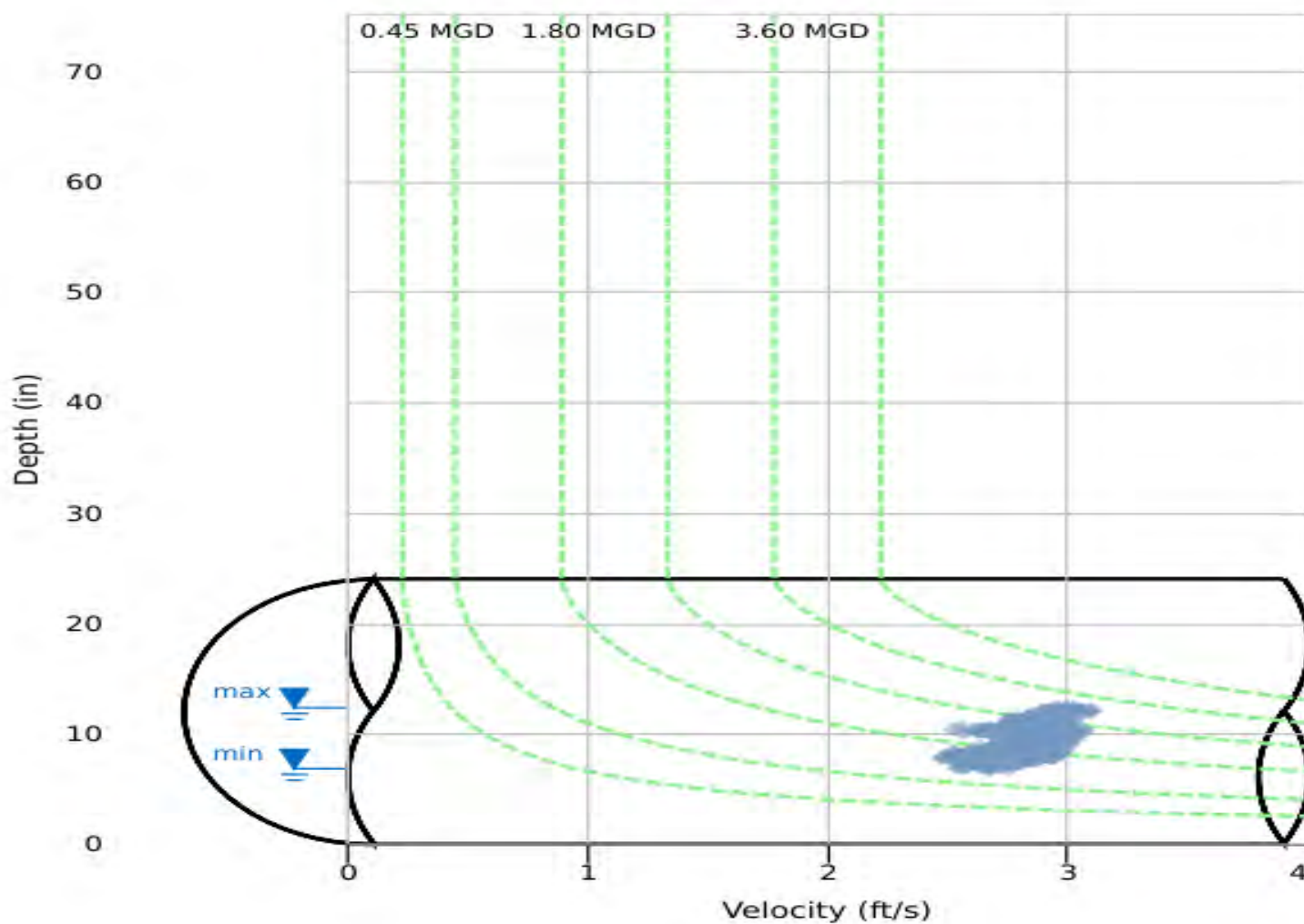
Flow Monitor
FM_15

Pipe Height
24.00
in

Report Period
06/11/2023
To
06/27/2023

Legend
□ DFINAL - VFINAL
--- Iso-QTH
▼ Min-Max Depth

ABS ENVIRONMENTAL SERVICES



Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_15Pipe: Elliptical (24 in H x 24 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	06:15	6.94	13:50	10.60	9.27	05:40	2.54	17:30	3.11	2.86	06:15	1.266	19:40	2.663	2.085	2.085	
06/12/2023	06:50	7.26	15:20	10.55	9.34	04:00	2.45	00:50	3.04	2.79	04:50	1.350	23:50	2.546	2.047	2.047	
06/13/2023	04:10	7.78	14:05	10.57	9.39	03:40	2.44	22:10	3.06	2.79	03:40	1.401	22:25	2.429	2.056	2.056	
06/14/2023	05:05	7.08	23:20	10.43	9.16	06:05	2.70	22:35	3.11	2.87	05:05	1.361	23:05	2.555	2.054	2.054	
06/15/2023	05:00	7.30	21:45	10.42	9.30	06:00	2.69	15:05	3.10	2.91	04:55	1.449	18:40	2.543	2.118	2.118	
06/16/2023	05:40	7.31	14:50	10.21	9.12	06:05	2.68	14:00	3.08	2.89	05:15	1.436	14:00	2.480	2.053	2.053	
06/17/2023	06:05	7.13	14:55	10.26	9.01	07:05	2.68	23:15	3.07	2.87	06:05	1.390	16:25	2.447	2.005	2.005	
06/18/2023	07:40	6.79	14:45	10.03	8.90	08:05	2.46	19:10	3.05	2.84	08:05	1.195	14:45	2.404	1.957	1.957	
06/19/2023	06:10	7.37	22:50	10.33	9.13	16:20	2.64	15:00	3.06	2.86	04:15	1.434	15:00	2.502	2.035	2.035	
06/20/2023	04:45	7.56	22:35	10.68	9.26	07:40	2.47	16:20	3.12	2.87	07:40	1.416	16:20	2.605	2.089	2.089	
06/21/2023	06:40	7.47	23:00	10.76	9.28	04:50	2.67	12:45	3.05	2.87	07:00	1.458	23:25	2.642	2.090	2.090	
06/22/2023	04:55	6.78	23:10	11.59	9.64	06:00	2.56	14:40	3.06	2.85	05:00	1.252	23:35	2.897	2.185	2.185	
06/23/2023	05:10	8.22	22:00	12.36	10.92	08:25	2.67	19:15	3.15	2.93	06:00	1.720	19:15	3.242	2.643	2.643	
06/24/2023	06:10	7.90	13:25	11.43	10.11	04:30	2.50	13:10	3.07	2.83	06:00	1.498	13:10	2.915	2.314	2.314	
06/25/2023	05:50	7.91	22:25	11.35	9.97	05:40	2.46	22:25	3.09	2.82	05:45	1.443	22:25	2.921	2.270	2.129	
06/26/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
06/27/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			31.859
Average	9.45	2.86	2.133

FM_16

Site Commentary

SITE INFORMATION

Pipe	Elliptical (36 in H x 36 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study.

This site was positioned downstream of sites FM_02, FM_08, FM_11, FM_12, FM_03, FM_01, and FM_06. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Average	11.45	2.67	3.420
Minimum	7.36	2.08	1.445
Maximum	16.24	3.11	6.098
Min Time	06/22/2023 5:45:00 AM	06/22/2023 5:00:00 AM	06/22/2023 5:45:00 AM
Max Time	06/13/2023 11:45:00 AM	06/13/2023 11:00:00 AM	06/13/2023 11:00:00 AM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the fifteen minutes average.

DATA UPTIME

Data uptime observed during **Sunday, 11 June 2023 to Tuesday, 27 June 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100

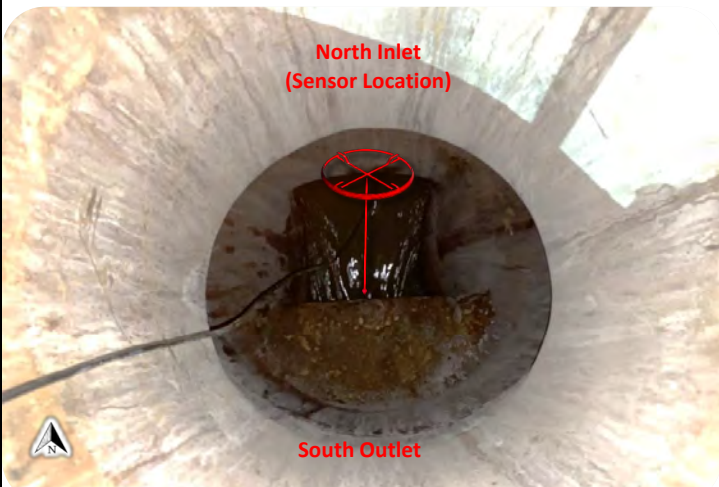
GoodYear.Carollo.TFM.AZ23				Site Name	
Flow Monitoring Site Report		FM_16			

Site Address /Location:	4980 S 157th Ave, Goodyear, AZ 85338		Monitor Series	TRITON+		Location Type	Temporary	
Site Access Details:	No Traffic Control required	Latitude:	33.4025189	Pipe Size (H x W)	36.00"x 36.00"		Pipe Shape	Circular
		Longitude:	-112.4007244					



Manhole #	System Characteristics
MH96B-102	Residential
Access	Traffic
Drive	Light





Installation Information	
Installation Date:	Installation Type:
Tuesday, June 6, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi
Installation Confirmation:	
Confirmation Time:	Pipe Size (HxW)
9:35:00 PM	36.00"x36.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
12.50"	-
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
3.2	0"
Silt (in)	Silt Type
0"	
Hydraulic Comments:	
Smooth flow with medium depth and medium velocity	
Manhole / Pipe Information:	
Manhole Depth (Approx. FT):	Manhole Configuration
9.86	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Vitrified Clay Pipe	Good
Communication Information:	
Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole
Additional Site Info. / Comments:	
No TC required	



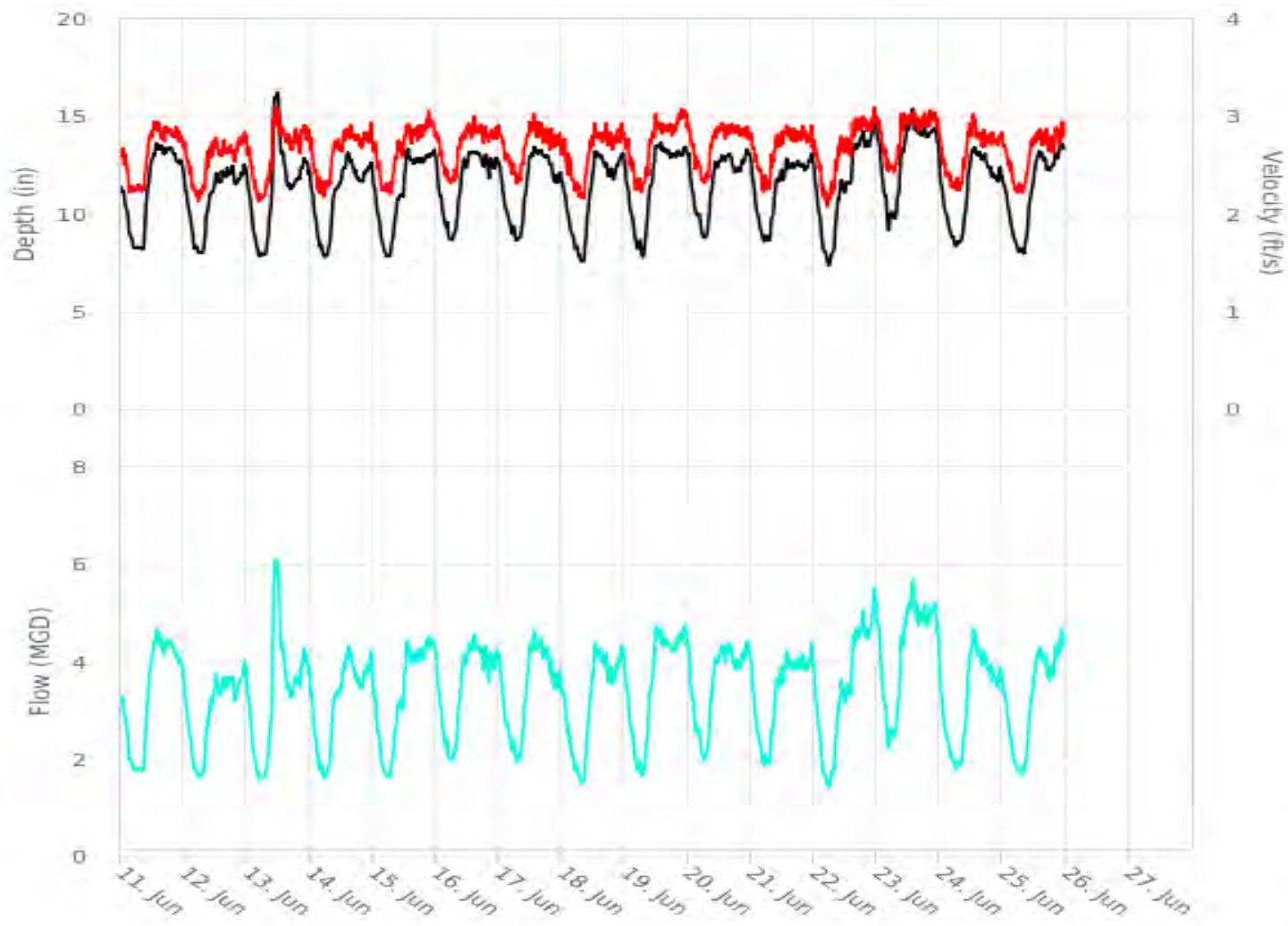
ADS Project Name:	GoodYear.Carollo.TFM.AZ23
ADS Project Number:	22930.11.325

Hydrograph Report

FM_16

Flow Monitor FM_16
Pipe Height 36.00 in
Report Period 06/11/2023 To 06/27/2023
Legend — DFINAL — QFINAL — VFINAL

ABS ENVIRONMENTAL SERVICES



Scattergraph Report
FM_16

Flow Monitor

FM_16

Pipe Height
36.00
in

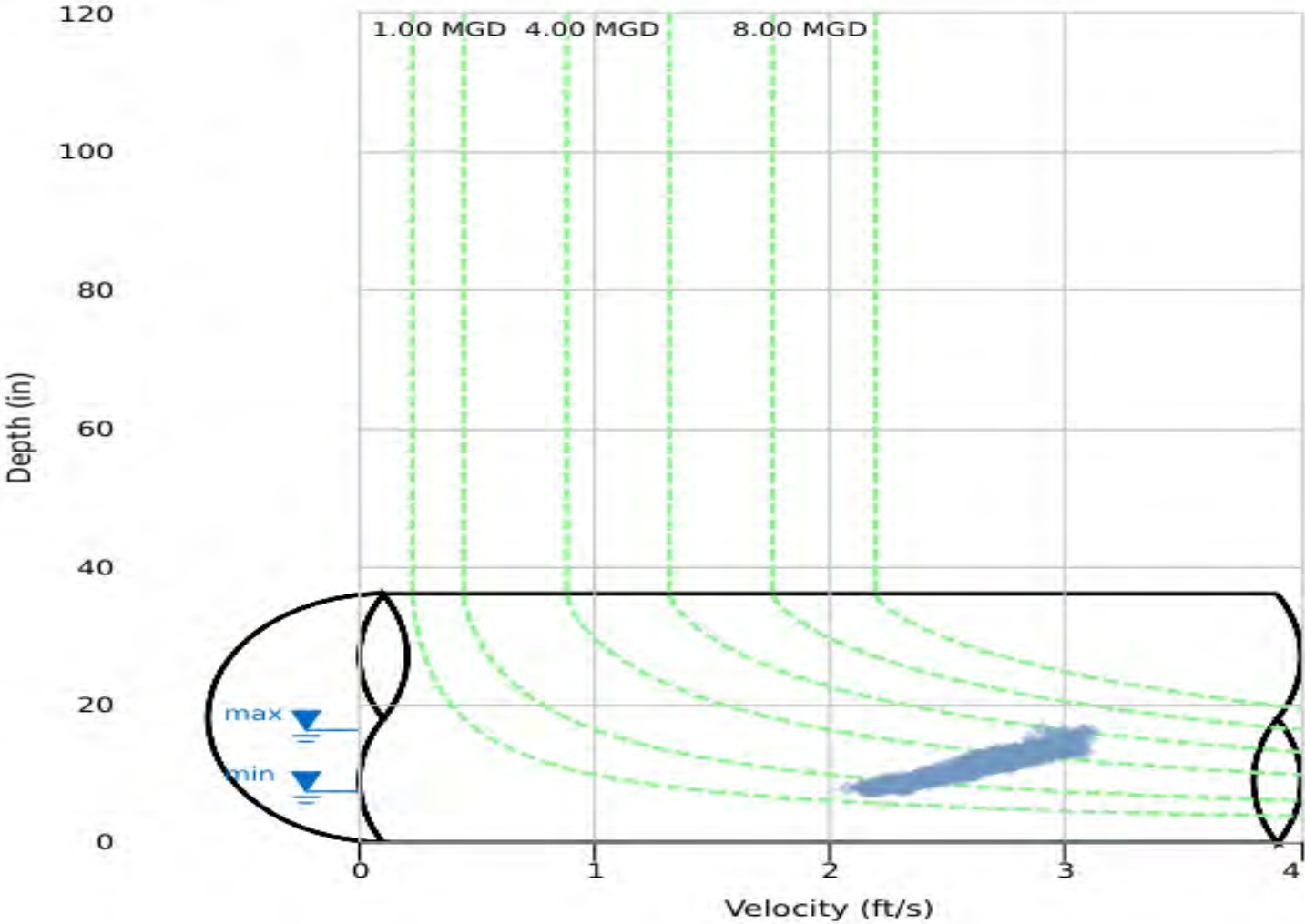
Report Period

06/11/2023
To
06/27/2023

Legend

- DFINAL - VFINAL
- Iso-Qth
- Min-Max Depth





Daily Tabular Report

06/11/2023 00:00 - 06/27/2023 23:59

FM_16Pipe: Elliptical (36 in H x 36 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)						
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	
06/11/2023	08:25	8.09	13:30	13.80	11.41	08:10	2.18	14:15	3.00	2.64	08:30	1.722	14:15	4.754	3.371	3.371	
06/12/2023	06:15	7.97	18:40	12.69	10.83	05:30	2.09	23:20	2.89	2.56	05:35	1.607	23:20	4.065	3.015	3.015	
06/13/2023	04:40	7.85	11:50	16.29	11.35	04:40	2.09	11:15	3.13	2.64	04:40	1.539	10:55	6.172	3.367	3.367	
06/14/2023	05:45	7.75	14:30	13.29	11.01	05:25	2.15	23:25	2.95	2.64	05:35	1.590	14:50	4.361	3.189	3.189	
06/15/2023	06:20	7.79	13:35	13.43	11.23	06:50	2.16	20:55	3.12	2.67	06:50	1.614	20:55	4.655	3.335	3.335	
06/16/2023	05:50	8.64	13:55	13.43	11.67	07:00	2.25	12:25	3.02	2.72	05:45	1.928	14:55	4.604	3.542	3.542	
06/17/2023	06:35	8.65	13:35	13.52	11.48	07:30	2.27	13:20	3.07	2.71	07:00	1.934	13:25	4.671	3.455	3.455	
06/18/2023	08:05	7.55	12:45	13.27	11.03	08:40	2.10	17:05	2.98	2.63	07:30	1.494	12:55	4.408	3.194	3.194	
06/19/2023	06:55	7.76	13:45	13.73	11.66	04:15	2.18	21:35	3.12	2.73	06:45	1.654	22:45	4.845	3.587	3.587	
06/20/2023	06:25	8.77	22:40	13.38	11.75	05:45	2.30	13:15	3.04	2.74	06:35	1.988	22:45	4.503	3.593	3.593	
06/21/2023	05:05	8.58	23:05	13.11	11.40	04:35	2.20	20:45	2.98	2.67	05:10	1.851	23:05	4.449	3.372	3.372	
06/22/2023	05:50	7.34	23:15	14.96	11.47	05:10	2.06	23:05	3.12	2.66	05:50	1.439	23:15	5.604	3.451	3.451	
06/23/2023	04:30	9.13	13:40	15.54	13.01	04:30	2.26	14:00	3.12	2.84	04:30	2.064	14:00	5.783	4.294	4.294	
06/24/2023	06:05	8.34	12:55	13.57	11.23	06:15	2.21	13:00	3.10	2.64	06:15	1.784	13:00	4.842	3.284	3.284	
06/25/2023	08:00	7.94	22:25	13.67	11.18	05:00	2.19	23:20	2.99	2.62	06:00	1.683	22:25	4.703	3.241	3.162	
06/26/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
06/27/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

06/11/2023 00:00 - 06/27/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			51.211
Average	11.45	2.67	3.420

APPENDIX 5B

MODEL CALIBRATION RESULTS

Flow Monitoring Site FM1, Dry Weather Flow Calibration

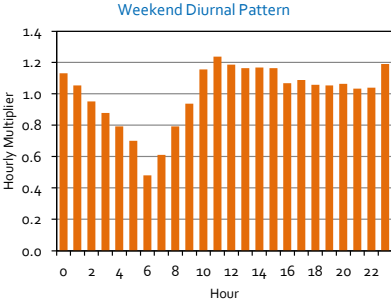
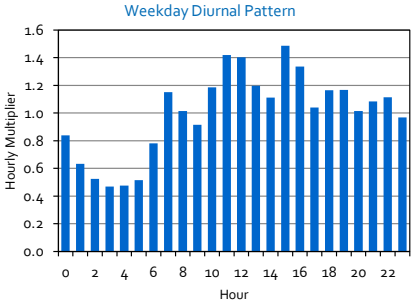
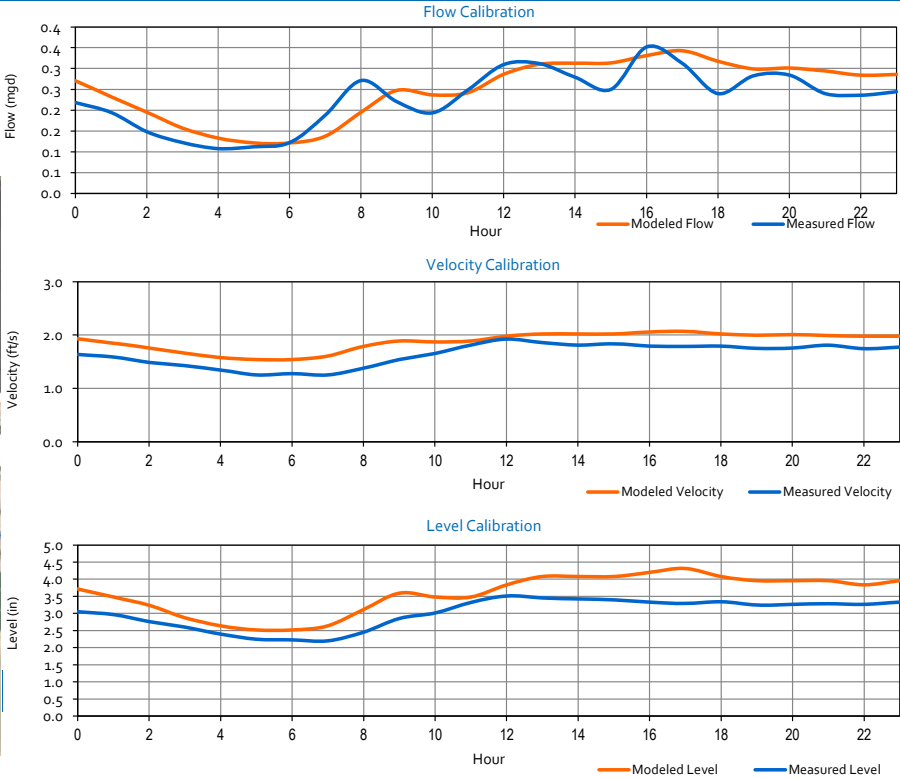
Pipeline Diameter: 12"
Manhole ID: MH88C-301
Model Pipe ID: 211 (gpm)



Model Calibration Summary

Day	Measured Data				Modeled Data				Percent Error ⁽¹⁾			
	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (%)	Peak Flow (%)	Avg. Level (%)	Avg. Vel. (%)
Thurs	0.23	0.35	3.5	1.8	0.25	0.34	3.61	1.89	9%	-3%	5%	2%

Notes:
(1) Percent Error = (Modeled - Measured) / Measured x 100



Flow Monitoring Site FM2, Dry Weather Flow Calibration

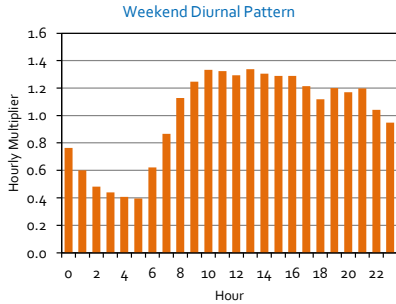
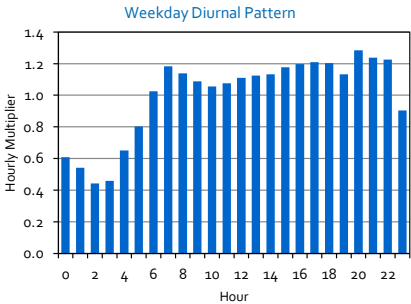
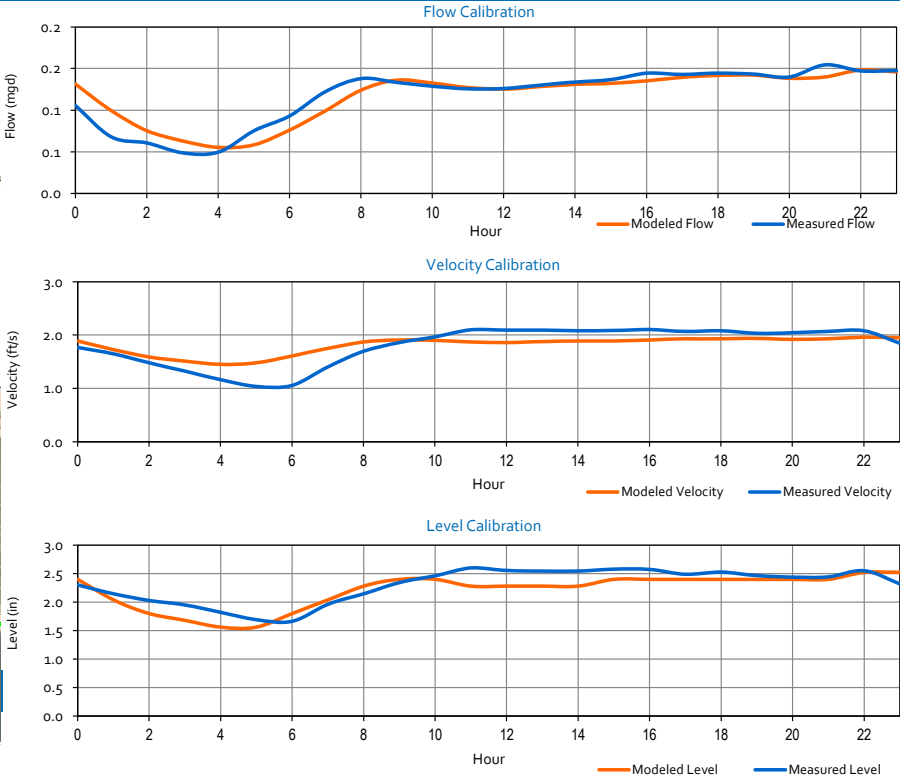
Pipeline Diameter: 12"
Manhole ID: MH86D-405
Model Pipe ID: 1758 (gpm)



Model Calibration Summary

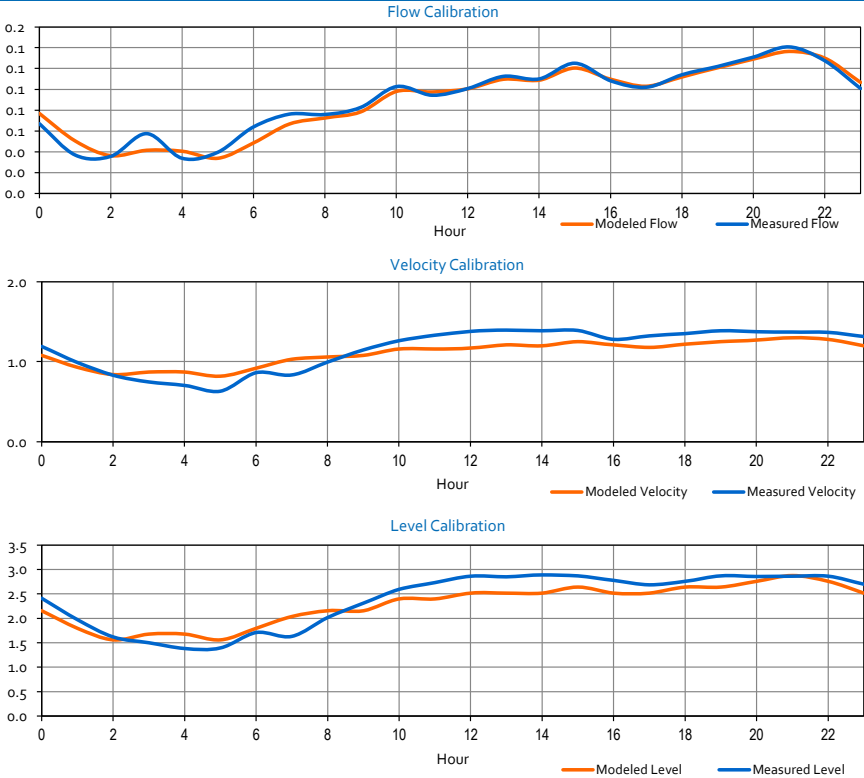
Day	Measured Data				Modeled Data				Percent Error ⁽¹⁾			
	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (%)	Peak Flow (%)	Avg. Level (%)	Avg. Vel. (%)
Thurs	0.12	0.15	2.3	1.7	0.12	0.15	2.21	1.81	0%	-4%	-3%	4%

Notes:
(1) Percent Error = (Modeled - Measured) / Measured x 100



Flow Monitoring Site FM3, Dry Weather Flow Calibration

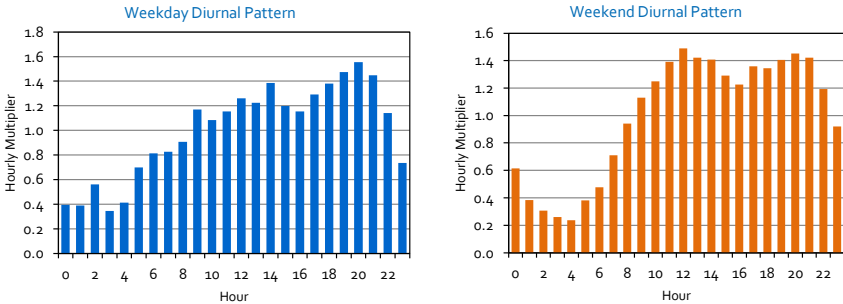
Pipeline Diameter: 15"
Manhole ID: MH57B-304
Model Pipe ID: 4029 (gpm)



Model Calibration Summary

Day	Measured Data				Modeled Data				Percent Error ⁽¹⁾			
	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (%)	Peak Flow (%)	Avg. Level (%)	Avg. Vel. (%)
Thurs	0.09	0.14	2.3	1.2	0.09	0.14	2.29	1.11	-2%	-3%	-1%	-4%

Notes:
(1) Percent Error = (Modeled - Measured) / Measured x 100



Flow Monitoring Site FM4, Dry Weather Flow Calibration

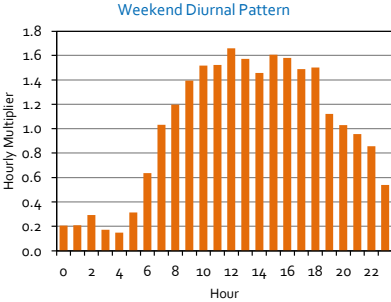
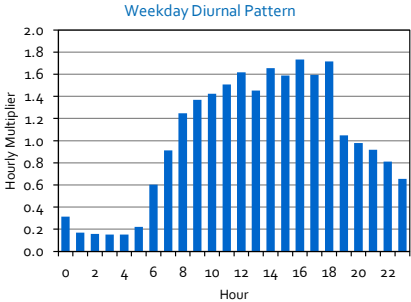
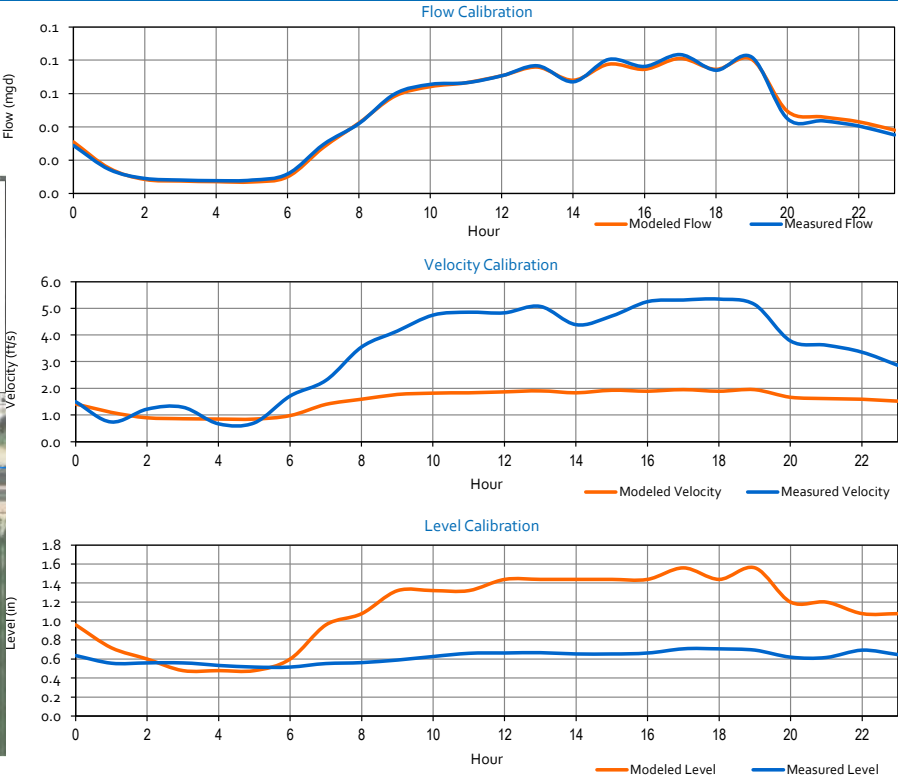
Pipeline Diameter: 15"
Manhole ID: MH64D-403
Model Pipe ID: 4263 (gpm)



Model Calibration Summary

Day	Measured Data				Modeled Data				Percent Error ⁽¹⁾			
	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (%)	Peak Flow (%)	Avg. Level (%)	Avg. Vel. (%)
Thurs	0.05	0.08	0.7	3.6	0.05	0.08	1.11	1.54	0%	-3%	70%	-58%

Notes:
(1) Percent Error = (Modeled - Measured) / Measured x 100



Flow Monitoring Site FM5, Dry Weather Flow Calibration

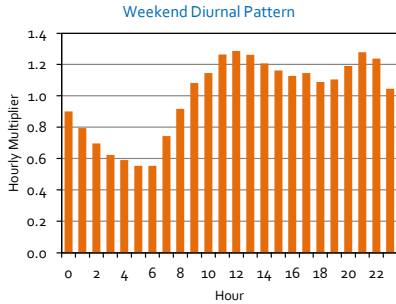
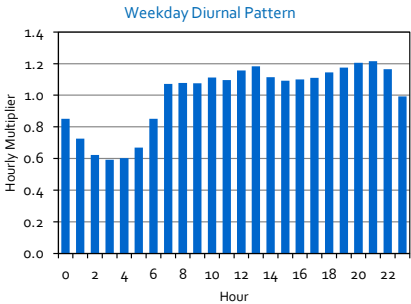
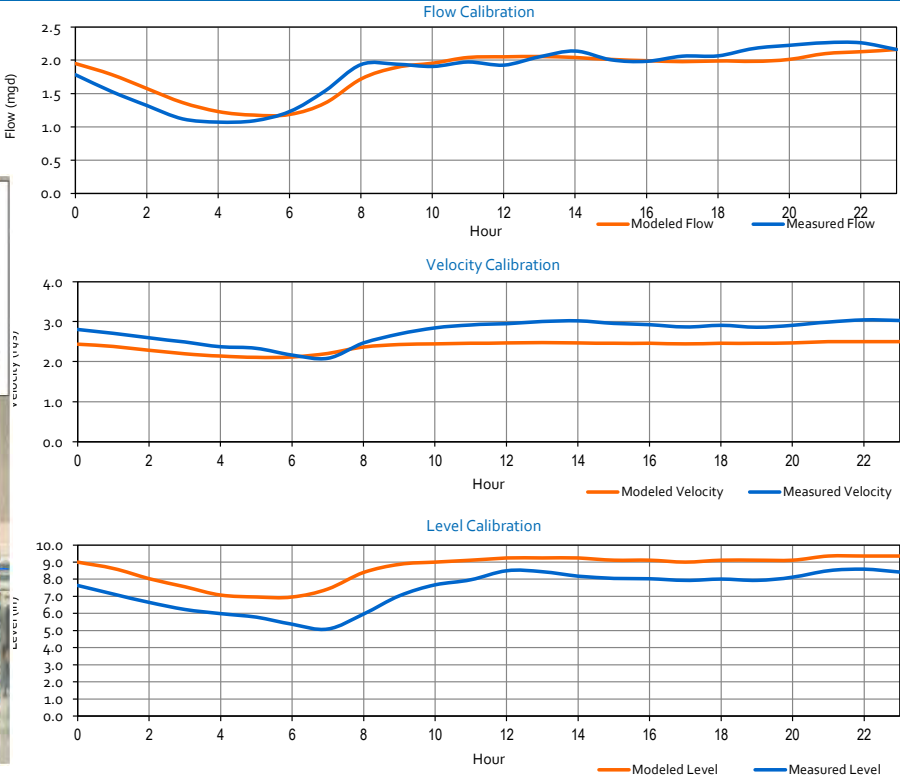
Pipeline Diameter: 30"
Manhole ID: MH86A-301
Model Pipe ID: 3056 (gpm)



Model Calibration Summary

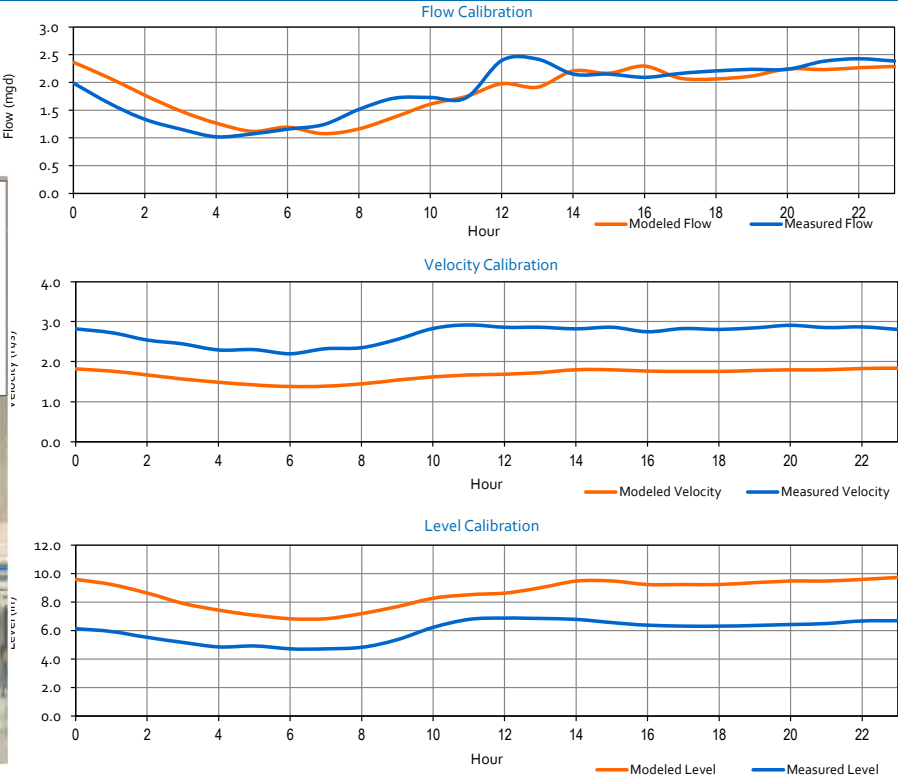
Day	Measured Data				Modeled Data				Percent Error ⁽¹⁾			
	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (%)	Peak Flow (%)	Avg. Level (%)	Avg. Vel. (%)
Thurs	1.82	2.27	7.6	2.9	1.82	2.16	8.65	2.39	0%	-5%	13%	-16%

Notes:
(1) Percent Error = (Modeled - Measured) / Measured x 100



Flow Monitoring Site FM6, Dry Weather Flow Calibration

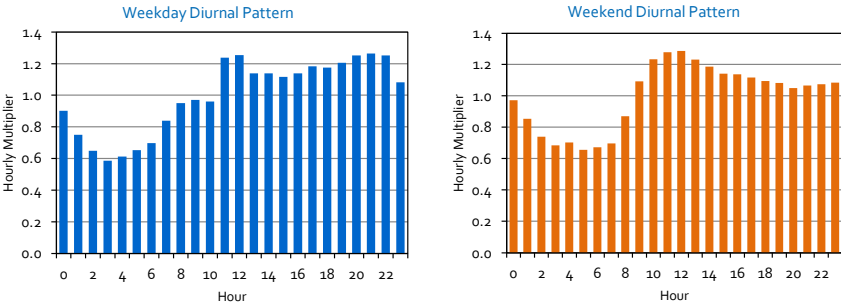
Pipeline Diameter: 54"
Manhole ID: MH86C-202
Model Pipe ID: 3859 (gpm)



Model Calibration Summary

Day	Measured Data				Modeled Data				Percent Error ⁽¹⁾			
	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (%)	Peak Flow (%)	Avg. Level (%)	Avg. Vel. (%)
Thurs	1.86	2.43	6.3	2.7	1.84	2.37	8.71	1.68	-1%	-3%	38%	-39%

Notes:
(1) Percent Error = (Modeled - Measured) / Measured x 100



Flow Monitoring Site FM7, Dry Weather Flow Calibration

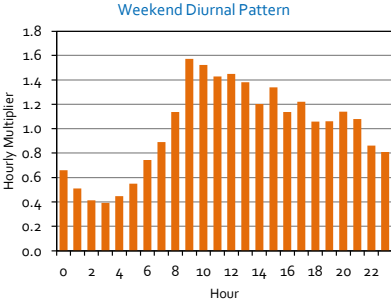
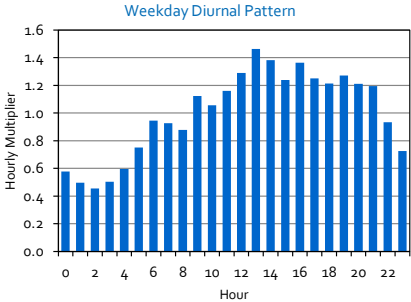
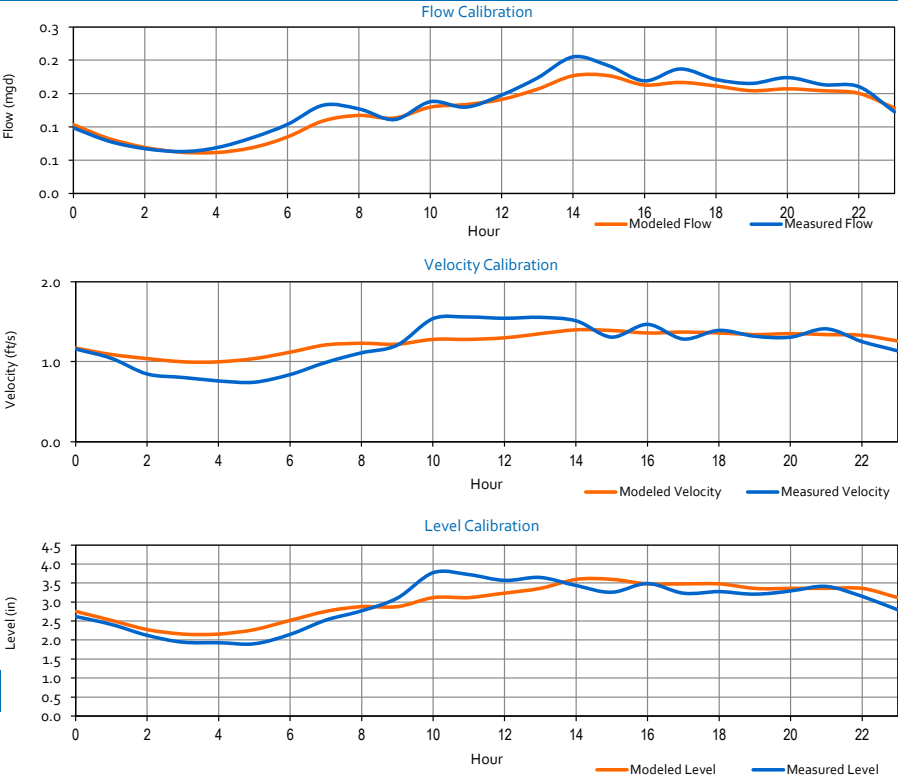
Pipeline Diameter: 12"
Manhole ID: MH79A-101
Model Pipe ID: 3099 (gpm)



Model Calibration Summary

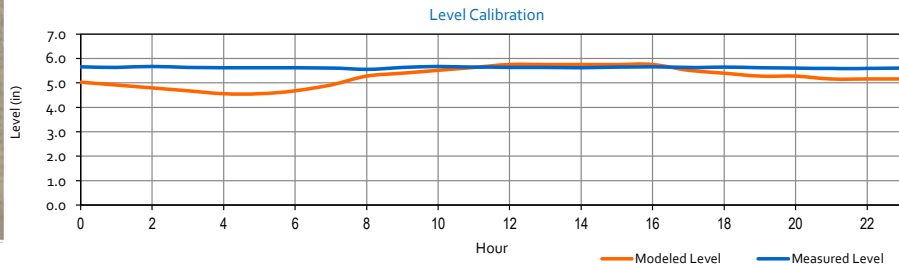
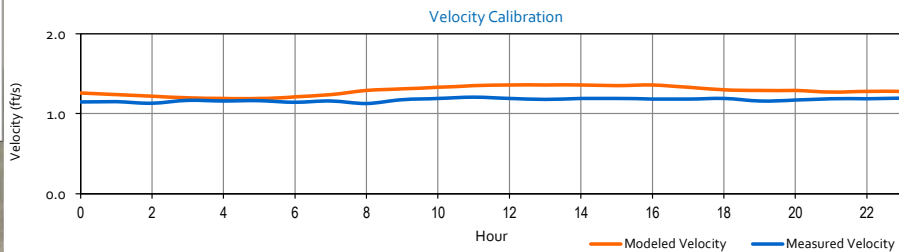
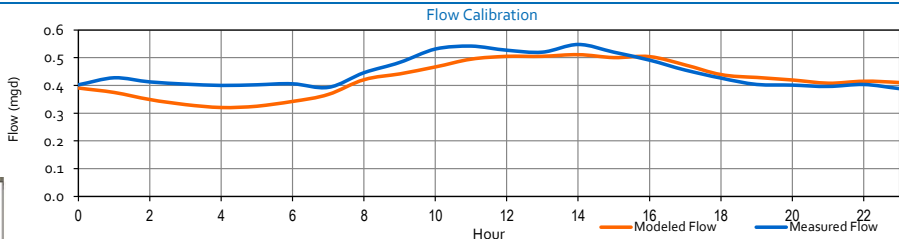
Day	Measured Data				Modeled Data				Percent Error ⁽¹⁾			
	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (%)	Peak Flow (%)	Avg. Level (%)	Avg. Vel. (%)
Thurs	0.13	0.21	3.0	1.3	0.13	0.18	2.99	1.24	-7%	-14%	-1%	-4%

Notes:
(1) Percent Error = (Modeled - Measured) / Measured x 100



Flow Monitoring Site FM8, Dry Weather Flow Calibration

Pipeline Diameter: 24"
 Manhole ID: MH77B-308
 Model Pipe ID: 5404 (gpm)

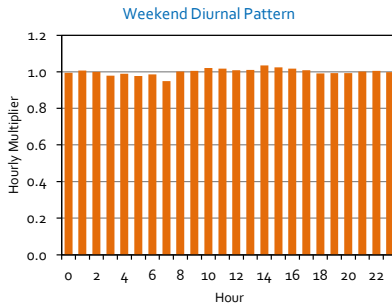
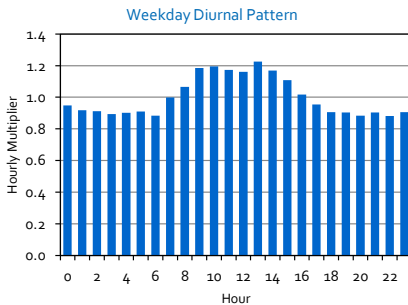


Model Calibration Summary

Day	Measured Data				Modeled Data				Percent Error ⁽¹⁾			
	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (%)	Peak Flow (%)	Avg. Level (%)	Avg. Vel. (%)
Thurs	0.45	0.55	5.9	1.2	0.42	0.51	5.24	1.29	-5%	-7%	-11%	8%

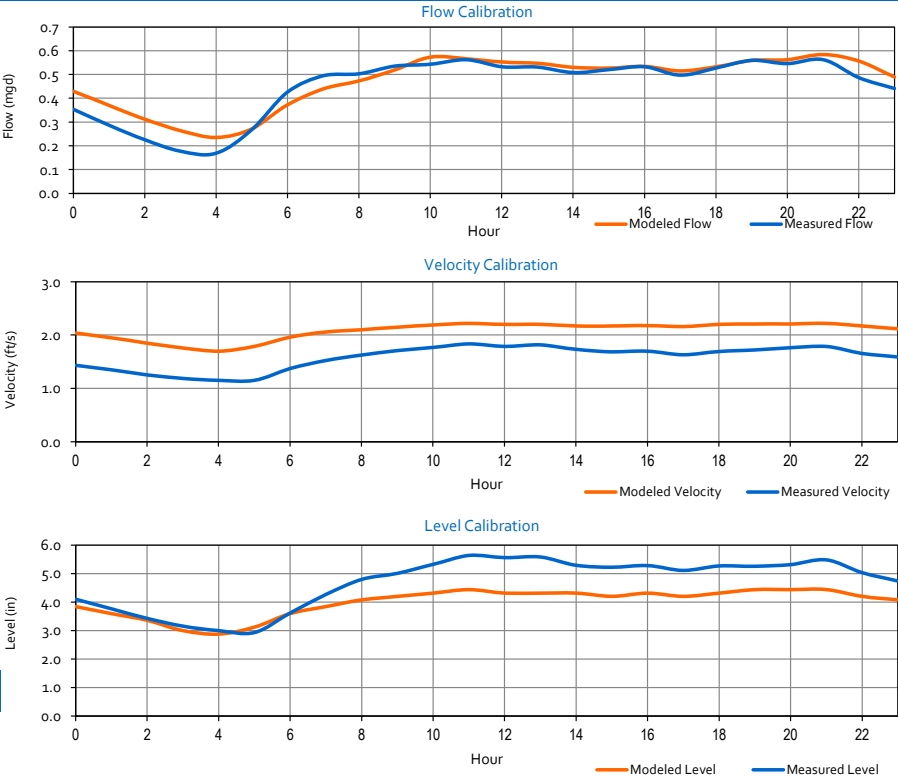
Notes:

(1) Percent Error = (Modeled - Measured) / Measured x 100



Flow Monitoring Site FMg, Dry Weather Flow Calibration

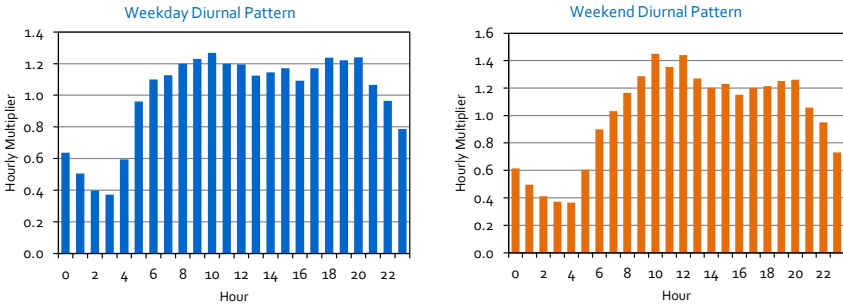
Pipeline Diameter: 24"
Manhole ID: MH45C-401
Model Pipe ID: 3091 (gpm)



Model Calibration Summary

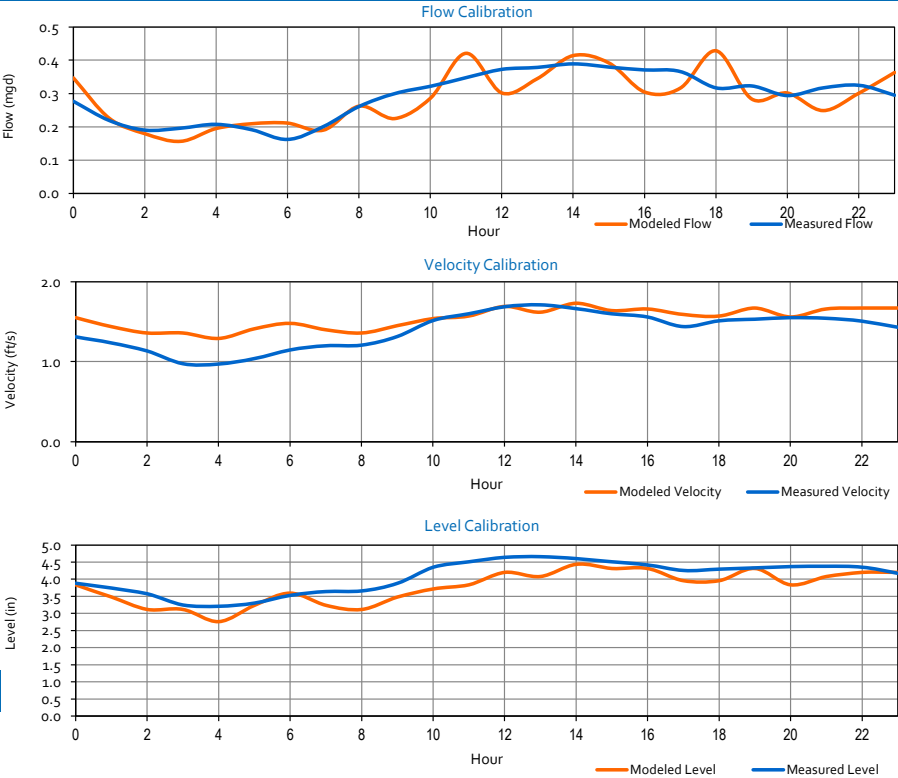
Day	Measured Data				Modeled Data				Percent Error ⁽¹⁾			
	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (%)	Peak Flow (%)	Avg. Level (%)	Avg. Vel. (%)
Thurs	0.45	0.56	4.6	1.6	0.47	0.58	4.00	2.09	5%	4%	-13%	30%

Notes:
(1) Percent Error = (Modeled - Measured) / Measured x 100



Flow Monitoring Site FM11, Dry Weather Flow Calibration

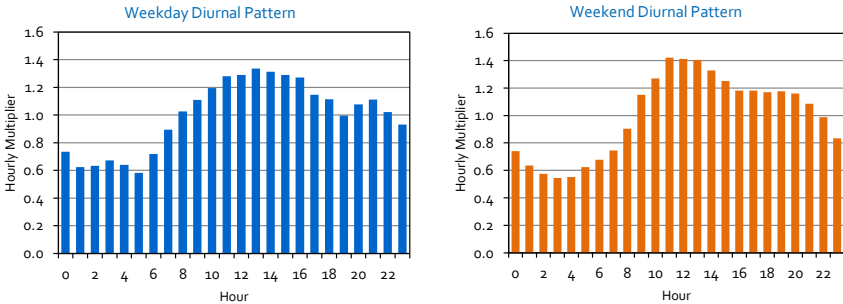
Pipeline Diameter: 18"
Manhole ID: MH58C-302
Model Pipe ID: 798 (gpm)



Model Calibration Summary

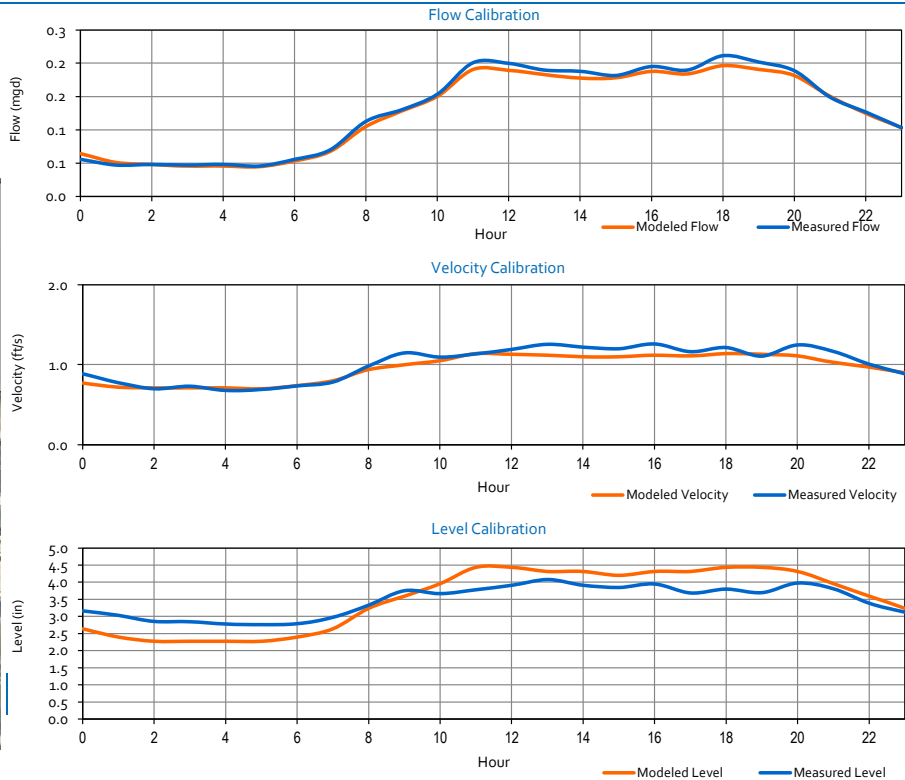
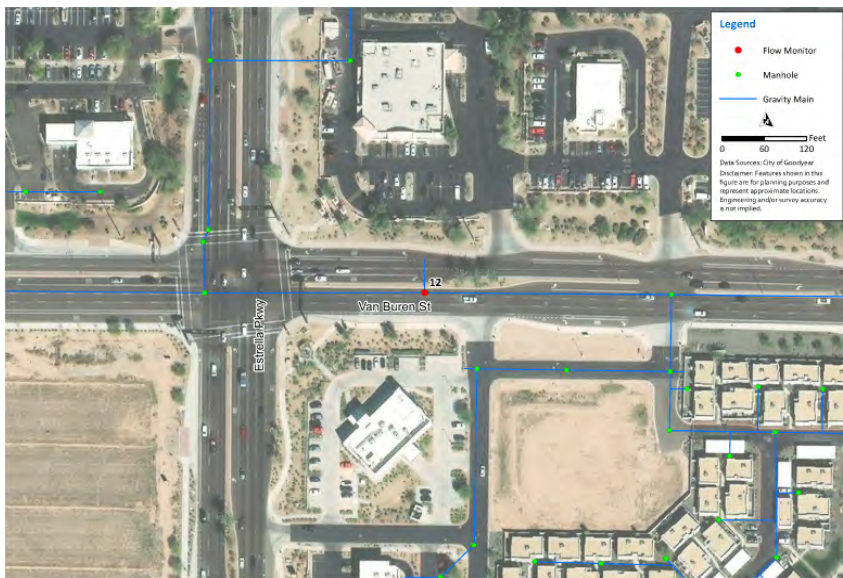
Day	Measured Data				Modeled Data				Percent Error ⁽¹⁾			
	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (%)	Peak Flow (%)	Avg. Level (%)	Avg. Vel. (%)
Thurs	0.29	0.39	4.2	1.4	0.29	0.43	3.87	1.57	-1%	10%	-7%	10%

Notes:
(1) Percent Error = (Modeled - Measured) / Measured x 100



Flow Monitoring Site FM12, Dry Weather Flow Calibration

Pipeline Diameter: 12"
 Manhole ID: MH67A-104
 Model Pipe ID: 3270 (gpm)

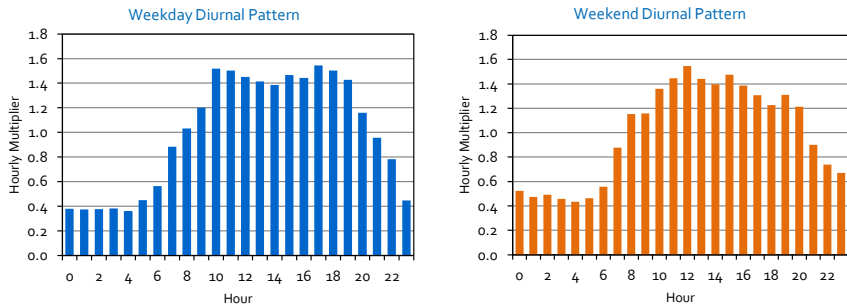


Model Calibration Summary

Day	Measured Data				Modeled Data				Percent Error ⁽¹⁾			
	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (%)	Peak Flow (%)	Avg. Level (%)	Avg. Vel. (%)
Thurs	0.13	0.21	3.5	1.0	0.13	0.20	3.51	0.95	-3%	-7%	1%	-8%

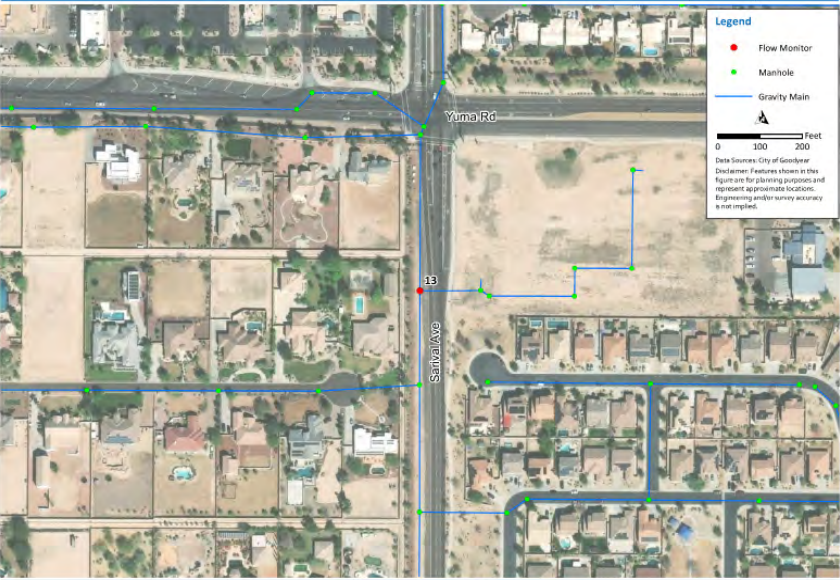
Notes:

(1) Percent Error = (Modeled - Measured) / Measured x 100



Flow Monitoring Site FM13, Dry Weather Flow Calibration

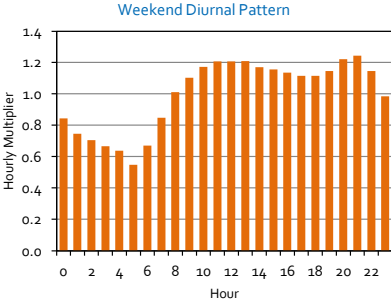
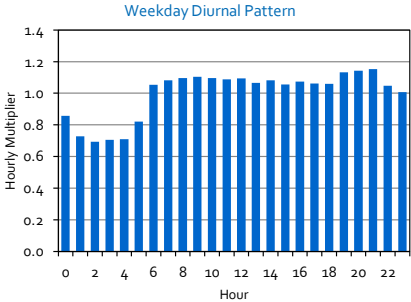
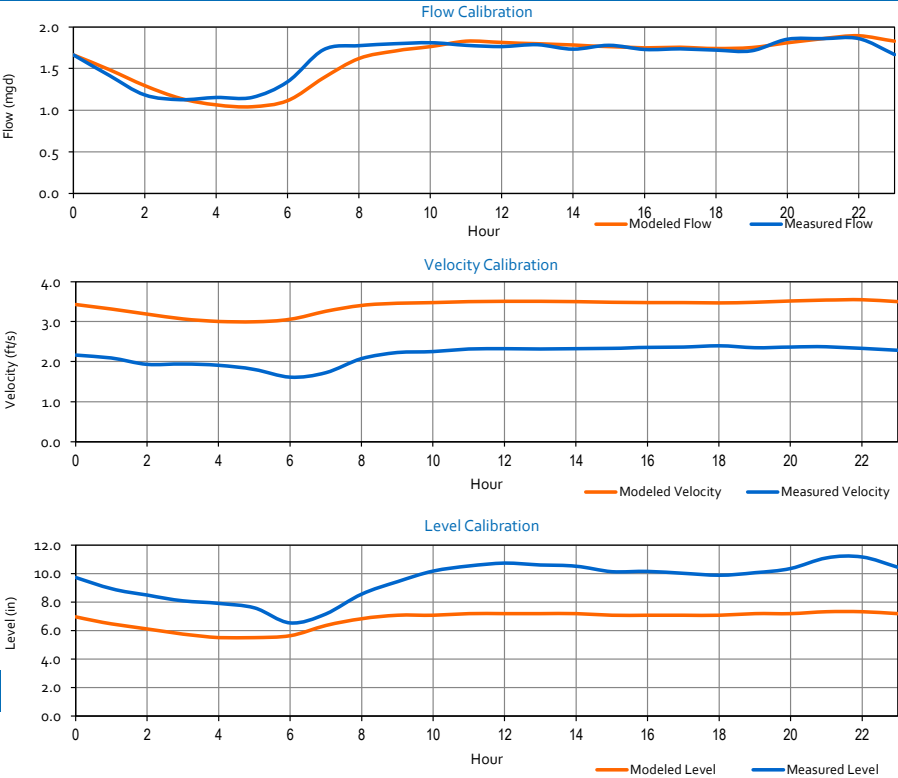
Pipeline Diameter: 24"
Manhole ID: MH75B-203
Model Pipe ID: 887 (gpm)



Model Calibration Summary

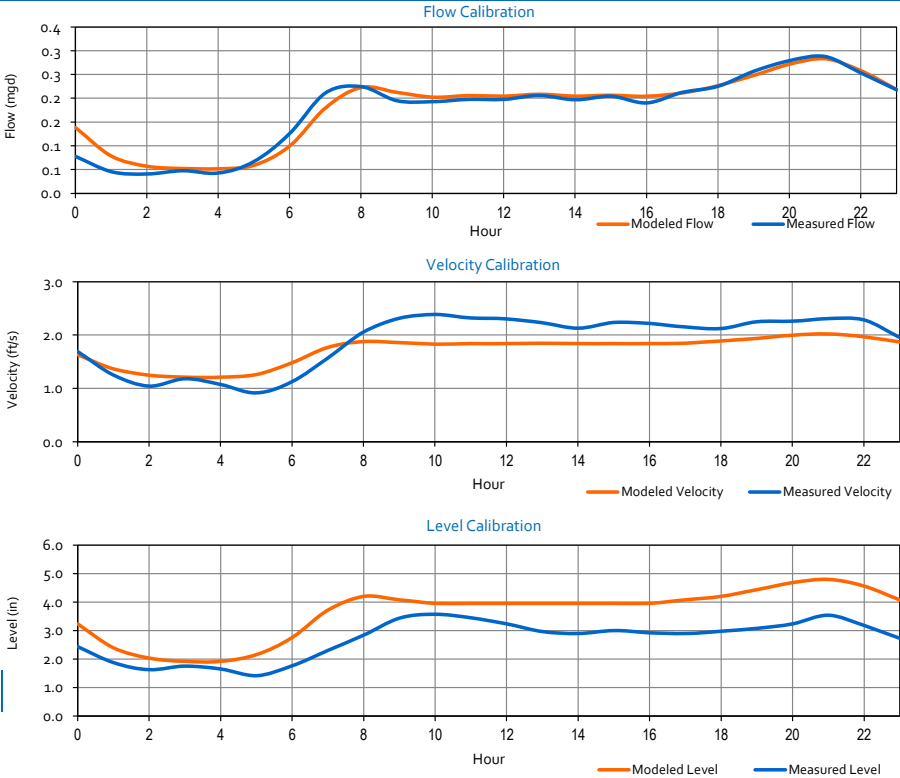
Day	Measured Data				Modeled Data				Percent Error ⁽¹⁾			
	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (%)	Peak Flow (%)	Avg. Level (%)	Avg. Vel. (%)
Thurs	1.63	1.86	10.0	2.0	1.61	1.89	6.79	3.39	-1%	2%	-32%	66%

Notes:
(1) Percent Error = (Modeled - Measured) / Measured x 100



Flow Monitoring Site FM14, Dry Weather Flow Calibration

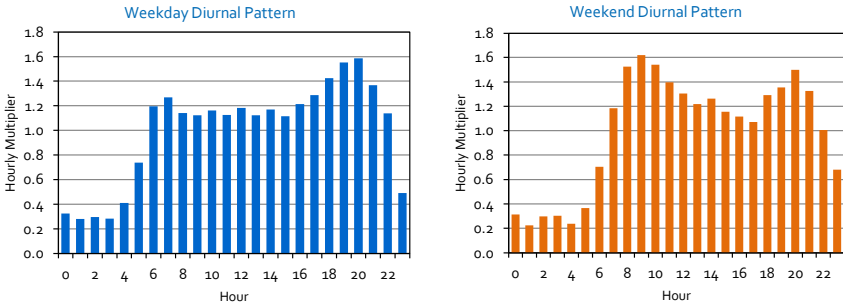
Pipeline Diameter: 8"
Manhole ID: MH83D-301
Model Pipe ID: 4231 (gpm)



Model Calibration Summary

Day	Measured Data				Modeled Data				Percent Error ⁽¹⁾			
	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (%)	Peak Flow (%)	Avg. Level (%)	Avg. Vel. (%)
Thurs	0.18	0.29	2.7	1.9	0.18	0.28	3.63	1.72	3%	-2%	34%	-9%

Notes:
(1) Percent Error = (Modeled - Measured) / Measured x 100

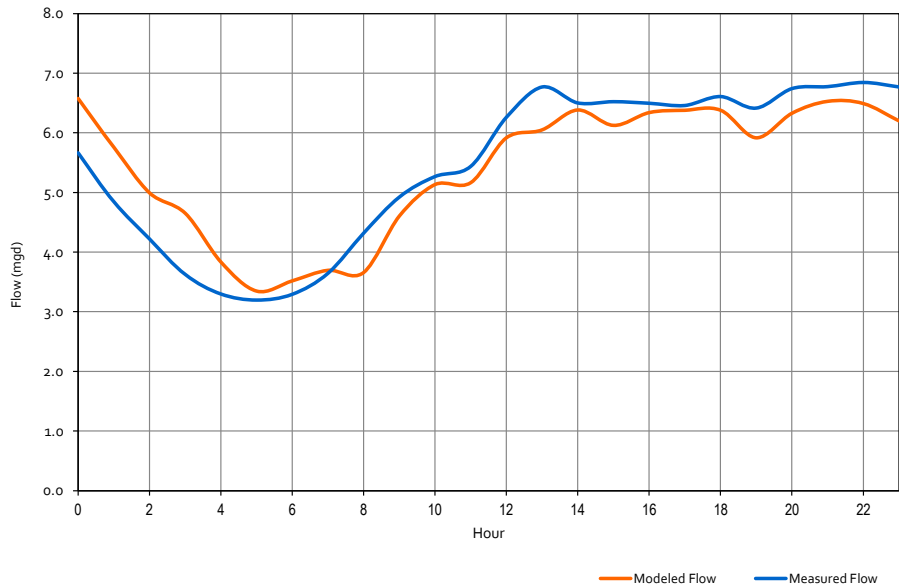


Flow Monitoring Site 15 and 16 DryWeatherFlowCalibration

Pipeline Diameter: 24-inch and 36-inch
 Manhole ID: MH96B-107 and MH96B-303
 Model Pipe ID: 3225 and 1975



Flow Calibration



Model Calibration Summary

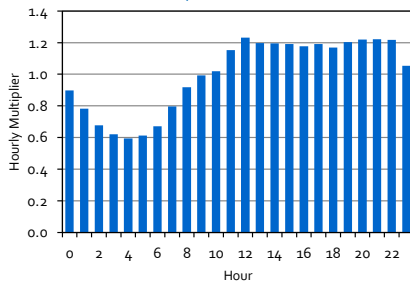
Day	Measured Data				Modeled Data				Percent Error ⁽¹⁾			
	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (mgd)	Peak Flow (mgd)	Avg. Level (in)	Avg. Vel. (ft/s)	Avg. Flow (%)	Peak Flow (%)	Avg. Level (%)	Avg. Vel. (%)
Thurs	5.46	6.85	-	-	5.42	6.58	-	-	-1%	-4%	-	-

Notes:

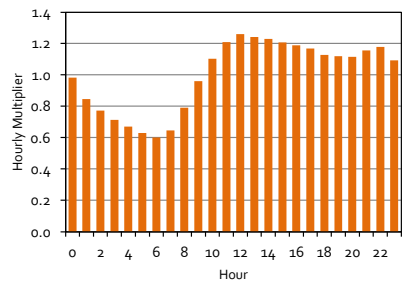
(1) Percent Error = (Modeled - Measured) / Measured x 100



Weekday Diurnal Pattern



Weekend Diurnal Pattern



APPENDIX 7A

WATER UNIT COSTS

8-inch Water Main

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Material DIP	Diameter (inch) 8	Length (mile) 1	Default Excavation Depth 4	Is the pipe crossing a freeway? No
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
PIPING						
	8" Push-on Joint Ductile Iron Pipe	1	LF	\$ 57	\$ 57	
	8" Adder For Restrained Joints	0.25	LF	\$ 27	\$ 7	
	Total Piping (per LF)					\$ 64
EARTHWORK						
	Hard Digging	0.30	CY	\$ 51	\$ 15	
	Trenching: Box Shoring	1	Day	\$ 5	\$ 5	
	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.20	CY	\$ 116	\$ 23	
	Imported Trench Backfill/Unconfined Struct. BF, Class B Material	0.08	CY	\$ 105	\$ 8	
	Controlled Density Fill (CDF)	0.01	CY	\$ 138	\$ 1	
	20 CY Dump Truck, 20 Miles/Round Trip	2.33	CY	\$ 11	\$ 26	
	Site Specific Requirements (% of Total Earthwork)	10%	LS		\$ 8	
	Total Earthwork (per LF)					\$ 86
PAVING						
	Asphalt Pavement Cutting	6	IN (Depth)	1.97	11.79	
	Remove 6" Asphalt Pavement	4.0	FT (Trench Width)	0.12	0.47	
	6" AC Paving ON 8" ABC	4.0	FT (Trench Width)	11.07	44.30	
	Micro Seal	50	FT (Street Width)	0.67	33.33	
	Total Paving (per LF)					\$ 90
FITTINGS, VALVES AND MANHOLES		No. per mile				
	Fittings	4	EA	0.09	0.37	
	Isolation Valve (Gate Valve for dia < 36", Butterfly Valve for dia >= 36")	7	EA	0.56	3.92	
	Air release Valve Assembly	4	EA	0.06	0.24	
	Blow off Valve Assembly	2	EA	0.06	0.12	
	Air release and blow off and valve manholes	13	EA	0.86	11.15	
	Total fittings, valves and manholes (per LF)					\$ 16
HYDRANT		No. per mile				
	Fire Hydrant	1	CY	0.03	0.03	
	Total Hydrant (per LF)					\$ 0.03
	TOTAL DIRECT COST (per LF)					\$ 260
	Contractor Overhead	10%				\$ 30
	Construction Profit	6%				\$ 20
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 20
	General Conditions	10%				\$ 30
	Traffic Control Multiplier	20%				\$ 50
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 410
	TOTAL CONSTRUCTION COSTS FOR 1 mile(s)					\$ 2,160,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

10-inch Water Main

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Material DIP	Diameter (inch) 10	Length (mile) 1	Default Excavation Depth 6	Is the pipe crossing a freeway? No
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
PIPING						
	10" Push-on Joint Ductile Iron Pipe	1	LF	\$ 55	\$ 55	
	10" Adder For Restrained Joints	0.25	LF	\$ 27	\$ 7	
	Total Piping (per LF)					\$ 62
EARTHWORK						
	Hard Digging	0.48	CY	\$ 51	\$ 25	
	Trenching: Box Shoring	1	Day	\$ 5	\$ 5	
	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.23	CY	\$ 116	\$ 27	
	Imported Trench Backfill/Unconfined Struct. BF, Class B Material	0.20	CY	\$ 105	\$ 22	
	Controlled Density Fill (CDF)	0.02	CY	\$ 138	\$ 3	
	20 CY Dump Truck, 20 Miles/Round Trip	2.77	CY	\$ 11	\$ 30	
	Site Specific Requirements (% of Total Earthwork)	10%	LS		\$ 11	
	Total Earthwork (per LF)					\$ 123
PAVING						
	Asphalt Pavement Cutting	6	IN (Depth)	1.97	11.79	
	Remove 6" Asphalt Pavement	4.2	FT (Trench Width)	0.12	0.48	
	6" AC Paving ON 8" ABC	4.2	FT (Trench Width)	11.07	46.14	
	Micro Seal	50	FT (Street Width)	0.67	33.33	
	Total Paving (per LF)					\$ 92
FITTINGS, VALVES AND MANHOLES		No. per mile				
	Fittings	4	EA	0.12	0.46	
	Isolation Valve (Gate Valve for dia < 36", Butterfly Valve for dia >= 36")	7	EA	0.71	4.98	
	Air release Valve Assembly	4	EA	0.06	0.24	
	Blow off Valve Assembly	2	EA	0.06	0.12	
	Air release and blow off and valve manholes	13	EA	0.86	11.15	
	Total fittings, valves and manholes (per LF)					\$ 17
HYDRANT		No. per mile				
	Fire Hydrant	1	CY	0.03	0.03	
	Total Hydrant (per LF)					\$ 0.03
	TOTAL DIRECT COST (per LF)					\$ 290
	Contractor Overhead	10%				\$ 30
	Construction Profit	6%				\$ 20
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 20
	General Conditions	10%				\$ 30
	Traffic Control Multiplier	20%				\$ 60
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 450
	TOTAL CONSTRUCTION COSTS FOR 1 mile(s)					\$ 2,380,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

12-inch Water Main

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Material DIP	Diameter (inch) 12	Length (mile) 1	Default Excavation Depth 6	Is the pipe crossing a freeway? No
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
PIPING						
	12" Push-on Joint Ductile Iron Pipe	1	LF	\$ 71	\$ 71	
	12" Adder For Restrained Joints	0.25	LF	\$ 36	\$ 9	
	Total Piping (per LF)					\$ 80
EARTHWORK						
	Hard Digging	0.52	CY	\$ 51	\$ 26	
	Trenching: Box Shoring	1	Day	\$ 5	\$ 5	
	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.27	CY	\$ 116	\$ 32	
	Imported Trench Backfill/Unconfined Struct. BF, Class B Material	0.19	CY	\$ 105	\$ 20	
	Controlled Density Fill (CDF)	0.02	CY	\$ 138	\$ 3	
	20 CY Dump Truck, 20 Miles/Round Trip	2.87	CY	\$ 11	\$ 31	
	Site Specific Requirements (% of Total Earthwork)	10%	LS		\$ 12	
	Total Earthwork (per LF)					\$ 130
PAVING						
	Asphalt Pavement Cutting	6	IN (Depth)	1.97	11.79	
	Remove 6" Asphalt Pavement	4.3	FT (Trench Width)	0.12	0.50	
	6" AC Paving ON 8" ABC	4.3	FT (Trench Width)	11.07	47.99	
	Micro Seal	50	FT (Street Width)	0.67	33.33	
	Total Paving (per LF)					\$ 94
FITTINGS, VALVES AND MANHOLES		No. per mile				
	Fittings	4	EA	0.15	0.61	
	Isolation Valve (Gate Valve for dia < 36", Butterfly Valve for dia >= 36")	7	EA	0.90	6.29	
	Air release Valve Assembly	4	EA	0.06	0.24	
	Blow off Valve Assembly	2	EA	0.06	0.12	
	Air release and blow off and valve manholes	13	EA	0.86	11.15	
	Total fittings, valves and manholes (per LF)					\$ 18
HYDRANT		No. per mile				
	Fire Hydrant	1	CY	0.03	0.03	
	Total Hydrant (per LF)					\$ 0.03
	TOTAL DIRECT COST (per LF)					\$ 320
	Contractor Overhead	10%				\$ 30
	Construction Profit	6%				\$ 20
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 30
	General Conditions	10%				\$ 30
	Traffic Control Multiplier	20%				\$ 60
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 490
	TOTAL CONSTRUCTION COSTS FOR 1 mile(s)					\$ 2,590,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

16-inch Water Main

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Material DIP	Diameter (inch) 16	Length (mile) 1	Default Excavation Depth 8	Is the pipe crossing a freeway? No
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
PIPING						
	16" Push-on Joint Ductile Iron Pipe	1	LF	\$ 115	\$ 115	
	16" Adder For Restrained Joints	0.25	LF	\$ 63	\$ 16	
	Total Piping (per LF)					\$ 131
EARTHWORK						
	Hard Digging	0.79	CY	\$ 51	\$ 40	
	Trenching: Box Shoring	1	Day	\$ 5	\$ 5	
	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.36	CY	\$ 116	\$ 42	
	Imported Trench Backfill/Unconfined Struct. BF, Class B Material	0.34	CY	\$ 105	\$ 36	
	Controlled Density Fill (CDF)	0.04	CY	\$ 138	\$ 5	
	20 CY Dump Truck, 20 Miles/Round Trip	3.51	CY	\$ 11	\$ 38	
	Site Specific Requirements (% of Total Earthwork)	10%	LS		\$ 17	
	Total Earthwork (per LF)					\$ 183
PAVING						
	Asphalt Pavement Cutting	6	IN (Depth)	1.97	11.79	
	Remove 6" Asphalt Pavement	4.7	FT (Trench Width)	0.12	0.54	
	6" AC Paving ON 8" ABC	4.7	FT (Trench Width)	11.07	51.68	
	Micro Seal	50	FT (Street Width)	0.67	33.33	
	Total Paving (per LF)					\$ 97
FITTINGS, VALVES AND MANHOLES		No. per mile				
	Fittings	4	EA	0.34	1.35	
	Isolation Valve (Gate Valve for dia < 36", Butterfly Valve for dia >= 36")	2	EA	3.03	6.06	
	Air release Valve Assembly	4	EA	0.06	0.24	
	Blow off Valve Assembly	2	EA	0.06	0.12	
	Air release and blow off and valve manholes	8	EA	0.86	6.86	
	Total fittings, valves and manholes (per LF)					\$ 15
HYDRANT		No. per mile				
	Fire Hydrant	1	CY	0.03	0.03	
	Total Hydrant (per LF)					\$ 0.03
	TOTAL DIRECT COST (per LF)					\$ 430
	Contractor Overhead	10%				\$ 40
	Construction Profit	6%				\$ 30
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 40
	General Conditions	10%				\$ 40
	Traffic Control Multiplier	20%				\$ 90
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 670
	TOTAL CONSTRUCTION COSTS FOR 1 mile(s)					\$ 3,540,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

20-inch Water Main

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Material DIP	Diameter (inch) 20	Length (mile) 1	Default Excavation Depth 8	Is the pipe crossing a freeway? No
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
PIPING						
	20" Push-on Joint Ductile Iron Pipe	1	LF	\$ 159	\$ 159	
	20" Adder For Restrained Joints	0.25	LF	\$ 89	\$ 22	
	Total Piping (per LF)					\$ 181
EARTHWORK						
	Hard Digging	0.96	CY	\$ 51	\$ 49	
	Trenching: Box Shoring	1	Day	\$ 5	\$ 5	
	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.50	CY	\$ 116	\$ 58	
	Imported Trench Backfill/Unconfined Struct. BF, Class B Material	0.34	CY	\$ 105	\$ 36	
	Controlled Density Fill (CDF)	0.04	CY	\$ 138	\$ 5	
	20 CY Dump Truck, 20 Miles/Round Trip	3.95	CY	\$ 11	\$ 43	
	Site Specific Requirements (% of Total Earthwork)	10%	LS		\$ 20	
	Total Earthwork (per LF)					\$ 217
PAVING						
	Asphalt Pavement Cutting	6	IN (Depth)	1.97	11.79	
	Remove 6" Asphalt Pavement	5.3	FT (Trench Width)	0.12	0.61	
	6" AC Paving ON 8" ABC	5.3	FT (Trench Width)	11.07	58.14	
	Micro Seal	50	FT (Street Width)	0.67	33.33	
	Total Paving (per LF)					\$ 104
FITTINGS, VALVES AND MANHOLES		No. per mile				
	Fittings	4	EA	0.57	2.28	
	Isolation Valve (Gate Valve for dia < 36", Butterfly Valve for dia >= 36")	2	EA	6.09	12.19	
	Air release Valve Assembly	4	EA	0.06	0.24	
	Blow off Valve Assembly	2	EA	0.06	0.12	
	Air release and blow off and valve manholes	8	EA	0.86	6.86	
	Total fittings, valves and manholes (per LF)					\$ 22
	TOTAL DIRECT COST (per LF)					\$ 520
	Contractor Overhead	10%				\$ 50
	Construction Profit	6%				\$ 30
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 40
	General Conditions	10%				\$ 50
	Traffic Control Multiplier	20%				\$ 100
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 790
	TOTAL CONSTRUCTION COSTS FOR 1 mile(s)					\$ 4,170,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

24-inch Water Main

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Material DIP	Diameter (inch) 24	Length (mile) 1	Default Excavation Depth 8	Is the pipe crossing a freeway? No
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
PIPING						
	24" Push-on Joint Ductile Iron Pipe	1	LF	\$ 215	\$ 215	
	24" Adder For Restrained Joints	0.25	LF	\$ 123	\$ 31	
	Total Piping (per LF)					\$ 246
EARTHWORK						
	Hard Digging	1.06	CY	\$ 51	\$ 54	
	Trenching: Box Shoring	1	Day	\$ 5	\$ 5	
	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.61	CY	\$ 116	\$ 71	
	Imported Trench Backfill/Unconfined Struct. BF, Class B Material	0.30	CY	\$ 105	\$ 31	
	Controlled Density Fill (CDF)	0.03	CY	\$ 138	\$ 5	
	20 CY Dump Truck, 20 Miles/Round Trip	4.19	CY	\$ 11	\$ 46	
	Site Specific Requirements (% of Total Earthwork)	10%	LS		\$ 21	
	Total Earthwork (per LF)					\$ 233
PAVING						
	Asphalt Pavement Cutting	6	IN (Depth)	1.97	11.79	
	Remove 6" Asphalt Pavement	5.6	FT (Trench Width)	0.12	0.65	
	6" AC Paving ON 8" ABC	5.6	FT (Trench Width)	11.07	61.83	
	Micro Seal	50	FT (Street Width)	0.67	33.33	
	Total Paving (per LF)					\$ 108
FITTINGS, VALVES AND MANHOLES		No. per mile				
	Fittings	4	EA	0.84	3.36	
	Isolation Valve (Gate Valve for dia < 36", Butterfly Valve for dia >= 36")	2	EA	9.60	19.20	
	Air release Valve Assembly	4	EA	0.16	0.62	
	Blow off Valve Assembly	2	EA	0.16	0.31	
	Air release and blow off and valve manholes	8	EA	0.86	6.86	
	Total fittings, valves and manholes (per LF)					\$ 30
	TOTAL DIRECT COST (per LF)					\$ 620
	Contractor Overhead	10%				\$ 60
	Construction Profit	6%				\$ 40
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 50
	General Conditions	10%				\$ 60
	Traffic Control Multiplier	20%				\$ 120
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 950
	TOTAL CONSTRUCTION COSTS FOR 1 mile(s)					\$ 5,020,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

2 MG Storage Tank

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

Capacity (MG)

2

	DESCRIPTION	SIZE	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Site Work	Cat Trackhoe, 1CY Bucket, Class B (Medium Digging), 0-16' D		1600	CY	\$ 19	\$ 29,921	
	8' H Double Swing Gate, Chain Link, 20' Opening	20'	1	EA	\$ 44,171	\$ 44,171	
	Standard Concrete Block, 8"	10'	5000	SF	\$ 25	\$ 124,412	
	2" ABC Finish		27	CY	\$ 133	\$ 3,591	
	6" AC Paving ON 6" ABC		162	SY	\$ 98	\$ 15,944	
	Bollard		12	EA	\$ 1,560	\$ 18,720	
	Overflow Retention Basin		1	LS	\$ 181,200	\$ 181,200	
	Large Site Grading		1	LS	\$ 75,000	\$ 75,000	
	Total Site Work						\$ 492,959
Structural Work	Reinforced concrete foundation		56	CY	\$ 500	\$ 28,000	
	Total Structural Work						\$ 28,000
Steel Tank	Welded steel tank	2 MGD	1	EA	\$ 2,144,645	\$ 2,144,645	
	2 MGD Active Mixing System with Recirculation Pump	2 MGD	1	EA	\$ 490,750	\$ 490,750	
	Total Steel Tank						\$ 2,635,395
Piping	Inlet piping	12"	110	LF	\$ 540	\$ 59,400	
	Outlet piping	12"	110	LF	\$ 540	\$ 59,400	
	Drain Piping	8"	100	LF	\$ 122	\$ 12,173	
	BFV Isolation valve	12"	2	EA	\$ 3,900	\$ 7,800	
	Check valve	12"	2	EA	\$ 12,905	\$ 25,810	
	Fitting	12"	6	EA	\$ 804	\$ 4,821	
	Total Piping						\$ 169,405
Painting & Coating	Epoxy Coating		50000	SF	\$ 9	\$ 450,000	
	Total Painting & Coating						\$ 450,000
	TOTAL						\$ 3,776,000
Electrical & Instrumentation	Electrical and Instrumentation		10%			\$ 377,600	
	Total Electrical & Instrumentation						\$ 378,000
Disinfection	Disinfection system		5%			\$ 188,800	
	Total Disinfection						\$ 189,000
	Total cost excluding landscaping and security						\$ 4,793,000
	Landscaping cost		1%			\$ 48,000	\$ 48,000
	Security costs for smaller capacity systems		1	EA	\$ 56,000	\$ 56,000	\$ 56,000
	TOTAL DIRECT COST						\$ 4,897,000
	Contractor Overhead		10%				\$ 490,000
	Construction Profit		6%				\$ 294,000
	Sales Tax (Applied to 65% of Total Direct Cost)		8%				\$ 411,000
	General Conditions		10%				\$ 490,000
	TOTAL CONSTRUCTION COSTS						\$ 6,582,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

3 MG Storage Tank

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

Capacity (MG)
3

	DESCRIPTION	SIZE	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Site Work	Cat Trackhoe, 1CY Bucket, Class B (Medium Digging), 0-16' D		1600	CY	\$ 19	\$ 29,921	
	8' H Double Swing Gate, Chain Link, 20' Opening		1	EA	\$ 44,171	\$ 44,171	
	Standard Concrete Block, 8"	10'	5000	SF	\$ 25	\$ 124,412	
	2" ABC Finish		27	CY	\$ 133	\$ 3,591	
	6" AC Paving ON 6" ABC		18	SY	\$ 98	\$ 1,772	
	Bollard		12	EA	\$ 1,560	\$ 18,720	
	Overflow Retention Basin		1	LS	\$ 181,200	\$ 181,200	
	Large Site Grading		1	LS	\$ 75,000	\$ 75,000	
	Total Site Work						\$ 478,786
Structural Work	Reinforced concrete foundation		88	CY	\$ 500	\$ 44,000	
	Total Structural Work						\$ 44,000
Steel Tank	Welded steel tank	3 MGD	1	EA	\$ 2,882,280	\$ 2,882,280	
	3 MGD Active Mixing System with Recirculation Pump	3 MGD	1	EA	\$ 490,750	\$ 490,750	
	Total Steel Tank						\$ 3,373,030
Piping	Inlet piping	16"	130	LF	\$ 720	\$ 93,600	
	Outlet piping	16"	130	LF	\$ 720	\$ 93,600	
	Drain Piping	8"	100	LF	\$ 122	\$ 12,173	
	BFV Isolation valve	16"	2	EA	\$ 5,634	\$ 11,268	
	Check valve	16"	2	EA	\$ 33,147	\$ 66,294	
	Fitting	16"	6	EA	\$ 1,782	\$ 10,690	
	Total Piping						\$ 287,625
Painting & Coating	Epoxy Coating		66000	SF	\$ 9	\$ 594,000	
	Total Painting & Coating						\$ 594,000
	TOTAL						\$ 4,777,000
Electrical & Instrumentation	Electrical and Instrumentation		10%			\$ 477,700	
	Total Electrical & Instrumentation						\$ 478,000
Disinfection	Disinfection system		5%			\$ 238,850	
	Total Disinfection						\$ 239,000
	Total cost excluding landscaping and security						\$ 6,088,000
	Landscaping cost		1%			\$ 61,000	\$ 61,000
	Security costs for smaller capacity systems		1	EA	\$ 56,000	\$ 56,000	\$ 56,000
	TOTAL DIRECT COST						\$ 6,205,000
	Contractor Overhead		10%				\$ 621,000
	Construction Profit		6%				\$ 372,000
	Sales Tax (Applied to 65% of Total Direct Cost)		8%				\$ 521,000
	General Conditions		10%				\$ 621,000
	TOTAL CONSTRUCTION COSTS						\$ 8,340,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

5 mgd Booster Pump Station

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Site Capacity (MGD)	Number of Pump Trains				
		5	4				
	DESCRIPTION	SIZE	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Site Work	Cat Trackhoe, 1CY Bucket, Class B (Medium Digging), 0-16' D		175	CY	\$ 19	\$ 3,273	
	8' H Double Swing Gate, Chain Link, 20' Opening	20'	1	EA	\$ 44,171	\$ 44,171	
	Standard concrete block wall 8"	8'	2880	SF	\$ 25	\$ 71,661	
	2" ABC Finish		900	CY	\$ 133	\$ 119,700	
	6" AC Paving ON 6" ABC		162	SY	\$ 98	\$ 15,944	
	Bollard		18	EA	\$ 1,560	\$ 28,080	
	Medium Site Grading		1	LS	\$ 38,880	\$ 38,880	
	Total Site Work						\$ 321,709
Structural Work	Precast concrete chlorine equipment building	10'x12'	1	LS	\$ 121,100	\$ 121,100	
	8" Chlorine building pad	10'x12'x8"	3	CY	\$ 500	\$ 1,500	
	12" Hydropneumatic tank pad	10'x20'x12"	30	CY	\$ 500	\$ 14,815	
	12" Pump and discharge piping pad	10'x25'x12"	10	CY	\$ 500	\$ 5,000	
	18" Generator pad	20'x20'x18"	17	CY	\$ 500	\$ 8,333	
	Precast concrete electrical equipment building	10'x30'	1	LS	\$ 280,000	\$ 280,000	
	12" Reinforced Concrete	3'x3'x12"	4	EA	\$ 500	\$ 2,000	
	Total Structural Work						\$ 432,748
Suction Header	20" CI 52 CLDI Mj Pipe - Plant	20"	25	LF	\$ 3,003	\$ 75,080	
	20" CLDI Flg Straight Tee In Place - Plant	20"	1	EA	\$ 12,747	\$ 12,747	
	Total Suction Header						\$ 87,827
Pump Train	10" CLDI Flg Straight Tee In Place - Plant	10"	12	EA	\$ 5,830	\$ 69,964	
	10" Resilient Wedge Gate Valve	10"	4	EA	\$ 3,760	\$ 15,038	
	12"- 200 PSI CI Fxf Swing Check Valve	10"	4	EA	\$ 9,229	\$ 36,916	
	10" AWWA Class 150B Flanged Butterfly Valve	10"	4	EA	\$ 3,026	\$ 12,106	
	30" Pipe Support	30"	12	EA	\$ 894	\$ 10,733	
	40 HP Vertical Turbine Pump	1200 gpm	4	EA	\$ 232,320	\$ 929,280	
	10" CI 52 CLDI Mj Pipe - Plant	10"	40	LF	\$ 1,502	\$ 60,073	
	1" 300 PSI Air/Vac Valve W/Shutoff	1"	8	EA	\$ 1,028	\$ 8,223	
	10" Fca Above Ground	10"	8	EA	\$ 2,112	\$ 16,894	
	Pressure/Vacuum Measurement Gauges		8	EA	\$ 1,867	\$ 14,940	
	5' C. I. Valve Box For 3"-20" Valves	5'	4	EA	\$ 2,450	\$ 9,801	
	Total Pump Train						\$ 1,183,967
Discharge Header	20" CI 52 CLDI Mj Pipe - Plant	20"	25	LF	\$ 3,003	\$ 75,080	
	20" CLDI Flg Straight Tee In Place - Plant	20"	1	EA	\$ 12,747	\$ 12,747	
	30" Pipe Support	30"	4	EA	\$ 894	\$ 3,578	
	Total Discharge Header						\$ 91,404
Pressure Relief	10" CI 52 CLDI Mj Pipe - Plant	10"	10	LF	\$ 1,502	\$ 15,018	
	10" 90° CLDI Mj Bend - Plant	10"	4	EA	\$ 696	\$ 2,783	
	10" AWWA Class 150B Flanged Butterfly Valve	10"	2	EA	\$ 3,026	\$ 6,053	
	High pressure relief valve	10"	1	EA	\$ 25,536	\$ 25,536	
	1" 300 PSI Air/Vac Valve W/Shutoff	1"	1	EA	\$ 1,028	\$ 1,028	
	5,000 gallon hydropneumatic tank w/ air comp & controls		1	EA	\$ 247,500	\$ 247,500	
	10,000 gallon hydropneumatic tank w/ air comp & controls		1	EA	\$ 360,000	\$ 360,000	
	Total Pressure Relief						\$ 657,918
	TOTAL						\$ 2,776,000
Electrical & Instrumentation	Electrical and Instrumentation		40%			\$ 1,110,400	
	Total Electrical & Instrumentation						\$ 1,110,000
Disinfection	Chlorine Disinfection		10%			\$ 277,600	
	Total Disinfection						\$ 278,000
Painting & Coatings	Painting & coating		10%			\$ 277,600	
	Total Painting & Coating						\$ 278,000
	Total cost excluding landscaping and security						\$ 4,442,000
	Landscaping cost		1%			\$ 44,000	\$ 44,000
	Security costs for smaller capacity systems		1	EA	\$ 56,000	\$ 56,000	\$ 56,000
	TOTAL DIRECT COST						\$ 4,542,000
	SRP Design Fee				\$ 200,000		\$ 200,000
	Contractor Overhead		10%				\$ 454,000
	Construction Profit		6%				\$ 273,000
	Sales Tax (Applied to 65% of Total Direct Cost)		8%				\$ 382,000
	General Conditions		10%				\$ 454,000
	TOTAL CONSTRUCTION COSTS						\$ 6,305,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

10 mgd Booster Pump Station

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Site Capacity (MGD)	Number of Pump Trains				
		10	4				
	DESCRIPTION	SIZE	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Site Work	Cat Trackhoe, 1CY Bucket, Class B (Medium Digging), 0-16' D		280	CY	\$ 19	\$ 5,236	
	8' H Double Swing Gate, Chain Link, 20' Opening	20'	1	EA	\$ 44,171	\$ 44,171	
	Standard concrete block wall 8"	8'	2880	SF	\$ 25	\$ 71,661	
	2" ABC Finish		900	CY	\$ 133	\$ 119,700	
	6" AC Paving ON 6" ABC		162	SY	\$ 98	\$ 15,944	
	Bollard		18	EA	\$ 1,560	\$ 28,080	
	Medium Site Grading		1	LS	\$ 38,880	\$ 38,880	
	Total Site Work						\$ 323,672
Structural Work	Precast concrete chlorine equipment building	10'x12'	1	LS	\$ 121,100	\$ 121,100	
	8" Chlorine building pad	10'x12'x8"	3	CY	\$ 500	\$ 1,500	
	12" Hydropneumatic tank pad	10'x20'x12"	30	CY	\$ 500	\$ 14,815	
	12" Pump and discharge piping pad	10'x25'x12"	10	CY	\$ 500	\$ 5,000	
	18" Generator pad	20'x20'x18"	17	CY	\$ 500	\$ 8,333	
	Precast concrete electrical equipment building	10'x30'	1	LS	\$ 280,000	\$ 280,000	
	12" Reinforced Concrete	4'x4'x12"	4	EA	\$ 500	\$ 2,000	
	Total Structural Work						\$ 432,748
Suction Header	30" CI 52 CLDI Mj Pipeh - Plant	30"	25	LF	\$ 4,504	\$ 112,602	
	30" CLDI Flg Straight Tee In Place - Plant	30"	1	EA	\$ 26,153	\$ 26,153	
	Total Suction Header						\$ 138,755
Pump Train	10" CLDI Flg Straight Tee In Place - Plant	10"	12	EA	\$ 5,830	\$ 69,964	
	10" Resilient Wedge Gate Valve	10"	4	EA	\$ 3,760	\$ 15,038	
	12"- 200 PSI CI Fxf Swing Check Valve	10"	4	EA	\$ 9,229	\$ 36,916	
	10" AWWA Class 150B Flanged Butterfly Valve	10"	4	EA	\$ 3,026	\$ 12,106	
	30" Pipe Support	30"	12	EA	\$ 894	\$ 10,733	
	75 HP Vertical Turbine Pump	2400 gpm	4	EA	\$ 343,510	\$ 1,374,041	
	10" CI 52 CLDI Mj Pipe - Plant	10"	40	LF	\$ 1,502	\$ 60,073	
	1" 300 PSI Air/Vac Valve W/Shutoff	1"	8	EA	\$ 1,028	\$ 8,223	
	10" Fca Above Ground	10"	8	EA	\$ 2,112	\$ 16,894	
	Pressure/Vacuum Measurement Gauges		8	EA	\$ 1,867	\$ 14,940	
	5' C. I. Valve Box For 3"-20" Valves	5'	4	EA	\$ 2,450	\$ 9,801	
	Total Pump Train						\$ 1,628,728
Discharge Header	30" CI 52 CLDI Mj Pipeh - Plant	30"	25	LF	\$ 4,504	\$ 112,602	
	30" CLDI Flg Straight Tee In Place - Plant	30"	1	EA	\$ 26,153	\$ 26,153	
	30" Pipe Support	30"	4	EA	\$ 894	\$ 3,578	
	Total Discharge Header						\$ 142,333
Pressure Relief	14" CI 52 CLDI Mj Pipe - Plant	14"	10	LF	\$ 2,102	\$ 21,019	
	14" 90° CLDI Mj Bend - Plant	14"	4	EA	\$ 1,755	\$ 7,018	
	14" AWWA Class 150B Flanged Butterfly Valve	14"	2	EA	\$ 4,537	\$ 9,074	
	High pressure relief valve	14"	1	EA	\$ 76,811	\$ 76,811	
	1" 300 PSI Air/Vac Valve W/Shutoff	1"	1	EA	\$ 1,028	\$ 1,028	
	5,000 gallon hydropneumatic tank w/ air comp & controls		1	EA	\$ 247,500	\$ 247,500	
	10,000 gallon hydropneumatic tank w/ air comp & controls		1	EA	\$ 360,000	\$ 360,000	
	Total Pressure Relief						\$ 722,451
	TOTAL						\$ 3,389,000
Electrical & Instrumentation	Electrical and Instrumentation		40%			\$ 1,355,600	
	Total Electrical & Instrumentation						\$ 1,356,000
Disinfection	Chlorine Disinfection		10%			\$ 338,900	
	Total Disinfection						\$ 339,000
Painting & Coatings	Painting & coating		10%			\$ 338,900	
	Total Painting & Coating						\$ 339,000
	Total cost excluding landscaping and security						\$ 5,423,000
	Landscaping cost		1%			\$ 54,000	\$ 54,000
	Security costs for smaller capacity systems		1	EA	\$ 56,000	\$ 56,000	\$ 56,000
	TOTAL DIRECT COST						\$ 5,533,000
	SRP Design Fee				\$ 200,000		\$ 200,000
	Contractor Overhead		10%				\$ 553,000
	Construction Profit		6%				\$ 332,000
	Sales Tax (Applied to 65% of Total Direct Cost)		8%				\$ 465,000
	General Conditions		10%				\$ 553,000
	TOTAL CONSTRUCTION COSTS						\$ 7,636,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

15 mgd Booster Pump Station

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Site Capacity (MGD)	Number of Pump Trains				
		15	5				
	DESCRIPTION	SIZE	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Site Work	Cat Trackhoe, 1CY Bucket, Class B (Medium Digging), 0-16' D		335	CY	\$ 19	\$ 6,265	
	8' H Double Swing Gate, Chain Link, 20' Opening	20'	1	EA	\$ 44,171	\$ 44,171	
	Standard concrete block wall 8"	8"	2880	SF	\$ 25	\$ 71,661	
	2" ABC Finish		900	CY	\$ 133	\$ 119,700	
	6" AC Paving ON 6" ABC		162	SY	\$ 98	\$ 15,944	
	Bollard		20	EA	\$ 1,560	\$ 31,200	
	Medium Site Grading		1	LS	\$ 38,880	\$ 38,880	
	Total Site Work						\$ 327,821
Structural Work	Precast concrete chlorine equipment building	10'x12'	1	LS	\$ 121,100	\$ 121,100	
	8" Chlorine building pad	10'x12'x8"	3	CY	\$ 500	\$ 1,500	
	12" Hydropneumatic tank pad	10'x20'x12"	30	CY	\$ 500	\$ 14,815	
	12" Pump and discharge piping pad	10'x30'x12"	12	CY	\$ 500	\$ 6,000	
	18" Generator pad	20'x20'x18"	17	CY	\$ 500	\$ 8,333	
	Precast concrete electrical equipment building	10'x30'	1	LS	\$ 280,000	\$ 280,000	
	12" Reinforced Concrete	4'x4'x12"	8	EA	\$ 500	\$ 4,000	
	Total Structural Work						\$ 435,748
Suction Header	36" CI 52 CLDI MJ Pipe - Plant	36"	30	LF	\$ 5,400	\$ 162,004	
	36" CLDI Flg Straight Tee In Place	36"	1	EA	\$ 39,934	\$ 39,934	
	Total Suction Header						\$ 201,938
Pump Train	10" CLDI Flg Straight Tee In Place - Plant	10"	15	EA	\$ 5,830	\$ 87,455	
	10" Resilient Wedge Gate Valve	10"	5	EA	\$ 3,760	\$ 18,798	
	12"- 200 PSI CI Fxf Swing Check Valve	10"	5	EA	\$ 9,229	\$ 46,144	
	10" AWWA Class 150B Flanged Butterfly Valve	10"	5	EA	\$ 3,026	\$ 15,132	
	30" Pipe Support	30"	15	EA	\$ 894	\$ 13,416	
	125 HP Vertical Turbine Pump	3127 gpm	5	EA	\$ 393,136	\$ 1,965,678	
	10" CI 52 CLDI MJ Pipe - Plant	10"	50	LF	\$ 1,502	\$ 75,092	
	1" 300 PSI Air/Vac Valve W/Shutoff	1"	10	EA	\$ 1,028	\$ 10,278	
	10" Fca Above Ground	10"	10	EA	\$ 2,112	\$ 21,117	
	Pressure/Vacuum Measurement Gauges		10	EA	\$ 1,867	\$ 18,675	
	5' C. I. Valve Box For 3"-20" Valves	5'	5	EA	\$ 2,450	\$ 12,251	
	Total Pump Train						\$ 2,284,037
Discharge Header	36" CI 52 CLDI MJ Pipe - Plant	36"	30	LF	\$ 5,400	\$ 162,004	
	36" CLDI Flg Straight Tee In Place	36"	1	EA	\$ 39,934	\$ 39,934	
	Concrete Pipe Support		5	EA	\$ 6,745	\$ 33,725	
	Total Discharge Header						\$ 235,663
Pressure Relief	16" CI 52 CLDI MJ Pipe - Plant	16"	10	LF	\$ 2,403	\$ 24,030	
	16" 90° CLDI MJ Bend - Plant	16"	4	EA	\$ 2,038	\$ 8,153	
	16" AWWA Class 150B Flanged Butterfly Valve	16"	2	EA	\$ 5,634	\$ 11,268	
	High pressure relief valve	16"	1	EA	\$ 78,650	\$ 78,650	
	1" 300 PSI Air/Vac Valve W/Shutoff	1"	1	EA	\$ 1,028	\$ 1,028	
	10,000 gallon hydropneumatic tank w/ air comp & controls		1	EA	\$ 360,000	\$ 360,000	
	20,000 gallon hydropneumatic tank w/ air comp & controls		1	EA	\$ 525,000	\$ 525,000	
	Total Pressure Relief						\$ 1,008,128
	TOTAL						\$ 4,493,000
Electrical & Instrumentation	Electrical and Instrumentation		40%			\$ 1,797,200	
	Total Electrical & Instrumentation						\$ 1,797,000
Disinfection	Chlorine Disinfection		10%			\$ 449,300	
	Total Disinfection						\$ 449,000
Painting & Coatings	Painting & coating		10%			\$ 449,300	
	Total Painting & Coating						\$ 449,000
	Total cost excluding landscaping and security						\$ 7,188,000
	Landscaping cost		1%			\$ 72,000	\$ 72,000
	Security costs for larger capacity systems		1	EA	\$ 84,000	\$ 84,000	\$ 84,000
	TOTAL DIRECT COST						\$ 7,344,000
	SRP Design Fee				\$ 200,000		\$ 200,000
	Contractor Overhead		10%				\$ 734,000
	Construction Profit		6%				\$ 441,000
	Sales Tax (Applied to 65% of Total Direct Cost)		8%				\$ 617,000
	General Conditions		10%				\$ 734,000
	TOTAL CONSTRUCTION COSTS						\$ 10,070,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

20 mgd Booster Pump Station

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Site Capacity (MGD)	Number of Pump Trains				
		20	5				
	DESCRIPTION	SIZE	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Site Work	Cat Trackhoe, 1CY Bucket, Class B (Medium Digging), 0-16' D		740	CY	\$ 19	\$ 13,838	
	8' H Double Swing Gate, Chain Link, 20' Opening	20'	1	EA	\$ 44,171	\$ 44,171	
	Standard concrete block wall 8"	8'	2880	SF	\$ 25	\$ 71,661	
	2" ABC Finish		900	CY	\$ 133	\$ 119,700	
	6" AC Paving ON 6" ABC		162	SY	\$ 98	\$ 15,944	
	Bollard		20	EA	\$ 1,560	\$ 31,200	
	Medium Site Grading		1	LS	\$ 38,880	\$ 38,880	
	Total Site Work						\$ 335,395
Structural Work	Precast concrete chlorine equipment building	10'x12'		LS	\$ 121,100	\$ -	
	8" Chlorine building pad	10'x12'x8"	3	CY	\$ 500	\$ 1,500	
	12" Hydropneumatic tank pad	10'x20'x12"	30	CY	\$ 500	\$ 14,815	
	12" Pump and discharge piping pad	10'x45'x12"	17	CY	\$ 500	\$ 8,500	
	18" Generator pad	20'x20'x18"	17	CY	\$ 500	\$ 8,333	
	Precast concrete electrical equipment building	10'x30'	1	LS	\$ 280,000	\$ 280,000	
	12" Reinforced Concrete	6'x6'x12"	20	EA	\$ 500	\$ 10,000	
	Total Structural Work						\$ 323,148
Suction Header	42" CI 52 CLDI MJ Pipe - Plant	42"	45	LF	\$ 6,300	\$ 283,507	
	42" CLDI Flg Straight Tee In Place	42"	1	EA	\$ 61,898	\$ 61,898	
	Total Suction Header						\$ 345,405
Pump Train	16" CLDI Flg Straight Tee In Place - Plant	16"	15	EA	\$ 17,397	\$ 260,957	
	16" Resilient Wedge Gate Valve	16"	5	EA	\$ 15,990	\$ 79,950	
	20"-250 PSI Swing Check Valve	16"	5	EA	\$ 44,439	\$ 222,196	
	16" AWWA Class 150B Flanged Butterfly Valve	16"	5	EA	\$ 5,634	\$ 28,171	
	30" Pipe Support	30"	15	EA	\$ 894	\$ 13,416	
	150 HP Vertical Turbine Pump	4169 gpm	5	EA	\$ 439,656	\$ 2,198,279	
	16" CI 52 CLDI MJ Pipe - Plant	16"	50	LF	\$ 2,403	\$ 120,148	
	1" 300 PSI Air/Vac Valve W/Shutoff	1"	10	EA	\$ 1,028	\$ 10,278	
	16" Fca Above Ground	16"	10	EA	\$ 3,756	\$ 37,562	
	Pressure/Vacuum Measurement Gauges		10	EA	\$ 1,867	\$ 18,675	
	5' C. I. Valve Box For 3"-20" Valves	5'	5	EA	\$ 2,450	\$ 12,251	
	Total Pump Train						\$ 3,001,884
Discharge Header	42" CI 52 CLDI MJ Pipe - Plant	42"	45	LF	\$ 6,300	\$ 283,507	
	42" CLDI Flg Straight Tee In Place	42"	1	EA	\$ 61,898	\$ 61,898	
	Concrete Pipe Support		5	EA	\$ 6,745	\$ 33,725	
	Total Discharge Header						\$ 379,130
Pressure Relief	20" CI 52 CLDI MJ Pipe - Plant	20"	10	LF	\$ 3,003	\$ 30,032	
	20" 90° CLDI MJ Bend - Plant	20"	4	EA	\$ 3,458	\$ 13,831	
	20" DIMJ AWWA Butterfly Valve, No Op	20"	2	EA	\$ 13,930	\$ 27,861	
	High pressure relief valve	20"	1	EA	\$ 85,391	\$ 85,391	
	1" 300 PSI Air/Vac Valve W/Shutoff	1"	1	EA	\$ 1,028	\$ 1,028	
	10,000 gallon hydropneumatic tank w/ air comp & controls		1	EA	\$ 360,000	\$ 360,000	
	20,000 gallon hydropneumatic tank w/ air comp & controls		1	EA	\$ 525,000	\$ 525,000	
	Total Pressure Relief						\$ 1,043,142
	TOTAL						\$ 5,428,000
Electrical & Instrumentation	Electrical and Instrumentation		40%			\$ 2,171,200	
	Total Electrical & Instrumentation						\$ 2,171,000
Disinfection	Chlorine Disinfection		10%			\$ 542,800	
	Total Disinfection						\$ 543,000
Painting & Coatings	Painting & coating		10%			\$ 542,800	
	Total Painting & Coating						\$ 543,000
	Total cost excluding landscaping and security						\$ 8,685,000
	Landscaping cost		1%			\$ 87,000	\$ 87,000
	Security costs for larger capacity systems		1	EA	\$ 84,000	\$ 84,000	\$ 84,000
	TOTAL DIRECT COST						\$ 8,856,000
	SRP Design Fee				\$ 200,000		\$ 200,000
	Contractor Overhead		10%				\$ 886,000
	Construction Profit		6%				\$ 531,000
	Sales Tax (Applied to 65% of Total Direct Cost)		8%				\$ 744,000
	General Conditions		10%				\$ 886,000
	TOTAL CONSTRUCTION COSTS						\$ 12,103,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

1 mgd Well Project: 2024 Integrated Water Master Plan Client: City of Goodyear							
		Well Capacity (MGD)	Well Depth (ft)	Well Diameter (in)			
3 MGD Well		1	1200	14			
	DESCRIPTION	SIZE	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Site Work	8' H Double Swing Gate, Chain Link, 20' Opening	20'	1	EA	\$ 44,171	\$ 44,171	
	Standard Concrete Block, 8"	8'	1600	SF	\$ 25	\$ 39,812	
	2" ABC Finish		20	CY	\$ 133	\$ 2,660	
	6" AC Paving ON 6" ABC		162	CY	\$ 98	\$ 15,944	
	Bollard		10	EA	\$ 1,560	\$ 15,600	
	Well drilling & steel casing		1	LS	\$ 1,000,000	\$ 1,000,000	
	Small Site Grading		1	LS	\$ 12,000	\$ 12,000	
	Total Site Work						\$ 1,130,187
Structural Work	12" Sloped Slab On Grade (To 30%)	10'x30'x12"	12	CY	\$ 500	\$ 6,000	
	Precast concrete building (HVAC, electrical and lighting)	10'x30'	1	LS	\$ 280,000	\$ 280,000	
	12" Reinforced Concrete	10'x20'x12"	7	CY	\$ 500	\$ 3,704	
	Total Structural Work						\$ 289,704
Well Pump	Well pump	694 gpm	1	LS	\$ 250,000	\$ 250,000	
	Total Well Pump						\$ 250,000
Discharge Header	Fitting	8"	3	EA	\$ 1,749	\$ 5,247	
	8" Flex Cplg, Above Ground	8"	3	EA	\$ 889	\$ 2,668	
	8" CLDI Flg Straight Tee In Place	8"	30	LF	\$ 1,749	\$ 52,467	
	2" 300 PSI Air/Vac Valve W/Shutoff	2"	1	EA	\$ 1,647	\$ 1,647	
	2" 150 PSI Air Release Valve Stainless Steel 317	2"	1	EA	\$ 819	\$ 819	
	10"- 200 PSI CI FXF Swing Check Valve	8"	1	EA	\$ 4,665	\$ 4,665	
	30" Pipe Support	30"	3	EA	\$ 894	\$ 2,683	
	8" AWWA Class 150B Flanged Butterfly Valve	8"	1	EA	\$ 2,980	\$ 2,980	
	SCH40 PVC Drain Pipe	2.5"	20	LF	\$ 192	\$ 3,831	
	Process Pressure Gauge		1	EA	\$ 240	\$ 240	
	Total Discharge Header						\$ 77,247
Pressure Relief	10,000 gal discharge surge tank	10,000 gal	1	EA	\$ 360,000	\$ 360,000	
	Total Pressure Relief						\$ 360,000
	TOTAL						\$ 2,107,000
Electrical & Instrumentation	Electrical and Instrumentation		35%			\$ 737,450	
	Total Electrical & Instrumentation						\$ 737,000
Disinfection	Chlorination system		10%			\$ 210,700	
	Total Disinfection						\$ 211,000
	Total cost excluding landscaping and security						\$ 3,055,000
	Landscaping cost		1%			\$ 31,000	\$ 31,000
	Security costs for smaller capacity systems		1	EA	\$ 56,000	\$ 56,000	\$ 56,000
	TOTAL DIRECT COST						\$ 3,142,000
	SRP Design Fee				\$ 200,000		\$ 200,000
	Contractor Overhead		10%				\$ 314,000
	Construction Profit		6%				\$ 189,000
	Sales Tax (Applied to 65% of Total Direct Cost)		8%				\$ 264,000
	General Conditions		10%				\$ 314,000
	TOTAL CONSTRUCTION COSTS						\$ 4,423,000

Notes:

This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

1.5 mgd Well

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Well Capacity (MGD)	Well Depth (ft)	Well Diameter (in)			
3 MGD Well		1.5	1200	16			
	DESCRIPTION	SIZE	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Site Work	8' H Double Swing Gate, Chain Link, 20' Opening	20'	1	EA	\$ 44,171	\$ 44,171	
	Standard Concrete Block, 8"	8'	1600	SF	\$ 25	\$ 39,812	
	2" ABC Finish		20	CY	\$ 133	\$ 2,660	
	6" AC Paving ON 6" ABC		162	CY	\$ 98	\$ 15,944	
	Bollard		10	EA	\$ 1,560	\$ 15,600	
	Well drilling & steel casing		1	LS	\$ 1,000,000	\$ 1,000,000	
	Small Site Grading		1	LS	\$ 12,000	\$ 12,000	
	Total Site Work						\$ 1,130,187
Structural Work	12" Sloped Slab On Grade (To 30%)	10'x30'x12"	12	CY	\$ 500	\$ 6,000	
	Precast concrete building (HVAC, electrical and lighting)	10'x30'	1	LS	\$ 280,000	\$ 280,000	
	12" Reinforced Concrete	10'x20'x12"	7	CY	\$ 500	\$ 3,704	
	Total Structural Work						\$ 289,704
Well Pump	Well pump	1050 gpm	1	LS	\$ 255,747	\$ 255,747	
	Total Well Pump						\$ 255,747
Discharge Header	Fitting	10"	3	EA	\$ 4,523	\$ 13,570	
	10" Flex Cplg, Above Ground	10"	3	EA	\$ 1,156	\$ 3,468	
	10" CLDI Flg Straight Tee In Place	10"	30	LF	\$ 4,523	\$ 135,705	
	2" 300 PSI Air/Vac Valve W/Shutoff	2"	1	EA	\$ 1,647	\$ 1,647	
	2" 150 PSI Air Release Valve Stainless Steel 317	2"	1	EA	\$ 819	\$ 819	
	12"- 200 PSI CI FXF Swing Check Valve	10"	1	EA	\$ 9,229	\$ 9,229	
	30" Pipe Support	30"	3	EA	\$ 894	\$ 2,683	
	10" AWWA Class 150B Flanged Butterfly Valve	10"	1	EA	\$ 3,026	\$ 3,026	
	SCH40 PVC Drain Pipe	2.5"	20	LF	\$ 192	\$ 3,831	
	Process Pressure Gauge		1	EA	\$ 240	\$ 240	
	Total Discharge Header						\$ 174,218
Pressure Relief	10,000 gal discharge surge tank	10,000 gal	1	EA	\$ 360,000	\$ 360,000	
	Total Pressure Relief						\$ 360,000
	TOTAL						\$ 2,210,000
Electrical & Instrumentation	Electrical and Instrumentation		35%			\$ 773,500	
	Total Electrical & Instrumentation						\$ 774,000
Disinfection	Chlorination system		10%			\$ 221,000	
	Total Disinfection						\$ 221,000
	Total cost excluding landscaping and security						\$ 3,205,000
	Landscaping cost		1%			\$ 32,000	\$ 32,000
	Security costs for smaller capacity systems		1	EA	\$ 56,000	\$ 56,000	\$ 56,000
	TOTAL DIRECT COST						\$ 3,293,000
	SRP Design Fee				\$ 200,000		\$ 200,000
	Contractor Overhead		10%				\$ 329,000
	Construction Profit		6%				\$ 198,000
	Sales Tax (Applied to 65% of Total Direct Cost)		8%				\$ 277,000
	General Conditions		10%				\$ 329,000
	TOTAL CONSTRUCTION COSTS						\$ 4,626,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

3 mgd Well

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Well Capacity (MGD)	Well Depth (ft)	Well Diameter (in)			
3 MGD Well		3	1200	18			
	DESCRIPTION	SIZE	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Site Work	8' H Double Swing Gate, Chain Link, 20' Opening	20'	1	EA	\$ 44,171	\$ 44,171	
	Standard Concrete Block, 8"	8'	1600	SF	\$ 25	\$ 39,812	
	2" ABC Finish		20	CY	\$ 133	\$ 2,660	
	6" AC Paving ON 6" ABC		162	CY	\$ 98	\$ 15,944	
	Bollard		10	EA	\$ 1,560	\$ 15,600	
	Well drilling & steel casing		1	LS	\$ 1,000,000	\$ 1,000,000	
	Small Site Grading		1	LS	\$ 12,000	\$ 12,000	
	Total Site Work						\$ 1,130,187
Structural Work	12" Sloped Slab On Grade (To 30%)	10'x30'x12"	12	CY	\$ 500	\$ 6,000	
	Precast concrete building (HVAC, electrical and lighting)	10'x30'	1	LS	\$ 280,000	\$ 280,000	
	12" Reinforced Concrete	10'x20'x12"	7	CY	\$ 500	\$ 3,704	
	Total Structural Work						\$ 289,704
Well Pump	Well pump	2082 gpm	1	LS	\$ 327,427	\$ 327,427	
	Total Well Pump						\$ 327,427
Discharge Header	Fitting	14"	3	EA	\$ 8,342	\$ 25,025	
	14" Flex Cplg, Above Ground	14"	3	EA	\$ 2,256	\$ 6,767	
	14" CLDI Flg Straight Tee In Place	14"	30	LF	\$ 8,342	\$ 250,245	
	3" 300 PSI Air/Vac Valve W/Shutoff	3"	1	EA	\$ 3,373	\$ 3,373	
	3" 150 PSI Air Release Valve Stainless Steel 318	3"	1	EA	\$ 1,744	\$ 1,744	
	16"- 125# Di FXF Swing Check Valve	14"	1	EA	\$ 33,147	\$ 33,147	
	30" Pipe Support	30"	3	EA	\$ 894	\$ 2,683	
	14" AWWA Class 150B Flanged Butterfly Valve	14"	1	EA	\$ 4,537	\$ 4,537	
	SCH40 PVC Drain Pipe	2.5"	20	LF	\$ 192	\$ 3,831	
	Process Pressure Gauge		1	EA	\$ 240	\$ 240	
	Total Discharge Header						\$ 331,592
Pressure Relief	10,000 gal discharge surge tank	10,000 gal	1	EA	\$ 360,000	\$ 360,000	
	Total Pressure Relief						\$ 360,000
	TOTAL						\$ 2,439,000
Electrical & Instrumentation	Electrical and Instrumentation		35%			\$ 853,650	
	Total Electrical & Instrumentation						\$ 854,000
Disinfection	Chlorination system		10%			\$ 243,900	
	Total Disinfection						\$ 244,000
	Total cost excluding landscaping and security						\$ 3,537,000
	Landscaping cost		1%			\$ 35,000	\$ 35,000
	Security costs for smaller capacity systems		1	EA	\$ 56,000	\$ 56,000	\$ 56,000
	TOTAL DIRECT COST						\$ 3,628,000
	SRP Design Fee				\$ 200,000		\$ 200,000
	Contractor Overhead		10%				\$ 363,000
	Construction Profit		6%				\$ 218,000
	Sales Tax (Applied to 65% of Total Direct Cost)		8%				\$ 305,000
	General Conditions		10%				\$ 363,000
	TOTAL CONSTRUCTION COSTS						\$ 5,077,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

APPENDIX 7B

WASTEWATER UNIT COSTS

8-inch Gravity Main						
Project:		2024 Integrated Water Master Plan				
Client:		City of Goodyear				
		Material	Diameter	Length (mile)	Default Excavation Depth	
		VCP	8	1	6	
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
PIPE						
	8" C-700 VCP In Open Trench	1	LF	\$ 31	\$ 31	
	Total Piping (per LF)					\$ 31
EARTHWORK						
Excavation	Hard Digging	0.44	CY	\$ 51	\$ 23	
	Trenching: Box Shoring	1	Day	\$ 5	\$ 5	
&Backfill	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.20	CY	\$ 116	\$ 23	
	Native Trench Backfill/Unconfined Struct. BF, Class A Material	0.21	CY	\$ 31	\$ 7	
	Controlled Density Fill (CDF)	0.02	CY	\$ 138	\$ 3	
	20 CY Dump Truck, 20 Miles/Round Trip	5.02	CY	\$ 11	\$ 55	
	Site Specific Requirements	10%	LS		\$ 12	
	Total Earthwork (per LF)					\$ 127
Asphalt Paving	ASPHALT PAVEMENT CUTTING	4	IN (Depth)	\$ 2	\$ 8	
Demo & Replacement	REMOVE 4"-6" ASPHALT PAVEMENT	12	FT (Street Width)	\$ 1	\$ 1	
	4" AC PAVING ON 8" ABC	12	FT (Street Width)	\$ 11	\$ 15	
	Micro Seal	50	FT (Street Width)	\$ 1	\$ 33	
	Total Paving (per LF)					\$ 57
Manholes						
		No. per 400 ft				
	Manhole	1	EA	\$ 11	\$ 11	
	Heavy Traffic Frame and Manhole Cover	1	EA	\$ 2	\$ 2	
	Concrete Manhole Invert, Single Channel	1	EA	\$ 2	\$ 2	
	Total Manholes (per LF)					\$ 20
	TOTAL DIRECT COST (per LF)					\$ 230
	Contractor Overhead	10%				\$ 20
	Construction Profit	6%				\$ 10
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 20
	General Conditions	10%				\$ 20
	Traffic Control costs	10%				\$ 20
	Cost for bypass lines	10%				\$ 20
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 340
	TOTAL CONSTRUCTION COSTS (per mile)					\$ 1,800,000

Notes:

This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

12-inch Gravity Main						
Project:		2024 Integrated Water Master Plan				
Client:		City of Goodyear				
		Material	Diameter	Length (mile)	Default Excavation Depth	
		VCP	12	1	6	
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
PIPE						
	12" C-700 VCP In Open Trench	1	LF	\$ 43	\$ 43	
	Total Piping (per LF)					\$ 43
EARTHWORK						
Excavation	Hard Digging	0.52	CY	\$ 51	\$ 26	
	Trenching: Box Shoring	1	Day	\$ 5	\$ 5	
&Backfill	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.27	CY	\$ 116	\$ 32	
	Native Trench Backfill/Unconfined Struct. BF, Class A Material	0.19	CY	\$ 31	\$ 6	
	Controlled Density Fill (CDF)	0.02	CY	\$ 138	\$ 3	
	20 CY Dump Truck, 20 Miles/Round Trip	5.18	CY	\$ 11	\$ 57	
	Site Specific Requirements	10%	LS		\$ 13	
	Total Earthwork (per LF)					\$ 142
Asphalt Paving	ASPHALT PAVEMENT CUTTING	4	IN (Depth)	\$ 2	\$ 8	
Demo & Replacement	REMOVE 4"-6" ASPHALT PAVEMENT	12	FT (Street Width)	\$ 1	\$ 1	
	4" AC PAVING ON 8" ABC	12	FT (Street Width)	\$ 11	\$ 15	
	Micro Seal	50	FT (Street Width)	\$ 1	\$ 33	
	Total Paving (per LF)					\$ 57
		No. per 400 ft				
Manholes	Manhole	1	EA	\$ 11	\$ 11	
	Heavy Traffic Frame and Manhole Cover	1	EA	\$ 2	\$ 2	
	Concrete Manhole Invert, Single Channel	1	EA	\$ 2	\$ 2	
	Total Manholes (per LF)					\$ 20
TOTAL DIRECT COST (per LF)						\$ 260
Contractor Overhead		10%				\$ 30
Construction Profit		6%				\$ 20
Sales Tax (Applied to 65% of Total Direct Cost)		8%				\$ 20
General Conditions		10%				\$ 30
Traffic Control costs		10%				\$ 30
Cost for bypass lines		10%				\$ 30
TOTAL CONSTRUCTION COSTS (per LF)						\$ 420
TOTAL CONSTRUCTION COSTS (per mile)						\$ 2,220,000

Notes:

This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

15-inch Gravity Main						
Project:		2024 Integrated Water Master Plan				
Client:		City of Goodyear				
		Material	Diameter	Length (mile)	Default Excavation Depth	
		VCP	15	1	8	
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
PIPE						
	15" C-700 VCP In Open Trench	1	LF	\$ 72	\$ 72	
	Total Piping (per LF)					\$ 72
EARTHWORK						
Excavation	Hard Digging	0.77	CY	\$ 51	\$ 39	
	Trenching: Box Shoring	1	Day	\$ 5	\$ 5	
&Backfill	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.34	CY	\$ 116	\$ 39	
	Native Trench Backfill/Unconfined Struct. BF, Class A Material	0.34	CY	\$ 31	\$ 11	
	Controlled Density Fill (CDF)	0.04	CY	\$ 138	\$ 5	
	20 CY Dump Truck, 20 Miles/Round Trip	5.74	CY	\$ 11	\$ 63	
	Site Specific Requirements	10%	LS		\$ 16	
	Total Earthwork (per LF)					\$ 178
Asphalt Paving	ASPHALT PAVEMENT CUTTING	4	IN (Depth)	\$ 2	\$ 8	
Demo & Replacement	REMOVE 4"-6" ASPHALT PAVEMENT	12	FT (Street Width)	\$ 1	\$ 1	
	4" AC PAVING ON 8" ABC	12	FT (Street Width)	\$ 11	\$ 15	
	Micro Seal	50	FT (Street Width)	\$ 1	\$ 33	
	Total Paving (per LF)					\$ 57
Manholes						
		No. per 400 ft				
	Manhole	1	EA	\$ 11	\$ 11	
	Heavy Traffic Frame and Manhole Cover	1	EA	\$ 2	\$ 2	
	Concrete Manhole Invert, Single Channel	1	EA	\$ 2	\$ 2	
	Total Manholes (per LF)					\$ 20
	TOTAL DIRECT COST (per LF)					\$ 330
	Contractor Overhead	10%				\$ 30
	Construction Profit	6%				\$ 20
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 30
	General Conditions	10%				\$ 30
	Traffic Control costs	10%				\$ 30
	Cost for bypass lines	10%				\$ 30
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 500
	TOTAL CONSTRUCTION COSTS (per mile)					\$ 2,640,000

Notes:

This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

16-inch Gravity Main						
Project:		2024 Integrated Water Master Plan				
Client:		City of Goodyear				
		Material	Diameter	Length (mile)	Default Excavation Depth	
		VCP	16	1	8	
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
PIPE						
	16" C-700 VCP In Open Trench	1	LF	\$ 104	\$ 104	
	Total Piping (per LF)					\$ 104
EARTHWORK						
Excavation	Hard Digging	0.79	CY	\$ 51	\$ 40	
	Trenching: Box Shoring	1	Day	\$ 5	\$ 5	
&Backfill	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.36	CY	\$ 116	\$ 42	
	Native Trench Backfill/Unconfined Struct. BF, Class A Material	0.34	CY	\$ 31	\$ 10	
	Controlled Density Fill (CDF)	0.04	CY	\$ 138	\$ 5	
	20 CY Dump Truck, 20 Miles/Round Trip	5.79	CY	\$ 11	\$ 64	
	Site Specific Requirements	10%	LS		\$ 17	
	Total Earthwork (per LF)					\$ 183
Asphalt Paving	ASPHALT PAVEMENT CUTTING	4	IN (Depth)	\$ 2	\$ 8	
Demo & Replacement	REMOVE 4"-6" ASPHALT PAVEMENT	12	FT (Street Width)	\$ 1	\$ 1	
	4" AC PAVING ON 8" ABC	12	FT (Street Width)	\$ 11	\$ 15	
	Micro Seal	50	FT (Street Width)	\$ 1	\$ 33	
	Total Paving (per LF)					\$ 57
		No. per 400 ft				
Manholes	Manhole	1	EA	\$ 11	\$ 11	
	Heavy Traffic Frame and Manhole Cover	1	EA	\$ 2	\$ 2	
	Concrete Manhole Invert, Single Channel	1	EA	\$ 2	\$ 2	
	Total Manholes (per LF)					\$ 20
TOTAL DIRECT COST (per LF)						\$ 360
Contractor Overhead		10%				\$ 40
Construction Profit		6%				\$ 20
Sales Tax (Applied to 65% of Total Direct Cost)		8%				\$ 30
General Conditions		10%				\$ 40
Traffic Control costs		10%				\$ 40
Cost for bypass lines		10%				\$ 40
TOTAL CONSTRUCTION COSTS (per LF)						\$ 570
TOTAL CONSTRUCTION COSTS (per mile)						\$ 3,010,000

Notes:

This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

18-inch Gravity Main						
Project:		2024 Integrated Water Master Plan				
Client:		City of Goodyear				
		Material	Diameter	Length (mile)	Default Excavation Depth	
		VCP	18	1	8	
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
PIPE						
	18" C-700 VCP In Open Trench	1	LF	\$ 86	\$ 86	
	Total Piping (per LF)					\$ 86
EARTHWORK						
Excavation	Hard Digging	0.91	CY	\$ 51	\$ 47	
	Trenching: Box Shoring	1	Day	\$ 5	\$ 5	
&Backfill	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.45	CY	\$ 116	\$ 52	
	Native Trench Backfill/Unconfined Struct. BF, Class A Material	0.36	CY	\$ 31	\$ 11	
	Controlled Density Fill (CDF)	0.04	CY	\$ 138	\$ 6	
	20 CY Dump Truck, 20 Miles/Round Trip	6.07	CY	\$ 11	\$ 67	
	Site Specific Requirements	10%	LS		\$ 19	
	Total Earthwork (per LF)					\$ 205
Asphalt Paving	ASPHALT PAVEMENT CUTTING	4	IN (Depth)	\$ 2	\$ 8	
Demo & Replacement	REMOVE 4"-6" ASPHALT PAVEMENT	12	FT (Street Width)	\$ 1	\$ 1	
	4" AC PAVING ON 8" ABC	12	FT (Street Width)	\$ 11	\$ 15	
	Micro Seal	50	FT (Street Width)	\$ 1	\$ 33	
	Total Paving (per LF)					\$ 57
Manholes						
		No. per 400 ft				
	Manhole	1	EA	\$ 11	\$ 11	
	Heavy Traffic Frame and Manhole Cover	1	EA	\$ 2	\$ 2	
	Concrete Manhole Invert, Single Channel	1	EA	\$ 2	\$ 2	
	Total Manholes (per LF)					\$ 20
	TOTAL DIRECT COST (per LF)					\$ 370
	Contractor Overhead	10%				\$ 40
	Construction Profit	6%				\$ 20
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 30
	General Conditions	10%				\$ 40
	Traffic Control costs	10%				\$ 40
	Cost for bypass lines	10%				\$ 40
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 580
	TOTAL CONSTRUCTION COSTS (per mile)					\$ 3,060,000

Notes:

This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

20-inch Gravity Main						
Project:		2024 Integrated Water Master Plan				
Client:		City of Goodyear				
		Material	Diameter	Length (mile)	Default Excavation Depth	
		VCP	20	1	8	
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
PIPE						
	20" C-700 VCP In Open Trench	1	LF	\$ 130	\$ 130	
	Total Piping (per LF)					\$ 130
EARTHWORK						
	Excavation					
	Hard Digging	0.96	CY	\$ 51	\$ 49	
	Trenching: Box Shoring	1	Day	\$ 5	\$ 5	
	&Backfill	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.50	CY	\$ 116	\$ 58
		Native Trench Backfill/Unconfined Struct. BF, Class A Material	0.34	CY	\$ 31	\$ 11
		Controlled Density Fill (CDF)	0.04	CY	\$ 138	\$ 5
		20 CY Dump Truck, 20 Miles/Round Trip	6.17	CY	\$ 11	\$ 68
		Site Specific Requirements	10%	LS		\$ 20
		Total Earthwork (per LF)				\$ 215
	Asphalt Paving					
	ASPHALT PAVEMENT CUTTING	4	IN (Depth)	\$ 2	\$ 8	
	Demo &					
	REMOVE 4"-6" ASPHALT PAVEMENT	12	FT (Street Width)	\$ 1	\$ 1	
	Replacement					
	4" AC PAVING ON 8" ABC	12	FT (Street Width)	\$ 11	\$ 15	
Manholes	Micro Seal	50	FT (Street Width)	\$ 1	\$ 33	
	Total Paving (per LF)					\$ 57
		No. per 400 ft				
	Manhole	1	EA	\$ 11	\$ 11	
	Heavy Traffic Frame and Manhole Cover	1	EA	\$ 2	\$ 2	
	Concrete Manhole Invert, Single Channel	1	EA	\$ 2	\$ 2	
	Total Manholes (per LF)					\$ 20
	TOTAL DIRECT COST (per LF)					\$ 420
	Contractor Overhead	10%				\$ 40
	Construction Profit	6%				\$ 30
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 40
	General Conditions	10%				\$ 40
	Traffic Control costs	10%				\$ 40
	Cost for bypass lines	10%				\$ 40
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 650
	TOTAL CONSTRUCTION COSTS (per mile)					\$ 3,430,000

Notes:

This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

21-inch Gravity Main						
Project:		2024 Integrated Water Master Plan				
Client:		City of Goodyear				
		Material	Diameter	Length (mile)	Default Excavation Depth	
		VCP	21	1	8	
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
PIPE						
	21" C-700 VCP In Open Trench	1	LF	\$ 167	\$ 167	
	Total Piping (per LF)					\$ 167
EARTHWORK						
	Excavation					
	Hard Digging	0.99	CY	\$ 51	\$ 50	
	Trenching: Box Shoring	1	Day	\$ 5	\$ 5	
	&Backfill	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.53	CY	\$ 116	\$ 61
		Native Trench Backfill/Unconfined Struct. BF, Class A Material	0.33	CY	\$ 31	\$ 10
		Controlled Density Fill (CDF)	0.04	CY	\$ 138	\$ 5
		20 CY Dump Truck, 20 Miles/Round Trip	6.22	CY	\$ 11	\$ 68
		Site Specific Requirements	10%	LS		\$ 20
		Total Earthwork (per LF)				\$ 220
	Asphalt Paving					
	ASPHALT PAVEMENT CUTTING	4	IN (Depth)	\$ 2	\$ 8	
	Demo & Replacement	REMOVE 4"-6" ASPHALT PAVEMENT	12	FT (Street Width)	\$ 1	\$ 1
		4" AC PAVING ON 8" ABC	12	FT (Street Width)	\$ 11	\$ 15
		Micro Seal	50	FT (Street Width)	\$ 1	\$ 33
		Total Paving (per LF)				\$ 57
Manholes						
		No. per 400 ft				
	Manhole	1	EA	\$ 11	\$ 11	
	Heavy Traffic Frame and Manhole Cover	1	EA	\$ 2	\$ 2	
	Concrete Manhole Invert, Single Channel	1	EA	\$ 2	\$ 2	
	Total Manholes (per LF)					\$ 20
	TOTAL DIRECT COST (per LF)					\$ 460
	Contractor Overhead	10%				\$ 50
	Construction Profit	6%				\$ 30
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 40
	General Conditions	10%				\$ 50
	Traffic Control costs	10%				\$ 50
	Cost for bypass lines	10%				\$ 50
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 730
	TOTAL CONSTRUCTION COSTS (per mile)					\$ 3,850,000

Notes:

This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

24-inch Gravity Main						
Project:		2024 Integrated Water Master Plan				
Client:		City of Goodyear				
		Material	Diameter	Length (mile)	Default Excavation Depth	
		VCP	24	1	8	
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
PIPE						
	24" C-700 VCP In Open Trench	1	LF	\$ 179	\$ 179	
	Total Piping (per LF)					\$ 179
EARTHWORK						
Excavation	Hard Digging	1.06	CY	\$ 51	\$ 54	
	Trenching: Box Shoring	1	Day	\$ 5	\$ 5	
&Backfill	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.61	CY	\$ 116	\$ 71	
	Native Trench Backfill/Unconfined Struct. BF, Class A Material	0.30	CY	\$ 31	\$ 9	
	Controlled Density Fill (CDF)	0.03	CY	\$ 138	\$ 5	
	20 CY Dump Truck, 20 Miles/Round Trip	6.37	CY	\$ 11	\$ 70	
	Site Specific Requirements	10%	LS		\$ 21	
	Total Earthwork (per LF)					\$ 235
Asphalt Paving	ASPHALT PAVEMENT CUTTING	4	IN (Depth)	\$ 2	\$ 8	
Demo & Replacement	REMOVE 4"-6" ASPHALT PAVEMENT	12	FT (Street Width)	\$ 1	\$ 1	
	4" AC PAVING ON 8" ABC	12	FT (Street Width)	\$ 11	\$ 15	
	Micro Seal	50	FT (Street Width)	\$ 1	\$ 33	
	Total Paving (per LF)					\$ 57
Manholes						
		No. per 400 ft				
	Manhole	1	EA	\$ 11	\$ 11	
	Heavy Traffic Frame and Manhole Cover	1	EA	\$ 2	\$ 2	
	Concrete Manhole Invert, Single Channel	1	EA	\$ 2	\$ 2	
	Total Manholes (per LF)					\$ 20
	TOTAL DIRECT COST (per LF)					\$ 490
	Contractor Overhead	10%				\$ 50
	Construction Profit	6%				\$ 30
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 40
	General Conditions	10%				\$ 50
	Traffic Control costs	10%				\$ 50
	Cost for bypass lines	10%				\$ 50
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 760
	TOTAL CONSTRUCTION COSTS (per mile)					\$ 4,010,000

Notes:

This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

6-inch Force Main

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Material DIP	Diameter 6	Length (mile) 1	Default Excavation Depth 6.00	User entered Excavation Depth 6
DESCRIPTION		QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Pipe	6" Push-on Joint Ductile Iron Pipe	2	LF	\$ 43	86.56	
	6" Adder For Restrained Joints	0.5	LF	\$ 21	10.59	
						\$ 97
EARTHWORK Excavation						
	Hard Digging	1.63	CY	\$ 51	83.05	
& Backfill	Trenching: Box Shoring	1	Day	\$ 5	5.00	
	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.66	CY	\$ 116	76.96	
	Native Trench Backfill/Unconfined Struct. BF, Class A Material	0.86	CY	\$ 31	26.36	
	Controlled Density Fill (CDF)	0.10	CY	\$ 138	13.14	
	20 CY Dump Truck, 20 Miles/Round Trip	7.78	CY	\$ 11	85.38	
	Site Specific Requirements	10%	LS		28.99	
	Total Earthwork (per LF)					\$ 319
Asphalt Paving Demo & Replacement	ASPHALT PAVEMENT CUTTING	4.00	Depth (in)	1.97	7.86	
	REMOVE 4"-6" ASPHALT PAVEMENT	12.00	Street Width (FT)	0.12	1.40	
	4" AC paving on 8" ABC	12.00		11.07	132.90	
	Micro Seal	50.00	FT (Street Width)	0.67	33.33	
	Total Paving (per LF)					\$ 175
Fittings & Valves		No. per mile				
	Fittings	2.00	EA	0.07	0.13	
	Air release valve Assembly	2.00	EA	0.06	0.12	
	Plug Valve	2.00	EA	0.71	1.43	
Manholes & Vaults	Total Fittings & Valves (per LF)					\$ 2
	Air release manhole	2.00	EA	0.86	1.71	
	Plug valve vault	2.00	EA	0.86	1.71	
	Total fittings, valves and manholes (per LF)					\$ 3
	TOTAL DIRECT COST (per LF)					\$ 600
	Contractor Overhead	10%				\$ 60
	Construction Profit	6%				\$ 40
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 50
	General Conditions	10%				\$ 60
	Traffic Control costs	10%				\$ 60
	Cost for bypass lines	10%				\$ 60
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 930
	TOTAL CONSTRUCTION COSTS (per mile)					\$ 4,910,400

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

8-inch Force Main

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Material DIP	Diameter 8	Length (mile) 1	Default Excavation Depth 6.00	User entered Excavation Depth 6
DESCRIPTION		QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Pipe	8" Push-on Joint Ductile Iron Pipe	2	LF	\$ 57	113.98	
	8" Adder For Restrained Joints	0.5	LF	\$ 27	13.69	
						\$ 128
EARTHWORK Excavation						
	Hard Digging	1.70	CY	\$ 51	86.83	
& Backfill	Trenching: Box Shoring	1	Day	\$ 5	5.00	
	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.78	CY	\$ 116	90.19	
	Native Trench Backfill/Unconfined Struct. BF, Class A Material	0.81	CY	\$ 31	24.94	
	Controlled Density Fill (CDF)	0.09	CY	\$ 138	12.43	
	20 CY Dump Truck, 20 Miles/Round Trip	7.95	CY	\$ 11	87.25	
	Site Specific Requirements	10%	LS		30.66	
	Total Earthwork (per LF)					\$ 337
Asphalt Paving Demo & Replacement	ASPHALT PAVEMENT CUTTING	4.00	Depth (in)	1.97	7.86	
	REMOVE 4"-6" ASPHALT PAVEMENT	12.00	Street Width (FT)	0.12	1.40	
	4" AC paving on 8" ABC	12.00		11.07	132.90	
	Micro Seal	50.00	FT (Street Width)	0.67	33.33	
	Total Paving (per LF)					\$ 175
Fittings & Valves		No. per mile				
	Fittings	2.00	EA	0.09	0.18	
	Air release valve Assembly	2.00	EA	0.06	0.12	
	Plug Valve	2.00	EA	0.93	1.87	
Manholes & Vaults	Total Fittings & Valves (per LF)					\$ 2
	Air release manhole	2.00	EA	0.86	1.71	
	Plug valve vault	2.00	EA	0.86	1.71	
	Total fittings, valves and manholes (per LF)					\$ 3
	TOTAL DIRECT COST (per LF)					\$ 650
	Contractor Overhead	10%				\$ 70
	Construction Profit	6%				\$ 40
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 50
	General Conditions	10%				\$ 70
	Traffic Control costs	10%				\$ 70
	Cost for bypass lines	10%				\$ 70
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 1,020
	TOTAL CONSTRUCTION COSTS (per mile)					\$ 5,385,600

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

10-inch Force Main

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Material DIP	Diameter 10	Length (mile) 1	Default Excavation Depth 6.00	User entered Excavation Depth 6
DESCRIPTION		QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Pipe	10" Push-on Joint Ductile Iron Pipe	2	LF	\$ 55	110.55	
	10" Adder For Restrained Joints	0.5	LF	\$ 27	13.68	
						\$ 124
EARTHWORK Excavation						
	Hard Digging	1.78	CY	\$ 51	90.60	
	Trenching: Box Shoring	1	Day	\$ 5	5.00	
& Backfill	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	0.90	CY	\$ 116	103.99	
	Native Trench Backfill/Unconfined Struct. BF, Class A Material	0.76	CY	\$ 31	23.28	
	Controlled Density Fill (CDF)	0.08	CY	\$ 138	11.60	
	20 CY Dump Truck, 20 Miles/Round Trip	8.12	CY	\$ 11	89.09	
	Site Specific Requirements	10%	LS		32.36	
	Total Earthwork (per LF)					\$ 356
Asphalt Paving Demo & Replacement	ASPHALT PAVEMENT CUTTING	4.00	Depth (in)	1.97	7.86	
	REMOVE 4"-6" ASPHALT PAVEMENT	12.00	Street Width (FT)	0.12	1.40	
	4" AC paving on 8" ABC	12.00		11.07	132.90	
	Micro Seal	50.00	FT (Street Width)	0.67	33.33	
	Total Paving (per LF)					\$ 175
		No. per mile				
Fittings & Valves	Fittings	2.00	EA	0.12	0.23	
	Air release valve Assembly	2.00	EA	0.06	0.12	
	Plug Valve	2.00	EA	1.17	2.34	
	Total Fittings & Valves (per LF)					\$ 3
Manholes & Vaults						
	Air release manhole	2.00	EA	0.86	1.71	
	Plug valve vault	2.00	EA	0.86	1.71	
	Total fittings, valves and manholes (per LF)					\$ 3
	TOTAL DIRECT COST (per LF)					\$ 660
	Contractor Overhead	10%				\$ 70
	Construction Profit	6%				\$ 40
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 60
	General Conditions	10%				\$ 70
	Traffic Control costs	10%				\$ 70
	Cost for bypass lines	10%				\$ 70
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 1,040
	TOTAL CONSTRUCTION COSTS (per mile)					\$ 5,491,200

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

12-inch Force Main

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Material DIP	Diameter 12	Length (mile) 1	Default Excavation Depth 6.00	User entered Excavation Depth 6
	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Pipe	12" Push-on Joint Ductile Iron Pipe	2	LF	\$ 71	141.99	
	12" Adder For Restrained Joints	0.5	LF	\$ 36	17.96	
						\$ 160
EARTHWORK Excavation						
	Hard Digging	1.85	CY	\$ 51	94.38	
	Trenching: Box Shoring	1	Day	\$ 5	5.00	
& Backfill	Imported Pipe Bed & Zone/Confined Structure Backfill, Class B Material	1.02	CY	\$ 116	118.38	
	Native Trench Backfill/Unconfined Struct. BF, Class A Material	0.69	CY	\$ 31	21.40	
	Controlled Density Fill (CDF)	0.08	CY	\$ 138	10.66	
	20 CY Dump Truck, 20 Miles/Round Trip	8.28	CY	\$ 11	90.90	
	Site Specific Requirements	10%	LS		34.07	
	Total Earthwork (per LF)					\$ 375
Asphalt Paving Demo & Replacement	ASPHALT PAVEMENT CUTTING	4.00	Depth (in)	1.97	7.86	
	REMOVE 4"-6" ASPHALT PAVEMENT	12.00	Street Width (FT)	0.12	1.40	
	4" AC paving on 8" ABC	12.00		11.07	132.90	
	Micro Seal	50.00	FT (Street Width)	0.67	33.33	
	Total Paving (per LF)					\$ 175
		No. per mile				
Fittings & Valves	Fittings	2.00	EA	0.15	0.30	
	Air release valve Assembly	2.00	EA	0.06	0.12	
	Plug Valve	2.00	EA	1.44	2.89	
	Total Fittings & Valves (per LF)					\$ 3
Manholes & Vaults						
	Air release manhole	2.00	EA	0.86	1.71	
	Plug valve vault	2.00	EA	0.86	1.71	
	Total fittings, valves and manholes (per LF)					\$ 3
	TOTAL DIRECT COST (per LF)					\$ 720
	Contractor Overhead	10%				\$ 70
	Construction Profit	6%				\$ 40
	Sales Tax (Applied to 65% of Total Direct Cost)	8%				\$ 60
	General Conditions	10%				\$ 70
	Traffic Control costs	10%				\$ 70
	Cost for bypass lines	10%				\$ 70
	TOTAL CONSTRUCTION COSTS (per LF)					\$ 1,100
	TOTAL CONSTRUCTION COSTS (per mile)					\$ 5,808,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

1 mgd Lift Station

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Capacity (MGD)	Number of Pump Trains				
		1	2				
	DESCRIPTION	SIZE	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Site Work	8' H Double Swing Gate, Chain Link, 20' Opening	20'	1	EA	\$ 44,171	\$ 44,171	
	Standard Concrete Block, 8"	8'	2400	SF	\$ 25	\$ 59,718	
	Site grading with 2" ABC finish		35	CY	\$ 133	\$ 4,655	
	Concrete work/drive pad	8'x10'x12"	3	CY	\$ 500	\$ 1,500	
	4" AC Paving ON 6" ABC	20'	85	SY	\$ 98	\$ 8,366	
	Wetwell excavation		150	CY	\$ 19	\$ 2,805	
	Bollard		10	EA	\$ 1,560	\$ 15,600	
	Medium Site Grading		1	LS	\$ 38,880	\$ 38,880	
	Total Site Work						\$ 175,694
Structural Work	12" Reinforced Concrete	10'x20'x12"	8	CY	\$ 500	\$ 4,000	
	18" Structural Flat Mat On Grade	15'x20'x18"	12	CY	\$ 500	\$ 6,000	
	12" Reinforced Concrete	10'x30'x12"	12	CY	\$ 500	\$ 6,000	
	Concrete Wet Well	8'x10'x24'	1	LS	\$ 67,500	\$ 67,500	
	Electrical and chemical pre-cast building	10'x30'		LS	\$ 280,000	\$ -	
	Lift station access hatch	60"	1	EA	\$ 4,550	\$ 4,550	
	Stainless steel pump rails		12	EA	\$ 2,162	\$ 25,939	
	Pole & base		1	LS	\$ 1,500	\$ 1,500	
	Davitt pump removal crane		1	EA	\$ 2,266	\$ 2,266	
	Total Structural Work						\$ 117,755
Pump Train	8" Push-On Joint Ductile Iron Pipe - Plant	8"	20	LF	\$ 1,200	\$ 24,000	
	8" Flex Cplg, Above Ground	8"	2	EA	\$ 889	\$ 1,779	
	10"- 200 PSI CI FXF Swing Check Valve	8"	2	EA	\$ 4,665	\$ 9,331	
	8" FXF Cast Iron Plug Valve W/Handwheel Op	8"	2	EA	\$ 4,936	\$ 9,872	
	30" Pipe Support	30"	6	EA	\$ 894	\$ 5,366	
	3" 300 PSI Combination Air Valve Stainless Steel	3"	2	EA	\$ 3,280	\$ 6,560	
	8" CLDI Flg Straight Tee In Place - Plant	8"	10	EA	\$ 2,236	\$ 22,357	
	Total Pump Train						\$ 79,265
Mechanical	8" Push-On Joint Ductile Iron Pipe - Plant	8"	50	LF	\$ 1,200	\$ 60,000	
	75 HP submersible pumps (duty and standby)	695 gpm	2	EA	\$ 65,340	\$ 130,680	
	8" FXF Cast Iron Plug Valve W/Handwheel Op	8"	5	EA	\$ 4,936	\$ 24,681	
	30" Pipe Support	30"	7	EA	\$ 894	\$ 6,261	
	3" 300 PSI Combination Air Valve Stainless Steel	3"	1	EA	\$ 3,280	\$ 3,280	
	8" Adder For Restrained Joints	8"	50	LF	\$ 27	\$ 1,369	
	Total Mechanical						\$ 226,270
Dual Force Main	8" Push-On Joint Ductile Iron Pipe - Plant	8"	30	LF	\$ 1,200	\$ 36,000	
	8" CLDI Flg Straight Tee In Place - Plant	8"	6	EA	\$ 2,236	\$ 13,414	
	Total Dual Force Main						\$ 49,414
	TOTAL						\$ 648,000
Electrical	Electrical & Instrumentation		40%			\$ 259,200	
	Total Electrical & Instrumentation						\$ 259,000
Odor Control	Odor control biofilters		10%			\$ 64,800	
	Total Odor Control						\$ 65,000
Painting & Coating	Painting & Coatings		10%			\$ 64,800	
	Total Painting & Coating						\$ 65,000
	Total cost excluding landscaping and security						\$ 1,037,000
	Landscaping cost		1%			\$ 10,000	\$ 10,000
	Security costs for smaller capacity systems		1	EA	\$ 56,000	\$ 56,000	\$ 56,000
	TOTAL DIRECT COST						\$ 1,103,000
	Contractor Overhead		10%	%			\$ 110,000
	Construction Profit		6%	%			\$ 66,000
	Sales Tax (Applied to 65% of Total Direct Cost)		8%	%			\$ 93,000
	General Conditions		10%	%			\$ 110,000
	Bypass pump costs		10%	%			\$ 110,000
	TOTAL CONSTRUCTION COSTS						\$ 1,592,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

3 mgd Lift Station

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Capacity (MGD)	Number of Pump Trains				
		3	3				
	DESCRIPTION	SIZE	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Site Work	8' H Double Swing Gate, Chain Link, 20' Opening	20'	1	EA	\$ 44,171	\$ 44,171	
	Standard Concrete Block, 8"	8'	2400	SF	\$ 25	\$ 59,718	
	Site grading with 2" ABC finish		35	CY	\$ 133	\$ 4,655	
	Concrete work/drive pad	7'x12'x12"	4	CY	\$ 500	\$ 2,000	
	4" AC Paving ON 6" ABC	20'	85	SY	\$ 98	\$ 8,366	
	Wetwell excavation		190	CY	\$ 19	\$ 3,553	
	Bollard		10	EA	\$ 1,560	\$ 15,600	
	Medium Site Grading		1	LS	\$ 38,880	\$ 38,880	
	Total Site Work						\$ 176,942
Structural Work	12" Reinforced Concrete	10'x20'x12"	8	CY	\$ 500	\$ 4,000	
	18" Structural Flat Mat On Grade	15'x20'x18"	12	CY	\$ 500	\$ 6,000	
	12" Reinforced Concrete	10'x30'x12"	12	CY	\$ 500	\$ 6,000	
	Concrete Wet Well	7'x12'x30'	1	LS	\$ 90,000	\$ 90,000	
	Electrical and chemical pre-cast building	10'x30'	1	LS	\$ 280,000	\$ 280,000	
	Lift station access hatch	60"	2	EA	\$ 4,550	\$ 9,100	
	Stainless steel pump rails		12	EA	\$ 2,162	\$ 25,939	
	Pole & base		1	LS	\$ 1,500	\$ 1,500	
	Davitt pump removal crane		1	EA	\$ 2,266	\$ 2,266	
	Total Structural Work						\$ 424,805
Pump Train	8" Push-On Joint Ductile Iron Pipe - Plant	8"	30	LF	\$ 1,200	\$ 36,000	
	8" Flex Cplg, Above Ground	8"	3	EA	\$ 889	\$ 2,668	
	10"- 200 PSI CI FXF Swing Check Valve	8"	3	EA	\$ 4,665	\$ 13,996	
	8" FXF Cast Iron Plug Valve W/Handwheel Op	8"	3	EA	\$ 4,936	\$ 14,808	
	30" Pipe Support	30"	9	EA	\$ 894	\$ 8,050	
	3" 300 PSI Combination Air Valve Stainless Steel	3"	3	EA	\$ 3,280	\$ 9,840	
	8" CLDI Flg Straight Tee In Place - Plant	8"	15	EA	\$ 2,236	\$ 33,535	
	Total Pump Train						\$ 118,898
Mechanical	16" Push-On Joint Ductile Iron Pipe - Plant	16"	50	LF	\$ 2,400	\$ 120,000	
	75 HP submersible pumps (duty and standby)	1041 gpm	3	EA	\$ 110,550	\$ 331,650	
	16" FXF Cast Iron Plug Valve W/Handwheel Op	16"	5	EA	\$ 13,645	\$ 68,226	
	30" Pipe Support	30"	7	EA	\$ 894	\$ 6,261	
	3" 300 PSI Combination Air Valve Stainless Steel	3"	1	EA	\$ 3,280	\$ 3,280	
	16" Adder For Restrained Joints	16"	50	LF	\$ 63	\$ 3,175	
	Total Mechanical						\$ 532,592
Dual Force Main	16" CI 52 CLDI Mj Pipe - Plant	16"	30	LF	\$ 2,403	\$ 72,089	
	16" CLDI Flg Straight Tee In Place - Plant	16"	6	EA	\$ 12,578	\$ 75,468	
	Total Dual Force Main						\$ 147,557
TOTAL							\$ 1,401,000
Electrical	Electrical & Instrumentation		40%			\$ 560,400	
	Total Electrical & Instrumentation						\$ 560,000
Odor Control	Odor control biofilters		10%			\$ 140,100	
	Total Odor Control						\$ 140,000
Painting & Coating	Painting & Coatings		10%			\$ 140,100	
	Total Painting & Coating						\$ 140,000
	Total cost excluding landscaping and security						\$ 2,241,000
	Landscaping cost		1%			\$ 22,000	\$ 22,000
	Security costs for smaller capacity systems		1	EA	\$ 56,000	\$ 56,000	\$ 56,000
	TOTAL DIRECT COST						\$ 2,319,000
	Contractor Overhead		10%	%			\$ 232,000
	Construction Profit		6%	%			\$ 139,000
	Sales Tax (Applied to 65% of Total Direct Cost)		8%	%			\$ 195,000
	General Conditions		10%	%			\$ 232,000
	Bypass pump costs		10%	%			\$ 232,000
	TOTAL CONSTRUCTION COSTS						\$ 3,349,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

3.5 mgd Lift Station

Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Capacity (MGD)	Number of Pump Trains				
		3.5	3				
	DESCRIPTION	SIZE	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Site Work	8' H Double Swing Gate, Chain Link, 20' Opening	20'	1	EA	\$ 44,171	\$ 44,171	
	Standard Concrete Block, 8"	8'	2400	SF	\$ 25	\$ 59,718	
	Site grading with 2" ABC finish		35	CY	\$ 133	\$ 4,655	
	Concrete work/drive pad	8'x16'x12"	5	CY	\$ 500	\$ 2,500	
	4" AC Paving ON 6" ABC	20'	85	SY	\$ 98	\$ 8,366	
	Wetwell excavation		260	CY	\$ 19	\$ 4,862	
	Bollard		10	EA	\$ 1,560	\$ 15,600	
	Medium Site Grading		1	LS	\$ 38,880	\$ 38,880	
	Total Site Work						\$ 178,752
Structural Work	12" Reinforced Concrete	10'x20'x12"	8	CY	\$ 500	\$ 4,000	
	18" Structural Flat Mat On Grade	15'x20'x18"	12	CY	\$ 500	\$ 6,000	
	12" Reinforced Concrete	10'x30'x12"	12	CY	\$ 500	\$ 6,000	
	Concrete Wet Well	8'x16'x27'	1	LS	\$ 105,000	\$ 105,000	
	Electrical and chemical pre-cast building	10'x30'	1	LS	\$ 280,000	\$ 280,000	
	Lift station access hatch	60"	2	EA	\$ 4,550	\$ 9,100	
	Stainless steel pump rails		12	EA	\$ 2,162	\$ 25,939	
	Pole & base		1	LS	\$ 1,500	\$ 1,500	
	Davitt pump removal crane		1	EA	\$ 2,266	\$ 2,266	
	Total Structural Work						\$ 439,805
Pump Train	8" Push-On Joint Ductile Iron Pipe - Plant	8"	30	LF	\$ 1,200	\$ 36,000	
	8" Flex Cplg, Above Ground	8"	3	EA	\$ 889	\$ 2,668	
	10"- 200 PSI CI FXF Swing Check Valve	8"	3	EA	\$ 4,665	\$ 13,996	
	8" FXF Cast Iron Plug Valve W/Handwheel Op	8"	3	EA	\$ 4,936	\$ 14,808	
	30" Pipe Support	30"	9	EA	\$ 894	\$ 8,050	
	3" 300 PSI Combination Air Valve Stainless Steel	3"	3	EA	\$ 3,280	\$ 9,840	
	8" CLDI Flg Straight Tee In Place - Plant	8"	15	EA	\$ 2,236	\$ 33,535	
	Total Pump Train						\$ 118,898
Mechanical	16" Push-On Joint Ductile Iron Pipe - Plant	16"	50	LF	\$ 2,400	\$ 120,000	
	75 HP submersible pumps (duty and standby)	1215 gpm	3	EA	\$ 110,550	\$ 331,650	
	16" FXF Cast Iron Plug Valve W/Handwheel Op	16"	5	EA	\$ 13,645	\$ 68,226	
	30" Pipe Support	30"	7	EA	\$ 894	\$ 6,261	
	3" 300 PSI Combination Air Valve Stainless Steel	3"	1	EA	\$ 3,280	\$ 3,280	
	16" Adder For Restrained Joints	16"	50	LF	\$ 63	\$ 3,175	
	Total Mechanical						\$ 532,592
Dual Force Main	16" CI 52 CLDI Mj Pipe - Plant	16"	30	LF	\$ 2,403	\$ 72,089	
	16" CLDI Flg Straight Tee In Place - Plant	16"	6	EA	\$ 12,578	\$ 75,468	
	Total Dual Force Main						\$ 147,557
TOTAL							\$ 1,418,000
Electrical	Electrical & Instrumentation		40%			\$ 567,200	
	Total Electrical & Instrumentation						\$ 567,000
Odor Control	Odor control biofilters		10%			\$ 141,800	
	Total Odor Control						\$ 142,000
Painting & Coating	Painting & Coatings		10%			\$ 141,800	
	Total Painting & Coating						\$ 142,000
	Total cost excluding landscaping and security						\$ 2,269,000
	Landscaping cost		1%			\$ 23,000	\$ 23,000
	Security costs for smaller capacity systems		1	EA	\$ 56,000	\$ 56,000	\$ 56,000
	TOTAL DIRECT COST						\$ 2,348,000
	Contractor Overhead		10%	%			\$ 235,000
	Construction Profit		6%	%			\$ 141,000
	Sales Tax (Applied to 65% of Total Direct Cost)		8%	%			\$ 197,000
	General Conditions		10%	%			\$ 235,000
	Bypass pump costs		10%	%			\$ 235,000
	TOTAL CONSTRUCTION COSTS						\$ 3,391,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

5 mgd Lift Station

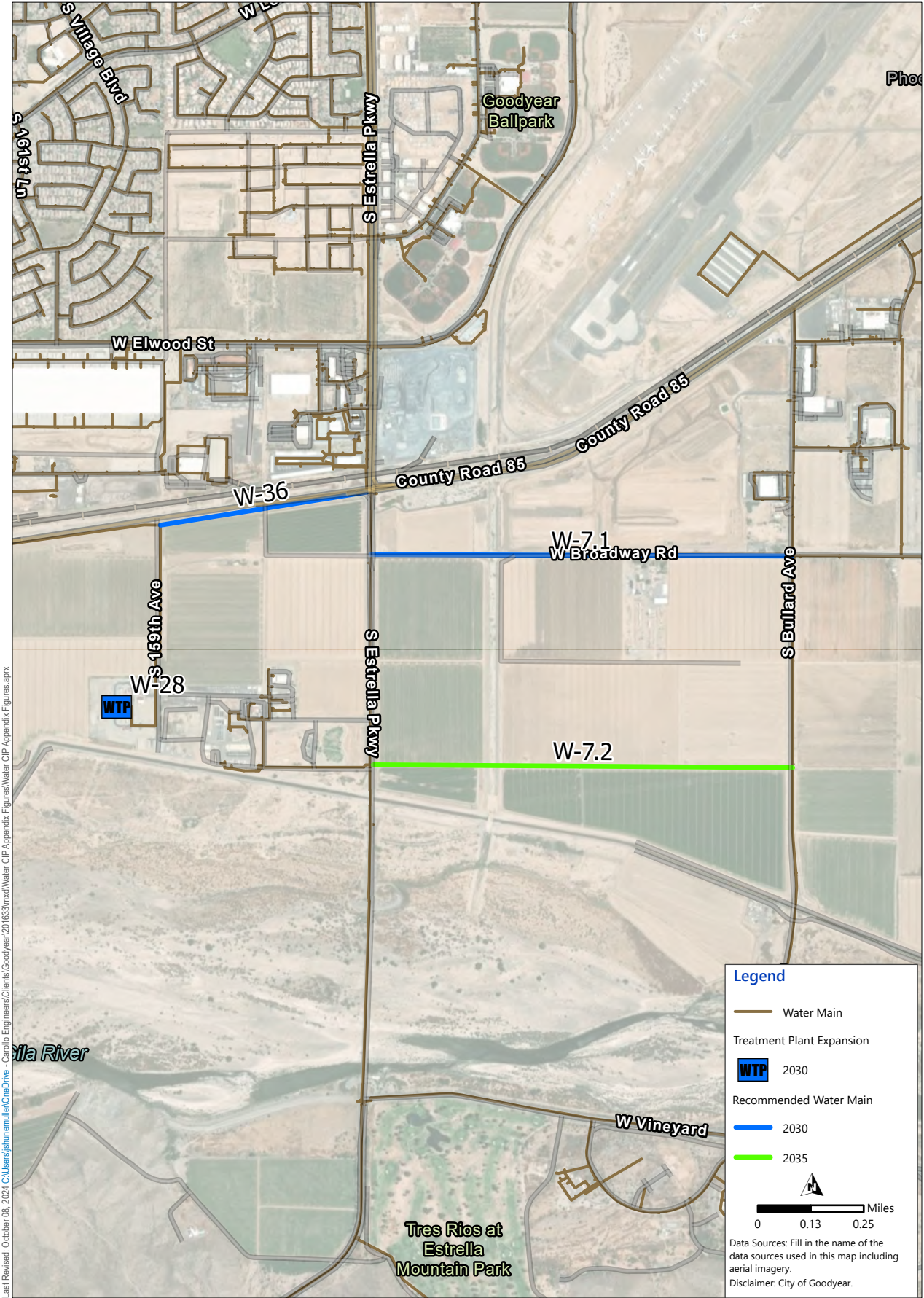
Project: 2024 Integrated Water Master Plan
Client: City of Goodyear

		Capacity (MGD)	Number of Pump Trains				
		5	3				
	DESCRIPTION	SIZE	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
Site Work	8' H Double Swing Gate, Chain Link, 20' Opening	20'	1	EA	\$ 44,171	\$ 44,171	
	Standard Concrete Block, 8"	8'	2400	SF	\$ 25	\$ 59,718	
	Site grading with 2" ABC finish		35	CY	\$ 133	\$ 4,655	
	Concrete work/drive pad	8'x16'x12"	5	CY	\$ 500	\$ 2,500	
	4" AC Paving ON 6" ABC	20'	85	SY	\$ 98	\$ 8,366	
	Wetwell excavation		260	CY	\$ 19	\$ 4,862	
	Bollard		10	EA	\$ 1,560	\$ 15,600	
	Medium Site Grading		1	LS	\$ 38,880	\$ 38,880	
	Total Site Work						\$ 178,752
Structural Work	12" Reinforced Concrete	10'x20'x12"	8	CY	\$ 500	\$ 4,000	
	18" Structural Flat Mat On Grade	15'x20'x18"	12	CY	\$ 500	\$ 6,000	
	12" Reinforced Concrete	10'x30'x12"	12	CY	\$ 500	\$ 6,000	
	Concrete Wet Well	8'x16'x27'	1	LS	\$ 105,000	\$ 105,000	
	Electrical and chemical pre-cast building	10'x30'	1	LS	\$ 280,000	\$ 280,000	
	Lift station access hatch	60"	2	EA	\$ 4,550	\$ 9,100	
	Stainless steel pump rails		12	EA	\$ 2,162	\$ 25,939	
	Pole & base		1	LS	\$ 1,500	\$ 1,500	
	Davitt pump removal crane		1	EA	\$ 2,266	\$ 2,266	
	Total Structural Work						\$ 439,805
Pump Train	8" Push-On Joint Ductile Iron Pipe - Plant	8"	30	LF	\$ 1,200	\$ 36,000	
	8" Flex Cplg, Above Ground	8"	3	EA	\$ 889	\$ 2,668	
	10"- 200 PSI CI FXF Swing Check Valve	8"	3	EA	\$ 4,665	\$ 13,996	
	8" FXF Cast Iron Plug Valve W/Handwheel Op	8"	3	EA	\$ 4,936	\$ 14,808	
	30" Pipe Support	30"	9	EA	\$ 894	\$ 8,050	
	3" 300 PSI Combination Air Valve Stainless Steel	3"	3	EA	\$ 3,280	\$ 9,840	
	8" CLDI Flg Straight Tee In Place - Plant	8"	15	EA	\$ 2,236	\$ 33,535	
	Total Pump Train						\$ 118,898
Mechanical	20" Push-On Joint Ductile Iron Pipe - Plant	20"	50	LF	\$ 3,000	\$ 150,000	
	75 HP submersible pumps (duty and standby)	1736 gpm	3	EA	\$ 110,550	\$ 331,650	
	20" FXF Cast Iron Plug Valve W/Handwheel Op	20"	5	EA	\$ 23,376	\$ 116,880	
	30" Pipe Support	30"	7	EA	\$ 894	\$ 6,261	
	4" 300 PSI Combination Air Valve Stainless Steel	4"	1	EA	\$ 4,280	\$ 4,280	
	20" Adder For Restrained Joints	20"	50	LF	\$ 89	\$ 4,426	
	Total Mechanical						\$ 613,497
Dual Force Main	18" Push-On Joint Ductile Iron Pipe - Plant	18"	30	LF	\$ 2,700	\$ 81,000	
	18" CLDI Flg Straight Tee In Place - Plant	18"	6	EA	\$ 7,511	\$ 45,068	
	Total Dual Force Main						\$ 126,068
	TOTAL						\$ 1,477,000
Electrical	Electrical & Instrumentation		40%			\$ 590,800	
	Total Electrical & Instrumentation						\$ 591,000
Odor Control	Odor control biofilters		10%			\$ 147,700	
	Total Odor Control						\$ 148,000
Painting & Coating	Painting & Coatings		10%			\$ 147,700	
	Total Painting & Coating						\$ 148,000
	Total cost excluding landscaping and security						\$ 2,364,000
	Landscaping cost		1%			\$ 24,000	\$ 24,000
	Security costs for smaller capacity systems		1	EA	\$ 56,000	\$ 56,000	\$ 56,000
	TOTAL DIRECT COST						\$ 2,444,000
	Contractor Overhead		10%	%			\$ 244,000
	Construction Profit		6%	%			\$ 147,000
	Sales Tax (Applied to 65% of Total Direct Cost)		8%	%			\$ 205,000
	General Conditions		10%	%			\$ 244,000
	Bypass pump costs		10%	%			\$ 244,000
	TOTAL CONSTRUCTION COSTS						\$ 3,528,000

Notes: This cost estimate is a Class V estimate as defined by the American Association of Costing Engineers

APPENDIX 7C

WATER CIP FIGURES



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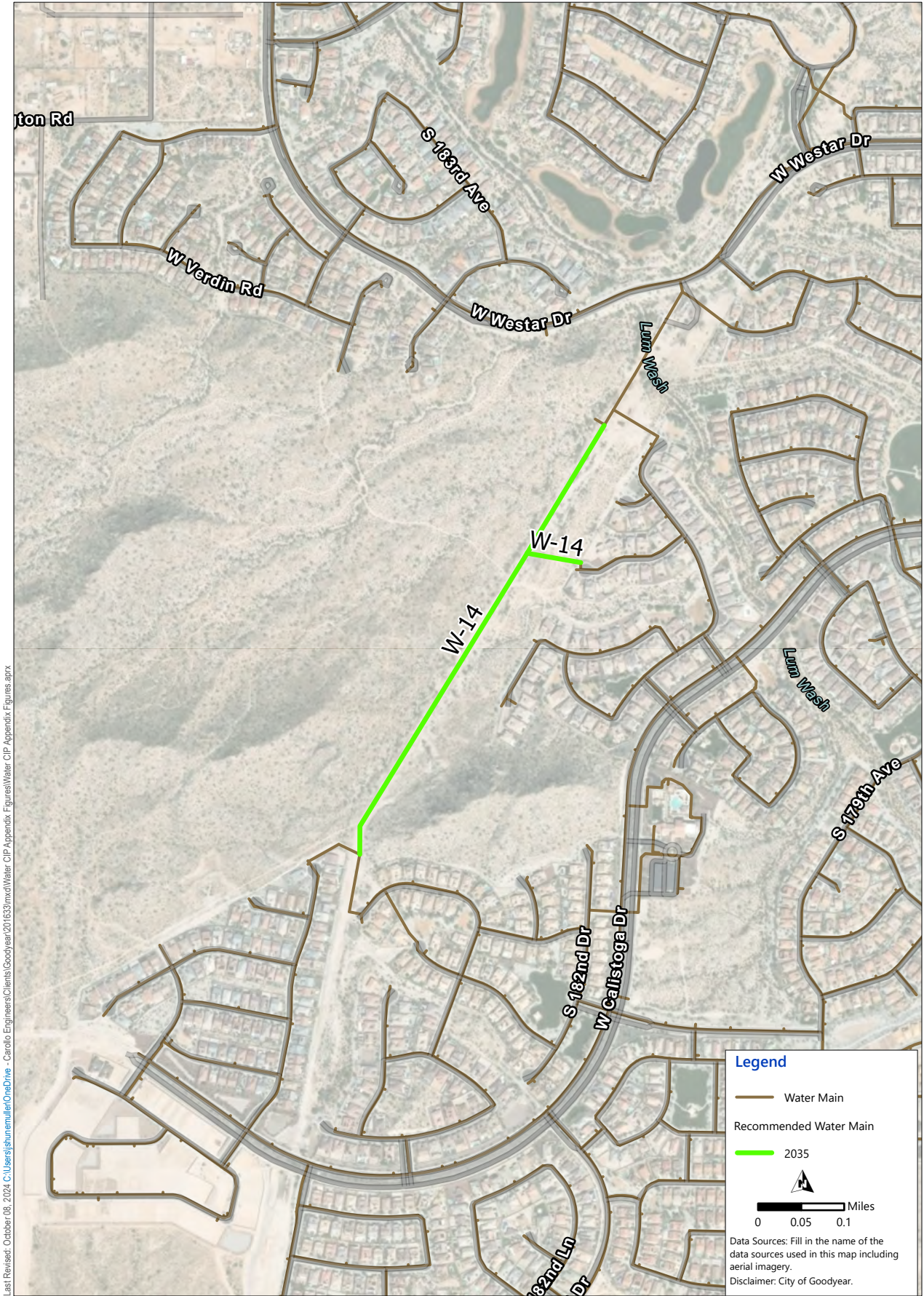


Figure 7C.2 Map of Capital Projects W-14
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN

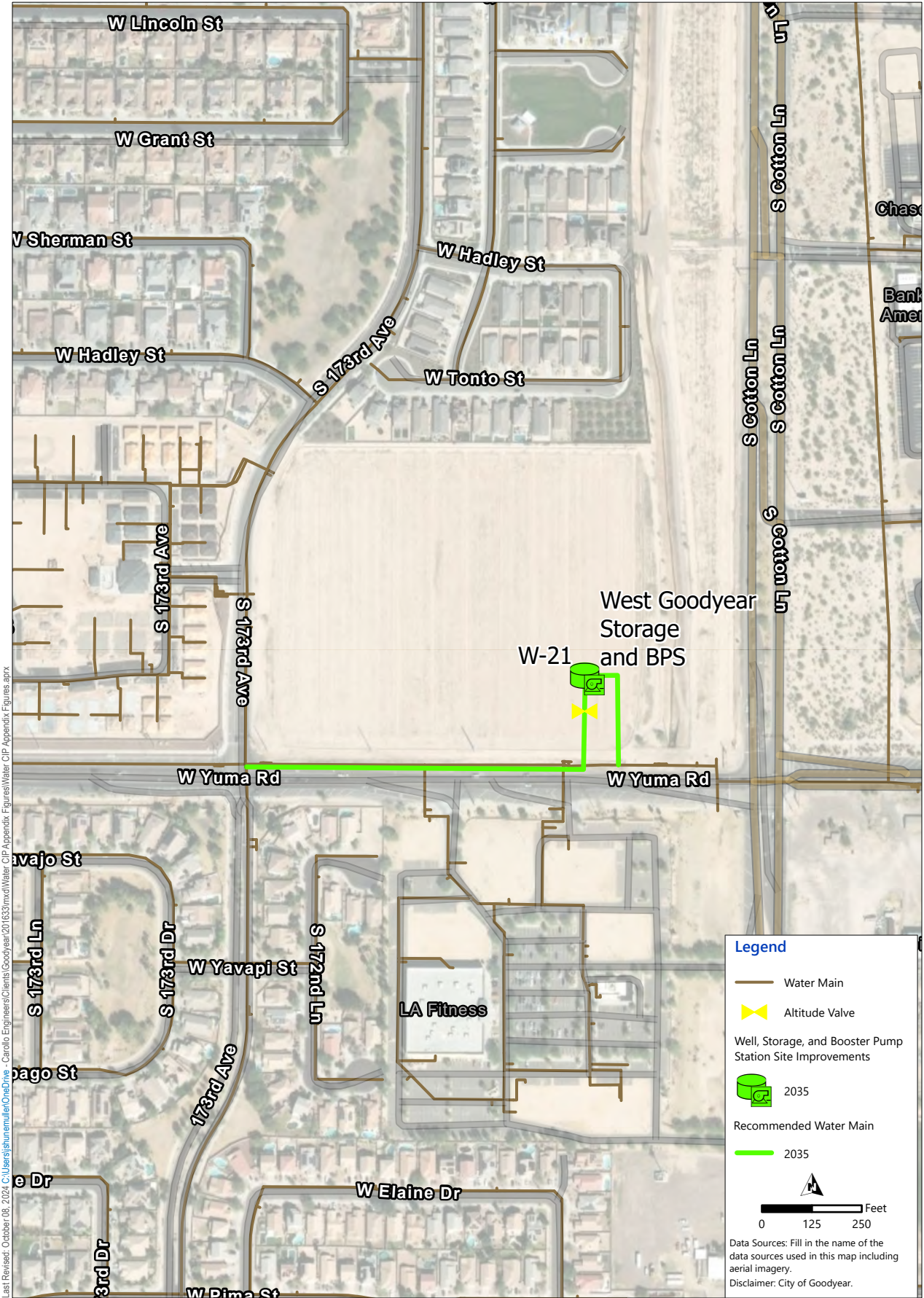


Figure 7C.3 Map of Capital Projects W-21
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN

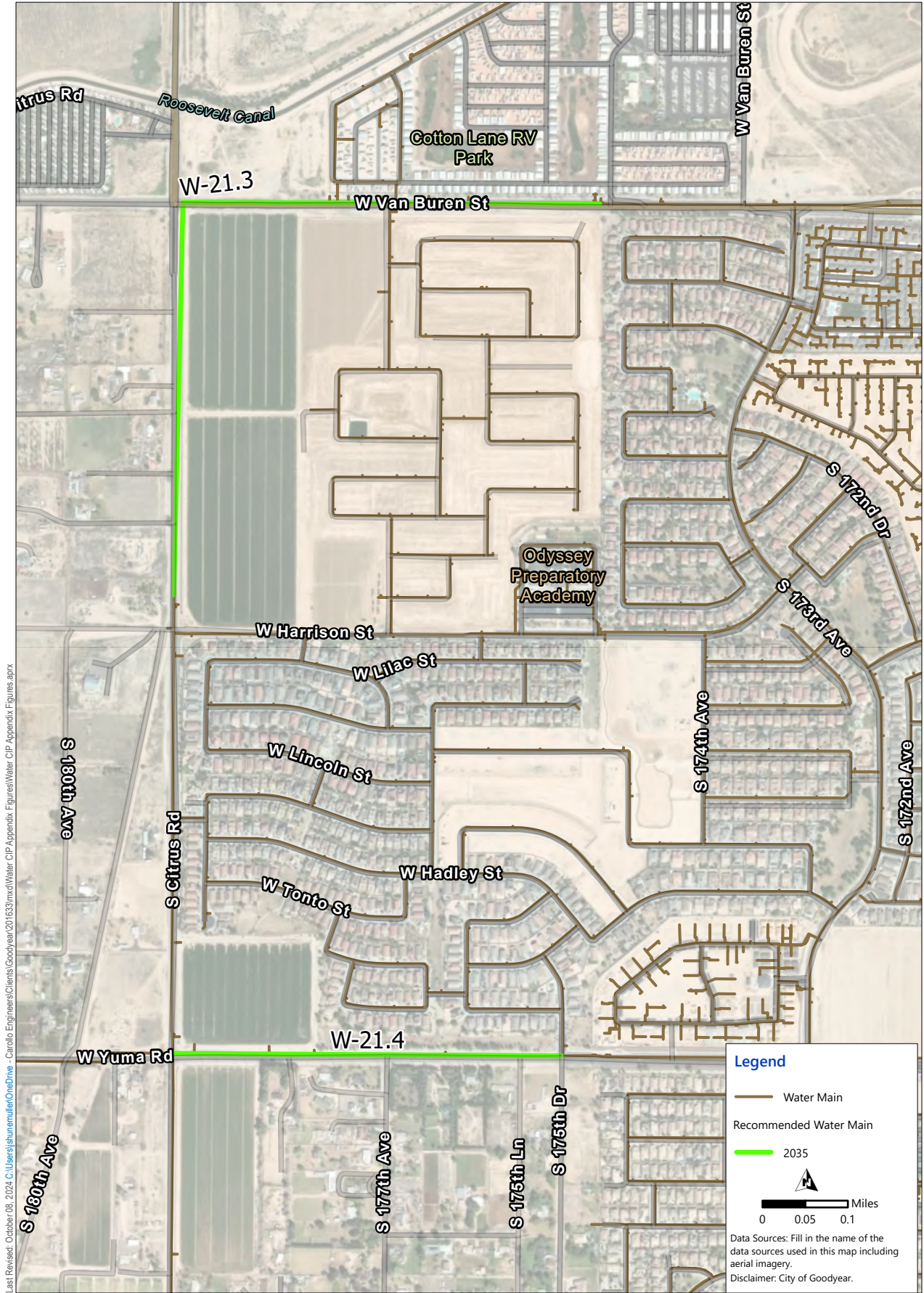


Figure 7C.4 Map of Capital Projects W-21.3 and W-21.4
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN

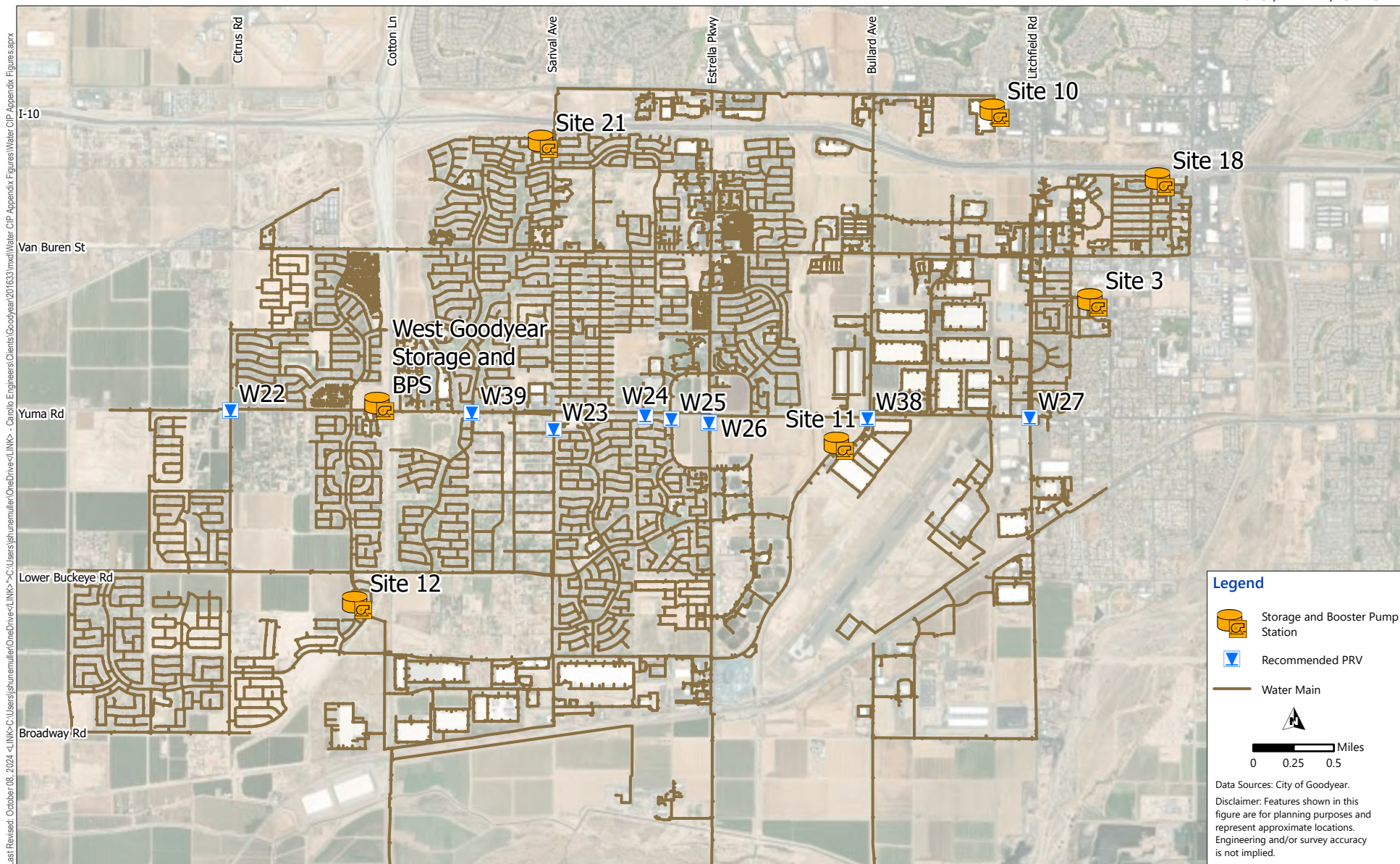


Figure 7C.5 Map of Capital Projects W-22, W-23, W-24, W-25, W-26, W-27, W-38, and W-39
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN

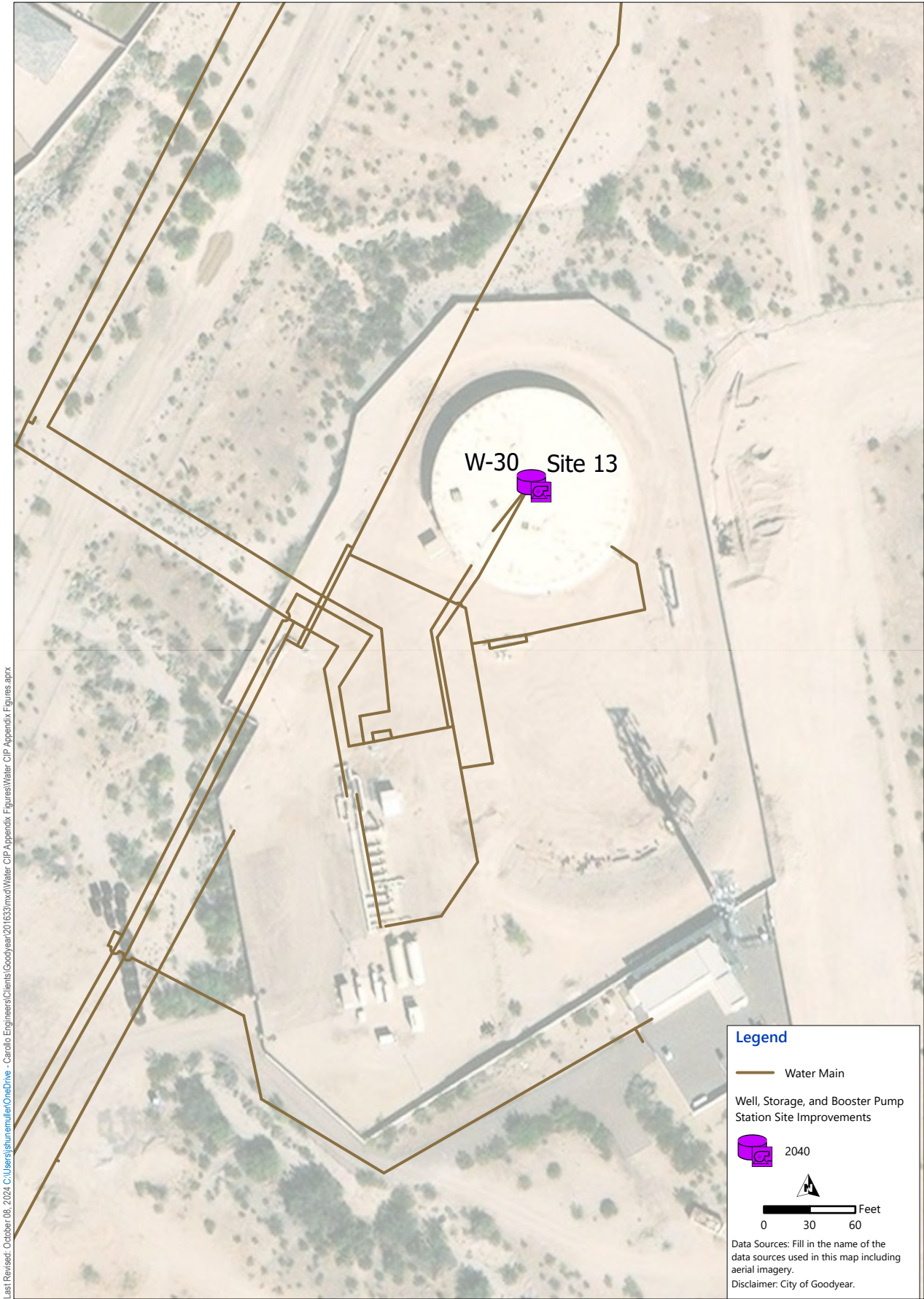
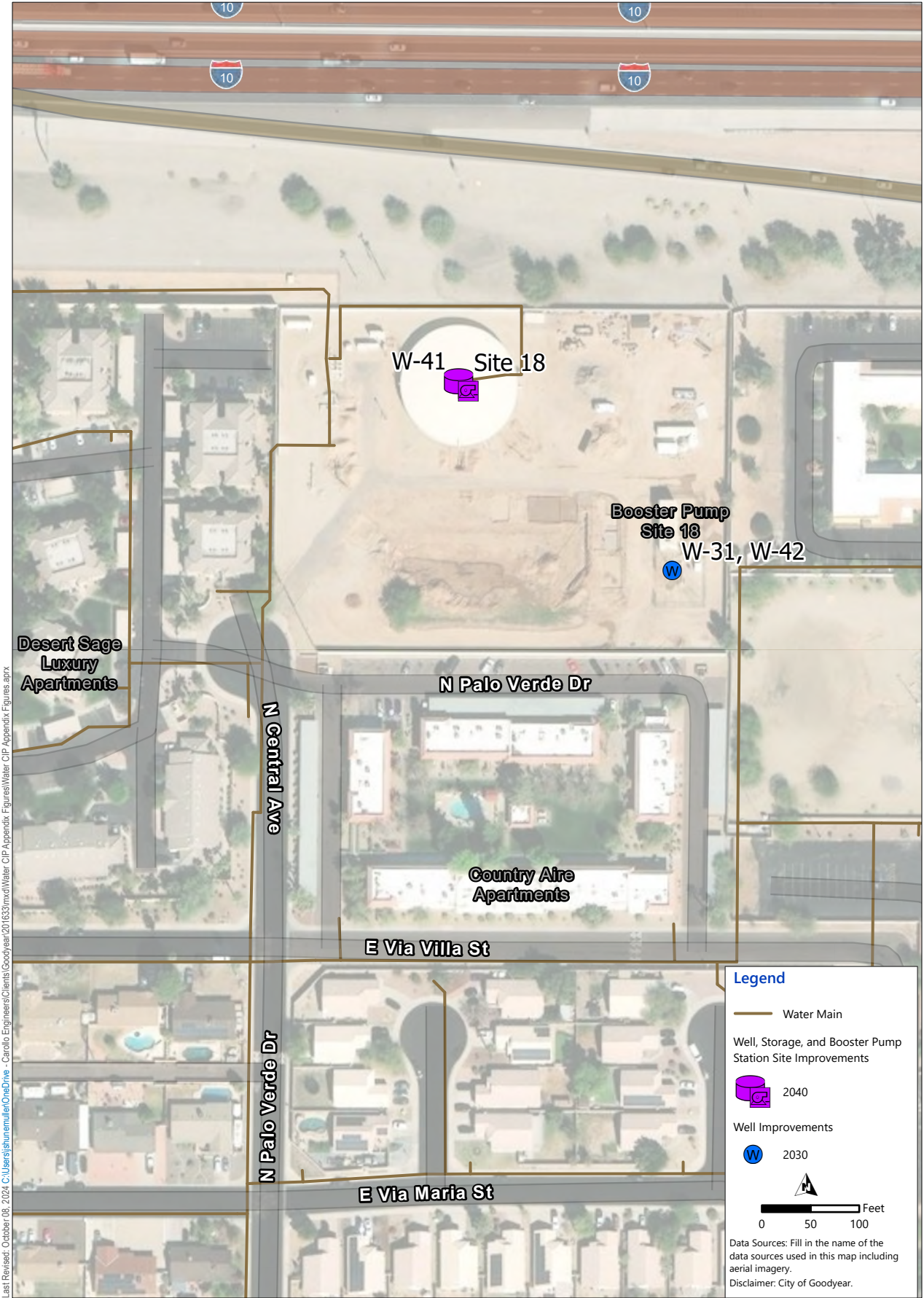


Figure 7C.6 Map of Capital Project W-30
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN



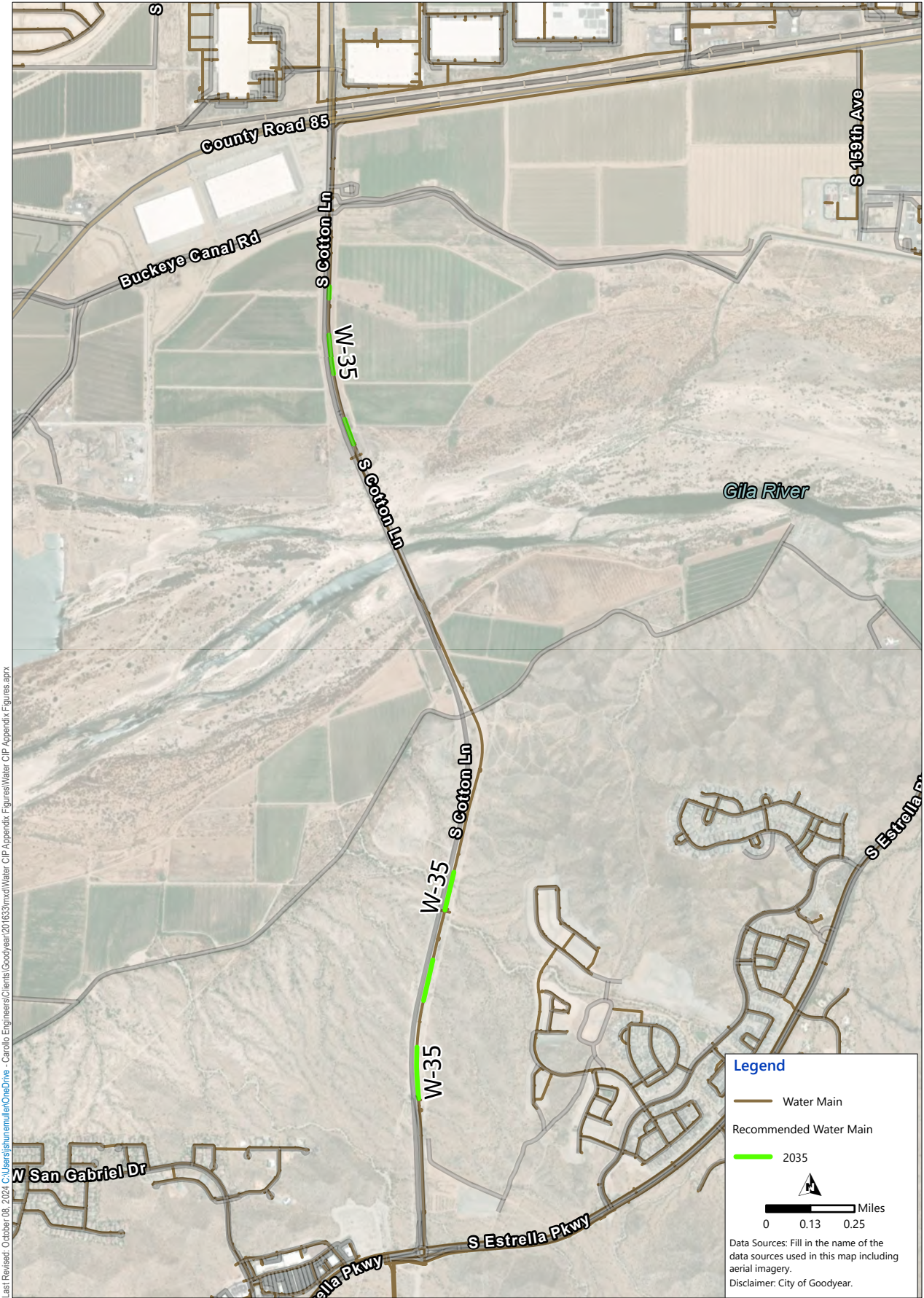
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Figure 7C.8 Map of Capital Project W-32
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN



Figure 7C.9 Map of Capital Projects W-33 and W-34
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN



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Figure 7C.10 Map of Capital Project W-35
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN



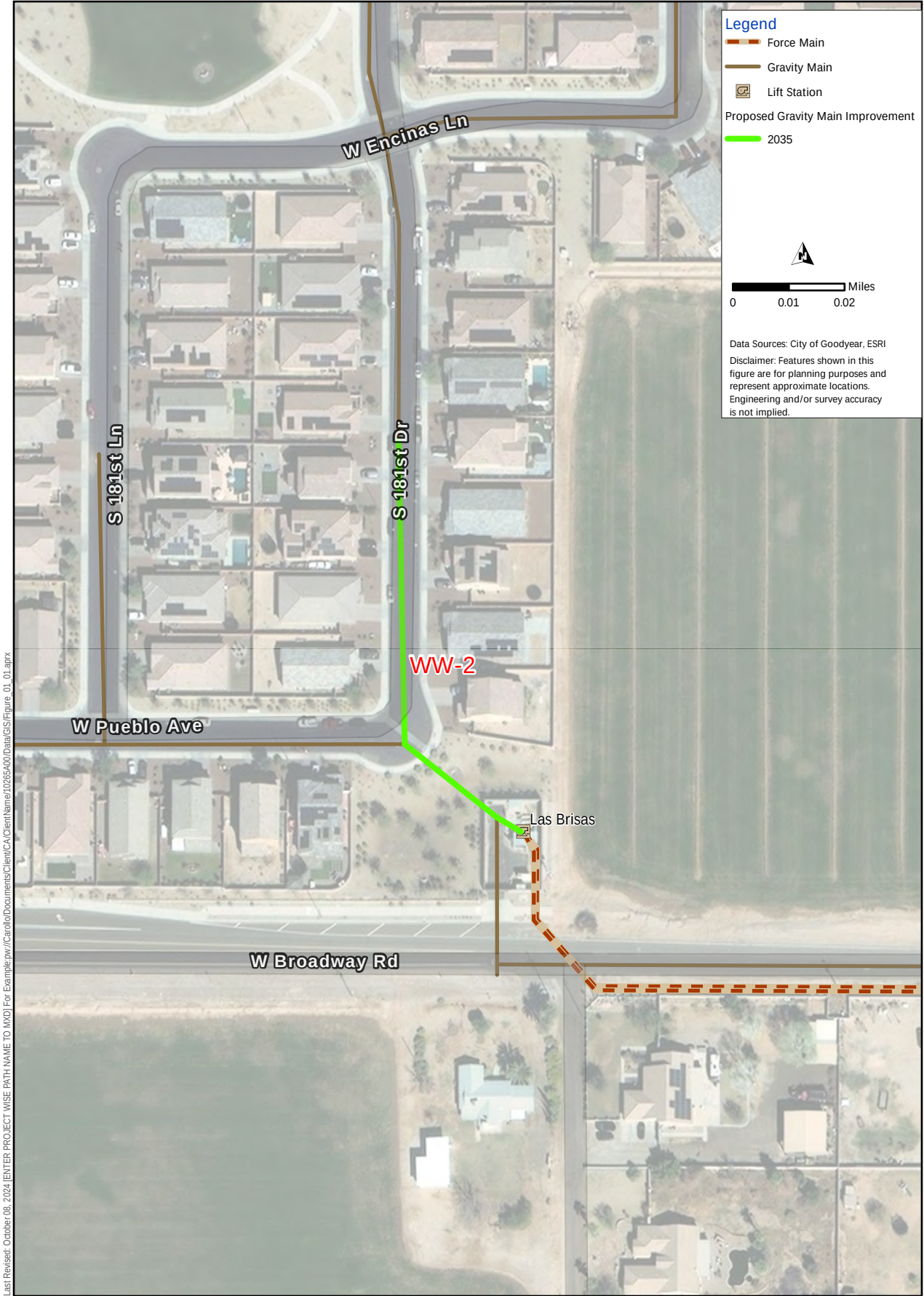
Figure 7C.11 Map of Capital Project W-37
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN

APPENDIX 7D

WASTEWATER CIP FIGURES

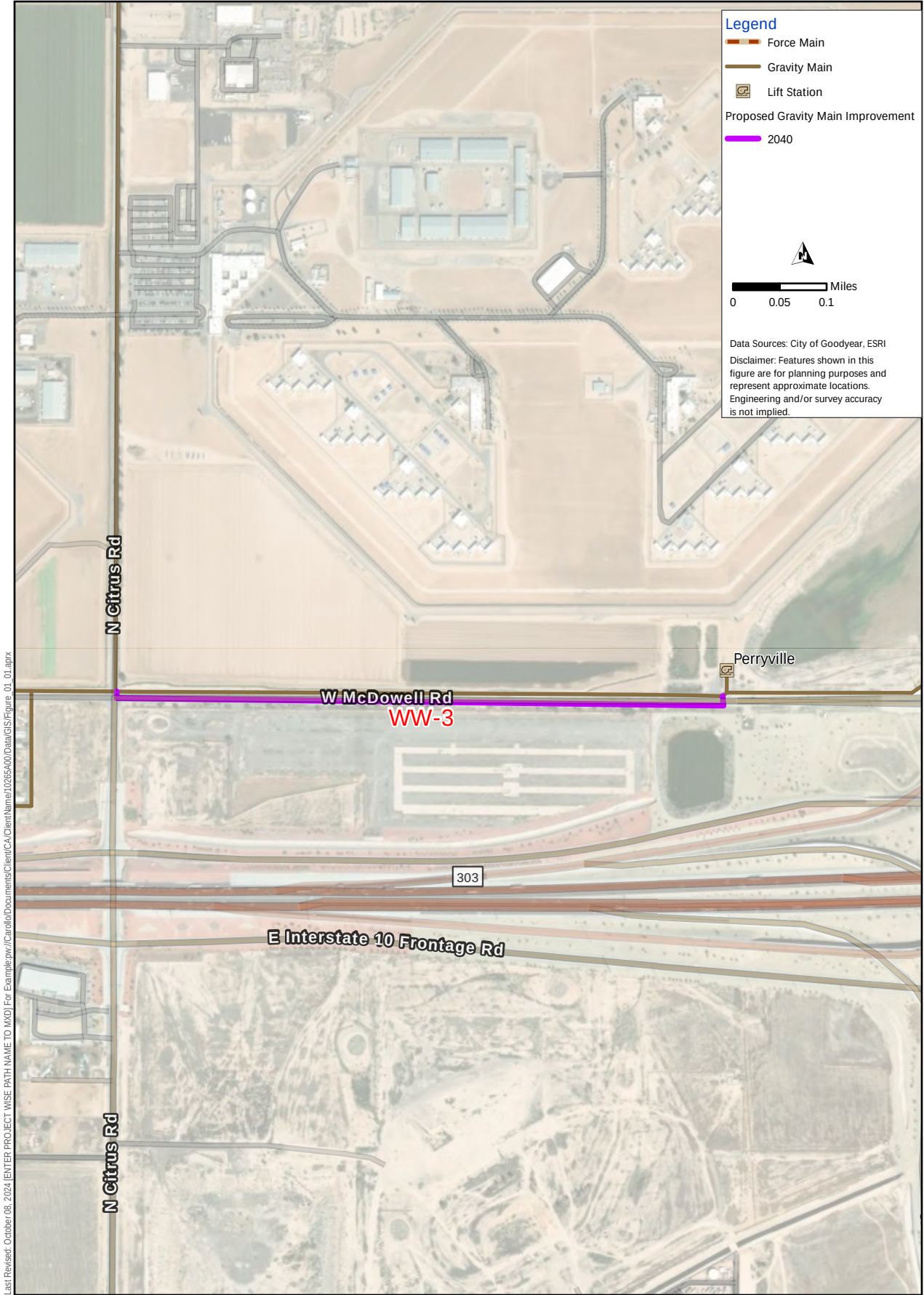


Figure 7D.1 Map of Capital Project WW-1
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN



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Figure 7D.2 Map of Capital Project WW-2
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN



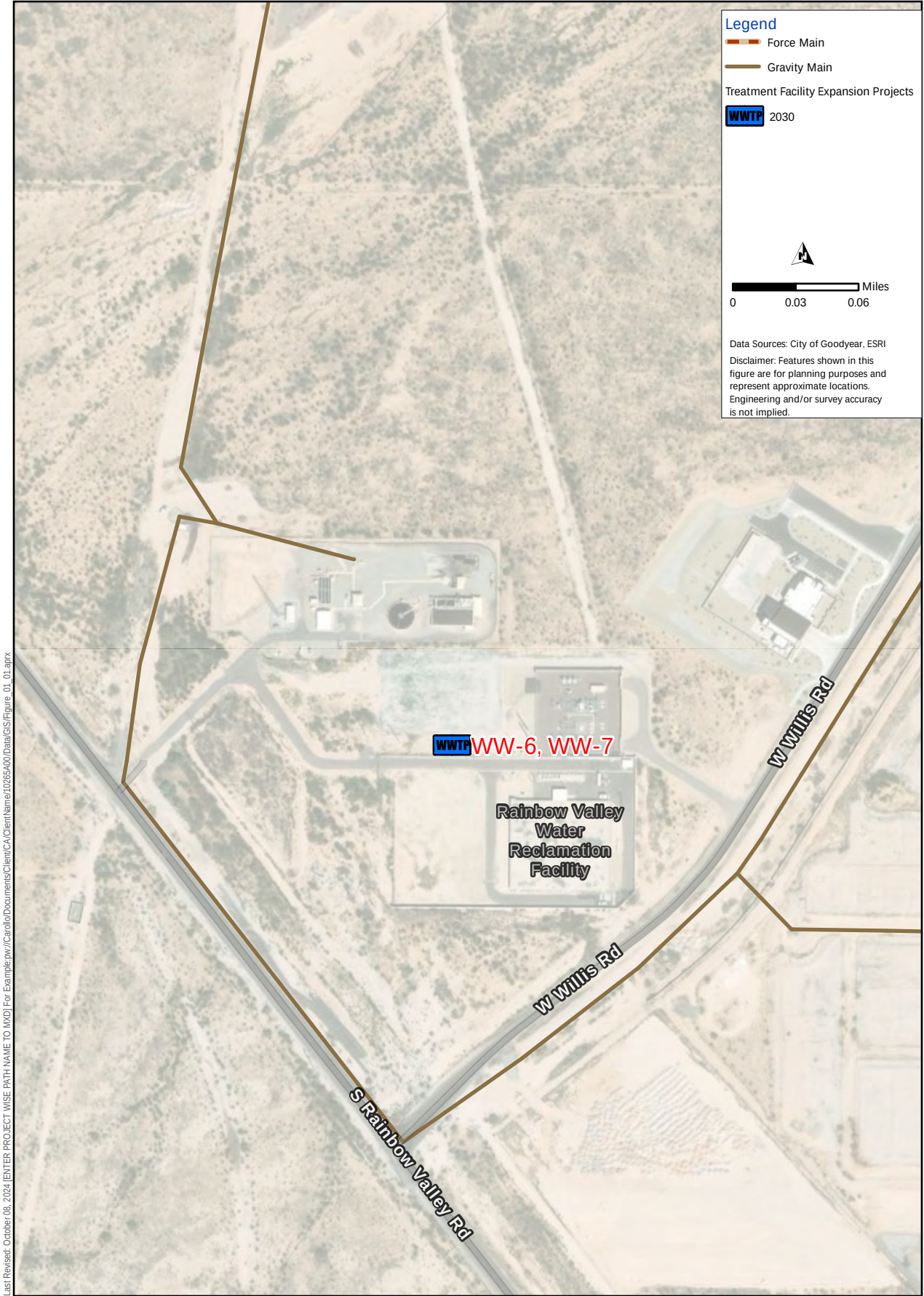
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Figure 7D.3 Map of Capital Project WW-3
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN



Last Revised: October 08, 2024 [ENTER PROJECT WISE PATH NAME TO MAD] For Example: pw://Carollo/Documents/Client/CA/ClientName/10265400/Data/CIS/Figure 01_01.aprx

Figure 7D.4 Map of Capital Projects WW-4 and WW-5
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN



Last Revised: October 08, 2024 [ENTER PROJECT WISE PATH NAME TO MAD] For Example: pw://Carollo/Documents/Client/CA/ClientName/10265400/Data/CIS/Figure 01_01.aprx

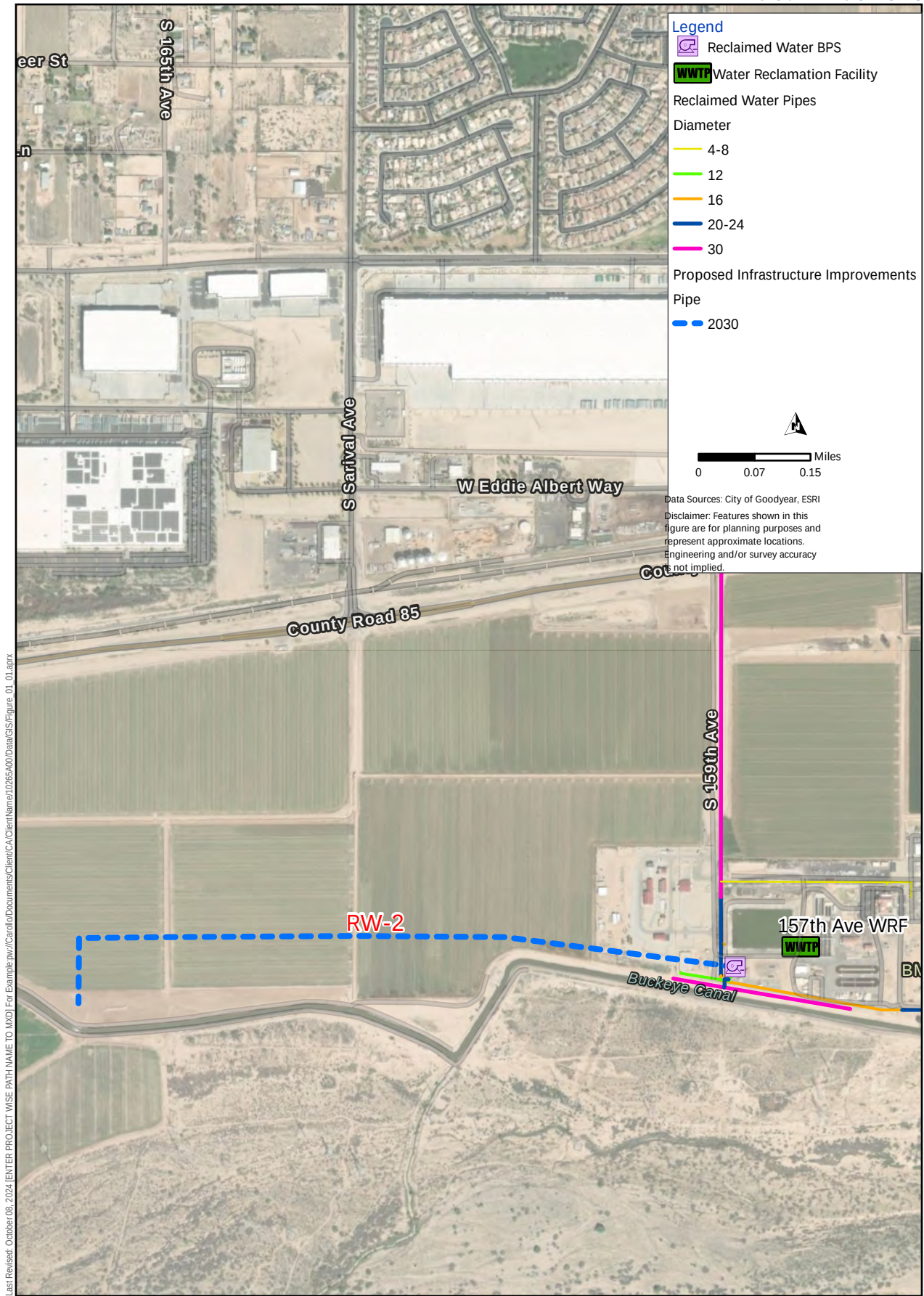
Figure 7D.5 Map of Capital Projects WW-6 and WW-7
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN

APPENDIX 7E

RECLAIMED WATER CIP FIGURES

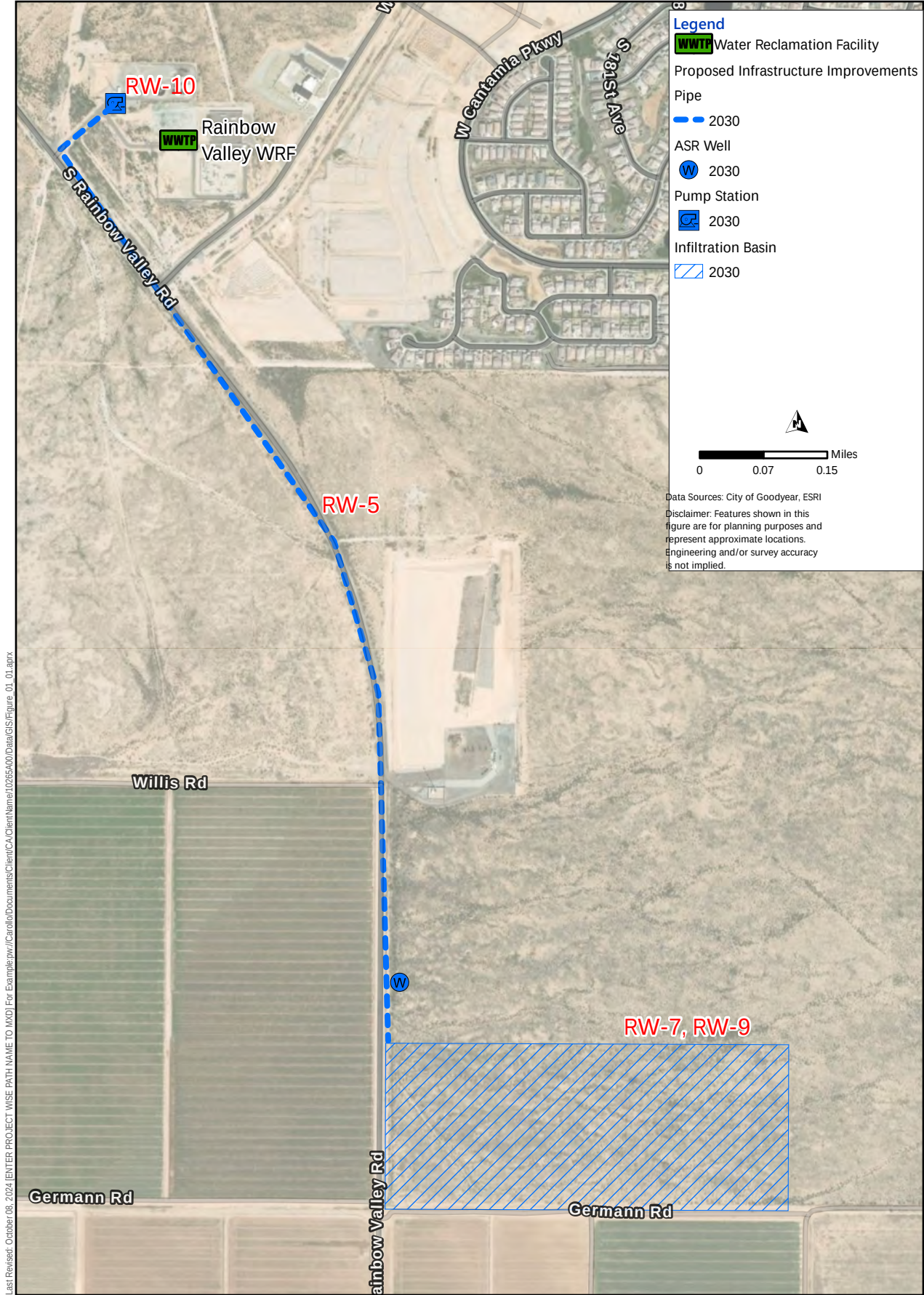


CITY OF GOODYEAR



Last Revised: October 08, 2024 [ENTER PROJECT WISE PATH NAME TO MXD] For Example: pw://Carollo/Documents/Client/CA/ClientName/10285400/Data/CS/figure 01_01.aprx

Figure 7E.2 Map of Capital Project RW-2
CITY OF GOODYEAR
2024 INTEGRATED WATER MASTER PLAN



Last Revised: October 08, 2024 [ENTER PROJECT WISE PATH NAME TO MAD] For Example: pw://Carollo/Documents/Client/CA/ClientName/10265400/Data/CIS/figure_01_01.aprx

Figure 7E.3 Map of Capital Projects RW-5, RW-7, RW-9, and RW-10
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