Master Plan Update

Aboite Division

Aqua Indiana

FINAL – May 2016

AQUA

Master Plan Update

Aboite Division

Aqua Indiana

FINAL – May 2016

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GREELEY AND HANSEN

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Executive Summary

Introduction

Aqua Indiana's (Aqua) wastewater collection and treatment system in Allen County includes approximately 200 miles of gravity sewer, 4,300 manholes, 34 lift stations, 18 miles of force main and two wastewater treatment plants (WWTPs).

The purpose of the wastewater collection and treatment master plan update is to evaluate current sewer flows and system capacities and to provide a prioritized capital improvement plan to meet conveyance and treatment requirements for the year 2025. The goals of the master plan update are as follows:

- Develop a plan to eliminate wet weather sanitary sewer overflows to achieve compliance.
- Maximize the capacity of the WWTPs by reducing wet weather flows through prioritized sewer system investigation.
- Identify and prioritize cost-effective removal of infiltration/inflow (I/I) sources.
- Identify potential future growth areas and develop a plan for adequate conveyance and treatment for the year 2025.
- Develop an asset management system to improve efficiency in data collection, management, and implementation of O&M that allow for risk-based decisions on capital reinvestment to provide a better return on investment.
- Develop a capital improvement plan including estimated construction costs and implementation schedule for recommended improvements.

Current Situation

The wastewater collection system for Main Aboite and Midwest are summarized below:

Sewer Service Area Statistics

Sewer Service Area	Gravity Sewer (miles)	Manholes (each)	Lift Station (each)	Force Main (miles)
Main Aboite	163	3,461	27	15.8
Midwest	37	853	7	2.4

Current Wastewater Flows

Five (5) temporary flow monitors were installed at the downstream ends of each major sewer basin to measure dry and wet weather flows. The flow monitoring period was from April 1, 2015 through June 30, 2015. The flow monitors recorded depth, velocity and flow in the sewer at 5-minute intervals. Daily precipitation totals were recorded at the Main Aboite WWTP. Hourly rainfall data from the Fort Wayne airport was used to determine the rainfall event return frequency. The flow monitoring results are summarized below:

Flow Monitoring Summary

Flow Meter Location	Sewer Basin	Average Flow (mgd)	Peak Flow (mgd)	Peaking Factor
C35-146	West Aboite	0.32	2.24 (1)	7.0
C35-148	West Aboite	0.37	1.53 (2)	4.1
D35-6	Central Aboite	0.67	1.95 (2)	2.9
D35-113	East Aboite	0.62	4.96 (1)	8.0
F32-73	Midwest	0.77	5.66 (1)	7.4

(1) June 27, 2015 storm produced nearly 3 inches of rain in 24 hours (5-year storm).
(2) April 19, 2015 storm produced 1.3 inches of rain in 12 hours (4-month storm).

Recorded peak to average flows were seven or greater at three of the five flow monitoring locations. It is recommended Aqua continue its ongoing program for sewer and manhole inspections to identify, prioritize and correct cost-effective infiltration/inflow sources.

Sewer segments were classified as 'limited' if peak flows were 70 to 90 percent of full-flow capacity. Sewer segments were classified as 'critical' if peak flows were greater than 90 percent of full-flow capacity. The approximate length of pipe identified as being limited or critical capacity for each interceptor are summarized below:

Limited and Critical Capacity Sewer Pipe

Sewer Basin	Limited/ Critical	U/S MH	D/S MH	Diameter (in)	Length (feet)
West Aboite	Critical	C35-11	Bittersweet LS	15	2,700
Central Aboite (primary)	Limited	D34-24	D35-3	18	2,100
Central Aboite (secondary)	Critical	D31-130	D33-117	12	1,700
Central Aboite (secondary)	Limited	D30-53	Covington Lakes LS	12	8,700
East Aboite	Limited	E32-29	E32-24	14	1,500
East Aboite	Limited	E34-18	E35-6	18	2,400
Midwest	Critical	E27-1	F27-1	12	4,000
Midwest	Limited	F31-12	F31-44	18	700
			Total		**23,800**

Wastewater Treatment

The table below summarizes current NPDES design capacities and current sewer flows.

Wastewater Treatment Plant Summary

Location	Design Average Flow (mgd)	Design Peak Flow (mgd)	Current Average Flow (mgd)	Reserve Capacity (mgd)
Main Aboite	3.25(1)	5.30(1)	2.10	0.82
Midwest	3.50(2)	12.00(2)	1.70	1.45

(1) The Main Aboite WWTP has annual average and peak NPDES permitted capacities of 3.25 mgd and 5.30 mgd, respectively.
(2) The Midwest WWTP is currently undergoing an expansion to increase its annual average and peak NPDES permitted capacities to 3.5 mgd and 12.0 mgd, respectively.

Future Situation

For the Main Aboite service area, growth and development is expected to continue in the northwest (to be served by Aboite Center Road Lift Station) and southern quadrants (to be served by Homestead Road Lift Station). Additionally, flows contributions could come from existing homes with septic systems that are forced to connect to sanitary sewers.

For the Midwest service area, growth and development is expected to continue in the north (area tributary to Braemar Lift Station) and northeast quadrants (to be served by Bass Road LS).

Population Projections

It is anticipated that Aqua's service area will experience growth similar to that forecast for Aboite Township. The increase in population from 2015 to 2025 is projected to be 10,550 people. This increase translates into 1,005,000 gallons per day of flow (at 100 gpd per person).

Wastewater Flow Projections

The table below shows the projected wastewater flows to each treatment plant for the year 2025. The estimated total wastewater flow increase is 1.0 mgd.

Wastewater Flow Projections

Location	Design Average Flow (mgd)	Design Peak Flow (mgd)	Year 2015 Average Flow (mgd)	Year 2025 Flow (mgd)[1]	Reserve Capacity (mgd)[2]
Main Aboite	3.25	5.30	2.10	2.70	0.22
Midwest	3.50	12.00	1.70	2.10	1.05

(1) Year 2025 average flow based upon a 26.2% increase in year 2015 flows.
(2) Reserve capacity is 90 percent of design average flow minus year 2025 flow.

Flows to the Main Aboite WWTP beyond the year 2025 will need to be considered. Aqua could defer the need for additional wastewater treatment (by an estimated 10 years or year 2035) by diverting flow permanently from Sycamore Hills Lift Station to the Midwest WWTP. An alternative option would be to construct a new wastewater treatment plant to serve future development likely to occur to the north and west (Whitley County). A plan should be developed in the next five years for how best to serve this area.

Lift Station Evaluation

On June 3 and 4, 2015 Greeley and Hansen and representatives of Aqua Indiana visited all 34 lift stations. This analysis included estimating the flow tributary to each lift station. The estimated peak flow was compared to the firm capacity of the lift station to estimate the remaining capacity. The recommended improvements for each lift station are included in Section 4.

Recommendations

The Master Plan Update includes recommendations to proactively plan and provide for anticipated growth and development within the service area for the next ten years (year 2025). The recommended projects will be required at various times over the next 5 years to sustain adequate wastewater collection and treatment to existing customers while also to provide the wastewater infrastructure for future planned development.

The following projects are recommended for the Main Aboite (MA) service area:

Project MA-1: Bittersweet Diversion – Phase 2
A two phase approach was recommended to correct wet weather sanitary sewer overflows in the Dells of Bittersweet neighborhood. Phase 1is under construction and includes expanding the capacity of the Bittersweet Moors Lift Station. Following the construction of the Phase 1 improvements, Aqua will monitor the performance of the system to determine if Phase 2 improvements are needed.

Phase 2 improvements consist of redirecting the Aboite Center Road Force Main to the Bittersweet Moors Lift Station in lieu of discharging to the Dells of Bittersweet collection system.
This project is also needed to allow for continued growth and development within the Aboite Center Road Lift Station service area.

The project includes the construction of 8,200 feet of 18-inch force main.

Project MA-2: Covington Lakes Lift Station and Force Main Improvements – Phase 2
A two phase approach is recommended to correct a wet weather sanitary sewer overflow in the Coves at Westlakes neighborhood. Phase 1 will be completed in-house by Aqua and consists of evaluating the hydraulic grade line of the sewer system upstream and downstream of the SSO location. The SSO location is the lowest point of relief. The evaluation will help determine if raising the manhole would correct or significantly reduce the SSO frequency at this location.

Phase 2 would consist of extending the existing force main to the south and discharging to the 12-inch sewer at the Aboite Center Road and Homestead Road intersection. The force main extension would eliminate the wet weather sanitary sewer overflow in the Coves at Westlakes neighborhood. This change would also require the Sycamore Hills Lift Station to permanently pump flow to the Braemar Force Main as the proposed discharge location for Covington Lakes does not have capacity to receive flow from both Sycamore Hills and Covington Lakes Lift Stations.

The project includes the construction of 2,100 feet of 10-inch force main.

Project MA-3: Sycamore Hills Flow Diversion Study (Flow Diversion to Midwest)
Sewer capacity evaluations in the central portion of Main Aboite showed limited capacity in the 18-inch interceptor upstream of the Main Aboite WWTP (MH D34-24 to MH D35-3) approximately 2,100 feet in length. This capacity limitation can be corrected by implementing the Sycamore Hills flow diversion to Midwest.

An engineering study is needed to evaluate the Braemar Lift Station and Sycamore Hills Lift Station working as one hydraulic system. The study is needed to identify improvements to increase overall system capacity to 3,000 to 3,500 gpm to meet year 2025 flows and beyond.

Project MA-4: East Aboite Interceptor Wet Weather Study - Phase 1
Sewer capacity evaluations in the east portion of Main Aboite showed limited capacity in the 18-inch interceptor south US 24 highway and Liberty Mills intersection. Wet weather SSOs occur at manholes D33-2, D33-3, and E33-69 which are all located in the Liberty Hills and Burnham Woods area just upstream of where the sewer connects to the East Aboite Interceptor northwest of the US 24 highway and Liberty Mills intersection.

The project would consist of a detailed engineering evaluation to develop a corrective action plan to eliminate the SSOs.

Project MA-5: East Aboite Interceptor Wet Weather Study – Phase 2
Sewer capacity evaluations in the east portion of Main Aboite showed limited capacity in the 14-inch sewer south of Aboite Center Road near Coventry Lane (MH E32-29 to MH E32-24) approximately 1,500 feet in length. Additionally, the East Aboite sewer basin collection system showed excessive high flows during wet weather. It is recommended that sewer flow monitoring be conducted to try and isolate the highest sources of infiltration and inflow for removal.

Midwest Service Area

The following projects are recommended for the Midwest (MW) service area:

Project MW-1: Bass Road Lift Station Relief Sewer
Sewer capacity evaluations in the northern portion of Midwest showed critical capacity in the 12-inch sewer between MH E27-1 and MH F27-1, approximately 4,000 feet in length. The sewer passes through Abbey Place and Hunt Club Apartments. This is a high priority sewer because it receives flow from the Bass Road Lift Station a key facility to serve anticipated future growth and development.

The project would consist of a detailed engineering evaluation to determine replacement sewer or relief sewer size to meet year 2025 flows and beyond.

Project MW-2: 18-inch Brierwood Hills Relief Sewer
Sewer capacity evaluations in the southern portion of Midwest showed limited capacity in the 18-inch interceptor north of US 24 highway near Brierwood Hills. The capacity limited sewer is between MH F31-12 to MH F31-44 and is approximately 700 feet in length.

The project would consist of a detailed engineering evaluation to identify potential relief sewer options.

Project MW-3: Midwest Interceptor Wet Weather Study
Sewer flow monitoring at the lower end of the basin showed that the collection system experiences excessive wet weather flows that warrant further investigation. It is recommended that sewer flow monitoring be conducted to try and isolate the highest sources of infiltration and inflow for removal.

System Wide Projects

The following projects are recommended for System Wide (SW) improvements:

Project SW-1: Existing Lift Station Improvements
This project consists of the lift station improvements recommended in Section 4.

Project SW-2: Sewer Computer Model Update
It is recommended that additional investment be made to update the SewerGEMs model. The existing model is not a calibrated model so it is very limited in its usefulness to analyze wet weather impacts on the collection system. As the service area grows and flows are shifted from basin to basin it will become increasingly important to have a more accurate accounting of flows.

Project SW-3: Wastewater Treatment Plant Study
The implementation of the Sycamore Hills flow diversion will delay the need for additional wastewater treatment through the year 2025. It is recommended that an engineering study be conducted to identify possible locations, NPDES permit effluent limits, proposed treatment processes, and land acquisition needs.

Estimated Project Costs

The estimated project costs presented in this plan include construction costs, construction contingency, engineering design and engineering services during construction. Estimated construction costs prepared at the planning level are intended to represent typical costs for projects of a similar nature. Estimated project costs do not include any land acquisition, easements or construction observation. The table below summarizes the estimated costs for the recommended projects.

Estimated Project Costs

Location	Project	Description	Dia. (in)	Length (feet)	Estimated Construction Cost
Main Aboite	MA-1	Bittersweet Diversion Force Main	18	8,200	$1,100,000
Main Aboite	MA-2	Covington Lakes Force Main	10	2,100	$160,000
Main Aboite	MA-2	Covington Lakes LS Improvements(1)	--	--	$125,000
Main Aboite	MA-3	Sycamore Hills Flow Diversion	--	--	$300,000
Main Aboite	MA-4	East Aboite Wet Weather Study – Ph. 1(1)	--	--	TBD
Main Aboite	MA-5	East Aboite Wet Weather Study – Ph. 2(1)	--	--	TBD
Midwest	MW-1	Bass Road LS Relief Sewer	15	4,000	$600,000
Midwest	MW-2	Brierwood Hills Relief Sewer	18	700	$150,000
Midwest	MW-3	Midwest Wet Weather Study Improvements(1)	--	--	$500,000
System Wide	SW-1	Existing Lift Station Improvements (Section 4)	--	--	$285,000
(1) Engineering evaluation is needed to define scope of work and cost.					
				Subtotal	3,720,000
				Construction Contingency (20%)	750,000
				Total Estimated Construction Cost	4,470,000
				Non-Construction / Design Engineering (20%)	900,000
				Total Estimated Capital Cost	5,370,000
Engineering Evaluations					
Main Aboite	MA-2	Engineering Evaluation (Study)			$50,000
Main Aboite	MA-3	Engineering Evaluation (Study)			$60,000
Main Aboite	MA-4	Engineering Evaluation (Study)			$50,000
Main Aboite	MA-5	Engineering Evaluation (SSES Study)			$125,000
Midwest	MW-1	Engineering Evaluation (Study)			$50,000
Midwest	MW-2	Engineering Evaluation (Study)			$30,000
Midwest	MW-3	Engineering Evaluation (SSES Study)			$125,000
System Wide	SW-2	Engineering Evaluation (Hydraulic Computer Model Update)			$500,000
System Wide	SW-3	Engineering Evaluation (WWTP Study)			$75,000
				Total Engineering Evaluations	$1,065,000
				Total Estimated Project Cost	**$6,435,000**

Implementation Schedule

Project Description	Activity	Milestone Start	Milestone Completion
MA-1: Bittersweet FM Diversion – Phase 2***	Bid	Spring 2020	Spring 2020
*** Potential to defer if Phase 1 is successful	Construction	Summer 2020	Spring 2021
MA-2: Covington Lakes LS & FM – Phase 2***	Study	Spring 2017	Summer 2017
*** Potential to defer if Phase 1 is successful	Design	Fall 2017	Spring 2018
	Bid	Spring 2018	Spring 2018
	Construction	Summer 2018	Spring 2019
MA-3: Sycamore Hills Flow Diversion	Study	Spring 2020	Summer 2020
	Design	Fall 2020	Spring 2020
	Bid	Spring 2021	Spring 2021
	Construction	Summer 2021	Spring 2022
MA-4: East Aboite Wet Weather Study – Phase 1	Study	Spring 2018	Winter 2018
	Design	Spring 2019	Fall 2019
	Bid	Winter 2019	Winter 2019
	Construction	Spring 2020	Spring 2021
MA-5: East Aboite Wet Weather Study – Phase 2	Study	Spring 2019	Winter 2019
	Design	Spring 2020	Fall 2020
	Construction	Spring 2021	Fall 2021
MW-1: Bass Road LS Relief Sewer	Study	Spring 2018	Fall 2018
	Design	Winter 2018	Fall 2019
	Bid	Winter 2019	Winter 2019
	Construction	Spring 2020	Spring 2021
MW-2: Brierwood Hills Relief Sewer	Study	Spring 2018	Fall 2018
	Design	Winter 2018	Summer 2019
	Bid	Spring 2020	Spring 2020
	Construction	Spring 2020	Winter 2021
MW-3: Midwest Wet Weather Study	Study	Spring 2019	Spring 2020
	Bid	Spring 2021	Spring 2021
	Construction	Spring 2021	Spring 2022
SW-1: Existing Lift Station Improvements	Design – Phase 1	Summer 2018	Winter 2018
	Bid – Phase 1	Spring 2019	Spring 2019
	Construction – Phase 1	Summer 2019	Winter 2019
	Design – Phase 2	Summer 2020	Winter 2020
	Bid – Phase 2	Spring 2021	Spring 2021

	Construction – Phase 2	Summer 2021	Winter 2021
SW-2: Sewer Computer Model Update	Flow Study	Spring 2021	Summer 2021
	Field Survey	Summer 2021	Winter 2021
	Model Update	Winter 2021	Summer 2021
SW-3: Wastewater Treatment Plant Study	Study	Summer 2020	Summer 2021

Section 1 Introduction

1.1 Background

Aqua Indiana's (Aqua) wastewater collection and treatment system in Allen County includes approximately 200 miles of gravity sewer, 4,300 manholes, 34 lift stations, 18 miles of force main and two wastewater treatment plants (WWTPs).

The purpose of the wastewater collection and treatment master plan update is to evaluate current sewer flows and system capacities and to provide a prioritized capital improvement plan to meet conveyance and treatment requirements for the year 2025. The goals of the master plan update are as follows:

- Develop a plan to eliminate wet weather sanitary sewer overflows to achieve compliance.
- Maximize the capacity of the WWTPs by reducing wet weather flows through prioritized sewer system investigation.
- Identify and prioritize cost-effective removal of infiltration/inflow (I/I) sources.
- Identify potential future growth areas and develop a plan for adequate conveyance and treatment for the year 2025.
- Develop an asset management system to improve efficiency in data collection, management, and implementation of O&M that allow for risk-based decisions on capital reinvestment to provide a better return on investment.
- Develop a capital improvement plan including estimated construction costs and implementation schedule for recommended improvements.

Section 2 Current Situation

2.1 Collection System

Aqua Indiana owns and operates a wastewater collection and treatment system under a Certificate of Territorial Authority (CTA) regulated under the Indiana Utility Regulatory Commission. The wastewater collection system is divided into two separate sewer service areas served by the Main Aboite WWTP and Midwest WWTP. **Figure 2-1** shows the existing wastewater facilities.

The wastewater collection system for Main Aboite and Midwest are summarized in **Table 2-1**.

Table 2-1
Sewer Service Area Statistics

Sewer Service Area	Gravity Sewer (miles)	Manholes (each)	Lift Station (each)	Force Main (miles)
Main Aboite	163	3,461	27	15.8
Midwest	37	853	7	2.4

There is an 'Aboite Diversion' that exists within the Main Aboite service area. This flow diversion includes all sanitary flow tributary to the Braemar Lift Station which is pumped to the Midwest WWTP. Flows in excess of the Braemar Lift Station passively flow to the Sycamore Hills Lift Station. To further enhance wet weather flow management, the Sycamore Hills Lift Station has the ability to send flow to either Main Aboite WWTP (existing condition) or to pump flow (flow diversion) into the Braemar Force Main tributary to the Midwest WWTP.

2.2 Current Wastewater Flows

Five (5) temporary flow monitors were installed at the downstream ends of each major sewer basin to measure dry and wet weather flows from the areas tributary to the flow monitors. The flow monitoring period was from April 1, 2015 through June 30, 2015. The flow monitors recorded depth, velocity and flow in the sewer at 5-minute intervals. Daily precipitation totals were recorded at the Main Aboite WWTP. Hourly rainfall data from the Fort Wayne airport was used to determine the rainfall event return frequency. **Figure 2-2** shows the flow monitor locations. **Table 2-2** summarizes the temporary flow monitoring results.

Table 2-2
Flow Monitoring Summary

Flow Meter Location	Sewer Basin	Average Flow (mgd)	Peak Flow (mgd)	Peaking Factor
C35-146	West Aboite	0.32	2.24 (1)	7.0
C35-148	West Aboite	0.37	1.53 (2)	4.1
D35-6	Central Aboite	0.67	1.95 (2)	2.9
D35-113	East Aboite	0.62	4.96 (1)	8.0
F32-73	Midwest	0.77	5.66 (1)	7.4

(1) June 27, 2015 storm produced nearly 3 inches of rain in 24 hours (5-year storm).
(2) April 19, 2015 storm produced 1.3 inches of rain in 12 hours (4-month storm).

2.2.1 Flow Frequency Plots

Frequency plots are used to determine how often a value in a data set is occurring. Flow frequency plots were developed for each flow monitor location to determine how frequent the extreme peak flow rates occurred. The 5-minute recorded flow rates were plotted so that we could examine how often flow rates were above or below a certain value. For instance, the maximum recorded flow rate for the flow monitor at Manhole F32-73 was 5.7 mgd. However, flow rates in the sewer were less than 1.2 mgd, 95 percent of the time during the flow monitoring period. **Figures 2-8** through **2-12** show the flow frequency plots for each flow monitoring site. **Table 2-3** summarizes the frequency plot results.

Table 2-3
Flow Frequency Summary

Flow Meter Location	Sewer Basin	95% of flow readings less than indicated value (mgd)
C35-146	West Aboite	0.61
C35-148	West Aboite	0.71
D35-6	Central Aboite	1.30
D35-113	East Aboite	1.10
F32-73	Midwest	1.20

2.2.2 Scattergraphs

The sewer flow monitoring data provided information relative to average and peak flow rates tributary to each flow monitoring location. Sewer flow monitoring data was used to create "scattergraphs" (or a plot of the sewer's depth of flow versus velocity). Scattergraphs are based on Manning's theory which states the velocity in an open channel pipe (i.e., gravity flow sewer) increases as the depth of flow increases. Therefore, for a given pipe, a certain depth should always correspond to a certain velocity. When this relationship is not followed, the arrangement of the data or "signature" can be used to identify and diagnose the reason for the change in the depth-velocity relationship. In this manner, scattergraphs can be used to estimate sewer capacity or to determine where sewer capacity is insufficient or where sewer capacity may be restricted.

Figure 2-3 shows the depth-velocity scattergraph for flow monitor MH C35-146 (West Aboite). The scattergraph shows the 8-inch sewer surcharged to a maximum depth of 16" during the June 27th rain event. The depth-velocity relationship went from shallower-faster to slower-deeper depicting a sewer that is "backing-up" – acting under the influence of a downstream restriction. In this case, the Bittersweet Woods Lift Station was restricting flow. During dry weather, the velocity in the sewer always exceeded 2 feet per second (fps) which is desirous to keep solids in suspension.

Figures 2-4 through **2-6** show the depth-velocity scattergraphs for flow monitors MH C35-148 (West Aboite), MH D35-6 (Central Aboite), and D35-113 (East Aboite). The depth-velocity relationships were similar for all three locations. The scattergraphs show normal open channel flow in which the sewers did not surcharge. The sewers reached maximum depths of approximately 60%, 67%, and 70% full, respectively during the flow monitoring period. The velocity in the sewers at all three locations exceed 2 fps during a typical day.

Figure 2-7 shows the depth-velocity scattergraph for flow monitor MH F32-73 (Midwest). The depth-velocity relationship shows normal open channel flow during dry weather and moderate rainfall events similar to April 19th (1.3 inches of rain in 12 hours). However, during the rainfall event on June 27th (3 inches of rain in 24 hours) the sewer depth could only reach ten inches in a 24-inch diameter pipe before experiencing a sudden decrease in velocity due to a downstream restriction. The downstream restriction was caused by the Midwest WWTP reaching its capacity which resulted in the sewer surcharging to a maximum depth of 170 inches.

2.3 Estimated Infiltration/Inflow

During the 90-day flow monitoring period, there were two storms that produced high flow responses in the collection system. A storm event is generally characterized by its size and the frequency of its occurrences. The size of the storm is the total precipitation that occurs in a specified duration. How often this size storm is likely to repeat is called the frequency.

For instance, the April 19, 2015 storm produced 1.3 inches of rain in 12 hours. According to the Rainfall Frequency Atlas of the Midwest, the frequency of this storm is 4 months. Stated another way, this storm is likely to occur 3 times in a given year. Conversely, the June 27, 2015 storm produced 3 inches of rain in 24 hours which is equivalent to a 5-year storm. A 5-year storm is a storm that occurs once every five years and has a 20 percent chance of occurring in a given year. **Table 2-4** summarizes the two largest storm events:

Table 2-4
Storm Frequency Summary

Storm Event	Frequency [1] (time)	Duration (hours)	Total Rainfall (inches)	Max. Intensity (in/hr)
April 19, 2015	4 month	12	1.3	0.24
June 27, 2015	5 year	24	3.0	0.55

[1] Rainfall Frequency Atlas of the Midwest, Bulletin 71, Huff and Angel, 1992.

Sewer flow monitoring data was used to estimate the wet weather flow contribution from each sewer basin. For this evaluation, inflow and infiltration (I/I) were treated as a single component.

To provide a visualization of the collection system's response to a rain event, sewer flows from a rain-day were overlaid on a typical dry-day hydrograph. A hydrograph is a plot of sewer flow versus time. **Figures 2-13** through **2-20** show estimated wet weather I/I volume for the April 19, 2015 storm and the June 27, 2015 storm. The estimated I/I volume is the difference between the measured sewer flow that occurred during the storm and the average dry weather flow recorded during the period. **Table 2-5** shows the estimated wet weather I/I volumes for each flow monitor location:

Table 2-5
Estimated I/I Volumes

Flow Monitor	Sewer Basin	4-month Storm I/I Volume (1) (gallons)	5-year Storm I/I Volume (2) (gallons)
C35-146	West Aboite	133,000	555,000
C35-148	West Aboite	249,000	Data Not Available
D35-6	Central Aboite	695,000	Data Not Available
D35-113	East Aboite	505,000	2,743,000
F32-73	Midwest	220,000	2,317,000

(1) April 19, 2015 storm produced 1.3 inches of rain in 12 hours (4-month storm).
(2) June 27, 2015 storm produced nearly 3 inches of rain in 24 hours (5-year storm).

2.4 Estimated Sewer Flows

The purpose of estimating sewer flows was to compare with total sewer basin flows (i.e., 90-day sewer flow monitoring) and to estimate flows to other facilities such as lift stations to assess current and future capacity requirements.

Current sewer flows to lift stations and interceptors were estimated based upon the Indiana Department of Environmental Management Facility Construction guidelines of 310 gallons per day (gpd) for a single family home. For commercial and general business areas, average daily flow rate was estimated using 1,000 gpd per developed acre. Average daily flow for industrial areas was estimated using 1,500 gpd per developed acre. A peaking factor of 4 was applied to the average daily flow rate to estimate peak hour flow (i.e., wet weather flows).

Table 2-6 shows the estimated average daily and peak hour flows for each major sewer basin upstream of their respective wastewater treatment plant. **Table 2-7** shows estimated wastewater flows tributary to each lift station.

Table 2-6
Estimated Wastewater Flows

Sewer Basin	Average Flow[(1)] (mgd)	Peak Flow[(2)] (mgd)
West Aboite	0.7	2.8
Central Aboite	0.8	3.2
East Aboite	1.4	5.6
South Aboite	<0.1	0.3
Midwest	1.1	4.4

[(1)] IDEM Facility Construction Section 310 gpd per single family home. Average daily flow of 1,000 gpd per developed acre and 1,500 gpd per developed acre were used to estimate commercial/general business and industrial areas, respectively.
[(2)] Peak flow estimated by taking average flow and multiplying by a peaking factor of 4.

Table 2-7
Estimated Flows to Lift Stations

Lift Station	Lift Station (#)	Average Flow[(1)] (gpm)	Peak Flow[(2)] (gpm)
Aboite Center Road	8	150	600
Aboite Meadows #1	9	75	300
Aboite Meadows #2	10	75	300
Amber Highlands	1	36	144
Bass Road	27	18	72
Bittersweet Moors	23	475	1,900
Bluewater	3	34	136
Braemar	5	300	1,200
Brigadoon	14	2	8
Brierwood	30	18	72
Covington Bluffs	31	5	20
Covington Club	32	9	36
Covington Lake	7	215	860
Devil's Hollow	16	53	212
Ellisville	21	1	4
Emerald Lake	6	36	144
Glens of Bittersweet	18	4	16
Goldspur	34	1	4
Grayfox	22	11	44
Hamlets	20	21	84
Highlands of Scotia	11	2	8
Homestead Road	25	45	180
Indian Creek	17	18	72
Inverness Hills	29	450	1,800
Liberty Mills	24	11	44
Micropulse	26	2	8
Peddler's Ford	15	2	8
Quail Hollow	13	10	40
Scotia	12	18	72
Shorewood	28	33	132
Sycamore Hills	4	250	1,000
Waterside Woods	33	6	24
Westfield Passage	2	3	12
West Hamilton Rd	19	7	28

2.5 Sewer and Lift Station Capacities

2.5.1 Interceptor Capacity

This section compares the metered and estimated sewer flows against the full-flow capacity of the existing interceptor sewers within each sewer basin. **Figure 2-21** shows estimated and measured sewer flows versus existing interceptor capacity.

The purpose of the comparison was to identify areas where sewer capacity may be marginal or insufficient to serve future development. Sewer segments were classified as 'limited' if peak flows were 70 to 90 percent of full-flow capacity. Sewer segments were classified as 'critical' if peak flows were greater than 90 percent of full-flow capacity. **Figure 2-22** shows the existing interceptor capacity analysis. **Table 2-8** summarizes the approximate length of pipe identified as being limited or critical capacity for each interceptor.

Table 2-8
Limited and Critical Capacity Sewer Pipe

Sewer Basin	Limited/ Critical	U/S MH	D/S MH	Diameter (in)	Length (feet)
West Aboite	Critical	C35-11	Bittersweet LS	15	2,700
Central Aboite (primary)	Limited	D34-24	D35-3	18	2,100
Central Aboite (secondary)	Critical	D31-130	D33-117	12	1,700
Central Aboite (secondary)	Limited	D30-53	Covington Lakes LS	12	8,700
East Aboite	Limited	E32-29	E32-24	14	1,500
East Aboite	Limited	E34-18	E35-6	18	2,400
Midwest	Critical	E27-1	F27-1	12	4,000
Midwest	Limited	F31-12	F31-44	18	700
			Total		**23,800**

Tables 2-9 through **2-13** show the estimated wastewater flow, sewer capacity and reserve capacity at various locations along an interceptor sewer reach. Reserve capacity is estimated to be 90 percent of the sewer's full-flow capacity minus current peak flow.

Table 2-9
West Aboite - Interceptor Capacity Analysis

Location	Diameter (inches)	Sewer Capacity (mgd)	Estimated Peak Flow (mgd)	Metered Peak Flow (mgd)	Reserve Capacity (mgd)
Covington Rd	12	1.7	0.6	N/A	0.9
Aboite Center Rd	15	3.0	0.9	N/A	1.8
Liberty Mills Rd	15	2.9	1.7	N/A	0.9
U/S of WWTP	15	3.7	2.7	2.3	0.6

Table 2-10
Central Aboite - Interceptor Capacity Analysis

Location	Diameter (inches)	Sewer Capacity (mgd)	Estimated Peak Flow (mgd)	Metered Peak Flow (mgd)	Reserve Capacity (mgd)
Illinois Rd	18	4.3	1.5	N/A	2.3
Covington Rd	15	2.6	1.2	N/A	1.1
Aboite Center Rd	12	1.8	1.3	N/A	0.3
Liberty Mills Rd	18	4.8	2.9	N/A	1.4
U/S of WWTP	15	4.8	3.2	2.0	1.1

Table 2-11
East Aboite - Interceptor Capacity Analysis

Location	Diameter (inches)	Sewer Capacity (mgd)	Estimated Peak Flow (mgd)	Metered Peak Flow (mgd)	Reserve Capacity (mgd)
Covington Rd	15	3.0	1.3	N/A	1.4
Aboite Center Rd	14	2.4	2.3	N/A	0
Liberty Mills Rd	18	4.3	3.3	N/A	0.6
U/S of WWTP	24	9.1	5.7	4.9	2.5

Table 2-12
South Aboite - Interceptor Capacity Analysis

Location	Diameter (inches)	Sewer Capacity[(1)] (mgd)	Estimated Peak Flow (mgd)	Metered Peak Flow (mgd)	Reserve Capacity (mgd)
Lower Huntington Rd.	12	1.1	0.1	N/A	0.9
Azbury Blvd	15	1.6	0.2	N/A	1.2
Homestead Rd	15	1.6	0.2	N/A	1.2
Homestead LS	12	1.1	0.3	N/A	0.7

(1) Capacity calculated using Ten States Standards minimum sewer slopes.

Table 2-13
Midwest - Interceptor Capacity Analysis

Location	Diameter (inches)	Sewer Capacity (mgd)	Estimated Peak Flow (mgd)	Metered Peak Flow (mgd)	Reserve Capacity (mgd)
Covington Rd	12	1.6	1.6	N/A	0
Aboite Center Rd	15	6.5	2.7	N/A	3.2
Liberty Mills Rd	18	3.9	2.9	N/A	1.0
U/S of WWTP	24	9.4	4.2	5.6	2.9

2.5.2 Lift Station Capacity

Table 2-14 summarizes existing lift station capacities.

Table 2-14
Lift Station Design Summary

Lift Station Name	Lift Station (#)	No. of Pumps	Capacity		Installation Year of Pumps
			Each Pump (gpm)	Firm (gpm)	
Aboite Center Road	8	3	640	1,280	2003
Aboite Meadows #1 (New)	9	2	225	225	2011
Aboite Meadows #2 (Old)	10	2	NA	NA	2014
Amber Highlands	1	2	270	270	2001
Bass Road	27	2	680	680	2004
Bittersweet Woods	23	3	1,400	2,900	2015
Bluewater	3	2	120	120	2013
Braemar	5	2	1,400	1,400	2014
Brigadoon	14	2	25	25	2000
Brierwood	30	2	110	110	2005
Covington Bluffs	31	2	80	80	1983
Covington Club	32	2	85	85	2010
Covington Lake	7	2	1,020	1,020	2015
Devil's Hollow	16	2	420	420	2007
Ellisville	21	2	190	190	2009
Emerald Lake	6	2	210	210	1987
Glens of Bittersweet	18	2	130	130	2007
Goldspur	34	2	NA	NA	2012
Grayfox	22	2	80	80	1988
Hamlets	20	2	820	820	2002
Highlands of Scotia	11	2	15	15	2005
Homestead Road	25	2	620	620	2004
Indian Creek	17	2	110	110	2001
Inverness Hills	29	4	1,175	2,350	2002
Liberty Mills	24	2	285	285	2004
Micropulse	26	2	45	45	2008
Peddler's Ford	15	2	25	25	2014
Quail Hollow	13	2	200	200	2001
Scotia	12	2	215	215	2004
Shorewood	28	2	110	110	1993
Sycamore Hills	4	2	1,750	1,750	2010
Waterside Woods	33	2	110	110	2001
Westfield Passage	2	2	20	20	1985
West Hamilton Rd	19	2	150	150	2003

2.5.3 Wet Weather Capacity Issues

During certain intense or heavy rainfalls, there are five recurring wet weather sanitary sewer overflow (SSO) locations. **Table 2-15** summarizes manhole locations with recurring wet weather SSOs.

Table 2-15
Wet Weather SSO Locations

Sewer Basin	Manhole
West Aboite	C35-12
Central Aboite	D31-120
East Aboite	D33-2, D33-3, E33-69

Manhole C35-12

Manhole C35-12 is located on a 15-inch sewer in the Dells of Bittersweet neighborhood (West Aboite sewer basin). The manhole is approximately 2,500 feet upstream of the Bittersweet Moors Lift Station. Hydraulic investigations showed the capacity of the 15-inch sewer to be approximately 1,100 gallons per minute (gpm). The current firm capacity of the lift station is approximately 1,625 gpm. Estimated peak wastewater flows, using IDEM Facility Construction Guidelines, suggest a peak flow of 1,800 gpm tributary to the lift station.

A two phase project is recommended to eliminate the wet weather SSO at MH C35-12.

- Phase 1 (currently underway) - Replace existing 40 HP motors with 75 HP motors and install largest pump impellers to increase the firm capacity of the Bittersweet Moors Lift Station to 2,900 gpm. This would provide capacity to convey current peak flows, and provide reserve capacity to serve anticipated growth and development in the area served by the Aboite Center Road Lift Station.
- Phase 2 would change the discharge location of the Aboite Center Road Force Main to connect directly into the Bittersweet Moors Lift Station to eliminate the wet weather SSO in the Dells of Bittersweet neighborhood and allow for growth and development of the area tributary to Aboite Center Road LS. The project would consist of approximately 8,200 feet of 18-inch force main pipe.

Manhole D31-120

Manhole D31-120 is located on a 12-inch sewer in the Coves at Westlakes neighborhood (Central Aboite sewer basin). The manhole is approximately 1,500 feet downstream of the force main discharge from Covington Lakes Lift Station. Hydraulic investigations show the capacity of the 12-inch sewer between the Coves at Westlakes and Homestead Acres to be approximately 1,000 gallons per minute (gpm). The current firm capacity of the Covington Lakes Lift Statin is approximately 1,000 gpm. Estimated peak wastewater flows, using IDEM Facility Construction Guidelines, suggest a peak flow of 1,400 gpm tributary to this sewer reach. During wet weather this hydraulic limitation results in recurring SSOs.

It is recommended that a detailed engineering evaluation be conducted to review the following possible solution:

- Extend Covington Lakes 10-inch force main approximately 2,100 feet south and discharge to the 12-inch sewer at the Aboite Center Road and Homestead Road intersection. This change would also require Sycamore Hills to permanently pump to the Braemar Force Main as the 12-inch sewer would not have the capacity to receive flow from both Sycamore Hills and Covington Lakes Lift Stations. A hydraulic evaluation of the Covington Lakes Lift Station would be required to determine lift station improvements (larger motors, impellers, etc.) needed to maintain lift station capacity for the new discharge condition.

Manholes D33-2, D33-3, and E33-69

Manholes D33-2, D33-3, and E33-69 are all located in the Liberty Hills and Burnham Woods area just upstream of where the sewer connects to the East Aboite Interceptor northwest of the US 24 highway and Liberty Mills intersection. Hydraulic capacity is limited in the 18-inch sewer south of US 24 highway which may be the cause of the SSOs at this location.

It is recommended that a detailed engineering evaluation be conducted to review the following possible solution:

- Investigative Study - Survey elevation of manhole castings in relation to the existing interceptor sewer. Inspect local sewer and connection to interceptor during wet weather or post wet weather event to determine if flows are being restricted at the point of connection. High flows in an interceptor can restrict flow from smaller collector sewers from entering the interceptor (i.e., ‘wall of water’). The interceptor at that location has several severe turns which increase head loss and raise the hydraulic grade line in the sewer. The investigate efforts should include televising downstream of the SSOs including the 18-inch sewer from MH E34-18 to MH E25-6

(or approximately 2,400 feet) to where the sewer changes to 24 inches in diameter. Televise to determine if there are any obstructions such as severe roots or grease that may be causing the flow to back-up.

2.6 Wastewater Treatment

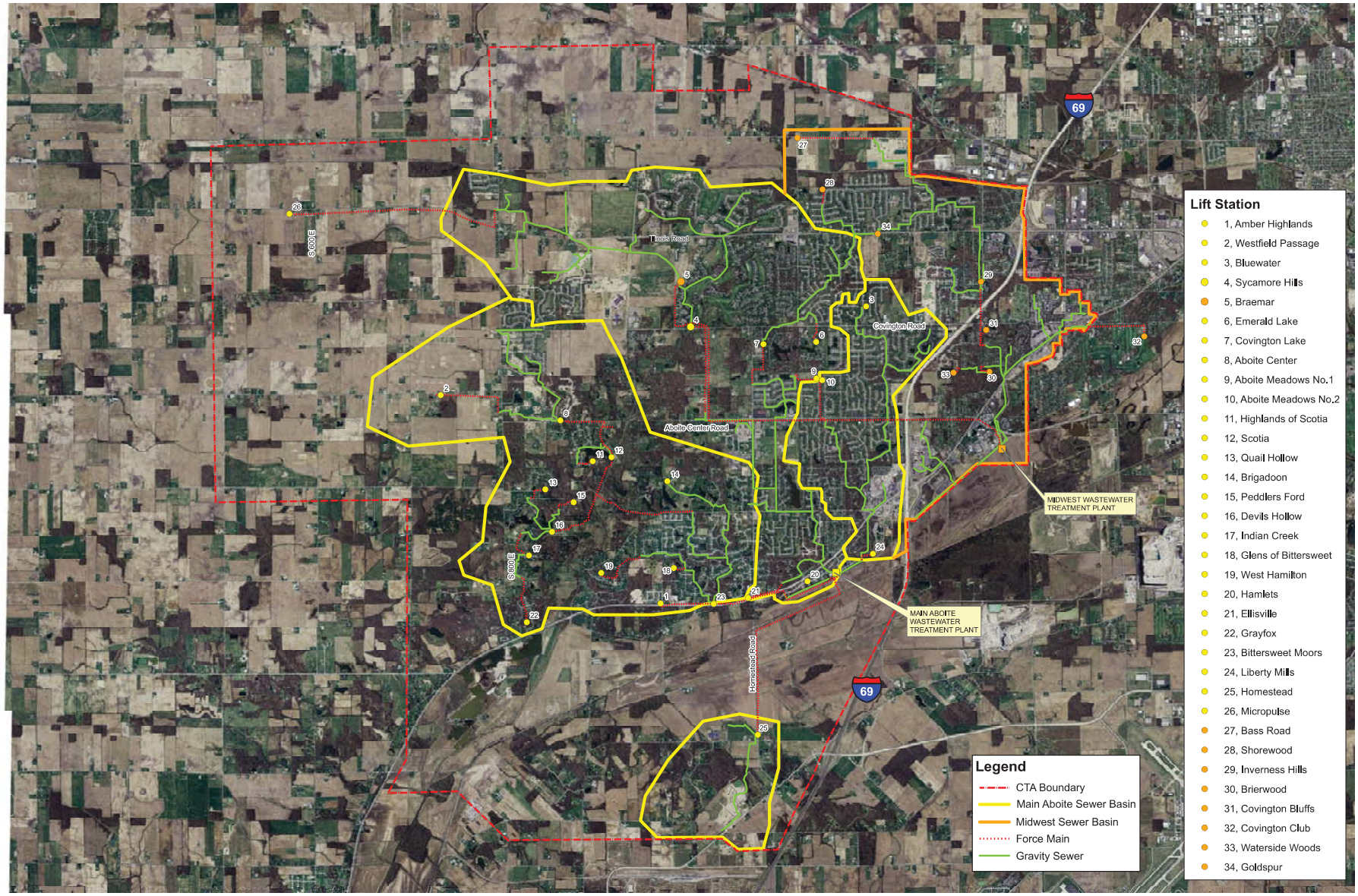
Aqua Indiana owns and operate two wastewater treatment plants in Allen County. **Table 2-16** summarizes current NPDES design capacities and current sewer flows.

Table 2-16
Wastewater Treatment Plant Summary

Location	Design Average Flow (mgd)	Design Peak Flow (mgd)	Current Average Flow (mgd)	Reserve Capacity[3] (mgd)
Main Aboite	3.25[1]	5.30[1]	2.10	0.82
Midwest	3.50[2]	12.00[2]	1.70	1.45

(1) The Main Aboite WWTP has an annual average and peak NPDES permitted capacities of 3.25 mgd and 5.30 mgd, respectively.
(2) The Midwest WWTP is currently undergoing an expansion to increase its annual average and peak NDPES permitted capacities to 3.5 mgd and 12.0 mgd, respectively.
(3) Reserve capacity is 90 percent of design average flow minus current average flow.

FIGURE 2-1



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EXISTING WASTEWATER FACILITIES

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TREATMENT SYSTEM MASTER PLAN

FIGURE 2-2
SHEET 1 OF 5

FLOW METER LOCATIONS

SCALE: 1"=100'

● – FLOW METER LOCATION

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TREATMENT SYSTEM MASTER PLAN

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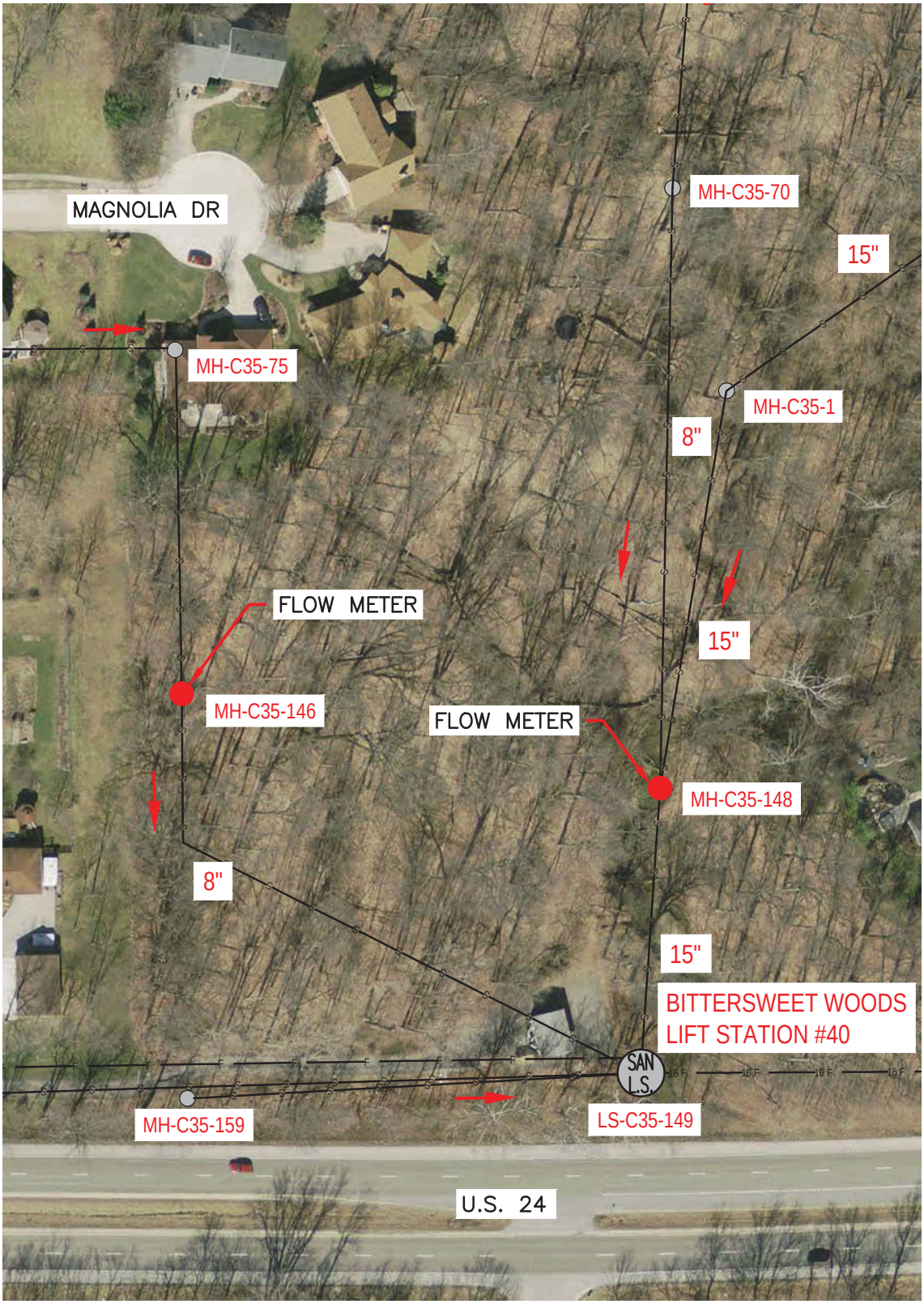
FIGURE 2–2
SHEET 2 OF 5



FLOW METERS AT MH–C35–146 AND MH–C35–148

SCALE: 1"=100'

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FIGURE 2–2
SHEET 3 OF 5

FLOW METER AT MH–D35–6

SCALE: 1"=100'

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FIGURE 2-2
SHEET 4 OF 5

FLOW METER AT MH-D35-113

SCALE: 1"=100'

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TREATMENT SYSTEM MASTER PLAN

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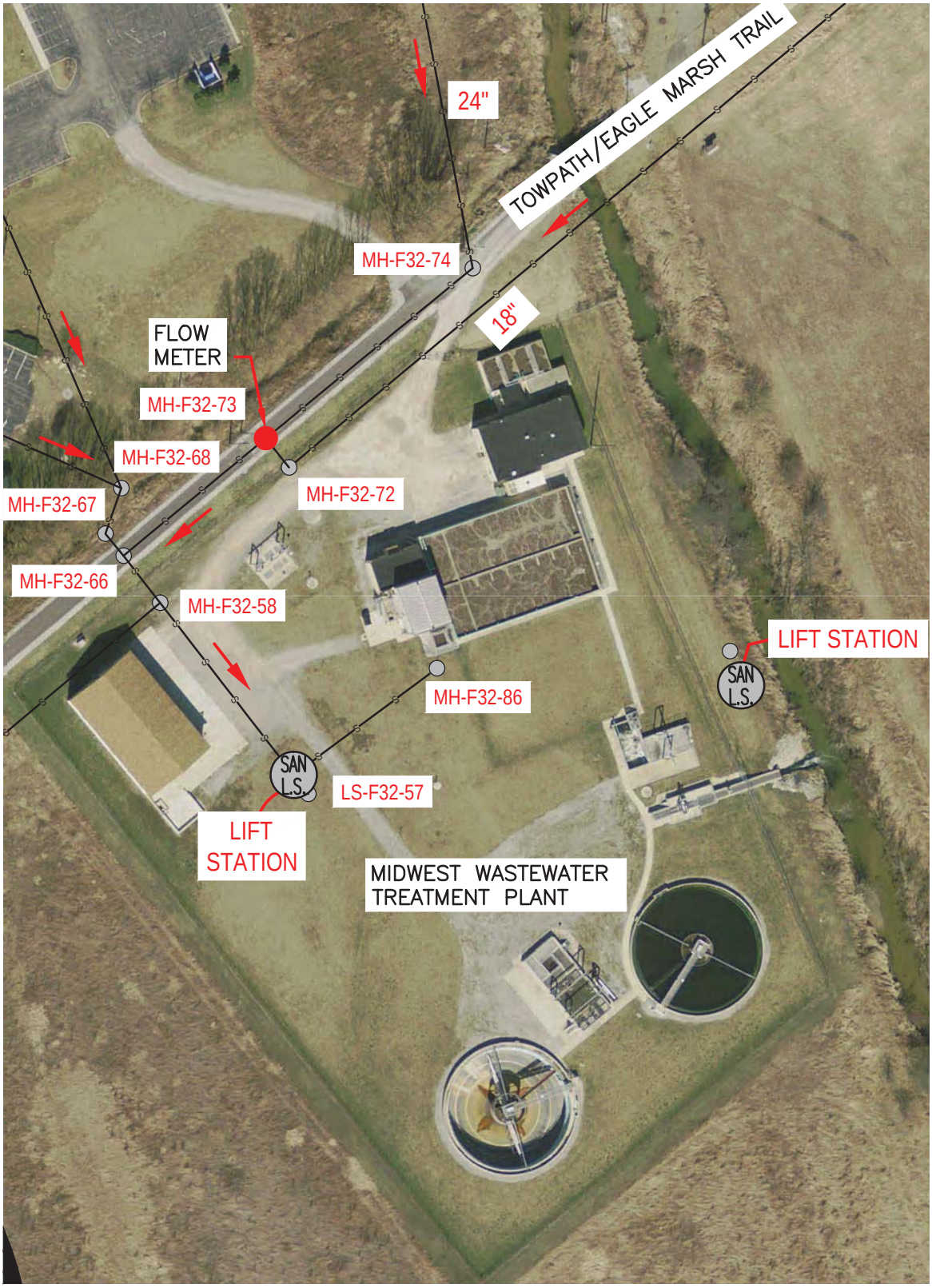
FIGURE 2–2
SHEET 5 OF 5



FLOW METER AT MH–F32–73

SCALE: 1"=100'

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TREATMENT SYSTEM MASTER PLAN

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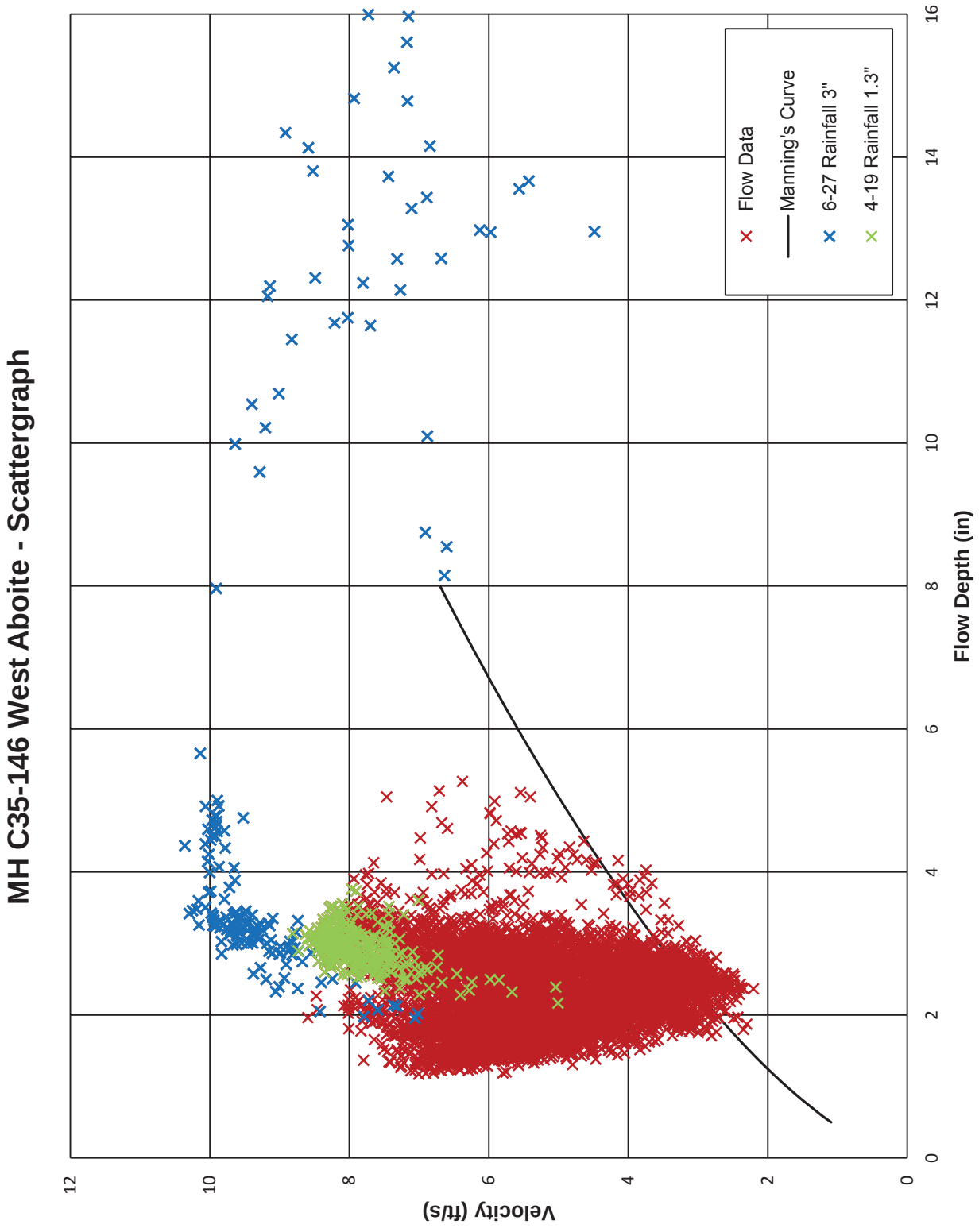
FIGURE 2-3



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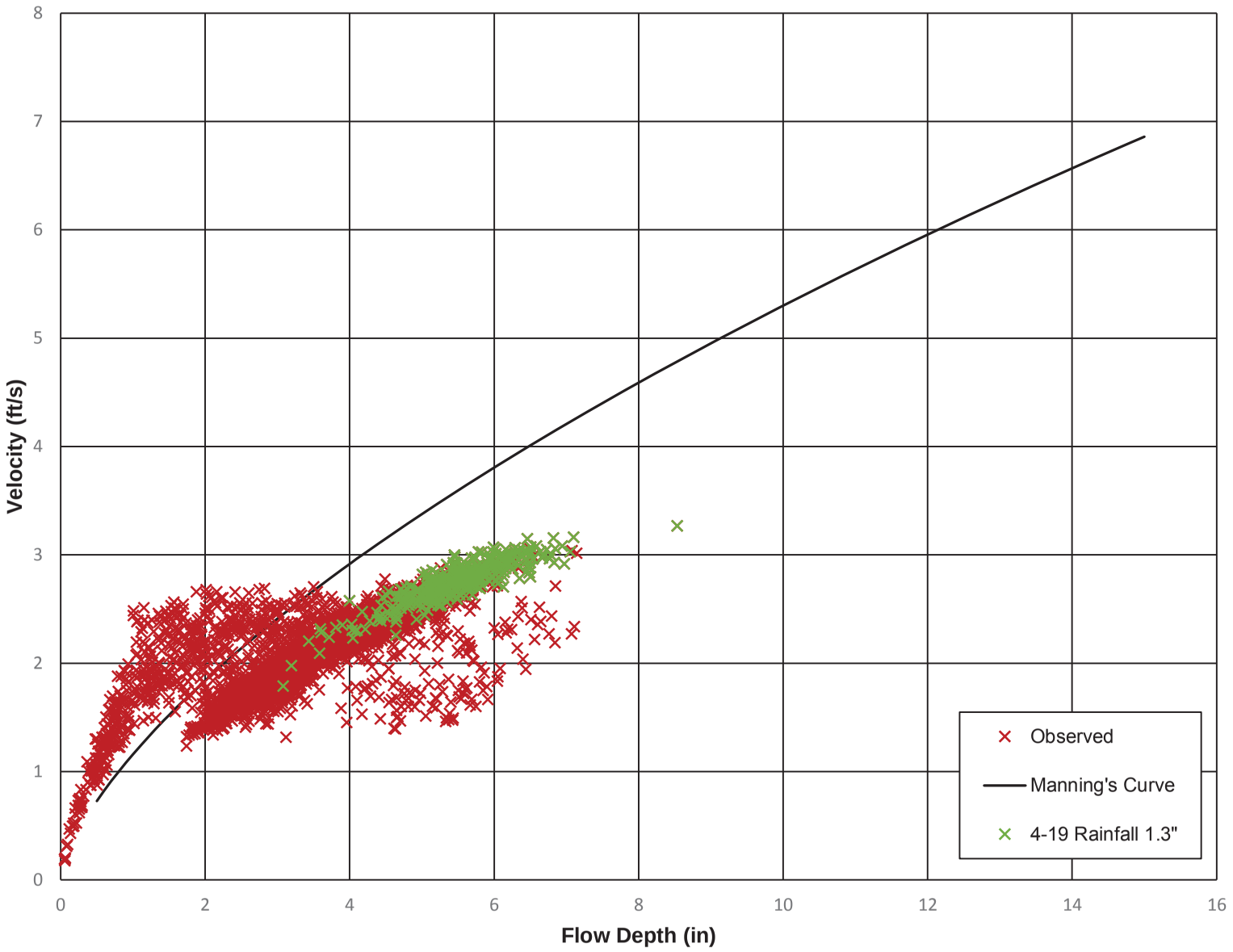

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FIGURE 2-4

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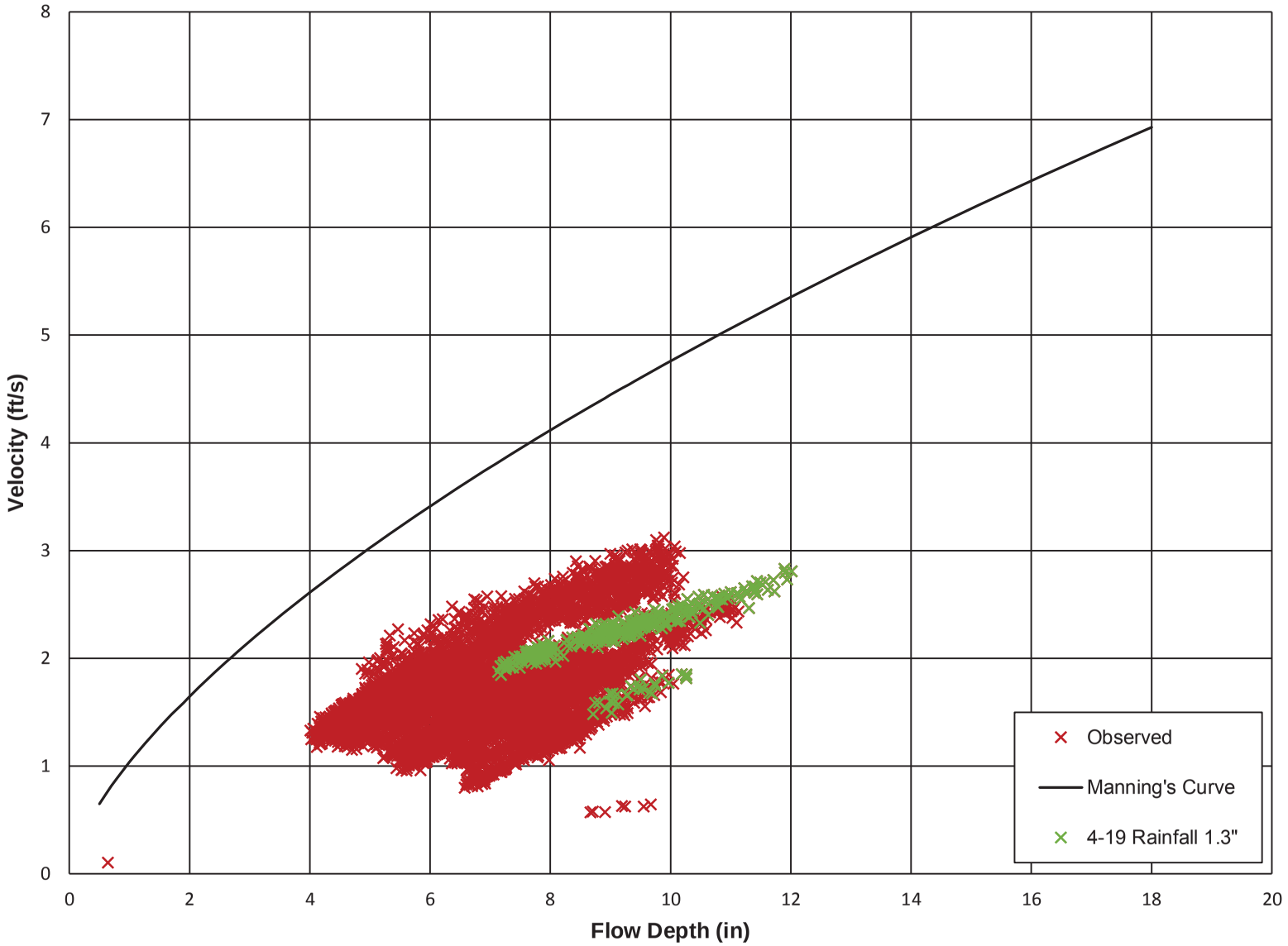

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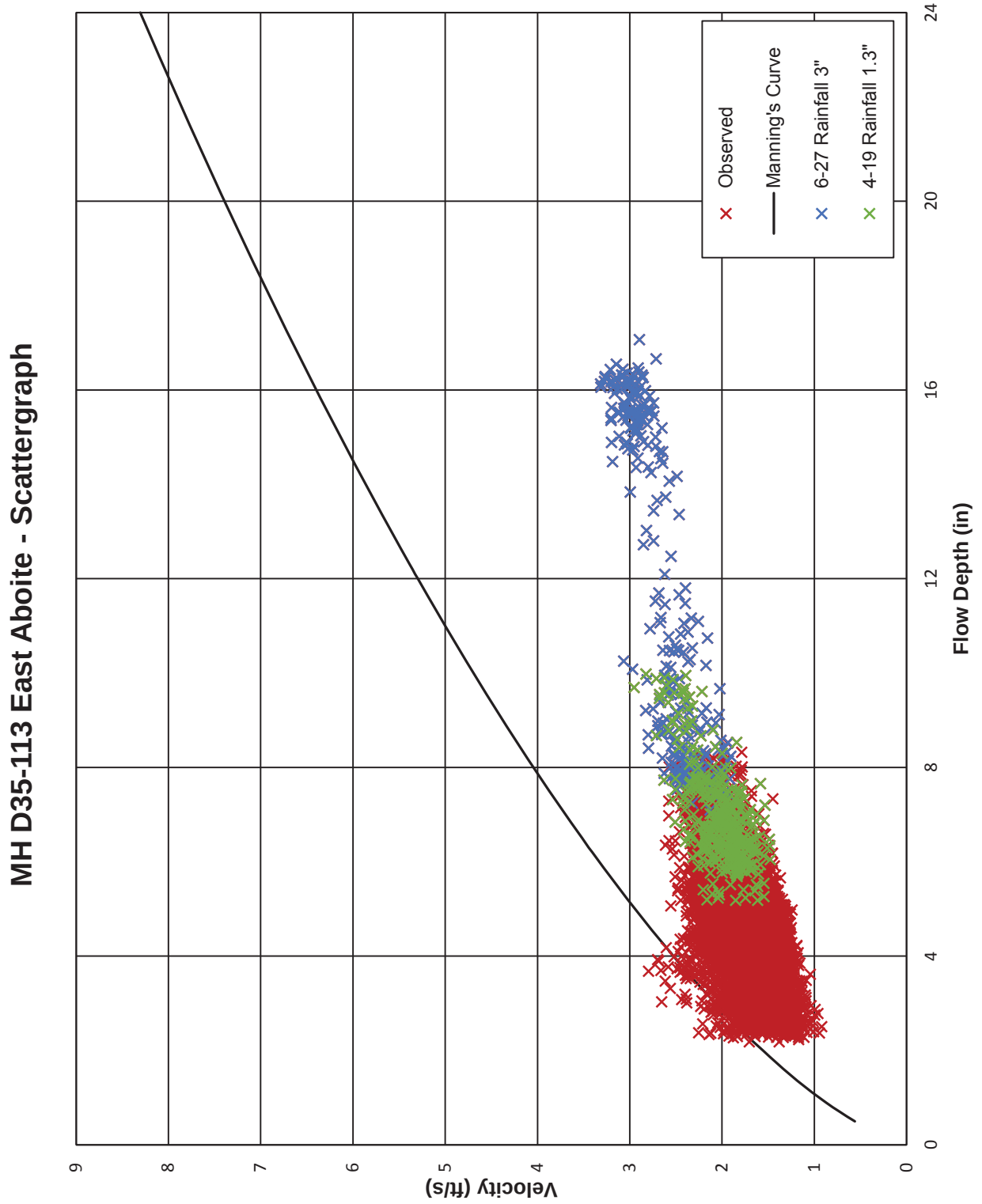
WASTEWATER COLLECTION
AND TREATMENT SYSTEM
MASTER PLAN UPDATE

FIGURE 2-5

FIGURE 2-6



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AND TREATMENT SYSTEM
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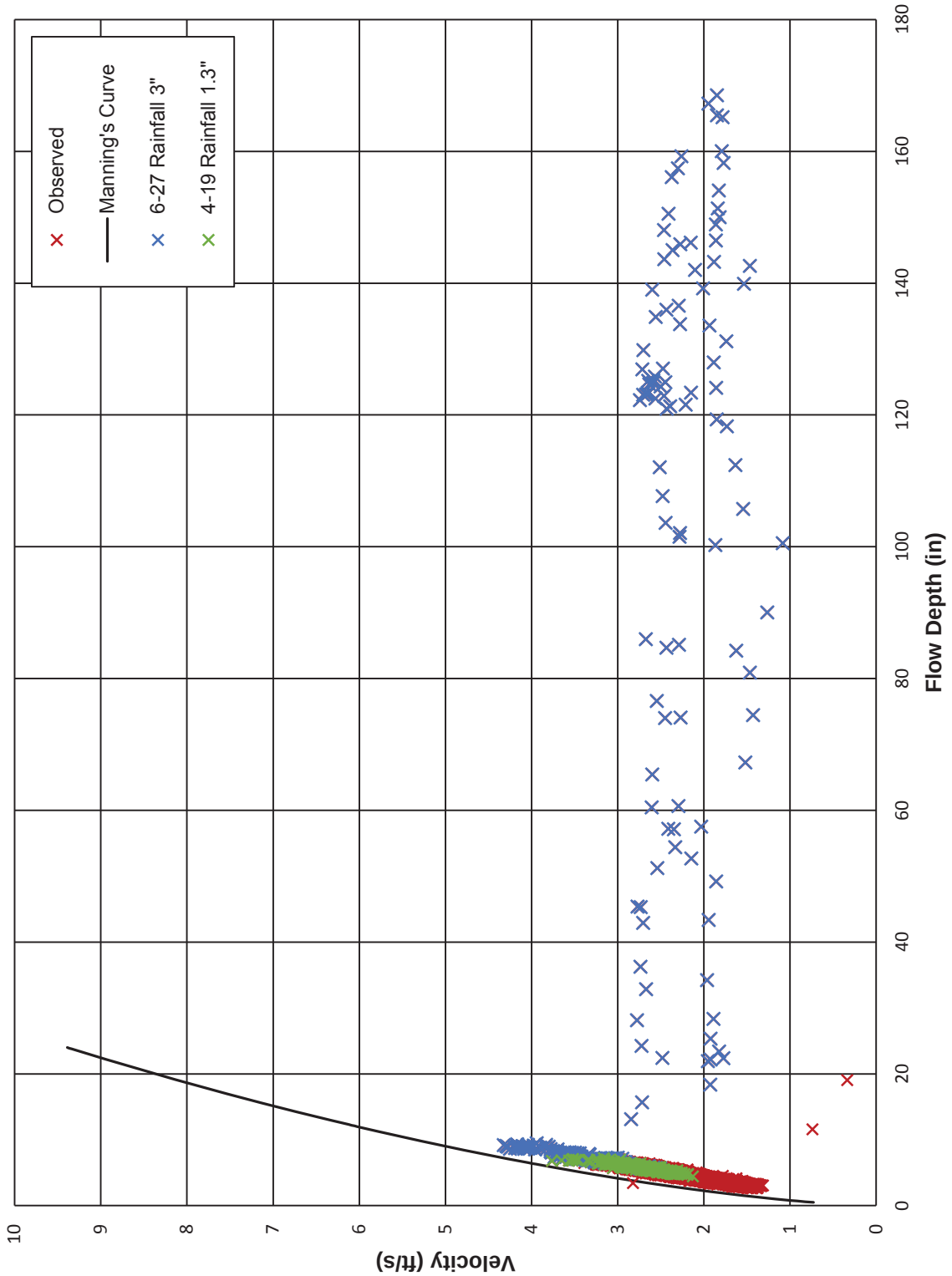
FIGURE 2-7



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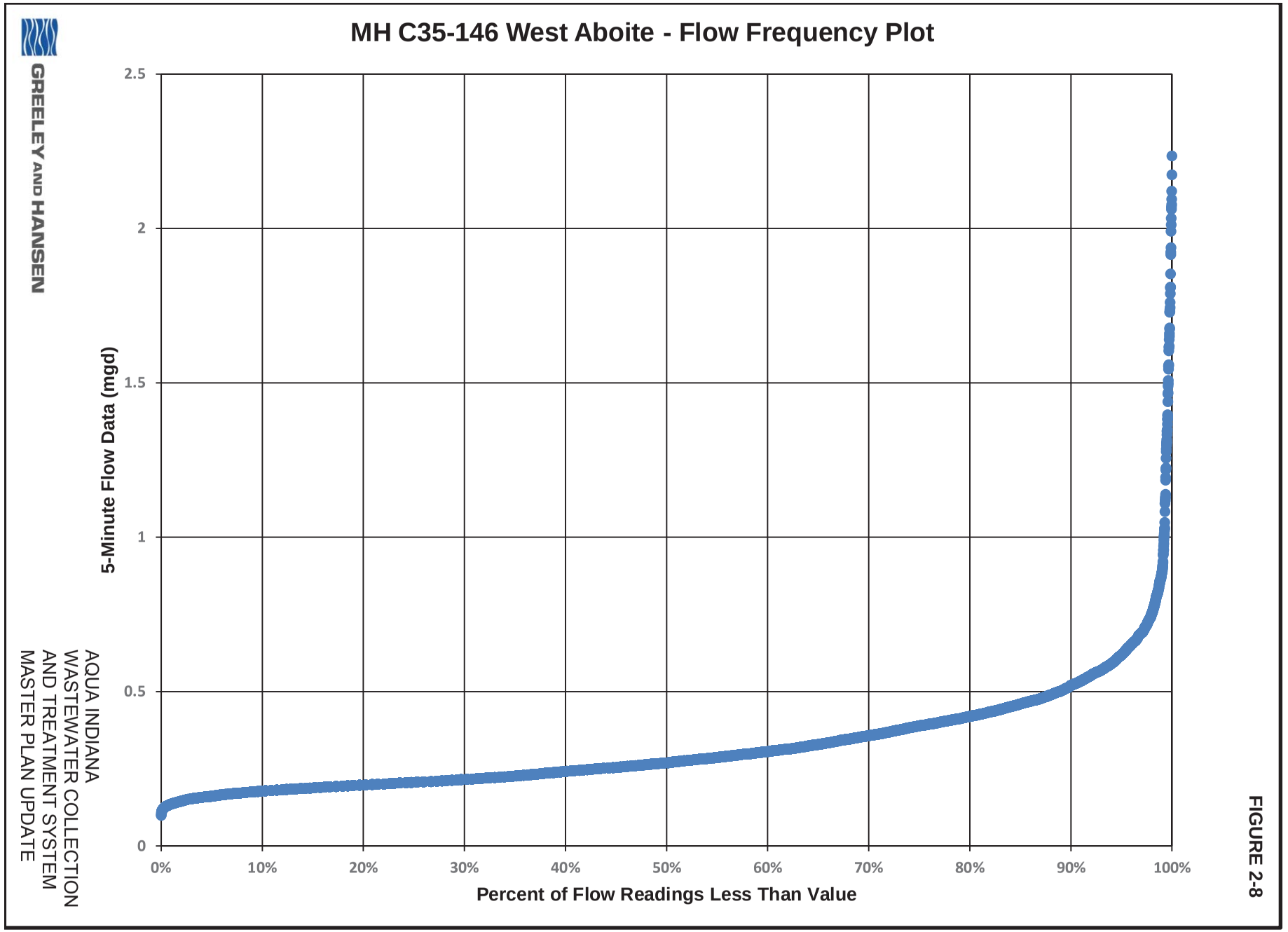
MASTER PLAN UPDATE


MH C35-146 West Aboite - Flow Frequency Plot
5-Minute Flow Data (mgd)
2.5
2
1.5
1
0.5
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Flow Readings Less Than Value
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MASTER PLAN UPDATE
FIGURE 2-8

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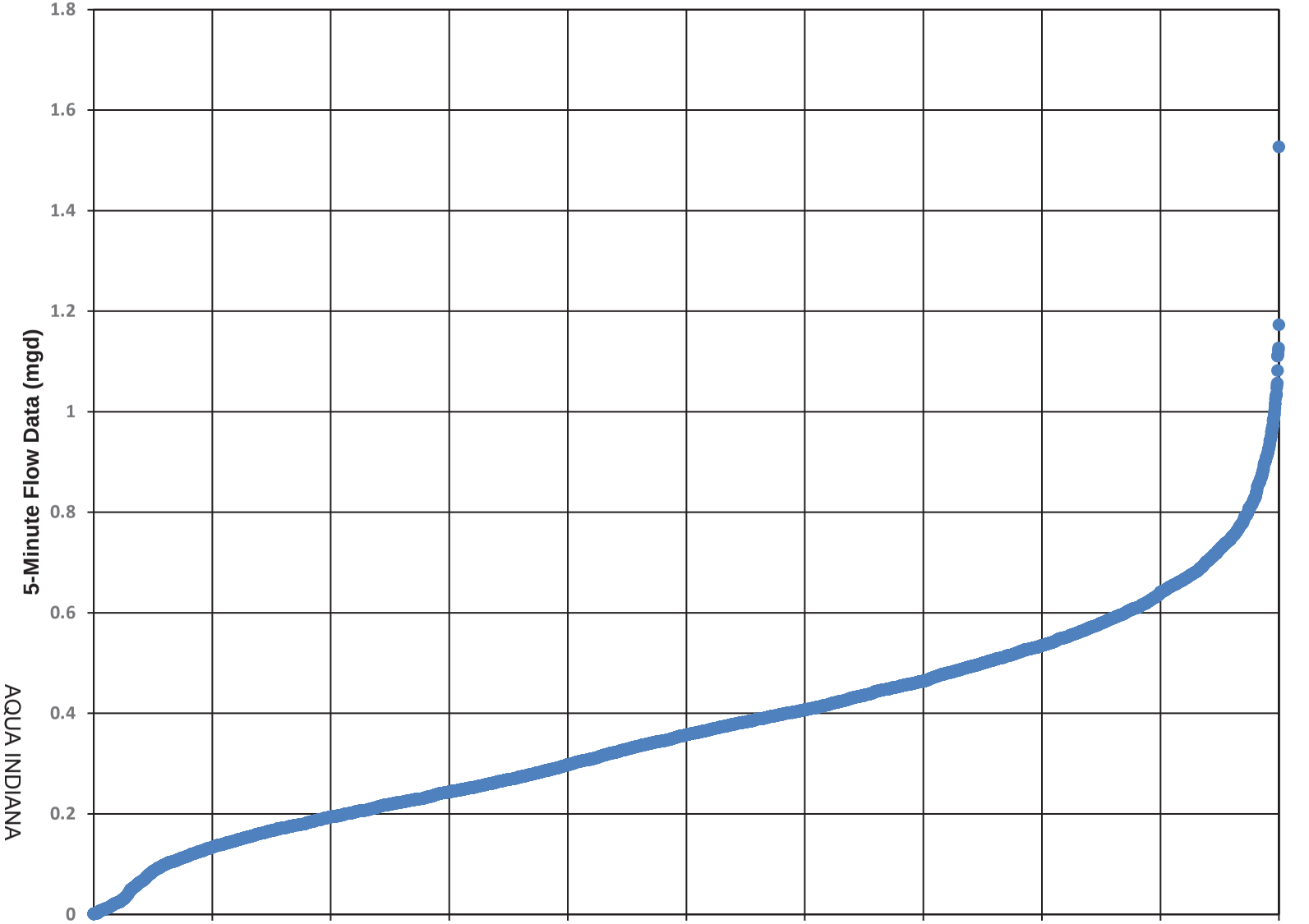

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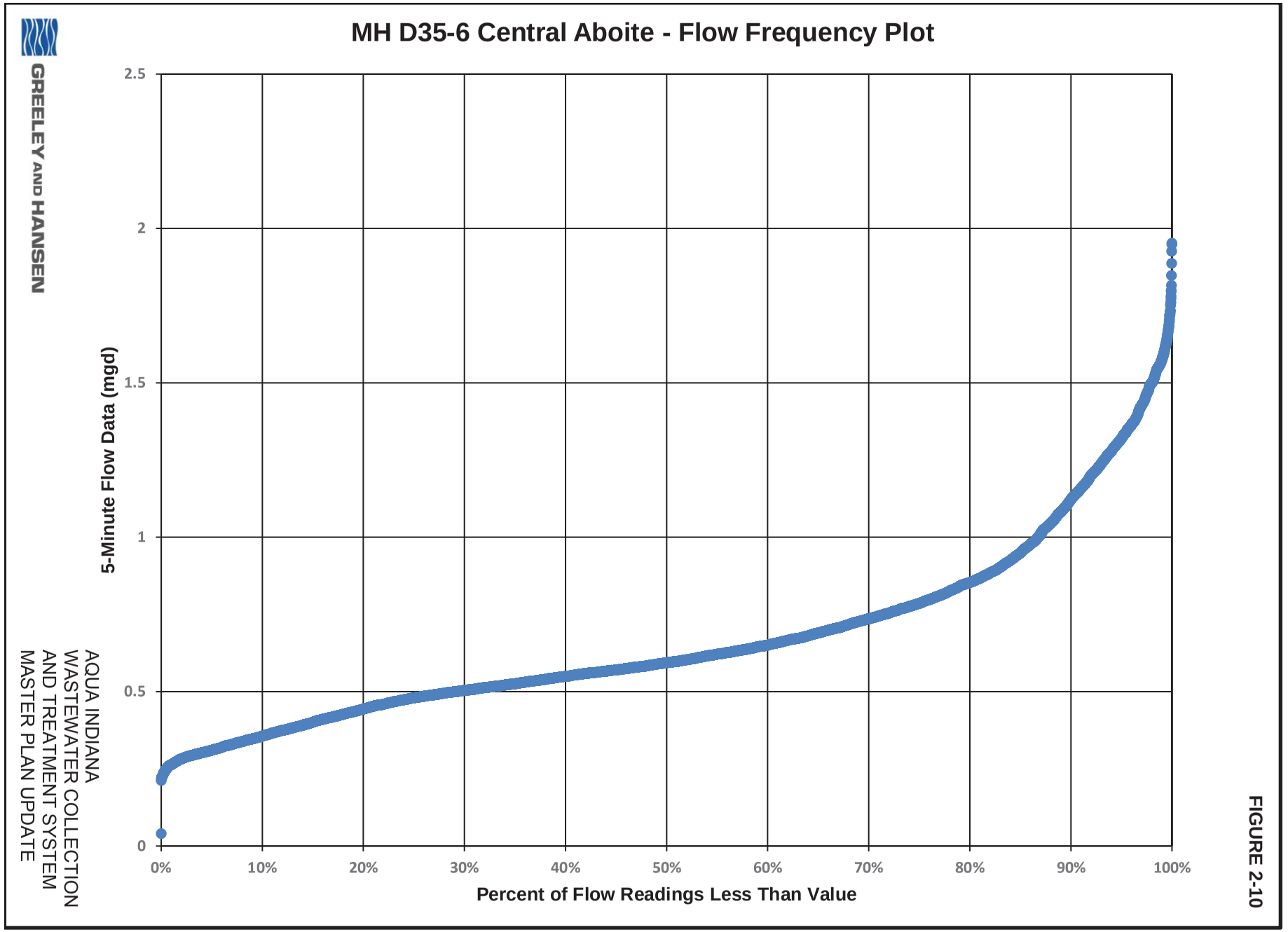
FIGURE 2-9


MH D35-6 Central Aboite - Flow Frequency Plot
5-Minute Flow Data (mgd)
2.5
2
1.5
1
0.5
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Flow Readings Less Than Value
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AND TREATMENT SYSTEM
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FIGURE 2-10

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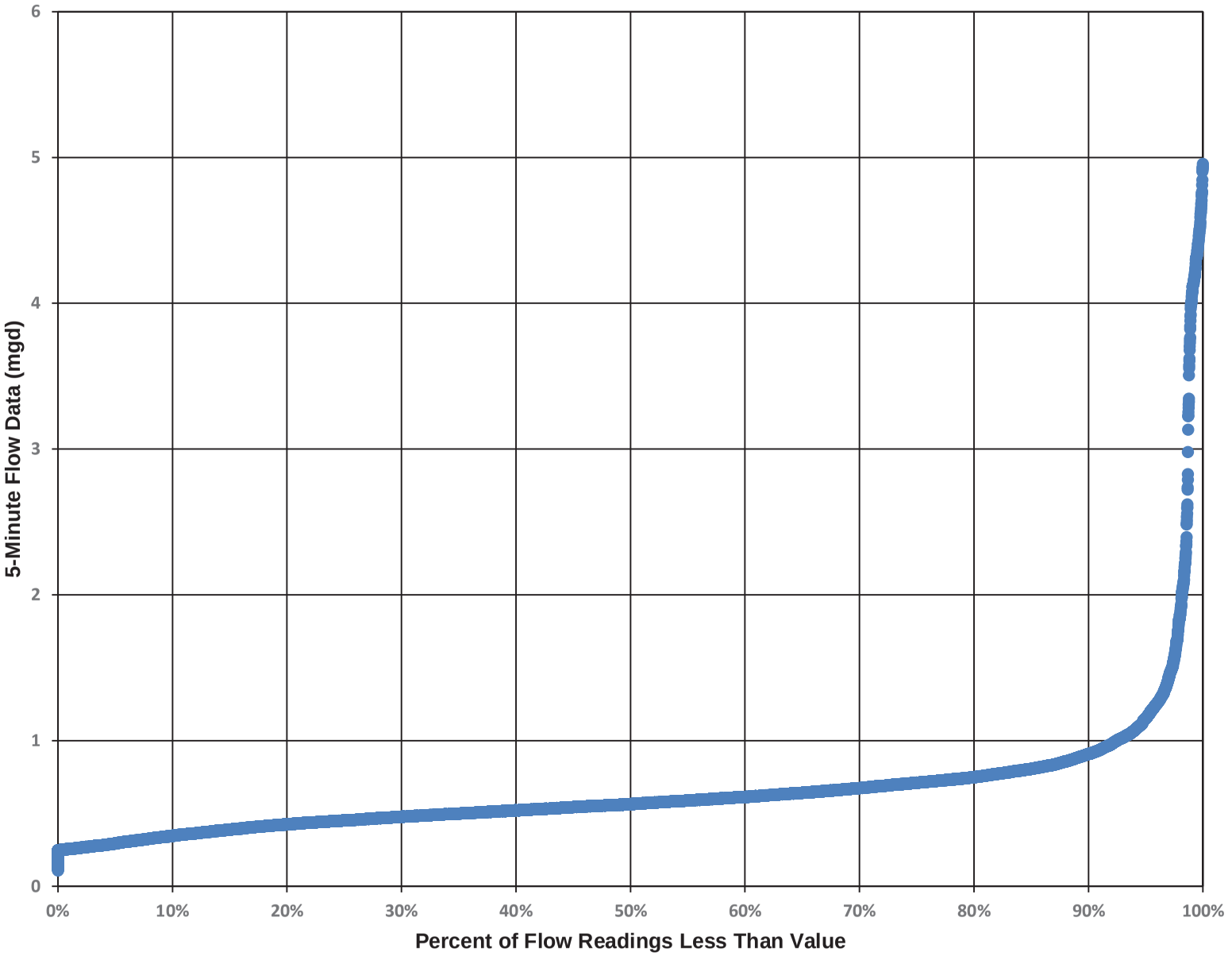

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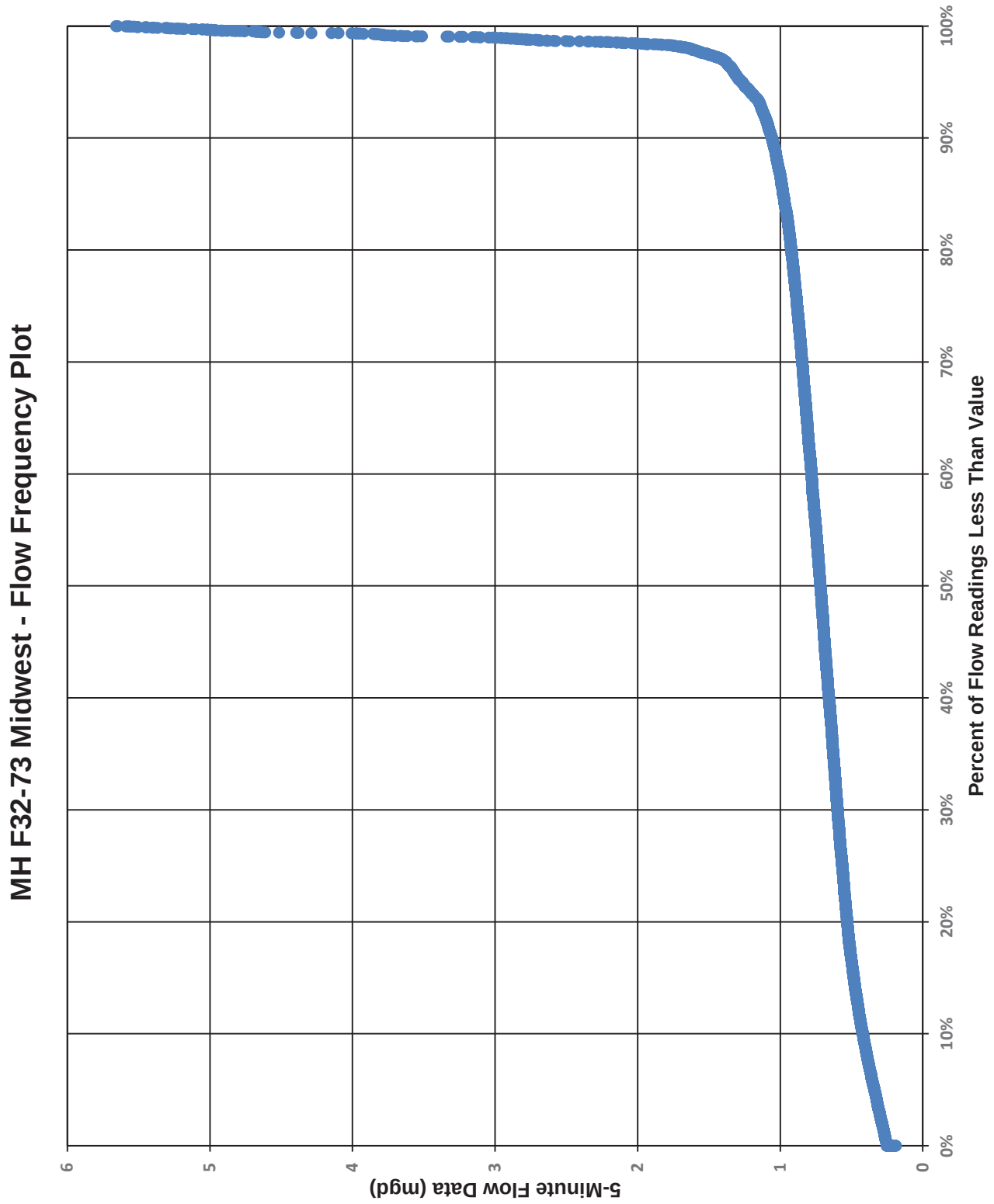
FIGURE 2-11

FIGURE 2-12



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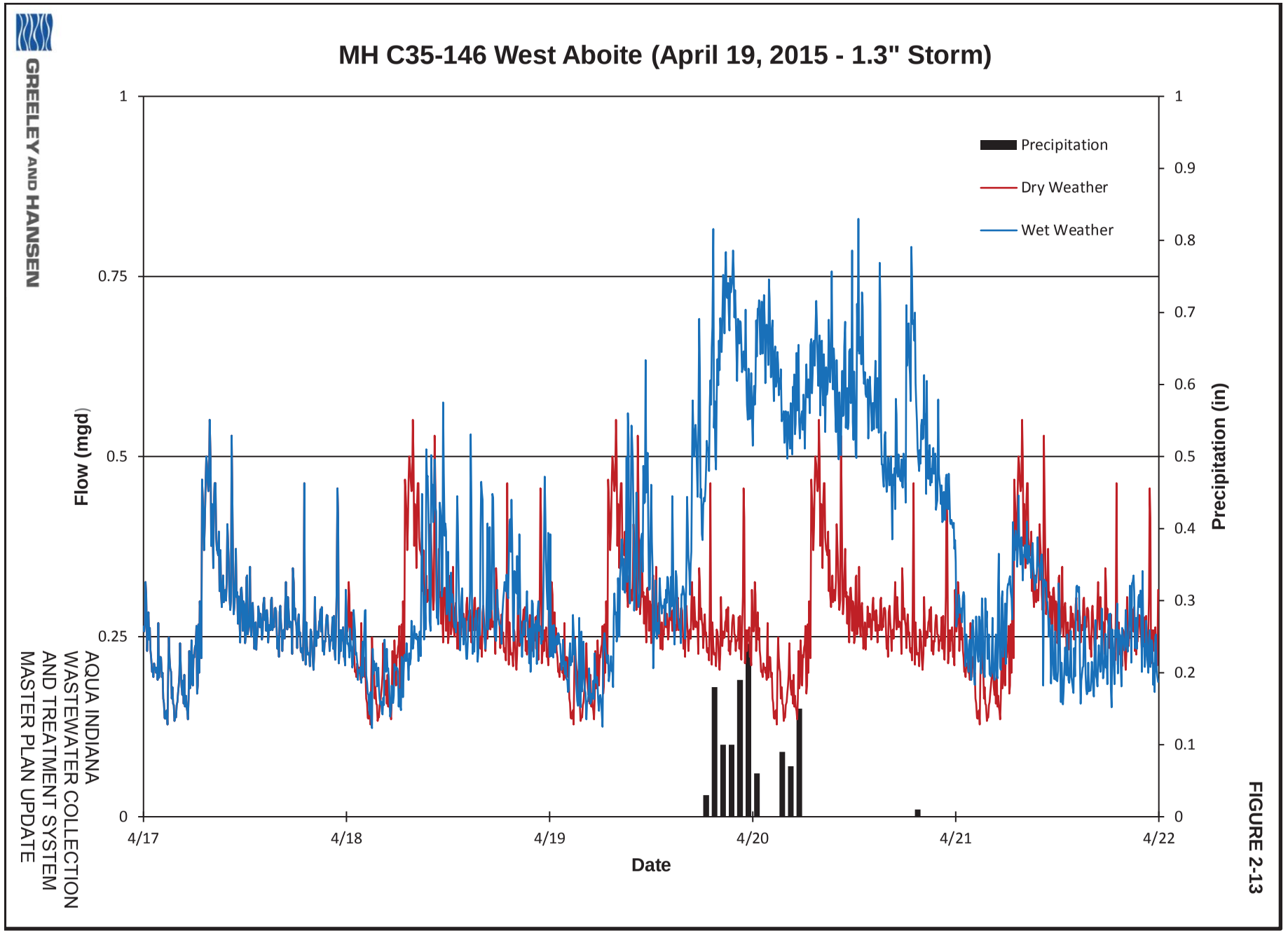
MH C35-146 West Aboite (April 19, 2015 - 1.3" Storm)
Precipitation
Dry Weather
Wet Weather
Flow (mgd)
Precipitation (in)
Date
1
0.75
0.5
0.25
0
0.9
0.8
0.7
0.6
0.4
0.3
0.2
0.1
4/17
4/18
4/19
4/20
4/21
4/22
GREELEY AND HANSEN
AQUA INDIANA
WASTEWATER COLLECTION
AND TREATMENT SYSTEM
MASTER PLAN UPDATE
FIGURE 2-13

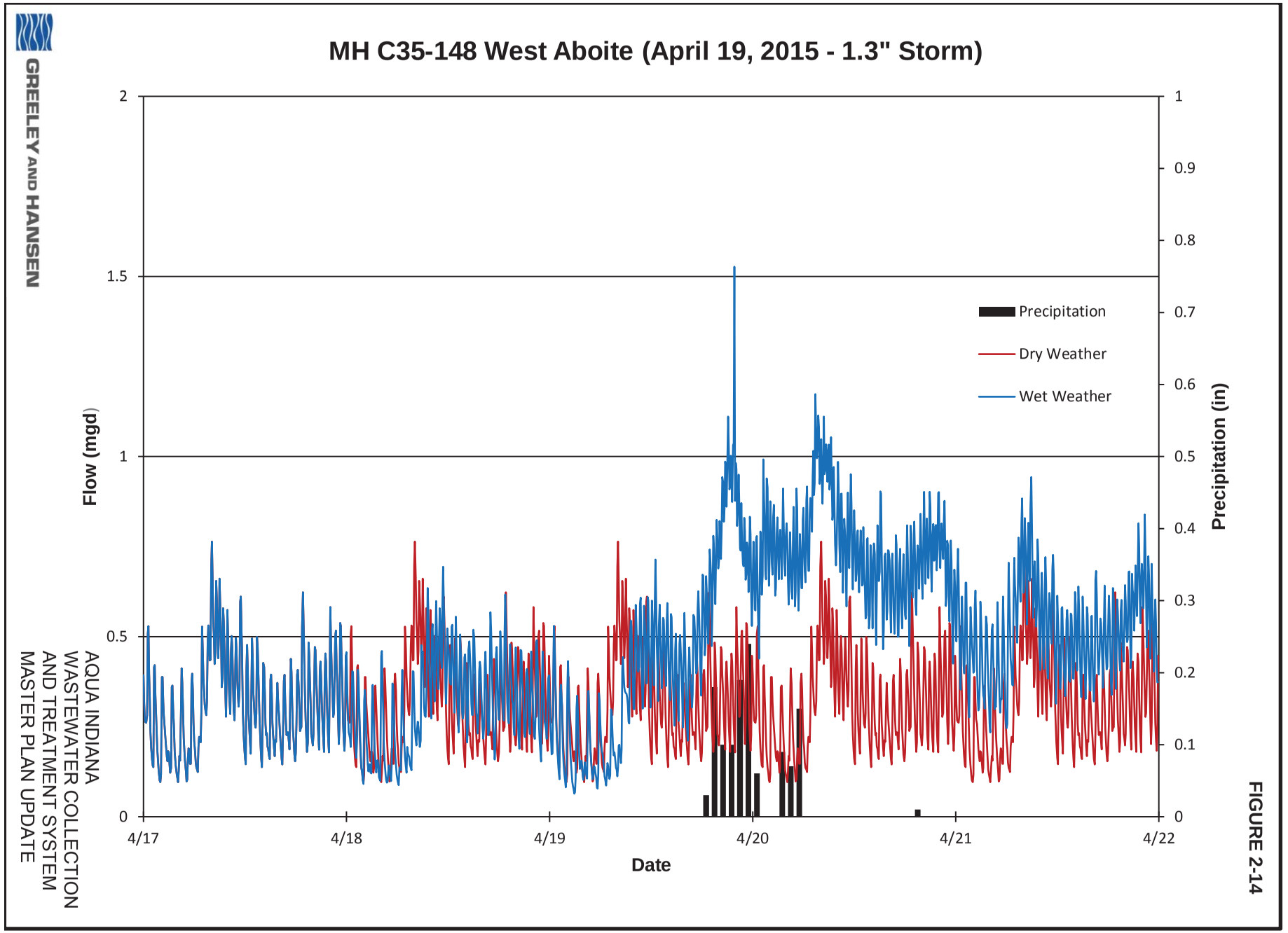

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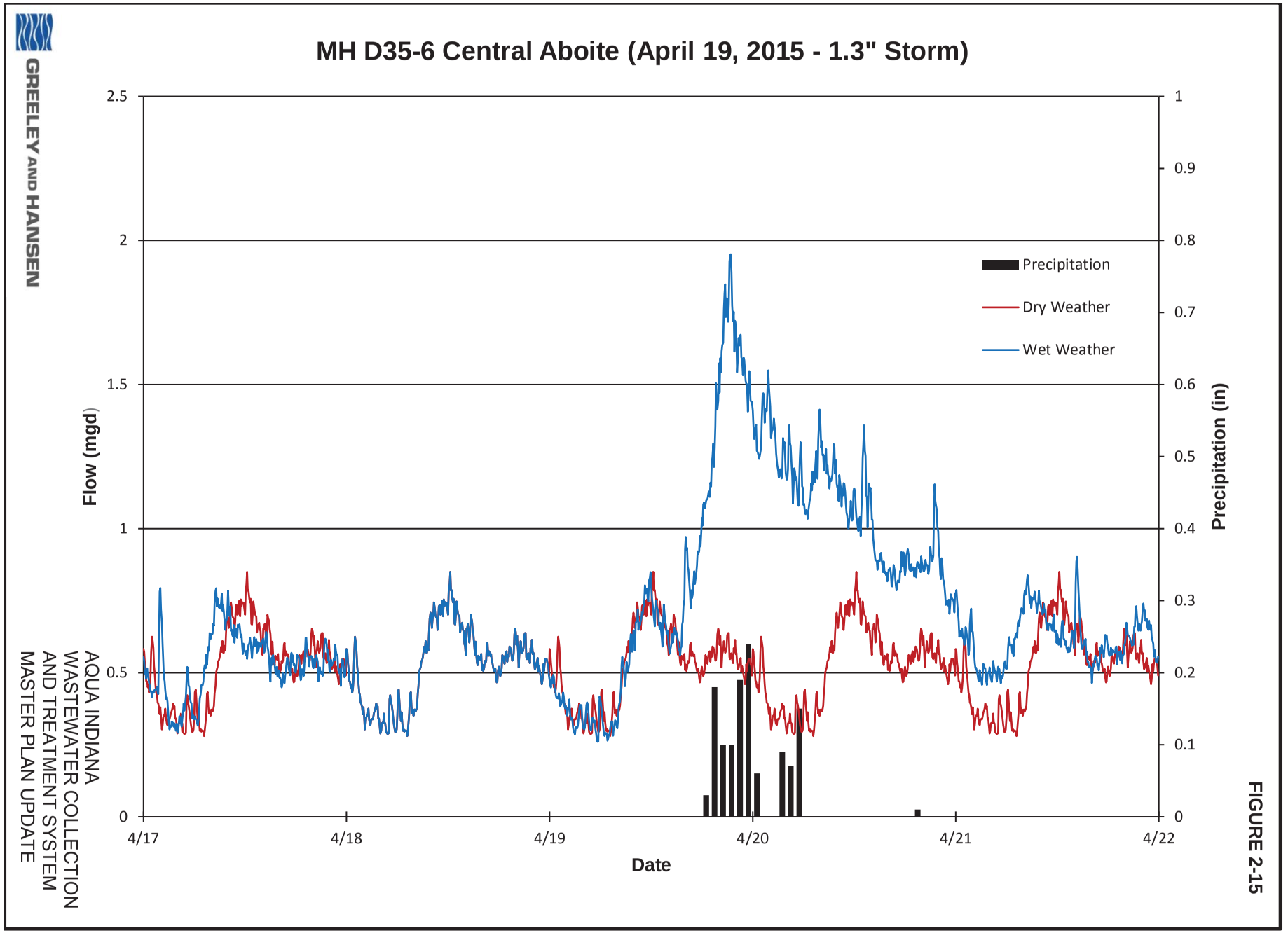
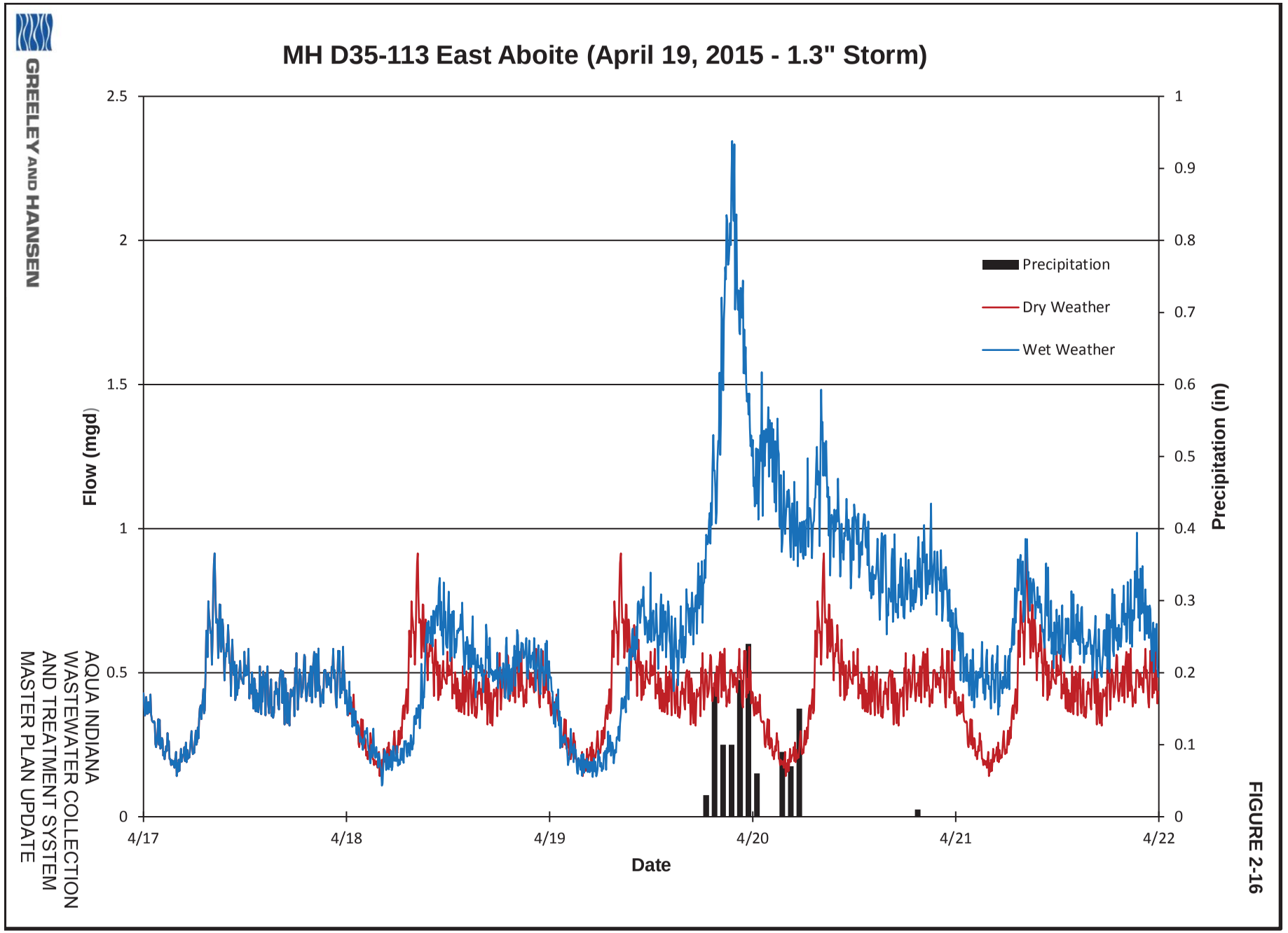
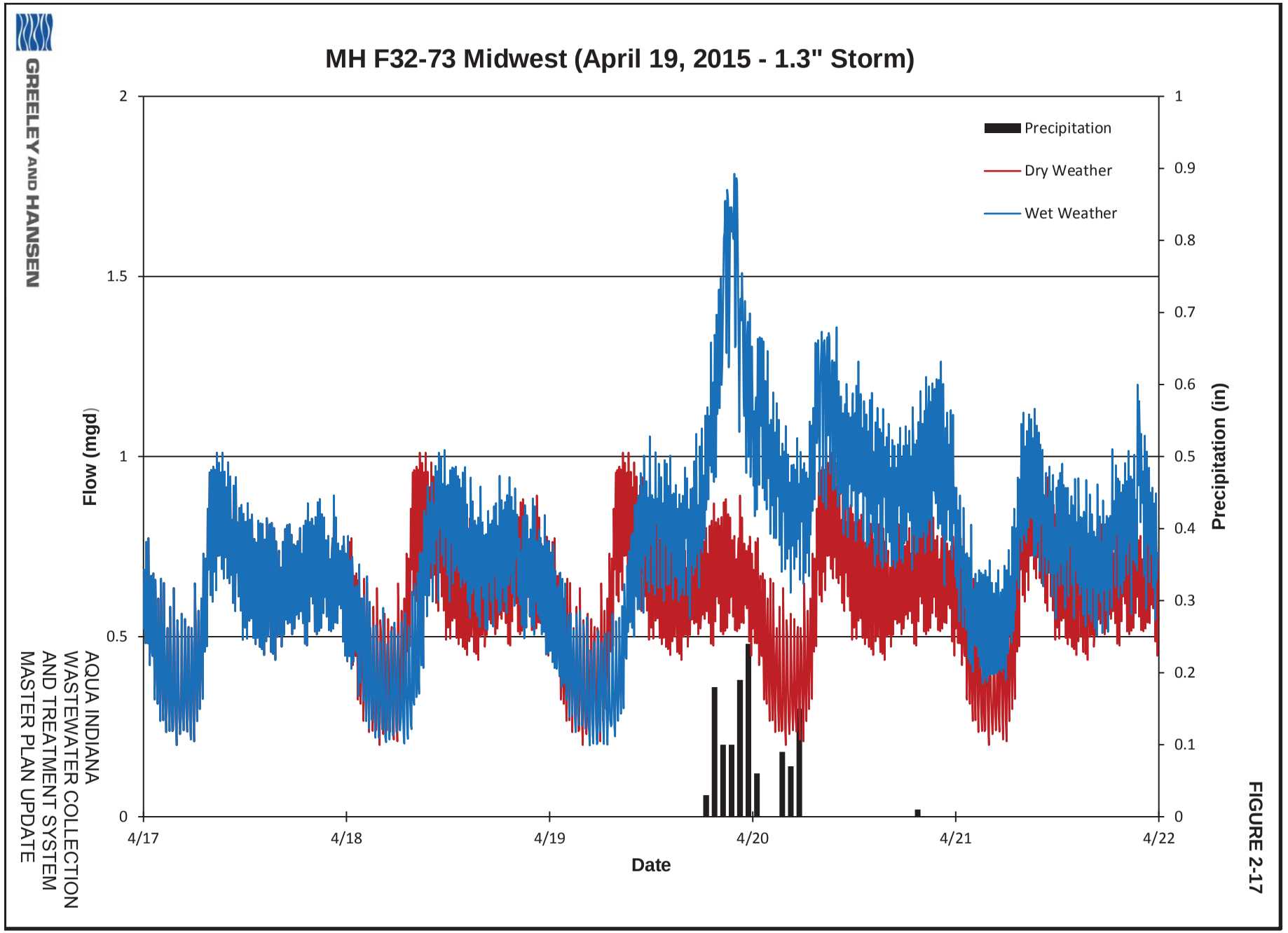
FIGURE 2-14


GREELEY AND HANSEN
MH D35-6 Central Aboite (April 19, 2015 - 1.3" Storm)
Flow (mgd)
Precipitation (in)
Precipitation
Dry Weather
Wet Weather
2.5
2
1.5
1
0.5
0
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
4/17
4/18
4/19
4/20
4/21
4/22
Date
AQUA INDIANA
WASTEWATER COLLECTION
AND TREATMENT SYSTEM
MASTER PLAN UPDATE
FIGURE 2-15


GREELEY AND HANSEN
MH D35-113 East Aboite (April 19, 2015 - 1.3" Storm)
Flow (mgd)
Precipitation (in)
Precipitation
Dry Weather
Wet Weather
2.5
2
1.5
1
0.5
0
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
4/17
4/18
4/19
4/20
4/21
4/22
Date
AQUA INDIANA
WASTEWATER COLLECTION
AND TREATMENT SYSTEM
MASTER PLAN UPDATE
FIGURE 2-16


GREELEY AND HANSEN
MH F32-73 Midwest (April 19, 2015 - 1.3" Storm)
Precipitation
Dry Weather
Wet Weather
Flow (mgd)
Precipitation (in)
Date
2
1.5
1
0.5
0
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
4/17
4/18
4/19
4/20
4/21
4/22
AQUA INDIANA
WASTEWATER COLLECTION
AND TREATMENT SYSTEM
MASTER PLAN UPDATE
FIGURE 2-17

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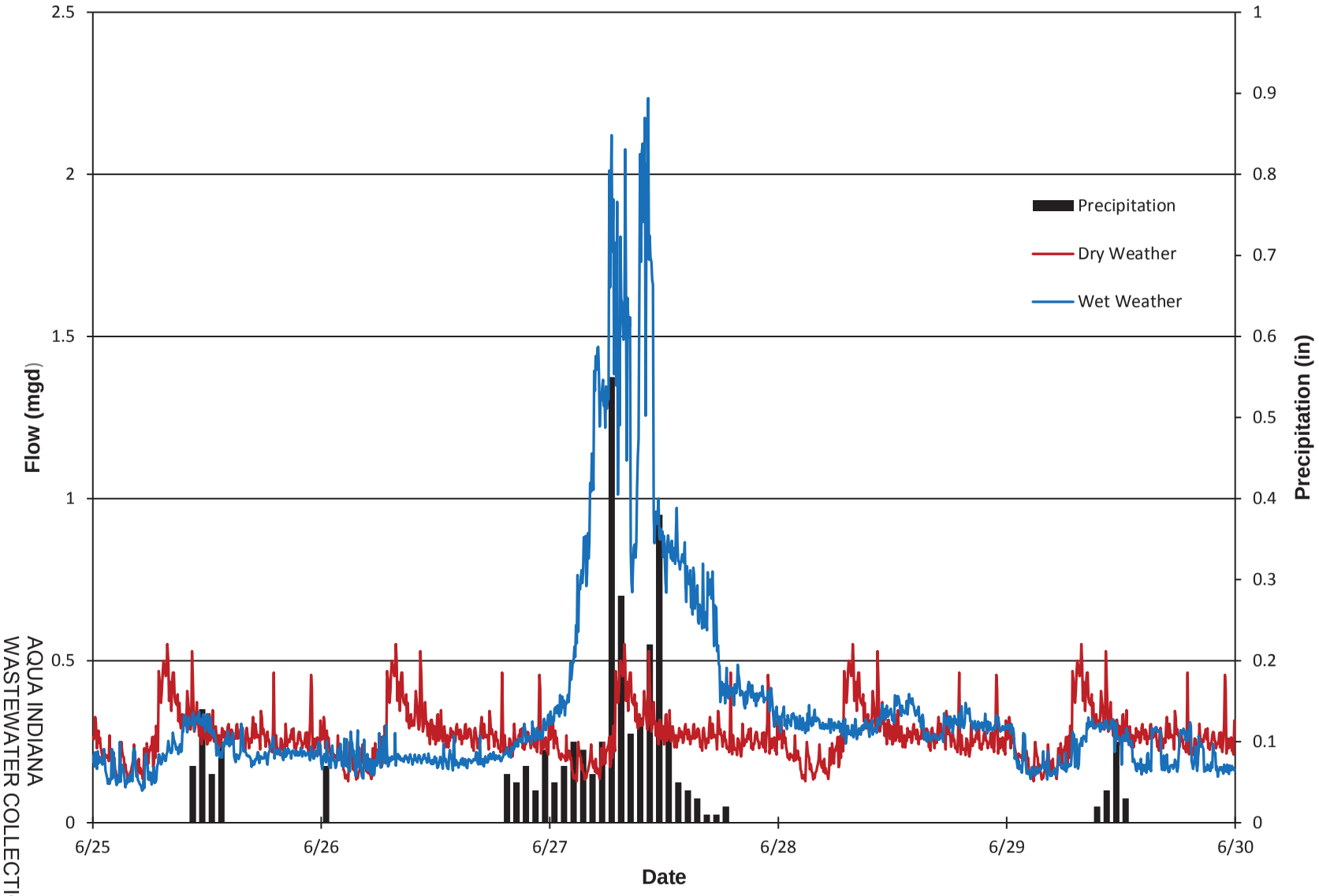

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WASTEWATER COLLECTION
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FIGURE 2-18

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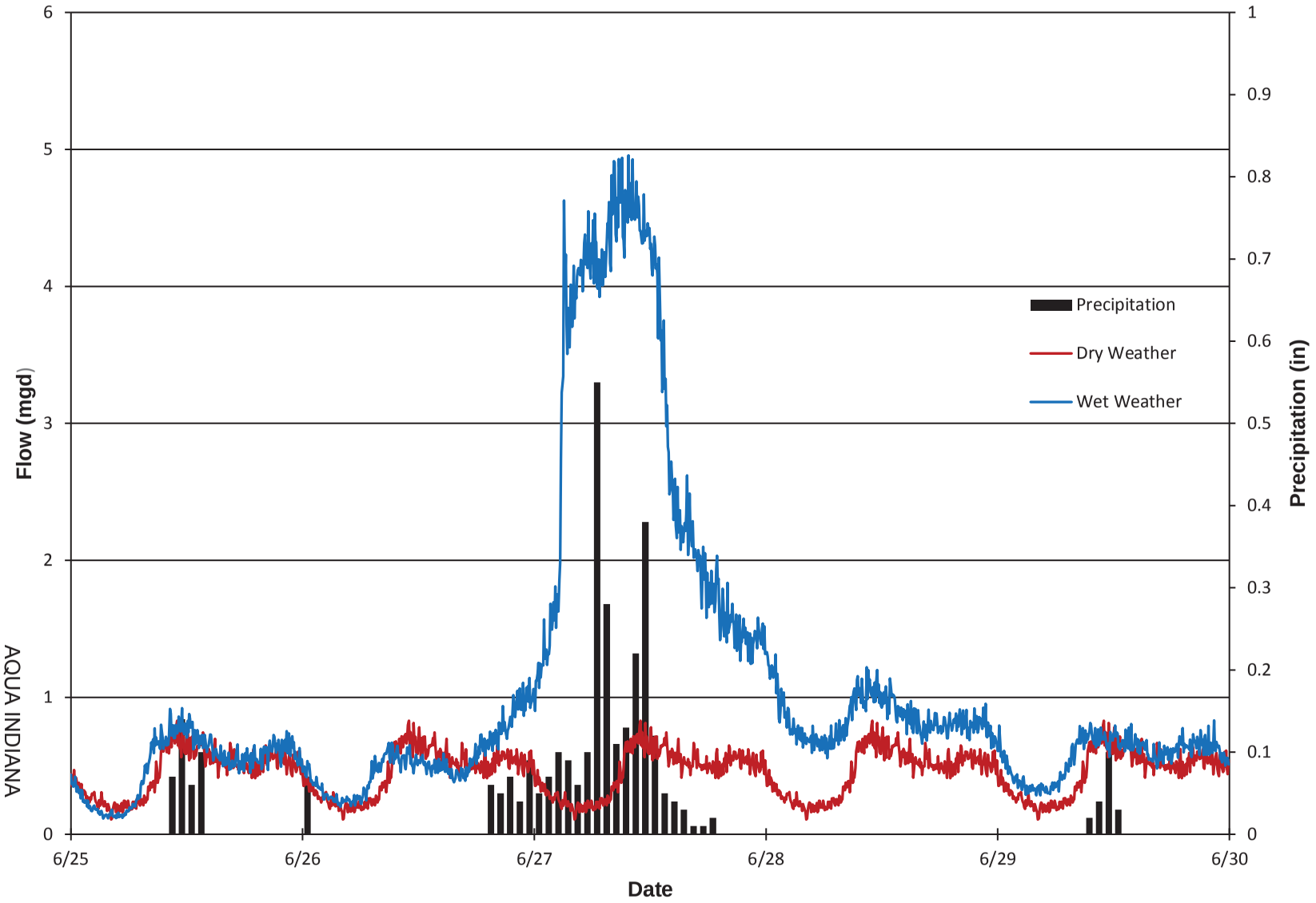
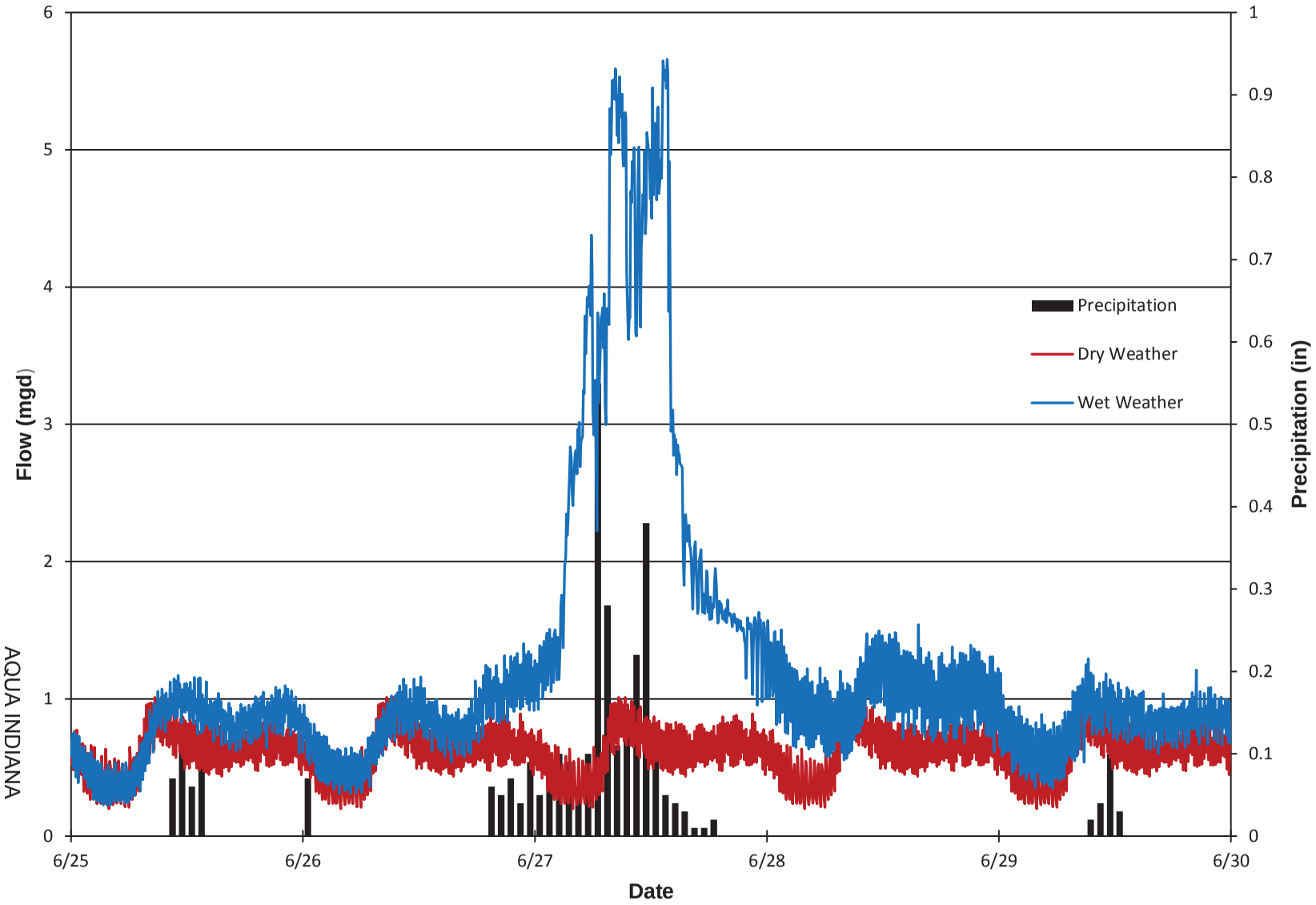


AQUA INDIANA
WASTEWATER COLLECTION
AND TREATMENT SYSTEM
MASTER PLAN UPDATE

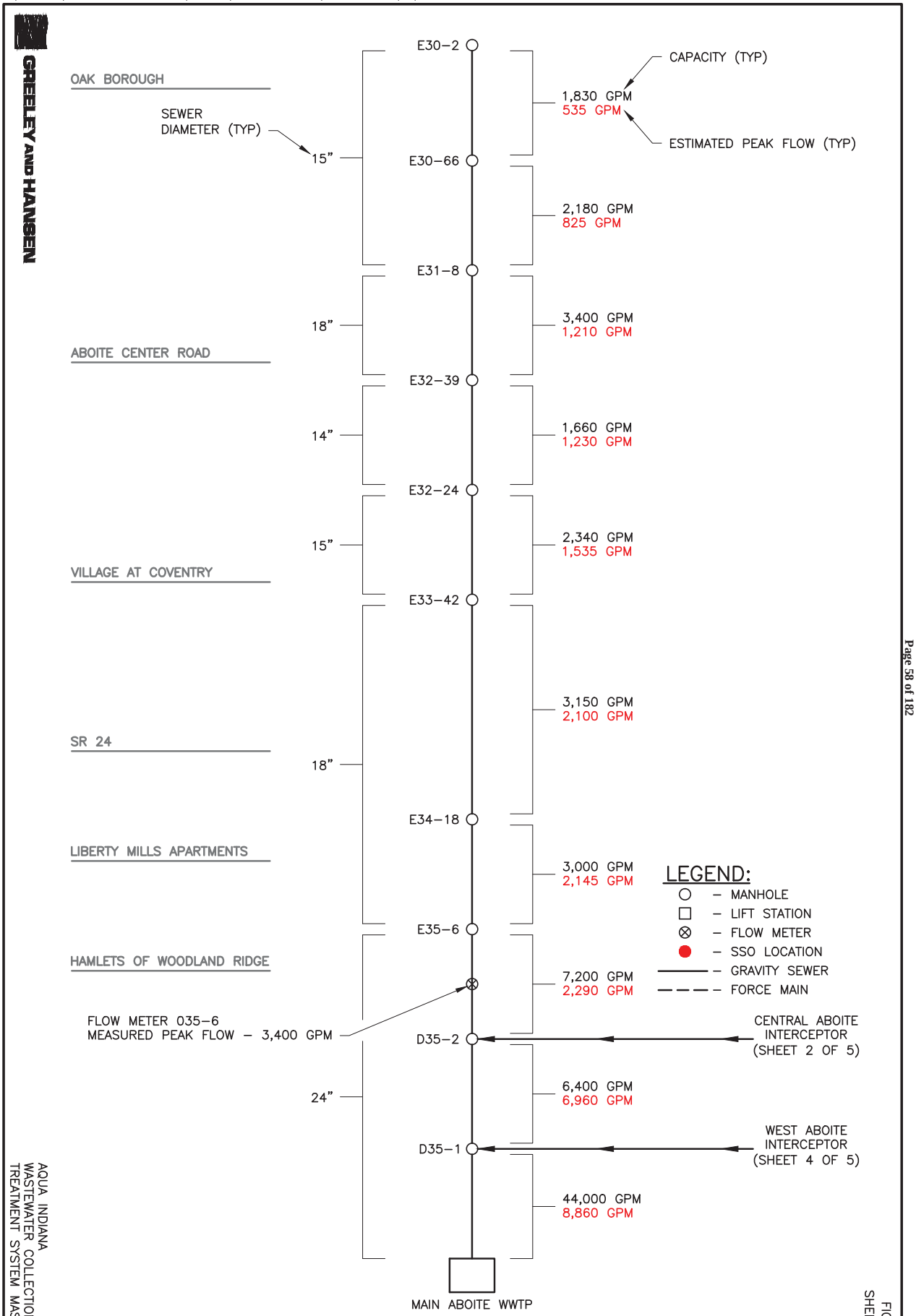
FIGURE 2-19

GREELEY AND HANSEN



AQUA INDIANA
WASTEWATER COLLECTION
AND TREATMENT SYSTEM
MASTER PLAN UPDATE

FIGURE 2-20



EAST ABOITE INTERCEPTOR

AQUA INDIANA
WASTEWATER COLLECTION AND
TREATMENT SYSTEM MASTER PLAN

FIGURE 2-21
SHEET 1 OF 5

Cause No. 44752
Attachment JTP-7
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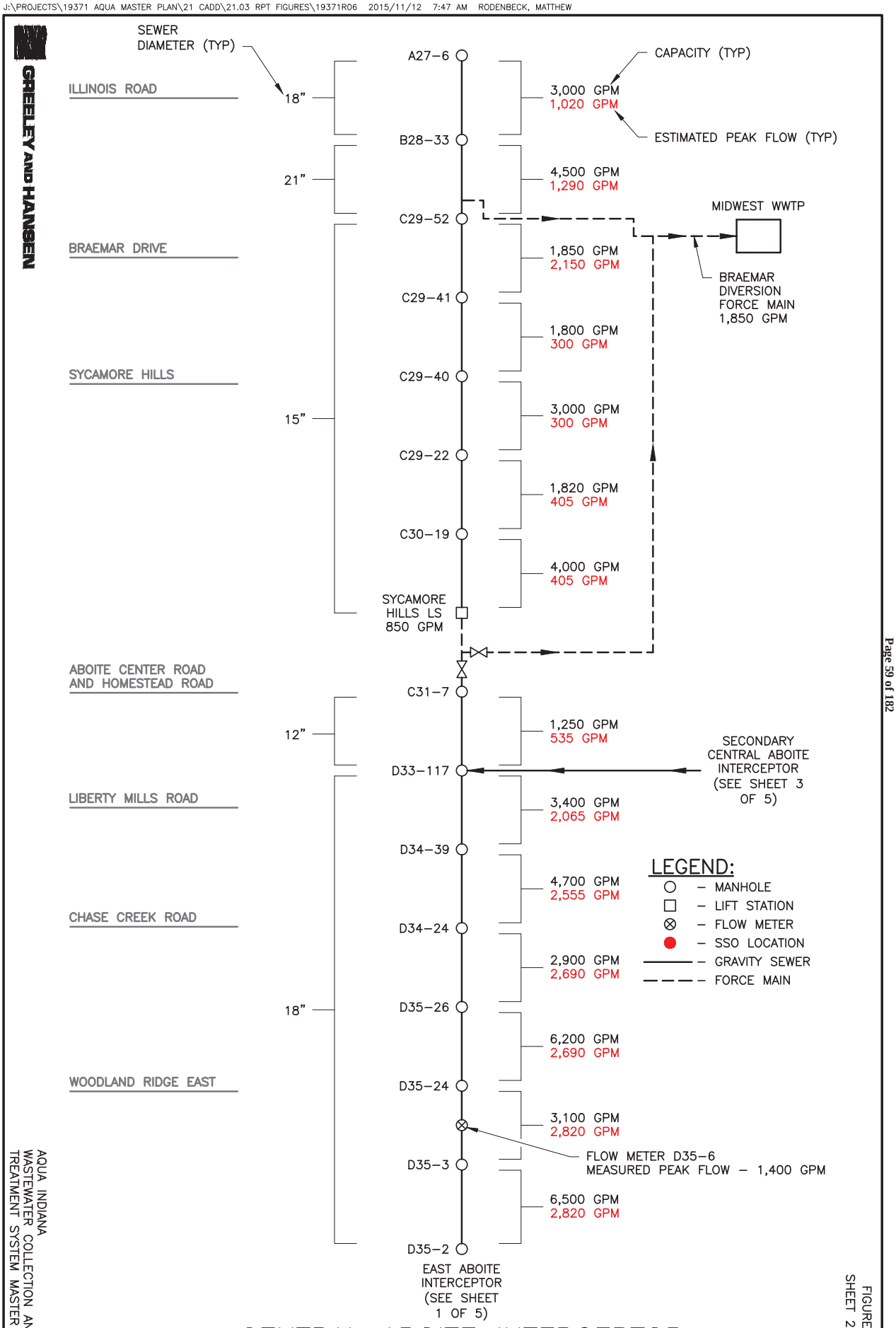

CENTRAL ABOITE INTERCEPTOR

GREELEY AND HANSEN

AQUA INDIANA WASTEWATER COLLECTION AND TREATMENT SYSTEM MASTER PLAN

FIGURE 2-21
SHEET 2 OF 5

Cause No. 44752
Attachment JTP-7
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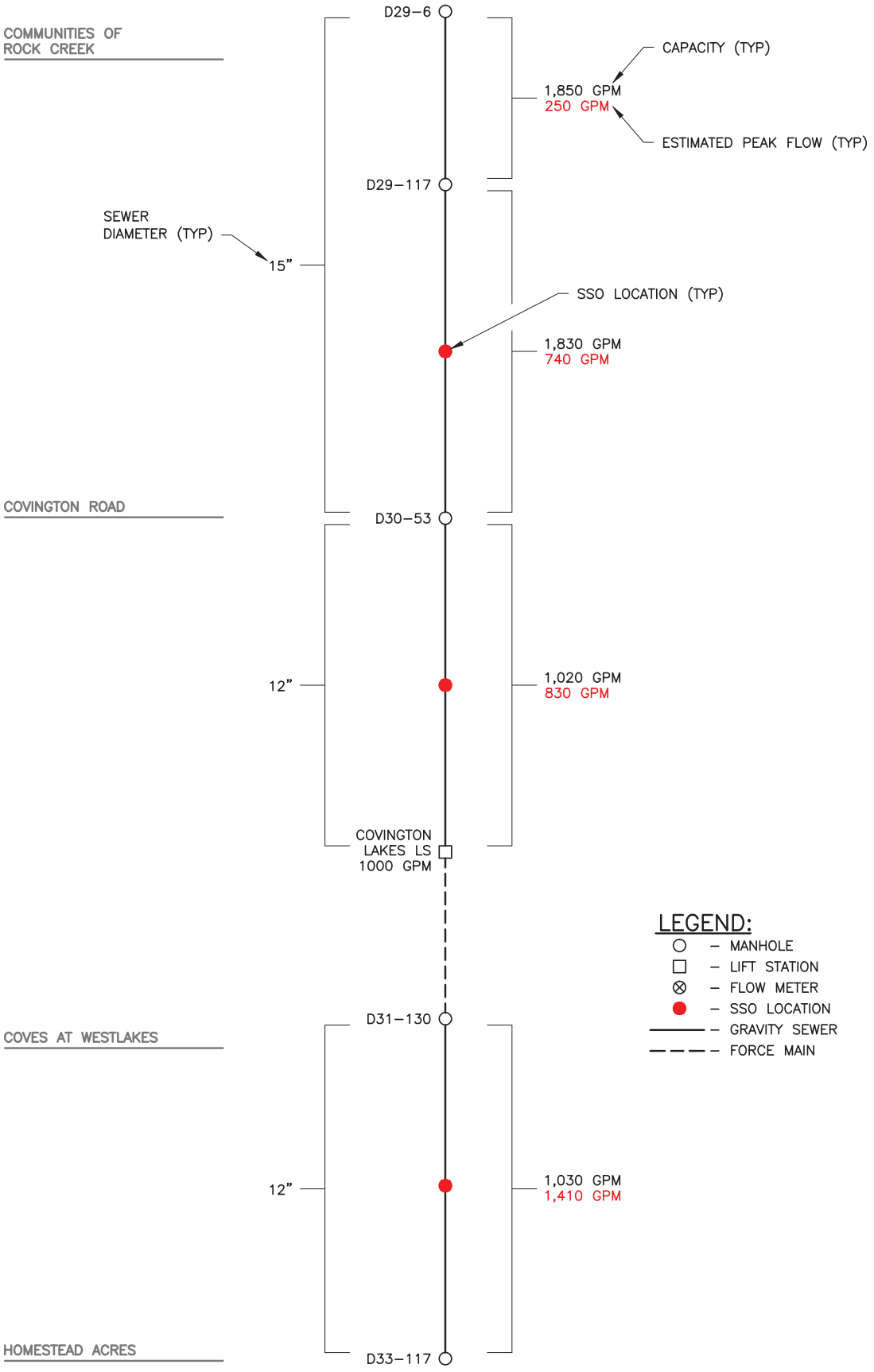
GREELEY AND HANSEN



SECONDARY CENTRAL ABOITE INTERCEPTOR

AQUA INDIANA WASTEWATER COLLECTION AND TREATMENT SYSTEM MASTER PLAN

FIGURE 2-21
SHEET 3 OF 5

Cause No. 44752
Attachment JTP-7
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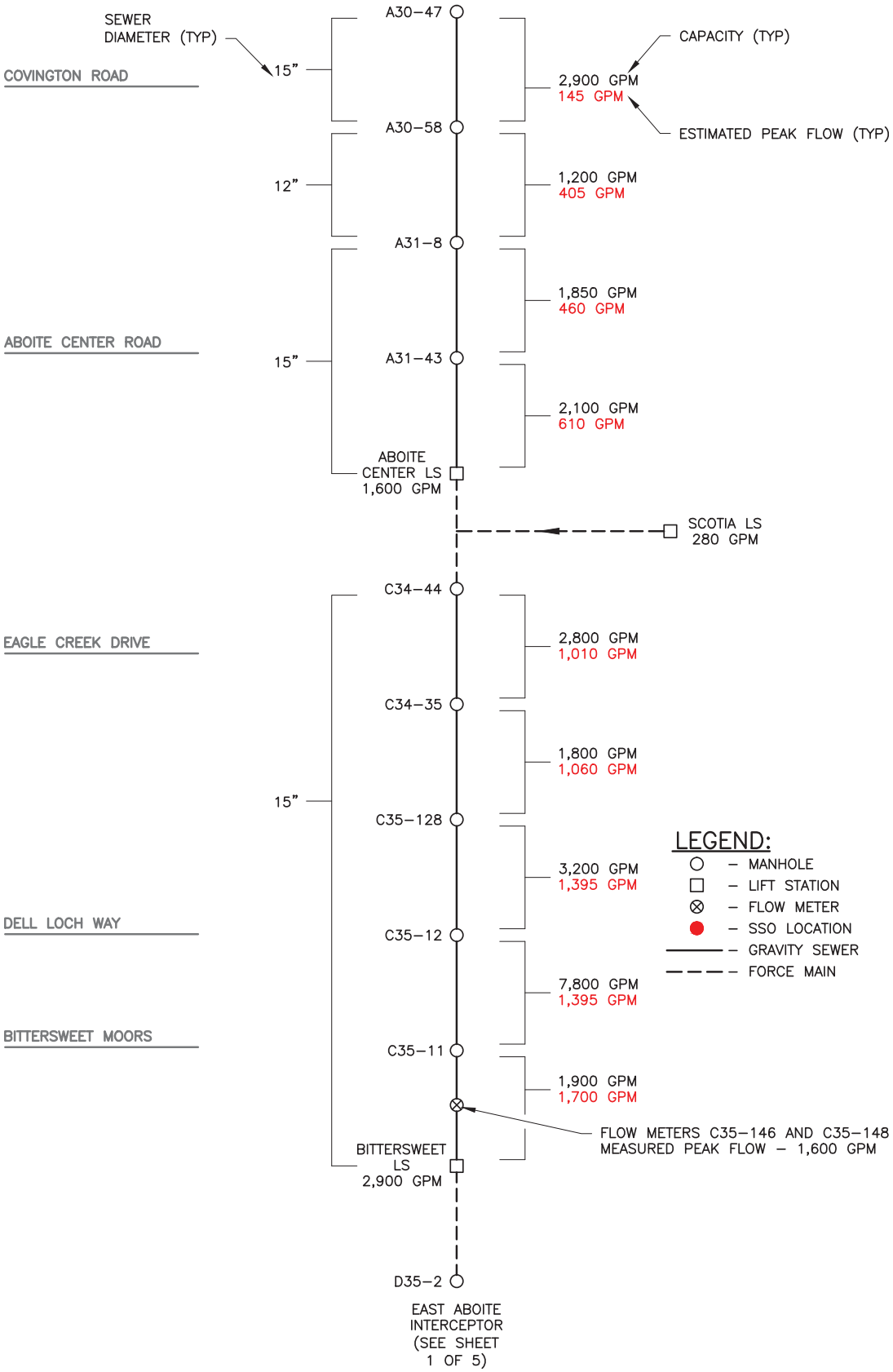
GREELEY AND HANSEN



WEST ABOITE INTERCEPTOR

AQUA INDIANA WASTEWATER COLLECTION AND TREATMENT SYSTEM MASTER PLAN

FIGURE 2-21
SHEET 4 OF 5

Cause No. 44752
Attachment JTP-7
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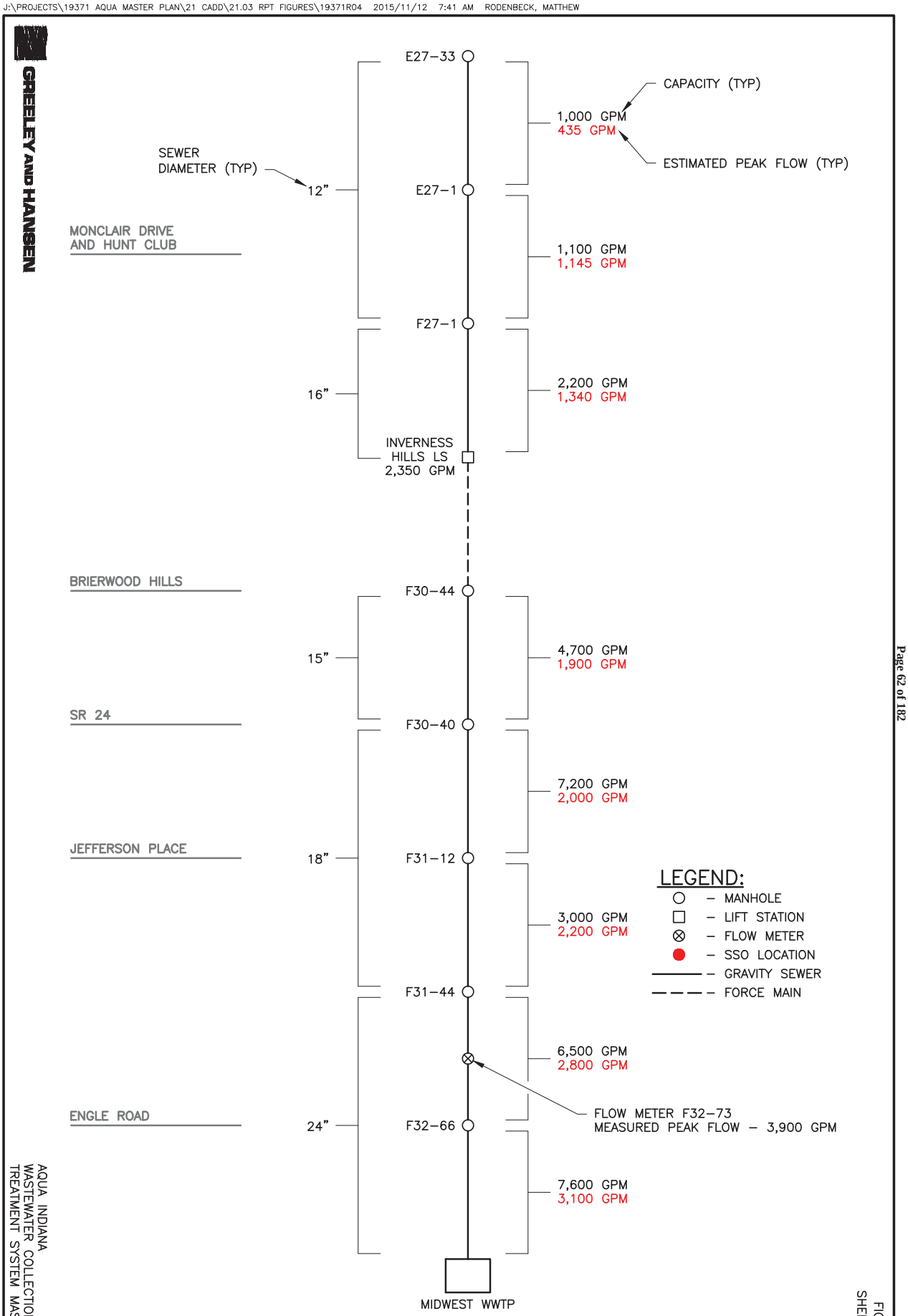

MIDWEST INTERCEPTOR

AQUA INDIANA
WASTEWATER COLLECTION AND
TREATMENT SYSTEM MASTER PLAN

FIGURE 2–21
SHEET 5 OF 5

Cause No. 44752
Attachment JTP-7
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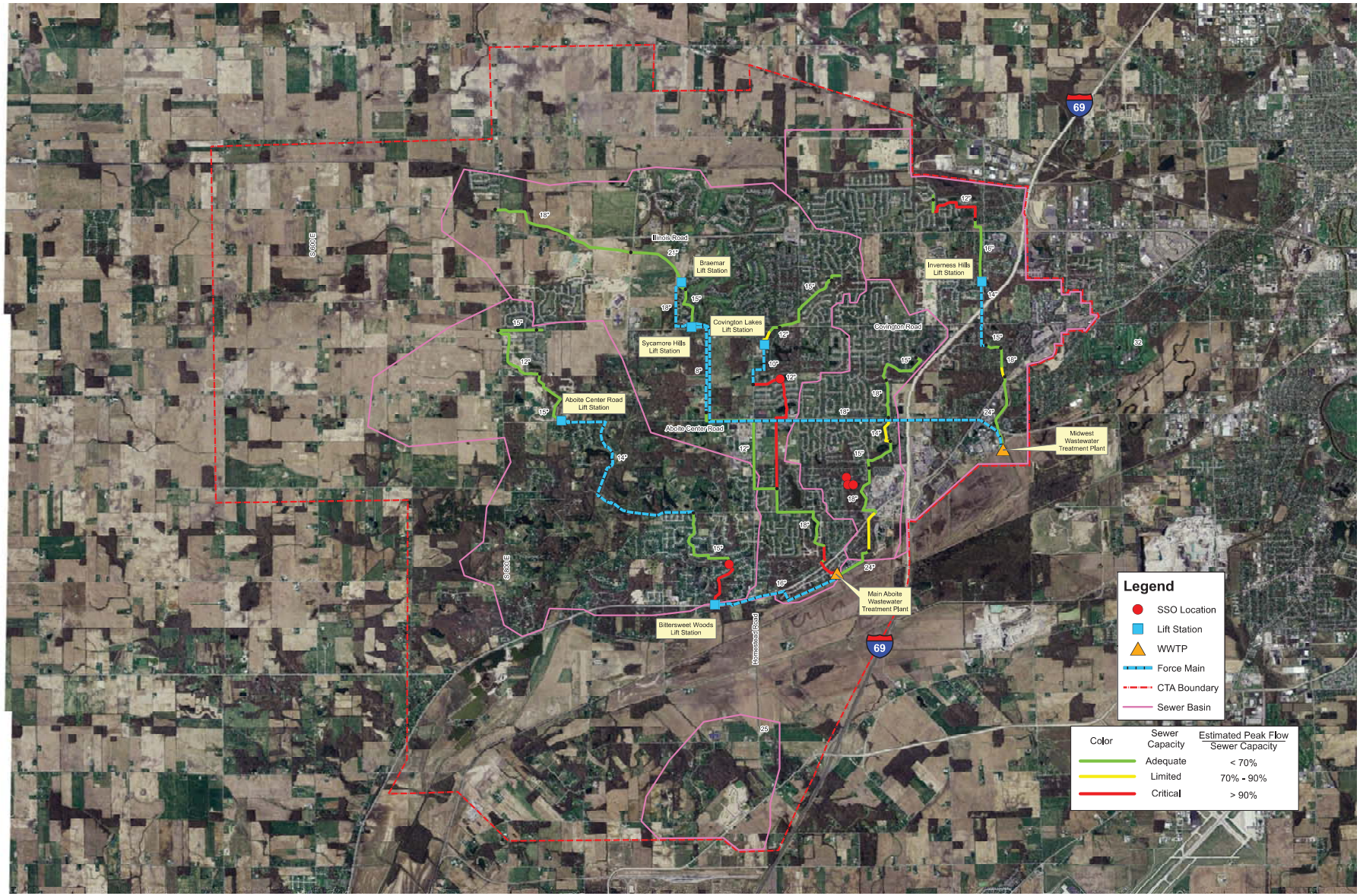
FIGURE 2-22



EXISTING INTERCEPTOR CAPACITY

GREELEY AND HANSEN

AQUA INDIANA
WASTEWATER COLLECTION AND
TREATMENT SYSTEM MASTER PLAN

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Section 3 Future Situation

3.1 Service Area

Figure 3-1 shows potential development areas from local developers such as Thomas, Delagrange and Granite Ridge.

For the Main Aboite service area, growth and development is expected to continue in the northwest (to be served by Aboite Center Road Lift Station) and southern quadrants (to be served by Homestead Road Lift Station). Additionally, flows contributions could come from existing homes with septic systems that are forced to connect to sanitary sewers.

For the Midwest service area, growth and development is expected to continue in the north (area tributary to Braemar Lift Station) and northeast quadrants (to be served by Bass Road LS).

3.2 Estimated Wastewater Flows

To estimate wastewater flow for the potential future development areas, each land use was assigned either a population density or an office/commercial/industrial contribution rate. Flows were estimated using a population density of 3.1 residents per unit and a flow rate of 100 gallons per day per resident for single family residences. Office, commercial, and industrial areas were assigned a flow rate of 1,000 gallons per acre. Peak flow was estimated by applying a peaking factor of 4 to the average daily flow.

Table 3-1 shows the estimated average and peak flow for the future development areas to be 0.75 mgd and 3 mgd, respectively.

Table 3-1
Estimated Wastewater Flows – Developer Requests

Area	Land Use	Units/ Acreage	Average Flow (gpm)	Peak Flow (gpm)	Tributary Lift Station	Tributary WWTP
A	Residential	49	11	44	Braemar	Midwest
B	Apartment	158	22	88	Braemar	Midwest
C	Residential	270	58	232	Braemar	Midwest
D	Residential	150	32	128	Braemar	Midwest
E	Residential	100	22	88	Braemar	Midwest
F	Residential	36	8	32	Sycamore Hills	Main Aboite
G	Apartment	46	6	24	Braemar	Midwest
H	Residential	16	3	12	Braemar	Midwest
I	Senior Living	62	43	172	Inverness	Midwest
J	Residential	6	2	8	Inverness	Midwest
K	Residential	28	6	24	Inverness	Midwest
L	Senior Living	8	6	24	Inverness	Midwest
M	Senior Living	14	10	40	Inverness	Midwest
N	Residential	60	13	52	Aboite Center	Main Aboite
O	Residential	100	22	88	Aboite Center	Main Aboite
P	Residential	100	22	88	Aboite Center	Main Aboite
Q	Apartment	80	11	44	Aboite Center	Main Aboite
R	Senior Living	28	19	76	NA	Midwest
S	Senior Living	92	64	256	NA	Midwest
T	Residential	14	3	12	Aboite Center	Main Aboite
U	Residential	5	1	4	Bittersweet	Main Aboite
V	Residential	20	4	16	NA	Main Aboite
W	Residential	16	3	12	NA	Main Aboite
X	Residential	19	4	16	NA	Main Aboite
Y	Senior Living	85	59	236	Homestead	Main Aboite
Z	Senior Living	100	69	276	Homestead	Main Aboite
	Subtotal – Main Aboite		**219**	**876**		
	Subtotal – Midwest		**304**	**1,216**		
		TOTAL	**523**	**2,092**	**gpm**	
			0.75	**3.0**	**mgd**	

3.3 Population Projections

Population is the most commonly used basis for estimating future water/wastewater use. The 1990, 2000, and 2010 Census population for Allen County and Aboite Township were used to develop the 10-year population projection. **Table 3-2** shows the annual growth rate for Aboite Township to be 2.4 percent between 2000 and 2010. The annual growth rate for Allen County between 2000 and 2010 was 0.7 percent annually. It is anticipated that Aqua's service area will experience growth similar to that forecast for Aboite Township. The increase in population from 2015 to 2025 is projected to be 10,550 people. This increase translates into 1,005,000 gallons per day of flow (at 100 gpd per person).

Table 3-2
Population Projections

Year	Allen County Population	Percent Change	Aboite Township Population	Percent Change
1990	300,836[(1)]	--	18,490[(1)]	--
2000	331,849[(1)]	10.3%	28,338[(1)]	53.3%
2010	355,329[(1)]	7.1%	35,765[(1)]	26.2%
2015	367,731[(2)]	3.5%	40,268[(3)]	--
2020	379,731[(2)]	3.3%	45,135[(3)]	26.2%
2025	391,546[(2)]	3.1%	**50,818[(3)]**	--
2030	402,134[(2)]	2.7%	56,960[(3)]	26.2%

[(1)] U.S. Census Bureau Data
[(2)] Projections from IU Business Research Center Kelly School of Business
[(3)] Projections based upon Aboite Township population growth (26.2%) from 2000 to 2010.

3.4 Wastewater Flow Projections

It is anticipated that Aqua's service population would grow at the same rate (26.2 percent over the next 10 years) as Aboite Township between 2015 and 2025. **Table 3-3** shows the projected wastewater flows to each treatment plant for the year 2025. The estimated total wastewater flow increase is 1.0 mgd.

Table 3-3
Wastewater Flow Projections

Location	Design Average Flow (mgd)	Design Peak Flow (mgd)	Year 2015 Average Flow (mgd)	Year 2025 Flow (mgd)[1]	Reserve Capacity (mgd)[2]
Main Aboite	3.25	5.30	2.10	2.70	0.22
Midwest	3.50	12.00	1.70	2.10	1.05

(1) Year 2025 average flow based upon a 26.2% increase in year 2015 flows.
(2) Reserve capacity is 90 percent of design average flow minus year 2025 flow.

3.5 Conveyance Capacity to Serve Development

Growth and development is expected to occur in the areas tributary to Main Aboite and Midwest WWTPs. Existing key conveyance facilities to support growth in the Main Aboite sewer basin are: Aboite Center Road Lift Station, Bittersweet Woods Lift Station, Homestead Road Lift Station, and Braemar Lift Station (pumps to Midwest WWTP). Existing key conveyance facilities to support growth in the Midwest sewer basin are: Bass Road Lift Station, Inverness Hills Lift Station, and interceptor capacity upstream and downstream of Inverness Hills. **Table 3-4** shows the reserve capacity of key existing wastewater facilities. It appears that the existing lift stations have adequate capacity to convey flows for year 2025.

Table 3-4
Capacity Analysis

Facility Description	2015 Average Flow (gpm)[1]	2015 Peak Flow (gpm)[1]	Design Capacity (gpm)[2]	Reserve Capacity (gpm)[3]	Proposed Peak Flow (gpm)[4]
Sewer U/S Aboite Center LS	150	600	2,100	1,290	284
Aboite Center Road LS	150	600	1,600	840	284
Bittersweet Woods LS	475	1,900	2,900	710	288
Homestead LS	45	180	620	380	512
Sycamore Hills LS (separate FM)	250	1,000	1,750	575	32
Braemar LS (separate FM)	300	1,200	1,400	60	616
Sycamore Hills LS (combined FM)	250	1,000	**1,375**	240	32
Braemar LS (combined FM)	300	1,200	**1,100**	--	616
Bass Road	18	72	680	540	--
Inverness Hills	450	1,800	2,400	1,980	268
Sewer U/S Inverness Hills	335	1,340	2,200	640	268
Sewer D/S Inverness Hills	550	2,200	3,000	500	268

(1) Refer to Section 2, Table 2-7.
(2) Lift station design capacity based upon firm pumping capacity (largest pump out of service).
(3) Reserve capacity is 90 percent of sewer and lift station design capacity minus current peak flow.
(4) Refer to Section 3, Table 3-1.

The capacity analysis shows that the Braemar Lift Station will need to be expanded to serve potential future development. By combining both the Sycamore Hills Lift Station and Braemar Lift Station into a single force main it would allow both lift stations to participate in serving future growth and development. It should be noted that the output of the two lift stations does decrease from 3,150 gpm (separate force mains) to 2,475 gpm when flows are combined into Braemar Force Main. Future development flows tributary to Braemar and Sycamore Hills are estimated to be 720 gpm (average daily) and 2,900 gpm (peak).

Homestead Road Lift Station has sufficient capacity to serve near-term growth, and has provisions to add a third pump to meet flows beyond year 2025. Aboite Center Road Lift Station has sufficient capacity to serve growth and development beyond year 2025.

3.6 Wastewater Treatment Capacity to Serve Development

The combined average daily flow to the Main Aboite and Midwest WWTPs is estimated to be 3.8 mgd. The year 2025 average daily flow increase is estimated to be 1.0 mgd (Table 3-3) based upon population projections for Aboite Township. Flows from future development areas (Table 3-1) as proposed by local developers show an estimated average daily flow increase of 0.75 mgd. It is likely that these developments could be fully implemented and contributing flow within 5-10 years.

3.7 Flow Diversion

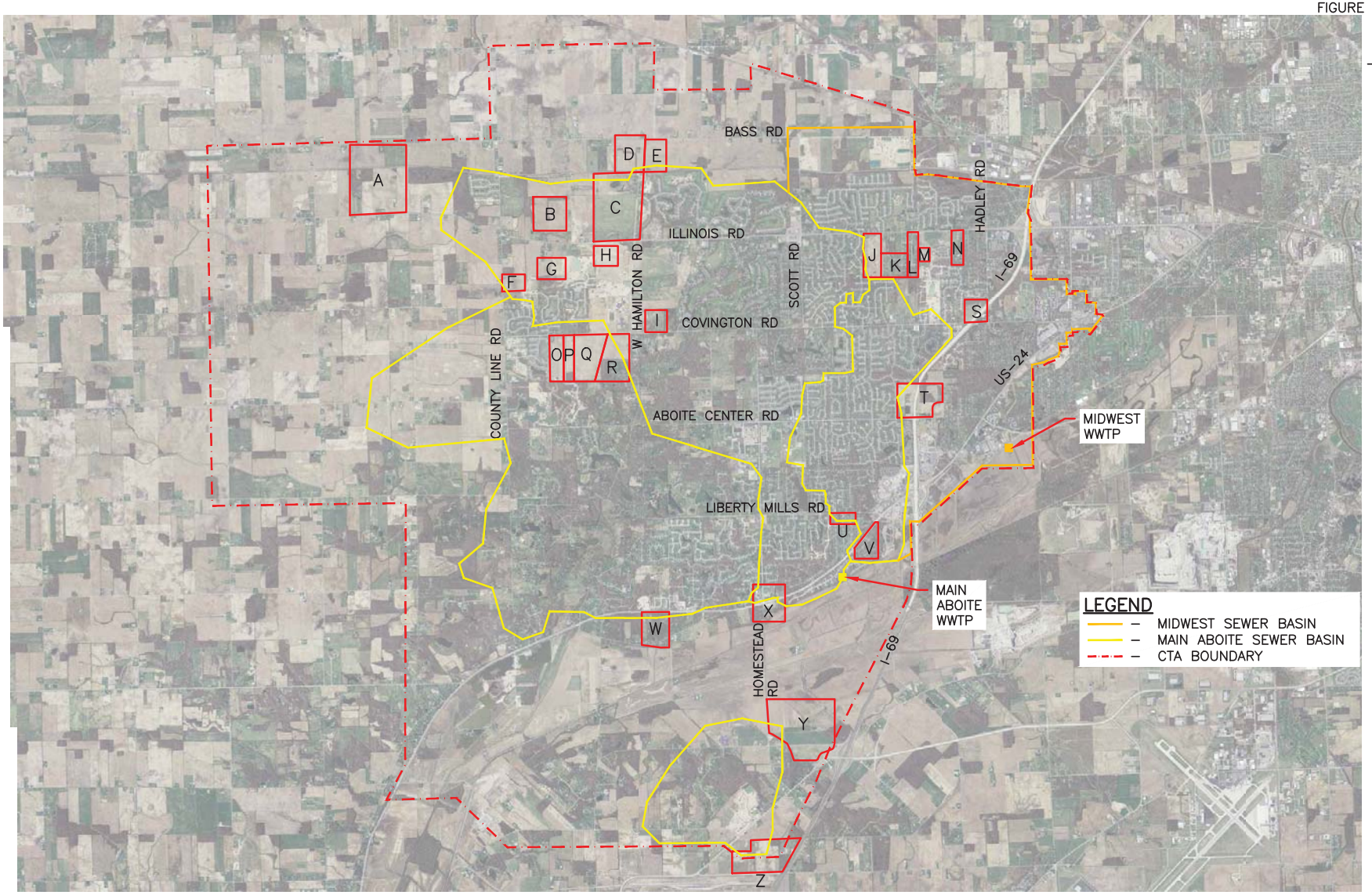
The Main Aboite WWTP is limited in its potential for expansion, if at all. This puts an emphasis on making sure treatment plant capacity at Main Aboite is used wisely. The 'Aboite Diversion' was constructed to reduce flows to the Main Aboite WWTP by redirecting flows from the Braemar Lift Station to the Midwest WWTP. It is recommended that the Aboite Diversion be expanded to include Sycamore Hills on a permanent basis. **Table 3-5** summarizes the impact of including Sycamore Hills as part of the Aboite Diversion. The table shows the importance of developing a Wet Weather Management Program to find and fix defects in the collection system on a comprehensive basis to help reclaim capacity over time through annual investment in sewer system rehabilitation.

Table 3-5
Year 2025 WWTP Flows with Flow Diversion

Location	Design Average Flow (mgd)	Design Peak Flow (mgd)	Year 2015 Average Flow (mgd)	Year 2025 WWTP Flow (mgd)[1]	Year 2025 WWTP w/ Flow Diversion[2] (mgd)	Reserve Capacity[3] (mgd)
Main Aboite	3.25	8.30	2.10	2.70	2.20	0.72
Midwest	3.50	12.00	1.50	2.10	2.60	0.55

[1] Refer to Table 3-3.
[2] Flow diversion is 350 gpm (0.50 mgd) from Sycamore Hills Lift Station to Braemar Force Main.
[3] Reserve capacity is 90 percent design average flow minus year 2025 Flow Diversion.

FIGURE 3–1



FUTURE DEVELOPMENT AREAS

GREELEY AND HANSEN

AQUA INDIANA
WASTEWATER COLLECTION AND
TREATMENT SYSTEM MASTER PLAN

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Section 4 Lift Station Evaluation

4.1 Introduction

On June 3 and 4, 2015 Greeley and Hansen and representatives of Aqua Indiana visited all 34 lift stations. During the site visits, special attention was given to the following items:

- Safety
- Security
- Structure condition
- Pump and motor conditions
- Piping and valve conditions
- Capacity and/or wet weather issues
- Standby power
- Supervisory Control and Data Acquisition (SCADA)
- Electrical system
- Site access

Figure 4-1 shows the existing lift station and force mains. **Figure 4-2** shows how the lift stations are interconnected in the Main Aboite and Midwest sewer basins. **Appendix A** includes lift station assessment forms.

A brief description and capacity analysis is provided below for each lift station. This analysis included delineating the service area and estimating the flow tributary to each lift station. Peak flows were estimated to be four times average flow. The estimated peak flow was compared to the firm capacity of the lift station to estimate the remaining capacity. The firm capacity of a lift station is the capacity of the lift station with the largest pump out of service. The force mains were also evaluated for current velocities at design flows with ultimate force main capacity being estimated at a velocity of 7 feet per second.

4.2 Aboite Center Road

This lift station was constructed in 2003 and is located in the West Aboite sewer basin at 14406 Aboite Center Road. There are three submersible pumps each rated at 640 gpm, and has a 200 kW standby generator for backup power. The lift station is connected to a 16-inch force main which discharges to the Dells of Bittersweet neighborhood. There is provisions for a fourth pump to be installed to serve future growth and development.

- Firm capacity rating: 1,280 gpm
- Service area peak flow: 610 gpm
- Remaining capacity: 670 gpm
- Current velocity in force main: 2 fps
- Force main ultimate capacity: 4,400 gpm

4.3 Aboite Meadows #1 (New)

This lift station was constructed in 2011 to replace the old Aboite Meadows station. The two stations are adjacent to each other, located south of Bronco Drive near the intersection with Turf Lane. The 8-inch force main from the new station travels west and discharges to a gravity sewer in the Coves at Westlakes. The new wet well is hydraulically connected to the wet well of the old lift station. The controls are such that the Old Lift Station only pumps when the capacity of the new lift station is exceeded. Since construction of the new station, there have been no wet weather issues reported at this location. However, the new force main location contributes to the wet weather issues experienced in the collection system at the Coves at Westlakes.

- Firm capacity rating: 225 gpm
- Service area peak flow: 290 gpm
- Remaining capacity: -
- Current velocity in force main: 1.4 fps
- Force main ultimate capacity: 1,100 gpm

4.4 Aboite Meadows #2 (Old)

This older lift station has been replaced by Aboite Meadows #1, but it still can be used if capacity is exceeded in the newer station. See description of Aboite Meadows #1 for more information. The 6-inch force main for this station runs south and discharges to the collection system in Haverhill.

- Firm capacity rating: Unknown
- Service area peak flow: 290 gpm
- Remaining capacity: N/A
- Current velocity in force main: N/A
- Force main ultimate capacity: 275 gpm

4.5 Amber Highlands

This station is located at the intersection of US Highway 24 and Amber Road. The two current submersible pumps were installed in 2001. The 6-inch force main runs east along US 24 and discharges at Bittersweet Woods Lift Station. There have been no wet weather issues reported for this location.

- Firm capacity rating: 270 gpm
- Service area peak flow: 240 gpm
- Remaining capacity: 30 gpm
- Current velocity in force main: 3.0 fps
- Force main ultimate capacity: 620 gpm

4.6 Bass Road

This lift station was constructed in 2004 and is located at the intersection of Bass Road and Scott Road. The station contains two submersible pumps and currently only receives flow from Sycamore Lakes, but it is expected that more homes will tie in as development continues. The 10-inch force main runs east along Bass Road and discharges into an 8-inch gravity sewer at Benton Glens Drive. There have been no wet weather issues reported for this lift station.

- Firm capacity rating: 680 gpm
- Service area peak flow: 70 gpm
- Remaining capacity: 610 gpm
- Current velocity in force main: 2.7 fps
- Force main ultimate capacity: 1,700 gpm

4.7 Bittersweet Woods

This lift station is currently undergoing improvements to expand its capacity, which will be completed in 2016. As part of the improvements, the three self-primed dry pit pumps are being fitted with new 75 HP motors and new rotating assemblies with larger impellers that will increase the firm capacity from 1,625 gpm to 2,900 gpm. The pump motors are controlled by variable frequency drives and the station has a 200 kW standby generator. The 16-inch force main runs east and discharges at the Main Aboite WWTP.

- Firm capacity rating: 2,900 gpm
- Service area peak flow: 1,900 gpm
- Remaining capacity: 1,000 gpm
- Current velocity in force main: 3.0 - 4.5 fps
- Force main ultimate capacity: 4,400 gpm

4.8 Bluewater

This lift station is located at 9018 Stage Coach Drive. The two submersible pumps were replaced in 2013. The lift station is connected to a 4-inch force main. There have been no reports of wet weather issues at this station.

- Firm capacity rating: 120 gpm
- Service area peak flow: 135 gpm
- Remaining capacity: -
- Current velocity in force main: 3.0 fps
- Force main ultimate capacity: 275 gpm

4.9 Braemar

This lift station was constructed in 2014 to reduce flows tributary to Sycamore Hills Lift Station to mitigate wet weather SSOs. The lift station is located in the Central Aboite basin, but the 18-inch force main travels more than 5 miles discharging to the Midwest WWTP. The force main is oversized and has the capacity to receive additional flow. The Sycamore Hills Lift Station force main can discharge to the Central Aboite interceptor (through an 8-inch force main) or can discharge to the Braemar force main (through an 18-inch force main). The 18-inch force main serves to divert flow from the Main Aboite WWTP to the Midwest WWTP. Braemar contains two submersible pumps controlled by variable frequency drives. It is anticipated that the Braemar Lift Station will correct the previous downstream wet weather SSOs.

- Firm capacity rating (One pump Braemar): 1,400 gpm
- Capacity with (1 pump Sycamore Hills & 1 pump Braemar): 1,100 gpm
- Capacity with (1 pump Sycamore Hills & 2 pumps Braemar): 1,500 gpm
- Service area peak flow: 1,200 gpm
- Remaining capacity: 300 gpm
- Current velocity in force main: 2.3-3.3 fps
- Force main ultimate capacity: 5,500 gpm

4.10 Brierwood

This lift station is located on the south side of the property at 7115 Rose Ann Parkway. It contains two submersible pumps installed in 2000. The site can flood during wet weather and the station has occasionally reported high water level alarms. During the site inspection it was noted that the influent was very clear, indicative of groundwater or clear water sources. The force main at this station is 4-inch in diameter.

- Firm capacity rating: 110 gpm
- Service area peak flow: 75 gpm
- Remaining capacity: 35 gpm
- Current velocity in force main: 2.8 fps
- Force main ultimate capacity: 275 gpm

4.11 Brigadoon

This lift station is located on Kingsbridge Road. The two submersible pumps were installed in 2005. The wet location suffers from poor drainage and the area around the wet well frequently contains standing water. Despite that there have been no reported wet weather issues for this station. The lift station is connected to a 2-inch force main.

- Firm capacity rating: 25 gpm
- Service area peak flow: 10 gpm
- Remaining capacity: 15 gpm
- Current velocity in force main: 2.5 fps
- Force main ultimate capacity: 70 gpm

4.12 Covington Bluffs

This lift station is located on the northwest corner of the property at 7030 Woodcroft Lane. Records indicate the two submersible pumps were replaced in 1983. There have been no reported wet weather issues for this station. The lift station is connected to a 4-inch force main.

- Firm capacity rating: 80 gpm
- Service area peak flow: 20 gpm
- Remaining capacity: 60 gpm
- Current velocity in force main: 2.0 fps
- Force main ultimate capacity: 275 gpm

4.13 Covington Club

This lift station is located on the west side of Covington Club Apartments, and also receives flow from the Fort Wayne Country Club. The two submersible pumps were updated in 2010, but the wet well shows signs of aging – exposed aggregate and signs of groundwater weep stains. There have been no reports of wet weather issues, but Aqua has indicated that this site has had grease accumulation issues in the past. The lift station is connected to a 4-inch force main.

- Firm capacity rating: 85 gpm
- Service area peak flow: 40 gpm
- Remaining capacity: 45 gpm
- Current velocity in force main: 2.1 fps
- Force main ultimate capacity: 275 gpm

4.14 Covington Lake

This lift station is located northwest of 3012 La Balme Trail in Covington Lake Estates. The two submersible pumps were replaced in 2015. There have been SSO's reported both upstream and downstream of this lift station – the more frequent SSOs have been downstream, where the 10-inch force main discharges into a 12 inch gravity sewer in the Coves at Westlakes.

- Firm capacity rating: 1,020 gpm
- Service area peak flow: 850 gpm
- Remaining capacity: 170 gpm
- Current velocity in force main: 4.2 fps
- Force main ultimate capacity: 1,700 gpm

4.15 Devil's Hollow

This lift station is located along Walnut Creek Drive, west of where it intersects with Devil's Hollow Road. The two submersible pumps were installed in 2007. This lift station receives flow from four lift stations (Peddler's Ford, Indian Creek, Quail Hollow, and Grayfox). The 6-inch force main runs northeast to Liberty Mills Road, where it connects to the 16-inch force main from Aboite Center Road Lift Station. There have been no reported wet weather issues for this station.

- Firm capacity rating: 420 gpm
- Service area peak flow: 210 gpm
- Remaining capacity: 210 gpm
- Current velocity in force main: 4.8 fps
- Force main ultimate capacity: 620 gpm

4.16 Ellisville

This lift station is located along US Highway 24, west of the intersection with Homestead Road. The two submersible pumps were replaced in 2009. There have been no reported wet weather issues at this station. The 4-inch force main runs northeast and discharges into an 8" gravity sewer that runs along Arbor Trail.

- Firm capacity rating: 190 gpm
- Service area peak flow: 40 gpm
- Remaining capacity: 150 gpm
- Current velocity in force main: 4.9 fps
- Force main ultimate capacity: 275 gpm

4.17 Emerald Lake

This station is located just south of 2919 Emerald Lake Drive. Records suggest the two submersible pumps were installed in 1987. The lift station occasionally reports high water alarms during wet weather, but has not experienced SSOs. There have been power failure issues at this site due to squirrels interfering with the nearby transformers. The station is connected to a 4-inch force main.

- Firm capacity rating: 210 gpm
- Service area peak flow: 145 gpm
- Remaining capacity: 65 gpm
- Current velocity in force main: 3.8 fps
- Force main ultimate capacity: 275 gpm

4.18 Glens of Bittersweet

This small lift station is located in the northeast corner of the property at 12201 Wood Glen Drive. The two submersible pumps were updated in 2007. There have been no reported wet weather issues at this site. The 4-inch force main runs along Wood Glen Drive before discharging into a 10-inch gravity sewer.

- Firm capacity rating: 130 gpm
- Service area peak flow: 20 gpm
- Remaining capacity: 110 gpm
- Current velocity in force main: 3.3 fps
- Force main ultimate capacity: 275 gpm

4.19 Goldspur

This lift station is located at the intersection of Illinois Road and Autumn Ridge, on the north side of the property at 8831 Illinois Road. It was constructed in 2012 and contains two submersible E/One Grinder pumps. The station has a short, 1-1/2-inch force main that runs under Illinois Road and discharges in a manhole across the street. There have been no wet weather issues at this lift station.

- Firm capacity rating: Unknown
- Service area peak flow: 15 gpm
- Remaining capacity: N/A
- Current velocity in force main: N/A
- Force main ultimate capacity: 40 gpm

4.20 Grayfox

This lift station is located across the street from 7621 Witling Boulevard. Records suggest the two submersible pumps installed in 1988. The wet well experiences occasional grease accumulation, but there have been no reported wet weather issues at this site. The 4-inch force main travels north to Chopine Road, where it discharges into an 8-inch gravity sewer.

- Firm capacity rating: 80 gpm
- Service area peak flow: 45 gpm
- Remaining capacity: 35 gpm
- Current velocity in force main: 2.0 fps
- Force main ultimate capacity: 275 gpm

4.21 Hamlets

This lift station is located on the same property as the Main Aboite WWTP. The two submersible pumps were installed in 2002. There are provisions for a third pump. The 8-inch force main discharges directly into the treatment plant's wet well. There have been no reported wet weather issues at this station.

- Firm capacity rating: 820 gpm
- Service area peak flow: 85 gpm
- Remaining capacity: 735 gpm
- Current velocity in force main: 5.2 fps
- Force main ultimate capacity: 1,100 gpm

4.22 Highlands of Scotia

This lift station is located near 13910 Whiskey Creek Drive. The two submersible pumps were installed in 2005. The lift station is connected to a 2-inch force main. It serves a limited number of homes. There have been no reported wet weather issues for this lift station.

- Firm capacity rating: 15 gpm
- Service area peak flow: 10 gpm
- Remaining capacity: 5 gpm
- Current velocity in force main: 1.5 fps
- Force main ultimate capacity: 70 gpm

4.23 Homestead Road

This lift station is located north of the Homestead Road and Ernst Road intersection. The lift station has a 150 kW backup generator for standby power. Inspection of the wet well showed visible high water lines, but there have been no reported wet weather issues at this location. Two submersible pumps were installed when the station was built in 2004. There are provisions for a third pump as future development is expected in this area. The lift station is connected to a 12-inch force main.

- Firm capacity rating: 620 gpm
- Service area peak flow: 175 gpm
- Remaining capacity: 445 gpm
- Current velocity in force main: 0.5 fps
- Force main ultimate capacity: 2,500 gpm

4.24 Indian Creek

This lift station is located between 14630 and 14820 Indian Creek Road. It receives flow from surrounding homes and the Grayfox Lift Station. The two submersible pumps were replaced in 2001. The 4-inch force main travels north and discharges into an 8-inch gravity sewer that runs along Walnut Creek Drive. There have been no reported wet weather issues for this lift station.

- Firm capacity rating: 110 gpm
- Service area peak flow: 75 gpm
- Remaining capacity: 35 gpm
- Current velocity in force main: 2.8 fps
- Force main ultimate capacity: 275 gpm

4.25 Inverness Hills

This lift station is located at the intersection of S Hadley Road and Blue Creek Drive. There are four submersible pumps installed now, but the station has provisions for a fifth. The pump motors are controlled by variable frequency drives. The station has not experienced any recent wet weather issues, and there is a 200 kW standby generator for backup power. The lift station is connected to a 14-inch force main.

- Firm capacity rating: 2,350 gpm
- Service area peak flow: 1,800 gpm
- Remaining capacity: 550 gpm
- Current velocity in force main: 2.5 – 5.2 fps
- Force main ultimate capacity: 3,400 gpm

4.26 Liberty Mills Apartments

This lift station serves the Liberty Mills Apartment Complex, and is located in the southeast corner of the property. The two submersible pumps were replaced in 2004. The wet well experiences grease buildup, but there have been no reported wet weather issues for this site. The lift station is connected to a 4-inch force main.

- Firm capacity rating: 285 gpm
- Service area peak flow: 45 gpm
- Remaining capacity: 240 gpm
- Current velocity in force main: 7.3 fps
- Force main ultimate capacity: 275 gpm

4.27 Micropulse

This lift station was constructed in 2008 to serve Micropulse Inc. located just north of Illinois Road as you enter the property. Two submersible pumps are connected to a 2-inch force main. There have been no reported wet weather issues for this location.

- Firm capacity rating: 45 gpm
- Service area peak flow: 15 gpm
- Remaining capacity: 30 gpm
- Current velocity in force main: 4.6 fps
- Force main ultimate capacity: 70 gpm

4.28 Peddler's Ford

This lift station is located on the northwest side of the property at 14117 Peddlers Ford and serves a limited number of homes. The two submersible pumps were replaced in 2014. This lift station is connected to a 2-inch force main. There have been no reported wet weather issues for this location.

- Firm capacity rating: 25 gpm
- Service area peak flow: 10 gpm
- Remaining capacity: 15 gpm
- Current velocity in force main: 2.5 fps
- Force main ultimate capacity: 70 gpm

4.29 Quail Hollow

This lift station serves the neighborhood of Quail Hollow, and is located near 14481 Liberty Mills Road. The two submersible pumps were installed in 2001. The lift station is connected to a 6-inch force main. There are visible signs of significant deterioration due to hydrogen sulfide and age. The pumps occasionally become clogged due to grease accumulation, but no wet weather issues have been reported at this site.

- Firm capacity rating: 200 gpm
- Service area peak flow: 40 gpm
- Remaining capacity: 160 gpm
- Current velocity in force main: 2.3 fps
- Force main ultimate capacity: 620 gpm

4.30 Scotia

This lift station is located at the end of the cul-de-sac on Brook Hollow Drive. The two submersible pumps were installed in 2004. The lift station is connected to a 4-inch force main which joins the 16-inch Aboite Center Road force main. There have been no reported wet weather issues at this location.

- Firm capacity rating: 215 gpm
- Service area peak flow: 70 gpm
- Remaining capacity: 145 gpm
- Current velocity in force main: 5.5 fps
- Force main ultimate capacity: 275 gpm

4.31 Shorewood

This lift station is located in the northwest corner of the property at 9734 Shorewood Trail. The two submersible pumps were updated in 1993. The lift station is connected to a 4-inch force main. There have been no reported wet weather issues at this location.

- Firm capacity rating: 110 gpm
- Service area peak flow: 110 gpm
- Remaining capacity: 0 gpm
- Current velocity in force main: 2.8 fps
- Force main ultimate capacity: 275 gpm

4.32 Sycamore Hills

This lift station is located along Covington Road on the east side of the entrance drive into the Sycamore Hills Golf Course. The two submersible pumps were updated in 2010. Due to recurring wet weather SSOs in the collection downstream of the lift station, the Braemar Lift Station was upgraded to reduce the flow to Sycamore Hills by diverting a portion of the flow to the Midwest WWTP. Sewer flows in excess of the Braemar Lift Station continue downstream to the Sycamore Hills Lift Station.

The Sycamore Hills Lift Station force main can discharge to the Central Aboite interceptor (through an 8-inch force main) or can discharge to the Braemar force main (through an 18-inch force main). The 18-inch force main serves to divert flow from the Main Aboite WWTP to the Midwest WWTP. Sycamore Hills has two submersible pumps controlled by variable frequency drives. Motorized valves on the force main permit flow to be sent to either force main depending on level. Recent operating data suggest this arrangement has been successful in correcting the previous downstream wet weather SSOs.

- Firm capacity rating (8” FM): 1,750 gpm
- Capacity with (1 pump Sycamore Hills & 1 pump Braemar): 1,375 gpm
- Service area peak flow: 1,000 gpm
- Remaining capacity: -
- Current velocity in 8” force main: 5.4 fps
- 8” Force main ultimate capacity: 1,100 gpm

4.33 Waterside Woods

This lift station is located near 3406 Tarrant Springs Trail at the end of the drive. The two submersible pumps were installed in 2001. The lift station is connected to a 4-inch force main. There have been no reported wet weather issues for this location.

- Firm capacity rating: 110 gpm
- Service area peak flow: 25 gpm
- Remaining capacity: 85 gpm
- Current velocity in force main: 2.8 fps
- Force main ultimate capacity: 275 gpm

4.34 Westfield Passage

This lift station is located near 7252 Westfield Trail. The two submersible pumps were installed in 2003. The lift station is connected to a 2-inch force main. There have been no reported wet weather issues at this location.

- Firm capacity rating: Unknown
- Service area peak flow: 15 gpm
- Remaining capacity: N/A
- Current velocity in force main: N/A
- Force main ultimate capacity: 70 gpm

4.35 West Hamilton Road

This lift station is located on a long drive between house numbers 6728 and 6716 on Post Road. The two submersible pumps were installed in 1985. The lift station is connected to a 4-inch force main. There have been no reported wet weather issues with this station.

- Firm capacity rating: 150 gpm
- Service area peak flow: 30 gpm
- Remaining capacity: 120 gpm
- Current velocity in force main: 3.8 fps
- Force main ultimate capacity: 275 gpm

4.36 SCADA System

All lift stations are equipped with a communications link to a central location (at the Aqua Indiana office) using cellular data communications which has been successful. Previous communication was with radio. SCADA panels at each site were provided by SCADATA, Inc. (Fort Wayne, IN, www.scadata.net), and are non-metallic. **Appendix B** contains an I/O list for all 34 lift stations.

4.36.1 Alarms and Information Collected

Lift station alarms are sent to the central location immediately. Totalized pump-running hours are sent once a day for the previous 24 hours. Most stations had alarm lights and horns, but these have been disabled (common utility practice given the more reliable cellular communications link).

Many of the stations had an I/O listing marked on the inside of the panel. The following observations were made:

- Most stations observed are equipped with ‘low battery’ signal
- Most stations observed are equipped with ‘pump failure’ signal

- Most stations observed are equipped with ‘power failure’ signal
- Most stations observed are equipped with ‘pump running’ status for each pump
- All stations observed are equipped with ‘high level’ signal

4.36.2 Control Panels

All control panels are locked, and are of the “dead front” style, with nothing mounted on the front of the panel. The panels, when opened, are equipped with a swing-frame inner “front panel” with various items mounted on the inner panel. Devices mounted on the inner front panel vary. Most panels are of stainless steel construction, others are painted steel. The painted steel panels show various levels of corrosion, some showing severe corrosion.

Aqua has started installing amperage indicators to interior panel fronts. This allows workers to get pump amperage readings without opening the inner panel. A comparison of amperage readings over several months may provide insight as to pump condition. Pump amperage readings may also be a candidate for monitoring remotely via the existing SCADA system. While remote monitoring would provide amperage data much more frequently than currently collected, it would also provide automatic recording and storage of amperage data for easy comparison and trending.

Analog level controls are used for pump control at several lift stations with variable speed drives for the pumps. The level monitoring technology used is a submersible level transducer. The transducer includes a small breather tube within the cable, and should be connected to a desiccant pack located topside to prohibit the introduction of water vapor in the sensor tube, which would affect the accuracy of the unit. In some situations the desiccant pack was not visible, and may not be installed.

Each station is equipped with at least four floats (for a lift station with two pumps), located for the following functions (listed from highest to lowest mounting height):

- High Alarm (many of the high level alarm floats had been tied to a higher mounting location with spare wire)
- Start Lag Pump (Additional floats are present for each additional pump where stations include more than two pumps)
- Start Lead Pump
- Stop Pumps

Aqua should continue adding confined space stickers located on the control panels at each lift station site.

Aqua should also consider the addition of an auxiliary force main connection (or pump bypass connection to force main) for connection to a portable pumping system. This is typically provided in an existing valve vault. All new lift stations should include this the bypass connection as common practice.

4.36.3 Automation / Flow Indication

Only the Scyamore Hills Lift Station is equipped with digital output for control of equipment from SCADA. SCADA controls two valves on the discharge of the lift station; selection of the open valves determines the destination of the discharge. The lift station flow can be pumped into either an 8-inch force main (to Main Aboite WWTP) or an 18-inch force main ('Aboite Diversion' to Midwest WWTP).

The Bittersweet Woods and Inverness Hills Lift Stations were equipped with a flow meter, located in a separate meter vault.

4.37 Recommendations

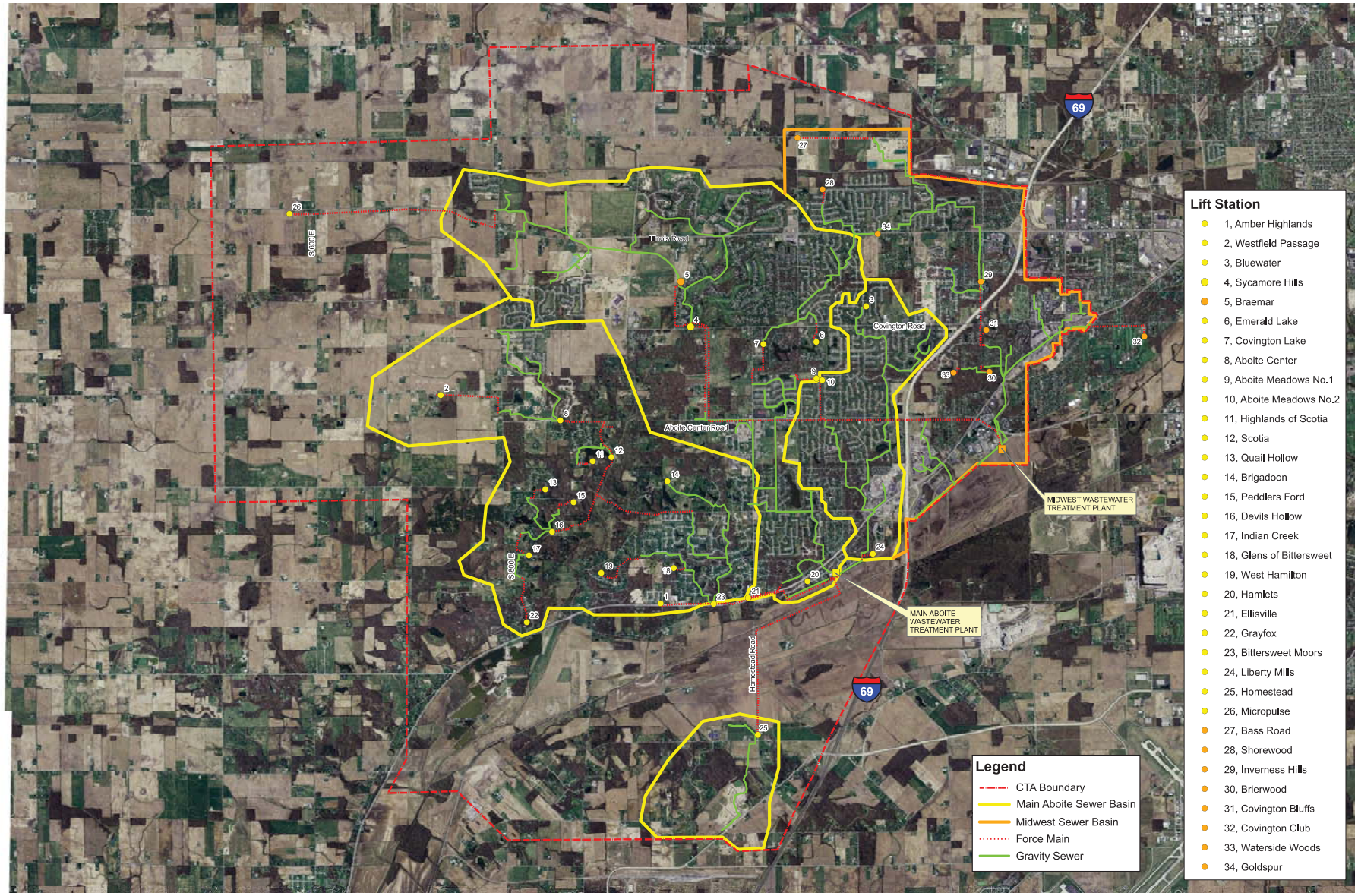
Table 4-1 shows the recommended improvements for each lift station.

Table 4-1
Lift Station Improvements

Lift Station	Proposed Improvements	Estimated Cost
Aboite Center Road	None	--
Aboite Meadows #1 (New)	None	--
Aboite Meadows #2 (Old)	None	--
Amber Highlands	None	--
Bass Road	None	--
Bittersweet Woods	Fall Protection above wet well, Security (door switch)	$5,000
Bluewater	Guiderail Alignment, Fall Protection above wet well	$7,000
Braemar	None	--
Brierwood	Fall Protection	$2,000
Brigadoon	Fall Protection	$2,000
Covington Bluffs	Replace Pumps and Access Hatch, Fall Protection	$20,000
Covington Club	Fall Protection	$2,000
Covington Lakes	Fall Protection, Replace Painted Steel Control Panel	$20,000
Devil's Hollow	Replace Pumps, Replace Access Hatch, VFDs (3-phase power)	$40,000
Emerald Lakes	Fall Protection, Squirrel Cage on Transformer	$2,000
Glens of Bittersweet	Fall Protection	$2,000
Goldspur	Fall Protection, Control Panel needs better mounting	$2,000
Grayfox	Pump Replacement, Fall Protection	$15,000
Hamlets	Replace Guiderail, Fall Protection	$7,000
Highlands of Scotia	Fall Protection	$2,000
Homestead	Pressure Transducer not working	$3,000
Indian Creek	Fall Protection, New Control Panel, VFDs (for 3-phase power)	$30,000
Inverness Hills	Wiring is not per code. Two main service breakers are wired in parallel. Both should be replaced with a single breaker large enough to handle total load of cabinet.	$25,000
Liberty Mills	Fall Protection	$2,000
Micropulse	Fall Protection	$2,000

Peddler's Ford	Fall Protection	$2,000
Quail Hollow	New Pump Rails, Pumps, Piping, Pump Hatches, Electrical Control Panel and VFDs for 3-phase power	$70,000
Scotia	Fall Protection	$2,000
Shorewood	Fall Protection	$2,000
Sycamore Hills	None	--
Waterside Woods	Fall Protection	$2,000
Westfield Passage	Fall Protection	$2,000
West Hamilton	New Pumps, Fall Protection	$15,000
	Total	**$285,000**

FIGURE 4-1



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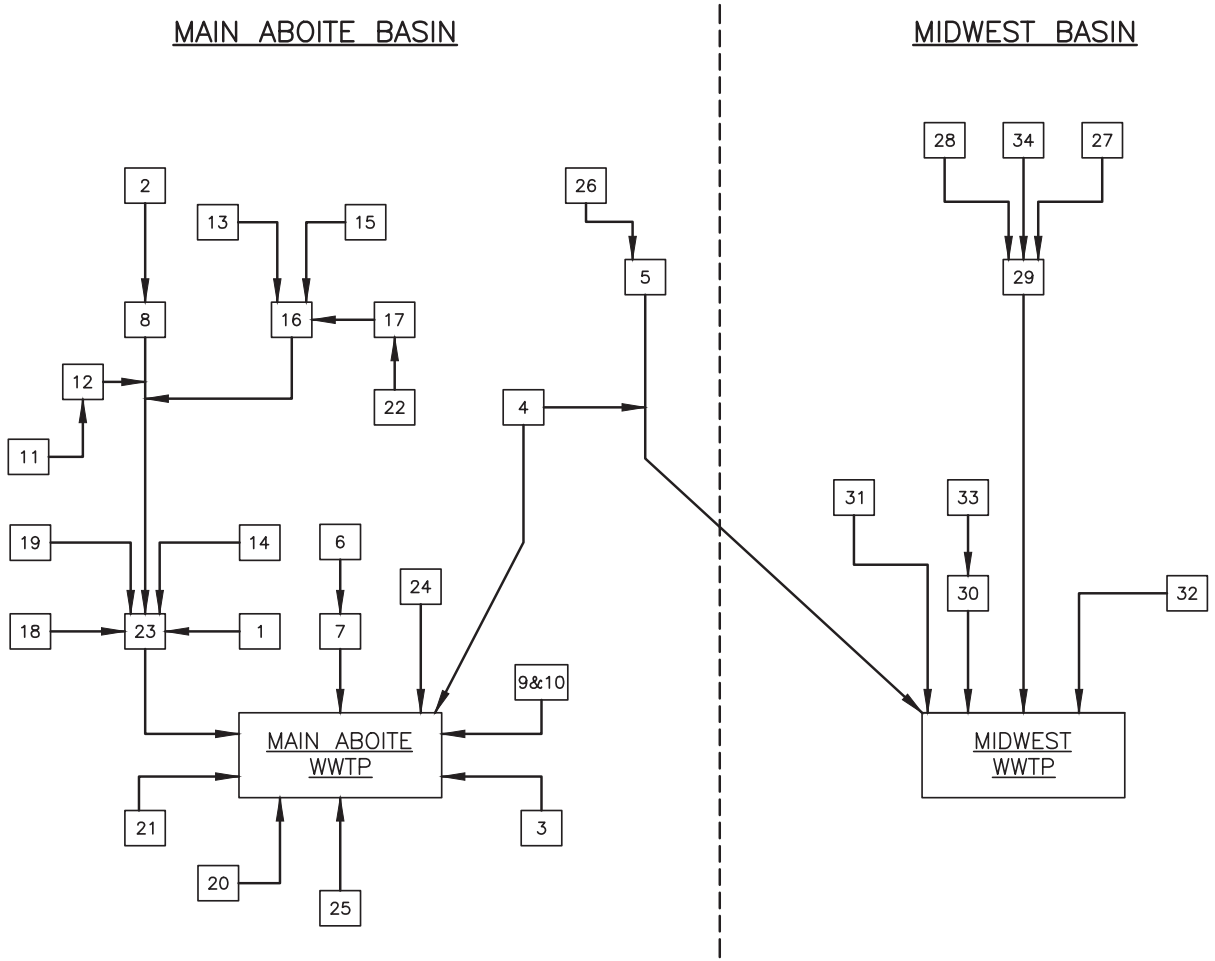
EXISTING LIFT STATIONS

AQUA INDIANA
WASTEWATER COLLECTION AND
TREATMENT SYSTEM MASTER PLAN

FIGURE 4–2



LIFT STATION LEGEND:

LOCATION	FIRM CAPACITY
1 – AMBER HIGHLANDS	270 GPM
2 – WESTFIELD PASSAGE	20 GPM
3 – BLUEWATER	120 GPM
4 – SYCAMORE HILLS	1,750 GPM
5 – BRAEMAR	1,400 GPM
6 – EMERALD LAKE	210 GPM
7 – COVINGTON LAKE	1,020 GPM
8 – ABOITE CENTER	1,280 GPM
9 – ABOITE MEADOWS NO.1	225 GPM
10 – ABOITE MEADOWS NO.2	NA GPM
11 – HIGHLANDS OF SCOTIA	15 GPM
12 – SCOTIA	215 GPM
13 – QUAIL HOLLOW	200 GPM
14 – BRIGADOON	25 GPM
15 – PEDDLERS FORD	25 GPM
16 – DEVILS HOLLOW	420 GPM
17 – INDIAN CREEK	110 GPM
18 – GLENS OF BITTERSWEET	130 GPM
19 – WEST HAMILTON	150 GPM
20 – HAMLETS	820 GPM
21 – ELLISVILLE	190 GPM
22 – GRAYFOX	80 GPM
23 – BITTERSWEET MOORS	2,900 GPM
24 – LIBERTY MILLS	285 GPM
25 – HOMESTEAD	620 GPM
26 – MICROPULSE	45 GPM
27 – BASS ROAD	680 GPM
28 – SHOREWOOD	110 GPM
29 – INVERNESS HILLS	2,350 GPM
30 – BRIERWOOD	110 GPM
31 – COVINGTON BLUFFS	80 GPM
32 – COVINGTON CLUB	85 GPM
33 – WATERSIDE WOODS	110 GPM
34 – GOLDSPUR	NA GPM

LIFT STATION CONNECTIVITY

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AQUA INDIANA
WASTEWATER COLLECTION AND
TREATMENT SYSTEM MASTER PLAN

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Section 5 Recommendations

5.1 Introduction

The Master Plan Update includes recommendations to proactively plan and provide for anticipated growth and development within the service area for the next ten years (year 2025). The recommended projects will be required at various times over the next 5 years to sustain adequate wastewater collection and treatment to existing customers while also to provide the wastewater infrastructure for future planned development.

5.2 Recommended Projects

This section summarizes the results of the sewer capacity evaluations and the recommended sewer system improvements in each major sewer basin. **Figure 5-1** shows the recommended projects.

5.2.1 Main Aboite Service Area

The following projects are recommended for the Main Aboite (MA) service area:

Project MA-1: Bittersweet Diversion – Phase 2
A two phase approach was recommended to correct wet weather sanitary sewer overflows in the Dells of Bittersweet neighborhood. Phase 1 is under construction and includes expanding the capacity of the Bittersweet Moors Lift Station. Following the construction of the Phase 1 improvements, Aqua will monitor the performance of the system to determine if Phase 2 improvements are needed.

Phase 2 improvements consist of redirecting the Aboite Center Road Force Main to the Bittersweet Moors Lift Station in lieu of discharging to the Dells of Bittersweet collection system.

This project is also needed to allow for continued growth and development within the Aboite Center Road Lift Station service area.

The project includes the construction of 8,200 feet of 18-inch force main.

Project MA-2: Covington Lakes Lift Station and Force Main Improvements – Phase 2
A two phase approach is recommended to correct a wet weather sanitary sewer overflow in the Coves at Westlakes neighborhood. Phase 1 will be completed in-house by Aqua and consists of evaluating the hydraulic grade line of the sewer system upstream and downstream of the SSO location. The SSO location is the lowest point of relief. The evaluation will help determine if raising the manhole would correct or significantly reduce the SSO frequency at this location.

Phase 2 would consist of extending the existing force main to the south and discharging to the 12-inch sewer at the Aboite Center Road and Homestead Road intersection. The force main extension would eliminate the wet weather sanitary sewer overflow in the Coves at Westlakes neighborhood. This change would also require the Sycamore Hills Lift Station to permanently pump flow to the Braemar Force Main as the proposed discharge location for Covington Lakes does not have capacity to receive flow from both Sycamore Hills and Covington Lakes Lift Stations.

The project includes the construction of 2,100 feet of 10-inch force main. The Covington Lakes Lift Station would need larger pumps due to new discharge condition. It is recommended that variable speed drives be installed to better match incoming flow rates to the station. An engineering evaluation would be required to verify downstream receiving sewer capacity and to size new pumping improvements.

The benefits of the Covington Lakes force main extension is as follows:

- Eliminates the SSO in the Coves at Westlakes neighborhood

Project MA-3: Sycamore Hills Flow Diversion Study (Flow Diversion to Midwest)

Sewer capacity evaluations in the central portion of Main Aboite showed limited capacity in the 18-inch interceptor upstream of the Main Aboite WWTP (MH D34-24 to MH D35-3) approximately 2,100 feet in length. This capacity limitation can be corrected by implementing the Sycamore Hills flow diversion to Midwest.

An engineering study is needed to evaluate the Braemar Lift Station and Sycamore Hills Lift Station working as one hydraulic system. The study is needed to identify improvements to increase overall system capacity to 3,000 to 3,500 gpm to meet year 2025 flows and beyond.

The engineering study would:

- Identify service area and design flow.
- Provide recommended plan to meet design condition.

The Sycamore Hills Flow Diversion benefits are as follows:

- Sycamore Hills current discharge location precludes it from pumping additional flow to Main Aboite WWTP. Covington Lakes Lift Station service area is fully developed so there would be no benefit to having it connect to the Braemar force main.
- Sycamore Hills can complement the Braemar Lift Station in serving anticipated growth and development to the north and northwest.

- Permanent flow diversion from Sycamore Hills would reduce flow to the Main Aboite WWTP by approximately 0.5 mgd.
- Higher flow rates will reduce residence time in the Braemar force main during dry weather periods which will help reduce septicity of flow.

Project MA-4: East Aboite Interceptor Wet Weather Study - Phase 1

Sewer capacity evaluations in the east portion of Main Aboite showed limited capacity in the 18-inch interceptor south US 24 highway and Liberty Mills intersection. Wet weather SSOs occur at manholes D33-2, D33-3, and E33-69 which are all located in the Liberty Hills and Burnham Woods area just upstream of where the sewer connects to the East Aboite Interceptor northwest of the US 24 highway and Liberty Mills intersection.

The project would consist of a detailed engineering evaluation to identify corrective action plan to eliminate the SSOs. The investigative study would include:

- Televise the sewers downstream of the SSOs including the 18-inch sewer from MH E34-18 to MH E25-6 (or approximately 2,400 feet) to where the sewer changes to 24 inches in diameter. Televise to identify potential obstructions such as severe roots or grease that may be causing the flow to back-up.
- Survey key manholes to obtain rim and invert elevations and pipe sizes to analyze existing capacity and hydraulic grade lines.
- Inspect flow in the sewer following a rain event to determine if flows are being restricted at the connection to the interceptor. Experience has shown that high flows in an interceptor can restrict flow from smaller collector sewers from entering the interceptor (i.e., 'wall of water').
- The interceptor makes several significant turns (downstream of SSO location) which can increase head loss and raise the hydraulic grade line in the sewer.
- Provide recommended plan to correct SSOs.

Project MA-5: East Aboite Interceptor Wet Weather Study – Phase 2

Sewer capacity evaluations in the east portion of Main Aboite showed limited capacity in the 14-inch sewer south of Aboite Center Road near Coventry Lane (MH E32-29 to MH E32-24) approximately 1,500 feet in length. Additionally, the East Aboite sewer basin collection system showed excessive high flows during wet weather. It is recommended that sewer flow monitoring be conducted to try and isolate the highest sources of infiltration and inflow for removal.

The investigative study would include:

- Survey key manholes to obtain rim and invert elevations and pipe sizes to analyze existing capacity and hydraulic grade lines.
- Install five (5) sewer flow monitors at key manhole locations to divide large basin into small mini-basins to quantify infiltration and inflow (I/I). This will help prioritize follow up smoke testing and CCTV inspections.
- Provide recommended plan to address capacity limitation through systematic field inspections and sewer rehabilitation.

The benefits of the East Aboite Interceptor Wet Weather Study – Phase 2 are as follows:

- Finding and fixing prioritized defects in the collection system to reduce wet weather flows.
- Reduce SSOs through sewer and manhole rehabilitation.
- Reclaiming capacity at the Main Aboite WWTP through reduction of I/I.
- Maintain existing sewer infrastructure in a state of repair to preclude future SSOs in the basin.

5.2.2 Midwest Service Area

The following projects are recommended for the Midwest (MW) service area:

Project MW-1: Bass Road Lift Station Relief Sewer

Sewer capacity evaluations in the northern portion of Midwest showed critical capacity in the 12-inch sewer between MH E27-1 and MH F27-1, approximately 4,000 feet in length. The sewer passes through Abbey Place and Hunt Club Apartments. This is a high priority sewer because it receives flow from the Bass Road Lift Station a key facility to serve anticipated future growth and development.

The project would consist of a detailed engineering evaluation to determine replacement sewer or relief sewer size to meet year 2025 flows and beyond. The engineering study would include:

- Survey key manholes to obtain rim and invert elevations and pipe sizes to analyze existing capacity and hydraulic grade lines.
- Summarize basis of design flows to meet year 2025 flows and beyond including its impact downstream sewer infrastructure and Inverness Hills Lift Station. Review potential relief sewer routes. Preliminary engineering analysis suggest a capacity increase of 1.5 mgd to match the downstream capacity of the larger 16-inch sewer located just north of Illinois Road.
- Provide recommended plan for 4,000 feet of relief or replacement sewer to meet design flow.

The benefits of the relief / replacement sewer are as follows:

- Sewer infrastructure need to serve anticipated future growth and development.
- Maintain existing sewer infrastructure in a state of repair to preclude future SSOs in the basin.

Project MW-2: 18-inch Brierwood Hills Relief Sewer

Sewer capacity evaluations in the southern portion of Midwest showed limited capacity in the 18-inch interceptor north of US 24 highway near Brierwood Hills. The capacity limited sewer is between MH F31-12 to MH F31-44 and is approximately 700 feet in length.

The project would consist of a detailed engineering evaluation to identify potential relief sewer options. The engineering study would include:

- Survey key manholes to obtain rim and invert elevations and pipe sizes to analyze existing capacity and hydraulic grade lines.
- Preliminary engineering analysis suggest an 18-inch parallel relief sewer. This would provide the same downstream capacity as the existing 24-inch sewer.

The benefits of the relief sewer are as follows:

- Provides needed capacity to convey flow from Inverness Hills (and Bass Road Lift Station) which are anticipated to serve the growth and development in the Midwest service area.
- Precludes future SSOs in the Midwest basin due to continued growth and development.

Project MW-3: Midwest Interceptor Wet Weather Study

Sewer flow monitoring at the lower end of the basin showed that the collection system experiences excessive wet weather flows that warrant further investigation. It is recommended that sewer flow monitoring be conducted to try and isolate the highest sources of infiltration and inflow for removal.

The investigative study would include:

- Install five (5) sewer flow monitors at key manhole locations in Brierwood Hills and Inverness Hills to isolate mini-basins for I/I evaluations. This will help to prioritize field inspections such as smoke testing and CCTV inspections.
- Provide recommended plan to correct sewer and manhole defects.

The benefits of the Midwest Interceptor Wet Weather Study are as follows:

- Finding and fixing prioritized defects in the collection system to reduce wet weather flows.
- Reclaiming capacity at the Midwest WWTP through reduction of I/I.
- Maintain existing sewer infrastructure in a state of repair to preclude future SSOs in the basin.

5.2.3 System Wide Projects

The following projects are recommended for System Wide (SW) improvements:

Project SW-1: Existing Lift Station Improvements

This project consists of the lift station improvements recommended in Section 4.

Project SW-2: Sewer Computer Model Update

It is recommended that additional investment be made to update the SewerGEMs model. During the study, it was discovered that the existing model data was suspect with respect to its source and accuracy. The existing model is not a calibrated model so it is very limited in its usefulness to analyze wet weather

impacts on the collection system. As the service area grows and flows are shifted from basin to basin it will become increasingly important to have a more accurate accounting of flows. The key elements to include are as follows:

- Main Aboite Service Area
  - West Interceptor
  - Central Interceptor
  - East Interceptor
  - Aboite Center Road LS, Bittersweet LS, Homestead Road, Covington Lakes
- Midwest Service Area
  - Midwest Interceptor
  - Bass Road LS, Sycamore Hills LS, Braemar LS, Inverness Hills

Information needed to build a successful model are as follows:

- Conduct field survey to obtain accurate pipe sizes, pipe invert elevations and manhole casting elevation for the key interceptors listed above. Collect similar information for key local sewers including those that convey flow to and from lift stations anticipated to serve future growth and development (Bass Road, Aboite Center, Homestead, etc.).
- Conduct drawdown tests for all of the key lift stations to verify actual pumping capacities.
- Calibrate 'interceptor and key lift station' model using 90-day system-wide flow monitoring data. It is recommended that thirteen (13) temporary flow monitors be installed to characterize the system.
  - West Aboite Interceptor – 3 flow monitors
  - Central Aboite Interceptor – 4 flow monitors
  - East Aboite Interceptor – 3 flow monitors
  - Midwest Interceptor – 3 flow monitors

Project SW-3: Wastewater Treatment Plant Study

The implementation of the Sycamore Hills flow diversion will delay the need for additional wastewater treatment through the year 2025. It is recommended that an engineering study be conducted to identify possible locations, NPDES permit effluent limits, proposed treatment processes, and land acquisition needs.

5.3 Estimated Project Costs

The estimated project costs presented in this plan include construction costs, construction contingency, engineering design and engineering services during construction. Estimated construction costs prepared at the planning level are intended to represent typical costs for projects of a similar nature. Estimated project costs do not include any land acquisition, easements or construction observation. **Table 5-1** summarizes the estimated costs for the recommended projects.

Table 5-1
Estimated Project Costs

Location	Project	Description	Dia. (in)	Length (feet)	Estimated Construction Cost
Main Aboite	MA-1	Bittersweet Diversion Force Main	18	8,200	$1,100,000
Main Aboite	MA-2	Covington Lakes Force Main	10	2,100	$160,000
Main Aboite	MA-2	Covington Lakes LS Improvements(1)	--	--	$125,000
Main Aboite	MA-3	Sycamore Hills Flow Diversion	--	--	$300,000
Main Aboite	MA-4	East Aboite Wet Weather Study – Ph. 1(1)	--	--	TBD
Main Aboite	MA-5	East Aboite Wet Weather Study – Ph. 2(1)	--	--	TBD
Midwest	MW-1	Bass Road LS Relief Sewer	15	4,000	$600,000
Midwest	MW-2	Brierwood Hills Relief Sewer	18	700	$150,000
Midwest	MW-3	Midwest Wet Weather Study Improvements(1)	--	--	$500,000
System Wide	SW-1	Existing Lift Station Improvements (Section 4)	--	--	$285,000
(1) Engineering evaluation is needed to define scope of work and cost.					
				Subtotal	3,720,000
				Construction Contingency (20%)	750,000
				Total Estimated Construction Cost	4,470,000
				Non-Construction / Design Engineering (20%)	900,000
				Total Estimated Capital Cost	5,370,000
Engineering Evaluations					
Main Aboite	MA-2	Engineering Evaluation (Study)			$50,000
Main Aboite	MA-3	Engineering Evaluation (Study)			$60,000
Main Aboite	MA-4	Engineering Evaluation (Study)			$50,000
Main Aboite	MA-5	Engineering Evaluation (SSES Study)			$125,000
Midwest	MW-1	Engineering Evaluation (Study)			$50,000
Midwest	MW-2	Engineering Evaluation (Study)			$30,000
Midwest	MW-3	Engineering Evaluation (SSES Study)			$125,000
System Wide	SW-2	Engineering Evaluation (Hydraulic Computer Model Update)			$500,000
System Wide	SW-3	Engineering Evaluation (WWTP Study)			$75,000
				Total Engineering Evaluations	$1,065,000
				Total Estimated Project Cost	**$6,435,000**

5.4 Implementation Schedule

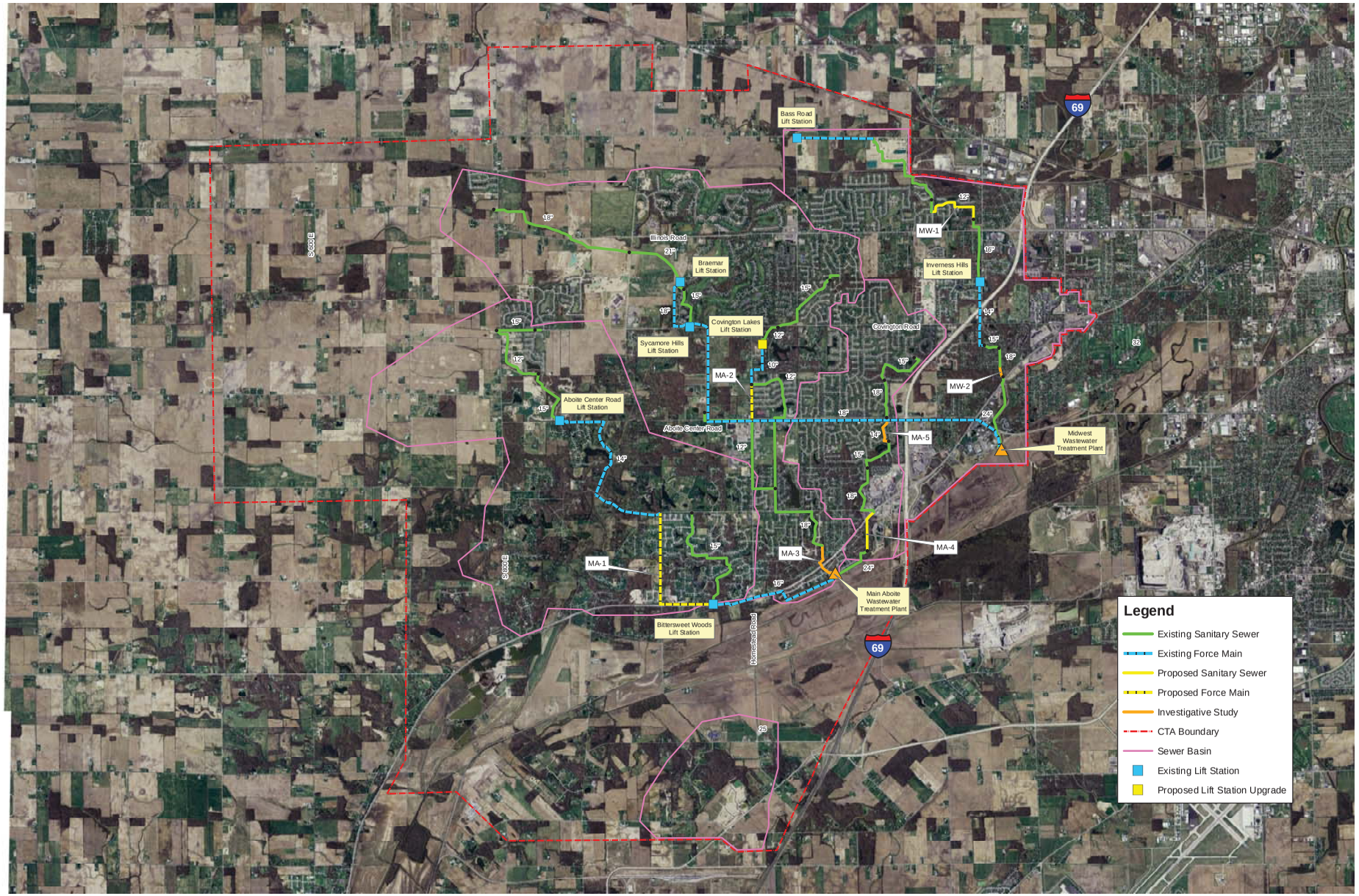
The proposed implementation schedule is shown in **Table 5-2**.

Table 5-2
Implementation Schedule

Project Description	Activity	Milestone Start	Milestone Completion
MA-1: Bittersweet FM Diversion – Phase 2***	Bid	Spring 2020	Spring 2020
*** Potential to defer if Phase 1 is successful	Construction	Summer 2020	Spring 2021
MA-2: Covington Lakes LS & FM – Phase 2***	Study	Spring 2017	Summer 2017
*** Potential to defer if Phase 1 is successful	Design	Fall 2017	Spring 2018
	Bid	Spring 2018	Spring 2018
	Construction	Summer 2018	Spring 2019
MA-3: Sycamore Hills Flow Diversion	Study	Spring 2020	Summer 2020
	Design	Fall 2020	Spring 2021
	Bid	Spring 2021	Spring 2021
	Construction	Summer 2021	Spring 2022
MA-4: East Aboite Wet Weather Study – Phase 1	Study	Spring 2018	Winter 2018
	Design	Spring 2019	Fall 2019
	Bid	Winter 2019	Winter 2019
	Construction	Spring 2020	Spring 2021
MA-5: East Aboite Wet Weather Study – Phase 2	Study	Spring 2019	Winter 2019
	Design	Spring 2020	Fall 2020
	Construction	Spring 2021	Fall 2021
MW-1: Bass Road LS Relief Sewer	Study	Spring 2018	Fall 2018
	Design	Winter 2018	Fall 2019
	Bid	Winter 2019	Winter 2019
	Construction	Spring 2020	Spring 2021
MW-2: Brierwood Hills Relief Sewer	Study	Spring 2018	Fall 2018
	Design	Winter 2018	Summer 2019
	Bid	Spring 2020	Spring 2020
	Construction	Spring 2020	Winter 2021
MW-3: Midwest Wet Weather Study	Study	Spring 2019	Spring 2020
	Bid	Spring 2021	Fall 2021
	Construction	Spring 2021	Spring 2022

SW-1: Existing Lift Station Improvements	Design – Phase 1	Summer 2018	Winter 2018
	Bid – Phase 1	Spring 2019	Spring 2019
	Construction – Phase 1	Summer 2019	Winter 2019
	Design – Phase 2	Summer 2020	Winter 2020
	Bid – Phase 2	Spring 2021	Spring 2021
	Construction – Phase 2	Summer 2021	Winter 2021
SW-2: Sewer Computer Model Update	Flow Study	Spring 2021	Summer 2021
	Field Survey	Summer 2021	Winter 2021
	Model Update	Winter 2021	Summer 2021
SW-3: Wastewater Treatment Plant Study	Study	Summer 2020	Summer 2021

FIGURE 5-1



RECOMMENDED PROJECTS

GREELEY AND HANSEN

AQUA INDIANA
WASTEWATER COLLECTION AND
TREATMENT SYSTEM MASTER PLAN

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APPENDIX A

Lift Station Assessments

Lift Station Name	Covington Bluffs
Year Constructed/Improved	1983
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Weil series 2500
Motor Horsepower	7.5
Force Main Size	4”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	Yes
	Odor	No
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Buried under landscaping mulch
	Valves	Could not check, see above
Pumping Equipment and Piping	Piping	Ok, somewhat rough
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Ok
Site Conditions	Site Access	Ok
	Drainage	Ok
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Covington Club
Year Constructed/Improved	2010
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Zoeller 6223
Motor Horsepower	15
Force Main Size	4” (needs verified)

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230V
	Enclosure	
	Standby Power	Power Tap Box
SCADA	SCADA Panel / Screen	SCADATA (lots of condensation)
	Primary Level Control	Floats
	Secondary Level Control	None
	Communications	Cellular
	Flow Monitoring	no

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	A little
	Odor	A little
	Structural Condition	Poor (exposed aggregate, bottom barrel weeps I/I)
	Venting	No
Valves	Valve Vault	None
	Valves	Vertical, ok
Pumping Equipment and Piping	Piping	Rough
	Pumps	2
	Pump Operation	Yes
	Pump Access	Ok
Site Conditions	Site Access	Ok
	Drainage	Ok
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Covington Lake Estates
Year Constructed/Improved	2015
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Zoeller 6923
Motor Horsepower	30
Force Main Size	8”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	No
	Odor	No
	Structural Condition	Good
	Venting	No
Valves	Valve Vault	Good
	Valves	Ok (some corrosion)
Pumping Equipment and Piping	Piping	Flow hits pump #1 (pump needs replaced often)
	Pumps	2
	Pump Operation	Ok
	Pump Access	Ok
Site Conditions	Site Access	Ok
	Drainage	Ok
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	SSO’s occur with rain upstream and downstream (downstream more frequent)

Lift Station Name	Devil's Hollow
Year Constructed/Improved	2007
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Fairbanks Morse
Motor Horsepower	50
Force Main Size	Short 6" to Aboite Center Road 16"

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	Rotating Phase 480V, history of power failures?
	Enclosure	Fire issues inside panel
	Standby Power	No
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	None
	Communications	Cellular
	Flow Monitoring	No

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Greeley and Hansen
Lift Station Assessment Form
June 2015

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	A little
	Odor	No
	Structural Condition	Good, fiberglass insert
	Venting	Yes
Valves	Valve Vault	Good
	Valves	Good
Pumping Equipment and Piping	Piping	Ok
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Wet well hatch is undersized
Site Conditions	Site Access	Ok
	Drainage	Ok
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Ellisville
Year Constructed/Improved	2009
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Zoeller 6650
Motor Horsepower	5
Force Main Size	4”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	Yes
	Odor	No
	Structural Condition	Ok (some exposed aggregate)
	Venting	Yes
Valves	Valve Vault	None
	Valves	Vertical, old
Pumping Equipment and Piping	Piping	Ok
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Hatches
Site Conditions	Site Access	Ok
	Drainage	Ok
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Aqua Indiana
Wastewater Collection and Treatment System Master Plan

Greeley and Hansen
Lift Station Assessment Form
June 2015

Lift Station Name	Emerald Lake Estates
Year Constructed/Improved	1987
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Zoeller
Motor Horsepower	10
Force Main Size	4”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230V, Needs squirrel cage on transformer (to be provided by REMC?)
	Enclosure	
	Standby Power	No
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	A little
	Odor	No
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Ok (manhole – casting needs reset)
	Valves	Ok
Pumping Equipment and Piping	Piping	Ok (some corrosion)
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Good
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	HWL occasionally, no SSO's

Lift Station Name	Glens of Bittersweet
Year Constructed/Improved	2007
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	ABS
Motor Horsepower	5
Force Main Size	4”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA -> Phase loss (all stations)
	Primary Level Control	Floats
	Secondary Level Control	None
	Communications	Cellular
	Flow Monitoring	No

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	No
	Odor	No
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Fair
	Valves	Fair
Pumping Equipment and Piping	Piping	Ok (corrosion)
	Pumps	Good
	Pump Operation	Good
	Pump Access	Hatch (corrosion)
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence (hidden in landscape)
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Goldspur (Apt complex coming in, will be upgraded)
Year Constructed/Improved	2012
Pump Type	Submersible (EONE grinder)
Number of Pumps	2
Pump Manufacturer & Model	E-ONE
Motor Horsepower	1
Force Main Size	1.5”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	1-phase 240V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	Yes
	Odor	No
	Structural Condition	Ok
	Venting	Yes
Valves	Valve Vault	No
	Valves	Isolation valve outside wet-well
Pumping Equipment and Piping	Piping	Ok
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Hatch, no safety
Site Conditions	Site Access	Ok
	Drainage	Ok
	Security	Lock is broken, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Grayfox
Year Constructed/Improved	1988
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Zoeller 6923
Motor Horsepower	30
Force Main Size	4”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230V
	Enclosure	
	Standby Power	Power tap
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Float
	Secondary Level Control	None
	Communications	Cellular
	Flow Monitoring	no

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	Yes
	Odor	No
	Structural Condition	Ok
	Venting	Yes
Valves	Valve Vault	Yes – manhole (no vent)
	Valves	Ok (some corrosion)
Pumping Equipment and Piping	Piping	Rough
	Pumps	Ok
	Pump Operation	Ok (one pump out of service)
	Pump Access	Hatch – no safety
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Hamlets
Year Constructed/Improved	2002
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Myers
Motor Horsepower	15
Force Main Size	4” to 8” (verify)

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 460V
	Enclosure	New 2013
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Greeley and Hansen
Lift Station Assessment Form
June 2015

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	A little
	Odor	No
	Structural Condition	Rough, some exposed aggregate (Rob would like improvements)
	Venting	Yes, missing candy cane
Valves	Valve Vault	Ok
	Valves	Ok
Pumping Equipment and Piping	Piping	Ok, piping and guide rails both rough
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Ok
Site Conditions	Site Access	Ok
	Drainage	Ok
	Security	Fence with locks, same property as Main Aboite WWTP
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Highlands of Scotia
Year Constructed/Improved	2005
Pump Type	Submersible grinder
Number of Pumps	2
Pump Manufacturer & Model	Zoeller
Motor Horsepower	2
Force Main Size	2”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	1-phase 230V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	None
	Communications	Cellular
	Flow Monitoring	No

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	A little
	Odor	No
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Good
	Valves	Good
Pumping Equipment and Piping	Piping	Good
	Pumps	Good
	Pump Operation	VFD's
	Pump Access	Good
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Homestead Road
Year Constructed/Improved	2004
Pump Type	Submersible
Number of Pumps	2 (provisions for third)
Pump Manufacturer & Model	BBC
Motor Horsepower	25
Force Main Size	12”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 480V
	Enclosure	
	Standby Power	Generator 150 kW
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Transducer (not working)
	Secondary Level Control	Floats
	Communications	Cellular
	Flow Monitoring	Yes (needs verified)

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	Heavy grease
	Odor	A little
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Good (drain does not work)
	Valves	Good, aux bypass connection exists
Pumping Equipment and Piping	Piping	Good
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Hatch with fall protection
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Fenced
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	High water level visible, no history of problems

Lift Station Name	Indian Creek
Year Constructed/Improved	2001
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Zoeller 6650
Motor Horsepower	5.2
Force Main Size	4”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	Add-A-Phase 3-phase 230V
	Enclosure	Cabinet heater / “Fire in Panel”
	Standby Power	No
SCADA	SCADA Panel / Screen	No
	Primary Level Control	Floats
	Secondary Level Control	None
	Communications	Cellular
	Flow Monitoring	No

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	No
	Odor	No
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Good
	Valves	Good
Pumping Equipment and Piping	Piping	Guide rails very poor
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Good
Site Conditions	Site Access	Ok
	Drainage	Ok
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Inverness Hills
Year Constructed/Improved	2002
Pump Type	Submersible
Number of Pumps	4 (with provisions for 5)
Pump Manufacturer & Model	ABS
Motor Horsepower	27
Force Main Size	14”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230/480V
	Enclosure	
	Standby Power	Generator 200 kW
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Pressure Transducer
	Secondary Level Control	Floats
	Communications	Cellular
	Flow Monitoring	Yes (meter vault submerged/flooded)

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	Yes
	Odor	Odor control equipped (not currently working)
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Good
	Valves	Good
Pumping Equipment and Piping	Piping	Ok (some corrosion)
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Hatches with safety grating
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Lift Station Name	Liberty Mills Apartments
Year Constructed/Improved	2004
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	ABS AFP 1030
Motor Horsepower	3
Force Main Size	4”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 480V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	Yes
	Odor	No
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Good
	Valves	Good
Pumping Equipment and Piping	Piping	Good
	Pumps	Good
	Pump Operation	Good
	Pump Access	Hatch – no safety grating
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Aqua Indiana
Wastewater Collection and Treatment System Master Plan

Greeley and Hansen
Lift Station Assessment Form
June 2015

Lift Station Name	
Year Constructed/Improved	
Pump Type	
Number of Pumps	
Pump Manufacturer & Model	
Motor Horsepower	
Force Main Size	

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	
	Enclosure	
	Standby Power	
SCADA	SCADA Panel / Screen	
	Primary Level Control	
	Secondary Level Control	
	Communications	
	Flow Monitoring	

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Greeley and Hansen
Lift Station Assessment Form
June 2015

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	
	Odor	
	Structural Condition	
	Venting	
Valves	Valve Vault	
	Valves	
Pumping Equipment and Piping	Piping	
	Pumps	
	Pump Operation	
	Pump Access	
Site Conditions	Site Access	
	Drainage	
	Security	
Alarms	Fire Alarm	
	Hazardous Gas Detection	
Other	Wet Weather Issues	

Lift Station Name	Micropulse
Year Constructed/Improved	2008
Pump Type	Submersible grinder
Number of Pumps	2
Pump Manufacturer & Model	Barnes SGV 303 2L-MS
Motor Horsepower	3
Force Main Size	2”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Float
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	No
	Odor	No
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Good
	Valves	Good
Pumping Equipment and Piping	Piping	Good
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Hatch, no safety
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Peddler's Ford
Year Constructed/Improved	2014
Pump Type	Submersible grinder
Number of Pumps	2
Pump Manufacturer & Model	ABS Piranha 51014-S30/2
Motor Horsepower	2
Force Main Size	2"

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	1-phase 230V
	Enclosure	
	Standby Power	
SCADA	SCADA Panel / Screen	
	Primary Level Control	Floats
	Secondary Level Control	None
	Communications	Cellular
	Flow Monitoring	No

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	No
	Odor	No
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Good
	Valves	Good
Pumping Equipment and Piping	Piping	Good
	Pumps	New
	Pump Operation	Good
	Pump Access	Good
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Quail Hollow
Year Constructed/Improved	2001
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Weil
Motor Horsepower	3
Force Main Size	6”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	Add-A-Phase 230V
	Enclosure	Old, poor condition
	Standby Power	No
SCADA	SCADA Panel / Screen	Needs to be replaced
	Primary Level Control	Floats
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

Aqua Indiana

Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	Heavy
	Odor	No
	Structural Condition	Corrosion, exposed aggregate (requested quote for replacement or insert)
	Venting	Yes
Valves	Valve Vault	Ok
	Valves	Ok
Pumping Equipment and Piping	Piping	Old, corroded (need replaced)
	Pumps	Rails are shot
	Pump Operation	Getting clogged because of grease problem
	Pump Access	Cast iron heavy hatches (should replace)
Site Conditions	Site Access	Requesting quotes to place drain tile and improve access
	Drainage	See above
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Scotia
Year Constructed/Improved	2004
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Zoeller
Motor Horsepower	25
Force Main Size	4” to 16” Aboite Center Road FM

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 480V
	Enclosure	
	Standby Power	No
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	None
	Communications	Cellular
	Flow Monitoring	No

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Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	No
	Odor	O
	Structural Condition	Good, FRP liner
	Venting	Yes
Valves	Valve Vault	No
	Valves	In yard
Pumping Equipment and Piping	Piping	Ok (some corrosion)
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Tight, ok
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/a
Other	Wet Weather Issues	No

Lift Station Name	Shorewood
Year Constructed/Improved	1993
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	ABS
Motor Horsepower	10
Force Main Size	4”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

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Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	A little
	Odor	No
	Structural Condition	Spectrashield lined 2014, good (had problems with tree roots)
	Venting	No
Valves	Valve Vault	Spectrasheield lined 2011, good
	Valves	Ok
Pumping Equipment and Piping	Piping	Ok, some corrosion
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Hatch, no safety grating
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Sycamore Hills
Year Constructed/Improved	2010
Pump Type	Submersible
Number of Pumps	2 in wet well (1 backup stored off-site)
Pump Manufacturer & Model	Myers
Motor Horsepower	75
Force Main Size	8” dry weather, wet weather -> 18” Braemar FM

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 480V
	Enclosure	
	Standby Power	No
SCADA	SCADA Panel / Screen	
	Primary Level Control	Transducer
	Secondary Level Control	Floats
	Communications	Cellular
	Flow Monitoring	No

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Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	A little
	Odor	No
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Good
	Valves	Good
Pumping Equipment and Piping	Piping	Good
	Pumps	Good
	Pump Operation	Good
	Pump Access	Hatches with fall protection
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	Lots of SSO's BEFORE Braemar diversion

Lift Station Name	Waterside Woods
Year Constructed/Improved	2001
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Myers 4V/4Vx
Motor Horsepower	5
Force Main Size	4”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	1-phase 230V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

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Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	Yes
	Odor	No
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Yes
	Valves	Good
Pumping Equipment and Piping	Piping	Ok
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Ok
Site Conditions	Site Access	Ok
	Drainage	Ok
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	West Hamilton Road
Year Constructed/Improved	1985
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Flygt
Motor Horsepower	10
Force Main Size	4”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230V
	Enclosure	
	Standby Power	Tap box
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	No
	Communications	cellular
	Flow Monitoring	No

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Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	A little
	Odor	No
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Good
	Valves	Good
Pumping Equipment and Piping	Piping	Ok
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Hatch – no safety grate
Site Conditions	Site Access	Good (remote)
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Westfield Passage
Year Constructed/Improved	2003
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	ABS
Motor Horsepower	2
Force Main Size	2”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Float
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

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Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	A little
	Odor	No
	Structural Condition	Good
	Venting	No
Valves	Valve Vault	Good
	Valves	Good
Pumping Equipment and Piping	Piping	2” PVC
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Hatch, no safety
Site Conditions	Site Access	Ok
	Drainage	Ok
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Aboite Center Road
Year Constructed/Improved	2003
Pump Type	Submersible
Number of Pumps	3
Pump Manufacturer & Model	Fairbanks Morse 5434 MV
Motor Horsepower	40
Force Main Size	16”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 480V
	Enclosure	
	Standby Power	Generator 200 kW
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Transducer
	Secondary Level Control	Floats
	Communications	Cellular
	Flow Monitoring	Mag-meter (1077gpm)

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Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	Yes
	Odor	A little
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Good
	Valves	Good
Pumping Equipment and Piping	Piping	Rough
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Hatch with safety net
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Aboite Meadows #1 (Newer)
Year Constructed/Improved	2011
Pump Type	Submersible grinder
Number of Pumps	2
Pump Manufacturer & Model	Zoeller 6222
Motor Horsepower	10
Force Main Size	8”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 480V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	None
	Communications	Cellular
	Flow Monitoring	No

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Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	Yes
	Odor	No
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Good, some deposits & infiltration @ discharge
	Valves	Good
Pumping Equipment and Piping	Piping	Good
	Pumps	Good, Rob says impellers are new and already shot
	Pump Operation	Ok
	Pump Access	Ok
Site Conditions	Site Access	Ok
	Drainage	Ok
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	HWL, old station used as backup

Lift Station Name	Aboite Meadows #2 (Older, only used as backup to #1)
Year Constructed/Improved	2014
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Zoeller
Motor Horsepower	10
Force Main Size	6”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230V
	Enclosure	
	Standby Power	
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

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Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	Yes
	Odor	No
	Structural Condition	Rough (corrosion)
	Venting	Yes
Valves	Valve Vault	In manhole
	Valves	Ok
Pumping Equipment and Piping	Piping	Rough
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Hatch
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	See Aboite Meadows #1

Lift Station Name	Amber Highlands
Year Constructed/Improved	2001
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	FE Myers 4v75m4-43
Motor Horsepower	7.5
Force Main Size	6”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 480V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	None
	Communications	Cellular
	Flow Monitoring	No

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Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	A little
	Odor	No
	Structural Condition	Ok
	Venting	Yes
Valves	Valve Vault	Good
	Valves	Good (auxiliary connection)
Pumping Equipment and Piping	Piping	Ok
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Hatch
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Bass Road
Year Constructed/Improved	2004
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Barnes
Motor Horsepower	60
Force Main Size	10”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 480V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Transducer
	Secondary Level Control	Float
	Communications	Cellular
	Flow Monitoring	No

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Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	Yes
	Odor	No (flow diversion @ influent)
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Good
	Valves	Good
Pumping Equipment and Piping	Piping	Good
	Pumps	Good (VFDs)
	Pump Operation	Ok
	Pump Access	Good, with safety et
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Fenced
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Bittersweet
Year Constructed/Improved	
Pump Type	Self-primed
Number of Pumps	3
Pump Manufacturer & Model	Hydromatic
Motor Horsepower	40
Force Main Size	16”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230/460V
	Enclosure	
	Standby Power	Generator size 250 kW
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	None
	Communications	Cellular
	Flow Monitoring	Magnetic flow meter

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Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	No
	Odor	A little
	Structural Condition	Good (hatches to be replaced)
	Venting	Yes
Valves	Valve Vault	No (dry well)
	Valves	Good condition
Pumping Equipment and Piping	Piping	Good
	Pumps	Good
	Pump Operation	Ok
	Pump Access	Good
Site Conditions	Site Access	Good
	Drainage	Good
	Security	No fence
Alarms	Fire Alarm	
	Hazardous Gas Detection	Ventilation needed NFPA 820
Other	Wet Weather Issues	Yes

Lift Station Name	Bluewater
Year Constructed/Improved	2013
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Hydromatic 54NRC
Motor Horsepower	2.2
Force Main Size	4”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	1-phase 230V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

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Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	Yes
	Odor	No
	Structural Condition	Good
	Venting	No
Valves	Valve Vault	Ok
	Valves	Ok
Pumping Equipment and Piping	Piping	Ok, somewhat rough
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Hatch, no safety grate
Site Conditions	Site Access	Ok
	Drainage	Ok
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Braemar
Year Constructed/Improved	2014
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Flygt
Motor Horsepower	85
Force Main Size	18”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 480V
	Enclosure	New
	Standby Power	No, passive diversion to sycamore hills system and lift station
SCADA	SCADA Panel / Screen	
	Primary Level Control	Transducer
	Secondary Level Control	Floats
	Communications	Cellular
	Flow Monitoring	None

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Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	No
	Odor	Long force main turns septic, complaints at YMCA and Midwest WWTP
	Structural Condition	New
	Venting	Yes
Valves	Valve Vault	New
	Valves	New
Pumping Equipment and Piping	Piping	New
	Pumps	New
	Pump Operation	Good
	Pump Access	Hatch with fall protection
Site Conditions	Site Access	Good
	Drainage	Good
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	No

Lift Station Name	Brierwood (possible/desired to eliminate by gravity)
Year Constructed/Improved	2000
Pump Type	Submersible
Number of Pumps	2
Pump Manufacturer & Model	Zoeller F6670
Motor Horsepower	12.5
Force Main Size	4”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	3-phase 230V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	No
	Communications	Cellular
	Flow Monitoring	No

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Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	A little
	Odor	No
	Structural Condition	Good
	Venting	Yes
Valves	Valve Vault	Good
	Valves	Good
Pumping Equipment and Piping	Piping	Ok, corroded discharge pipe
	Pumps	Ok
	Pump Operation	Influent hits pumps
	Pump Access	Ok
Site Conditions	Site Access	Difficult, small excavator needed to pull pumps
	Drainage	Floods during wet weather
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	HWL on occasion (influent looked clear, possible I/I)

Lift Station Name	Brigadoon
Year Constructed/Improved	2005
Pump Type	Submersible grinder
Number of Pumps	2
Pump Manufacturer & Model	ABS Piranha Model E2W
Motor Horsepower	2
Force Main Size	2”

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Electrical	Power to Site	230V
	Enclosure	
	Standby Power	Power Pak
SCADA	SCADA Panel / Screen	SCADATA
	Primary Level Control	Floats
	Secondary Level Control	None
	Communications	Cellular
	Flow Monitoring	No

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Wastewater Collection and Treatment System Master Plan

Category	Aspect	Comments (Status, Corrosion, Concerns, etc.)
Wet Well	Grease	A little
	Odor	No
	Structural Condition	Ok
	Venting	Yes
Valves	Valve Vault	Good
	Valves	Ok
Pumping Equipment and Piping	Piping	Ok
	Pumps	Ok
	Pump Operation	Ok
	Pump Access	Hatch – no safety
Site Conditions	Site Access	Good
	Drainage	Poor (natural spring)
	Security	Locks, no fence
Alarms	Fire Alarm	N/A
	Hazardous Gas Detection	N/A
Other	Wet Weather Issues	no

APPENDIX B

SCADA IO List

Aqua Indiana – Wastewater Collection and Treatment System Master Plan

I/O Notes from Lift Station Assessment Site Visits June 3 and 4, 2015

Input/Output List

Lift Station	Signal Type	Signal Term.	Description	Comments
Aboite Center Rd	DI	DK	Pump 1 Run	SCADATA
	DI	DK	Pump 2 Run	
	DI	DK	Pump 3 Run	
	DI	DK	High Wet Well (Transducer)	
	DI	DK	High Wet Well (Float)	
	DI	DK	Phase Loss	
	DI	DK	Battery Test Fail	
	DI	DK	Power Fail	
	DO	DK	Pump Takeover	
	DO	DK	Pump 1 Start	
	DO	DK	Pump 2 Start	
	DO	DK	Pump 3 Start	
	AI	DK	Flow Meter	
	DI	DK	Generator Fault	Generator Panel
	DI	DK	Generator Run	
	DI	DK	Generator Transfer	
	DI	DK	Generator Low Battery	
	DI	DK	Gen. Power Fail	
Aboite Meadows 1	DI	9	Pump 1 Run	Physical I/O for Aboite Meadows 1 housed in Aboite Meadows 2 panel.
	DI	10	Pump 2 Run	
	DI	11	Station 1 Power Fail	
	DI	12	High Water 1 To 2	
Aboite Meadows 2	DI	3	Station 2 Power Fail	SCADATA
	DI	4	Pump 3 Run	
	DI	5	Pump 4 Run	
	DI	6	Station 2 Blowing	
	DI	8	Station 2 High Level	
	DI	DK	Low Battery	
Amber Highlands	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Seal	

Lift Station	Signal Type	Signal Term.	Description	Comments
	DI	7	Pump 2 Seal	
	DI	8	High Level	
	DI	15	Phase Loss	
	DI	16	Low Battery	
Bass Road	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Overtemp	
	DI	7	Pump 2 Overtemp	
	DI	8	Pump 1 Seal Fail	
	DI	9	Pump 2 Seal Fail	
	DI	10	High Level	
	DI	16	Low Battery	
	DI	DK	Phase Loss	
Bittersweet Woods	AI	3	Flow Meter	Field Verified all points
	DI	1	Pump 1 Run	
	DI	2	Pump 2 Run	
	DI	3	Pump 3 Run	
	DI	4	High Level	
	DI	5	24 Hr Test	
	DI	6	Sewer Daily Test	
	DI	DK	Battery Test Fail	
	DI	DK	Power Fail	
	DO	1	System Test	
	DI	DK	Generator Run	Generator Panel
	DI	DK	Generator Fail	
	DI	DK	Low Battery	
	DI	DK	Power Fail	
Bluewater	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Over Heat	
	DI	7	Pump 2 Over Heat	
	DI	8	Pump 1 Seal Fail	
	DI	9	Pump 2 Seal Fail	
	DI	10	High Level	
	DI	16	Low Battery	
Braemar	AI	DK	Wet Well Level	SCADATA – Data Source
	AI	DK	Pump 1 Current	

Lift Station	Signal Type	Signal Term.	Description	Comments
	AI	DK	Pump 2 Current	
	DI	DK	Pump 1 Run	
	DI	DK	Pump 2 Run	
	DI	DK	Pump 1 Common Alarm	
	DI	DK	Pump 2 Common Alarm	
	DI	DK	High Wet Well	
	DI	DK	Low Battery	
	DI	DK	Power Fail	
Brierwood	DI	1	Pump 1 Run	Field Verified all points
	DI	2	Pump 2 Run	
	DI	3	High Float	
	DI	4	Low Float	
	DI	5	Phase Loss	
	DI	6	Pwr. On	
	DI	7	Gen. On	
	DI	13	Hi Level	
	DI	14	Blowing	
	DI	16	Power Fail	
Brigadoon	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Ovr Ht	
	DI	7	Pump 2 Ovr Ht	
	DI	8	Pump 1 Seal	
	DI	9	Pump 2 Seal	
	DI	10	High Level	
	DI	16	Low Battery	
Covington Bluffs	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Ovr Ht	
	DI	7	Pump 2 Ovr Ht	
	DI	8	Pump 1 Seal	
	DI	9	Pump 2 Seal	
	DI	10	High Level	
	DI	16	Low Battery	
Covington Club	DI	1	P1 Run	Field Verified all points
	DI	2	P2 Run	
	DI	3	High Level	
	DI	4	Phase Loss	

Lift Station	Signal Type	Signal Term.	Description	Comments
	DI	16	Power Fail	
	DI	DK	Low Battery	SCADATA
Covington Lake Estates	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Seal	
	DI	7	Pump 2 Seal	
	DI	8	High Level	
	DI	16	Low Battery	
Devils Hollow	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Seal	
	DI	7	Pump 2 Seal	
	DI	8	High Level	
	DI	16	Low Battery	
Ellisville	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Seal	
	DI	7	Pump 2 Seal	
	DI	8	High Level	
	DI	15	Runtime Test	
	DI	16	Low Battery	
Emerald Lake Estates	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	High Level	
	DI	7	Phase Loss	
	DI	16	Low Battery	
Glens of Bittersweet	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	7	High Level	
	DI	15	Phase Loss	
	DI	16	Low Battery	
Goldspur	DI	1	Pump 1 On	Field Verified all points
	DI	2	Pump 2 On	

Lift Station	Signal Type	Signal Term.	Description	Comments
	DI	3	High Level Alarm	
	DI	DK	Low Battery	
	DI	DK	Power Fail	
Gray Fox	DI	3	Power Fail	
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Over Heat	
	DI	7	Pump 2 Over Heat	
	DI	8	Pump 1 Seal Fail	
	DI	9	Pump 2 Seal Fail	
	DI	10	High Level	
	DI	15	Phase Loss	
	DI	16	Low Battery	
Hamlets	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Seal	
	DI	7	Pump2 Seal	
	DI	8	Pump1 Overheat	
	DI	9	Pump 2 Overheat	
	DI	10	High Level	
	DI	16	Low Battery	
Highlands of Scotia	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Ovr Ht	
	DI	7	Pump 2 Ovr/Ht	
	DI	8	Pump 1 Seal	
	DI	9	Pump 2 Seal	
	DI	10	High Level	
	DI	16	Low Battery	
Homestead Road	AI	1	Wet Well Level	Field Verified all points
	AI	2	Flow	
	AO	DK	Pump Speed	
	DI	1	Generator Run	
	DI	2	Comminuter Fault	
	DI	3	High Level	
	DI	4	Stop Pumps Float	
	DI	5	Lead Start Float	
	DI	6	Lag Start Float	

Lift Station	Signal Type	Signal Term.	Description	Comments
	DI	7	Back Up On	
	DI	8	Pump 1 Run	
	DI	9	Pump 2 Run	
	DI	11	Float Control On	
	DI	13	Power Fail	
	DI	14	Pump 1 Fault	
	DI	15	Pump 2 Fault	
	DI	DK	Low Battery	
	DO	DK	Pump 1 Start	
	DO	DK	Pump 2 Start	
	DI	DK	Generator Fault	Generator Panel
	DI	DK	Stop Pumps Float	
	DI	DK	VFD to Float Control	
	DI	DK	Lead Start Float	
	DI	DK	Lag Start Float	
	DI	DK	Transducer or Float	
Indian Creek	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	High Level	
	DI	16	Low Battery	
Inverness Lakes/Hills	AI (#1)	1	Flow Meter	Field Verified and SCADATA
	DI (#1)	1	Pump 1 Run	
	DI (#1)	2	Pump 2 Run	
	DI (#1)	3	Pump 3 Run	
	DI (#1)	DK	Low Battery	
	DI (#1)	DK	Power Fail	
	DI (#2)	1	Rain Gauge	
	DI (#2)	2	Low Level	
	DI (#2)	3	High Level	
	DI (#2)	4	Phase Loss	
	DI	DK	Generator Fail	Generator Control Panel
	DI	DK	Generator Run	
	DI	DK	Power Fail	
Liberty Mills Apts.	DI	9	Pump 1 Run	Field Verified all points
	DI	10	Pump 2 Run	
	DI	11	High Level	
	DI	16	Low Battery	
Micropulse	DI	DK	Pump 1 Run	SCADATA

Lift Station	Signal Type	Signal Term.	Description	Comments
	DI	DK	Pump 2 Run	
	DI	DK	High Level	
	DI	DK	Phase Loss	
	DI	DK	Power Fail	
Peddlers Ford	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Ovr/Ht	
	DI	7	Pump 2 Ovr/Ht	
	DI	8	Pump 1 Seal	
	DI	9	Pump 2 Seal	
	DI	10	High Level	
	DI	16	Low Battery	
Quail Hollow	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Fail	
	DI	7	Pump 2 Fail	
	DI	8	Pump 1 Seal	
	DI	9	Pump 2 Seal	
	DI	10	High Level	
	DI	16	Low Battery	
Scotia	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Ovr/Ht	
	DI	7	Pump 2 Ovr/Ht	
	DI	8	Pump 1 Seal	
	DI	9	Pump 2 Seal	
	DI	10	High Level	
	DI	16	Low Battery	
Shorewood	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Overheat	
	DI	7	Pump 2 Overheat	
	DI	8	Pump 1 Seal	
	DI	9	Pump 2 Seal	
	DI	10	High Level	
	DI	16	Low Battery	

Lift Station	Signal Type	Signal Term.	Description	Comments
	DI	DK	Phase Loss	
Sycamore Hills	AI	DK	Pump 1 Current	SCADATA
	AI	DK	Pump 2 Current	
	AI	DK	Wet Well Level	
	AI	DK	Valve 1 Position	
	AI	DK	Valve 2 Position	
	AI	DK	Calculated Flow (gpm)	
	DI	DK	Pump 1 Run	SCADATA
	DI	DK	Pump 2 Run	
	DI	DK	Blowing	
	DI	DK	High Wet Well Level	
	DI	DK	Phase Loss	
	DI	DK	Valve 1 Remote	
	DI	DK	Valve 2 Remote	
	DI	DK	Low Battery	
	DI	DK	Power Fail	
Waterside Woods	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	High Level	
	DI	16	Low Battery	
Westfield Passage	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	Pump 1 Ovr/Ht	
	DI	7	Pump 2 Ovr/Ht	
	DI	8	Pump 1 Seal	
	DI	9	Pump 2 Seal	
	DI	10	High Level	
	DI	15	Phase Loss	
	DI	16	Low Battery	
West Hamilton Road	DI	3	Power Fail	Field Verified all points
	DI	4	Pump 1 Run	
	DI	5	Pump 2 Run	
	DI	6	High Level	
	DI	15	Phase Loss	
	DI	16	Low Battery	

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