



## **SECTION 3:** Wastewater Analysis

# Section 3 Wastewater Analysis

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## 3.1 Wastewater Collection System Background, Regulations, and Goals

### 3.1.1 Background

The City contracted B&W to identify and plan for the necessary improvements required to meet future standards and growth demands on the City's wastewater utility system.

The purpose of the following Wastewater Master Plan is to evaluate the existing wastewater utility system (with focus on the wastewater lift stations, force main and transmission system) and make recommendations for necessary improvements needed to maintain adequate LOS for the anticipated short term (1 to 10 years) and long term (11 to 20 years) planning horizons. The evaluation and recommendations focus on improvements required to meet system demands resulting from, redevelopment projects, to maintain compliance with federal, state and local regulatory requirements, and to provide proper renewal and replacement of aging system components. The Master Plan also presents recommendations and benchmark comparisons regarding wastewater system operations, staffing, regulatory compliance, and wastewater rates.

The City owns and maintains a wastewater collection system that consists of the following:

- 12 lift stations with variable pumping capacity ranging from 1 horsepower (HP) to 110 HP pumps
- 10,310 linear feet (LF) of various diameter force mains
- 830 manholes
- 188,260 LF of various diameter gravity sewer mains

The City's sanitary collection system functions as a system of gravity basins, lift stations, and force mains. The City's wastewater flows are ultimately collected in the City's master Lift Station 11 (LS 11). LS 11 re-pumps the flow into the FTL 24-inch force main on the corner of E. Oakland Park Blvd and NE 16<sup>th</sup> Ave. The City's wastewater ultimately is treated by the G.T. Lohmeyer Sanitary Waste Facility, owned by FTL. The City and FTL have a Large User Wastewater Agreement dated August 1<sup>st</sup>, 2001 under resolution 01-138, with an expiration date of December 31<sup>st</sup>, 2021. **Figure 3-1** depicts the City's wastewater service area and collection system and **Figure 3-2** outlines the flow schematic of the wastewater system.



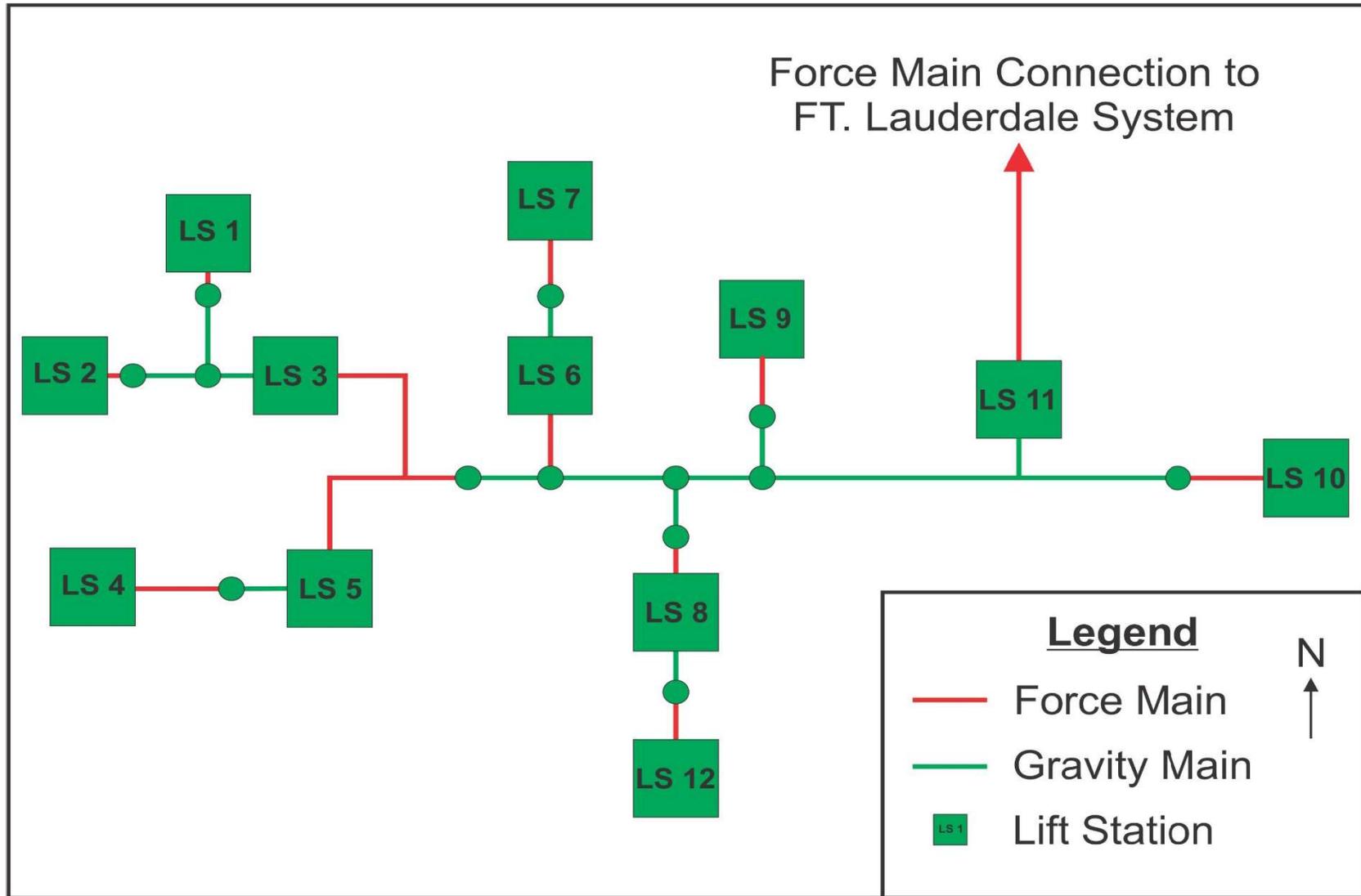


Figure 3-2: Wastewater Flow Schematic

### 3.1.2 Current and Future Wastewater Regulatory Requirements

Operation of the City’s wastewater system is regulated by several authorities, including the United States Environmental Protection Agency (USEPA), the Florida Department of Environmental Protection (FDEP), the Broward County Environmental Protection and Growth Management Department (EPGMD) and the Broward County Public Health Unit (BCPHU). Local agencies, such as BCPHU and EPGMD, generally serve as the permitting and enforcement authorities for the local, State and Federal regulatory standards. The BCPHU has regulatory responsibility for issuing septic tank permits under Chapter 10D-6 of the Florida Administrative Code and Broward County Ordinance 78-50. Connecting new sanitary sewers to the wastewater collection system is the regulatory responsibility of EPGMD. The only neighborhood which is currently partially on septic tanks and not totally connected to the City’s wastewater collection system is Lazy Lakes. The south end of the community has a gravity system which collects and distributes wastewater to the City while the north end of the community is still on septic tanks. The City does not have plans to connect the north end of the community at this time. Lazy Lakes is located in the heart of the City but is not actually incorporated into the City.

The following sections present a summary of current regulatory requirements and policies governing the City’s wastewater collection system.

#### **Florida Administrative Code – Chapter 62-604: Collection Systems and Transmission Facilities**

The Florida Administrative Code (FAC) provides design requirements for gravity sewer, force mains and lift stations, which include location of facilities, minimum slope requirements, separations from other utilities, and type of pipe. This chapter also provides a guideline for the permitting process and required documents for a new wastewater collection and transmission system.

#### **Florida Administrative Code – Chapter 62-625: Pretreatment Requirements for Existing and New Sources of Pollution**

The chapter implements the pretreatment requirements of Section 403.0885, Florida Statutes (F.S.), under the State National Pollutant Discharge Elimination System (NPDES) Program and in accordance with Section 402 of the Clean Water Act of 1987 (CWA), specifically including the pretreatment program under 40 CFR Part 403. Industrial pretreatment program requirements are currently included under Broward County Code of Ordinance – Chapter 34 (see below). A county-wide industrial pretreatment program has been developed and is implemented and enforced through Broward County Water and Wastewater Services.

#### **Broward County Code of Ordinances – Chapter 34: Water and Sewers; Article II: Water and Sewer Connection Ordinance**

This chapter governs the requirements for properties to connect to a public or private sanitary sewer system. The chapter includes: installation requirements; regulation of septic tank usage;

wastewater discharge standards (and industrial pretreatment requirements); wastewater rates, fees and charges; system utilization requirements and prohibitions; County's/City's right to inspection; and penalties for violations.

**Broward County Code of Ordinances – Chapter 27: Pollution Control; Article V: Water Resource Management**

The chapter delegates to the County (via EPGMD) certain domestic wastewater permitting authorization from the FDEP and surface water management permitting authorization from the South Florida Water Management District (SFWMD).

**Broward County Oil & Grease Program**

Broward County Water & Wastewater Services has launched a “No Frog. No Clog.” campaign to educate residents and large users on the proper disposal of Fats, Rags, Oil and Grease (FROG), which can cause clogs and damage to sewer systems. Although there is no specific requirement for local municipalities within Broward County to implement a specific oil and grease program, prohibitions regarding the discharge of oil and grease into the sewer system is regulated under Broward County's sewer use ordinance, Wilton Manor's sewer use ordinance, and the Large User Agreement between the FTL and the City.

### 3.1.3 Wastewater Collection System Goals

Wastewater system goals have been established by the City’s Utility Department to optimize the operational performance of the system and to improve reliability in the system. These goals are as follows:

- **Redundancy Goals** - For duplex pump stations, one (1) pump shall be capable of pumping peak flow at maximum expected force main pressure. The second pump will serve as “back-up”. For triplex stations, two (2) pumps shall be capable of pumping peak flow at maximum expected force main pressure, and the third pump will serve as “back-up”.
- **Surcharge and Wastewater Backup Mitigation** – The City shall implement a scheduled plan of action to mitigate any areas within the City that currently or could incur wastewater backup within the collection system. The upgrades identified within this goal shall take precedence when scheduling future work.
- **Can Lift Station Elimination and Replacement** – The can lift stations originally installed in the 1960’s are nearing the end of their useful service life. Can lift stations are also considered confined spaces and are hazardous requiring special precautions from maintenance staff. It is a City goal to eliminate these types of stations with newer and more easily maintained submersible type lift stations.

## 3.2 Wastewater Collection System Analysis

The City’s wastewater system consists of gravity sewers, pump stations and force mains. The majority of the City’s sanitary sewer system was constructed in the 1960’s and 1970’s. Through field observations, discussions with the City and desktop analysis, B&W has identified several existing concerns that are outlined in the subsequent sections.

### 3.2.1 Historical Wastewater Demands and Level of Service

The City’s wastewater LOS are listed in *Table 3-1* and are based on historical data presented in subsequent sections, as well as, standards established by the City’s Utility Department.

*Table 3-1: Wastewater System Levels of Service*

Service Item	Value
Average Per Capita Wastewater Generation Rate	158 gpcd
Max. Month Flow: Average Month Flow Ratio	1.5
Peak Hour Factor <sup>1</sup>	1.12
Maximum Force Main Velocity	7.5 ft/sec
Average Person Per Household <sup>2</sup>	1.81
Average Wastewater Generation Rate per Householed <sup>3</sup>	286

1. Peaking factors calculated using the Recommended Standards for Wastewater Facilities (10 State Standards), Section 11.24 - Hydraulic Capacity

2. Source: U.S. Census Bureau, City of Wilton Manors, Florida, 2013-2017 data.

3. For comparison purposes, Broward County's LOS for single family residential is 300 gpd/unit (Ref: Broward County Code of Ordinances, Chapter 27, Article V, "Water Resource Management").

### 3.2.2 City Infiltration and Inflow Abatement Program

The City, like many older utilities in South Florida, experiences infiltration and inflow (I&I) of stormwater and groundwater into the sanitary sewage collection system. Infiltration is the introduction of groundwater into the sanitary sewer system through leaking pipes or failing joints, typically found in older systems as a result of aging construction materials. Inflow is characterized by additional flow entering the sanitary sewer system through rainfall runoff or other waters that enter the collection system through illegal storm drains, loose fitting manhole covers and other non-groundwater sources.

The primary concerns associated with I&I are the excessive hydraulic loads that are placed on the piping and pumping systems, thereby decreasing overall available capacity of the system as well as the resulting deterioration of the system integrity. Other negative effects that I&I have on the City's wastewater collection system include:

- Pumping and electrical power costs increase due to the additional I&I flow.
- Additional wear and tear and increased maintenance requirements on the pumping equipment due to longer and more frequent run cycles caused by the additional I&I flow.
- Increased capacity fees due to higher wastewater flows to the County's and to FTL's wastewater treatment facility. I&I also effectively decreases the available reserve wastewater treatment capacity the City could allocate for future growth.

- Potential for roadway or structural degradation due to infiltration, thereby causing sinkholes requiring the City to put forth additional expenditures for repair.
- Potential environmental damage and fines from County and State regulatory agencies.

All of the City's wastewater flow are repumped by Lift Station 11 (LS 11). B&W reviewed 26 months of LS 11 flow data along with historical rainfall data to study the City's reactivity to rainstorm events. As seen in **Figure 3-3**, the City generates a considerable amount of additional wastewater during storm events. The City is very reactive to dry and wet weather seasons. From January 2018 to May 2018 the City went through a dry season and the ADF at LS 11 during this period was 1.9 MGD. Alternatively, during the 26 month review period, four (4) rainstorm events produces wastewater in excess of 3.5 MGD. That is almost two (2) times the flow during dry periods. This indicates a sever I&I issue within the City.

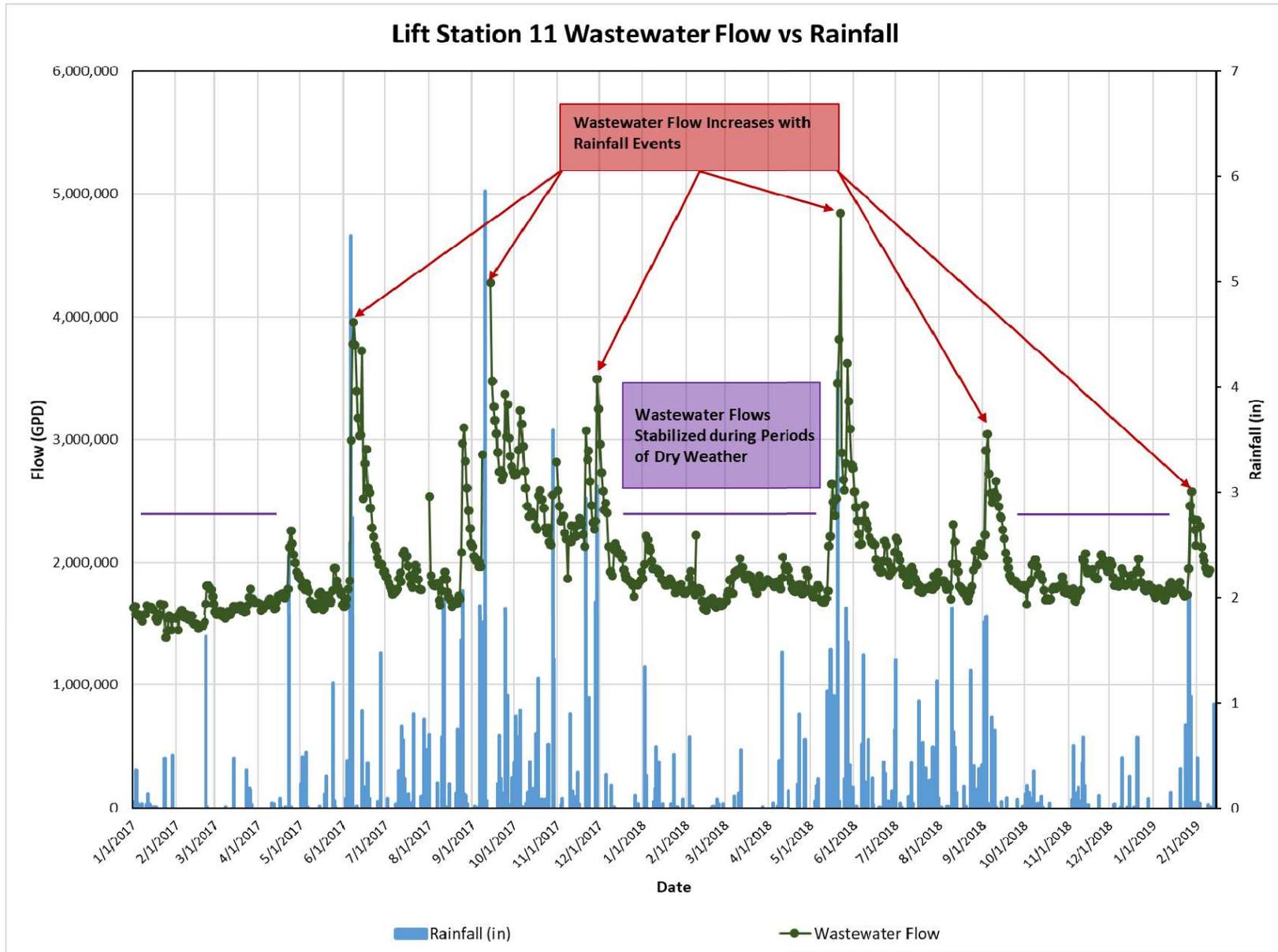


Figure 3-3: Lift Station No. 11 and Rainfall

### 3.2.2.1 Water to Wastewater Return Ratio and Infiltration Analysis

B&W performed an infiltration analysis by comparing the City's water consumption to its wastewater production. A healthy system typically has 75% - 90% of its water use return as wastewater flow. This means that a systems total wastewater flow should be only 75% - 90% of its total water consumption. If the total wastewater flow is equal to or higher than its total water consumption, there is typically infiltration of groundwater into the collection system. This value or ratio can vary for each specific basin due to irrigation habits and industrial/commercial establishments within the City.

Daily water consumption data and wastewater flow data was provided by the City. B&W analyzed this data for a 33 month period from January 2017 to October 2019. The data for each lift station's sub-basin was consolidated into total monthly flows in gallons. **Figure 3-4** shows the water service locations relative to the lift station sub-basin zones. **Table 3-2** provides a breakdown of the infiltration analysis and shows the basins with the highest wastewater to water ratio (WW:W). For the purpose of the analysis, B&W assumed any WW:W ratio above a factor of 1.00 denoted an area with infiltration attributed to the additional of groundwater flow.

The historical data shows that the City experiences a relatively high amount of infiltration into the system, with wastewater flows averaging 137% of the water consumption flows. It appears that infiltration accounts for up to 664,280 gallons per day or 242.5 million gallons per year of generated wastewater flow. LS No. 4's sub-basin had the highest WW:W ratio of 3.259. Only three (3) of the City's sub basins, LS No.'s 1, 9 and 12, demonstrated no infiltration generated wastewater flow. Nine (9) of the twelve (12) lift station sub-basins showed a degree of infiltration of groundwater into the collection system.

Note that this analysis does not include wastewater generated from inflow. For example, as discussed in later sections although LS 1 was identified as having higher than normal pump runtimes, the water to wastewater return analysis demonstrates that this is not attributed to infiltration of groundwater in the LS 1 collection basin. However, the high runtimes observed at LS 1 is a pump capacity and inflow issue rather than an infiltration issue. B&W calculated that LS 1 is not negatively affected by infiltration of groundwater into the system, this does not mean the LS and its collection basin is not affected by inflow of stormwater into the system during heavy rain events. See **Section 3.2.2.2** for an analysis on inflow of stormwater into the wastewater collection system.

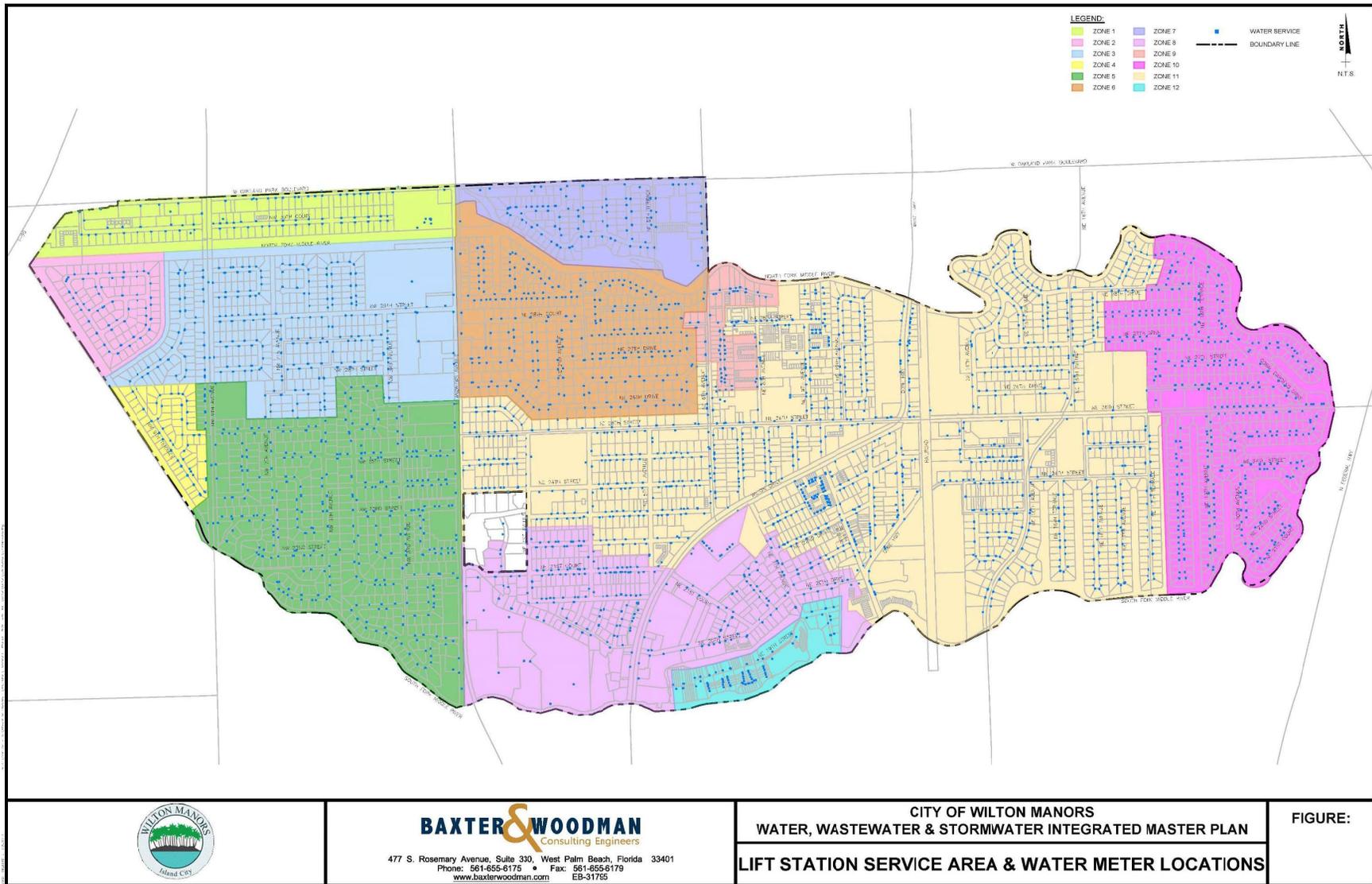


Figure 3-4: Wastewater Zones and Water Service Locations

Table 3-2: Infiltration and Inflow Analysis: Water to Wastewater Return

LS No.	Repumped LS	WW Flow (GPD)	WW Flow from LS Service Area (GPD)	Water Usage per LS Service Area (GPD)	WW:W Ratio	Daily Wastewater Generation from I&I (GPD) <sup>2</sup>	Annual Wastewater Generation from I&I (MG)	Ft. Lauderdale WW charge per 1,000 gallons	Annual WW Cost for I&I (2019 \$)	10-Year Cost (2019 \$)	20-Year Cost (2019 \$)	Cost for I&I Improvements (2019 \$)	Return on Investment (years)
1		49,090	49,090	55,598	0.88	-	-	\$ 1.00				\$ 479,507.18	
2		23,196	23,196	19,248	1.21	4,911	1.8	\$ 1.00	\$ 1,792	\$ 17,923.66	\$ 35,847	\$ 251,508.47	140.3
3	LS1, LS2	356,494	284,207	105,870	2.68	183,631	67.0	\$ 1.00	\$ 67,025	\$ 670,253.09	\$ 1,340,506	\$ 1,256,724.52	18.7
4		45,765	45,765	12,755	3.59	33,648	12.3	\$ 1.00	\$ 12,281	\$ 122,814.29	\$ 245,629	\$ 199,390.41	16.2
5	LS4	321,493	275,728	126,932	2.17	155,142	56.6	\$ 1.00	\$ 56,627	\$ 566,269.51	\$ 1,132,539	\$ 1,571,529.40	27.8
6	LS7	126,714	32,703	72,654	0.45	-	-	\$ 1.00				\$ 1,038,117.73	
7		94,012	94,012	46,116	2.04	50,202	18.3	\$ 1.00	\$ 18,324	\$ 183,236	\$ 366,472	\$ 409,862.23	22.4
8	LS12	214,144	201,786	184,995	1.09	26,041	9.5	\$ 1.00	\$ 9,505	\$ 95,048	\$ 190,096	\$ 1,166,886.17	122.8
9		20,413	20,413	24,192	0.84	-	-	\$ 1.00				\$ 174,585.09	
10		190,879	190,879	160,965	1.19	37,963	13.9	\$ 1.00	\$ 13,856	\$ 138,563	\$ 277,127	\$ 1,273,275.45	91.9
11	LS3, LS5, LS6, LS8, LS9, LS10	1,989,919	759,782	617,935	1.23	172,743	63.1	\$ 1.00	\$ 63,051	\$ 630,513	\$ 1,261,027	\$ 4,112,217.82	65.2
12	-	12,358	12,358	23,025	0.54	-	-	\$ 1.00				\$ 208,185.88	
<b>Total System WW Flow (GPD):</b>		<b>1,989,919</b>	<b>Total WW Generated from I&amp;I:</b>	<b>664,280</b>		<b>242.5</b>			<b>\$ 242,462</b>	<b>\$ 2,424,622</b>	<b>\$ 4,849,243</b>		

1. City checking accuracy of LS 4 and LS 6 flow meters

2. Wastewater Flow from LS Service Area - (Water Consumption per LS Service Area\*0.95)

3. This spreadsheet should be used as a guide to determine which lift station basin to line first. However, the City should note that there are other factors associated with lining that do not have a monetary value and therefore it could be important to line a basin with a high ROI

### 3.2.2.2 Lift Station Pump Runtime and Inflow Analysis

B&W performed an inflow analysis by comparing lift station daily runtime data. Many of the City's lift stations demonstrate high overall runtimes, according to collected data. This analysis identifies how often each lift station fails to keep up with the additional flows produced by a rainstorm event and the resulting I&I into each respective lift stations collection basin.

During a rainfall event, if a lift station cannot handle additional wastewater flow caused by I&I, the added flow surcharges into the lift station's collection system. After the rainstorm event is over the pump must continue to pump all surcharged wastewater. Five (5) of the twelve (12) lift stations operated for a full 24 hours during and after rainstorm events which indicated severe I&I and surcharge.

B&W used a total lift station pumping threshold of 10 hours or more a day for duplex lift stations and 15 hours or a day for triplex lift stations to indicate if there is sever surcharge occurring due to I&I within each lift station basin. The data indicated that pumps at Lift Station No's 1, 5 and 10 frequently operated over the designated threshold during the study period. Pumps at Lift Station No's 1, 5, and 10 operated 12 or more hours a day 95.8%, 99.4% and 99.6% respectively. This indicates that these lift station basins are often surcharging and unable to keep up with wastewater flow into the lift station wet well. **Table 3-3** provides a breakdown of the runtime analysis.

Note that the analysis within this section does not include wastewater generated from infiltration. For a review of wastewater generated from infiltration from groundwater, see **Section 3.2.2.2.1**. Lift station basins can be negatively affected by infiltration and not inflow, or vice versa. An example of this is within the City's collection system is LS 1. LS 1 was identified as having higher than normal pump runtimes, which is attributed to pumping capacity and inflow rather than an infiltration. LS 1 does not have enough pumping capacity during regular average daily flow and peak hour flows to affectively operate. The pumping capacity issue is exacerbated during rain events when there is a surge of wastewater due to inflow in the collection basin. The result of the inflow and undersized pumps at LS 1 is higher than normal operating times. The pumps at LS 1 often operate 24 hours a day. This leads to surcharging within the system and the potential for overflow. See **Section 6** for the recommended improvements to Lift Station's No. 1, 5 and 10.

Table 3-3: Infiltration and Inflow Analysis: Runtime

Lift Station No.	Number of Pumps	Average Total Runtime (Hours)	Recommended Max Daily Runtime (Hours)	Number of Days LS Pumps Operated Over Max Recommended Daily Runtime	How often did the LS Pumps Operate more than the Max Recommended Daily Runtime?
1	2	17.7	10	990	95.8%
2	2	4.9	10	198	19.2%
3	2	11.4	10	198	19.2%
4	2	8.1	10	187	18.1%
5	2	23.9	10	1027	99.4%
6	2	8.5	10	247	23.9%
7	2	6.9	10	117	11.3%
8	2	5.7	10	32	3.1%
9	2	3.3	10	2	0.2%
10	2	18.0	10	1029	99.6%
11	3	14.7	15	283	27.4%
12	2	4.5	10	13	1.3%

Note: Historical runtime data was provided by the City and analyzed between November 2017 and October 2019

### 3.2.3 Existing Wastewater Collection System Capacity

#### 3.2.3.1 Lift Stations

B&W and City Operation and Maintenance Staff performed drawdown tests at twelve (12) City lift stations on March 21<sup>st</sup>, 2019. The City received several days of rainfall preceding the drawdown tests and during the test; B&W observed extreme infiltration and inflow (I&I) within the collection system. Lift Station No.'s 1, 5, 10, and 12 were overwhelmed by the flow rate entering the lift station wet wells.

LS 12 had significant amount of surcharge within the upstream gravity system. After 30 minutes of continuous pumping, conditions did not improve. This lift station is currently under redesign and is scheduled for complete replacement in Year 2020.

Following the field drawdown assessment, B&W performed an analysis on two (2) years of historical runtime data, as discussed in *Section 3.2.2.2*. This assessment used runtime data from January 2017 through February of 2019 to determine the average runtime for the lift stations' individual pumps. A typical wastewater pumping unit should operate on average, approximately 1 to 5 hours per pump per day or a total of 10 hours for a duplex lift station and 15 hours for a triplex lift station. B&W used 10 hours of daily operation for duplex and 15 hours of daily operation for triplex as a threshold for this analysis. Lift stations that continually operate over this threshold should be inspected by the City. Pumps that operate for longer periods of time could have environmental and/or mechanical issues such as ragging, blow-by, excessive I&I or the capacity of the pumps may be inappropriate to handle flow conditions.

Lift Station No.'s 1, 3, 5, and 10 all demonstrate higher than normal average daily runtimes per day. LS 1, 5 and 10 have significantly higher runtimes and should be a priority to improve system performance. Results from the runtime analysis are summarized in *Table 3-4*. The 2-year daily total lift station runtime data is graphically depicted in *Figures 3-5 to 3-16*.

*Table 3-4: Lift Station Hourly Runtime*

Lift Station No.	Number of Pumps	Total LS Hourly Runtime	Recommended Max Hourly Total Daily Runtime (Hours)	Does LS Exceed Maximum Recommended Runtime?
1	2	17.7	10.0	YES
2	2	4.9	10.0	NO
3	2	11.4	10.0	YES
4	2	8.1	10.0	NO
5	2	23.9	10.0	YES
6	2	8.5	10.0	NO
7	2	6.9	10.0	NO
8	2	5.7	10.0	NO
9	2	3.3	10.0	NO
10	2	18.0	10.0	YES
11	3	14.7	15.0	NO
12	2	4.5	10.0	NO

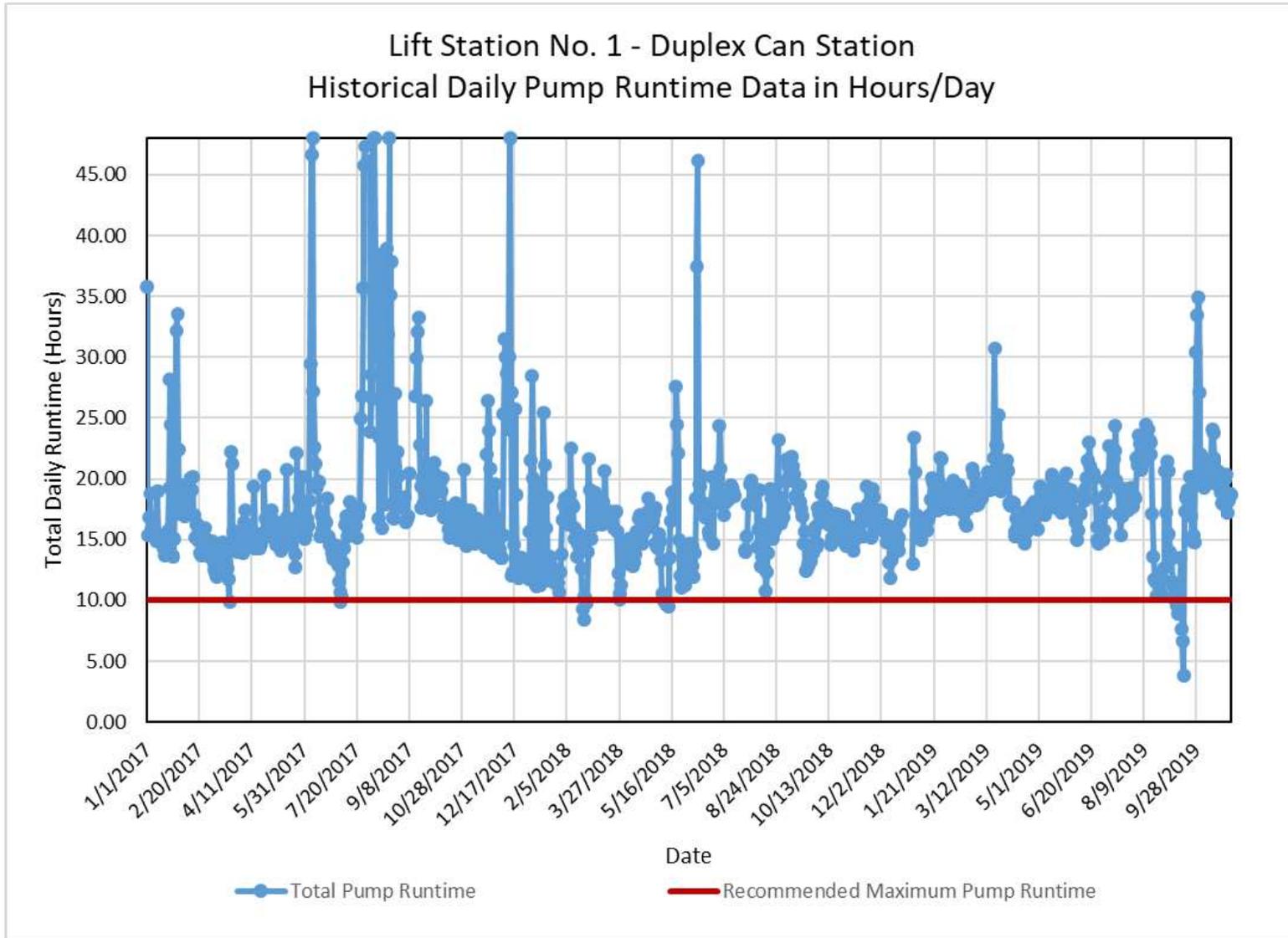


Figure 3-5: Lift Station No. 1 Daily Runtime Analysis

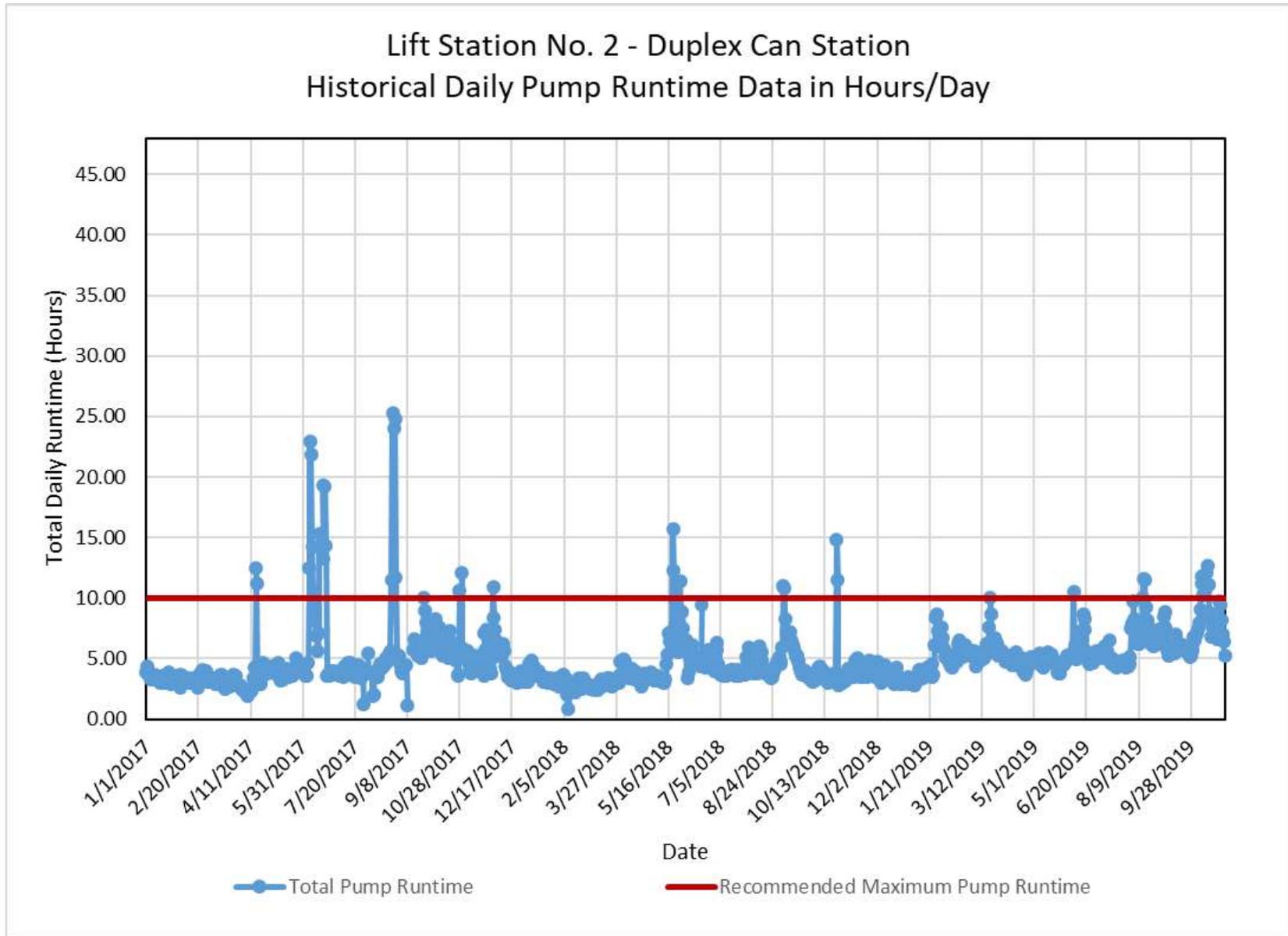


Figure 3-6: Lift Station No. 2 Daily Runtime Analysis

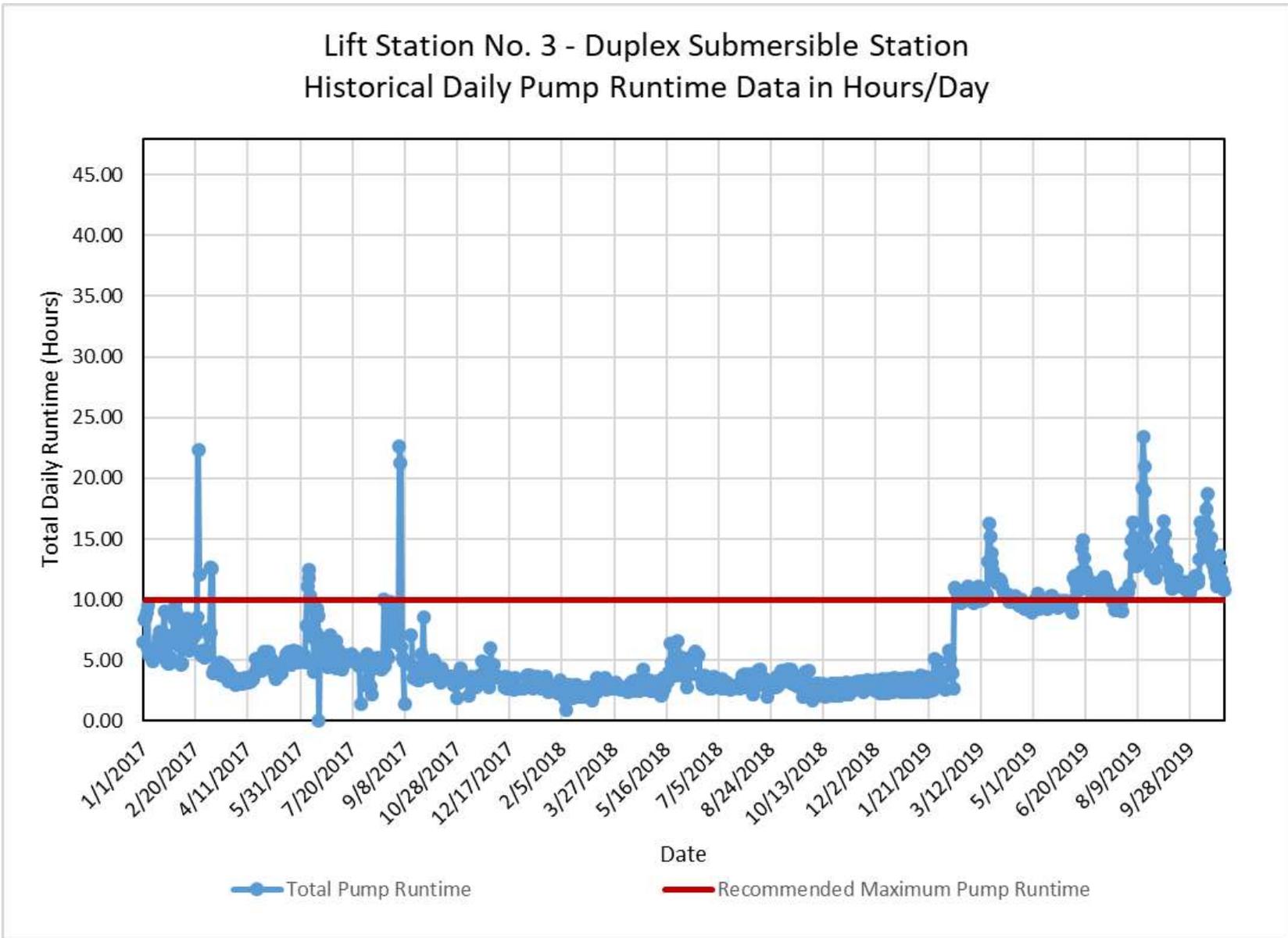


Figure 3-7: Lift Station No. 3 Daily Runtime Analysis

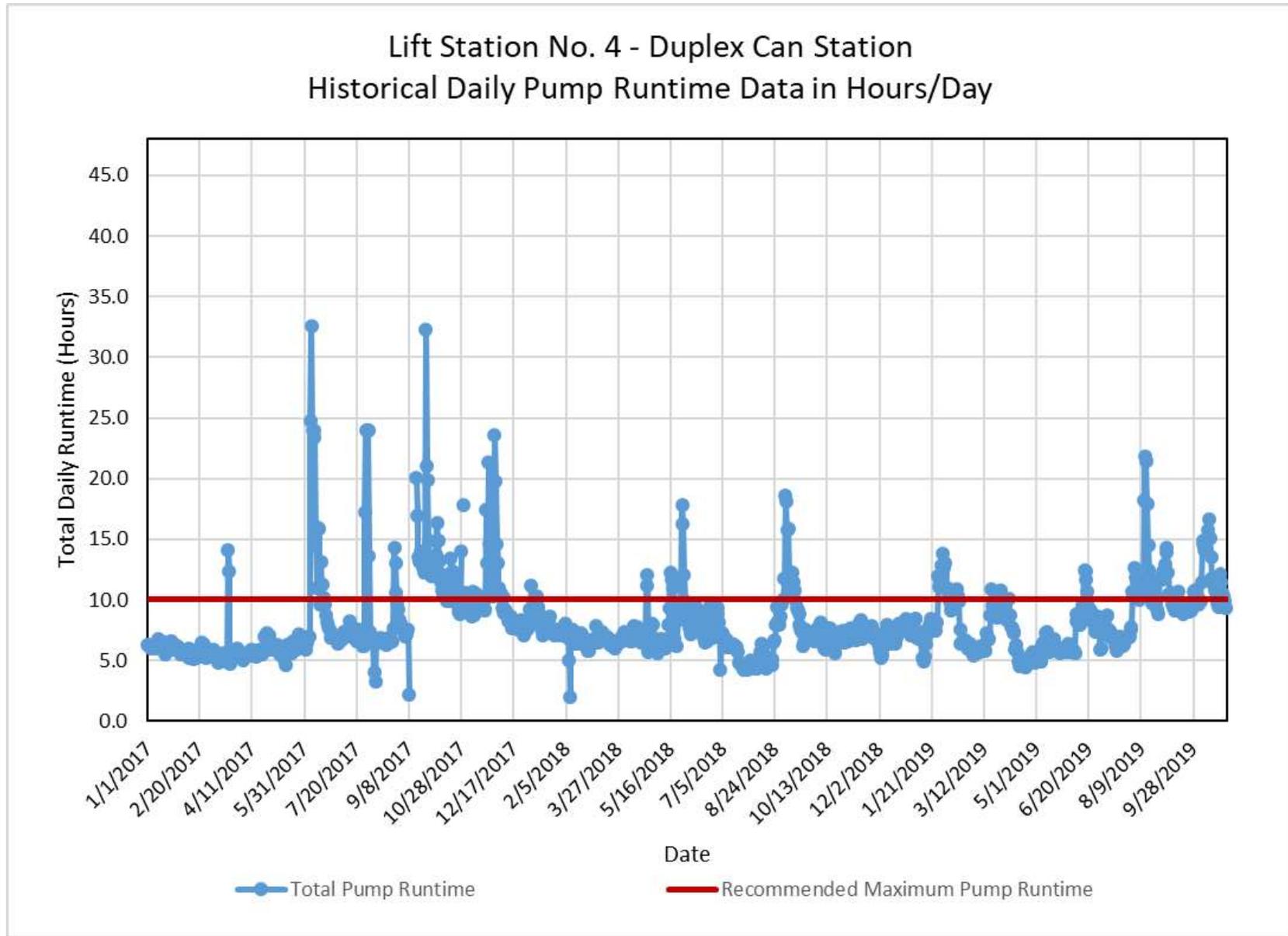


Figure 3-8: Lift Station No. 4 Daily Runtime Analysis

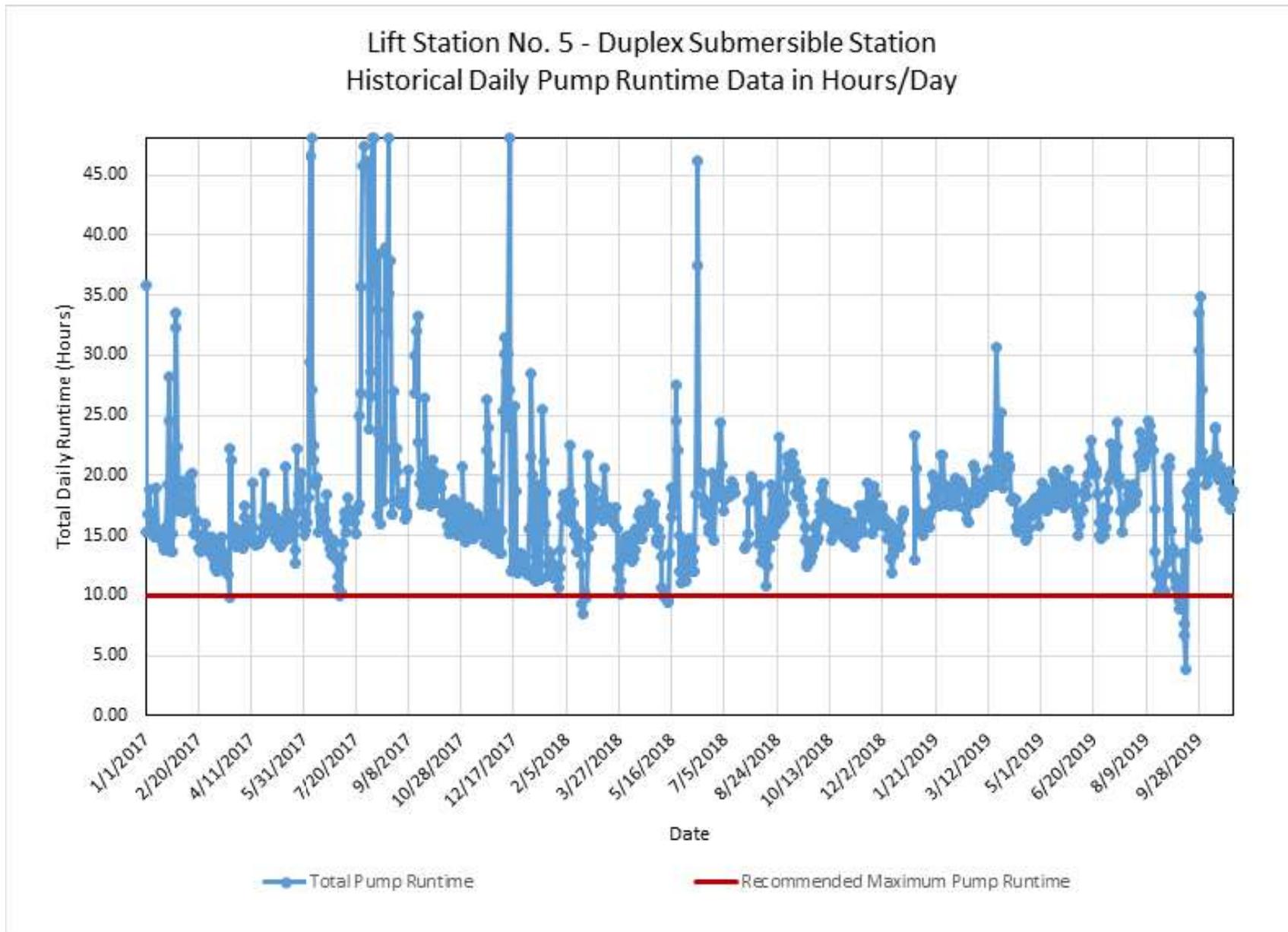
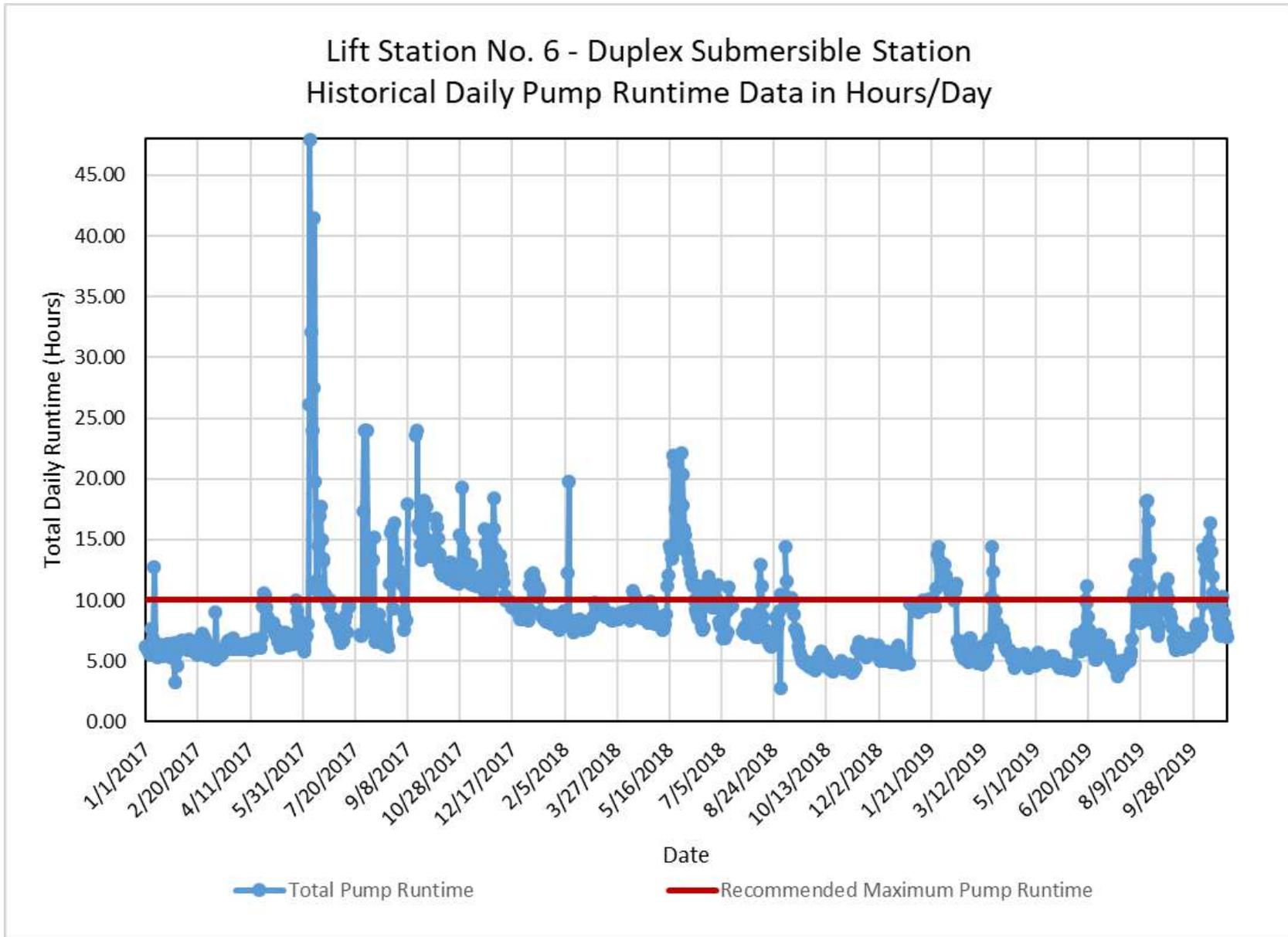


Figure 3-9: Lift Station No. 5 Daily Runtime Analysis



**Figure 3-10: Lift Station No. 6 Daily Runtime Analysis**

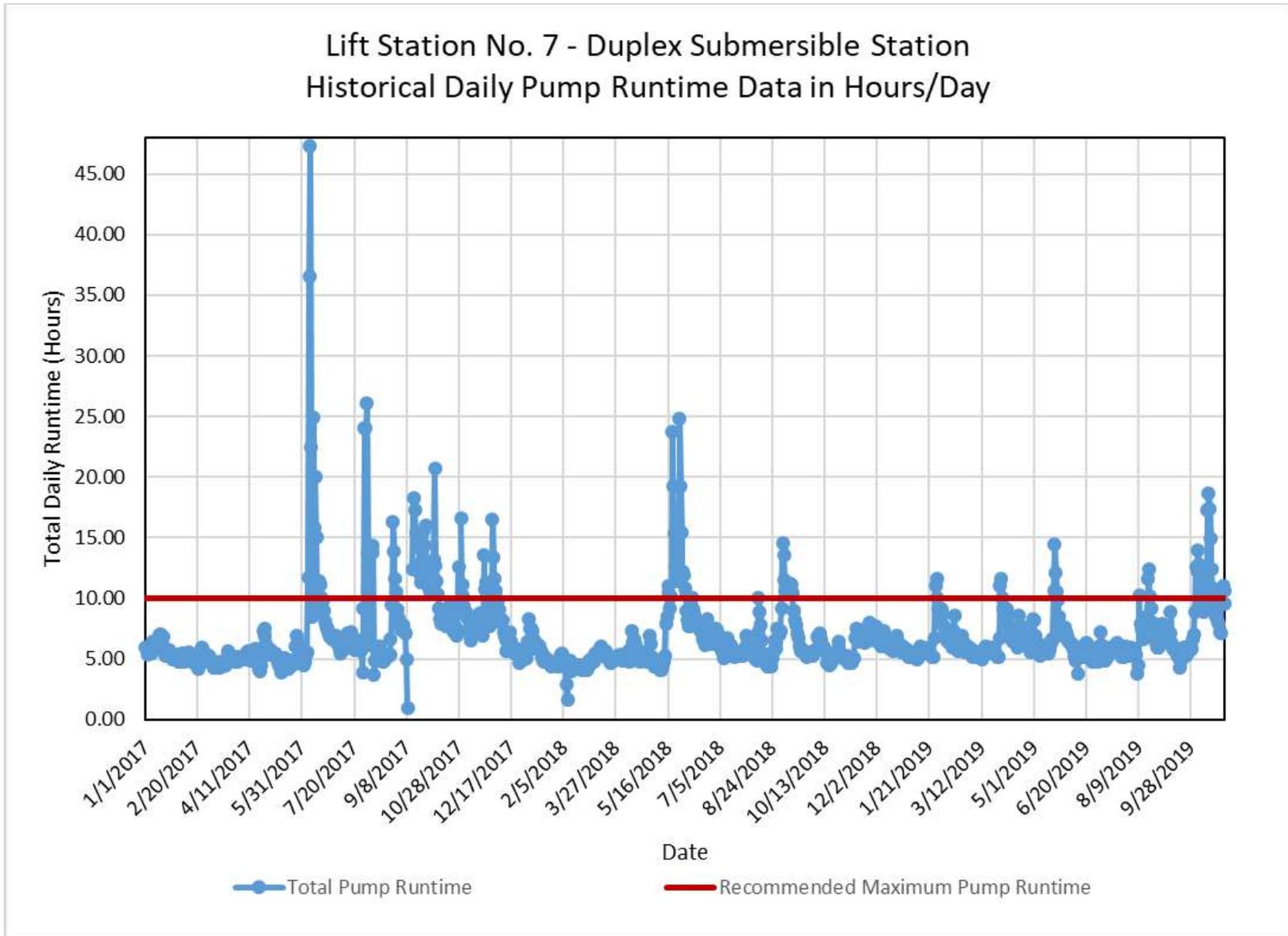
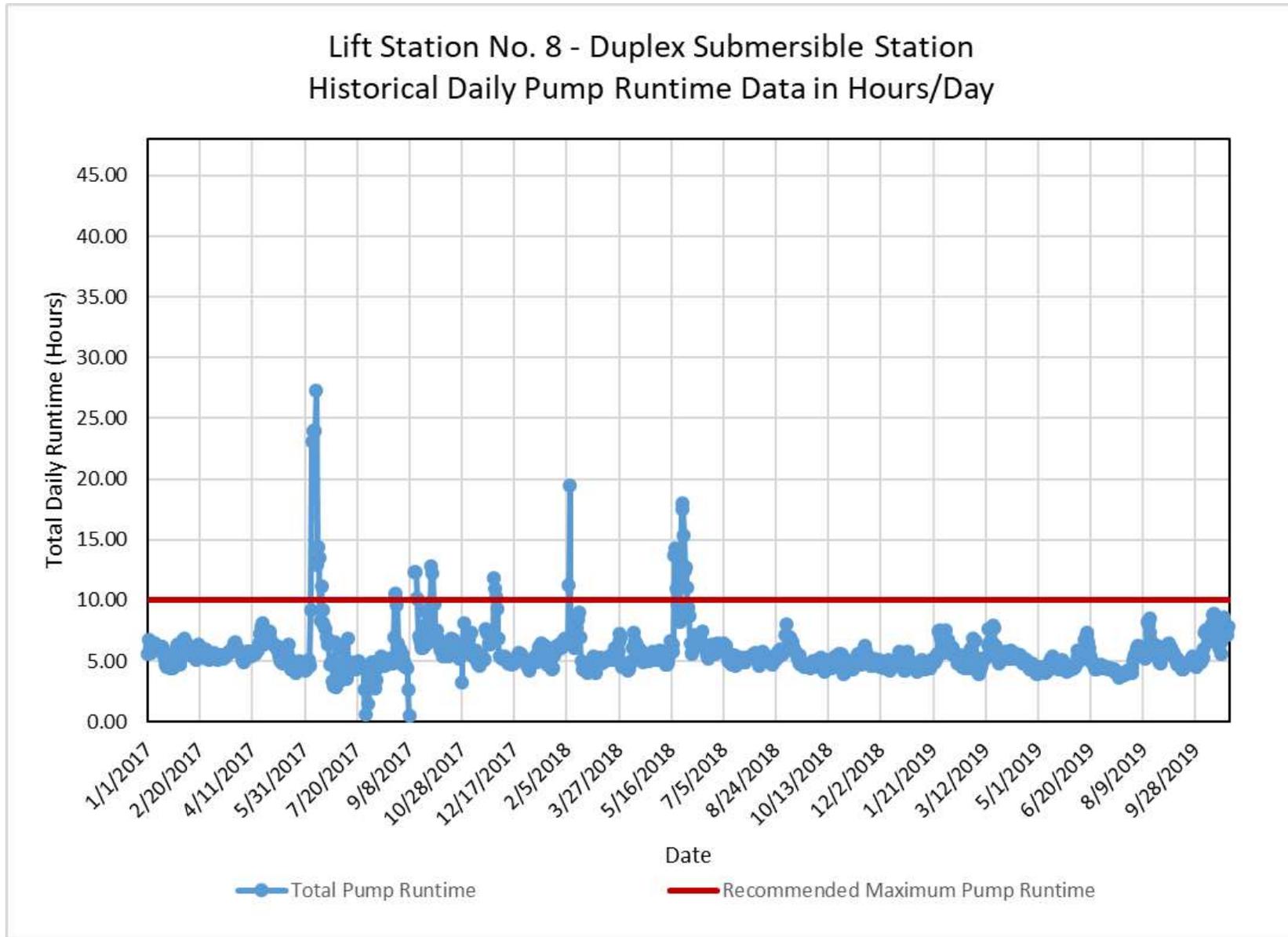


Figure 3-11: Lift Station No. 7 Daily Runtime Analysis



**Figure 3-12: Lift Station No. 8 Daily Runtime Analysis**

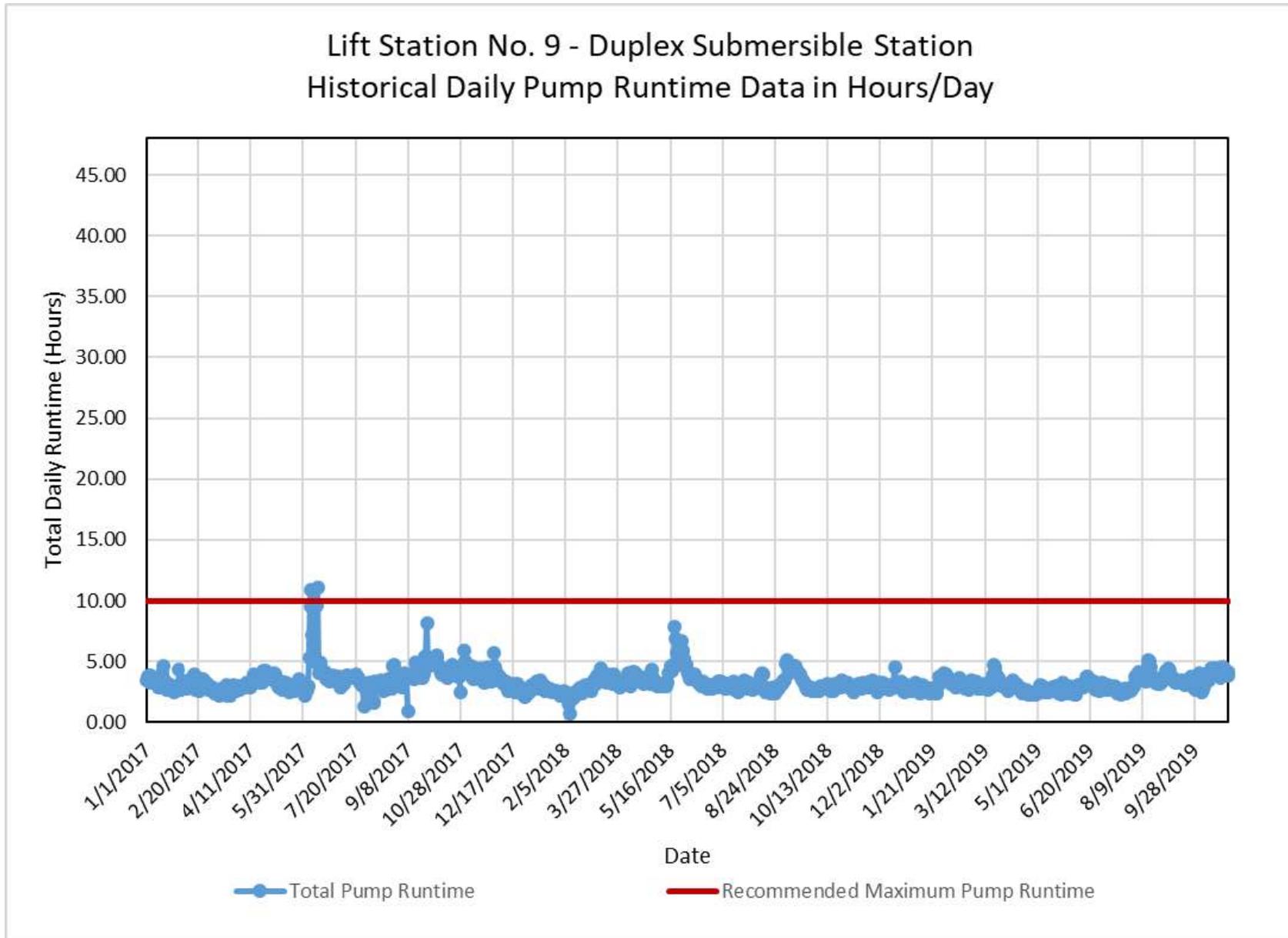


Figure 3-13: Lift Station No. 9 Daily Runtime Analysis

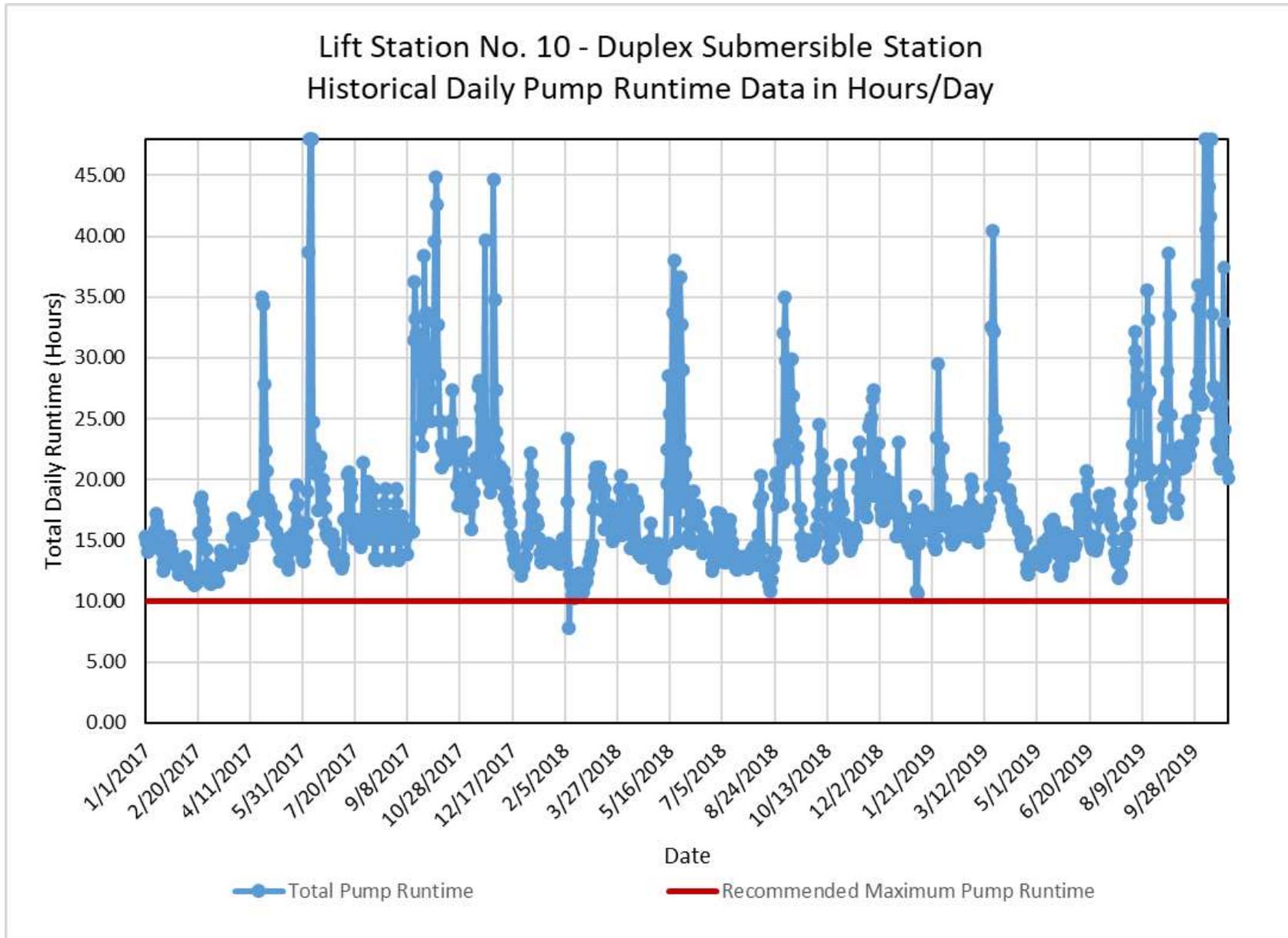


Figure 3-14: Lift Station No. 10 Daily Runtime Analysis

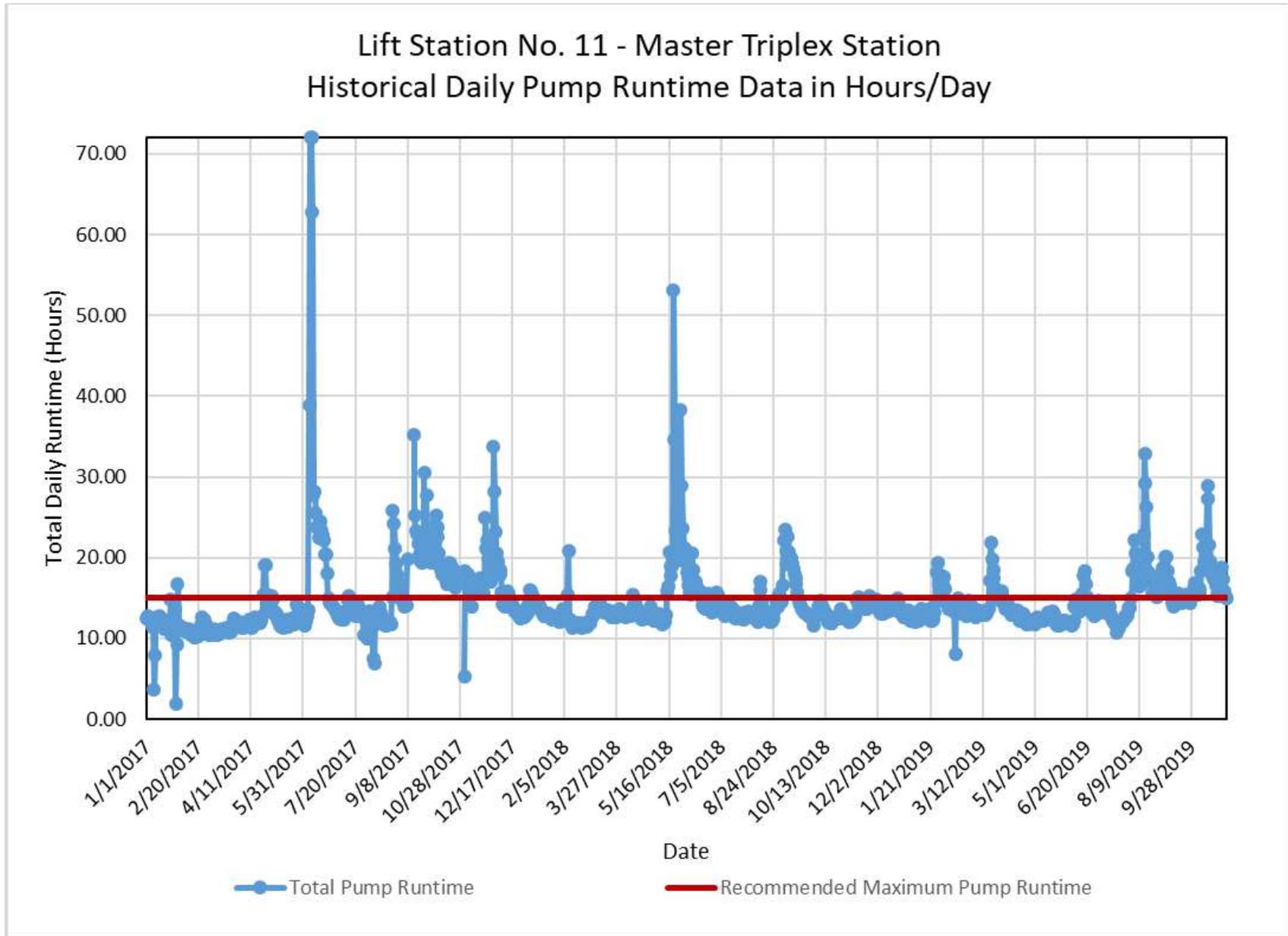


Figure 3-15: Lift Station No. 11 Daily Runtime Analysis

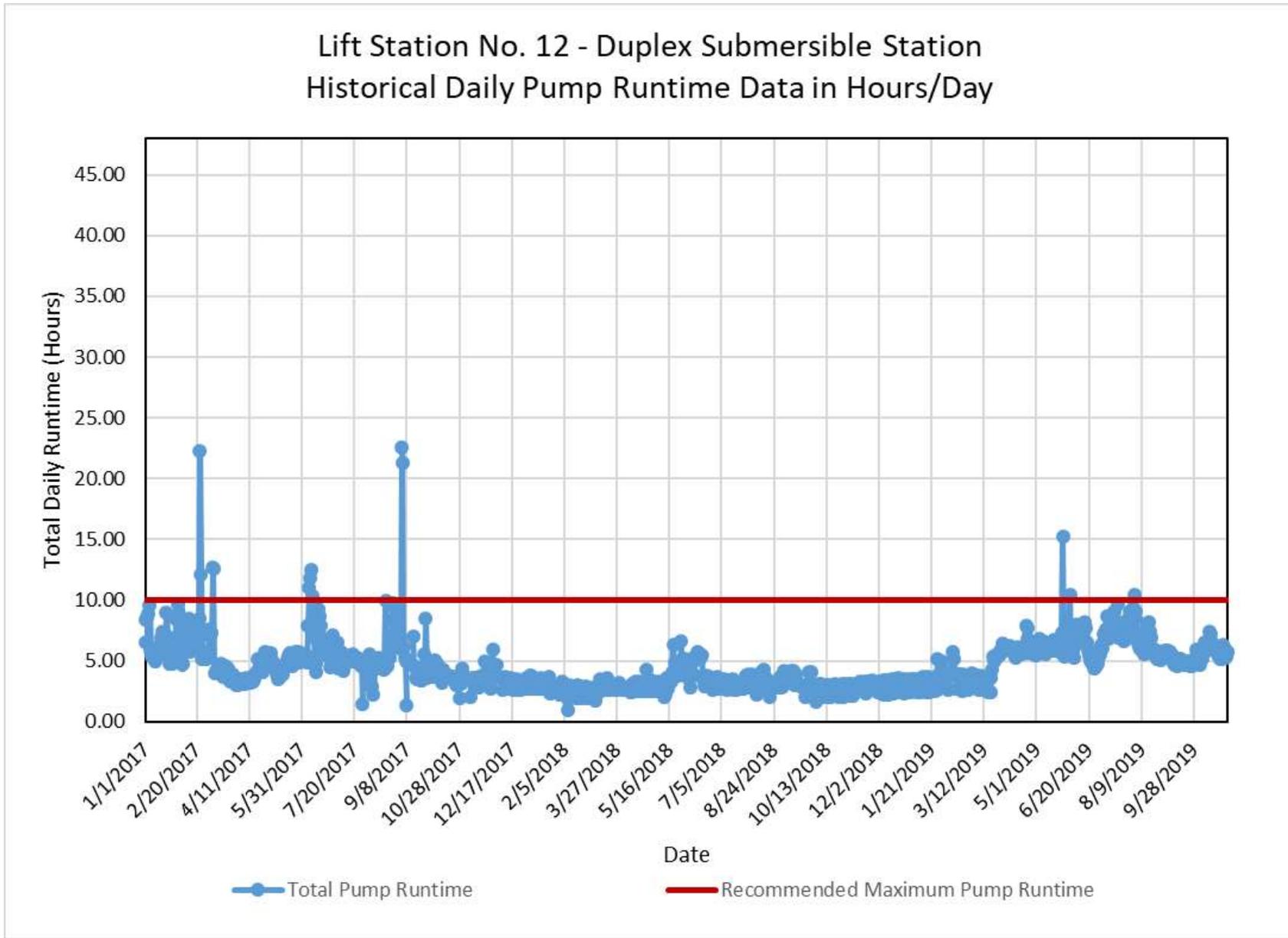


Figure 3-16: Lift Station No. 12 Daily Runtime Analysis

### 3.2.3.2 Gravity Sewer Main Trunkline

The City's major gravity trunkline along NE 26<sup>th</sup> Street, NE 16<sup>th</sup> Ave, NE 26<sup>th</sup> Dr, and NE 15<sup>th</sup> Ave consists of 10, 12, 15, 18, 20 and 21-inch diameter pipe. City Operations and Maintenance staff have observed surcharge and some wastewater spillage at or near manhole B-327, located on NE 26<sup>th</sup> St and N Andrews Ave, the western most end of the trunkline. Flow from Lift Station service area's 1, 2, 3, 4 and 5 all discharge into this manhole and gravity section. During heavy rainfall events, when both LS 3 and LS 5 are operating at full capacity, the City has observed wastewater build-up and surcharge within this trunkline and have received complaints by the public of wastewater spillage from this manhole.

The City has witnessed a modest increase in population without significant redevelopment projects in the last 10 years. Population projection for Year 2040 in **Section 2** indicates a slight decrease in population which should reduce (not increase) flow observed within the gravity trunkline. The increase in wastewater flows without significant increases in population suggest the system has an I&I issue.

The City has several basins that are negatively affected by I&I, particularly during rainstorm events. Many of the City's lift station pumps operate 24 hours a day. The City's gravity trunkline was not designed to convey this significant amount of additional flow. If the City reduces the amount of I&I flow collecting during rainstorm events, the trunkline surcharge issues will be greatly reduced. See **Figure 3-17** for the location of this gravity trunkline which was analyzed.

B&W performed an analysis on the City's trunkline for Average Daily Flow, Peak Hour Flow and Redevelopment Scenarios. A maximum pipe capacity threshold of 90% flow depth was used to determine if the trunkline had enough capacity to handle flow during each Scenario. The calculations indicated that approximately 6,800 linear feet of gravity trunkline was flowing over the 90% flow depth threshold during the Peak Hour Flow and Redevelopment Scenarios. Historically the City has witness overflowing within this trunkline during heavy rainstorm events which coincides with the analysis.

At this time B&W is recommending the City increase the gravity trunkline capacity to accommodate the additional wastewater flow introduced into the sanitary system at existing peak hour flows. However, it is also recommended that the City have an engineering consultant perform a study of the trunkline which should include televising of the pipes, flow monitoring at various locations through the line and a detailed design of the recommended improvements. This study should be completed before the City moves forward with any construction of the gravity main trunkline.

The City should also continue to perform lining within selected lift station basins to reduce the introduction of stormwater and groundwater at the source. The lining of the gravity basins and the increase in pipe diameter in the trunkline should help reduce spills and overflow situations occurring in the future. **Table 3-5** includes the existing gravity trunkline pipe diameter along with the recommended pipe upgrades.

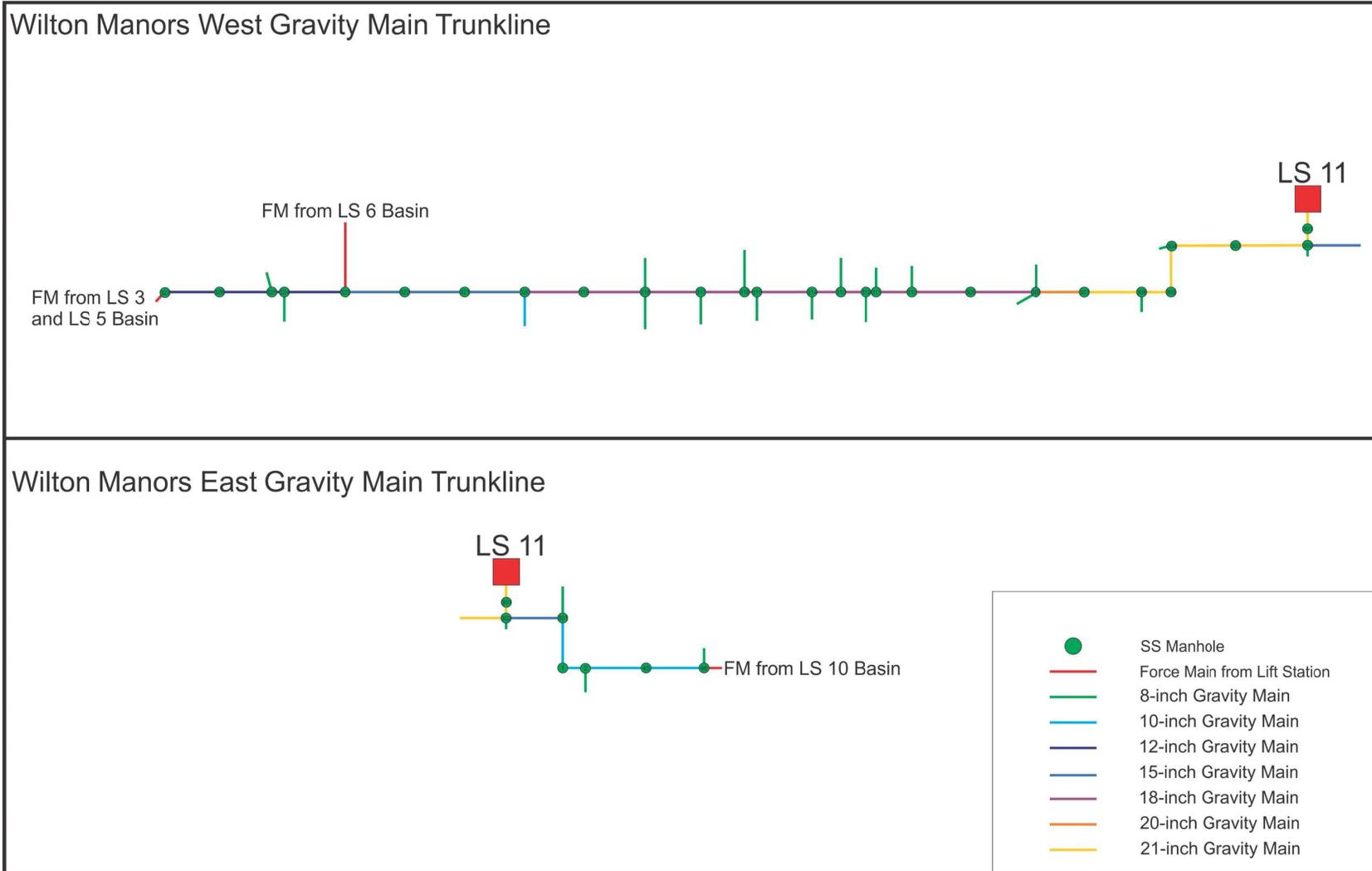


Figure 3-17: Wastewater Zones and Water Service Locations

Table 3-5: Recommended Pipe Diameter Increase to Gravity Trunkline

Gravity Main Trunkline - West			
Pipe From MH No.	MH to MH Pipe length (ft)	Pipe Diameter (in)	Recommended Pipe Diameter (in)
To MH No.			
MH 327	290	12	15
MH 326			
MH 326	290	12	15
MH 325			
MH 325	65	12	15
MH 324			
MH 324	326	12	15
MH 323			
MH 323	326	15	18
MH 322			
MH 322	318	15	18
MH 321			
MH 321	330	15	18
MH 320			
MH 320	327	18	21
MH 319			
MH 319	330	18	21
MH 318			
MH 318	301	18	21
MH 317			
MH 317	229	18	21
MH 316			
MH 316	72	18	21
MH 315			
MH 315	301	18	21
MH 314			
MH 314	157	18	21
MH 313			
MH 313	144	18	21
MH 312			
MH 312	42	18	21
MH 311			
MH 311	193	18	21
MH 310			
MH 310	332	18	21
MH 309			
MH 309	338	18	21
MH 308			
MH 308	274	20	24
MH 307			
MH 307	305	21	24
MH 306			
MH 306	152	21	24
MH 305			
MH 305	260	21	24
MH 304			
MH 304	370	21	24
MH 303			
MH 303	373	21	24
MH 302			
MH 302	34	20	42
MH 300			

Table 3-5: Recommended Pipe Diameter Increase to Gravity Trunkline (Cont.)

Gravity Main Trunkline - East			
Pipe From MH No.	MH to MH Pipe length (ft)	Pipe Diameter (in)	Recommended Pipe Diameter (in)
To MH No.			
MH 46	318	10	10
MH 45			
MH 45	332	10	10
MH 2			
MH 2	134	10	10
MH 1			
MH 1	273	10	10
MH 301			
MH 301	297	12	15
MH 302			

### 3.2.4 Asset Evaluation and Assessment of Existing Structures and Equipment

An Asset Evaluation and Assessment of existing structures and equipment was conducted by B&W. B&W was contracted to perform field investigations to visually evaluate the existing condition of the City's twelve (12) lift stations. The assessment recorded observations of each lift station's general site conditions, top slabs, discharge piping, valves, flow meters, valve and meter vaults, wet wells, electrical systems, emergency generator equipment...etc. Details of the assessment are included herein.

#### 3.2.4.1 Lift Stations

Overall, the City's submersible type lift stations are in good condition while the can and dry pit type stations require attention. The City maintains an annual renewal and replacement (R&R) program to replace aging and worn equipment. The following sheets provide summary of the lift station condition assessment of each lift station. Photographs from the field visits are included in *Appendix A*.

# THE CITY OF WILTON MANORS, FL LIFT STATION 1



<b>Type of Lift Station</b>	Duplex Can Station
<b>Pumps</b>	Smith and Loveless , 1.5 horsepower
<b>Last Historical Improvements</b>	<ul style="list-style-type: none"> <li>• Original structures from 1967</li> <li>• Electrical upgrades installed in 1987</li> </ul>
<b>In-field Inspection and Assessment</b>	
<b>Drawdown</b>	During the drawdown the City was unable to turn off the pumps for more than a minute at a time for fear of surcharge within the gravity system. The pumps were not able to keeping up with the wastewater flow and did not drawdown the wastewater level in the wet well while on. The pumps operated at 47 gpm.
<b>Pumping Results</b>	The pumps each run 8.70 hours per day which is very high for a typical wastewater pumping system. The field observations along with the calculated high pump runtimes point to pumps that are undersized.
<b>General Site Condition</b>	<ul style="list-style-type: none"> <li>• The lift station location is very tight and is wedged between two roads and a parking lot. A concrete power pole was installed 2 feet away from the wet well</li> <li>• The concrete slab showed signs of major wear with significant cracking. The bottom of the slab was beginning to wash out</li> <li>• MC was unable to view the pump discharge piping or valves because confined space certification and protocol is required for entry into can stations</li> <li>• The wet well is in average condition</li> <li>• The flow meter was not in working order</li> </ul>
<b>Electrical Condition</b>	<ul style="list-style-type: none"> <li>• The control panel was mounted a few inches above the concrete pad and susceptible to flooding</li> <li>• There was corrosion found in main disconnect and equipment rack</li> <li>• The main disconnect and station control panel looked to be reaching the end of their useful life</li> <li>• There were no seal offs or duct seal to prevent sewer gasses from entering electrical panel</li> <li>• The clearance between the control panel and dry well was below the required 3 feet</li> <li>• The analog flow meter and transmitter were very hard to read</li> </ul>

# THE CITY OF WILTON MANORS, FL LIFT STATION 2



<b>Type of Lift Station</b>	Duplex Can Station
<b>Pumps</b>	Smith and Loveless , 1.5 horsepower
<b>Last Historical Improvements</b>	<ul style="list-style-type: none"> <li>• Original structures from 1967</li> <li>• Electrical upgrades installed in 1987</li> <li>• In design to replace current can lift station to a submersible type lift station</li> </ul>
<b>In-field Inspection and Assessment</b>	
<b>Drawdown</b>	The pumps operate at 86 gpm.
<b>Pumping Results</b>	The pumps each run 2.2 hours per day which is average for a typical wastewater pumping system.
<b>General Site Condition</b>	<ul style="list-style-type: none"> <li>• The lift station is located in close proximity to the road.</li> <li>• The concrete slab was in good condition</li> <li>• MC was unable to view the pump discharge piping or valves because confined space certification and protocol is required for entry into can stations</li> <li>• The wet well was in average condition.</li> </ul>
<b>Electrical Condition</b>	<ul style="list-style-type: none"> <li>• The control panel was mounted a few inches above the concrete pad and susceptible to flooding</li> <li>• There was corrosion found in main disconnect and equipment rack</li> <li>• The main disconnect and station control panel looked to be reaching the end of their useful life</li> <li>• There were no seal offs or duct seal to prevent sewer gasses from entering electrical panel</li> <li>• The clearance between the control panel and dry well was below the required 3 feet</li> <li>• The analog flow meter and transmitter were very hard to read</li> </ul>

# THE CITY OF WILTON MANORS, FL LIFT STATION 3



<b>Type of Lift Station</b>	Duplex Submersible Station
<b>Pumps</b>	Ebara , 10 horsepower
<b>Last Historical Improvements</b>	Complete rehabilitation in 2018
<b>In-field Inspection and Assessment</b>	
<b>Drawdown</b>	The pumps operate at 520 gpm.
<b>Pumping Results</b>	The pumps each run 5.7 hours per day which is average for a typical wastewater pumping system.
<b>General Site Condition</b>	<ul style="list-style-type: none"> <li>• The lift station is located in in a parking lot with H-20 traffic rated hatches</li> <li>• The site is in excellent condition</li> <li>• The wet well, valve vault, HDEP discharge piping and all appurtenances are in excellent condition</li> </ul>
<b>Electrical Condition</b>	<ul style="list-style-type: none"> <li>• There were no seal offs or duct seal to prevent sewer gasses from entering electrical panel</li> <li>• Electrical systems are in excellent condition.</li> </ul>

# THE CITY OF WILTON MANORS, FL LIFT STATION 4



<b>Type of Lift Station</b>	Duplex Can Station
<b>Pumps</b>	Smith and Loveless , 1 horsepower
<b>Last Historical Improvements</b>	<ul style="list-style-type: none"> <li>• Original structures from 1967</li> <li>• Electrical upgrades installed in 1987</li> </ul>
<b>In-field Inspection and Assessment</b>	
<b>Drawdown</b>	The pumps operate at 86 gpm.
<b>Pumping Results</b>	The pumps each run 4 hours per day which average for a typical wastewater pumping system.
<b>General Site Condition</b>	<ul style="list-style-type: none"> <li>• The lift station was well maintained and had space for operations and maintenance staff</li> <li>• The concrete slab was in good condition</li> <li>• The wet well was in average condition</li> </ul>
<b>Electrical Condition</b>	<ul style="list-style-type: none"> <li>• The control panel was mounted a few inches above the concrete pad and susceptible to flooding</li> <li>• The main disconnect and station control panel looked to be reaching the end of their useful life</li> <li>• There were no seal offs or duct seal to prevent sewer gasses from entering electrical panel</li> <li>• The clearance between the control panel and dry well was below the required 3 feet</li> <li>• The analog flow meter and transmitter were very hard to read</li> </ul>

# THE CITY OF WILTON MANORS, FL

## LIFT STATION 5



<b>Type of Lift Station</b>	Duplex Submersible Station
<b>Pumps</b>	Tsurumi , 5 horsepower
<b>Last Historical Improvements</b>	<ul style="list-style-type: none"> <li>The station was last rehabilitated in 2005</li> </ul>
<b>In-field Inspection and Assessment</b>	
<b>Drawdown</b>	During the drawdown the City was unable to turn off the pumps for more than a minute at a time for fear of surcharge within the gravity system. The pumps were not able to keeping up with the wastewater flow and did not drawdown the wastewater level in the wet well while on. MC was unable to accurately calculate a pumping rate.
<b>Pumping Results</b>	The pumps each run 12.1 hours per day which is very high for a typical wastewater pumping system.
<b>General Site Condition</b>	<ul style="list-style-type: none"> <li>The lift station is located in close proximity to the road minimal protection. There are only two bollard protecting the site.</li> <li>The concrete top slabs were in good condition</li> <li>The wet well , valve vault and meter vault were in good condition</li> <li>The wet well piping was in poor condition and requires a new coat</li> <li>The valve vault piping was in good condition</li> <li>The meter vault was in good condition</li> </ul>
<b>Electrical Condition</b>	<ul style="list-style-type: none"> <li>There was corrosion found in main disconnect and equipment rack</li> <li>The main disconnect and station control panel looked to be reaching the end of their useful life</li> <li>The analog flow meter and transmitter were very hard to read</li> </ul>

# THE CITY OF WILTON MANORS, FL LIFT STATION 6



<b>Type of Lift Station</b>	Duplex Submersible Station
<b>Pumps</b>	Ebara , 10 horsepower
<b>Last Historical Improvements</b>	Complete rehabilitation in 2018
<b>In-field Inspection and Assessment</b>	
<b>Drawdown</b>	The pumps operate at 400 gpm.
<b>Pumping Results</b>	The pumps each run 4.5 hours per day which is average for a typical wastewater pumping system.
<b>General Site Condition</b>	<ul style="list-style-type: none"> <li>• The site is in excellent condition</li> <li>• The wet well, valve vault, stainless steel discharge piping and all appurtenances are in excellent condition</li> </ul>
<b>Electrical Condition</b>	<ul style="list-style-type: none"> <li>• There were no seal offs or duct seal to prevent sewer gasses from entering electrical panel</li> <li>• Gas detector indicated "missing sensor"</li> <li>• Otherwise electrical systems are in excellent condition</li> </ul>

# THE CITY OF WILTON MANORS, FL

## LIFT STATION 7



<b>Type of Lift Station</b>	Duplex Submersible Station
<b>Pumps</b>	Tsurumi , 5 horsepower
<b>Last Historical Improvements</b>	The station was last rehabilitated in 1990
<b>In-field Inspection and Assessment</b>	
<b>Drawdown</b>	The pumps operate at 210 gpm.
<b>Pumping Results</b>	The pumps each run 3.5 hours per day which is average for a typical wastewater pumping system.
<b>General Site Condition</b>	<ul style="list-style-type: none"> <li>• The lift station is located in close proximity to the road no protection.</li> <li>• The wet well and valve vault are located on the road and do not have a typical concrete top slab but an asphalt top which connects to the road. The asphalt is in good condition</li> <li>• The wet well currently has 3 inverts and wastewater flow is dumping directly on the submersible pumps</li> <li>• The wet well, valve vault were in good condition while the meter vault was in average condition.</li> <li>• The wet well piping was in average condition</li> <li>• The valve vault piping was in good condition</li> <li>• The meter vault piping was in good condition and the flow meter itself was broken</li> </ul>
<b>Electrical Condition</b>	<ul style="list-style-type: none"> <li>• There were no seal offs or duct seal to prevent sewer gasses from entering electrical panel</li> <li>• The main disconnect and station control panel looked to be reaching the end of their useful life</li> <li>• The analog flow meter and transmitter were very hard to read</li> </ul>

# THE CITY OF WILTON MANORS, FL LIFT STATION 8



<b>Type of Lift Station</b>	Duplex Submersible Station
<b>Pumps</b>	Tsurumi , 15 horsepower
<b>Last Historical Improvements</b>	The station was last rehabilitated in 2008
<b>In-field Inspection and Assessment</b>	
<b>Drawdown</b>	The pumps operate at 480 gpm.
<b>Pumping Results</b>	The pumps each run 2.90 hours per day which is average for a typical wastewater pumping system. The City's downstream manhole and force main piping does not have enough capacity to take regular flow from the lift station pumps. The City throttles back the operation of the lift station pumps during normal operation.
<b>General Site Condition</b>	<ul style="list-style-type: none"> <li>• The lift station is located in a City park and the general site is in excellent condition</li> <li>• The lift station top slab is in excellent condition</li> <li>• The wet well currently has 3 inverters and wastewater flow is discharging directly onto the submersible pumps</li> <li>• The wet well, valve vault and meter vault were in excellent condition.</li> <li>• The wet well and meter vault piping were in poor condition</li> <li>• The valve vault piping was in excellent condition</li> <li>• City has odor complaints at this location</li> </ul>
<b>Electrical Condition</b>	<ul style="list-style-type: none"> <li>• The electrical system was in good condition</li> </ul>

# THE CITY OF WILTON MANORS, FL LIFT STATION 9



<b>Type of Lift Station</b>	Duplex Submersible Station
<b>Pumps</b>	Ebara , 5 horsepower
<b>Last Historical Improvements</b>	The station was last rehabilitated in 2007
<b>In-field Inspection and Assessment</b>	
<b>Drawdown</b>	The pumps operate at 130 gpm.
<b>Pumping Results</b>	The pumps each run 1.7 hours per day which is average for a typical wastewater pumping system.
<b>General Site Condition</b>	<ul style="list-style-type: none"> <li>• The lift station wet well is located in the middle of the road and requires an operation and maintenance truck and torch drill to open the hatch. The valve vault and electrical systems are also located near the road and only have bollards for protection.</li> <li>• The valve vault top slab was in good condition</li> <li>• The wet well was in excellent condition</li> <li>• The wet well piping was in average condition</li> <li>• The valve vault had sitting water and was in average condition</li> <li>• The valve vault piping was in average condition</li> <li>• The meter was located in the valve vault and is in average condition</li> </ul>
<b>Electrical Condition</b>	<ul style="list-style-type: none"> <li>• There was corrosion found in main disconnect and equipment rack</li> <li>• There were no seal offs or duct seal to prevent sewer gasses from entering electrical panel</li> <li>• The main disconnect and station control panel looked to be reaching the end of their useful life</li> <li>• Flow indicating transmitter was not mounted in the enclosure</li> <li>• The elapsed time meter was not connected</li> </ul>

# THE CITY OF WILTON MANORS, FL

## LIFT STATION 10



<b>Type of Lift Station</b>	Duplex Submersible Station
<b>Pumps</b>	Tsurumi , 5 horsepower
<b>Last Historical Improvements</b>	The station is original and has had various minor repairs and upgrades over the last 40 years
<b>In-field Inspection and Assessment</b>	
<b>Drawdown</b>	During the drawdown the City was unable to turn off the pumps for more than a minute at a time for fear of surcharge within the gravity system. The pumps were not able to keeping up with the wastewater flow and did not drawdown the wastewater level in the wet well while on. MC was unable to accurately calculate a pumping rate.
<b>Pumping Results</b>	The pumps each run 8.20 hours per day which is very high for a typical wastewater pumping system.
<b>General Site Condition</b>	<ul style="list-style-type: none"> <li>• The lift station is located in close proximity to the road with no protection</li> <li>• The wet well currently has 3 invert and wastewater flow is dumping directly on the submersible pumps</li> <li>• The concrete top slabs were in average condition</li> <li>• The wet well was in good condition</li> <li>• The wet well piping was in average condition</li> <li>• The valve vault was in excellent condition</li> <li>• The valve vault piping was in excellent condition</li> <li>• The meter vault was in poor condition and piping was in average condition</li> <li>• Flow meter was in poor condition</li> </ul>
<b>Electrical Condition</b>	<ul style="list-style-type: none"> <li>• The main disconnect and station control panel looked to be reaching the end of their useful life</li> <li>• The analog flow meter and transmitter were very hard to read There were no seal offs or duct seal to prevent sewer gasses from entering electrical panel</li> <li>• The clearance between the control panel and dry well was below the required 3 feet</li> </ul>

# THE CITY OF WILTON MANORS, FL

## LIFT STATION 11



<b>Type of Lift Station</b>	Triplex Submersible Station
<b>Pumps</b>	Flygt, 110 horsepower
<b>Last Historical Improvements</b>	Complete Rehabilitation in 2013
<b>In-field Inspection and Assessment</b>	
<b>Drawdown</b>	The pumps operate at 2,400 gpm.
<b>Pumping Results</b>	The pumps each run 4.9 hours per day which is average for a typical wastewater pumping system.
<b>General Site Condition</b>	<ul style="list-style-type: none"> <li>• The site is in excellent condition</li> <li>• The wet well, valve vault, meter vault, valve vault piping, meter vault piping, flow meter and all appurtenances were in excellent condition</li> <li>• The wet well piping was in good condition</li> </ul>
<b>Electrical Condition</b>	<ul style="list-style-type: none"> <li>• There were no seal offs or duct seal to prevent sewer gasses from entering electrical panel</li> <li>• There was corrosion found in the pump cable/ signal terminal cabinet</li> <li>• Water appeared to be entering into Pump No. 1's enclosure</li> <li>• The O&amp;M staff said that the generator trips out the breaker intermittently</li> <li>• Flygt MAS display (pump seal fail relay) not showing data correctly</li> </ul>

# THE CITY OF WILTON MANORS, FL LIFT STATION 12



<b>Type of Lift Station</b>	Dry-Pit Station
<b>Pumps</b>	3 horsepower
<b>Last Historical Improvements</b>	The station is scheduled to be fully replaced in 2020. The consultant has completed the 90% set of plans
<b>In-field Inspection and Assessment</b>	
<b>Drawdown</b>	During the drawdown the City was unable to turn off the pumps for fear of surcharge within the gravity system. The pumps were not able to keeping up with the wastewater flow and did not drawdown the wastewater level in the wet well while on. MC was unable to accurately calculate a pumping rate.
<b>Pumping Results</b>	The pumps each run 1.4 hours per day which is average for a typical wastewater pumping system.
<b>General Site Condition</b>	<ul style="list-style-type: none"> <li>• The lift station is located in a parking lot and is protected by large bollards</li> <li>• The wet well is current sized too small and does not offer much storage</li> <li>• The concrete top slabs were in average condition</li> <li>• The wet well was in average condition</li> <li>• The wet well piping was in poor condition</li> <li>• The valve vault was in average condition</li> <li>• The valve vault piping was in poor condition</li> <li>• The meter vault was in poor condition with standing water present</li> <li>• The flow meter and associated piping was in poor condition</li> </ul>
<b>Electrical Condition</b>	<ul style="list-style-type: none"> <li>• All electrical components were original installed in 1967 and are nearing the end of their useful life</li> </ul>

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## 3.3 Wastewater Hydraulic Model

### 3.3.1 Model Development and Analysis

A computerized hydraulic model was developed using the Bentley/Haested WaterCad® Ver. 8.0 software program. The model was developed using two (2) different time steps as follows:

- Current Conditions (2020)
- Redevelopment

The model utilized wastewater as-builts, GIS, and pump curves provided by the City. The hydraulic model only evaluated the wastewater force main system. No modeling or evaluation was completed for the wastewater gravity collection system serving those areas. The model was calibrated using system pressure data obtained in the field by the City. Existing system pressures were recorded at twelve (12) lift station locations throughout the City.

Model results were analyzed for apparent impacts on the existing system and future system due to the anticipated growth and redevelopment projects.

### 3.3.2 Model Results and Recommendations

First, the existing pipe sizes were evaluated to determine if there is sufficient capacity in the existing force main system to convey the future wastewater flows. The criterion used to evaluate force main capacity is velocity at peak hour flow conditions. A maximum of 7.5 feet per second (fps) is recommended for the City's force main system. If the modeling results show that velocities exceed this criteria, upsizing the force main or running a parallel line is required. The existing model indicated no immediate need for additional capacity in the force mains. There were also no force main impacts (e.g. velocities greater than 7.5 fps) as a result of existing wastewater flow.

The City is currently planning to invest major resources into a large redevelopment program. The additional flow generated due to the redevelopment is more than the current lift station and force main system capacity can handle. As part of the future wastewater analysis in **Section 3.4**, it was identified that several lift stations require an increase in pumping capacity and force main upsizing to operate at increased flows throughout the City. A Redevelopment Hydraulic Model was created to include these changes to the City's lift station and force main transmission system.

See **Section 3.5** for the recommended wastewater system improvements.

### 3.4 Redevelopment Program Wastewater Collection System Evaluation

The City is currently planning to invest major resources into a large redevelopment program within the City. The redevelopment program consisted of adding both commercial and residential space and all planned construction is scheduled for completion by Year 2025-2026. This proposed development is expected to add 5,864 residents, increasing the population from 12,778 in 2020 to 18,335 in 2030. See *Figure 2-11* for a map of the proposed redevelopment and *Table 2-8* for a population breakdown.

The significant population increase along with the addition of commercial space will increase both water and sewer demands and generation within the City. The City's current wastewater collection and transmission system will be unable to sufficiently operate and transmit the additional wastewater.

B&W performed an analysis to determine the required improvements necessary to accommodate the City's redevelopment goals. *Section 3.2.3.2* outlined the required upgrades to the City's gravity trunkline. It is recommended the City also provide various improvements to increase capacity at Lift Station No.'s 1, 3, 5, 6, 7, 8 and 11. Note that the wastewater flow from the proposed development on corner of NE 7<sup>th</sup> Avenue and Wilton Drive was assumed to be gravity fed or pumped to the Lift Station No. 11 service basin. Also, the wastewater flow from the proposed development on the corner of NE 21<sup>st</sup> Court and Wilton Drive was assumed to be gravity fed or pumped to the Lift Station No. 11 service basin.

*Table 3-6* provides a breakdown of the recommended projects based on pre and post-development in the City.

Lift Station	Lift Station Recommended Projects Pre-Development					Projected Total Recommended Projects Post- Development							Additional Improvements	Additional Cost for Improvements
	Wet Well Diameter, Feet	Pump Size, Horsepower	No. of Pumps	Pumping Rate to Meet Peak Hour Flow Demands	Discharge FM Diameter, inches	Min. Pumping Rate to Meet Peak Hour Flow Demands, GPM	Pressure, Ft	Wet Well Diameter, Feet	Pump Size, Horsepower	No. of Pumps	Discharge FM Diameter, inches	Peak Hour Velocity, ft/s		
1	6	5.5	2	150	4	306	25	6	5.5	2	6	3.47	- Increase 560 LF of Discharge Force Main, fittings, gate valves and check valves from 4-inch to 6-inch - Replace Pumps with New N Flygt 3102 MT - 465, 5.5 HP Submersible Pumps	\$ 671,005.82
3	6	20	2	675	6	1,194	106	8	60	2	8	7.63	- Increase 2,816 LF of Discharge Force Main, fittings, gate valves and check valves from 6-inch to 8-inch - Increase Wet Well from 6-ft to 8-ft Diameter - Replace Pumps with New N Flygt 3202 HT - 467, 60 HP Submersible Pumps, Replace panel	\$ 1,549,449.00
5	6	7.5	2	550	6	715	20	6	7.5	2	8	4.57	- Increase 1,000 LF of Discharge Force Main, fittings, gate valves and check valves from 6-inch to 8-inch - Replace Pumps with New N Flygt 3127 LT - 426, 7.5 HP Submersible Pumps, Replace panel	\$ 612,908.98
6	6	5	2	249	6	609	55	6	17	2	6	6.91	- Replace Pumps with New N Flygt 3153 MT - 435, 17 HP Submersible Pumps. Replace panel.	\$ 514,622.36
7	4	5	2	177	4	427	30	6	5.5	2	6	4.85	- Increase 550 LF of Discharge Force Main, fittings, gate valves and check valves from 4-inch to 6-inch - Increase Wet Well from 4-ft to 6-ft Diameter - Replace Pumps with New N Flygt 3102 MT - 463, 5 HP Submersible Pumps. Replace Panel.	\$ 659,002.84
8	8	15	2	618	6	675	23	8	7.5	2	8	4.31	- Increase 120 LF of Discharge Force Main, fittings, gate valves and check valves from 6-inch to 8-inch - Replace Pumps with New N Flygt 3127 LT - 426, 7.5 HP Submersible Pumps. Replace Panel.	\$ 342,856.80
11	12	110	3	4,000	16	2,372 per pump with Two (2) Pumps Running	125	12	110	3	16	7.57	- Keep same Flygt NP 3231 Submersible Pumps, but change out Impellers from IMP450mm to IMP 475mm	\$ 22,477.50

Table 3-6: Recommended Projects based on Redevelopment

### 3.5 Wastewater Collection System Recommended Improvements

The recommended project list below is a result of in-field lift station assessments and drawdown tests, workshops with the City which include discussions with managerial and operations staff, City customer complain logs, gravity trunkline analysis, hydraulic modeling and I&I analysis . The following lists outline the wastewater projects identified in each analysis herein for a ten (10) year and twenty (20) year planning horizon. The City should note that this list should be utilized as a guide to determine potential project schedules and should not be used as a hard timeline of completion. The City should pick and choose when projects are started, as it makes sense to the City.

#### 10 Year Planning Horizon

- 1) Lift Station No. 11 Pump Impeller Upgrade\*
- 2) Lift Station No. 1 Replacement and Force Main Replacement\*
- 3) Lift Station No. 4 Service Basin Lining
- 4) Lift Station No. 4 Replacement
- 5) Lift Station No. 2 Replacement
- 6) Lift Station No. 5 Service Basin Lining\*
- 7) Lift Station No. 5 Electrical, Pumps and Force Main Replacement\*
- 8) Gravity Main Trunkline Replacement\*
- 9) Lift Station No. 3 Service Basin Lining\*
- 10) Lift Station No. 3 Replacement and Force Main Replacement\*
- 11) Lift Station No. 7 Service Basin Lining\*
- 12) Lift Station No. 7 Replacement and Force Main Replacement\*
- 13) Lift Station No. 6 Pump and Force Main Replacement\*
- 14) Lift Station No. 8 Odor Control, Electrical, Pumps and Force Main Replacement\*
- 15) Lift Station No. 10 Service Basin Lining
- 16) Lift Station No. 10 Rehabilitation

\*Indicates a project created to increase capacity due to development within the City. If the City finds that development is less aggressive or development in certain areas of the City changes, the City should shift the following projects schedules to meet the demand requirements.

#### 20-Year Planning Horizon

- 1) Lift Station No. 9 Rehabilitation

Further description of each project along with figures and cost estimates are provided in **Section 6**.