C. CONDITION OF FACILITIES

1. Primary Lift Station. Total rainfall, and particularly heavy rainfall event duration, gives rise to extraneous stormwater flow into the wastewater collection system, which in turn places an inordinate high hydraulic load onto the primary lift station. Apparently, the individual pump discharge rate of 550 gpm (792,000 gpd) has been insufficient in transferring all the peak flows to the treatment plant as overflows have occurred at the manhole in the 8-inch sewer just north of the station. Current records from the plant flowmeter indicate the station, with both pumps operating, can deliver 850 gpm (1,224,000 gpd). Earlier, when the pumps were new and not plagued with trash build-up, 1000 gpm was recorded at the plant.

Given that the storage volume in the lift station wet well is limited, it had been contemplated that variable speed controllers (VFD) be acquired and installed for each of the existing 25-hp pump motors. However, considering the average day flow for the period March 2018 through June 2019 to be 150,850 gallon per day (105 gpm), the existing 550 gpm pump would need to operate at such low rpm that velocity in the 8-inch force main would fall below 2 feet per second (at about 320 gpm) and solids would tend to settle in the pipe creating a plugging potential. An alternate arrangement would be the addition of duplex 7.5-hp VFD controlled pumps, each of 150 gpm capacity, in a separate wetwell ahead of the existing wetwell, along with a new 4-inch PVC force main. This addition would allow the station discharge rate to more closely match the dry-weather flow rate to the station. The existing pumps would serve as peak flow back-up pumps to operate when the discharge capacity of the smaller pumps was exceeded or if they failed to operate. With the smaller and one larger pump operating, the station discharge would be 700 gpm (1,00,800 gpd). With four pumps operating in parallel approximately 840 gpm (1,209,600 gpd) would be pumped to the plant.

The station is in need of a trash screen-conveyor-compactor system to remove trash from the raw wastewater and minimize the repeated clogging of the duplex submersible pumps. There is reason to believe that the peak day flows experienced during rain storms tends to flush the sewers of accumulated solids. This creates an inordinate load of solids on the pumps and necessitates frequent unclogging of pumps and cleaning of the wetwell.

The 60 KW standby generator has been repaired and is considered adequate and reliable for the two submersible pumps.

In summary,

- There is need for a trash screen-conveyor-compactor unit in the 12-inch sewer upstream of the lift station.
- The discharge rate of the station should be modified in order to match pump discharge with the variable rate of raw wastewater flow.

2. Treatment Plant. As was stated previously in this report, with the receipt of the engineering evaluation of the plant in 2014 and the implementation of the Compliance Plan in 2015, the City carried out, by force account and contract, numerous improvements and repairs at the treatment plant during the period November 2014 and August 2015. These improvements were intended to enhance operational reliability until a Facility Plan could be prepared setting forth any major improvements seen needed for long-term adequacy.

Currently, the treatment plant can produce an effluent with characteristics well within the NPDES permit limits as long as the raw wastewater influent is below 300,000 gallons per day. There is a lack of sufficient peak flow detention volume and when flows exceed 300,000 gallons per day, the quality of effluent begins to approach the NPDES limits. At peak flows above 300,000 gpd, the operators have no alternative except to turn the aerators and mixers off and use the aeration basins as settling basins. Decant flow is then continuous until the peak flow subsides and the plant can return to a sequencing operation. Peak flows in the upper range can persist for more than one day.

Intake Structure – This fabricated steel, above grade, structure incorporating aerated grit removal, comminution of suspended debris, and a trash screen has deteriorated to such degree that it should be abandoned, removed and replaced with an alternate facility.
SBR Basins – These dual reinforced concrete basins, each with a 1008 sq.ft. water surface area, are without visible deficiency. The piping and aeration system are considered reliable if given timely maintenance, cleaning and repair.
Equalization Tank – This concrete tank, with floating aerator, serves now as both a raw wastewater equalization tank and a holding tank for occasional lime treatment of wasted sludge. The tank is considered without deficiency, while the floating aerator has questionable mixing capability.
Disinfection Chamber – The existing control panel and banks of ultra-violet lamps are obsolete and should be replaced. The building, piping and valves are considered adequate.
In-Plant Pump Station – The wet well with a single 3 hp pump should be enlarged and a second pump added for reliability.
Process Pumping & Aeration – The dual blowers and dual recirculating/mixing pumps are considered adequate for the size of basins served, and are supplemented with spare units.
Sludge Aeration/Storage Basin – The concrete tank is without deficiency although undersized. The floating aerator needs an extended draft tube, but with timely maintenance, the equipment should serve for the next ten years. However, the inability to achieve volatile solids reduction through aeration in a timely manner creates a backlog of stored sludge.
Process Controls – The SCADA and sequencing control system requires periodic examination and upgrade which is an expected aspect of this equipment.
Standby Plant Generator – This unit has a 125 KW capacity and is considered adequate.
Laboratory & Pump Room Building – Aside for periodic maintenance and repair, the building is adequate for its intended use.

In summary,

- The obsolescence and deterioration of the ultraviolet disinfection system is considered a major deficiency as the availability of replacement components becomes problematic.
- The lack of an adequately sized peak flow detention basin is a major deficiency of the plant and severely limits the ability of the plant operators to manage peak flows.
- A more effective method of waste sludge treatment is needed in order to achieve volatile solids reduction.

For sizing a peak flow detention basin, it is recommended that a basin with 6.0 Acre-feet of storage volume (1,955,000 gallons) be provided. With the SBR plant carrying 300,000 gpd of the 1,209,000 gpd lift station maximum discharge, 909,600 gpd could be diverted for two consecutive days.

A record peak flow period, April 26th to May 3rd, 2017 was studied assuming a detention basin had been available. During that eight-day period, 3,257,000 gallons was pumped to the plant which included a peak day of 1,100,000 gpd. 1,160,000 gallons were diverted over three days, April 28th to April 30th. Beginning April 28th, and operating at 300,000 gpd, the daily flows and basin contents were treated, and basin emptied, by May 10th.

3. Collection System. Previous investigations to search out sources of infiltration and inflow of extraneous water disclosed several locations. Corrections were carried out, but some are yet to be corrected.

In reviewing the NPDES Monitoring Reports for the wastewater treatment plant, a series of relationships between recorded rainfall and the daily flow is noted. On days when rainfall is less than 1 inch, the recorded flow for that day and the next day does not change appreciatively from the average. Then, on days when rainfall totals greater than one inch, sufficiently greater wastewater flows are received at the plant. Upon secession of rainfall, the daily flow to the plant rapidly returns to near average rates. As an example, consider the flow vs. rainfall relationship for the period June 9 through June 27, 2019, as reproduced from the monthly Monitoring Report in the table of data on the following page.

Date	Influent Flow, MGD	Rainfall, inches
June 9	0.122	-0-
10	0.130	-0-
11	0.123	1.03
12	0.139	0.17
13	0.122	-0-
14	0.122	-0-
15	0.167	1.76
16	0.312	2.35
17	0.591	0.10
18	0.274	0.93
19	0.302	-0-
20	0.202	-0-
21	0.160	-0-
22	0.150	2.85
23	0.830	0.36
24	0.292	-0-
25	0.195	0.16
26	0.166	-0-
27	0.146	-0-

These data are interpreted to indicate that inflow to the sewers occurs when rainfall is at a level such that surface runoff is generated. As rainfall intensity decreases or ends, influent to the plant also decreases.

In summary,

- There are points in the collection system where surface water is entering and should be readily located through the use of smoke testing and closed-circuit televising.
- Repairs to the collection system are needed to maintain the integrity of the system and to reduce the needless expense of treating extraneous water.

4. Waste Sludge Management. As raw organic matter is received by the plant and is processed, the volume of sludge in the aeration basins increases. Current operating practice requires approximately 7,500 gallons of sludge to be removed from the aeration basins daily during five days of each seven-day week. Thus, waste sludge amounts to 150,000 gallons per month, an amount greater than the 125,000-gallon capacity of the sludge storage tank. Only be timely and rigorous manual decanting of supernatant, plus the use of the 24-foot square equalization basin (69,000 gallons) for batch aeration can the volume of waste sludge be digested to meet the specific oxygen uptake rate (SOUR) limit thereby permitting final disposal by land application.

Assuming waste sludge amounts to 300,000 gallons in two months and 194,000 gallons is the available storage volume, 104,000 gallons of supernatant, 35% of the waste sludge, must be returned to the process. Should the settling characteristics of the sludge diminish, the amount of supernatant that can be removed also diminishes.

Winter temperatures reduce the rate of volatile solids digestion resulting in the need to utilize lime for raising the pH of the sludge above 12 for 24 hours and before sludge may be land applied.

For land application there is available a 1500-gallon tank/truck with high floatation tires. Experience shows that from fifteen to twenty loads per work day may be accomplished thus allowing the 69,000-gallon basin to be emptied in three days.

- There is need for modifications to the existing floating aerator in the large sludge tank to enhance mixing and aeration so as to increase the rate of volatile solids reduction.
- The 24-foot square basin should be dedicated to sludge aeration to increase the available storage/digestion volume. The existing floating aerator should be replaced with a more effective coarse bubble diffuser and air blower system.

A diffused air system would be sized at 30 cfm per 1000 cu.ft. of tank volume. For the 69,000-gallon tank, 9,225 cu.ft. x 30 cfm/1000 cu.ft.= 276.7 cfm, round up to 300 cfm