Water Quality Trends for Port Jefferson Harbor

2021

This report summarizes water quality data for fecal coliform and total coliform in Port Jefferson Harbor for the years 2003-2021.

Prepared by:

Brian M. McCaffrey
Stormwater Management Program Administrator

For:

Incorporated Village of Port Jefferson
121 West Broadway
Port Jefferson, New York 11777

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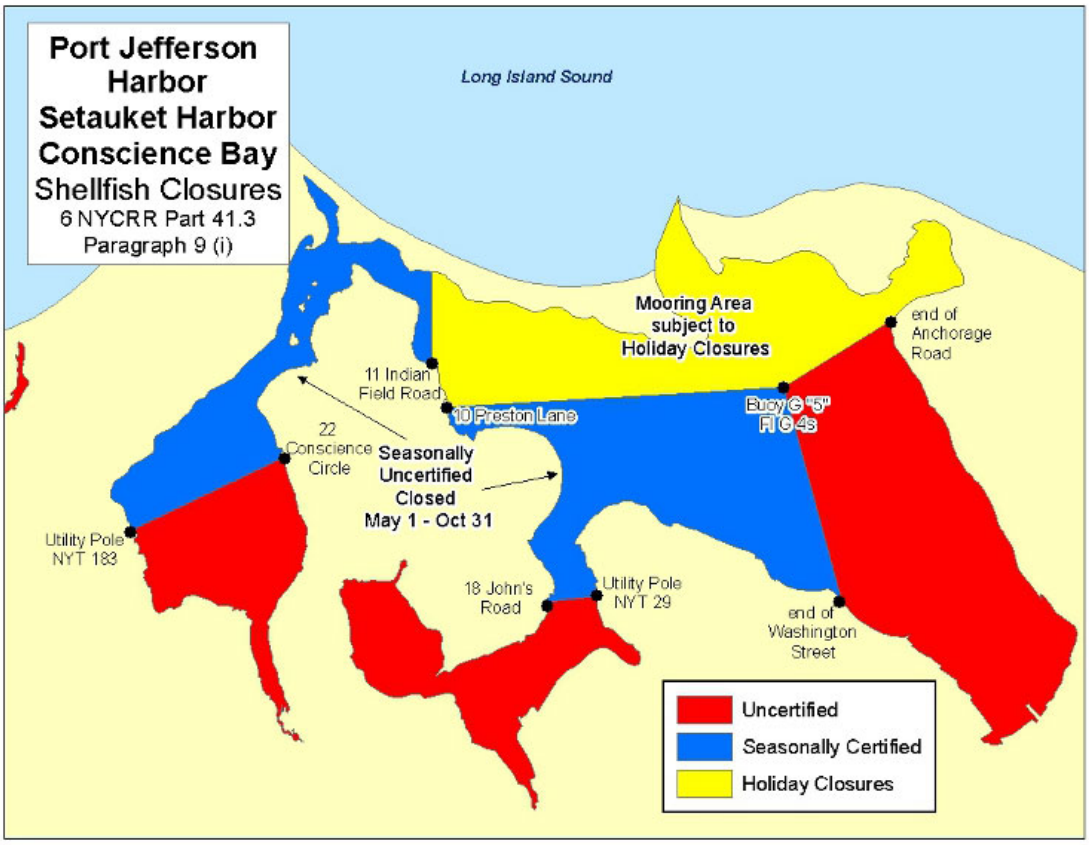
Introduction

The majority of Port Jefferson Harbor has long been closed (uncertified) to shellfishing by the New York State Department of Environmental Conservation (NYSDEC) due to water quality concerns. This area is permanently off-limits to shellfishing due to the proximity to actual or potential sources of pathogenic bacteria from sewage treatment plant outfalls, marinas, and high-density mooring areas. However, it should be noted that the bacteria levels in Port Jefferson Harbor have been trending downward considerably over the past ten-plus years, which have coincided with upgrades to the Port Jefferson sewage treatment plant, the NYSDEC's designation of Port Jefferson Harbor as a No Discharge Zone for boat sewage waste, and the introduction of stormwater management regulations.

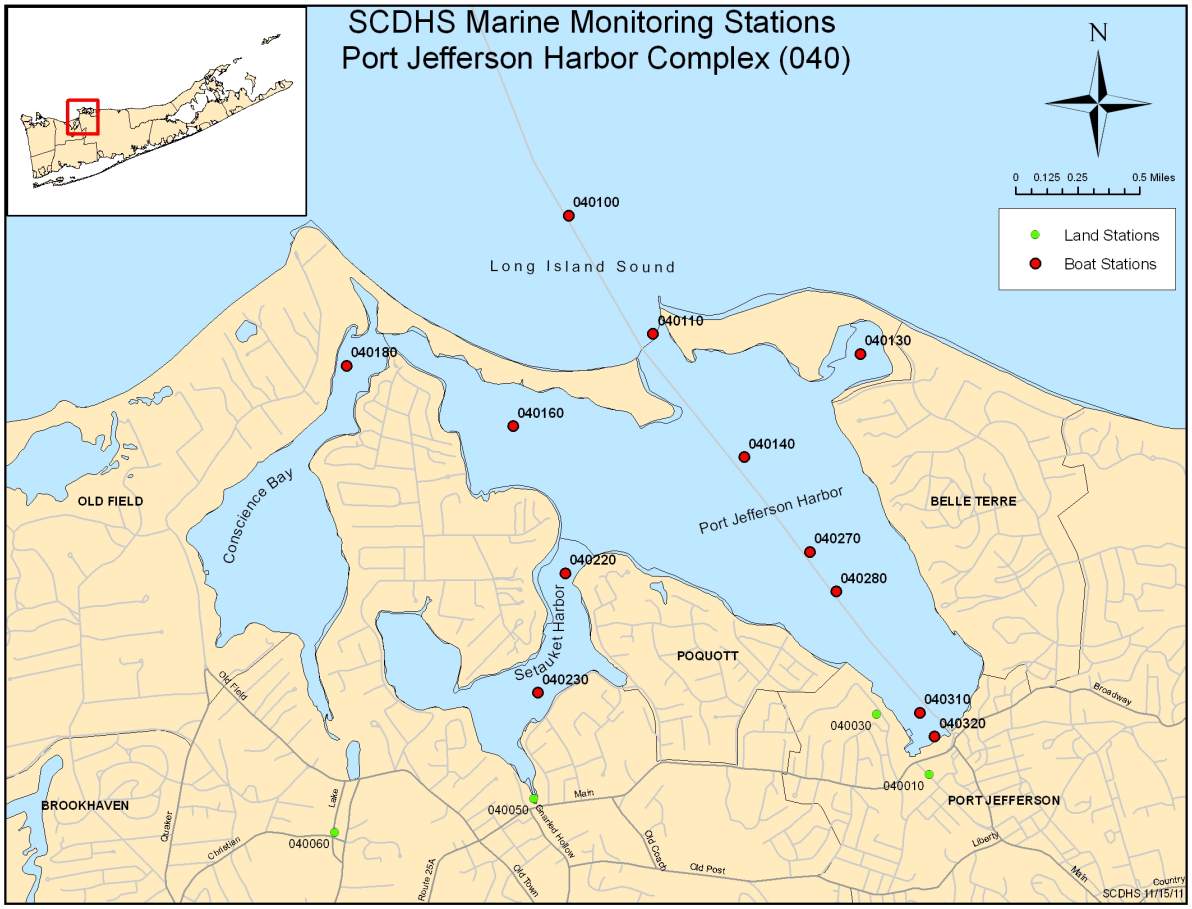


As part of the Village of Port Jefferson's "*Watershed Management Plan for Reducing Pathogen Loading in the Port Jefferson Harbor Complex Management Area*" (2011), the Village of Port Jefferson reviews collected microbiological indicator data to assess progress toward the goals of the Total Maximum Daily Loads (TMDL) for pathogens.

Fecal coliform and total coliform are considered to be microbiological indicator organisms, which are assumed to indicate the presence of pathogenic organisms associated with fecal material from warm blooded animals.

Sample Collection

Water samples are collected from Port Jefferson Harbor by the Suffolk County Department of Health Services (SCDHS) and analyzed for various water quality parameters. Sampling locations are shown below.



For the purposes of this water quality trend report, eight locations were selected for Port Jefferson Harbor. The locations are: 040140, 040270, 040280, 040310, and 040320.

These locations were selected to coincide with the sampling stations that exhibited exceedances for fecal and/or total coliform as presented in the "*Final Report for Shellfish Pathogen TMDLs for 27 303(d)-listed Waters*", prepared by Battelle (2007). It should be noted that the Battelle report listed stations 040140, 040290, 040300, 040305, 040310, and 040320; however, the SCDHS ceased collecting fecal and total coliform samples for stations 290 and 300 after January 31, 2008 and for station 305 after November 10, 2009. Additionally, station 280 was added as a sampling location by the SCDHS in March 2010.

Water Quality Standards

New York State participates in the National Shellfish Sanitation Program (NSSP) which recommends strict bacteriological water quality standards for shellfish harvesting areas to be designated as approved, or certified, for the harvest of shellfish for human consumption. The NSSP standards for fecal coliform and total coliform are as follows:

- Fecal Coliform – The geometric mean of samples shall not exceed 14 MPN / 100 mL
- Fecal Coliform – The 90th percentile value of the samples shall not exceed 49 MPN / 100 mL
- Total Coliform – The geometric mean of samples shall not exceed 70 MPN / 100 mL
- Total Coliform – The 90th percentile value of the samples shall not exceed 330 MPN / 100 mL

Data Analysis Methodology and Results

A 24-year record (1998 – 2021) of fecal coliform and total coliform data was used to calculate the statistical geometric mean ("geomean") and 90th percentile values.

The main benefit of using geometric means for trend charts (see Figures 1 through 6) is that they help smooth out the effects of occasional very high or very low values. It is common in microbiology to use a rolling geometric mean to analyze trends. For this report, data from the previous 30 sampling events are used to create one data point for the rolling geometric mean. A sample size of 30 is typically used in statistical analyses to reduce statistical errors.

The 90th percentile is a measure of statistical distribution. The 90th percentile tells you the value for which 90% of the data points are smaller and 10% are bigger. For this report, data from the previous 30 sampling events are used to create one data point for the rolling 90th percentile. A sample size of 30 is typically used in statistical analyses to reduce statistical errors.

Some of the SCDHS sampling data was expressed as "<20", indicating the minimum detection level. Since the actual measurement is not known, and choosing one would be random and arbitrary, a value of "19.9" was selected.

Some of the SCDHS sampling data was expressed as ">16000", indicating the maximum detection limit. Since the actual measurement is not known, and choosing one would be random and arbitrary, a value of "16001" was selected.

For dates in which two samples were collected in one day (e.g., morning and afternoon), the higher values of the set were used in the analyses.

The most recent 30 sample data points used to generate the geometric mean and 90th percentile data are presented in Table 1 below and are inclusive of data from 2011 to 2020.

Table 1. Summary of Stations for Fecal and Total Coliform – Rolling Data

Station ID	Fecal Coliform (MPN/100 mL)		Total Coliform (MPN/100 mL)		No. of Samples	Effective Date
	Geomean (>14 MPN)	90th Percentile (>49 MPN)	Geomean (>70 MPN)	90th Percentile (>330 MPN)		
040-140	**20.31**	20	21.79	22	30	6/3/21
040-270	**20.64**	20	22.81	40	30	1/7/20
040-280	**22.46**	**22**	28.39	83	30	1/7/20
040-310	**36.20**	**116**	**73.49**	**1300**	30	1/7/20
040-320	**80.53**	**740**	**277.49**	**2640**	30	1/7/20

Notes: Bold values indicate concentrations higher than the NSSP Standards
* - Beginning in 2019, the method detection limit for SCDHS analyses was 18 MPN / 100 mL.

Note: Due to lack of resources during the COVID-19 pandemic, only one fecal coliform sample and one total coliform sample was collected in Port Jefferson Harbor during 2021; this sample was collected from Station ID 040-140.

Water Quality Trends

Trending charts for fecal coliform and total coliform are provided below.

Figure 1. Fecal Coliform Data – Rolling Geometric Mean for Stations 040310 and 040320.

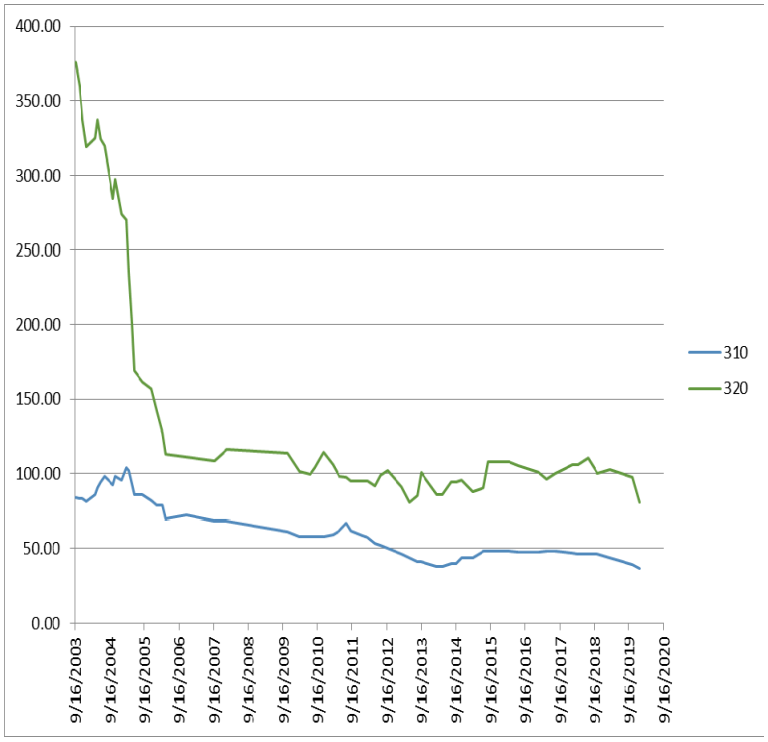


Figure 2. Fecal Coliform Data – Rolling Geometric Mean for Stations 040140, 040270, and 040280.

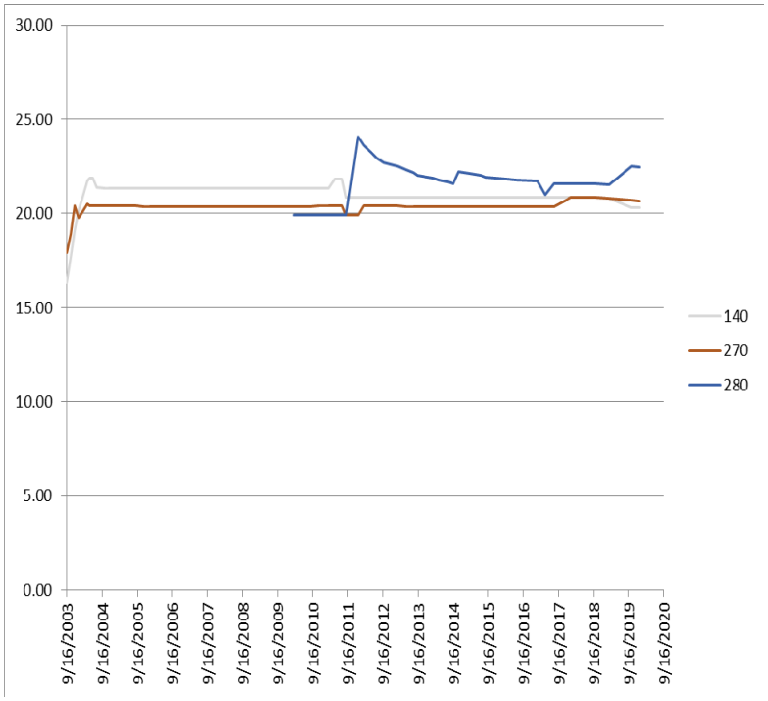


Figure 3. Total Coliform Data – Rolling Geometric Mean for Stations 040310 and 040320.

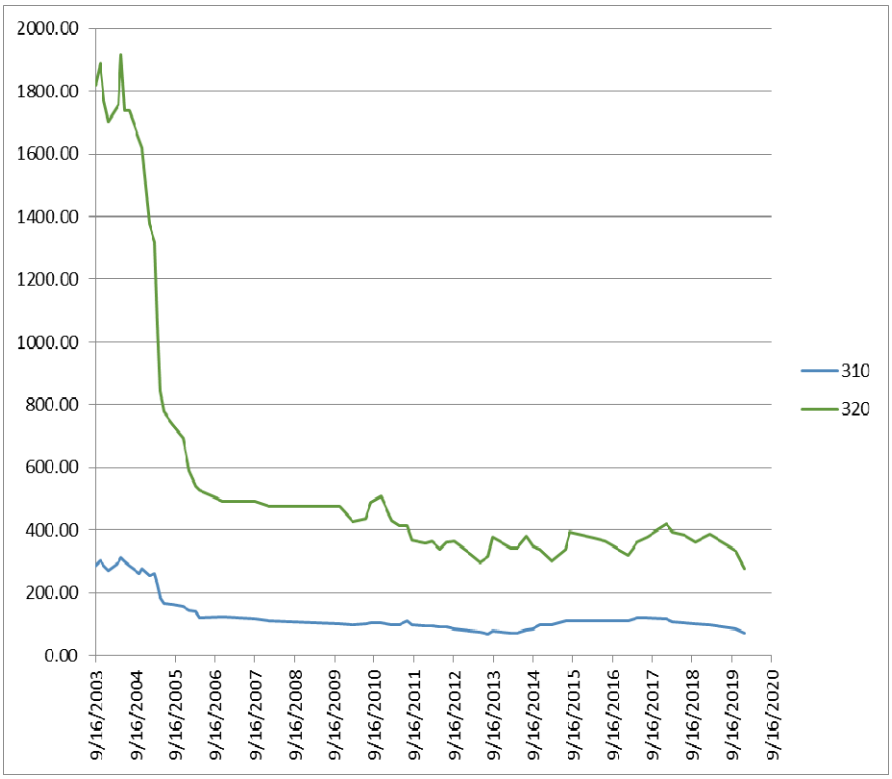


Figure 4. Total Coliform Data – Rolling Geometric Mean for Stations 040140, 040270, and 040280.

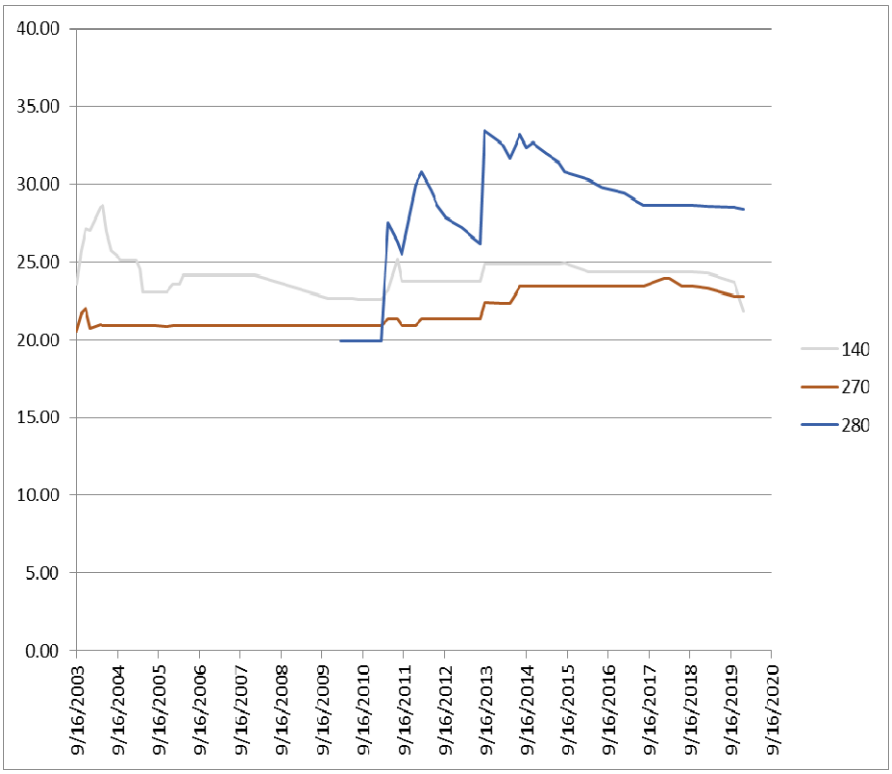


Figure 5. Seasonal Variation at Station 040-320 with Third Order Polynomial Trendline for Fecal Coliform

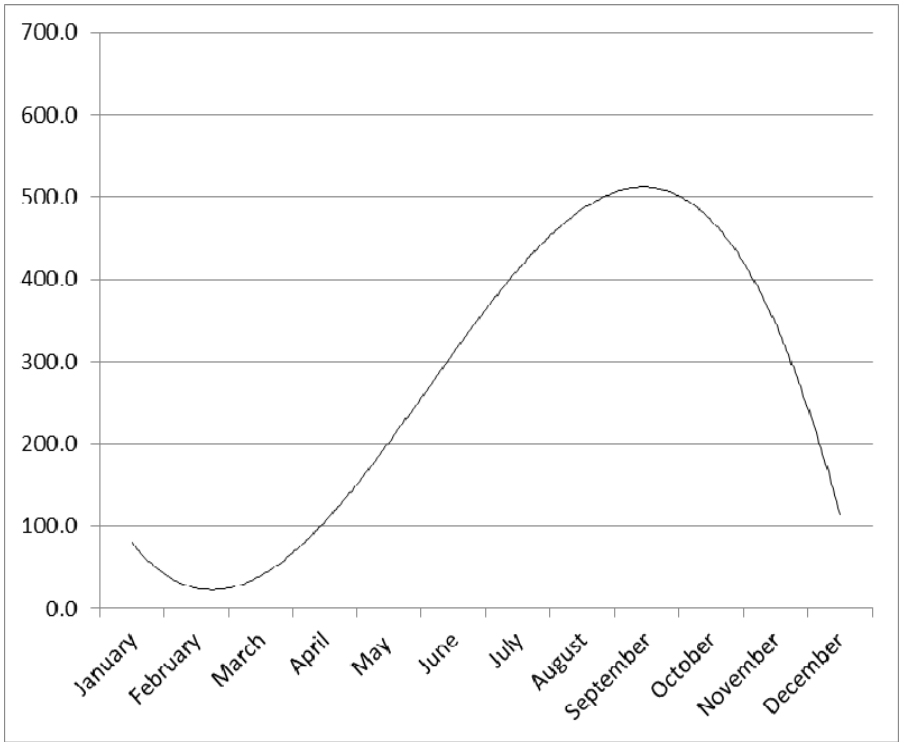
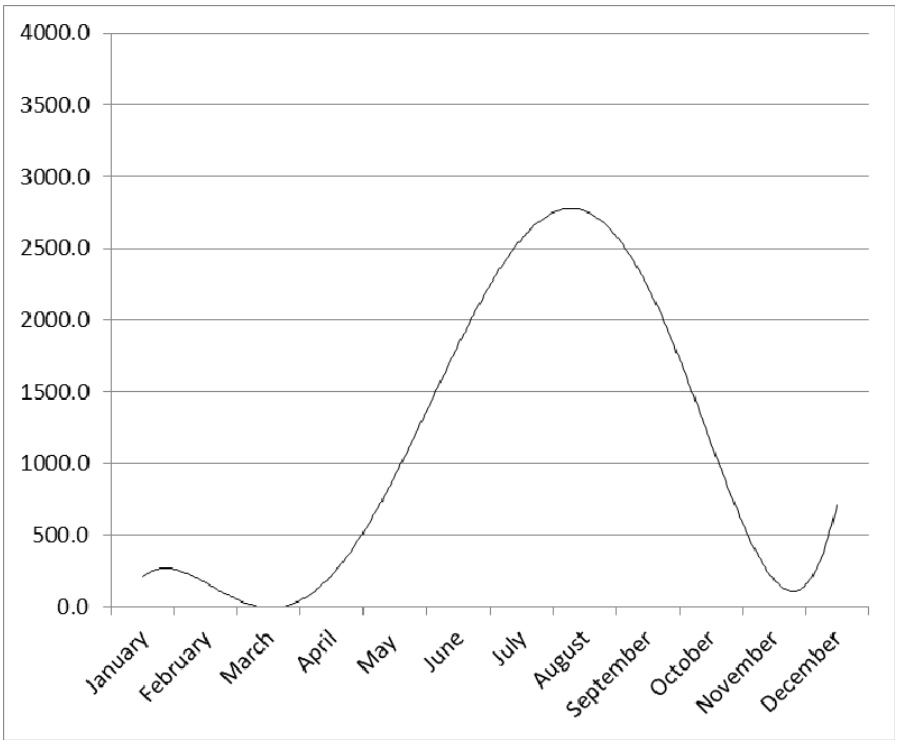


Figure 6. Seasonal Variation at Station 040-320 with Third Order Polynomial Trendline for Total Coliform



Findings and Conclusions

The data illustrates that the concentrations of the bacterial indicator fecal coliform and total coliform have been trending downward at the southern end of Port Jefferson Harbor. Additionally, concentrations of fecal coliform and total coliform in the middle and upper portions of Port Jefferson Harbor have been asymptotically decreasing and approaching the method detection limit of 18 MPN/100 mL. Therefore, the data suggests that the waters of Port Jefferson Harbor, with the exception of the southern end, may meet the National Shellfish Sanitation Program (NSSP) standards for fecal coliform and total coliform.

Seasonality appears to play a strong role in fecal coliform and total coliform concentrations in Port Jefferson Harbor, as illustrated in Figures 5 and 6. The highest precipitation totals typically occur in the winter months / early spring in Port Jefferson, coinciding with the lowest seasonal concentrations of fecal coliform and total coliform in the Harbor. Therefore, wet weather stormwater runoff does not appear to play a role in contributing to fecal and total coliform contamination in the Harbor. However, concentrations of fecal indicators peak in the June to October months corresponding to boating season and drier weather. Therefore, due to the large number of boat slips and moorings in Port Jefferson Harbor, it is plausible that sanitary discharges from boats are a significant source of pathogenic bacteria in the Harbor.

Prior versions of this document (see "Water Quality Trends for Port Jefferson Harbor – 2015) stated that DNA of surface water sample testing in Mill Creek was largely successful in eliminating humans as a source of pathogenic bacteria (from failing septic systems or a leaking sanitary force main) in Mill Creek, and identified the sources of pathogenic bacteria in the Creek as wild waterfowl and domestic dogs.

Based upon the data collected to date, stormwater runoff appears to play a very minor role in contributing pathogenic bacteria to the Harbor; whereas wild waterfowl, domestic dogs, and boaters may play a much more significant role.

The results of the fecal and total coliform data suggest that efforts to reduce pathogen loading in Mill Creek and Port Jefferson Harbor should focus on wildlife management along with an aggressive public education campaign specifically targeting boaters and pet owners.

References

Battelle, 2007. *Final Report for Shellfish Pathogen TMDLs for 27 303(d)-listed Waters*.

Port Jefferson Harbor Complex – Water Quality Protection Committee, 2011. *Watershed Management Plan for Reducing Pathogen Loading in the Port Jefferson Harbor Complex Management Area.*

Suffolk County Department of Health Services (SCDHS), 2021. Surface water quality monitoring data provided by the SCDHS Office of Ecology, Yaphank, N.Y.