

Measuring Total Coliform and E. Coli Levels at Surfside Beach, South Carolina

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Abstract

Coliforms are bacteria that are present in the intestinal track of all humans and other warm-blooded animals, with large numbers being found in feces. E. coli is a species of coliform with specific strains being harmful to humans. E. coli can be the cause of an array of intestinal infections ranging in severity. It is important to test water quality for coliform bacteria to determine if the water being tested has come in contact with fecal matter. The tests conducted for both total coliforms and E. coli were done with Micrology's Coliscan Easygel medium. Between May 27, 2010, and February 9, 2021, 242 samples were collected on 11th Avenue at Surfside Beach. The mean total coliform and E. coli counts are 864.6 CFU/100 mL and 118.9 CFU/100 mL respectively, which are in accordance with USGS and S.C. DHEC water quality standards of 1200 CFU/100 mL and 126 CFU/100 mL.

Background

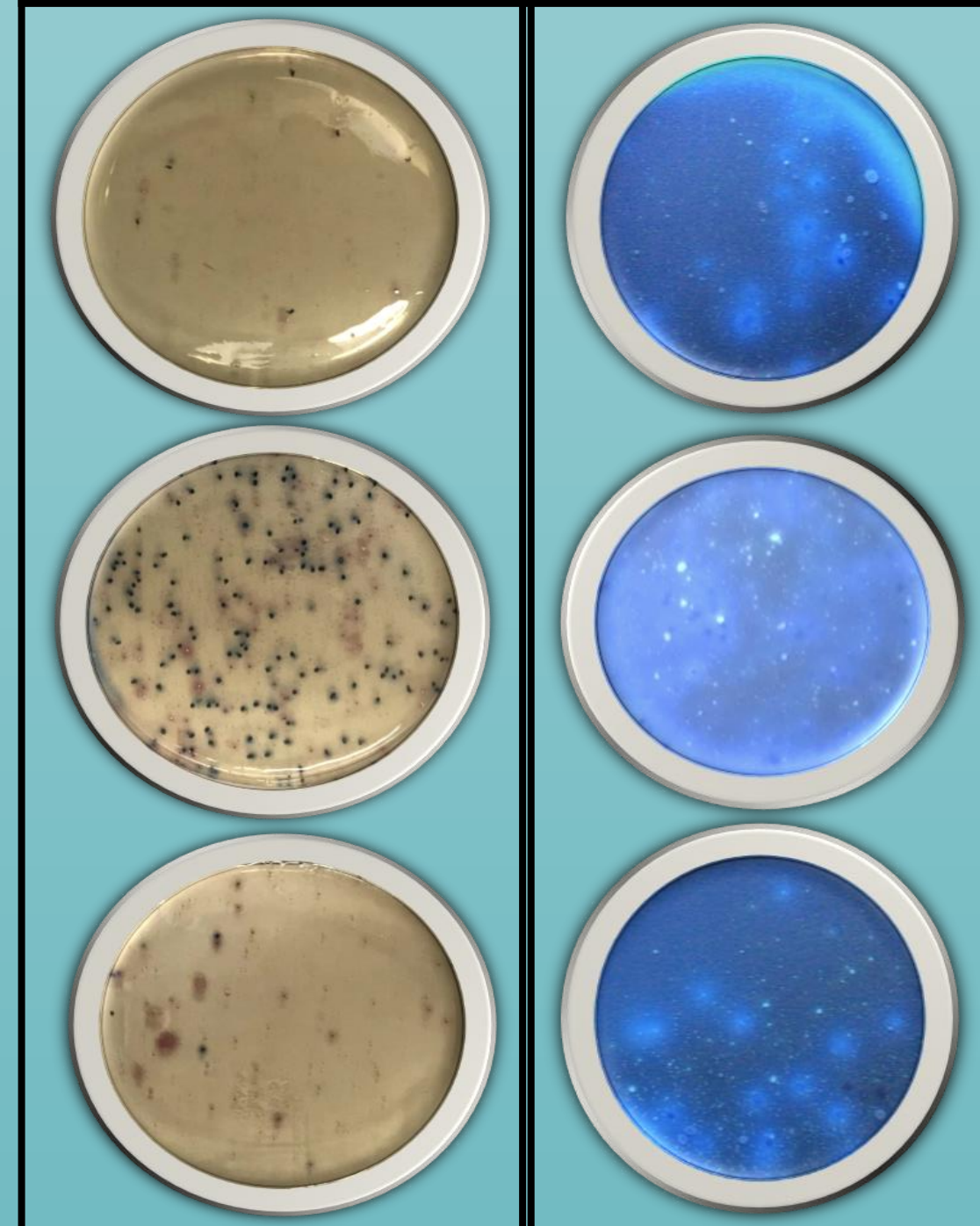
- Coliforms are bacteria that are present in the intestinal track of all humans and other warm-blooded animals, with large numbers being found in feces.
- E. coli is a species of coliform with specific strains being harmful to humans, mostly found in cattle, sheep, chickens, and pigs.
- It is important to test water quality for coliform bacteria to determine if the water being tested has encountered fecal matter.
- Your chances of contracting a water-borne illness increases if there is a presence of coliform bacteria in your water.
- Total coliform water quality standards come informally from the United States Geological Survey (USGS). Waters with Total coliform concentrations greater than 1200 CFU/100 mL are contaminated with respect to pathogens.
- E. coli water quality standards come from South Carolina Department of Health and Environmental Control (S.C. DHEC). S.C. DHEC states that E. coli water samples are not to exceed a geometric mean of 126 CFU/100 mL based on at least four samples over a 30 day period, nor shall a single sample maximum exceed 349/100 mL.

Methods



The tests conducted for both total coliforms and E. coli were done with Micrology's Coliscan Easygel medium.

- Samples of water were collected from 11th Avenue at Surfside Beach and added to the Easygel medium, mixed well, and poured into a sterile Petri dish.
- Dishes were incubated at 35°C for 24 hours.
- Following the 24-hour incubation period, any bacteria present in the water samples would be visible on the petri dishes. Any visible colonies, which would be pink in color, were counted and recorded.
- Under a UV light, any E. coli colonies present in the dish will glow and the number of glowing colonies under the light is the E. coli count.
- The number of pink colonies not under the light, in addition to the glowing colonies, represents total coliforms.



Results

Table 1: Variation of total coliforms over monitoring period at sampling point (measured in CFU/100 mL).

Site Name	# of Samples	Mean	SD	Median	Max	Min	10th	25th	75th	90th
11th Avenue	242	865	1,314	567	10,500	0	100	267	992	1,500

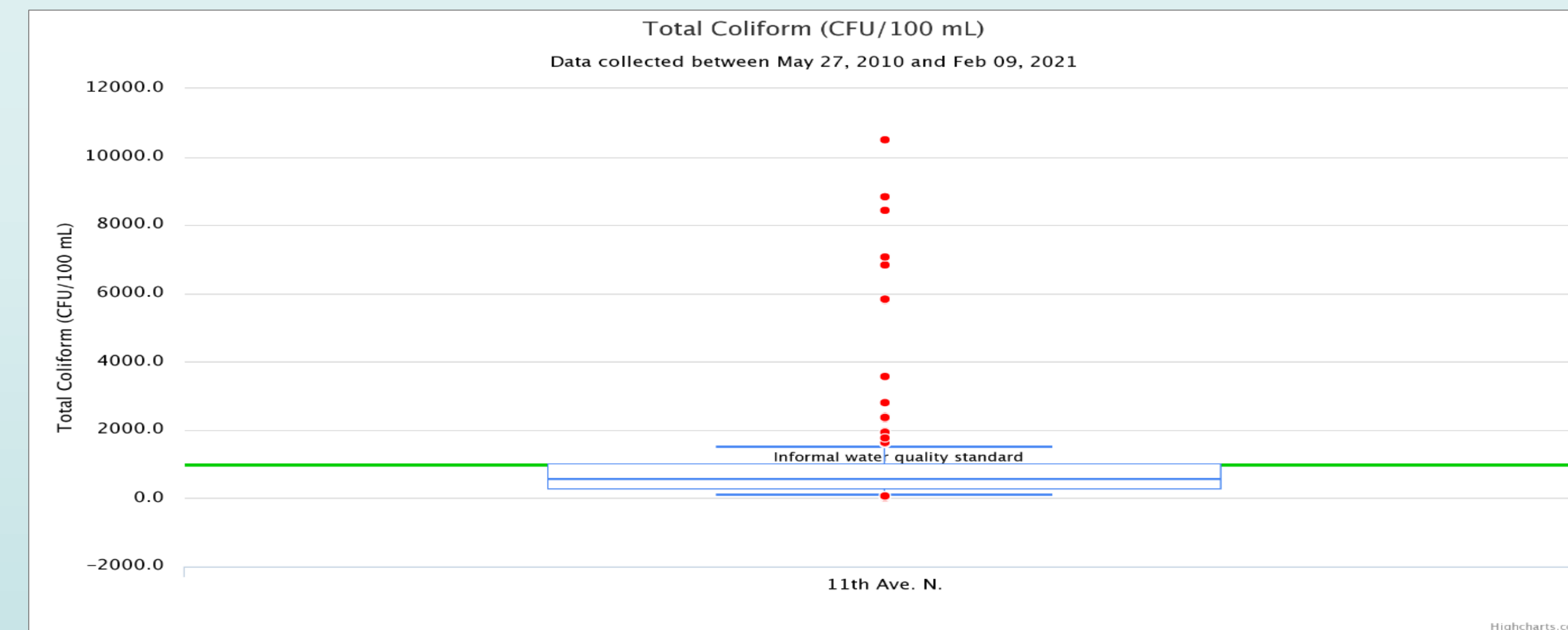


Figure 1: Box plot for total coliforms over monitoring period at sampling point compared to informal water quality standard (green line).

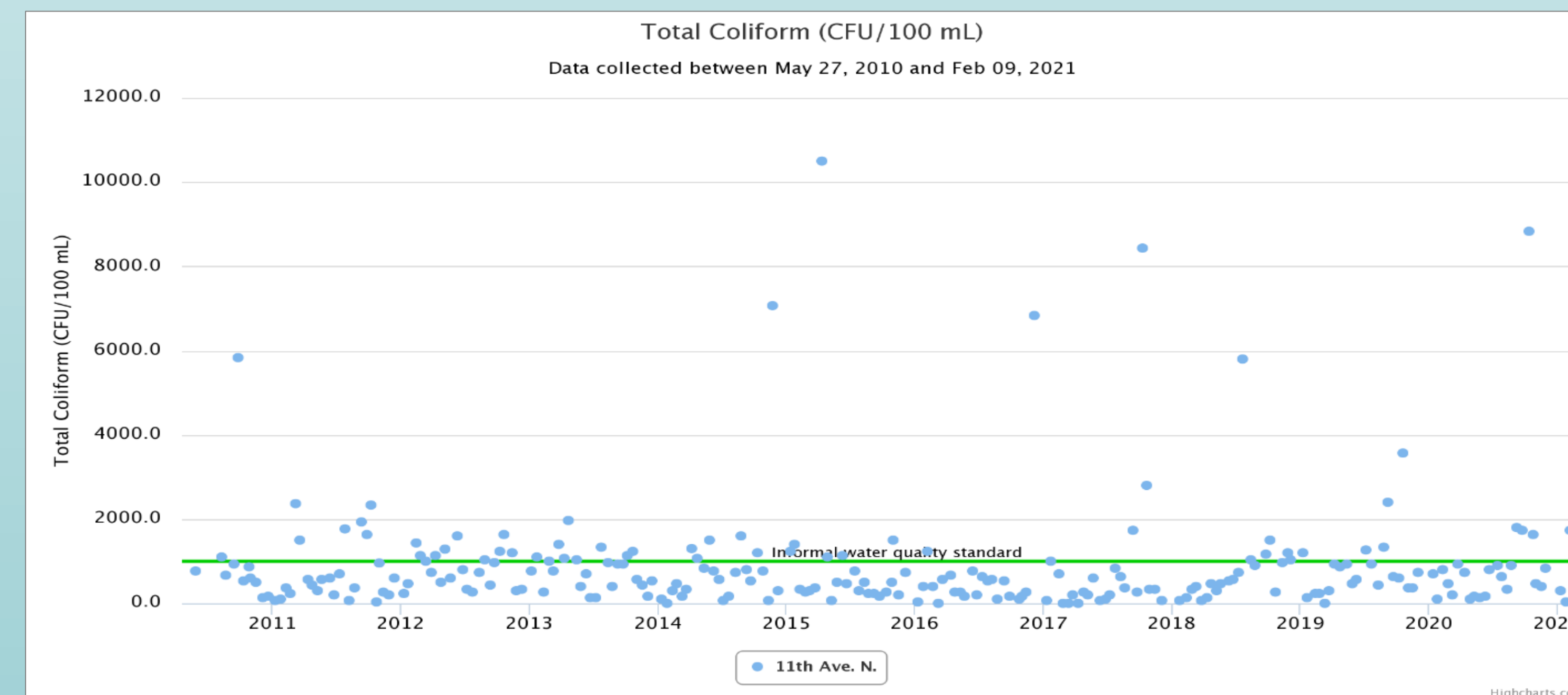


Figure 2: Time trend for total coliforms over monitoring period at sampling point compared to informal water quality standard (green line).

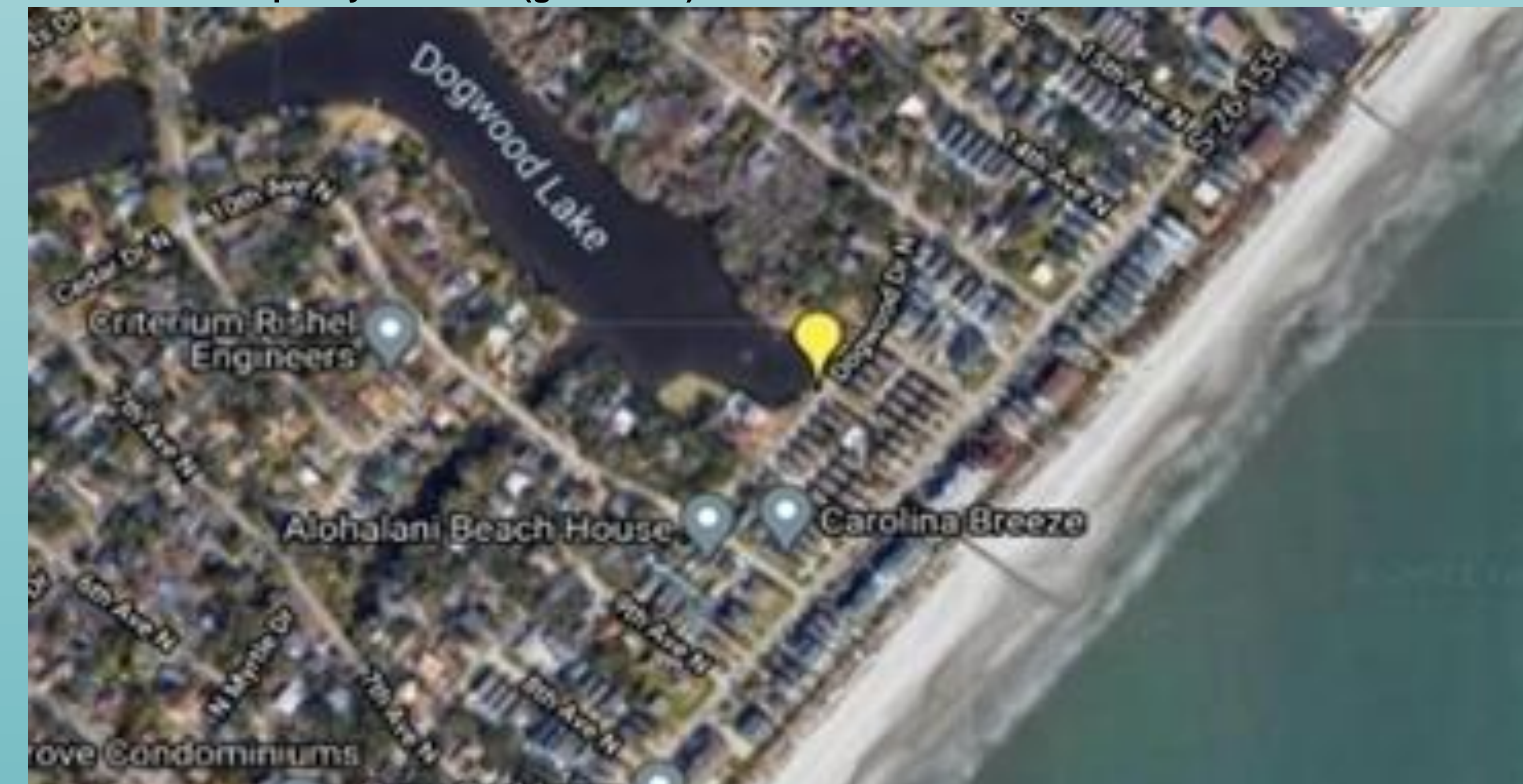


Figure 3: Map of Surfside beach showing 11th Avenue, the site location, as a yellow pin.

Table 2: Variation of E. coli over monitoring period at sampling point (measured in CFU/100 mL).

Site Name	# of Samples	Mean	SD	Median	Max	Min	10th	25th	75th	90th
11th Avenue	242	119	420	33	5,100	0	0	0	100	200

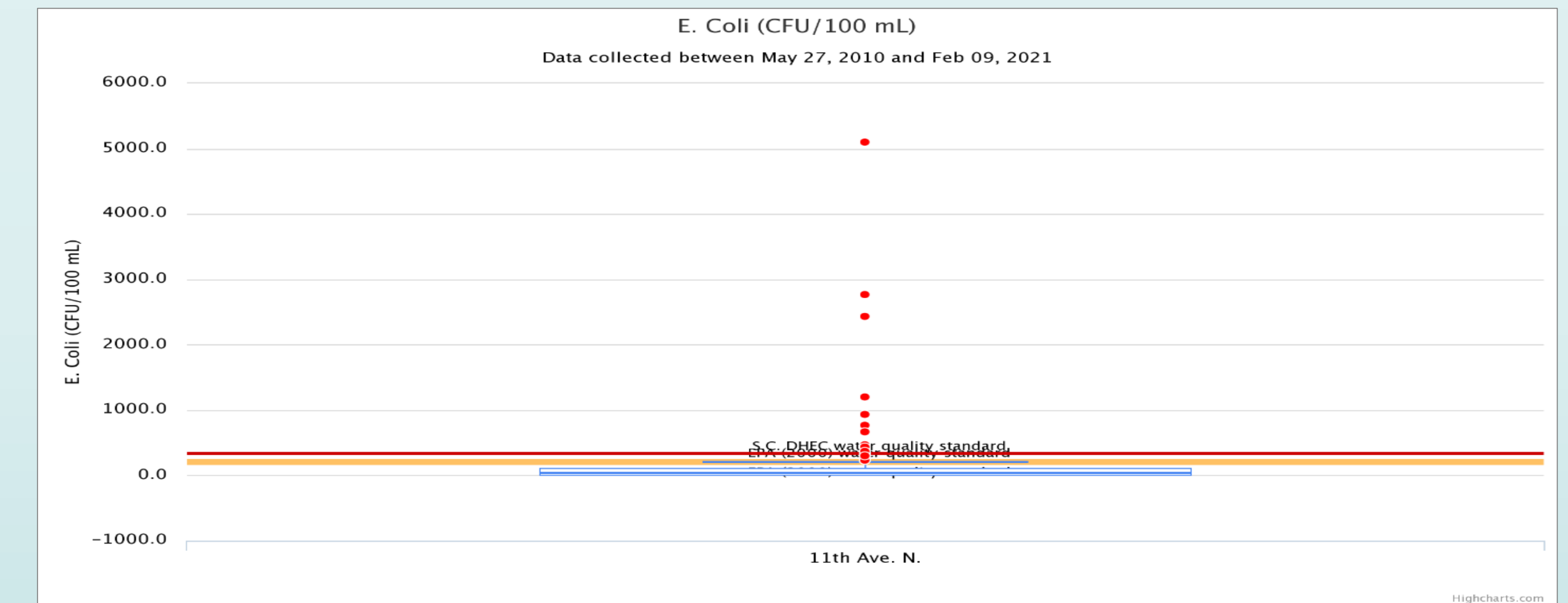


Figure 3: Box plot for E. Coli over monitoring period at sampling point compared to S.C. DHEC water quality standard (red line).

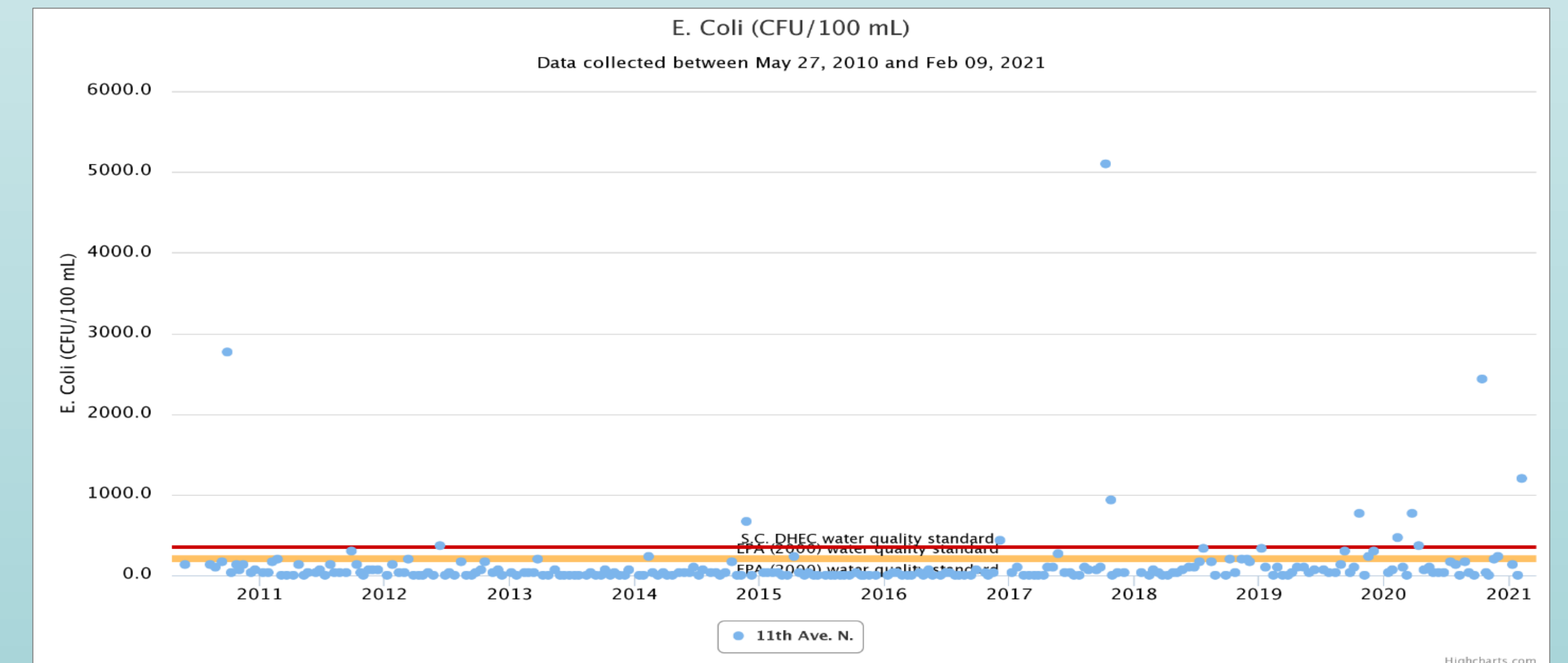


Figure 4: Time trend for E. Coli over monitoring period at sampling point compared to S.C. DHEC water quality standard (red line).

Conclusion

- Each parameter has a mean and median value below the given water quality standard, although there are some outliers in each.
- The data shown above can be used as a good indicator of what is "normal" for the water at 11th Avenue. Because the number of samples above the water quality standard is low, the risk of contracting a water-borne illness is low as well.
- When the quality of water is poor, caution should be taken when swimming and drinking the contaminated water.
- It is important to know the water quality of our beaches and rivers.
- Significantly decreasing your chances of contracting an illness due to poor water quality is as simple as environmental monitoring for indicator microorganisms.
- All information from the graphs and tables are available online for public use and further research at <http://bccmws.coastal.edu/ccum/index.html>.

Acknowledgments: Advisor, Dr. Monica Gray mgray2@coastal.edu