

# Venice Beach Outfall

## Water Quality Monitoring Sarasota County, Florida

### SUBMITTED TO



City of Venice  
401 W. Venice Avenue  
Venice, Florida 34285

### PREPARED FOR



Taylor Engineering, Inc.  
1800 2<sup>nd</sup> Street  
Suite 714  
Sarasota, Florida 34236

### PREPARED BY



301 N. Cattlemen Road  
Suite 105  
Sarasota, FL 34232

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# 1

## Introduction

The City of Venice has multiple stormwater outfalls which discharge partially or untreated stormwater directly into the Gulf of Mexico, Roberts Bay and the Intracoastal Waterway. These outfalls are located on the Island of Venice and are connected to an urban stormwater system that was installed in the 1920's. The persistent red tide off the southwest coast of Florida has generated increased scrutiny of the quality of runoff from these outfalls. The City of Venice has embarked on an aggressive effort to monitor their outfalls, identify pollutant loads and priority outfalls, and develop best management practices (BMPs) to reduce pollutant loading from these priority outfalls.

Taylor Engineering and VHB are developing a GIS based model to generate pollutant load estimates for non-point sources. That the model incorporates the lands use type, soil type, runoff rates, irrigation, septic tanks, and BMPs in a basin to estimate the pollutant load. The model uses estimated pollutant runoff concentrations for the different land use types to calculate, less any removal by BMPs, the pollutant load estimates for non-point sources at all 16 priority outfalls. The City desired water quality samples from each outfall to evaluate the existing water quality, determine areas of concern, and as a comparison to the concentrations anticipated based upon the pollutant load model.

# 2

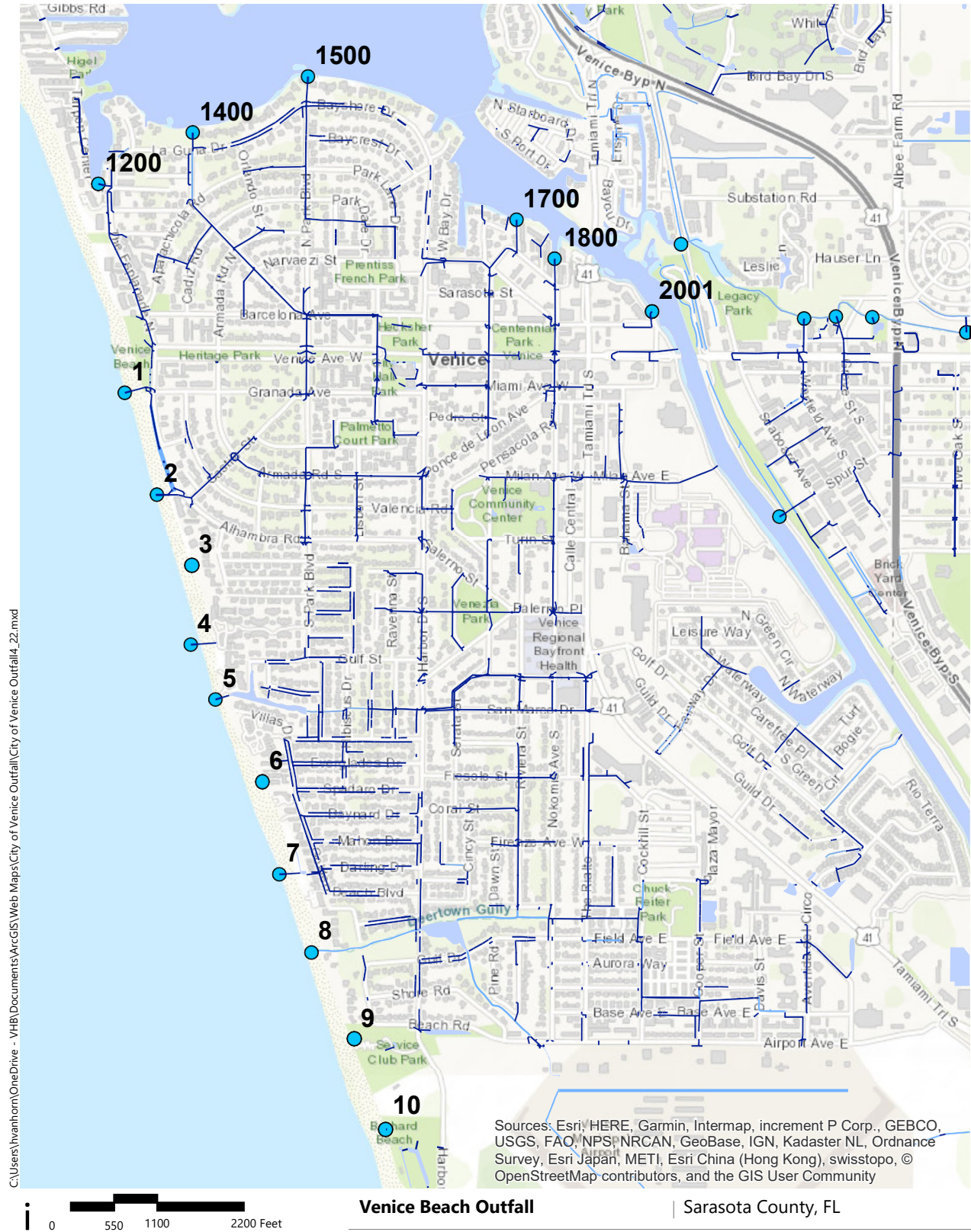
## Station Locations

A total of sixteen (16) priority city outfalls were established as water quality sampling stations to monitor rainfall events for the City of Venice. Ten sites are located on west side of the Island and drain into the Gulf of Mexico (Sites 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10). There are six sites located on the northern and northeastern edge of the Island of Venice, of which five sites drain into Roberts Bay (Sites 1200, 1400, 1500, 1700, and 1800). One station (Site 2001) drains into the Intercoastal Water Way. The stations locations are depicted in **Figure 1**.



April 22, 2019

FIGURE #1



# 3

## Parameters and Methods

### 3.1 Parameters

Water quality sampling was conducted at the 16 designated major outfalls. Sampling occurred during or immediately after rainfall events to maximize the potential for water being discharged. Some of the outfalls did not discharge from a given storm since the stormwater is captured and retained in dry retention systems. Water quality grab samples were collected and analyzed for the following parameters:

- Nitrate/Nitrite Nitrogen
- Ammonia Nitrogen
- Total Kjeldahl Nitrogen
- Total Nitrogen
- Orthophosphorus
- Total Phosphorus
- Turbidity
- Total Suspended Solids
- Fecal Coliform
- Enterococcus

### 3.2 Methods

All surface water grab samples were collected from mid-depth at approximately mid-stream, contingent upon the presence of discernable flow. In-situ measurements were made using a multiparameter water quality sonde that is calibrated according to manufacturer's specifications prior to deployment in the field. Field notes recorded during each sampling event include: water depth and sampling depth, date, time, station name, and initials of sampling team. All collections and analyses are made in accordance with the eighteenth edition of Standard Methods for the Examination of Water and Wastewater (American Public Health Association, 1992) and Methods for the Chemical Analysis of Water and Wastes (USEPA, 1983). Table 1 provides the methods used to collect, handle, store and analyze all samples.

**Table 1. Collection and Analytical Methods to be used during the Venice Beach Outfall Water Quality Monitoring**

Parameter	Sample Type	Field Handling	Hold Time	Laboratory Handling	Analytical Method	Method Reference
Total Coliform Bacteria	Grab	Stored on Ice	30 Hours	Immediate Analysis	Membrane filter	APHA 9222 B
Enterococci Bacteria	Grab	Stored on Ice	8 Hours	Immediate Analysis	Membrane filter	EPA 1600
Ammonia Nitrogen	Grab	H <sub>2</sub> SO <sub>4</sub> to pH <2, Stored on Ice	28 Days	Stored at 4°C	Automated Phenate	EPA 350.1
Nitrate + Nitrite Nitrogen	Grab	H <sub>2</sub> SO <sub>4</sub> to pH <2, Stored on Ice	28 Days	0.45 $\mu$ Filtration Stored at 4°C	Colorimetric Automated Cadmium Reduction	EPA 353.2
Total Organic Nitrogen	Grab	----See Ammonia, Total Kjeldahl----			Calculation	EPA 351-350.1
Total Kjeldahl Nitrogen	Grab	H <sub>2</sub> SO <sub>4</sub> to pH <2, Stored on Ice	28 Days	Stored at 4°C	Colorimetric Automated Block Digestion,	EPA 351.2
Total Nitrogen	Grab	----See Nitrate + Nitrite and Total Kjeldahl Nitrogen ----			Calculation	EPA 353+351
Orthophosphate	Grab	Stored on Ice	48 Hours	Stored at 4°C	Colorimetric Automated, Ascorbic Acid	EPA 365.3
Total Phosphorus	Grab	H <sub>2</sub> SO <sub>4</sub> to pH <2, Stored on Ice	28 Days	Stored at 4°C	Colorimetric Automated Block Digestion,	EPA 365.3
Total Suspended Solids (TSS)	Grab	Stored on Ice	7 Days	Stored at 4°C	Glass Fiber Filtration, Dried at 105EC	APHA 2540D
Turbidity	Grab	Stored on Ice	48 Hours	Stored at 4°C	Nephelometric	EPA 180.1
<i><u>In situ Measurements Performed by VHB</u></i>						
Dissolved Oxygen	<i>In situ</i>	-----	-----	-----	Membrane Electrode	APHA 4500 G
pH	<i>In situ</i>	-----	-----	-----	Electrometric	APHA 4500 H
Temperature	<i>In situ</i>	-----	-----	-----	Thermistor	APHA 2550 B
Specific Conductance	<i>In situ</i>	-----	-----	-----	Wheatstone Bridge	APHA 2510 B

APHA - American Public Health Association, American Water Works Association and Water Pollution Control Federation, 1992. Standard Methods for the Examination of Water and Wastewater, 18th Edition. American Public Health Association.

EPA - U.S. Environmental Protection Agency, 1983. Methods for Chemical Analysis of Water and Wastes, EPA - 600/4-79-020. National Environmental Research Center, Cincinnati, Ohio



# 4

## Results

On January 24 and February 13, 2019, *in-situ* measurements were performed, and surface water quality grab samples were collected at 10 sites for laboratory analysis. Six sites were sampled during the January 24 sampling event, but Beach Outfalls 1, 2, 3, 4, and 5 were not flowing. Sites 2, 5, 8, and 10 were sampled during the February 13 sampling, but no flow or dry conditions were observed at Sites 1, 3, 4, 6, 7, and 9. During a follow-up sampling event on April 19, 2019 after substantial rain, Sites 6, 7, and 9 remained dry or non-flowing, and consequently were not sampled. Analytical results for the water quality sampling and applicable state criteria are provided in **Table 2**.

The results of all *in-situ* measurements and laboratory analysis from the 2019 dry season sampling events are in compliance with applicable State Water Quality Standards as specified under Chapter 62-302, F.A.C with the exception of Total Nitrogen, Total Phosphorus and Enterococcus at almost all the sites. Total Nitrogen (TN) values at most sites exceed the Estuarine Numeric Nutrient Criteria (NNC) of 0.42 mg/L, with Outfall 1800 being the highest at 1.27 mg/L but were all below the freshwater criterion (1.65 mg/L). Total Phosphorus (TP) concentrations almost all exceeded the estuarine NNC (0.18 mg/L), but only Outfall 1800 exceeded the freshwater NNC (0.49 mg/L). For enterococcus, all sites were above the State standard (130 No./100ml), with very high concentrations observed at Outfalls 1200 (6,900 No./100ml), 1700 (6,800 No./100ml), and 2001 (27,000 No./100 ml). Fecal coliform bacteria were above the State standard (800 No./100ml) for 8 of the 10 sites, with the highest concentrations at Outfalls 1700, 2 and 8 (2,700, 5,300 and 2,500 No./ml, respectively). Additionally, at Outfall 1800 the Total Suspended Solids and Turbidity exhibited elevated levels. The high concentrations of suspended particles likely lead to the high TN and TP concentrations recorded at this site and may reflect construction runoff in the basin.

**Table 2. Field Measurements and Analytical Results of Water Quality Grab Samples Collected January 24, February 13, and April 19, 2019.**

Parameter	Stations																62-302, F.A.C. Criteria
	1200	1400	1500	1700	1800	2001	1	2	3	4	5	6	7	8	9	10	
Specific Conductivity (µmhos/cm)	27365	4425	28398	1700	2282	174	-	579	-	-	13004	-	-	1303	-	1151	<150% of background; <1275 µmhos/cm
Salinity (PSU)	14.04	2.41	17.72	1.21	1.18	0.08	-	0.28	-	-	7.58	-	-	0.66	-	0.58	---
pH (pH Units)	8.02	6.79	7.68	8.08	8.41	8.36	-	6.94	-	-	7.36	-	-	6.98	-	7.18	6.0 – 8.5; +/- 1 pH unit of background
Dissolved Oxygen (% Sat)	88.2	74.6	76.6	92.3	97.0	100.1	-	69.1	-	-	68.6	-	-	49.8	-	58.1	>38
Temperature (°C)	18.89	20.95	19.66	20.00	19.73	19.76	-	22.17	-	-	22.41	-	-	20.34	-	19.06	Produce no nuisance conditions
Nitrate/Nitrite Nitrogen (mg/L)	0.472	0.101	0.380	0.094	0.051	0.122	-	0.159	-	-	0.024	-	-	0.196	-	0.315	---
Ammonia Nitrogen (mg/L)	0.008	0.008	0.008	0.008	0.008	0.008	-	0.008	-	-	0.008	-	-	0.008	-	0.008	---
Total Kjeldahl Nitrogen (mg/L)	0.295	0.431	0.311	0.41	1.22	0.181	-	0.767	-	-	0.635	-	-	0.618	-	0.972	---
Total Nitrogen (mg/L)	<b>0.767</b>	<b>0.532</b>	<b>0.691</b>	<b>0.504</b>	<b>1.27</b>	0.303	-	0.926	-	-	0.659	-	-	0.814	-	1.29	0.42 mg/L in estuary, narrative criteria in Gulf
Orthophosphorus (mg/L)	0.106	0.1	0.109	0.051	0.168	0.031	-	0.112	-	-	0.162	-	-	0.114	-	0.139	---
Total Phosphorus (mg/L)	<b>0.227</b>	<b>0.226</b>	<b>0.189</b>	0.166	<b>5.89</b>	0.118	-	0.211	-	-	0.315	-	-	0.218	-	0.250	0.18 mg/L in estuary, narrative criteria in Gulf
Turbidity (NTU)	20	4.8	6.2	24	400	11	-	5.5	-	-	3.0	-	-	3.3	-	2.3	< 29 above natural background conditions
Total Suspended Solids (mg/L)	7.0	4.33	4.33	17.7	93.0	8.00	-	3.67	-	-	6.0	-	-	2.33	-	1.0	---
Fecal Coliform (No./100ml)	<b>1700<sup>B</sup></b>	<b>1600<sup>B</sup></b>	<b>1500<sup>B</sup></b>	<b>2700</b>	<b>1800<sup>B</sup></b>	540	-	<b>5300</b>	-	-	<b>1000</b>	-	-	<b>2500</b>	-	190 <sup>B</sup>	800 colonies/100 ml
Enterococcus (No./100ml)	<b>6900<sup>B</sup></b>	<b>3900</b>	<b>4400</b>	<b>6800<sup>B</sup></b>	<b>4800</b>	<b>27000</b>	-	<b>6400</b>	-	-	<b>4400</b>	-	-	<b>5900</b>	-	<b>2100</b>	130 colonies per 100 ml

<sup>B</sup> – Results based on cell count outside the ideal range.

*Italics* – Analyte was below the shown detection limit.

**Bold** – Violation of State Water Quality Standards (62-302, F.A.C.)