



Rhode Island
Airport Corporation

First Quarter 2023
Outfall and In-Stream Sampling
Rhode Island T.F. Green International Airport

Prepared by:
Rhode Island Airport Corporation

April 2023

Summary of Flow

Flow meters are installed at three of the major outfalls: 002A, 003A, and 008A. Continuous flow measurements during the 12 hours of sampling were made using these Isco 2150 area velocity meters programmed to measure level and velocity at 15 minute increments. No flow meters are installed at minor outfalls or at outfall 010A, as it is off airport property.

Flow meters were not operational for this event. Maximum daily and average monthly flows for outfalls 002A, 003A, and 008A were calculated using hourly depth of precipitation (water equivalent) and drainage area for each outfall. Estimated runoff volumes calculated using drainage area and depth of precipitation for February 28, 2023 for all outfalls are presented in Table 3.

Sample Collection

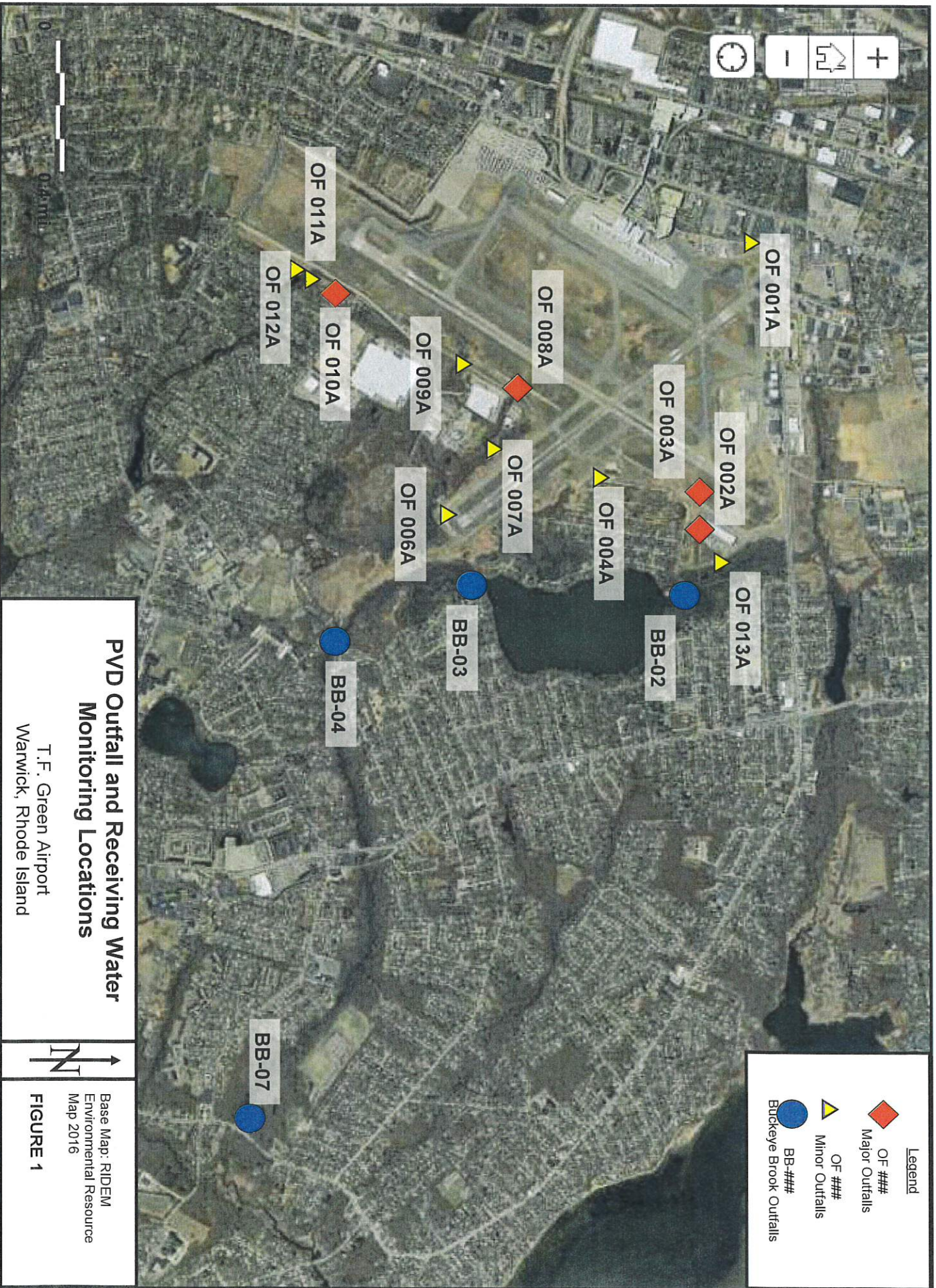
For the First Quarter the major outfalls (002A, 003A, 008A, and 010A) were sampled hourly for twelve hours, beginning at 6:30 AM on February 28, 2023 and continued until approximately 5:45 PM on February 28, 2023. All samples were collected and decanted into sample bottles. The bottles were then placed in ice in a cooler for transport to the laboratory for analysis. Because of the short sample holding time for Fecal Coliform, all samples collected in the first three hours were transported to the laboratory immediately following the third hour of sampling.

In-stream sampling commenced at 9:00 AM February 28, 2023 and continued until approximately 5:50 AM on March 2, 2023. Samples were collected every four hours for 48 hours. During downstream sample collection, no discoloration, foaming, or unusual odors were observed by sampling personnel.

At the major outfalls and in-stream sampling measurements for temperature, pH, and dissolved oxygen (DO), were taken and recorded in the field. Dissolved oxygen percent saturation and specific conductance were also measured at in-stream locations.

Sampling Results

A summary of sampling results for major outfalls are presented in Tables 4 and 5. In-stream sampling results are presented in Tables 6 and 7.



Legend

- OF ### Major Outfalls
- OF ### Minor Outfalls
- BB-### Buckeye Brook Outfalls

**PVD Outfall and Receiving Water
Monitoring Locations**

T.F. Green Airport
Warwick, Rhode Island



Base Map: RIDEM
Environmental Resource
Map 2016

FIGURE 1

TABLE 1
 LABORATORY ANALYTICAL PARAMETERS
 T.F. GREEN AIRPORT
 WARWICK, RHODE ISLAND
 FIRST QUARTER 2023

Sample Identification	Hours 1-3	Hours 4-12
OF-002A, OF-003A, OF-008A, OF-010A	<ul style="list-style-type: none"> • Fecal coliform • BOD, TSS, Surfactants • COD, TOC • Oil & grease -1664 • Propylene glycol • Dissolved Potassium and Sodium • Total Metals (aluminum, chromium, copper, iron, lead, and zinc) 	<ul style="list-style-type: none"> • BOD, surfactants • COD, TOC • Propylene glycol • Dissolved Potassium and Sodium • Total Metals (aluminum, chromium, copper, iron, lead, and zinc)
Sample Identification	Hours 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, and 48	
BB-02, BB-03, BB-04, BB-07	<ul style="list-style-type: none"> • BOD • COD • Propylene glycol 	

Note: Outfalls include field measurements for pH, Specific Conductance, Temperature, and Dissolved Oxygen. BB includes those field measurements plus Specific Conductance and DO % saturation
 BOD -biological oxygen demand
 COD -chemical oxygen demand
 TOC -total organic carbon
 TSS -total suspended solids

TABLE 2
PRECIPITATION AMOUNTS
T.F. GREEN AIRPORT
WARWICK, RHODE ISLAND
FIRST QUARTER 2023

Date	Total Precipitation (water equivalent, in inches)	Snowfall (inches)
February 25, 2023	0.02	0.8
February 26, 2023	0	0
February 27, 2023	0.1	1.2
February 28, 2023	0.53	4
March 1, 2023	T	0
March 2, 2023	0.12	0

Sampling commenced at 06:30 on February 28, 2023

Major outfall sampling ended at 17:45 on February 28, 2023

Buckeye Brook sampling started at 09:00 February 28, 23 and ended at 05:51 on March 2, 2023

**TABLE 3
PVD RUNOFF VOLUME CALCULATION
T.F. GREEN AIRPORT
WARWICK, RHODE ISLAND
FIRST QUARTER 2023**

2/28/2023 Precip (inches): 0.53

Drainage Basin ID	PVD Storm Water Discharge	Receiving Water	Drainage Area (ac)	gal precip
1	Outfall 001A	Warwick Pond	5.9	84,906
2	Outfall 002A	Warwick Pond	93.4	1,344,098
3	Outfall 003A	Warwick Pond	119.8	1,724,014
4	Outfall 004A	Warwick Pond	30.1	433,162
6	Outfall 006A	Buckeye Brook	10.7	153,981
6B	Outfall 006B	Buckeye Brook	1.5	21,586
6C	Outfall 006C	Buckeye Brook	0.8	11,513
6D	Outfall 006D	Buckeye Brook	0.7	10,074
7	Outfall 007A	Buckeye Brook	9.6	138,151
7B	Outfall 007B	Buckeye Brook	1.2	17,269
8	Outfall 008A	Buckeye Brook	240.6	3,462,420
9	Outfall 009A	Buckeye Brook	38.4	552,606
10	Outfall 010A	Tuscatucket Brook	26	374,160
11	Outfall 011A	Tuscatucket Brook	14	201,471
12	Outfall 012A	Tuscatucket Brook	46.4	667,732
13	Outfall 013A	Warwick Pond	28	402,942
			667.1	9,600,084

**TABLE 4
ANALYTICAL RESULTS
MAJOR OUTFALLS
T.F. GREEN AIRPORT
WARWICK, RHODE ISLAND
FIRST QUARTER 2023**

Parameter	Major Outfalls							
	Outfall 002A		Outfall 003A		Outfall 008A		Outfall 010A	
	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily
Flow (gpd) ^{1,8}	1,141,215	2,434,593	1,463,786	3,122,743	2,939,790	6,271,553	317,683	677,724
Oil & Grease (mg/l) ⁵		ND		ND		0.56		0.9
TSS (mg/l) ^{4,5}	3.2	5.7	6.0	8.0	4.6	6.7	8.8	13.0
Fecal Coliform (MPN/100ml) ^{7,5}	1.8	1.8	10.19	23.0	2.35	4.0	3.04	7.8
BOD ₅ (mg/l) ^{2,6}	42.5	99	5.8	17	81.7	219	15.1	101
Propylene Glycol (mg/l) ^{2,6}	21.8	66	ND	ND	85.4	330	31.2	180
COD (mg/l) ^{2,6}	72.4	180	20.4	68	220.6	770	75.4	440
Dissolved Potassium (mg/l) ^{2,6}	7.50	11.00	4.39	5.80	6.54	10.00	9.36	12.00
Dissolved Sodium (mg/l) ^{2,6}	214.18	570.00	19.71	77.00	1407.46	2500.00	211.43	1300.00
Surfactants (ug/l) ^{2,6}	226.4	1300	129.1	1800	235.1	360	35.6	220
Dissolved Oxygen (mg/l) ^{2,3}	9.66	11.51	8.57	10.34	8.98	11.00	7.18	7.79
TOC (mg/l) ^{2,6}	21.21	50.0	4.61	11.0	53.36	190.0	22.89	130.0
Total Aluminum (ug/l) ^{2,6}	77.4	160	99.9	310	205.5	450	46.4	210
Total Chromium (ug/l) ^{2,6}	ND	ND	ND	ND	1.38	2.6	0.12	1.6
Total Copper (ug/l) ^{2,6}	ND	ND	ND	ND	ND	ND	ND	ND
Total Iron (mg/l) ^{2,6}	2.23	4.8	5.08	11.00	2.12	3.00	2.22	4.50
Total Lead (ug/l) ^{2,6}	ND	ND	3.7	13	0.78	1.8	0.12	1.5
Total Zinc (ug/l) ^{2,6}	3.6	14	12.6	33	20.6	49	1.3	30

¹ Results reported as average monthly were determined using the arithmetic average of measurement made every 15 minutes during the 12 hours of sampling. Results reported as maximum daily was the maximum flow measurements over the 12 hours of sampling. Both reported values were converted from GPM to GPD reflecting a 24 hour day

² Results reported as maximum daily were the maximum of the 12 samples collected during the 12 hours of sampling.

³ Results reported as average monthly were determined using the arithmetic average of the 12 samples collected during the 12 hours of sampling.

⁴ Results reported as average monthly were determined using the arithmetic average of the 3 samples collected (when available) during the first 3 hours of sampling.

⁵ Results reported as maximum daily were the maximum of the 3 samples collected (when available) during the first 3 hours of sampling

⁶ Results reported as average monthly were determined by using a flow-weighted average of the 12 samples collected during the 12 hours of sampling.

⁷ Results reported as average monthly were determined by using a geometric mean of the 3 samples collected (when available) during the 3 hours of sampling

⁸ Outfall 010A does not have a flow meter installed. Therefore, flow was calculated arithmetically utilizing the Outfall drainage area, storm intensity, and duration.

BOD₅ Biological oxygen demand 5-day test

COD Chemical oxygen demand

TOC Total organic carbon

TSS Total suspended solids

gpd gallons per day

mg/l milligrams per liter

ug/l micrograms per liter

ND - Non-Detect

TABLE 5
FIELD ANALYTICAL RESULTS
MAJOR OUTFALLS
T.F. GREEN AIRPORT
WARWICK, RHODE ISLAND
FIRST QUARTER 2023

Parameter	Major Outfalls									
	Outfall 002A		Outfall 003A		Outfall 008A		Outfall 010A			
	Minimum Daily ¹	Maximum Daily ²	Minimum Daily ¹	Maximum Daily ²	Minimum Daily ¹	Maximum Daily ²	Minimum Daily ¹	Maximum Daily ²		
pH	6.47	7.02	6.62	7.21	6.54	6.87	6.43	7.16		
Temperature (°F)		49.4		52.7		48.3		48.2		

Bold text indicates exceedance of permit standards

Reported values are from laboratory analysis. Field pH measurements were taken but not used for this report

¹ results reported as minimum daily were the minimum of the samples collected during the 12 hours of sampling.

² results reported as maximum daily were the maximum of the samples collected during the 12 hours of sampling.

TABLE 6
ANALYTICAL RESULTS
BUCKEYE BROOK
T.F. GREEN AIRPORT
WARWICK, RHODE ISLAND
FIRST QUARTER 2023

Parameter	BB-02		BB-03		BB-04		BB-07	
	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily
Conductivity (umhos/cm) ^{1,2}	737.2	2,586.0	288.3	368.9	496.7	1,102.0	574.7	957.9
BOD ₅ (mg/l) ^{1,2}	5.7	8.9	4.0	4.8	7.2	20.0	5.5	10.0
COD (mg/l) ^{1,2}	18.4	28	16.2	21	24.8	47	21.8	44
Dissolved Oxygen (mg/l) ^{1,2}	9.79	12.09	12.29	13.11	10.46	12.58	10.80	12.53
Dissolved Oxygen Saturation (%) ^{1,2}	77.3	93.4	91.5	99.3	80.3	96.7	83.1	97.8
Propylene Glycol (mg/l) ^{1,2}	ND	ND	ND	ND	ND	ND	ND	ND

¹ Results reported as average monthly were determined using the arithmetic average of measurements made every 4 hours during the 48 hours of sampling.
² Results reported as maximum daily were the maximum samples collected every 4 hours during the 48 hours of sampling.
 BOD₅ Biological oxygen demand 5-day test
 COD Chemical oxygen demand
 mg/l milligrams per liter
 ND - Non-Detect

TABLE 7
 FIELD ANALYTICAL RESULTS
 BUCKEYE BROOK
 T.F. GREEN AIRPORT
 WARWICK, RHODE ISLAND
 FIRST QUARTER 2023

Parameter	BB-02		BB-03		BB-04		BB-07	
	Minimum Daily ¹	Maximum Daily ²	Minimum Daily ¹	Maximum Daily ²	Minimum Daily ¹	Maximum Daily ²	Minimum Daily ¹	Maximum Daily ²
pH	6.07	7.30	6.07	7.34	5.54	7.11	6.18	7.27
Temperature (°F)		53.5		48.3		51.0		48.6

Bold text indicates exceedance of permit standards

¹ Results reported as average monthly were determined using the arithmetic average of measurement made every 4 hours during the 48 hours of sampling. Results reported as maximum daily was the maximum flow measurements over the 12 hours of sampling.
² Results reported as maximum daily were the maximum of the 12 samples collected during the 48 hours of sampling.