



# **Rhode Island**

T. F. Green International Airport

**Second Quarter 2022**

**Outfall Sampling**

Prepared by:  
Rhode Island Airport Corporation

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## **Background**

The RIPDES permit identifies a total of 16 perimeter outfalls at PVD. Outfalls 001A, 002A, 003A, 004A and 013A discharge to tributaries of Warwick Pond. Outfalls, 006A, 006B, 006C, 006D, 007A, 007B, 008A and 009A discharge to tributaries of Buckeye Brook downstream of Warwick Pond. Outfalls 010A, 011A, and 012A discharge to Tuscatucket Brook. Major outfalls, 002A, 003A, 008A, and 010A, are those outfalls which receive or may receive drainage from areas where aircraft deicing fluid is applied. Sampling for these major outfalls is defined at Part I.A.1 of the permit. Minor outfalls drain taxiways, runways and other paved services. Outfall 005A was combined with Outfall 006A during construction of Runway 34 Safety Area Improvements. Sampling for these minor outfalls is defined at Part I.A.2. of the permit. Additional sampling requirements are defined at Part I.A.5. and Parts I.C. and I.D. Table 1 lists parameters sampled. Figure 1 identifies outfall and in-stream sampling locations.

Industrial activities at PVD with the potential to impact stormwater quality include the use of glycol-based Aircraft Deicing and Anti-icing Fluids (ADFs/AAFs) and pavement deicers. Only propylene glycol (PG)-based ADFs/AAFs are used at PVD. Pavement deicers used at PVD include solid sodium formate, and liquid potassium acetate. No aircraft or pavement deicing material was applied during this event.

## **Summary of Storm**

Second Quarter (April 1 through June 30) sampling includes the major outfalls (002A, 003A, 008A and 010A) hourly for twelve hours, and minor outfalls (001A, 004A, 006A, 007A, 009A, 011A, 012A and 013A) hourly for the first three hours. The sampling began upon a precipitation event of sufficient magnitude as specified in the RIPDES permit.

Light rain began falling around 2:00 AM on June 8, 2021. Sampling commenced at 7:00 AM subsequent to measurable accumulation and continued until approximately 6:30 PM June 8, 2021.

A total of 0.75 inches of precipitation (as water equivalent) was measured at PVD during this event. Precipitation data is summarized in Table 2.

## **Summary of Flow**

Flow meters are installed at three of the major outfalls: OF-002A, OF-003A, and OF-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 and produce flow rate (GPM) at 15 minute increments. No flow meters are installed at minor outfalls or at outfall 010A, as it is off airport property.

Maximum daily and average monthly flows for the major outfalls were calculated and are presented in Table 3. Maximum daily and average monthly flows for the minor outfalls were calculated and are presented in Table 5. Estimated runoff volumes calculated using drainage area and depth of precipitation for all outfalls are presented in Table 7.

## **Sample Collection**

The laboratory analytical parameters for each sample for this event are listed in Table 2. For the Second Quarter sampling event the major outfalls (002A, 003A, 008A, and 010A) were sampled hourly for twelve hours. There was no observed flow in the last four hours of sampling at Outfall 010A. The major outfall sampling results can be found in Tables 3 and 4.

The minor outfalls (001A, 004A, 006A, 007A, 009A, 011A, 012A, and 013A) were also sampled for the first three hours of the event. There was no observed flow at Outfalls 006A, 007A, 009A, 011A, and 013A. The minor outfall sampling results can be found in Tables 5 and 6.

Samples were collected and decanted into sample bottles based on the analysis necessary. The bottles were then placed on ice in a cooler for transport to RIAL. Because of the short sample holding time (six hours) for some of the analytical parameters, all samples collected in the first three hours were delivered to the laboratory immediately. Samples collected in hours four through 12 were delivered at the completion of sampling.

RIAC also collected and recorded field measurements at each outfall for temperature, pH, specific conductance, and dissolved oxygen (DO).

## **Sampling Results**

Tables 3-6 present a summary of field measurements and analytical results expressed as monthly average and maximum daily concentrations for both the major and minor outfalls. Table values presented as zero reflect data that was non-detect. Temperature and Oil and Grease are expressed as maximum daily only. pH is expressed as minimum daily and maximum daily.



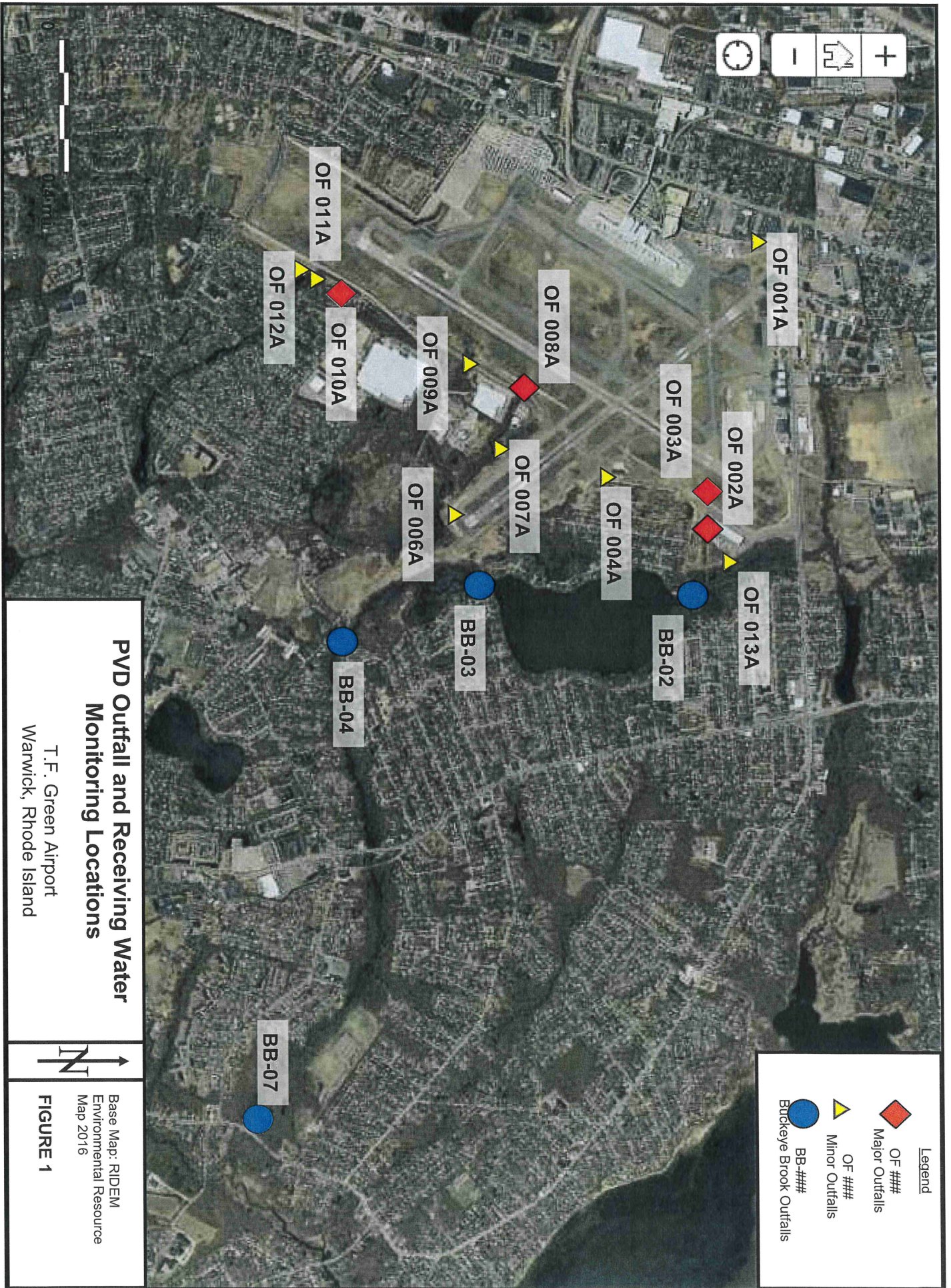


TABLE 3  
ANALYTICAL RESULTS  
MAJOR OUTFALLS  
T. F. GREEN AIRPORT  
WARWICK, RHODE ISLAND  
SECOND QUARTER 2022

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	Average Monthly	Maximum Daily
Flow (gpd) <sup>1, 8</sup>	3,804,051	21,302,687	4,879,286	27,324,003	9,799,301	54,876,086	12,707,136	12,707,136		
Oil & Grease (mg/l) <sup>5</sup>		0.8		0.5		1.8		1.5		
TSS (mg/l) <sup>4, 5</sup>	22.5	29	4.00	9.0	6.7	16	15.6	27		
Fecal Coliform (MPN/100ml) <sup>7, 5</sup>	52	2,200	336	5,400	24	3,500	537.0	5400		
BOD <sub>5</sub> (mg/l) <sup>2, 6</sup>	1.8	5.3	2.30	11	0.60	3.4	1.40	4.1		
Propylene Glycol (mg/l) <sup>2, 6</sup>	ND	ND	ND	ND	ND	ND	ND	ND		
COD (mg/l) <sup>2, 6</sup>	24.2	28	25.4	32	19.9	26	23.8	31		
Dissolved Potassium (mg/l) <sup>2, 6</sup>	2.811	4.000	2.820	5.580	1.777	4.640	4.255	6.200		
Dissolved Sodium (mg/l) <sup>2, 6</sup>	2.061	7.600	3.302	19,000	8.379	32,800	6.728	16,000		
Surfactants (ug/l) <sup>2, 6</sup>	196	300	242.0	460	106.0	280	128	320		
Dissolved Oxygen (mg/l) <sup>2, 3</sup>	6.53	6.92	6.75	7.32	6.22	6.73	4.95	6.41		
TOC (mg/l) <sup>2, 6</sup>	5.32	6.4	5.60	6.8	3.30	4.2	4.74	6.1		
Total Aluminum (ug/l) <sup>2, 6</sup>	103	220	26.0	150	103.0	250	111	450		
Total Chromium (ug/l) <sup>2, 6</sup>	ND	ND	0.70	5	0.90	2	1.3	5.4		
Total Copper (ug/l) <sup>2, 6</sup>	2.6	10.7	2.1	12	1.8	10.4	ND	ND		
Total Iron (mg/l) <sup>2, 6</sup>	3.39	10.4	0.57	1.56	1.59	3.05	1.12	1.80		
Total Lead (ug/l) <sup>2, 6</sup>	1.20	3.8	0.40	2.5	0.3	1.5	1.2	4.8		
Total Zinc (ug/l) <sup>2, 6</sup>	ND	ND	ND	ND	ND	ND	ND	ND		

<sup>1</sup> 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

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

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

<sup>4</sup> Results reported as average monthly were the maximum of the 3 samples collected (when available) during the first 3 hours of sampling.

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

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

<sup>7</sup> 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

<sup>8</sup> Outfall 010A: Results reported as average monthly were determined using the arithmetic average of rainfall amount during the entire storm for the outfall drainage area. Results reported as maximum daily was determined from maximum rainfall measurement for the duration of the storm for each outfall drainage area.

BOD<sub>5</sub> - Biological oxygen demand 5-day test  
 COD - Chemical oxygen demand  
 gpd - Gallons per day  
 mg/l - Milligrams per liter  
 TOC - Total organic carbon  
 TSS - Total suspended solids  
 ug/l - Micrograms per liter

TABLE 4  
 FIELD ANALYTICAL RESULTS  
 MAJOR OUTFALLS  
 T.F. GREEN AIRPORT  
 WARWICK, RHODE ISLAND  
 SECOND QUARTER 2022

Parameter	Major Outfalls							
	Outfall 002A		Outfall 003A		Outfall 008A		Outfall 010A	
	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>
pH	6.40	6.60	6.30	6.90	6.40	6.70	6.10	6.40
Temperature (°F)		66.4		65.9		66.7		67.2

**Bold text** indicates exceedance of permit standards

<sup>1</sup> Results reported as minimum daily were the minimum of the samples collected during the 12 hours of sampling.

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



TABLE 5  
ANALYTICAL RESULTS  
MINOR OUTFALLS  
T.F. GREEN AIRPORT  
WARWICK, RHODE ISLAND  
SECOND QUARTER 2022

Parameter	Minor Outfalls															
	Outfall 001A		Outfall 004A		Outfall 006A		Outfall 007A		Outfall 009A		Outfall 011A		Outfall 012A		Outfall 013A	
	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily
Flow (gpd) <sup>1</sup>	120,149	120,149	612,965	612,965	NO FLOW	NO FLOW	NO FLOW	NO FLOW	NO FLOW	NO FLOW	NO FLOW	NO FLOW	944,904	944,904	NO FLOW	NO FLOW
Oil & Grease (mg/l) <sup>3</sup>	2.8				0.5	4.7									6.0	6
TSS (mg/l) <sup>2,3</sup>	30.0	30.0	3.57												2.0	2
Fecal Coliform (MPN/100ml) <sup>2,3</sup>	24,000,000	24,000,000	490	3,500											ND	ND
BOD <sub>5</sub> (mg/l) <sup>2,3</sup>	7.9	7.9	4.03	5.7											7.760	7.760
Dissolved Potassium (mg/l) <sup>2,3</sup>	12,400	12,400	9,733	11,000											10,000	10,000
Dissolved Sodium (mg/l) <sup>2,3</sup>	4,090	4,090	ND	ND												

<sup>1</sup> Results reported as average monthly were determined using the arithmetic average of rainfall amount during the entire storm for the outfall drainage area. Results reported as maximum daily was determined from maximum rainfall measurement for the duration of the storm for each outfall drainage area.

<sup>2</sup> 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.

<sup>3</sup> Results reported as maximum daily were the maximum of the 3 samples collected (when available) during the first 3 hours of sampling

gpd - Gallons per day  
mg/l - Milligrams per liter  
TSS - Total suspended solids

TABLE 6  
 FIELD ANALYTICAL RESULTS  
 MINOR OUTFALLS  
 T.F. GREEN AIRPORT  
 WARWICK, RHODE ISLAND  
 SECOND QUARTER 2022

Parameter	Outfall 001A		Outfall 004A		Outfall 006A		Outfall 007A		Outfall 009A		Outfall 011A		Outfall 012A		Outfall 013A	
	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>
pH	6.40	6.40	6.40	6.40	NO FLOW	NO FLOW	NO FLOW	NO FLOW	NO FLOW	NO FLOW	NO FLOW	NO FLOW	NO FLOW	NO FLOW	NO FLOW	NO FLOW
Temperature (°F)		65.7		63.5												55.7

**Bold text** indicates exceedance of permit standards  
<sup>1</sup> Results reported as minimum daily were the minimum of the samples collected during the 3 hours of sampling.  
<sup>2</sup> Results reported as maximum daily were the maximum of the samples collected during the 3 hours of sampling.