

Rhode Island Airport Corporation

Third Quarter 2020

Outfall Sampling

T.F. Green Airport

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

Third Quarter (July 1 through September 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) 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 September 30, 2020. Sampling commenced at 6:05 AM subsequent to measurable accumulation and continued until approximately 5:40 PM September 30, 2020.

A total of 0.54 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 at Outfall 010A. The major outfall sampling results can be found in Tables 3 and 4.

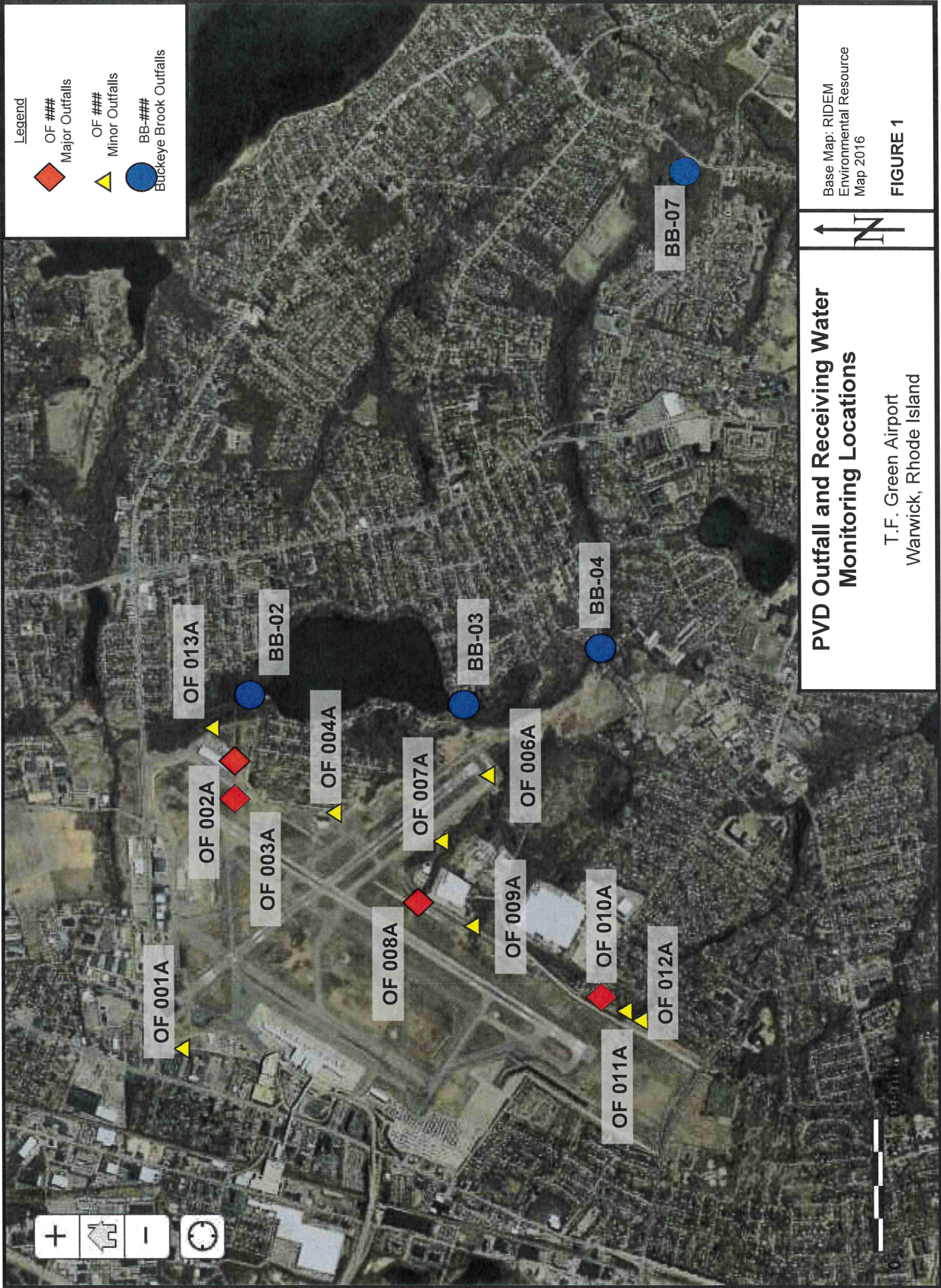
The minor outfalls (001A, 004A, 006A, 007A, 009A, 011A, 012A, and 013A) were also sampled for the first three hours of the event. There was no observed flow at Outfalls 006A, 007A, 009A, 011A, and 013A. Outfall 001A did not have measurable flow during the third hour of the sampling event. The minor outfall 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 1
PRECIPITATION AMOUNTS
T.F. GREEN AIRPORT
WARWICK, RHODE ISLAND
THIRD QUARTER 2020
September 27-30, 2020**

Date	Total Precipitation (water equivalent, in inches)
September 27, 2020	0
September 28, 2020	0
September 29, 2020	0.05
September 30, 2020	0.54

TABLE 2
LABRATORY ANALYTICAL PARAMETERS
T.F. GREEN AIRPORT
WARWICK, RHODE ISLAND
THIRD QUARTER 2020

Sample Identification	Hours 1-3	Hours 4-12
OF-001A, OF-004A, OF-006A, OF-007A, OF-009A, OF-011A, OF-012A, OF-013A	<ul style="list-style-type: none"> • TSS, Dissolved Oxygen • Fecal coliform • Dissolved Potassium and Sodium • Oil & grease - 1664 • BOD, pH, and Temperature • Fecal coliform 	
OF-002A, OF-003A, OF-008A, OF-010A	<ul style="list-style-type: none"> • BOD, Surfactants, Dissolved Oxygen • pH and Temperature • COD, TOC • Oil & grease -1664, TSS • Propylene glycol • Dissolved Potassium and Sodium • Total Metals (aluminum, chromium, copper, iron, lead, and zinc) 	<ul style="list-style-type: none"> • BOD, Surfactants, Dissolved Oxygen • pH and Temperature • COD, TOC • Propylene glycol • Dissolved Potassium and Sodium • Total Metals (aluminum, chromium, copper, iron, lead, and zinc)

BOD -Biological oxygen demand
COD -Chemical oxygen demand
TOC -Total organic carbon
TSS -Total suspended solids

**TABLE 3
ANALYTICAL RESULTS
MAJOR OUTFALLS
T.F. GREEN AIRPORT
WARWICK, RHODE ISLAND
THIRD QUARTER 2020**

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}	213,424	1,579,069	409,727	3,261,665	1,629,640	9,467,039	381,220	381,220
Oil & Grease (mg/l) ⁵		2.6		2		3.7		3.6
TSS (mg/l) ^{4,5}	21.9	55	4.8	12	9.3	21	6.2	15
Fecal Coliform (MPN/100ml) ^{7,5}	1600	1600	1600	1600	1600	1600	1600	1600
BOD ₅ (mg/l) ^{2,6}	0.1	3.6	2.7	4.1	0.24	5.3	ND	ND
Propylene Glycol (mg/l) ^{2,6}	ND	ND	ND	ND	ND	ND	ND	ND
COD (mg/l) ^{2,6}	23.3	27	26.1	30	23.5	36	22.2	30
Dissolved Potassium (ug/l) ^{2,6}	1664.1	2900	3653.7	6950	2817.1	5180	1636	2180
Dissolved Sodium (ug/l) ^{2,6}	331	4310	1667.3	10100	6882.0	17300.00	2946	5970
Surfactants (ug/l) ^{2,6}	0.05	0.26	0.14	0.34	0.11	0.23	ND	ND
Dissolved Oxygen (mg/l) ^{2,3}	6.42	7.40	6.19	6.97	5.77	6.52	6.57	6.82
TOC (mg/l) ^{2,6}	5.02	8.30	7.36	9.1	3.81	4.7	5.42	6.3
Total Aluminum (ug/l) ^{2,6}	129.97	203	105.5	159	125.5	770	81.8	299
Total Chromium (ug/l) ^{2,6}	0.09	1.1	0.09	1.1	0.82	2.8	2.46	3.3
Total Copper (ug/l) ^{2,6}	ND	ND	9.49	13.40	7.0	13.7	ND	ND
Total Iron (ug/l) ^{2,6}	11721.9	18000	644.6	754	1660.4	7340	393.2	584
Total Lead (ug/l) ^{2,6}	2.11	3.30	0.11	1.4	0.65	4.1	2.0	3.6
Total Zinc (ug/l) ^{2,6}	ND	ND	ND	ND	ND	ND	ND	ND

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: 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.

BOD₅ - 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

Outfall 010A did not flow during hours 6 through 12.

TABLE 4
 FIELD ANALYTICAL RESULTS
 MAJOR OUTFALLS
 T.F. GREEN AIRPORT
 WARWICK, RHODE ISLAND
 THIRD QUARTER 2020

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	6.5	6.8		6.6	7.2		6.5	7.0		6.2	6.3	
Temperature (°F)		72.3			72.3			72.2			72.2	

Bold text indicates exceedance of permit standards

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.

Outfall 010A did not flow during hours 6 through 12.

TABLE 5
ANALYTICAL RESULTS
MINOR OUTFALLS
T.F. GREEN AIRPORT
WARWICK, RHODE ISLAND
THIRD QUARTER 2020

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) ¹	86,508	86,508	441,335	441,335	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Oil & Grease (mg/l) ³		2.9		2.4												
TSS (mg/l) ^{2,3}	19.5	28	8.3	11												
Fecal Coliform (MPN/100ml) ^{2,3}	1600	1600	1,600	1,600												
BOD ₅ (mg/l) ^{2,3}	ND	ND	4.87	8.6												
Dissolved Potassium (mg/l) ^{2,3}	1125	1170	10800	10900												
Dissolved Sodium (mg/l) ^{2,3}	3000	3000	4046.7	4780												

¹ 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.

² 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.

³ 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
NF - No Flow

Outfall 001A did not flow during hour 3.

TABLE 6
 FIELD ANALYTICAL RESULTS
 MINOR OUTFALLS
 T.F. GREEN AIRPORT
 WARWICK, RHODE ISLAND
 THIRD QUARTER 2020

Parameter	Minor Outfalls															
	Outfall 001A		Outfall 004A		Outfall 006A		Outfall 007A		Outfall 009A		Outfall 011A		Outfall 012A		Outfall 013A	
	Minimum Daily ¹	Maximum Daily ²	Minimum Daily ¹	Maximum Daily ²	Minimum Daily ¹	Maximum Daily ²	Minimum Daily ¹	Maximum Daily ²	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	6.5	6.6	6.4	6.4	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Temperature (°F)		73.9		72.4												

Bold text indicates exceedance of permit standards

¹ Results reported as minimum daily were the minimum of the samples collected during the 3 hours of sampling.

² Results reported as maximum daily were the maximum of the samples collected during the 3 hours of sampling.

NF No Flow

Outfall 001A did not flow during hour 3.

**TABLE 7
PVD RUNOFF VOLUME CALCULATION
T.F. GREEN AIRPORT
WARWICK, RHODE ISLAND
THIRD QUARTER 2020**

September 30, 2020

Precip (inches): 0.54

Drainage Basin ID	PVD Storm Water Discharge	Receiving Water	Drainage Area (ac)	cu ft precip	gal precip
1	Outfall 001A	Warwick Pond	5.9	11,565.2	86,508
2	Outfall 002A	Warwick Pond	93.4	183,082.7	1,369,458
3	Outfall 003A	Warwick Pond	119.8	234,832.0	1,756,543
4	Outfall 004A	Warwick Pond	30.1	59,002.0	441,335
4B	Outfall 004B	Buckeye Brook	2	3,920.4	29,325
4C	Outfall 004C	Buckeye Brook	3	5,880.6	43,987
6	Outfall 006A	Buckeye Brook	10.7	20,974.1	156,887
6B	Outfall 006B	Buckeye Brook	1.5	2,940.3	21,993
6C	Outfall 006C	Buckeye Brook	0.8	1,568.2	11,730
6D	Outfall 006D	Buckeye Brook	0.7	1,372.1	10,264
7	Outfall 007A	Buckeye Brook	9.6	18,817.9	140,758
7B	Outfall 007B	Buckeye Brook	1.2	2,352.2	17,595
8	Outfall 008A	Buckeye Brook	240.6	471,624.1	3,527,748
9	Outfall 009A	Buckeye Brook	38.4	75,271.7	563,032
10	Outfall 010A	Tuscatucket Brook	26	50,965.2	381,220
11	Outfall 011A	Tuscatucket Brook	14	27,442.8	205,272
12	Outfall 012A	Tuscatucket Brook	46.4	90,953.3	680,331
13	Outfall 013A	Warwick Pond	28	54,885.6	410,544
TOTAL AREA			672.1	1,317,450.4	9,854,529