1ST QUARTER (SEPTEMBER THROUGH NOVEMBER 2010) MONITORING REPORT MASSPORT AIR QUALITY MONITORING STUDY, YEAR 2 LOGAN INTERNATIONAL AIRPORT

Prepared for

Massport
Capital Programs and Environmental Management
Logan Office Center
One Harborside Drive, Suite200S
East Boston, MA 02128-2909

Prepared by

EA Engineering, Science, and Technology
2374 Post Road, Suite 102
Warwick, Rhode Island 02886

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LIST OF ACRONYMS

BAM	Beta attenuation monitor
BC	Black carbon
CDM	Camp, Dresser & McKee, Inc.
EA	EA Engineering, Science, and Technology, Inc.
EPA	(U.S.) Environmental Protection Agency
FRM	Federal Reference Method
HAP	Hazardous air pollutants
MassDEP	Massachusetts Department of Environmental Protection
MassDPH	Massachusetts Department of Public Health
MDL	Minimum detection limit
MRL	Method reporting limit
MV	(Airmetrics) MiniVol™
NAAQS	National Ambient Air Quality Standard
PAH	Polynuclear aromatic hydrocarbon
RPD	Relative percent difference
QA/QC	Quality assurance/quality control
QAPP	Quality Assurance Project Plan, "*Massport Air Quality Monitoring Study, Year 2, Logan International Airport, July 2010"*
SVOC	Semi-volatile organic compound
VOC	Volatile organic compound

1. PROJECT OVERVIEW

As part of the Massachusetts Environmental Policy Act Certificate on the Final Environmental Impact Report for the Logan Airside Improvements Project, the Secretary of the Executive Office of Environmental Affairs has called for a focused air quality study (the Study). The purpose of the Study is to monitor air quality conditions (with a focus on air toxics) in the vicinity of Logan in advance of, and following, the implementation of the new Centerfield Taxiway. The Centerfield Taxiway is one of the primary components of the Logan Airside Improvements Project.

The monitoring network in this study is composed of 11 monitoring locations previously selected based on criteria established in the *Massport, Logan International Air Quality Monitoring Study, Final Air Quality Work Plan, September 2007, Camp, Dresser & McKee* (CDM). Of these 11 monitoring sites, three primary sites were established that use real-time and time-integrated air monitoring methods specifically selected for this study. In addition, seven satellite sites and one urban background site were added to expand the study area. These additional sites utilize cost-effective methods of collecting active $PM_{2.5}$ samples. The urban background site is located at the Massachusetts Department of Environmental Protection (MassDEP) Harrison Avenue monitoring site. An aerial map showing the 11 monitoring sites is provided as Figure 1. A table outlining the sampling locations and sampling methods conducted at each location is provided as Table 1.

To facilitate an accessible data collection and storage platform, a telemetry system was installed and incorporated into an EA Engineering, Science, and Technology, Inc. (EA) web portal in October 2010. The primary objective of the telemetry system is to monitor the real-time sampling equipment to ensure proper operation. Additionally, Massport has posted data and documents related to the Study on the internet at the following web address: *http://www.massport.com/environment/environmental_reporting/Air%20Quality/CenterfieldTaxiwayStudy.aspx*.

The *Final Work Plan Massport Air Quality Study, Year 2, Logan International Airport* (EA, June 2011) identifies 13 target pollutants that the U.S. Environmental Protection Agency (EPA) and the Federal Aviation Administration (FAA) classify as toxic air pollutants typically associated with airports. Fine PM (i.e., $PM_{2.5}$) and black carbon (BC) were added to this list to provide a more comprehensive record of pollutants that could originate from Logan. A table outlining the airport-related hazardous air pollutants (HAPs) is provided as Table 2.

The second year of the monitoring program was initiated in September 2010, with the first full quarter of monitoring from September through November 2010. The real-time measurements of $PM_{2.5}$ and BC occurred continuously throughout the 3-month monitoring period. The monitoring program for the other compounds followed the EPA Ambient Monitoring Technology Information Center 6-day sampling schedule, with the first round of sampling conducted on 5 September 2010.

This quarterly report focuses primarily on the data collection and quality assurance activities related to the monitoring for these target pollutants. However, samples were also analyzed for other potential pollutants. These secondary pollutant concentrations are reported in Appendix A.

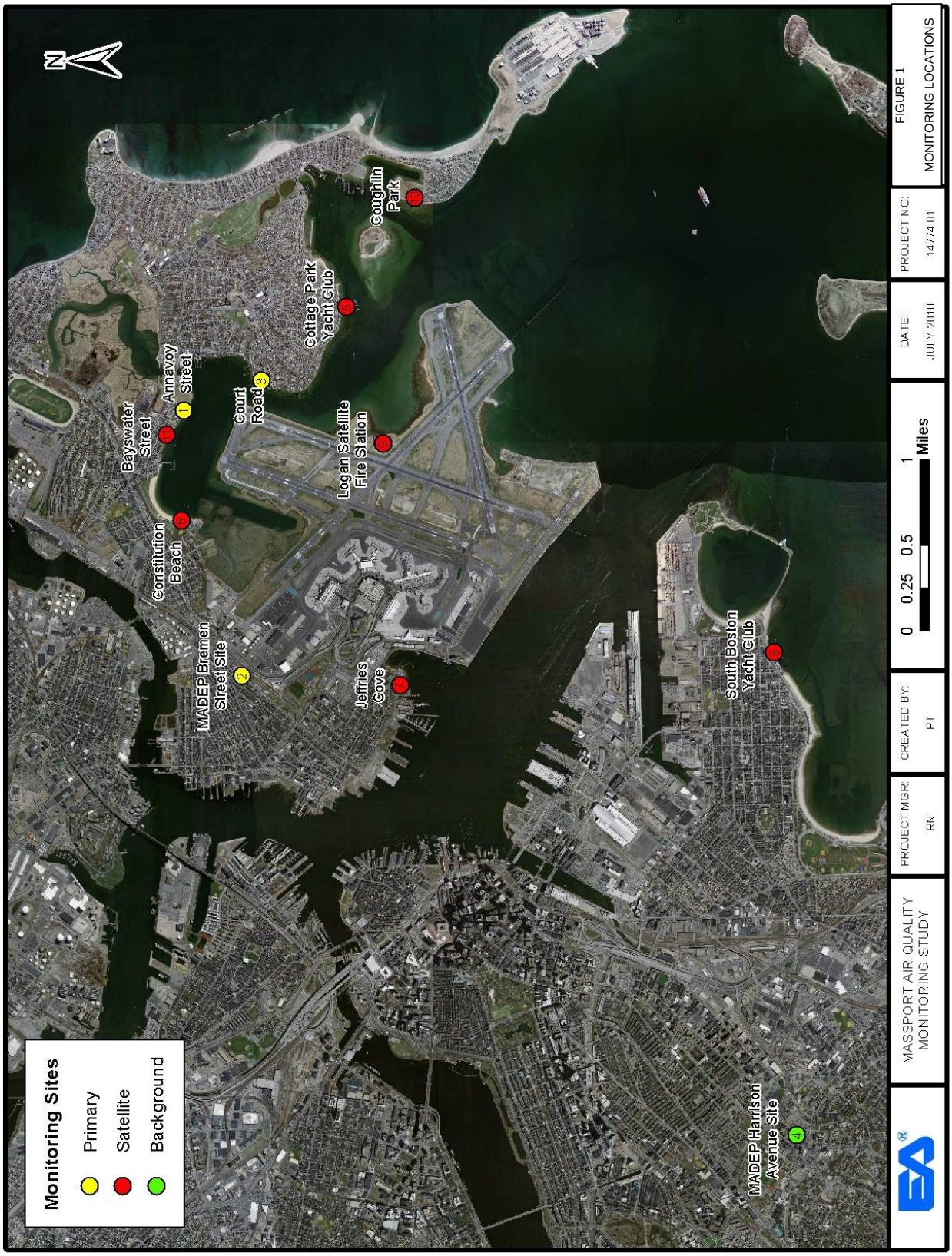
Monitoring Sites
Primary
Satellite
Background
Annavoy Street
Bayswater Street
Court Road
Cottage Park Yacht Club
Coughlin Park
Logan Satellite Fire Station
Constitution Beach
MADEP Bremen Street Site
Jeffries Cove
South Boston Yacht Club
MADEP Harrison Avenue Site
0 0.25 0.5 1 Miles
MASSPORT AIR QUALITY MONITORING STUDY
PROJECT MGR: RN
CREATED BY: PT
DATE: JULY 2010
PROJECT NO: 14774.01
FIGURE 1
MONITORING LOCATIONS

TABLE 1 SUMMARY OF MONITORING SITES, STATION TYPE, AND INSTRUMENTATION

Site ID	*Site Description*	*Monitoring Station Type*	*Monitoring Method and Instrumentation*
01	Annavoy Street	Primary	Real-Time: BAM $PM_{2.5}$, aethalometer, meteorological (wind speed, wind direction, temperature, relative humidity) Time-Integrated: VOCs, carbonyls, PAHs, MiniVol $PM_{2.5}$, FRM $PM_{2.5}$
02	Bremen Street	Primary	Real-Time: BAM $PM_{2.5}$, aethalometer Time-Integrated: VOCs, carbonyls, MiniVol $PM_{2.5}$
03	Court Road	Primary	Real-Time: BAM $PM_{2.5}$, aethalometer, meteorological (wind speed, wind direction, temperature, relative humidity) Time-Integrated: VOCs, carbonyls, PAHs, MiniVol $PM_{2.5}$
04	Harrison Avenue	Satellite (urban background)	Time-Integrated: PAHs, MiniVol $PM_{2.5}$
05	Cottage Park Yacht Club	Satellite	Time-Integrated: MiniVol $PM_{2.5}$
06	Constitution Beach	Satellite	Time-Integrated: MiniVol $PM_{2.5}$
07	Jeffries Cove	Satellite	Time-Integrated: MiniVol $PM_{2.5}$
08	South Boston Yacht Club	Satellite	Time-Integrated: MiniVol $PM_{2.5}$
09	Logan Satellite Fire Station	Satellite	Time-Integrated: MiniVol $PM_{2.5}$
10	Coughlin Park	Satellite	Time-Integrated: MiniVol $PM_{2.5}$
11	Bayswater Street	Satellite	Time-Integrated: MiniVol $PM_{2.5}$

TABLE 2 AIRPORT-RELATED HAPS

1,3-Butadiene (VOC)	Lead (Metal)
Acetaldehyde (Carbonyl)	Naphthalene (SVOC)
Acrolein (Carbonyl)	Proprionaldehyde (Carbonyl)
Benzene (VOC)	Styrene (VOC)
Ethylbenzene (VOC)	Toluene (VOC)
Formaldehyde (Carbonyl)	Xylene (VOC)
PAHs: 2,2,4-Trimethylpentane,Acenaphthylene, Phenanthrene, Fluorene, Fluoranthene, Pyrene, Anthracene, Acenphthene, Benzo(ghi)perylene, Benzo(bk)fluoranthene, Benzo(a)anthracene, Benzo(a)pyrene, Chrysene, Indeno(123-cd)pyrene, and Dibenzo(ah)anthracene (SVOCs)	
Source: FAA, 2003.	

2. INTRODUCTION

This report serves as the first of four quarterly monitoring data reports covering post-construction monitoring results for the year at all monitoring locations as part of the Year 2 Study. EA prepared this report to provide:

- An overall status of the air quality monitoring program from startup of Year 2 through 30 November 2010.
- The status of meeting the data quality objectives presented in the *Quality Assurance Project Plan, Massport Air Quality Monitoring Study, Year 2, Logan International Airport, July 2010* (QAPP).
- Summary statistics for each compound including minimum, maximum, mean, median, and standard deviation values.
- The raw air quality monitoring and meteorological data for review by Massport, MassDEP, and the Massachusetts Department of Public Health (MassDPH).

The following sections of this technical memorandum include an overview discussion of issues affecting the data quality and quantity during this portion of the monitoring program, along with data collection and quality assurance activities based on the objectives established in the QAPPs. A CD with the raw air quality monitoring and meteorological data is provided as Appendix A. This data will also be provided on the Massport website at the following web address: *http://www.massport.com/environment/environmental_reporting/Air%20Quality/CenterfieldTaxiwayStudy.aspx.*

3. DATA COLLECTION ACTIVITIES

The following sections present a summary of the percent data recovery and percent data reported below minimum detection limits (MDLs) for both continuous and real-time integrated monitoring data for the target pollutants.

3.1 CONTINUOUS DATA

The pollutant concentrations were measured using continuous ambient air monitoring instruments and time-integrated ambient air sampling equipment. The continuous pollutant data includes mass of BC measured using a 7-wavelength aethalometer (Magee Scientific Co.) and mass of particulate matter with an equivalent aerodynamic diameter of 2.5 micrometers ($PM_{2.5}$) measured using a beta attenuation monitor (BAM) (Met One Instruments, Inc.). In addition to the air pollution data, meteorological data was collected at the three primary sites. This included wind speed, wind direction, ambient temperature, and relative humidity. Meteorological stations were operated at two of the primary sites, and data was collected from a third party at the third primary site.

3.1.1 Percent Data Recovery for Continuous Data

EA has developed a database to track the sampling program progress to achieve the percent data recovery goal established for the study. The data collection period of September through November 2010 included 2,184 hours in total. The goal for the study is to obtain at least 75 percent data recovery, i.e., at least 75 percent of scheduled data samples collected as valid samples. This percentage recovery is the average for the entire 12-month monitoring program. For continuous monitoring instruments, this value would represent 1,638 hours of valid data during the reporting period.

The percent data recovery for the continuous data collected during the reporting period is presented in Table 3. The 41 percent data recovery for BC data collected at Bremen Street in September reflects operational errors encountered with the aethelometers during the startup of the monitoring program. The unit reset when EA downloaded the initial round of data and was not capturing data until the next data download. In the absence of the telemetry system currently employed, the fact the aethelometer was not capturing data was not identified until the following attempt to download the data. Once these errors were identified and corrected, BC data recovery met the desired goals (Table 1).

Annavoy and Court Road locations had 63 and 78 percent data recovery, respectively, in September for $PM_{2.5}$. The reduced $PM_{2.5}$ data recovery is related to moisture damaging flow sensors within the BAMs during a significant rain event. EA ordered and replaced the flow sensors upon discovery. Subsequently, repairs to the roof seals were made to prevent future moisture intrusion.

At Court Road, no meteorological data was captured from the meteorological instruments for September. The data logger at Court Road responsible for capturing meteorological data was found to be inoperable upon installation. EA immediately sent the unit in for servicing and/or repair to the manufacturer. Unfortunately, the vendor was unresponsive and took several weeks before determining the data logger was not repairable and then providing a new data logger. A new data logger was installed by EA in December 2010. EA used data collected by sensors installed for the telemetry system to provide data in October and November. The data recovery for October is 30 percent, since the telemetry system was installed in mid-October.

Meteorological data is collected by others at a monitoring station adjacent to the Bremen Street station. EA will continue to acquire meteorological data from MassDEP to supplement the data collected by EA.

TABLE 3 DATA RECOVERY FOR CONTINUOUS MONITORING (%)

	Sep	***Oct***	***Nov***	***Quarter 1***
Black Carbon				
Annavoy	96	100	100	99
Bremen	41	80	95	72
Court	100	100	100	100
$PM_{2.5}$ BAM				
Annavoy	63	98	79	81
Bremen	91	99	83	91
Court	78	99	80	86
Meteorology				
Annavoy	100	100	100	100
Bremen	100	100	100	100
Court	0	30	100	43

3.1.2 Percent Data Reported Below Minimum Detection Limit for Continuous Data

MDLs of monitoring equipment utilized in this study and laboratory analyses performed for this study are presented below. Most air pollutant concentrations tend to be normally distributed in the ambient air, resulting in a significant proportion of measured values being found at relatively low concentrations and a much lower proportion being found at higher concentrations. Due to analytical limitations, some of the lower concentrations cannot be quantified and must be considered to be below the MDL of the analytical method. The MDL for the Magee Scientific 7-wavelength aethalometer is 50 nanograms of BC per cubic meter ($\mu g/m^3$) for one-hour average measurements. The MDL for the Met One Instruments' BAM is 5 micrograms of $PM_{2.5}$ per $\mu g/m^3$ for one-hour measurements. Table 4 presents the percent of continuous data reported below MDL. For the continuous BC one-hour average measurements, less than five percent of the time measurements were below the MDL at all three monitoring sites during this period. For

the continuous $PM_{2.5}$ one-hour average measurements, about 35 percent of the time measurements were below the MDL at two of the three monitoring sites during this period, with 13 percent of the readings below the MDL at the Bremen Street monitoring site. The higher concentrations at Bremen Street may be attributable to its proximity to a highway adjacent to the Site. However, this discrepancy was not found in Year 1 of the Study. The Year 1 Study indicated Annavoy as having the lowest $PM_{2.5}$ reading.

TABLE 4 PERCENT OF CONTINUOUS DATA REPORTED BELOW MDL

	Annavoy	***Bremen***	***Court***
Black Carbon	3.86%	0.32%	3.48%
$PM_{2.5}$ (BAM)	35%	13%	35%

3.2 TIME-INTEGRATED DATA

The time-integrated pollutant data includes speciated volatile organic compounds (VOCs), speciated carbonyl compounds, speciated polynuclear aromatic hydrocarbons (PAHs), and $PM_{2.5}$ mass. The time-integrated samples were collected consistent with the EPA Ambient Monitoring Technology Information Center 6-day sampling schedule over designated periods of 24 consecutive hours from midnight to midnight.

Time-integrated samples of $PM_{2.5}$ were collected at the Annavoy Street site once every six days using a Federal Reference Method (FRM) BGI, Inc. PQ200 $PM_{2.5}$ sampler. Time-integrated samples of $PM_{2.5}$ were also collected at each of the three primary sites, the seven satellite sites, and one urban background site once every six days using an Airmetrics MiniVol™ (MV) sampler. Time-integrated air samples were collected over a 24-hour period once every six days in passivated Summa canisters for analysis of speciated VOCs at each of the three primary sites. Time-integrated samples were also collected once every six days on dinitrophenylhydrazine medium for analysis of speciated carbonyl compounds. In addition, time-integrated samples were collected once every six days on XAD resin with pre-filters for analysis of speciated PAHs.

3.2.1 Percent Data Recovery for Time-Integrated Data

During the data collection period from September through November 2010, 11 total samples of $PM_{2.5}$ were collected using the FRM at one of the primary sites, a range of 5 to 10 time-integrated samples for $PM_{2.5}$ analysis at the 11 satellite sites, 15 time-integrated samples for VOCs and carbonyl analyses at each of the primary sites, and a range of 14 to 15 time-integrated samples for PAH analysis at two of the primary sites and the urban background site.

The percent data recovery for the time-integrated data collected during the reporting period is presented in Table 5. The data recovery goal was met for VOC samples, PAH samples, and carbonyl samples during this quarter. The data recovery goal was not met for any of the time-integrated $PM_{2.5}$ sampling locations. This is attributed to samples not meeting the quality control

and handling requirements specified by the program. This situation has been addressed, and recovery percentiles should improve in the future.

TABLE 5 DATA RECOVERY FOR TIME-INTEGRATED MONITORING (%)

	Sep	***Oct***	***Nov***	***Quarter 1***
VOC				
Annavoy	100	100	100	100
Bremen	100	100	100	100
Court	100	100	100	100
Carbonyl				
Annavoy	100	100	100	100
Bremen	100	100	100	100
Court	100	100	100	100
PAH				
Annavoy	100	80	100	93
Court	80	100	100	93
Harrison	100	100	100	100
$PM_{2.5}$ FRM				
Annavoy	100	100	20	73
$PM_{2.5}$ MiniVol				
Annavoy	100	60	20	60
Bayswater	80	40	20	47
Bremen	100	40	20	53
Constitution	80	20	20	40
Cottage	80	80	20	60
Coughlin	80	100	20	67
Court	100	80	20	67
Harrison	100	40	20	53
Jeffries	80	40	0	40
Logan	20	60	20	33
S. Boston	80	60	20	53

3.2.2 Percent Data Reported Below Method Reporting Limit for Time-Integrated Data

Table 6 presents the percent of time-integrated data reported below the method reporting limit (MRL) for the sampling program. The VOC data indicates benzene, toluene, and xylene measurements are typically detected above the MRLs in samples collected at all three sites. Carbonyl data indicates acrolein is not usually present in ambient air at concentrations above the MRL, while acetaldehyde, formaldehyde and propionaldehyde detections vary spatially. PAH analytes were detected above the MRL consistently in respect to the location, with most samples not containing the target analytes at concentrations above the MRL.

TABLE 6 ACTIVE SAMPLE TARGET POLLUTANTS
PERCENT OF TIME-INTEGRATED DATA REPORTED BELOW MRL

	Annavoy (%)	***Bremen (%)***	***Court (%)***	***MRLs (ug/m^3)***
VOC				
1,3-Butadiene	100	93	100	0.11
Benzene	0	0	0	0.16
Ethylbenzene	53	7	47	0.217
m,p-Xylene	7	0	0	0.217
o-Xylene	7	40	7	0.217
Styrene	73	0	67	0.213
Toluene	0	0	0	0.188
Carbonyl				
Acetaldehyde	7	7	7	0.0045
Acrolein	100	87	100	1.14
Formaldehyde	7	7	7	0.0022
Propionaldehyde	7	0	7	0.0001
	Annavoy (%)	***Court (%)***	***Harrison (%)***	***MRLs (ug/m^3)***
PAH				
1-Methylnaphthalene	7	0	7	0.0005
2-Methylnaphthalene	7	0	7	0.0005
Naphthalene	7	0	6	0.0005

The results presented in these tables represent a subset of the total number of compounds that were collected and analyzed from the sampling media. The concentration results for the additional compounds are presented in Appendix A.

4. DATA SUMMARY

As noted above, air monitoring for Year 2 of the Study commenced in September 2010. The first quarter of Year 2 includes September through November 2010. Included in this section are summary statistics of data from real-time and time-integrated monitoring methods for the first quarter of Year 2 monitoring.

Real-time monitoring data includes:

- Mass of BC measured using a seven-wavelength aethalometer
- Mass of particulate matter with an equivalent aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$) measured using a BAM
- Meteorological data including wind speed, wind direction, temperature, and relative humidity.

Time-integrated monitoring data includes:

- Speciated VOC, analyzed via EPA Method TO-15 SIM
- Speciated semi-volatile organic compounds (SVOC), analyzed via EPA Method TO-13a
- Speciated carbonyls, analyzed via EPA Method TO-11a
- Mass of $PM_{2.5}$, by gravimetric analysis

TABLE 7 CARBONYL TARGET POLLUTANTS ANALYTICAL SUMMARY STATISTICS

Location	*Minimum Result*	*Maximum Result*	*Mean Result*	*Standard Deviation*	*Benchmark*
Acetaldehyde					
Annavoy Street	0.0021	0.9288	0.4547	0.2361	5
Bremen Street	0.1030	3.9040	0.9604	1.1186	
Court Road	0.0503	3.2667	0.3825	0.8021	
Acrolein					
Annavoy Street	0.2451	0.7224	0.2769	0.1232	0.009
Bremen Street	0.2451	1.2556	0.3297	0.2646	
Court Road	0.2451	0.2451	0.2451	0.0000	

Location	*Minimum Result*	*Maximum Result*	*Mean Result*	*Standard Deviation*	*Benchmark*
Formaldehyde					570
Annavoy Street	0.0410	20.5184	7.4314	5.5525	
Bremen Street	0.0632	30.9735	5.1338	8.1560	
Court Road	0.1993	37.8012	2.9887	9.6357	
Propionaldehyde					3.4
Annavoy Street	0.00002	0.1676	0.0472	0.0628	
Bremen Street	0.00002	0.3875	0.0824	0.1285	
Court Road	0.00002	0.2566	0.0498	0.0959	

* All concentrations presented in parts per billion by volume (ppbv)
**Benchmark values are chronic inhalation reference concentrations (RfCs), except for formaldehyde, which is based on chronic oral reference doses (RfDs), from EPA's Integrated Risk Information System (IRIS). The benchmark values should be compared to the mean result.

Summary statistics indicate acrolein is the only carbonyl target pollutants exceeding the benchmark value. The maximum acetaldehyde value observed at Bremen Street approaches the benchmark value of 5.0 ppbv (note the benchmark values should be compared to the average concentrations). The average concentrations of formaldehyde and propionaldehyde are well below the benchmark values of 570 and 3.4 ppbv, respectively.

TABLE 8 PAH TARGET POLLUTANTS ANALYTICAL SUMMARY STATISTICS

Location	*Minimum Result*	*Maximum Result*	*Mean Result*	*Standard Deviation*	*Benchmark*
1-Methylnaphthalene					NA
Annavoy Street	0.0003	0.0020	0.0012	0.0006	
Court Road	0.0005	0.0032	0.0014	0.0008	
Harrison Avenue	0.0001	0.0036	0.0015	0.0010	
2-Methylnaphthalene					2.6
Annavoy Street	0.0005	0.0050	0.0023	0.0013	
Court Road	0.0009	0.0064	0.0027	0.0017	
Harrison Avenue	0.0002	0.0088	0.0030	0.0023	
Naphthalene					0.57
Annavoy Street	0.0011	0.0094	0.0049	0.0029	
Court Road	0.0016	0.0085	0.0046	0.0021	
Harrison Avenue	0.0001	0.0178	0.0075	0.0057	

*All concentrations presented in ppbv
**Benchmark values are RfCs, except for 2-methyl naphthalene, which is based on RfDs, from EPA's IRIS. The benchmark values should be compared to the mean result.

The table above demonstrates that the average values of the three PAH target pollutants do not approach the benchmark values. Furthermore, the maximum values are well below the benchmark values.

TABLE 9 VOC TARGET POLLUTANTS ANALYTICAL SUMMARY STATISTICS

Location	*Minimum Result*	*Maximum Result*	*Mean Result*	*Standard Deviation*	*Benchmark*
1,3-Butadiene					0.9
Annavoy Street	0.0248	0.0729	0.0280	0.0124	
Bremen Street	0.0248	0.1215	0.0312	0.0250	
Court Road	0.0248	0.0248	0.0248	0.0000	
Benzene					9.4
Annavoy Street	0.0654	0.3078	0.1203	0.0615	
Bremen Street	0.0654	0.4681	0.2002	0.1112	
Court Road	0.0632	0.4929	0.1120	0.0374	
Ethylbenzene					230
Annavoy Street	0.0250	0.5129	0.0886	0.1235	
Bremen Street	0.0250	0.2622	0.1265	0.0623	
Court Road	0.0250	0.2346	0.0742	0.0634	
m,p-Xylenes					23
Annavoy Street	0.0250	1.6560	0.2257	0.3993	
Bremen Street	0.0529	0.5842	0.3220	0.1498	
Court Road	0.0589	0.5750	0.1947	0.1549	
o-Xylene					23
Annavoy Street	0.0250	3.2660	0.6509	0.8859	
Bremen Street	0.0589	0.2576	0.1421	0.0535	
Court Road	0.0250	4.0480	0.7367	1.0649	
Styrene					230
Annavoy Street	0.0245	0.1116	0.0410	0.0267	
Bremen Street	0.0245	0.1263	0.0570	0.0321	
Court Road	0.0245	0.1518	0.0499	0.0416	
Toluene					1300
Annavoy Street	0.1027	2.3166	0.4570	0.5391	
Bremen Street	0.1430	7.4100	1.1905	1.8459	
Court Road	0.1352	0.8866	0.4062	0.2399	

*All concentrations presented in ppbv
**Benchmark values are RfCs from EPA's IRIS. The benchmark values should be compared to the mean result.

The table above demonstrates that the average values of the VOC target pollutants do not approach the benchmark values. Furthermore, the maximum values are well below the benchmark values as well.

TABLE 10 FINE PARTICULATE MATTER ($PM_{2.5}$) ANALYTICAL SUMMARY STATISTICS

Location	*Minimum Result*	*Maximum Result*	*Mean Result*	*Standard Deviation*	*Benchmark*
FRM $PM_{2.5}$					35 and 15
Annavoy Street	0.1023	80.6089	23.6275	26.4877	
MiniVol $PM_{2.5}$					
Annavoy Street	0.2829	57.7729	24.7317	24.8340	
Bayswater Street	0.2576	50.0274	19.2316	18.5257	
Bremen Street	0.2597	58.3794	22.7813	20.5407	
Constitution Beach	0.2514	23.7345	9.6579	9.9100	
Cottage Park Yacht Club	0.2968	58.8114	20.9592	22.3673	
Coughlin Park	0.2452	26.7281	7.0498	10.4368	
Court Road	0.2569	25.1815	3.5479	7.7192	
Harrison Avenue	0.2579	35.7936	10.8746	12.1443	
Jeffries Cove	0.2596	29.2985	15.4200	10.9943	
Logan Satellite Fire Station	0.2593	4.9280	1.2086	2.0793	
South Boston Yacht Club	0.2504	56.8601	31.7366	16.7184	

* All concentrations shown in $\mu g/m^3$

** Benchmark values are the 24-hour (35 $\mu g/m^3$) and annual (15 $\mu g/m^3$) National Ambient Air Quality Standards (NAAQS) for $PM_{2.5}$. The 24-hour NAAQS (to be compared to the maximum result) is not to be exceeded more than once per year while the annual NAAQS (to be compared to the average measured concentration) is not to be exceeded.

Summary statistics for the fine particulate matter sampling and analysis are provided above. As compared to the benchmark value, the average values exceed the applicable NAAQS benchmark at seven of the eleven sites. The maximum value measured at six of the eleven sites exceeds the applicable benchmark.

TABLE 11 CONTINUOUS DATA SUMMARY STATISTICS

Site Name	*Min*	*Max*	*Median*	*Avg*	*Std Dev*	*Benchmarks*
Hourly BC/Aethalometer Data ($\mu g/m^3$)						
Annavoy	0.00	8.15	0.25	0.40	0.47	N/A
Bremen	0.00	6.27	0.32	0.43	0.42	
Court	0.00	36.19	0.37	0.59	1.03	

Site Name	*Min*	*Max*	*Median*	*Avg*	*Std Dev*	*Benchmarks*
24-Hour BC/Aethalometer Data (µg/m^3)						
Annavoy	0.05	1.55	0.32	0.40	0.29	5.00
Bremen	0.10	1.31	0.36	0.44	0.26	
Court	0.07	2.13	0.46	0.59	0.41	
Hourly $PM_{2.5}$/BAM Data (µg/m^3)						
Annavoy	-15.0	80.0	6.0	7.2447	6.5637	N/A
Bremen	-2.0	40.0	8.0	9.8168	6.3675	
Court	-7.0	403.0	6.0	7.3010	10.9174	
24-Hour $PM_{2.5}$/BAM Data (µg/m^3)						
Annavoy	-9.36	23.96	6.04	7.32	5.17	35 and 15
Bremen	3.04	32.96	8.67	9.76	5.21	
Court	-0.71	26.13	6.04	7.21	4.63	

* Benchmark for 24-hour BC is the RfC for diesel engine exhaust from EPA's IRIS. The benchmark values should be compared to the average measured concentrations.
** Benchmark values for the 24-hour BAM data are the 24-hour (35 µg/m^3) and annual (15 µg/m^3) NAAQS, respectively, for $PM_{2.5}$. The 24-hour NAAQS (to be compared to the maximum measured concentrations) is not to be exceeded more than once per year while the annual NAAQS (to be compared to the average measured concentrations) is not to be exceeded.
***-5 µg/m^3 measurement reflects negative offset of BAM units to reflect urban background conditions.

Summary statistics for the aethelometer indicate BC concentrations are well below the benchmark values established for this study. The BAM values appear to represent accurate $PM_{2.5}$ measurements based on historical sampling, as well as measurements collected subsequent to this quarter. As compared to the benchmark value, the average values do not exceed the applicable NAAQS benchmark. The maximum values measured at the sites also do not exceed the applicable benchmark.

5. QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

Quality assurance/quality control (QA/QC) activities include those routine and non-routine activities that are intended to improve or assure the quality of measured data. The following discussion briefly addresses those activities conducted during this monitoring period. The QAPP provides more in-depth discussion of the monitoring QA/QC procedures. Table 12 provides tallies of the field and lab blank samples that were analyzed during this monitoring period.

TABLE 12 SUMMARY OF SAMPLES COLLECTED DURING THE 1ST QUARTER WITH BLANKS AND DUPLICATES

Samples/Blanks/Duplicates	*Active*				
	VOC	***Carbonyl***	***PAH***	***PM (FRM)***	***PM (MiniVol)***
Field Samples	45	45	43	11	111
Field Blanks	1	4	1	0	1
Lab Blanks	10	9	15	0	0
Lab Duplicates	10	9	0	0	0

5.1 FIELD BLANKS

The practice of conducting and analyzing field blanks is to provide information about contamination that may be introduced during sample collection, storage, and transport. Field blanks are to be collected on or near the scheduled FRM sample day and shipped back to the laboratory for analysis.

For the active sampling portion of the Study during the reporting period, there was one field blank analyzed each for speciated PAHs, speciated VOCs, $PM_{2.5}$ via FRM, and $PM_{2.5}$ via MVs. Four field blanks were analyzed for speciated carbonyls. Acetone was detected slightly above the method reporting limit in one field blank collected on 22 November 2010 (0.27 µg vs. MRL of 0.25 µg). No other analytes were detected in any of the other field blanks analyzed. Details of the field blank results can be found in the data tables in Appendix A.

5.2 DATA PRECISION (REPLICATE AND DUPLICATE SAMPLING)

Data precision is of one of the measures used to assess the quality of the monitoring data. Data precision is the degree of mutual agreement among individual measurements under identical or substantially similar conditions measured as either the range or as the standard deviation. This can be done by either using the same analytical instrument to make repeated analyses of the same (replicate) sample, or it can be done by collecting, processing, and analyzing collocated (duplicate) samples.

For time-integrated samples with subsequent laboratory analysis, precision was determined by periodic laboratory replicate analyses. Laboratory replication involves splitting a single sample in the laboratory and performing replicate tests. For continuous measurements, it is determined by periodic presentation of transfer standards to the measurement system.

There were ten valid replicate analyses for speciated VOCs performed in the laboratory which provide a measure of the precision, or reproducibility, of the sample data. The results of the replicate analyses for the six target VOCs were less than 15 percent, with the exception of one sample. The laboratory duplicate analysis of the VOC sample collected at Court Road on 29 October 2010 indicates m,p-xylene and styrene relative percent differences (RPD) of 16 and 17, respectively. O-xylene and ethylbenzene concentrations in the same sample had RPDs of 14. In all other samples, there were two RPDs of 13 and two RPDs of 10. All other RPDs were below 10 for the six target VOCs. A RPD of 25 is considered valid.

It should be noted that there are collocated active measurements of $PM_{2.5}$ being made at the three primary sites. The Annavoy Street site includes sample collection for $PM_{2.5}$ via an FRM as well as via an MV and continuous measurement of $PM_{2.5}$ via the BAM. Both the Bremen Street site and the Court Road site include both an MV and a BAM. However, since the collocated methods at each of these sites represent different methodologies, a direct comparison of the collocated results is not a true measure of precision for $PM_{2.5}$.

6. UPCOMING DELIVERABLES

The next reporting period will summarize project activities for the period from December 2010 through February 2011. The monitoring report will present the monitoring results and will include a discussion of any changes made to improve the monitoring program.

APPENDIX A

Air Quality Monitoring and Meteorological Data on CD