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AMBIENT AIR MONITORING PROGRAM

ACUSHNET RIVER ESTUARY, NEW BEDFORD, MASSACHUSETTS

VOLUME I

DRAFT REPORT

Prepared by
NUS Corporation
February 1986

Table of Contents

VOLUME I

		Page
1.0	Introduction	1-1
2.0	Summary of Results	2-1
3.0	Sampling Program Methodology and Conditions	3-1
3.1	Sampling Locations	3-1
3.2	Sampling Methods	3-1
3.3	Sampling Schedule and Conditions	3-4
3.4	Quality Assurance/Quality Control	3-6
3.5	Data Processing	3-7
4.0	Sample Analysis	4-1
4.1	Particulate Filter Analyses	4-1
4.1.1	Methods of Analysis	4-1
4.1.2	Results of Elemental Analyses	4-2
4.1.3	Quality Control for Metals Analyses	4-4
4.2	PUF Filter Analyses	4-6
4.2.1	Method of Analysis	4-6
4.2.2	Results of PCB Analyses	4-7
4.2.3	Quality Control for PCB Analyses	4-8
5.0	Ambient Concentrations	5-1
5.1	Total Suspended Particulates and Metals Concentrations	5-1
5.2	Airborne PCB Concentrations	5-3
5.3	Results of Quality Control Checks	5-8
5.3.1	Particulate Sampling Quality Control	5-8
5.3.2	PCB Sampling Quality Control	5-9
6.0	References	

Appendices:

Total Suspended Particulate and Metals Data Listing	Appendix A
PCB Data Listing	Appendix B
Meteorological Data Listing	Appendix C

VOLUME II

Laboratory Metals Analyses Quality Control Forms	Appendix D
Laboratory PCB Analyses Quality Control Forms	Appendix E

List of Tables

		Page
3-1	Air Sampling Locations on Acushnet River Estuary	3-2
5-1	Tidal Phase, Average Meteorological Conditions, and Airborne Concentrations of Aroclor-1242 ng/m^3, Acushnet River Estuary, September 4-8, 1985	5-4
5-2	Aroclor-1242 Composite 24-Hour Airborne Concentrations, ng/m^3, Acushnet River Estuary, September 4-8, 1985	5-7

List of Figures

		Page
Figure 1	Ambient Air Monitoring Locations, Acushnet River Estuary, 1985	2-3

1.0 INTRODUCTION

The Environmental Protection Agency (EPA) has been conducting an extensive remedial investigation and feasibility study (RI/FS) to support a remedial action program for containment of polychlorinated biphenyls (PCBs) and metals in New Bedford, Massachusetts and the surrounding area. Airborne PCBs and metals have been detected in several studies in the New Bedford metropolitan area. An extensive air sampling program conducted in September 1982, and other smaller studies, have produced considerable data on PCBs in the ambient air in the New Bedford area[1]. PCB concentrations differing significantly from background values were detected near the upper part of the Acushnet River estuary. As a result, the Environmental Services Division of EPA recommended that future studies concentrate on the areas downwind of the tidal mud flats[2]. Consequently, the air monitoring program requirements for the RI/FS were first described under Task 12 of the work plan developed by NUS Corporation in late 1983[3]. The objective of the monitoring task was to provide new data to confirm earlier results and to identify temporal changes. In subsequent meetings between NUS and EPA personnel during 1985, the specific monitoring requirements in the work plan were modified to focus the field study on the possible tidal influence on airborne concentrations of PCBs and metals. The monitoring locations and sampling time were selected to characterize the concentrations at high and low tides around the mud flats near the Aerovox plant, a primary source of PCB's in the past.

This technical report describes the activities and results of the monitoring program for airborne PCBs and metals at the northern end of the Acushnet River estuary in New Bedford. Samples were collected between September 4 and 9, 1985. A summary of the program is provided in Section 2, and the sampling methodology and schedule are described in Section 3. PCB samples were collected on polyurethane foam filters in accordance with EPA Method TO 4, and the suspected metals were collected with standard high volume particulate samplers. The samples were analyzed at the NUS analytical laboratory with strict quality control requirements following the Contract Laboratory Program (CLP) guidelines. A description of the analytical techniques, and the quality control program are provided in Section 4. This section also contains an analysis of the laboratory results and an evaluation of the laboratory quality control checks. Section 5 contains an evaluation of the airborne concentrations, a comparison of the results with the values obtained in the 1982 field program in New Bedford, and an evaluation of the results of the quality control checks on the field sampling. Also, any standards or guideline concentrations are identified for the compounds and elements measured during this study. The appendices list the specific details for each sample collected during the program and the details of the laboratory analyses.

2.0 SUMMARY OF RESULTS

Five sampling locations were established around the northern end of the Acushnet River estuary. The sampling locations are shown in Figure 1. Three locations were selected on the east side of the estuary due to the historical prevalence of southwesterly and westerly winds during early September. One location was selected at the far northern end of the estuary to collect downwind samples off the estuary during southerly winds. The fifth location was upwind of the estuary and served as a background sampling location.

During three days of favorable weather, 6-hour samples were collected during intervals centered on the high and low tide times for the day. Additionally, one set of 12-hour and one set of 24-hour samples were collected during a period of less favorable weather conditions for collecting airborne pollutants from the estuary. In total, samples were collected for 95 hours during the period September 4 through September 9, 1985. A total of 45 ambient air samples for PCBs were collected and analyzed. Of the 52 suspended particulate samples collected, total suspended particulate (TSP) concentrations were determined for all the filters. However, due to the small amount of particulate mass collected in the filters, only 16 filters were selected for analyzsis of airborne concentrations of lead, zinc, cadmium and chromium.

The only PCB found on the samples was Aroclor-1242, and it was measured on 39 of the 45 samples analyzed. Ambient concentrations ranged from a low of 7 ng/m^3 at the background sampling location to a high of 471 ng/m^3 at location 2. Background concentrations are consistent with those measured during the 1982 field study. Maximum concentrations during the NUS field program were larger than those measured in 1982 due, most likely, to the NUS samplers being closer to a major source: location 2 was directly east of a large expanse of mud flats in the estuary, and also the closest sampling location to the Aerovox plant site. Concentrations of Aroclor-1242 at the other locations were significantly less than the concentrations at location 2. Although the data set is small, the concentrations measured at location 2 indicate that there is a relationship between the tidal phase and the

Figure 1
Air Monitoring Locations
Acushnet River Estuary, 1985

(K) 1978 EPA Region I
▲ EPA, 1984 (approx)

airborne concentration. Concentrations at location 2 during low tide periods were always larger than the concentrations during adjacent high tide periods. Since the weather conditions did not change significantly between adjacent tidal periods, the high concentrations of Aroclor-1242 are attributed to the mud flats.

In contrast to the PCB concentrations, the TSP concentrations showed much less variation among the sampling locations. Although location 2 again had the highest concentration at 117 ug/m^3, location 4 was close with 114 ug/m^3. Both concentrations were measured on the first day of sampling, September 4, when the wind was from the southwest at between 10 and 20 miles per hour. The minimum concentrations (21-28 ug/m^3) occurred during a 24-hour period with light rain. Generally, TSP concentrations were lowest during the night and increased during the day.

No cadmium was found in any of the 16 filters analyzed for metals content. Chromium and zinc were detected, but these values are attributed to residual amounts of these elements that remain in the glass fiber media during manufacturing. Only slight amounts of lead were detected in the particulate samples. However, the small amounts of lead collected on the six-hour samples were insufficient to make precise determinations of the ambient lead concentration due to trace amounts of residual lead in the glass fiber material. The calculated lead concentrations range from 0.07 to 0.31 ug/m^3, and they are well below the National Ambient Air Quality standard of 1.5 ug/m^3. Although there was little variation among the five locations, the nighttime concentrations were lower than the daytime concentrations at all locations except the background location, which is subject to heavy nighttime traffic. The calculated concentrations, although considered conservative due to the residual lead in the filters, are consistent with the concentrations of lead determined in the 1982 field program.

3.0 SAMPLING PROGRAM METHODOLOGY AND CONDITIONS

This section provides a description of the sampling locations, the methods of sample collection, the collection schedule and a summary of the weather conditions during sampling, the quality assurance program, and a description of the data processing steps.

3.1 SAMPLING LOCATIONS

Five sampling locations were selected around the Acushnet River estuary north of Interstate Highway 195. Four of these locations were chosen as downwind sampling locations from the exposed tidal flats, and the fifth location was for collecting background readings upwind of the estuary. The expected wind direction during the desired daytime sampling conditions was from the south through west compass quadrant. Figure 1 shows the location of the five sampling locations around the estuary. A description of each sampling location is provided in Table 3-1 along with the range in wind direction headings which would place the sampling location downwind of the two major mud flats on the east side of the estuary. During low tide, the largest exposed area of mud is to the south and west of location 2. The other mud flat is near location 4.

Two temporary meteorological towers (10 meter) were erected to collect data on the wind speed, direction, and temperature during the sampling program. The south tower was located on the eastern bank of the estuary just south of sampling location 4. This tower contained a sensor for measuring relative humidity also. The north tower was located on the west side of the estuary across the river from sampling location 2. The location of each tower is shown in Figure 1, and a description of each tower location is included in Table 3-1.

3.2 SAMPLING METHODS

Two types of air samplers were employed at each of the five air sampling locations: one for the collection of PCBs, the other for particulates that might contain heavy metals. Both of these classes of pollutants were

Table 3-1. Air Sampling Locations on Acushnet River Estuary

Location	Description	Wind Direction to be Downwind of Mudflats
1.	On the west bank of Acushnet River, approximately 600 feet south of Main Street, at the east end of storage yard for Reliable Truss Company.	SE through S
2.	Overlooking the tidal flats area south of the Acushnet Company's Titleist Plant	SE through S to NW
3.	West side of Acushnet substation of Commonwealth Electric Company. Area surrounded by marsh grass and some trees.	NW through NNE and S through SSE
4.	East side of estuary on the bank of the small inlet overlooking the tidal flat and marsh grass directly to the west.	SW through NW
5.	Background sampler in maintenance yard for Brooklawn Park. Area is surrounded by tall trees and a few buildings. Infrequent traffic during the day.	Easterly
North Met Tower	Approximately 20 feet west of the western bank of the Acushnet River, directly across the river from location 2. Small trees (approximately 15 feet high) and bushes 50 feet southeast of the tower; low buildings 100 feet northeast of tower.	
South Met Tower	On the eastern bank of the estuary, 800 feet south of location 4. Paved parking lot immediately to the east of tower, and field of weeds to the north.	

collected on a separate type of media that had been prepared and evaluated for quantifying that specific category of chemicals. Although both types of media employed were distinct from each other, both sampling systems had several features in common. Both types of samplers drew air through the collection media that either filters or adsorbs the chemicals of interest. The air drawn through the filter was controlled to a preset flow rate which was determined for each sample by reference to a flow calibration record prepared for each sampling unit. Flow settings and time were recorded on a sample information sheet. The actual time of sampling was determined for each field sample by taking the difference between the start and stop time on the elapsed time meter for that piece of sampling equipment. The average flow rate for each sample was determining from averaging flow rates observed at different times during the sample collection period in the case of the PCB samplers. Average flows for the particulate samplers were determined from a chart record of the flow rate during each sampling period. Via these methods, the total sampled air volume is the product of multiplying the average sample flow rate by the elapsed sampling time for each sample. This sampled air volume is expressed in cubic meters or cubic feet in the data listings.

PCBs were collected on a Model PS-1 sampler from General Metal Works (GMW). The procedure for preparation and collection of the sample followed method TO4 from the EPA's Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (EPA-600/4-84-041). Polyurethane foam (PUF) filters were prepared at the NUS laboratory and shipped in sealed containers to the site. Prior to sample collection, the PUF filters were inserted into a cleaned glass cartridge. The cartridge was then loaded into a sampling head which also supported a four-inch round, glass fiber filter. Both ends of the sampling head were covered with aluminum foil (hexane-rinsed to remove residual organics) for transport to the sampling location. The foil was removed when the sampling head was installed in the sampler. At the end of the sampling period the sampling head was removed from the sampler and again wrapped in aluminum foil at the sampling location. Within a motel room reserved solely for sample handling during the program, the glass fiber filter and PUF filters were transferred to a shipping container which was then sealed for shipment to the NUS laboratory in Pittsburgh, PA.

Suspended particulate matter was collected by a GMW high-volume air sampler (Hi-Vol) according to the EPA reference method for determination of suspended particulates in the atmosphere (CFR 40, Part 50.11). Each Hi-Vol was equipped with a flow control unit for maintaining a constant flow rate and with an elapsed time meter. The clean filters were pre-weighed at the NUS laboratory before being shipped to the site in individual folders. Just before sampling, a filter was inserted into a pre-assigned filter cassette for transport to its monitoring station. This cassette prevents the filter from being damaged when the filters are changed at the sampling location. At the end of the sampling period, the cassettes were retrieved from the sampling stations. The filters were transferred to their original folders and envelopes for return shipment to the NUS laboratory.

Both meteorological towers were equipped with a Climatronics Electronic Weather Station (EWS) and associated crossarm and sensors. The EWS system recorded temperature, wind speed, direction, and sigma theta (standard deviation of the wind direction over 15 minute period) at the 10 meter level throughout the monitoring program. The wind direction sensors were aligned by sighting with a magnetic compass and correcting for the magnetic declination. Alignment of the south tower's wind direction sensor was also confirmed by sighting to a known landmark (electrical substation tower) that was due north of the meteorological tower. Data were collected continuously during the monitoring program on pressure sensitive strip charts at both locations. The data were checked during each sampling period. At the completion of the field monitoring program, the charts were submitted to the NUS data reduction group for timing checks and for reducing the data to 15-minute average values.

3.3 SAMPLING SCHEDULE AND CONDITIONS

The proposed sampling schedule consisted of a series of 6-hour samples starting on the morning of September 4 and continuing through September 8, 1985 with the exception of one 12-hour and one 24-hour sampling period between September 5 and 7. The midpoint of the 6-hour sampling periods coincided approximately with the times of the alternating high and low tides. The initial day of sampling (September 4) had the daytime high tide occurring at noon, and the last scheduled day of sampling had the high tide at 3:30 in the afternoon. During this five day period, the minimum area of the mud flats was exposed during the warmest part of the day. Ambient concentrations of PCBs determined during the afternoon sampling periods were thus expected to represent the minimum daytime concentrations during the summer. Exposure of the tidal mud flats to the afternoon sun was expected to increase the rate of volatilization of any PCBs present in the estuary sediment. This would result in even higher daytime ambient concentrations of PCBs than those actually measured if the meteorological conditions were constant.

Due to a delay in gaining access to sampling location 2, only two of the first set of five scheduled samples were collected, and these were not started on time. A five hour and a 24-hour sample were started at location 2 at around 11:00 A.M. rather than at 9:00 A.M. as planned. No collocated samples were collected on the first sampling day either due to a lack of adequate electrical power circuits at location 2. Another sample was started at location 4 at noon. However, no other samples were started during the first sampling period since less than half the scheduled sampling time remained before the second sampling period.

In order for the samplers to collect PCBs and particulates emanating from the estuary and its shoreline, the samplers must be downwind from at least part of the estuary. The expected wind direction during favorable weather conditions was from the southwest for the early part of September. Other desirable conditions during the sampling periods included a lack of precipitation and clear skies during the day. Actual weather conditions during the sampling program deteriorated from the desired conditions after the second day of sampling, September 5, 1985. During the early hours of September 6, there were scattered showers in the New Bedford area, and the wind direction shifted to the north. Later in the day the wind direction returned to a southerly flow for a few hours, but turned to a northeasterly flow with some light rain for the remainder of the scheduled 24-hour sampling period. No samples were collected on September 7 due to rain during the day and easterly winds until 11:00 P.M. Sampling resumed at noon on September 8 under favorable weather conditions, but northeast winds returned at midnight. The collection of 6-hour samples was stopped, but the 24-hour samples in progress were continued. Due to the unfavorable weather forecast for the next several days, the sampling program was terminated on the morning of September 9, 1985.

3.4 QUALITY ASSURANCE/QUALITY CONTROL

The quality assurance program of NUS requires the preparation of a specific design control document (DCD) which outlines project responsibilities, schedule, scope of work, technical approach, and a quality plan. The design of the technical approach and quality plan establish the sampling and analytical requirements, and the acceptable level of conformance for the program. For the New Bedford sampling program, the technical approach specified that the following procedures be followed:

- Reference Method for the Determination of Suspended Particulates in the Atmosphere (High-Volume Method). CFR Volume 40, Part 50.11, Appendix B.

- Method TO-4, Method for the Determination of Organochlorine Pesticides and Polychlorinated Biphenyls in Ambient Air. EPA-600/4-84-041.

Each of these methods required that the flow rate of the instrument be calibrated over a specified operational range. NUS prepared and employed the following internal calibration procedures:

- NUS Environmental Monitoring Department (EMD) 5.2.17.31 "PUF Sampler Calibration Procedure", January 24, 1985, Rev. 0.

- EMD 5.0.17.12 "Hi-Vol Calibration Procedure", May 21, 1984, Rev. 1.

The quality plan also required the use of several sample blanks and the assessment of sampling precision. The quality control checks incorporated in the monitoring program include laboratory sample blanks, field blanks, shipping blanks, and collocated samples. Laboratory blanks were selected from among the prepared filters, and they were submitted for analysis prior to shipping the prepared filters to the site. Two types of blanks were sent to the site (but never employed) and returned for analyses. One type, called field blanks, were handled in exactly the same way as the regular samples, except that no air was drawn through the sample media. One field blank of each type accompanied each set of PUF filters and all but one set of high-volume filters. The other type of blanks were referred to as shipping blanks. The shipping blanks travelled with the regular samples to and from the site, but they were opened only for analysis at the NUS laboratory (i.e., never opened at New Bedford). At location 2, two collocated PUF samplers and two collocated high-volume samplers were operated during three 24-hour sampling periods to access the precision of the PUF and Hi-Vol sampling methods.

The DCD plan also required the keeping of records to document the above quality control activities. These records include the field log books, sample information forms, instrument calibration forms, laboratory analysis sheets, and chain of custody records. These forms were reviewed for internal consistency and accuracy. Chain of custody records provided confirmation that a responsible party maintained possession of the samples during all shipping and handling.

3.5 DATA PROCESSING

A total of 52 PCB samples and 52 particulate samples were collected during the four days of sampling. Each sample was accompanied by a field sampling data sheet upon which the sample number and information on flow rates and sampling time were recorded. Data from the sample information sheet were used to calculate the sampled air volume for each sample. These data were entered into separate data base files for the PUF and particulate filters. The files were maintained on an IBM Personal Computer. Sample identification number and sampling data from the field data sheets were indexed parameters for each sample record. The laboratory mass results for each sample were then entered into the appropriate file record for each PCB mixture

mixture or metal element. The software then computed and stored the airborne concentration value of each PCB mixture or metal based on the sampled air volume and the reported mass. The small amounts of mass collected on each sample were either expressed as milligrams (10^{-3}) grams or as micrograms (10^{-6} grams). Dividing the collected mass of a given compound by the sampled air volume produced an average (over the time of the sampling period) air concentration of that compound, usually expressed in micrograms per cubic meter (ug/m^3).

The data files present sample identification numbers, type of sample (6-hour high tide or low tide period, 24-hour), relative position of the sampler (either upwind or downwind of the estuary), date of collection, sampling location, and total air volume of the sample, followed by the results of the analyses for the PCB mixtures or elements. Appendix A and Appendix B contain a listing of the complete computerized data file for the TSP high volume filters and the PUF filters, respectively.

The strip charts containing the meteorological data from the two towers were checked for timing problems, and the hour indicators on the chart were adjusted as necessary. The charts were read for 15-minute averages of wind speed, wind direction, sigma, temperature and relative humidity. Appendix C presents a combined listing of these parameters for both towers by date and time for the period September 4 at 8:00 A.M. through September 9 at 11:30 A.M. The averages reported in the listing were determined from the conditions existing 15-minutes prior to the reported time. All times are in Eastern Daylight Time (EDT).

4.0 SAMPLE ANALYSES

The following sections describes the analytical methods and procedures employed at the laboratory for analyzing the particulate and PUF filters. The results of the analyses are then examined for significant values and consistency. Each section concludes with a description and an evaluation of the quality control checks on the laboratory analyses.

4.1 PARTICULATE FILTER ANALYSES

Glass fiber filters (Mead Flow S-935-BJH) were desiccated and weighed prior to being placed in manilla folders. The folders were then wrapped with aluminum foil for shipment to the site. Upon return to the laboratory, the Hi-Vol particulate filters were desiccated for at least 24 hours before being weighed. The new gross weight and the net weight, or mass increment, were recorded. A subset of filters were chosen for reweighing as a quality control check. The net weight for each sample is presented in Appendix A. The results of the quality control reweighing are discussed at the end of this section.

4.1.1 Methods of Analysis

Since the conditions favoring higher concentrations of TSP were best during the first day of sampling, the samples taken on September 4 were considered most likely to have collected a sufficient mass such that the ambient concentration of heavy metals could be measured. Fourteen filters collected on September 4, plus an additional background filter from location 5 (taken September 5) and a field blank (taken September 8), were selected for initial analyses of cadmium, chromium, lead, and zinc. If these compounds were not detected in significant amounts on the filters most likely to have high concentrations, then there would be only a remote possibility that significant concentrations would be found on the remaining filters.

A quarter of each filter was placed in separate acid digestion baths to dissolve the particulate matter on the filter into solution. After several rinses and filtrations, the solution volume was brought up to 100 ml prior to performing the analyses. Concentrations of cadmium (Ca), chromium (Cr), and zinc (Zn) in the solution were determined from individual injections of sample aliquot into a flame atomic absorption (AA) analyzer. Lead (Pb) concentrations were determined by the graphite furnace method. The chromium and zinc analyses both had a detection limit of 0.004 milligrams per filter (mg/filter), and the cadmium analyses had a detection limit of 0.002 mg/filter. The furnace technique produced the lowest detection limits for lead at 0.0004 mg/filter. Seven of the 16 samples required that the Method of Standard Addition (MSA) be used to determine the lead concentration in the sample. These samples are identified in the data listing.

4.1.2 Results of Elemental Analyses

None of the 16 samples had measurable amounts of cadmium. Chromium was detected on three samples at levels just above the detection limit. However, since one of these was a field blank, the results on the other two samples could also be due to field handling and/or residual chromium in the filter from manufacturing. The mass of chromium on the two filters was 0.016 and 0.012 mg for the 24-hour and a 6-hour samples, respectively. Since the field blank contained a similar level of chromium, the reported masses are probably higher than the actual mass of chromium collected during the sampling periods.

Similarly, the reported lead amounts in the data listing probably over estimate the actual amounts collected. The field blank contained an amount of lead at the approximate mid-point in the range of lead of most of the other filters. With one exception, the amount of lead on each filter ranged between 0.028 and 0.084 mg. It is unlikely that contamination during field handling of the filters would have produced such a uniform amount on each of the filters by itself. The detected lead is more likely due to uniform ambient concentrations and/or residual amounts of soluble lead in the glass fiber filter. Lead is known to be retained in minute amounts in glass fiber filters. The laboratory blank was analyzed at less than 0.01 mg of lead/filter, which would indicate that there was no soluble lead in the filters. However, this blank was analyzed prior to establishing the exact methods of analysis for the filters. The method of analysis for the laboratory blank was flame atomic absorption spectrometry, and not the furnace method as used for the other filters. The graphite furnace method has greater sensitivity and lower detection limits than the flame method, which may account for this inconsistency. The field blank in question also contained the largest mass of zinc of the analyzed filters, and a detectable amount of chromium. Thus, this field blank may have an exceptionally high level of residual elements which would suggest greater field contamination than actually occurred.

The 24-hour sample that was analyzed, filter #3, contained the largest mass of lead. This is consistent with expectations since the sampling time was four times longer than the other samples. The detected lead (0.172 mg) on filter #3 is at least twice the amount detected on the other analyzed filters. Therefore, airborne lead was collected on the filters, but the precision of the sampling and analysis methods is very limited in quantifying the exact amount due to the field blank values, the probability of residual lead in the filters, and the possiblity of contamination picked up in the field.

The analytical results for zinc are inconsistent with the collected mass increments on most of the analyzed filters, and with the expected results. For most of the 16 filters analyzed, the mass of zinc determined for each filter surpassed the total increment in TSP mass collected on the filter. These filters contained residual amounts of zinc from the manufacturing process that dissolved in the acid digestion of the samples for analysis. The analysis of a laboratory blank also indicates that there is a fairly large amount (approximately 23 mg in the blank) of soluble zinc in the filters. Although zinc is retained in small amounts in the glass fiber material, the reported results are exceptionally high. However, filter #20 and #55 had lower masses of zinc (0.040 mg and 0.024 mg, respectively) that are close to the expected values, which are based on results of other field sampling programs. The difference between the zinc values for the first 14 filters and filters #20 and #55 is a factor of 500 to 1000. Although some variation in residual amounts of a chemical are expected within a batch of filters, a variation of this magnitude, even on only one filter, is improbable. This variability in zinc levels was traced to the use of two different batches (boxes) of filters for the project. The first fifteen or so filters were left over from a previous project, and the filters from approximately #20 on came from a second box. Although both boxes of filters came from the same manufacturer (Mead Specialty Paper Division), and had the same part number, variations in the manufacturing of the filters or in the glass fiber (from Johns-Manville) apparently are responsible for the wide variation in zinc levels in the two sets of filters. Due to the exceptionally large values and their associated inconsistencies, the zinc results for the first days samples (September 4) are not useable for determining ambient concentrations of airborne zinc. Although the remaining filters could be analyzed for zinc and lead, the lack of chromium and cadmium in the analyzed filters, and the small amounts of mass collected on the remaining filters, make it unlikely that any significant concentration of metals would be detected. Thus, additional filter analyses are not warranted.

4.1.3 Quality Control for Metals Analyses

The laboratory's quality control program for the particulate filter analyses was based on the USEPA Contract Laboratory Program, "Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration"(4). The program consisted of the following seven requirements:

1. Initial Calibration - 2-point calibration verified by 2 additional standards prepared from same stock solution. Analysis of an EPA QC sample; recovery must be ± 10% of true value.

2. Continuing Calibration - Analysis of the EPA QC sample after every 10 samples or every 2 hours, whichever is more frequent, and after the last sample; recovery must be ± 10% of true value.

3. Preparation Blank - With each set of 20 samples, or when each day's samples are prepared, whichever is more frequent.

4. Matrix Duplicate - Duplicate analysis of digested sample at a frequency of one sample in every twenty. Relative percent differences (RPD) are calculated and reported when both values are greater than the detection limit.

5. Matrix Spike (Flame AA) - Analysis of a spiked sample at a frequency of one sample in every twenty. Spike is added after digestion of the sample. If recoveries are not within 75-125%, the data for all samples analyzed with the spiked sample are flagged during reporting.

6. Matrix Spike (Graphite Furnace) - Single-point matrix spike analysis of every sample. Matrix spike 3-point standard additions are performed if single-point spike recoveries indicate matrix problems. Spikes are added after digestion of the sample. Spike recoveries outside the limits specified in the CLP protocol are flagged on the reports.

7. Aqueous Laboratory Control Sample - Digestion and analysis of an EPA QC sample at a frequency of one sample in every 20 or one in every set of samples digested, whichever is more frequent, using the same digestion procedure used for filters. Recoveries must be within EPA established limits.

The sample analyses met all of the above criteria. Copies of the data analysis forms are provided in Appendix D, including: Data sheets, calibration verification forms, blank results, spike sample recoveries, detection limits, and control sample results.

The quality control program for the weighing of the filters followed NUS procedure 5.0.17.14, "Inhouse Filter Weighing for Hi-Vol Sampling Programs, Rev. 1". This procedure requires that 10% of both the clean filters and the sampled filters be reweighed after a second desiccation period of at least 24 hours. The difference in weight for any filter must not exceed 2.8 mg for clean filters, and 5 mg for sampled filters. If the tolerance is exceeded, then the entire lot must be reweighed again until the tolerances are met. These requirements were adopted from the EPA Quality Assurance Handbook for Air Pollution Measurement Systems[5]. The largest difference obtained on the reweighed filters was 1.3 mg from a sampled filter. When the clean filters were reweighed, there were no changes in the weights.

4.2 PUF FILTER ANALYSES

The PUF (polyurethane foam) filters were prepared in the NUS laboratory in accordance with EPA method TO4, "Method for the Determination of Organochlorine Pesticides and Polychlorinated Biphenyls in Ambient Air"[6]. This method requires the cleaning of the filters in an acetone rinse for several hours, and the analysis of a laboratory blank before the filters could be used for sample collection. Upon return to the laboratory, the filters were rinsed in hexane to remove any organics following the procedure in TO 4, and the hexane extract was reduced to a volume of 1 ml. For all but four of the samples, the quartz particulate filter was extracted with the PUF filter. These four particulate filters were analyzed separately to determine if any of the PCBs would remain on the collected particulate matter during sampling. Each sample extract was then passed through a chromatographic column packed with alumina to remove potentially interfering compounds. The column was then rinsed with 10 ml of hexane at the rate of 0.5 ml/min, and the recovered volume was adjusted to 10 ml. Each sample extract was stored in sealed vials under refrigeration until analysis.

4.2.1 METHOD OF ANALYSIS

The extracts were analyzed on a gas chromatograph with an electron capture detector following the procedures in EPA Method 608. The method of analysis and quality control requirements were further defined in the Contract Laboratory Program's statement of work[7]. The quality control checks during the analyses are discussed below. The detection limit for the different PCB mixtures varied for individual samples due to the effects of the alumina cleanup procedure and the selection of the appropriate output scale for the amount of 1242 present. In general, the lowest achievable detection limits were 0.1 ug for Arochlors 1016, 1221, 1232, 1242, and 1248, while Arochlors 1254 and 1260 were detectable above 0.2 ug.

4.2.2 RESULTS OF PCB ANALYSES

The only PCB mixture found on the samples was Arochlor-1242. Amounts above the detection limit were found on 39 of 45 ambient samples (87 percent) analyzed. Only one field blank had a detectable mass (1.2 ug) greater than the detection limit, but this filter was not a true field blank. See Section 5.3.2 for explanation. The results for the other eight field blanks were all below the detection limits. The largest mass of Arochlor-1242 on the filters was 64 ug, which was collected on a 24-hour sample at location 2. The results of the sample analyses are reasonable and consistent with expected values. Two sets of collocated samples show very good agreement, and the laboratory blank results were all below the sample detection limits.

The only problem that arose with the PUF samples concerned the identity of several of the samples. All or part of some sample identification numbers were erased during shipment when the sample jars vibrated against the foam packing. Six samples could not be identified, and these were not analyzed. Two of the unidentified samples were collocated 24-hour samples. Three other samples have tentative identification and these samples were analyzed. Additionally, one sample extract was lost during analysis, and no results were obtained for that sample. A total of 69 analyses were performed: 45 ambient samples, 4 separate glass fiber filters, 9 field blanks, 2 shipping blanks, and 9 laboratory blanks. Appendix E lists the analysis results for each PUF filter, and the notes identify those samples without positive identification numbers.

* The results for each of the four quartz fiber filters, which were analyzed separately from their corresponding PUF filter, were all below the detection limit; while three of the corresponding four PUF filters contained detectable amounts of Arochlor-1242. These results are consistent with earlier findings[8] which showed that PCBs were not retained on the particulate pre-filter for the PUF sample.

4.2.3 QUALITY CONTROL FOR PCB ANALYSES

The laboratory's quality control program for the PUF filter analyses was based on the USEPA Contract Laboratory Program, "Statement of Work for Organic Analysis, Multi-Media, Multi-Concentrations". The quality control checks consisted of the following requirements:

1. Preparation Blank (with surrogate, dibutylchlorendate) - Reagent water carried through a Soxhlet extraction and GC analysis at a frequency of one sample in every 20 samples or each time samples are extracted, whichever is more frequent.

2. Dibutylchlorendate (DBC) - Surrogate added to each sample prior to extraction. DBC recovery is monitored; retention time shift must be evaluated after each analysis and must be within 2% for packed columns and 0.30% for capillary columns.

3. Calibration - The calibration sequence listed below is followed every 24-hour period during the analyses.

   3.1 Evaluation Standard Mix A — % Relative Standard
   3.2 Evaluation Standard Mix B — Deviation (% RSD)
   3.3 Evaluation Standard Mix C — of DBC $\leq$ 10%
   3.4 Run one concentration of each: Arochlor 1016, 1221, 1232, 1242, 1248, 1254, 1260
   3.5 Analyze five samples
   3.6 Run one Arochlor Standard - If any sample contains PCBs, Arochlor(s) will be tested for linearity
   3.7 Analyze another five samples
   3.8 One Arochlor Standard - Continue sample analyses (5 at a time) followed by analysis of one Arochlor standard as a continuing calibration check ending each 24-hour sequence with an Arochlor standard. All quantitations are completed using a

packed column; a second column (fused silica capillary) is used for confirmation. The % difference of the calibration factors for continuing calibration checks must be ± 20% for confirmations.

The PUF sample analyses met all of the above criteria with three exceptions. Sample #9 contained no dibutylchlorendate (DBC). Apparently it was not added during the sample preparation step. Samples #9 and #19 indicated PCBs when analyzed on the primary column, but the analyses on the second column did not produce confirmatory results. Samples #38, #39, and #40 had a DBC shift greater than two percent due to the presence of an interfering compound. Copies of the data analyses forms are provided in Appendix E, including: data sheets, calibration verification forms, blank results, spike sample recoveries, detection limits, and control sample results.

5.0 AMBIENT CONCENTRATIONS

The results of the laboratory analyses for each filter were entered into the project data base file. For those results that were greater than the detectable limit of the method, the data base calculated an ambient concentration in microgram per cubic meter (ug/m^3) by dividing the sample mass by the sample air volume. The resulting ambient air concentrations for the particulate filters and the PUF filters are presented in Appendices A and B, respectively. In the following two sections, the data on particulate concentrations and the PCB concentrations are examined. Each section compares the air concentrations with the conditions during the sampling program and with the concentrations determined by the 1982 monitoring program. This part of the report concludes with an evaluation of the quality control samples employed during the field study.

5.1 TOTAL SUSPENDED PARTICULATES AND METALS CONCENTRATIONS

In general, the total suspended particulate (TSP) concentrations during the program were at their maximum on the first day, decreased to their minimums during the rainy days, and increased again during the last two days of the program. The highest concentrations were 117 and 114 ug/m^3 measured at locations 2 and 4, respectively, during the first few hours of sampling. The lowest concentrations were measured during a 24-hour period of intermittent rain showers. These values ranged from 21 to 28 ug/m^3 at all five locations. Locations 2 and 4 usually had the highest concentrations, although there was little difference in the concentrations between the five sampling locations. The slightly higher concentrations at location 2 are attributed to the road construction work on the northeast side of the Acushnet Company plant, and to the employees driving over the dirt road.

All the 24-hour samples and all the composite averages of the four 6-hour samples are well below the National Ambient Air Quality Standard for TSP of 150 ug/m^3. Airborne particulate concentrations are influenced by the air temperature, amount of soil moisture, and wind speed in addition to the extent of human activity. There is no apparent relationship between airborne concentration and the condition of high or low tide during the study. Except during periods of rain, concentrations were lowest during the evening and early morning sampling periods when fog and light winds were present. The TSP concentrations increased slightly during the day with the increased temperatures, higher wind speeds, and general increase in human activity.

The laboratory results provide useable data only for detectable amounts of airborne lead on the few samples analyzed. These samples were collected on September 4, when the weather conditions were the most favorable during the program for the generation of TSP. Although the residual lead content of the filters makes precise determination of the ambient lead levels impossible, the results can be used for estimating the approximate level of ambient lead. If no correction is applied to the laboratory results for residual lead in the filters, the calculated concentrations will overestimate the actual concentrations. These conservatively high concentrations are listed in Appendix A. The calculated concentrations range from 0.07 to 0.31 ug/m^3 with the maximum occurring during morning sampling at location 4, and the minimum occurring at location 1 at night. The afternoon and nighttime group of calculated concentrations show little variation, but each nighttime concentration is less than its corresponding daytime concentration for all sampling locations except location 5. The results from location 5, Brooklawn Park, are consistent with the observed pattern of increased human activity in the evening and at night in the park and little activity during the day. The uniform concentrations indicate that the airborne lead is due to a diffuse source, such as automobile exhaust emissions, rather than a specific source near the estuary.

The largest mass of lead among the samples analyzed was collected on the 24-hour sample at location 2. This sample concentration (0.11 ug/m^3) should be the most accurate measurement of airborne lead of the samples analyzed. Any residual lead in this filter would account for a smaller percentage of the total lead determined during analysis. Ambient 24-hour concentrations of lead determined from the 1982 study[1] ranged from 0.16 to 0.45 ug/m^3 for four samples collected near the north end of the estuary.

The 1982 concentrations are comparable to the calculated maximum concentrations for the 1985 study. The National Ambient Air Quality Standard for lead is 1.5 ug/m^3 quarterly (90 day) average. The 90 day average is itself an average of the lead results from a series of 24-hour high-volume particulate samples.

5.2 AIRBORNE PCB CONCENTRATIONS

Calculated concentrations of Aroclor-1242 ranged from below the ambient detection limit (0.5 ng/m^3) to a maximum of 471 ng/m^3. Similar to the particulate concentrations, the concentration of Aroclor-1242 were generally greatest on the first day of sampling, decreased through the rainy days, and increased again as the weather cleared. Unlike the TSP concentrations, the Aroclor-1242 concentrations at location 2 stand out since they are several times the concentrations measured at the other locations. Location 2 was adjacent to the mud flats that are due northeast of the site of the Aerovox plant. The mud flats extend slightly up river from sampling location 2 and approximately 1000 feet downriver. Location 2 was downwind of some part of the mud flats for at least a portion of each sampling period. Although there are only seven samples from location 2 that were synchronized with the tide changes, these samples indicate that the ambient air concentration of Aroclor-1242 increases during low tide periods, relative to the concentrations during high tides. The data for locations 1, 3 and 4 do not show as much variation with the tide changes as at location 2 with one exception. On September 8, the concentration of Aroclor-1242 at location 4 changed from 15 ng/m^3 to 137 ng/m^3 with the high and low tide periods, respectively.

Table 5-1 presents the air concentrations of Aroclor-1242 for each of the 6-hour sampling periods during the program along with a summary of the wind conditions during each period. In addition to the tides, meteorological factors such as relative humidity, temperature, and solar radiation may also influence the formation of airborne PCB's, but an evaluation of these factors is beyond the scope of the program and data. The concentrations of PCBs at a monitoring location will depend upon the wind conditions and the

Table 5-1. Tidal Phase, Meteorological Conditions, and Airborne Concentrations of Aroclor 1242
Acushnet River Estuary, September 4-8, 1985

Date	Time (Hrs)	Tide	Wind Direction/Speed	Average Temperature	Aroclor-1242 Concentrations, ng/m^3				
					Location 1	Location 2	Location 3	Location 4	Location
9/4	1100-1500	High	Southwesterly, 10-20 mph	83°F	*	153	*	52	*
9/4	1500-2200	Low	Westerly, 5-10 mph	83°F	32	471	40	55	<24
9/4-5	2200-0300	High	Westerly, 10 mph	75°F	<6	128	29	35	<12
9/5	0300-0900	Low	Northwesterly, 2 mph	73°F	30	290	42	43	7
9/5	0900-1500	High	Westerly, 5-15 mph	82°F	15	128	28	*	<7
9/5	1500-2100	Low	Southwesterly, 3-15 mph	80°F	*	196	<33	24	13
9/8	1200-1800	High	Southerly, 3-8 mph	82°F	*	79	17	15	16
9/8	1800-2400	Low	Southwesterly, 1-5 mph	73°F	53	*	17	137	12

* = Samples not collected or samples not identifiable

< = Maximum possible concentration determined from reported laboratory detection limit for the sample and the sampled air volum

Location	$\bar{X}$ (high)	$\bar{X}$ (low)	$\bar{X}$	$\bar{X}$ GCA, 1984	$\bar{X}$ 1978
1	10	38	24	--	
2	122	319	220.5	16	295 hi
3	25	72	57	11 (more inland)	400
4	31	65	50	--	
5	11.6	19	15	5	

[illegible] inland

spatial relationship between the source of PCBs and the monitoring location. The wind direction was not steady during any of the sampling periods, and these fluctuations in wind direction and speed prevent a precise determination of the source or sources. Data from location 5, Brooklawn Park, and from the concurrent 24-hour samples (collected at all locations except location 3), suggest a background air concentration of approximately 10 ng/m^3 of Aeroclor-1242 for the area around the north end of the estuary. The 24-hour samples were collected during a period of predominantly northeasterly winds and light rain. With the wind from the northeast, locations 1, 2, 3 and 4 were upwind of the estuary, yet they still collected measurable and consistent amounts of Aroclor-1242. The 10 ng/m^3 background value is consistent with the concentrations measured in the 1982 study at Burt School in Acushnet and Brooklawn Park[1], and with the average of 11 ± 6 ng/m^3 from all the background stations in that study.

The concentrations of Aroclor-1242 at location 2, however, are much greater than those measured in the vicinity of the Aerovox site in 1982. Concentrations of four samples at location 9 (C and W welding), which was the closest monitoring location to the Aerovox plant in the 1982 study, ranged from 62 to 99 ng/m^3. These were 12-hour samples collected during daylight hours. The air concentrations of Aroclor-1242 measured on 14 samples collected at location 2 during the NUS study ranged from 10 ng/m^3 to 471 ng/m^3. The 10 ng/m^3 concentration was collected on a 24-hour sample during rainy weather. The lowest concentration measured during dry weather at location 2 was 79 ng/m^3 during a high tide sampling period.

Location 2 is quite close to an apparent source of PCBs: the mudflat at the far northend of the estuary. However, it is not evident from the data if locations 1, 3, and 4 are receiving airborne PCBs soley from local sources near each sampling location, or if these locations are receiving some PCBs from the mudflat near location 2 and/or other sources at same distance. The background concentration of approximately 10 ng/m^3 accounts for a significant portion of the concentrations measured at these three loctions. Additionally, there is very little variation in the concentrations at locations 3 and 4 during periods of high and low tides except for one occurrence. If the smaller mudflat near location 4 were a major source of PCBs, locations 3 and 4 would be expected to show more variation in the measured concentrations, especially when the wind was from the south and southwest. This situation occurs only once at location 3, when the concentration was 137 ng/m^3 during low tide on September 8. However, a similar concentration would be expected for the September 5 low tide period which had similar meteorological conditions, yet the concentration was only 24 ng/m^3. The concentrations at location 3 show even less variation, ranging from a minimum of 17 ng/m^3 to a maximum of 42 ng/m^3. This maximum value was measured when the wind was from the northwest, and location 3 was downwind of the mudflat at location 2.

Composite 24-hour average concentrations were calculated for those periods that had sufficient 6-hour samples to cover the approximately 24-hour composite period. These composite concentration are shown in Table 5-2 along with the regular 24-hour samples collected at location 2. Again, the concentrations at location 2 are several times greater than any of the other averages except for samples collected on September 6-7 during light rain and easterly winds. A comparison of the composite sample averages at location 2 with the primary and collocated sampler results indicates that the 24-hour samples may be underestimating the actual concentration. This could occur if the collected mass at the beginning of the sampling period had sufficient time to migrate through the PUF cartridge and was exhausted with the air flow. Laboratory evaluations of PUF filter retention times show that PCBs do migrate through the PUF filter with the more volatile components achieving greater penetration(8). However, the same study concluded that the amount of PUF material used in the NUS samples would be adequate for retaining more than 90 percent of the PCBs collected. Other possible reasons for the differences in the calculated concentrations are discussed in Section 5.3.2, PCB Sampling Quality Control.

Only the first 24-hour sample (9/4-9/5) at location 2 exceeded the Canadian guideline of 150 ng/m^3 for PCBs in a 24-hour period. Based on the collected data, this location may exceed the Canadian guideline of 35 ng/m^3 for an annual arithmetic mean as well. All locations, including location 2, have 6-hour concentrations that are at least 1000 times lower than the

Table 5-2. Aroclor-1242 Composite 24-Hour Airborne Concentrations[a], ng/m³
Acushnet River Estuary, September 4-8, 1985

Sampling Period	Location 1	Location 2 Composite	Location 2 Primary	Location 2 Collocated	Location 3	Location 4	Location 5
9/4, 1100 hrs - 9/5, 0900 hrs	<21[b]	269	201	NA	37[b]	46	<15[b]
9/5, 0900 hrs - 9/6, 0900 hrs	NA	118	99	95	<28	NA	<5
9/6, 0900 hrs - 9/7, 0900 hrs	10	--	NA	11	NA	12	11
9/8, 1200 hrs - 9/9, 1300 hrs	NA	NA	66	63	NA	NA	NA

a. Total sampled mass and total sampled air volume for the 6-hour samples determine 24-hour average concentrations.

b. Average determined from only three 6-hour samples.

< = Indicates that at least one of the laboratory results was below the detectable limit for the sample.

NA = Insufficient samples for determining a comparable 24-hour average concentration.

Threshold Limit Values (TLV) for chlorodiphenyl, both 42 percent and 54 percent chlorine, time weighted (8 hour) averages of 1.0 and 0.5 mg/m^3, respectively, as established by the American Conference of Government Industrial Hygienists.

5.3 RESULTS OF QUALITY CONTROL CHECKS

The quality control checks on the sample collection program consisted of collocated 24-hour samples, field blanks, and shipping blanks for both the particulate filters and the PUF filters. The collocated sample results for airborne concentrations provide a measure of the overall program precision in that both the laboratory analyses and the measurement of the sampled air volume are included in the determination of the ambient concentration. The field blanks indicate the possible level of contamination of the samples from handling. Shipping blanks provide an indication of possible contamination due to the shipping procedure that might not be discernable on the field blanks by themselves.

5.3.1 PARTICULATE SAMPLING QUALITY CONTROL

Three sets of collocated particulate filters were collected during the program. The results, presented below indicate fairly good precision for TSP with a maximum difference of only 11 percent, and an average of 5 percent difference.

Collocated TSP Sample Results

Date	Primary Sample, ug/m^3	Collocated Sample ug/m^3	Percent Difference
Sept. 5	65	72	10.8
Sept. 6	28	28	0
Sept. 8	64	67	4.7

Two of the field blanks had slight increases in weight of approximately 2 to 3 mg. This is an indication of possible contamination from handling. The other six field blanks and the two shipping blanks all had a small loss in weight. A loss in weight of 1 to 2 mg is normal from handling and folding the friable glass fiber filters. In either case, the change in weight of the blanks amounts to at most 13 percent of the collected mass in each of corresponding sample sets. The weight change of the blanks is less significant for normal 24-hour samples (1 to 5 percent). However, the six-hour samples collected less mass than the 24-hour samples, so the weight change of the blanks has a proportionally greater effect on the mass determination. For approximately half the 6-hour samples, the weight change of the blanks corresponded to about 10 percent of the collected mass. For the other half, the ratio of blank to sample mass increments was less than five percent. Since the majority of the blanks lost a small amount of weight due to handling, the reported mass increases for the samples can be expected to underestimate the true amount of mass collected. Consequently, the calculated ambient concentrations are slightly less than the actual concentrations if the sample volume determinations are accurate.

Sampled air volume was determined by measurement of each sampler's flow rate and the sampling time. Each sampler was calibrated against a Kurz Hi-Vol air flow calibrator, Model 341, which is traceable to NBS standards. The samplers were calibrated at the beginning of the program, and they were checked for flow rate drift at the end of the program. Generally, traces on the flow rate chart recorders at the end of the program were in close agreement with the expected traces based on the calibrations. Location 4 was an exception, however, due to the extreme variation in AC line voltage. Power fluctuations were so rapid at location 4 during the post program check that an accurate determination of flow rate could not be determined. Samples from location 4 with suspected flow rate inaccuracies are identified in the data listing.

5.3.2 PCB SAMPLING QUALITY CONTROL

Although three sets of collocated PUF samples were taken during the program, one of the samples lost its identification number, and its results are not available. This particular sample came from a set of 24-hour samples from all locations. Since the variation in concentration among the four samples from different locations around the estuary is only 2 ng/m^3, it is unlikely that the missing sample would vary significantly from those at the other locations. The other two sets of collocated samples show excellent precision for Aroclor-1242 as shown below:

Collocated PCB Sample Results

Date	Primary Sample, ng/m^3	Collocated Sample ng/m^3	Percent Difference
Sept. 5	99	95	4.0
Sept. 8	66	63	4.5

One field blank had a detectable amount of Aroclor-1242 of 1.2 ug. However, this filter was originally intended as a sample for the collocated sampler at location 2. The filter assembly was installed and the sampler turned on, but after a few minutes the sampler shut down due to a tripped circuit breaker. Since a new power line would need to be installed before the collocated samplers could be operated, this filter was labeled as a field blank. At that time, the few minutes that the sampler operated were not considered sufficient to accumulate a detectable amount of PCBs. Unfortunately, during this sampling period at location 2 the highest concentration of Aroclor-1242 was measured, 471 ng/m^3. So the detected amount of 1242 on the filter is credited to the active sampling, and not to field handling of the filter.

Each sampler was calibrated with a calibrated orifice according to the NUS PUF Sampler Calibration Procedure. Readings on each sampler's magnehelic gauge were plotted against the flow rate as determined from the orifice calibration sheet. During sample collection, readings of the magnahelic gauge and the elapsed time meter were recorded at the beginning and end of each sample. At the end of the field program, the sampled air volume for each sample was calculated from the data on the sample information sheet and the corresponding flow rate from each sampler's calibration curve. Each of these calculations were checked before the volume measurements were entered into the data base.

As mentioned previously in Section 5.2, the composite concentration of the 6-hour samples at location 2 are greater than the primary and collocated 24-hour samples by 20 to 30 percent. This implies that one or more of the measurements for sample flow rate and/or the amount of Aroclor 1242 on the filter were biased. It is unlikely that there was any significant error in the recording of the readings from the elapsed time meters or in the meters themselves. Although there is a possibility that the 24-hour samples could have had breakthrough of the collected PCBs while sampling, this is not likely either. Likewise, the probability is low that the laboratory analyses are biased towards reporting slightly higher masses than actually collected for samples with amounts just above the detection limit.

The determination of the air flow rate for each sample is the most likely source of the differences in the samples. Although each sampler's gauge readings corresponded to a known flow rate because of the calibration of the sampler, readings for the 6-hour samples were taken only at the beginning and end of the sampling period, and at 6-hour intervals for the 24-hour samples. There was no chart to indicate flow rate throughout the sampling period as with the high volume samplers for TSP. Consequently, any variation in flow due to voltage fluctuations during sampling would go unnoticed. The six samplers at location 2 were connected to three different electrical circuits. Variations in voltage did occur at location 2 based on the chart traces of the high volume samplers. However, it is not known which hivol, if any, was on the same circuit with one, or more, of the PUF samplers. Therefore, no estimate can be made of possible voltage changes and resulting flow changes for any of the PUF samplers at location 2. Although the precision of the measurements from the two 24-hour samplers is quite good, the discrepancy in the results of the composite value for the 6-hour samples imply that the accuracy of the measurements are ± 10 to 15 percent. In contrast, the composite values for the 6-hour TSP samples collected on September 4 and 5 at location 2 are within 1 ug/m^3 of the 24-hour primary TSP samples. The flow charts for each TSP sample provided a means for estimating average flow for each sample even though the flow rate may have varied over the sampling period.

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APPENDIX A

TOTAL SUSPENDED PARTICULATE AND METALS DATA LISTING

LEGEND

Sample number	number assigned by Pittsburg lab
Station number	number of sampling site station for monitoring project
Sample Type	duration in hours, blank, or shipping blank, high tide (HITD), or low tide (LOTD).
Relative Location	upwind or downwind relative to estuary, or colocated 24 hour
Sample Start	day, month, hour
Day of Week	Starting day of the week for sample start
Sample Conditions	Numbers indicate which comments under NOTES heading apply to sample collection or analysis information
Standard Volume	sampled air volume at 25 degrees C and 760 mm Hg
Total Mass Increment	total mass change for the TSP filter after exposure. Values in parentheses indicate weight loss
TSP Concentration	total TSP concentration of exposed filter.
Compound(element)	standard name and laboratory result. Results reported are for TSP sample metals plus filter media (i.e., uncorrected for filter media contribution).
Concentration	concentration of compound(element) to immediate left

NOTES:

1) AC power fluctuations noted in field were based upon Dickson chart recordings.
2) Lead analyses by method of standard addition.
3) Analyzed prior to other filters.

* HI-VOL SAMPLES * 03-Feb-86

* HI-VOL SAMPLES *

SAMPLE NUMBER	STA #	SAMPLE TYPE	RELATIVE LOCATION	SAMPLE START DAY	MON	HR	DAY OF WEEK	SAMP COND NOTE	STANDARD VOLUME [feet3]	TOTAL MASS INCR. [gram]	TSP CONC [micro gm/meter3]	CADMIUM Cd [milli-grams]	CONC [micro gm/meter3]	CHROMIUM Cr [milli-grams]	CONC [micro gm/meter3]	LEAD Pb [milli-grams]	CONC [micro gm/meter3]	ZINC Zn [milli-grams]	CONC [micro gm/meter3]	SAMPLE END DAY	MON	HR
TMF 3	2	HITD	DOWNWIND	4	9	11	wed		10,588	0.0343	114	(.002		(.004		0.065	0.22	28.400	94.73	4	9	16
TMF 7	4	HITD	DOWNWIND	4	9	12	wed		5,865	0.0195	117	(.002		(.004		0.057	0.34	34.400	207.14	4	9	15
TMF 11	2	24 HR	DOWNWIND	4	9	11	wed		55,840	0.1289	82	(.002		0.016		0.172	0.11	20.400	12.90	6	9	11
TMF 1	1	LOTD	UPWIND	4	9	15	wed		14,149	0.0269	67	(.002		(.004		0.070	0.17	20.400	50.92	4	9	22
TMF 4	2	LOTD	DOWNWIND	4	9			1	15,815	0.0382	85	(.002		(.004		0.072	0.16	20.400	45.55	4	9	22
TMF 5	3	LOTD	DOWNWIND	4	9				14,776	0.0315	75	(.002		(.004		0.065	0.16	29.600	70.74	4	9	22
TMF 8	4	LOTD	DOWNWIND	4	9				12,474	0.0304	86	(.002		(.004		0.084	0.24	29.600	83.80	4	9	21
TMF 9	5	LOTD	UPWD/BKGN	4	9				17,690	0.0418	83	(.002		(.004		0.060	0.12	22.800	45.52	4	9	23
TMF 12	***	BLANK		4	9					0.0033		(.002		0.012		0.061		40.800				
TMF 2	1	HITD	UPWIND	4	9	22	wed		13,592	0.0174	45	(.002		(.004		0.028	0.07	15.200	39.49	5	9	4
TMF 13	2	HITD	DOWNWIND	4	9				15,079	0.0182	43	(.002		(.004		0.043	0.10	37.200	87.13	5	9	3
TMF 6	3	HITD	DOWNWIND	4	9				13,508	0.0178	47	(.002		(.004		0.059	0.15	29.200	76.34	5	9	3
TMF 14	4	HITD	DOWNWIND	4	9				11,697	0.0161	49	(.002		0.012		0.057	0.17	33.600	101.45	5	9	3
TMF 10	5	HITD	UPWD/BKGN	4	9				11,573	0.0161	49	(.002		(.004		0.046	0.14	34.000	103.75	5	9	4
TMF 16	1	LOTD	UPWIND	5	9	3	thurs		13,034	0.0170	46									5	9	10
TMF 17	2	LOTD	DOWNWIND	5	9				18,110	0.0494	96									5	9	11
TMF 18	3	LOTD	DOWNWIND	5	9				15,580	0.0203	46									5	9	10
TMF 19	4	LOTD	DOWNWIND	5	9				8,820	0.0129	52									5	9	6
TMF 20	5	LOTD	UPWD/BKGN	5	9				12,765	0.0170	46	(.002		(.004		0.031	0.08	0.040	0.11	5	9	10
TMF 21	***	BLANK		5	9					0.0017												
TMF 22	1	HITD	UPWIND	5	9	9	thurs		12,398	0.0255	73									5	9	15
TMF 23	2	HITD	DOWNWIND	5	9				11,541	0.0187	57									5	9	15
TMF 24	3	HITD	DOWNWIND	5	9				13,121	0.0186	50									5	9	15
TMF 26	5	HITD	UPWD/BKGN	5	9				11,899	0.0222	66									5	9	16
TMF 29	***	BLANK		5	9					(0.0004)												
TMF 27	2	24 HR	COLOCATED	5	9	9	thurs		57,473	0.1168	72									6	9	9
TMF 28	2	24 HR		5	9				45,303	0.0850	65									6	9	9

TMF	30	1	LOTD	UPWIND	5	9	15	thurs		13,516	0.0273	71				5	9	21
TMF	31	2	LOTD	DOWNWIND	5	9			1	14,487	0.0276	67				5	9	21
TMF	32	3	LOTD	DOWNWIND	5	9				13,364	0.0222	59				5	9	21
TMF	25	4	LOTD	DOWNWIND	5	9			1	10,759	0.0219	72				5	9	22
TMF	33	5	LOTD	UPWD/BKGN	5	9				13,608	0.0260	67				5	9	21
TMF	34	***	BLANK		5	9					(0.0010)							
TMF	35	1	12 HR	DOWNWIND	5	9	21	thurs		31,576	0.0417	47				6	9	10
TMF	36	2	12 HR	DOWNWIND	5	9				33,959	0.0630	66				6	9	9
TMF	37	3	12 HR	DOWNWIND	5	9				30,612	0.0367	42				6	9	9
TMF	38	4	12 HR	DOWNWIND	5	9			1	29,946	0.0395	47				6	9	9
TMF	39	5	12 HR	UPWD/BKGN	5	9				32,000	0.0306	34				6	9	9
TMF	40	***	BLANK		5	9					(0.0014)							
TMF	41	1	24 HR	DOWNWIND	6	9	9	fri		55,636	0.0350	22				7	9	10
TMF	42	2	24 HR	COLOCATED	6	9				57,646	0.0457	28				7	9	9
TMF	43	2	24 HR	UPWIND	6	9	9	fri		46,315	0.0365	28				7	9	9
TMF	44	3	24 HR	UPWIND	6	9				57,076	0.0368	23				7	9	9
TMF	45	4	24 HR	UPWIND	6	9			1	51.433	0.0403	28				7	9	9
TMF	46	5	24 HR	DWWD/BKGN	6	9				55,400	0.0335	21				7	9	10
TMF	47	***	BLANK		6	9					(0.0016)							
TMF	48	1	HITD	DOWNWIND	8	9	12	sun		14,480	0.0233	57				8	9	19
TMF	49	2	HITD	DOWNWIND	8	9				16,578	0.0291	62				8	9	19
TMF	50	3	HITD	DOWNWIND	8	9				15,176	0.0192	45				8	9	16
TMF	51	4	HITD	DOWNWIND	8	9			1	13,666	0.0204	53				8	9	16
TMF	52	5	HITD	UPWD/BKGN	8	9				14,392	0.0204	50				8	9	19
TMF	55	***	BLANK		8	9					(0.0020)		(.004		0.024			
TMF	56	1	LOTD	DOWNWIND	8	9	18	sun		12,768	0.0169	47				8	9	24
TMF	57	2	LOTD	DOWNWIND	8	9				15,377	0.0251	58				9	9	1
TMF	58	3	LOTD	DOWNWIND	8	9				14,248	0.0187	46				8	9	24
TMF	59	4	LOTD	DOWNWIND	8	9			1	14,252	0.0232	57				8	9	24
TMF	60	5	LOTD	UPWD/BKGN	8	9				12,808	0.0174	48				8	9	24
TMF	61	***	BLANK		8	9					(0.0016)							
TMF	53	2	24 HR	COLOCATED	8	9	12	sun		62,513	0.1188	67				9	9	13
TMF	54	2	24 HR		8	9				49,186	0.0890	64				9	9	13
TMF	62	***	SHPBLNK		10	9					(0.0016)							
TMF	63	***	SHPBLNK		10	9					(0.0018)							
TMF	15	***	LABBLNK		9	9												

APPENDIX B
PCB DATA LISTING

* PUF SAMPLES * 31-Jan-86

LEGEND

Sample number	number assigned by NUS Pittsburg lab
Station number	number of sampling site station for monitoring project
Sample Type	6-HR high tide (HITD) or low tide (LOTD) period, 12-HR, 24-HR, colocated, field blank, or shipping blank
Relative Location	upwind or downwind relative to estuary, for greater than half the monitoring period, or colocated designation
Sample Start	day, month, hour
Day of Week	Starting day of the week for sample start
Sample Conditions	EF-erratic flow due to power variations TP-timer problem
Actual Volume	air volume at sampled temperature and pressure,cubic meters
Compound(element)	standard name and laboratory result
Concentration	concentration of compound(element) to immediate left
Average Flow	field reading of flow (cfm, lpm)

NOTES:

1) sample identification number erased from sample jar. Specific sample cannot be identified
2) sample extract lost during analysis
3) sample identification suspect
4) F designation in Sample Number indicates analysis of 4 inch round, glass fiber filter only
5) PCB detected on first column, but not confirmed on second column
6) PCB-1254 reading is due to spike recovery determination
7) Sampled air for a few minutes

* PUF SAMPLES * 31-Jan-86 PAGE 1-1

SAMPLE NUMBER	STA #	SAMPLE TYPE	RELATIVE LOCATION	SAMPLE START DAY	MON	HR	DAY OF WEEK	SAMP COND NOTE	ACTUAL VOLUME (meter3)	PCB-1016 (micro-grams)	CONC (micro gm/meter3)	PCB-1221 (micro-grams)	CONC (micro gm/meter3)	PCB-1232 (micro-grams)	CONC (micro gm/meter3)	PCB-1242 (micro-grams)	CONC (micro gm/meter3)	PCB-1248 (micro-grams)	CONC (micro gm/meter3)	PCB-1254 (micro-grams)	CONC (micro gm/meter3)	PCB-1260 (micro-grams)	CONC (micro gm/meter3)	SAMPLE END DAY	MON	HR
PUF 15	2	HITD	DOWNWIND	4	9	11	wed		65	<2.5		<2.5		<2.5		10.00	0.153	<2.5		<5.0		<5.0		4	9	16
PUF 18	4	HITD	DOWNWIND	4	9	12			38	<1.0		<1.0		<1.0		2.00	0.052	<1.0		<2.0		<2.0		4	9	15
PUF 20	2	24 HR	DOWNWIND	4	9	11			318	<25		<25		<25		64.00	0.201	<25		<50		<50		6	9	11
PUF 12	1	LOTD	UPWIND	4	9	15	wed		86	<1.0		<1.0		<1.0		2.70	0.032	<1.0		<2.0		<2.0		4	9	22
PUF 7	2	LOTD	DOWNWIND	4	9				83	<10		<10		<10		39.00	0.471	<10		<20		<2.0		4	9	22
PUF 17	3	LOTD	DOWNWIND	4	9				82	<1.0		<1.0		<1.0		3.30	0.040	<1.0		<2.0		<2.0		4	9	22
PUF 10	4	LOTD	DOWNWIND	4	9				87	<1.0		<1.0		<1.0		4.80	0.055	<1.0		<2.0		<2.0		4	9	21
PUF 19	5	LOTD	UPWD/BKGN	4	9			5	103	<2.5		<2.5		<2.5		<2.5		<2.5		<5.0		<5.0		4	9	23
PUF 14	***	BLANK						7		<0.2		<0.2		<0.2		1.20		<0.2		<0.4		<0.4				
PUF 6	1	HITD	UPWIND	4	9	22	wed		79	<0.5		<0.5		<0.5		<0.5		<0.5		<0.1		<0.1		5	9	
PUF 6F	1	HITD	UPWIND	4	9			4		<0.1		<0.1		<0.1		<0.1		<0.1		<0.2		<0.2				
PUF 16	2	HITD	DOWNWIND	4	9				78	<1.0		<1.0		<1.0		10.00	0.128	<1.0		<2.0		<2.0		5	9	3
PUF 16F	2	HITD	DOWNWIND	4	9			4		<0.1		<0.1		<0.1		<0.1		<0.1		<0.2		<0.2				
PUF 8	3	HITD	DOWNWIND	4	9				77	<0.5		<0.5		<0.5		2.20	0.029	<0.5,		<1.0		<1.0		5	9	3
PUF 8F	3	HITD	DOWNWIND	4	9			4		<0.1		<0.1		<0.1		<0.1		<0.1		<0.2		<0.2				
PUF 13	4	HITD	DOWNWIND	4	9				76	<1.0		<1.0		<1.0		2.70	0.035	<1.0		<2.0		<2.0		5	9	3
PUF 13F	4	HITD	DOWNWIND	4	9			4		<0.1		<0.1		<0.1		<0.1		<0.1		<0.2		<0.2				
PUF 11	5	HITD	UPWD/BKGN	4	9				81	<1.0		<1.0		<1.0		<1.0		<1.0		<2.0		<2.0		5	9	4
PUF 4	***	BLANK						5		<0.1		<0.1		<0.1		<0.1		<0.1		<0.2		<0.2				
PUF 1	1	LOTD	UPWIND	5	9	3	thurs		78	<1.0		<1.0		<1.0		2.30	0.030	<1.0		<2.0		<2.0		5	9	10
PUF 2	2	LOTD	DOWNWIND	5	9				90	<5.0		<5.0		<5.0		26.00	0.290	<5.0		<10.0		<10.0		5	9	11
PUF 3	3	LOTD	DOWNWIND	5	9				85	<1.0		<1.0		<1.0		3.60	0.042	<1.0		<2.0		<2.0		5	9	10
PUF 23	4	LOTD	DOWNWIND	5	9				48	<0.5		<0.5		<0.5		2.10	0.043	<0.5		<1.0		<1.0		5	9	6
PUF 5	5	LOTD	UPWD/BKGN	5	9				78	<0.5		<0.5		<0.5		0.57	0.007	<0.5		<1.0		<1.0		5	9	10
PUF 24	***	BLANK								<0.5		<0.5		<0.5		<0.5		<0.5		<1.0		<1.0				
PUF 22	1	HITD	UPWIND	5	9	9	thurs		73	<0.5		<0.5		<0.5		1.10	0.015	<0.5		<1.0		<1.0		5	9	15
PUF 25	2	HITD	DOWNWIND	5	9				64	<2.5		<2.5		<2.5		8.20	0.128	<2.5		<5.0		<5.0		5	9	1[illegible]

PUF 39	5	HITD	UPWD/BKGN	5	9			69	<0.5	<0.5	<0.5	<0.5		<0.5	<1.0	<1.0	5	9	16
PUF 35	***	BLANK							<0.2	<0.2	<0.2	<0.2		<0.2	<0.4	<0.4			
PUF 37	2	24 HR		5	9	11 thurs		304	<10	<10	<10	30.00	0.099	<10	<20	<20	6	9	9
PUF 36	2	24 HR	COLOCATED	5	9	11		314	<10	<10	<10	30.00	0.095	<10	<20	<20	6	9	9
PUF 29	1	LOTD	UPWIND	5	9	15 thurs	1	77	*	*	*	*		*	*	*	5	9	21
PUF 30	2	LOTD	DOWNWIND	5	9			76	<5.0	<5.0	<5.0	15.00	0.196	<5.0	<10.	<10.	5	9	21
PUF 31	3	LOTD	DOWNWIND	5	9			76	<2.5	<2.5	<2.5	<2.5		<2.5	<5.0	<5.0	5	9	21
PUF 21	4	LOTD	DOWNWIND	5	9		3	69	<1.0	<1.0	<1.0	1.70	0.024	<1.0	<2.0	<2.0	5	9	22
PUF 32	5	LOTD	UPWD/BKGN	5	9			77	<0.5	<0.5	<0.5	1.00	0.013	<0.5	<1.0	<1.0	5	9	21
PUF 33	***	BLANK							<0.2	<0.2	<0.2	<0.2		<0.2	<0.4	<0.4			
PUF 26	1	12 HR	DOWNWIND	5	9	21 thurs	1	178	*	*	*	*		*	*	*	6	9	10
PUF 27	2	12 HR	DOWNWIND	5	9			174	<5.0	<5.0	<5.0	14.00	0.080	<5.0	<10.	<10.	6	9	9
PUF 34	3	12 HR	DOWNWIND	5	9			173	<2.0	<2.0	<2.0	4.50	0.026	<2.0	<4.0	<4.0	6	9	9
PUF 28	4	12 HR	DOWNWIND	5	9		1	154	*	*	*	*		*	*	*	6	9	9
PUF 40	5	12 HR	UPWD/BKGN	5	9			180	<2.0	<2.0	<2.0	<0.1		<2.0	<4.0	<4.0	6	9	[illegible]
PUF 41	***	BLANK							<1.0	<0.1	<0.1	<0.1		<0.1	<0.2	<0.2	7	9	1..
PUF 42	1	24 HR	UPWIND	6	9	9 fri		314	<2.0	<2.0	<2.0	3.20	0.010	<2.0	<4.0	<4.0	7	9	10
PUF 48	2	24 HR	COLOCATED	6	9			317	<2.0	<2.0	<2.0	3.40	0.011	<2.0	<4.0	<4.0	7	9	9
PUF 49	2	24 HR	UPWIND	6	9		1	317	*	*	*	*		*	*	*	7	9	9
PUF 44	3	24 HR	UPWIND	6	9		1	323	*	*	*	*		*	*	*	7	9	9
PUF 45	4	24 HR	UPWIND	6	9		3	324	<2.0	<2.0	<2.0	3.80	0.012	<2.0	<4.0	<4.0	7	9	9
PUF 46	5	24 HR	DWND/BKGN	6	9		3	313	<2.0	<2.0	<2.0	3.40	0.011	<2.0	<4.0	<4.0	7	9	10
PUF 43	***	BLANK							<0.2	<0.2	<0.2	<0.2		<0.2	<0.4	<0.4			
PUF 47	1	HITD	DOWNWIND	8	9	12 sun	2	82	*	*	*	*		*	*	*	8	9	17
PUF 51	2	HITD	DOWNWIND	8	9			84	<2.5	<2.5	<2.5	6.60	0.079	<2.5	<5.0	<5.0	8	9	13
PUF 50	3	HITD	DOWNWIND	8	9			86	<1.0	<1.0	<1.0	1.50	0.017	<1.0	<2.0	<2.0	8	9	18
PUF 91	4	HITD	DOWNWIND	8	9			86	<0.5	<0.5	<0.5	1.30	0.015	<0.5	<1.0	<1.0	8	9	18
PUF 92	5	HITD	UPWD/BKGN	8	9			81	<1.0	<1.0	<1.0	1.30	0.016	<1.0	<2.0	<2.0	8	9	17
PUF 95	***	BLANK							<0.5	<0.5	<0.5	<0.5		<0.5	<1.0	<1.0			
PUF 93	2	24 HR	COLOCATED	8	9	12 sun		335	<10	<10	<10	21.00	0.063	<10	<20	<20	9	9	13
PUF 94	2	24 HR		8	9			334	<10	<10	<10	22.00	0.066	<10	<20	<20	9	9	13
PUF 82	1	LOTD	DOWNWIND	8	9	18 sun		72	<2.0	<2.0	<2.0	3.80	0.053	<2.0	<4.0	<4.0	8	9	24
PUF 83	2	LOTD	DOWNWIND	8	9		1	81	*	*	*	*		*	*	*	9	9	1
PUF 89	3	LOTD	DOWNWIND	8	9			81	<0.5	<0.5	<0.5	1.40	0.017	<0.5	<1.0	<1.0	8	9	[illegible]
PUF 88	4	LOTD	DOWNWIND	8	9			80	<4.0	<4.0	<4.0	11.00	0.137	<4.0	<8.0	<8.0	8	9	[illegible]
PUF 90	5	LOTD	UPWD/BKGN	8	9			72	<0.5	<0.5	<0.5	0.88	0.012	<0.5	<1.0	<1.0	8	9	13
PUF 96	***	BLANK							<0.5	<0.5	<0.5	<0.5		<0.5	<1.0	<0.1			
PUF 9	***	SHPBLNK		10	9				<0.1	<0.1	<0.1	<0.1		<0.1	<0.2	<0.2			
PUF 8C	***	SHPBLNK		10	9				<0.1	<0.1	<0.1	<0.1		<0.1	<0.2	<0.2			
PUF 68	***	LABBLNK		11	9				<0.1	<0.1	<0.1	<0.1		<0.1	<0.2	<0.2			
PUF107	***	LABBLNK		13	9		6		<0.1	<0.1	<0.1	<0.1		<0.1	0.38	<0.2			
PUF116	***	LABBLNK		17	9				<0.1	<0.1	<0.1	<0.1		<0.1	<0.2	<0.2			
PUF132	***	LABBLNK		17	9				<0.1	<0.1	<0.1	0.63		<0.1	<0.2	<0.2			
PUF140		LABBLNK		21	10				<0.1	<0.1	<0.1	<0.1		<0.1	<0.2	<0.2			
PUF09-2		LABBLNK		16	10				<0.1	<0.1	<0.1	<0.1		<0.1	<0.2	<0.2			
PUF144		LABBLNK		29	10				<0.1	<0.1	<0.1	<0.1		<0.1	<0.2	<0.2			
PUF145		LABBLNK		29	10				<0.1	<0.1	<0.1	0.84		<0.1	<0.2	<0.2			
PUF123		LABBLNK		30	10				<0.5	<0.5	<0.5	<0.5		<0.5	<1.0	<1.0			

APPENDIX C

METEOROLOGICAL DATA LISTING

YRMODY H MPH DEG SIG TEMP LOC MPH DEG SIG TEMP RH LOC OBSERVATIONS FROM NEW BEDFORD WEATHER STATION

YRMODYHRMN	MPH	DEG	SIG	TEMP	LOC	MPH	DEG	SIG	TEMP	RH	LOC	OBSERVATIONS FROM NEW BEDFORD WEATHER STATION
8509040815	9.5	245	11	73.0	NBDN	12.5	225	5	73.0	89	NBDS	
8509040830	9.0	245	13	75.0	NBDN	13.0	225	3	74.0	87	NBDS	
8509040845	10.0	240	11	76.0	NBDN	13.0	235	7	75.0	83.	NBDS	
8509040900	9.5	250	13.	76.0	NBDN	12.5	240	7	75.0	81	NBDS	VISIBILITY 2 MILES IN FOG AND HAZE. BROKEN CLOUDS
8509040915	7.5	250	14	76.0	NBDN	15.0	245	7	75.0	80	NBDS	
8509040930	7.0	250	15	77.0	NBDN	14.5	235	7	76.0	79	NBDS	
8509040945	7.0	250	19	78.0	NBDN	14.0	240	8	77.0	77	NBDS	
8509041000	7.5	255	15	79.0	NBDN	12.5	245	9	78.0	72	NBDS	
8509041015	7.5	250	14	80.0	NBDN	14.0	245	9	79.0	70	NBDS	
8509041030	10.0	250	15	80.0	NBDN	14.0	245	9	80.0	69	NBDS	
8509041045	10.0	255	13	81.0	NBDN	15.0	245	8.	80.0	65.	NBDS	
8509041100	9.0	260	20.	82.0	NBDN	13.5	250	8	80.0	64	NBDS	
8509041115	11.0	255	16.	82.0	NBDN	16.5	250	15	81.0	64	NBDS	
8509041130	12.0	255	16.	82.0	NBDN	15.5	255	15.	81.0	61	NBDS	
8509041145	13.0	255	16.	82.0	NBDN	17.5	250	6	81.0	61	NBDS	
8509041200	12.5	255	15	83.0	NBDN	13.0	230	10	82.0	61	NBDS	
8509041215	10.0	255	13	84.0	NBDN	18.0	265	10	83.0	60	NBDS	
8509041230	14.5	250	13	84.0	NBDN	13.0	235	16.	83.0	60	NBDS	
8509041245	13.5	255	17	84.0	NBDN	20.5	225	7	83.0	60	NBDS	
8509041300	13.0	255	16.	84.0	NBDN	21.5	225	7	83.0	60	NBDS	
8509041315	10.5	255	15	84.0	NBDN	21.0	250	7.	83.0	59	NBDS	
8509041330	10.0	250	17	85.0	NBDN	17.5	240	12	83.0	59	NBDS	
8509041345	12.5	260	16	85.0	NBDN	17.0	235	7	83.0	59	NBDS	
8509041400	14.0	250	15	85.0	NBDN	17.5	220	5	82.0	60	NBDS	
8509041415	7.0	250	23.	85.0	NBDN	16.5	210	8	82.0	60	NBDS	
8509041430	7.5	240	17	85.0	NBDN	15.0	210	8	82.0	60	NBDS	
8509041445	9.0	260	17	84.0	NBDN	10.5	215	17	83.0	61	NBDS	
8509041500	7.5	250	16	85.0	NBDN	13.0	245	11	85.0	60	NBDS	VISIBILITY 3 MILES IN FOG AND HAZE. BROKEN CLOUDS
8509041515	10.5	265	15.	85.0	NBDN	20.5	255	12.	83.0	56	NBDS	
8509041530	9.5	265	19	85.0	NBDN	18.0	250	9	85.0	57	NBDS	
8509041545	8.0	250	17	84.0	NBDN	17.5	250	10	84.0	59	NBDS	
8509041600	9.5	255	16	85.0	NBDN	16.0	245	7	84.0	59	NBDS	
8509041615	8.0	265	17	84.0	NBDN	17.5	200	10.	84.0	58	NBDS	
8509041630	7.5	260	16	84.0	NBDN	17.0	225	7	84.0	59	NBDS	
8509041645	8.0	260	19	83.0	NBDN	17.0	205	5	84.0	60	NBDS	
8509041700	6.5	265	14	83.0	NBDN	14.0	245	10	84.0	60	NBDS	
8509041715	6.5	999	999.	82.0	NBDN	11.5	250	6.	84.0	60	NBDS	
8509041730	5.0	999	999	82.0	NBDN	12.5	220	11	84.0	60	NBDS	
8509041745	6.0	270	15	82.0	NBDN	12.5	260	12	82.0	60	NBDS	
8509041800	8.0	280	14	82.0	NBDN	14.0	270	5	80.0	60	NBDS	
8509041815	4.5	275	13.	82.0	NBDN	12.0	270	8	82.0	61	NBDS	
8509041830	4.0	285	12	82.0	NBDN	9.0	270	5	82.0	62	NBDS	
8509041845	3.0	260	16	81.0	NBDN	3.0	265	8	81.0	64	NBDS	
8509041900	2.5	285	13	80.0	NBDN	5.5	245	9.	81.0	65	NBDS	
8509041915	2.5	295	15.	80.0	NBDN	5.0	260	10.	81.0	66	NBDS	
8509041930	2.0	290	19	80.0	NBDN	5.0	300	19	81.0	67	NBDS	
8509041945	2.0	275	9.	80.0	NBDN	6.5	315	16.	80.0	69	NBDS	
8509042000	3.0	999	999.	79.0	NBDN	6.5	290	11	80.0	70	NBDS	
8509042015	2.0	999	999.	79.0	NBDN	5.5	275	9.	80.0	73.	NBDS	
8509042030	4.0	250	10.	79.0	NBDN	6.0	270	8.	80.0	74.	NBDS	
8509042045	3.5	270	13	79.0	NBDN	6.5	265	8.	80.0	74	NBDS	
8509042100	4.5	260	15	78.0	NBDN	3.0	260	14.	80.0	75	NBDS	VISIBILITY 5 MILES IN FOG, OVERCAST
8509042115	5.5	250	16.	78.0	NBDN	3.5	240	9.	80.0	74	NBDS	
8509042130	5.0	270	13.	78.0	NBDN	3.0	270	14.	80.0	74	NBDS	

YRMODYHR M	MPH	DEG	SIG	TEMP	LOC	MPH	DEG	SIG	TEMP	RH	LOC	
8509042145	4.0	270	11	78.0	NBDN	3.5	270	2	77.0	75	NBDS	
8509042200	4.5	230	10	77.0	NBDN	3.0	225	3	78.0	76	NBDS	
8509042215	3.5	253	14	76.0	NBDN	3.5	275	2	77.0	77	NBDS	
8509042230	4.0	275	12.	76.0	NBDN	7.5	275	7	72.0	77	NBDS	
8509042245	5.0	999	999	75.0	NBDN	7.0	270	3	77.0	79	NBDS	
8509042300	3.5	265	13	75.0	NBDN	7.0	275	9	77.0	80	NBDS	
8509042315	4.0	270	11	74.0	NBDN	3.0	265	6	77.0	80	NBDS	
8509042330	4.5	270	9	74.0	NBDN	9.0	260	7	77.0	81	NBDS	
8509042345	4.5	270	12.	74.0	NBDN	7.0	265	8	77.0	80	NBDS	
8509042400	5.0	270	15.	74.0	NBDN	8.5	260	9	77.0	80	NBDS	
8509050015	4.0	260	12.	74.0	NBDN	7.0	265	9	77.0	79	NBDS	
8509050030	4.0	270	13.	74.0	NBDN	7.5	260	10.	77.0	79	NBDS	
8509050045	4.5	270	12	74.0	NBDN	8.0	270	9	78.0	75	NBDS	
8509050100	5.0	270	9	75.0	NBDN	7.5	270	8	78.0	74	NBDS	
8509050115	5.5	270	10	75.0	NBDN	11.5	270	7	78.0	74	NBDS	
8509050130	5.5	999	999	75.0	NBDN	11.0	275	8.	78.0	75	NBDS	
8509050145	5.0	999	999	74.0	NBDN	10.5	275	10.	77.0	76	NBDS	
8509050200	5.0	275	13.	74.0	NBDN	9.5	275	9	77.0	77	NBDS	
8509050215	5.5	275	11.	74.0	NBDN	9.0	270	5	76.0	79	NBDS	
8509050230	6.5	275	14.	75.0	NBDN	7.5	280	5	76.0	80	NBDS	
8509050245	4.5	285	14.	75.0	NBDN	7.0	275	11	75.0	81	NBDS	
8509050300	4.5	300	16	75.0	NBDN	7.0	285	7	75.0	81.	NBDS	VISIBILITY 7 MILES, BROKEN CLOUDS
8509050315	4.5	270	12.	75.0	NBDN	7.0	275	9	75.0	81	NBDS	
8509050330	4.0	290	17	74.0	NBDN	8.0	270	7	74.0	83	NBDS	
8509050345	3.5	300	15.	74.0	NBDN	5.0	285	11	74.0	84	NBDS	
8509050400	3.5	999	999.	74.0	NBDN	7.0	275	3	73.0	86.	NBDS	
8509050415	1.0	999	999	73.0	NBDN	5.0	270	[illegible]	73.0	86	NBDS	
8509050430	1.5	999	999	73.0	NBDN	5.5	295	10	73.0	87	NBDS	
8509050445	2.0	325	44.	73.0	NBDN	4.5	295	7	73.0	88.	NBDS	
8509050500	3.0	340	17.	73.0	NBDN	3.0	360	41	74.0	87	NBDS	
8509050515	3.0	325	17	73.0	NBDN	3.5	325	17	74.0	87	NBDS	
8509050530	2.5	230	17.	73.0	NBDN	4.5	275	17	74.0	85.	NBDS	
8509050545	2.0	275	15.	72.0	NBDN	2.5	275	12	74.0	85.	NBDS	
8509050600	2.0	360	20.	72.0	NBDN	2.0	350	39	73.0	86.	NBDS	
8509050615	2.5	25	7	71.0	NBDN	3.0	55	14	73.0	86	NBDS	
8509050630	2.0	345	17.	70.0	NBDN	3.0	15	7	72.0	87.	NBDS	
8509050645	1.5	10	25.	70.0	NBDN	2.5	255	19	72.0	90.	NBDS	
8509050700	1.0	90	57.	71.0	NBDN	2.5	30	13	73.0	90	NBDS	
8509050715	1.0	999	999	71.0	NBDN	7.0	260	12	72.0	89	NBDS	
8509050730	1.0	20	13	72.0	NBDN	3.0	5	11	73.0	89	NBDS	
8509050745	0.5	230	59	74.0	NBDN	2.0	320	21	74.0	86.	NBDS	
8509050800	1.5	310	52.	76.0	NBDN	2.5	295	22.	77.0	83	NBDS	
8509050815	2.0	345	37	75.0	NBDN	2.5	345	20	76.0	79	NBDS	
8509050830	3.0	20	16.	76.0	NBDN	4.0	345	14	75.0	76.	NBDS	
8509050845	3.5	355	13.	77.0	NBDN	5.0	350	16	77.0	76	NBDS	
8509050900	3.5	360	13.	78.0	NBDN	6.5	250	15	78.0	74.	NBDS	VISIBILITY 5 MILES IN HAZE, SCATTERED CLOUDS
8509050915	3.5	360	15.	78.0	NBDN	5.0	5	23	77.0	74.	NBDS	
8509050930	3.0	345	46.	77.0	NBDN	5.0	330	27	79.0	69	NBDS	
8509050945	3.0	999	999	80.0	NBDN	6.0	355	17	80.0	65.	NBDS	
8509051000	3.0	999	999	80.0	NBDN	3.0	340	999.	81.0	62.	NBDS	
8509051015	2.5	305	35.	81.0	NBDN	10.0	300	999.	81.0	61.	NBDS	
8509051030	3.5	295	21.	81.0	NBDN	10.0	275	21.	82.0	60.	NBDS	
8509051045	4.0	335	19.	82.0	NBDN	7.0	245	42.	82.0	58.	NBDS	
8509051100	2.0	345	50.	83.0	NBDN	9.5	280	36.	82.0	56.	NBDS	
8509051115	4.5	270	21.	83.0	NBDN	9.5	225	39.	80.0	60.	NBDS	

YRMODYHRMN	MPH	DEG	SIG	TEMP	LOC	MPH	DEG	SIG	TEMP	RH	LOC	
8509051130	4.5	235	30.	82.0	NBDN	9.5	200	18.	81.0	62	NBDS	
8509051145	6.5	245	19	82.0	NBDN	13.5	235	11.	81.0	62	NBDS	
8509051200	6.0	235	21	82.0	NBDN	12.0	245	16	81.0	61	NBDS	
8509051215	8.5	250	13.	82.0	NBDN	14.5	235	13	81.0	62	NBDS	
8509051230	8.0	245	11.	82.0	NBDN	14.0	235	11	81.0	62	NBDS	
8509051245	5.0	250	22.	82.0	NBDN	12.0	245	20.	82.0	61	NBDS	
8509051300	5.0	265	21	82.0	NBDN	11.0	270	15	82.0	60	NBDS	
8509051315	4.5	265	14	83.0	NBDN	12.0	235	19	82.0	61	NBDS	
8509051330	4.5	265	17	83.0	NBDN	10.0	195	31	81.0	62	NBDS	
8509051345	4.5	250	21	84.0	NBDN	9.5	160	7	81.0	63	NBDS	
8509051400	5.0	265	23	84.0	NBDN	9.5	190	23	82.0	62	NBDS	
8509051415	5.0	285	27.	84.0	NBDN	9.0	240	41	81.0	59	NBDS	
8509051430	5.0	295	38	81.0	NBDN	10.0	225	39	84.0	52	NBDS	
8509051445	5.0	285	29	81.0	NBDN	9.0	310	24	85.0	48	NBDS	
8509051500	6.0	320	17	81.0	NBDN	11.0	295	22	85.0	48	NBDS	VISIBILITY 5 MILES IN HAZE, THIN BROKEN CLOUDS
8509051515	5.5	295	25	81.0	NBDN	12.5	295	41.	85.0	46	NBDS	
8509051530	5.0	280	24.	81.0	NBDN	10.0	235	65	84.0	53	NBDS	
8509051545	4.5	300	25	85.0	NBDN	11.0	170	40	83.0	57	NBDS	
8509051600	4.5	345	53	84.0	NBDN	10.0	190	55	84.0	56	NBDS	
8509051615	2.5	90	25.	81.0	NBDN	11.5	290	17.	83.0	54	NBDS	
8509051630	4.0	120	12	81.0	NBDN	11.5	220	19.	81.0	60	NBDS	
8509051645	6.5	215	25.	81.0	NBDN	13.0	210	12	80.0	66	NBDS	
8509051700	7.5	215	11	80.0	NBDN	9.0	205	12	79.0	70	NBDS	
8509051715	7.0	220	17	80.0	NBDN	12.5	210	6	79.0	71	NBDS	
8509051730	8.5	245	16	80.0	NBDN	15.0	220	6.	79.0	72	NBDS	
8509051745	7.5	245	16	79.0	NBDN	14.5	245	7	78.0	74.	NBDS	
8509051800	6.0	245	13	78.0	NBDN	13.5	220	9	78.0	77	NBDS	
8509051815	4.5	220	44	76.0	NBDN	7.5	145	25	78.0	77	NBDS	
8509051830	3.0	240	24	78.0	NBDN	6.5	190	17	78.0	78	NBDS	
8509051845	3.5	245	25	78.0	NBDN	5.0	170	18	78.0	78	NBDS	
8509051900	3.0	240	27	78.0	NBDN	4.5	155	21	78.0	78	NBDS	
8509051915	3.0	220	24	78.0	NBDN	5.0	170	17	78.0	76	NBDS	
8509051930	4.0	215	17	78.0	NBDN	5.5	200	12	78.0	77	NBDS	
8509051945	4.5	210	13	78.0	NBDN	6.0	200	10.	77.0	79	NBDS	
8509052000	4.0	170	25	78.0	NBDN	5.0	190	11	77.0	79	NBDS	
8509052015	3.0	170	13.	76.0	NBDN	4.5	155	11.	76.0	79	NBDS	
8509052030	2.5	150	21	76.0	NBDN	4.0	170	13	78.0	79	NBDS	
8509052045	3.5	155	16.	74.0	NBDN	5.5	180	11	77.0	81	NBDS	
8509052100	4.5	140	11	74.0	NBDN	5.0	175	15	76.0	82	NBDS	VISIBILITY 2 MILES IN FOG, BROKEN CLOUDS
8509052115	4.5	160	11	73.0	NBDN	5.0	170	14	75.0	82	NBDS	
8509052130	4.5	160	11	73.0	NBDN	4.5	170	14	74.0	84	NBDS	
8509052145	4.0	170	11.	73.0	NBDN	5.0	175	13.	73.0	86	NBDS	
8509052200	4.0	180	12.	72.0	NBDN	5.5	175	11	73.0	89	NBDS	
8509052215	5.0	195	17	72.0	NBDN	5.5	185	9.	72.0	90	NBDS	
8509052230	3.0	185	27.	72.0	NBDN	4.0	190	13	72.0	91	NBDS	
8509052245	2.0	110	9	71.0	NBDN	2.5	200	17	72.0	91	NBDS	
8509052300	2.5	60	37	71.0	NBDN	2.0	100	55	72.0	91	NBDS	
8509052315	2.0	145	44	71.0	NBDN	2.5	90	19	72.0	93	NBDS	
8509052330	2.0	145	11	71.0	NBDN	2.5	125	15	72.0	93	NBDS	
8509052345	2.0	135	7.	71.0	NBDN	1.0	125	16.	72.0	92	NBDS	
8509052400	2.0	999	999	71.0	NBDN	1.5	125	15	72.0	93	NBDS	
8509060015	2.0	175	9	70.0	NBDN	2.0	120	19	72.0	96	NBDS	
8509060030	2.5	135	13	70.0	NBDN	2.5	130	11	72.0	96	NBDS	
8509060045	1.5	115	15	70.0	NBDN	1.5	110	19.	72.0	97	NBDS	
8509060100	1.5	115	10	70.0	NBDN	1.0	130	51.	72.0	98	NBDS	

YRMODY IN	MPH	DEG	SIG	TEMP	LOC	MPH	DEG	SIG	TEMP	RH	LOC	OBSERVATIONS FROM NEW BEDFORD WEATHER STATION
8509061500	4.5	150	18.	78.0	NBDN	5.5	145	27.	79.0	63.	NBDS	VISIBILITY 7 MILES, BROKEN CLOUDS
8509061515	5.5	145	12.	77.0	NBDN	6.0	135	18	78.0	63.	NBDS	
8509061530	4.5	135	9.	76.0	NBDN	5.5	120	10.	77.0	64.	NBDS	
8509061545	5.5	95	25.	73.0	NBDN	3.0	120	17	77.0	65	NBDS	
8509061611	6.0	45	19	73.0	NBDN	5.0	90	14	76.0	72.	NBDS	
8509061615	6.0	35	13	73.0	NBDN	4.5	70	21	74.0	79.	NBDS	
8509061630	6.0	35	9.	72.0	NBDN	5.0	40	3	73.0	79.	NBDS	
8509061645	4.0	60	20.	72.0	NBDN	4.0	40	16	73.0	81.	NBDS	
8509061700	5.0	70	19.	71.0	NBDN	5.5	75	18.	72.0	82.	NBDS	
8509061715	6.0	65	16.	71.0	NBDN	6.5	65	11	71.0	83.	NBDS	
8509061730	5.0	70	17.	70.0	NBDN	5.0	65	17	71.0	83	NBDS	
8509061745	5.5	70	18.	70.0	NBDN	7.0	70	14	70.0	84.	NBDS	
8509061800	6.5	50	14.	69.0	NBDN	6.5	35	14	70.0	85	NBDS	
8509061315	5.0	999	999.	68.0	NBDN	6.0	35	11.	69.0	86	NBDS	
8509061830	5.0	999	999.	68.0	NBDN	6.0	45	9	69.0	89	NBDS	
8509061045	5.0	40	22.	68.0	NBDN	5.5	65	21.	69.0	89	NBDS	
8509061700	4.5	60	30.	68.0	NBDN	4.5	70	22	69.0	90	NBDS	
8509061915	5.0	35	18.	67.0	NBDN	8.5	35	10.	68.0	91.	NBDS	
8509061930	4.5	60	36.	66.0	NBDN	5.5	65	25.	69.0	92.	NBDS	
8509061945	4.5	65	22.	66.0	NBDN	4.0	50	13.	67.0	93.	NBDS	
8509062000	3.5	125	47.	66.0	NBDN	2.0	90	13.	67.0	94.	NBDS	
8509062015	3.5	110	25.	65.0	NBDN	3.5	70	58.	66.0	95.	NBDS	
8509062030	3.5	45	55.	65.0	NBDN	3.5	15	20.	66.0	96.	NBDS	
8509062045	4.0	20	55.	65.0	NBDN	3.0	100	44.	65.0	97	NBDS	
8509062100	4.5	50	17	65.0	NBDN	4.0	95	12.	65.0	97	NBDS	VISIBILITY 1.5 MILES IN THUNDERSTORM WITH MODERATE RAIN AND FO
8509062115	5.0	95	13.	65.0	NBDN	4.0	110	14	65.0	98.	NBDS	
8509062130	5.0	120	19	65.0	NBDN	3.5	110	19	65.0	98	NBDS	
8509062145	5.5	105	9.	65.0	NBDN	4.5	110	19.	66.0	97	NBDS	
8509062200	4.5	115	15.	65.0	NBDN	3.5	105	16.	65.0	97	NBDS	
8509062215	5.5	110	10.	64.0	NBDN	5.5	100	19.	65.0	97	NBDS	
8509062230	5.5	100	13.	64.0	NBDN	4.5	90	15	64.0	97	NBDS	
8509062245	5.0	100	13.	64.0	NBDN	4.0	95	17.	64.0	97	NBDS	
8509062300	4.5	100	10.	64.0	NBDN	3.0	100	16.	64.0	97	NBDS	
8509062315	4.5	95	18.	64.0	NBDN	3.0	90	27.	64.0	97	NBDS	
8509062330	4.0	90	20.	64.0	NBDN	4.0	75	25	64.0	97	NBDS	
8509062345	5.5	95	17.	64.0	NBDN	4.5	80	16	64.0	97	NBDS	
8509062400	3.5	105	15.	64.0	NBDN	3.5	80	17	64.0	97	NBDS	
8509070015	4.5	90	11.	64.0	NBDN	3.5	60	15.	63.0	98.	NBDS	
8509070030	3.5	75	21.	64.0	NBDN	4.0	60	12.	63.0	98	NBDS	
8509070045	4.5	30	15	64.0	NBDN	4.0	65	16.	63.0	99	NBDS	
8509070100	4.0	35	16.	64.0	NBDN	3.5	35	17	63.0	99	NBDS	
8509070115	6.0	25	16.	63.0	NBDN	6.5	25	11.	63.0	99	NBDS	
8509070130	7.0	35	14.	63.0	NBDN	6.5	25	9	63.0	100	NBDS	
8509070145	4.5	35	62.	63.0	NBDN	6.5	25	9	63.0	100.	NBDS	
8509070200	5.0	35	48.	63.0	NBDN	6.0	25	12.	63.0	100.	NBDS	
8509070215	4.5	25	14.	63.0	NBDN	6.0	25	10.	62.0	100.	NBDS	
8509070230	4.5	35	16.	63.0	NBDN	5.0	33	14.	62.0	100.	NBDS	
8509070245	4.5	55	17.	63.0	NBDN	5.0	45	12.	63.0	100.	NBDS	
8509070300	4.5	25	14.	63.0	NBDN	5.0	35	13	63.0	100.	NBDS	VISIBILITY 1.5 MILES IN LIGHT DRIZZLE, FOG AND HAZE*
8509070315	5.5	35	15.	62.0	NBDN	6.0	35	11.	63.0	100.	NBDS	
8509070330	6.5	40	15.	62.0	NBDN	6.5	35	10.	63.0	100.	NBDS	
8509070345	4.5	45	15.	62.0	NBDN	5.5	35	11.	63.0	100.	NBDS	
8509070400	5.5	50	19.	62.0	NBDN	4.0	40	11.	63.0	100.	NBDS	
8509070415	6.0	60	49.	62.0	NBDN	4.5	40	10.	62.0	100.	NBDS	
8509070430	3.5	10	45.	62.0	NBDN	3.5	25	12.	62.0	100.	NBDS	

YRMODY N	MPH	DEG	SIG	TEMP	LOC	MPH	DEG	SIG	TEMP	RH	LOC	
8509070445	3.5	30	25.	62.0	NBDN	3.5	25	17.	62.0	100	NBDS	
8509070500	4.0	45	13.	62.0	NBDN	5.0	30	10	62.0	100.	NBDS	
8509070515	4.0	20	16.	62.0	NBDN	4.5	30	11.	62.0	100	NBDS	
8509070530	4.0	25	19	61.0	NBDN	5.0	20	10.	62.0	100	NBDS	
8509070545	4.5	30	13.	61.0	NBDN	5.5	20	9.	62.0	100.	NBDS	
8509070600	5.0	30	17.	61.0	NBDN	5.5	30	11.	62.0	100	NBDS	
8509070615	4.0	25	17.	61.0	NBDN	5.5	25	9.	62.0	100	NBDS	
8509070630	5.0	35	14	61.0	NBDN	5.5	25	10.	62.0	100.	NBDS	
8509070645	4.5	15	27	61.0	NBDN	5.0	25	9	61.0	100.	NBDS	
8509070700	5.0	15	44.	61.0	NBDN	6.5	20	9.	61.0	100.	NBDS	
8509070715	5.0	15	15.	61.0	NBDN	6.0	20	7	61.0	100.	NBDS	
8509070730	4.5	10	16.	61.0	NBDN	6.5	20	8.	61.0	100.	NBDS	
8509070745	4.5	20	15.	61.0	NBDN	6.0	25	10	61.0	100.	NBDS	
8509070800	5.5	360	17	61.0	NBDN	5.5	25	8.	61.0	100.	NBDS	
8509070815	5.0	360	16.	62.0	NBDN	6.5	5	10	62.0	100	NBDS	
8509070830	5.5	10	14.	62.0	NBDN	7.0	20	8	62.0	100	NBDS	
8509070845	5.0	25	17.	62.0	NBDN	8.0	20	8	62.0	99	NBDS	
8509070900	6.0	25	15.	62.0	NBDN	8.0	25	10.	62.0	99	NBDS	VISIBILITY 3 MILES IN LIGHT RAIN AND FOG. CEILING RAGGED
8509070915	7.0	15	14	62.0	NBDN	8.5	20	8.	63.0	99	NBDS	
8509070930	6.5	15	12.	62.0	NBDN	8.5	20	9.	63.0	99	NBDS	
8509070945	7.0	360	16	62.0	NBDN	8.0	20	8.	63.0	99	NBDS	
8509071000	8.0	20	16.	62.0	NBDN	8.0	15	8.	63.0	99.	NBDS	
8509071015	7.5	15	14.	62.0	NBDN	7.5	15	10.	63.0	100	NBDS	
8509071030	7.5	15	16.	62.0	NBDN	9.5	10	9.	63.0	100.	NBDS	
8509071045	7.5	25	14.	63.0	NBDN	7.5	10	10.	63.0	100.	NBDS	
8509071100	6.0	20	20.	63.0	NBDN	8.0	15	12.	63.0	100	NBDS	
8509071115	6.5	35	18.	63.0	NBDN	7.5	20	10.	63.0	100	NBDS	
8509071130	6.5	15	16.	63.0	NBDN	8.5	25	10.	64.0	99	NBDS	
8509071145	6.5	15	19.	64.0	NBDN	7.5	25	12.	64.0	99	NBDS	
8509071200	7.0	20	16.	64.0	NBDN	9.0	15	12.	64.0	98	NBDS	
8509071215	8.0	20	17.	65.0	NBDN	8.5	15	7.	65.0	98.	NBDS	
8509071230	7.0	20	17.	65.0	NBDN	10.0	20	13.	65.0	97	NBDS	
8509071245	7.0	30	19.	65.0	NBDN	10.5	25	9.	65.0	94	NBDS	
8509071300	7.0	40	14.	66.0	NBDN	9.0	30	11.	66.0	92.	NBDS	
8509071315	8.0	30	16.	66.0	NBDN	8.0	25	8.	66.0	86.	NBDS	
8509071330	6.5	30	16.	67.0	NBDN	7.5	35	13.	67.0	85	NBDS	
8509071345	7.0	70	17.	67.0	NBDN	7.5	35	13.	67.0	83.	NBDS	
8509071400	7.0	70	19.	68.0	NBDN	7.5	45	13.	68.0	82	NBDS	
8509071415	6.5	65	19.	68.0	NBDN	6.5	25	16.	69.0	80.	NBDS	
8509071430	6.5	999	999.	68.0	NBDN	7.5	40	16.	69.0	79	NBDS	
8509071445	5.5	999	999.	69.0	NBDN	7.0	35	14.	69.0	78	NBDS	
8509071500	6.0	55	20.	70.0	NBDN	7.5	40	14.	70.0	77	NBDS	VISIBILITY 12 MILES. BROKEN CLOUDS
8509071515	5.5	35	33.	70.0	NBDN	5.5	30	22.	71.0	75.	NBDS	
8509071530	4.5	55	34.	71.0	NBDN	4.5	35	28.	71.0	68.	NBDS	
8509071545	5.5	30	26	71.0	NBDN	5.5	20	23.	72.0	66.	NBDS	
8509071600	3.5	45	35.	71.0	NBDN	5.0	5	46.	72.0	65.	NBDS	
8509071615	4.0	40	26.	71.0	NBDN	4.0	40	41.	72.0	65.	NBDS	
8509071630	3.5	70	32.	72.0	NBDN	3.0	360	26.	72.0	62.	NBDS	
8509071645	5.0	70	37.	71.0	NBDN	4.5	360	29.	72.0	62.	NBDS	
8509071700	5.0	15	17.	70.0	NBDN	5.0	5	24.	72.0	62.	NBDS	
8509071715	4.0	10	16.	70.0	NBDN	5.5	10	14.	70.0	66.	NBDS	
8509071730	3.5	45	20.	70.0	NBDN	3.0	30	24.	71.0	65.	NBDS	
8509071745	3.0	40	39.	69.0	NBDN	4.0	85	16.	71.0	65.	NBDS	
8509071800	3.0	15	10.	69.0	NBDN	5.0	85	18.	70.0	68.	NBDS	
8509071815	3.5	10	14.	69.0	NBDN	5.0	55	18.	70.0	72.	NBDS	

YRMODYHRMN	MPH	DEG	SIG	TEMP	LOC	MPH	DEG	SIG	TEMP	RH	LOC	
8509071830	2.0	15	19.	69.0	NBDN	3.0	80	26.	70.0	74.	NBDS	
8509071845	3.0	75	42.	69.0	NBDN	3.0	95	16.	69.0	76.	NBDS	
8509071900	3.5	70	27.	69.0	NBDN	3.0	70	11.	69.0	77.	NBDS	
8509070915	3.0	80	15.	69.0	NBDN	3.0	65	14.	69.0	79.	NBDS	
8509071930	3.0	110	15.	68.0	NBDN	3.0	75	15	68.0	81	NBDS	
8509071945	4.0	115	7.	68.0	NBDN	3.5	100	13.	65.0	81.	NBDS	
8509072000	4.0	70	15.	68.0	NBDN	4.5	110	12.	68.0	62	NBDS	
8509072015	3.5	95	15.	67.0	NBDN	2.5	70	20.	67.0	85	NBDS	
8509072030	2.0	110	23.	66.0	NBDN	1.5	20	46	67.0	85	NBDS	
8509072045	1.0	125	14.	66.0	NBDN	1.0	260	61.	66.0	88	NBDS	
8509072100	1.0	115	29.	66.0	NBDN	1.0	20	40.	66.0	87	NBDS	VISIBILITY 10 MILES, SCATTERED CLOUDS
8509072115	2.0	145	21.	65.0	NBDN	2.0	160	28.	65.0	90.	NBDS	
8509072130	2.0	165	13.	65.0	NBDN	2.0	160	10.	65.0	90	NBDS	
8509072145	1.0	150	15.	65.0	NBDN	1.5	140	15.	65.0	91	NBDS	
8509072200	1.5	160	14.	65.0	NBDN	1.5	145	11.	66.0	91.	NBDS	
8509072215	2.0	165	16.	64.0	NBDN	2.0	155	6.	66.0	92.	NBDS	
8509072230	1.5	120	19.	64.0	NBDN	2.5	155	7	66.0	92.	NBDS	
8509072245	2.0	180	23.	65.0	NBDN	2.5	165	14.	66.0	92.	NBDS	
8509072300	3.5	240	39.	65.0	NBDN	3.0	170	17	67.0	92	NBDS	
8509072315	3.0	255	16.	64.0	NBDN	5.5	240	5	66.0	92	NBDS	
8509072330	3.5	225	18.	65.0	NBDN	4.5	210	15.	66.0	93.	NBDS	
8509072345	3.5	215	12.	65.0	NBDN	5.0	215	7.	66.0	93.	NBDS	
8509072400	3.5	215	12.	65.0	NBDN	5.0	215	6.	66.0	93.	NBDS	
8509080015	4.0	220	12.	66.0	NBDN	5.0	210	6.	66.0	95.	NBDS	
8509080030	5.0	215	12.	66.0	NBDN	5.0	205	8.	66.0	95	NBDS	
8509080045	4.5	220	11.	66.0	NBDN	5.0	210	6.	65.0	96.	NBDS	
8509080100	4.5	225	14.	66.0	NBDN	5.5	210	8.	66.0	96.	NBDS	
8509080115	4.0	999	999.	65.0	NBDN	6.0	205	7.	66.0	97.	NBDS	
8509080130	4.5	999	999.	65.0	NBDN	5.5	215	8.	65.0	96.	NBDS	
8509080145	3.5	225	20.	65.0	NBDN	5.5	215	8.	66.0	95.	NBDS	
8509080200	4.5	205	11.	65.0	NBDN	4.0	205	7.	66.0	96	NBDS	
8509080215	3.5	215	12.	65.0	NBDN	5.5	205	7	66.0	97.	NBDS	
8509080230	4.5	215	13.	65.0	NBDN	5.5	210	7.	66.0	97.	NBDS	
8509080245	3.5	230	17.	65.0	NBDN	5.5	205	8.	66.0	98	NBDS	
8509080300	5.5	225	14.	65.0	NBDN	6.5	220	11	66.0	98	NBDS	
8509080315	5.0	220	14.	65.0	NBDN	7.0	210	9	66.0	99	NBDS	
8509080330	4.5	240	15.	66.0	NBDN	6.5	225	9	65.0	98	NBDS	
8509080345	5.5	999	999.	66.0	NBDN	7.5	235	7.	67.0	98.	NBDS	
8509080400	5.5	999	999.	66.0	NBDN	6.5	235	8.	67.0	97.	NBDS	
8509080415	4.5	235	15.	66.0	NBDN	8.0	230	8.	66.0	97	NBDS	
8509080430	4.5	245	16.	66.0	NBDN	7.5	240	6.	66.0	97	NBDS	
8509080445	4.5	245	18.	66.0	NBDN	8.5	240	8	67.0	97.	NBDS	
8509080500	4.0	225	18.	66.0	NBDN	7.0	235	8.	67.0	97.	NBDS	
8509080515	4.5	255	17.	66.0	NBDN	6.0	240	8.	67.0	97.	NBDS	
8509080530	4.5	260	19.	66.0	NBDN	6.0	250	12.	67.0	98.	NBDS	
8509080545	3.5	265	23.	66.0	NBDN	7.0	255	8.	67.0	99	NBDS	
8509080600	3.5	270	21.	66.0	NBDN	6.5	270	15.	68.0	99.	NBDS	VISIBILITY 2 MILES IN FOG, SKY OBSCURED
8509080615	3.5	999	999.	66.0	NBDN	6.0	265	12.	68.0	99.	NBDS	
8509080630	3.5	999	999.	67.0	NBDN	6.0	270	12	68.0	99.	NBDS	
8509080645	5.5	999	999.	67.0	NBDN	5.0	275	13.	69.0	99.	NBDS	
8509080700	4.5	280	15.	67.0	NBDN	7.0	270	12.	69.0	99.	NBDS	
8509080715	4.5	280	18.	68.0	NBDN	7.5	275	10.	69.0	98	NBDS	
8509080730	4.0	280	17.	68.0	NBDN	7.0	280	9.	69.0	98.	NBDS	
8509080745	4.0	295	16.	68.0	NBDN	7.0	280	7.	69.0	98.	NBDS	
8509080800	5.0	305	14.	69.0	NBDN	7.5	295	10.	69.0	97.	NBDS	

YRMODYH	MPH	DEG	SIG	TEMP	LOC	MPH	DEG	SIG	TEMP	RH	JC	
8509080815	3.5	305	15.	69.0	NBDN	7.0	300	9	70.0	76.	NBDS	
8509080830	5.5	305	15.	70.0	NBDN	7.0	300	9	70.0	96	NBDS	
8509080845	6.0	300	18.	70.0	NBDN	7.5	300	10.	70.0	93	NBDS	
8509080900	6.0	999	999	71.0	NBDN	7.5	305	9.	70.0	93	NBDS	
8509080915	6.0	999	999.	71.0	NBDN	7.5	310	9	71.0	90	NBDS	
8509080930	5.5	999	999	72.0	NBDN	8.5	300	8.	71.0	89.	NBDS	
8509080945	5.0	310	18.	73.0	NBDN	8.5	275	7.	72.0	87.	NBDS	
8509081000	5.5	310	18.	74.0	NBDN	8.0	295	11.	72.0	85.	NBDS	
8509081015	6.0	320	22.	75.0	NBDN	7.0	310	14.	74.0	80	NBDS	
8509081030	5.5	340	23.	76.0	NBDN	5.5	325	15.	75.0	78.	NBDS	
8509081045	5.5	340	41.	78.0	NBDN	5.5	340	10.	76.0	77	NBDS	
8509081100	5.5	360	30.	79.0	NBDN	5.0	345	17.	76.0	71.	NBDS	
8509081115	5.0	20	20.	78.0	NBDN	4.0	10	22.	80.0	67	NBDS	
8509081130	3.0	35	34.	80.0	NBDN	3.5	5	20.	80.0	64.	NBDS	
8509081145	3.0	999	999	81.0	NBDN	4.0	5	49.	81.0	61.	NBDS	
8509081200	3.5	999	999	82.0	NBDN	5.0	10	21.	82.0	58.	NBDS	
8509081215	2.5	80	29	82.0	NBDN	3.0	360	41	83.0	55.	NBDS	
8509081230	3.0	120	67.	83.0	NBDN	3.5	320	37.	83.0	53.	NBDS	
8509081245	3.0	10	47.	84.0	NBDN	4.0	345	43.	84.0	50.	NBDS	
8509081300	3.0	10	46.	85.0	NBDN	5.5	40	17	85.0	48	NBDS	VISIBILITY 10 MILES, SCATTERED CLOUDS
8509081315	4.0	40	35.	84.0	NBDN	6.5	190	50.	84.0	50.	NBDS	
8509081330	4.0	175	57.	83.0	NBDN	7.5	160	20.	83.0	56.	NBDS	
8509081345	6.0	190	15	82.0	NBDN	7.0	180	8.	82.0	59	NBDS	
8509081400	6.5	190	11.	82.0	NBDN	7.5	180	16.	82.0	57	NBDS	
8509081415	6.5	190	14.	82.0	NBDN	8.5	180	8.	81.0	59	NBDS	
8509081430	6.5	185	15.	81.0	NBDN	8.0	180	10.	81.0	61	NBDS	
8509081445	5.5	180	20.	81.0	NBDN	7.5	165	9.	81.0	61.	NBDS	
8509081500	5.5	175	16.	81.0	NBDN	8.0	165	12.	82.0	61.	NBDS	
8509081515	5.5	180	13.	81.0	NBDN	9.0	165	11	81.0	62.	NBDS	
8509081530	5.5	130	11.	81.0	NBDN	8.0	175	8.	81.0	62	NBDS	
8509081545	6.0	180	10	82.0	NBDN	7.5	150	12.	82.0	62.	NBDS	
8509081600	6.5	175	17.	82.0	NBDN	8.0	160	12.	81.0	62	NBDS	
8509081615	5.5	170	15.	81.0	NBDN	8.0	155	6.	81.0	63.	NBDS	
8509081630	6.0	165	14.	80.0	NBDN	8.0	165	10.	81.0	63.	NBDS	
8509081645	6.5	180	16	80.0	NBDN	8.0	170	9.	80.0	65.	NBDS	
8509081700	7.5	205	13.	80.0	NBDN	9.0	205	9.	20.0	66.	NBDS	
8509081715	5.5	205	18.	79.0	NBDN	7.5	195	10.	79.0	67.	NBDS	
8509081730	5.5	205	24	79.0	NBDN	6.5	190	11.	79.0	68.	NBDS	
8509081745	5.5	200	15.	79.0	NBDN	8.5	205	7	79.0	68.	NBDS	
8509081300	5.5	195	11	78.0	NBDN	7.0	190	10.	78.0	69.	NBDS	VISIBILITY 5 MILES IN HAZE, BROKEN CLOUDS
8509081815	4.5	200	15.	78.0	NBDN	6.5	175	6.	78.0	69.	NBDS	
8509081830	4.5	215	17.	78.0	NBDN	7.5	210	7.	78.0	67	NBDS	
8509081345	5.0	225	15.	77.0	NBDN	7.5	210	6.	78.0	68.	NBDS	
8509081900	4.5	220	18.	77.0	NBDN	5.0	205	10.	77.0	70.	NBDS	
8509081915	3.5	210	15.	77.0	NBDN	4.0	225	9.	77.0	70	NBDS	
8509081930	1.5	275	33.	76.0	NBDN	2.5	225	18.	77.0	71.	NBDS	
8509081945	2.0	270	35.	76.0	NBDN	3.5	230	19.	77.0	71.	NBDS	
8509082000	3.5	360	51.	75.0	NBDN	3.5	45	22.	75.0	78.	NBDS	
8509082015	2.0	10	17.	74.0	NBDN	3.0	65	14.	74.0	81.	NBDS	
8509082030	2.0	170	25.	73.0	NBDN	2.5	160	18.	74.0	82.	NBDS	
8509082045	2.5	160	13.	72.0	NBDN	2.5	165	24.	74.0	85.	NBDS	
8509082100	2.0	160	17.	72.0	NBDN	3.0	155	18.	73.0	87.	NBDS	
8509082115	4.0	175	13.	72.0	NBDN	6.5	170	15.	73.0	90	NBDS	
8509082130	4.0	235	40.	73.0	NBDN	7.0	220	15.	73.0	94.	NBDS	
8509082145	1.5	235	22.	73.0	NBDN	2.0	200	23.	73.0	95.	NBDS	

YRMODYHRMN	MPH	DEG	SIG	TEMP	LOC	MPH	DEG	SIG	TEMP	RH	LOC	OBSERVATIONS FROM NEW BEDFORD WEATHER STATION
8509082200	1.5	225	61.	72.0	NBDN	1.5	210	24.	72.0	95.	NBDS	
8509082215	2.5	190	31.	72.0	NBDN	3.5	195	6.	72.0	95	NBDS	
8509082230	2.0	230	36.	72.0	NBDN	2.0	225	26.	73.0	95.	NBDS	
8509082245	1.5	999	999.	72.0	NBDN	1.5	180	45.	73.0	94.	NBDS	
8509082300	1.5	999	999.	72.0	NBDN	1.0	290	41.	73.0	94.	NBDS	
8509082315	1.0	220	29.	73.0	NBDN	1.0	295	45	74.0	92.	NBDS	
8509082330	1.5	270	68.	73.0	NBDN	1.5	335	59.	74.0	91.	NBDS	
8509082345	2.5	360	12.	73.0	NBDN	1.5	10	41.	74.0	89	NBDS	
8509082400	2.0	360	27.	72.0	NBDN	2.0	20	7	73.0	89	NBDS	VISIBILITY 5 MILES IN HAZE, SCATTERED CLOUDS
8509090015	2.0	280	47.	71.0	NBDN	1.5	205	49.	73.0	90	NBDS	
8509090030	2.0	125	27.	71.0	NBDN	1.5	115	29.	72.0	90	NBDS	
8509090045	2.5	165	22.	71.0	NBDN	3.0	155	11.	73.0	94	NBDS	
8509090100	2.5	160	23.	71.0	NBDN	1.5	155	27	72.0	95	NBDS	
8509090115	1.5	130	17.	71.0	NBDN	2.0	145	16.	72.0	96.	NBDS	
8509090130	1.0	999	999.	71.0	NBDN	1.5	145	59.	71.0	97.	NBDS	
8509090145	1.5	999	999.	71.0	NBDN	1.5	190	49.	71.0	98.	NBDS	
8509090200	1.5	90	32.	71.0	NBDN	1.5	80	28	71.0	98	NBDS	
8509090215	1.0	315	68.	71.0	NBDN	1.0	95	21.	71.0	98.	NBDS	
8509090230	1.0	325	17.	71.0	NBDN	1.5	25	25.	71.0	98.	NBDS	
8509090245	1.5	340	8.	71.0	NBDN	1.5	360	7	71.0	99.	NBDS	
8509090300	2.5	360	19.	71.0	NBDN	3.0	10	6	71.0	98	NBDS	
8509090315	2.0	350	9.	71.0	NBDN	3.5	260	7.	72.0	98	NBDS	
8509090330	3.5	350	19.	71.0	NBDN	4.5	10	11	72.0	96.	NBDS	
8509090345	4.5	5	13.	71.0	NBDN	6.5	5	6.	71.0	92.	NBDS	
8509090400	5.5	5	13.	71.0	NBDN	6.0	360	6	71.0	82.	NBDS	
8509090415	4.0	999	999.	71.0	NBDN	5.0	5	7.	71.0	80.	NBDS	
8509090430	4.0	999	999.	71.0	NBDN	5.5	360	7.	71.0	77	NBDS	
8509090445	3.5	360	16.	71.0	NBDN	5.5	10	6.	71.0	75	NBDS	
8509090500	4.5	360	14.	70.0	NBDN	5.5	5	6	71.0	74.	NBDS	
8509090515	4.5	5	14.	70.0	NBDN	5.5	5	6.	71.0	72.	NBDS	
8509090530	3.5	5	15.	69.0	NBDN	6.0	5	8	71.0	72.	NBDS	
8509090545	4.0	5	17.	69.0	NBDN	5.5	5	8.	70.0	74.	NBDS	
8509090600	4.0	20	17	68.0	NBDN	4.5	15	12	70.0	78	NBDS	VISIBILITY 7 MILES, BROKEN CLOUDS
8509090615	5.0	25	17.	68.0	NBDN	5.5	10	10.	69.0	80.	NBDS	
8509090630	5.0	30	14.	68.0	NBDN	5.0	30	11.	69.0	80.	NBDS	
8509090645	5.5	25	17.	68.0	NBDN	5.5	30	11.	69.0	80.	NBDS	
8509090700	5.5	35	16.	67.0	NBDN	7.5	35	10.	68.0	81.	NBDS	
8509090715	6.0	35	999.	67.0	NBDN	6.5	30	9.	68.0	81.	NBDS	
8509090730	5.5	45	14.	67.0	NBDN	8.5	35	12.	68.0	77.	NBDS	
8509090745	6.0	55	14.	67.0	NBDN	8.5	45	11.	68.0	68.	NBDS	
8509090800	5.5	65	17.	67.0	NBDN	7.5	45	10.	68.0	62.	NBDS	
8509090815	5.5	70	23.	68.0	NBDN	6.5	65	16.	69.0	59.	NBDS	
8509090830	5.0	50	17.	67.0	NBDN	8.0	50	15.	69.0	57.	NBDS	
8509090845	5.0	35	15.	67.0	NBDN	7.0	40	9.	69.0	58.	NBDS	
8509090900	5.0	30	15.	67.0	NBDN	7.0	40	13.	68.0	58.	NBDS	
8509090915	5.5	45	15.	68.0	NBDN	7.0	40	13.	68.0	59.	NBDS	
8509090930	5.0	45	14.	68.0	NBDN	7.5	45	15.	69.0	58.	NBDS	
8509090945	6.0	65	57.	69.0	NBDN	6.5	55	15.	70.0	57.	NBDS	
8509091000	6.0	999	999.	70.0	NBDN	8.0	55	15.	70.0	54	NBDS	
8509091015	5.5	70	22.	70.0	NBDN	7.5	55	9.	70.0	52.	NBDS	
8509091030	6.5	70	21.	70.0	NBDN	7.0	70	15.	71.0	52.	NBDS	
8509091045	9.9	999	999.	99.9	NBDN	7.5	55	10.	71.0	52.	NBDS	
8509091100	9.9	999	999.	99.9	NBDN	6.0	55	19.	71.0	52.	NBDS	
8509091115	9.9	999	999.	99.9	NBDN	7.0	55	14.	71.0	50.	NBDS	
8509091130	9.9	999	999	99.9	NBDN	6.5	55	13.	71.0	50.	NBDS	VISIBILITY 15 MILES, OVERCAST