

**Seward PM<sub>10</sub> Air  
Monitoring Program  
January 2011 to May 2012  
Final Report**



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## Executive Summary

Prompted by air quality complaints recorded over several years, the Alaska Department of Environmental Conservation, in cooperation with the City of Seward and with the assistance of the Alaska Native Tribal Health Consortium and the Qutekcaak Native Tribe, set up a monitoring network to assess airborne dust measured as PM<sub>10</sub> (particulate matter with a aerodynamic diameter of less than or equal to 10 micrometers). The monitoring program began in January 2011 and collected data from February 20, 2011 through May 27, 2012.

The objective of the monitoring program was to collect samples which would be representative of the overall air quality in terms of PM<sub>10</sub> for the City of Seward. Samples were collected in accordance with EPA Reference Methods.

Air quality samples were collected from three locations. The first site was located in a residential neighborhood at the Mountain Haven assisted living facility. The second site was located at the Ballaine Boulevard lift station downwind of the Seward Coal Terminal and small-boat harbor, and adjacent to the Seward City campground. The third site was in the downtown district atop of the Seward Community Library.

Each PM<sub>10</sub> sample provided a mass concentration of PM<sub>10</sub> particles per volume of air expressed in micrograms per cubic meter (µg/m<sup>3</sup>) over the 24-hour period of the sample date. Samples were collected according to the EPA 1 in 6 day sampling schedule.

The EPA National Ambient Air Quality Standard (NAAQS) for PM<sub>10</sub> is 150 µg/m<sup>3</sup> for a 24-hour period. There were no exceedances of the PM<sub>10</sub> NAAQS recorded at any of the sites during this monitoring program. The highest 24-hour PM<sub>10</sub> concentration of 54 µg/m<sup>3</sup> recorded during the sampling program was collected at the Ballaine Boulevard site and represents only 36% of the PM<sub>10</sub> NAAQS. (see Figure 2). According to the EPA air quality index (AQI) the highest PM<sub>10</sub> concentration recorded during the monitoring period would be categorized as “good air quality.”

The following is a summary of the data collected from February 20, 2011 through May 27, 2012

**Table 1 Summary of the Seward PM<sub>10</sub> sampling results**

<b>Mountain Haven</b>		<b>Ballaine Blvd</b>		<b>Library</b>	
<b>Statistical Summary</b>		<b>Statistical Summary</b>		<b>Statistical Summary</b>	
Highest 24-hour PM <sub>10</sub> Concentration as µg/m <sup>3</sup>	25	Highest 24-hour PM <sub>10</sub> Concentration as µg/m <sup>3</sup>	54	Highest 24-hour PM <sub>10</sub> Concentration as µg/m <sup>3</sup>	36
Date Recorded	8/7/2011	Date Recorded	4/27/2012	Date Recorded	2/26/2012
2nd Highest 24-hour PM <sub>10</sub> Concentration as µg/m <sup>3</sup>	18	2nd Highest 24-hour PM <sub>10</sub> Concentration as µg/m <sup>3</sup>	44	2nd Highest 24-hour PM <sub>10</sub> Concentration as µg/m <sup>3</sup>	34
Date Recorded	10/30/2011	Date Recorded	8/7/2011	Date Recorded	4/3/2012
Average 24-hour PM <sub>10</sub> Concentration as µg/m <sup>3</sup>	7	Average 24-hour PM <sub>10</sub> Concentration as µg/m <sup>3</sup>	11	Average 24-hour PM <sub>10</sub> Concentration as µg/m <sup>3</sup>	11

## Background

For years, Seward City officials and the Alaska Department of Environmental Conservation (DEC) had received air quality complaints concerning wind-blown dust. In air pollution terms, wind-blown dust is generally categorized as particulate matter with a particle size less than or equal to 10 micrometers (PM<sub>10</sub>). The concern was not only wind-blown dust from natural sources but also coal dust from the Seward Coal Terminal, which stockpiles large quantities of coal for export to locations along the Pacific Rim. In 2010, the City requested assistance from DEC to establish a monitoring program.

The monitoring program was a cooperative effort between the City of Seward, the Alaska Native Tribal Health Consortium (ANTHC), the Qutekcak Native Tribe (QNT), and DEC. The City provided the land and access to the monitoring sites. ANTHC provided grant funding for the site installations and sampling operations. QNT provided logistical support for the sampling operations and the site operator. DEC was responsible for project management providing the sampling equipment, materials, laboratory services, routine QA/QC, and reporting.

The monitoring objective of the program was to assess ambient air concentrations of PM<sub>10</sub> which would be representative for the entire City of Seward. Ambient air is defined by the EPA as “that portion of the atmosphere, external to buildings, to which the general public has access.” The three sites were selected to represent the overall air quality for the City of Seward. In accordance with EPA guidance, the sites were designated as special purpose monitoring sites, which measured air quality on a neighborhood scale. One site was located in the downtown district, another located downwind of commercial and industrial activities of the Seward Coal Terminal and small boat harbor, and a third in a residential area near the Seward High School/Middle School Complex. The samples were collected according to the EPA 1-in-6 day sampling schedule.

## Description of the Monitoring Site

Figure 1 shows the locations of the three Seward PM<sub>10</sub> monitoring sites.

The first monitoring site was located at Mountain Haven (site A), a senior nursing and assisted living facility owned and operated by Providence Health & Services. The sampler was secured on the roof of the main building of the complex. Located on the hillside above the Seward High School/Middle School and upwind of the Seward Coal Terminal, the site was selected to be representative of a residential neighborhood. The major sources of dust impacting this site were expected to be from unpaved roads and traffic dust from around the Middle School/High School complex and wind-blown glacial silt from the river and stream beds feeding into the northern end of Resurrection Bay. Emissions of fine particulate from residential wood stoves and vehicle exhausts were also expected to contribute to the measured particulate.

The second location was the Ballaine Boulevard (site B) monitoring site located near the beach adjacent to the Seward City campgrounds. The monitoring platform and sampler were installed within the fence line of the Ballaine Boulevard Lift Station. This site was selected to be representative of a neighborhood with a mixture of commercial, industrial, and recreational activities. The site was downwind of the Seward Coal Terminal and small boat harbor, and adjacent to the City campgrounds. The major sources of coarse particulate matter impacting this site were anticipated to be wind-blown dust entrained into the air from glacial silt in the local soil and unpaved parking areas, stockpiles of materials e.g., from the Seward Coal Terminal and

aggregate from the DOT road maintenance facility; vehicular traffic; the breakdown of road surfaces; and road sanding materials used in the winter. The site is surrounded by un-vegetated ground in the City campground and other adjacent lots. The monitoring site is located downwind of the Seward Coal Terminal at a distance of 1.33 kilometers (0.8 miles).

Figure 1 Seward Monitoring Site Locations



The third location (collocated site C & D) was in the Seward Downtown district at the southeast corner of 5<sup>th</sup> Avenue and Adam Street on the roof of the Seward Community Library. This site was selected to be representative of commercial activities. The major sources of coarse particulate matter impacting this site were anticipated to be wind-blown dust entrained into the air from road dust associated with vehicular traffic, the breakdown of road surfaces and road sanding materials used in the winter, glacial silt from local soils, and stockpiles of materials such e.g., from the Seward Coal Terminal. The library site was located approximately 2.2 kilometers (1.4 miles) downwind from the Seward Coal Terminal stockpiles.

## **EPA Sampling Method for PM<sub>10</sub>**

The monitoring program collected air quality data using the “*EPA Reference Method for the Determination of Particulate Matter as PM<sub>10</sub> in the Atmosphere*”. This filter-based method collected particulate matter onto a pre-weighed, quartz glass-fiber filter over a 24-hour period from midnight to midnight. The sampler is specifically designed with a size-selective inlet and an electronic flow controller which only allowed particulate matter equal to or less than 10 micrometers to be captured onto the filter. For each sample run date, the site operator installed and recovered filters in accordance with the EPA 1 in 6 day sampling schedule. In addition, the operator recorded sample data for pre and post-run sample flow and the total sample time. The filter weighing was conducted in the DEC weighing laboratory in Juneau. As required by the reference method and to ensure weighing accuracy, the DEC laboratory is precisely controlled for temperature and humidity. The sample filters are weighed on a certified analytical balance to the nearest 0.1 milligrams. The PM<sub>10</sub> sample results are calculated from the filter weights and sample records and expressed as a 24-hour mass concentration expressed as micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ). The electronic flow controller and sample time indicators were initially calibrated and routinely checked to ensure compliance with method QA/QC critical criteria. If the data did not meet the QA/QC critical criteria, the data were invalidated.

## **Sampling Operations**

The sampling program began with initial calibrations in mid-January 2011 and sample collection began January 15<sup>th</sup>. However, there was an error in the initial calibration flow calculations. The samplers were recalibrated and sampling restarted February 20<sup>th</sup>. The objective of the monitoring program was to collect one year of sample data. Because of the initial data losses in January and February 2011, DEC decided to extend the sampling period through the end of May 2012. DEC extended the sample period because many of the air quality complaints were received during the cold, dry, and windy conditions of late winter and early spring.

The Library site consisted of two collocated mechanical Hi-Vol samplers. The PM<sub>10</sub> concentrations collected from the collocated samplers are statistically compared to evaluate data precision for the Seward network. Sampler D was designated as the official sampler for data reporting; however, some PM<sub>10</sub> values from the C sampler were inserted into the final record to fill missing or validated data.

Samples have been weighed and data processed for all three sites for the period February 20, 2011 through May 27, 2012, a total of 78 sample dates. Sampling operations were challenging. Calibrations and monthly flow checks were difficult in windy conditions (any wind speeds greater than 8 mph). The day to day operations to install and recover the samples were complicated by high winds and unusually inclement weather. Three sample dates were missed in January 2012 because record snowfalls made it impossible to safely access the three sample sites. Some equipment problems were encountered at the Library site and were suspected to be caused by fluctuations with on-site power supply.

## **National Ambient Air Quality Standard for PM<sub>10</sub>**

The National Ambient Air Quality Standards (NAAQS) were authorized under Title I of the Clean Air Act. The Clean Air Act identifies two types of standards for the NAAQS: a primary standard to protect human health including sensitive populations such as children, the elderly and others with existing health conditions; and a secondary standard to protect public welfare including protection of the environment. Both the primary and secondary standards for PM<sub>10</sub> are

currently set at a concentration of  $150 \mu\text{g}/\text{m}^3$ , determined as a 24-hour average, not to be exceeded more than once on average over 3 years.

### Discussion of Results

The Seward  $\text{PM}_{10}$  monitoring program was not designed to assess wind-blown dust from one particular industrial source at the source's property boundary but rather to evaluate the overall "ambient" air quality for the City of Seward. This was accomplished by locating the sample sites in three different neighborhoods with a mixture of residential, commercial, and industrial activities.

$\text{PM}_{10}$  data collected from the three Seward sample locations are summarized in Table 2.

**Table 2 Summary of Seward  $\text{PM}_{10}$  Data 2/20/2011 through 5/27/2012**

Statistical Summary	Mountain Haven	Ballaine Boulevard	Seward Library
Highest $\text{PM}_{10}$ 24-hour Concentration	$25 \mu\text{g}/\text{m}^3$	$54 \mu\text{g}/\text{m}^3$	$36 \mu\text{g}/\text{m}^3$
Date Recorded	8/7/11	4/27/12	2/26/11
2 <sup>nd</sup> Highest $\text{PM}_{10}$ 24-hour Concentration	$18 \mu\text{g}/\text{m}^3$	$44 \mu\text{g}/\text{m}^3$	$34 \mu\text{g}/\text{m}^3$
Date Recorded	10/30/11	8/7/11	4/3/12
Average $\text{PM}_{10}$ 24-hour Concentration	$7 \mu\text{g}/\text{m}^3$	$11 \mu\text{g}/\text{m}^3$	$11 \mu\text{g}/\text{m}^3$
# of Valid Samples	63	61	67
Total # of Sample Dates	78	78	78
Overall Data Capture	80.8%	78.2%	85.9%

A graphic comparison of the sample concentrations to the NAAQS standard is presented in Figure 2. These sample data are relatively low as compared to the  $150 \mu\text{g}/\text{m}^3$  standard. Figure 3 is a bar graph of the sample data which shows the comparison of the  $\text{PM}_{10}$  concentrations between sites.

The EPA devised an information tool to advise the public of air pollution conditions. This information tool is referred to as the Air Quality Index (AQI). According to the AQI index the highest recorded  $\text{PM}_{10}$  concentration of  $54 \mu\text{g}/\text{m}^3$  would represent an index value of 50. AQI values from 0 to 50 are categorized as "good air quality".

To supplement the  $\text{PM}_{10}$  data collected, DEC also summarized meteorological parameters for each 24-hour sample date. The meteorological parameters included: prevailing wind direction, average wind speed, maximum wind gust, average temperature, average dew point temperature, relative humidity, and atmospheric pressure. DEC obtained the meteorological data from the National Weather Service site at the Seward Airport. The meteorological parameters were statistically compared to the  $\text{PM}_{10}$  concentrations at each site. The statistical correlation calculations showed little relationship between meteorological parameters and  $\text{PM}_{10}$  concentrations. Table 3 presents data collected for each sample date including the  $\text{PM}_{10}$

concentration collected at each site and daily meteorological parameters. The blank yellow spaces denote missing or invalidated data.

The Seward monitoring program began on February 20, 2011 and concluded on May 27, 2012. In accordance with the EPA 1 in 6 day sampling schedule, the period represented a total of 78 possible samples. Percent data capture for this monitoring period was 80.8 percent for the Mountain Haven site, 78.2 percent for the Ballaine Boulevard site, and 85.9 for the Community Library site. The EPA has a minimum data capture requirement of 75 percent.

### **Study Conclusions**

There were no exceedances of the PM<sub>10</sub> NAAQS recorded during the sample period from February 20, 2011 through May 27, 2012. The highest 24-hour PM<sub>10</sub> value observed during the fourteen month monitoring period was 54 µg/m<sup>3</sup>, collected at the Ballaine Boulevard monitoring site. This sample value only represents 36 percent of the 150 µg/m<sup>3</sup> PM<sub>10</sub> NAAQS and would be categorized by the AQI as “good air quality”.

Based on the sample results obtained during this monitoring program, the DEC believes that further investigation into PM<sub>10</sub> in the city of Seward is not warranted at this time. Should conditions change significantly and additional funding becomes available, DEC may reconsider future monitoring.



## Seward PM10 Sample Data February 2011 - May 2012 as compared to the NAAQS

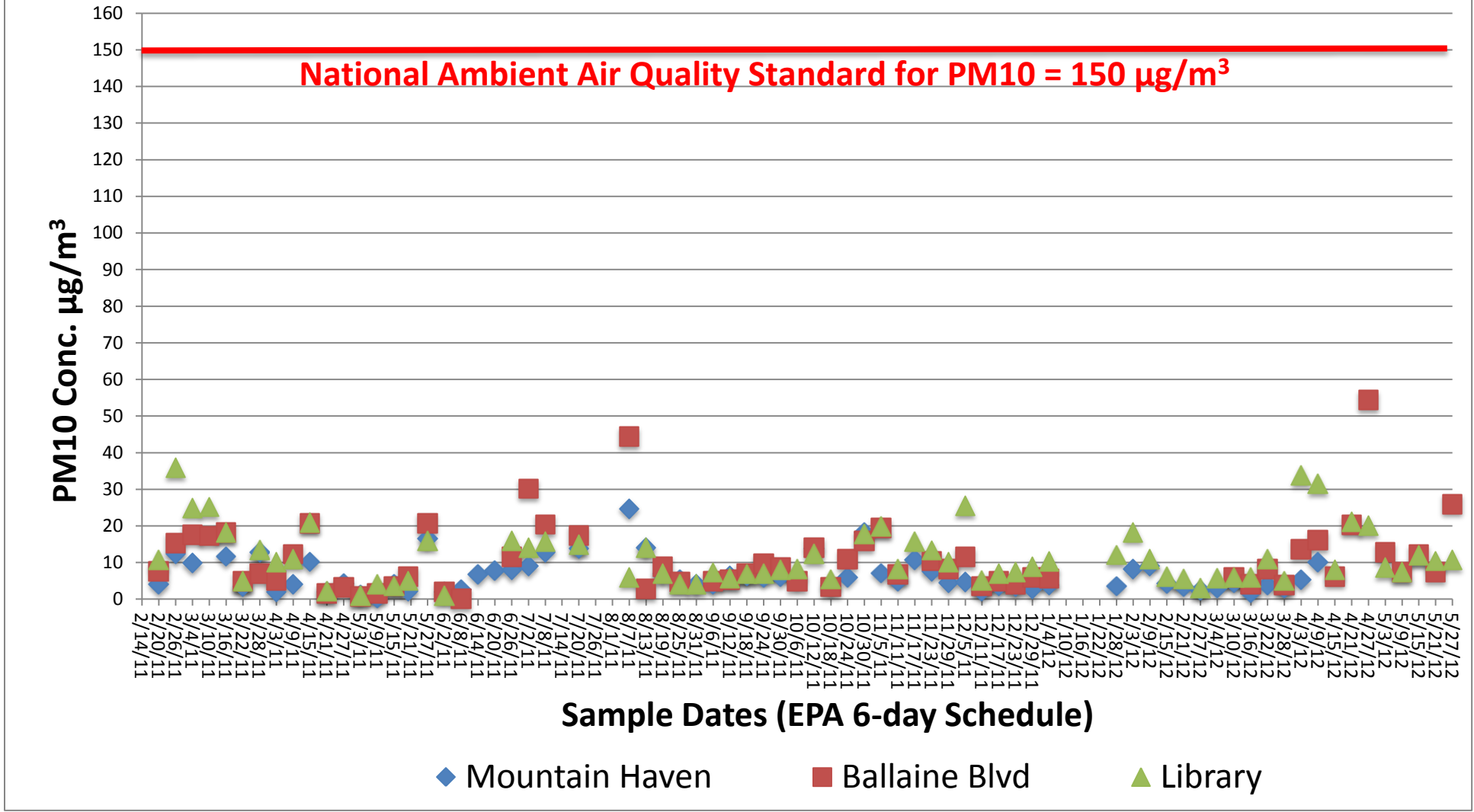


Figure 2 Seward PM<sub>10</sub> Sample Concentrations as Compared to the PM<sub>10</sub> NAAQS

## Seward PM10 Sample Data February 2011 - May 2012 Comparing Data from Site to Site

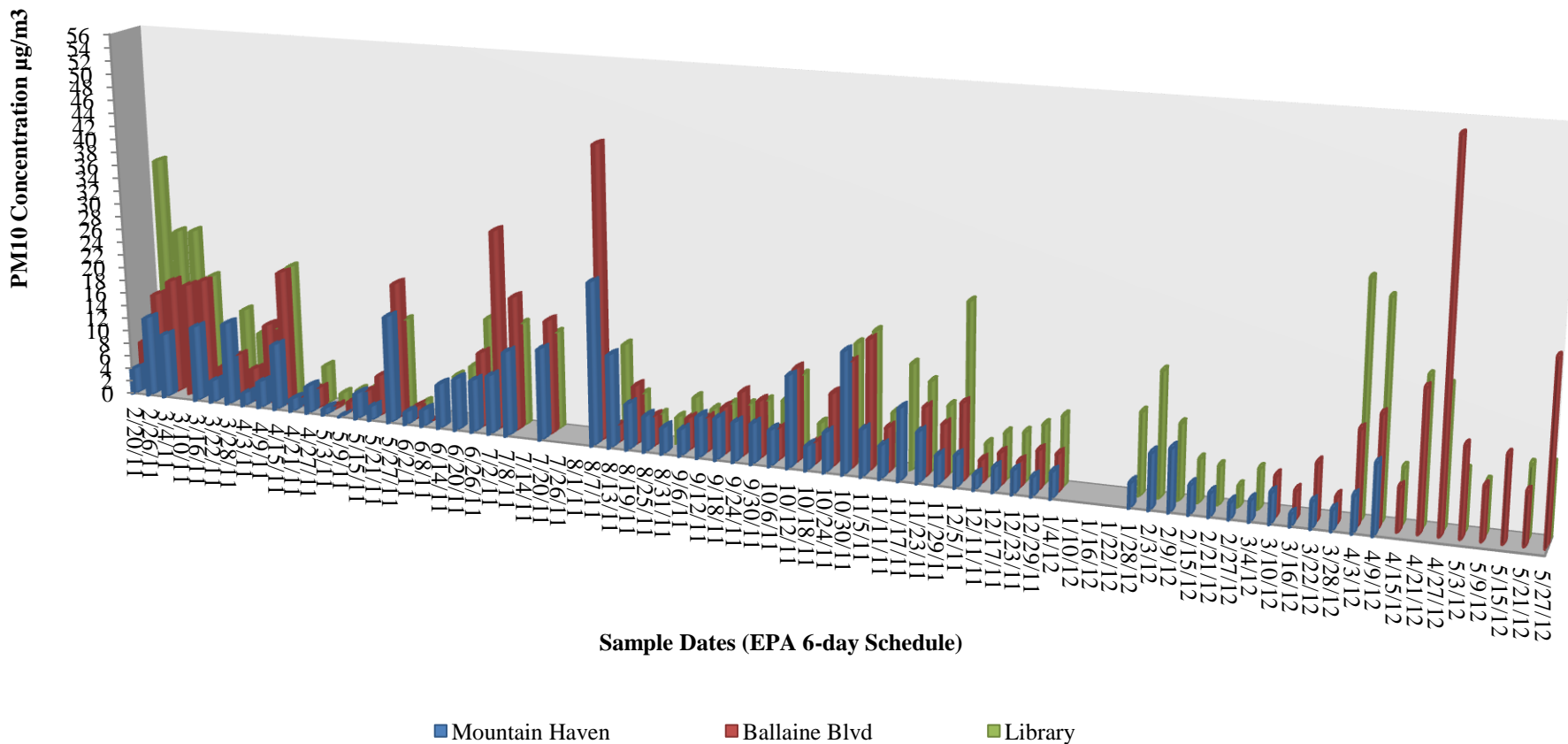


Figure 3 Seward PM<sub>10</sub> concentrations as compared site to site

Table 3 Complete Data Record of the Seward PM<sub>10</sub> concentrations as compared to Seward Daily Meteorological Parameters

Sample Date	Mountain Haven PM10 (µg/m3)	Ballaine Blvd. PM10 (µg/m3)	Library PM10 (µg/m3)	Prevailing Wind Direction	Average Wind Speed (mph)	Maximum Wind Gusts (mph)	Average Ambient Temp (° F)	Average Dew Pt Temp (° F)	Percent Relation Humidity (%)	Average Ambient Pressure (Hg")
2/20/2011	4	8	11	N	16.1	32	21.0	5.3	52.2	29.97
2/26/2011	12	15	36	NW	25.4	54	22.4	-2.5	32.7	30.18
3/4/2011	10	18	25	N	15.1	44	20.8	3.4	46.2	29.94
3/10/2011		17	25	N	11.7	29	24.1	4.3	41.7	29.68
3/16/2011	12	18	18	N	5.5	0	34.7	25.8	69.6	29.25
3/22/2011	3	5	5	SSE	1.8	0.0	33.2	28.3	82.0	29.60
3/28/2011	13	7	13	NNE	6.5	23	34.0	26.6	74.0	29.54
4/3/2011	2	5	10	NNE	6.2	18	39.8	28.7	64.2	29.28
4/9/2011	4	12	11	N	3.6	0	36.1	29.3	76.1	29.36
4/15/2011	10	21	21	N	6.0	16	39.0	23.4	53.1	30.08
4/21/2011	2	1	2	S	5.7	23	37.7	32.7	82.0	29.69
4/27/2011	4	3		SSE	4.2	0	38.9	35.0	85.7	29.82
5/3/2011	1	1	1	SSE	3.2	0	38.9	34.0	82.4	29.86
5/10/2011	0	2	4	S	4.1	16	42.4	36.2	79.1	29.84
5/15/2011	4	4	4	S	6.8	20	42.2	34.7	74.5	29.79
5/20/2011	2	6	5	SSW	8.5	26	43.0	36.9	78.9	29.98
5/27/2011	16	21	16	SSE	5.8	20	54.0	42.5	65	29.86
6/2/2011	2	2	1	SSE	9.0	21	52.0	44.9	76.7	29.88
6/8/2011	3	0		SSE	7.0	17	47.2	42.6	83.6	30.06
6/14/2011	7			S	5.0	0	49.3	44.4	83.6	29.97
6/20/2011	8			SSE	4.7	0	51.4	45.8	81.1	29.95
6/26/2011	8	11	16	SSE	2.7	0	52.5	48.0	84.6	29.97
7/2/2011	9	30	14	S	2.5	0	51.6	47.2	84.9	29.63

Sample Date	Mountain Haven PM10 (µg/m3)	Ballaine Blvd. PM10 (µg/m3)	Library PM10 (µg/m3)	Prevailing Wind Direction	Average Wind Speed (mph)	Maximum Wind Gusts (mph)	Average Ambient Temp (° F)	Average Dew Pt Temp (° F)	Percent Relation Humidity (%)	Average Ambient Pressure (Hg")
7/8/2011	13	20	16	SSE	6.5	0	52.9	44.3	84.9	30.08
7/14/2011				NNW	15.7	37	65.5	43.4	84.88	29.64
7/20/2011	14	17	15	N	7.7	0	58.3	45.0	61.2	29.93
7/26/2011				SSE	3.7	0	51.1	47.3	86.8	29.82
8/1/2011				SSE	4.3	17	55.4	51.1	85.43	29.73
8/7/2011	25	44	6	S	3.6	0	53.2	47.6	85.4	29.97
8/13/2011	14	3	14	S	2.2	0	56.0	51.3	84.2	29.91
8/19/2011	7	9	7	S	1.7	0	50.4	48.9	94.6	29.28
8/25/2011	5	5	4	N	4.0	29	49.1	45.6	87.7	29.73
8/31/2011	4		4	S	6.3	24	52.2	48.0	85.6	29.80
9/6/2011	4	5	7	E	3.7	26	49.3	45.9	88.0	28.92
9/12/2011	6	5	6	N	2.1	0	46.8	45.5	95.2	29.84
9/18/2011	6	7	7	S	4.8	20	46.7	41.6	82.3	29.47
9/24/2011	6	10	7	N	0.7	0	45.6	41.9	84.8	29.54
9/30/2011	6	9	8	N	4.2	0	40.9	33.9	75.9	29.50
10/6/2011	5	5	8	N	1.0	0	40.1	38.8	95.1	29.41
10/12/2011	14	14	12	N	13.0	32	40.0	18.5	41.3	29.83
10/18/2011	4	3	5	NW	15.3	37	39.1	24.3	55	29.62
10/24/2011	6	11		S	10.7	43	42.4	37.6	83.6	29.59
10/30/2011	18	16	18	N	11.2	30	35.4	24.6	64.4	29.45
11/5/2011	7	19	20	N	7.0	31	33.0	21.3	61.7	29.58
11/11/2011	5	7	8	NNW	5.5	21	30.7	20.7	66	29.38
11/17/2011	11		16	N	21.0	61	16.1	-5.0	38	29.95
11/23/2011	8	10	13	NNE	17.9	39	14.5	5.5	66.8	29.00

Sample Date	Mountain Haven PM10 (µg/m3)	Ballaine Blvd. PM10 (µg/m3)	Library PM10 (µg/m3)	Prevailing Wind Direction	Average Wind Speed (mph)	Maximum Wind Gusts (mph)	Average Ambient Temp (° F)	Average Dew Pt Temp (° F)	Percent Relation Humidity (%)	Average Ambient Pressure (Hg")
11/29/2011	4	8	10	N	7.2	25	22.0	16.2	78	29.87
12/5/2011	5	12	26	N	4.6	22	24.0	15.8	70.4	30.17
12/11/2011	2	4	5	NNW	8.2	34	35.3	31.7	86.6	29.22
12/17/2011	4	5	7	S	5.2	26	32.2	31.4	96.8	29.55
12/23/2011	3	4	7	NNE	11.0	23	22.3	12.1	64.3	29.35
12/29/2011	3	6	9	N	15.0	29	14.6	2.7	58.4	29.26
1/4/2012	4	6	10	N	23.7	56	14.9	-0.7	49.2	29.19
1/10/2012				Variable	5.7	30	30.9	27.8	88.1	29.67
1/16/2012										
1/22/2012				N	10.9	47	15.0	10.1	80.5	28.69
1/28/2012	4		12	NNE	21.0	46	-1.0	-10.3	63.7	29.67
2/3/2012	8		18	N	18.5	47	27.3	18.9	70.2	29.16
2/9/2012	9		11	N	9.9	32	37.9	28.7	69.1	29.65
2/15/2012	4		6	SSW	6.4	30	34.3	29.9	83.7	29.55
2/21/2012	3		6	N	10.9	28	33.8	21.7	60.8	29.19
2/27/2012	2		3	N	8.4	26	32.8	25.8	75.1	29.24
3/4/2012	3		6	N	20.5	41	21.8	9.7	59	29.88
3/10/2012	4	6	6	N	23.5	45	20.1	6.1	53.9	29.24
3/16/2012	2	4	6	N	11.8	26	28.0	19.0	68.1	29.24
3/22/2012	4	8	11	N	12.5	24	24.4	9.8	53.1	29.97
3/28/2012	3	4	5	N	2.8	18	37.5	31.8	79.7	29.10
4/3/2012	5	14	34	N	10.2	26	37.2	18.0	45.3	29.59
4/9/2012	10	16	31	N	5.1	0	34.8	23.6	63	30.11
4/15/2012		6	8	N	4.6	0	39.0	33.6	80.8	29.73

Sample Date	Mountain Haven PM10 (µg/m3)	Ballaine Blvd. PM10 (µg/m3)	Library PM10 (µg/m3)	Prevailing Wind Direction	Average Wind Speed (mph)	Maximum Wind Gusts (mph)	Average Ambient Temp (° F)	Average Dew Pt Temp (° F)	Percent Relation Humidity (%)	Average Ambient Pressure (Hg")
4/21/2012		20	21	S	2.6		40.0	33.8	78.3	29.93
4/27/2012		54	20	SSE	5.1	20	40.8	32.7	72.6	29.72
5/3/2012		13	9	S	6.3	17	38.3	19.5	46.3	29.70
5/9/2012		7	7	SSW	12.2	37	40.1	32.9	75.2	29.64
5/15/2012		12	12	N	8.1	18	45.0	30.3	56.1	30.27
5/21/2012		7	10	S	5.2	17	48.0	39.5	72.3	29.61
5/27/2012		26	11	SSE	4.9	0	44.5	38.8	80.2	29.82