



Seward PM₁₀ Monitoring Program Interim Monitoring Report January 30, 2012

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 Qutekcak Native Tribe set up a monitoring network to assess airborne dust measured as PM₁₀ (particulate matter with a aerodynamic diameter of less than or equal to 10 micrometers). The monitoring program began in January 2011 and is ongoing. Samples are collected in accordance with EPA Reference Methods and the EPA national 1-in-6 day monitoring schedule.

Air quality sample are collected from three locations to assess overall air quality for the City of Seward. The first site is located in a residential neighborhood at the Mountain Haven assisted living facility. The second site is 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 is in the downtown district on top of the Seward Community Library. Each PM₁₀ sample represents a mass concentration expressed in microgram per cubic meter ($\mu\text{g}/\text{m}^3$) over the 24-hour period of the sample date. Samples are collect every sixth day according to the EPA schedule.

The following is a summary of the data collected from February 20 through November 29, 2011.

| Mountain Haven | | Ballaine Blvd | | Library | |
|--|----------|--|--------|--|-----------|
| Statistical Summary | | Statistical Summary | | Statistical Summary | |
| Highest 24-hour PM ₁₀ Concentration as $\mu\text{g}/\text{m}^3$ | 25 | Highest 24-hour PM ₁₀ Concentration as $\mu\text{g}/\text{m}^3$ | 44 | Highest 24-hour PM ₁₀ Concentration as $\mu\text{g}/\text{m}^3$ | 36 |
| Date Recorded | 8/7/11 | Date Recorded | 8/7/11 | Date Recorded | 2/26/11 |
| 2nd Highest 24-hour PM ₁₀ Concentration as $\mu\text{g}/\text{m}^3$ | 18 | 2nd Highest 24-hour PM ₁₀ Concentration as $\mu\text{g}/\text{m}^3$ | 30 | 2nd Highest 24-hour PM ₁₀ Concentration as $\mu\text{g}/\text{m}^3$ | 25 |
| Date Recorded | 10/30/11 | Date Recorded | 7/2/11 | Date Recorded | 3/4&10/11 |
| Average 24-hour PM ₁₀ Concentration as $\mu\text{g}/\text{m}^3$ | 7 | Average 24-hour PM ₁₀ Concentration as $\mu\text{g}/\text{m}^3$ | 11 | Average 24-hour PM ₁₀ Concentration as $\mu\text{g}/\text{m}^3$ | 11 |

The EPA National Ambient Air Quality Standard (NAAQS) for PM₁₀ is 150 $\mu\text{g}/\text{m}^3$ for a 24-hour period. The highest 24-hour PM₁₀ concentration recorded thus far in Seward represents 29% of the PM₁₀ standard.



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Background

The air quality monitoring program in Seward was established in January 2011 to evaluate the ambient air concentration of wind-blown dust categorized as particulate matter equal to or less than 10 micrometers (PM₁₀). The monitoring program was prompted by mounting complaints from local residents received by City officials and DEC over several years. 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 purpose of monitoring program was to assess PM₁₀ levels and determine the overall air quality for the City of Seward.

The monitoring program is a cooperative effort between the City of Seward, the Qutekcak Native Tribe (QNT), the Alaska Native Tribal Health Consortium (ANTHC) and DEC. The City provided the land and access to the monitoring sites, QNT is providing the site operator, ANTHC provided funding for the site installations and site operator, and DEC is providing the sampling equipment, materials, laboratory services, reporting, and technical oversight.

The monitoring program consists of a network of three sites. The three sites were selected to represent the overall air quality for the City of Seward. Designated as special purpose monitors (SPM), the sites measure air quality on a neighborhood scale. One site is 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 monitoring program is collecting samples on the EPA 1-in-6 day sampling schedule.

Description of the Monitoring Site

Figure 1 shows the locations of the three Seward PM₁₀ monitoring sites.

The first monitoring site is located at Mountain Haven (site A), a senior nursing and assisted living facility owned and operated by Providence Health & Services. The sampler is located on the roof of the main building of the complex. The monitoring site is located in a residential area of Seward on the hillside above the Seward High School/Middle School and upwind of the Seward Coal Terminal. The major sources of dust impacting this site are from unpaved roads, traffic dust from around the Middle School/High School complex, wind-blown glacial silt from the river and stream beds feeding into the northern end of Resurrection Bay. Emissions of ultra-fine particulate from residential wood stoves also impact the site.

The second monitoring site is the Ballaine Boulevard (site B) monitoring site is 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. The major sources of coarse particulate matter impacting this site are anticipated to be wind-blown dust entrained into the air from glacial silt in the local soil, breakdown of road surfaces, road sanding materials used in the winter, stockpiles of materials such as aggregate for road maintenance, and the Seward

Coal Terminal. 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 site is a collocated sampler site located in the Seward Downtown district at the southeast corner of 5th Avenue and Adam Street on the roof of the Seward Community Library (sites C & D). The major sources of coarse particulate matter impacting this site are wind-blown dust entrained into the air from glacial silt in the local soil (open un-vegetated areas), breakdown of road surfaces, road sanding materials used in the winter, stockpiles of materials such as aggregate for road maintenance, and the Seward Coal Terminal. The library site is located approximately 2.2 kilometers (1.4 miles) from the Seward Coal Terminal stockpiles.

EPA Method for PM₁₀

The monitoring program is collecting air quality data using the “*EPA Reference Method for the Determination of Particulate Matter as PM₁₀ in the Atmosphere*”. This filter-based method collects 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 which only allows particulate in the PM₁₀ size range to be captured onto the filter. The high volume sampler (“Hi-Vol”) is electronically controlled to precisely control the volumetric flow rate. The sample flow and sample time are recorded for sample calculation. The site operator installs and recovers the filters in accordance with the 1 in 6 day sampling schedule, records sample data, receives supplies and ships filters, and performs month quality control flow checks. The filter weighing is conducted in the DEC weighing laboratory in Juneau. Pre- and Post-weights are performed in the contained laboratory precisely controlled for temperature and humidity. The sample filters are weighed on a certified analytical balance to the nearest 0.1 milligrams. The DEC project manager performs routine equipment calibrations, compiles the data, calculates the results, and prepares reports. The PM₁₀ sample results are expressed as a 24-hour mass concentration expressed as micrograms per cubic meter ($\mu\text{g}/\text{m}^3$).

Sampling Operations

The sampling program began with initial calibrations in mid-January 2011 and sample collection began January 15th. However, there was an error in the initial calibration flow calculations. The samplers were recalibrated and sampling restarted February 20th. Sample collection is ongoing in accordance with the EPA National 1-in-6 day schedule. The Library site has two collocated mechanical Hi-Vol samplers. The PM₁₀ 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.

Samples have been weighed and data processed for all three sites for the period February 20 through November 29, 2011, a total of 48 sample dates. Sampling operations have been challenging. Calibrations and monthly flow checks are difficult in windy conditions (any wind speeds greater than 8 mph). The day to day operations to install and recover the samples has been complicated by high winds and unusually inclement weather. Some problems were encountered at the Library site and are suspected to be caused by fluctuations of the on-site power.

National Ambient Air Quality Standard for PM₁₀

The Seward monitoring program is what the EPA refers to as a special purpose monitoring program. The data collected is to be compared to National Ambient Air Quality Standard (NAAQS) for PM₁₀, which is established under the federal regulations of the Clean Air Act. The PM₁₀ NAAQS is currently established at 150 $\mu\text{g}/\text{m}^3$ over a 24-hour period.

Summary of Results

PM₁₀ data collected from the three Seward sample locations are summarized in Table 1.

Table 1 Summary of Seward PM10 Data 2/20/2011 through 11/29/2011

| Statistical Summary | Mountain Haven | Ballaine Boulevard | Seward Library |
|--|-----------------------|---------------------------|-----------------------|
| Highest PM ₁₀ 24-hour Concentration | 25 µg/m ³ | 44 µg/m ³ | 36 µg/m ³ |
| Date Recorded | 8/7/11 | 8/7/11 | 2/26/11 |
| 2 nd Highest PM ₁₀ 24-hour Concentration | 18 µg/m ³ | 30 µg/m ³ | 25 µg/m ³ |
| Date Recorded | 10/30/11 | 7/2/11 | 3/4 & 10/11 |
| Average PM ₁₀ 24-hour Concentration | 7 µg/m ³ | 11 µg/m ³ | 11 µg/m ³ |
| # of Valid Samples | 44 | 41 | 43 |
| Total # of Sample Dates | 48 | 48 | 48 |
| Overall Data Capture | 91.7% | 85.4% | 89.6% |

These sample data are relatively low as compared to the 24-hour PM₁₀ NAAQS set at 150 µg/m³. A graphic comparison of the data to the NAAQS standard is presented in Figure 1.

The complete data is shown in Table 2. The blank yellow spaces denote missing or invalidated data. The missing and invalidated data were attributed to a number of problems: damage to the filter during recovery or shipping; equipment malfunctions, and logistical problems shipping new filters. Several samples were invalidated because the sample data failed to meet critical quality control criteria required by the EPA method.

Continuation of the Sampling Program

DEC anticipates continuing the sampling program through the end of May 2012. This will assure good data recovery for the periods of cold dry weather which seem to promote opportunities for high dust events. DEC is currently working with the City and QNT to extend the program beyond the initial one-year period.

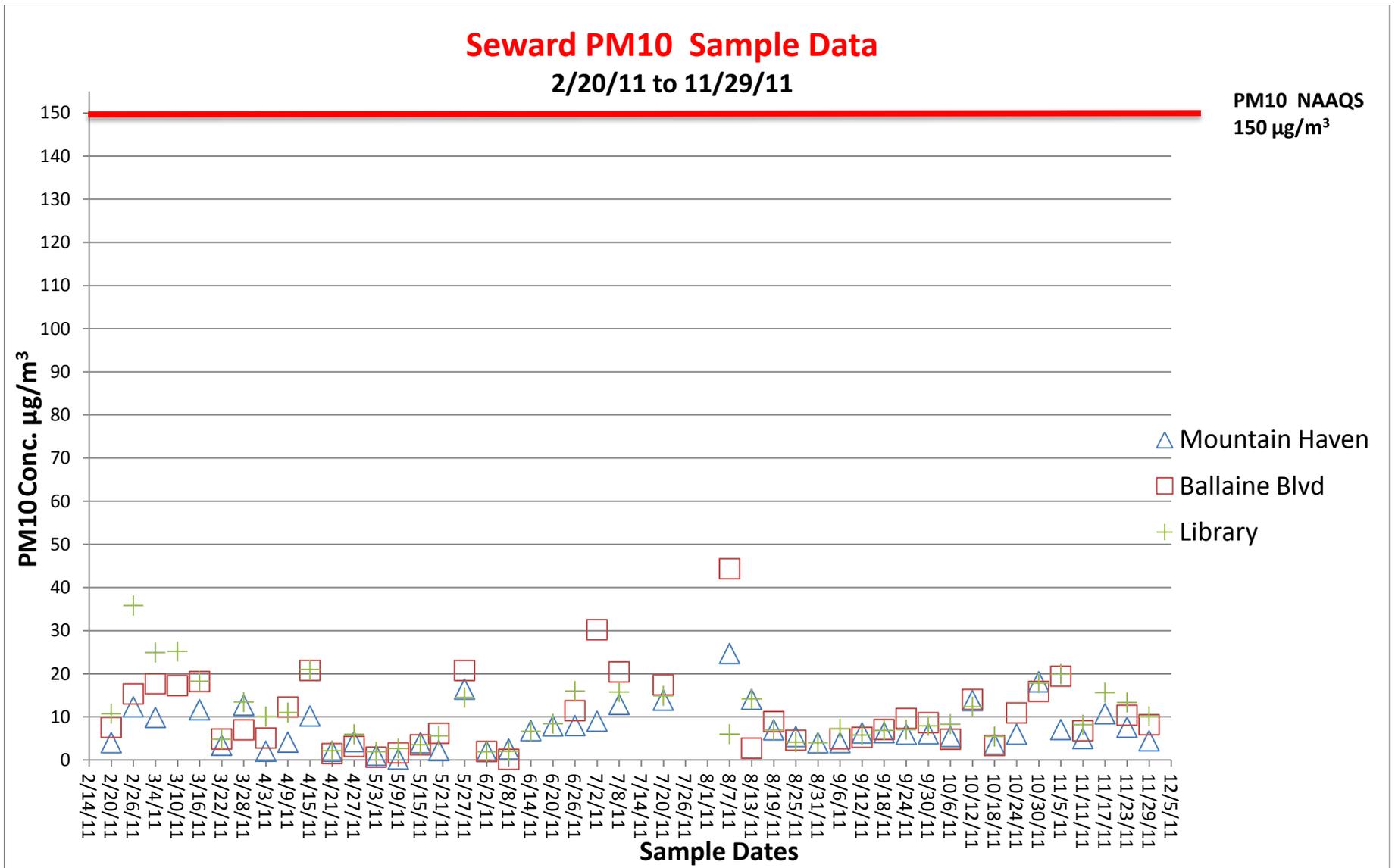


Figure 2 Seward PM₁₀ Sample data as Compared to the PM₁₀ NAAQS

Table 2 Complete Data Record (to date) of the Seward PM₁₀ Monitoring Program

| Mountain Haven Site Sampler A | |
|----------------------------------|---|
| Sample Date | PM ₁₀ µg/m ³ std |
| 2/20/11 | 4 |
| 2/26/11 | 12 |
| 3/4/11 | 10 |
| 3/10/11 | |
| 3/16/11 | 12 |
| 3/22/11 | 3 |
| 3/28/11 | 13 |
| 4/3/11 | 2 |
| 4/9/11 | 4 |
| 4/15/11 | 10 |
| 4/21/11 | 2 |
| 4/27/11 | 4 |
| 5/3/11 | 1 |
| 5/9/11 | 0 |
| 5/15/11 | 4 |
| 5/20/11 | 2 |
| 5/27/11 | 16 |
| 6/2/11 | 2 |
| 6/8/11 | 3 |
| 6/14/11 | 7 |
| 6/20/11 | 8 |
| 6/26/11 | 8 |
| 7/2/11 | 9 |
| 7/8/11 | 13 |
| 7/14/11 | |
| 7/20/11 | 14 |
| 7/27/11 | |
| 8/1/11 | |
| 8/7/11 | 25 |
| 8/13/11 | 14 |
| 8/19/11 | 7 |
| 8/25/11 | 5 |
| 8/31/11 | 4 |

| Ballaine Blvd. Site Sampler B | |
|----------------------------------|---|
| Sample Date | PM ₁₀ µg/m ³ std |
| 2/20/11 | 8 |
| 2/26/11 | 15 |
| 3/4/11 | 18 |
| 3/10/11 | 17 |
| 3/16/11 | 18 |
| 3/22/11 | 5 |
| 3/28/11 | 7 |
| 4/3/11 | 5 |
| 4/9/11 | 12 |
| 4/15/11 | 21 |
| 4/21/11 | 1 |
| 4/27/11 | 3 |
| 5/3/11 | 1 |
| 5/9/11 | 2 |
| 5/15/11 | 4 |
| 5/20/11 | 6 |
| 5/27/11 | 21 |
| 6/2/11 | 2 |
| 6/8/11 | 0 |
| 6/14/11 | |
| 6/20/11 | |
| 6/26/11 | 11 |
| 7/2/11 | 30 |
| 7/8/11 | 20 |
| 7/14/11 | |
| 7/20/11 | 17 |
| 7/27/11 | |
| 8/1/11 | |
| 8/7/11 | 44 |
| 8/13/11 | 3 |
| 8/19/11 | 9 |
| 8/25/11 | 5 |
| 8/31/11 | |

| Library Site Sampler D | |
|---------------------------|---|
| Sample Date | PM ₁₀ µg/m ³ std |
| 2/20/11 | 11 |
| 2/26/11 | 36 |
| 3/4/11 | 25 |
| 3/10/11 | 25 |
| 3/16/11 | 18 |
| 3/22/11 | 5 |
| 3/28/11 | 13 |
| 4/3/11 | 10 |
| 4/9/11 | 11 |
| 4/15/11 | 21 |
| 4/21/11 | 2 |
| 4/27/11 | 6 |
| 5/3/11 | 2 |
| 5/9/11 | 3 |
| 5/15/11 | 4 |
| 5/20/11 | 6 |
| 5/27/11 | 14 |
| 6/2/11 | 2 |
| 6/8/11 | 2 |
| 6/14/11 | 7 |
| 6/20/11 | 8 |
| 6/26/11 | 16 |
| 7/2/11 | |
| 7/8/11 | 16 |
| 7/14/11 | |
| 7/20/11 | 15 |
| 7/27/11 | |
| 8/1/11 | |
| 8/7/11 | 6 |
| 8/13/11 | 14 |
| 8/19/11 | 7 |
| 8/25/11 | 4 |
| 8/31/11 | 4 |

| | |
|----------|----|
| 9/6/11 | 4 |
| 9/12/11 | 6 |
| 9/18/11 | 6 |
| 9/24/11 | 6 |
| 9/30/11 | 6 |
| 10/6/11 | 5 |
| 10/12/11 | 14 |
| 10/18/11 | 4 |
| 10/24/11 | 6 |
| 10/30/11 | 18 |
| 11/5/11 | 7 |
| 11/11/11 | 5 |
| 11/17/11 | 11 |
| 11/23/11 | 8 |
| 11/29/11 | 4 |

| | |
|----------|----|
| 9/6/11 | 5 |
| 9/12/11 | 5 |
| 9/18/11 | 7 |
| 9/24/11 | 10 |
| 9/30/11 | 9 |
| 10/6/11 | 5 |
| 10/12/11 | 14 |
| 10/18/11 | 3 |
| 10/24/11 | 11 |
| 10/30/11 | 16 |
| 11/5/11 | 19 |
| 11/11/11 | 7 |
| 11/17/11 | |
| 11/23/11 | 10 |
| 11/29/11 | 8 |

| | |
|----------|----|
| 9/6/11 | 7 |
| 9/12/11 | 6 |
| 9/18/11 | 7 |
| 9/24/11 | 7 |
| 9/30/11 | 8 |
| 10/6/11 | 8 |
| 10/12/11 | 12 |
| 10/18/11 | 5 |
| 10/24/11 | |
| 10/30/11 | 18 |
| 11/5/11 | 20 |
| 11/11/11 | 8 |
| 11/17/11 | 16 |
| 11/23/11 | 13 |
| 11/29/11 | 10 |

| Mountain Haven | |
|---|----------|
| Statistical Summary | |
| Highest 24-hour PM ₁₀ Concentration as µg/m ³ | 25 |
| Date Recorded | 8/7/11 |
| 2nd Highest 24-hour Concentration as µg/m ³ | 18 |
| Date Recorded | 10/30/11 |
| Average PM ₁₀ Concentration as µg/m ³ | 7 |
| # of Valid Samples | 44 |
| Total # of Sample Dates | 48 |
| Overall Data Capture % | 91.7 |

| Ballaine Blvd | |
|---|--------|
| Statistical Summary | |
| Highest 24-hour PM ₁₀ Concentration as µg/m ³ | 44 |
| Date Recorded | 8/7/11 |
| 2nd Highest 24-hour Concentration as µg/m ³ | 30 |
| Date Recorded | 7/2/11 |
| Average PM ₁₀ Concentration as µg/m ³ | 11 |
| # of Valid Samples | 41 |
| Total # of Sample Dates | 48 |
| Overall Data Capture % | 85.4 |

| Library | |
|---|-------------|
| Statistical Summary | |
| Highest 24-hour PM ₁₀ Concentration as µg/m ³ | 36 |
| Date Recorded | 2/26/11 |
| 2nd Highest 24-hour Concentration as µg/m ³ | 25 |
| Date Recorded | 3/4 & 10/11 |
| Average PM ₁₀ Concentration as µg/m ³ | 11 |
| # of Valid Samples | 43 |
| Total # of Sample Dates | 48 |
| Overall Data Capture % | 89.6 |

Blank yellow spaces denote missing or invalidated data which resulted from equipment failures or sample data which did not meet EPA critical QC/QA criteria.