

Daily Wintertime PM_{2.5} Speciation at Hawthorne and Smithfield

Memorandum of Understanding

May 29, 2018

For the primary purposes of better validating Utah DAQ's photochemical modeling, UDAQ will do more frequent speciation of wintertime PM_{2.5} filters. EPA's Chemical Speciation Network (CSN) requirements specify either one-in-three or one-in-six day speciation of PM_{2.5} at three Utah locations (Hawthorne, Bountiful, and Lindon).

The State of Utah is in nonattainment of EPA's 24-hour PM_{2.5} standards. Wintertime violations of the National Ambient Air Quality Standard (NAAQS) for 24-hour PM_{2.5} are due to relatively short lived Persistent Cold Air Pool (PCAP) episodes, driven by prolonged temperature inversions occurring in Salt Lake Valley, Utah Valley, and Cache Valley.

Due to the short-lived nature of these PCAP events (e.g., 1-2 weeks), exceedances of the NAAQS may occur for only 2 or 3 days during an event. For that reason, the relatively infrequent sampling required by CSN protocols could be insufficient for model validation as peak PM_{2.5} days might not coincide with days when CSN sampling is scheduled.

Also, it should be noted that there currently is no filter-based PM_{2.5} instrument in the Logan Nonattainment Area (Cache Valley) that can be used for air quality model validation. Past Cache Valley model validation has been based on either: older special studies conducted at Logan, or an assumption that wintertime PM_{2.5} composition is similar between Cache Valley and Salt Lake Valley.

To address these issues, UDAQ will 1) increase sampling at Hawthorne (located in Salt Lake Valley) to a daily frequency and 2) conduct daily sampling in the Cache Valley during occasional PCAP events.

Project Details

For the three winter months (December, January, February), UDAQ will collect samples to be chemically speciated everyday at Hawthorne. At Hawthorne, UDAQ is already collecting samples for chemical speciation every third day of the year to satisfy CSN requirements. Therefore, UDAQ will collect nearly 60 additional samples at Hawthorne to compliment the 30 or so currently collected every year during the winter months. The same instrument currently used

for CSN sampling will be used for measuring PM2.5 for the additional two-of-three day sampling UDAQ is planning to do.

To ensure UDAQ is using current data to validate peak PM2.5 composition similarities between the Cache Valley and Salt Lake Valley, UDAQ will occasionally conduct daily sampling for the purposes of PM2.5 speciation. It's foreseeable that this will be done every year at least once. We estimate this could potentially mean collecting an additional 14 samples at Smithfield.

Past studies demonstrate that Cache Valley PM2.5 composition is similar to Salt Lake Valley during elevated wintertime pollution events. However, with perpetual changes in demographics and economic behavior, this assumption of similarity between the two basins should be periodically challenged using up-to-date observations.

In summary, UDAQ will begin:

1. Sampling every day for purposes of the chemical speciation of PM2.5 at Hawthorne.
2. Conduct daily sampling for chemical speciation at Smithfield (Cache Valley) during occasional wintertime PCAP events.

To avoid biases, it is necessary that the same lab and analysis techniques be used to analyze the filters as what is currently used for EPA's CSN analysis. UDAQ will use the same laboratory to conduct the analysis of the wintertime PM2.5 filters discussed in this document as what EPA is currently using to conduct their CSN analysis.

Air Monitoring Section staff will collect filters from Hawthorne and Smithfield and maintain PM2.5 monitoring instruments. Filters will be placed in cold storage at the Air Monitoring Center until it is time to ship them to the laboratory for chemical analysis. UDAQ air quality modelers will provide guidance and oversight. For example: air quality modelers will determine specific sampling periods and choose which filters should be sent to the laboratory for chemical speciation.

Budget

To account for costs in sampling media, analysis, staff time and labor, \$50,000 will be provided to the the Air Monitoring Section from the Utah DAQ research budget for the 2019 fiscal year. This project will be re-examined yearly in order to determine funding for future years. We estimate we will require the chemical analysis of, between, 30 and 80 filters per year. Given the range of filters needing analyzed, the total cost of sampling media and chemical analysis on a yearly basis would range between \$12,981 and \$34,616. Money left over from the \$50,000 project budget will be used to help compensate Air Monitoring Section staff for their time and labor. The budget for 80 samples (high end of the range required) is itemized in the following table:

		Unit Cost	Quantity	Amount
Sampling Media/Supplies	Teflon filter	\$20.19	80	\$1,615.20
	Nylon filter	\$11.51	80	\$920.80
	Quartz filter	\$8.26	80	\$660.80
Shipping & Handling	Teflon filter	\$24.92	80	\$1,993.60
	Nylon filter	\$24.92	80	\$1,993.60
	Quartz filter	\$24.92	80	\$1,993.60
Filter Analysis	Mass	\$38.23	80	\$3,058.40
	Carbon (EC/OC)	\$55.93	80	\$4,474.40
	XRF	\$68.85	80	\$5,508.00
	Anions	\$71.43	80	\$5,714.40
	Cations	\$71.43	80	\$5,714.40
Data Handling	Data processing/reporting	\$12.11	80	\$968.80
Total				\$34,616.00

- Table above based on DRI quote. This is likely *not* the lab UDAQ will use for analysis.