APPENDIX AVAILABLE ON REQUEST

Research Report 162

Assessing the Impact of a Wood Stove Replacement Program on Air Quality and Children's Health

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Appendix F. Quality Assurance / Quality Control Results

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This document was reviewed by the HEI Health Review Committee
but did not undergo the HEI scientific editing and production process.

APPENDIX F. QUALITY ASSURANCE / QUALITY CONTROL RESULTS

$PM_{2.5}$ data (both 24-hour values collected by the FRMs and the hourly data collected by the TEOM) were provided to the University of Montana by Montana DEQ. The data that were provided were already QA/QC'd by the Montana DEQ, therefore any invalid data points were removed from the dataset before being provided to the University of Montana.

School and residential programs: Before final concentrations were calculated for $PM_{2.5}$ mass, OC/EC, and chemical markers of wood smoke, each 24-hour sample run was carefully scrutinized to ensure that the data was of the highest technical quality. Any sampling run where the Leland/PEM sampler exhibited unacceptable flow rates (<8 LPM post run flow rate) was discarded from the final data set, with the reason for discarding the data recorded. This was also true for the school $PM_{2.5}$ cyclones if a final flow rate (as measured by a calibrated DeltaCal) was below 15 LPM. In addition, our target sampling duration (for all sampling episodes) was 1440 minutes (24 hours). Any sample run that did not meet a run time of at least 1400 minutes was discarded from the final dataset (again documenting why the data were not used). Some reasons why runs times were shortened included power failures, pump failures, and programming errors. Mass, OC, and EC results (as reported by Chester LabNet) for the filter blanks did not show any significant contamination throughout the program.

Chemical markers of wood smoke analyses (includes analyzing samples from ambient, school, and residential programs). Levoglucosan, abietic acid, and the methoxyphenols were detected at low levels on less than 1/3 of the blanks analyzed. Dehydroabietic acid was detected at low levels (blank levels were less than 30% of the average levels measured on the samples) on almost every blank that was analyzed. To correct for this background, an average value of dehydroabietic acid on the blanks was calculated and subtracted from all reported values. The other analytes were not corrected for average blank concentrations. For the methoxyphenols, acetovanillone and vanillin were only detected on a couple of blanks, but at relatively high levels. Since these two methoxyphenols are semi-volatile and

were not detected in most of the samples, the data were not used and their presence on the blanks is inconsequential. Guaiacol and 4-ethylguaiacol were detected on most of the blanks at higher levels, but again the guaiacol and 4-ethylguaiacol data had little utility and their presence on blanks is inconsequential. None of the blank filters were positive for more than four of the compounds, suggesting that contamination during transport or storage did not occur. The presence of different compounds on the blanks is likely due to small contamination during the sample preparation or analysis.

Recovery of markers of wood smoke. Clean quartz filters were spiked with known levels of all seven compounds (and four deuterated internal standards) and passed through the extraction procedure daily in parallel with the samples analyzed (at least 1 spiked filter for every 10 samples analyzed). Recovery was calculated from these spiked filters to monitor method efficiency and instrument performance. The spike solutions were all prepared in ethyl acetate, except for levoglucosan, which was prepared in acetonitrile. Calibration standards were also made at least once a week to monitor solutions and instrument calibration. A full set of calibration standards was analyzed whenever new solutions were prepared or instrument maintenance was performed, or as necessary when indicated by the single calibration point analyzed weekly (no less than 1 full set analyzed per month). Five of the compounds had recoveries near 100%, while the two resin acids exhibited low, but consistent, recoveries. The recoveries were close to 100% for levoglucosan, vanillin, acetovanillone, guaiacol, and 4-ethylguaiacol. The resin acids both exhibited recoveries that were significantly lower than 100%, but they were still reproducible. The reported values for the two resin acids were adjusted to correct for this low recovery, allowing the values to be compared to other published values.