

Evaluation of Hydrogen Sulfide, Ammonia, Particulate Matter, and Meteorological Measurements Collected During ATSDR’s Ambient Air Monitoring/Sampling Program on the Yakama Reservation

Table 5. Comparison of 24-hour and Annual Background PM_{2.5} Data to Measured Concentrations in Harrah (µg/m³).

Measurement	Harrah ^a	4th St ^b	Toppenish ^c	White Swan
Fall				
Mean 24-hr	16.20	12.7	12.9	9.9
Max 24-hr	153.56	41	47.9	37.4
Summer				
Mean 24-hr	10.34	4.9	13.7	9.3
Max 24-hr	47.22	14.5	61.9	35.8
Annual^d				
Mean 24-hr	12.88	8.6	13.6	6.8
Max 24-hr	153.36	63.9	184	62

Source: [WSDE 2018]

^a The annual values reported for Harrah are the combined 24-hr average from the fall and summer sampling events.

^bPM_{2.5} data was not available for the duration of the EI, data from the same dates in Fall 2015 and summer 2016 are presented

^c PM_{2.5} data was not available for the duration of the EI, data from the same dates in Fall 2016 and summer 2017 are presented

^dAnnual data from Harrah are from the dates of the EI, where annual values from other sites cover an entire year (365 days) from the start date of the Fall sampling event in the corresponding year of available data.

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Community members in Harrah expressed concerns to ATSDR regarding the proximity of some AFOs to nearby schools. To address those concerns, ATSDR installed sampling and monitoring equipment near Harrah Elementary School (Site 5). Ammonia, hydrogen sulfide, and PM_{2.5} were measured at Site 5 during the Fall 2014 and Summer 2015 sampling. Measured concentrations at Site 5 were close to that of other monitors. Data from Site 5 show the following:

Ammonia- None of the 346 30-min samples exceeded the acute CV for ammonia (1700 ppb), and none of the 24-hour samples exceeded the chronic CV (100 ppb). The Site 5 mean 24-hour ammonia concentration for the entire EI was below the chronic CV, thus ammonia concentrations measured near Harrah Elementary School should not cause adverse health effects;

Hydrogen Sulfide- Seventeen of 100 (17%) 24-hour samples exceeded the reference chronic CV for hydrogen sulfide (1.4 ppb), but none exceeded the intermediate (20 ppb) or acute (70) CVs. The concentration at site 5 averaged over the entire EI was also below

the chronic CV. Sixty-four of 100 (64%) hydrogen sulfide 24-hour samples exceeded the odor threshold, which means on most days during the EI, individuals near Harrah Elementary School would likely smell rotten-egg like odors during some part of the day. Sensitive individuals in the area may experience odor-related health symptoms such as headaches, nausea, and stress or annoyance when hydrogen sulfide and other gases exceeds their odor threshold;

PM2.5- Forty-seven of the 84 (56%) days sampled at Harrah elementary School fall into the good AQI category; 33 of 84 (39%) fall into the moderate AQI category; and 4 of 83 (5%) are categorized as unhealthy for sensitive individuals. See Appendix A, Table A1, for the concentration range of each category and the associated public health statements; and

The mean for the entire EI was $12.88 \mu\text{g}/\text{m}^3$, which suggest that there is a potential for sensitive individuals to have health effects from PM2.5. Daily exposure to the mean concentration of PM2.5 may require some sensitive individuals to reduce prolonged or heavy exertion; the health of other individuals should not be affected. On days when PM2.5 is above the NAAQS ($12 \mu\text{g}/\text{m}^3$), there is an increasing likelihood of respiratory symptoms in older adults, children, and people of lower socioeconomic status; aggravation of heart or lung disease; and premature mortality in people with heart or lung disease. People who fall into this category should reduce prolonged or heavy exertion [USEPA 2016].

Because of their size, physiology, behavior, and activity level, the inhalation rates of children differ from those of adults. Factors that might contribute to enhanced lung deposition in children include higher ventilation rates, less contribution from nasal breathing, less efficient uptake of particles in the nasal airways, and greater deposition efficiency of particle and some vapor phase chemicals in the lower respiratory tract. In addition, children spend 3 times as much time outdoors as adults and engage in three times as much time playing sports and other vigorous activities [USEPA 2011b]. Based on these parameters, children are more likely to be exposed to more outdoor air pollution than adults. Further, a child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight.

While, it is not clear that children are more toxicologically sensitive to the specific exposures of hydrogen sulfide and ammonia, they are likely more vulnerable due to their increased exposure. In terms of PM, children (and the elderly) have increased susceptibility to PM-related respiratory effects, and the health effects observed in children could be initiated by pre and/or postnatal exposures to PM [USEPA 2009].