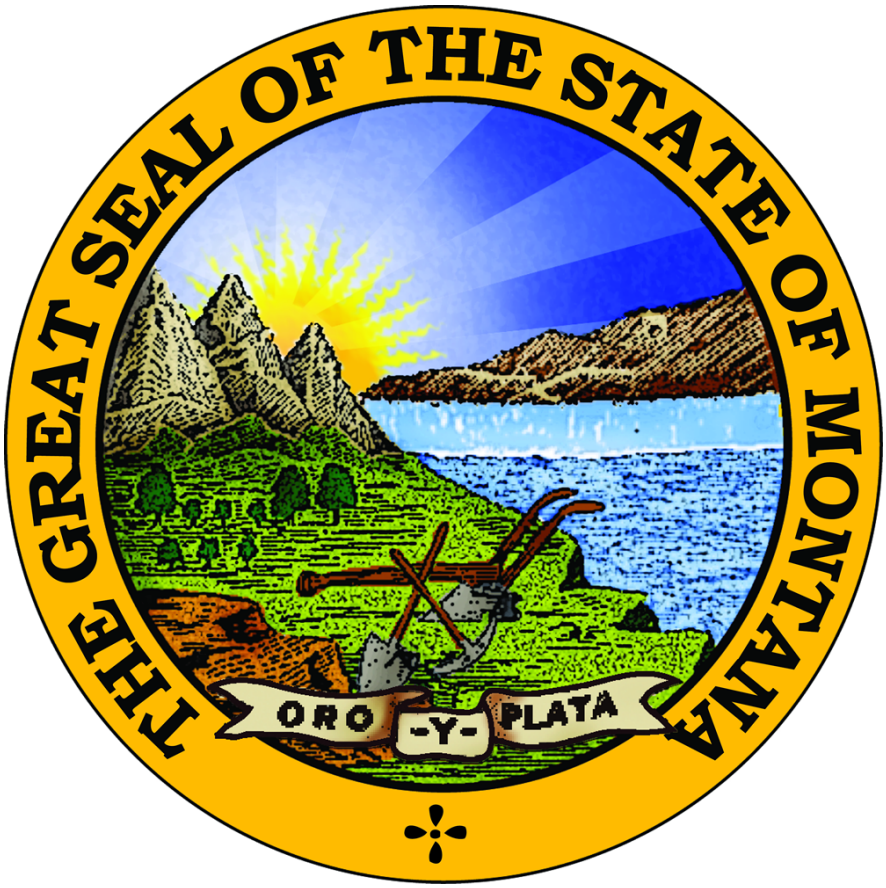
# STATE OF MONTANA

## AIR QUALITY MONITORING NETWORK PLAN

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**Montana Department of Environmental Quality**
**Air Resources Management Bureau**

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# 2010 AIR QUALITY MONITORING NETWORK PLAN

## Introduction

Since 1979, the Montana Department of Environmental Quality (DEQ) air monitoring program has been producing an annual Network Review Report. The purpose of that report was to document how DEQ was actively evaluating monitoring requirements and using resources effectively.

Federal regulatory changes in December of 2006 altered this requirement to effectively split the required elements of the Network Review Report into two separate documents: (1) the annual Monitoring Network Plan, and (2) the supplemental 5-year assessment of the air quality surveillance system beginning in 2010. This document represents DEQ's fourth Monitoring Network Plan (2010 Plan).

The objective of 2010 Plan is to accurately describe the monitoring sites in the agency network, identify their monitoring objectives, and describe any deviations in physical characteristics or operation from regulatory requirements. The 2010 Plan also describes changes DEQ anticipates making to the network in the next year. Detailed descriptions of the individual monitoring sites can be found in Appendix A, while Appendix B is a summary of all monitoring.

DEQ monitors air quality in large part by measuring concentrations of criteria air pollutants pursuant to the federal Clean Air Act. Criteria air pollutants are the most common air pollutants with known harmful human health effects, and are the pollutants for which ambient air quality standards have been set. The six criteria pollutants are: carbon monoxide (CO), sulfur dioxide ($SO_2$), lead (Pb), nitrogen dioxide ($NO_2$), ozone ($O_3$), and particulate matter (PM). PM includes particles with an aerodynamic diameter of 10 microns and less ($PM_{10}$) and particles with an aerodynamic diameter of 2.5 microns and less ($PM_{2.5}$). For each criteria air pollutant, National Ambient Air Quality Standards (NAAQS) are established to protect public health and welfare. Montana has adopted similar air quality standards called the Montana Ambient Air Quality Standards (MAAQS). Appendix C outlines the current NAAQS and MAAQS.

## Ambient Air Monitoring Requirements

The term 'ambient air' is defined in the Code of Federal Regulations (CFR) as that portion of the atmosphere, external to buildings, to which the general public has access (40 CFR 50.1).
The Environmental Protection Agency (EPA) requires each state to establish a network of ambient air monitors based upon population and air quality.

DEQ meets and exceeds its regulatory obligation for measuring air pollution throughout Montana. In Montana, there are no communities with populations large enough or air quality bad enough to require more than one monitoring site for any of the criteria air pollutants.

## Ozone ($O_3$) Requirements

The minimum number of ozone monitors required in the monitoring network is defined in Table D-2 below.

**Table D–2 of Appendix D to Part 58. Minimum $O_3$ Monitoring Requirements**

| MSA population[1,2] | Most recent 3-year design value concentrations ≥ 85% of any $O_3$ NAAQS[3] | Most recent 3-year design value concentrations < 85% of any $O_3$ NAAQS[3,4] |
|---|---|---|
| >10 million | 4 | 2 |
| 4–10 million | 3 | 1 |
| 350,000–<4 million | 2 | 1 |
| 50,000–<350,000[5] | 1 | 0 |

[1] Minimum monitoring requirements apply to the Metropolitan statistical area (MSA)
[2] Population based on latest available census figures.
[3] The ozone ($O_3$) National Ambient Air Quality Standards (NAAQS) levels and forms are defined in 40 CFR Part 50.
[4] These minimum monitoring requirements apply in the absence of a design value.
[5] Metropolitan statistical areas (MSA) must contain an urbanized area of 50,000 or more population.

Montana has three Metropolitan Statistical Areas (MSAs) with populations between 50,000 and 350,000. The design value for Billings was determined during 2005-2007 to be 0.059 ppm or 78.7 percent of the current NAAQS.

Measurements made in the Missoula MSA suggested a lower design value. For Great Falls, historical monitoring data and professional judgment support even lower ozone values. Available ozone monitoring data are well within the standard, and indicate that ozone is not currently a pollutant of concern in Montana's populated areas.

The primary ozone NAAQS is, however, being reviewed. It is anticipated that the standard will be reduced from the current 0.075 ppm to between 0.060 and 0.070 ppm. A new primary ozone NAAQS below 0.070 ppm would require monitoring in Billings and Missoula and potentially Great Falls to begin June 1, 2011. The proposed standard also includes a requirement for rural monitoring which should be satisfied by the existing monitors at Broadus (30-075-0001), Birney (30-087-0001), and the new NCore site (30-049-0004).

The proposed changes to the ozone NAAQS include changing the secondary standard to one reflecting the cumulative exposure of vegetation to ozone over the growing season. The impact of the new secondary standard can not be projected at this time. It will take years of rural monitoring to determine compliance with the standard and the adequacy of the monitoring effort itself.

## Lead (Pb) Requirements

East Helena is the site of ASARCO's now-defunct, primary lead smelter and was designated as a nonattainment area (NAA) for sulfur dioxide and lead during the smelter's operation. The ASARCO smelter ceased operations in 2003 and shortly thereafter, DEQ stopped lead monitoring when the measured levels dropped well below the lead NAAQS.

The lead regulations have changed significantly since 2003. The NAAQS has been reduced substantially, and states are now required to operate at least one lead monitor in areas with a point source of lead emissions greater than 0.50 ton per year or in areas with a population greater than 500,000.

In Montana, neither of these criteria is met and DEQ does not plan to conduct any lead monitoring in 2010. However, as part of the process of designating East Helena back into attainment for the lead NAAQS, DEQ may resume lead monitoring in 2011.

## Particulate Matter ≤ 10 Microns in Diameter ($PM_{10}$) Requirements

The minimum number of required $PM_{10}$ sites is established by Table D-4 below. None of Montana's three MSAs meets the requirement for medium concentration, so no $PM_{10}$ sites are required.

**Table D–4 of Appendix D to Part 58. $PM_{10}$ Minimum Monitoring Requirements**
**(Number of Stations per MSA)[1]**

| Population category | High concentration[2] | Medium concentration[3] | Low concentration[4,5] |
|---|---|---|---|
| >1,000,000 | 6–10 | 4–8 | 2–4 |
| 500,000–1,000,000 | 4–8 | 2–4 | 1–2 |
| 250,000–500,000 | 3–4 | 1–2 | 0–1 |
| 100,000–250,000 | 1–2 | 0–1 | 0 |

[1] Selection of urban areas and actual numbers of stations per area within the ranges shown in this table will be jointly determined by EPA and the State Agency.
[2] High concentration areas are those for which ambient $PM_{10}$ data show ambient concentrations exceeding the $PM_{10}$NAAQS by 20 percent or more.
[3] Medium concentration areas are those for which ambient $PM_{10}$ data show ambient concentrations exceeding 80 percent of the $PM_{10}$ NAAQS.
[4] Low concentration areas are those for which ambient $PM_{10}$ data show ambient concentrations less than 80 percent of the $PM_{10}$ NAAQS.
[5] These minimum monitoring requirements apply in the absence of a design value.

Montana does, however, operate monitors in seven areas designated as nonattainment under the 24-hour $PM_{10}$ standard. They are: Libby, Columbia Falls, Kalispell, Whitefish, Thompson Falls, Missoula, and Butte.

In 2006, EPA revoked the annual $PM_{10}$ standard but retained the 24-hour standard. Although DEQ is now more focused on smaller particles ($PM_{2.5}$), a network of monitors is operated in the $PM_{10}$ NAAs to demonstrate the adequacy of control plans as required by EPA.

## Particulate Matter ≤ 2.5 Microns in Diameter ($PM_{2.5}$) Requirements

Based on the requirements summarized in Table D-5 below, the number of required monitoring sites is based on the $PM_{2.5}$ design criteria and the population of the MSA. In Montana, there are only three MSA and all fall into the smallest population category. The Missoula MSA is the only one with a $PM_{2.5}$ design value greater than 85 percent of the NAAQS, thus it's the only Montana community required to have a $PM_{2.5}$ monitoring site. This requirement is met in Missoula with the operation of two $PM_{2.5}$ monitoring sites: one at the Missoula City-County Health Department (#30-063-0031) and the other at Boyd Park (#30-063-0026).

**Table D–5 of Appendix D to Part 58. $PM_{2.5}$ Minimum Monitoring Requirements**

| MSA population[1,2] | Most recent 3-year design value ≥85% of any $PM_{2.5}$NAAQS[3] | Most recent 3-year design value <85% of any $PM_{2.5}$NAAQS[3,4] |
|---|---|---|
| >1,000,000 | 3 | 2 |
| 500,000–1,000,000 | 2 | 1 |
| 50,000–<500,000[5] | 1 | 0 |

[1] Minimum monitoring requirements apply to the Metropolitan statistical area (MSA).
[2] Population based on latest available census figures.
[3] The $PM_{2.5}$National Ambient Air Quality Standards (NAAQS) levels and forms are defined in 40 CFR part 50.
[4] These minimum monitoring requirements apply in the absence of a design value.
[5] Metropolitan statistical areas (MSA) must contain an urbanized area of 50,000 or more population.

DEQ's $PM_{2.5}$ monitoring network goes well beyond the minimum requirement. DEQ and the local county air quality programs operate $PM_{2.5}$ monitors in mountain communities with winter air quality issues as well as a network of continuous monitors to provide near real-time public exposure information of particular interest during the summer wildfire season.

## Sulfur Dioxide ($SO_2$) Requirements

Unlike the federal requirements for a minimum number of $O_3$, Pb, $PM_{10}$ and $PM_{2.5}$ monitoring sites, there is currently no similar requirement for $SO_2$. Currently, $SO_2$ monitoring is conducted in the Great Falls and Billings areas due to emissions from local industries, e.g. power plants and petroleum refineries.

In the Great Falls area, there is one $SO_2$ monitoring site in the community of Black Eagle operated by the Montana Refining petroleum refinery. In the Billings/Laurel area there are six sites. One is operated by DEQ, two are operated by a power producer, and three sites are operated by a consortium of local $SO_2$-emitting industries. DEQ intends to review $SO_2$ data from all of these sites in 2010. However, only part of the data will be archived in the AQS database.

The $SO_2$ NAAQS and monitoring requirements are currently being reviewed, and it is anticipated that there will be a requirement for a minimum of one $SO_2$ monitor in the Billings area in 2013.

## Nitrogen Dioxide ($NO_2$) Requirements

The $NO_2$ NAAQS and monitoring requirements changed in January 2010. Montana does not have any population centers large enough to require $NO_2$ monitoring under the new rules. The EPA regional administrator could, however, require monitoring in any area where he/she has concerns that the $NO_2$ NAAQS may be exceeded.

DEQ currently operates three $NO_2$ monitoring sites located at Sidney (30-083-0001), Broadus (30-075-0001), and Birney (30-087-0001). All three sites are in eastern Montana and associated with the expanding oil and gas industry in that part of the state. A fourth site monitoring background concentrations will be added when the NCore site begins operation in January 2011.

## Carbon Monoxide (CO) Requirements

There is no requirement for a minimum number of carbon monoxide monitoring sites. In Montana, like most other states, CO is closely associated with motor vehicle emissions. Ambient CO concentrations increase near locations with high traffic volumes and under conditions of poor atmospheric ventilation. Currently, DEQ and local county air programs conduct CO monitoring in the communities of Missoula, Great Falls, and Billings. Monitoring for CO in Kalispell was discontinued at the end of 2009.

Due to consistently low CO concentrations and the need to re-direct limited resources to core air monitoring priorities, DEQ intends to reduce monitoring in Great Falls and Billings to only the first and fourth quarters, and eventually discontinue all CO monitoring.

## Summary of Requirements

DEQ designs its network and operates the air monitoring sites in compliance with EPA's requirements for monitoring sites (40 CFR Part 58, Appendices A,C,D and E). There are very few exceptions. Two sites do not meet all of the siting requirements of Appendix E. The Hamilton - PS#46 site (#30-081-0007) and the Columbia Falls - Ball Park site (#30-029-0007) are less than 15 meters from roadways. The Columbia Falls site also has partially obstructed air flow.

The data from $PM_{2.5}$ monitoring sites with spatial scales designated as smaller than 'neighborhood' may not be compared to the annual $PM_{2.5}$ NAAQS. Data from such sites can only be compared to the 24-hour $PM_{2.5}$ NAAQS. The only $PM_{2.5}$ site in the Montana network of this nature is the one at the west entrance to Yellowstone National Park (#30-031-0017). All other $PM_{2.5}$ monitors designated as Federal Reference Method or Equivalent generate data used for determining compliance with the annual $PM_{2.5}$ NAAQS.

If circumstances should make it necessary or desirable to relocate a violating $PM_{2.5}$ monitor, the change would be discussed among the existing local county program, Air Quality Permitting, Air Planning Section, and the Air Monitoring Section. The Air Monitoring Section would seek public comment through the annual Monitoring Network Plan and would seek EPA approval for the change. No such change would ever be made without demonstrating that a replacement site produced comparably high values unless circumstances precluded such a comparison. Montana does not have any community monitoring zones or anticipate creating one, so the impact of relocating a site on such zones is not relevant.

## Revisions to the Montana Air Quality Monitoring Network

This Monitoring Network Plan is the result of considerable discussion between the Air Monitoring Section and our data users, both within DEQ and at the county level. A review of air pollutant trends and knowledge of occurring and projected emission changes was balanced against available resources to identify five broad air monitoring priorities:

(1) Impact of oil and gas development,
(2) Particulate matter in western Montana,
(3) Requirements of changing NAAQS,
(4) Background (NCore) monitoring, and
(5) Termination of CO monitoring.

Each priority and its impact on the network are discussed in the following pages.

### <u>Eastern Montana and Oil & Gas Development</u>

The fastest and most dramatic expansion of oil and gas production in Montana has occurred in the Bakken Oil Field in the northeastern corner of the state. In 2008, DEQ responded by establishing a multi-pollutant monitoring site west of Sidney (#30-083-0001) in the middle of the oil field. Sulfur dioxide was not monitored initially, but concern for the flaring of reduced sulfur gases has lead to the proposal to add $SO_2$ monitoring to the Sidney site during 2010.

Coal bed natural gas development has been projected to sweep out of Wyoming and down the Powder and Tongue rivers. In preparation for such an occurrence, DEQ established two new multi-pollutant monitoring sites last year. These sites near Broadus and Birney will monitor for

$NO$-$NO_x$, $O_3$, $PM_{10}$, $PM_{2.5}$, and collect weather data. Since development has not yet occurred, it is possible for these monitors to establish background values, and track the effect of advancing development as it happens. DEQ is working cooperatively with the federal Bureau of Land Management to collect this baseline air pollution data to assist the agencies in evaluating the effects of coal bed natural gas development.

## Particulate Matter in Western Montana

Fine particulate is a pollutant of considerable concern in western Montana. In the mountainous part of the state much of the population resides in valley communities which are poorly ventilated. Unlike the eastern part of the state which experiences consistent surface winds, the rugged terrain of western Montana tends to deflect winds upward and allow air in the valleys to stagnate. This tendency is worsened in the winter with cold, dense air collecting in the valleys with warmer air above. The cloud layer that forms at the temperature transition zone during these inversions blocks solar input into the valley creating a stable, stagnant condition that can persist until blown out by a substantial wind. This unfortunate meteorological circumstance is exacerbated by the ready availability of cheap wood for domestic heating. Inefficient combustion of wood pumps smoke into the stagnant air mass resulting in unhealthy $PM_{2.5}$ concentrations. Chemical mass balance studies have shown that about 70 percent of the winter-time $PM_{2.5}$ in these valleys comes from wood burning.

These circumstances have resulted in the agency maintaining a substantial fine particulate monitoring network to track population exposure. The DEQ Air Monitoring Section has also created a website (http://todaysair.mt.gov) where near real-time $PM_{2.5}$ data from 13 sites is available for public information and regulatory response. A few of the sites from the eastern part of the state exist primarily to provide area wide perspective particularly for summer wildfire events, but most sites exist to monitor winter population exposure and to provide data for local burning control programs. Table 1 provides rough 24 hour design values for valley communities for the 2007-2009 period. These are not regulatory numbers. They were calculated excluding all wildfire impact and joining data from multiple monitors in a few situations. Complete data sets were not available in all cases, but the numbers are indicative of air quality in the listed communities relative to the NAAQS during the last 3 years.

**Table 1 – $PM_{2.5}$ Levels**

| Community | Design Value (2007-2009) |
|---|---|
| Columbia Falls | 26.7 |
| Whitefish | 21.0 |
| Kalispell | 18.8 |
| Belgrade | 22.9 |
| Helena | 25.3 |
| Missoula | 25.3 |
| Butte | 32.2 |
| Hamilton | 26.9 |
| Libby | 31.2 |
| Thompson Falls | 18.4 |

As outlined in the 2009 Plan, DEQ established a new $PM_{2.5}$ monitoring site in Seeley Lake last year. Results from the site (Seeley Lake Elem. Sch. - 30-063-0038) were high. Even though the old Seeley Lake-Fire Station site and the new site are only 0.50 mile apart, the measured concentrations at the new site are consistently twice as high. During the next year DEQ expects to conduct a winter saturation study to characterize $PM_{2.5}$ distribution. To gain public acceptance of any $PM_{2.5}$ control efforts, it is going to be necessary to determine what geographic area is experiencing the elevated values.

Since October of 2009, DEQ has worked with Missoula County to monitor $PM_{2.5}$ in Frenchtown. The site and equipment belong to Missoula County, but DEQ is acting as the Primary Quality Assurance Organization for the site and validating and archiving the data. While in the same valley, Frenchtown is about 10 miles from Missoula and preliminary data would indicate probably a separate air shed. Figure 1 suggests that during the winter heating season Frenchtown has $PM_{2.5}$ concentrations consistently higher than Missoula's.

DEQ has conducted a 1 year comparison of $PM_{2.5}$ data collected by the Federal Reference Method and an equivalent beta-attenuation monitor at two sites. The values were sufficiently close that the agency considers them interchangeable. An immediate objective is to reduce operating cost and manpower requirements by replacing filter based, FRM samplers with FEM continuous beta-attenuation monitors wherever possible.

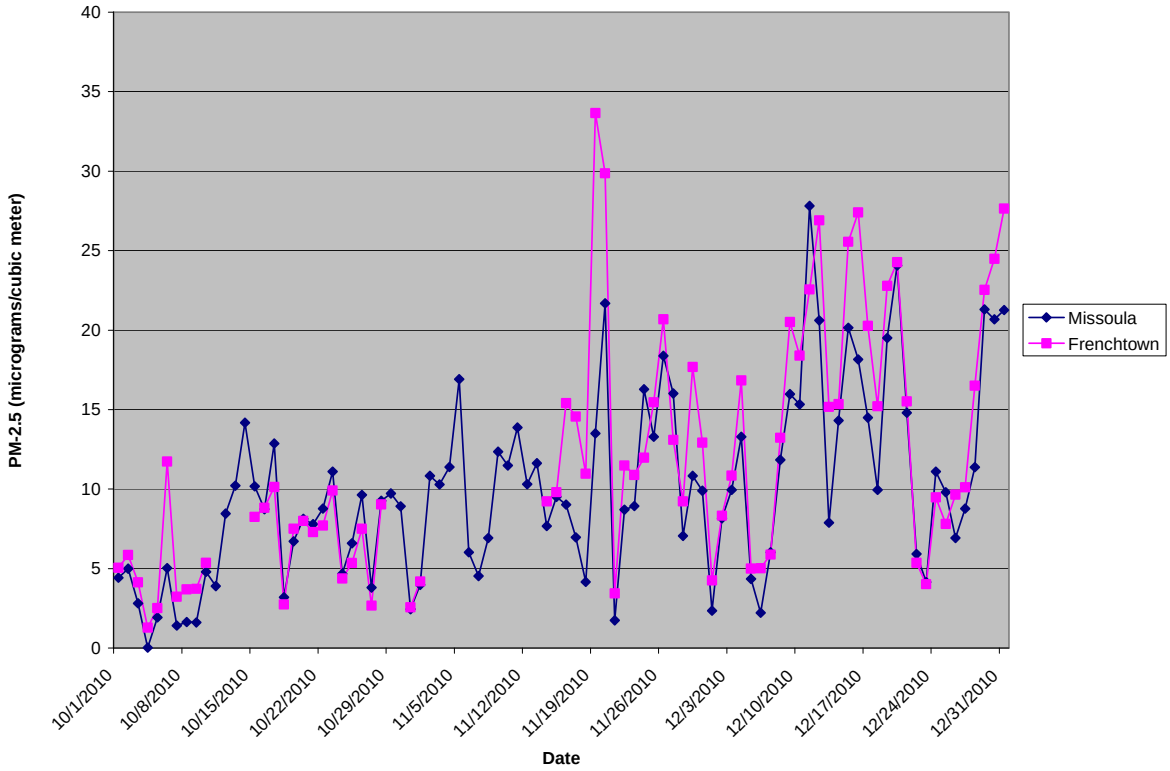



Figure 1-Missoula/Frenchtown $PM_{2.5}$ Comparison

## Requirements of Changing NAAQS

The EPA has been very actively reviewing air quality standards in the last year. Many of the reviews are incomplete at this time and the ultimate impact on monitoring activities is speculative.

The recently completed $NO_2$ NAAQS created no new monitoring requirements on DEQ.

The new ozone monitoring rule created a requirement for rural monitoring that will be satisfied by the sites at Sidney, Broadus, Birney, and the new NCore site. The reconsideration of the ozone NAAQS may require at least 3 years of monitoring in Missoula and Great Falls. Setting the standard at any value below 0.070 ppm will require long term monitoring in the Billings area. DEQ has begun ozone monitoring in Missoula in May of 2010. If known design values in Billings and Missoula are low enough relative to the new NAAQS, DEQ will request a waiver for the requirement to monitor in Great Falls where strong summer winds assure an even lower design value.

The $SO_2$ standard and monitoring rule proposed in December 2009 does require a minimum of one monitor in the Billings area that is satisfied by the Coburn Road site (30-111-0066).

## Regional Background Monitoring Site (NCore)

The development of a national core network of monitoring sites (NCore) grew out of the EPA's National Ambient Air Monitoring Strategy which reached final draft status in 2004 after years of preparation. NCore created a backbone monitoring network of about 75 multi-parameter trends monitoring sites. Approximately 55 of the sites are intended to be urban and the remaining 20 sites will be rural. Montana is required to have one NCore site in operation January 1, 2011.

With Montana's limited population distributed over a huge area, each community becomes an isolated airshed, and measurements made in any given community are relevant to only that one population. Given that the NCore site in any city would represent the air quality of a very limited number of people, a rural site representing background air quality for a broad geographical area was considered the best siting strategy.

Practical considerations restricted the possible sites. It is important that the site be close enough to Helena to be serviced economically, have good year-around access, available power, and telephone service. The site selected is on state land north of Helena on Sieben's Flat. The site is expected to monitor about 10 parameters as well as surface meteorology. Details appear in other sections of this 2010 Plan. DEQ will be constructing the site, assembling the equipment, and beginning operation as the January 2011 deadline approaches.

## Termination of Carbon Monoxide Monitoring

As previously explained, DEQ's highest air monitoring priorities are to continue energy related monitoring, to maintain or expand PM and $O_3$ monitoring, and to install the NCore background monitoring site. For DEQ to implement and maintain these air monitoring priorities in the next year, DEQ had to re-assess all monitoring activities to identify resources that could be freed-up to implement these highest air monitoring goals.

Air monitoring for gaseous air pollutants requires significant resources to operate, maintain and audit the monitors, and process the data. DEQ currently monitors CO in three communities: Missoula, Great Falls, and Billings which return data of questionable value. All of these communities were nonattainment for CO in the past, but the NAAQS was attained over a decade ago. The values presented in Table 2 clearly indicate that all three communities are in compliance with the CO NAAQS with more than an adequate margin of safety, and the CO values are either stable or declining. Continued monitoring under these circumstances is a resource drain, and DEQ is working toward eliminating these monitors. Until such time as a satisfactory agreement can be reached with EPA to discontinue monitoring, it is DEQ's intent to operate these CO monitors only during the winter calendar quarters when measured values are highest.

**Table 2 – Carbon Monoxide Values (2001-2009)**

| Year | | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| NAAQS* | 1 hr. | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| | 8 hr. | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| | | | | | | | | | | |
| Great Falls | 2nd Max 1 hr. | 7.2 | 5.5 | 4.6 | 5.7 | 3.7 | 2.8 | 2.9 | 3.0 | 2.9 |
| | 2nd Max 8 hr. | 3.6 | 2.8 | 2.7 | 2.4 | 2.0 | 1.7 | 1.5 | 1.5 | 1.6 |
| | | | | | | | | | | |
| Billings | 2nd Max 1 hr. | 5.5 | 5.4 | 5.7 | 4.5 | 5.6 | 4.9 | 4.0 | 3.7 | 4.3 |
| | 2nd Max 8 hr. | 3.8 | 3.2 | 3.9 | 2.9 | 3.5 | 2.0 | 2.2 | 2.0 | 1.8 |
| | | | | | | | | | | |
| Missoula | 2nd Max 1 hr. | 6.6 | 5.2 | 4.4 | 3.6 | 4.3 | 3.0 | 4.3 | 3.4 | 3.1 |
| | 2nd Max 8 hr. | 3.9 | 3.6 | 3.6 | 2.9 | 3.6 | 2.4 | 2.4 | 2.7 | 2.5 |

*Not to be exceeded more than once per year.

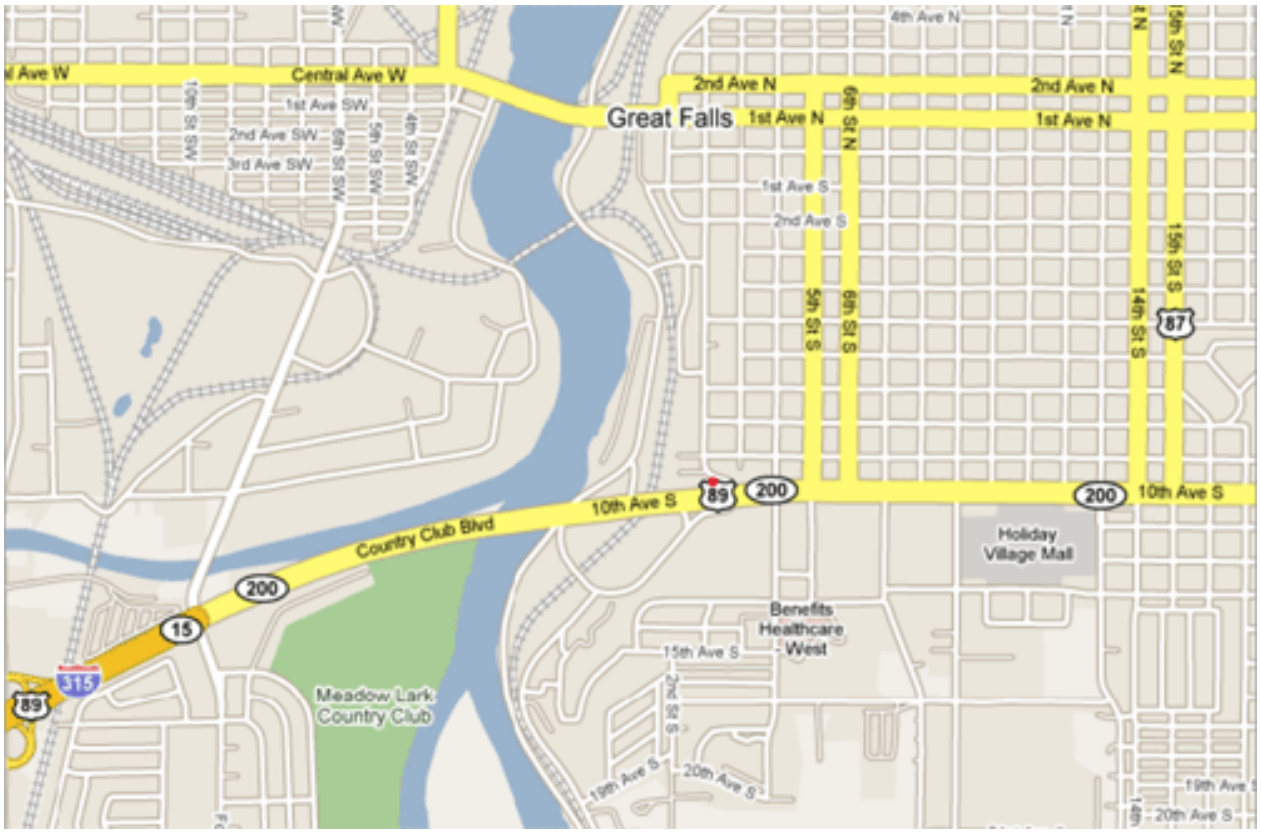
## Summary

The monitoring network revisions as proposed above are intended to occur in 2010. No revisions to the monitoring network will occur without prior discussion and approval from EPA Region 8 through, in part, a formal Network Modification Request.

# APPENDIX A
# MONITORING SITE DESCRIPTIONS

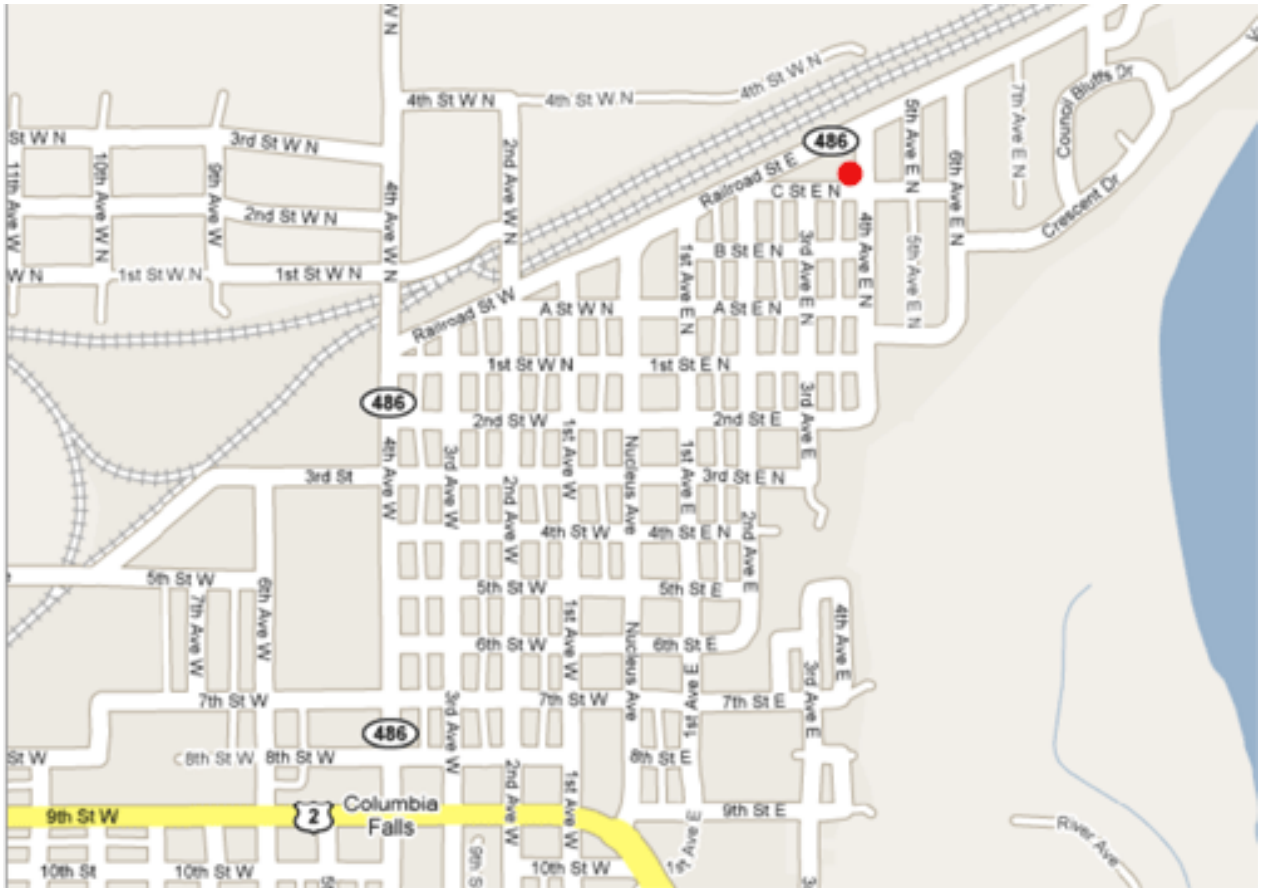
| | | | |
|---|---|---|---|
| Great Falls-Overlook Park | | 10th Ave. S. and 2nd St. E. | |
| ID# 30-013-0001 | Lat: 47.49417 | Long: -111.30278 | Elevation: 3,350 ft<br>1,021 m |
| MSA: Great Falls/24500 | | | |

This site was established in 2001 to monitor carbon monoxide continuously. The monitoring objective of this microscale site is to track compliance with the NAAQS for the "Limited Maintenance Plan" in the 10th Avenue CO nonattainment corridor. A continuous $PM_{2.5}$ monitor was added to the site during the spring of 2008 to provide near, real-time particulate data for use on the Todays Air website.



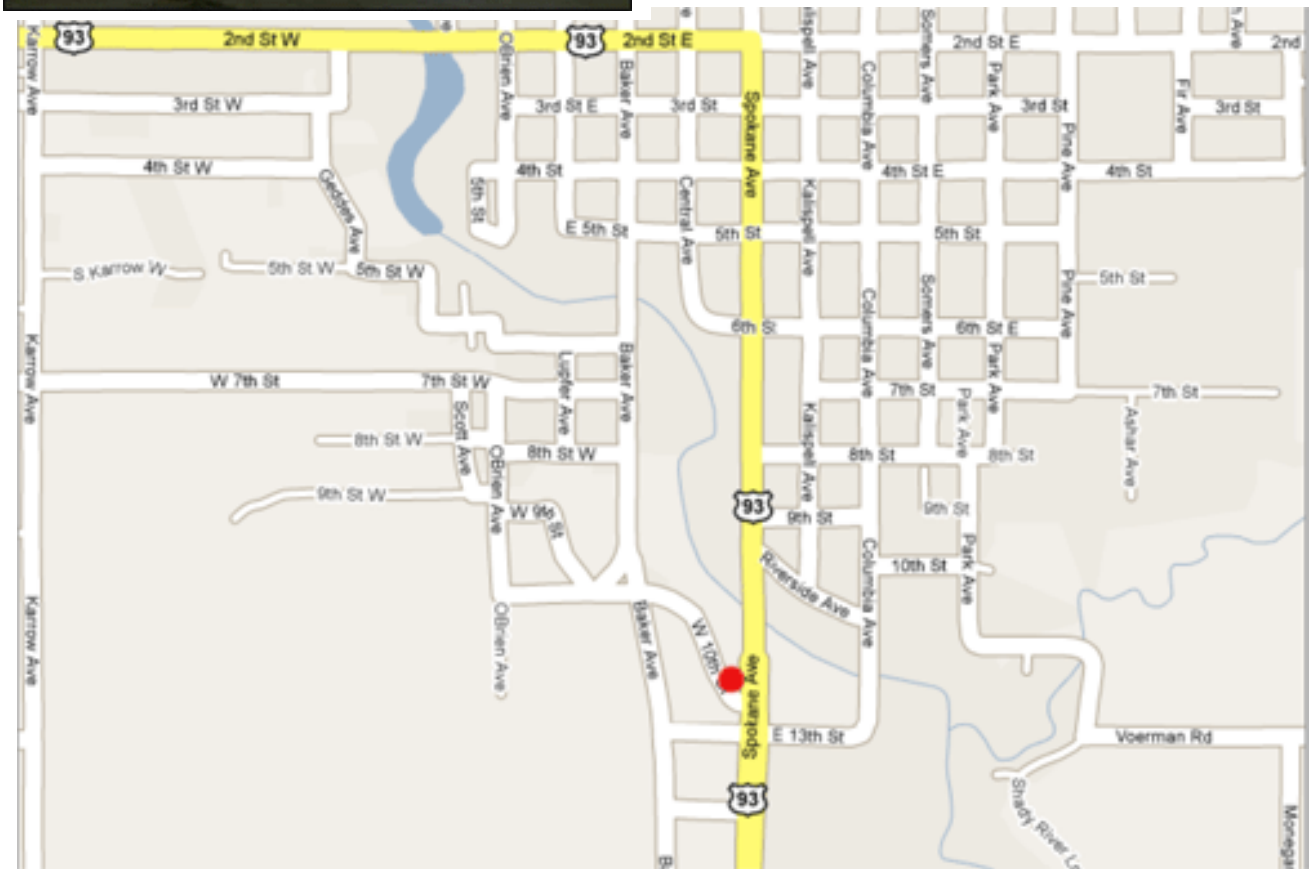
| | | | |
|---|---|---|---|
| Columbia Falls-Ball Park | | C St. and 4th Ave. E N | |
| ID# 30-029-0007 | Lat: 48.38111 | Long: -114.17472 | Elevation: 3,100 ft<br>945 m |
| MSA: | | | |

This co-located $PM_{10}$ site began in 2006 and exists to demonstrate continued compliance with the NAAQS in the Columbia Falls $PM_{10}$ nonattainment area. $PM_{2.5}$ monitoring was added in 2008. The site is neighborhood scale and it's located in the corner of a park between an industrial area to the North and a residential neighborhood to the South. A tree partially obstructs airflow about 90 degrees to the East. The monitors are closer than desirable to the adjacent streets which are paved and have very low traffic volumes.



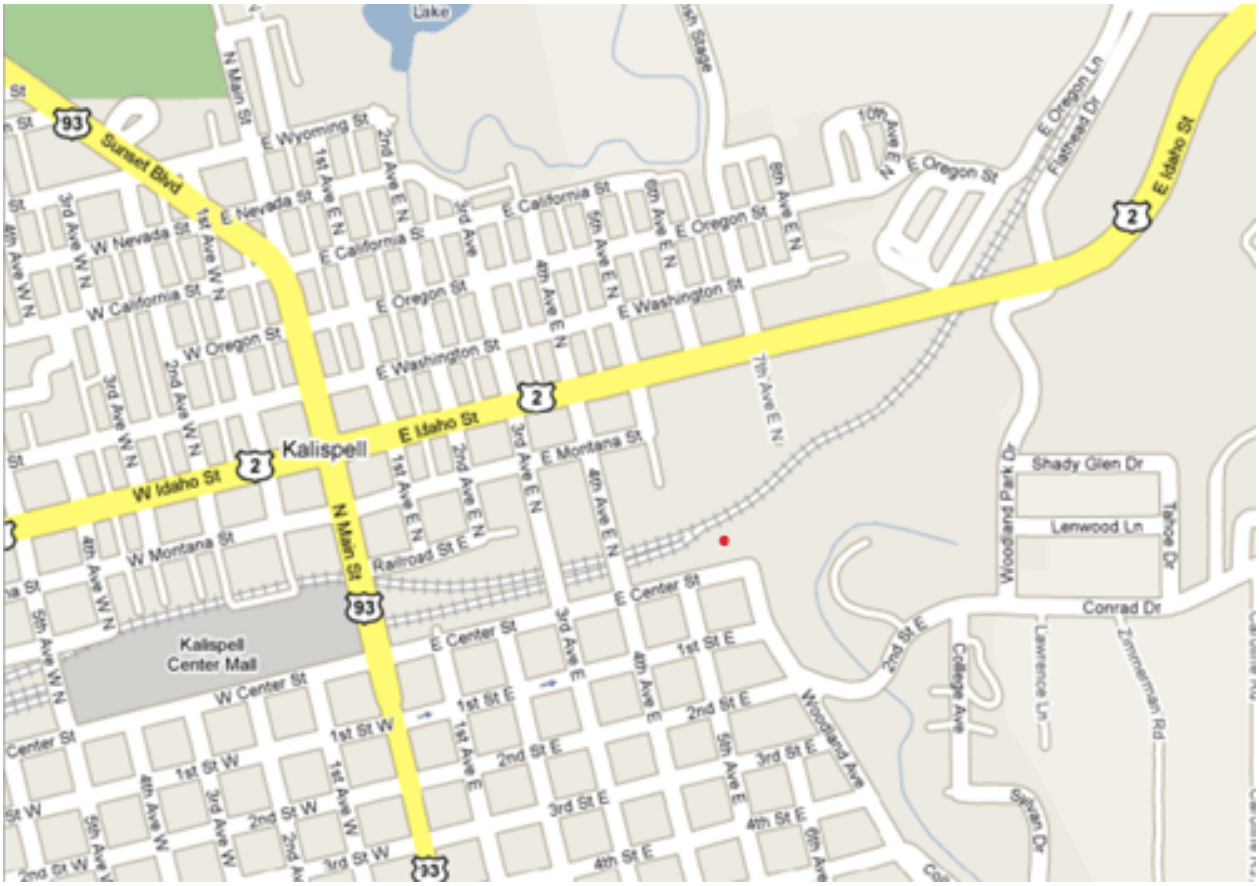
| | | | |
|---|---|---|---|
| Whitefish – Dead End | | End of 10th St. | |
| ID# 30-029-0009 | Lat: 48.39972 | Long: -114.33361 | Elevation: 3,019 ft<br>920 m |
| MSA: | | | |

Both $PM_{10}$ and $PM_{2.5}$ are monitored at this site which is located at the end of 10th Street near the point where US 93 crosses the Whitefish River. The site is neighborhood scale and was installed to provide continuing $PM_{10}$ monitoring for the local nonattainment area. It also provides $PM_{2.5}$ data for the local wood burning control program and to assess population exposure.



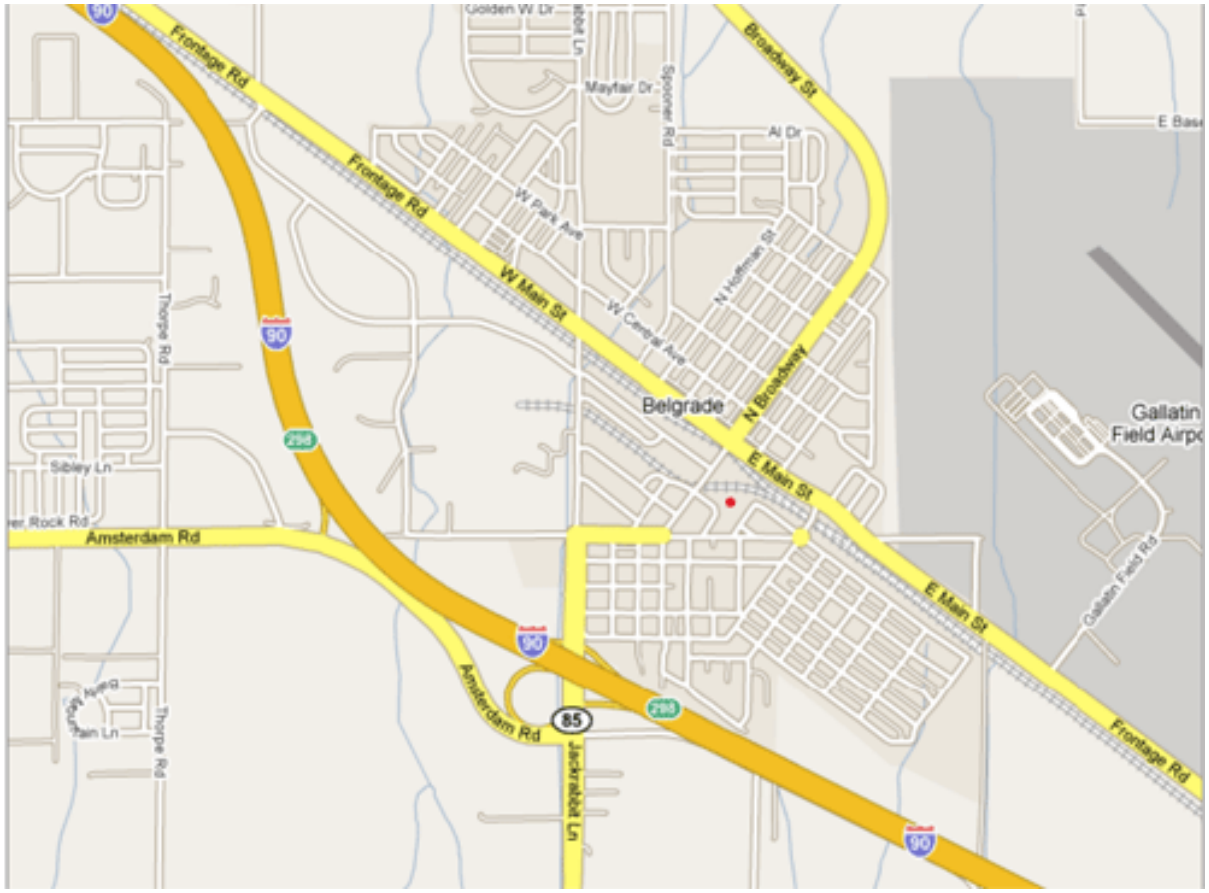
| | | | |
|---|---|---|---|
| Kalispell – Flathead Electric | | Center St. and Woodland Ave. | |
| ID# 30-029-0047 | Lat: 48.2025 | Long: -114.30556 | Elevation: 2,920 ft<br>890 m |
| MSA: | | | |

This site was installed in 1999 to consolidate particulate monitoring in the Kalispell area. The site is neighborhood scale and collects $PM_{10}$ and $PM_{2.5}$ data for population exposure information. It also provides continuous $PM_{2.5}$ data for Flathead County's wood burning control program and demonstrates NAAQS compliance for the Kalispell $PM_{10}$ nonattainment area.



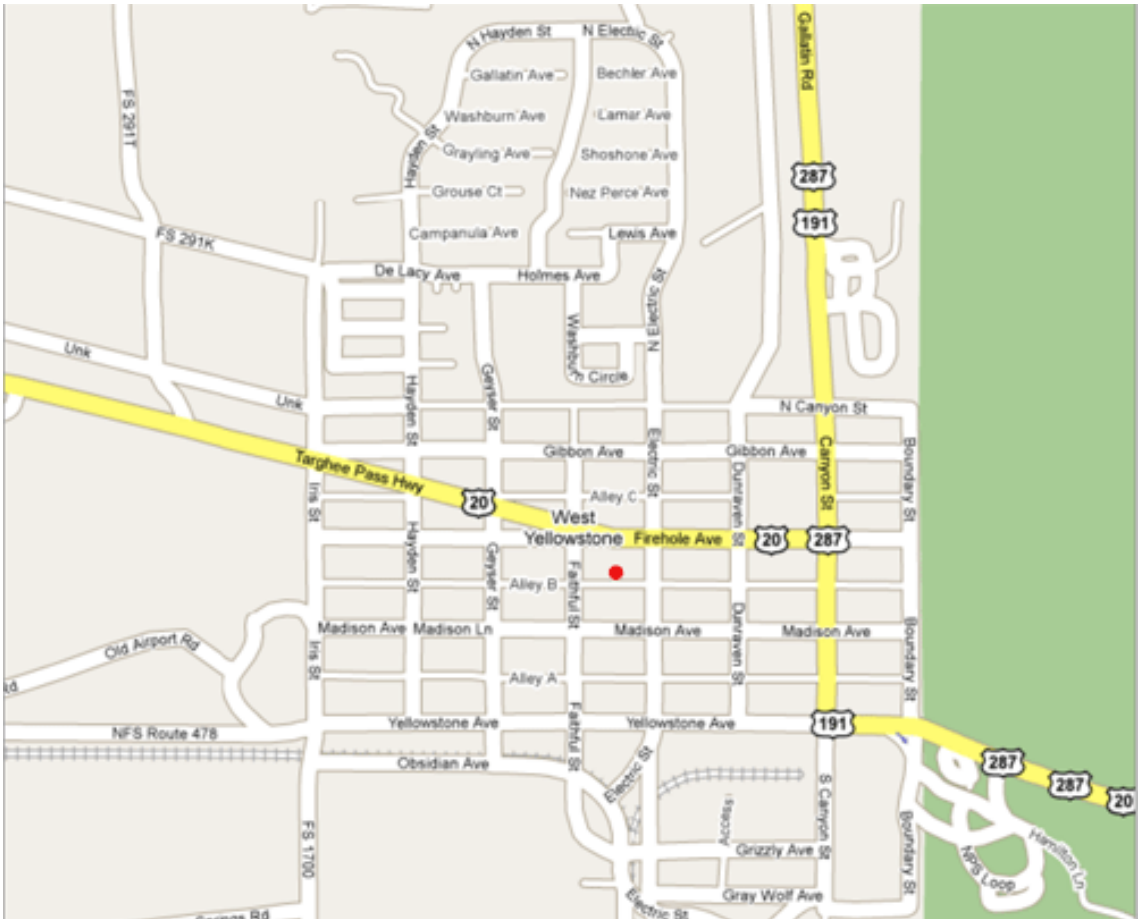
| | | | |
|---|---|---|---|
| Belgrade - ConAgra | | 100 S. Broadway | |
| ID# 30-031-0008 | Lat: 45.77372 | Long: -111.17758 | Elevation: 4,498 ft<br>1,371 m |
| MSA: | | | |

This $PM_{2.5}$ site is located close to the center of the community. It is neighborhood scale and provides $PM_{2.5}$ data for population exposure information. This site has historically measured the highest $PM_{10}$ and $PM_{2.5}$ concentrations in the Gallatin Valley.



| West Yellowstone – City Center | | | |
|---|---|---|---|
| ID# 30-031-0016 | Lat: 44.6617 | Long: -111.1049 | Elevation: 6,683 ft<br>2,037 m |
| MSA: | | | |

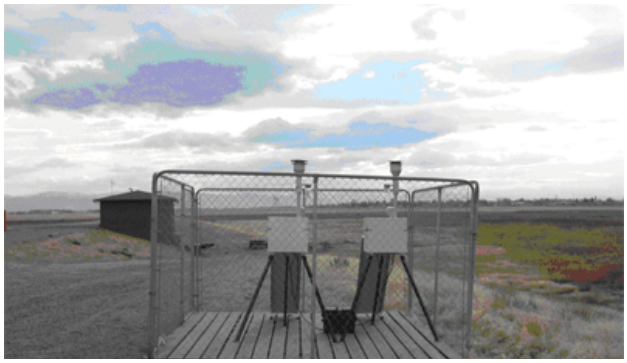
This site was established in 2007 to monitor community wide exposure to CO and $PM_{2.5}$. It is located in the center of town and is neighborhood scale. Like the site at the west entrance to Yellowstone National Park, this site is funded by the National Park Service. However, the site is operated to comply with EPA requirements.



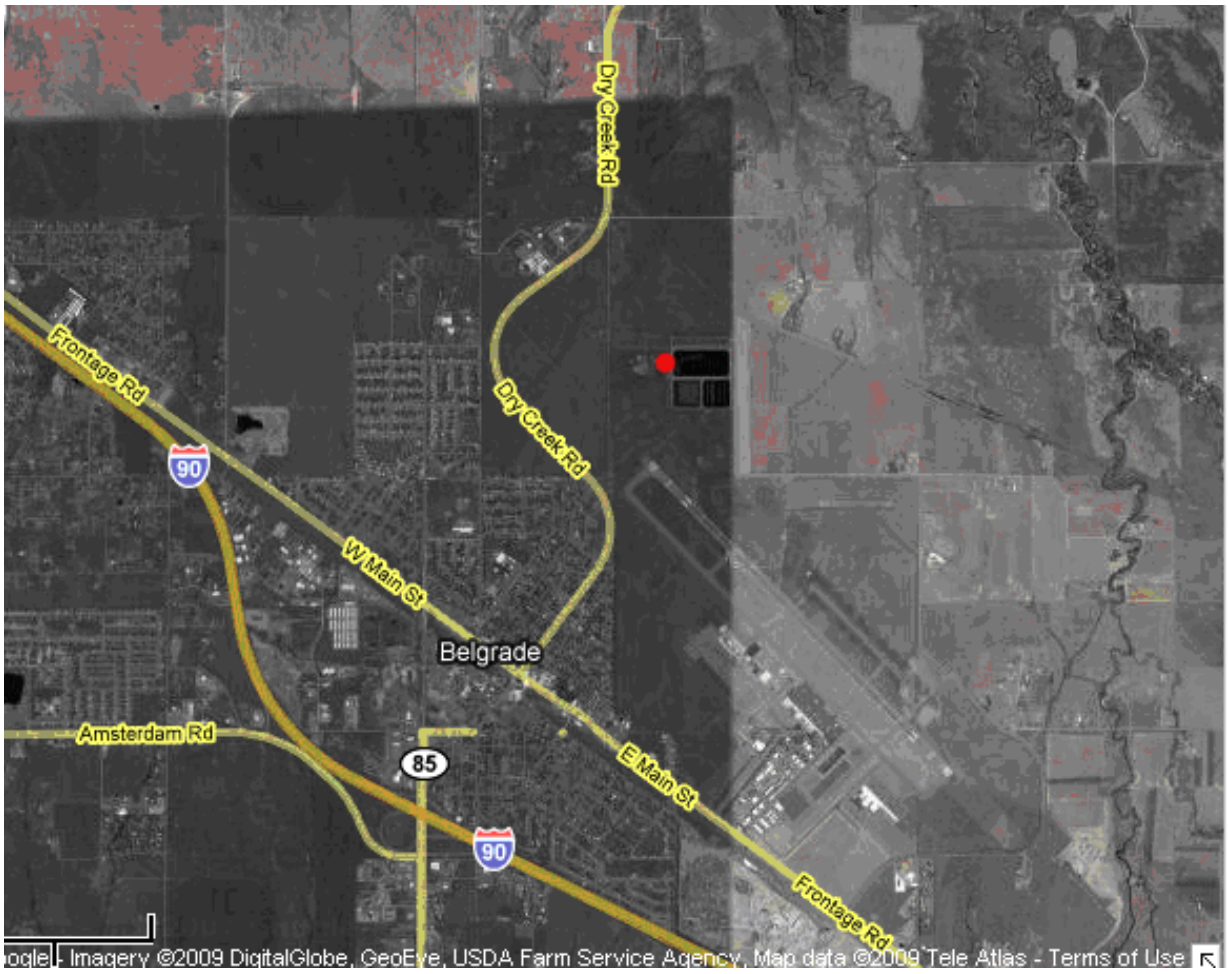
| West Yellowstone – Park Entrance #2 | | West Entrance to National Park | |
|---|---|---|---|
| ID# 30-031-0017 | Lat: 44.65703 | Long: -111.08958 | Elevation: 6,660 ft<br>2,030 m |
| MSA: | | | |

This microscale site monitors CO and $PM_{2.5}$. It was established in 1998 to measure CO at the west entrance to Yellowstone National Park (YNP). The site was moved about ¼ mile further into YNP during the spring of 2008. Continuous $PM_{2.5}$ monitoring was added in 2003. The site is very close to the roadway and is surrounded by tall trees. Air flow at monitoring height is up and down the roadway. Results are relevant only to the immediate vicinity. This site is funded by the National Park Service. However, the site is operated to comply with EPA requirements.

| | | | |
|---|---|---|---|
| Belgrade - Wastewater Lagoon | | Lagoon Road | |
| ID# 30-031-0018 | Lat: 47.79367 | Long: -111.16489 | Elevation: 4,436 ft<br>1,352 m |
| MSA: | | | |

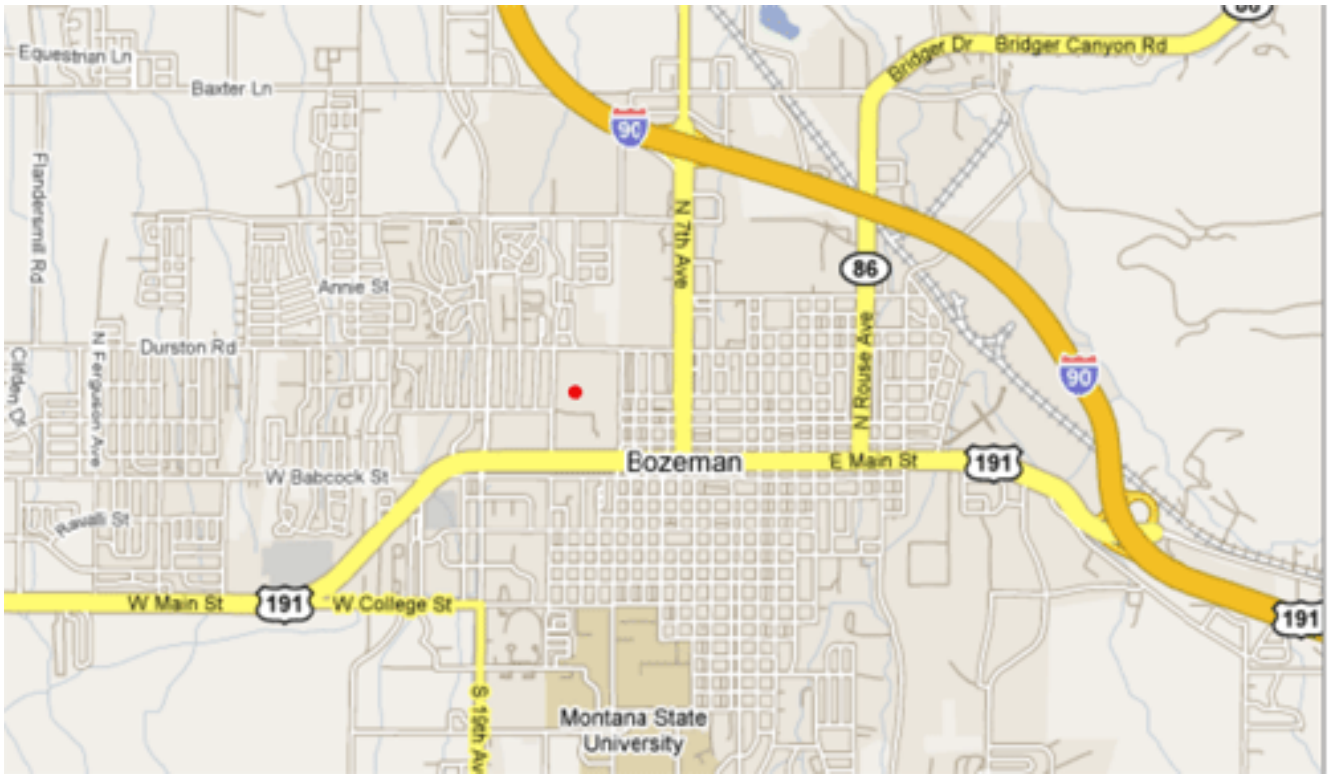


This site was established in 2008 and it measures $PM_{2.5}$ every third day on a neighborhood scale. The $PM_{2.5}$ data from this site is being compared with the $PM_{2.5}$ data from the Belgrade - ConAgra site. Since this is a trial site, line electric power was not installed and the samplers are powered by solar cells.

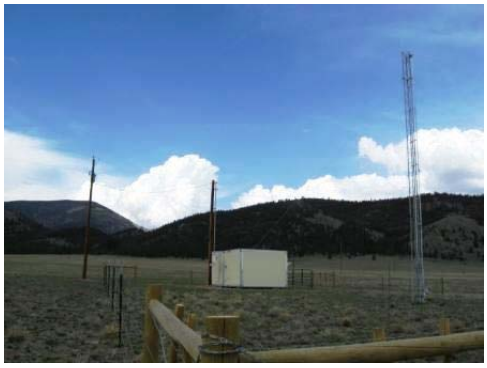


| | | | |
|---|---|---|---|
| Bozeman – High School | | N. 15th Ave. | |
| ID# 30-031-0019 | Lat: 45.68379 | Long: -111.05634 | Elevation: 4,817 ft<br>1,468 m |
| MSA: | | | |

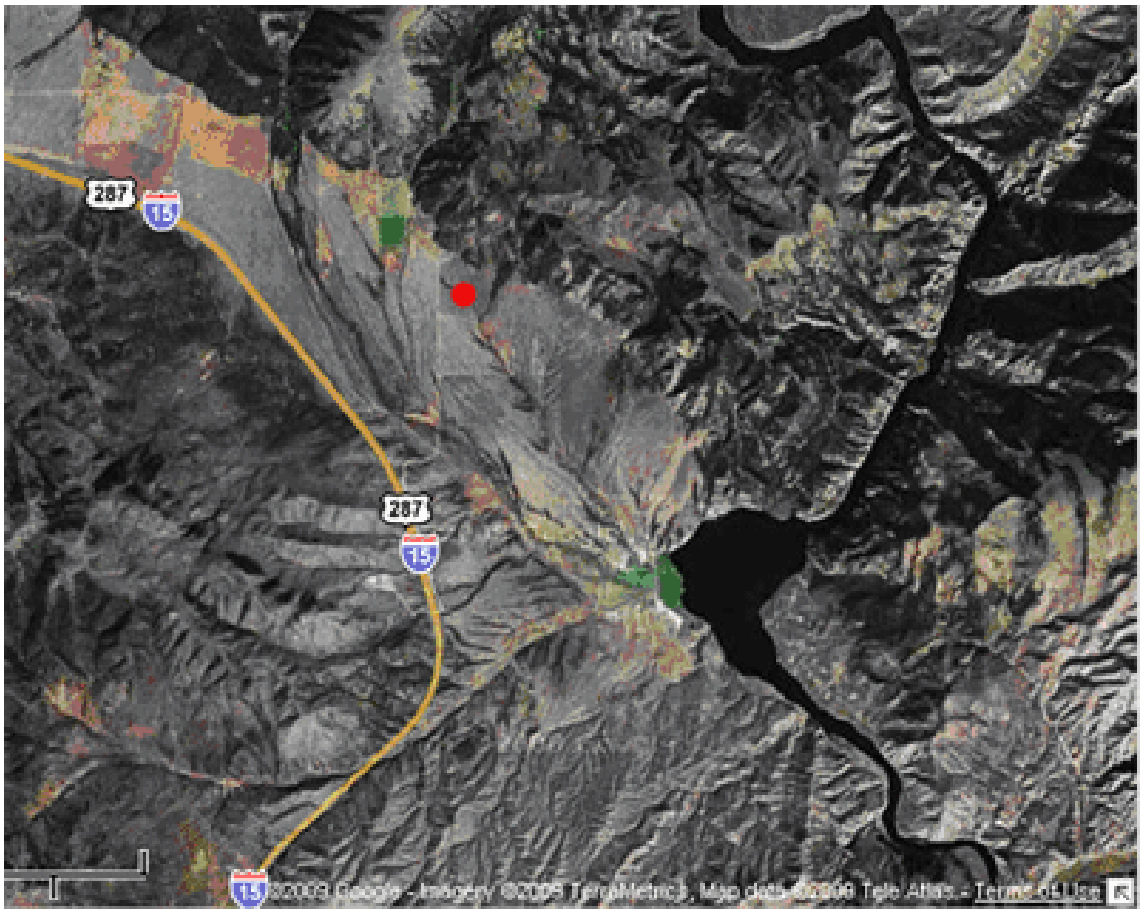
This neighborhood scale monitoring site was installed in January of 2009. The site continuously monitors $PM_{2.5}$ to provide data for population exposure assessment in the Bozeman area, and it also provides real-time data for DEQ's Today's Air website. This site replaced the Bozeman Wastewater Treatment Plant $PM_{2.5}$ site which was lost in the fall of 2008 due to construction activities for expansion of the plant.



| | | | |
|---|---|---|---|
| NCore | | Sieben Flats | |
| ID# 30-049-0004 | Lat: 46.85049 | Long: -111.98727 | Elevation: 3,918 ft<br>1,194 m |
| MSA: | | | |

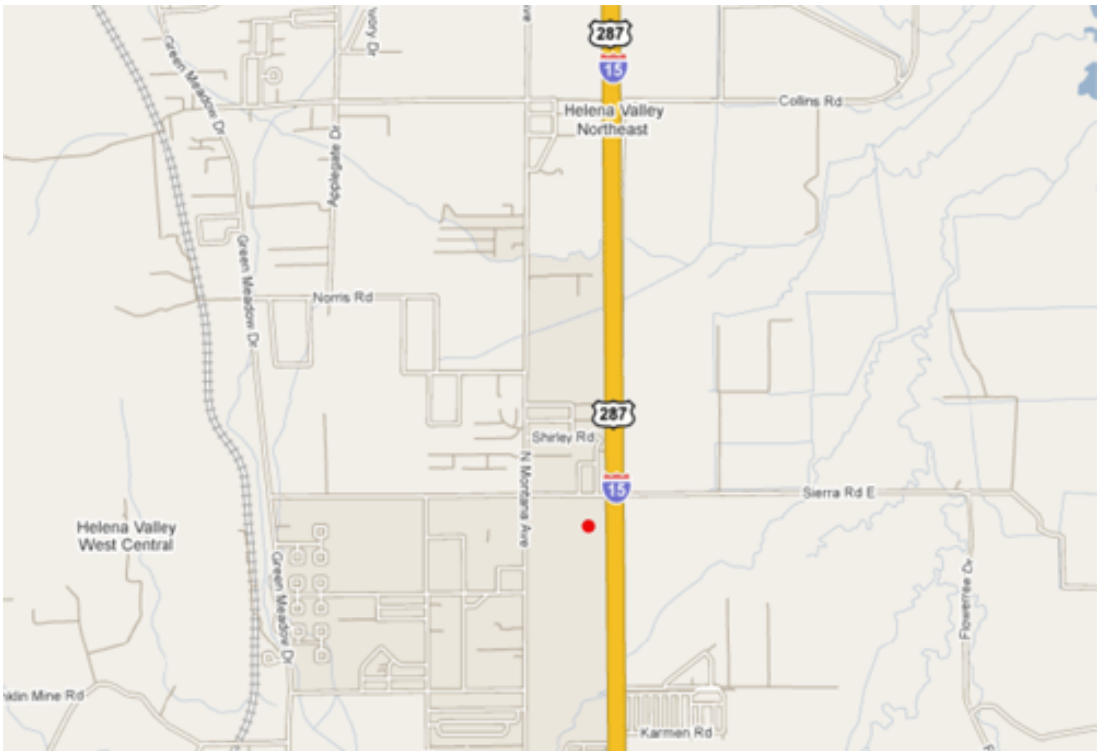


This new monitoring site is currently under construction. The site will monitor background air quality on a regional scale as part of a national air monitoring trends network. EPA requires the site to be fully operational by January 1, 2011.

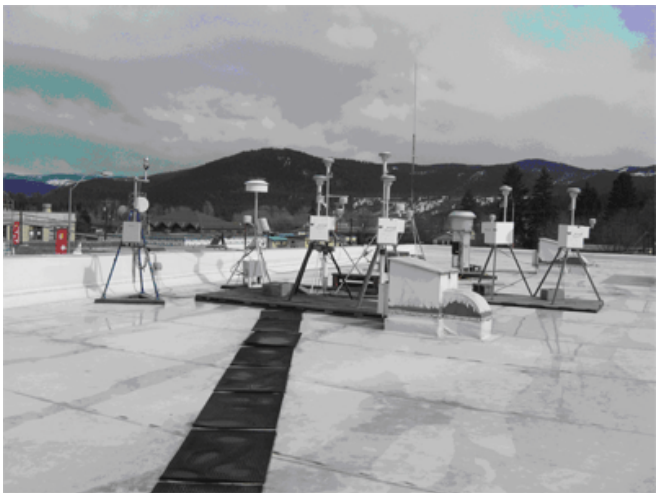


| | | | |
|---|---|---|---|
| Helena – Rossiter Pump House | | 1497 Sierra Rd. East | |
| ID# 30-049-0026 | Lat: 46.6588 | Long: -112.0131 | Elevation: 3,737 ft<br>1,139 m |
| MSA: | | | |

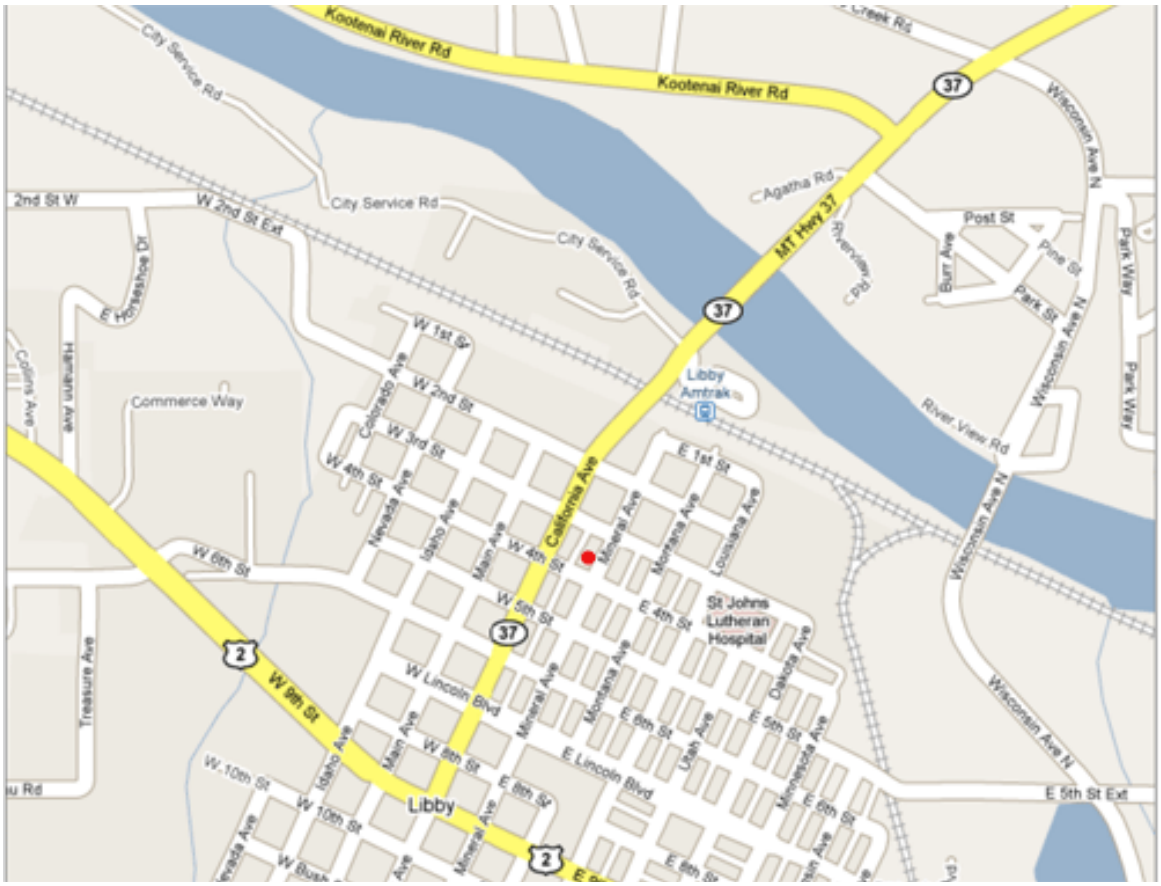
This neighborhood scale site is located in the middle of a field at the Rossiter School in the Helena Valley. The site monitored $PM_{10}$ for many years but in January 2007 sampling switched over to $PM_{2.5}$. In 2009 the $PM_{2.5}$ monitoring was converted to continuous monitoring. This site collects real time data to assess population exposure and to track air pollution changes in the Helena Valley.



| | | | |
|---|---|---|---|
| Libby – Courthouse Annex | | 418 Mineral Ave. | |
| ID# 30-053-0018 | Lat: 48.38416 | Long: -115.54805 | Elevation: 2,080 ft<br>634 m |
| MSA: | | | |

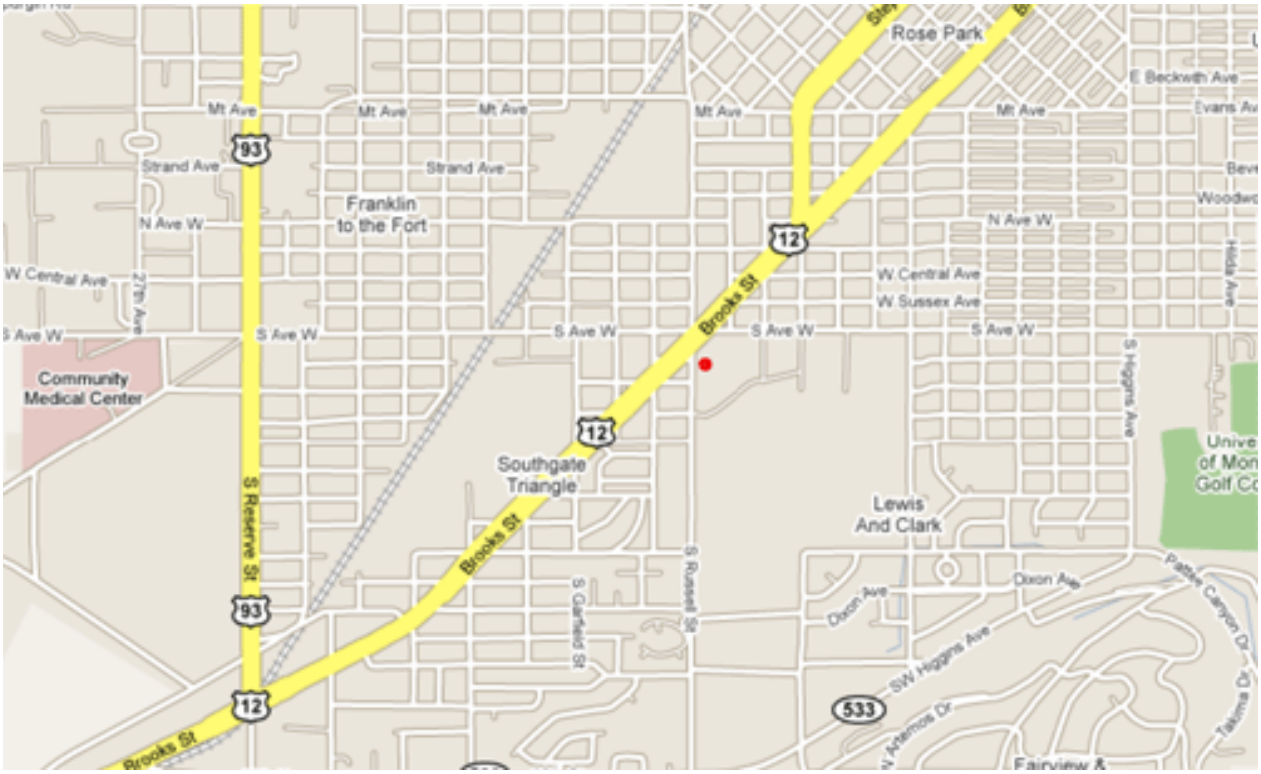


This site on the roof of the Courthouse Annex near the center of Libby has collected particulate data on a neighborhood scale basis since 1987. The site currently monitors $PM_{10}$ and $PM_{2.5}$ for population exposure and NAAQS compliance for the $PM_{10}$ and $PM_{2.5}$ nonattainment areas. $PM_{2.5}$ data is also continuously monitored for the local wood burning control program and to provide data for the Today's Air website.



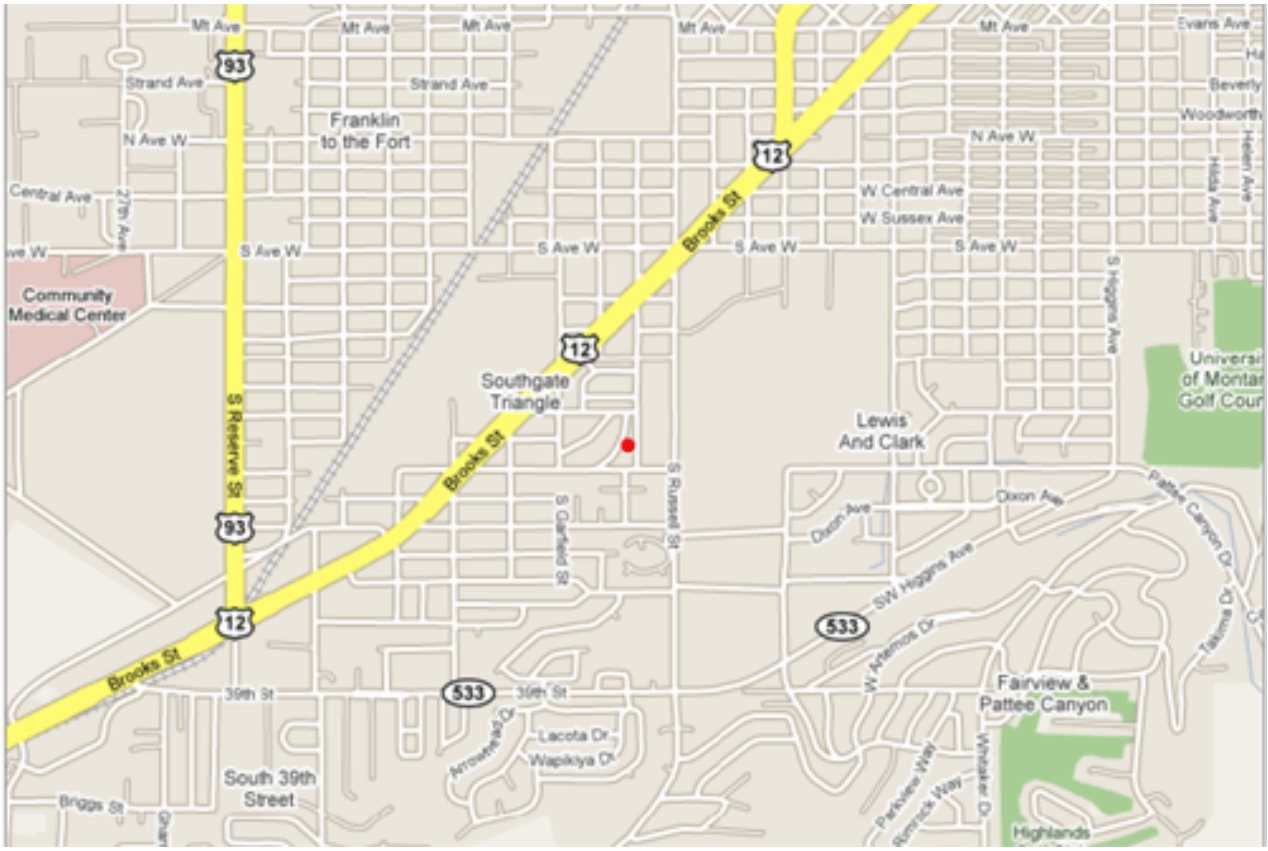
| | | | |
|---|---|---|---|
| Missoula – Malfunction Junction | | Fairgrounds | |
| ID# 30-063-0005 | Lat: 46.84889 | Long: -114.01611 | Elevation: 3,179 ft<br>969 m |
| MSA: Missoula/33540 | | | |

This long-term microscale site collects CO data to verify continued NAAQS compliance in the Missoula CO nonattainment area. The monitor is only operated during the winter months when the historic CO violations were originally measured due to frequent temperature inversions.



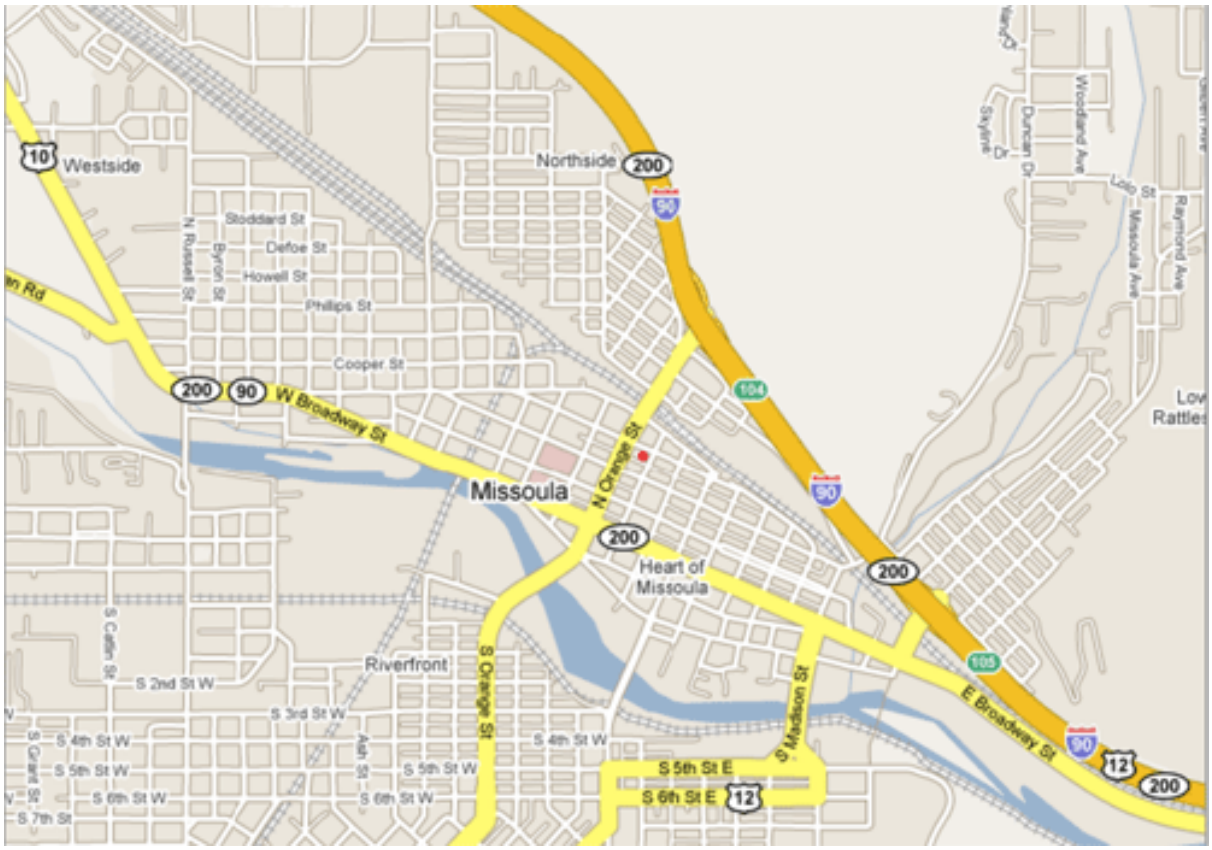
| | | | |
|---|---|---|---|
| Missoula – Boyd Park | | 3131 Washburn Rd. | |
| ID# 30-063-0024 | Lat: 46.84222 | Long: -114.01972 | Elevation: 3,179 ft<br>969 m |
| MSA: Missoula/33540 | | | |

Monitors at this site have collected particulate data on a neighborhood scale basis since 1981. $PM_{2.5}$ and $PM_{10}$ are currently monitored continuously to demonstrate NAAQS compliance in the Missoula $PM_{10}$ nonattainment area and to provide data for population exposure assessment. $PM_{2.5}$ data is also collected continuously for the Today's Air website and for the local wood burning control program.



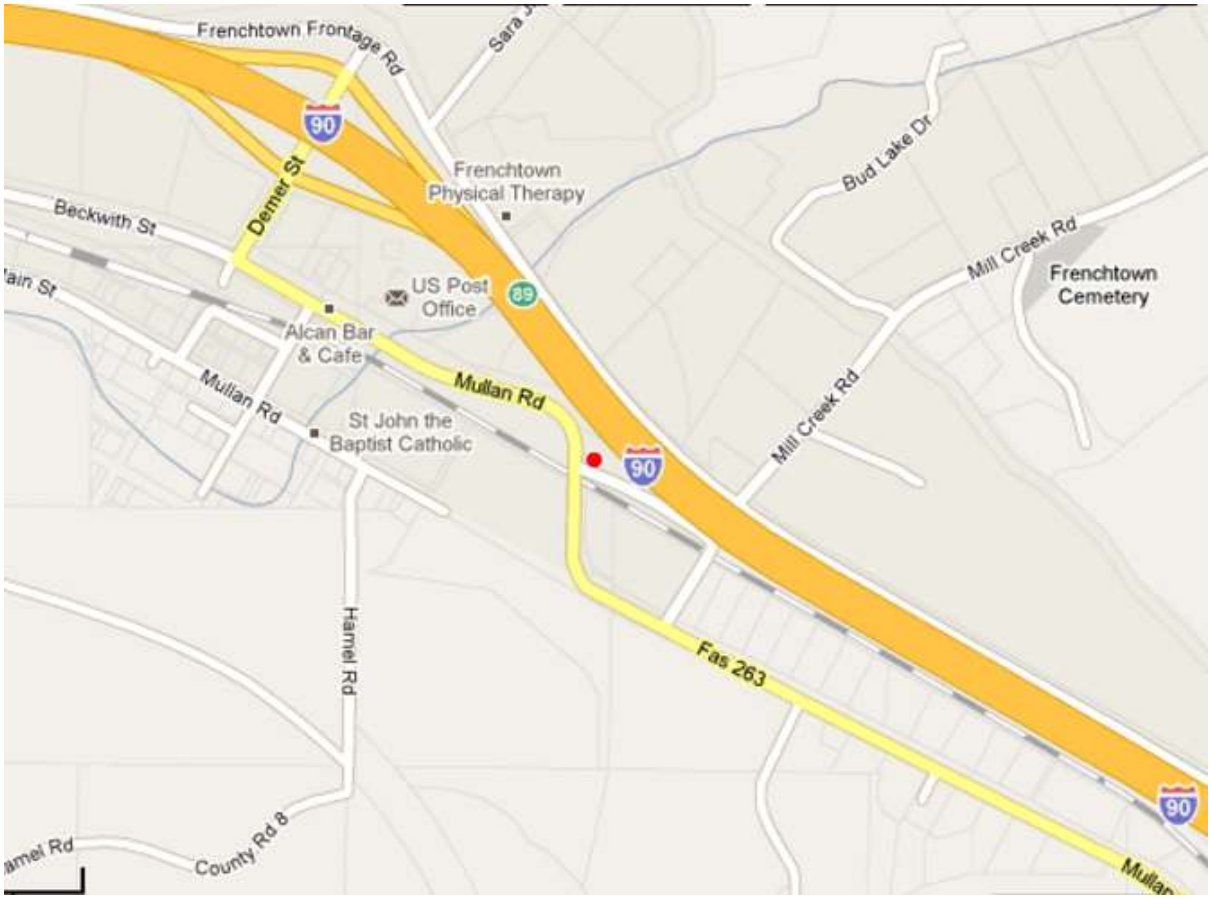
| | | | |
|---|---|---|---|
| Missoula – Health Department | | 301 West Alder | |
| ID# 30-063-0031 | Lat: 46.87491 | Long: -113.99525 | Elevation: 3,199 ft<br>975 m |
| MSA: Missoula/33540 | | | |

This neighborhood scale site is located on the roof of the Missoula City-County Health Department and particulate data has been collected since 1985. The $PM_{2.5}$ data collected at this time is used for population exposure assessment and NAAQS compliance purposes.



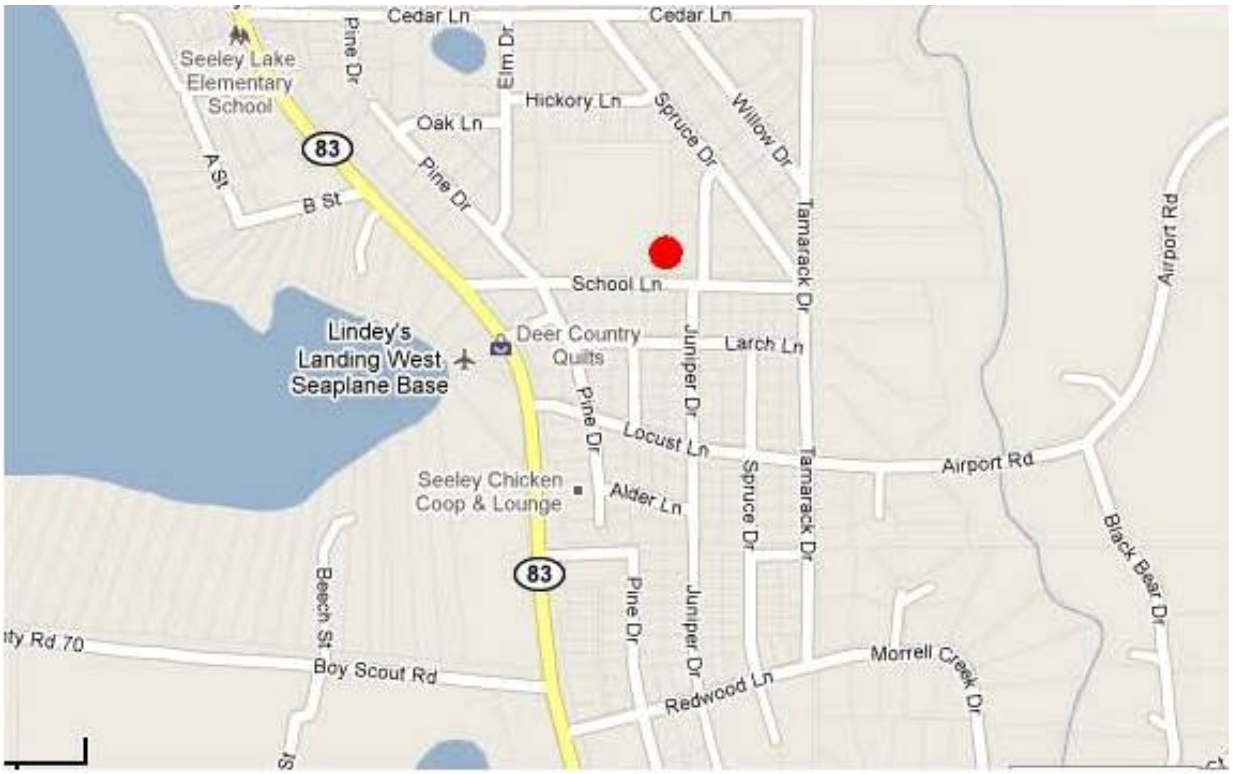
| | | | |
|---|---|---|---|
| Frenchtown-Beckwith | | | |
| ID# 30-063-0037 | Lat: 47.01290 | Long: -114.22427 | Elevation: 3,061 ft<br>933 m |
| MSA: Missoula/33540 | | | |

This site has monitored $PM_{2.5}$ continuously since November 2009. It is a neighborhood scale site, and is located near the Frenchtown interchange on I-90. The site was created to determine whether air quality differed in Frenchtown and Missoula.



| | | | |
|---|---|---|---|
| Seeley Lake-Elementary School | | School Lane | |
| ID# 30-063-0038 | Lat: 47.17564 | Long: -113.47623 | Elevation: 4,065 ft<br>1,239 m |
| MSA: Missoula/33540 | | | |

This site was established late in 2009 to provide continuous $PM_{2.5}$ data to the Today's Air website.

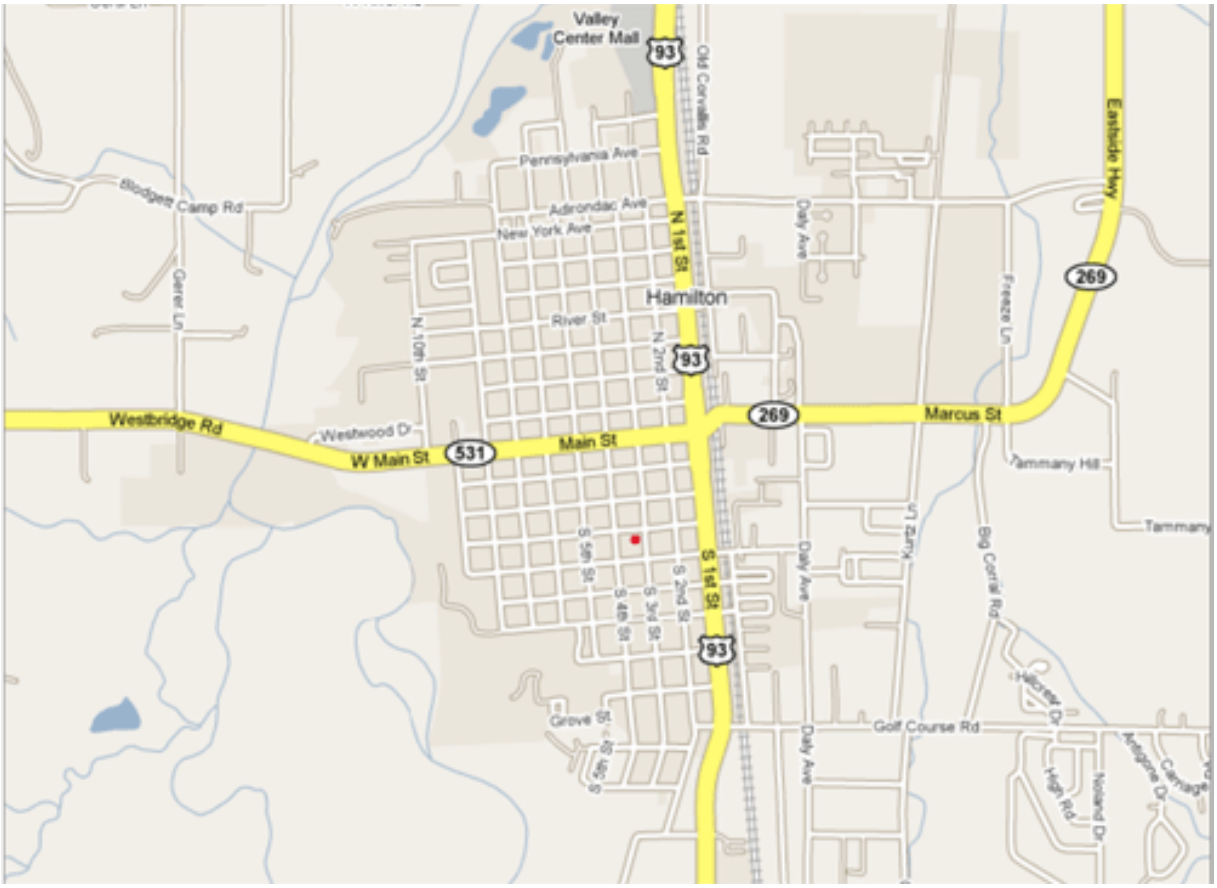


| | | | |
|---|---|---|---|
| Broadus – Powder River | | 2 miles east of Broadus | |
| ID# 30-075-0001 | Lat: 45.44007 | Long: -105.37024 | Elevation: 3,097 ft<br>944 m |
| MSA: | | | |

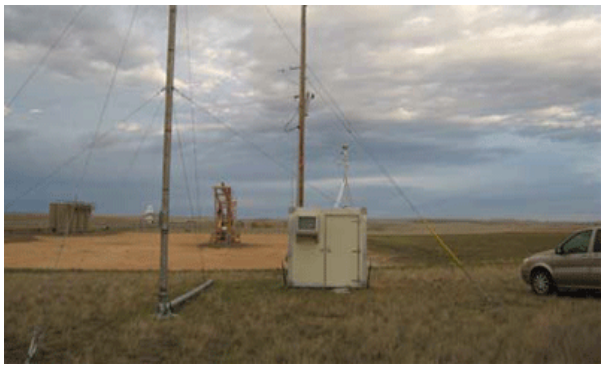
In 2009, this site was established in the Powder River Valley of south-eastern Montana to determine the current levels of a variety of air pollutants and to track changes in air quality that may occur due to coal bed natural gas development. A variety of surface level meteorological data (wind speed and direction, temperature, etc.) are also collected at this site.

| | | | |
|---|---|---|---|
| Hamilton – PS#46 | | Madison and 3rd St. South | |
| ID# 30-081-0007 | Lat: 46.24583 | Long: -114.15886 | Elevation: 3,570 ft<br>1,088 m |
| MSA: | | | |

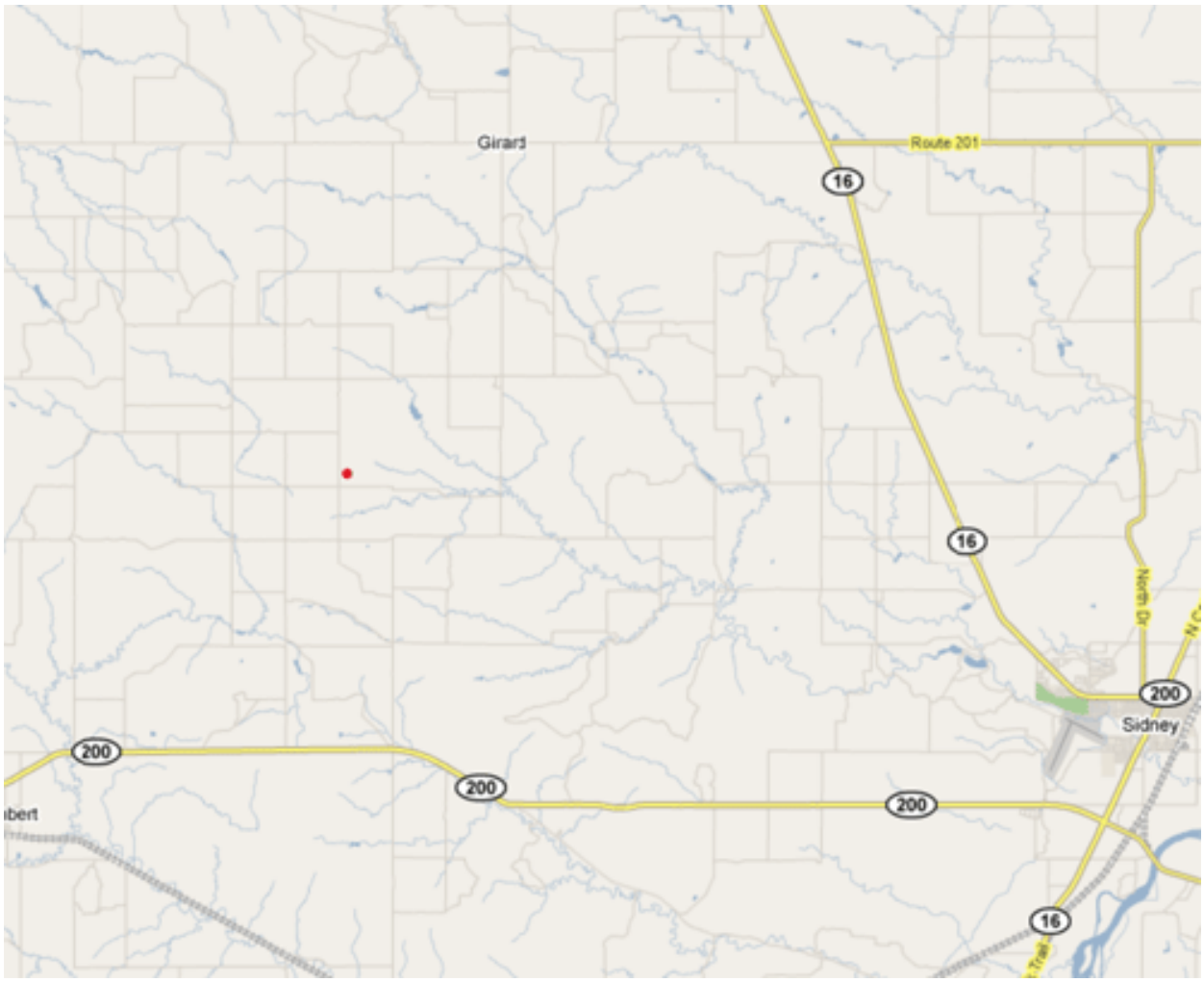
This neighborhood scale site was established in 2005 in the paved parking lot at the corner of Madison and 3rd Street South. The site is within five meters of an alley (gravel) and Madison Street (paved) but both roadways experience very low levels of motor vehicle traffic. $PM_{2.5}$ data is collected continuously. The data is used to assess population exposure and NAAQS compliance. The continuous $PM_{2.5}$ data is reported to the Today's Air website and used for public health protection plans during periods of poor air quality which the community frequently experiences during summer wildfire events.



| | | | |
|---|---|---|---|
| Sidney – Oil Field | | 15 miles northwest of Sidney | |
| ID# 30-083-0001 | Lat: 47.80342 | Long: -104.48562 | Elevation: 2,546 ft<br>776 m |
| MSA: | | | |

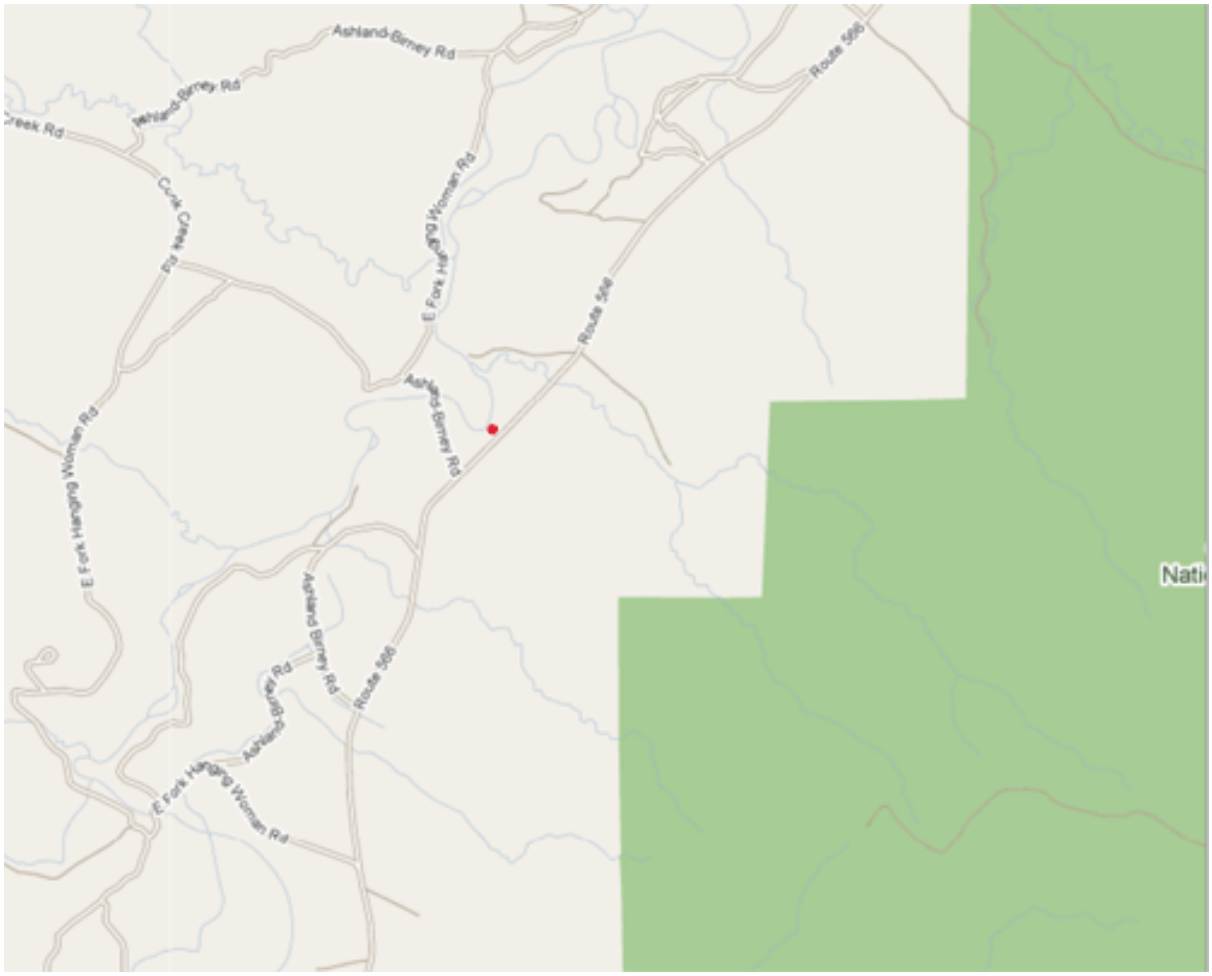


In 2008, this site was established in eastern Montana to determine the levels of a variety of air pollutants on a neighborhood scale basis and to track changes in air quality that may occur due to the development of the Bakken Oil Field. The continuously monitored $PM_{2.5}$ data is reported to the Today's Air website.



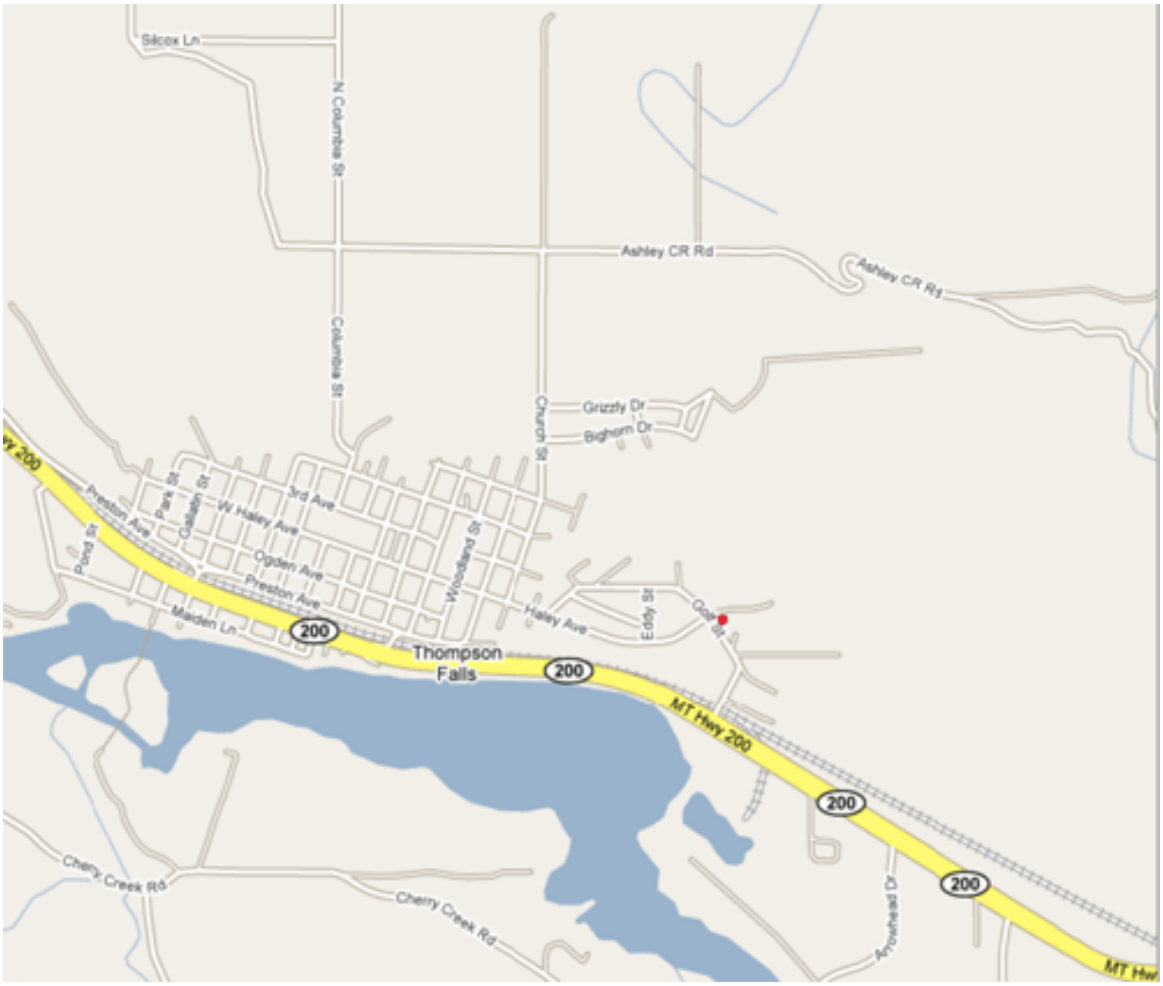
| | | | |
|---|---|---|---|
| Birney – Tongue River | | 3 miles north of Birney | |
| ID# 30-087-0001 | Lat: 45.36620 | Long: -106.48943 | Elevation: 3,153 ft<br>961 m |
| MSA: | | | |

In 2009, this site will be established in the Tongue River Valley of south-eastern Montana to determine the current levels of a variety of air pollutants and to track changes in air quality that may occur due to coal bed natural gas development. A variety of surface level meteorological data (wind speed and direction, temperature, etc.) will also be collected at this site.



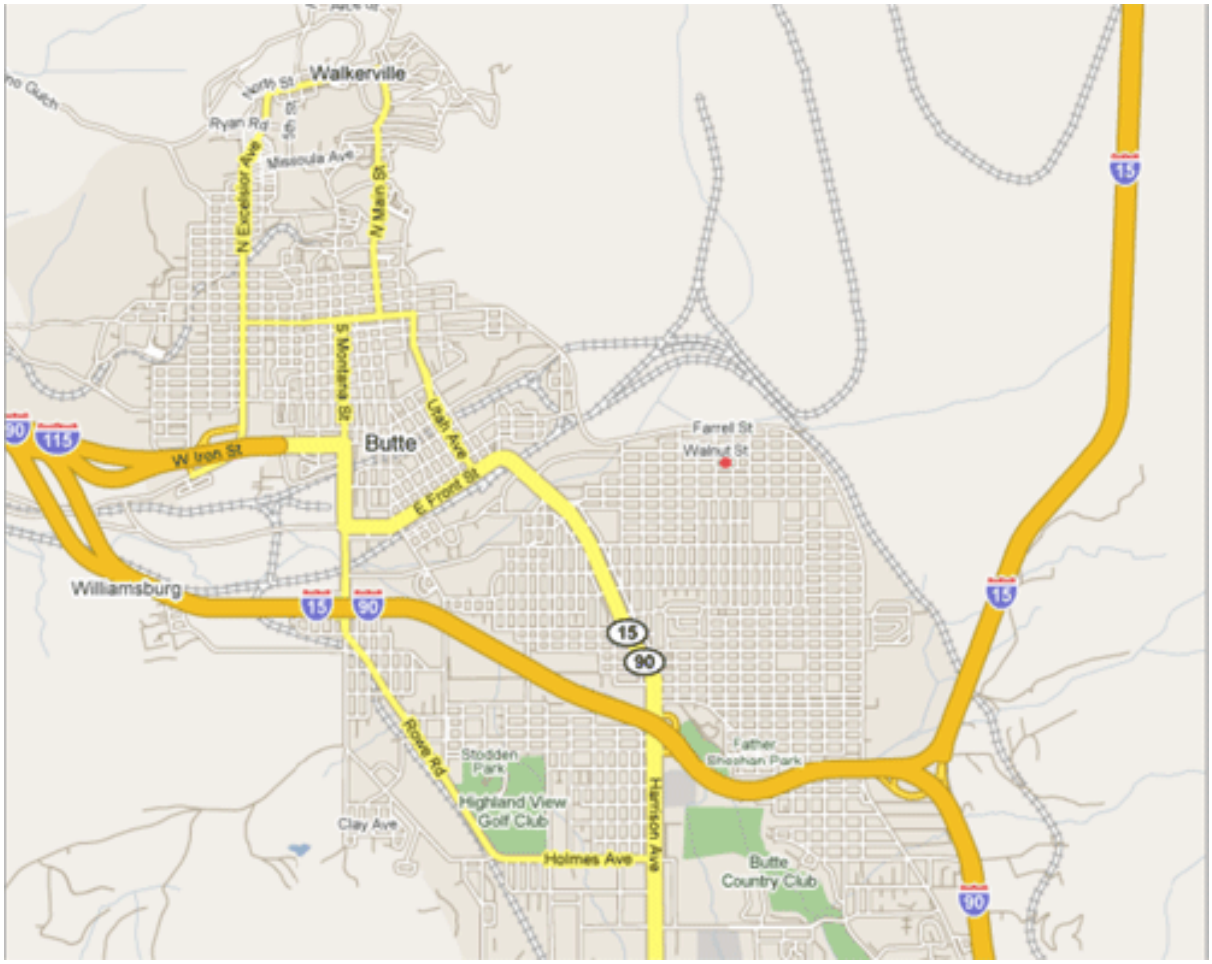
| | | | |
|---|---|---|---|
| Thompson Falls – High School | | Golf and Haley | |
| ID# 30-089-0007 | Lat: 47.59639 | Long: -115.32361 | Elevation: 2,461 ft<br>750 m |
| MSA: | | | |

This site is located on the east side of Thompson Falls at the high school. The site was established in 1999 and collects $PM_{10}$ and $PM_{2.5}$ data on a neighborhood scale basis. Data from the site is used to track NAAQS compliance in the local PM10 nonattainment area and to assess population exposure to particulate matter.



| Butte – Greeley School | | | |
|---|---|---|---|
| ID# 30-093-0005 | Lat: 46.00240 | Long: -112.50089 | Elevation: 5,519 ft<br>1,682 m |
| MSA: | | | |

This historical site is at a closed elementary school in a residential neighborhood on the north side of Butte and very near an operating open pit metals mine. $PM_{10}$ and $PM_{2.5}$ data collected at this site represents population exposure on a neighborhood scale. Continuous $PM_{10}$ data is used to monitor NAAQS compliance in the local nonattainment area. Continuous $PM_{2.5}$ data is reported to the Today's Air website and used for public health protection plans during periods of poor air quality as well as for NAAQS compliance. The wintertime saturation study of 2008/09 determined Greeley School to be the location for maximum $PM_{2.5}$ concentrations in Butte.

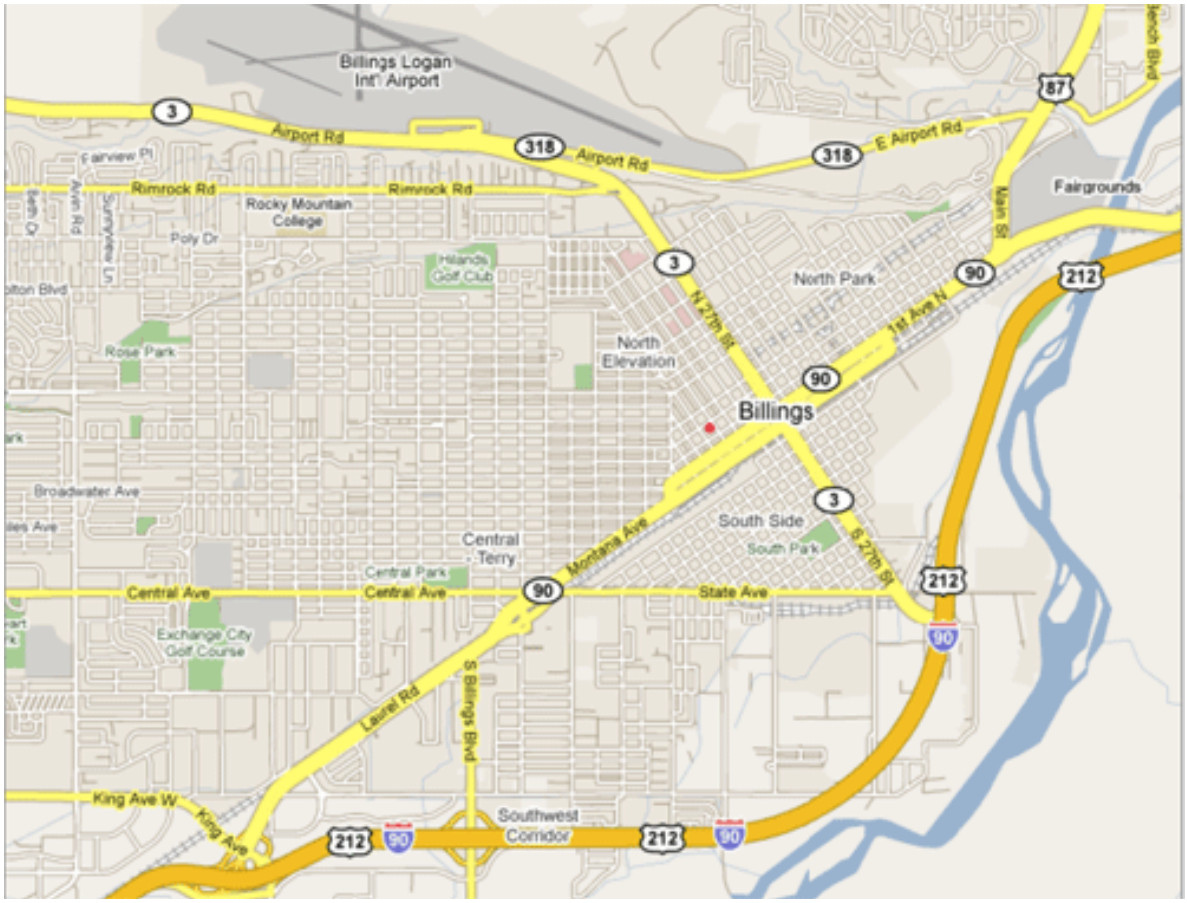


| | | | |
|---|---|---|---|
| Billings – Coburn Road | | Coburn Hill Road | |
| ID# 30-111-0066 | Lat: 45.78667 | Long: -108.45778 | Elevation: 3,396 ft<br>1,035 m |
| MSA: Billings/13740 | | | |

This neighborhood scale historical $SO_2$ monitoring site is located on high ground south of the Conoco and Exxon refineries and has operated for the last three decades. It measures some of the highest $SO_2$ levels in the Billings area and exists to monitor compliance with the federal and state $SO_2$ ambient air standards.

| | | | |
|---|---|---|---|
| Billings – St Luke's | | 2nd Ave. North and North 32nd Street | |
| ID# 30-111-0085 | Lat: 45.78218 | Long: -108.51153 | Elevation: 3,166 ft<br>965 m |
| MSA: Billings/13740 | | | |

This site monitors CO on a microscale basis in downtown Billings at the corner of 2nd Ave. North and North 32nd Street. The site was installed to demonstrate compliance with the CO NAAQS in the Billings nonattainment area. In 2008, continuous $PM_{2.5}$ monitoring was added to provide data for the Today's Air website and to be used for public health protection plans during periods of poor air quality.



# APPENDIX B

# EXISTING & PROPOSED AIR MONITORING NETWORK

## Table B-1
## Existing Montana Ambient Air Monitoring Network

| AQS Number | Site Location City-Name | Parameter-POC | Method | Frequency | Type | Spatial Scale | Monitoring Obj.* |
|---|---|---|---|---|---|---|---|
| *H=high concentration, P=population exposure, S=source impact, B=background | | | | | | | |
| 30-013-0001 | Great Falls-Overlook Park | 42101-1 CO | 093[1] | Continuous | SLAMS | Micro. | H,P,S |
| | | 88502-3 $PM_{2.5}$ | 731[5] | Continuous | SPM | Middle | H,P |
| 30-029-0007 | Columbia Falls-Ball Park | 81102-1 $PM_{10}$ | 125[3] | 1 in 6 | SLAMS | Neigh | H,P,S |
| | | 81102-2 $PM_{10}$ | 125[3] | (collocated) | | | |
| | | 88101-1 $PM_{2.5}$ | 116[2] | 1 in 3 | SLAMS | Neigh | H,P |
| 30-029-0009 | Whitefish-Dead End | 88502-3 $PM_{2.5}$ | 731[5] | Continuous | SPM | Neigh. | H,P |
| | | 88101-1 $PM_{2.5}$ | 116[2] | 1 in 3 | SLAMS | Neigh. | H,P |
| | | 81102-2 $PM_{10}$ | 125[3] | 1 in 6 | SLAMS | Neigh. | H,P |
| 30-029-0047 | Kalispell-Flathead Electric | 88502-3 $PM_{2.5}$ | 731[5]1 | Continuous | SPM | Neigh. | H,P |
| | | 88101-1 $PM_{2.5}$ | 116[2] | 1 in 3 | SLAMS | Neigh. | H,P |
| | | 81102-2 $PM_{10}$ | 125[3] | 1 in 6 | SLAMS | Neigh. | H,P |
| 30-031-0008 | Belgrade-ConAgra | 88101-1 $PM_{2.5}$ | 116[2] | 1 in 3 | SLAMS | Neigh. | H,P |
| 30-031-0016 | West Yellowstone-City Center | 42101-1 CO | 093[1] | Continuous | SLAMS | Neigh. | H,P |
| | | 88101-3 $PM_{2.5}$ | 170[8] | Continuous | SLAMS | Neigh. | H,P |
| 30-031-0017 | West Yellowstone-Park Entrance | 42101-1 CO | 093[1] | Continuous | SPM | Micro | S |
| | | 88502-3 $PM_{2.5}$ | 731[5] | Continuous | SPM | Micro | S |
| 30-031-0018 | Belgrade-Wastewater Lagoon | 88101-1 $PM_{2.5}$ | 116[2] | 1 in 3 | SPM | Neigh. | H,P |
| 30-031-0019 | Bozeman-High School | 88502-3 $PM_{2.5}$ | 731[5] | Continuous | SPM | Neigh. | P |

## Table 2 (Continued)
## Existing and Proposed Montana Ambient Air Monitoring Network

| AQS Number | Site City-Name | Parameter-POC | Method | Frequency | Type | Spatial Scale | Monitoring Obj * |
|---|---|---|---|---|---|---|---|
| *H=high concentration, P=population exposure, S=source impact, B=background | | | | | | | |
| 30-049-0004 | Sieben's Flat | 42101-1 CO | 054 | Continuous | NCore | Region | B |
| | | 42401-1 $SO_2$ | 100 | Continuous | | Region | B |
| | | 42601-1 NO | 574 | Continuous | | Region | B |
| | | 42600 -1 NOy | 574 | Continuous | | Region | B |
| | | 44201-1 O3 | 047[9] | Continuous | | Region | B |
| | | 81102-1 $PM_{10}$ | 122[4] | Continuous | | Region | B |
| | | 88101-1 $PM_{2.5}$ | 170[8] | Continuous | | Region | B |
| | | 88101-1 $PM_{2.5}$ | 116[2] | 1 in 3 | | Region | B |
| | | 86101-1 $PM_{coarse}$ | 185[12] | Continuous | | Region | B |
| | | 88502-5 $PM_{2.5}$ | 810[6] | 1 in 3 | Speciation | Region | B |
| 30-049-0026 | Helena-Rossiter Pump House | 88101-3 $PM_{2.5}$ | 170[8] | Continuous | SLAMS | Neigh. | H,P |
| | | 88101-2 $PM_{2.5}$ | 116[2] | Collocated | | | |
| 30-053-0018 | Libby-Courthouse Annex | 81102-1 $PM_{10}$ | 122[4] | Continuous | SLAMS | Neigh. | H,P |
| | | 88101-1 $PM_{2.5}$ | 116[2] | 1 in 3 | SLAMS | Neigh. | H,P |
| | | | | Collocated | | | |
| | | 88502-3 $PM_{2.5}$ | 731[5] | Continuous | SPM | Neigh. | H,P |
| 30-063-0005 | Missoula-Malfunction Junction | 42101-1 CO | 093[1] | Continuous 1st & 4th quarters | SLAMS | Micro | H,P,S |
| 30-063-0024 | Missoula-Boyd Park | 81102-6 $PM_{10}$ | 122[4] | Continuous | SLAMS | Neigh. | H,P |
| | | 88101-3 $PM_{2.5}$ | 170[8] | Continuous | SLAMS | Neigh. | H,P |
| | | 88101-4 $PM_{2.5}$ | 170[8] | Collocated | | | |
| | | 44201-1 O3 | 047[9] | Continuous | SLAMS | Neigh. | H,P |

## Table 2 (Continued)
## Existing and Proposed Montana Ambient Air Monitoring Network

| AQS Number | Site City-Name | Parameter-POC | Method | Frequency | Type | Spatial Scale | Monitoring Obj * |
|---|---|---|---|---|---|---|---|
| 30-063-0031 | Missoula-Health Dept. | 88101-$PM_{2.5}$ | 116[2] | 1 in 3 Collocated | SLAMS | Neigh. | H,P |
| 30-063-0037 | Frenchtown-Beckwith | 88101-1 $PM_{2.5}$ | 170[8] | Continuous | SLAMS | Neigh. | H,P |
| 30-063-0038 | Seeley Lake-Elem. School | 88502-1 $PM_{2.5}$ | 731[5] | Continuous | SPM | Neigh. | H,P |
| 30-075-0001 | Broadus-Powder River | 44201-1 $O_3$ | 047[9] | Continuous | SLAMS | Neigh. | B |
| | | 42601-1 NO | 074[11] | Continuous | SLAMS | Neigh. | B |
| | | 42602-1 $NO_2$ | 074[11] | Continuous | SLAMS | Neigh. | B |
| | | 42603-1 NOx | 074[11] | Continuous | SLAMS | Neigh. | B |
| | | 81102-1 $PM_{10}$ | 122[4] | Continuous | SLAMS | Neigh. | B |
| | | 88101-3 $PM_{2.5}$ | 170[8] | Continuous | SLAMS | Neigh. | B |
| 30-081-0007 | Hamilton-Parking Spot #46 | 88101-3 $PM_{2.5}$ | 170[8] | Continuous | SLAMS | Neigh. | H,P |
| 30-083-0001 | Sidney-Oil Field | 44201-1 $O_3$ | 047[9] | Continuous | SLAMS | Neigh. | S |
| | | 42601-1 NO | 099[10] | Continuous | SLAMS | Neigh. | S |
| | | 42602-1 $NO_2$ | 099[10] | Continuous | SLAMS | Neigh. | S |
| | | 42603-1 NOx | 099[10] | Continuous | SLAMS | Neigh. | S |
| | | 81102-1 $PM_{10}$ | 122[4] | Continuous | SLAMS | Neigh. | S |
| | | 88101-3 $PM_{2.5}$ | 170[8] | Continuous | SLAMS | Neigh. | S |

*H=high concentration, P=population exposure, S=source impact, B=background

## Table 2 (Continued)
## Existing and Proposed Montana Ambient Air Monitoring Network

| AQS Number | Site City-Name | Parameter-POC | Method | Frequency | Type | Spatial Scale | Monitoring Obj * |
|---|---|---|---|---|---|---|---|
| *H=high concentration, P=population exposure, S=source impact, B=background | | | | | | | |
| 30-087-0001 | Birney-Tongue River | 44201-1 $O_3$ | 047[9] | Continuous | SLAMS | Neigh. | B |
| | | 42601-1 NO | 074[11] | Continuous | SLAMS | Neigh. | B |
| | | 42602-1 $NO_2$ | 074[11] | Continuous | SLAMS | Neigh. | B |
| | | 42603-1 NOx | 074[11] | Continuous | SLAMS | Neigh. | B |
| | | 81102-1 $PM_{10}$ | 122[4] | Continuous | SLAMS | Neigh. | B |
| | | 88101-3 $PM_{2.5}$ | 170[8] | Continuous | SLAMS | Neigh. | B |
| 30-089-0007 | Thompson Falls-High School | 81102-1 $PM_{10}$ | 125[3] | 1 in 6 | SLAMS | Neigh. | H,P |
| | | 88101-1 $PM_{2.5}$ | 116[2] | 1 in 3 | SLAMS | Neigh. | H,P |
| 30-093-0005 | Butte-Greeley School | 81102-4 $PM_{10}$ | 122[4] | Continuous | SLAMS | Neigh. | H,P,S |
| | | 88101-3 $PM_{2.5}$ | 170[8] | Continuous | SLAMS | Neigh. | H,P |
| | | 88101-5 $PM_{2.5}$ | 810[6] | 1 in 6 | Suppl Speciation | Neigh. | H,P |
| 30-111-0066 | Billings-Coburn Road | 42401-1 $SO_2$ | 100[7] | Continuous | SLAMS | Neigh. | H,S |
| 30-111-0085 | Billings-St. Luke's | 42101-1 CO | 093[1] | Continuous | SLAMS | Micro. | H,P,S |
| | | 88502-3 $PM_{2.5}$ | 731[5] | Continuous | SPM | Micro. | P |

[1]Teledyne-API Model 300. Nondispersive infrared-equivalent method.
[2]BGI-PQ200 with very sharp cut cyclone. Federal Reference Method.
[3]BGI-PQ200 with WINS eliminator. Federal Reference Method.
[4]MetOne BAM 1020. Beta attenuation monitor-equivalent method $PM_{10}$.
[5]MetOne BAM 1020 with $PM_{2.5}$ sharp cut cyclone. Beta attenuation monitor.
[6]MetOne Speciation Air Sampling System.
[7]Teledyne-API Model 100. Ultraviolet fluorescence-equivalent method.
[8]MetOne FEM-BAM 1020 with $PM_{2.5}$ very sharp cut cyclone. Beta attenuation monitor-equivalent method $PM_{2.5}$.
[9]Thermo Model 49i. UV absorption-equivalent method.
[10]Teledyne-API Model 200EV. Chemiluminescence-Federal Reference Method.
[11]Thermo Model 42i TL. Chemiluminescence-Federal Reference Method.
[12]MetOne BAM1020 $PM_{10-2.5}$ Measurement System. Paired beta attenuation monitors.

# APPENDIX C

# NATIONAL & MONTANA AMBIENT AIR QUALITY STANDARDS

# FEDERAL & STATE AIR QUALITY STANDARDS

| POLLUTANT | TIME PERIOD | FEDERAL (NAAQS) | MONTANA (MAAQS) | STANDARD TYPE |
|---|---|---|---|---|
| Carbon Monoxide | Hourly Average<br>8-Hour Average | 35 ppm [a]<br>9 ppm [a] | 23 ppm [b]<br>9 ppm [b] | Primary<br>Primary |
| Fluoride in Forage | Monthly Average<br>Grazing Season | - -<br>- - | 50 µg/g [c]<br>35 µg/g [c] | - -<br>- - |
| Hydrogen Sulfide | Hourly Average | - - | 0.05 ppm [b] | - - |
| Lead | 90-Day Average<br>Rolling 3-Month Avg. | - -<br>0.15 $\mu g/m^3$ [c] | 1.5 $\mu g/m^3$ [c]<br>- - | - -<br>Prim. & Sec. |
| Nitrogen Dioxide | Hourly Average<br>Annual Average | 0.100 ppm[m]<br>0.053 ppm [d] | 0.30 ppm [b]<br>0.05 ppm [e] | Prim. & Sec.<br>Prim. & Sec. |
| Ozone | Hourly Average<br>8-Hour Average | 0.12 ppm [f]<br>0.075 ppm [g] | 0.10 ppm [b]<br>- - | Prim. & Sec.<br>Prim. & Sec. |
| PM -10 | 24-Hour Average<br>Annual Average | 150 $\mu g/m^3$ [i]<br>- - | 150 $\mu g/m^3$ [i]<br>50 $\mu g/m^3$ [j] | Prim. & Sec.<br>Prim. & Sec. |
| PM-2.5 | 24-Hour Average<br>Annual Average | 35 $\mu g/m^3$ [k]<br>15 $\mu g/m^3$ [l] | - -<br>- - | Prim. & Sec.<br>Prim. & Sec. |
| Settleable Particulate | 30-Day Average | - - | 10 $g/m^2$ [c] | - - |
| Sulfur Dioxide | Hourly Average<br>3-Hour Average<br>24-Hour Average<br>Annual Average | - -<br>0.50 ppm [a]<br>0.14 ppm [a]<br>0.030 ppm [d] | 0.50 ppm [h]<br>- -<br>0.10 ppm [b]<br>0.02 ppm [e] | - -<br>Secondary<br>Primary<br>Primary |
| Visibility | Annual Average | - - | $3 \times 10^{-5}/m$ [e] | - - |

[a] Federal violation when exceeded more than once per calendar year.
[b] State violation when exceeded more than once over any 12 consecutive months.
[c] Not to be exceeded (ever) for the averaging time period as described in state or federal regulation.
[d] Federal violation when the annual arithmetic mean concentration for a calendar year exceeds the standard.
[e] State violation when the arithmetic average over any four consecutive quarters exceeds the standard.
[f] Applies only to NA areas designated before the 8-hour standard was approved in July, 1997. MT has none.
[g] Federal violation when 3-year average of the annual 4th-highest daily max. 8-hour concentration exceeds standard.
[h] State violation when exceeded more than eighteen times in any 12 consecutive months.
[i] State and federal violation when more than one expected exceedance per calendar year, averaged over 3-years.
[j] State violation when the 3-year average of the arithmetic means over a calendar year at each monitoring site exceed the standard.
[k] Federal violation when 3-year average of the 98th percentile values at each monitoring site exceed the standard.
[l] Federal violation when 3-year average of the annual mean at each monitoring site exceeds the standard.
[M] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm.

**END OF DOCUMENT**