Latah Valley PM_{10}/$PM_{2.5}$ Air Quality Study (May 1999 – April 2000)

Spokane County Air Pollution Control Authority
Spokane, Washington

EXECUTIVE SUMMARY

The Spokane County Air Pollution Control Authority (SCAPCA) monitored ambient PM_{10} and $PM_{2.5}$ mass concentrations in the Latah Valley of southwest Spokane from May 1999 to April 2000. The main objective was to determine whether monitoring stations elsewhere in Spokane adequately represent pollution mass concentrations in the Latah Valley. This report summarizes the results of this monitoring effort and provides a basis on which to determine air pollution monitoring needs in the area. This study was conducted using portable air pollution samplers to provide data and information to characterize relative PM_{10} and $PM_{2.5}$ mass concentrations in the Latah Valley and assess the need to establish an additional monitoring station there.

Two samplers were mounted on utility poles along Inland Empire Way, the main thoroughfare through the Latah Creek neighborhood, a residential area located in the valley. Samplers were sited in locations representative of northern and southern portions of the neighborhood. These monitoring sites are referred to here as Latah North and Latah South. Portable samplers were deployed at Crown Z for comparison with mass concentrations measured at the Latah Valley sites and for quality control purposes.

The Latah Valley [PM_{10}] and [$PM_{2.5}$] data were compared to mass concentrations measured concurrently at Crown Z, an established air pollution monitoring station in Spokane. The data show no appreciable difference in $PM_{2.5}$ mass concentrations between the Latah Valley sites and the Crown Z station. Average $PM_{2.5}$ mass concentrations were 14 $\mu g\ m^{-3}$ for Crown Z, 12 $\mu g\ m^{-3}$ for Latah North, and 12 for Latah South while Latah North was operating and 13 $\mu g\ m^{-3}$ for Crown Z and 11 $\mu g\ m^{-3}$ for Latah South for the duration of the study. PM_{10}, however, was higher at the Latah North site compared to the Latah South or Crown Z sites, with average PM_{10} mass concentrations of 30, 27, and 25 $\mu g\ m^{-3}$, respectively, for the period during which Latah North was operating. This was probably caused by dust emissions from a busy intersection and an unpaved road near the Latah North site. Dust is implicated because elevated mass concentrations occur in PM_{10} but not $PM_{2.5}$ samples. Crown Z and Latah South both averaged 27 $\mu g\ m^{-3}$ of PM_{10} for the duration of the study.

Analysis of the study results concluded that [PM_{10}] and [$PM_{2.5}$] data from existing monitoring stations in the Spokane area are representative of the mass concentrations of those pollutants in the Latah Valley and no additional monitoring stations are needed.

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1. INTRODUCTION

1.1 Rationale

The Latah Creek neighborhood is a growing residential area located in the Latah Valley, also known as the Hangman Valley, a depression shadowed by steep relief on the southwest edge of Spokane. In December 1998, the Spokane County Air Pollution Control Authority (SCAPCA) received a request from the Latah Creek Neighborhood Council for placement of air pollution monitors in the Latah Valley (Figure 2). The council was mainly concerned about the trapping of air pollution in the Latah Valley during air inversions, dust emissions from unpaved roads, and the possible exacerbation of these problems in the future as residential development continues. Air pollution had never been monitored in the Latah Valley and monitoring stations elsewhere in Spokane were assumed to represent air pollution characteristics throughout the Spokane area, including the Latah Valley. SCAPCA regularly evaluates the adequacy of the existing monitoring network using portable air pollution samplers to obtain air pollution data from normally non-monitored areas. This study used the portable samplers to compare particulate matter air pollution characteristics in the Latah Valley with those at an established monitoring station in another part of Spokane.

1.2 Background

Air pollution impacts occurring throughout the year can reflect the effects of source and meteorological influences that vary both within and between seasons. Automobiles and residential wood combustion are the most significant sources of air pollution during winter in the Spokane area. The cool, sunny winter days and cold, clear nights with little or no wind lead to temperature inversions and increased air pollution mass concentrations, especially in low lying areas such as the Latah Valley. In late winter, paved road emissions predominate as roads begin to dry and traction materials are ground up and airborne. In the fall, unpaved road dust emissions are an important source of air pollution because they tend to be concentrated. With the exception of automobile emissions of carbon monoxide, most air pollution in Spokane is in the form of particulate matter.

SCAPCA is responsible for monitoring particulate matter mass concentrations in the Spokane area and implementing reasonable control measures to reduce emissions. Particulate matter is the general term for solid or liquid particles suspended in the atmosphere. SCAPCA monitors concentrations of two particle size fractions; those with aerodynamic diameters less than or equal to 10 micrometers (μm) and those with aerodynamic diameters less than or equal to 2.5 μm, hereafter referred to as PM_{10} and $PM_{2.5}$, respectively. Coarse particles, with aerodynamic diameters between 2.5 and 10 μm originate from a variety of sources including windblown dust and grinding operations. Fine particles, with aerodynamic diameters less than 2.5 μm, often come from combustion sources, e.g., wood stoves, power plants, and diesel buses and trucks. Under the National Ambient Air Quality Standards (NAAQS), authorized by the Clean Air Act, 24-hour ambient mass concentrations of PM_{10} cannot exceed 150 $\mu g\ m^{-3}$ and $PM_{2.5}$ cannot exceed 65 $\mu g\ m^{-3}$, on average, more than once per calendar year in any three year period. The annual standard for PM_{10} is 50 $\mu g\ m^{-3}$ and for $PM_{2.5}$ is 15 $\mu g\ m^{-3}$.

SCAPCA monitors PM_{10} at four State and Local Air Monitoring Stations (SLAMS). Crown Z, located in a light industrial area in east Spokane usually exhibits the highest mass concentrations in Spokane. Rockwood is in a residential/commercial district in north Spokane. Millwood is located in a residential/commercial/industrial area in the city of Millwood, a suburb of Spokane. The fourth station is located at the Turnbull National Wildlife Refuge, about 15 miles southwest of Spokane, and is used to monitor background mass concentrations of PM_{10} for the Spokane area. The Washington State Department of Ecology (Ecology) monitors PM_{10} at Monroe, located in a residential area near the intersection of Wellesley and Monroe streets in north Spokane. $PM_{2.5}$ is monitored at Crown Z and Monroe.

Ambient air pollution monitoring stations used for the purpose of tracking a community's compliance with the NAAQS tend to remain in fixed locations for many years at a time. The monitoring networks in which these stations reside are periodically evaluated to ensure adequate representation of acute air pollution episodes and long-term trends, especially in densely populated areas of the community.
Modification of the SLAMS network is implemented through the network review process at the state and federal levels, i.e., it requires the approval of Ecology and the U.S. Environmental Protection Agency (EPA). Action toward establishing a monitoring station in the Latah Valley, either by recommending an addition to the SLAMS network or installing a sampler to be operated without state and federal approval, i.e., the station would not be part of the SLAMS network, should be pursued if it is shown that acquiring air pollution data for that area is critical for meeting the overall monitoring objectives for Spokane, thereby protecting the health of Latah Creek neighborhood residents. The Code of Federal Regulations, Title 40, Part 58 (40 CFR 58), which contains EPA's ambient air quality surveillance regulations, provides the foundation on which monitoring networks are designed and operated. Specifically, Appendix D of 40 CFR 58 requires that the SLAMS monitoring network be designed to meet a minimum of four basic monitoring objectives. These basic objectives are: (1) To determine the highest pollutant mass concentrations expected to occur in the area covered by the network; (2) to determine representative mass concentrations in areas of high population density; (3) to determine the impact on ambient pollution levels of significant sources or source categories; and (4) to determine general background mass concentration levels.

Background mass concentrations of PM_{10} are monitored at the Turnbull station. Background mass concentrations include regional mass concentrations of particulates transported into the Spokane area, such as windblown dust originating mostly from tilled land on the Columbia Plateau southwest of Spokane, smoke from forest or range fires, or pollution transported from other urban areas. In response to the suggestion made by the neighborhood council in their letter to SCAPCA (Figure 1), the Latah Valley would not be an appropriate location for a background monitoring station because it contains local sources of particulate matter air pollution, e.g., many homes and unpaved roads.

Air quality measurements taken in the Spokane urban area recorded 48 exceedances of the 24-hour PM_{10} standard during the period 1985-1993. Particulate matter air pollution has generally improved since 1993 with only two recorded exceedances of the PM_{10} standard, both resulting from dust storms. These exceedances occurred at the Crown Zellerbach monitoring station on August 30, 1996 and September 25, 1999 with 24 hour average mass concentrations measuring 186 and 330 $\mu g\ m^{-3}$, respectively. The Spokane area was in violation of the annual standard in 1987 and 1988, but there have been no exceedances of the standard since that time. By contrast, PM_{10} averaged only 25 $\mu g\ m^{-3}$ on days when PM_{10} was monitored for the study with a maximum value of 59 $\mu g\ m^{-3}$. Average PM_{10} concentration for the study period, May 1999 through April 2000, was 28 $\mu g\ m^{-3}$ at Crown Z. The Spokane area has had no exceedances of the $PM_{2.5}$ standard since $PM_{2.5}$ federal reference method (FRM) monitoring began in December 1998.

Maximum particulate matter mass concentrations can vary significantly from year to year or season to season. Some high-impact events last only a few hours and can be easily missed in air monitoring projects. The next section discusses these and other limitations to short term air pollution studies.

1.3 Limitations

All studies are subject to uncertainties. The following qualifications identified with this study do not necessarily diminish the validity of the study results, but rather frame their present and future application and interpretation within the context of appropriate caution.

- Occurrence of elevated mass concentrations. Conditions inducing high levels of ambient PM_{10} or $PM_{2.5}$ are not guaranteed to occur when monitoring for periods of short duration despite the evidence observed in historical data. Even with careful project management and active meteorological forecasting, such studies run a high risk of missing high-impact events of interest. Pollutant concentrations can remain lower than historical levels for an entire year or several years.
- Seasonality of impacts. Impacts of interest occurring throughout the year can reflect the effects of source and meteorological influences that vary within and between seasons. The Latah South site was monitored for one year to provide observations from all seasons. However, vandalism limited monitoring at the Latah North site to six months from May to November 1999. Extension of the Latah North results to describing the character of impacts there during the rest of the year is not appropriate.
- Network design. In siting study samplers to measure maximum mass concentrations, there are often substantial uncertainties. Because elevated PM_{10} and $PM_{2.5}$ mass concentrations can be a highly localized phenomenon, particularly when viewed over the smaller spatial scales, there is a relatively low probability of effectively weighing contributing factors toward correctly selecting the particular sites where maximum mass concentrations will occur.
- Identification of air pollution sources. The study seeks to characterize only ambient mass concentrations of particulates for the neighborhood in general and is not intended as a definitive determination of pollution sources in the Latah Valley. The methods used to effectively identify

pollutant/pollution sources, chemical analysis and source/receptor modeling, are beyond the scope of this project.

- Sampling method. The study data are generated using a sampling method, portable survey samplers, not approved by EPA for use as the primary basis for NAAQS attainment determinations or for the definitive demonstration of pollution control strategy effectiveness. The method is considered a good indicator of relative mass concentrations and is widely accepted for use in studies where mass concentrations of particulates suspended in the atmosphere are compared. Due to the nature of the sampling methodology, some uncertainties about the absolute veracity of the data have been recognized and accepted from the study's inception. The portable sampler's flow rate is much lower than flow rates used by reference method samplers. This results in a greater deviation in accuracy, especially at low mass concentrations of particulates where precision can be lost through the handling and weighing of a minute particle sample.

In order to diminish the uncertainties described above, standard procedures were followed and quality control measures implemented. These are discussed in Section 2 of this report.

2. METHODOLOGY

2.1 Network Design and Siting

Portable survey samplers were deployed at two sites in the Latah Valley (Figure 2). These sites were located near the intersections of Coeur d'Alene Street and Inland Empire Way (Latah North) and 23rd Avenue and Inland Empire Way (Latah South). Samplers were mounted on utility poles at a height of 11.5 feet. SCAPCA sought monitoring sites that were representative of the study area in terms of air quality and in general conformance to 40 CFR 58, Appendix D, which describes monitoring objectives and general criteria to be applied when establishing SLAMS networks and for selecting locations for new monitoring stations. However, no site in the study area met the siting criteria, primarily because of dense tree coverage and many unpaved roads. Sites were selected along Inland Empire Way, a busy street. The City of Spokane Transportation Department measured the traffic volume on Inland Empire Way at the 1600 block and the 2800 block on October 3rd, 2000. Average daily traffic (ADT) for those locations was 2,000 and 1,000 vehicles, respectively (Chris Cafaro, Pers. Comm., 2000). Pollution sources in the immediate vicinity, such as chimneys and unpaved roads as well as obstacles to pollutant transport, e.g., trees, were avoided when possible. Latah Creek is an older neighborhood with dense coverage from large trees and many unpaved roads.

Crown Z monitoring station is located about 4 miles to the east-northeast in a light industrial area in east Spokane. It was equipped with portable survey samplers for comparison of pollution levels with the Latah Valley sites and for quality control purposes, which are described in section 2.3 of this report.

2.2 Instrumentation and Measurements

All PM_{10} and $PM_{2.5}$ samplers used in this study draw a known volume of ambient air at a constant flow rate through a size-selective inlet and filter. Particles in the PM_{10} or $PM_{2.5}$ size range are collected on the filter during a specified sampling period. Each sample filter is weighed before and after sampling to determine the net weight gain of the collected sample. The total volume of air sampled is determined from the measured volumetric flow rate and the elapsed sampling time. The mass concentration of PM_{10} or $PM_{2.5}$ in the ambient air is computed as the total mass of collected particles divided by the volume of air sampled.

2.2.1 Portable Samplers

The AirMetrics MiniVol (AIRmetrics, Springfield, Oregon, version 4.2) portable air sampler is compact, lightweight, battery-operated and constructed from durable PVC, qualities that allow for a wide range of deployment options. The sampling technique used by the MiniVol is a modification of the standard PM_{10} reference method described in 40 CFR 50, Appendix J. While the MiniVol is not a reference or equivalent method, its configuration is based on the FRM design criteria, i.e., it has a sample air inlet system to provide particle size separation, a flow control device capable of maintaining a flow rate within specified limits, a means to measure the flow rate during the sampling period, and a timing control device capable of starting and stopping the sampler.

In operation, the sampler's vacuum pump maintains an actual flow rate of approximately 5 liters per minute through an inlet that is designed to remove particles larger than 2.5 or 10 micrometers from the sample stream, depending on the impactor installed. In order to maintain sampling effectiveness, particles must adhere to the impaction plate; the re-entrainment of these large particles significantly degrades the performance of impaction inlets. Impaction surfaces are regularly cleaned and coated with Apiezon M grease to retard the loss of these particles. Critical to the collection of the correct particle size is the correct flow rate through the inlet. The actual flow rate must be maintained at 5 liters per minute in order to maintain the proper particle size cut-point. The sampler is equipped with a rotameter, which is used to measure the flow rate of air through the size selective inlet and filter assembly.

The sampled air with entrained particulate matter is drawn through a 47 mm diameter filter on which the sample collects. Quartz fiber and polytetrafluoroethylene (PTFE), i.e., Teflon®, filters were used in the study. Quartz fiber filters were used for all PM_{10} sampling for the duration of the study. Quartz fiber filters were also used for $PM_{2.5}$ sampling until September 27, 1999. PTFE filters were then used for the rest of the study.

A particle sampling filter consists of a tightly woven fibrous mat or a plastic membrane that has been penetrated by microscopic pores. Filters should lie flat in the sampler, remain in one piece, and provide a good seal with the sampling system to eliminate leaks. A brittle filter might flake and negatively bias mass measurements. Pure quartz-fiber filters are very brittle, and portions of their edges often become attached to the filter holder, thereby biasing the mass measurement. Each filter was individually examined over a light table prior to use for discoloration, pinholes, creases, or other defects. To minimize contamination, filters were loaded and unloaded from filter holders in a clean laboratory environment. More information regarding filter handling and analysis is provided in section 2.2.3.

2.2.2 Federal Reference Methods

Federal reference method samplers operated at Crown Z include the Graseby-Anderson model SAUV-16H high volume PM_{10} sampler and the Rupprecht and Patashnick 2025 $PM_{2.5}$ sequential sampler. The following operating procedures were strictly adhered to: *High Volume PM_{10} Volumetric Flow Controlled Procedures*, Washington State Department of Ecology, Air Program, Document #95-201D and *$PM_{2.5}$ Sequential Sampler Procedure*, Washington State Department of Ecology, Air Program, Document #99-205. Federal reference methods are assumed to measure the "true" mass concentration of PM_{10} or $PM_{2.5}$ and are used for quality control purposes by comparison with MiniVol data. Quality control methods are discussed further in section 2.3.

2.2.3 Analytical Methods

Filters were weighed at SCAPCA's laboratory using standard NAAQS protocol. Electronic microbalances, Sartorius M5P-000V001 for weighing the 47mm diameter filters and Sartorius AC121S for weighing the 8"x 10" hi-vol filters, were used throughout the study. Filters were equilibrated for 24 hours in a humidity and temperature controlled chamber (42 % ± 5 % RH and 22 °C ± 3 °C) to normalize hygroscopic variables prior to weighing. Analytical precision was checked by re-weighing 20 % (every fifth successive filter) of all clean and loaded filters. $PM_{2.5}$ FRM filters were analyzed at the Washington State Department of Ecology's Manchester laboratory.

2.3 Quality Control

Errors can occur during various data collection activities, including the initial weighing of the filters, the operation of the instruments, the removal, handling, and transportation of the filters, the storage and weighing of the sampled filters, and finally, data reduction and reporting of the values. Quality control measures are undertaken to help ensure the collection of data having both high and demonstrable quality.

All sampling was required to meet specific quality assurance criteria. For the MiniVols, the EPA document *PM_{10} Saturation Sampler O&M/QA Manual,* June 1992, was followed. The accuracy of deployed reference methods was evaluated according to protocol described in 40 CFR 58, Appendix A, *Quality Assurance Requirements For State and Local Air Monitoring Stations*, July 1993, and Ecology Procedures 95-201D, *High Volume PM_{10} Volumetric Flow Controlled Procedures*, July 1993 and 99-205, *$PM_{2.5}$ Sequential Sampler Procedure*, March 1999.

2.3.1 Precision

Precision data were evaluated at the Crown Z site by calculating the percent difference in measured PM_{10} or $PM_{2.5}$ mass between duplicate, collocated samplers for all monitoring methods/attempts. In each case, one sampler was used to report PM_{10} or $PM_{2.5}$ mass concentrations at the site, while a duplicate sampler provided data for evaluating sampling precision. Precision evaluation procedures conformed to those described in 40 CFR 58, Appendix A, *Quality Assurance Requirements for State and Local Air Monitoring Stations*, July 1993 and *PM_{10} Saturation Sampler O&M/QA Manual,* June 1992. As expected, the survey samplers exhibit significantly poorer precision than federal reference methods (Figures 3 to 6). The PM_{10} MiniVol data show good agreement on average and an R^2 (The coefficient of determination, R^2, ranges from 0 to 1. A value of one means the data are perfectly correlated, i.e., all x and y data are equal and fall on the trend-line, which is described by the regression equation. If the value is 0, the data are too disperse and the regression equation is not helpful for describing the data set) value of 0.9333, but some of the paired measurements exceed the maximum allowable difference of ±15 %. The cause of this problem is not known. Likewise, the trend-line for the precision pairs lies close to the 1:1 line, however many of the precision-paired values fall outside the ±15% acceptable limit. Both the PM_{10} and $PM_{2.5}$ FRM precision data sets show trend-lines lying on or near 1:1 and R^2 values greater than 0.99.

2.3.2 Accuracy

Accuracy was evaluated by performing quality control checks and performance audits on both the FRM and survey samplers. Audit data are available from SCAPCA. MiniVol sampler accuracy was determined primarily by comparison with co-located FRM samplers, which provide [PM_{10}] and [$PM_{2.5}$] data that are considered to reflect the "true" mass concentrations of these pollutants. The accuracy objective was ±10% variation in measured ambient PM_{10} mass concentrations between the two methods for common monitoring periods. The accuracy of deployed survey samplers and FRMs was evaluated according to protocol described in 40 CFR 58, Appendix A, *Quality Assurance Requirements For State and Local Air Monitoring Stations*, July 1993.

The accuracy of the MiniVol samplers was poor for both PM_{10} and $PM_{2.5}$. The data show much variability in accuracy data differences (Figures 7 and 8) and R^2 values of 0.7828 for the [PM_{10}] data and 0.678 for [$PM_{2.5}$].

Some of the measurement error seen in the precision and accuracy data might be explained by examination of filter field and laboratory blank data. Fourteen percent of all filters used in the study were designated as field blanks and were subjected to all handling procedures except for actual sampling. Of the 50 field blanks, 6 (12%) failed the QC limit of ±30 μg difference in filter weight before and after the filters were handled in the field (Figure 9). Laboratory blanks fared worse. Out of 28 filters, 7 (25%) exceeded the QC limit of ±15 μg (Figure 10). There are several possible explanations for this problem, including humidity conditions in the laboratory, contamination of the filters, improper handling or weighing techniques, or changes in laboratory personnel. The most important reason for these errors is not known.

Quality control limits for all air monitoring, meteorological, and analytical instruments with suggested corrective actions are presented in Table 1.

3. RESULTS

The Latah Valley [PM_{10}] and [$PM_{2.5}$] data were compared to mass concentrations measured concurrently at Crown Z, an established air pollution monitoring station in Spokane. Daily average PM_{10} and $PM_{2.5}$ mass concentration data for the study are presented in Table 2. Average PM_{10} mass concentrations were significantly higher at the Latah North site compared to Latah South and Crown Z, which showed similar results. The scatter diagrams for Latah North [PM_{10}] compared to Crown Z (Figure 11) and Latah South (Figure 13) show these trends, which may be a result of PM_{10} emissions from unpaved roads. One of these roads, 11th Avenue, is about 50 meters (approximately 160 feet) of the sampling stations. The $PM_{2.5}$ results from the same locations and time frame do not show an elevation of mass concentrations at the Latah North site, lending support to the idea that road dust was a significant source of PM_{10} in the area. The Latah South and Crown Z PM_{10} mass concentrations were similar (Figure 12).

The data show higher $PM_{2.5}$ mass concentrations at Crown Z than Latah North or Latah South (Figures 14 and 15). Latah North and Latah South show moderate differences in [$PM_{2.5}$] on a day-to-day basis (R^2 = 0.6999) but little difference on average (Figure 16). Average $PM_{2.5}$ mass concentrations were 14 $\mu g\ m^{-3}$ for Crown Z, 12 $\mu g\ m^{-3}$ for Latah North, and 12 for Latah South while Latah North was operating and 13 $\mu g\ m^{-3}$ for Crown Z and 11 $\mu g\ m^{-3}$ for Latah South for the duration of the study. PM_{10}, however, was higher at the Latah North site compared to the Latah South or Crown Z sites, with average PM_{10} mass concentrations of 30, 27, and 25 $\mu g\ m^{-3}$, respectively, for the period during which Latah North was operating. This was probably caused by dust emissions from a busy intersection and an unpaved road near the Latah North site. Dust is implicated because elevated mass concentrations occur in PM_{10} but not $PM_{2.5}$ samples. Crown Z averaged 27 $\mu g\ m^{-3}$ of PM_{10} and Latah South averaged 27 $\mu g\ m^{-3}$ for the duration of the study. Crown Z is located on the roof of a building, removing it somewhat from dust emissions near street level. Wood smoke is more of a regional phenomenon than dust, therefore $PM_{2.5}$ values are more uniform across the city than PM_{10} which is more closely tied to dust emissions than $PM_{2.5}$.

4. CONCLUSION

Establishment of a monitoring station in the Latah Valley is not recommended at this time. Considering the placement of the portable samplers along busy streets, the Latah North and Latah South sites did not exhibit sufficiently greater PM_{10} and PM_{25} mass concentrations than Crown Z. Therefore, SCAPCA believes established monitoring stations in Spokane adequately represent the air quality in the Latah Valley.

Figure 1: Letter from the Latah Creek Neighborhood Council requesting placement of air pollution Monitors in the Latah Valley.

RECEIVED
DEC 02 1998
SPOKANE COUNTY AIR POLLUTION CONTROL AUTHORITY

November 20, 1998

Patrick Davidson
Steering Committee Member
Latah Creek Neighborhood Council
1526 South Chestnut
Spokane WA 99224
Tel. #(509) 455-9787

Ron Edgar
SCAPCA
1101 West College Avenue, Suite #403
Spokane WA 99201

Re: Air Pollution Monitoring

Dear Mr. Edgar,

The Latah Creek Neighborhood Council meeting was held the evening of November 18, 1998 during which we discussed your conversation with Gail Howard regarding the possibility of placing portable air pollution monitors in the Latah Valley.

As you know, the Latah Valley area is in a unique situation. It is lower than the Spokane City at large and has a severe inversion layer during the winter time. It is also on the southwest border of Spokane in a unique position to monitor wind born particulates from the agricultural activities to the southwest. In addition, in the Latah Creek Valley itself, there are many unpaved roads one of which, 11th receives quite a bit of traffic. These may be an additional source of particulate pollution to the downtown Spokane area as they may be carried to downtown Spokane with the prevailing winds. With the current status of the Growth Management Act and the comprehensive plan for Spokane, explosion in development is planned for this area. It might be useful to know what the existing air quality in this area is and how it affects the greater downtown Spokane area before, during, and after this proposed development occurs.

The Latah Creek Neighboorhod Council requests SCAPCA to place air pollution monitors in our Valley. We greatly appreciate your interest in monitoring air quality in our area and deeply appreciate any efforts that you and your organization may be able to apply to our area.

Sincerely,

Patrick Davidson,
Latah Creek Neighborhood Council
Steering Committee Member

copy: Barb Fulsas,
Chair of the Latah Creek
Neighborhood Council

Gail Howard,
Steering Committee Member

Figure 2: Map showing the monitoring locations in the Latah Creek Neighborhood of Spokane, Washington.

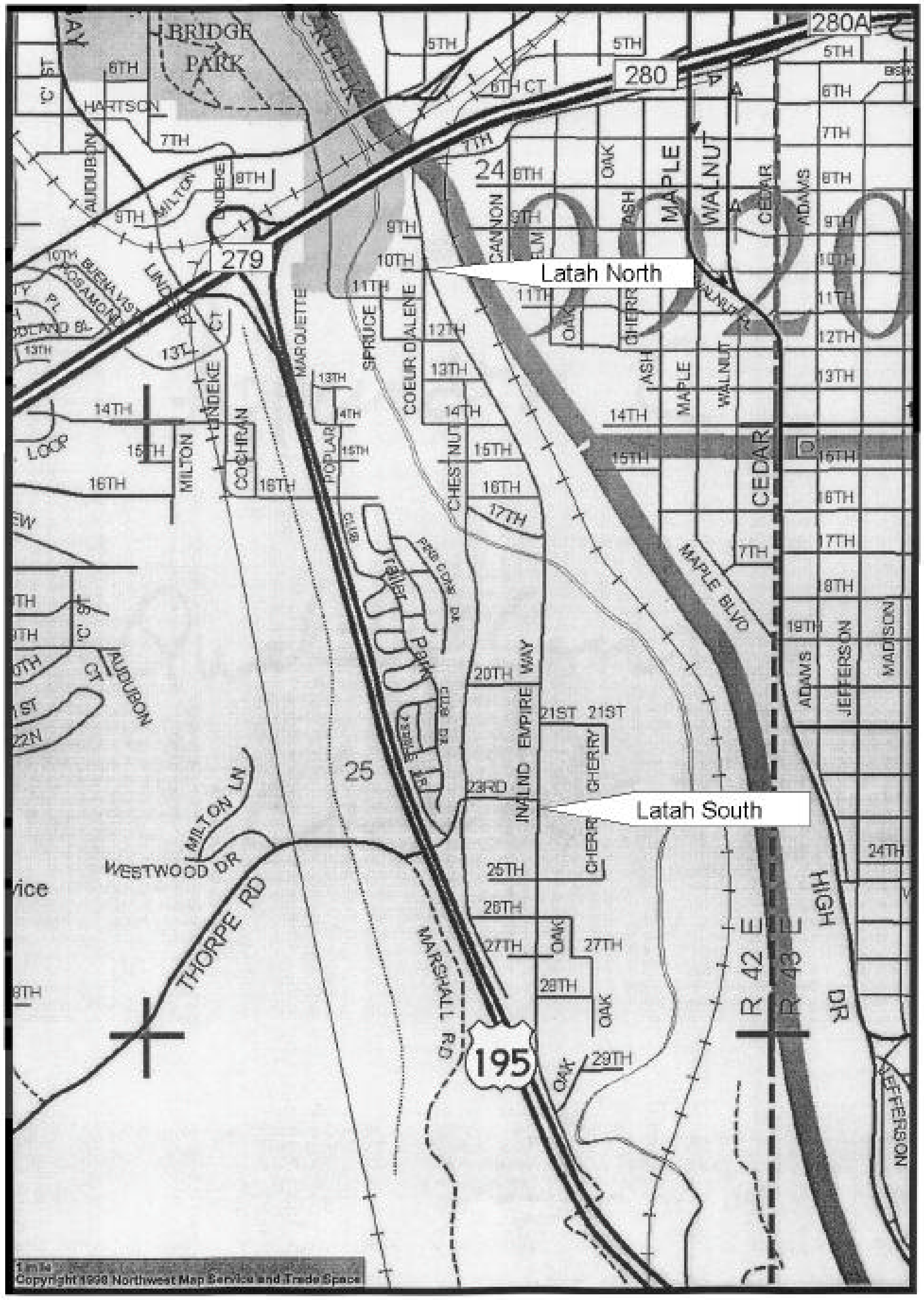


Figure 3: Ambient PM_{10} Concentrations (mg m^{-3})
Crown Z Monitoring Station Portable Sampler Precision Data
5/99 - 4/00

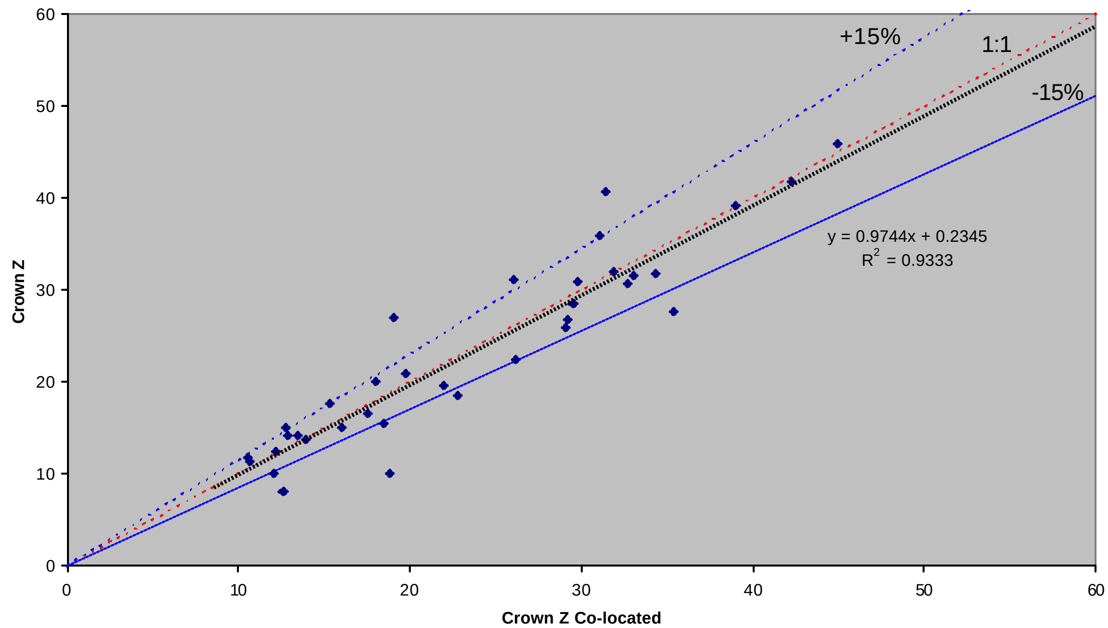
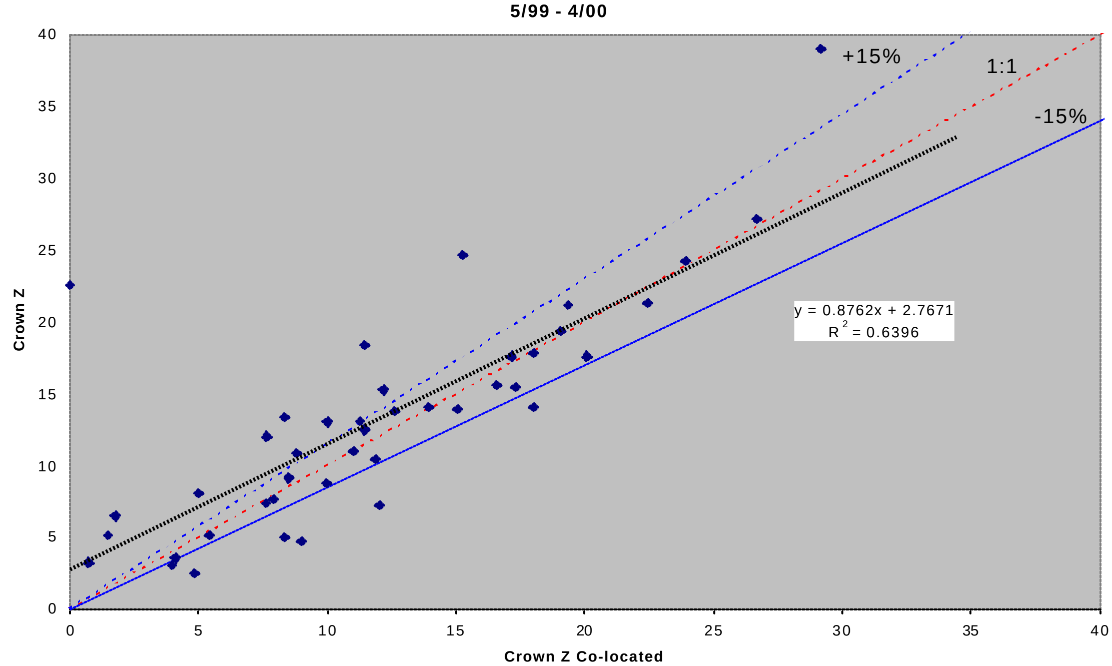
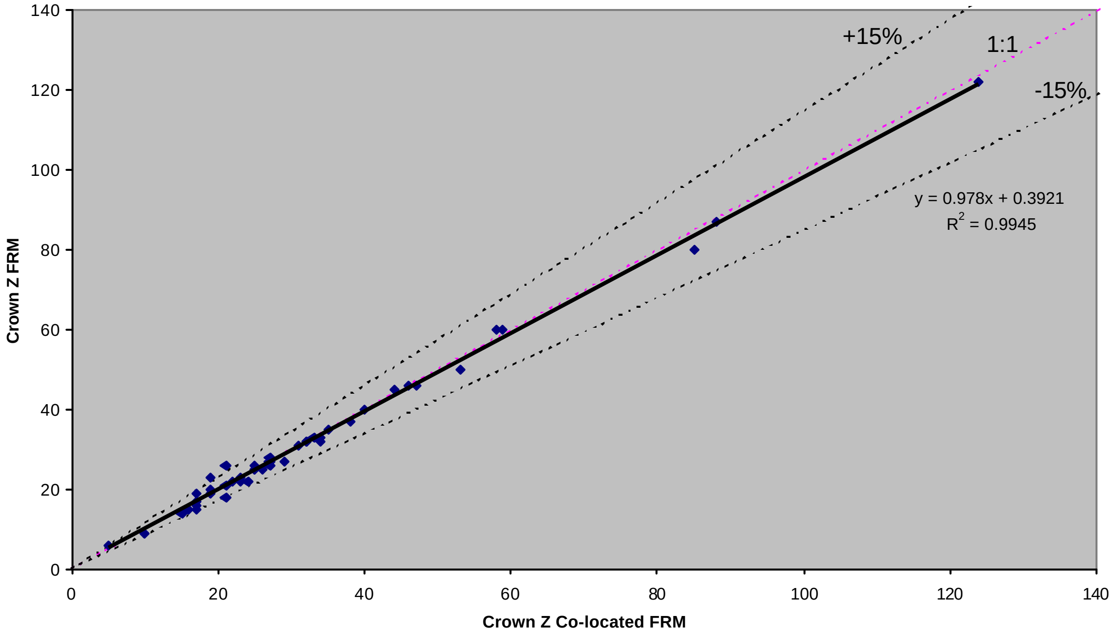


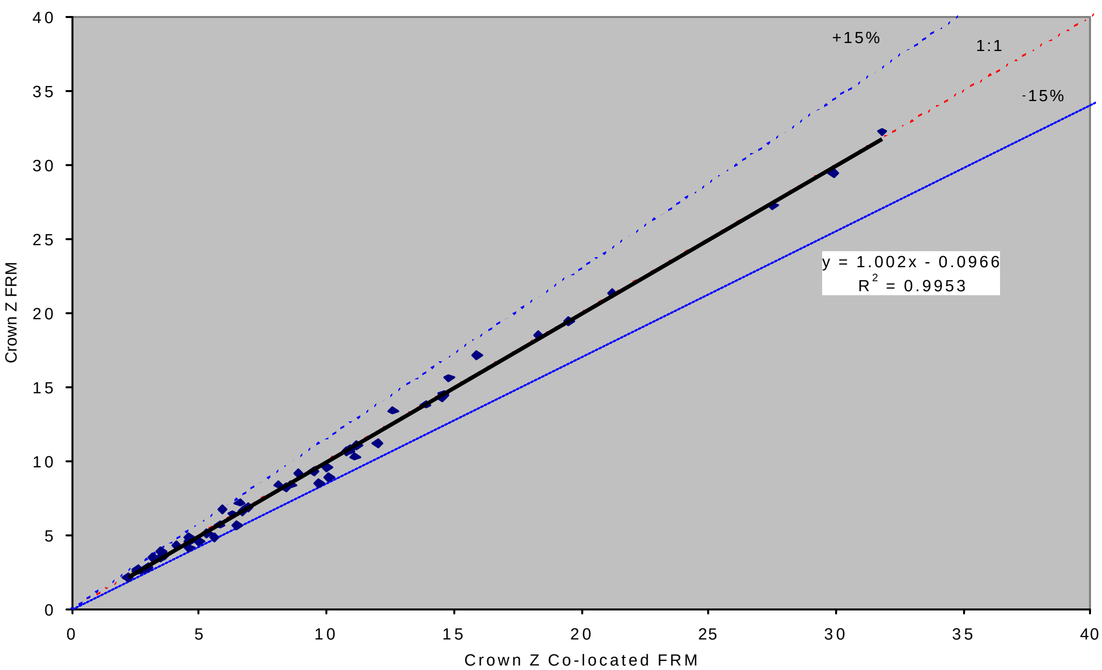
Figure 4: Spokane, Washington Ambient $PM_{2.5}$ Concentrations (mg m^{-3})
Crown Z Monitoring Station Portable Sampler Precision Data
5/99 - 4/00



<u>Figure 5</u>: Spokane, Washington Ambient PM_{10} Concentrations (μg m^{-3})
Crown Z Monitoring Station FRM Precision Data
5/99 - 4/00



<u>Figure 6</u>: Spokane, Washington Ambient PM2.5 Concentrations (μg m-3)
Crown Z Monitoring Station FRM Precision Data
5/99 - 4/00



~~Figure 7~~: Spokane, Washington Ambient PM10 Concentrations (mg m-3)
Crown Z Monitoring Station Accuracy Data
5/99 - 4/00

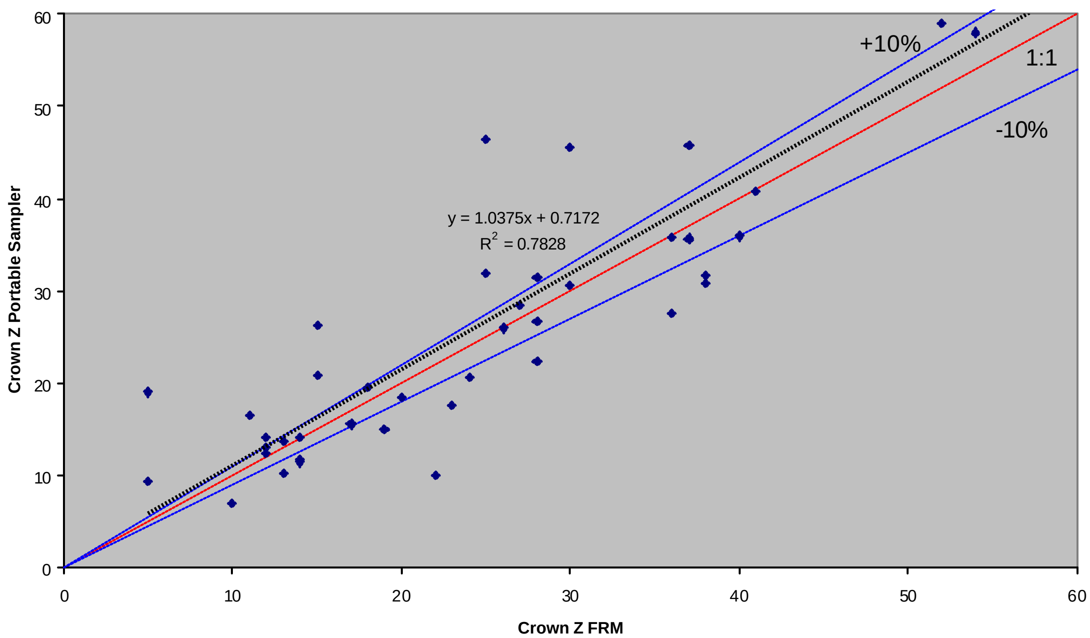
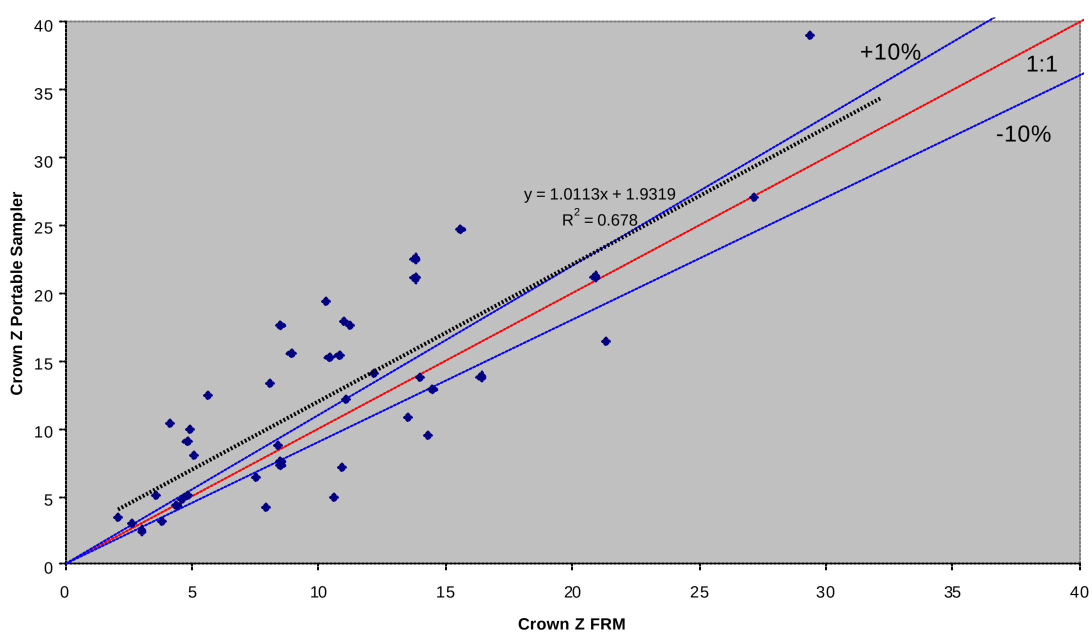
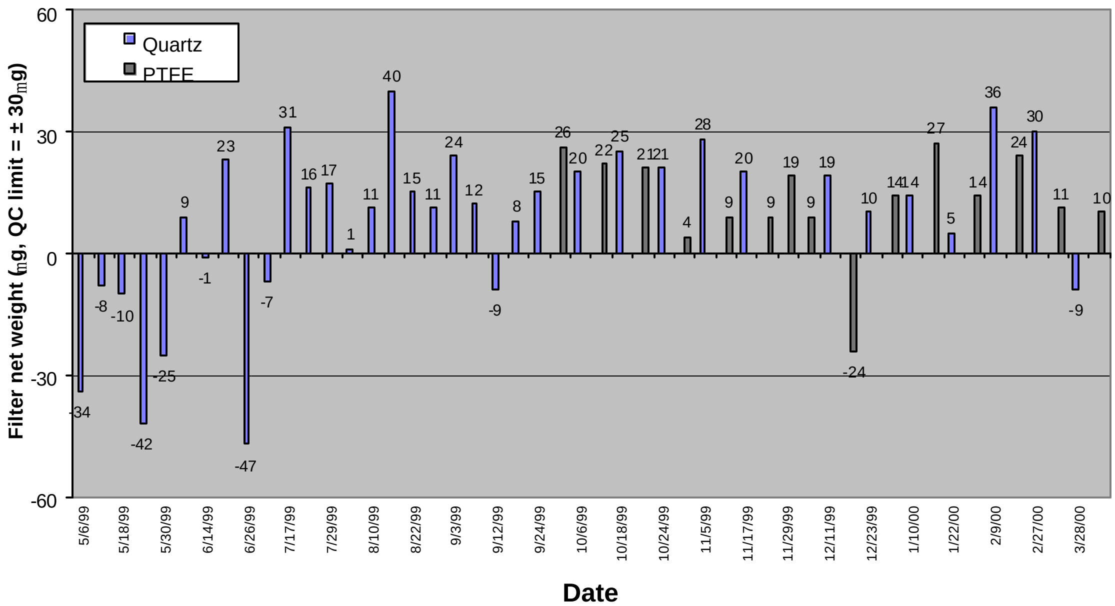


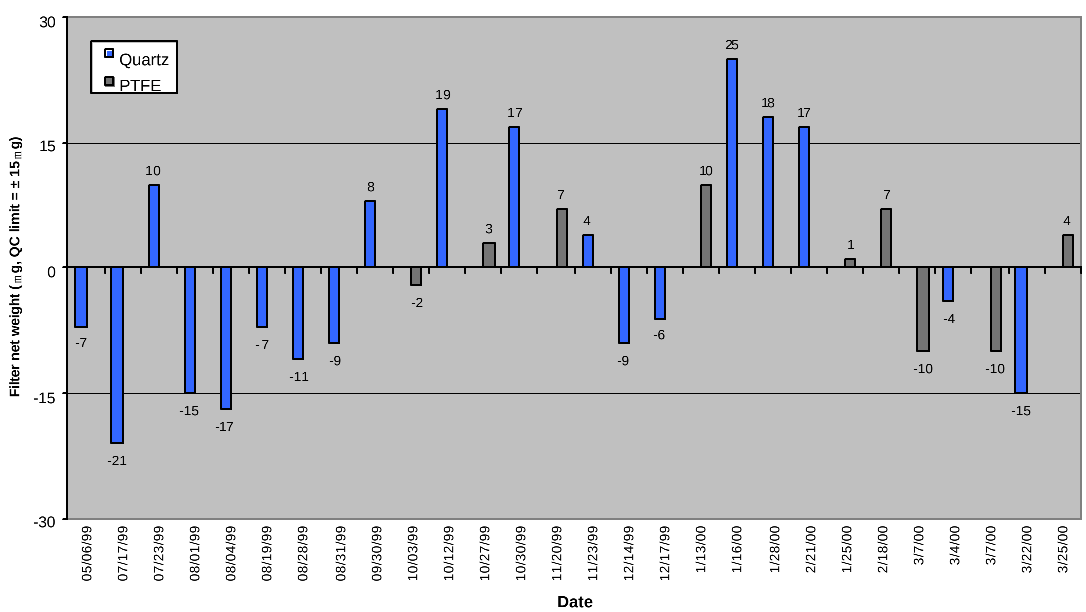
Figure 8: Spokane, Washington Ambient PM2.5 Concentrations (mg m-3)
Crown Z Monitoring Station Accuracy Data
5/99 - 4/00



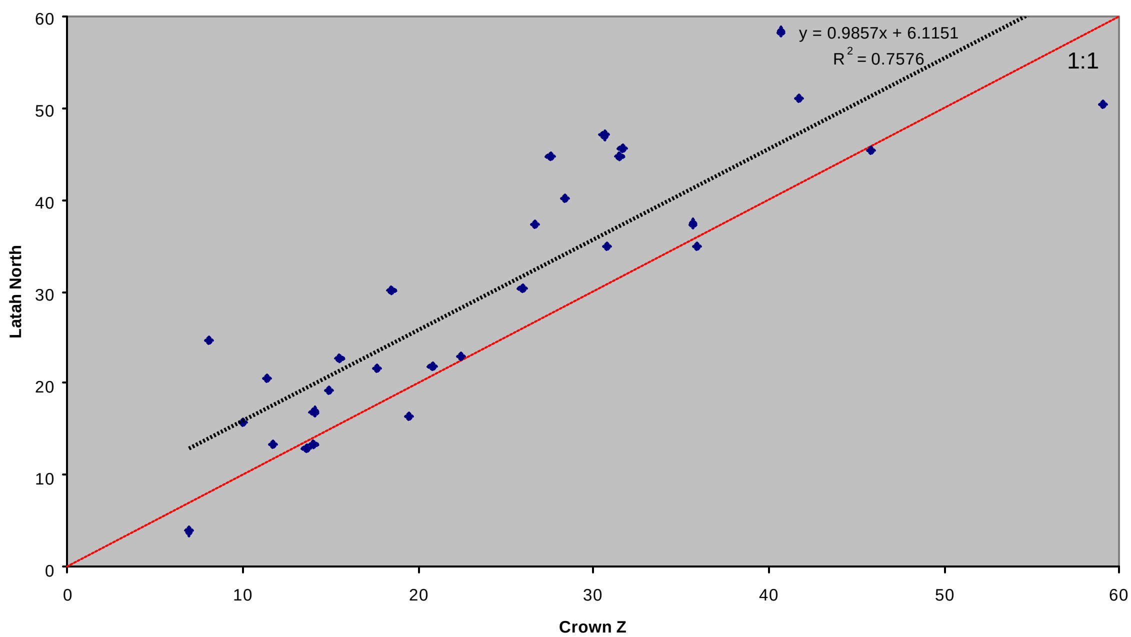
~~Figure 9~~: 1999-2000 Latah Creek Neighborhood Air Pollution Study
QC Field Blanks



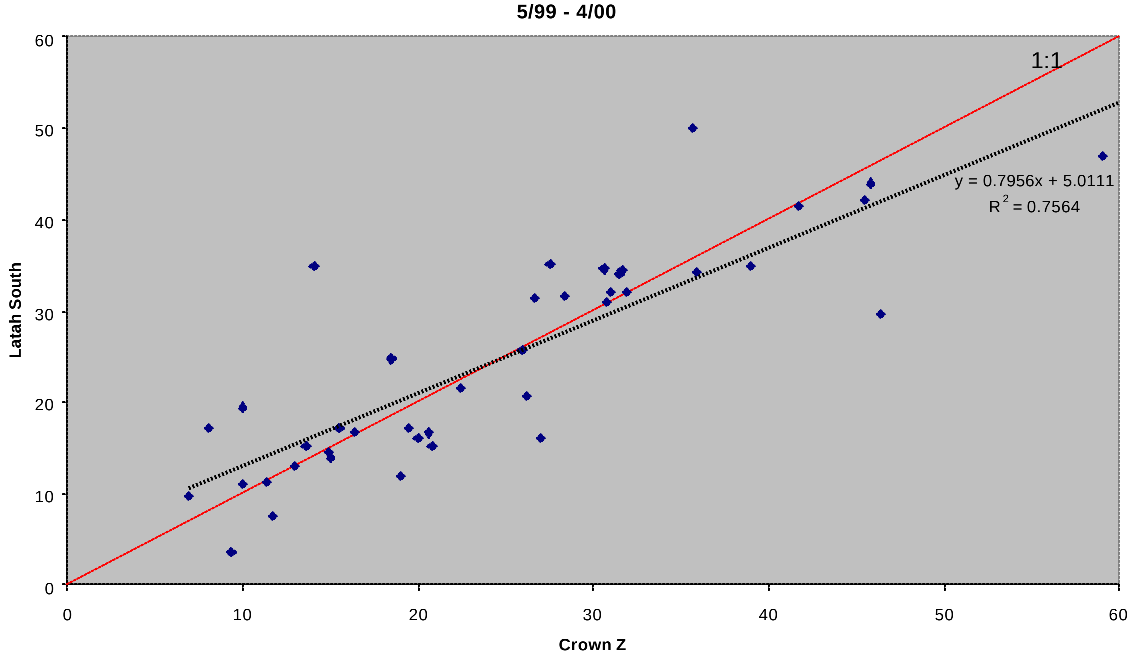
~~Figure 10~~: 1999-2000 Latah Creek Neighborhood Air Pollution Study
QC Laboratory Blanks



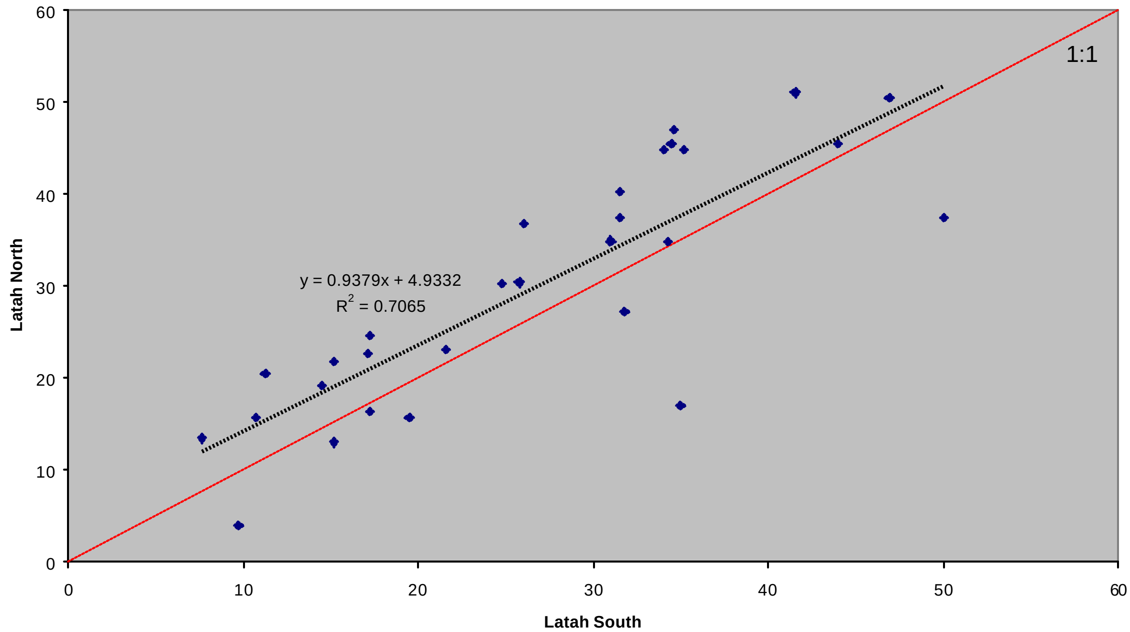
~~Figure 11~~: Spokane, Washington Ambient PM_{10} Concentrations ($\mu g\ m^{-3}$)
Latah Creek Neighborhood vs. Crown Z Monitoring Station
5/99 - 11/99



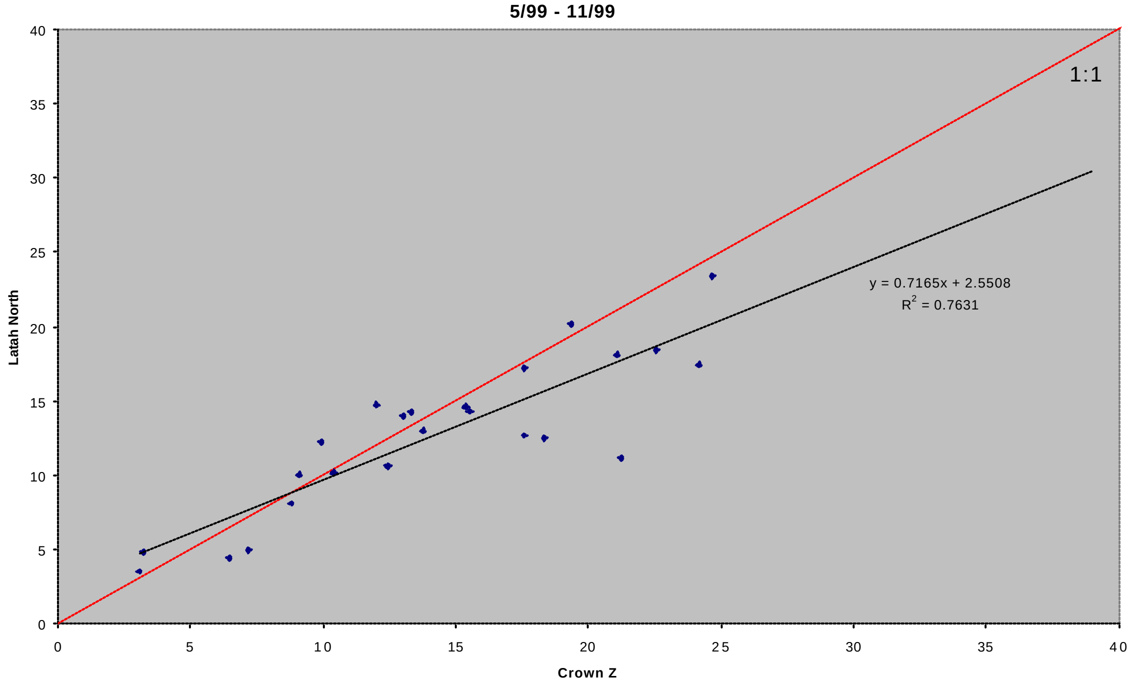
~~Figure 12~~: Spokane, Washington Ambient PM_{10} Concentrations ($\mu g\ m^{-3}$)
Latah Creek Neighborhood vs. Crown Z Monitoring Station
5/99 - 4/00



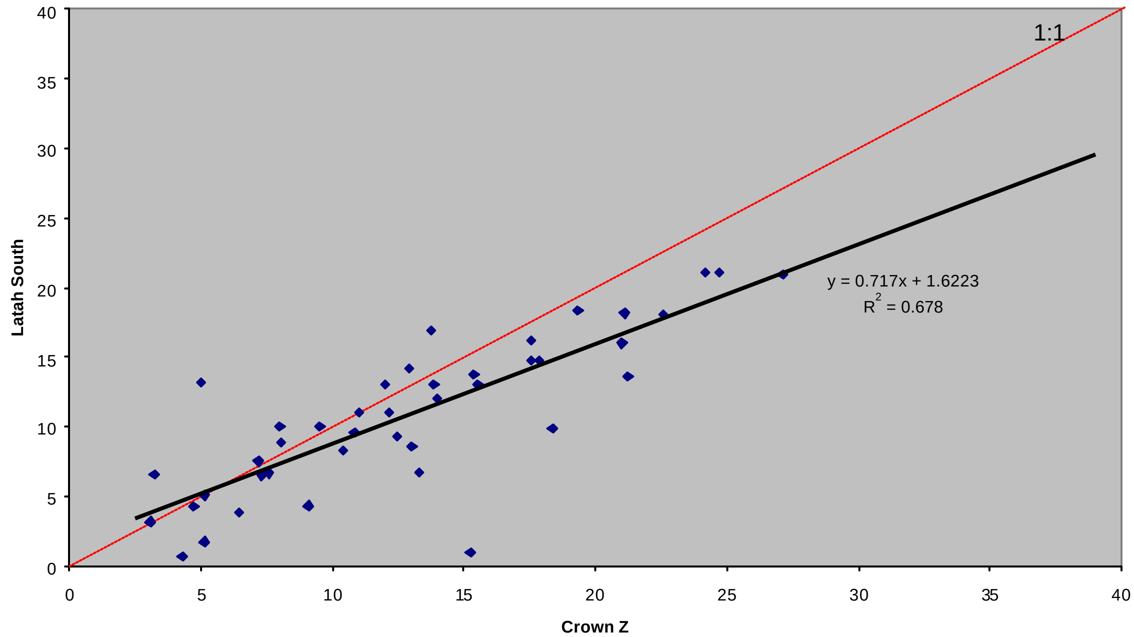
~~Figure 13~~: Spokane, Washington Ambient PM_{10} Concentrations (µg m^{-3})
Latah N v. Latah S PM10
5/99 - 11/99



~~Figure 14~~: Spokane, Washington Ambient $PM_{2.5}$ Concentrations (µg m^{-3})
Latah Creek Neighborhood vs. Crown Z Monitoring Station
5/99 - 11/99



~~Figure 15~~: Spokane, Washington Ambient $PM_{2.5}$ Concentrations (µg m^{-3})
Latah Creek Neighborhood vs. Crown Z Monitoring Station
5/99 - 4/00



~~Figure 16~~: Spokane, Washington Ambient $PM_{2.5}$ Concentrations (µg m^{-3})
Latah N v. Latah S PM2.5
5/99 - 11/99

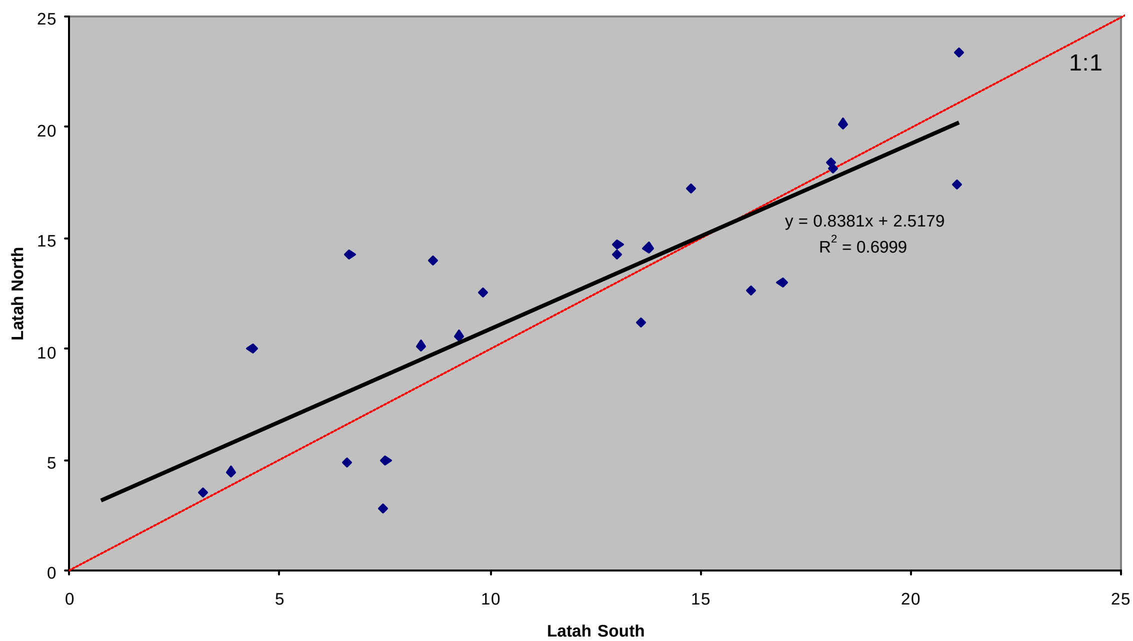


Table 1: Quality control limits for all air monitoring, meteorological and analytical instruments with corrective actions.

Activity	QC Frequency	Methodology/ Performance Limit	Suggested Action
Portable Sampler Precision	Each sampling period	Co-located samplers (±15%)	Flag data, perform flow audit, explain of resolve source of error
Portable sampler Accuracy	Each sampling period	Collocate w/Hi-Vols at Rockwood site ±10% Difference in measured mass	Flag data, explain or resolve source of error
Portable sampler leak check	each sampling period	occlude air flow at inlet rotameter drops(0.0 l min $^{-1}$)	inspect and repair, re-calibrate
Portable sampler timer and elapsed time meter	each sampling period	± 30 minutes	reset or replace
Hi-Vol precision	weekly	Collocated samplers For PM_{10} mass < 80 μg m^{-3}, ± 5 μg m^{-3} For PM_{10} mass > 80 μg m^{-3}, ± 7 % Lower limit of evaluation = 20 μg m^{-3}	Flag data , explain or resolve source of error
Hi-Vol accuracy	monthly	Single point flow check with transfer orifice (± 10%)	Re-calibrate
Hi-Vol timer and elapsed time meter	each sampling period	± 30 minutes	Reset or replace
Filter integrity inspection 8"x 10" and 47 mm diameter	All	No tears, creases, or holes	discard
Filter equilibration 8"x 10" and 47 mm diameter	Prior to weighing	Temperature = 22 °C (± 3 °C) Relative Humidity = 42% (± 5%)	Adjust chamber controls, re-equilibrate
Filter weighing, clean 8"x 10" and 47 mm diameter	Re-weigh every filter	± 15 μg	Repeat
Filter weighing, loaded 8"x 10" and 47 mm diameter	Re-weigh 10%	± 20 μg	Repeat
Sartorius balance - Precision Model AC121S (For weighing 8"x 10" filters)	Every 5 filters	Re-zero	Re-calibrate, repeat
Sartorius balance - Accuracy Model AC121S (For weighing 8"x 10" filters)	Every 15 filters	Compare to NIST Class S Standard (± 0.5 mg)	Re-calibrate, repeat
Sartorius balance - Precision Model M5P-000V001 (For weighing 47 mm diameter filters)	Each filter	Re-zero	Re-calibrate, repeat
Sartorius balance - Accuracy Model M5P-000V001 (For weighing 47 mm diameter filters)	Every 15 filters	Compare to NIST Class S Standard (± 1.0 μg)	Re-calibrate, repeat

Table 2: This table summarizes PM_{10} and $PM_{2.5}$ data for the 1999-2000 Latah Creek Neighborhood Air Quality Study. Error code definitions are as follows: CA - instrument calibration, ID - invalid data (negatives, zeros, or extremely large values), MF - sampler malfunction, NA - no attempt, ND - no data, OE - operator error, and SR -station removed.

PM_{10}

Date	Crown Z	Latah North	Latah N vs. Crown Z % Diff.	Latah South	Latah S vs. Crown Z % Diff.	Crown Z Co-located	Precision % Diff.	Crown Z FRM	Accuracy % Diff.
Maximum	*66*	*58*	-12	*55*	-17	*68*	3	*59*	-11
Minimum	*7*	*4*	-44	*4*	-48	*9*	22	*5*	-28
Average	*27*	*30*	12	*25*	-6	*25*	-8	*25*	-6
05/06/99	**MF**	16	----	11	----	14	----	27	----
05/12/99	**18**	22	23	MF	----	15	-13	23	31
05/18/99	**7**	4	-44	10	40	OE	----	10	44
5/24/99	**MF**	27	----	32	----	31	----	36	----
5/30/99	**11**	20	79	11	-1	11	-6	14	23
6/5/99	**10**	16	58	19	95	19	89	22	----
6/11/99	**15**	19	28	14	-3	13	-15	19	27
6/17/99	**27**	37	40	31	18	29	10	28	5
6/23/99	**8**	25	206	17	115	13	56	ND	----
6/29/99	**12**	13	14	8	-35	11	-10	14	20
7/5/99	**16**	23	46	17	10	18	19	17	9
7/14/99	**41**	58	43	NA	----	31	-23	41	1
7/20/99	**28**	45	63	35	28	35	28	36	31
7/26/99	**32**	46	44	34	9	34	8	38	20
8/1/99	**19**	30	63	25	34	23	23	20	8
8/7/99	**19**	16	-16	17	-12	22	13	18	-8
8/13/99	**26**	30	17	26	-1	29	12	26	0
8/19/99	**28**	40	41	32	11	29	4	27	-5
8/25/99	**31**	35	13	31	1	30	-3	38	24
8/31/99	**12**	MF	----	MF	----	12	-1	12	-2
9/6/99	**22**	23	3	22	-4	26	16	28	25
9/12/99	**31**	47	54	35	13	33	7	30	-2
9/18/99	**42**	51	22	42	-1	42	1	OE	----
9/24/99	**36**	37	5	50	40	MF	----	37	4
9/30/99	**59**	50	-15	47	-21	MF	----	52	-12
10/6/99	**46**	45	-1	44	-4	45	-2	37	-19
10/12/99	**MF**	37	----	26	----	28	----	24	----
10/18/99	**65**	MF	----	MF	----	68	6	59	-9
10/24/99	**31**	45	42	34	8	33	5	28	-11
10/30/99	**14**	17	20	35	149	13	-8	14	0
11/5/99	**36**	35	-3	34	-4	31	-13	40	11
11/11/99	**21**	22	5	15	-27	20	-5	15	-28
11/17/99	**14**	13	-5	15	12	14	2	13	-5
11/23/99	**14**	13	-5	MF	----	13	-4	12	-15
11/29/99	**MF**	SR	----	MF	----	22	----	26	----
12/5/99	**10**	SR	----	MF	----	MF	----	13	27
12/11/99	**MF**	SR	----	MF	----	9	----	7	----
12/17/99	**36**	SR	----	MF	----	MF	----	36	1
12/23/99	**58**	SR	----	MF	----	MF	----	54	-7
12/29/99	**26**	SR	----	21	-21	MF	----	15	-43
1/4/00	**9**	SR	----	4	-61	NA	----	5	-47
1/10/00	**21**	SR	----	17	-19	NA	----	24	16
1/16/00	**19**	SR	----	12	-37	NA	----	5	-74
1/22/00	**13**	SR	----	13	0	NA	----	12	-8
1/28/00	**32**	SR	----	MF	----	NA	----	MF	----
2/3/00	**46**	SR	----	42	-7	NA	----	30	-34
2/9/00	**66**	SR	----	55	-17	66	0	44	-34
2/15/00	**46**	SR	----	30	-36	MF	----	25	-46
2/21/00	**32**	SR	----	32	0	32	0	25	-22
2/27/00	**16**	SR	----	17	2	18	7	11	-33
3/4/00	**10**	SR	----	11	10	12	23	10	5
3/10/00	**31**	SR	----	32	3	26	-17	38	23
3/16/00	**15**	SR	----	14	-7	16	5	14	-8
3/22/00	**27**	SR	----	16	-41	19	-30	22	-20
3/28/00	**20**	SR	----	16	-20	18	-11	16	-19
4/3/00	**39**	SR	----	35	-10	18	-54	37	-5

$PM_{2.5}$

Date	Crown Z	Latah North	Latah N vs. Crown Z % Diff.	Latah South	Latah S vs. Crown Z % Diff.	Crown Z Co-located	Precision % Diff.	Crown Z FRM	Accuracy % Diff.
Maximum	***39***	*23*	-40	*21*	-46	*34*	-12	*32*	-17
Minimum	***2***	*3*	14	*1*	-71	*1*	-71	*2*	-16
Average	***13***	*12*	-4	*11*	-13	*13*	0	*11*	-17
05/09/99	**4**	MF	----	MF	----	MF	----	7.9	87
05/15/99	**4**	MF	----	1	-83	ID	----	4.4	3
05/21/99	**13**	14	7	9	-34	11	-13	OE	----
5/27/99	**13**	14	7	7	-50	8	-37	8.1	-39
6/2/99	**6**	4	-31	4	-40	2	-73	7.5	16
6/8/99	**5**	ID	----	2	-66	1	-71	3.6	-30
6/14/99	**24**	17	-28	21	-13	24	-1	MF	----
6/20/99	**10**	10	-2	8	-20	12	14	4.1	-61
6/26/99	**ID**	3	----	7	----	6	----	2.7	----
7/2/99	**3**	5	51	7	104	1	-77	3.8	18
7/11/99	**21**	18	-14	18	-14	19	-8	14	-35
7/17/99	**10**	12	23	MF	----	OE	----	4.9	-51
7/23/99	**12**	15	23	13	8	8	-37	OE	----
7/29/99	**18**	13	-32	10	-46	11	-38	CA	----
8/4/99	**18**	17	-2	15	-16	17	-2	8.5	-52
8/10/99	**18**	13	-28	16	-8	20	14	11	-36
8/16/99	**9**	10	10	4	-52	9	-6	4.8	-47
8/22/99	**12**	11	-15	9	-25	11	-8	5.6	-55
8/28/99	**19**	20	4	18	-5	19	-1	10	-47
9/3/99	**16**	14	-8	13	-16	17	7	8.9	-43
9/9/99	**15**	15	-5	14	-11	17	13	11	-30
9/15/99	**23**	18	-18	18	-20	24	5	14	-39
9/21/99	**25**	23	-5	21	-14	15	-38	16	-37
9/27/99	**9**	8	-8	MF	----	10	13	8.4	-4
10/3/99	**14**	MF	----	MF	----	14	-1	12	-13
10/9/99	**5**	MF	----	14	172	5	6	4.8	-6
10/15/99	**15**	ID		5	-64	12	-20	10	-32
10/21/99	**39**	MF	----	MF	----	29	-25	29	-25
10/27/99	**14**	13	-6	17	23	13	-8	14	2
11/2/99	**27**	MF	----	21	-23	27	-2	27	0
11/8/99	**7**	5	-30	8	5	12	67	11	52
11/14/99	**21**	11	-47	14	-36	22	6	21	-2
11/20/99	**3**	4	15	3	4	4	29	2.6	-15
11/26/99	**8**	SR	----	7	-13	8	4	8.5	12
12/2/99	**4**	SR	----	MF	----	4	17	2.1	-40
12/8/99	**7**	SR	----	7	-11	8	4	8.5	16
12/14/99	**2**	SR	----	MF	----	5	94	3	21
12/20/99	**11**	SR	----	10	-12	9	-19	14	25
12/26/99	**14**	SR	----	13	-6	15	9	16	18
1/1/00	**NA**	SR	----	NA	----	NA	----	8.4	----
1/7/00	**5**	SR	----	4	-9	9	90	4.6	-3
1/13/00	**8**	SR	----	9	10	NA	----	5.1	-37
1/19/00	**16**	SR	----	MF	----	NA	----	21	30
1/25/00	**12**	SR	----	11	-10	NA	----	11	-9
1/31/00	**10**	SR	----	10	5	NA	----	14	50
2/6/00	**13**	SR	----	14	10	NA	----	15	13
2/12/00	**5**	SR	----	13	164	8	68	11	113
2/18/00	**ID**	SR	----	ID	----	34	----	32	----
2/24/00	**18**	SR	----	15	-17	18	1	11	-38
3/1/00	**11**	SR	----	11	0	11	0	5.7	-48
3/7/00	**21**	SR	----	16	-23	MF	----	19	-8
3/13/00	**8**	SR	----	10	21	5	-38	14	80
3/19/00	**11**	SR	----	MF	----	11	0	4.3	-61
3/25/00	**13**	SR	----	MF	----	10	-23	8.2	-37
3/31/00	**14**	SR	----	12	-16	18	29	9.6	-31