2008 Annual Air Monitoring Report for Wheelabrator North Andover, Inc. (WNA)

Town of North Andover, Massachusetts

June 2009

tech environmental
FOCUSED KNOWLEDGE. REAL SOLUTIONS.

2008 ANNUAL
AIR MONITORING REPORT FOR
WHEELABRATOR NORTH ANDOVER, INC. (WNA)

Submitted to:

Health Department
Town of North Andover
1600 Osgood Street
North Andover, MA 01845

Prepared by:

Tech Environmental, Inc.
303 Wyman Street, Suite 295
Waltham, MA 02451
(781) 890-2220

June 2009

TABLE OF CONTENTS

No.	Section	Page
1.0	INTRODUCTION	1
2.0	FACILITY DESCRIPTION	2
2.1	Waste to Energy Plants	2
2.2	Emissions and Emissions Control	3
3.0	MONTHLY-BASED MONITORING	6
3.1	Introduction to the CEMS	6
3.2	Check of Monitored Parameters for 2008	8
4.0	QUARTERLY-BASED MONITORING	13
4.1	Witness Quarterly Testing	13
4.2	Review Reports	16
4.3	Review On-Site Records	17
4.4	Dispersion Modeling Review	18
5.0	ANNUALLY-BASED MONITORING AND REPORTING	37
5.1	MassDEP File Review	37
5.2	Material Separation Plan for the Diversion of Mercury	38
5.3	General Facility Review	39
6.0	CONCLUSIONS	40

LIST OF TABLES

No.	Table	Page
3-1	Monthly CEMS/Emissions Review for 2008	12
4-1	Emissions Limits	24
4-2	Modeled Stack Parameters (7/08)	25
4-3	Maximum ISCST3 Ambient Concentrations (7/08)	26
4-4	Toxics Modeling Results (7/08)	27
4-5	Criteria Pollutant Modeling Results (7/08)	28

LIST OF FIGURES

No.	Figure	Page
4-1	Mercury	29
4-2	Post-Retrofit Mercury	30
4-3	Dioxins/Furans	31
4-4	Post-Retrofit Dioxins/Furans	32
4-5	Cadmium	33
4-6	Lead	34
4-7	Hydrogen Chloride	35
4-8	Ammonia	36

1.0 INTRODUCTION

As part of an ongoing program for the North Andover Board of Health (BOH), Tech Environmental (Tech) has developed and implemented a plan to monitor and evaluate various aspects of the Wheelabrator North Andover Inc. (WNA) facility and its operations. This monitoring plan includes the preparation of an annual report to describe the results and conclusions of the program to Town officials and the general public. This seventh annual report presents the results of the monitoring program for calendar year 2008.

Section 2 contains a description of the facility. Section 3 contains the results of the review, on a monthly basis, of WNA's Continuous Emissions Monitoring Systems (CEMS) data to compare facility emissions to permit limits. Section 4 describes quarterly monitoring of stack testing and compliance testing reports. Section 5 describes the annual monitoring results, with particular emphasis on a review of the WNA files conducted at the Massachusetts Department of Environmental Protection (MassDEP) North East Regional Office (NERO). Section 6 presents our conclusions regarding facility compliance.

2.0 FACILITY DESCRIPTION

The Wheelabrator North Andover Inc. (WNA) facility is located on approximately 15 acres of land off of Route 125 on Holt Road in North Andover. The facility includes two municipal waste combustors (MWCs) outfitted with air pollution control equipment. Each combustor has the capacity to burn up to 750 tons per day of municipal solid waste (MSW) from northeastern Massachusetts. In addition to the ability to reduce the volume of MSW through combustion, the facility can generate 40 megawatts of electricity in its capacity as a waste-to-energy (WTE) plant.

Wheelabrator North Andover Facility

2.1 Waste to Energy Plants

WTE plants have the potential to produce significant amounts of air pollution. However, WTE facilities produce less pollution than most existing fossil fuel power plants in the United States. This is due in part to stringent air pollution control standards for large units at municipal waste combustion facilities, introduced by the United States Environmental Protection Agency (EPA) as part of the 1990 Clean Air Act mandates.[1] EPA adopted Emission Guidelines for existing MWCs,[2] which were later promulgated by Massachusetts.[3] To comply with the EPA's tougher

[1] Regulations/standards for WTE facilities were required to be promulgated under the 1990 Clean Air Act Amendments, Sections 111(d) and 129.

[2] EPA's Emission Guidelines, which apply to WNA, are in 40 CFR 60, Subpart Cb. At the same time, EPA also promulgated New Source Performance Standards (NSPS), which apply to new facilities. Both apply to large MWC units, which combust greater than 250 tons per day of MSW.

[3] Massachusetts rules for MWCs are in 310 CMR 7.08(2); the new air pollution control equipment modifications were required to be completed by November 19, 2000 and compliance was required by December, 19, 2000, according to 310 CMR 7.08(2)(k)(1).

standards, the WNA facility underwent major renovations beginning in the spring of 1999 to add additional air pollution control systems. These systems became operational in the fall of 2000. The air pollution control systems added to the WNA facility greatly reduce the emissions of gaseous and solid pollutants, such as carbon monoxide, nitrogen oxides, sulfur dioxide, hydrogen chloride, metals (such as mercury), organic pollutants (such as dioxins/furans) and particulate matter (or soot). However, careful monitoring of operations and controls is critical, given these complex new air pollution controls.

At WNA and other WTE facilities, waste is used as a fuel to generate electricity and/or produce steam. WTE plants are generally considered to be a form of renewable energy, because the fuel these plants use is both sustainable and indigenous; WTE plants convert waste into useful energy forms.[4] In addition to producing energy, WTE facilities can help to reduce pollution: in 1993, Los Angeles District Sanitation Department officials concluded that less pollution was created by their local WTE facility than by the trucks which would have been used to take the waste to a nearby landfill.[5] The Massachusetts DEP has estimated that combustion of waste reduces the material being disposed of by 90% (by volume) or by 75% (by weight), so less waste is buried in landfills as a result.[6]

2.2 Emissions and Emissions Control

Carbon monoxide (CO) emissions are generated as a product of incomplete combustion. Emissions of CO are typically reduced by combustion controls: for example, the maintenance of proper air/fuel mixing and proper excess air levels. The WNA facility reduces emissions of CO by attempting to achieve complete combustion; no additional control technology is used for this pollutant.

The WNA facility also utilizes combustion control to control emissions of nitrogen oxides[7] (NO_x). A post-combustion control technology known as Selective Non-Catalytic Reduction (SNCR) is also employed at WNA. Reducing NO_x emissions is important because NO_x reacts with volatile organic

[4] Department of Energy's National Renewable Energy Laboratory
[5] Waste-to-Energy Industry fact sheet, Integrated Waste Services Association, August 14, 2000.
[6] http://www.mass.gov/dep/recycle/solid/mwcabout.htm
[7] Nitrogen oxides, abbreviated as "NO_x", are a mixture of nitrogen oxide (NO) and nitrogen dioxide (NO_2).

compounds (VOCs) in the atmosphere to produce ozone (smog). The SNCR system reduces NO_x through the controlled injection of urea into the exhaust gases of the unit. The urea reacts selectively in the presence of oxygen to reduce the NO_x to harmless molecular nitrogen (N_2) and water (H_20). This equation shows the reduction of nitrogen oxide (NO):

$$CO(NH_2)_2 + 2NO + ½\ O_2 \rightarrow 2N_2 + CO_2 + 2H_20$$

Urea + Nitrogen Oxide + Oxygen → Nitrogen + Carbon Dioxide + Water

Emissions of sulfur dioxide (SO_2) and hydrogen chloride (HCl) are acidic and are sometimes referred to as "acid gases". The air pollution control equipment for these acid gases, called a spray dryer absorber or a scrubber, introduces a wet solution of lime into the exhaust stream. Lime is chemically basic and serves to neutralize the acidic SO_2 and HCl in much the same way that lime is used in gardens to neutralize acidic soil. The scrubber system also helps to control mercury present in the exhaust.

Mercury is further captured by a powdered activated carbon injection system (PACIS) at WNA that blows charcoal (carbon) into the exhaust stream to adsorb mercury; the charcoal/mercury is then removed with other solid pollutants (including particulate matter) by a fabric filter. The PACIS also helps to reduce organic pollutants such as dioxins/furans. The level of control achieved for these compounds is impressive when you consider that a four person family burning trash in their backyard could potentially emit as much dioxins/furans as a well-controlled municipal waste incinerator serving tens of thousands of households.[8,9]

The fabric filter (or "baghouse") removes solid pollutants such as particulate matter, lime salts, activated charcoal (with adsorbed mercury), and metals. The baghouse works like a vacuum cleaner equipped with hundreds of fabric filter bags to capture solid particles in the hot flue gases (often called "fly ash"). The bags are cleaned by bursts of compressed air that dislodge any

[8] Lemieux, Paul M., Abbott, Judith A., and Aldous, Kenneth M. "Emissions of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans from the Open Burning of Household Waste in Barrels", *Environmental Science & Technology*, Web Release Date: January 4, 2000.

[9] Gullett, Brian K., Lemieux, Paul M., Lutes, Christopher C., Winterrowd, Chris K., and Winters, Dwain L. "PCDD/F Emissions from Uncontrolled, Domestic Waste Burning", *Organohalogen Compounds*, Volume 41: 27-30, 1999.

deposits, which are then collected into a collection hopper. Ash is then removed from the hoppers for off-site disposal.

The current emissions limits set by EPA regulations are much more stringent than those in place before WNA's air pollution control system retrofits were completed in 1999-2000, as is reflected by the charts of emissions testing data shown in Section 4. The Massachusetts DEP has adopted the federal emission limits for most pollutants, with the exception of mercury, for which MassDEP has imposed a more stringent limit than the federal emission limit.[10] MassDEP has imposed the federal mercury limit of 0.080 milligrams per dry standard cubic meter (mg/dscm) for any single test. However, MassDEP imposed a more stringent requirement for the four-quarter average, lowering the emission limit for mercury to 0.028 mg/dscm.

The Massachusetts DEP has also imposed limits on WNA that are more stringent than the state regulations for incinerators (CMR 7.08). MassDEP has imposed a more stringent requirement on WNA for cadmium emissions, lowering the limit from the state/federal limit of 0.040 mg/dscm to 0.020 mg/dscm. MassDEP has also reduced the emission limit for CO from 100 parts per million by volume on a dry basis (ppmvd) (corrected to 7% oxygen) to 69 ppmv @ 7% O_2.[11]

[10] CMR 7.08(2)(g)(2)

[11] Since emissions in parts per million (ppm) represent concentrations, the concentration will vary depending on the oxygen content of the stack gas. To avoid confusion when reporting emissions in ppm, the emissions are standardized by specifying that the limit is corrected to a specific oxygen content, such as 3% or 7% O_2. Without this correction, the stack gases could be diluted with extra air to reduce the concentration.

3.0 MONTHLY-BASED MONITORING

The Wheelabrator North Andover Inc. (WNA) facility's Continuous Emissions Monitoring Systems (CEMS) are used to monitor and record emissions of pollutants such as nitrogen oxides (NO_x), sulfur dioxide (SO_2), and carbon monoxide (CO) emissions, exhaust gas opacity, and facility and air pollution control system operating parameters such as carbon feed, fabric filter inlet temperature, and steam load.[12] Charts of these data for each unit on a monthly and daily basis are available on the WNA website, fulfilling a requirement of the facility's permit from the Massachusetts DEP.[13] The facility has been displaying emissions data on their website since the spring of 2002, and data are now available on the WNA website for at least the previous six months. Tech checks the emissions data on a monthly basis on the WNA website to compare emissions to permit limits and to confirm that the facility is operating in compliance with all federal and state air quality requirements.

3.1 Introduction to the CEMS

The WNA CEMS are located at both inlet and outlet locations of the two flues, and consist of four systems. The inlet systems monitor oxygen and sulfur dioxide emissions from the two flues in the ductwork leading to the spray dryer absorber (SDA). The outlet systems monitor nitrogen oxides, carbon monoxide, carbon dioxide, oxygen and sulfur dioxide emissions from each of the two flues in the ductwork, which lead to the single stack.

WNA Flue Inlet

[12] Carbon dioxide (CO_2) and oxygen (O_2) are also monitored by the CEMS, but there are no permit limits for these compounds and data are not displayed on the website.
[13] http://www.wheelabrator-northandover.com/index.html

Although emissions are monitored "continuously", the regulations do allow for some CEMS downtime. Massachusetts' regulations[14] and WNA's permit stipulate that valid CEMS data be obtained for 75% of the operating hours per day (i.e. 18 hours/day) for 75% of the days per month (23 days/month for a 30-day month) that a municipal solid waste combustor is combusting solid waste continuously (24 hours/day) and that valid CEMS data must be obtained for 90% of the operating hours per quarter. During operational changes, when the boiler is shut down for maintenance or taken offline due to an electrical or mechanical problem, the data shown on the charts may appear to be out of compliance. As a practical matter, however, the facility is allowed time during start-up to bring the combustion process up to a stable operating condition before being required to meet emissions limits.

By continuously monitoring the emissions of NO_x, the facility is able to control the feed of urea to the combustor as part of the SNCR system briefly described in Section 2.0. The exhaust concentration limit for NO_x is 205 parts per million by volume on a dry basis (ppmvd) (corrected to 7% oxygen); as emissions approaching the limit are detected by the CEMS, more urea is fed to the SNCR system. In turn, the monitored emissions of SO_2 help determine the amount of lime necessary for the scrubbers. The exhaust concentration limit for SO_2 is 29 ppmvd (corrected to 7% oxygen) or 75% reduction (whichever is less stringent), but not both. As increased emissions are detected by the CEMS, more lime is fed to the scrubbers.

The CEMS also monitor and record opacity, or visible emissions, which is reported as a 6-minute average. Opacity is a measure of how much soot or smoke is being emitted, as measured by continuous opacity monitors which are located at the outlet of the stack, after the air pollution control equipment. The opacity levels are required to be less than 10%.

Critical operating parameters related to the operation of the air pollutant control devices and air pollutant emissions are also monitored continuously. The CEMS track and record operating parameters such as carbon feed (part of the PACIS), the inlet temperature for the fabric filter or baghouse, and steam load. The PACIS and fabric filter were described in Section 2.0. The steam load is the amount of steam which is sent to a turbine-generator to produce electricity. The

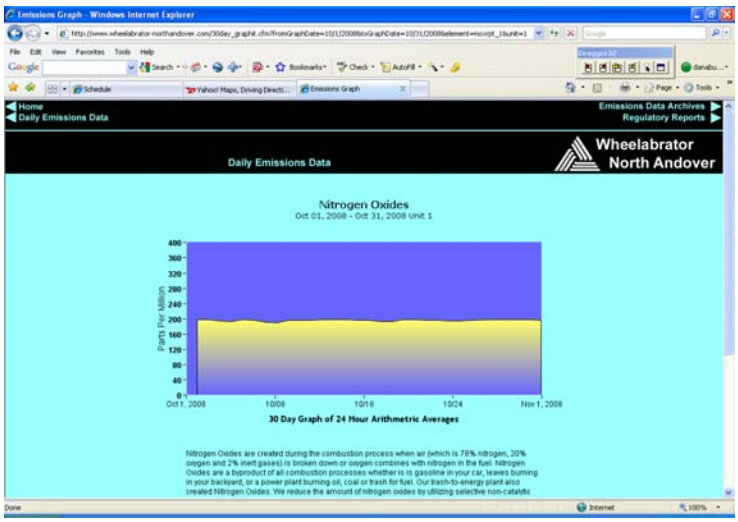
[14] 310 CMR 7.08(2)(g)5.

steam is generated by the incineration, and the turbine-generator then produces the energy in a waste-to-energy facility. The load is recorded as pounds per hour; the maximum allowable steam load is variable. According to the facility's permit, the maximum allowable steam load cannot be greater than 110% of the maximum load, as demonstrated during the most recent dioxins/furans emission test.

According to Massachusetts state regulations, WNA is required to submit semiannual and annual reports[15] that include: 1) the highest emission level recorded by the CEMS for the year; 2) the number of operating hours and days when valid data were collected and reported; 3) the dates when data were excluded, the reason for the exclusion and the corrective action taken (such as a unit being down for preventative maintenance); and 4) data regarding start-ups, shut-downs, or facility malfunctions. Quarterly emission reports are also required by federal regulations.[16] These reports include information on any excess emissions, the reason for the emissions, and a performance summary for the CEMS, which includes any downtime and an explanation. Several examples of CEMS downtime for WNA in 2008 were for Quality Assurance/Quality Control (QA / QC) calibration, analyzer adjustment or maintenance, or for an electrical grid failure.

3.2 Check of Monitored Parameters for 2008

As Table 3-1 shows, the review of the monthly emissions data from the WNA website (shown in figure at right) demonstrates that, in general, the facility was in compliance with emissions limits for NO_x (205 ppmvd, 7% O_2), SO_2 (29 ppmvd, 7% O_2), CO (69 ppmvd, 7% O_2), and opacity (10%) in 2008.



WNA Website

[15] 310 CMR 7.08(2)(i).
[16] 40 CRF 60.7

The monitored operating parameters were also generally in compliance. As has been noted, cases in which data anomalies occurred were checked to confirm that no problems occurred.

Table 3-1 shows a check next to each unit number, indicating that the pollutant or operating parameter is clearly in compliance; the shaded cells containing an "X" by at least one of the two units indicate that the data initially appear to be out of compliance, but were checked and no violation was determined to have occurred. As mentioned previously, when the facility is undergoing an operational change, such as maintenance, startup, or shutdown, the data shown on the charts may appear to be out of compliance. In these cases, the cell was flagged and the events/data were subsequently checked against daily emission data, quarterly or semi-annual emission reports, or the facility's records. Once these data anomalies were explained, the flag was changed to the letter X and a note made on the table to explain any apparent exceedance. If insufficient information was found to make this determination, or if an exceedance occurred, a flag remains on the table. This is not necessarily a problem, and could simply mean that insufficient data was found to make a determination. Even if an exceedance does occur, the facility will likely not cause an adverse impact on air quality, as demonstrated in Section 4.4.

In certain instances, such as startup or shutdown or for periodic maintenance, the facility is allowed time to bring the equipment into proper operating condition before being required to meet emissions limits. One example of a preventative maintenance procedure is testing the CEMS. This is done daily and by more rigorous methods once per quarter. The two types of quarterly tests on the CEMS are the Relative Accuracy Test Audits (RATA) and the Calibration Gas Audits (CGA). WNA has typically hired CEMServices of Norton, Massachusetts to conduct these quarterly tests.

Calibration Gas for the CEMS

The accuracy of the opacity CEMS is also checked quarterly in an "opacity audit".[17] In these tests, the opacity monitor, which measures opacity by a sensor that monitors the intensity of the projected light, is calibrated using optical filters of known opacity. During the tests, the opacity will appear to exceed the limit when the optical filter is changed or when an optical filter

[17] 40 CFR 60, Appendix B, Specification 1.

of greater than 10% opacity is placed in the path of the monitor. Readings for the facility are typically about 3%, which is generally as low as the opacity monitors can accurately measure. In general, the human eye cannot detect opacity levels that are less than 5%.

In the case of an exceedance, an apparent exceedance, or a disruption in facility operations that affects the CEMS data collection, WNA notifies Massachusetts DEP in one of the periodic reports that the facility is required to submit on a quarterly, semi-annual or annual basis. These reports were used by Tech to check and explain any apparent exceedances in the review of data on WNA's website. Tech also reviewed the facility excess emissions data available on MassDEP's website.[6]

Emissions of CO are generated as a product of combustion, and are reduced by maintaining proper air/fuel mixing and proper excess air levels. Increased CO emissions are typical during periods of startup and shutdown. Emissions of nitrogen oxides (NO_x) are also generated as the products of combustion, with the rate of NO_x and CO generation being inversely proportional and a function of the oxygen (O_2) content in the system. In general, as the concentration of O_2 increases, NO_x emissions will increase and CO emissions will decrease. Decreasing the O_2 concentration in the exhaust concentrations has the opposite effect. According to the facility's permit, emissions limits do not apply during periods of startup and shutdown, allowing time for the combustion system and CEMS to stabilize. The facility has a three-hour window to startup/shutdown the units in which the emission limits do not apply; if the emissions cannot be reduced in that window, an exceedance of CO has occurred. An exceedance of CO or NO_x should not cause residents concern about health effects (as demonstrated by the criteria pollutant modeling analysis presented in Section 4.4).

Slight exceedances of opacity, or visible emissions, are also possible when a malfunction occurs that leads to the shutdown of a unit. Most opacity "exceedances" are really the result of the analyzer being tested during an opacity audit, as explained earlier. If an exceedance over the opacity standard does occur, this should not trigger concerns about health effects from opacity, which is generally not a health hazard. Even if a link between opacity and particulate matter (PM_{10} and $PM_{2.5}$) emissions were assumed, which is rare, there would not be a health concern

from the highest opacity levels at WNA (demonstrated by the PM_{10} and $PM_{2.5}$ modeling analysis presented in Section 4.4).

As described in Section 3.1, Massachusetts' regulations and WNA's permit stipulate that valid CEMS data be obtained for 75% of the operating hours per day (i.e. 18 hours/day) for 75% of the days per month (23 days/month for a 30-day month) that a municipal solid waste combustor is combusting solid waste continuously (24 hours/day) and that valid CEMS data must be obtained for 90% of the operating hours per quarter. In 2008, sufficient data were collected for each Unit for every month and pollutant, and sufficient data were also collected for every quarter for both Units.

Table 3-1. Monthly CEMS / Emissions Review for 2008

Wheelabrator North Andover

Year	Month	Monitored Parameters						
		NO_x	SO_2	CO	Carbon Feed	Fabric filter inlet temperature	Opacity	Steam load
2008	January	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓
	February	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓
	March	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 X	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓
	April	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 X	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓
	May	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 X	1 ✓ 2 ✓	1 ✓ 2 ✓	1 X 2 X	1 ✓ 2 ✓
	June	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 X	1 ✓ 2 ✓	1 ✓ 2 ✓	1 X 2 X	1 ✓ 2 ✓
	July	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓
	August	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓
	September	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 X	1 ✓ 2 ✓	1 ✓ 2 ✓	1 X 2 X	1 ✓ 2 ✓
	October	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓
	November	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓
	December	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 ✓ 2 ✓	1 X 2 X	1 ✓ 2 ✓

Check of Unit 1 and Unit 2: 1 ✓ or 2 ✓ means that no problems/violations were found for that unit. In a shaded cell, 1 X or 2 X means that the emissions chart appeared to show a problem/violation but the event/data were checked with emission reports or with WNA and no violation was determined to have occurred, as described in more detail below. A flagged (⚑) unit contains either a potential violation that has not been explained or is an exceedance; these violations represent minor operational problems and are not necessarily exceedances.

Description of X's / shaded cells:

January: No Potential Problems

February: No Potential Problems

March: CO (Mar 6: Unit 2 spike on shutdown, exempt)

April: CO (Apr 10 & 11: Unit 2 spike on shutdown and startup, exempt)

May: CO (May 4 & 5: Unit 2 spike, possible exceedance); Opacity (May 19: Units 1 and 2, Quarterly Monitor Audit, not an exceedance)

June: CO (June 29: Unit 2 spike on startup, exempt); Opacity (June 26 - 29: Units 1 and 2, slight spikes look like potential exceedances but are not)

July: No Potential Problems

August: No Potential Problems

September: CO (Sept 27, 30: Unit 2 spike on shutdown and startup, 9/30 is exempt); Opacity (Sept 4: Units 1 and 2, Quarterly Monitor Audit, not an exceedance)

October: No Potential Problems

November: No Potential Problems

December: Opacity (Dec 12: Units 1 and 2, Quarterly Monitor Audit, not an exceedance)

4.0 QUARTERLY-BASED MONITORING

WNA has generally been required to conduct stack testing for emissions on a quarterly basis. Tech has witnessed this testing, as discussed in Section 4.1. The emissions testing reports and on-site records are regularly reviewed, as discussed in Sections 4.2 and 4.3. As part of the facility's major testing program occurring every nine months, WNA conducts an air quality analysis using dispersion modeling to assess the ambient impact of emissions using actual stack test data. The dispersion modeling review and additional modeling performed by Tech are described in Section 4.4.

4.1 Witness Quarterly Testing

WNA has generally been required to conduct stack testing for emissions on a quarterly basis, although MassDEP regulations allow for reduced testing frequency. Prior to 2004, the facility tested for mercury[18] and for dioxins/furans (generally abbreviated as PCDD/PCDF)[19] every quarter. Beginning in 2004, testing for mercury was reduced from quarterly to every nine months, as allowed by MassDEP after WNA demonstrated low mercury emissions. Quarterly testing for dioxins/furans has been required by an agreement between WNA and the North Andover Office of Community Development and Services, as will be described in more detail later in this section.

Every nine months, the quarterly testing program is expanded to include additional metals, namely cadmium[18] and lead[18]; visual emissions, namely opacity[20]; fugitive emissions[21]; ash collection[22] and analysis for dioxins/furans[23]; and particulate matter (PM)[24], hydrogen chloride (HCl)[25] and ammonia (NH_3)[25]. As part of this testing program, the stack testing firm also

[18] Using EPA Method 29
[19] Using EPA Method 23
[20] Using EPA Method 9
[21] Using EPA Method 22
[22] Collected using Arthur D. Little Method S007 (during the Method 23 dioxin/furan testing)
[23] Analyzed for dioxins/furans using EPA Method 8290
[24] Using EPA Method 5
[25] Using EPA Method 26A

monitors the oxygen (O_2)[26] and carbon dioxide (CO_2)[26] concentrations, gas stream moisture content[27], and volumetric flow rate[28].

In general, WNA has hired one of two stack-testing firms to conduct the emissions testing programs, either DEECO of Raleigh, North Carolina or ENSR located in Westford, Massachusetts. When a testing program is scheduled, the stack testing firm arrives on site and sets up their equipment, then begins testing the next day. Testing is conducted on both of the two identical units, at two locations on each unit, the "inlet" and the "outlet". The inlet location is before the spray dryer absorbers, and the outlet location is at the outlet of the fabric filters, before leading to a single stack for the two units. Testers are usually stationed at the two different testing locations and in a trailer where someone works to remove samples from tests which have already been conducted and to prepare equipment for the next set of tests. Each test run lasts from 1 to 4 hours, depending on which pollutant is being sampled.

MassDEP initially required quarterly testing for mercury. When a facility can demonstrate compliance with the mercury emission limit in each quarter for eight consecutive quarters, MassDEP has allowed the facility to reduce compliance testing to every nine months.[10] After the facility demonstrated that its low level of mercury emissions met MassDEP's strict standards, testing for mercury was reduced to both units every nine months, beginning in 2004.

Stack Testing at the WNA Inlet

[26] Using EPA Method 3 / 3A
[27] Using EPA Method 4
[28] Using EPA Methods 1 and 2

According to Massachusetts regulations and the facility's permit, if compliance tests from both units demonstrate that the dioxin/furan emissions are at or below 7 nanograms per dry standard cubic meter total mass (ng/dscm), the facility may test one unit every nine months instead of testing both units every nine months.[29] This secondary limit is more stringent than the permit limit for dioxin/furan emissions, which is 30 ng/dscm. If compliance test results rise above this 7 ng/dscm limit, WNA must resume testing *both* units every nine months. However, there is an even more stringent requirement for quarterly dioxin testing included in the Notice of Decision dated August 19, 1998 with the North Andover Office of Community Development and Services.

Since compliance with the requirements for both mercury and dioxins/ furans had been demonstrated through 2003, as shown in Figures 4-1, 4-2, 4-3 and 4-4, WNA took steps to reduce the testing frequencies. Starting in 2004, WNA was able to opt for less frequent mercury testing. Testing for mercury is now conducted every nine months, rather than quarterly.

Stack Testing at the WNA Outlet

WNA also expressed an interest in reducing the frequency of testing for dioxins/furans to one unit every nine months[30], and petitioned the Town on September 7, 2004 to modify the Notice of Decision, which required the more frequent testing. Tech attended this meeting to answer the Planning Board's questions and to present the dioxins/furans testing results. A decision was issued by the Town on December 8, 2004 allowing testing every nine months, provided WNA can demonstrate emissions of

[29] 310 CMR 7.08(2)(g)1.b

dioxins/furans are at or below 7 ng/dscm in July and December of 2005.[31] According to the decision, if the dioxin/furan emission test results exceed 7 ng/dscm in the future, the tests must again be conducted on a quarterly basis. Although the test results from July 2005 demonstrated compliance with the more stringent dioxins/furans limits, the test results from December of 2005 did not. As a result, since the third quarter of 2006, WNA has resumed quarterly testing for dioxins/furans on both units, instead of testing one unit every nine months (alternating units) as allowed by MassDEP. It is important to keep in mind that even though the emissions of dioxins/furans are over the Town's more stringent limit, they are still well below the limits in WNA's permit issued by MassDEP.

Tech has witnessed the quarterly and 9-month expanded testing programs. The current project budget is not adequate for observing every test; since stack tests for hazardous air pollutants are usually conducted in triplicate, Tech has generally witnessed only the first test, in order to verify the setup and methodologies in use. Tech has developed and used a form for recording stack testing observations.[32] While onsite, we have an opportunity to ask questions about the facility operations and to identify any potential areas of concern and issues to watch for during future testing programs. Through our observations in 2008, and in past observations, we have found that WNA has been diligent in conducting emissions testing, and has hired both professional stack testing firms and a third party consultant to witness and coordinate the testing programs.

4.2 Review Reports

Reports of the stack testing are due within 90 days after the completion of the testing program. After each report was issued, Tech obtained a copy directly from WNA and then conducted a review of the test report (based on a request from the Town that Tech receive reports directly). In the past, reports were obtained from WNA, the North Andover Board of Health, or from the MassDEP at the annual file review. Tech reviewed testing procedures and confirmed that the

---

[30] Wheelabrator North Andover Semiannual and annual report for 2002, submitted to Edward Braczyk, Massachusetts Department of Environmental Protection, February 14, 2003.
[31] Town of North Andover Notice of Decision dated December 8, 2004, regarding Wheelabrator North Andover's Special Permit, originally issued on 8/25/98, minor Modification to Condition #2b(i)(6).
[32] Stack testing observation form is available in Appendix D of the full report.

emission limits in the facility's air permit, shown in Table 4-1, were met. The emissions data were also summarized in tables by Tech.[33]

From the summary tables, Tech prepares graphs of the testing results for easier assessment of compliance. Graphs of testing results from 1999-2008 are shown in Figures 4-1 through 4-8 for mercury, post-retrofit mercury, dioxins/furans, post-retrofit dioxins/furans, cadmium, lead, hydrogen chloride, and ammonia, respectively. The graphs of mercury, hydrogen chloride, and dioxins/furans demonstrate the improvements and lower emissions as a result of the facility air pollution control equipment retrofit and lower permit limits.

4.3 Review On-Site Records

As discussed in Section 4.1, WNA's CEMS monitor and record NO_x, SO_2, and CO emissions, opacity and operating parameters such as carbon feed, fabric filter inlet temperature, and steam load; the facility's permit also requires that records of these data be kept on-site. The facility also keeps records of any dates when average emissions concentrations or operating parameters exceed applicable limits, the reasons for the exceedance, and the corrective actions taken, along with dates when sufficient CEMS data were not obtained, including reasons and corrective action taken. These on-site records are reviewed approximately once every nine months, when Tech staff is on-site to witness the stack testing.

The review of records was conducted on July 9, 2008. Tech reviewed records related to the CEMS data tracking and backup data. Tech examined the documentation related to the "CEMS Running Average" that are collected by the Control Room Operators as a backup to the electronic monitoring data. The Director of Environmental Health and Safety at WNA monitors the CEMS data at least once every 24 hours, but Control Room Operators monitor real-time data in order to catch any instrument problems more quickly, and allow maintenance to be conducted in a more timely fashion. The Operators also keep records of facility start-up and shut-down procedures that are used to explain the emissions data presented to MassDEP and EPA in reports and to the public on the WNA webpage. The Director is able to check the system online and add

[33] Tables of stack testing data are available in Appendix C of the full report.

notes to the webpage and to emissions reports to describe and explain process changes. These systems were found to be in order.

4.4 Dispersion Modeling Review

As part of the facility's major testing program every nine months, WNA conducts an air quality analysis, using dispersion modeling and actual stack test data to assess the ambient impact of emissions on the surrounding area. An updated dispersion modeling protocol was most recently issued in October 2008 by the company WNA hires to conduct the dispersion modeling, Epsilon Associates, Inc. (EAI).[34] Tech reviewed the revised protocol and confirmed that the protocol was consistent with good modeling procedures. These changes to the modeling protocol were necessary because the EPA and MassDEP now require the use of AERMOD as the approved dispersion model.

The dispersion model is a computer program that uses real meteorological data with actual stack parameters and pollutant emissions data to predict the pollutant impacts or off-site pollutant concentrations at "receptors" around the facility. Receptors are the locations where the model is instructed to make air pollutant concentration predictions. Each receptor is identified by its elevation and by its location or distance from the stack. The plant emissions impacts are modeled using what is referred to as a "unit emission rate" (1 gram/second), which is then scaled by the actual pollutant emission rates determined during the stack test program to obtain the actual emissions. The air quality dispersion modeling analysis was performed for WNA by EAI; Tech Environmental reviewed the analysis to verify that the modeling was performed correctly and that the proper emission rates and stack parameters were applied. Tech then compared the results to air quality guidelines for toxic substances developed by the Massachusetts Department of Environmental Protection's (MassDEP's) Office of Research and Standards, and to Massachusetts and National Ambient Air Quality Standards (NAAQS).

[34] Epsilon Associates, Inc., "Air Quality Modeling Protocol for Emissions from Wheelabrator North Andover, Inc.," October 2008.

The most recent major testing program occurred in July 2008. The Air Quality Modeling Analysis[35] associated with this testing was reviewed and found to be consistent with the Protocol. The main differences between this and the previous modeling protocol/reports are:

- The modeling analysis has switched from using the Environmental Protection Agency's (EPA's) ISCST3 model to using the EPA's AERMOD modeling system. AERMOD is now the EPA's preferred model. The AERMOD system includes the AERMOD air quality dispersion model, the AERMAP terrain processor, and the AERMET meteorological data processor.
- The modeling now uses a different method for calculating "building downwash", the phenomenon that occurs when wind traveling above a structure, like a building, redirects a previously rising exhaust gas plume downward towards the ground. The new modeling uses the PRIME downwash algorithm to model building wake effects on dispersion, rather than the older downwash algorithms used in the previous (ISCST3) model.
- The modeling analysis uses the more-representative meteorological data from Lawrence, MA/Gray, ME for 2000 – 2004 rather than the data from Boston, MA/Gray, ME for 1991 - 1995. These new meteorological data are processed with the AERMET program.

Additionally, the revised protocol proposes to simplify the prediction of the air quality impacts for future stack testing by rerunning the AERMOD model only when the measured stack temperature and exit velocity vary by more than 5% from the previous testing, although impacts would still be well below compliance levels in that scenario.

Tech verified that the AERMOD-predicted pollutant concentrations in the 2008 Modeling Report correctly apply the maximum predicted unit air quality impacts and emissions rates that are presented in the report. Tech also reran the model and verified that the modeling was done correctly. The maximum predicted air toxics concentrations are predicted to be safely in compliance with the air quality criteria and will not have an adverse impact on public health. The following is a review of various issues relating to the air quality dispersion modeling.

[35] Epsilon Associates, Inc., "Air Quality Modeling Analysis of the Wheelabrator North Andover Facility using the July 2008 Performance Certification Test Data," November 3, 2008.

AERMOD vs. ISCST3 Model

The AERMOD model is considered to be a significant improvement over the ISCST3 model. The latest version (07026) of AERMOD was used for the modeling analysis. The modeling was correctly performed without using the "urban" option of AERMOD.

A comparison of the unit emission rate modeling impacts from using the AERMOD model in the 2008 Modeling Report to using the ISCST3 model from the last two reports (in calendar year 2007) shows that the ISCST3 predicted unit emissions rate impacts are on the order of 3.5 times (24-hour average) to 2.1 times (annual average) larger than the AERMOD modeling results for similar stack parameters. These differences in predicted impacts are a result of using different models and different meteorological data.

Receptors

The receptor network appears to be identical to what was used for the previous ISCST3 modeling. No details of the AERMAP processing of the receptor network are provided. The AERMAP processor calculates the hill height and elevation of each receptor. We have confirmed that these receptors are the same as those used for the previous modeling with the ISCST3 model.

Meteorological Data

The modeling now uses hourly surface data from the Lawrence Municipal Airport and upper-air data from Gray, Maine (as before) for the most recent 5-year period of 2000 – 2004. This is a significant improvement from using Boston Logan surface data, as the Lawrence meteorological station is located only about one-mile south of the stacks at WNA, and thus is more representative of the meteorological conditions on-site.

Tech's experience has been that smaller airports, such as Lawrence Municipal, may have more than 10% missing data in a given year, which would make the data for that year unacceptable for

modeling. This was checked with EAI and each year was found to have less than 1% missing data, confirming that the data is acceptable for use. The correct anemometer height of 10-meters was referenced.

Stack Parameters and Emission Rates

The Modeling Report uses the correct emission rates and stack parameters, shown in Tables 4-2 and 4-3 from the July 2008 stack testing.

Modeling Results – Air Toxics

The 24-hour and annual average air quality impacts for each pollutant were compared to the Massachusetts DEP's 24-hour average Threshold Effects Exposure Limits (TELs) and annual average Allowable Ambient Limits (AALs) for Ambient Air. The TELs and AALs have been designed by the Massachusetts DEP as concentrations that a source of air pollution should not exceed to protect public health. All calculated concentrations for these pollutants are below these criteria, demonstrating that the operation of WNA does not have an adverse air quality impact in North Andover. These results assume operation of WNA for 100% of the time each year, and are shown in Table 4- 4.

Modeling Results – Criteria Air Pollutants

Tech performed an additional analysis related to the air dispersion modeling for WNA. This work focused on the criteria air pollutants (i.e. regulated air pollutants that are not air toxics) that the facility emits in significant quantities: carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter (PM_{10} and $PM_{2.5}$). WNA is not required to perform modeling for criteria air pollutants emitted from the facility; however, Tech looked at these compounds to provide more complete information on the facility's air quality impacts and its potential for health effects.

The modeling results for additional averaging periods associated with Massachusetts and National Ambient Air Quality Standards (NAAQS) were also considered. CO has NAAQS for 1-hour and 8-hour averaging periods, NO_2 has a NAAQS for the annual averaging period, SO_2 has NAAQS for 3-hour, 24-hour, and annual averaging periods, PM_{10} has a NAAQS for a 24-hour averaging period, and $PM_{2.5}$ has NAAQS for 24-hour and annual averaging periods.

The NAAQS are air pollutant concentration limits that have been established by the US EPA to protect the public's health and welfare in outdoor air, with a margin for safety. Table 4-5 shows the NAAQS for each pollutant and averaging period. The NAAQS for averaging periods of 24 hours or less allow for one exceedance of the standard each year; therefore, the dispersion model was set to predict the second-highest concentration for these short-term averaging periods for each year. This is the standard procedure for dispersion modeling of criteria air pollutants.

The results of the dispersion modeling for each air pollutant and averaging period only represent the impacts from the facility. Background concentrations, representing all other sources of each pollutant, were added to the dispersion modeling results to predict the total air quality impacts from the facility. Background air quality information was obtained from MassDEP air quality monitoring stations that are most representative, or conservatively representative, of the North Andover area for the most recent 3-year period for which data are available (2006 – 2008). The Massachusetts DEP monitor in Lowell was used to establish the 1-hour and 8-hour background concentrations for CO. The Massachusetts DEP monitor in Haverhill was used to establish the annual background concentrations for NO_2. The Massachusetts DEP monitor in East Boston was used to establish the 3-hour, 24-hour, and annual background concentrations for SO_2. The Massachusetts DEP monitor in Chelmsford was used to establish the background concentration for PM_{10}. The Massachusetts DEP monitor in Lawrence was used to establish the background concentration for $PM_{2.5}$. The background concentrations are shown in Table 4-5.

The emission rates used for modeling PM_{10} are from the July 2008 testing report. The emissions of $PM_{2.5}$ were conservatively assumed to be the same as for PM_{10} since WNA is not required to test for $PM_{2.5}$; therefore, no $PM_{2.5}$ emissions data were available. The emission rates used for modeling CO, NO_2, and SO_2 represent worst-case operating conditions, obtained from the

highest concentration measured by the CEMS during the year 2008. Because these emission rates are significantly larger than typical emission rates from the facility, this air quality analysis is conservative and overestimates the potential air quality impacts from the facility.

Table 4-5 shows the maximum predicted air quality impacts for the criteria air pollutants in 2008 based on the CEMS emissions data from WNA's annual report to the MassDEP and the July 2008 stack testing. Background concentrations and the total predicted air quality impacts are compared to the NAAQS in both tables. The results demonstrate that the facility will not cause adverse effects on air quality, even under the worst-case operating emission rates.

Summary

The revised modeling protocol defines a procedure that properly models the air quality impacts from the Wheelabrator facility in North Andover with the AERMOD system. The 2008 Modeling report appears to correctly apply the revised modeling protocol procedures and demonstrates that the air quality impacts, based on the July 2008 stack testing, are safely in compliance with the air toxics TELs and AALs. The modeling results show that the air quality impacts from the WNA facility are not a threat to pubic health.

We concur with the recommendation that the dispersion modeling of unit emission impacts does not have to be revised and that scaling of the unit impacts can be used to predict the facility impacts, as long as the following two conditions are met:

1) Both the tested stack temperature and exit velocity from the testing do not differ cumulatively by more than 5% from the values presented in the November 3, 2008 Modeling Report; and

2) The maximum predicted impact for each pollutant is less than 10% of the modeling criteria.

Table 4-1. Emissions Limits
WNA Facility

Pollutant	Emission Limit / Standard	Units	Time Period
Particulate Matter	≤ 27	mg/dscm @ 7% O_2, dry	
Opacity	≤ 10	%	6 minute block average
Cadmium (Cd)	≤ 0.020	mg/dscm @ 7% O_2, dry	
Lead (Pb)	≤ 0.440	mg/dscm @ 7% O_2, dry	
Mercury, elemental (Hg)	≤ 0.028	mg/dscm @ 7% O_2, dry	(average of 4 quarters)
	≤ 0.08	mg/dscm @ 7% O_2, dry OR 85% reduction [1]	(single test)
Sulfur dioxide (SO_2)	≤ 29	ppmv @ 7% O_2, dry OR 75% reduction [1]	24-hour geometric mean
Hydrogen Chloride (HCl)	≤ 29	ppmv @ 7% O_2, dry OR 95% reduction [1]	
Dioxin/Furan (PCDD/PCDF)	≤ 30	ng/dscm @ 7% O_2, dry	
Carbon monoxide (CO)	≤ 69	ppmv @ 7% O_2, dry	4-hour block average
Ammonia (NH_3)	≤ 10	ppmv @ 7% O_2	
Nitrogen oxides (NO_x)	≤ 205	ppmv @ 7% O_2, dry	24-hour daily average
Sulfuric Acid (H_2SO_4)	≤ 0.02	lb/MMBtu	
Fugitive Ash	≤ 9	minutes of visible emissions	3-hour period

[1] Whichever is less stringent.

Table 4-2. Modeled Stack Parameters
July 2008 Testing Data for the WNA Facility

Parameter		Value	
		Unit 1	Unit 2
Stack Base Elevation (m)		20.1	
Stack Height (m)		70.1	
Stack Diameter	Per Flue (m)	2.1	2.1
	Equivalent Diameter (m)	3.02	
Stack Exit Temperature (^{o}F)		302.5	310.0
Average Stack Exit Temperature (K)		425.5	
Building Height (m)		37.5	
Max. Building Width (m)		76.9	
Stack Velocity	Air Flow Rate (acfm)	157,500	163,300
	Exit Velocity (m/s)	21.14	
Stack Location	UTM-E (km)	326.293	
	UTM-N (km)	4732.393	

Table 4-3. Maximum Ambient Concentrations
July 2008 Testing Data for the WNA Facility

Pollutant	Emission Rates (g/s)		Total (Units 1 & 2) Modeled Concentrations ($\mu g/m^3$)	
	Unit 1	Unit 2	24-hour	Annual
Cadmium (Cd)	0.0000048	0.0000146	0.0000100	0.0000013
Lead (Pb)	0.0000306	0.0001033	0.000069	0.000009
Mercury, elemental (Hg)	0.0003102	0.0008925	0.00062	0.00008
Hydrogen Chloride (HCl)	0.2091868	0.2081086	0.21	0.03
Ammonia (NH_3)	0.0217924	0.0336664	0.028	0.0038
PCDD/PCDF, Toxic Equiv. ("dioxins")	0.000000007	0.000000010	0.0000000087	0.0000000012

Table 4-4. Toxics Modeling Results
July 2008 Testing Data for the WNA Facility

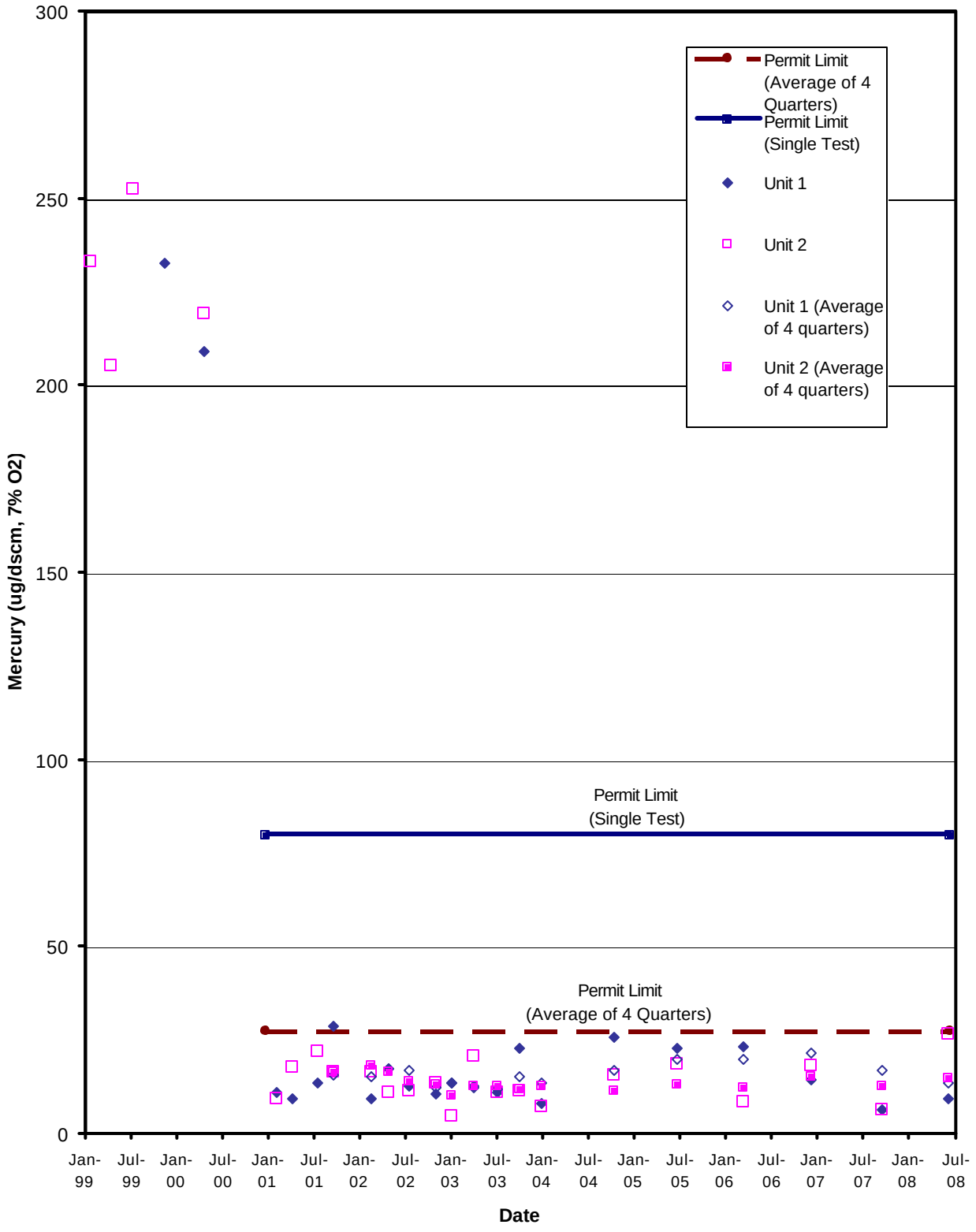
Pollutant	Emission Rate (g/s)	24-hour Conc ($\mu g/m^3$)	TEL ($\mu g/m^3$)	Complies with TEL?	Annual Conc ($\mu g/m^3$)	AAL ($\mu g/m^3$)	Complies with AAL?
Cadmium (Cd)	0.0000194	0.0000100	0.003	**Yes**	0.0000013	0.001	**Yes**
Lead(Pb)	0.000134	0.000069	0.14	**Yes**	0.0000091	0.07	**Yes**
Mercury, elemental (Hg)	0.00120	0.00062	0.14	**Yes**	0.000082	0.07	**Yes**
Hydrogen Chloride (HCl)	0.417	0.21	7	**Yes**	0.0285	7	**Yes**
Ammonia (NH_3)	0.0555	0.0285	100	**Yes**	0.00378	100	**Yes**
PCDD/PCDF, Toxic Equiv. ("dioxins")	0.0000000169	0.0000000087	n/a	**n/a**	0.0000000012	0.0000000450	**Yes**

Table 4-5. Criteria Pollutant Modeling Results
WNA Facility July 2008

Pollutant	Averaging Period	Emission Rate (g/s)	Predicted Conc ($\mu g/m^3$)	Background Conc ($\mu g/m^3$)	Total Conc ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Complies with NAAQS?
Carbon Monoxide (CO)	1-hour	20.4	45.9	3,680.0	3,725.9	40,000	**Yes**
	8-hour	20.4	20.9	2,415.0	2,435.9	10,000	**Yes**
Nitrogen Dioxide (NO_2)	Annual	52.4	3.6	16.9	20.5	100	**Yes**
Sulfur Dioxide (SO_2)	3-hour	11.7	16.3	70.7	87.0	1,300	**Yes**
	24-hour	11.7	6.0	36.7	42.7	365	**Yes**
	Annual	11.7	0.8	13.1	13.9	80	**Yes**
Particulate Matter (PM_{10})	24-hour	0.03	0.01	35.0	35.0	150	**Yes**
Particulate Matter ($PM_{2.5}$) [1]	24-hour	0.03	0.01	26.9	26.9	35	**Yes**
	Annual	0.03	0.00	9.2	9.2	15	**Yes**

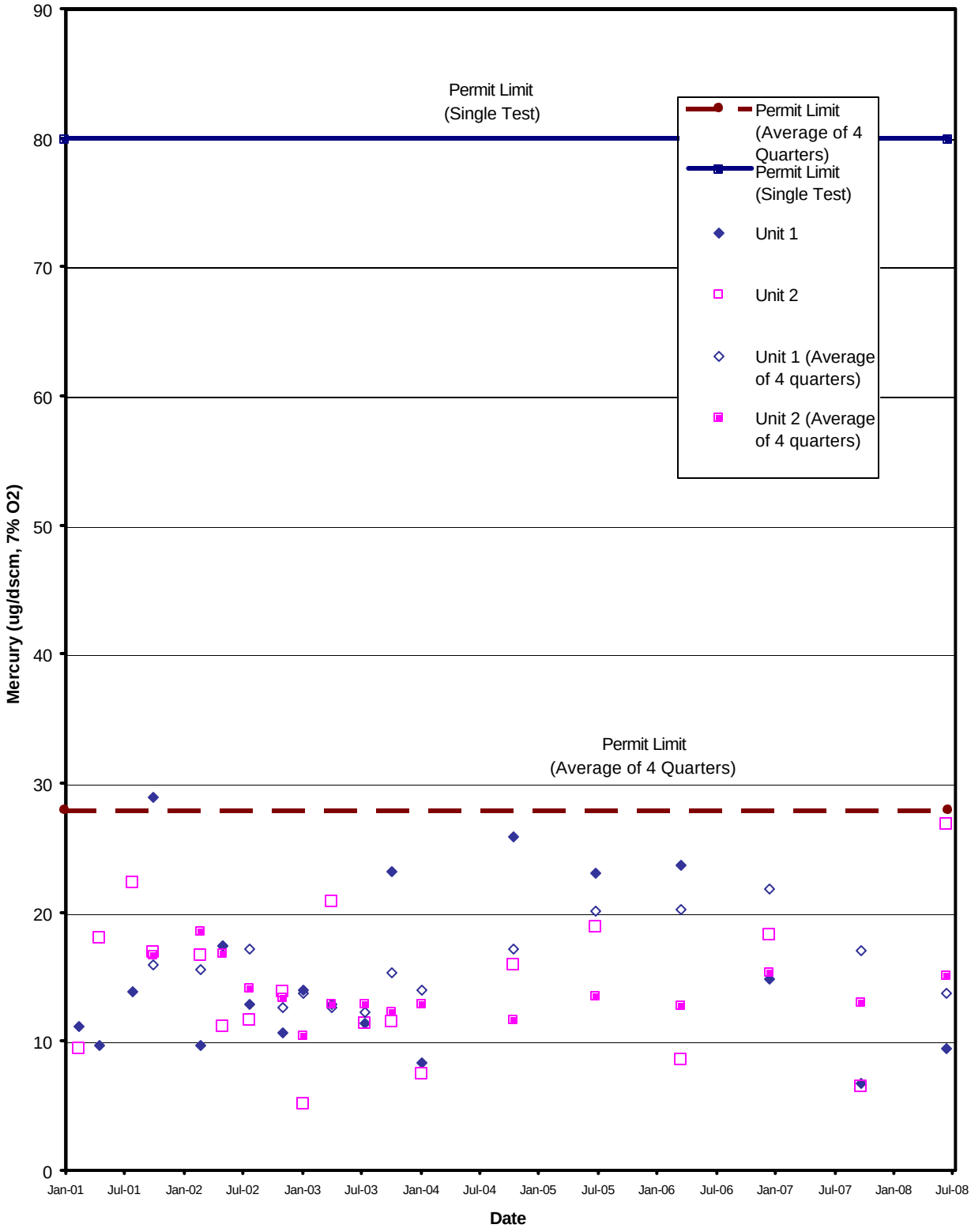
[1] Emissions of $PM_{2.5}$ are conservatively assumed to be the same as emissions of PM_{10}.

Figure 4-1. Mercury Test Results



Summary of Limits - 3-test Ave Graphs v2, Hg graph

Figure 4-2. Post-Retrofit Mercury Test Results



Summary of Limits - 3-test Ave Graphs v2, Hg graph - post retro

Figure 4-3. Dioxins/Furans Test Results

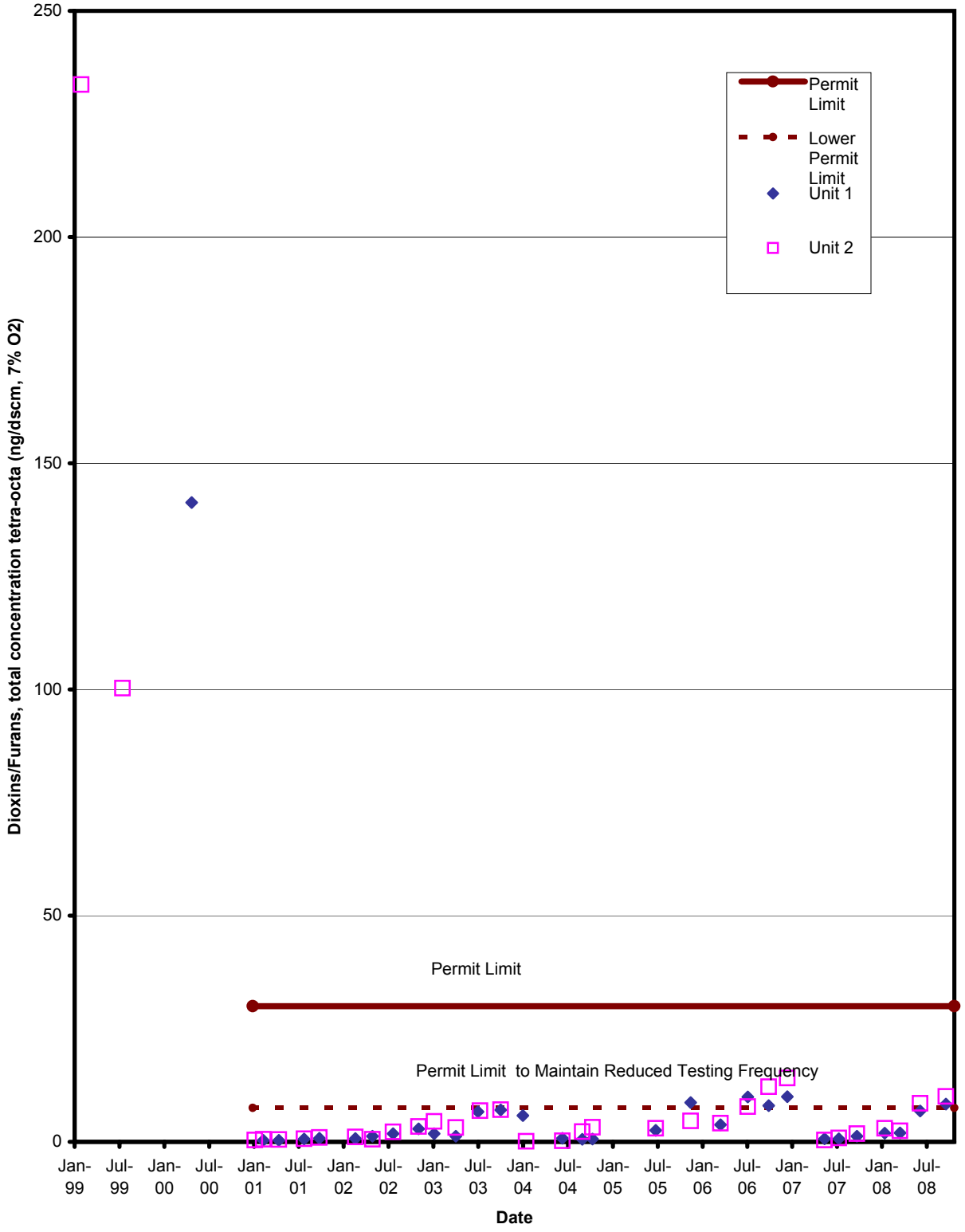


Figure 4-4. Post-Retrofit Dioxins/Furans Test Results

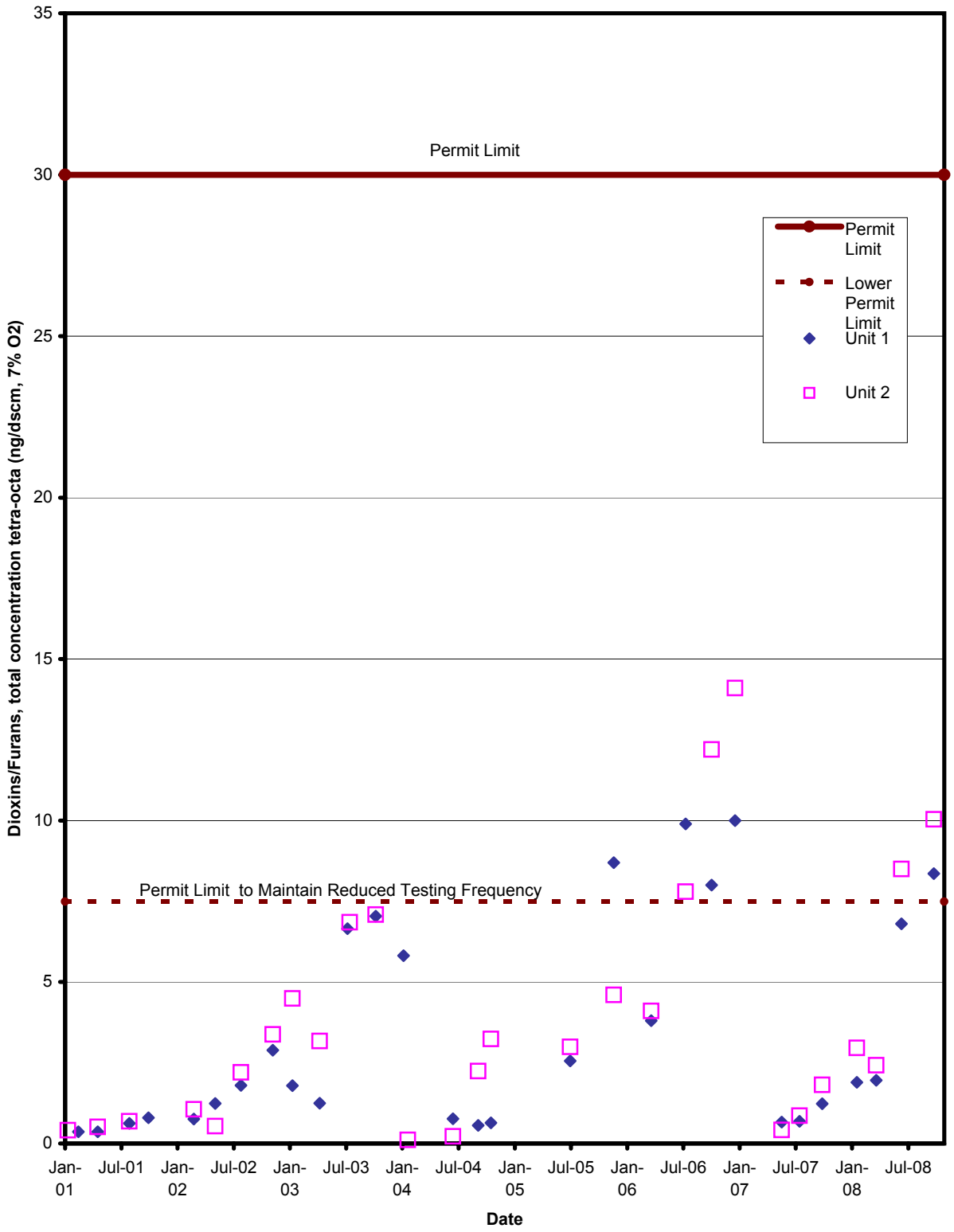
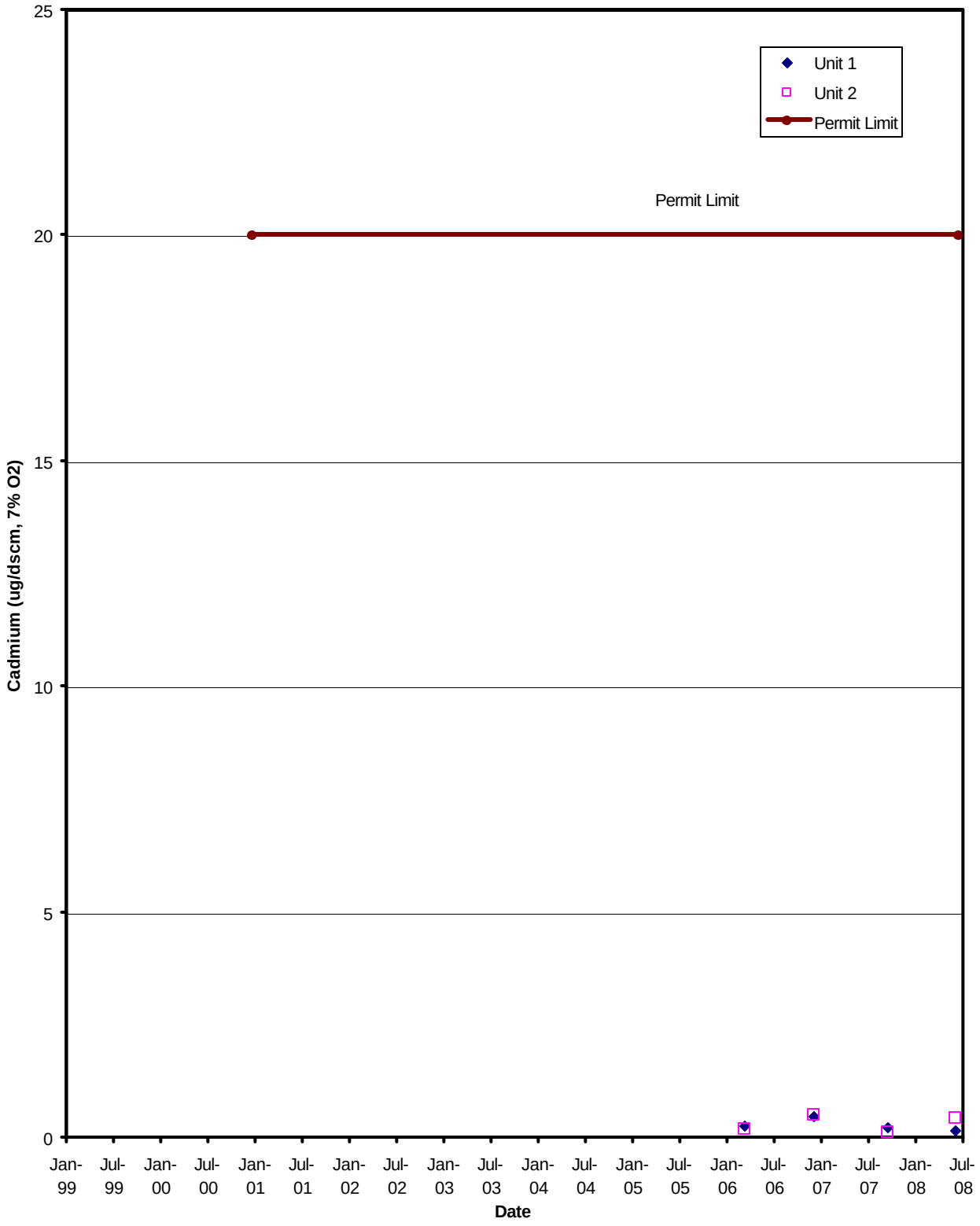


Figure 4-5. Cadmium



Summary of Limits - 3-test Ave Graphs v2, Cd graph

Figure 4-6 Lead

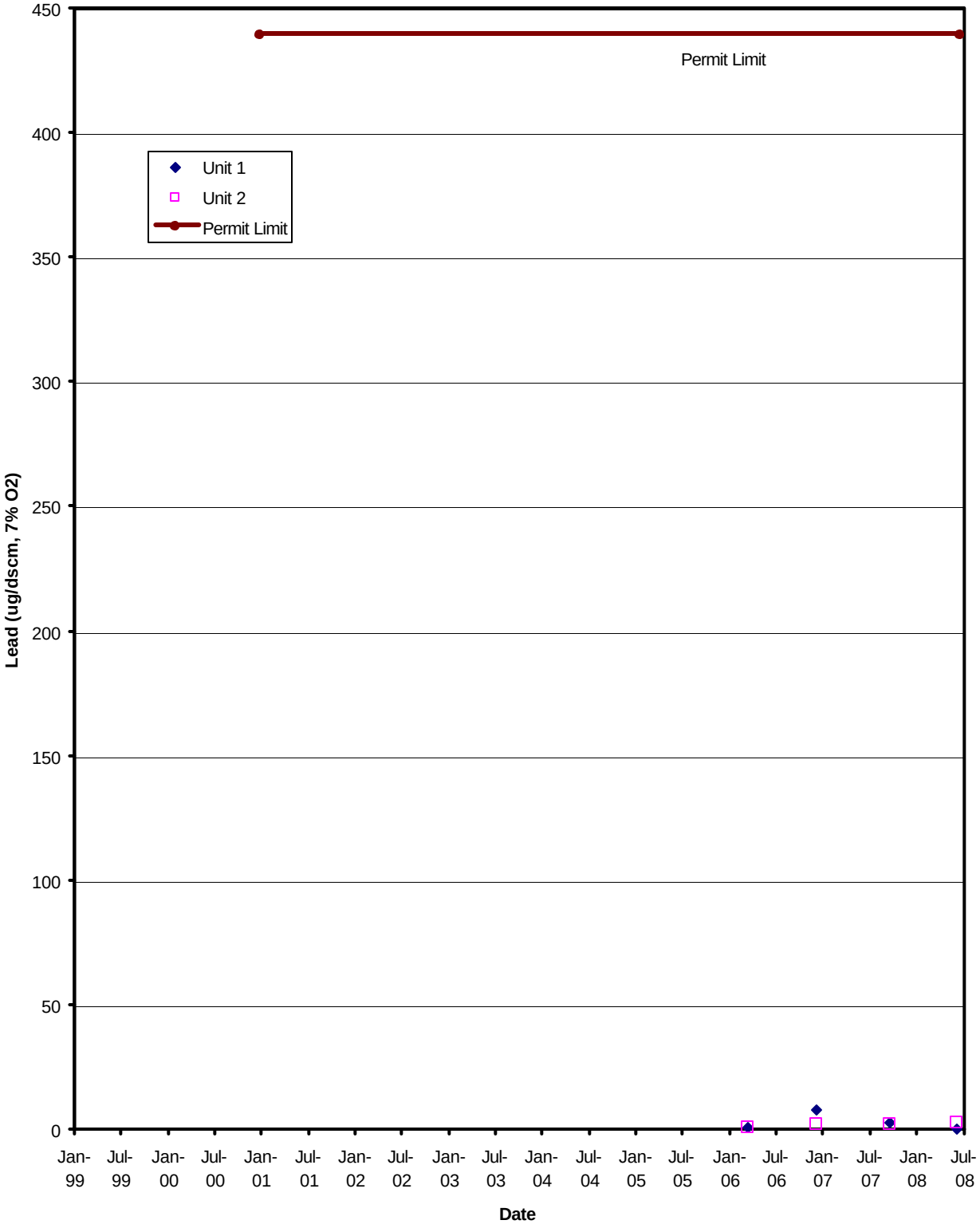
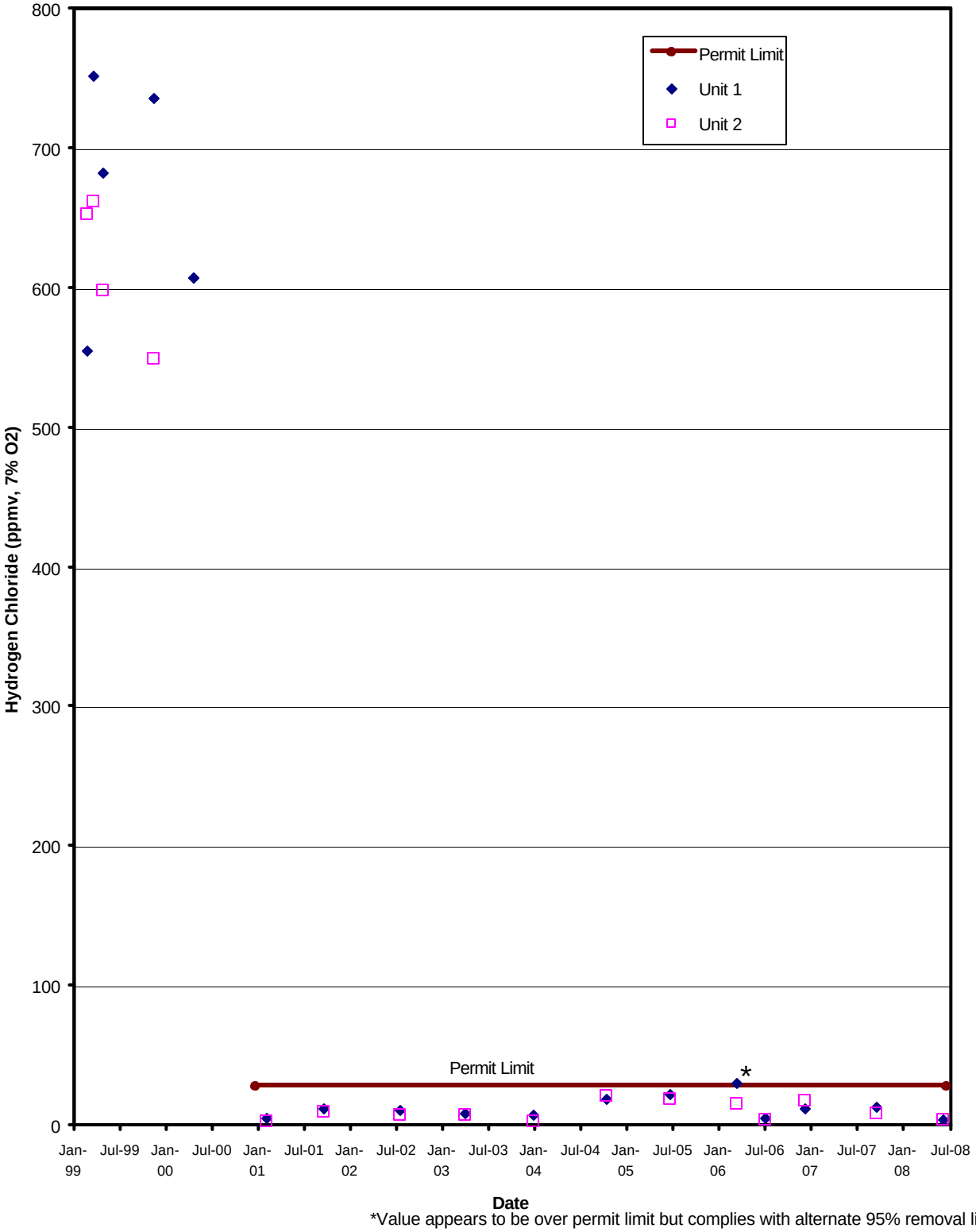
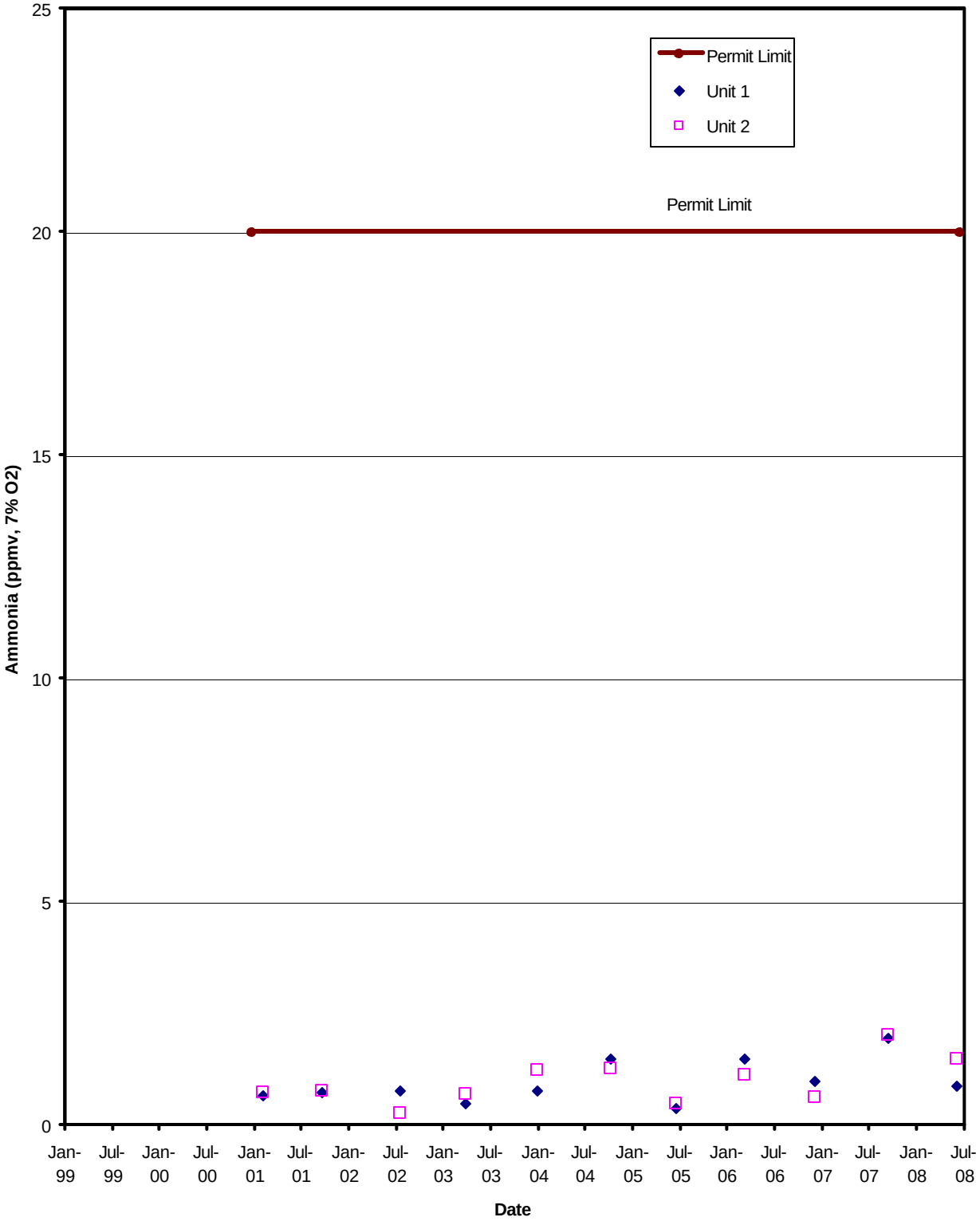


Figure 4-7. Hydrogen Chloride



*Value appears to be over permit limit but complies with alternate 95% removal limit.

Figure 4-8. Ammonia



Summary of Limits - 3-test Ave Graphs v2, NH3 graph

5.0 ANNUALLY-BASED MONITORING AND REPORTING

Tech conducts an annual file review at the Massachusetts Department of Environmental Protection (MassDEP) to check data and reporting related to the WNA facility, and to confirm facility compliance. The WNA facility is under the jurisdiction of the Northeast Regional Office (NERO) of MassDEP, located in Wilmington, Massachusetts. The file review for 2008 was conducted on March 26, 2009. Tech also supplemented information obtained in the file review by reviewing documents related to MWC available on MassDEP's website.[6] The more significant information obtained during the reviews is briefly summarized below.

5.1 MassDEP File Review

As in previous file reviews, Tech reviewed files related to Waste Ban Inspections. There was one Waste Ban Inspection conducted by the MassDEP in 2008. Nine loads were inspected to check for the presence of "restricted materials" such as batteries, appliances or large amounts of yard waste, recyclables or construction materials. The inspection was conducted on May 22, 2008 and no violations were found.

Documents were also reviewed related to the Air Quality Modeling Analysis, which is part of the comprehensive emissions testing program conducted every 9 months. The Modeling Analysis conducted using the data from 2008 was reviewed by MassDEP and shown to be in compliance, as had been found during Tech's review (Section 4.4). Beginning in March 1, 2008, MassDEP required the use of a new model, the currently-EPA-approved AERMOD model. MassDEP also approved the Air Quality Modeling Protocol which proposed to scale future modeling results with a scaling factor based on present results provided that the stack parameters (stack exit velocity and stack exit temperature) do not vary by more than 5%. This request was approved by MassDEP.

During 2008, MassDEP also reviewed the compliance records for the WNA CEMS. These documents were also reviewed by Tech and the records did not indicate any problems.

5.2 Material Separation Plan for the Diversion of Mercury

In February of each year, WNA submits an Annual Report for the previous year on their Material Separation Plan for the Diversion of Mercury to the MassDEP for their review. This report for 2008 has been reviewed by the MassDEP, who provided a copy for Tech to review .

This annual report for 2007 was not included in last year's annual report, since it was not released in time, and so it is also included in this report. Both the 2007 and the 2008 Annual Reports on the Results of the Mercury Recovery Program fall under the fourth Material Separation Plan (MSP). This Plan, MSP4, was issued in August of 2006. MSP4 is effective from January 1, 2007 through December 31, 2008. The goals of the Plan are to divert mercury-containing products that could potentially be delivered to WNA and incinerated. As part of the plan, WNA attempts to educate the general public and businesses about the need and methods for the proper disposal of mercury-containing products. The plan is focused in each of the communities that send waste to WNA and includes education, advertising, thermometer exchanges, and thermostat recovery programs. Each Mercury Recovery Program is locally based and operated, with Wheelabrator providing technical, logistical, and financial support for the programs. Each community has at least one easily-accessible location where residents can conveniently and safely dispose of mercury-containing products.

The mercury outreach educational campaign is called "Keep Mercury from Rising" and is available online.[36] Other community outreach efforts to publicize the program include radio advertising and advertising in local community newspapers.

The report summarizes the expenditures associated with the program and the success of each year's efforts. In 2007, the Mercury Recovery Program operated in twenty-six of the twenty-eight communities in the WNA service area. In 2008, twenty-seven of the twenty-eight communities in the WNA service area participated. The program continued the collection of mercury-containing devices such as thermometers, fluorescent lamps and button-cell batteries. Collection is expected to decrease as the program continues and more residents replace mercury-

[36] Located at www.keepmercuryfromrising.org.

containing devices. The program also included a survey to gauge the effectiveness of the educational campaign and to help redirect future efforts. In addition to general community outreach, efforts are also made to educate contractors on the correct disposal of thermometers and other mercury-containing devices.

5.3 General Facility Review

Wheelabrator North Andover is a participant in the Occupational Safety and Health Administration's (OSHA) Voluntary Protection Programs (VPP). The VPP are programs that are designed to promote workplace safety and health. As part of the VPP, the facility management, workers, and OSHA work together to establish cooperative relationships at workplaces that have implemented a comprehensive safety and health management system. WNA was last recertified for this program as an OSHA Star site in September 2006 for the next five years.

6.0 CONCLUSIONS

As part of an on-going program for the North Andover Board of Health, Tech Environmental (Tech) has developed a plan to monitor various aspects of the Wheelabrator North Andover Inc. (WNA) facility; this report presents the results of the monitoring program for 2008. In the course of the monitoring program for calendar year 2008, all evidence suggests the facility is fully in compliance. WNA was diligent in their conduct of emissions testing in 2008. Well-respected, professional stack testing firms were hired to conduct the required emissions testing, and a third party consultant was retained to witness and coordinate the testing programs. The facility began displaying emissions data on their website in the spring of 2002, and charts of data on both a daily and a monthly basis are available on the web for at least the previous six months. WNA has been generally diligent in updating the website data quickly, so that concerned members of the community can obtain emissions data in a timely manner.

Tech reviewed the air quality analyses using dispersion modeling, which was conducted using actual stack test data from July 2008. Tech verified that the modeling was performed correctly, and that the proper emission rates and stack parameters were applied. The modeling results were compared to health-based air quality standards for toxic substances developed by the Massachusetts Department of Environmental Protection's (MassDEP's) Office of Research and Standards, and to Massachusetts and National Ambient Air Quality Standards. The maximum predicted air toxics concentrations were predicted to be safely in compliance with the air quality criteria. The results demonstrate that even under the worst-case meteorological conditions, the WNA facility will not cause adverse effects on air quality.