Air Modeling Report
BMWNC Medical Waste Incinerator

BMWNC in Matthews, North Carolina

Louis Zeller, Science Director
November 9, 2010

Blue Ridge Environmental Defense League

www.BREDL.org PO Box 88 Glendale Springs, North Carolina 28629 BREDL@skybest.com (336) 982-2691

Printed on 100% post-consumer, recycled paper processed without chlorine
using 43% less energy, 49% less water and creating 36% fewer greenhouse gas emissions than non-recycled paper.

Contents

First, do no harm

Primum non nocere. *First, do no harm* is the central law of medical ethics. Since the days of Hippocrates, this has been the foundation of medical treatment and diagnosis. Nothing in the realm of law, politics or commerce can or should have greater importance. It is the central tenet of humility and good will which guides medical practice. If nonmaleficence is the rule, can the waste products of modern medicine be exempt? No, there can be no exceptions which admit of acceptable contamination levels or legal pollution limits. There can be no cost-benefit rationale, no privilege for commercial incentive.

For two decades the Blue Ridge Environmental Defense League has worked to reduce and eliminate toxic air pollution created by the burning of medical waste. Incineration of medical waste has come under increasing scrutiny because of the inherent problems associated with the incinerators themselves. In fact, the trend is towards elimination of incinerators. According to the North Carolina Department of Environment and Natural Resources:

> Many hospitals and medical waste treatment facilities have discontinued use of incinerators because of increased costs. The costs of operating medical waste incinerators have risen mainly because of the recently enacted EPA regulations for Hospital/Medical/Infectious Waste Incinerators (HMIWI). A number of new technologies have been developed which minimize or nearly eliminate environmental discharges. A summary of some representative technologies is presented in USEPA Alternate Treatment Technologies Fact Sheets.[1]

Incinerators create problems; commercial incinerator operators make the problems worse by importing and burning waste from near and far. In North Carolina, two incinerators operated by commercial companies continue to operate: Stericycle in Haw River and BMWNC in Matthews. The litany of their transgressions would fill pages of this account. However, the purpose of this report is to show why state air pollution permits for medical waste incinerators are not protective of public health and, more importantly, why they *cannot be*.

[1] "Alternative Medical Waste Treatment Technologies," http://wastenotnc.org/swhome/medlst.htm

Air pollutants released from medical waste incinerators

Dioxins & Furans – Dioxins have been called the most dangerous chemical known to man. Dioxins cause cancer. Long-term, low-level exposure of humans to dioxins and furans can lead to the impairment of the immune system, impairment of the development of the nervous system and endocrine system, birth defects, altered liver functions, breast cancer, and reproductive functions. Dioxins have also been linked with lowered sperm counts, behavioral problems and increased incidence of diabetes. Even when not present in the waste stream, dioxins form during the burning of plastics and paper. Furans are similar to dioxins and are suspected carcinogens. These chemicals form when temperatures are not consistent, when waste is not completely incinerated, and during by-pass events when air pollution control equipment fails. Items common to medical waste that may create dioxins and furans are plastic blood bags and fluid (IV) bag, bleached paper products including facial tissue and paper towels. Dioxins formed during incineration are released into the air and travel long distances, contaminating fields, crops livestock and dairy products.

Mercury - Mercury can affect the brain functioning, causing mental retardation and seizures. Mercury causes kidney damage, digestive problems, and may result in irritability, tremors, changes in vision or hearing, and memory problems. Children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and it can also pass to a nursing infant through breast milk.

Hydrogen Chloride - Hydrogen chloride is a colorless gas with a pungent odor. Heavier than air, it accumulates in low-lying areas. Hydrogen chloride is irritating and corrosive to any tissue it contacts. Brief exposure to low levels causes throat irritation; exposure to higher levels can result in rapid breathing, narrowing of the bronchioles, blue coloring of the skin, accumulation of fluid in the lungs, and even death. Some people may develop an inflammatory reaction to hydrogen chloride, called reactive airways dysfunction syndrome, a type of asthma caused by irritating or corrosive substances.

Lead - Lead is highly toxic and can enter the human body through uptake of contaminated food, water and air. Health effects include anemia, elevated blood pressure, kidney damage, miscarriage, disruption of nervous systems, brain damage, and declined fertility of men through sperm damage. Lead is particularly harmful to children, and exposure can result in diminished learning abilities, and behavioral disruptions such as aggression and hyperactivity.

Cadmium - Cadmium is a toxic metal and causes cancer. Chronic exposure can cause lung cancer and kidney damage. Cadmium also is believed to cause pulmonary emphysema and bone disease. Cadmium may also cause anemia.

Particulate matter - Fine particle pollutants are microscopic solid or liquid droplets that pass into the lungs and cause serious health problems. Studies link particulate pollution exposure to a variety of respiratory problems including irritation of the airways, decreased lung function, aggravated asthma and chronic bronchitis. People with heart or lung diseases, children and older adults are the most likely to be affected by particulate pollution.

Medical Waste Incinerator Regulations: Not Good Enough

Medical waste incinerators are the second largest known source of dioxin in the United States. Dioxin is a known human carcinogen. The effects of prolonged dioxin exposure include impairment of immune, nervous and endocrine systems. In addition to dioxin, hazardous air pollutants from medical waste incinerators include arsenic, chromium VI, cadmium, lead, hydrochloric acid, and mercury.

U.S. Environmental Protection Agency

According to the EPA, medical waste is defined as "any solid waste which is generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in production or testing of biologicals." Medical waste is regulated under the Resource Conservation and Recovery Act (RCRA). Hospital medical infectious waste incinerators (HMIWI) are regulated under national emission standards for hazardous air pollutants (NESHAP), new source performance standards (NSPS), and national ambient air quality standards (NAAQS). The federal Clean Air Act Amendments of 1990 established a federal operating permit program under Title V of the Act (40 CFR Part 70). [2]

The amount of medical waste incinerated has increased while the number of medical waste incinerators continues to decrease. In the 1990's there were thousands of medical waste incinerators; today there are just 57 HMIWI in operation nationwide. Currently, the US EPA estimates the annual increase in waste is 5.7%.[2]

A study of medical institutions revealed that a significant factor in the amount of waste produced was the amount of insurance reimbursement. The study concluded: "The fractions of medical waste treated as infectious at all levels of healthcare establishments are much greater than that recommended by the [US Centers for Disease Control] guidelines."[3]

In 2009, the U.S. Environmental Protection Agency issued new rules for medical waste incinerators, including new requirements for lower emissions, better waste management, and the removal of exemptions for emissions during startup, shutdown and malfunctions. However, the rule does not come into effect until 2014.

North Carolina

In North Carolina, medical waste is regulated as solid waste. State medical waste management regulations, 15A NCAC 13B, include packaging, storage, transportation, treatment and disposal.

---

[2] *Economic Impacts of Revised MACT Standards for Hospital/Medical/Infectious Waste Incinerators, Final Report*, U.S. Environmental Protection Agency Office of Air Quality Planning and Standards (MD-C439-02), Heller et al, RTI International, Research Triangle Park, NC, RTI Project Number 0209897.003.060, July 2009

[3] "Medical waste production at hospitals and associated factors" YW Cheng et al, *Waste Management*, Volume 29, Issue 1, January 2009, Pages 440-444

There are just two medical waste incinerators with operating permits in North Carolina: Stericycle, Inc. in Graham and BMWNC in Matthews. According to the NC Division of Waste Management:[4]

> Many hospitals and medical waste treatment facilities have discontinued use of incinerators because of increased costs. The costs of operating medical waste incinerators have risen mainly because of the recently enacted EPA regulations for Hospital/Medical/Infectious Waste Incinerators (HMIWI). A number of new technologies have been developed which minimize or nearly eliminate environmental discharges. A summary of some representative technologies is presented in USEPA Alternate Treatment Technologies Fact Sheets.

However, in 2002 the Blue Ridge Environmental Defense League submitted written comments to North Carolina's Division of Air Quality which stated: "The state of North Carolina cannot at present ensure that medical waste incinerators are operated without threatening public health and the environment." Our experience during the last eight years indicates this is still true.

Mecklenburg County

Prisoners Of Our Homes (POOH) outside BMWNC

As a Local Program, Mecklenburg County Air Quality (MCAQ) is authorized by the EPA and the State of North Carolina to implement the air pollution permit program in Mecklenburg County, including medical waste incinerators. Mecklenburg County Air Pollution Control Ordinance Section 1.5500 contains county Title V Procedures.

BMWNC permit lists emission standards and ambient standards required by MCAQ under MCAPCO Regulation 2.1206(c)(14). Because these standards are local regulations, not federal, they are not enforced by the EPA.[5] They mirror North Carolina toxic air pollution regulations codified at 15 NCAC 2Q .1104.

For years, residents have complained to the agency about strong odors, fumes, smoke, falling ash and other problems. For two decades Blue Ridge Environmental Defense League and its local members have documented visible emissions, flames from the smoke stacks, and half-burned gauze and waste from the incinerator. They have appeared before county and town boards many times. Ten

[4] North Carolina Department of Environment and Natural Resources, Division of Waste Management website, http://wastenotnc.org/swhome/medlst.htm, last accessed November 8, 2010

[5] Title V permits are authorized by the federal Clean Air Act and require permitting agencies to list all applicable regulations for a facility, whether they are federally enforceable or locally enforceable.

years ago, Geneva Johnson, who lived in Matthews and founded Prisoners Of Our Homes, said "We shouldn't have to live in a cloud of toxic fumes. It is time Mecklenburg County stopped protecting this polluting industry and protect the citizens."

On April 20, 2010, the Mecklenburg County Board of Commissioners adopted a pair of resolutions which 1) directed the county to move forward with implementation of the EPA's 2009 medical waste incinerator rule no later than October 6, 2012, and 2) requested that the state's Environmental Management Commission adopt the same rule on the same schedule.[6] The resolutions were adopted in response to the concerns of local residents. Citizens for a Healthy Environment, also a chapter of the Blue Ridge Environmental Defense League, had communicated with MCAQ about the escalating numbers of health problems in their community. The resolutions are a sign that the county has at last recognized that there is a problem, but more needs to be done.

How Medical Waste Incinerators Work[7]

Combustion of waste in controlled air incinerators occurs in two stages. In the first stage, waste is fed into the primary, or lower, combustion chamber, which is operated with less than the stoichiometric amount of air required for combustion. Combustion air enters the primary chamber from beneath the incinerator hearth (below the burning bed of waste). This air is called primary or underfire air. In the primary (starved-air) chamber, the low air-to-fuel ratio dries and facilitates volatilization of the waste, and most of the residual carbon in the ash burns. At these conditions, combustion gas temperatures are relatively low (760 to 980°C [1,400 to 1,800°F]). In the second stage, excess air is added to the volatile gases formed in the primary chamber to complete combustion. Secondary chamber temperatures are higher than primary chamber temperatures--typically 980 to 1,095°C (1,800 to 2,000°F).

The BMWNC Medical Waste Incinerator

BMWNC's medical waste incinerator is located in Matthews, North Carolina at 3250 Campus Ridge Road. The incinerator began operation in 1986. The company imports waste from approximately 12 states. BMWNC is a DISC International Model No. 1500 with a dry scrubber using hydrated lime and activated carbon working in series with a fabric filter. The permitted maximum throughput is 1,826 pounds per hour, allowing up to 7,998 tons of waste to be burned annually.

[6] 40 CFR 60 Subpart Ce, Emission Guidelines and Compliance Times for HMIWI

[7] US EPA AP-42 Section 2.3 Medical Waste Incineration

The most recent permit for BMWNC issued by Mecklenburg County Air Quality allows large amounts of toxic air pollution. Table A lists some of the annual totals.

Table A: Toxic Air Pollutant Emissions from BMWNC

Pollutant	Annual Emissions Limit (Pounds)
Arsenic	7.0
Cadmium	157.7
Chromium VI	2.5
Hydrogen chloride	972,360
Hexachlorodibenzo-p-Dioxin	2.2
Mercury	2883.5
Polychlorinated biphenyls (PCB)	2452.8
Tetrachlorodibenzo-p-Dioxin	0.09
Trichloroethylene	1,708,200

Emissions data from MCAQ Permit No. 10-01V-099, E-10

In addition to these air toxics, the permit emissions limits for major pollutants, also known as criteria pollutants, could add over 20 tons of pollution to the air above Charlotte and Mecklenburg County annually.

Table B: Criteria Air Pollutant Emissions from BMWNC

Pollutant	Annual Emissions Limit
Particulate matter (PM-10)	620
Sulfur dioxide	5,660
Nitrogen oxides	37,140
Carbon monoxide	180
Volatile organic compounds	180
Hazardous air pollutants total	2,780

As long as BMWNC does not exceed these permit limits, it is operating in accordance with the relevant laws and regulations governing air quality in Mecklenburg County: MCAPCO Regulation 1.5711. However, the current permit is not protective of public health.

Computer Modeling: The Worst Case Scenario

The Blue Ridge Environmental Defense League utilizes a mathematical formula developed by the US EPA and based on computerized air dispersion models. The model takes into account three basic methods of air pollution estimation: point source, area source and volume source.

- **Point source** — A single, identifiable source of air pollutant emissions; for example, a fossil-fuel power plant's flue gas stack.
- **Area source** — A two-dimensional source of diffuse air pollutant emissions; for example, a forest fire or landfill gas.
- **Volume source** — A three-dimensional source of diffuse air pollutant emissions; for example, the fugitive gaseous emissions from pipe flanges, valves, conveyors and other

equipment at various heights within industrial facilities such as oil refineries and asphalt plants.

The most recent Mecklenburg County Air Quality permit review for the BMWNC medical waste incinerator lists three types of emission rates: modeled, calculated and tested. Of the three, the 2009 stack test results, shown below, are the lowest.[8]

Figure A: Permit Review Tests and Computer Modeling

	Modeled Emission Rate from 09-01V-099 application		Calculated Emission Rate (Application)		2009 Stack Test Results
	ES-1 through stack #1	ES-1 through stack #2	Potential Uncontrolled	Potential Controlled	
Hydrogen Chloride (lbs/hr)	184.00	111.00	13.80		0.55
Manganese (lbs/day)	576.00	408.00	0.00		0.0012
Dioxin (lbs/yr)	4.05	2.28	0.00		3.0E-5
Arsenic (lbs/yr)	11.39	7.01	0.36		0.020
Beryllium (lbs/yr)	210.24	113.88	0.01		0.0048
Cadmium (lbs/yr)	280.32	157.68	2.45		0.04
Chlorine (lbs/hr)*	5.45	N/A	0.0		N/A
Chromium (lbs/yr)	4.20	2.45	4.38	1.08**	0.98
Hydrogen Fluoride (lbs/hr)	66.00	39.00	1.53		N/A
Hydrogen Fluoride (lbs/day)	552.00	40.01	3.670		N/A
Mercury Vapor (lbs/day)	11.28	7.92	0.08		0.0065
Nickel Metal (lbs/day)	112.80	79.20	31.30		0.0014
Polychlorinated Biphenyls (lbs/year)	4204.80	2452.80	0.75		N/A
Tricholorotrifluoroethane (lbs/hr)	250000.00	151475.00	0.00		N/A

For this report, we selected the most conservative emissions data for the plant, the stack tests done in 2009, and the EPA worst-case model. The results are summarized in the Table C.

Table C: Worst Case Model Results

Pollutant	**Point**	**Area**	**Volume**	**AAL mg/m3**	**Emission rate grams/second**
Arsenic	10	900	800	2.3×10^{-7}	2.88×10^{-7}
Cadmium	10	100	10	5.5×10^{-6}	5.70×10^{-7}
Chromium	>10000	>10000	>10000	8.3×10^{-8}	1.41×10^{-5}
Dioxin	10	200	100	3.0×10^{-9}	4.32×10^{-10}
Hydrogen chloride	10	100	10	0.7	0.69
Mercury	<10	100	<10	0.0006	3.41×10^{-5}

[8] Mecklenburg County Air Quality PERMIT APPLICATION REVIEW SUMMARY, Title V, Permit No. 09-01V-099, Approved 11/12/09, page 6

Hydrogen chloride (hydrochloric acid), cadmium, and mercury all exceed NC standards 328 feet (100 meters) from the plant. Dioxin exceeds NC standards 656 feet (200 meters) from the plant. Arsenic emissions exceed standards a half-mile from the plant (900 meters). And chromium exceeds NC standards over six miles from the plant (10,000 meters). Note these distances are measured from the actual incinerator, not the property line. All of these substances are toxic air pollutants, some are carcinogens. The map, Figure A, illustrates the BMWNC location in Matthews and other nearby communities. In the Appendix to this report are additional maps which illustrate the terrain and local environs.

Figure B: BMWNC Incinerator Site

Some Dioxins May Be Much Higher Than Models Predict

A study of dioxin emitted by incinerators, conducted jointly by the Harvard School of Public Health and the EPA's Center for Environmental Assessment, revealed large differences between what the EPA's ISCST3 computer model predicted compared with actual measurements of the pollutant.[9] The study coordinated stack tests at an incinerator burning municipal solid waste,

[9] Citation: Eschenroeder, A., M. Lorber. 1999. An Evaluation of EPA's ISCST - Version 3 model Part 1. Air dispersion of dioxins. Presented at Dioxin '99, the 19th International Symposium on Halogentated Environmental Organic Pollutants and POPs, held September 12-17 in Venice, Italy. Short paper in, Organohalogen Compounds, Volume 41:547-552.

ambient monitors in the community two kilometers (about a mile and a quarter) from the incinerator and the computer model using local and regional weather data. The study gathered samples and data during two 48-hour periods a month apart.

There are 75 types of dioxin; the most toxic is tetra-chloro-dibenzo-dioxin (TCDD). And it is TCDD which shows the greatest discrepancy between modeled and actual values emitted from an incinerator. Overall, the study indicated that total dioxin levels predicted by the model may underestimate the actual impact by half. For TCDD, the difference was about large as ten times more of the pollutant in the environment than what was estimated by the model. Table D lists the data sets for five homologues of dioxin studied:

Table D: Comparison of Observed and Modeled Concentrations

	First Period		Second Period	
Homologue	**Observed**	**Modeled**	**Observed**	**Modeled**
TCDD	490	67	851	65
PCDD	594	204	1144	198
HxCDD	543	632	1402	611
HpDD	424	1078	1378	1043
OCDD	384	1225	1575	1185
TOTAL	2435	3206	6350	3102

All concentrations are in femtograms/cubic meter, fg/m^3

Observed data are the result of emissions measured at the stack and at six monitoring stations. The study corrected the data for background dioxin levels. Of course, residents living or working near the incinerator are affected by all the forms of dioxin emitted into the environment at the same time.

> While TCDD is the most toxic form of dioxin, 90% of the total toxicity resulting from exposure to dioxins is due to dioxin-like compounds other than TCDD.[10]

The study posited three possible reasons for the differences in modeled and actual concentrations: 1) the vapor to particle ratios for the different types of dioxin could affect stack air sampling (unlikely), 2) The ISCST3 model did not account for particle deposition. Higher chlorinated dioxins would be absorbed by such particles, and 3) de-chlorination of higher chlorinated dioxins by photolysis could increase the level of lower chlorinated dioxins.

Problems with the BMWNC Smoke Stack

We have identified two basic problem areas with regards to the incinerator's pollution exhaust stack: 1) the interconnection of the main stack with another stack and 2) the pollution control bypass system.

---

[10] The American People's Dioxin Report, Technical Support Document, Executive Summary at iii, Center for Health, Environment and Justice, November 1999

First, the configuration of the incinerator's pollution exhaust stack presents a complication which may add to the emissions and confound other air dispersion models. The MCAQ permit review states:

> The facility has requested the ability to use two stack configurations ES-1 through fan/stack #1 or ES-1 through fan/stack #2. The current modeling demonstration was completed with emissions through either of the fan/stack configurations.[11]

Not only will the incinerator emit air pollutants through one or both stacks, Stack 1 and stack 2 and have connections joining them. According to a consultant's report:

> Cross-connections also allow the incinerator to exhaust through a second exhaust stack associated with a now-defunct incinerator.[12]

Here the complication is that the single incinerator not only will emit hot gas through one stack or the other, the stacks themselves are "cross-connected" in a manner which could cause pollution to escape through the interconnection itself.

Second, the pollution control device bypass system is also a confounding factor. On April 21, 2009 BMWNC, Inc. was issued a notice of violation of MCAPCO Regulation 2.1206 - "Hospital, Medical, and Infectious Waste Incinerators" paragraph (b) and MCAPCO Regulation 1.5104 - "General Duties of the Director with the Approval of the Board" listed in Permit to Construct/Operate No. 04-01V-099. This violation cited BMWNC for use of the bypass stack resulting in a violation of the particulate matter, dioxin, furan, hydrogen chloride, lead, cadmium and mercury emission limits.[13]

Other areas of concern include the relatively low exhaust point. Stacks ES-1 and ES-2 are only 66 feet high. Pollution engineering practice considers short stacks to be those of less than 50 meters tall (164 feet). "Emissions from short stacks are not as well studied and often exhibit large deviations from the Gaussian model owing to interactions with local terrain and buildings."[14] Tall stacks are considered to be those that are at least 2.5 times as tall as the nearest buildings. Examples would include coal fired power plant stacks of 500 to 800 feet tall. (Cooper and Alley)

Conclusion

Based on the uncertainties in predicting pollution levels, the inherent weakness in the regulations, the lack of demonstrated need for incineration, and the impact of toxic pollution on public health, we call for the elimination of incineration as a method of managing medical waste.

---

[11] MCAQ Permit Application Review Summary, Title V, page 7

[12] Providence Environmental Partners Air Dispersion Modeling Report for BMWNC, Inc., Matthews, NC, February 2009, page 5

[13] MCAQ Permit Application Review Summary, Title V, page 4

[14] *Air Pollution Control: A Design Approach*, 2nd Edition, 1994, Cooper and Alley, ISBN 0-88133-758-7, page 625

APPENDIX A: Worst Case Model Runs

Enter the peak emission rate of the contaminant of concern
arsenic

Peak (30 min) Emission Rate =	**0.000000288**	**g/s**	**1E-05**	**tons/yr**
MW=	**74.92**			
Concern level	**0.000000074**	**ppm**	**2E-04**	**ug/m3**

Distance (M)	**Point**	**Area**	**Volume**	**Worst**	**Recommendation**
10	3.70E-03	4.95E-02	4.92E-03	**4.95E-02**	reduce emissions
100	2.12E-04	6.80E-03	2.22E-03	**6.80E-03**	reduce emissions
200	1.16E-04	2.69E-03	1.23E-03	**2.69E-03**	reduce emissions
300	7.97E-05	1.46E-03	7.93E-04	**1.46E-03**	reduce emissions
400	6.12E-05	9.26E-04	5.58E-04	**9.26E-04**	reduce emissions
500	4.98E-05	6.45E-04	4.17E-04	**6.45E-04**	reduce emissions
600	4.21E-05	4.78E-04	3.34E-04	**4.78E-04**	reduce emissions
700	3.56E-05	3.70E-04	2.71E-04	**3.70E-04**	reduce emissions
800	3.10E-05	3.00E-04	2.26E-04	**3.00E-04**	reduce emissions
900	3.12E-05	2.50E-04	1.93E-04	**2.50E-04**	reduce emissions
1000	3.12E-05	2.12E-04	1.67E-04	**2.12E-04**	its OK
1100	3.08E-05	1.83E-04	1.46E-04	**1.83E-04**	its OK
1200	3.08E-05	1.60E-04	1.29E-04	**1.60E-04**	its OK
1300	3.08E-05	1.42E-04	1.15E-04	**1.42E-04**	its OK
1400	3.05E-05	1.27E-04	1.04E-04	**1.27E-04**	its OK
1500	3.01E-05	1.14E-04	9.39E-05	**1.14E-04**	its OK

Enter the peak emission rate of the contaminant of concern
cadmium

Peak (30 min) Emission Rate =	**0.00000057**	**g/s**	**2E-05**	**tons/yr**
MW=	**112.4**			
Concern level	**0.00000118**	**ppm**	**0.005**	**ug/m3**

Distance (M)	**Point**	**Area**	**Volume**	**Worst**	**Recommendation**
10	7.31E-03	9.79E-02	9.75E-03	**9.79E-02**	reduce emissions
100	4.20E-04	1.35E-02	4.39E-03	**1.35E-02**	reduce emissions
200	2.29E-04	5.33E-03	2.44E-03	**5.33E-03**	its OK
300	1.58E-04	2.89E-03	1.57E-03	**2.89E-03**	its OK
400	1.21E-04	1.83E-03	1.10E-03	**1.83E-03**	its OK
500	9.85E-05	1.28E-03	8.25E-04	**1.28E-03**	its OK
600	8.33E-05	9.46E-04	6.62E-04	**9.46E-04**	its OK
700	7.05E-05	7.33E-04	5.37E-04	**7.33E-04**	its OK
800	6.14E-05	5.95E-04	4.47E-04	**5.95E-04**	its OK

900	6.17E-05	4.94E-04	3.83E-04	**4.94E-04**		its OK
1000	6.18E-05	4.19E-04	3.31E-04	**4.19E-04**		its OK

Enter the peak emission rate of the contaminant of concern
chromium

Peak (30 min) Emission Rate =	**0.0000141**	**g/s**	**5E-04**	**tons/yr**
MW=	**51.99**			
Concern level	**3.85E-08**	**ppm**	**8E-05**	**ug/m3**

Distance (M)	**Point**	**Area**	**Volume**	**Worst**	**Recommendation**
10	1.81E-01	2.42E+00	2.41E-01	**2.42E+00**	reduce emissions
100	1.04E-02	3.33E-01	1.09E-01	**3.33E-01**	reduce emissions
200	5.67E-03	1.32E-01	6.02E-02	**1.32E-01**	reduce emissions
300	3.90E-03	7.15E-02	3.88E-02	**7.15E-02**	reduce emissions
400	3.00E-03	4.53E-02	2.73E-02	**4.53E-02**	reduce emissions
500	2.44E-03	3.16E-02	2.04E-02	**3.16E-02**	reduce emissions
600	2.06E-03	2.34E-02	1.64E-02	**2.34E-02**	reduce emissions
700	1.74E-03	1.81E-02	1.33E-02	**1.81E-02**	reduce emissions
800	1.52E-03	1.47E-02	1.10E-02	**1.47E-02**	reduce emissions
900	1.53E-03	1.22E-02	9.47E-03	**1.22E-02**	reduce emissions
1000	1.53E-03	1.04E-02	8.18E-03	**1.04E-02**	reduce emissions
1100	1.51E-03	8.95E-03	7.15E-03	**8.95E-03**	reduce emissions
1200	1.51E-03	7.84E-03	6.33E-03	**7.84E-03**	reduce emissions
1300	1.51E-03	6.94E-03	5.64E-03	**6.94E-03**	reduce emissions
1400	1.49E-03	6.19E-03	5.08E-03	**6.19E-03**	reduce emissions
1500	1.47E-03	5.57E-03	4.60E-03	**5.57E-03**	reduce emissions
1600	1.45E-03	5.05E-03	4.19E-03	**5.05E-03**	reduce emissions
1700	1.42E-03	4.60E-03	3.84E-03	**4.60E-03**	reduce emissions
1800	1.39E-03	4.22E-03	3.53E-03	**4.22E-03**	reduce emissions
1900	1.35E-03	3.88E-03	3.26E-03	**3.88E-03**	reduce emissions
2000	1.32E-03	3.59E-03	3.06E-03	**3.59E-03**	reduce emissions
2100	1.28E-03	3.34E-03	2.86E-03	**3.34E-03**	reduce emissions
2200	1.24E-03	3.13E-03	2.68E-03	**3.13E-03**	reduce emissions
2300	1.21E-03	2.93E-03	2.52E-03	**2.93E-03**	reduce emissions
2400	1.17E-03	2.76E-03	2.38E-03	**2.76E-03**	reduce emissions
2500	1.14E-03	2.60E-03	2.24E-03	**2.60E-03**	reduce emissions
2600	1.11E-03	2.46E-03	2.12E-03	**2.46E-03**	reduce emissions
2700	1.07E-03	2.33E-03	2.01E-03	**2.33E-03**	reduce emissions
2800	1.04E-03	2.21E-03	1.91E-03	**2.21E-03**	reduce emissions
2900	1.01E-03	2.10E-03	1.82E-03	**2.10E-03**	reduce emissions
3000	9.86E-04	2.00E-03	1.75E-03	**2.00E-03**	reduce emissions
3500	8.61E-04	1.62E-03	1.42E-03	**1.62E-03**	reduce emissions
4000	7.61E-04	1.35E-03	1.19E-03	**1.35E-03**	reduce emissions
4500	6.78E-04	1.15E-03	1.02E-03	**1.15E-03**	reduce emissions
5000	6.10E-04	9.96E-04	8.82E-04	**9.96E-04**	reduce emissions
5500	5.53E-04	8.75E-04	7.76E-04	**8.75E-04**	reduce emissions

6000	5.04E-04	7.77E-04	6.90E-04	**7.77E-04**	reduce emissions
6500	4.63E-04	6.97E-04	6.20E-04	**6.97E-04**	reduce emissions
7000	4.27E-04	6.30E-04	5.61E-04	**6.30E-04**	reduce emissions
7500	3.96E-04	5.76E-04	5.13E-04	**5.76E-04**	reduce emissions
8000	3.69E-04	5.29E-04	4.72E-04	**5.29E-04**	reduce emissions
8500	3.45E-04	4.89E-04	4.36E-04	**4.89E-04**	reduce emissions
9000	3.24E-04	4.54E-04	4.05E-04	**4.54E-04**	reduce emissions
9500	3.05E-04	4.23E-04	3.78E-04	**4.23E-04**	reduce emissions
10000	2.88E-04	3.96E-04	3.53E-04	**3.96E-04**	reduce emissions

Enter the peak emission rate of the contaminant of concern
dioxin

Peak (30 min) Emission Rate =	**4.32E-10**	**g/s**	**2E-08**	**tons/yr**
MW=	**321.96**			
Concern level	**2.25E-10**	**ppm**	**3E-06**	**ug/m3**

Distance (M)	**Point**	**Area**	**Volume**	**Worst**	**Recommendation**
10	5.54E-06	7.42E-05	7.39E-06	**7.42E-05**	reduce emissions
100	3.18E-07	1.02E-05	3.33E-06	**1.02E-05**	reduce emissions
200	1.74E-07	4.04E-06	1.85E-06	**4.04E-06**	reduce emissions
300	1.20E-07	2.19E-06	1.19E-06	**2.19E-06**	its OK
400	9.18E-08	1.39E-06	8.37E-07	**1.39E-06**	its OK
500	7.46E-08	9.67E-07	6.25E-07	**9.67E-07**	its OK
600	6.32E-08	7.17E-07	5.02E-07	**7.17E-07**	its OK
700	5.34E-08	5.56E-07	4.07E-07	**5.56E-07**	its OK
800	4.66E-08	4.51E-07	3.38E-07	**4.51E-07**	its OK
900	4.67E-08	3.75E-07	2.90E-07	**3.75E-07**	its OK
1000	4.69E-08	3.17E-07	2.51E-07	**3.17E-07**	its OK

Enter the peak emission rate of the contaminant of concern
hydrogen chloride

Peak (30 min) Emission Rate =	**0.069**	**g/s**	**2.407**	**tons/yr**
MW=	**36.47**			
Concern level	**0.463**	**ppm**	**690.6**	**ug/m3**

Distance (M)	**Point**	**Area**	**Volume**	**Worst**	**Recommendation**
10	8.89E+02	1.19E+04	1.19E+03	**1.19E+04**	reduce emissions
100	5.11E+01	1.64E+03	5.33E+02	**1.64E+03**	reduce emissions
200	2.79E+01	6.48E+02	2.96E+02	**6.48E+02**	its OK
300	1.92E+01	3.51E+02	1.91E+02	**3.51E+02**	its OK
400	1.47E+01	2.23E+02	1.34E+02	**2.23E+02**	its OK

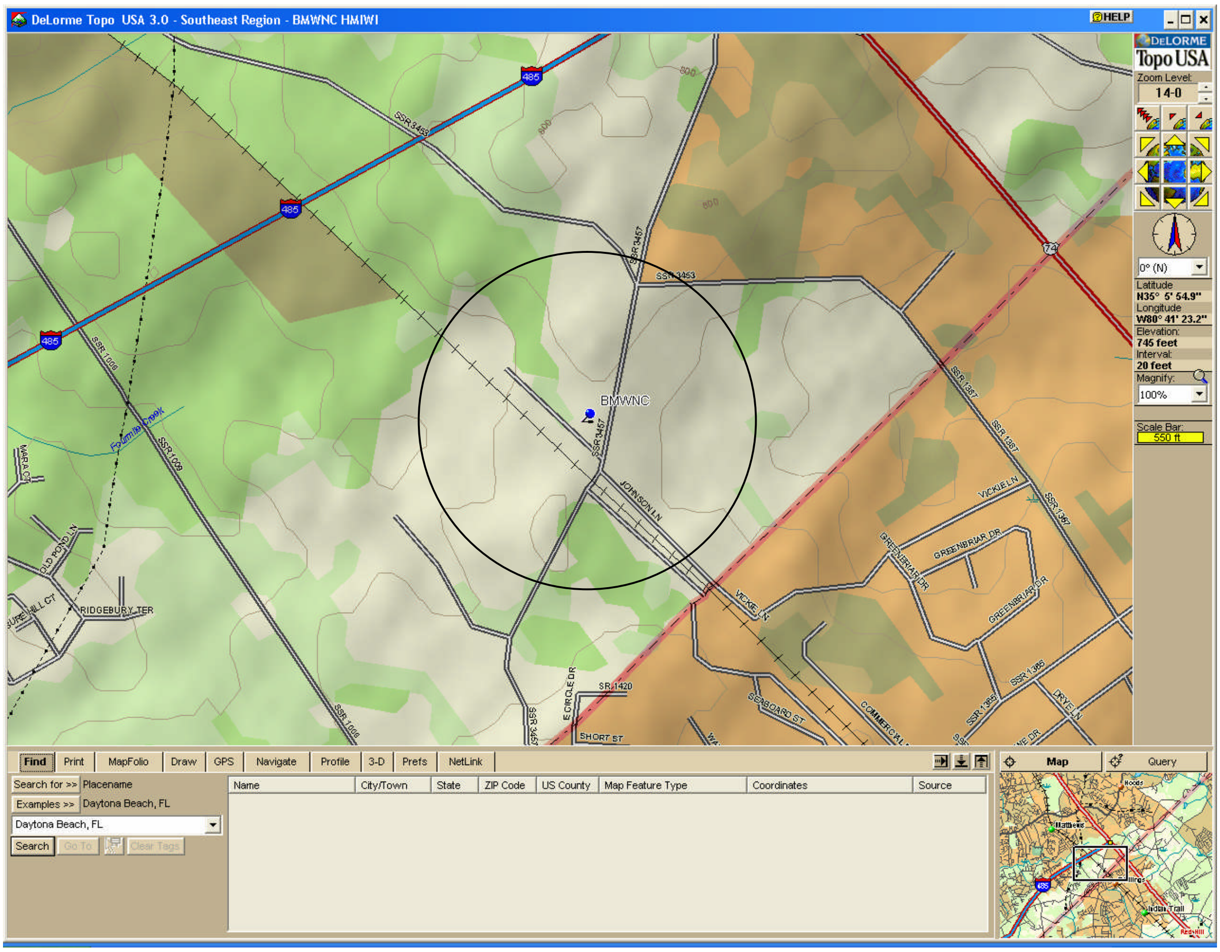
500	1.20E+01	1.55E+02	1.00E+02	**1.55E+02**	its OK
600	1.01E+01	1.15E+02	8.05E+01	**1.15E+02**	its OK
700	8.57E+00	8.91E+01	6.53E+01	**8.91E+01**	its OK
800	7.47E+00	7.23E+01	5.43E+01	**7.23E+01**	its OK
900	7.50E+00	6.01E+01	4.65E+01	**6.01E+01**	its OK
1000	7.52E+00	5.09E+01	4.02E+01	**5.09E+01**	its OK

Enter the peak emission rate of the contaminant of concern
mercury

Peak (30 min) Emission Rate =	**0.0000341**	**g/s**	**0.001**	**tons/yr**
MW=	**200.59**			
Concern level	**0.0000722**	**ppm**	**0.592**	**ug/m3**

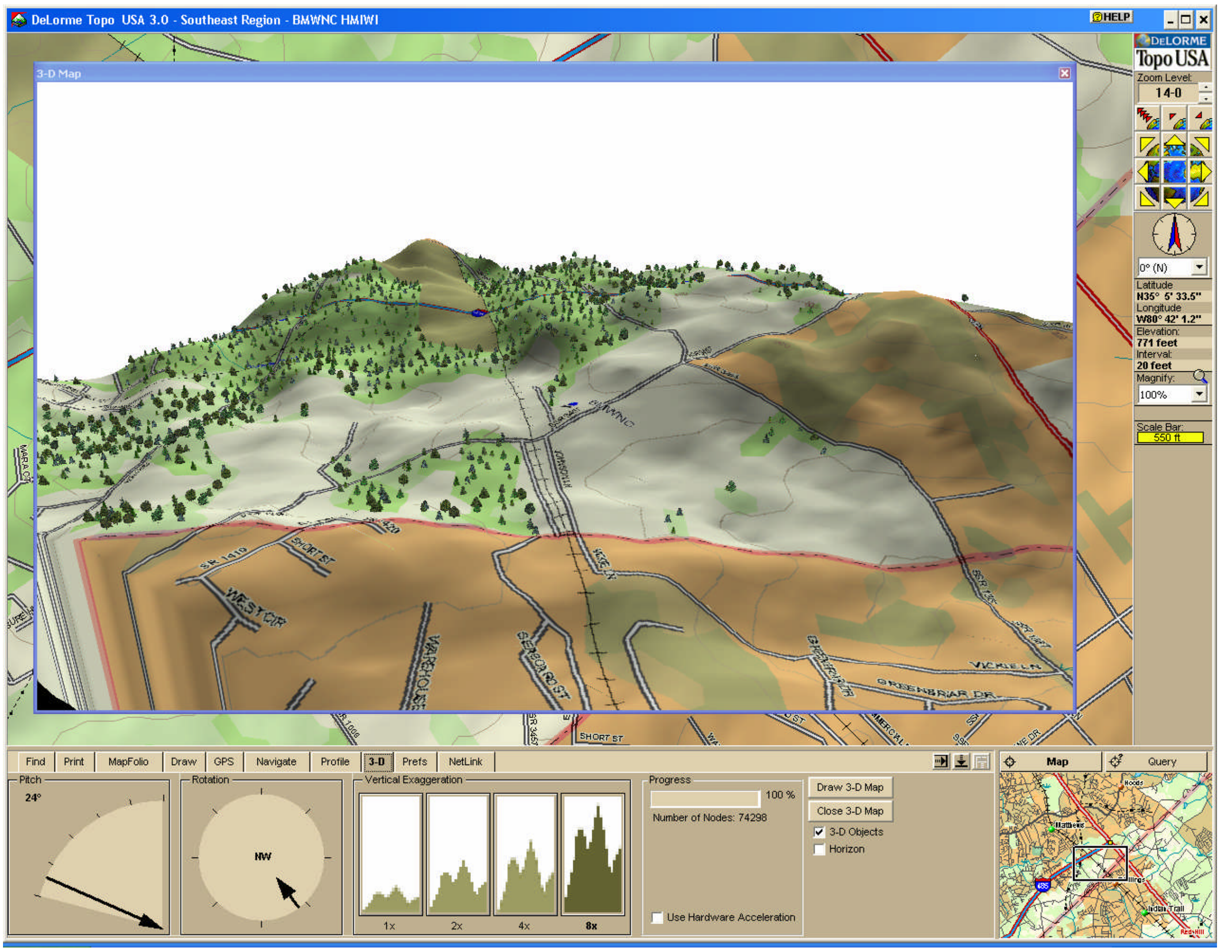
Distance (M)	**Point**	**Area**	**Volume**	**Worst**	**Recommendation**
10	4.38E-01	5.86E+00	5.83E-01	**5.86E+00**	reduce emissions
100	2.51E-02	8.05E-01	2.63E-01	**8.05E-01**	reduce emissions
200	1.37E-02	3.19E-01	1.46E-01	**3.19E-01**	its OK
300	9.44E-03	1.73E-01	9.38E-02	**1.73E-01**	its OK
400	7.25E-03	1.10E-01	6.61E-02	**1.10E-01**	its OK
500	5.89E-03	7.63E-02	4.93E-02	**7.63E-02**	its OK
600	4.99E-03	5.66E-02	3.96E-02	**5.66E-02**	its OK
700	4.22E-03	4.39E-02	3.21E-02	**4.39E-02**	its OK
800	3.68E-03	3.56E-02	2.67E-02	**3.56E-02**	its OK
900	3.69E-03	2.96E-02	2.29E-02	**2.96E-02**	its OK
1000	3.70E-03	2.50E-02	1.98E-02	**2.50E-02**	its OK

APPENDIX B: BMWNC Site Maps



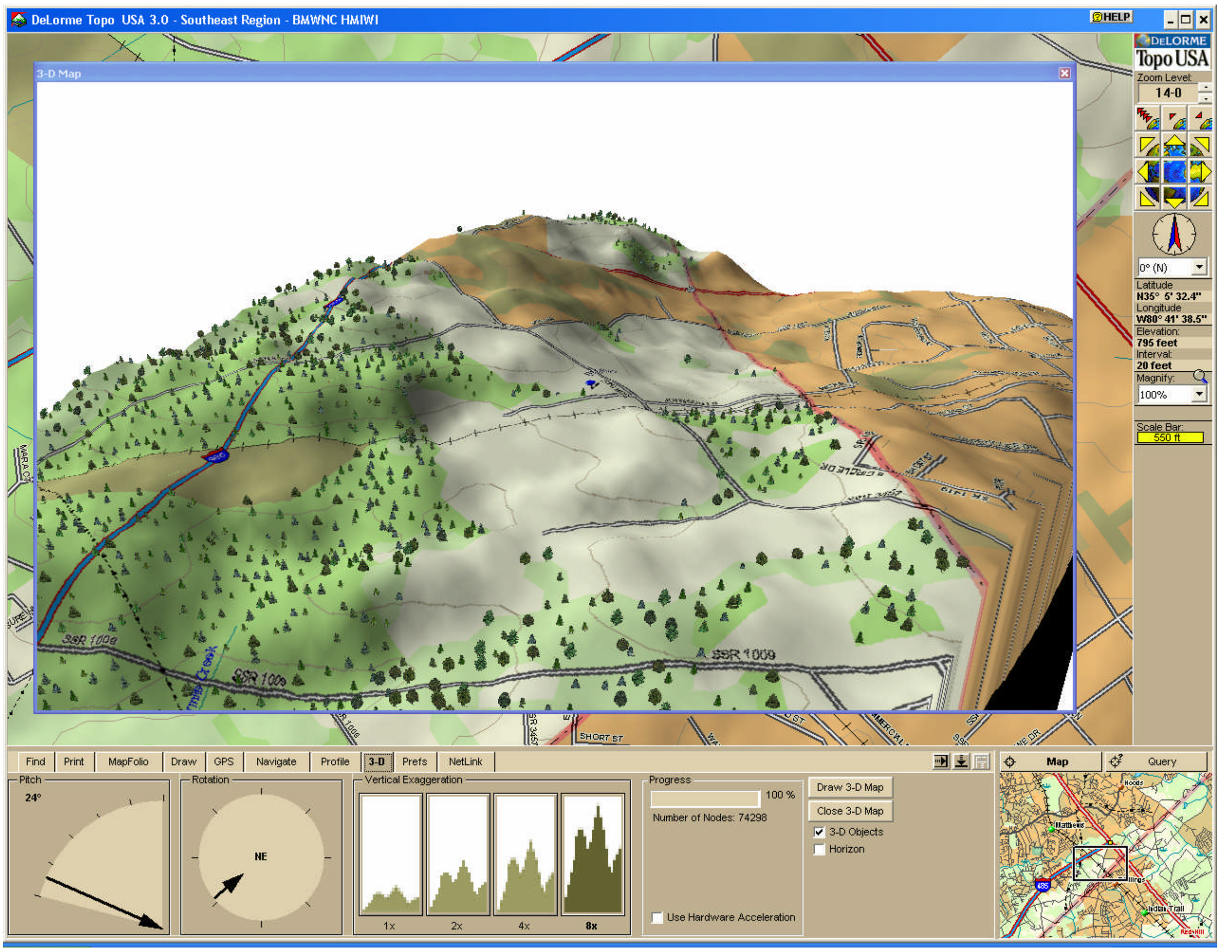
Map 1: Vertical Overhead View

APPENDIX B: BMWNC Site Maps



Map 2: Three-dimensional Relief Map, Northwest Aspect

APPENDIX B: BMWNC Site Maps



Map 3: Three-dimensional Relief Map, Northeast Aspect

Appendix C: The Case Against Medical Waste Incineration

Physicians for Social Responsibility, Ted Schettler, MD, MPH

- Hospitals in the United States produce an estimated 2 million tons of waste per year. This does not include waste generated in physicians' offices, nursing homes, and outpatient facilities
- About 10-15% of hospital waste is regulated as infectious. Detailed analyses of red-bag contents show that red-bagging is overused in most institutions. Depending on the definition of regulated medical waste, which varies considerably from state to state, 1.5-2.5 lbs. of red-bag waste per day per bed occupied is justified. Yet 2.5-3.5 lbs. per day per bed is common and more than four lbs. per day is sometimes found. In operating rooms, surveys show that a considerable amount of red-bag waste is often generated before the patient even enters the room.
- Plastics comprise 15-30% of the medical waste stream -- twice that of ordinary household waste. Polyvinyl chloride (PVC) is a larger portion of hospital waste than other solid waste streams. PVC contains about 50% chlorine by weight and represents a large source of chlorine necessary for dioxin formation in incinerators. One analysis found that PVC gloves and IV bags alone accounted for over 80% of the chlorine content in medical waste from New York City.
- PVC may be present in: ventilator and oxygen therapy tubing, endotracheal tubes, ambu bags, facemasks and oral airways, IV bags and tubing, dialysis equipment, patient ID ~ bracelets, gloves, protective covers and record binders, mattress covers, and packaging.
- Mercury is present in batteries, thermometers, Miller-Abbot tubes, Cantor tubes, sphygmomanometers, electrical equipment, fluorescent lamps, laboratory reagents, and disinfectants.
- Much of this medical waste, including the unregulated portion, is disposed of in incinerators.