OFFICIAL

PETERS TOWNSHIP
WASHINGTON COUNTY, PENNSYLVANIA

ORDINANCE___________

AN ORDINANCE OF PETERS TOWNSHIP, WASHINGTON COUNTY. PENNSYLVANIA, AMENDING ORDINANCE No. 657, DATED NOVEMBER 29, 2005, CHAPTER 27, PETERS TOWNSHIP, ZONING ORDINANCE OF THE TOWNSHIP CODE OF ORDINANCES SPECIFICALLY SECTION 200 LANGUAGE INTERPRETATIONS AND SECTION 303 PERMITTED AND CONDITIONAL USES AND USES BY SPECIAL EXCEPTION BY ZONING DISTRICT.

WHEREAS, funeral homes are permitted uses in C-1 and C-2 zoning districts; and

WHEREAS, the Peters Township Planning Staff found that allowing funeral homes with crematories in the C-1 and C-2 zoning districts to be consistent with the C-1 and C-2 district intent set forth in Section 302 of the Zoning Ordinance; and

WHEREAS, the Council of Peters Township has held a Public Hearing, reviewed the proposed ordinance and determined the amendment to be sound land use planning.

NOW, THEREFORE, be it ordained and enacted by the Council of Peters Township in meeting assembled, and it is hereby ordained and enacted by and with the authority of same as follows:

<u>Section 1.</u>

§ 200. Language Interpretations.

Funeral Home - A building used for the embalming of the deceased prior to burial, but not including cremation, and/or for the viewing of the deceased and ceremonies connected therewith before burial or cremation.

be amended as follows:

Funeral Home - A building used for the embalming and/or cremation of the deceased prior to burial and for the viewing of the deceased and ceremonies connected therewith before burial or cremation.

Section 2.

That any ordinance or part of any ordinance conflicting with the provisions contained within this ordinance amendment be and the same are hereby repealed to the extent of such conflict.

BE IT ORDAINED AND ENACTED BY the Township of Peters, Washington County, Pennsylvania this _________ day of ___________________ 2011.

ATTEST: PETERS TOWNSHIP

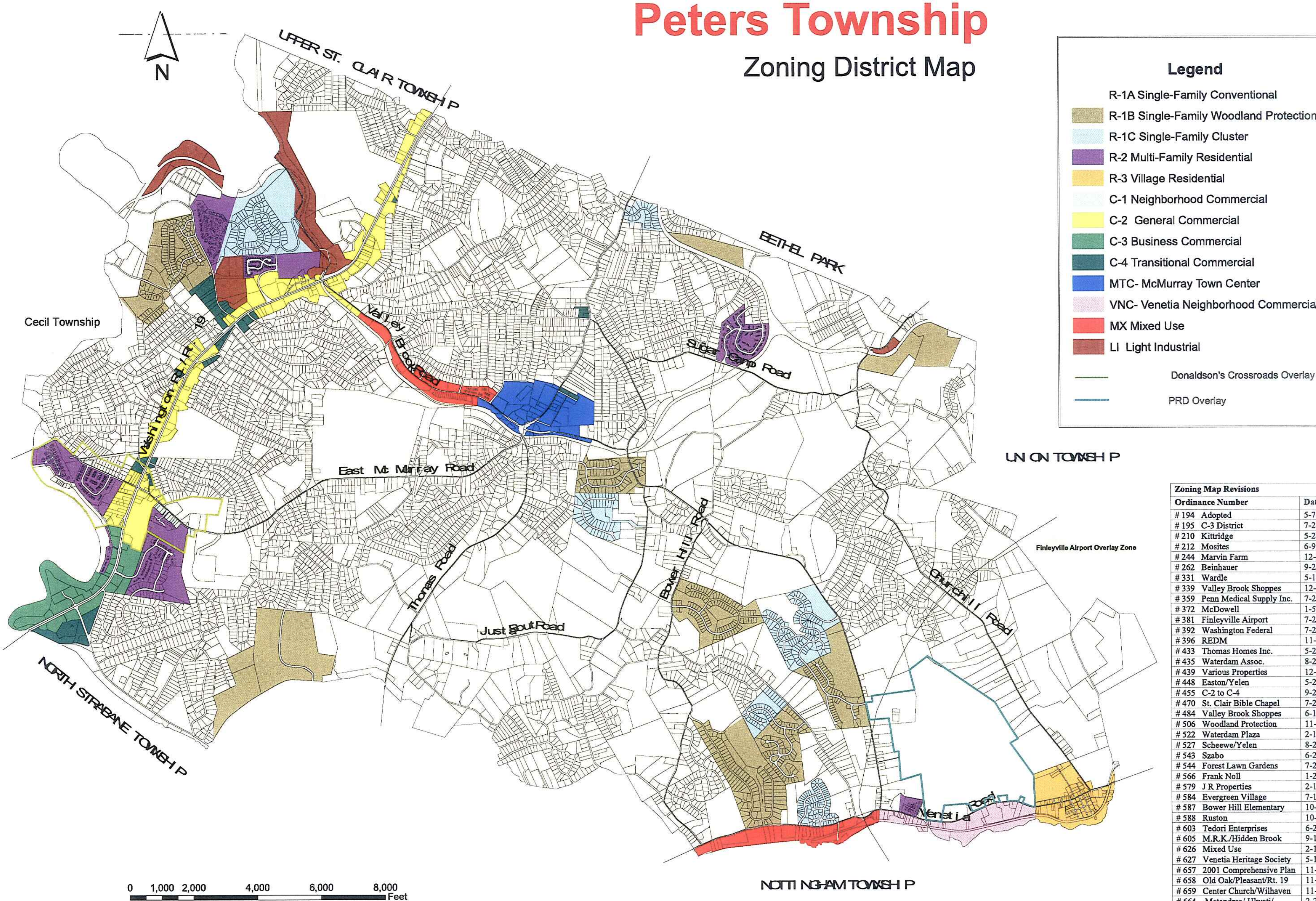
_________________________________ By: _______________________________

Michael A. Silvestri
Township Manager

Robert L. Atkison
Chairman of Council

Peters Township

Zoning District Map



Source: Peters Township GIS
5/24/06

Zoning Map Revisions	
Ordinance Number	Date
# 194 Adopted	5-7-1979
# 195 C-3 District	7-2-1979
# 210 Kittridge	5-27-1980
# 212 Mosites	6-9-1980
# 244 Marvin Farm	12-14-1981
# 262 Beinhauer	9-27-1982
# 331 Wardle	5-13-1985
# 339 Valley Brook Shoppes	12-9-1985
# 359 Penn Medical Supply Inc.	7-28-1986
# 372 McDowell	1-5-1987
# 381 Finleyville Airport	7-27-1987
# 392 Washington Federal	7-25-1988
# 396 REDM	11-28-1988
# 433 Thomas Homes Inc.	5-29-1990
# 435 Waterdam Assoc.	8-27-1990
# 439 Various Properties	12-10-1990
# 448 Easton/Yelen	5-28-1991
# 455 C-2 to C-4	9-23-1991
# 470 St. Clair Bible Chapel	7-27-1992
# 484 Valley Brook Shoppes	6-14-1993
# 506 Woodland Protection	11-14-1994
# 522 Waterdam Plaza	2-12-1996
# 527 Scheewe/Yelen	8-26-1996
# 543 Szabo	6-23-1997
# 544 Forest Lawn Gardens	7-28-1997
# 566 Frank Noll	1-25-1999
# 579 J R Properties	2-14-2000
# 584 Evergreen Village	7-10-2000
# 587 Bower Hill Elementary	10-23-2000
# 588 Ruston	10-23-2000
# 603 Tedori Enterprises	6-25-2001
# 605 M.R.K./Hidden Brook	9-10-2001
# 626 Mixed Use	2-10-2003
# 627 Venetia Heritage Society	5-12-2003
# 657 2001 Comprehensive Plan	11-29-2005
# 658 Old Oak/Pleasant/Rt. 19	11-29-2005
# 659 Center Church/Wilhaven	11-29-2005
# 664 Matandrea/ Hlwati/ Snyder	2-27-2006
# 668 Martik	5-22-2006
#708 Szabo	2-9-2009

Peters Township
WASHINGTON COUNTY

MICHAEL A. SILVESTRI, *Manager*
PAUL F. LAUER, *Assistant Manager*

610 East McMurray Road
McMurray, Pennsylvania 15317-3496
724/941-4180 Fax 942-5022
Dept. Direct Dial No.:

MEMO TO: M. A. Silvestri
FROM: Ed Zuk EZ
DATE: March 16, 2011
TOPIC: **Planning Commission Recommendation to Council – Zoning Ordinance Amendment to Allow Use to Funeral Homes in the C-1, C-2 and VNC Commercial Zoning Districts**

Audia Group Investments, LLC and Danielle & Andy Belusco have filed and are requesting a landowner curative amendment to amend the definition of funeral homes to include cremation services. The current definition of funeral home in the Peters Township Zoning Ordinance is as follows:

> A building used for the embalming of the deceased prior to burial, but not including cremation, and/or for the viewing of the deceased and ceremonies connected therewith before burial or cremation.

The proposed Amendment would revise the definition of a funeral home as follows:

> A building used for the embalming or cremation of the deceased prior to burial and/or for the viewing of the deceased and ceremonies connected therewith before burial or cremation.

The action Planning Commission was required to take on a zoning ordinance amendment is to make a recommendation to Council. Council is scheduled to review this request in a public hearing scheduled for Monday, March 21, 2011.

If the amendment is approved funeral homes with crematory services will be a permitted use in the C-1 Neighborhood Commercial, C-2 General Commercial, and the VNC Venetia Neighborhood Commercial Districts. Currently funeral homes without crematory services are a permitted use in the C-1, C-2 and the VNC Zoning Districts
Peters Township currently does not within the zoning ordinance specifically provide a zoning district for crematories and excludes them from funeral homes. Based on the failure of the Zoning Ordinance to provide for crematories the applicants have challenged the validity of the ordinance as written.

Summary of sample communities and how they zone for crematories:

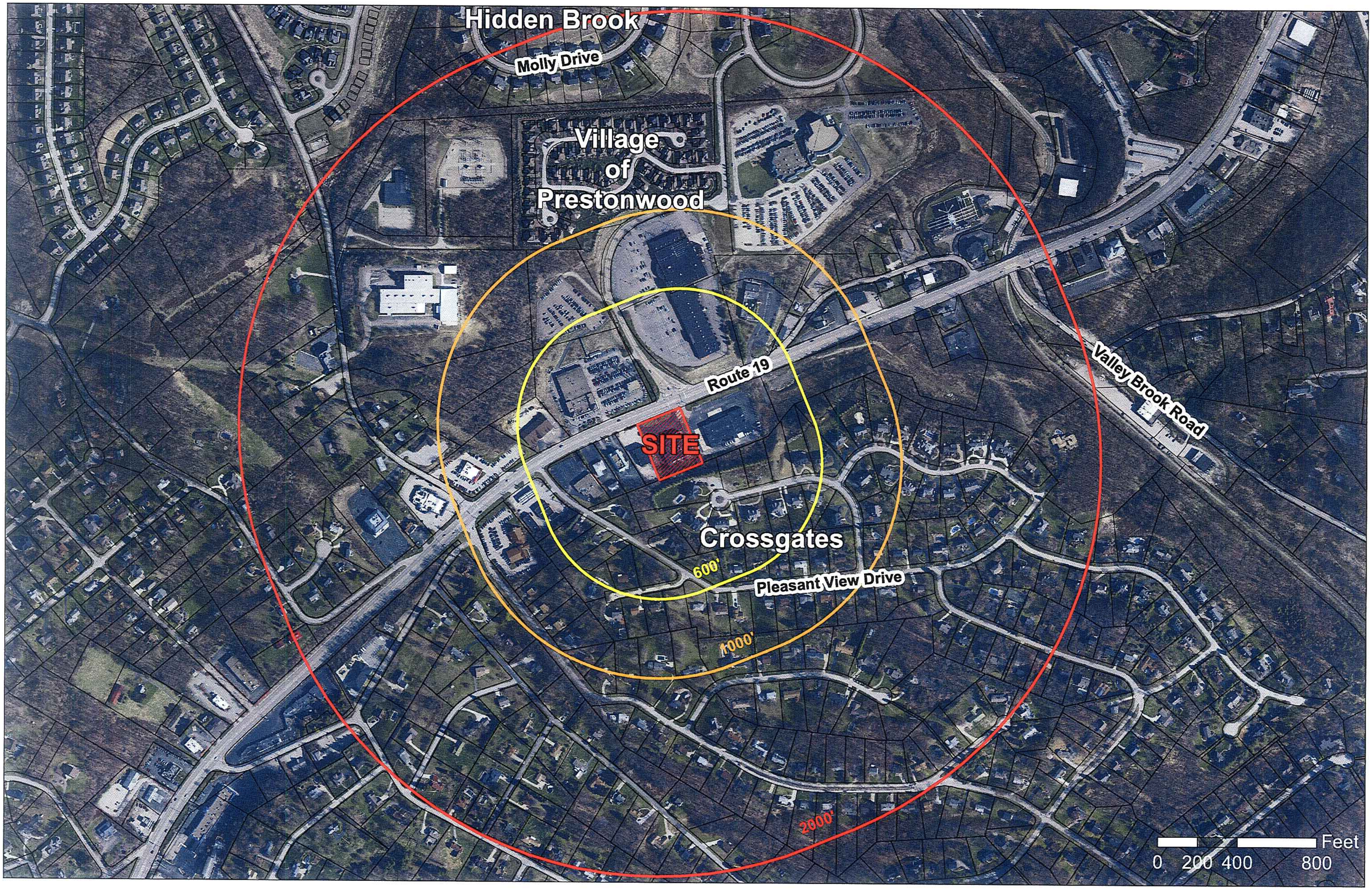
Community	Zoning
USC	Permitted as an accessory use to funeral homes in C-2 – C-3 Districts
Bethel Park	Not provided for in any district
N. Strabane	Permitted in C-1 District accessory to funeral home special exception in a cemetery in the A-1 zone
Mt. Lebanon	Permitted accessory to funeral home & mortuary in the C-2 (Rt. 19) zoning district
Monroeville	Accessory to cemetery in S-1 and S zoning districts
Cranberry Twp	Conditional use in R-1, R-3 SV-1, SP-1 and TND_PRD districts

To assist the Planning Commission and Council the Township hired a third party consultant, Air Science Consultants Inc. to review the crematory proposal materials submitted and provide a report of the their findings. In addition, the consultant will be in attendance at the March 21, 2011 public hearing to present and discuss their report.

Planning Commission Recommendation:
At their March 10, 2011 meeting the Planning Commission unanimously recommended Council deny the applicants proposed ordinance amendment to allow crematories accessory to funeral homes in the C-1, C-2 and VNC zoning districts.

Attached:
- Aerial View Twp GIS
- Proposed Zoning Ordinance Amendment
- CEC Reports 2-21-11/9-2-10
- DEP Letter 3-1-11
- Air Science Consultants Inc. 3-2011 Report
- DEP Regulations (GP 14)
- Several Letters from Property Owners

Cc:
Audia Group Investments, LLC
T. Ribar, Houston Harbaugh
File


Hidden Brook
Molly Drive
Village of Prestonwood
Route 19
SITE
Valley Brook Road
Crossgates
600'
Pleasant View Drive
1000'
2000'
Feet
0 200 400 800

MEMO TO: Planning Commission
FROM: Emily Moldovan and Grant Shiring
DATE: March 10, 2011
TOPIC: 03-08-11 Crematory Visit: Drew Gilbert Funeral Home

On Tuesday March 8, 2011, Emily Moldovan and Grant Shiring visited the Drew Gilbert Funeral Home and Crematory at 6028 Smithfield St, Boston, PA 15135. Also present during the visit were Danielle Andy Belusko (the Applicant), Tammy Ribar (Legal Representative for the Applicant), Kris Macoskey (CEC Principal-Air Emissions Consultant), Drew Gilbert (Funeral Home and Crematory Owner/Operator), and additional funeral home employees. The purposes of the visit were the following:

1. To observe the cremation process; and
2. To investigate claims that there are visible emissions, odors, and noises generated during the cremator operation; and
3. To meet with Mr. Gilbert and discuss various aspects of the cremator operation, maintenance, and inspection.
4. To observe the surrounding land use; and
5. To research any issues with surrounding property owners.

Mr. Gilbert has been in operation for roughly 14 years and currently operates 2 cremation units at the Boston, PA location. One unit was manufactured by Crematory Manufacturing and Service, Inc. and the other by Matthews International. Mr. Gilbert has conducted over 8,000 cremations since opening and stated that the business has grown slowly over the years. He estimates his funeral home generates 700 cremations per year. Of that 700, 100 cremations originate from his funeral home operation and the additional 600 are cremations completed for neighboring funeral homes.

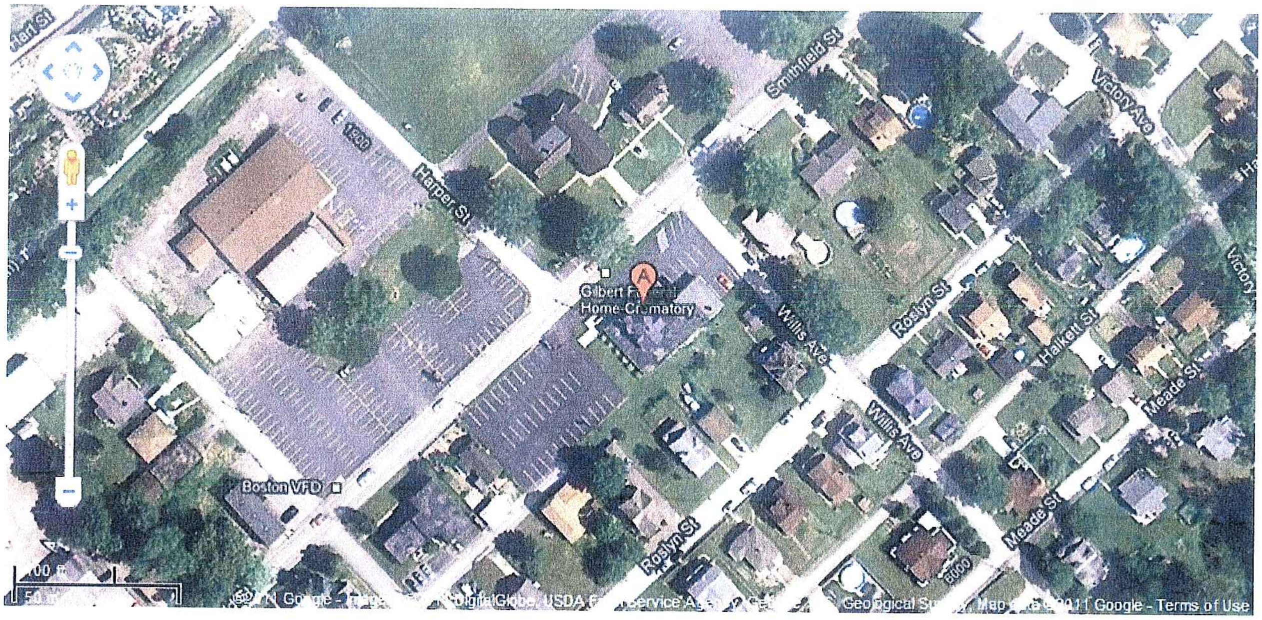
At the time of the visit, two cremations were in progress. The tour began with a walk (approximately 30 min.) around the outside of the building and adjacent properties. Single-family homes were located to the south and east. A church was located to the north and a banquet hall and additional single-family homes were to the west. While standing at the home closest to the cremation stacks, there were no visible emissions, other than heat, or detectable odors observed. The cremation units did generate a low hum. However, the sound created was minor.

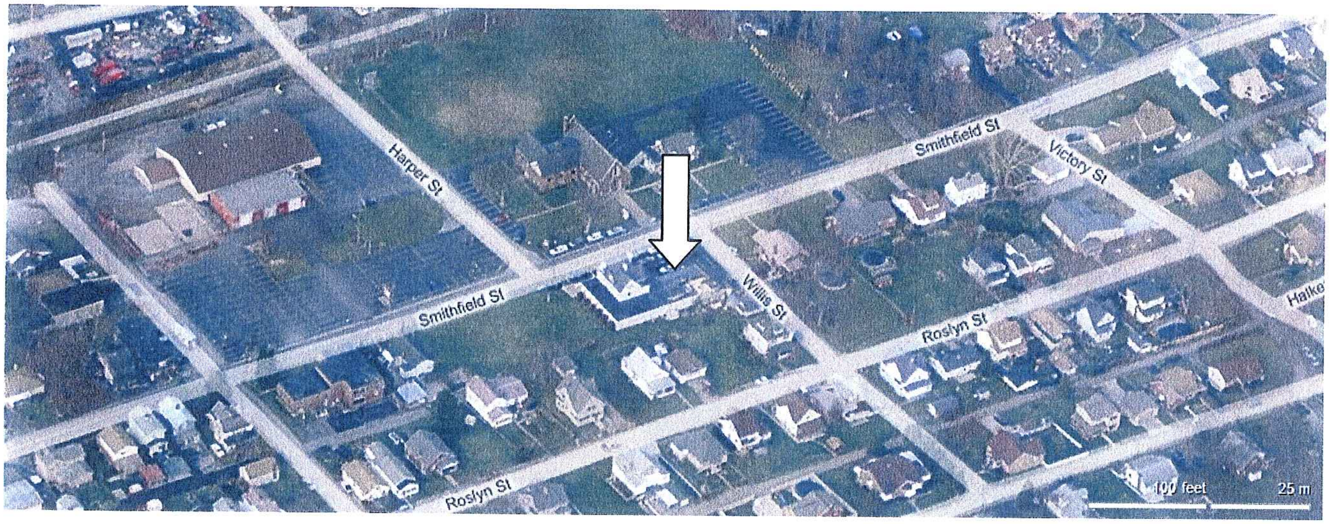
The tour continued inside the funeral home where the cremation units were located. At that time, Mr. Gilbert explained the cremation process, how the units are operated, maintained, and inspected. Mr. Gilbert stated that the certification process to operate the cremator was a day long educational course conducted by the manufacturer. He himself is certified. He also stated that the manufacturers perform annual inspections of the units to ensure proper operation and maximum efficiency. The units are renovated approximately every 5 years. Mr. Gilbert also informed us that his funeral home is under the jurisdiction of the Allegheny County Health Dept: Air Quality Program and that the department actively conducts unannounced inspections of his facilities approximately 4 times a year. The Department also routinely reviews records that Mr. Gilbert is required to keep. The records are created for each cremation and include who is being cremated, what funeral home the cremation is for, how long the cremation takes, and at what temperature the cremator operates for the duration of the process. The tour concluded on the second floor of the funeral home where it was possible to look down on the crematory stacks. Again, no visible emissions, other than heat, were observed.

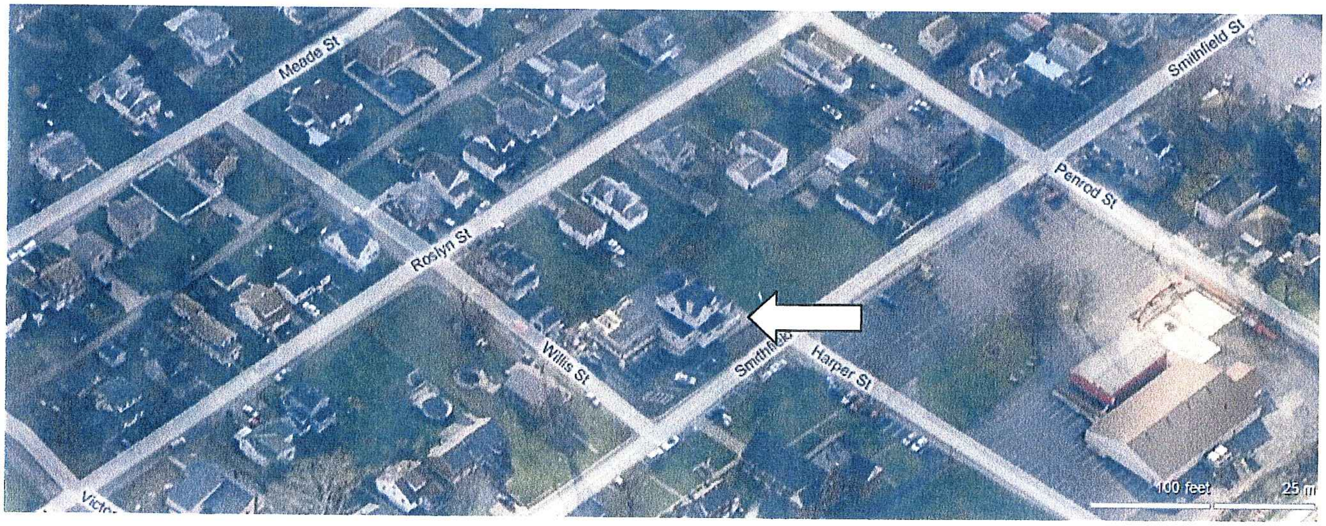
In conclusion, Staff did not witness any visible emission, other than heat, or detectable odors. There were no issues raised by surrounding property owners and the noise generated by the process was minimal. Mr. Gilbert extended an open invitation to anyone who is interested in touring the funeral home and is willing to answer any questions regarding cremation.

Attached: Aerial View
03-08-11 Site Visit Pictures

CC: File
Audia Group Investments, LLC.
Rod and Danielle Andy Belusko
Houston Harbaugh, P.C. Attn: Tammy Ribar


Harper St
Smithfield St
Victory Ave
Home-Crematory
Willis Ave
Roslyn St
Halket St
Meade St
Willis Ave
Meade St
Boston VFD
Roslyn St
100 ft


Harper St
Smithfield St
Victory St
Willis St
Smithfield St
Roslyn St
Roslyn St
100 feet
25 m


Meade St
Smithfield St
Penrod St
Roslyn St
Willis St
Harper St
100 feet
25 m

1. View southeast to adjacent single-family properties from the church across the street.

2. View northeast to adjacent single-family properties from the rear of the funeral home.

3. View west to the rear of the funeral home from the adjacent single-family property.

4. View southwest of the property line between the funeral home and a single-family residence in the rear of the funeral home. The structure to the left is a shed.

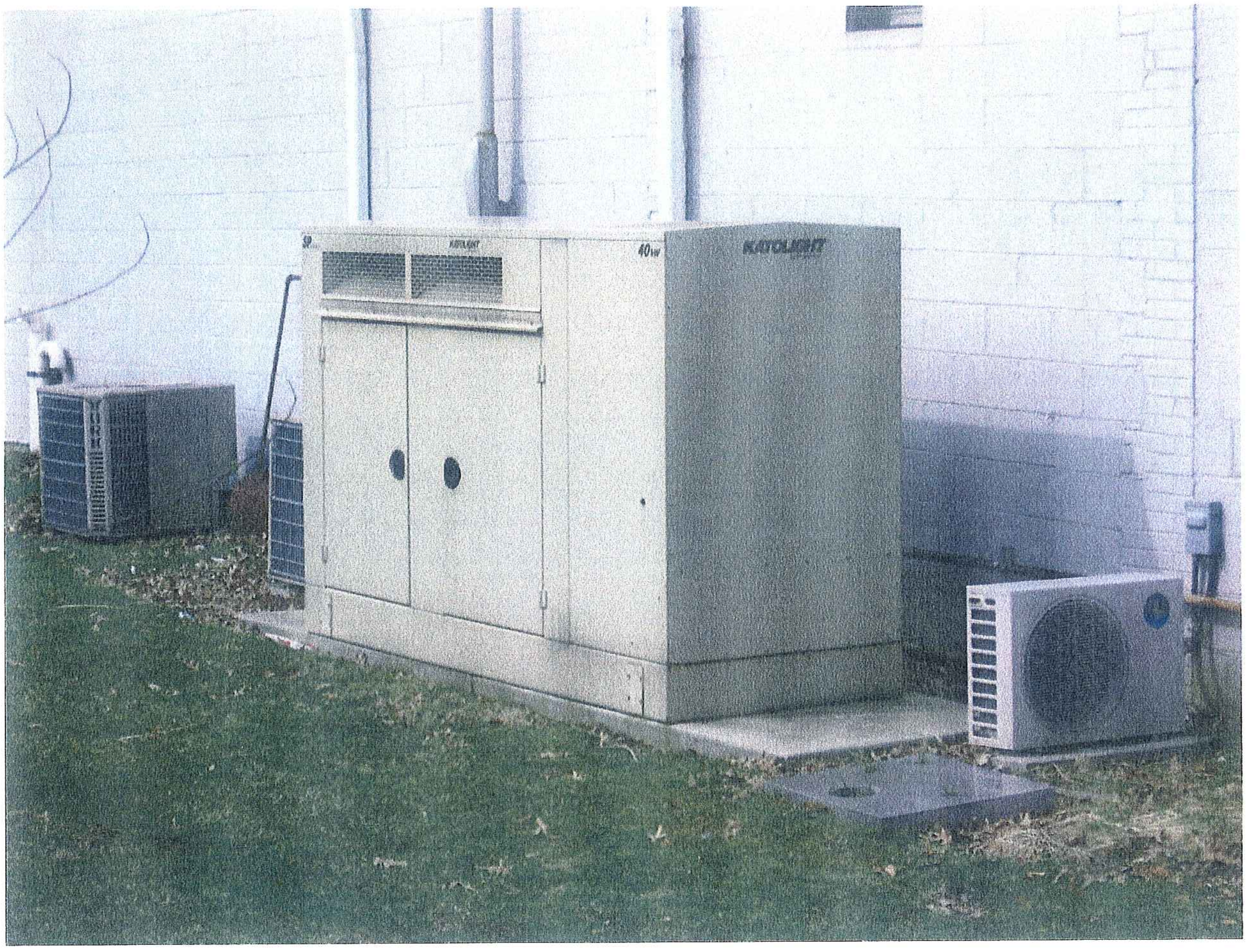
5. View southeast to the neighborhood behind the funeral home.

6. View from the second floor of the funeral home to the crematory stacks.

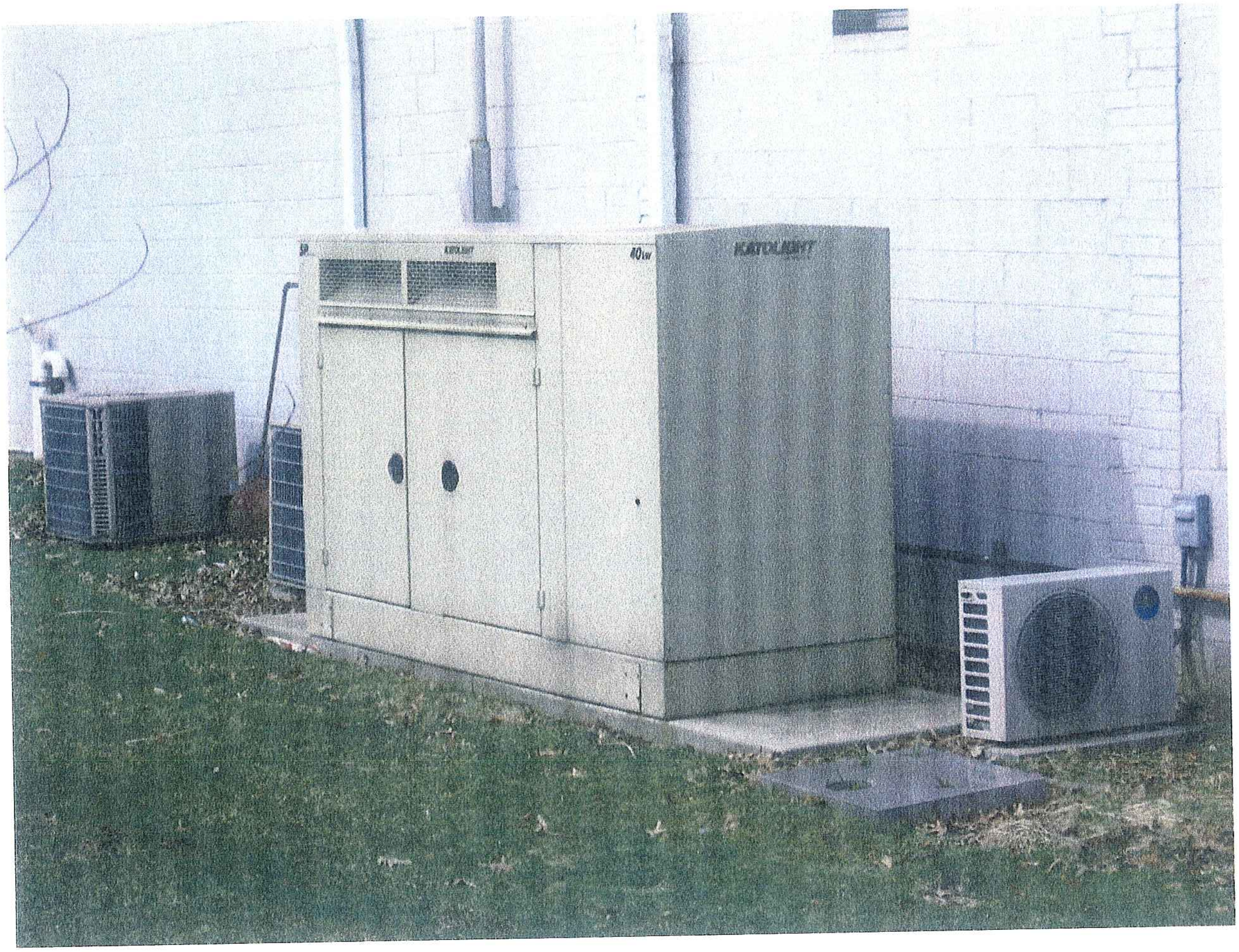
7. View to an adjacent single-family property from the second floor of the funeral home.

8. View to the northeast of the rear property line of the funeral home.

9. Generator that provides power when there is a power outage.



9. Generator to maintain crematory operation during a power outage.



AIR
SCIENCE
CONSULTANTS, INC.

Evaluation of Funeral Home with Crematory Variance Request

March, 2011

INTRODUCTION

Air Science Consultants, Inc. is an environmental consulting and weather forecasting company with a wide range of clients including private, commercial, and government entities. The principal author of this report, Dr. Stanley J. Penkala, has extensive experience in the modeling of air emissions from a variety of sources. He also currently serves as an advisor on dispersion modeling as a member of the Criteria Pollutants Subcommittee of the Allegheny County Health Department.

Air Science was hired by the Peters Township Planning Commission to evaluate a package of information pertaining to the Funeral Home with Crematory variance request, and the licensing of a specific funeral home with crematory in the Township. The topics which are evaluated pertain to the ambient air impacts of the proposed installation. Specific topics include:

- Explanation of Some Technical Terms of Importance
- Cremator design submitted relative to Pennsylvania DEP General Plan Operating Permit.
- Critique of the Air Quality Evaluation Report prepared by Civil & Environmental Consultants, Inc.
- Evaluation of the proposed Cremator Stack Height
- Consideration of Mercury Emissions
- Consideration of Radioisotope Emissions

TECHNICAL TERMS OF IMPORTANCE

Poison – Any substance that causes injury, illness, or death, especially by chemical means.

Concentration – The amount of a particular material in a specific volume of gas, liquid, or solid.

Toxic/Toxicity – The concentration and duration of exposure to a particular material required to cause injury, illness, or death.

Many people have the misconception that the mere presence of an element or chemical characterized as a 'poison' indicates "toxicity". However, that is an oversimplification of reality. To illustrate this concept, please decide which items in this list of materials you would consider toxic.

Water, salt, aspirin, carbon monoxide, carbon dioxide, arsenic, selenium, zinc.

In fact, every item on the list could be toxic and cause death, depending on the concentration and duration of exposure. Yet we know that water and salt are essential to sustaining life processes and that aspirin has useful therapeutic value. In addition, arsenic, selenium, and zinc are essential trace elements found in the human body. Furthermore, carbon dioxide is a natural product of oxygen utilization by humans [and other living creatures] through the process of respiration.

Carbon monoxide [CO] gives us a clear example of toxicity caused by duration of exposure. Carbon Monoxide interferes with the transfer of oxygen to human tissues by forming stronger bonds with the hemoglobin in the blood. Normally, hemoglobin carries Carbon Dioxide [CO2] from the tissues to the lungs, where the CO2 is dumped and replaced by oxygen [O2]. CO binds about 200 times more strongly than O2, so it does not get replaced by O2 unless very little CO is present in the air being breathed. This prevents necessary O2 from getting to the tissues that need it, and without O2, the tissues begin to die. That's why CO monitors generally have two alarm levels. There is an acute level which causes an alarm to sound with very high concentrations of CO... levels that can saturate the blood hemoglobin in a short time and cause loss of consciousness and death quickly. Then there is a lower level, which causes the alarm to sound because the low level will gradually cause increases in blood hemoglobin and sneak up on the victims, who gradually get sleepy from lack of oxygen and die slowly.

Exposure pathways – Chemicals can enter the body by inhalation [absorbed from the air we breathe], ingestion [absorbed from the liquids and solids we consume], and dermal absorption [liquids or gases absorbed through the skin]. Some chemicals can enter in multiple ways, such as metals that are dispersed in the air as a vapor and that are part of the foods that we eat. There are also multiple chemical forms of some materials, which may or may not have the same chemical activity in the body. For example, methyl mercury is a form found in biological tissues and typically ingested from sources such as contaminated fish and grain. Elemental mercury in the form of vapor will result from combustion of mercury-containing materials.

Air Dispersion Models – Computer models designed to estimate the amount by which the concentrated gases/vapors/solids emitted from a particular source, such as a smokestack, will decrease in concentration as a function of time and distance. Parameters affecting the dispersion include the meteorological conditions [primarily wind speed and atmospheric mixing], the surrounding buildings, and the surrounding terrain. Because of the complexity of trying to replicate myriad atmospheric conditions and source emission rates, air dispersion modeling starts with 'screening' models. These produce very conservative [high] concentrations using worst case meteorological conditions and simplified assumptions as to the other variables. Due to the simplifications, they are quick and easy to apply. If the results are within acceptable limits, no further action is usually necessary.

In the event that the screening model does not produce acceptable results, more refined models may be necessary. These can utilize site-specific estimates of the meteorology affecting a particular facility, and incorporate more exact representations of the facility structure, the surrounding terrain, and the emissions anticipated.

DEP General Plan Approval and/or General Operating Permit (BAQ-GPA/GP-14) Human or Animal Crematories – This document sets forth the operational conditions by which a human [or animal] crematory is allowed to be installed and operated within the Commonwealth. It includes the express compliance requirements of crematorium operating conditions, monitoring requirements, operator training, and record keeping. The first of those compliance conditions is the requirement that the crematory shall be ... operated in such a manner as not to cause air pollution, as defined in 25 Pa. Code

§ 121.1. It also requires that the local municipality and the county in which the unit is located shall state that "The installation and/or operation of this crematory is not inconsistent with applicable comprehensive plans and zoning ordinances" or "All required zoning approvals or variances have been secured for the installation and/or operation of this crematory."

LOCATION OF PROPOSED FUNERAL HOME WITH CREMATORY

The proposed facility location is a property located at 3287 Washington Road along Route 19 in Peters Township. This was the site of a La-Z-Boy furniture store. This building is south of the Sears Service Center and opposite South Hills Chrysler Jeep. These report comments assume that the existing building will be renovated to house both the funeral home and the crematorium, with the exhaust stack of that unit projecting through the roof of the building.

The existing building on the site is approximately 120 feet by 125 deep, and approximately 26 feet high. From the aerial photo of the building, it appears to have a flat roof with a parapet wall around its perimeter. There are a number of structures on the roof, some of which are probably air conditioning units for the building. No building dimensions or property dimensions are cited in the modeling report prepared by Civil & Environmental Consultants, Inc.

The property itself extends a distance of about 300 ft. [91 meters] from Route 19 to the nearest property line of residential homes in the Crossgates plan. The frontage on Rt. 19 is 230 ft. [70 m.]. The property terrain starts at the elevation of Route 19 and slopes up to the level of the existing building and parking. There is a steeper rise in elevation at the rear of the building, so that the nearest residence is at some level above the elevation of the building. There was no terrain reported or discussed in the modeling report.

The nearest wall of the existing building is located approximately 75 ft. [23 m.] from the nearest commercial building [to the south], and 125 ft. [38 m.] from the nearest residence in the Crossgates plan to the east.

CREMATORY DESIGN

The facility proposes to use a Matthews International Power-Pak II Model, equipped with a Smoke-Buster™ 140 feature for "complete combustion of smoke and odor."

In reviewing the Matthews literature, this unit has the capability to meet the emission requirements for the General Operating Permit required of a Human Crematory under Pennsylvania DEP (BAQ-GPA/GP-14). The Smoke-Buster™ 140 feature qualifies for Best Available Control Technology [BACT] when operated with the proper preheating and cycling times. The automated controls and operation sequencing design also should prevent any emission excursions over expected levels. Finally, an opacity monitor [instrumental means of observing 'visual' emissions on a continuous basis] built into the exhaust gas stack will provide continuous monitoring of actual operations. This will provide documentation of visual emissions, to accompany the other records which the facility must maintain.

One aspect of the design that is not covered in the material presented is the exhaust stack design for this specific facility. In the Matthews literature, a generic plan of the Roof Penetration by the stack is shown, which uses a sloping roof. The stack top should be a minimum of 36 inches [0.9 m.]

above the roof peak according to the notation on that page, with the admonition that this "may vary by location".

Because this building has a flat roof, the location and height of the exhaust stack may result in trapping of the exhaust gases in the building cavity under certain meteorological conditions. When ambient air flows over and around any structure, low pressure areas may form in the lee of the building or stack. Emissions which are released into this low pressure area can accumulate and produce higher than the normal concentrations estimated when such trapping does not occur. A common display of this low pressure trapping can be seen when a bus or truck with a smoky diesel exhaust goes by, with a cloud of trapped exhaust gas trailing in the wake of the vehicle.

CRITIQUE OF AIR QUALITY EVALUATION REPORT [CEC REPORT]

The Civil & Environmental Consultants report covers five main topics, process description, emissions literature review, emission estimates, screening level human health risk evaluation, and air quality regulatory applicability. These comments will briefly address each topic.

1. Process Description – The description of the process equipment essentially covers the same ground as presented above under CREMATORY DESIGN.

As far as it goes, the information is acceptable.

2. Emissions Literature Review – The crematory emissions as measured on similar units by four testing firms and the U.S. EPA are reported. All reported data for four criteria pollutants, and some reported volatile organic compounds [VOCs] and several hazardous air pollutants [HAPs]. The Bay Area Air Quality Management District [California] provided estimates of HAPs, and EPA's database WebFIRE was also queried.

It is not stated whether these other crematory units were equipped with the same secondary burner chamber as in the Smoke-Buster™ 140. Expectations would be that the newer units would be equipped with such controls. As the proposed unit does utilize the BACT of the Smoke-Buster™ 140, it would be expected to emit concentrations at the low end of the range.

To operate within PA General Operating Permit guidelines, they must remove prosthetics, other medical devices and "potentially hazardous remedial devices" before cremation. It would be valuable to have source testing from a Power-Pak II Cremator operating at a facility that utilized those protocols. This would produce much better estimates of VOCs and HAPs than the reported data.

3. Emission Estimates [compared to other sources] – The crematory emissions are compared to emissions from wood stove emissions, charbroiling emissions, and automotive engine idling.

Section 2.3.1 of the CEC report states emission estimates for the crematory based on the literature search. For two criteria pollutants, particulate matter and sulfur dioxide [SO2], the General Operating Permit sets specific limits. The CEC report should have compared the typical cremator operations to these criteria. This comparison could not be made based upon the manufacturer's documentation alone, because it requires an estimate of the maximum short term concentration of particulates and sulfur dioxide gas in the exhaust gases of the facility. When a body is cremated, it is likely that the emission rates of each component go from zero to some peak, and then gradually decrease back to zero as complete combustion is achieved.

Particulate emissions are not to exceed <u>at any time</u> 0.08 gr/dscf, corrected to 7% oxygen. The units of grains per dry standard cubic foot are typical for a lot of industrial sources. The reason for setting a maximum in the standard 'not to be exceeded' rather than an average emission over time is to eliminate operations which have large puffs of pollution followed by long periods of very low emissions. Even though the average might be acceptable, those large puffs might cause a visual plume. The SO2 restriction to no more than 500 parts per million by volume is similarly phrased. Neither of these standards were addressed in the CEC report, possibly because they did not have sufficient data. The five sets of stack test data presented did not cover this issue.

There are no standards in the GOP for the other criteria pollutants, carbon monoxide [CO] and nitrogen oxides [NOx], although there is a restriction on visual emissions. I believe that the installation includes an opacity monitor, which would eliminated the need for a visual observation of the plume during each cremation. There still must be a check for odor, and record of the results.

The estimates of Hazardous Air Pollutant emissions are based on the available test data. Some of these are probably higher than they will be, when the facility is operated in compliance with restrictions to remove prosthetics and other foreign materials from the bodies prior to cremation.

The wood stove emission comparison [Table 4 of the CEC report] compares component emissions from operating the crematory for a full year against the emissions from a residential fireplace and a catalytic wood stove burning one cord of wood. However, the mass of one cord of wood is estimated at 3 tons, while the estimated body mass cremated during the year would be 43 tons. The mass of emissions from the cremator should have been converted to pounds per ton before dividing by the pounds per ton figures from the comparison sources, in generating the "Cremator equivalence" numbers. All of the "Cremator equivalence" values will be reduced to 7% of their current values.

The comparison to emissions from charbroiling of meat appears valid.

The light duty vehicle engine idling comparison is meaningless, because the data from E.P.A. testing is outdated. The EPA emission estimates are based on testing reported in 1998 from cars and trucks on the road in 1998, which would include vehicles built through the 90s. There have been tremendous advances in engine technology in the past 13 years, and practically every gasoline-fueled vehicle now on the road now uses computer-controlled fuel injection with catalytic conversion of the exhaust gases to control CO and VOCs. As a consequence, those emissions are essentially eliminated from today's fleet of light duty vehicles.

Nitrogen oxide emissions from the facility are almost exclusively a function of burning natural gas at a high temperature. Power plants fueled with natural gas have the same propensity to produce high NOx. This is noted in the California test results, which break out the natural gas component of the emissions from the actual body combustion products.

It is not clear why the crematory emissions were compared to these three sources. Apparently, CEC wished to provide an order of magnitude comparison of crematory emissions with sources which are commonly accepted and tolerated in the community.

4.Screening Level Human Health Risk Evaluation [Dispersion Modeling] – This section of the CEC report applies the SCREEN3 dispersion model to the facility, in order to estimate concentrations of various emitted chemicals. As stated in the report, the SCREEN3 model is suitable for screening sources to identify whether further, more refined, modeling is needed. However, the model in this instance was not applied correctly.

Appendix B of the CEC report contains the significant modeling input options. Characteristics of the exhaust gases were obtained from vendor literature.

The stack exit gas temperature was given as 1,800 °F, which is the temperature at which the Smoke-Buster™140 secondary burning chamber should be operated. However, the exit gas temperature as the gases exit the stack might be cooled as the gases travel up the stack to reach ambient air. The crematory combustion unit is 6 ft – 8" high [2.0 m]at the point where the stack begins. It is not clear how tall the stack will be in the final installation, but the generic height used in the modeling was 25 ft [7.6 m]. Therefore, stack gases travel up through more than 18 ft of stack before they reach ambient air, which can cause significant cooling of the stack gases, even though the stack is insulated with refractory material. This can be important, as the temperature of the stack gases is a factor in buoyancy of the plume. Plume buoyancy is required for plume rise, and for the dispersion that it creates.

The stack height might not be accurate for this installation. Back in the discussion of the existing building dimensions we estimated that the existing building is 26 ft high. This is not consistent with a stack height of only 25 ft, since the manufacturers specifications call for the exterior portion of the stack to be at least 3 feet above the roof peak. In this case, 'above the roof peak' could be interpreted to mean above the high point of the building parapet. In any case, the stack height used in the modeling is inadequate.

The next problem with the model input is the use of 29 inches [0.74 m] for the stack INSIDE diameter [I.D.]. On the manufacturers documentation, the 29" dimension refers to the stack OUTSIDE diameter, and the INSIDE diameter is 20" [0.51 m]. Again, the actual stack I.D. affects plume rise, exit gas velocity, and the prospect of building downwash.

The building dimensions are given as:

BUILDING HEIGHT (M)	=	.0000
MIN HORIZ BLDG DIM (M)	=	.0000
MAX HORIZ BLDG DIM (M)	=	.0000

This selection of zero for all the building dimensions is curious, because we know there is a building involved, and it is a significant building with respect to the size of the stack being modeled. What this means is that the stack is modeled as if it were a free-standing pole on a flat plane with no obstructions to wind flow or terrain in any direction. The picture below, in the immediate vicinity of the stack [before the little hill], depicts this situation.

In the modeling that CEC performed, the gases exit the stack [as indicated on the next page by the dotted centerline of the plume, in the figure labeled 12.6 from the original reference, Handbook of Atmospheric Diffusion, S.R. Hanna, G.A. Briggs, & R.P.Hosker, Jr., DOE/TIC-11223] and travel downwind [the wind is blowing from left to right across the page]. The model assumes that as the plume encounters terrain its centerline lifts up and over any such obstacles, even obstacles taller than the stack itself. As the plume travels further from the stack, the stack gases spread out vertically and horizontally until measurable concentrations reach the ground.

The model output shows the concentrations that were computed for distances out to 2,300 meters, in 100 meter increments. The highest concentrations occurred at the closest interval [100 m], and there is a secondary peak at 400 meters due to the model selecting a different atmospheric stability as the controlling [highest] concentration. I noted that the last column of the model output has the consistent notation "DWASH = NO". DWASH refers to downwash. Downwash is the effect that buildings and the stacks themselves can have on plume dispersion when a low pressure cavity forms in the lee of a structure, as shown in the second figure below [labeled Fig. 3.3 from the original reference].

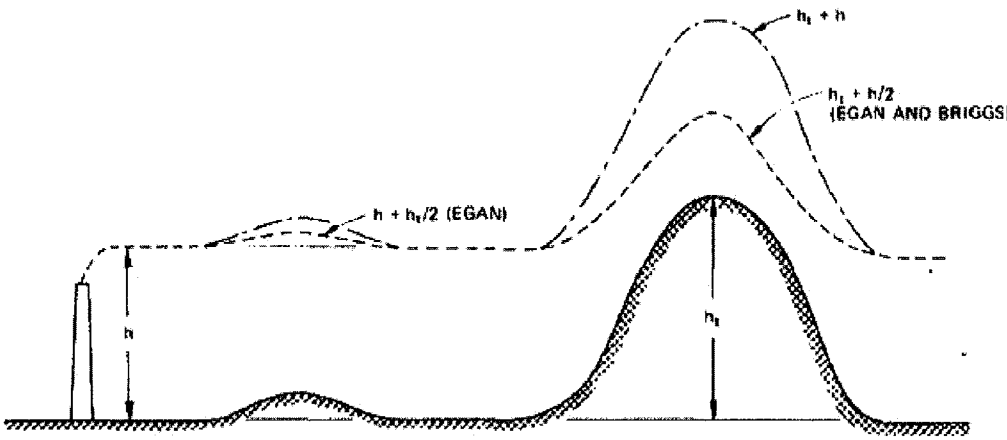


Fig. 12.6 Illustration of plume height assumptions in Briggs (1973) (———) and Egan (1975) (— — —) models for neutral and unstable conditions. The line $h_t + h$ is also shown.

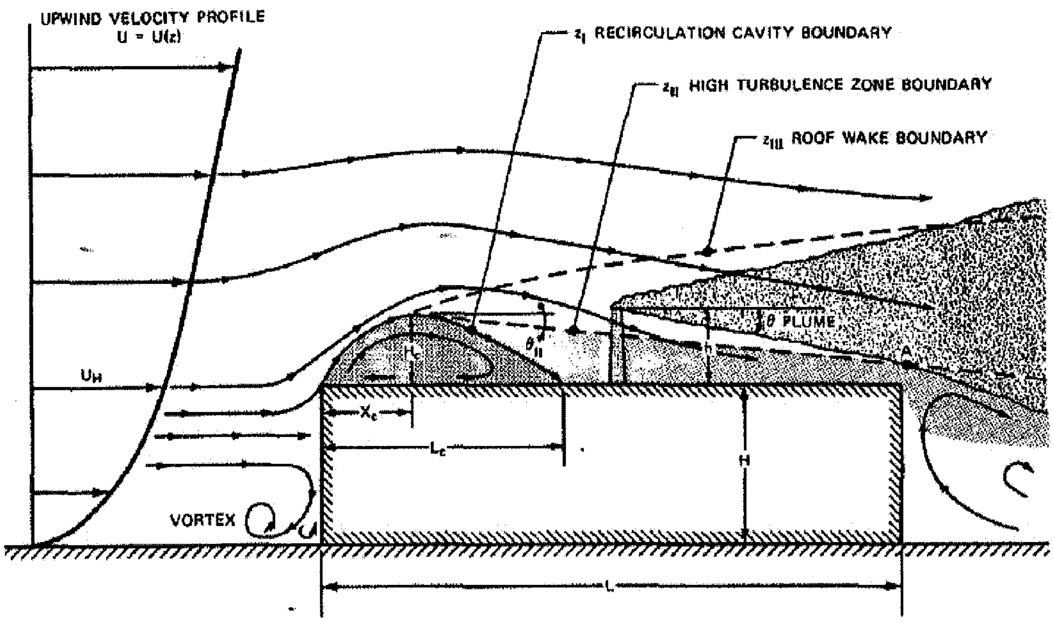


Fig. 3.3 Flow over center of a long flat building roof for wind perpendicular to the upwind face. [From D. J. Wilson, Flow Patterns Over Flat-Roofed Buildings and Application to Exhaust Stack Design, *ASHRAE Trans.*, 85(Part 2): 284-295 (1979).]

In this case, wind blowing from the left to right is impacting on a 'long flat building roof', and the air currents caused by the building interfering with the airflow sets up a bunch of vortices and recirculation cavities both on the rooftop and in front and in the lee of the building. Also depicted in this picture is a stack located on top of the building, emitting a cone of material which is traveling downwind [i.e., to the right]. The important features to note is that the building creates areas in the air flow that can trap emissions from a stack. And if the stack is too short, essentially all of the emissions can be caught in the recirculation zone and brought down to ground level right around the base of the building. This is the situation that was not allowed to happen in the CEC modeling by their selection of zero for the building dimensions.

Furthermore, with downwash in the immediate vicinity of the building, concentrations from the stack emissions will be at their highest predicted values right there, and its only as the emissions are pushed further from the building and spread out more that the concentrations decrease.

This brings into question the assumptions of CEC in modeling with the closed receptor location at 100 meters from the stack. In the description of the building location and surroundings, I pointed out that the closest commercial building to the nearest wall of the existing facility is only 70 ft [21 m], and the distance to the nearest residence is 125 ft [38 m]. Obviously, the property boundaries are even closer. In modeling this facility, the concentration estimations should have started at the nearest distance to a property line, in whatever direction that might be, and significant receptors [e.g., nearest commercial building, nearest residence] should have also been input. And the building dimensions should also have been key inputs, rather than zero.

Stack heights on buildings can be made high enough that they escape the trapping effect of the building cavity. This could require a stack to be nearly high as the building its on. However, stacks that high might be unwarranted for a source that has very small emissions to start with. There is nothing intrinsically wrong with a short exhaust stacks for a commercial establishment, so long as it is designed with the building's ventilation system and surrounding neighbors in mind. The potential exists that a short stack could have low enough emissions to avoid creating excessive concentrations to surrounding neighbors, even though the emissions are trapped in the building cavity zone. However, if the emissions are trapped in that cavity zone, and the building air conditioning units draw air from the same cavity zone, those emissions might get sucked into the building and cause an indoor air problem.

What is also interesting is that the version of the SCREEN3 model which CEC used had been modified from its previous version in order to allow rooftop stacks in various locations on a building roof. The model incorporated multiple versions of building downwash algorithms for that very reason.

CONSIDERATION OF OTHER HAPS

In February of this year, CEC presented an Addendum to their original report, specifically dealing with emissions of mercury released by cremation of bodies containing amalgam fillings [mercury-silver mixture]. When exposed to high heat, the mercury volatilizes and is released with the other combustion gases to the atmosphere.

The addendum report presented some references pertaining to mercury emissions as a function of crematory operations, and applied the same normalized concentration results from their first study to the specifics of mercury releases. As the modeling of the first report was flawed, the results of this addendum would be similarly tainted. This is not to say that the SCREEN3 model correctly applied, or a refined model, will not find that the emissions of mercury are innocuous. It simply says that the question remains to be answered.

Although not specifically mentioned in the CEC report, the PA DEP General Operating Permit does specify operation procedures to minimize the atmospheric release of potentially hazardous materials. In Section 14, it states,

The owner or operator of the crematory must ensure that all medical devices (e.g., pacemakers, defibrillators, etc.) and potentially hazardous remedial devices (e.g., radioactive implant, etc.) have been remove from bodies and properly disposed of prior to cremation. Documentation certifying compliance with this requirement shall be maintained for each cremation.

With the increase in prosthetics and the number of families utilizing cremation for their loved ones, the problems involved in volatilization of the metals and plastics comprising these prosthetics will become more prevalent. Amalgam fillings could certainly be considered potentially hazardous remedial devices. Removing them prior to cremation would eliminate the potential for dispersion of the vaporized metal, whatever the relative risk.

RECOMMENDATIONS

1. Forward the comments and suggestions for corrections to the modeling to Houston Harbaugh, P.C. for revised modeling by rerunning the SCREEN3 model or employing a refined model, as required.

2. Consider incorporating a requirement to remove amalgam fillings as a listed item of the "potentially hazardous remedial devices", for operation of a crematory in the Township.

3. There does appear to be a need for a site specific stack test of a new facility, unless more recent stack tests on a similar facility measured SO_2 concentrations for comparison with the PA standard in the General Operating Permit.

Prepared at request of the Peters Township Planning Commission
March 9, 2011

Air Science Consultants, Inc.

Stanley J. Penkala, Ph.D., Q.E.P.

Excerpts from PA DEP Website

Mercury in Rain

Mercury is emitted into the air primarily by large coal-fired power plants. Mercury in the air is usually of little direct concern. But when mercury is washed from the air by rain into our streams and lakes, it is transformed to a highly toxic form that can build up in fish. People are then exposed to mercury by eating fish.

Pennsylvania

NEW 2006 Mercury in Rain Report
Results of mercury sampling in Pennsylvania's rain with comparisons to the rest of the country.

Mercury Monitoring Sites and Data
See a map of acid rain monitoring sites in Pennsylvania. Click on a site to get more information including mercury data.

Mercury in Rain Isopleth Maps
Colored maps depicting the concentration and deposition of mercury in rain in Pennsylvania.

P3ERIE
A pollution prevention initiative comprised of businesses, government organizations, civic organizations, educational institutions in the greater Erie community.

DEP Mercury Thermometer Web Site
Common questions, and answers, on mercury thermometers in your home.

Fish Consumption Advisory
Mercury in the environment can accumulate in fish. Refer to the advisory for more information on which fish are safe to eat.

- Fish Tissue Sampling Results in Pa. (Excel)
- Pennsylvania Fish Consumption Advisory
- EPA's National Advisory for women and children.

Other

NADP-MDN Concentration and Deposition Maps
Maps showing mercury concentrations and deposition amounts at various sites across the country.

EPA's Mercury Web Site
Learn more about mercury and what's being done to protect your health.

PADEP 2006 Mercury In Rain Report Summary

"The statistically significant decreasing total mercury concentration trends at Hills Creek (PA90), Allegheny-Portage NHS (PA13), and Holbrook (PA37) are similar to observed decreasing seasonal sulfate concentration trends at these sites (Figures 25-27), although the seasonal sulfate concentrations trends are not statistically significant ($p<0.05$). Given the close association between sulfate and mercury concentrations at these sites (Table 6 and 7), it is reasonable to assume that some of the decline total mercury concentrations would be related to reductions in
sulfate concentrations that are in turn directly related to decreasing sulfur dioxide emissions in the eastern half of the United States following implementation in 1995 of Title IV of the Clean Air Act Amendments of 1990 (CAAA). Sulfur emissions reductions were achieved through a combination of scrubber technology, fuel switching (e.g., oil or natural gas for coal), the use of lower sulfur coal for Mid-western sources, and/or emissions trading. It is possible that this combination of approaches to reduced sulfur dioxide emissions has resulted in a concurrent reduction in mercury emissions as well.

"Given the location of the Hills Creek site and the lack of nearby mercury and sulfur emissions sources, it is reasonable to assume that long range transport of pollutants from upwind sources are the likely sources that were affected by the CAAA emissions reductions and are thus likely the sources also contributing to the reductions in mercury concentrations and deposition at his site. This would not necessarily be the case at either the Allegheny-Portage or Holbrook sites, because of their relative close proximity to major point sources. In addition, the stepwise regression analysis at each site with the possible exception of PA13 (Table 7) suggests multiple mercury emissions sources which may account for the lack of concurrent statistically significant trends in both mercury and sulfate concentrations at these sites.

"As stated earlier, sources of mercury emissions to the atmosphere in the United States can be broadly classified as natural mercury emissions, anthropogenic mercury emissions and re-emitted mercury. Re-emitted mercury is mercury that was previously deposited on the Earth's surface following either anthropogenic or natural releases and is reemitted to the atmosphere by natural, biologic or geologic processes. Multiple sources of mercury at the Valley Forge site (Figure 28) where sulfate concentrations are decreasing ($p=0.023$) would also help to explain the lack of a concurrent decrease in mercury concentrations at this site.

Summary

"Annual total mercury wet deposition at all MDN sites in the United States and southern Canada that met data completeness criteria for 2005 and 2006 ranged from 2.5 µg/m2 in New Mexico to 21.5 µg/m2 in west central Florida in 2005 (Figure 5) and from 2.1 µg/m2 in Nevada to 18.8 µg/m2 in southern Florida (Figure 7) in 2006. Wet mercury deposition in Pennsylvania in 2005 ranged from 6.7 µg/m2 in Tioga and Cambria counties to 9.9 µg/m2 in Montgomery County (Table 5). Wet mercury deposition in 2006 was lowest (8.1 µg/m2) in Adams County and highest (10.1µg/m2) in Pike County (Table 5). Because the Montgomery County site did not meet MDN data completeness criteria because of a large number of invalid samples it was not included in this comparison despite the fact that mercury deposition at the site measured 13.4 µg/m2 in 2006. Volume-weighted mean annual concentrations of total mercury in precipitation in the United States ranged from 3.5 ng/L (southeast Canada) to 17.5 ng/L (New Mexico) in 2005 and from 3.6 ng/L (Oregon) to 20.7 ng/L (New Mexico) in 2006 (Figures 5 and 7). The volume-weighted 66 mean concentrations of total mercury in Pennsylvania ranged from 6.4 ng/L in Tioga County to 8.7 ng/L in Montgomery County in 2005 and from 7.5 ng/L in Pike and Adams counties to 8.7 ng/L in Greene County in 2006 (Table 4). Total mercury concentrations and wet deposition estimates in the United States as well as in Pennsylvania in 2005 and 2006 were similar to values reported since network monitoring began. Although some differences were evident, these differences can be attributed to an annual increase in new MDN sites and to fluctuations in precipitation volumes within and between regions as well as possible fluctuations in mercury emissions.

"In general, mercury concentrations and wet depositions in the United States are lowest in New England and southeastern Canada and higher in Florida and other Gulf states and around the Great Lakes. Mercury depositions in Pennsylvania are, for the most part, in the middle of this range, although annual observations at some sites in Pennsylvania (e.g., Hills Creek in Tioga County where mercury deposition is generally lower than most eastern sites) do not always fit into this general spatial pattern. Mean annual mercury concentrations (Figure 15) and wet depositions (Figure 16) in Pennsylvania the last four years have not demonstrated any consistent spatial pattern. In 2003 the highest concentrations were measured in western Pennsylvania; in 2004 the highest concentrations were in the eastern region of the state; in 2005 mercury concentrations were highest in northwestern Pennsylvania; and, in 2006 the highest concentrations were reported in the extreme southeast and southwest corners of the state. Wet deposition patterns show the same type of variability, confounded even more by regional differences in precipitation patterns.

"Seasonal mercury concentrations and wet depositions in the United States are generally highest during the summer months and lowest during the winter. This seasonal pattern has been evident in Pennsylvania for most but not all years at most but not all sites. Seasonally variable mercury concentrations and precipitation volumes have resulted in very inconsistent seasonal mean concentration and wet deposition patterns at individual sites as well as across the state. Some of this variability can be associated with one or more unusually high weekly mercury concentrations and wet depositions that account for a substantial percentage of the volume-weighted mean seasonal concentration wet deposition.

"Correlation and stepwise regression analyses were conducted between weekly mercury concentrations and wet depositions and the concentrations and depositions of the major cations and anions found in precipitation samples collected at each of the MDN sites. The results of these analyses indicated that sulfate was significantly correlated with mercury concentrations at all sites in Pennsylvania. Calcium and/or magnesium concentrations were also significantly correlated with mercury concentrations at all sites and were the most significantly correlated at the Adams County (Arendtsville) and Lancaster County (Millersville) sites. Results from the stepwise regression analysis were very similar to the correlation analysis. At all sites, sulfate deposition was the most significant variable for predicting total mercury wet deposition followed by the wet deposition of one or more of the major cations, usually calcium. All of the models were statistically very significant with r-squared values around 0.70 (Table 9).

"Trend analyses at four sites (Allegheny-Portage, Hills Creek, Holbrook, and Valley Forge) indicate statistically significant decreasing mercury concentration trends at each site except Valley Forge. The concentration trends do not appear to be influenced by precipitation at any of the sites. However, precipitation volumes did have significant influence over the wet mercury deposition trends. It is interesting to note that decreasing total mercury concentration patterns at Hills Creek, Allegheny-Portage and Holbrook are similar to observed decreasing patterns in sulfate concentrations at these sites, even though the quarterly sulfate concentration trends are not statistically significant. What these comparisons might suggest is that multiple sources of mercury likely influence mercury concentration patterns at these sites as well as across the network.

"Sulfate concentrations in precipitation result from the oxidation of sulfur dioxide released to the atmosphere during combustion. The primary source of sulfur dioxide in Pennsylvania is from coal-fired power plants. We also know that sulfate concentrations in precipitation are highest during the summer and lowest during the winter months, the same temporal pattern that is frequently observed for mercury concentrations at all MDN sites in Pennsylvania. We also know that coal combustion is one of the primary sources of mercury emissions to the atmosphere in the eastern United States. The association of sulfate concentrations with mercury concentrations as illustrated by the correlation coefficients, stepwise regression models, and trend analyses, appears to indicate that at least some of the mercury in precipitation at Pennsylvania MDN sites is from combustion sources, most likely coal-fired power plants. We also know that wind blown soil particles are an important source of cations in precipitation, particularly calcium and magnesium. The close association of these cations with mercury concentrations would seem to indicate that terrestrial/agricultural sources are potentially important at all sites as well. The fact that calcium is the most significant variable in predicting mercury concentrations at the Arendtsville (Adams County) and Millersville (Lancaster County) sites would tend to support this position. Both of these sites are located in areas that are dominated by agricultural activities, particularly Lancaster County where calcium concentrations explain more than 50% of the variance in weekly mercury concentrations. How agricultural activities would affect the release of mercury cannot be determined by this analysis. However, mercury has been used extensively in agriculture for many years and may be a contributing factor. In addition, soil disturbance in agricultural areas and the subsequent increase in wind erosion may also be factor.

"Although the results of seasonal trend analyses as well as correlation and stepwise regression analyses for both mercury and sulfate concentrations suggest a positive relationship between sulfate and mercury concentration in precipitation, verification of this relationship and the reasonable assumptions presented in this report can only be achieved through the use of transport modeling to target source-receptor relationships. In addition, mercury deposition monitoring should continue in Pennsylvania in 2007 and beyond in order to establish a database of sufficient length to more accurately describe spatial and temporal patterns across the Commonwealth and to assess how these patterns are related to mercury emissions, climatic variability, and land cover/land use patterns. The establishment of a MDN site in Lycoming County at Little Pine State Park in 2007 and the possible establishment of another site in west central Pennsylvania will help to better define spatial patterns across the state as well as quantify mercury deposition inputs to surface waters of the Commonwealth. The additional sites will also help to evaluate the impact of any mercury emissions reduction programs in Pennsylvania and neighboring states."

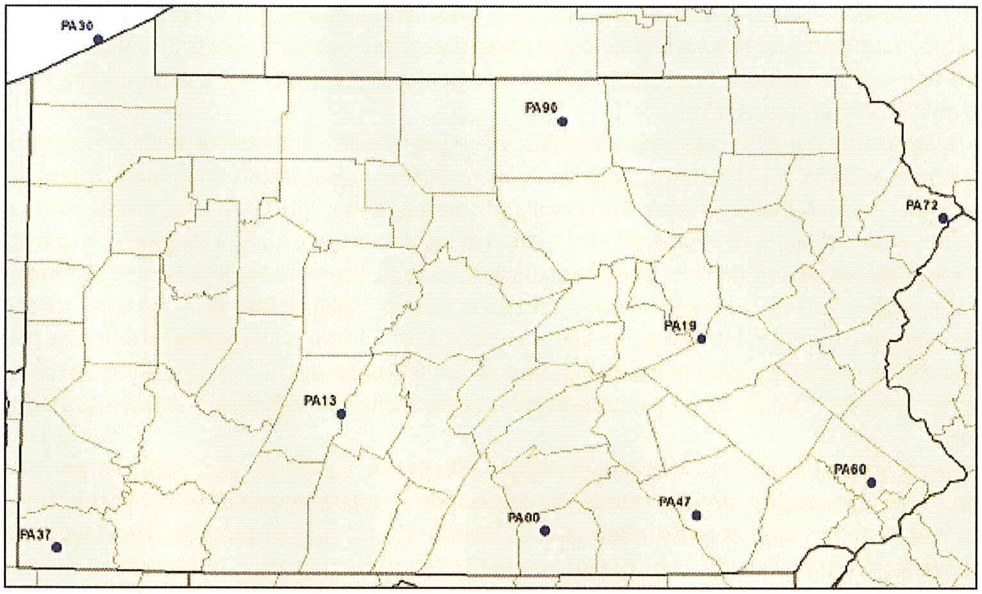


Figure 4. Location of active National Atmospheric Deposition Program/Mercury Deposition Network (NADP/MDN) sites in Pennsylvania in 2005 and 2006.

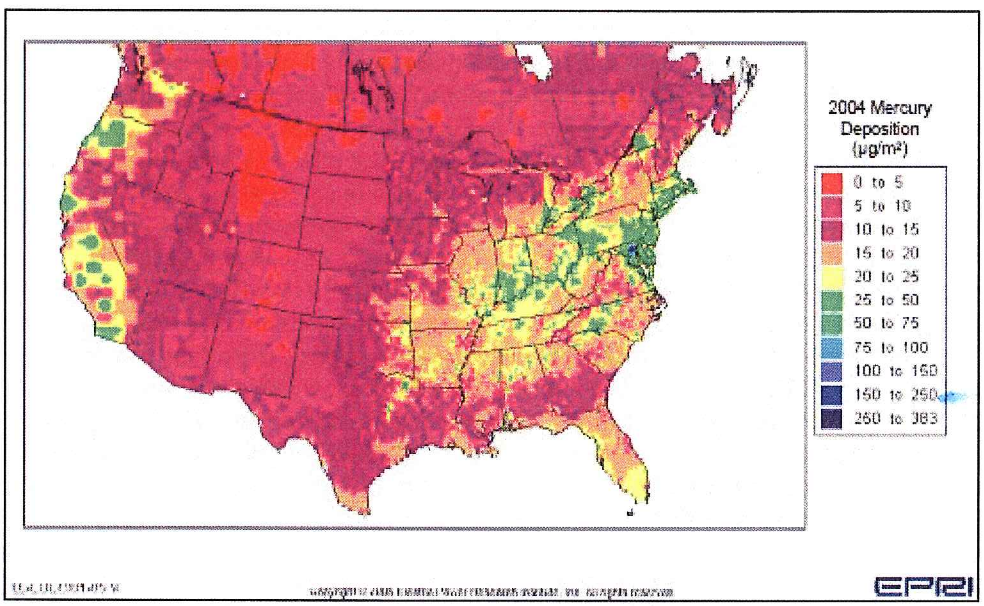


Figure 1. Total mercury deposition simulation for the United States and southern Canada using the Regional Lagrangian Model of Air Pollution (EUEC, 2005).

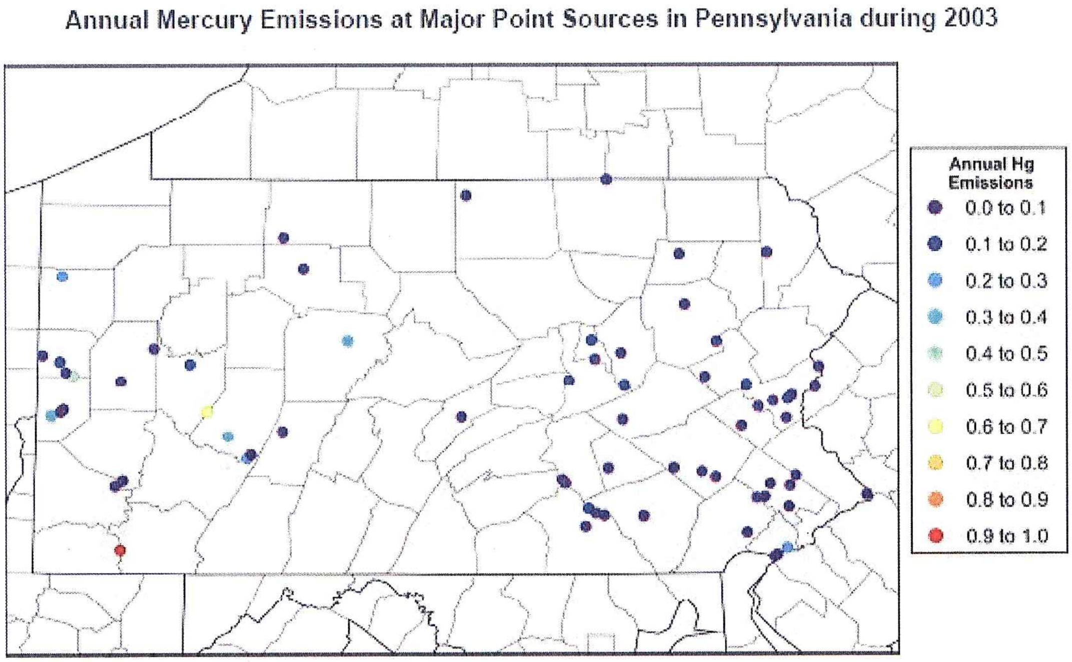


Figure 13. Location of annual mercury emissions (tons/year) at major point sources in Pennsylvania in 2003 through 2006.

[The two sources in Washington County are the Elrama and Mitchell Power plants. Hatfield Station is the red dot.]

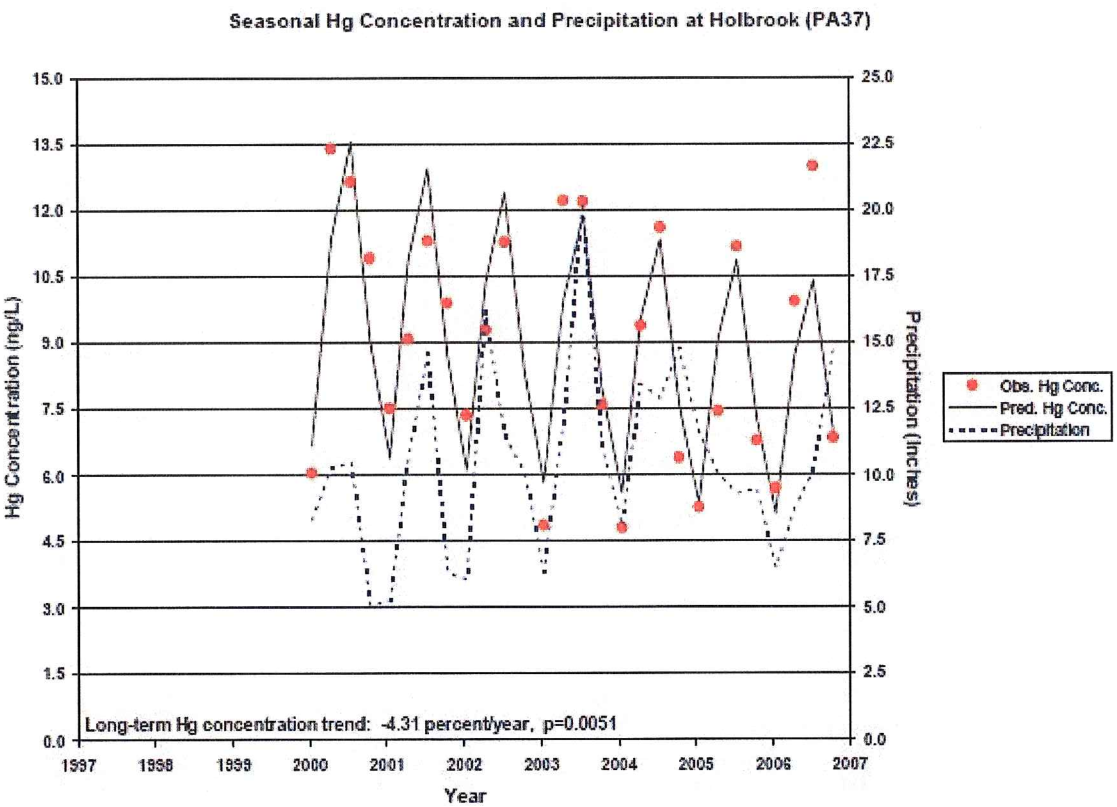


Figure 21. Seasonal trends in total mercury concentrations and precipitation at the Holbrook MDN site in Greene County Pennsylvania from 2000 through 2006.

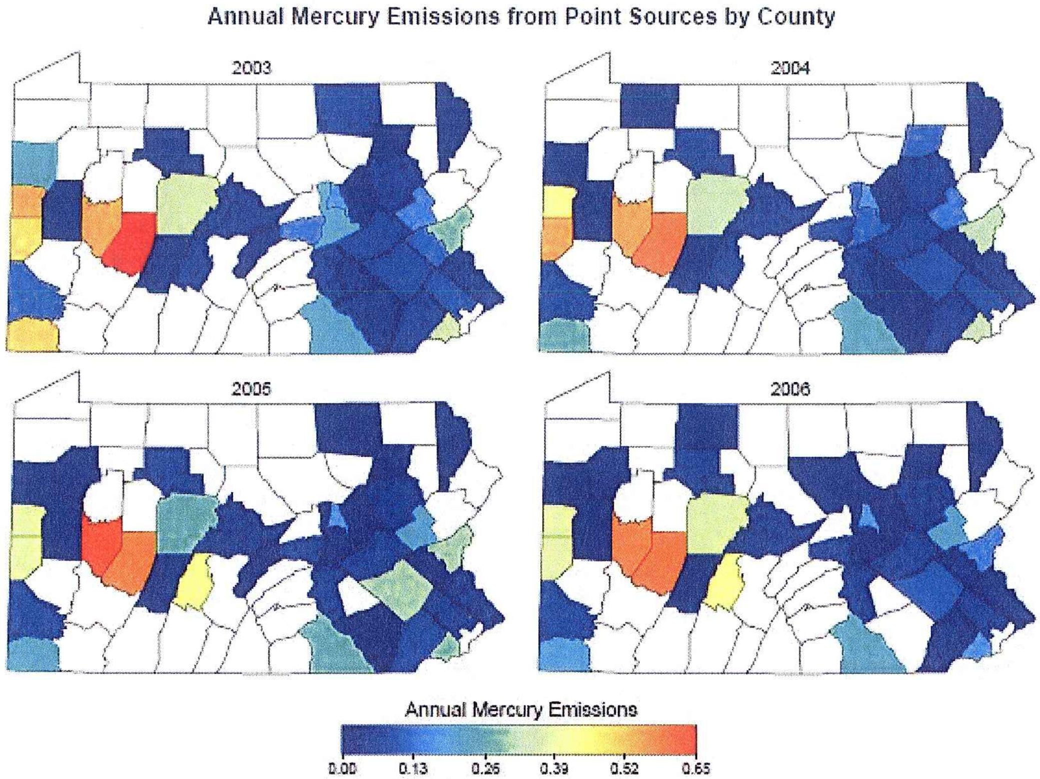


Figure 14. County summary of annual mercury emissions (tons/year) at major point sources in Pennsylvania in 2003 through 2006.

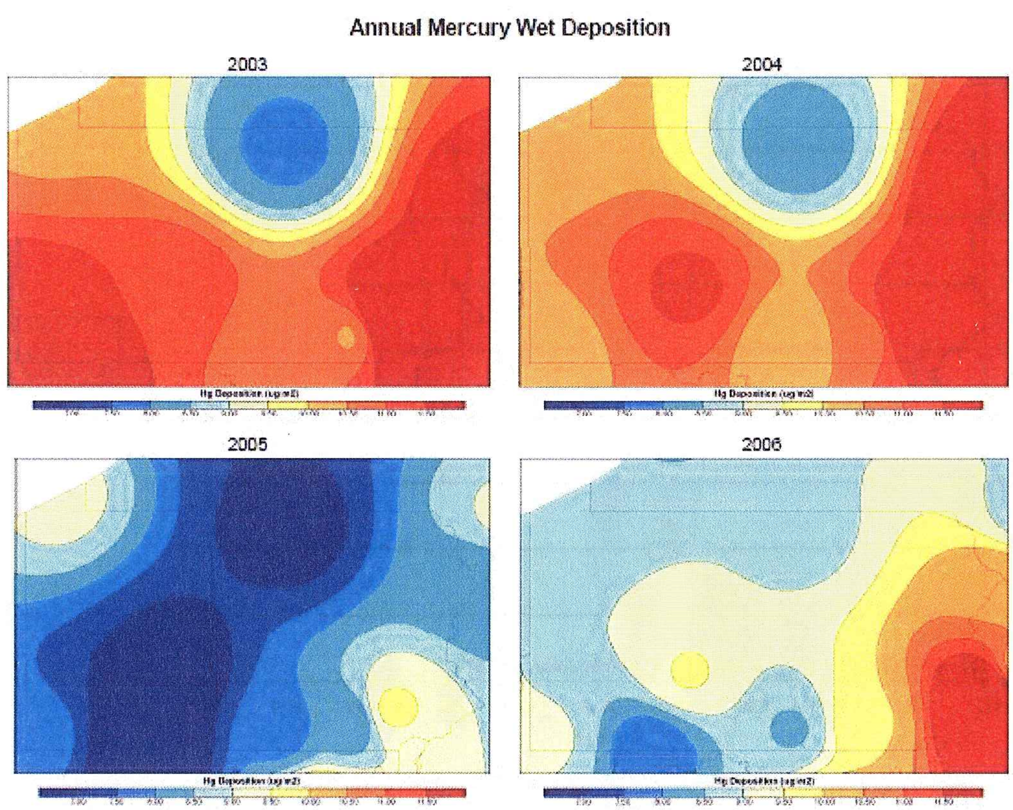


Figure 16. Spatial interpolations of annual total mercury wet deposition across Pennsylvania in 2003 through 2006.

Other potential sources of mercury

- Accustats
- Automatic Car Wash Equipment *(contact the manufacturer)*
- Barometers
- Batteries: *mercuric oxide or button.*
- Catalysts for Urethane and Vinyl Production
- Cinnabar
- Conveyor Counterweights
- Counterweights for Old Grandfather Clocks
- Dental Amalgam and Amalgam Capsules
- DC Watt Hour Meters
- Displacement/Plunger Relays
- Electroplating Solutions and Processes: *Zinc-mercury plating, steel coloring, mercuric chloride, mercuric sulfate, mercuric nitrate, mercuric cyanide, mercuric oxide and mercuric dichromate have been used in the past in the metal finishing industry.*
- Elemental Mercury *for demonstrations, displays or refilling mercury-containing equipment.*
- Flame Sensors *sometimes found in the pilot light and burner assembly on gas-fired furnaces, boilers, unit heaters, space heaters, residential and commercial cooking equipment, commercial hot water heaters, industrial ovens and in central air conditioning systems.*
- Flow Meters
- Feeding Tubes
- Gas Extraction Apparatus
- Gas Regulators
- Gastrointestinal Diagnostic Equipment
- Gyroscopes
- Hydrometers with Thermometers
- Hydronic and Warm Air Controls *with tilt switches such as aquastats, pressurestats, firestats, fan limit controls and pressure/flow controls on air handling units.*
- Industrial Chemicals *(see the Industrial Chemical Connection): caustic soda, sulfuric acid, potassium hydroxide, muriatic acid and ferric chloride.*
- Laboratory Chemicals: *histological fixatives, mercury chloride, mercury (II) chloride, mercury iodide, mercury nitrate, mercury (II) oxide, mercury (II) sulfate, nessler reagent, zenker's solution and dozens of other less commonly used laboratory chemicals.*
- Lamps: *fluorescent, high-pressure sodium, metal halide, ultraviolet and neon (except red, orange and pink).*
- Level and Rotation Sensors
- Lighthouse Lamp Bearings
- Manometers and Vacuum Gauges
- Mercury Displacement Relays *sometimes found in street lighting, resistance heating, plastics molding equipment, motors, pipe organs and commercial electric cooking appliances such as pizza ovens and deep fryers.*
- Mercury-Sealed Pistons
- Microwave Relays/Transmitters
- Permeters
- Pesticides Manufactured Before 1994 *(seed preservatives and fungus control for turf)*
- Pharmaceuticals: *Look for "mer" or "merc" in the name. Mercury is used as a preservative in some pharmaceutical products.*
- Pressure-trols
- Rectifiers
- Ring Balances
- Semiconductors, Solar Cells, Thin Film Transistors, Infrared Detectors and Ultrasonic Amplifiers *may contain mercury-cadmium-telluride, mercury-selenide or mercury-telluride thât can contaminate electroplating baths.*
- Shunt Trips
- Sphygmomanometers *(blood pressure meters)*
- Stokes Gauges
- Switches and Relays: *fire alarm box switch, pressure control switches (mounted on bourdon tube or diaphragm), silent light switch, relay switches, switches in pneumatic tube and conveyor belt messagesystems, phase splitters, sump pump, bilge pump and other float controls, tilt switches, etc.*
- Thermometers *including industrial dial face thermometers with capillary tubes.*
- Thermostats and Thermoregulators
- Wastewater Treatment Plant Pivot Arm Bearings

Mercury

Managing, Recycling, Disposing

A Business Guide to Conducting a Mercury Audit

MercERIE—sponsored by the Pollution Prevention Partnership for Environmental Responsibility in Erie (P^3ERIE)—is a project that encourages businesses and organizations to prevent mercury from contaminating our environment and Lake Erie by conducting an internal mercury audit.

Mercury is a useful but toxic substance that accumulates in higher levels of the food chain. Nationwide, mercury is represented in more fish consumption advisories than any other chemical. The Great Lakes Binational Toxics Strategy calls for the United States and Canada to work on the virtual elimination of persistent toxic substances, including mercury, in the Great Lakes Basin. The United States' goal is to reduce mercury use and release to the environment by 50 percent.

MercERIE supports this goal by helping businesses and organizations conduct internal mercury audits to determine the amount of mercury in their facility.

Use this audit brochure to help you:

- *Identify items that contain mercury.*
- *Consider alternatives for mercury-containing items.*
- *Manage and recycle mercury properly.*
- *Determine the mercury content of industrial chemicals that may contain residual mercury.*
- *Manage energy efficiently.*

MercERIE

What are Common Mercury-Containing Items?

Mercury is being phased out of many industrial and consumer applications. However, mercury-containing items and chemicals are still used, and old equipment and processes containing mercury may still be used in some facilities.

Inventory your facility for the following items that may contain mercury. Note the location and quantity of the devices and consider acceptable mercury-free substitutes where applicable and properly manage and recycle the mercury where acceptable substitutes do not exist.

- **Accustats**
- **Automatic Car Wash Equipment** *(contact the manufacturer)*
- **Barometers**
- **Batteries:** *mercuric oxide or button.*
- **Catalysts for Urethane and Vinyl Production**
- **Cinnabar**
- **Conveyor Counterweights**
- **Counterweights for Old Grandfather Clocks**
- **Dental Amalgam and Amalgam Capsules**
- **DC Watt Hour Meters**
- **Displacement/Plunger Relays**
- **Electroplating Solutions and Processes:** *Zinc-mercury plating, steel coloring, mercuric chloride, mercuric sulfate, mercuric nitrate, mercuric cyanide, mercuric oxide and mercuric dichromate have been used in the past in the metal finishing industry.*
- **Elemental Mercury** *for demonstrations, displays or refilling mercury-containing equipment.*
- **Flame Sensors** *sometimes found in the pilot light and burner assembly on gas-fired furnaces, boilers, unit heaters, space heaters, residential and commercial cooking equipment, commercial hot water heaters, industrial ovens and in central air conditioning systems.*
- **Flow Meters**
- **Feeding Tubes**
- **Gas Extraction Apparatus**
- **Gas Regulators**
- **Gastrointestinal Diagnostic Equipment**
- **Gyroscopes**
- **Hydrometers with Thermometers**
- **Hydronic and Warm Air Controls** *with tilt switches such as aquastats, pressurestats, firestats, fan limit controls and pressure/flow controls on air handling units.*
- **Industrial Chemicals** *(see the Industrial Chemical Connection): caustic soda, sulfuric acid, potassium hydroxide, muriatic acid and ferric chloride.*
- **Laboratory Chemicals:** *histological fixatives, mercury chloride, mercury (II) chloride, mercury iodide, mercury nitrate, mercury (II) oxide, mercury (II) sulfate, nessler reagent, zenker's solution and dozens of other less commonly used laboratory chemicals.*
- **Lamps:** *fluorescent, high-pressure sodium, metal halide, ultraviolet and neon (except red, orange and pink).*
- **Level and Rotation Sensors**
- **Lighthouse Lamp Bearings**
- **Manometers and Vacuum Gauges**
- **Mercury Displacement Relays** *sometimes found in street lighting, resistance heating, plastics molding equipment, motors, pipe organs and commercial electric cooking appliances such as pizza ovens and deep fryers.*
- **Mercury-Sealed Pistons**
- **Microwave Relays/Transmitters**
- **Permeters**
- **Pesticides Manufactured Before 1994** *(seed preservatives and fungus control for turf)*
- **Pharmaceuticals:** *Look for "mer" or "merc" in the name. Mercury is used as a preservative in some pharmaceutical products.*
- **Pressure-trols**
- **Rectifiers**
- **Ring Balances**
- **Semiconductors, Solar Cells, Thin Film Transistors, Infrared Detectors and Ultrasonic Amplifiers** *may contain mercury-cadmium-telluride, mercury-selenide or mercury-telluride that can contaminate electroplating baths.*
- **Shunt Trips**
- **Sphygmomanometers** *(blood pressure meters)*
- **Stokes Gauges**
- **Switches and Relays:** *fire alarm box switch, pressure control switches (mounted on bourdon tube or diaphragm), silent light switch, relay switches, switches in pneumatic tube and conveyor belt message systems, phase splitters, sump pump, bilge pump and other float controls, tilt switches, etc.*
- **Thermometers** *including industrial dial face thermometers with capillary tubes.*
- **Thermostats and Thermoregulators**
- **Wastewater Treatment Plant Pivot Arm Bearings**

What is P³ERIE?

P³ERIE is a voluntary pollution prevention initiative comprised of businesses, educational institutions, local government in the greater Erie community and the Pennsylvania Department of Environmental Protection's Office of Pollution Prevention and Compliance Assistance (OPPCA). P³ stands for Pollution Prevention Partnership and ERIE stands for Environmental Responsibility In Erie. P³ERIE's mission is to prevent pollution by raising awareness of pollution issues and implementing projects that reduce the amount of persistent toxins used and released into the greater Erie environment, especially the Lake Erie watershed.

P³ERIE is funded through a grant from the United States Environmental Protection Agency's Great Lakes National Program Office.

Thanks to Stephanie Vogler and the Edinboro State University Graphic Arts Department for their initial conceptualization of this brochure. Thanks to Western Lake Superior Sanitary District for the use of their Blue Print for Mercury Reduction as a model for portions of this brochure and to John Gilkeson of the Minnesota Office of Environmental Assistance for his technical assistance with this brochure. For a complete list of references, contact the Pennsylvania Department of Environmental Protection at 814 332-6839.

Take the Mercury Audit

Mercury Sources

Refer to the list of mercury-containing items in this brochure to identify mercury sources located or used in your work area. List the mercury-containing items used or stored in your workplace:

____

____

____

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Mercury Management

Answer the following questions to help you access your management of mercury:

Is staff trained on the health and environmental concerns of mercury? **Yes** ☐ **No** ☐

Is staff trained on mercury spill prevention and management? **Yes** ☐ **No** ☐

Is there a mercury spill clean-up kit on site? **Yes** ☐ **No** ☐

Do you have a procedure to report mercury spills? **Yes** ☐ **No** ☐

Have your sewer drain traps or catch basins been checked for mercury and cleaned to remove mercury? **Yes** ☐ **No** ☐

Has your facility tested all wastewater discharges for mercury? **Yes** ☐ **No** ☐

Does your facility currently recycle mercury? **Yes** ☐ **No** ☐

If your business or institution is involved with demolition, remodeling, HVAC or automobile scrapping, are mercury-containing items (thermostats, switches, etc.) removed and recycled? **Yes** ☐ **No** ☐

Is mercury phased out during retrofitting or new facility construction? **Yes** ☐ **No** ☐

Does your facility have a policy on purchasing mercury-containing products? **Yes** ☐ **No** ☐

Does your purchasing department currently require a disclosure by your vendors of mercury concentrations in chemicals? (If not, then refer to the last page of this brochure to see a sample letter you can use with your vendors to request a mercury certificate of analysis) **Yes** ☐ **No** ☐

Evaluating Your Audit

If you answered "No" to any of these questions, or could not answer a question, then you may be improperly managing, recycling or disposing mercury in your workplace. For more information or assistance regarding proper mercury management, contact:

- *Pennsylvania Department of Environmental Protection at 814 332-6839*
- *Or, visit the DEP Web site at http://www.dep.state.pa.us. Click on* ***Pollution Prevention and Compliance Assistance*** *then select* ***P³Erie.***

What are Common Mercury-Containing Items?

Mercury is being phased out of many industrial and consumer applications. However, mercury-containing items and chemicals are still used, and old equipment and processes containing mercury may still be used in some facilities.

Inventory your facility for the following items that may contain mercury. Note the location and quantity of the devices and consider acceptable mercury-free substitutes where applicable and properly manage and recycle the mercury where acceptable substitutes do not exist.

- **Accustats**
- **Automatic Car Wash Equipment** *(contact the manufacturer)*
- **Barometers**
- **Batteries:** *mercuric oxide or button.*
- **Catalysts for Urethane and Vinyl Production**
- **Cinnabar**
- **Conveyor Counterweights**
- **Counterweights for Old Grandfather Clocks**
- **Dental Amalgam and Amalgam Capsules**
- **DC Watt Hour Meters**
- **Displacement/Plunger Relays**
- **Electroplating Solutions and Processes:** *Zinc-mercury plating, steel coloring, mercuric chloride, mercuric sulfate, mercuric nitrate, mercuric cyanide, mercuric oxide and mercuric dichromate have been used in the past in the metal finishing industry.*
- **Elemental Mercury** *for demonstrations, displays or refilling mercury-containing equipment.*
- **Flame Sensors** *sometimes found in the pilot light and burner assembly on gas-fired furnaces, boilers, unit heaters, space heaters, residential and commercial cooking equipment, commercial hot water heaters, industrial ovens and in central air conditioning systems.*
- **Flow Meters**
- **Feeding Tubes**
- **Gas Extraction Apparatus**
- **Gas Regulators**
- **Gastrointestinal Diagnostic Equipment**
- **Gyroscopes**
- **Hydrometers with Thermometers**
- **Hydronic and Warm Air Controls** *with tilt switches such as aquastats, pressurestats, firestats, fan limit controls and pressure/flow controls on air handling units.*
- **Industrial Chemicals** *(see the Industrial Chemical Connection): caustic soda, sulfuric acid, potassium hydroxide, muriatic acid and ferric chloride.*
- **Laboratory Chemicals:** *histological fixatives, mercury chloride, mercury (II) chloride, mercury iodide, mercury nitrate, mercury (II) oxide, mercury (II) sulfate, nessler reagent, zenker's solution and dozens of other less commonly used laboratory chemicals.*
- **Lamps:** *fluorescent, high-pressure sodium, metal halide, ultraviolet and neon (except red, orange and pink).*
- **Level and Rotation Sensors**
- **Lighthouse Lamp Bearings**
- **Manometers and Vacuum Gauges**
- **Mercury Displacement Relays** *sometimes found in street lighting, resistance heating, plastics molding equipment, motors, pipe organs and commercial electric cooking appliances such as pizza ovens and deep fryers.*
- **Mercury-Sealed Pistons**
- **Microwave Relays/Transmitters**
- **Permeters**
- **Pesticides Manufactured Before 1994** *(seed preservatives and fungus control for turf)*
- **Pharmaceuticals:** *Look for "mer" or "merc" in the name. Mercury is used as a preservative in some pharmaceutical products.*
- **Pressure-trols**
- **Rectifiers**
- **Ring Balances**
- **Semiconductors, Solar Cells, Thin Film Transistors, Infrared Detectors and Ultrasonic Amplifiers** *may contain mercury-cadmium-telluride, mercury-selenide or mercury-telluride that can contaminate electroplating baths.*
- **Shunt Trips**
- **Sphygmomanometers** *(blood pressure meters)*
- **Stokes Gauges**
- **Switches and Relays:** *fire alarm box switch, pressure control switches (mounted on bourdon tube or diaphragm), silent light switch, relay switches, switches in pneumatic tube and conveyor belt message systems, phase splitters, sump pump, bilge pump and other float controls, tilt switches, etc.*
- **Thermometers** *including industrial dial face thermometers with capillary tubes.*
- **Thermostats and Thermoregulators**
- **Wastewater Treatment Plant Pivot Arm Bearings**

The Industrial Chemical Connection

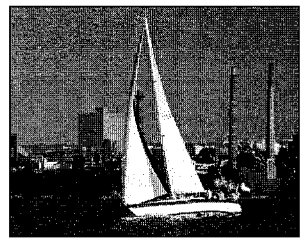
Widely used industrial chemicals such as caustic soda (sodium hydroxide) and sulfuric acid may contain mercury below the 10,000 parts per million (ppm) listing requirement for Material Safety Data Sheets but in concentrations high enough to affect the environment and municipal wastewater treatment plant regulatory requirements. The mercury content of caustic soda and sulfuric acid is dependent upon the chemical's manufacturing process. Caustic soda is produced by the electrolysis of salt brine using the porous-diaphragm process, ion-exchange membrane process or the mercury-cell process. Most caustic soda is produced with the diaphragm process. Approximately 13 percent of all caustic soda is produced by the mercury-cell process.

The mercury cell process uses mercury as a cathode. Caustic soda produced by the mercury-cell process can contain mercury in the hundreds of parts per billion range as a contaminant. Over one dozen chemical plants in the United States and in Mexico use the mercury-cell process. Other chemicals manufactured by the mercury-cell process include potassium hydroxide, chlorine, and muriatic acid. Mercury grade caustic soda is high-quality grade (low salt) and is more expensive than diaphragm-grade caustic. Typically, mercury grade caustic soda and membrane grade caustic soda (also high quality) are used for water conditioning for boilers, ion-exchange regeneration, synthesis process and other processes requiring low-salt caustic.

Sulfuric acid is sometimes produced as a secondary product of lead and copper smelting. Sulfuric acid produced as a byproduct of lead or copper smelting can contain mercury up to the tens of thousands parts per million range as a contaminant.

Although the mercury concentrations in these industrial chemicals may be relatively low, the mass of mercury reaching a wastewater treatment plant can be large. The amount of chemicals used, and the wastewater flow from the industry, determines the mercury loading. The mercury may be discharged from the wastewater treatment plant's effluent or the mercury captured in the wastewater treatment plant sludge may be released into the air if the sludge is incinerated. The City of Erie Wastewater Treatment Plant incinerates its sludge. Mercury released into the air can be deposited in the Great Lakes or other bodies of water.

Caustic soda users should evaluate their caustic uses and needs and determine if high-quality grade is necessary. Mercury levels in raw materials can vary depending upon the source. Sources for raw materials vary from one region of the country to another. Industries should specify low-mercury chemicals and request certificates of analysis from all chemical suppliers when purchasing materials. The certificate of analysis should list the mercury content in parts per billion (ppb), not as a percentage. A Material Safety Data Sheet is not the equivalent of a certificate of analysis.



The Energy Connection

Coal contains small amounts of naturally occurring mercury. Coal-fired power plants are a major source of mercury emissions that can ultimately be deposited in the Great Lakes and other bodies of water. Reducing demand for electric power means less mercury is emitted into the environment from power plants.

Understand your facilities electric use and implement an energy-efficiency program. Using energy efficient and reduced mercury fluorescent lamps instead of incandescent light bulbs are examples of ways to reduce energy use. DEP has a fluorescent lamp recycling pilot program that treats fluorescent lamps as a universal waste. For more information concerning the fluorescent lamp recycling program, energy efficiency or energy cost savings, please contact DEP at 814 332-6839.

Case Study

International Paper

Scott Newell, Environmental Engineer at International Paper's Erie Mill and a P^{3}ERIE steering committee member, completed an internal mercury audit at International Paper's Erie Mill. The mill is an integrated pulp and paper mill that employs approximately 950 people and produces over 300 tons of fine paper per day. The Erie Mill's wastewater discharge accounts for approximately one-fourth of the flow to the City of Erie Wastewater Treatment Plant (POTW). The first thing Scott did in his mercury audit was review the mill's record of mercury analysis for the mill influent to the POTW from 1992 to 1997. The influent to the POTW was analyzed by a local analytical laboratory to a detection level of 0.0001 mg/l. No mercury was detected. Scott also analyzed in-plant wastestreams from production areas with the highest potential for mercury content. These tests also showed mercury to be below the detection level. An inventory of the facility discovered two mercury manometers in the process line and elemental mercury at the mill's laboratory. The mercury manometers were removed and replaced with acceptable substitutes. The mercury-containing items and elemental mercury were recycled. Scott also checked the sources of caustic soda and acids used at the mill. The pulp and paper industry uses about 20 percent of the total United States production of caustic soda for pulping wood chip and other processes. International Paper's Erie Mill does not purchase any caustic soda made from the mercury-cell process or any acids manufactured from sulfur dioxide captured from smelters.

Convinced of the importance of the MercERIE campaign, International Paper supported the project by internally announcing a mercury collection for the public and businesses on Earth Day 1998. Scott Newell also participated in a local radio talk show in April 1998 to discuss the environmental problems associated with mercury and International Paper's internal mercury audit. International Paper's mercury audit and zero mercury discharge demonstrate the company's commitment to being an environmental as well as industry leader. International Paper's proactive approach to protecting Lake Erie from mercury provides an excellent model for all businesses and institutions to follow.

Managing, Recycling and Disposing of Mercury

Elemental mercury cannot be destroyed through standard waste treatment and disposal methods. Mercury can be recycled from mercury-containing items and mercury-containing chemicals. Please contact the Pennsylvania Department of Environmental Protection (DEP) at 814 332-6839 for a list of mercury recyclers and participants in DEP's fluorescent lamp recycling pilot program.

Sample Letter Requesting a Certificate of Analysis for Industrial Chemicals

Mary Smith
Director of Sales
XYZ Industrial Chemicals
30 Caustic Drive
Niagara Falls, NY 55555

Subject: Certificate of Analysis

Dear Ms. Smith:

Mercury is ever increasingly becoming a concern as an environmental pollutant. Mercury released from air and water sources is transformed into methylmercury in lakes or rivers. The methylmercury bioaccumulates in the aquatic food chain making consumption of contaminated fish hazardous to organisms high on the food chain, including humans.

Because of this knowledge, and our concern for the environment, our institution has instituted a mercury reduction policy. This policy requires the elimination or minimization of mercury in all our purchases. Low-level concentrations of mercury in products (less than 10,000 ppm) are not required to be listed on Material Safety Data Sheets. The contribution from the sum of these low-concentration sources account for a large fraction of the mercury in the wastewater stream. In order for our purchasing department to be able to make an informed choice on mercury concentration within the products that it buys, we are requesting that all vendors supply us with a certificate of analysis and/or a notarized affidavit which describes product mercury concentration and the detection method used in the analysis. This information will be used along with other criteria in the selection process of our vendors.

Please submit the above mentioned information on all products that you intend to supply our institution. Thank you for your assistance in this matter.

Sincerely,

John Doe
Purchasing
Acme Manufacturing

Sample Certificate of Analysis

ABC Acids
30 Smelter Drive
Newark, NJ 55554

Customer: Acme Manufacturing

Product Grade: Sulfuric Acid 93%
B/L Number: 00008650
Customer P.O No.: C125062
Routing:
Tank Car/Tank Truck No.: UTLX 125021

Shipment Date: 12/7/97
Quantity: 100,400 Tons

The analysis below is representative of the quality of product loaded into the above shipment.

Parameter	Analysis	Specification
Strength (% H2S04)	93.67	93.19 MIN
Color (HU)	11	40 MAX
Iron (ppm Fe)	9	50 MAX
Sulfur Dioxide (ppm S02)	10	50 MAX
Appearance (%T)	100	
Oxides of Nitrogen (ppm N03)	1	10 MAX
POM (ml 0.02 KMn04	1.00	10 MAX
Mercury (ppm Hg)	0.060	

Analyst: Joe Jones

P[3]ERIE "A Partnership for Greater Erie" *consists of:*

Department of Environmental Protection
www.dep.state.pa.us

Erie County Recycling Program
Erie County Health Department

Erie County Dental Association

GANNON UNIVERSITY

GE Transportation Systems

Hamot

INTERNATIONAL PAPER

PENNSTATE Erie

Sea Grant Pennsylvania

Strong Vincent High School
Erie City School District

Wastewater Treatment Plant

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Greensburg District Mining Office

March 1, 2011

Mr. Jeff Ross
450 Racetrack Road
Washington PA 15301

Dear Mr. Ross:

A review of the citizen complaint database in the Southwest Region has produced one crematory complaint in the last three years while the number of permitted crematories has risen significantly.

These facilities do require DEP permits and they are routinely inspected by Air Quality Specialists.

Respectfully,

Dan Haney
Operations Chief
Air Quality Program

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

GENERAL PLAN APPROVAL AND/OR GENERAL OPERATING PERMIT (BAQ-GPA/GP-14)

HUMAN OR ANIMAL CREMATORIES

1. Statutory Authority and General Description

In accordance with Section 6.1(f) of the Air Pollution Control Act, 35 P.S. § 4006.1(f), and 25 *Pa. Code* § 127.611, the Department of Environmental Protection ("Department") hereby issues this general plan approval and/or general operating permit for human or animal crematories (hereinafter referred to as "General Permit").

2. Applicability/Source Coverage Limitations

This General Permit shall serve as a plan approval and/or an operating permit for human or animal crematories.

This General Permit may not be used where the installation of the crematory, individually or in conjunction with other source installations or modifications, would be subject to the requirements of 25 *Pa. Code* Chapter 127, Subchapter D (relating to prevention of significant deterioration) or 25 *Pa. Code* Chapter 127, Subchapter E (relating to new source review).

This General Permit has been established in accordance with the provisions described in 25 *Pa. Code*, Chapter 127, Subchapter H (relating to general plan approvals and operating permits). If the Department determines that the crematory at the facility cannot be adequately regulated under the requirements of this General Permit, a plan approval and/or an operating permit issued in accordance with 25 *Pa. Code*, Chapter 127, Subchapter B (relating to plan approval requirements) and/or Subchapter F (relating to operating permit requirements) will be required. If the facility is a Title V facility, a Title V operating permit issued in accordance with Subchapters F and G (relating to Title V operating permits) is required.

<u>Plan Approval</u>

Once authorization to use this General Permit is granted, construction of the human or animal crematory designated in the application may proceed.

This General Permit does not authorize the construction of a new crematory with a rated capacity equal to or greater than 500 pounds per hour.

This General Permit may be used to authorize the construction of a new crematory that is subject to the best available technology (BAT) required under 25 *Pa. Code* §§ 127.1 and 127.12(a)(5). For purposes of this General Permit, compliance with the emission limitations specified in Condition 12 and the work practice standards in Condition 13 satisfies the BAT requirement for new crematories.

A facility that had been authorized to use this General Permit for any existing unit(s) shall submit a new General Permit application, along with the appropriate fee, prior to the installation of any new unit(s).

Operating Permit

This General Permit is not intended for use by a Title V facility as defined in 25 *Pa. Code* §121.1 (relating to definitions). A Title V facility is one whose sources have the potential to emit or actually emit at a rate equal to or greater than the "Facility Potential to Emit" levels shown in the following table. A crematory is eligible to operate under this General Permit if its potential to emit and its actual emissions will remain below the "Facility Potential to Emit" levels listed below.

Pollutant	Facility Potential to Emit (PTE)
CO	100 TPY
NO_x	100 TPY
SO_x	100 TPY
VOCs	50 TPY
PM_{10}	100 TPY
HAP	10 TPY
HAPs	25 TPY

Once authorization to use this General Permit is granted, operation may proceed provided that the permittee notifies the Department in accordance with Condition 6.

3. **Application for Use**

Any person applying for authorization to use this General Permit to construct and/or operate a crematory shall notify the Department, in writing, using the General Permit application provided by the Department and shall receive prior written approval from the Department as required under 25 *Pa. Code* § 127.621 (relating to application for use of general plan approvals and general operating permits).

With the application for any new crematory, the permittee shall provide a letter from the local municipality and a letter from the county in which the unit(s) are located, or are proposed to be located, signed by the public officials on their respective letterheads, stating that "The installation and/or operation of this crematory is not inconsistent with applicable comprehensive plans and zoning ordinances" or "All required zoning approvals or variances have been secured for the installation and/or operation of this crematory."

4. **Compliance**

Any crematory operating under this General Permit must comply with the terms and conditions of the General Permit. The crematory shall be:

a. Operated in such a manner as not to cause air pollution, as defined in 25 *Pa. Code* § 121.1.

b. Operated and maintained in a manner consistent with good operating and maintenance practices.

c. Attended by a trained operator at all times when the unit is in operation.

d. Operated and maintained in accordance with the manufacturer's specifications and the applicable terms and conditions of this General Permit.

e. Designed to provide sufficient secondary chamber volume to maintain the exhaust gases at the required temperature for at least one second.

f. Fueled by natural gas, LP gas, propane or # 2 fuel oil meeting the applicable sulfur requirements for commercial fuel oil. Compliance with this requirement shall be deemed to establish compliance with the sulfur compound emission limitations in Conditions 9 and 12 of this General Permit.

g. Observed by a trained operator for stack emissions as required in Conditions 8 and 11 below. These are to be qualitative observations establishing the absence or presence of visible and odor emissions. If these observations confirm that there are no visible and no odor emissions from the crematory during each cremation cycle, this shall be deemed to establish compliance with the visible and odor emission limitations in Conditions 9 and 12 below. As an alternative to the stack emission observations, the permittee may install and operate an opacity monitoring device, provided that the device is maintained in accordance with the manufacturer's recommendations and the operator is instructed in the proper operation and maintenance of the opacity monitoring device as part of the operator training program identified in Condition 18. The operator must observe the output readings during each cremation cycle, and readings in excess of the applicable limitations identified in Conditions 9 and 12 below shall be addressed in the same manner as the visual stack observations.

h. If nighttime operation of the crematory is to occur, adequate artificial lighting of the plume at the stack outlet must be provided to enable these observations of stack emissions to occur at night.

i. Stack tested for particulate matter emissions as required in Condition 7 below or, as an alternative, the permittee may provide a copy of a stack test performed on an identical unit within the last five years. Compliance with this requirement shall be deemed to establish compliance with the particulate matter emission limitations in Conditions 9 and 12 of this General Permit.

5. Permit Modification, Suspension and Revocation

This General Permit may be modified, suspended, or revoked if the Department determines that affected crematories cannot be adequately regulated under this General Permit.

Authorization to use this General Permit shall be suspended or revoked by the Department if the permittee fails to comply with applicable terms and conditions of the General Permit.

Authorization to use this General Permit to construct and/or operate a crematory shall be suspended if the permittee causes, permits or allows any modification (as defined in 25 *Pa. Code* § 121.1) of the crematory covered by this General Permit without Department approval. Upon suspension of the General Permit, the permittee may not continue to operate the crematory until the Department grants approval, in writing.

6. Notice Requirements

The application required by 25 *Pa. Code* § 127.621 shall be submitted to the appropriate Regional Office responsible for authorizing the use of general plan approvals and operating permits in the county in which the crematory is, or will be, located.

a. This General Permit may be used by the owner or operator of a new source to authorize operation provided that the Department receives written notice from the permittee of the completion of construction and the intent to commence operation at least five (5) working days prior to completion of construction.

b. The permittee shall notify the Department within twenty-four (24) hours of discovery or by 12:00 noon of the next business day following a weekend or holiday of any malfunction of the crematory which results in, or which may reasonably be expected to result in, the emission of air contaminants in excess of the limitations specified in, or established pursuant to, any applicable rule or regulation contained in 25 *Pa. Code*, Subpart C, Article III (relating to air resources) or any of the conditions of this General Permit.

7. Sampling and Testing

a. In order to demonstrate compliance with the particulate matter emission limitations in Conditions 9 and 12 of this General Permit, the permittee shall either perform a stack test during initial operation of the unit or, as an alternative, provide a copy of a stack test performed on an identical unit within the last five (5) years.

b. If, at any time, the Department has cause to believe that air contaminant emissions from a crematory authorized to use this General Permit are in excess of the limitations specified in, or established pursuant to, any applicable regulation contained in 25 *Pa. Code,* Subpart C, Article III, the Department may require the permittee to conduct tests deemed necessary by the Department to determine the actual emission rate(s). The permittee shall perform such tests in accordance with applicable provisions of 25 *Pa. Code,* Chapter 139 (relating to sampling and testing) and in accordance with any restrictions or limitations established by the Department within one hundred and eighty (180) days of the date the Department notifies the permittee, in writing, of the testing requirement.

8. Monitoring, Recordkeeping, and Reporting for Crematories for which Construction Commenced on or before April 17, 1989 and are not subject to the Department's "Recommended Criteria for Crematory Incinerators"

The permittee shall comply with applicable monitoring, recordkeeping and reporting requirements set forth in this General Permit. The permittee shall collect and record the information specified in this condition. The information shall be maintained at the facility for a minimum of five (5) years and shall be made available upon request to the Department.

a. The permittee shall verify compliance with the visible and odor emission limitations in Condition 9 through the following procedures:

   i. The permittee shall observe the exhaust stack of the crematory at least once during each cremation cycle for the presence of visible emissions;

   ii. If any visible or odor emissions are apparent, the permittee shall take immediate action to eliminate them; and

iii. If any visible or odor emissions are apparent after the corrective action, the crematory shall not start another cremation cycle until the permittee can verify compliance with the visible emission limitations specified in Condition 9 through methods prescribed in 25 *Pa. Code* § 123.43 (relating to measuring techniques), such as Method 9 readings taken by a certified visible emissions reader.

b. The permittee shall install, maintain, and operate continuous temperature monitors to measure the temperatures at the exit from the primary combustion chamber and at the exit from the secondary (or last) chamber of the crematory. Sensors shall be located such that flames from the burners do not impinge on the sensors. These temperatures shall be recorded in either analog or digital read-only format.

c. The permittee shall maintain records of:

i. Visible emission observations and any corrective actions;

ii. A time and corresponding temperature during each cremation cycle when the temperature of the secondary (or last) combustion chamber achieves the temperature required in Condition 10;

iii. The amount and type of fuel used on a monthly basis;

iv. The hours of operation;

v. The number of cremations performed;

vi. Operating training certification(s);

vii. Burner adjustments and maintenance;

viii. Thermocouple calibrations, adjustments and replacements;

ix. The fuel oil sulfur content as certified by the supplier of any and all fuel oil burned in the crematory; and

x. The removal from the body and proper disposal of any implanted electronic devices and potentially hazardous remedial devices (See Condition 14 of this General Permit).

9. Emission Limitations for Crematories for which Construction Commenced on or before April 17, 1989 and are not subject to the Department's "Recommended Criteria for Crematory Incinerators"

The operation of the crematory shall not at any time result in the emission of:

a. Particulate matter emissions in excess of 0.1 gr/dscf, corrected to 12% carbon dioxide as specified in 25 *Pa. Code* § 123.12 (relating to incinerators).

b. Sulfur compound emissions in excess of 500 parts per million, by volume, dry basis, as specified in 25 *Pa. Code* § 123.21.

c. Visible emissions in excess of either of the following limitations:

   i. Equal to or greater than 20% for a period or periods aggregating more than three minutes in any 1 hour;

   ii. Equal to or greater than 60% at any time.

d. Odor emissions in such a manner that the malodors are detectable outside the property of the permittee as specified in 25 *Pa. Code* § 123.31 (relating to odor emissions).

10. Work Practice Standards for Crematories for which Construction Commenced on or before April 17, 1989 and are not subject to the Department's "Recommended Criteria for Crematory Incinerators"

Crematories for which construction commenced on or before April 17, 1989 shall comply with the following work practice standards:

a. The temperature at the exit of the secondary (or last) chamber shall achieve and be maintained at or above 1600 ° F throughout the cremation cycle.

b. If an interlock system is available, the unit shall not be charged until:

   i. The secondary (or last) chamber exit temperature is established and holding at or above 1600 ° F; and,

   ii. The previous cremation cycle is complete.

c. If an interlock system is not available, the permittee shall develop and follow a written standard operating procedure for the crematory. All operators of the unit shall be trained in the procedure. The operating procedure shall specify the minimum secondary (or last) chamber exit temperature at which the next cremation cycle may commence.

d. The manufacturer's representative or another qualified technician shall adjust the burners at appropriate times such as when the use of an alternate fuel is initiated and when visible emissions are observed.

11. Monitoring, Recordkeeping, and Reporting Requirements for Crematories for which Construction Commenced after April 17, 1989 and are subject to the Department's "Recommended Criteria for Crematory Incinerators" (Technical Guidance Document #275-2101-007)

The permittee shall comply with applicable monitoring, recordkeeping and reporting requirements set forth in this General Permit. The permittee shall collect and record the information specified in this condition. The information shall be maintained at the facility for a minimum of five (5) years and shall be made available upon request to the Department.

a. The permittee shall verify compliance with the visible and odor emission limitations in Condition 12 through the following procedures:

   i. The permittee shall observe the exhaust stack of the crematory at least once during each cremation cycle for the presence of visible and odor emissions. As an alternative to the stack observations, if the crematory is equipped with an opacity monitoring device, the operator may observe the output from the opacity monitoring device for the presence of visible emissions;

ii. If any visible or odor emissions are apparent, the permittee shall take immediate action to eliminate them; and

iii. If any visible or odor emissions are apparent after the corrective action, the crematory shall not start another cremation cycle until the permittee can verify compliance with the visible emission limitations specified in Condition 12 through methods prescribed in 25 *Pa. Code* § 123.43, such as Method 9 readings taken by a certified visible emissions reader.

b. The permittee shall install, maintain, and operate temperature monitors to measure and continuously record the temperature at the exit from the primary combustion chamber and at the exit from the secondary (or last) chamber of the crematory. Sensors shall be located such that flames from the burners do not impinge on the sensors.

c. The permittee shall maintain records of:

i. Visible emission observations and any corrective actions;

ii. The temperature of the primary and secondary combustion chamber during each cremation cycle on a continuous basis;

iii. The amount and type of fuel used on a monthly basis;

iv. The hours of operation;

v. The number of cremations performed;

vi. Operator training certifications and training program content;

vii. Burner adjustments and maintenance;

viii. Thermocouple calibrations, adjustments and replacements;

ix. The fuel oil sulfur content as certified by the supplier of any and all fuel oil burned in the crematory; and

x. The removal from the body and proper disposal of any implanted electronic devices and potentially hazardous remedial devices (See Condition 14 of this General Permit).

12. Emission Limitations for Crematories for which Construction Commenced after April 17, 1989 and are subject to the Department's "Recommended Criteria for Crematory Incinerators" (Technical Guidance Document #275-2101-007)

The operation of the crematory shall not at any time result in the emission of:

a. Particulate matter emissions in excess of 0.08 gr/dscf, corrected to 7% oxygen.

b. Sulfur compound emissions in excess of 500 parts per million, by volume, dry basis, as specified in 25 *Pa. Code* § 123.21.

c. Visible emissions in excess of either of the following limitations:

   i. Equal to or greater than 10% for a period or periods aggregating more than three minutes in any hour;

   ii. Equal to or greater than 30% at any time.

d. Odor emission in such a manner that the malodors are detectable outside the property of the permittee as specified in 25 *Pa. Code* § 123.31.

13. Work Practice Standards for Crematories for which Construction Commenced after April 17, 1989 and are subject to the Department's "Recommended Criteria for Crematory Incinerators" (Technical Guidance Document #275-2101-007)

Crematories for which construction commenced after April 17, 1989 shall comply with the following work practice standards:

a. Before charging the unit, the temperature at the exit of the secondary (or last) chamber shall achieve 1800° F or higher and be maintained throughout the cremation cycle;

   or,

   For units that are charged when both chambers are cold, the temperature at the exit of the secondary (or last) chamber shall achieve and be maintained at or above 1800°F before firing of the primary chamber burner.

b. The crematory shall provide an interlock system that either:

   i. Precludes charging of the primary chamber until the secondary (or last) chamber exit temperature is established and holding at 1800 ° F and after charging, precludes opening the charge door until the cremation cycle is complete; or,

   ii. In units that are charged when both chambers are cold, precludes firing the primary chamber burner until the secondary chamber temperature is established and holding at 1800 ° F. In these units, the interlock system must also preclude opening the charge door until the previous cremation cycle is complete and the primary chamber is cooled to less than 150 ° F.

c. The manufacturer's representative or another qualified technician shall adjust the burners after the unit is constructed and before a new unit is first operated and at other appropriate times such as when the use of an approved fuel is initiated and when visible emissions are observed.

14. Prohibited Use

Any air contamination source that is subject to the requirements of 25 *Pa. Code* Chapter 127, Subchapters D (relating to prevention of significant deterioration), E (relating to new source review) and G (relating to Title V operating permits) or 25 *Pa. Code* §129.91 (relating to control of major sources of NOx and VOCs) may not be constructed and/or operated under this General Permit except that the owners and operators of Title V facilities may use this General Permit as a plan approval when the requirements of Subchapters D or E are not applicable.

The owner or operator of the crematory must ensure that all medical devices (e.g. pacemakers, defibrillators, etc.) and potentially hazardous remedial devices (e.g. radioactive implants, etc.) have been removed from bodies and properly disposed of prior to cremation. Documentation certifying compliance with this requirement shall be maintained for each cremation.

The owner or operator of any crematory authorized to use this General Permit may cremate either human or animal remains, but not both in the same unit.

The owner or operator of any crematory authorized to use this General Permit may only cremate either human or animal remains and the container used to transport the remains.

The owner or operator of any crematory authorized to use this General Permit is prohibited from using the crematory to dispose of any animals used for commercial or medical experimentation purposes.

The owner or operator of any crematory authorized to use this General Permit may not incinerate any other type of waste (e.g. hospital, medical, hazardous, chemotherapeutic, radioactive, etc.).

The owner or operator of any crematory authorized to use this General Permit may not cremate human or animal bodies whose weight exceeds 500 pounds, including the weight of the container.

15. Transfer of Ownership or Operation

The permittee may not transfer the authorization to use the General Permit to another person. New owners or operators of the crematory shall submit a new application and fees to the Department as described in Condition 19 of this General Permit.

16. Term of Authorization to Use this General Permit

Authority to operate under this General Permit is granted for a fixed term of five (5) years. Provided the applicability requirements are met, the Department will provide each applicant a written authorization to use this General Permit.

17. Expiration and Renewal of Authorization to Use this General Crematory Permit

The permittee's authority to construct and/or operate under this General Permit terminates on the date of expiration of the Authorization to Use the General Permit unless a timely and complete renewal application is submitted to the Department no later than thirty (30) days prior to the expiration date.

Upon receipt of a timely and complete application for renewal, the crematory may continue to operate subject to the Department's final action on the renewal application. Operation pending receipt of the renewal shall cease if, subsequent to a completeness determination, the applicant fails to submit by the deadline specified in writing by the Department, any additional information required by the Department to process the renewal application.

The renewal application shall include the identity of the owner or operator, location of the crematory, General Permit number, description of source category, the appropriate renewal fee listed in Condition 19 and any other information requested by the Department.

18. Operator Training

The manufacturer's representative or another qualified training source shall provide adequate instruction to all operators of each new crematory and to new operators of existing crematories including hands-on control of the unit for at least two operating cycles. The training shall include all of the following elements:

a. Principles of combustion;

b. Operating monitors and controls;

c. Operating sequence under normal conditions;

d. Safety and operating procedures under foreseeable upset conditions (e.g. power or fuel interruption, burner malfunction, visible emissions, high and low temperature incidents, etc);

e. Regulatory requirements;

f. Calibration, adjustment and replacement of thermocouples;

g. Preventive maintenance practices and procedures and recommended frequency; and

h. Recordkeeping requirements and procedures.

19. Permit Fees

The General Permit establishes the following application and permit renewal fees:

Five hundred dollars ($500).

A new application for BAQ-GPA/GP-14 and fee are required each time the permittee installs or modifies a crematory. The installation or modification of a crematory must be conducted according to the terms and conditions of this General Permit.

20. Applicable Laws

Nothing in this General Permit relieves the permittee of its obligation to comply with all applicable Federal, state and local laws and regulations.

Approved by: ______________________________

Joyce E. Epps
Director
Bureau of Air Quality

Date Approved: July 27, 2006

2700-PM-AQ0024 8/2006

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

GENERAL PLAN APPROVAL AND/OR GENERAL OPERATING PERMIT APPLICATION

General Permit BAQ-GPA/GP-14: Human or Animal Crematories

This application is for:	This application is for how many
☐ Human Cremation unit(s) ☐ Animal Cremation unit(s) ☐ New or Modified Cremation unit(s) ☐ Renewal of General Permit for a Cremation unit(s) without any modification	_____ Cremation unit(s)

SECTION A. OWNER INFORMATION

Owner's Name and Tax ID ____________________

Address Line 1 ____________________

Address Line 2 ____________________

City State Zip + 4 ____________________

Phone

SECTION B. CONTACT INFORMATION

Owner ____________________

Address Line 1 ____________________

Address Line 2 ____________________

City State Zip + 4 ____________________

Phone

SECTION C. CREMATORY INFORMATION

Address Line 1 ____________________

Address Line 2 ____________________

Municipality ____________________ County ____________________

Manufacturer ____________________ Model No. ____________________

Date Installed ____________________

Rated Charging Capacity (lbs/hr) of each Cremation unit ____________________

Crematory Burning Hours (Daily) ____________________

Fuel Used ☐ Natural Gas ☐ Propane

Fuel Usage Metered ☐ Yes ☐ No

Secondary Chamber Exit Temperature ____________________

Primary and Secondary Chamber Burners' Capacity (Mbtu/Hr) ____________________

Primary and Secondary Chamber Burners' Make and Model ____________________

Exhaust – Stack Height and Stack Diameter ____________________

Make and Model of Temperature Monitor and Recorder Used in Primary and Secondary Combustion Chambers ____________________

Will the addition of the Crematory result in applicability of the following?

New Source Review ☐ Yes ☐ No

Title V (major source threshold) ☐ Yes ☐ No

Particulate Compliance Demonstration	☐ On-site stack testing	☐ EPA reference method stack test performed in last five (5) years on an identical crematory
Operator's Training Certificate Attached	☐ Yes	☐ No
Installation of the Crematory is not inconsistent with Local and County Zoning Ordinance	☐ Yes (Attach signed letters from local municipality and county officials)	☐ No
Remarks (Use extra sheets as needed)		

SECTION D. APPLICANT'S CHECKLIST

I have enclosed the following:

☐ General Information Form (GIF) (For new plant only)

☐ Compliance Review Form

☐ Permit Fee for new or renewal of authorization

☐ Fee for change in location

SECTION E. AFFIDAVIT

I certify that, subject to the penalties of Title 18 Pa. C.S.A. Section 4904 and 35 P.S. Section 4009(b)(2), I am the responsible official having primary responsibility for the design and operation of the facilities to which this application applies and that the information provided in this application is true, accurate and complete to the best of my knowledge, information and belief formed after reasonable inquiry. I further certify that the facility will be operated in conformity with all limitations and conditions of the Human or Animal Crematories General Permit (BAQ-GPA/GP-14).

______________________________ Signature

______________________________ Date

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

GENERAL PLAN APPROVAL AND/OR GENERAL OPERATING PERMIT APPLICATION INSTRUCTIONS

General Permit BAQ-GPA/GP-14: Human or Animal Crematories

GENERAL INFORMATION

1. The owner or operator of any crematory proposing to operate under the general plan approval and/or operating permit (BAQ-GPA/GP-14) must comply with the terms and conditions specified therein. Failure to comply with the applicable laws, rules and regulations and terms and conditions of this General Permit, for any reason, is grounds for the revocation or suspension of the permittee's authorization to operate under BAQ-GPA/GP-14.

2. BAQ-GPA/GP-14 may not be used for the installation of a crematory where the emission increases from the installation of the new crematory and other emission increases that have occurred at the facility would subject the owner or operator to the requirements specified in 25 Pa. Code, Chapter 127, Subchapter D (relating to prevention of significant deterioration) or 25 Pa. Code, Chapter 127, Subchapter E (relating to new source review). Guidance in this regard may be obtained by contacting the appropriate Regional Office of the Department.

3. BAQ-GPA/GP-14 applies to any crematory fueled by natural gas, propane or commercial fuel oils which are No. 2 or lighter, and which meet the applicable sulfur requirements for commercial fuel oil.

4. An applicant requesting authorization to use BAQ-GPA/GP-14 may either perform a stack test during initial operation or provide results of a recent stack test, performed, within five (5) years on an identical crematory to meet the sampling and testing requirements prescribed in Condition 7 of this General Permit.

5. BAQ-GPA/GP-14 may not be used for units burning hospital, medical, radioactive, infectious, or municipal/industrial/hazardous wastes or animals from commercial or medical experimentation.

6. An applicant requesting authorization to use BAQ-GPA/GP-14 must fulfill the compliance review form requirements in 25 Pa. Code Section 127.412 (relating to compliance review forms).

7. Authorization to use BAQ-GPA/GP-14 is granted for a term of five (5) years. The application fee schedule is described in Condition 19 of the General Permit. An application for renewal of the General Permit and the renewal fee must be submitted thirty (30) days prior to expiration of the General Permit.

8. The application and fees must be submitted to the appropriate Regional Office.

9. Authorization to use BAQ-GPA/GP-14 may not be transferred to another crematory owner or operator. The new owner of the crematory shall submit a new application and fees to the Department as described in Condition 19 of the General Permit for human or animal crematories.

10. If the crematory at the facility cannot be regulated in accordance with the requirements of BAQ-GPA/GP-14, the owner or operator must apply for a plan approval pursuant to 25 Pa. Code Chapter 127, Subchapter B (relating to plan approval requirements).

11. **Crematories for which Construction Commenced after April 17, 1989** – The applicant shall provide design calculations to confirm a sufficient volume in the secondary chamber and any additional refractory-lined volume, excluding the primary chamber volume to provide for at least a 1.0 second gas residence time at 1800 °F. The thermocouple must be located at the exit from the total volume included in the residence time calculation.

    Crematories for which Construction Commenced on or before April 17, 1989 – The applicant shall provide design calculations to confirm a sufficient volume in the secondary chamber and any additional refractory-lined volume, excluding the primary chamber volume to provide for at least a 1.0 second gas residence time at 1600 °F. The thermocouple must be located at the exit from the total volume included in the residence time calculation.

12. The application requesting authorization to use BAQ-GPA/GP-14 shall contain a drawing of the unit showing the combustion chambers, burners, thermocouples, exhaust, etc.

![HH]

HoustonHarbaugh
ATTORNEYS AT LAW

WRITER'S DIRECT DIAL:
(412) 288-5018
ribartl@hh-law.com

February 18, 2011

Via Email – EJZuk@peterstownship.com and U.S. First Class Mail Mr. Edward J. Zuk Planning Director Peters Township Planning Office 610 East McMurray Rd McMurray, PA 15317	Via Email - wajohnsonesq@yahoo.com and U.S. First Class Mail Mr. William A. Johnson, Esquire 8 East Pine Avenue Washington, PA 15301

Re: Zoning Ordinance Amendment related to funeral homes and crematories

Dear Mr. Zuk and Mr. Johnson:

As you know, Danielle Belusko previously made a request for a landowner curative amendment to the Peters Township Zoning Ordinance (the "Ordinance") to permit funeral homes in the C-4 Commercial Zoning District and to amend the definition of funeral homes to include crematories. Mrs. Belusko was under agreement to purchase a property along Hidden Valley Road which is located in a C-4 zoning district, where funeral homes are not permitted. The Planning Commission held a hearing on October 14, 2010, and voted to recommend no change to the Ordinance. On January 11, 2011, I requested that a public hearing be scheduled before Council. In response to that request, a special meeting has been called for March 21, 2011.

Since that time, Ms. Belusko has terminated the agreement for the Hidden Valley Road property and is now focusing on the former La-Z-Boy furniture showroom property located in a C-2 zoning district at 3297 Washington Road (the "C-2 Property"). A family owned company, Audia Group Investments, LLC ("Audia") is under agreement to purchase the C-2 Property from the LZP McMurray Trust. I have attached a fully executed copy of the Agreement of Sale with the purchase price redacted. Audia will then lease the C-2 Property to Mrs. Belusko and her husband Rod, or an entity formed and controlled by them, to own and operate the funeral home.

As a result of the above, Mrs. Belusko and Audia desire to withdraw the prior request to permit funeral homes with crematories in C-4 Zoning Districts and to amend the landowner curative amendment to simply change the definition of funeral homes to include cremation services. Please see the attached amended landowner curative amendment. It is our position that this constitutes a "substantial amendment" to the proposed ordinance per Section 610(b) of the Municipalities Planning Code (the "MPC") which requires the Township to re-advertise the amended ordinance at least ten (10) days prior to enactment. It is our understanding that this amended ordinance should also be submitted to the County Planning Commission for review and will be submitted to the Township Planning Commission and considered at a public hearing before the Planning Commission on March 10, 2011.

Section 916.1(e) of the MPC also requires the notice of public hearing to include notice that the validity of the ordinance is being challenged. Please advertise that this is a validity challenge.

Thank you for your time and attention to this matter.

Very truly yours,

Tammy L. Ribar

Tammy L. Ribar

TLR/mb

cc: Danielle Andy Belusko – via email
Mary-Jo Rebelo, Esquire – via email
Richard Violi, Esquire – via email
Jeff Ross – via email

AIR QUALITY EVALUATION OF
ATMOSPHERIC EMISSIONS FROM A PROPOSED CREMATOR

PREPARED FOR:

HOUSTON HARBAUGH P.C.
401 Liberty Avenue, 22nd Floor
Pittsburgh, PA 15222

PREPARED BY:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
333 Baldwin Road
Pittsburgh, PA 15205

CEC PROJECT 101-462

SEPTEMBER 2, 2010

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FIGURE

TABLES

APPENDICES

1.0 INTRODUCTION

This report presents an evaluation of atmospheric emissions produced by the operation of a cremator. Civil & Environmental Consultants, Inc. (CEC) performed the evaluation at the request of Mr. Michael J. Dempster, Esquire of Houston Harbaugh, P.C. in accordance with our proposal dated August 4, 2010.

1.1 PURPOSE

The purpose of this evaluation was to characterize atmospheric emissions from the proposed cremator and compare those emissions to other common sources of combustion emissions.

1.2 CREMATOR DESCRIPTION

The proposed cremator is manufactured by Matthews International Corporation - Cremation Division (MCD) (www.matthewscremationdivision.com). The MCD Power-Pak II Cremation System is the subject of this evaluation. The system uses natural gas to heat primary and secondary combustion chambers that convert human remains and their cardboard or wooden containers to ash and atmospheric emissions.

1.3 EXECUTIVE SUMMARY

The atmospheric emissions from the operation of cremators have been measured and published by numerous sources including the U.S. EPA and regional air quality authorities. The proposed Power-Pak II is expected to generate significantly lower emissions of criteria air pollutants than common sources of combustion emissions such as wood stoves and fireplaces, restaurant charbroiling of meat, and automobile engine idling when operated for comparable periods of time. Hazardous air pollutants produced by the cremator will not produce significant human health risks. Overall, this equipment will be an insignificant source of atmospheric emissions when operated in accordance with manufacturer specifications.

2.0 AIR QUALITY EVALUATION

This evaluation consisted of five phases. Initially, CEC obtained information about the proposed equipment and its expected operating schedule. Next, we collected and reviewed available published literature about atmospheric emissions from cremators. Emission estimates for the proposed cremator were then developed and compared to three other common sources of combustion emissions. Cremator emissions were also evaluated relative to screening level human health risk criteria. Finally, the applicability of local air quality regulations was evaluated.

2.1 PROCESS DESCRIPTION

The Power-Pak II is a batch process combustion device designed to reduce human remains to ash and atmospheric emissions. The cremator is approximately 14 feet in length, 6 feet in width, and 8 feet tall. The primary and secondary combustion chambers are fired by burners rated at three million British thermal units (MMBtu) per hour. The primary combustion chamber has a maximum loading capacity of 750 pounds (total weight of human remains plus container) although the typical batch weight is 175 pounds (150 pounds of human remains plus 25 pounds of container).

The system has a processing capacity of two hours per batch which includes a ½-hour pre-heat to reach the 1,800 °F secondary combustion chamber temperature. Maximum production capacity would therefore equal about 4 batches per day (assuming an 8-hour business day) if there was sufficient demand for this service.

Statistics compiled by the Cremation Association of North America (CANA, 2009) indicate that far fewer than 4 cremations per day will be performed. In calendar year 2008, there were 92 crematories in the Commonwealth of Pennsylvania. During that year, 40,374 cremations were performed in Pennsylvania (average of 439 cases per facility). Projections to calendar year 2015 suggest that an average of 575 cases per year per facility may be processed. Assuming a processing rate of 2 hours per batch, the 575 cases would consist of about 1,150 hours of operation per year. This equals about 4.6 hours daily, assuming 5 days per week and a 50-week year. An operating schedule of 1,150 hours per year equals about 13% production (equivalent to idle time of about 87%).

Atmospheric emissions are vented from the secondary combustion chamber through a vertical stack that exits through the building roof. Typical stack diameters are 24 to 29 inches. The exhaust system is equipped with an opacity monitor that measures the level of smoke particles in the exhaust and is capable of controlling the combustion process, if needed, to achieve optimal performance. Literature and specifications for the Power-Pak II are included as Appendix A.

2.2 EMISSIONS LITERATURE REVIEW

The literature review for this evaluation consisted of obtaining information from the equipment vendor, the U.S. EPA, and other regulatory authorities about the atmospheric emissions produced by operation of cremation systems for human or animal remains. Both types of remains produce the same type of atmospheric emissions, so data from both sources have been compiled here.

2.2.1 Vendor Literature

CEC contacted MCD by telephone to obtain performance data for the Power-Pak II (Gogel, 2010). Mr. Jarrod Gogel, Engineering Aide, provided five reports that contained emission rate information as summarized in Table 1: AirNova (2006); Air Testing & Consulting, Inc. (2005); Arlington Environmental Services (2010); Horizon Engineering (2003); and U.S. EPA (1999). All reports contained emission rate information for four criteria air pollutants: particulate matter (PM), carbon monoxide (CO), nitrogen dioxide and other oxides of nitrogen (NO_x), and sulfur dioxide (SO_2). One report contained factors for a fifth pollutant: volatile organic compounds (VOC). Two reports also contained emission measurements for several hazardous air pollutants (HAP). Emission rates were reported in units of pounds per hour. All emissions were reported as uncontrolled, meaning that no additional pollution control devices in addition to the cremator itself were used to reduce pollutant emissions. Average reported emission rates for all five tests are summarized in the right hand column of Table 1.

2.2.2 U.S. EPA Emission Factors

The U.S. EPA maintains a collection of emission factors referred to as the Factor Information Retrieval (FIRE) Data System. The WebFIRE version is a web-based application that enables the user to query the database according to Standard Classification Code (SCC) (U.S. EPA, 2010a). CEC used the WebFIRE system to search for emission factors associated cremators (SCC 31502101).

WebFIRE factors for this source were limited to HAPs and PM (no other pollutants). The emission factors are reported as uncontrolled emissions in units of "pounds per each body burned" and all factors were the result of a single source test study of a propane-fired cremator in 1992. For comparison to the stack test results discussed above, CEC assumed a two-hour per batch production cycle to convert emission rates from pounds per body to pounds per hour (all values were divided by 2). Table 2 summarizes the WebFIRE emission rates.

2.2.3 BAAQMD Emission Factor Compilation

The Bay Area Air Quality Management District (BAAQMD) is the regulatory authority with jurisdiction over air quality permitting and compliance in the nine-county San Francisco, California Bay Area. The BAAQMD has compiled a *Permit Handbook* that contains a chapter as well as an emission spreadsheet for crematories (BAAQMD, 2009). BAAQMD's summary separates the emissions associated with natural gas combustion in the cremator from the emissions associated with combustion of a body and case. Emissions for natural gas combustion are derived from U.S. EPA's *Compilation of Air Pollutant Emission Factors* referred to as AP-42 (U.S. EPA, 1998b). Combustion emissions associated with the body and case were derived from AP-42 Section 2.3 – Medical Waste Incinerator (U.S. EPA, 1993). Factors for HAP were derived from U.S. EPA's FIRE database for cremators, as discussed above (SCC = 31502101) although formaldehyde and acetaldehyde emission factors were calculated from a California Air Resources Board test report on two propane-fired crematories. Table 3 is a copy of the spreadsheet obtained from BAAQMD's *Permit Handbook* combined with additional emission factors obtained from WebFIRE.

2.3 EMISSION ESTIMATES

2.3.1 Cremator Emissions

Table 3 summarizes emission estimates for air pollutants from the proposed cremator. Criteria pollutant emission rates are expected to be less than 0.5 tons per year for each pollutant. Values range from a low of 0.07 tpy (about 150 pounds) of SO_2 and VOC to a high of 0.31 (about 600 pounds) of nitrogen oxides (NOx).

Emissions of individual HAPs would be less than one pound per year for all constituents except hydrogen chloride (HCl) which is estimated at about 196 pounds per year. (It should be noted that HCl emissions would be associated with the combustion of plastics. The most common sources of plastics in cremations are prosthetics. Standard practice is not to include prosthetics in the cremation, so it is expected that HCl emission would be negligible during normal operation). Emissions of five constituents (cadmium, zinc, hydrogen fluoride, lead, and mercury) are estimated to range from 0.1 to 2.0 pounds per year. All other constituents would be emitted at less than 0.1 pounds per year. Total HAP emissions from the cremator are estimated at 199 pounds per year, over 98% of which is attributed to hydrogen chloride.

2.3.2 Wood Stove Emissions

Residential fireplaces and wood stove emission estimates were developed for comparison to the proposed cremator. U.S. EPA AP-42 emission factors for residential fireplaces and wood stoves (U.S. EPA, 1996a and 1996b, respectively) were used to obtain available factors. The quantity of wood consumed in a fireplace or woodstove annually was assumed to be equivalent to one cord. For purposes of this evaluation, one cord (equal to 128 cubic feet) of dry oak (density 47 lb/cf) was determined to equal approximately 6,000 pounds (3 tons). Emission factors provided by U.S. EPA were provided in terms of pounds emitted per ton of wood burned for a limited set of pollutants. Calculations provided in Table 4 indicate the quantity of each pollutant emitted from combustion of one cord on one fireplace or stove. Table 4 includes the annual emissions associated with the proposed cremator for reference. In general, due to the lower temperatures present in woodstoves and fireplaces, the combustion process is much less efficient than the cremator. Consequently, constituents like CO, VOC, and polycyclic organic matter/polycyclic aromatic hydrocarbons (POM/PAH) which consist primarily of unburned hydrocarbons, are more prevalent in wood smoke exhaust than cremator exhaust. The presence of certain metals in cremator exhaust and not in wood smoke is likely a consequence of incomplete test data.

The right hand columns of Table 4 provide the ratio of cremator emissions to fireplace or woodstove emissions (cremator annual emission divided by annual emissions from one fireplace or stove burning one cord of wood). As shown, emissions of particulate are similar to about two wood stoves or fireplaces. Emissions of CO, VOC, (from fireplaces), and POM/PAH from a fireplace or woodstove exceed those from the cremator. Cremator emissions of nitrogen oxides, sulfur dioxide, volatile organic compounds (from wood stoves), and two metal HAPs exceed that of a single woodstove.

2.3.3 Charbroiling Restaurant Emissions

Restaurant charbroiling emissions have received attention in regions such as the California South Coast Air Quality Management District (SCAQMD) because commercial cooking is recognized as an important contributor to the formation of fine particulate, secondary aerosols, and organic carbon (Roe, et al., 2004). U.S. EPA's Emission Inventory Improvement Program (U.S. EPA, 2000) published guidance on charbroiling emission estimates. That guidance includes factors for total particulate matter (PM) and reactive organic gases (ROG) more commonly referred to as VOC. In addition, the WebFIRE database contains factors for three common POM (benzo(a)anthracene, benzo(a)pyrene, and fluoranthene).

Table 5 summarizes emission estimates from charbroiling operations and compares those emissions to the proposed cremator. As shown, pollutant emission rates associated with a typical charbroiling restaurant that cooks about 1,160 pounds of meat weekly (a figure derived from historic Whopper® sales by Burger King®) will be greater than the cremator for all available pollutants by several times over. This is again a reflection of the design of the cremator which is intended to achieve very efficient combustion compared to a restaurant grill which does not.

2.3.4 Engine Idling Emissions

A final common source of combustion emissions evaluated for this comparison is automotive engine idling. While automotive, truck, and bus emissions are a significant source of regional air pollution, individual sources are not regulated because automobile manufacturers are required to achieve certain emission standards. Consequently, the number of each type of vehicle in use, the geographic distribution of those vehicles, the varying age of the vehicle fleet, and the manner in which vehicles are operated, all influence regional air pollution. For the purpose of this evaluation, emissions produced by light duty vehicles (i.e., cars) while idling (e.g., while sitting at a stop light) have been considered. Engine idling emissions for winter and summer, as provided by U.S. EPA (1998a) were averaged and applied to annual operation. Emission estimates reflect the total emissions associated with engine idling for one year by a single car (e.g., as produced at an intersection where at least one vehicle is idling while waiting to proceed at all times).

Table 6 summarizes the results of those calculations. As shown, engine idling produces large quantities of VOC and CO. Unfortunately, factors for the HAPs present in tailpipe exhaust were not readily available during the course of this review although it is certain that multiple HAPs are present in the VOC and PM emitted from the tailpipe. As shown in Table 6, relative to these three criteria pollutants, the VOC and CO emissions produced in one year of engine idling by a light duty automobile are greater than the cremator. The higher NO_x emissions from the cremator are a result of the large quantity of natural gas used by the unit.

2.3.5 Emission Comparisons

Figure 1 provides a graphic comparison of the pollutant emission evaluation discussed above for these four sources. The emissions produced during a year of typical cremator operation are shown to be less than or very similar to those produced by three common sources of combustion emissions: a woodstove burning one cord of wood annually, a charbroiling restaurant cooking 1,160 pounds of meat per week, and a light duty automobile idling for one year.

2.4 SCREENING LEVEL HUMAN HEALTH RISK EVALUATION

Because available emission data did not allow for a comparison of HAP emission rates similar to the criteria pollutant evaluation presented in Section 2.3, and because HAPs have the potential to create health risks at very low emission rates, a screening-level human health risk evaluation was performed for the proposed cremator. The screening-level risk assessment consisted of two steps: 1) modeling of ground-level HAP air concentrations and 2) screening risk assessment calculations to evaluate the significance of the modeled concentrations.

2.4.1 Dispersion Modeling

Dispersion modeling is the science of estimating what the ground-level concentration of a pollutant will be after it has been released from a source. Modeling evaluations fall into two categories: screening and refined. Screening evaluations use simplifying and very conservative assumptions to overestimate the impacts of a source. If the results of a screening evaluation demonstrate that pollutant levels are acceptable, then more detailed (refined) modeling evaluations are generally not needed. A refined evaluation typically involves a detailed review of emission sources, sensitive receptor locations, topography, meteorology and the incorporation of that information into more sophisticated modeling software.

For this screening evaluation, the U.S. EPA computer model, SCREEN3 was used (U.S. EPA, 1996c). As stated by U.S. EPA, "SCREEN3 is a single source Gaussian plume model which provides maximum ground-level concentrations for point, area, flare, and volume sources, as well as concentrations in the cavity zone, and concentrations due to inversion break-up and shoreline fumigation." SCREEN3 is recognized by the U.S. EPA and state and regional permitting authorities, including the Pennsylvania Department of Environmental Protection (PADEP) as an appropriate screening tool.

SCREEN3 model inputs include exhaust characteristics, meteorological data assumptions, and receptor locations. The model is typically run with a unit emission rate (e.g., 1.0 grams per second [g/s]) of a generic pollutant. By doing so, it is possible to evaluate downwind concentrations for any pollutant emission rate by simply multiplying the actual emission rate in g/s times the modeled result. That approach was used for this evaluation.

Characteristics of the exhaust gases exiting the cremator stack were obtained from vendor literature as follow:

- Stack height: (25 feet, 7.6 meters or greater)
- Stack inside diameter: (29 inches, 0.74 meters or less)
- Stack gas temperature: (1,800 °F, 1,255 °K)

Significant modeling options that were included in the evaluation can be seen from the model input and output files included in Appendix B. Two key assumptions were the use of the model's default worst-case meteorological conditions which tend to maximize ground-level concentrations and the use of an automated array of receptor locations at 100-meter intervals starting at 100 meters from the stack and ending at 10,000 meters.

As shown in Appendix B, the maximum ground-level concentration associated with the model inputs described above was 196.8 micrograms per cubic meter ($\mu g/m^3$) at a distance of 100 meters. This means that if the facility were to operate continuously (8,760 hours per year) and produce 1.0 grams per second (about 8 lbs/hr) for that entire time, then the maximum 1-hour average ground-level concentration at a point 100 meters (328 feet) from the stack would be 196.8 micrograms (10^{-6} grams) in each cubic meter of air. By convention, the 1-hour average is multiplied by 10% to obtain the annual average (19.68 $\mu g/m^3$).

To evaluate the ground-level concentrations that would result from the estimated emission rates discussed in Section 2.3.1, Table 7 was developed. Table 7 addresses a subset of the HAPs for which emission factors are provided in Table 2. CEC limited this evaluation to those chemicals for which U.S. EPA provides published risk factors as discussed below. Table 7 displays the original emission factor (lb/body), the factor converted to lb/hr and the same factor converted to g/s. The g/s values have been multiplied times the maximum annual ground-level concentration of 19.68 $\mu g/m^3$ to obtain chemical-specific ground-levels concentrations in $\mu g/m^3$.

2.4.2 Screening Level Human Health Risk Assessment

Human health risk assessment requires an understanding of the population of potentially exposed individuals, the possible exposure pathways for chemical species (e.g., ingestion, inhalation, or dermal absorption), the toxicity of chemical species, and the relationships between chemical toxicity, exposures, and health effects. As in the case of screening-level modeling evaluations, screening-level risk assessments make generalized assumptions about exposure pathways and durations to determine if there is potential for a source to produce a health risk for one or more chemicals.

For this evaluation, the exposure pathway being evaluated is the inhalation route. Although there is potential for dermal or ingestion exposure to chemicals emitted from the cremator that are deposited on the ground surface over time, soil sampling downwind of a cremator that performed over 112,000 cremations over 40-year period found no contamination of mercury in the soil (Anon, 1999). For the purpose of this evaluation, it is felt that the inhalation pathway provides the best basis to perform a screening evaluation of potential health effects from human exposure to cremator operation.

U.S. EPA's *Regional Screening Levels for Chemical Contaminants at Superfund Sites* (U.S. EPA, 2010b) were used to evaluate potential health risks from the proposed cremator. This web-based calculator enables the user to specify exposure scenarios (in this case, residential – children and adults) and select chemicals of interest to obtain tables of screening level exposure concentrations associated with default exposure assumptions and risk levels. The default risk level is an excess cancer risk of 1 in 1,000,000 (1×10^{-6}) or a non-cancer hazard quotient of 1 (meaning there is no adverse health effect).

CEC evaluated all of the HAPs for which emission rates had been calculated. However, the EPA's calculator does not contain inhalation exposure data for all of these chemicals, so inhalation risks for a subset of chemicals were calculated. CEC initially ran the calculator with all default assumptions including an exposure frequency of 24 hours per day 350 days per year (meaning that the source was assumed to operate 8,400 hours per year instead of the 1,150 hours discussed in Section 2.1.

Table 7 summarizes the results of the screening-level risk assessment (model output is provided in Appendix C). As shown in the right-hand column, all worst-case chemical concentrations, with the exception of chromium VI, were found to be below the screening level exposure thresholds (hydrogen chloride emissions, assuming the presence of plastics to form HCl, would be over five times lower than levels that would exceed the screening criteria). For chromium VI, the exposure concentration of 1.67×10^{-5} $\mu g/m^3$ was about 1.5 times higher than the screening level threshold of 1.14×10^{-5} $\mu g/m^3$. To provide a more realistic comparison for this chemical, the exposure frequency was revised to reflect the expected operating frequency of 1,150 hours per year (4.6 hours per day for 250 days per year). Based on that assumption, the screening level threshold becomes 8.35×10^{-5} $\mu g/m^3$. Based on that revised threshold, the chromium VI exposure is only 20% of the screening threshold (equivalent to an excess cancer risk less than 1 in 1,000,000).

U.S. EPA's guidance for acceptable exposure to contamination from Superfund sites ranges from 1 in 10,000 to 1 in 1,000,000. This screening-level assessment suggests that the proposed facility could produce an excess cancer risk of less than 1 in 1,000,000 which is very protective of health considering the very conservative exposure assumptions that have been used.

2.5 AIR QUALITY REGULATORY APPLICABILITY

From a regulatory compliance perspective, the proposed facility would be exempt from permitting requirements on the basis of its emissions alone. The facility will produce less than one ton per year of any criteria pollutant and all HAP emissions are well below the one ton per year (individual) and 2.5 tons per year (combined) state permitting thresholds. Even at a 10 times greater production capacity (which is infeasible given the existing projections for cremation services) the facility would not exceed PADEP permitting requirements.

However, because the PADEP has established a General Permit requirement for cremation systems, this facility will be subject to PADEP permitting requirements. The facility will be required to obtain General Plan Approval and General Operating Permit (BAQ-GPA/GP-14) for Human or Animal Crematories. The permit will stipulate that the facility meet specific engineering and performance requirements. Stack emission testing will most likely be required following construction and emissions will be monitored on an ongoing basis through visual observations.

The proposed facility consists of a pollution control technology, namely the secondary combustion chamber, that qualifies as the best available control technology for such equipment. When operated in accordance with the manufacturer's recommendation, atmospheric emissions from this operation will not result in adverse health effects.

3.0 CONCLUSIONS

The proposed facility would generate significantly lower emissions of several criteria air pollutants than common combustion sources such as woodstoves and fireplaces, charbroiling of meat at restaurants, or idling of automobile engines. When compared to annual emissions from those sources, the proposed cremator produced nearly 2,000 times less products of incomplete combustion (e.g., POM/PAH) than a residential fireplace and over 43,000 times less than a wood stove. Compared to a typical charbroiling restaurant, the cremator would produce over one hundred to three thousand times less PAH and less PM and VOC as well. Engine idling emissions, assuming one year of exhaust, would be greater for VOC and CO.

From the human health risk perspective, this assessment has demonstrated that the proposed facility would not cause unacceptable levels of health risk. Based on the conservative dispersion modeling and human health exposure assumptions included in this screening-level assessment, excess cancer and non-cancer health risks were shown to be within acceptable ranges for all constituents. With a more refined analysis, it is expected that actual health risks from this facility would be found to be less than existing exposures to many constituents produced by the other similar combustion sources evaluated here.

The proposed cremator will be subject to PADEP permitting requirements by virtue of PADEP's establishment of permitting requirements for this type of equipment. If the General Permit requirement did not exist, this source would be exempt from permitting requirements because of the extremely low levels of atmospheric emissions produced under normal operation. The equipment included in this proposed design represents the best available control technology for this type of facility.

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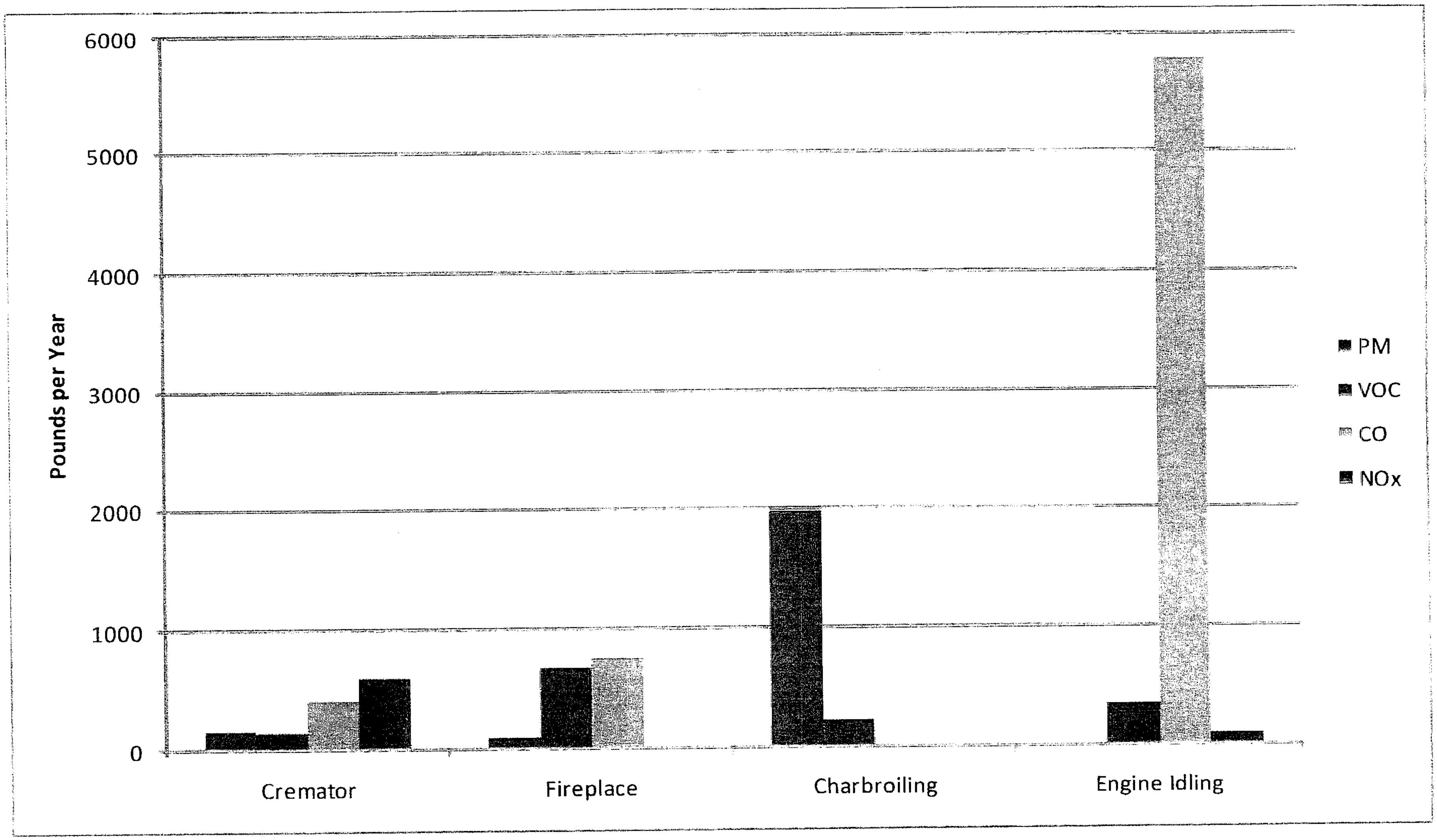
FIGURE

P:\2010\101-462\-CADD\DWG\101462-FIGURE 1.DWG{MODEL} (DDIABLE) - AUG 31, 2010 - 10:26:29



Civil & Environmental Consultants, Inc. 333 Baldwin Road - Pittsburgh, PA 15205 412-429-2324 · 800-365-2324 www.cecinc.com				CREMATOR AIR QUALITY EVALUATION HOUSTON HARBAUGH P.C. EMISSIONS COMPARISON		
DRAWN BY: DWD		CHECKED BY: DJL		APPROVED BY: KAM		FIGURE NO.: 1
DATE: 8/31/10		DWG SCALE: NTS		PROJECT NO: 101-462		

TABLES

Table 1

Power-Pak II and Related Cremator Stack Testing Results

Year	1999	2003	2005	2006	2010	
Study Name	U.S. EPA	Horizon	Air Testing & Consulting	AirNova	Arlington	
Make/Model	not stated	IEE Power-Pak II	Matthews Power-Pak II	Power-Pak II	Matthews Power-Pak II	
Heat Input (MMBtu/hr)	1.6	assume 3	assume 3	assume 3	3	
Test Notes	1800 F case (inlet) no weight data	charge weight 145 lbs	2ndary chamber = 1600 F, burn rate 82 lb/hr	unknown production rate	205 lb/hr production rate	
EMISSION RATES (POUNDS PER HOUR)						**AVERAGE** [b]
PM	2.450E-01	4.000E-02	6.590E-02	2.600E-01	1.370E-01	1.496E-01
CO	1.080E-02	1.000E-02	4.700E-03	nd [a]	nd	8.500E-03
NOx	3.000E-01	3.000E-01	1.000E+00	nd	nd	5.333E-01
SO2	1.420E-01	6.000E-02	1.540E-01	nd	nd	1.187E-01
VOC	nd	nd	3.500E-03	nd	nd	3.500E-03
Hydrogen Chloride	2.600E-01	nd	8.000E-02	nd	nd	1.700E-01
Mercury	1.896E-04	nd	nd	Not Detected [c]	nd	1.896E-04
Lead	1.301E-03	nd	nd	6.400E-05	nd	6.824E-04
Cadmium	2.425E-04	nd	nd	2.100E-05	nd	1.318E-04
Antimony	nd	nd	nd	Not Detected	nd	NA
Arsenic	nd	nd	nd	Not Detected	nd	NA
Beryllium	nd	nd	nd	Not Detected	nd	NA
Chromium (total)	nd	nd	nd	7.900E-05	nd	7.900E-05
Manganese	nd	nd	nd	2.300E-05	nd	2.300E-05
Nickel	nd	nd	nd	9.600E-06	nd	9.600E-06
Thallium	nd	nd	nd	Not Detected	nd	NA
Dioxin/Furan	2.540E-08	nd	nd	nd	nd	2.540E-08

Notes:

(a) No data (nd) was reported for this parameter.

(b) Where measurable results for only one test are reported, no average is calculated.

(c) "Not Detected" indicates that the parameter was tested for but not measured.

Table 2
EPA WebFIRE HAP Emission Factors

CAS	POLLUTANT	LB/BODY	LB/HOUR (Calculated)
83-32-9	Acenaphthene	1.11E-07	5.55E-08
208-96-8	Acenaphthylene	1.22E-07	6.10E-08
120-12-7	Anthracene	3.24E-07	1.62E-07
7440-36-0	Antimony	< 3.02E-05	1.51E-05
7440-38-2	Arsenic	< 3.00E-05	1.50E-05
7440-39-3	Barium	2.40E-05	1.20E-05
7440-41-7	Beryllium	1.37E-06	6.85E-07
7440-43-9	Cadmium	1.11E-05	5.55E-06
7440-47-3	Chromium	2.99E-05	1.50E-05
18540-29-9	Chromium (VI)	1.35E-05	6.75E-06
7440-48-4	Cobalt	< 1.75E-06	8.75E-07
7440-50-8	Copper	2.74E-05	1.37E-05
206-44-0	Fluoranthene	2.05E-07	1.03E-07
86-73-7	Fluorene	4.17E-07	2.09E-07
7647-01-0	Hydrogen chloride	7.20E-02	3.60E-02
7664-39-3	Hydrogen fluoride	6.55E-04	3.28E-04
7439-92-1	Lead	6.62E-05	3.31E-05
7439-97-6	Mercury	3.29E-03	1.65E-03
7439-98-7	Molybdenum	< 1.67E-05	8.35E-06
7440-02-0	Nickel	3.82E-05	1.91E-05
85-01-8	Phenanthrene	2.29E-06	1.15E-06
	PAH (benzo(a)pyrene eq.)	4.90E-08	2.45E-08
129-00-0	Pyrene	1.62E-07	8.10E-08
7782-49-2	Selenium	< 4.36E-05	2.18E-05
7440-22-4	Silver	7.30E-06	3.65E-06
7440-28-0	Thallium	< 8.52E-05	4.26E-05
7440-62-2	Vanadium	5.79E-05	2.90E-05
7440-66-6	Zinc	3.53E-04	1.77E-04
	Total Dioxin/Furan (2,3,7,8-TCDD eq.)	1.40E-09	7.00E-10

Emissions Testing of a Propane Fired Incinerator at a Crematorium. October 29, 1992.
(Confidential Report No. ERC-39)
Wrapping material = 4 lbs of cardboard and 2 lbs of wood.
Assume average weight of body = 150 pounds, assume 2 hours per burn cycle.
SCC: 31502101 - Uncontrolled emissions

Table 3
Cremator Emission Estimate Summary

Basis:	
Maximum Natural Gas Firing Rate (MMBTU/hr)	3
Maximum Annual Bodies Cremated (body/yr)	575
Maximum Daily Bodies Cremated (body/day)	2.5
Maximum Hourly Burn Rate (lb/hr)	75
Typical Annual Operating Days (day/yr)	260

Constants	
Natural Gas Heating Value (BTU/ft^3)	1020
Average Body Weight (lbs)	150

Calculated Values:	
Annual Cremating Hours (hr/yr)	1150
Maximum Annual Daily Natural Gas Usage (MMft^3/day)	1.47E-02
Maximum Annual Natural Gas Usage (MM ft^3/yr)	3.38

Natural Gas Combustion Emissions

Notes:
1. Emission factors from AP-42 for uncontrolled natural gas combustion in boilers < 100 MMBTU/hr. AP-42 Chapter 1.4 (Tables 1.4-1 and 1.4-2)

Emissions from Natural Gas Combustion			
Pollutant	Emission Factor (lb/MMft^3)	Max Daily (lb/day)	Annual (lb/yr)
PM10	7.6	0.11	25.71
NOx	100	1.47	338.24
CO	84	1.24	284.12
SO2	0.6	0.01	2.03
VOC	5.5	0.08	18.60

Cremation Emissions

Notes:
1. PM10 emission factor from EPA's FIRE program
2. Emission factors from other pollutants are from AP-42 for uncontrolled medical waste incineration. AP-42 Chapter 2.3 (Tables 2.3-1 and 2.3-2)

Emissions from Cremation of Body (including case wrappings)			
Pollutant	Emission Factor (lb/body)	Max.Daily (lb/day)	Annual (lb/yr)
PM10	8.50E-02	0.21	48.88
NOx	2.57E-01	0.64	147.78
CO	2.21E-01	0.55	127.08
SO2	1.63E-01	0.41	93.73
VOC	2.24E-01	0.56	128.80

Total Criteria Pollutant Emissions

Total Criteria Pollutant Emissions				
Pollutant	Source [a]	Emission Rate (lb/hr) (Values are the greater of either EPA data provided here or stack test averages from Table 1, as noted)	(lb/yr)	(TPY)
PM10	Table 1	0.15	172.5	0.09
NOx	Table 1	0.533	613.0	0.31
CO	Table 3	0.36	414.0	0.21
SO2	Table 1	0.119	136.9	0.07
VOC	Table 3	0.13	149.5	0.07

Toxic Emissions from Cremator					
Pollutant	Emission Factor (lb/body)	(lb/hr)	Stack Test Emission Rates From Table 1	Annual (lb/yr)	Using Table 1
Acenaphthene	1.11E-07	5.55E-08	ND	6.38E-05	
Acenaphthylene	1.22E-07	6.10E-08	ND	7.02E-05	
Anthracene	3.24E-07	1.62E-07	ND	1.86E-04	
Antimony	3.02E-05	1.51E-05	ND	1.74E-02	
Arsenic	3.00E-05	1.50E-05	ND	1.73E-02	
Barium	2.40E-05	1.20E-05	ND	1.38E-02	
Beryllium	1.37E-06	6.85E-07	ND	7.88E-04	
Cadmium	1.11E-05	5.55E-06	1.32E-04	1.52E-01	X
Chromium, VI	1.35E-05	6.75E-06	ND	7.76E-03	
Cobalt	1.75E-06	8.75E-07	ND	1.01E-03	
Copper	2.74E-05	1.37E-05	ND	1.58E-02	
Fluoranthene	2.05E-07	1.03E-07	ND	1.18E-04	
Fluorene	4.17E 07	2.09E-07	ND	2.40E-04	
Hydrogen chloride	7.20E-02	3.60E-02	1.70E-01	1.96E+02	X
Hydrogen fluoride	6.55E-04	3.28E-04	ND	3.77E-01	
Lead	6.62E-05	3.31E-05	6.82E-04	7.85E-01	X
Mercury	3.29E-03	1.65E-03	1.90E-04	1.89E+00	
Nickel	3.82E-05	1.91E-05	9.60E-06	2.20E-02	
Phenanthrene	2.29E-06	1.15E-06	ND	1.32E-03	
Pyrene	1.62E-07	8.10E-08	ND	9.32E-05	
Selenium	4.36E-05	2.18E-05	ND	2.51E-02	
Silver	7.30E-06	3.65E-06	ND	4.20E-03	
Vanadium	5.79E-05	2.90E-05	ND	3.33E-02	
Zinc	3.53E-04	1.77E-04	ND	2.03E-01	
Chlorinated dibenzodioxins and furans	1.40E-09	7.00E-10	2.54E-08	2.92E-05	X
PAH (benzo(a)pyrene equivalents)	4.90E-08	2.45E-08	ND	2.82E-05	

(a): Criteria pollutant emission rates reflect the higher of either the EPA factors reported here or the Power-Pak II stack testing results presented in Table 1

Table 4

Comparison of Fireplace and Woodstove Emissions to a Cremator

Pollutant	Residential Fireplace		Catalytic Wood Stove		Cremator operating for one year (lbs)	Cremator Equivalence to Fireplace	Cremator Equivalence to Woodstove
	Emission Factor (lb/ton)	Emissions from Burning One Cord (lbs)[a]	Emission Factor (lb/ton)	Emissions from Burning One Cord (lbs)[a]			
PM_{10}	34.6	**103.8**	20.4	**61.2**	**172**	1.7	2.8
NO_x	2.6	**7.8**	2	**6**	**613**	79	102
CO	252.6	**757.8**	104.4	**313.2**	**414**	0.5	1.3
SO_2	0.4	**1.2**	0.4	**1.2**	**137**	114	114
VOC	229	**687**	15	**45**	**150**	0.2	3
POM/PAH[b]	0.016	**0.048**	0.41	**1.24**	**2.82E-05**	5.9E-04	2.3E-05
Cadmium	ND	**ND**	4.60E-05	**1.38E-04**	**1.52E-01**	NA	1,101
Nickel	ND	**ND**	2.20E-06	**6.60E-06**	**2.19E-02**	NA	3,318

(a) For comparison, it is assumed that a residence could consume one cord (3 tons) or wood per season.

(b) POM = polycyclic organic matter which includes polycyclic aromatic hydrocarbons (PAH) as reported for the crematory. Fireplace emissions are given in terms of POM while woodstove emissions are given in terms of PAH.

Table 5

Comparison of Charbroiling Emissions to a Cremator

Pollutant	Charbroiling: Emission Factor (lb/1,000 lbs cooked)(b)	Charbroiling: Emissions from One Year of Operation (lbs)[a]	Cremator operating for one year (lbs)	Cremator Equivalence to Charbroiling Restaurant
PM	32.67	**1970.65**	**172**	0.087
VOC	3.94	**237.66**	**150**	0.631
Benzo(a)anthracene	2.99E-04	**1.80E-02**	**5.58E-06**	0.0003
Benzo(a)pyrene	1.89E-04	**1.14E-02**	**1.67E-05**	0.001
Fluoranthene	2.41E-04	**1.45E-02**	**1.18E-04**	0.008

(a) Assume 1,160 pounds of meat are cooked per week at a typical Burger King restaurant (EPA, 2000).

(b) Factors for PM and VOC are from EPA (2000). Factors for the HAPs are from Web Fire (SCC = 2302002000, Charbroiling)

Table 6

Comparison of Light Duty Vehicle Engine Idling Emissions to a Cremator

Pollutant	Engine Idling		Cremator operating for one year (lbs)	Cremator Equivalence to One Year of Engine Idling
	Light Duty Gasoline Vehicle (grams/hr)	Emissions from One Year of Idling (per car) (lbs)[(a)]		
VOC	18.6	**359**	**150**	0.42
CO	300.0	**5,794**	**414**	0.07
NOx	5.4	**105**	**613**	5.83

(a) Emission estimates are based on EPA (1998a) factors for light duty gasoline vehicles when idling (average of winter and summer factors).

Table 7
Risk Screening Summary

Pollutant	Emission Factor (lb/body)	Emission Rate (lb/hr)	Emission Rate (g/s)	Max Conc.[a] (µg/m³)	EPA Risk Screen[b] (µg/m³)	Exceeds Screen? (yes/no)
Arsenic	3.00E-05	1.50E-05	1.89E-06	3.72E-05	5.66E-04	no
Barium	2.40E-05	1.20E-05	1.51E-06	2.98E-05	5.21E-01	no
Beryllium	1.40E-06	7.00E-07	8.82E-08	1.74E-06	1.01E-03	no
Chromium, (VI)	1.35E-05	6.75E-06	8.51E-07	1.67E-05	1.14E-05	YES
Cobalt	1.75E-06	8.75E-07	1.10E-07	2.17E-06	2.70E-04	no
Hydrogen chloride	7.20E-02	3.60E-02	4.54E-03	8.93E-02	2.09E+01	no
Hydrogen fluoride	6.55E-04	3.28E-04	4.13E-05	8.12E-04	1.46E+01	no
Mercury	3.29E-03	1.65E-03	2.07E-04	4.08E-03	3.13E-01	no
Nickel	3.82E-05	1.91E-05	2.41E-06	4.74E-05	1.04E-01	no
Selenium	4.36E-05	2.18E-05	2.75E-06	5.41E-05	2.09E+01	no
Vanadium	5.79E-05	2.90E-05	3.65E-06	7.18E-05	1.04E-01	no
Total Dioxin/Furan	1.40E-09	7.00E-10	8.82E-11	1.74E-09	1.87E-06	no
PAH (benzo(a)pyrene equivalents)	4.90E-08	2.45E-08	3.09E-09	6.08E-08	8.73E-04	no

(a) Derived from maximum annual ground-level concentration of 19.68 ug/m3 at 100 meters downwind of source using SCREEN3 modeling of typical stack configuration consisting of:

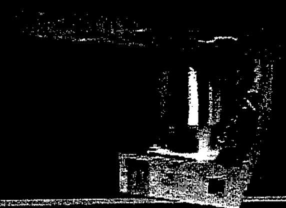
Stack Height: 25 feet
Stack Inside Diameter: 29 inches
Stack Exhaust Temperature: 1800 F
Exhaust Flow Rate: 1,857 acfm
Emission Rate: 1.0 g/s (unit basis)

(b) Obtained from U.S. EPA Regional Screening Tables: http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search

APPENDIX A

VENDOR LITERATURE

ECP-200 Electric Cremated Remains Processor



- Reduces cremated remains below 200 cubic inches to fit standard sized urns
- Average processing time is 30 seconds or less
- Quiet and dust-proof.

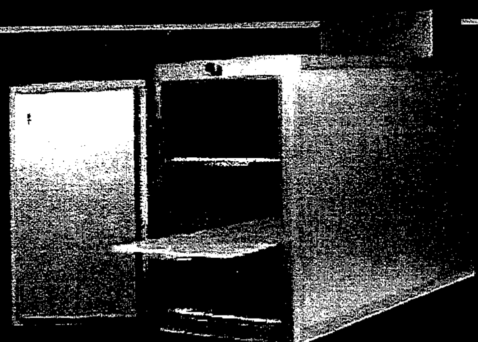
VPS-1 Processing Station

- Recovers dust when transferring cremated remains for operator safety
- Ventless design eliminates wall or ceiling openings
- Built in florescent lighting adds convenience and safety
- Steel frame construction, finished with heavy gauge stainless steel.

Deluxe Processing Workstation

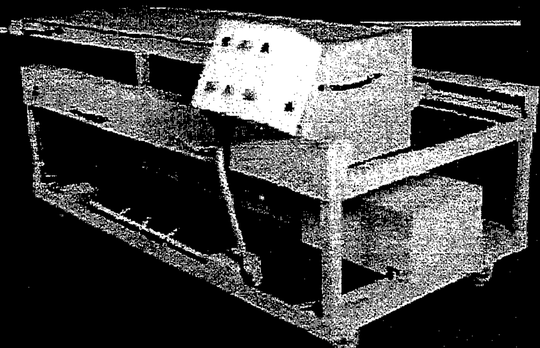
Similar features to the ECP and VPS-1 Processing station with additional benefits:

- Cooling station for cremated remains
- Built in temporary container filler
- No perforated screens or drums to clog and eliminates potential commingling.



Three-body Cooler

- Safe storage until final disposition
- Thermostatically controlled system maintains constant temperature
- Removable shelves accommodate a mortuary cart or caskets
- On/Off switch, door-mounted thermometer and self-sealing magnetic door



Auto-Loader

- Increases production & enhances operator safety
- Extends the cremation chamber floor life
- Offers a professional presentation during family viewing.

Matthews Cremation Division

offers several accessories to complement the professional crematory.

Matthews International Cremation Division

2045 Sprint Boulevard
Apopka, FL 32703
Phone: 407-886-5533
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FAX: 407-886-5990
www.matthewscremationdivision.com

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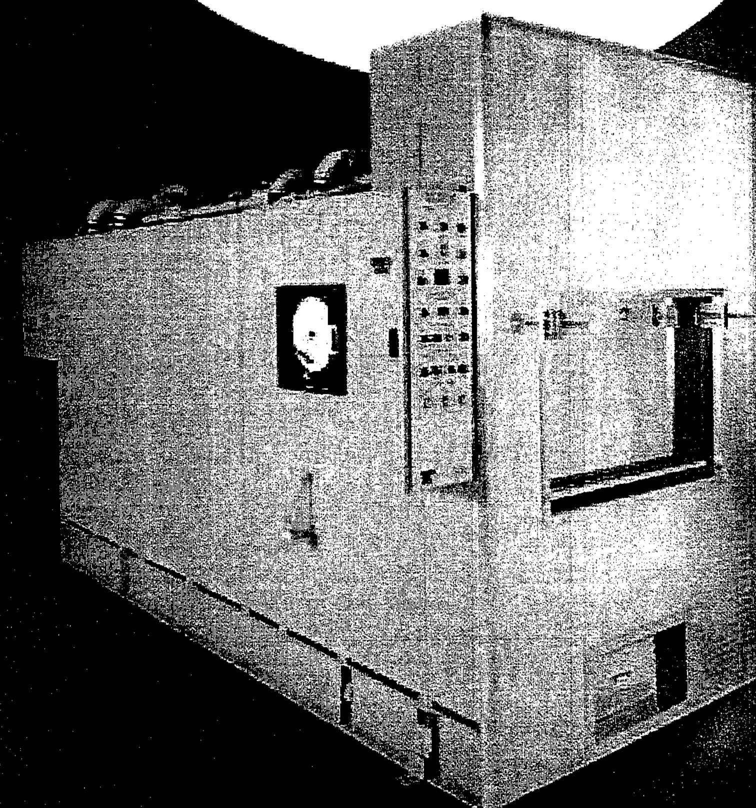
SMOKE-BUSTER™ **140**

2-Hours or Less Cremation Time

Up to 4 Cremations in 8 Hours



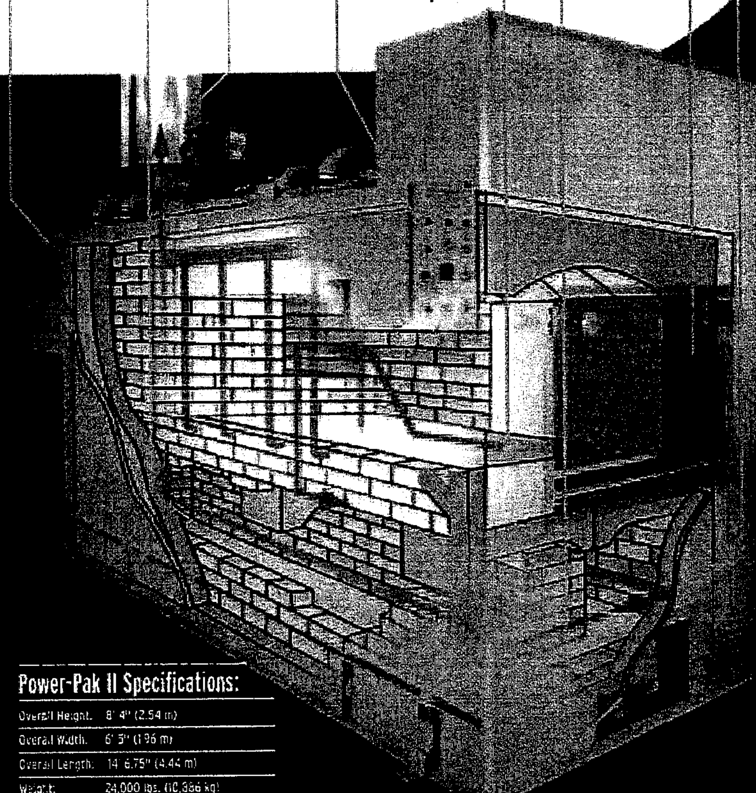
The Standard of Excellence in Cremation Solutions.

Matthews Cremation Division (MCD) represents over 100 years of experience in cremator technology and our equipment has set the standard of excellence for quality and performance. With over 3,000 installations in 50 countries, we are the oldest and largest manufacturer in the cremation industry.

From design through startup, our goal is to protect your interest and make certain that your investment in cremation equipment is supported with the foundation for long-term success. We'll determine your equipment needs, evaluate your facility, design floor plans, guarantee environmental acceptance, assist your contractors in the installation and provide on-site operator training.

Our Matthews commitment is to go the extra mile…

- **Customized Return on Investment Analysis (ROI)**
- **Zoning Board Assistance**
- **Operator Certification**
- **24/7 Customer Service**
- **Custom Engineering & Design**
- **Industry & Trade Support**
- **Widest array of cremation accessories**
- **Lease & Finance options.**



Highly advanced engineering. Highly efficient operation. Highly profitable results.

The Power-Pak II Cremation System represents the very latest in cremation industry technology. Designed to provide fully automated operation, the Power-Pak II is the fastest, most fuel efficient cremator in its class.

- **Automatic Operation** – The self-monitoring control system simplifies the cremation process, shutting itself off upon completion of the cycle
- **Operator Safety** – Underwriter's Laboratories (UL) listed represents the most widely recognized measure of safety and compliance, ensuring the safety of personnel and facilities

***SMOKE-BUSTER*™ 140** – This feature effectively consumes and destroys smoke and odor from the cremation process

- **Hydraulic Loading Table** – Conveniently allows one person to safely and easily load the case into the chamber, coolers, coaches and vans
- **Pollution Monitoring and Control System** – Automatically checks and regulates stack emissions.

The Power-Pak II is pre-wired, pre-piped, and pre-tested before shipment, requiring only off-loading, one connection each for gas and electricity and placement of the stack we provide.

Power-Pak II Specifications:

Overall Height:	8' 4" (2.54 m)
Overall Width:	6' 5" (1.96 m)
Overall Length:	14' 6.75" (4.44 m)
Weight:	24,000 lbs. (10,886 kg)
Fuel:	Natural or L.P. Gas (Oil available)
Electrical:	220 volts, 1-phase/3-phase
Control panel can be located right, left or remote	
Dimensions include control panel and whisper shield.	

Who is *Matthews Cremation Division?*

Matthews Cremation Division is the premier manufacturer of Industrial Equipment & Engineering (IEE) and ALL Crematory (ALL) cremation equipment. We are the global leader in cremation equipment sales, service and repair. Representing the highest standards for safety, we manufacture a wide range of human and animal cremation equipment. As a full-service provider, we offer accessory equipment, supplies and memorial products to meet your business requirements.

A significant number of our cremators are still operating, including some manufactured more than 40 years ago. Discover why Matthews Cremation Division is the most trusted name in cremation products and services.

SPECIFICATIONS- Model Power-Pak II

1. Equipment Type .... Model Power-Pak II
   A. Model No. IE43-PPII
   B. Underwriters Laboratories Listing and File No. ... 87E8; MH14647

2. Dimensions
   A. Footprint .... 12' – 6 ½ " x 6' – 8" (3.82 m x 2.03 m)
   B. Maximum Length.. 14' – 8" (4.47 m)
   C. Maximum Width .... 6' -5" (1.96 m)
   D. Maximum Height.. 8' - 4" (2.54 m)
   E. Chamber Loading Opening .... 25 ¾ " H x 39 ½ " W (654 mm x 990 mm)

3. Weight .... 24,000 lbs. (10,900 kg)

4. Utility/Air Requirements
   A. Gross Gas Input, Natural or LP Gas .... 2,000,000 BTU/hr. (2,110,112 kJ/h)
   3,000,000 BTU/hr. (3,165,168 kJ/h) if operating temperature is greater than 1,600° F (871° C)
   Running Gas Pressure, Natural Gas.................. 7 inches (177.8 mm) water column or greater
   Running Gas Pressure, LP Gas .... 11 inches (279.4 mm) water column or greater
   B. Electrical Supply .... 230 volt, 3Ø or 1Ø, 50/60 hz (other available)
   C. Air Supply .... 2,500 cfm (70.8 standard m^3/min)

5. Incineration Capacity .... 150 lbs./hr. (68 kg/h)

6. Typical Loading Capacity of Waste Types .... 750 lbs. (340.2 kg)

7. Construction and Safety Standards .... Incineration Institute of America, Underwriters Laboratories, Canadian Standards Association

8. Steel Structure Construction
   A. Frame .... 2" (51 mm) square tubing
   B. Front/Rear Plates.. 3/8" (9.5 mm) plate
   C. Floor Plates... 3/16" (5 mm) plate
   D. Outer Side Casing.. 12 gauge (3 mm) plate
   E. Inner Side Casing .... 12 gauge (3 mm) plate

9. Stack Construction
   A. Inner Wall .... 4 1/2" (110 mm) insulating firebrick or castable
   B. Outer Wall.. 12 gauge (3 mm) sheet, 304 s.s., welded seams (unlined stack available)

10. Draft Nozzle Construction... Schedule 40 type 316 s.s. pipe, welded connections

11. Main Chamber Door Construction
    A. Steel Shell.. 3/16" (5 mm) steel, welded with reinforcement
    B. Outer Refractory .... 1" (25 mm) insulating block
    C. Inner Refractory .... 4½" (110 mm) insulating firebrick

12. Primary Chamber Wall Construction
    A. Outer Casing Wall... 12 gauge (3 mm) sheet
    B. Inner Frame/Air Compartment........................... 2" (51 mm) air compartment
    C. Inner Casing Wall.. 12 gauge (3 mm) sheet

SPECIFICATIONS- Model Power-Pak II

D. Outer Refractory Wall .... 5" (127 mm) insulating block
E. Inner Refractory Wall .... 4½" (114 mm) firebrick

13. Secondary Chamber Wall Construction
A. Outer Casing Wall .... 12 gauge (3 mm) sheet
B. Inner Frame/Air Compartment .... 2" (51 mm) air compartment
C. Inner Casing Wall .... 12 gauge (3 mm) sheet
D. Outer Refractory Wall .... 6" (152 mm) insulating block
E. Inner Refractory Wall .... 4½" (114 mm) firebrick

14. Refractory Temperature Ratings
A. Standard Firebrick .... 3,100° F. (1704° C)
B. Insulating Firebrick .... 2,600° F. (1427° C)
C. Castable Refractory (Hearth) .... 2,550° F. (1399° C)
D. Castable Refractory .... 2,550° F. (1399° C)
E. Insulating Block .... 1,900° F. (1038° C)
F. Bonding Mortar .... 3,200° F. (1760° C)

15. Chamber Volumes (not including external flues, stacks or chimneys)
A. Primary Chamber .... 64 cubic feet (1.8 m^3)
B. Secondary Chamber .... 74 cubic feet (2.1 m^3)

16. Emission Control Features
A. Secondary Chamber with Afterburner .... Included
B. Opacity Monitor and Controller with Visual and Audible Alarms .... Included
C. Auxiliary Air Control System .... Included
D. Microprocessor Temperature Control System ..... Included

17. Operating Temperatures
A. Primary Chamber .... 1,200° F. - 1,800° F. (649° C - 982° C)
B. Secondary Chamber .... 1,400° F. - 1,800° F. (760° C - 982° C) as required

18. Secondary Chamber Retention Time .... > 1 second

19. Ash Removal .... Door functions as a heat shield. Sweep out beneath front door into hopper that fills collection pan.

20. Safety Interlocks
A. High Gas Pressure .... Optional
B. Low Gas Pressure .... Optional
C. Blower Air Pressure .... Included
D. Door Position .... Included
E. Opacity .... Included
F. Motor Starter Function .... Included
G. Chamber Temperature .... Included
H. Motor Overload .... Included
I. Flame Quality .... Included
J. Burner Safe Start .... Included

22. Burner Description .... The nozzle mix burners used on this cremation equipment are industrial quality and designed for

SPECIFICATIONS- Model Power-Pak II

incinerator use.

23. Ultraviolet Flame Detection .... Ultraviolet flame detection has proven to be the most reliable means of flame safety. The system is completely sealed in a quartz capsule to eliminate problems, caused by moisture and dust created in the cremation process, which effect flame rod detectors.

24. Operating Panel Indicating Lights
    A. Safe Run .... Included
    B. Door Closed .... Included
    C. Pollution Alarm .... Included
    D. Afterburner On (Secondary Burner) .... Included
    E. Cremation Burner On .... Included
    F. Low Fire Cremation Burner On .... Included
    G. Afterburner (Secondary Burner) Reset .... Included
    H. Cremation Burner Reset .... Included
    I. Hearth Air .... Included
    J. Throat Air Off .... Included

25. Automatic Timer Functions
    A. Master Cycle .... Included
    B. Afterburner (Secondary Burner) .... Included
    C. Cremation Burner .... Included
    D. Low Fire Cremation Burner .... Included
    E. Hearth Air .... Included
    F. Throat Air .... Included
    G. Pollution Monitoring .... Included
    H. Afterburner (Secondary Burner) Prepurge .... Included
    I. Cremation Burner Prepurge .... Included
    J. Cool Down .... Included

26. Exterior Finish
    A. Primer .... 2 coats rust inhibiting
    B. Finish .... 2 coats textured finish

27. Start-Up and Training .... Startup of cremation equipment and training of operators to properly operate and maintain the equipment is performed on-site under actual operating conditions. Included is a comprehensive owner's manual, with details on the equipment, its components and proper operation.

28. Environmental Submittals .... Complete technical portion of state environmental permits. Engineering calculations, technical data, existing stack test results and equipment blueprints provided.

APPENDIX B

SCREEN3 DISPERSION MODELING INPUT AND OUTPUT

08/19/10
09:17:45

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Crematorium - unit emission rate

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	1.00000
STACK HEIGHT (M)	=	7.6000
STK INSIDE DIAM (M)	=	.7400
STK EXIT VELOCITY (M/S)	=	2.0378
STK GAS EXIT TEMP (K)	=	1255.0000
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	.0000
URBAN/RURAL OPTION	=	URBAN
BUILDING HEIGHT (M)	=	.0000
MIN HORIZ BLDG DIM (M)	=	.0000
MAX HORIZ BLDG DIM (M)	=	.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

STACK EXIT VELOCITY WAS CALCULATED FROM
VOLUME FLOW RATE = 1857.0000 (ACFM)

BUOY. FLUX = 2.097 M**4/S**3; MOM. FLUX = .133 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
100.	196.8	4	3.5	3.5	1120.0	16.91	15.98	14.13	NO
200.	123.5	4	1.5	1.5	480.0	32.28	31.60	28.11	NO
300.	91.65	4	1.0	1.0	320.0	44.93	46.59	41.62	NO
400.	97.81	6	1.0	1.0	10000.0	39.17	41.84	26.86	NO
500.	91.52	6	1.0	1.0	10000.0	39.17	51.01	31.55	NO
600.	81.59	6	1.0	1.0	10000.0	39.17	59.95	35.97	NO
700.	71.75	6	1.0	1.0	10000.0	39.17	68.65	40.14	NO
800.	63.09	6	1.0	1.0	10000.0	39.17	77.12	44.08	NO
900.	55.75	6	1.0	1.0	10000.0	39.17	85.37	47.83	NO
1000.	49.60	6	1.0	1.0	10000.0	39.17	93.40	51.39	NO
1100.	44.44	6	1.0	1.0	10000.0	39.17	101.24	54.81	NO
1200.	40.10	6	1.0	1.0	10000.0	39.17	108.88	58.08	NO
1300.	36.42	6	1.0	1.0	10000.0	39.17	116.34	61.22	NO
1400.	33.28	6	1.0	1.0	10000.0	39.17	123.63	64.25	NO
1500.	30.57	6	1.0	1.0	10000.0	39.17	130.76	67.17	NO
1600.	28.23	6	1.0	1.0	10000.0	39.17	137.73	70.00	NO
1700.	26.19	6	1.0	1.0	10000.0	39.17	144.56	72.74	NO
1800.	24.39	6	1.0	1.0	10000.0	39.17	151.24	75.40	NO
1900.	22.80	6	1.0	1.0	10000.0	39.17	157.80	77.99	NO
2000.	21.39	6	1.0	1.0	10000.0	39.17	164.23	80.51	NO
2100.	20.13	6	1.0	1.0	10000.0	39.17	170.53	82.96	NO
2200.	18.99	6	1.0	1.0	10000.0	39.17	176.73	85.35	NO
2300.	17.97	6	1.0	1.0	10000.0	39.17	182.81	87.69	NO

2400.	17.05	6	1.0	1.0	10000.0	39.17	188.79	89.97	NO
2500.	16.20	6	1.0	1.0	10000.0	39.17	194.66	92.21	NO
2600.	15.44	6	1.0	1.0	10000.0	39.17	200.44	94.40	NO
2700.	14.73	6	1.0	1.0	10000.0	39.17	206.13	96.54	NO
2800.	14.09	6	1.0	1.0	10000.0	39.17	211.73	98.64	NO
2900.	13.49	6	1.0	1.0	10000.0	39.17	217.24	100.71	NO
3000.	12.94	6	1.0	1.0	10000.0	39.17	222.67	102.73	NO
3500.	10.72	6	1.0	1.0	10000.0	39.17	248.68	112.36	NO
4000.	9.124	6	1.0	1.0	10000.0	39.17	273.03	121.28	NO
4500.	7.927	6	1.0	1.0	10000.0	39.17	295.96	129.63	NO
5000.	6.998	6	1.0	1.0	10000.0	39.17	317.67	137.50	NO
5500.	6.258	6	1.0	1.0	10000.0	39.17	338.33	144.95	NO
6000.	5.656	6	1.0	1.0	10000.0	39.17	358.05	152.06	NO
6500.	5.157	6	1.0	1.0	10000.0	39.17	376.95	158.85	NO
7000.	4.737	6	1.0	1.0	10000.0	39.17	395.10	165.38	NO
7500.	4.379	6	1.0	1.0	10000.0	39.17	412.60	171.67	NO
8000.	4.070	6	1.0	1.0	10000.0	39.17	429.49	177.73	NO
8500.	3.801	6	1.0	1.0	10000.0	39.17	445.83	183.60	NO
9000.	3.565	6	1.0	1.0	10000.0	39.17	461.68	189.30	NO
9500.	3.356	6	1.0	1.0	10000.0	39.17	477.06	194.82	NO
10000.	3.170	6	1.0	1.0	10000.0	39.17	492.02	200.20	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 100. M:

100.	196.8	4	3.5	3.5	1120.0	16.91	15.98	14.13	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	196.8	100.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

APPENDIX C

EPA RISK SCREENING MODEL OUTPUT

Default

Resident Equation Inputs for Ambient Air

Variable	Value
Target cancer risk (TR) - unitless	1.0E-6
Target hazard quotient (THQ) - unitless	1
Averaging time (AT) - days	365
Exposure time (ET) - hours/day	24
Exposure frequency (EF) - days	350
Exposure duration (ED) - years	30
Mutagenic Exposure duration (ED_{0-2}) - years	2
Mutagenic Exposure duration (ED_{2-6}) - years	4
Mutagenic Exposure duration (ED_{6-16}) - years	10
Mutagenic Exposure duration (ED_{16-30}) - years	14
Life Time (LT)	70

Output generated 19AUG2010:09:04:25

Default

Resident Risk-Based Screening Levels for Ambient Air

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL),
max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat

Chemical	CAS Number	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	Chronic RfC (mg/m^3)	RfC Ref	Carcinogenic SL TR=1.0E-6 (ug/m^3)	Noncarcinogenic SL HI=1 (ug/m^3)	Screening Level (ug/m^3)
Antimony (metallic)	7440-36-0	-		-		-	-	
Arsenic, Inorganic	7440-38-2	4.30E-03	I	1.50E-05	C	5.66E-04	1.56E-02	5.66E-04 ca*
Barium	7440-39-3	-		5.00E-04	H	-	5.21E-01	5.21E-01 nc
Beryllium and compounds	7440-41-7	2.40E-03	I	2.00E-05	I	1.01E-03	2.09E-02	1.01E-03 ca*
Chromium(VI)	18540-29-9	8.40E-02	I	1.00E-04	I	1.14E-05	1.04E-01	1.14E-05 ca
Chromium, Total	7440-47-3	-		-		-	-	
Cobalt	7440-48-4	9.00E-03	P	6.00E-06	P	2.70E-04	6.26E-03	2.70E-04 ca*
Copper	7440-50-8	-		-		-	-	
Furan	110-00-9	-		-		-	-	
Hydrogen Chloride	7647-01-0	-		2.00E-02	I	-	2.09E+01	2.09E+01 nc
Hydrogen Fluoride	7664-39-3	-		1.40E-02	C	-	1.46E+01	1.46E+01 nc
Lead and Compounds	7439-92-1	-		-		-	-	
Molybdenum	7439-98-7	-		-		-	-	
Mercury (elemental)	7439-97-6	-		3.00E-04	I	-	3.13E-01	3.13E-01 nc
Nickel Oxide	1313-99-1	-		1.00E-04	C	-	1.04E-01	1.04E-01 nc
Acenaphthene	83-32-9	-		-		-	-	
Anthracene	120-12-7	-		-		-	-	
Fluoranthene	206-44-0	-		-		-	-	
Fluorene	86-73-7	-		-		-	-	
Pyrene	129-00-0	-		-		-	-	
Selenium	7782-49-2	-		2.00E-02	C	-	2.09E+01	2.09E+01 nc
Silver	7440-22-4	-		-		-	-	
Thallium (Soluble Salts)	7440-28-0	-		-		-	-	
Vanadium, Metallic	7440-62-2	-		1.00E-04	A	-	1.04E-01	1.04E-01 nc
Vanadium and Compounds	NA	-		-		-	-	
Zinc (Metallic)	7440-66-6	-		-		-	-	

Output generated 19AUG2010:09:04:25

Default

Resident Equation Inputs for Ambient Air

Variable	Value
Target cancer risk (TR) - unitless	1.0E-6
Target hazard quotient (THQ) - unitless	1
Averaging time (AT) - days	365
Exposure time (ET) - hours/day	24
Exposure frequency (EF) - days	350
Exposure duration (ED) - years	30
Mutagenic Exposure duration (ED_{0-2}) - years	2
Mutagenic Exposure duration (ED_{2-6}) - years	4
Mutagenic Exposure duration (ED_{6-16}) - years	10
Mutagenic Exposure duration (ED_{16-30}) - years	14
Life Time (LT)	70

Output generated 19AUG2010:10:20:51

Default

Resident Risk-Based Screening Levels for Ambient Air

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL),
max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat

Chemical	CAS Number	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Chronic RfC (mg/m^3)	RfC Ref	Carcinogenic SL TR=1.0E-6 (ug/m^3)	Noncarcinogenic SL HI=1 (ug/m^3)	Screening Level (ug/m^3)
Hexachlorodibenzo-p-dioxin, Mixture	NA	1.30E+00	I	-		1.87E-06	-	1.87E-06 ca**
TCDD, 2,3,7,8-	1746-01-6	3.80E+01	C	4.00E-08	C	6.40E-08	4.17E-05	6.40E-08 ca
Heptachlorodibenzofuran, 1,2,3,4,6,7,8-	67562-39-4	3.80E-01	C	-		6.40E-06	-	6.40E-06 ca**

Output generated 19AUG2010:10:20:51

Default

Resident Equation Inputs for Ambient Air

Variable	Value
Target cancer risk (TR) - unitless	1.0E-6
Target hazard quotient (THQ) - unitless	1
Averaging time (AT) - days	365
Exposure time (ET) - hours/day	24
Exposure frequency (EF) - days	350
Exposure duration (ED) - years	30
Mutagenic Exposure duration (ED_{0-2}) - years	2
Mutagenic Exposure duration (ED_{2-6}) - years	4
Mutagenic Exposure duration (ED_{6-16}) - years	10
Mutagenic Exposure duration (ED_{16-30}) - years	14
Life Time (LT)	70

Output generated 19AUG2010:09:16:58

Default

Resident Risk-Based Screening Levels for Ambient Air

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL),
max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat

Chemical	CAS Number	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Chronic RfC (mg/m^3)	RfC Ref	Carcinogenic SL TR=1.0E-6 (ug/m^3)	Noncarcinogenic SL HI=1 (ug/m^3)	Screening Level (ug/m^3)
Dibenzofuran	132-64-9	-		-		-	-	
Benzo[a]pyrene	50-32-8	1.10E-03	C	-		8.73E-04	-	8.73E-04 ca**

Output generated 19AUG2010:09:16:58

Site-specific
Resident Equation Inputs for Ambient Air

Variable	Value
Target cancer risk (TR) - unitless	1.0E-6
Target hazard quotient (THQ) - unitless	1
Averaging time (AT) - days	365
Exposure time (ET) - hours/day	4.6
Exposure frequency (EF) - days	250
Exposure duration (ED) - years	30
Mutagenic Exposure duration (ED_{0-2}) - years	2
Mutagenic Exposure duration (ED_{2-6}) - years	4
Mutagenic Exposure duration (ED_{6-16}) - years	10
Mutagenic Exposure duration (ED_{16-30}) - years	14
Life Time (LT)	70

Output generated 19AUG2010:10:09:29

Site-specific

Resident Risk-Based Screening Levels for Ambient Air
ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca (Where nc SL < 10 x ca SL),**
max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat

Chemical	CAS Number	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Chronic RfC (mg/m^3)	RfC Ref	Carcinogenic SL TR=1.0E-6 (ug/m^3)	Noncarcinogenic SL HI=1 (ug/m^3)	Screening Level (ug/m^3)
Chromium(VI)	18540-29-9	8.4E-02	U	1.0E-04	U	8.35E-05	7.62E-01	8.35E-05 ca

Output generated 19AUG2010:10:09:29

February 24, 2011

Ms. Tammy L. Ribar, Esquire
Houston Harbaugh, P.C.
Three Gateway Center
401 Liberty Avenue, 22nd Floor
Pittsburgh, Pennsylvania 15222-1005

Dear Ms. Ribar:

Subject: Report Addendum: Air Quality Evaluation of Atmospheric Emissions from a Proposed Cremator
CEC Project 101-462.0001

1.0 INTRODUCTION

The purpose of this Report Addendum is to present additional facts and interpretations regarding atmospheric emissions from cremation of human remains. Specifically, the subject of this addendum is the human health risk of potential mercury emissions produced by cremation of human remains.

2.0 BACKGROUND

Civil & Environmental Consultants, Inc. (CEC) prepared a report entitled, *Air Quality Evaluation of Atmospheric Emissions from a Proposed Cremator* (CEC, 2010).[1] In that report, CEC stated that "Hazardous air pollutants produced by the cremator will not produce significant human health risks." CEC concluded that:

> "Based on the conservative dispersion modeling and human health exposure assumptions included in this screening-level assessment, excess cancer and non-cancer health risks were shown to be within acceptable ranges for all constituents. With a more refined analysis, it is expected that actual health risks from this facility would be found to be less than existing exposures to many constituents produced by the other similar combustion sources evaluated here."

In light of concerns regarding the potential for mercury to be emitted in cremator stack exhaust, Houston Harbaugh has requested that CEC perform and report on additional research into this issue.

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[1] CEC (2010). Air Quality Evaluation of Atmospheric Emission from a Proposed Cremator, September 2.

CEC's initial evaluation consisted of a five-phase process:

(1) Review of the proposed equipment and operating schedule;
(2) Review of available literature regarding atmospheric emissions from cremators;
(3) Comparison of cremator emission estimates to other common combustion sources;
(4) Human health screening-level risk assessment; and
(5) Regulatory evaluation.

CEC's evaluation of human health risk from inhalation exposure to mercury was based on the following:

(1) The amount of mercury released during the cremation of a single human corpse is 1.5 grams (3.3×10^{-3} pounds) and the duration of an average human cremation is two (2) hours so the average emission rate is 1.5 grams per two hours;

(2) Mercury would be exhausted at the rate of 1.5 grams every two hours (i.e., 2.1×10^{-4} grams per second) continually (24 hours per day, 365 days per year) from a 25-foot tall and 29-inch diameter stack at the temperature of 1800 °F and an exhaust flow rate of 1,857 acfm under worst-case atmospheric conditions;

(3) A resident would be located at the point of worst-case downwind ground-level concentration (100 meters from the stack) constantly for a period of 30 years where he or she would inhale 4.1×10^{-3} micrograms of mercury per cubic meter ($\mu g/m^3$) of air (i.e., the estimated maximum ground-level concentration) for 350 days each year.

(4) Significant health risk is associated with air concentrations exceeding EPA risk screen thresholds corresponding to 10^{-6} cancer risk and a hazard index ≥ 1 for non-cancer chemicals.

Based on those assumptions, CEC concluded that because the maximum exposure of mercury produced by the cremator would not exceed EPA's non-cancer risk screen threshold of 3.13×10^{-1} $\mu g/m^3$, there would be no significant health risk associated with inhalation exposure to mercury. As can be seen from the ratio of the predicted concentration (4.1×10^{-3} $\mu g/m^3$) to the EPA screening level (3.13×10^{-1} $\mu g/m^3$), the predicted exposure was estimated to be 77 times lower than the screening threshold.

The purpose of this addendum was to focus additional attention on the review of available literature relative to mercury emissions from cremators. At the time of this writing, nothing has changed about the proposed cremation technology or the regulatory environment within which the equipment would be operated so no attempt has been made to revisit those elements of the original study. In addition, no further effort has been made to compare cremator emissions to other common sources of combustion emissions.

However, if additional available literature indicated that mercury emissions from cremators similar to the proposed unit could be significantly different from the emission rates considered in the initial evaluation, it would be appropriate to determine if the initial conclusions regarding human health risk would change.

3.0 SUPPLEMENTAL LITERATURE REVIEW

A draft report entitled *Summary of References on Mercury Emissions from Crematoria* (Reindl, 2008)[2] was obtained through an internet search. The report contains data collected from around the world on atmospheric emissions of mercury from human cremation. Mr. Reindl also compiled data from around the world on mercury in soil surrounding crematoria.

In his review of atmospheric mercury emissions, Mr. Reindle cites over 15 references from the United States, the United Kingdom, Norway, Sweden, Switzerland, and Germany published between 1990 and 2006. He states that,

> "While estimates of the quantities vary significantly, it appears that each cremation releases between 2 and 4 grams, with the maximum seen by this reviewer at 8.6 grams in an individual cremation in Switzerland."

In his review of mercury in soil surrounding crematoria, Mr. Reindl, cites at least eight studies from the United Kingdom, Denmark, Switzerland, New Zealand, and Norway covering a period between 1990 and 2003. Based on that review, Mr. Reindl concludes that:

> "Most of the mercury from crematoria is released to the air, although some may collect on the walls of the oven and chimney. Soil surveys have shown that while there is often an elevation of mercury in the top soils near crematoria, most (over 99%) of the mercury emitted to the air does not settle to the soil in the nearby area, but is instead added to the general atmosphere."

Studies cited in support of his conclusion that most mercury does not settle on nearby soils included a 1990 article published in *Resurgam* that found soil concentrations that were acceptable for food production in the vicinity of the crematoria after 40 years and 112,000

[2] Reindl, John, P.E. (2008). Summary of References on Mercury Emissions from Cremation, DRAFT, November 3.