

**Landowner Curative Amendment
to Allow Use of Crematories with
Funeral Homes in the C-1, C-2 and
VNC Commercial Zoning Districts**

Applicants: Audia Group Investments, LLC
Danielle Andy Belusko & Rod Belusko

Property: 3287 Washington Road
(C-2 General Commercial District)

Council
Hearing Date: May 2, 2011 (Continued from March 21, 2011)

**SUPPLEMENTAL
EXHIBITS OF APPLICANTS
IN SUPPORT OF LANDOWNER
CURATIVE AMENDMENT
(EXHIBIT NOS. 40-47)**

**INDEX TO SUPPLEMENTAL EXHIBITS SUBMITTED TO PETERS TOWNSHIP
COUNCIL ON MAY 2, 2011 ON BEHALF OF APPLICANTS, AUDIA GROUP
INVESTMENTS, LLC AND DANIELLE ANDY BELUSKO AND ROD BELUSKO**

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PROFESSIONAL QUALIFICATIONS
OF
BRIAN P. KELLY, MAI, SRA

Occupation	Real Estate Appraiser/Consultant
Member	Appraisal Institute President of Metropolitan Pittsburgh Chapter of the Appraisal Institute MAI Designation SRA Designation Public Relations Chairman 1999-2007
Professional Licenses	General Appraiser / Pennsylvania -1994 (GA001205L) Licensed Real Estate Broker / Commonwealth of Pennsylvania - 1998
Experience	Kelly-Rielly-Nell-Barna Associates, Inc. - Partner Pittsburgh, PA 1991 - Present Real estate appraisals and consulting for residential, commercial, industrial, recreational, institutional and special purpose real estate Contributed expert witness testimony in Pennsylvania courtrooms John C. R. Kelly Realty, Inc. Pittsburgh, PA 1990 - 1991 Real estate sales and management
Graduate	Duquesne University 1988 Pittsburgh, PA B.A. - Economics
Education	Appraisal Institute/Penn State University 550 Advanced Applications SPP - Standards of Professional Practice 1A2 - Basic Valuation Procedures 1BB - Capitalization Theory & Techniques - Part B 1BA - Capitalization Theory & Techniques - Part A 520 - Highest and Best Use & Market Analysis 540 Report Writing and Valuation Analysis Residential Property Construction and Inspection Appraisal Review Residential Properties Appraiser as an Expert Witness: Preparation & Testimony

Tammy L. Ribar

From: Stanley Penkala [webmaster@skywatchweather.com]
Sent: Thursday, March 31, 2011 12:04 PM
To: Macoskey, Kris
Cc: Ed Zuk; masilvestri@peterstownship.com; wajohnson@peterstownship.com; Tammy L. Ribar
Subject: Re: Audia Group Crematory

From: Stan Penkala, Air Science Consultants, Inc.
To: Kris Macoskey, Civil & Environmental Consultants, Inc.
Date: March 31, 2011

Kris,

I have to decline your offer to discuss the air quality evaluation work which your firm is performing on behalf of the Audia Group Crematorium variance application.

This is my reasoning.

First of all, I was hired by Peters Township to provide them with an independent, third party evaluation of the technical issues dealing with the Crematorium. This included the screening modeling application and its interpretation by your firm, and also my insight into the current ambient air situation in Peters Twp and how that might change with the addition of the Crematorium source in its proposed location.

Second, I do not have any official standing in the Peters Township government, other than as a paid consultant. My reports to date and conversations I have had with township officials and with you after the last township council meeting do not have the weight of governmental authority. The reports and my comments during the Council meeting were prepared to present to the various Peters Township boards [Zoning, Planning, Council, Legal] to aid them in making decisions for Peters Township. They represent my professional interpretation of the information I reviewed [from CEC, Matthews International, public comments, PA DEP, US EPA] based on my experience in the environmental field. I do not want to put myself in the position of making suggestions to you and have your next report say something like, "Dr. Penkala said we should do this, and we did this and everything is still all right with the pollution concentrations", followed by the Audia group lawyer saying "We've satisfied all of Dr. Penkala's objections, so now we want the variance we are requesting." I'm sorry if this comes out sounding harsh, but that was the gist of what I heard during your presentation of the CEC report revisions at the Council meeting on March 21st.

Third, I didn't receive your report revisions until the morning of the Council meeting, and I did not have sufficient time to review it in its entirety prior to the meeting. What I did see indicated that you introduced new assumptions about operation of the proposed Crematorium which reduce its modeled impact, and you made changes to the US EPA comparison concentrations based on estimated crematorium operations. An analogy using speed limits would be like saying that the speed limit of 60 mph could be met by driving at 120 mph, but only for a half hour.

Fourth, I gave Peters Township an estimate of the time necessary to perform various tasks, including review of your latest report. They have directed me to put further evaluations on hold. That means that until authorized to proceed, any further work I do on the project is uncompensated. And I will not compromise my third party status by accepting compensation from your firm or the Apria Group in this

4/29/2011

matter. You already have my suggestions that better data is needed for the hazardous material emission estimates to be used in any modeling, and that a screening model might not be sufficient to demonstrate acceptable concentrations at critical receptors in the vicinity of the proposed site.

Before preparing this response, I discussed your offer with my Peters Township contacts, and I am copying this email to them, so that they are aware of my position.

In conclusion, I have nothing against installation or operation of a crematorium in Peters Township or elsewhere, so long as it conforms to the operational requirements and meets air quality objectives. A crematorium can be an inoffensive, innocuous neighbor. As it turns out, my Bridgeville office is within 2 blocks of a pet crematorium which I pass every day on my way to and from work. It has been in operation for the past 6 years, and I wasn't aware that it existed until doing some research for this project.

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

Stanley J. Penkala

Macoskey, Kris wrote:

Hello Stan,

I'm following up from the 3/21 Peters Township meeting. Would you like to meet to discuss the air quality evaluation? I think it'd be helpful to sit together so your comments can be fully addressed. You're welcome to visit me here or I'd be happy to meet at your office. If a call is better, please let me know when it'd be convenient.

Thank you,

Kris

Kristian A. Macoskey, QEP

Principal, Environmental Services

Civil & Environmental Consultants, Inc.

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Pittsburgh, PA 15205

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4/29/2011



Houston Harbaugh

ATTORNEYS AT LAW

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

File # 35537-0001

April 1, 2011

VIA FACSIMILE NO. (724) 225-1365
AND E-MAIL - wajohnsonesq@yahoo.com

William A. Johnson, Esquire
8 East Pine Avenue
Washington, PA 15301

**RE: Dr. Stanley J. Penkala, Ph.D., Q.E.P./Next Council Meeting for Landowner
Curative Amendment for Crematory**

Dear Mr. Johnson:

I am writing in response to Dr. Penkala's March 31, 2011 email, a copy of which is attached hereto. In the paragraph beginning "Fourth", Dr. Penkala indicates that he will not compromise his third party status by accepting compensation from CEC or the Applicant. I do not think Dr. Penkala intended his statement to suggest that he was offered compensation, but to a third party reading his email, the implication is there. Therefore, for the record, neither CEC or the Applicant, or my firm, or anyone affiliated with any of the foregoing, has offered any compensation to Dr. Penkala related to this matter. Please ensure that this letter and the attachments are entered as part of the record.

To explain, the reason Kris Macoskey of CEC offered to communicate directly with Dr. Penkala is because Dr. Penkala's March 9, 2011 report specifically made comments and suggestions for corrections to the modeling performed by CEC. Therefore, Mr. Macoskey was compelled to respond and was seeking clarification from Dr. Penkala in order for CEC to accurately do so.

Interestingly, and much to my and the Applicant's surprise, Dr. Penkala indicates in his email that the Township has directed Dr. Penkala to put further evaluations on hold. Given this and Dr. Penkala's conclusion in his email that "a crematorium can be an inoffensive, innocuous neighbor" and that he has no objections to the installation or operation of a crematorium in Peters Township or elsewhere, so long as it conforms to the operational requirements and meets air quality objectives", we are assuming there is no longer any reason to hold the record open from the March 21 meeting. However, I have not yet received a response from you to my email

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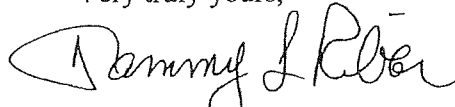
Phone 412.281.5060 • Fax 412.281.4499 • www.hh-law.com

William A. Johnson, Esquire
April 1, 2011
Page 2

dated March 30, 2011, a copy of which is attached hereto. Please contact me at your earliest convenience to discuss the procedure for closing the record and the timing of the next public meeting for Council to announce its decision.

Thank you for your attention to this matter.

Very truly yours,



Tammy L. Ribar

TLR/mb

cc: Edward J. Zuk (via e-mail - EJZuk@peterstownship.com)
Michael A. Silvestri (via e-mail - MASilvestri@peterstownship.com)
Danielle Andy Belusko (via e-mail - belusko1@comcast.net)
Jeff Ross (via e-mail - Jeff.Ross@washpenn.com)
Richard Violi, Esquire (via e-mail - violi@washpenn.com)
Mary-Jo Rebelo, Esquire (via e-mail - mrebelo@hh-law.com)
Kris Macoskey (via e-mail - kmacoskey@cecinc.com)

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Sent: Thursday, March 31, 2011 12:04 PM
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Dr. Stanley J. Penkala, Ph.D., Q.E.P.

Stanley J. Penkala

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Thank you,

Kris

Kristian A. Macoskey, QEP

Principal, Environmental Services

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Tammy L. Ribar

From: Tammy L. Ribar
Sent: Wednesday, March 30, 2011 4:10 PM
To: 'William Johnson'
Cc: Michael Silvestri; Ed Zuk; 'Danielle Andy Belusko'; Richard Violi; 'Jeff Ross'; Mary-Jo Rebelo
Subject: RE: Landowner Curative Amendment for Crematory

Mr. Johnson,

Thank you for your reply to my letter. However, I need further clarification. We did not expect a decision from Council on April 11 because Council elected to hold the record open at the end of the March 21 meeting to give Mr. Penkala time to review CEC's addendum. If the record is being left open for any other reason, please advise.

Even though Council elected to hold the record open, your email below seems to indicate that Council may unilaterally decide to close the record and issue a decision. If Council decides to close the record, that mean that Dr. Penkala will not be responding in writing to CEC's addendum. If Dr. Penkala is going to issue another written opinion or provide additional testimony in response to CEC's addendum, the record must be kept open.

In any event, we are struggling to understand why Council needs the transcript in advance of the next meeting. What will happen if the transcript is not available by April 11?

Any unnecessary delay is prejudicial to the applicant. We need to understand what Council's position is, so that we can prepare accordingly.

If the record is kept open, we request that Council schedule a special meeting, as soon as possible, adhering to the necessary advertising requirements, to conclude the testimony on this matter, so that a timely decision can be made.

Please clarify these issues. Thank you.

Tammy L. Ribar, Esquire
Houston Harbaugh

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-----Original Message-----

From: William Johnson [mailto:wajohnsonesq@yahoo.com]
Sent: Wednesday, March 30, 2011 1:44 PM
To: Tammy L. Ribar
Cc: Michael Silvestri; Ed Zuk
Subject: Landowner Curative Amendment for Crematory

Dear Ms. Ribar:

This will acknowledge receipt of your correspondence dated March 29, 2011. As you may know, Council has requested a transcript of the hearing and does expect to have it within the next two weeks. Council cannot schedule a decision on the curative amendment for its April 11, 2011 meeting, but I anticipate that it will schedule either a date for decision or the continued hearing on the amendment at its April 11th meeting. Bear in mind that we have certain advertising requirements that must be met in scheduling the hearing.

4/1/2011

William A. Johnson, Esquire

8 East Pine Avenue

Washington, PA 15301

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Evaluation of Funeral Home with Crematory Variance Request

Part 2

April, 2011

INTRODUCTION

Air Science Consultants, Inc. was hired by the Peters Township Planning Commission to evaluate information submitted to the Commission pertaining to a Funeral Home with Crematory variance request. The initial evaluation, performed by Dr. Stanley J. Penkala and presented on March 9th, 2011 discussed a report dated September 2, 2010 by Civil & Environmental Consultants, Inc. At the time our original evaluation was prepared, we were unaware that the CEC report was not based on a crematory in the proposed building with the surrounding terrain and receptors, but on a generic crematory with no specific location. In this report, information from my March 9th document will be referred to as "Part 1", for simplicity. In like manner, the original CEC report will be referred to as "CEC-1".

Based upon comments in our March report, CEC made some modifications to their modeling, revising parameters and the analysis to more closely represent the actual site and its surroundings. Their revised report [dated March 18th] did not become available to me until the morning of the last Planning Commission meeting date [March 21st], which was insufficient time for me to evaluate the parameter changes, new modeling results, and report conclusions. This evaluation ["Part 2"] is the result of a more thorough evaluation of the March 18th CEC report, here referred to as "CEC-2". Specific topics include:

- Revised Modeling Parameters
- Receptors Selected For Evaluation
- Emission Estimates Used In Modeling
- EPA Critical Concentrations As Used in the Evaluation
- Screening Model Results
- Summary Conclusions & Recommendations

REVISED MODELING PARAMETERS

Stack Gas Temperature

In Part 1, I speculated that the exit gas temperatures would be considerably lower than the 1,800°F (1,255°K) stack exit gas temperature used in the CEC-1 modeling. That is the temperature at which the Smoke-Buster™140 secondary burning chamber should be operated, but significant cooling will occur before the gases reach the top of the stack. In CEC-2, the effect of this cooling was considered, and the average of four stack tests referenced in CEC-1 resulted in reducing the exit gas temperature to 1,170°F (905°K).

Stack ID [Inside Diameter]

In Part 1, I pointed out that the manufacturer's specification for Stack ID is 20" (0.51 m), but CEC-1 modeling used 29" (0.74 m). This difference has a considerable effect on the exit gas velocity and the buoyancy of the stack gases, as it more than doubles the area of the stack. CEC-2 corrects the error.

Stack Gas Volumetric Flow Rate

This is an important parameter which incorporates exit gas temperature and velocity, and the mass of the gas flow from a process. The volumetric flow rate strongly affects how a plume reacts [rises, spreads, and disperses] once it reaches the ambient air. Another related parameter is plume "buoyancy", since heated plume gases will rise in the atmosphere until the density of the exit gases equilibrate to ambient air conditions. The resulting plume rise is critical for dispersion of stack gases. Tied into this evaluation are considerations of building-related plume downwash, as stack gases with sufficient buoyancy and exit gas velocity can escape downwash throughout a wide range of meteorological conditions.

In CEC-1, the volumetric flow rate used in modeling was 1,857 acfm @ 1,255°K. The term acfm stands for "actual cubic feet per minute". Because gases expand and contract as their temperature changes, specifying gas flows requires giving the acfm rate and the actual temperature. Alternately, the scfm [standard cubic feet per minute] and temperature could be provided. As I pointed out in Part 1, the temperature and stack ID used in CEC-1 were incorrect, so that derived parameters such as exit gas velocity and buoyancy were also incorrect.

In CEC-2, the volumetric flow rate used in the modeling became 2,000 ACFM, with the notation "Exhaust Flow Rate: 2,000 acfm (per vendor) compared to 1,857 acfm".

There are inconsistencies in these volumetric flow figures, when compared with other vendor information provided in CEC-1, along with some calculations performed using the Matthews International literature. First of all, CEC-1 used 1,857 acfm @ 1,800°F for the exit gases, and CEC-2 uses 2,000 acfm @ 1,170°F. These volumetric flow rates are not equivalent. The CEC-2 estimate of exit gas temperature comes from the average of four stack test reported previously. This temperature is believable, given a secondary chamber temperature of 1,800°F. However, there is no documentation in CEC-2 supporting the exhaust flow rate of 2,000 acfm except the notation "per vendor". Similarly, there was no documentation for the 1,857 acfm used in CEC-1. However, it is possible that the same stack tests which produced the average exit gas temperatures have volumetric flow rates and exit gas flow rates which would eliminate that uncertainty.

It would be preferable to express the gas volumes in scfm, standard cubic feet per minute, because then the volumetric flows at different points in the process could be more easily tracked as the stack gas temperatures change. For one thing, the secondary chamber gas residence time could be verified to exceed 1 second with a temperature of 1,800°F.

We note that the Matthews literature in CEC-1 states that the Air Supply [for combustion and transport] is 2,500 cfm (70.8 standard m³/min). That 2,500 scfm would become about 12,000 acfm when 3 MMBTU per hour natural gas and combustion gases from the charged weight combine to produce a temperature of 1,800°F. The same volume of gases at the stack top would be 8,650 acfm @ 1,170°F. This would be an exit gas flow rate more than four times the value used in the CEC-2 modeling. However, I believe this air supply must be considered a maximum capacity number rather than an operational number. Presumably, air is supplied into the chamber in limited quantities to support combustion

during unit warm-up, then modified as necessary to support combustion and maintain desired operating temperatures as the crematory process continues. An air flow of 2,500 scfm would increase the need for more natural gas to heat the air to 1,800°F. While this large exit gas flow rate would improve plume buoyancy and dispersion, this much gas flow would transit the secondary chamber in approximately 4/10ths of a second, rather than provide the mandated residence time of 1 second or longer.

Stack Height

In Part 1, we point out the inconsistency of a stack height of 25 ft, when the building height is 26 ft. This discrepancy was due to CEC-1 modeling a generic facility rather than the actual building. The manufacturer's recommendation is for the stack top at a minimum of 36" above the facility's roof peak, which might vary by location. In the CEC-2 modeling, 'above the roof peak' was interpreted to mean above the high point of the building parapet, making the stack height 29 ft. However, this stack height might not be adequate to avoid building downwash, and excessive concentrations might occur due to building downwash plume trapping.

Downwash Considerations

In CEC-1, no downwash calculations were performed in the Screen3 modeling, and the closest receptor was considered to be at 100 meters or further from the stack. This was a result of modeling the crematory as a generic facility not associated with any building. In CEC-2, Screen3 was run using Simple Terrain with Schulman-Scire downwash calculations, and the concentrations at essentially any distance from the stack were computed. Also, Building Cavity calculations were also performed, using the dimensions of the proposed building. The assumed location of the stack on the building roof is not specified in the modeling printout provided in CEC-2. However, the critical concentrations occurred during the Complex Terrain calculations, at a distance of only 38 meters.

RECEPTORS SELECTED FOR EVALUATION

In CEC-1, only Simple Terrain modeling using Screen3 was performed. The highest concentration was stated to occur at 328 ft [100 m], which was the nearest receptor for which concentrations were calculated. The decision to start evaluating predicted concentrations at a distance of 100 meters was questioned in Part 1, as the nearest commercial receptor is only 70 ft [21 m] away from the proposed facility, and the nearest home is 125 ft [38 m] away. The presence of significant terrain was also questioned, as the hillside rises behind the proposed funeral home building. The 100 meter distance was a default setting based on this report describing a generic facility.

In CEC-2, the concentrations were evaluated as close as 1 meter from the source. The highest Simple Terrain predicted concentration occurred at a distance of 24 meters. Building cavity concentrations were predicted to occur out to a distance of 30 to 35 meters, depending upon wind speed and direction. All of these predicted concentrations were lower than the maximum 24 hour and Annual concentration from Complex Terrain modeling. These concentrations occurred with Complex Terrain modeling at the residences to the rear of the facility, at a distance of 38 meters.

EMISSION ESTIMATES USED IN MODELING

In both CEC-1 and CEC-2, the Screen3 modeling was performed assuming a nominal emission rate of 1.0 gram per second for a generic pollutant. This procedure results in a normalized concentration, which would apply to any species emitted in the stack gases. For example, if the nominal

1.0 g/s emission rate resulted in a modeled concentration of 1,000 micrograms per cubic meter [$\mu\text{g}/\text{m}^3$], we could describe any emission species by taking its g/s rate and multiplying by 1,000 to get the equivalent $\mu\text{g}/\text{m}^3$.

To produce meaningful estimates of ambient concentrations, the modeling must start with credible estimates of emission rates of the process under evaluation. In both CEC-1 and CEC-2, the stack emission rates come from five reports provided to CEC by Matthews International, and an EPA WebFIRE HAP Emission Factor report performed in 1992. The tests vary widely in operating conditions: secondary chamber temperatures are only known for one case, charge weights are missing in two of the cases, fuel heat input rates are unknown in one test and are assumed to be 3 million BTU/hr for the most recent four cases, and only one criteria pollutant [particulate matter] was reported for all five cases. Most of the HAPS [Hazardous Air Pollutants] are only available from a single test plus the WebFIRE report.

Furthermore, the emission rates are reported as pounds per hour. Presumably, the time duration of the stack tests produce an emission rate which was used to characterize the burn, and that data is recomputed to the anticipated 2 hour cycle time for an individual cremation.

For the U.S. EPA test performed in 1999, we can't even say that the crematory tested is a model equivalent to the Matthews International Power-Pak II with Smoke Buster, as proposed for this installation. As that test was performed in 1999, it likely did not have the computer-controlled combustion process of the newer equipment.

As for the HAPS emission estimates, we don't know whether the cases included prostheses or other combustibles that could increase the emissions of some species. The same criticism applies to the EPA WebFIRE data, which dates back to 1992 and utilized propane rather than natural gas as the combustion fuel. An indication that these parameters are affected by individual test variations can be found in the high variability of species emission rates when data are available for multiple tests. For example, Cadmium emission estimates were $5.55\text{E-}06$, $2.100\text{E-}05$, and $2.425\text{E-}04$ lbs/hr in the 3 sources reporting emissions of that HAP. The modeling evaluation used the average of the two highest test results, as if the average of two values which differ by an order of magnitude is significant and representative of the cremation process.

This is very sketchy information on which to evaluate any source. Whether a particular modeled concentration turns out to be lower or higher than the comparable screening concentration, we won't know if that is because there is a real problem or because the assumed emission rate is erroneous.

The CEC-1 and CEC-2 reports both start from the same emission data, based on a typical 2-hour cremation and the estimate of lbs/hr emissions during that event. In CEC-1 the pound per body emission rates are converted to grams per second emitted during the 2-hour cremation event. That value is then converted to a maximum hourly concentration using the results from the normalized modeling results for comparison with the EPA Risk Screen numbers. However, in CEC-2 the lb/body emission rates are converted to grams per second emitted on an annual average basis. The additional assumption inserted into the calculation is that there will be a maximum production rate of 575 bodies cremated per year. This production rate is the annual number of cremations projected for the average of all Pennsylvania human crematories in 2015.

This change in the calculation means that the computed concentration is no longer the maximum hourly concentration anticipated from the facility, but an annual average concentration

predicated on processing during only 1,150 hours during the year. There is, however, no limitation in a Pennsylvania General Operating Permit that restricts a facility to operations at this reduced level.

EPA CRITICAL CONCENTRATIONS AS USED IN THE EVALUATION

The EPA screening concentrations which were presented in CEC-1 were developed using an assumption of 24 hr per day, 250 days per year exposures to the species. In CEC-1, all species except Chromium VI were found to have maximum hourly concentrations under their respective screening level. By incorporating the anticipated operating schedule of 1,150 hours per year, rather than full time, the comparison screening threshold for Chromium VI was increased from 1.14E-05 to 8.35E-05. At the increased level, the predicted maximum hourly Chromium VI concentration of 1.67E-5 went from being 1.5 times higher than the threshold to about 20% of the threshold. In this manner, all of the HAPS species in CEC-1 were projected to be less than the EPA Risk Screen levels.

In CEC-2, the crematorium-related concentrations of all of the HAPS were higher than in the CEC-1 report, because the normalized concentrations from the modeling were higher due to terrain and downwash considerations. This is undoubtedly the reason that the Risk Screening Summary in Table 7 of CEC-2 incorporated a reduced operational schedule [1,150 hours per year rather than 8,760 hours] into the crematorium-related Maximum Concentration estimates. The critical normalized concentrations increased by a factor of 7.965, from 19.68 $\mu\text{g}/\text{m}^3$ to 156.76 $\mu\text{g}/\text{m}^3$ for each gram per second of emissions. This increase was nearly eliminated by applying the production hour factor [1,150 hrs divided by 8,760 hours = 0.131]. The net effect of applying both factors is a modest increase of only 9% in the Maximum Concentrations of CEC-2, compared to the data in Table 7 of CEC-1.

However, CEC-2 still has a significant problem with Chromium VI concentrations. The operating hour factor was invoked in CEC-1 to INCREASE the EPA Risk Screen concentration of Chromium VI for comparison with a true maximum hourly concentration for that species. The same procedure cannot be used in CEC-2 to get the Chromium VI concentration below the EPA Risk Screen concentration. That's because the operating hour factor was already used to modify the Maximum Concentrations for ALL HAPS in Table 7, including Chromium VI. This is a significant error in Table 7 of CEC-2. The EPA Risk Screen concentration for Chromium VI should be 1.14E-05, for comparison with the Maximum Concentration estimate of 1.76E-05. Chromium VI does not pass the screening process, even after invoking the reduced operating hour factor.

We note that both CEC-1 and CEC-2 utilize the projected average operating rate of 1,150 hours to reduce estimated maximum concentrations and/or increase the EPA Risk Screen concentration used in the comparison. This invocation of actual operating conditions to meet a comparison standard is not a valid procedure when applying the screening procedure. Taken to the extreme, any process could achieve any concentration criteria if allowed to arbitrarily claim that the process will only operate "x" hours per year. There will be instances when a short-term, high concentration exposure will cause significant health effects, while an equivalent dosage, spread across a longer time frame, will not. When a questionable situation arises, it might require more refined modeling.

SUMMARY CONCLUSIONS & RECOMMENDATIONS

1. The CEC-2 report does a credible job of applying the Screen3 process to the proposed crematory facility, in that it considers simple terrain, building cavity downwash, and complex terrain.

2. Estimated exit gas flow rate in CEC-2 needs better documentation than "per vendor", perhaps by reference to acfm values from the four stack tests used to estimate the exit gas temperature.

3. CEC-2 demonstrates that the PA DEP requirements for Particulate and SO₂ emission rates ought to be met by the proposed installation.

4. CEC-2 does not demonstrate that all of the HAPS species pass the EPA Risk Concentration Screen. Specifically, Chromium VI is the only species that does not pass.

5. More consistent estimates of HAPS emission rates are needed, as measured from crematorium facilities of the type proposed for installation. Additional data might document Chromium VI emission estimates with acceptably low levels to pass the screening tests.

6. The Screening should compare Maximum Hourly Concentrations against EPA Risk Screen concentrations without recourse to estimated actual hours of operation.

7. If the proposed installation cannot meet the Risk Screening criteria using Screen3 or another EPA-approved screening model, demonstration of acceptable concentrations might require recourse to refined modeling that more closely represents the site meteorology and dispersion conditions.

Prepared at request of the Peters Township Planning Commission
April 21, 2011

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Tammy L. Ribar

From: Stanley Penkala [webmaster@skywatchweather.com]
Sent: Thursday, April 21, 2011 8:04 PM
To: Tammy L. Ribar; Ed Zuk; Macoskey, Kris; Silvestri, Michael A.
Subject: Evaluation of latest CEC report for May 2nd Planning Meeting



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ation-Part 2.... webmaster.vcf
(405 B)

8:05 pm, April 21, 2011

Re: Evaluation of latest CEC report for May 2nd Planning Meeting

Attached is the Report I promised to send you.

Stan Penkala
Air Science Consultants, Inc.

Air pollution—The presence in the outdoor atmosphere of any form of contaminant, including, but not limited to, the discharging from stacks, chimneys, openings, buildings, structures, open fires, vehicles, processes or any other source of any smoke, soot, fly ash, dust, cinders, dirt, noxious or obnoxious acids, fumes, oxides, gases, vapors, odors, toxic, hazardous or radioactive substances, waste or other matter in a place, manner or concentration inimical or which may be inimical to public health, safety or welfare or which is or may be injurious to human, plant or animal life or to property or which unreasonably interferes with the comfortable enjoyment of life or property.

BACT—Best available control technology—An emissions limitation (including a visible emissions standard) based on the maximum degree of reduction for each regulated NSR pollutant which would be emitted from any proposed major facility or major modification which the Department, on a case-by-case basis, taking into account energy, environmental and economic impacts and other costs, determines is achievable for the facility or modification through application of production processes or available methods, systems and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of the pollutant. The application of BACT may not result in emissions of a pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Part 60 or 61. If the Department determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. The standard must, to the degree possible, set forth the emissions reduction achievable by implementation of the design, equipment, work practice or operation, and provide for compliance by means which achieve equivalent results.

THE MYTH OF 10^{-6} AS A DEFINITION OF ACCEPTABLE RISK

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*Updated From a Paper
Originally Presented at the
84th Annual Meeting
Air & Waste Management Association
Vancouver, B.C., Canada
16-21 June 1991*

ABSTRACT

The concept of 10^{-6} (or one-in-a-million risk of developing cancer) has had a major economic effect in environmental hazard mitigation and pollution control. For example, in hazardous waste site cleanups, 10^{-6} is a common standard adopted by many authorities and countries as a designation of "acceptable" risk. This paper discusses the origins of 10^{-6} as a standard of "acceptable risk" and its widespread use today. The article concludes that despite its widespread use: no agencies we contacted could provide documentation on the origins of 10^{-6} ; its origin was determined to be a completely arbitrary figure adopted by the FDA as an "essentially zero" level of risk for residues of animal drugs; there was virtually no public debate on the appropriateness of this level despite requests by the FDA; this legislation stated that 10^{-6} was specifically not intended to be used as a definition of acceptable risk; 10^{-6} is almost exclusively applied to contaminants perceived to be of great risk (hazardous waste sites, pesticides); and 10^{-6} as a single criterion of "acceptable risk" is not and has never been in any EPA legislation or guidance documents. In light of the billions of dollars that have been spent or committed to reaching this goal, it would seem appropriate to revisit the scientific, social, and economic basis of 10^{-6} as a criterion of "acceptable" risk.

INTRODUCTION

It is difficult to imagine a criterion in wider use in U.S. environmental legislation than 10^{-6} . This number guides the use of pesticides and food additives; it defines our allowable exposure to groundwater contamination and incinerators. It is the most influential determinant we have in deciding what emissions should be allowed from stacks, how a hazardous waste site should be cleaned up, and how much Alar to leave on apples.

In the context of human health risks, 10^{-6} is a shorthand description for an increased lifetime chance of 0.000001 in 1 (or one chance in a million) of developing cancer due to lifetime exposure to a substance. The number 10^{-5} represents 1 chance in 100,000, and so on. Lifetime exposure to a substance associated

with a risk of 10^{-6} would increase our current chances of developing cancer from all causes (which are 1 in 3, or 3.33×10^{-1}) by a mere 0.0003%.

The risk of developing cancer associated with background levels of exposure to environmental contaminants is estimated at 10^{-3} to 10^{-2} .¹ The vast majority of our exposure to carcinogens is thought to be due to those that occur naturally in our foods.² The risk level 10^{-6} is less than our current risk of background exposure to environmental contaminants or developing cancer from all causes by a factor of 1,000 to 100,000. As 10^{-6} is an upper-bound estimate of risk, not an absolute or average value, the relative difference may actually be much greater.

The past, present, and future costs of achieving compliance with such a stringent criterion are virtually incalculable; certainly many billions of dollars have been spent in attempting to achieve this goal for cleanups at hazardous waste sites in the U.S. As a result, the origins of 10^{-6} is of considerable social, scientific, and economic interest.

This paper reveals that there is apparently no sound scientific, social, economic, or other basis for the selection of 10^{-6} as a cleanup goal for hazardous waste sites. Remarkably, this criterion, which has cost society billions of dollars, has never received widespread debate or even thorough regulatory or scientific review. It is an arbitrary level proposed 30 years ago for completely different regulations (animal drug residues), the circumstances of which do not apply to hazardous waste site regulation. As a result, implementing it consistently has frequently been socially, politically, technically, and economically unfeasible. Although the benefits of 10^{-6} generally have not been shown to outweigh the significant costs of attaining this goal, many federal and state cleanup guidelines still advocate or require the use of 10^{-6} .

Under these circumstances, communicating the meaning of 10^{-6} and the definition of "acceptable risk" poses considerable challenges to those responsible for explaining risk. The origin of 10^{-6} relative to its use as a criterion of "acceptable risk" is explored below.

THE SURPRISING ORIGINS OF 10^{-6}

In 1991, we conducted an extensive review to determine the origin of 10^{-6} as a criterion of "acceptable risk." We began with an informal telephone survey of affected agencies and an extensive literature search. The conclusions of this survey include the following:

1. *None of the officials contacted at any federal or state agency currently using 10^{-6} as a criterion knew the basis of this criterion, nor is there any readily available documentation that specifically describes the origin of 10^{-6} .*

The extensive literature search included numerous toxicological, medical, regulatory, pollution, environmental, and governmental databases that were queried back to the origin of each database (usually the mid-1970s). Not finding any written documentation, the authors began calling a "Who's Who" of the environmental industry. The contacts included the following:

- The White House
- The U.S. Environmental Protection Agency (EPA)
- The EPA's Science Advisory Board
- The EPA's Risk Assessment Forum
- The U.S. Food and Drug Administration (FDA)
- The U.S. Department of Agriculture

- The U.S. Conference of Mayors
- Oak Ridge National Laboratories
- The Congressional Office of Technology Assessment
- The Natural Resources Defense Council
- Citizen's Clearinghouse for Hazardous Waste
- Greenpeace
- Two former EPA Administrators
- A former state environmental commissioner
- Rockefeller University
- Environmental divisions of major law firms
- Staff members of several Congressmen
- And many other contacts in government and industry.

Despite widespread use of this criterion, none of the agencies could cite the source of 10^{-6} , although there was almost universal surprise that the origin of 10^{-6} was not readily available. We were offered many good theories, but no written documentation. A sample of the responses:

- "My mind is a complete blank."
- "My, what an interesting question!"
- "I think it came from pesticides legislation or the Delaney Clause."
- "It came from the FDA in the 1950s."
- "It was derived from the Virtually Safe Dose used in the Safe Drinking Water Act."
- "It's an economic criterion."
- "It's based on the chance of being hit by lightning, which is one in a million."
- "I just assumed it was because one-in-a-million sounded like such a nice phrase."
- "It was selected because it was 'doable.' Or at least that's what we thought at the time."
- "It was a purely political decision made by several of the major agencies behind closed doors in the 1970s. I doubt very much you'll get anyone to talk to you about it."
- And our favorite, "You really shouldn't be asking these questions" (this from one of the federal agencies).

2. *The concept of 10^{-6} was originally an arbitrary number, finalized by the U.S. Food and Drug Administration 14 years ago as a screening level of "essentially zero" or de minimus risk. This concept was traced back to a 1961 proposal by two scientists from the National Cancer Institute (NCI) regarding methods to determine "safety" levels in carcinogenicity testing.*

The proposal for *de minimus* risk was contained in a 1973 notice in the Federal Register entitled "Compounds Used in Food-Processing Animals: Procedures for Determining Acceptability of Assay Methods Used for Assuring the Absence of Residues in Edible Products of Such Animals," commonly called the "Sensitivity of Method" regulations.³ The term *de minimus* is an abbreviation of the legal concept, "*de minimus non curat lex*: the law does not concern itself with trifles." In other words, 10^{-6} was developed as a level of risk below which was considered a "trifle" and not of regulatory concern.

The purpose of these proposed rules was to set forth guidelines for assay methods for carcinogenic animal drugs "which may be administered to food-producing animals, but for which no residue is permitted in human food" under the Delaney Clause of 1958. The rules were specifically prompted by the use of diethylstilbestrol (DES) as a growth promoter in cattle.

In adopting a threshold of safety, the FDA referred to a 1961 article by Nathan Mantel and Ray Bryan, originators of the well-known Mantel-Bryan equation, on the subject of safety testing in animal studies. Mantel, a biostatistician at the National Cancer Institute, had been asked by the Director of the institute to develop guidelines for the number of laboratory animals required to establish the safety of a substance. This in turn was in response to a request made after the Thanksgiving cranberry scare of 1959 by the Secretary of the Department of Health, Education and Welfare (HEW) to the NCI. (Trace residues of a cancer-causing herbicide were found in supplies of cranberries shortly before the holiday, prompting the Secretary to recommend against buying cranberries that year. This in turn set off a mild panic which nearly devastated the cranberry industry.) HEW wanted NCI to help establish which cancer-causing substances were "safe" and at what levels.

In their 1961 article, Mantel and Bryan reasonably pointed out that to define the parameters of safety testing, one must first come up with a definition of safety. For the purposes of discussion, they said, we'll assume "safe" is equal to 1 chance in 100,000,000 of developing cancer. Asked how he chose the number of one in one hundred million, Mantel replied, "We just pulled it out of a hat." After all, defining "safe" was not the focus of their article. But this is the ultimate origin of 10^{-6} .

FDA initially adopted this "1 in 100,000,000" in their 1973 notice in the Federal Register, but changed this value to 1 in 1,000,000 by the time the final rule was issued in 1977. "One in one million" was thus established as the "maximum lifetime risk that is essentially zero," or the level below which no further regulatory consideration would be given regarding the safety of residues of a carcinogenic animal drug. Only two comments were received on these proposed rules, despite a specific request from the FDA Commissioner for public comment on the setting of one-in-a-million risk as a threshold of "essentially zero" risk.

3. *In the FDA legislation, the regulators specifically stated that this level of "essentially zero" was not to be interpreted as equal to an acceptable level of residues in meat products.⁴*

Nevertheless, many current regulations and guidance documents have done exactly that: interpreted this "essentially zero" level developed by the FDA, a level below which there would be no regulatory consideration given regarding safety, as a maximum "acceptable" level of risk.

An analogy to automobiles is that if we could not measure when a car were standing completely still, the FDA might consider one mile per hour a "virtually safe" rate of speed. Below this rate either speed is unmeasurable, or the costs of such measurements outweigh the benefits of the information gained.

In a sense, this criterion of one mile per hour has been misinterpreted to be a maximum "acceptable" rate of speed for driving a car on the highway without risk of dying in a car crash. The former is a *screening* level below which no regulatory consideration would be given to risks; the latter is a *safety* decision that takes into account cost-benefit considerations of highway safety, the road conditions, type and weight of automobile, etc.

Cleaning up all hazardous waste sites to a 10^{-6} level of "essentially zero" risk is therefore comparable to limiting highway traffic to 1 mph. The cost-benefit tradeoffs need to be evaluated more carefully in selecting a final cleanup number, using 10^{-6} as a starting point instead of a goal.

HOW IS 10^{-6} USED?

A review of the evolution of 10^{-6} reveals that *perception* of risk is a major determinant of the circumstances under which this criterion is used.

1. *The risk level 10^{-6} is not consistently applied to all environmental legislation. Rather, it seems to be applied according to the general perception of the risk associated with the source being regulated. Specifically, 10^{-6} has been applied almost exclusively to hazardous waste sites, pesticides, and selected carcinogens, but not to air, drinking water, or other sources perceived to be of less risk.*

Cleanup levels for a given contaminant are not consistent from site to site and vary by orders of magnitude. From these past site cleanup decisions, we can see that "acceptable" is not a set value; the threshold of "acceptability" varies among countries, among states, and among different cities of the same state. Furthermore, the lack of consistent quality among risk assessments has resulted in widely differing cleanup levels at similar sites, all of which are claimed to have been cleaned up to 10^{-6} .

Less well known are the extreme differences even among various divisions of the same agency for the same substance. For example, there are six orders of magnitude (one million-fold) difference in target risk within different EPA regulations for arsenic.⁵ The differences may be partly due to the *perception* of risk associated with the particular regulatory decision: the greater the perceived risk, the narrower the gap between "essentially zero" and what the public will allow as "acceptable risk." As a result, some sources that actually pose a higher risk to society, such as automobile emissions, are regulated less stringently simply because they are *perceived* to pose less risk than such sources as hazardous waste management facilities, whether or not the data support that assumption.

2. *Although it has been in widespread use for hazardous waste sites for many years, the concept of 10^{-6} as a criterion of acceptable risk has never been mandated in any EPA regulations. In fact, the target range of 10^{-6} to 10^{-4} as a range of "generally acceptable risk" was not actually codified into EPA Superfund legislation until 1990 with the passage of the revised National Contingency Plan (NCP).*

How did the misconception arise that 10^{-6} was a legislative requirement? As the concept of risk assessment was broadened over two decades from carcinogenic animal drugs at the FDA to a host of other decisions and agencies (including food, water, air, hazardous waste, and others), the 10^{-6} concept was carried along as well. In the opinion of a former FDA counsel, the concept of 10^{-6} was repeated so often that it took on the stature of a firm regulatory policy, although the record clearly indicates otherwise. The original intent of 10^{-6} as a screening level was lost, and still is not recognized today.

No reference to 10^{-6} as a criterion for "acceptable risk" could be found in any published EPA regulation or guidelines. The guidance published in 1984 by the Office of Science and Technology Policy⁶ made no mention whatsoever of any target risk with which to compare results of health risk assessments, nor did EPA's proposed or final Guidelines for Carcinogenic Risk Assessment.^{7,8}

The first use of "acceptable risk" in any environmental guidance appears to have been a part of the Superfund Public Health Evaluation Manual, issued in 1986 and now superseded by the 1990 National Contingency Plan.⁹ The original Superfund guidelines stated: "... remedies considered should reduce ambient chemical concentrations to levels associated with a carcinogenic risk range of 10^{-4} to 10^{-7} ." This range was modified to 10^{-4} to 10^{-6} in the final NCP.

3. *In codifying 10^{-6} for the first time in hazardous waste site rules, the National Contingency Plan specifically designates 10^{-6} as a starting point for discussion of acceptable target risk at a site or as a "point of departure," not the ultimate goal.⁹ This designation is consistent with the original intent of the use of 10^{-6} as a level below which regulatory consideration was not warranted, i.e., as a starting point for discussion.*

The plan specifically states that 10^{-6} should not be presumed to be the final target risk for hazardous waste sites, but instead a "point of departure" for deciding an appropriate target level. Levels of 10^{-6} to 10^{-4} are given as a range of "generally acceptable risk," with the option that even 10^{-4} may be exceeded in some circumstances.

Because no two sites are alike, the NCP guidance then lists several site-specific or remedy-specific factors that can be used to assist in the selection of a final risk level. This approach is consistent with EPA's requirement to develop protective strategies for hazardous waste sites, not eliminate risk.

4. *A single value of "acceptable risk" has never been used in EPA hazardous waste site regulation -- only a range of values.*

In an analysis of the final NCP by one of the EPA attorneys who drafted the rule, the attorney states:

"The use of a *range* of acceptable risk is general practice for most government programs...[It] affords the Agency the flexibility to take into account different situations, different kinds of threats, and different kinds of technical remedies. If a single risk level had been adopted (e.g., at the more stringent end of the risk range), fewer alternatives would be expected to pass the protectiveness threshold and qualify for consideration in the balancing phase of the remedy selection process."¹⁰

The use of 10^{-6} as a definition of acceptable risk thus has no scientific or regulatory basis. Its use appears to be arbitrary and generally applied where risks are perceived to be high relative to other risks, regardless of the available data.

SO WHAT IS AN ACCEPTABLE LEVEL OF RISK?

Much has been written about determining the acceptability of risk. The general consensus in the literature is that "acceptability" of a risk is a judgment decision properly made by those exposed to the hazard or their designated health officials. It is not a scientifically derived value or a decision made by outsiders to the process. Acceptability is based on many factors, such as the number of people exposed, the consequences of the risk, the degree of control over exposure, and 40 or so other factors. The degree of risk acceptable at hazardous waste sites has never been formally quantified, but it does vary with each site, and the public tolerates a very low threshold of acceptable risk at hazardous waste sites in part because hazardous waste ranks very high with many of these factors.

Travis *et al.* attempted to answer the question of what is acceptable risk indirectly by quantifying the risk levels associated with 132 federal regulatory decisions, and thus determine a *de facto* level of acceptable risk.⁵ If a consistent threshold of risk could be shown in other federal health and safety decisions, that threshold could provide guidance for comparable protection at hazardous waste sites. From this effort, they rather convincingly concluded that the *de facto* level of acceptable risk in federal regulatory decisions is approximately 10^{-4} .

This level, which is 100 times greater than 10^{-6} , is likely due to several factors. Chief among those reasons is that *perception* of risk may largely drive the regulatory decision on what constitutes the level of "acceptable" risk. This notion is supported by findings of the U.S. EPA Science Advisory Board (SAB).¹¹ The SAB ranks hazardous waste near the bottom of its list of actual risks to the public but near the top of the agency's priorities, which in turn are dictated by public perceptions and Congressional funding. In response to these findings, former U.S. EPA Administrator Reilly undertook a major reorganization of the EPA to refocus its efforts on the major sources of actual risk and their reduction, apparently without success.¹²

A second reason 10^{-6} has probably been so widely applied to hazardous waste sites is that unlike decisions about air contamination, pesticides, and other agency reviews made at the federal level, hazardous waste site cleanup decisions are made on a very local and site-specific basis. What seems "doable" at the local level, such as spending a million dollars for cleaning up a site in return for virtual elimination of risk, often does not seem "doable" on a larger scale — thousands of sites at perhaps several million dollars per site to reduce risk to levels well below those considered "acceptable" by other public health standards. Indeed, current estimates for cleaning up all currently designated U.S. hazardous waste sites range up to one trillion dollars.

What does this mean for current and pending state environmental policy? One possible outcome is that agencies will begin to adopt policies such as that established by the New Jersey Department of Environmental Protection, Division of Environmental Quality (DEQ), in their guidance for risk assessments for municipal solid waste incineration facilities. This policy quite succinctly states:

"Incremental risks from a new source which are less than one in a million are considered by the DEQ to be negligible. Incremental risks greater than one in ten thousand are deemed unacceptable. Risks between these two limits are judged on a case-by-case basis."¹³

SUMMARY AND CONCLUSIONS

It has been over two decades since the FDA introduced the concept of risk assessment in its efforts to deal with DES as a growth promoter in cattle. As part of this effort, the threshold of one-in-a-million risk of developing cancer was established as a screening level to determine what carcinogenic animal drug residues merited further regulatory consideration.

Since then, the use of risk assessment and 10^{-6} (or variations thereof) have been greatly expanded to almost all areas of chemical regulation, to the point where today clearly one-in-a-million risk means different things to different agencies. What the FDA intended to be a *lower* regulatory level of "zero risk" below which no consideration would be given as to risk to human health, many federal and state agency decisions somehow came to consider a *maximum* or *target* level of "acceptable" risk.

As 10^{-6} seemed like a reasonably conservative level (or "doable," according to many), it was adopted first for a few chemicals and exposure pathways, then more chemicals and exposure pathways, and so forth. Not until the rule came into widespread use -- or until everyone was limited to one mile per hour on the freeway, so to speak, and it was costing billions of dollars to eliminate risk -- did it become readily apparent that the "zero risk" screening criterion was not intended to be interpreted as "acceptable risk." Accordingly, the benefits of the 10^{-6} criterion applied to hazardous waste sites will rarely exceed the risks and costs, and the criterion is thus unsuitable for regular implementation or enforcement.

Furthermore, 10^{-6} as a criterion for "acceptable risk" has not been applied to other sources of exposure that pose considerably more risk to public health than hazardous waste, such as automobile emissions,

radon, or sources of benzene. The primary reason for the inconsistent application of this criterion appears to be that public perception of risk has driven the regulatory management of these sites to a greater degree than supported by the actual data. Reorganizing the EPA's priorities towards issues of actual rather than perceived risk was a major goal of former EPA Administrator Reilly.

Lack of a sound basis for extrapolating the use of 10^{-6} from its very specific origins to a wide variety of other non-related applications partly explains the extreme difficulty agencies have had in implementing 10^{-6} as a goal. Such extrapolations face costs and benefits that are often not in balance (e.g., the Office of Management and Budget's unwillingness to approve proposed hazardous waste incineration rules because of EPA's inability to fully account for and justify the costs of implementing these rules -- i.e., \$288 million dollars per case of cancer avoided).¹⁴

The discovery of a lack of a sound basis for the choice of 10^{-6} offers opportunities for introducing health-based considerations into the discussion of how to clean up hazardous waste sites, particularly when so many sites demand attention for cleanup and funds are limited. This is particularly urgent considering the Agency for Toxic Substances and Disease Registry announced in 1990 that only 11.5% of all Superfund sites pose an actual or current risk to human health or the environment.¹⁵ Revisiting the issue of 10^{-6} as a Holy Grail that is frequently sought but rarely found allows us the opportunity to create cleanup criteria with a more scientific basis, rather than to present a continued obstacle to further informed decision-making regarding important health and environmental matters. Efforts by the 104th Congress to implement just such risk reform legislation, which would require the agencies to demonstrate the costs of proposed regulations were commensurate with their benefits, were ultimately unsuccessful.¹⁶

The solution to developing better criteria for environmental contaminants is not to adopt arbitrary thresholds of "acceptable risk" in an attempt to manage the public's perception of risk, or develop oversimplified tools for enforcement or risk assessment. Rather, the solution is to standardize the *process* by which risks are assessed, and to undertake efforts to narrow the gap between the public's understanding of actual vs. perceived risk. A more educated public with regard to the actual sources of known risks to health, environmental or otherwise, will greatly facilitate the regulatory agencies' ability to prioritize their efforts and standards to reduce overall risks to public health.

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Table 7
Risk Screening Summary
Audia Group Peters Township Cremator

Pollutant	Emission Factor (lb/body)	Emission Rate		Max Conc. ^(b) (µg/m ³)	EPA Risk Screen ^(c) (µg/m ³)	Exceeds? Screen? (yes/no)	Safety Factor ^(d)
		(lb/hr)	(g/s) ^(a)				
Arsenic	3.00E-05	1.50E-05	1.89E-06	2.27E-04	5.66E-04	no	2
Barium	2.40E-05	1.20E-05	1.51E-06	1.82E-04	5.21E-01	no	2,867
Beryllium	1.40E-06	7.00E-07	8.82E-08	1.06E-05	1.01E-03	no	95
Chromium, (VI)	1.35E-05	6.75E-06	8.51E-07	1.02E-04	1.14E-05	YES	0.11
Cobalt	1.75E-06	8.75E-07	1.10E-07	1.33E-05	2.70E-04	no	20
Hydrogen chloride	7.20E-02	3.60E-02	4.54E-03	5.45E-01	2.09E+01	no	38
Hydrogen fluoride	6.55E-04	3.28E-04	4.13E-05	4.96E-03	1.46E+01	no	2,944
Mercury	3.29E-03	1.65E-03	2.07E-04	2.49E-02	3.13E-01	no	13
Nickel	3.82E-05	1.91E-05	2.41E-06	2.89E-04	1.04E-01	no	360
Selenium	4.36E-05	2.18E-05	2.75E-06	3.30E-04	2.09E+01	no	63,302
Vanadium	5.79E-05	2.90E-05	3.65E-06	4.38E-04	1.04E-01	no	237
Total Dioxin/Furan	1.40E-09	7.00E-10	8.82E-11	1.06E-08	1.87E-06	no	176
PAH (benzo(a)pyrene equivalents)	4.90E-08	2.45E-08	3.09E-09	3.71E-07	8.73E-04	no	2,353

(a) Emission rates are based on continuous operation of the cremator 8,760 hours per year (estimated 4,380 cremations per year or 12 per day, 365 days per day). This assumes a 2-hour cycle time with no time for cool down or clean out prior to the next cremation. No allowance for shutdowns due to maintenance, holiday, or vacation. This is a worst-case and very conservative (unrealistic) assumption, but all parameters meet this criteria except CrVI.

(b) Derived from maximum 24-hr ground-level concentration of 300.6 ug/m³ at 45 meters adjusted for an annual average (multiplied times 0.4 = 120.2 ug/m³) downwind of source with ground-level receptor at 11-meter elevation.

Receptor Location (Sussex Way Residence): Distance (38 m from building exterior), elevation (11 m)

Additional 7 meters (23 feet) from stack is attributed to the actual stack position within the building (45 m - 38 m = 7 m)

Stack Height: 29 feet (8.83 m) compared to 26 feet (CEC-1)

Stack Inside Diameter: 20 inches (0.51 m) compared to 29 inches (CEC-1)

Stack Exhaust Temperature: 977 F (798 K) compared to 1800 F (CEC-1) and 1,170 F (CEC-2)

Exhaust Flow Rate: 2,266 (per August 2010 stack test on Power-Pak II) compared to 2,000 acfm (CEC-2) and 1,857 acfm (CEC-1)

Emission Rate: 1.0 g/s (unit basis)

Building Dimensions: 26 feet tall 7.925 m

120 feet wide minimum horizontal dimension = 36.6 m

125 feet long max horizontal dimension is the diagonal = 173 ft (52.8 m)

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

(d) Number the maximum concentration must be multiplied by to equal the EPA risk screen concentration.

Additional modeling on Chromium VI to determine acceptable operating conditions and stack height/location^(g):

Modeling Case	Emission Factor (lb/body)	Emission Rate ^(e)		Max Conc. ^(f) (µg/m ³)	EPA Risk Screen ^(c) (µg/m ³)	Exceeds? Screen? (yes/no)	Safety Factor ^(d)
		(lb/hr)	(g/s)				
Case 4 (44-ft stack at proposed location [45m])	1.35E-05	8.86E-07	1.12E-07	1.18E-05	1.14E-05	YES	0.97
Case 5 (47-ft stack at proposed location [45m])	1.35E-05	8.86E-07	1.12E-07	1.03E-05	1.14E-05	no	1.11
Case 6 (44-ft stack at mid-bldg location [51m])	1.35E-05	8.86E-07	1.12E-07	9.83E-06	1.14E-05	no	1.16
Case 7 (41-ft stack at mid-bldg location [51m])	1.35E-05	8.86E-07	1.12E-07	1.10E-05	1.14E-05	no	1.03
Case 8 (29-ft stack at front of building [76m])	1.35E-05	8.86E-07	1.12E-07	7.41E-06	1.14E-05	no	1.54
Case 9 (29-ft stack at mid-bldg [57m] location)	1.35E-05	8.86E-07	1.12E-07	1.05E-05	1.14E-05	no	1.09
Case 10 (29-ft stack at mid-bldg [53m] location)	1.35E-05	8.86E-07	1.12E-07	1.14E-05	1.14E-05	no	1.00
Case 11 (39-ft stack at original [38m] location)	1.35E-05	8.86E-07	1.12E-07	1.84E-05	1.14E-05	YES	0.62

(e) Emission rates for the Chromium VI evaluation are based on the "lb/body" emission factor and a maximum production rate of 575 cremations per year.

(f) Maximum ground-level concentration based on SCREEN3 model output for closest residence after correction for actual emission rate. Unit based annual average concentrations ug/m3 (g/s)⁻¹ are as follow:

Case 4:	105.7 ug/m3 (g/s) ⁻¹
Case 5:	92.06 ug/m3 (g/s) ⁻¹
Case 6:	88.05 ug/m3 (g/s) ⁻¹
Case 7:	98.89 ug/m3 (g/s) ⁻¹
Case 8:	66.4 ug/m3 (g/s) ⁻¹
Case 9:	93.8 ug/m3 (g/s) ⁻¹
Case 10:	102.0 ug/m3 (g/s) ⁻¹
Case 11:	164.7 ug/m3 (g/s) ⁻¹

(g) The chromium VI (CrVI) emission rate is from a 1992 study that included wrapping materials consisting of 4 lbs of cardboard and 2 lbs of wood.